EXHIBIT K

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

ContentGuard Holdings, Inc., Plaintiff, -against- Amazon.com, Inc.; Apple Inc.; BlackBerry Limited (fka Research In Motion Limited) and BlackBerry Corporation (fka Research In Motion Corporation); DirecTV, LLC; HTC Corporation and HTC America, Inc.; Huawei Technologies Co., Ltd. and Huawei Device USA, Inc.; Motorola Mobility LLC; Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Samsung Telecommunications America, LLC. Defendants.	§	Civil Action No. 2:13-cv-01112-JRG JURY TRIAL DEMANDED
ContentGuard Holdings, Inc., Plaintiff, -against- Google, Inc. Defendant.	§	Civil Action No. 2:14-cv-00061-JRG JURY TRIAL DEMANDED

DECLARATION OF DR. MICHAEL GOODRICH IN SUPPORT OF CONTENTGUARD'S OPENING CLAIM CONSTRUCTION BRIEF

1. I have been retained on behalf of Plaintiff ContentGuard Holdings, Inc. ("ContentGuard") to provide expert opinions in connection with this case. I am being compensated at a rate of $400 per hour for my work on this matter. My compensation is not dependent upon my opinions, testimony, or the outcome of this case.

2. I am a Chancellor's Professor in the Department of Computer Sciences at the University of California at Irvine. A Chancellor's Professor is a title bestowed to at most 3 percent of U.C. Irvine's entire faculty who have "demonstrated unusual academic merit and whose continued promise for scholarly achievement is unusually high." (See http://www.evc.uci.edu/DistProf/chan_prof.asp.)

3. I obtained a Ph.D. in Computer Sciences from Purdue University in 1987. Shortly thereafter, I joined the faculty of the Department of Computer Science at John Hopkins University in July of 1987 as an Assistant Professor. At John Hopkins University, I was promoted to Associate Professor in July of 1992 and to Professor in July of 1996. In July of 2001, I joined the faculty of the Department of Computer Science at U.C. Irvine as a Professor. I became a Chancellor's Professor in April of 2007.

4. I have authored or coauthored over 300 peer-reviewed publications in Computer Science. I have also coauthored several books, including *Introduction to Computer Security* (2011), *Data Structures and Algorithms in Java* (1st to 5th editions, 1998, 2001, 2004, 2006, 2011), *Data Structures and Algorithms in C++* (1st and 2nd editions, 2004, 2011), *Data Structures and Algorithms in Python* (2013), and *Algorithm Design: Foundations, Analysis*, and *Internet Examples* (2002).

5. I have coauthored publications on topics involved in digital rights management. For instance, my publications include work on computer security, data integrity, and digital

certificates and credentials, including (J-63) M.T. Goodrich, R. Tamassia, and D. Yao, "Notarized Federated Identity Management for Web Services," *Journal of Computer Security*, 16(4), 2, 399–418, 2008, (J-78) M.T. Goodrich, D. Nguyen, O. Ohrimenko, C. Papamanthou, R. Tamassia, N. Triandopoulos, and C.V. Lopes, "Efficient Verification of Web-Content Searching Through Authenticated Web Crawlers," *Proc. VLDB*, 5(10):920-931, 2012, (C-80) G. Ateniese, B. de Medeiros, and M.T. Goodrich, "TRICERT: A Distributed Certified E-mail Scheme," Network and Distributed Systems Security Symposium (NDSS), 2001, 47–56 (which led to U.S. Patent Application US 2004/0073790), (C-83) M.T. Goodrich and R. Tamassia, "Implementation of an Authenticated Dictionary with Skip Lists and Commutative Hashing," Proc. DARPA Information Survivability Conference & Exposition II (DISCEX), IEEE Press, 2001, 68–82 (which led to U.S. Patent 7,257,711), (C-85) A. Anagnostopoulos, M.T. Goodrich, R. Tamassia, "Persistent Authenticated Dictionaries and Their Applications," Proc. Information Security Conference (ISC), Lecture Notes in Computer Science 2200, Springer- Verlag, 2001, 379–393, (C-91) M.T. Goodrich, M. Shin, R. Tamassia, and W.H. Winsborough, "Authenticated Dictionaries for Fresh Attribute Credentials," 1st Int. Conference on Trust Management (iTrust), Lecture Notes in Computer Science 2692, Springer-Verlag, 2003, 332–347, (C-98) M.T. Goodrich, J.Z. Sun, and R. Tamassia, "Efficient Tree-Based Revocation in Groups of Low-State Devices," Advances in Cryptology (CRYPTO), Springer, Lecture Notes in Computer Science 3152, 511–527, 2004, (C-100) M.J. Atallah, K.B. Frikken, M.T. Goodrich, and R. Tamassia, "Secure Biometric Authentication for Weak Computational Devices," 9th Int. Conf. on Financial Cryptograpy and Data Security, Springer, Lecture Notes in Computer Science 3570, 357–371, 2005, (C-122) M.T.Goodrich, R. Tamassia, and N. Triandopoulos, "Super-Efficient Verification of Dynamic Outsourced Databases," Proc. RSA Conference—Cryptographers' Track (CT-RSA),

LNCS, vol. 4964, Springer, 2008, 407–424, and (C-133) M.T. Goodrich, R. Tamassia, and N. Triandopoulos, J.Z. Sun, "Reliable Resource Searching in P2P Networks," 5th International ICST Conference on Security and Privacy in Communication Networks (SecureComm), Lecture Notes of ICST, vol. 19, Springer, 2009, 437–447.

6. Additionally, I have coauthored publications on topics related to digital rights management, such as distributed/parallel algorithms, data structures, and transaction processing, including (J-7) M.T. Goodrich and M.J. Atallah, "On Performing Robust Order Statistics in Tree-Structured Dictionary Machines," *Journal of Parallel and Distributed Computing*, 9(1), 1990, 69–76, (J- 19) M.J. Atallah, M.T. Goodrich, and S.R. Kosaraju, "Parallel Algorithms for Evaluating Sequences of Set-Manipulation Operations," *Journal of the ACM*, 41(6), 1994, 1049–1088, (J-24) M.T. Goodrich and S.R. Kosaraju, "Sorting on a Parallel Pointer Machine with Applications to Set Expression Evaluation," *Journal of the ACM*, 43(2), 1996, 331–361, (J-36) G. Barequet, S.S. Bridgeman, C.A. Duncan, M.T. Goodrich, and R. Tamassia, "GeomNet: Geometric Computing Over the Internet," *IEEE Internet Computing*, 3(2), 1999, 21–29, (J-56) A. Bagchi, A. Chaudhary, M.T. Goodrich, C. Li, and M. Shmueli-Scheuer, "Achieving Communication Efficiency through Push-Pull Partitioning of Semantic Spaces to Disseminate Dynamic Information," *IEEE Trans. on Knowledge and Data Engineering (TKDE)*, 18(10), 1352–1367, 2006, and (C-105) L. Arge, D. Eppstein, and M.T. Goodrich, "Skip-Webs: Efficient Distributed Data Structures for Multi-Dimensional Data Sets," 24th ACM Symp. on Principles of Distributed Computing (PODC), 2005.

7. Also, my coauthored books, *Algorithm Design: Foundations, Analysis, and Internet Examples* and *Introduction to Computer Security*, each includes an entire chapter on

Cryptography, and the latter book also includes an entire chapter section specifically on digital rights management.

8. My research has been supported by several grants directed at topics involved in digital rights management, including NSA grant, "Certification Management Infrastructure – Certificate Revocation," $52,023, 1998, DARPA grant, "Efficient and Scalable Infrastructure Support for Dynamic Coalitions," $1,495,000, 2000-2003, NSF grant, "An Algorithmic Approach to Cyber-Security," $100,000, 2003–2006, NSF grant, "Algorithms for the Technology of Trust," $300,000, 2003–2009, and NSF grant, "Towards Trustworthy Interactions in Cloud Computing," $500,000, 2010-2015.

9. Together with collaborators, I worked from 2000 to 2006 on the design of software and hardware systems for the secure and trustworthy distribution of validations for digital certificates, with seed funding from DARPA. These systems provided cryptographic mechanisms to validate the authenticity and freshness of digital certificates used for identification and attribute credentials, even if the query responses are coming from untrusted servers. I also aided in performing technology transfer efforts for these systems to startup companies, which were funded in part by angel investors and the State of Rhode Island, for licensing the associated patent, U.S. Patent 7,257,711 (on which I am a named inventor). As a result of these efforts, my collaborators and I received a Spirit of Technology Transfer Award from the DARPA Dynamic Coalitions Program in 2002 and an Award for Technological Innovation from Brown University in 2006.

10. I was named as a Distinguished Scientist in 2006 by the Association for Computing Machinery (ACM). I received a Technical Achievement Award in 2006 from the Institute of Electrical and Electronics Engineers (IEEE) Computer Society, "for outstanding contributions to

the design of parallel and distributed algorithms for fundamental combinatorial and geometric problems." I became a Fulbright Scholar in 2007, as a senior specialist to Aarhus University in Denmark. I was named Fellow of the American Association for the Advancement of Science (AAAS) in 2007, "for distinguished contributions to parallel and distributed algorithms for combinatorial and geometric problems, and excellence in teaching, academic and professional service, and textbook writing." In 2009, I was named Fellow of the IEEE, "for contributions to parallel and distributed algorithms for combinatorial and geometric problems." In 2009, I was also named Fellow of the ACM, "for contributions to data structures and algorithms for combinatorial and geometric problems."

11. I am also a named inventor on three issued patents: U.S. Patent No. 7,257,711 entitled "Efficient Authenticated Dictionaries with Skip Lists and Commutative Hashing," U.S. Patent No. 7,299,219 entitled "High Refresh-Rate Retrieval of Freshly Published Content using Distributed Crawling," and U.S. Patent 8,681,145 entitled "Attribute Transfer Between Computer Models Including Identifying Isomorphic Regions in Polygonal Meshes."

12. In 2013–14, I served as a technical expert and deponent, retained by ContentGuard and Kirkland & Ellis LLP (New York), in *inter partes* review of U.S. Patents 7,523,072, 7,269,576, 7,139,736, and 6,963,859.

13. I have reviewed the Patents-in-Suit, and their subject matter is within the scope of my education and experience.

Legal Understanding

14. I understand that a means-plus-function claim limitation is limited to the structures disclosed in the specification and equivalents thereof. I understand that a court must look to the specification to determine the structures that correspond to the claimed function. I understand

that structure disclosed in the specification is corresponding structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. I understand that if a patentee chooses to disclose a single embodiment, then any means-plus-function claim limitation will be limited to the single disclosed structure and equivalents thereof. I understand the written description may also disclose distinct and alternative structures for performing the claimed function. I understand that structural features that do not actually perform the recited function do not constitute corresponding structure and thus do not serve as claim limitations. I understand that the structure disclosed in the specification must be necessary to perform the function described in the claim.

15. I understand that for computer-implemented means-plus-function claims where the disclosed structure is a computer programmed to implement an algorithm, the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm. I understand that a patentee may express a procedural algorithm in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure. I understand that the patent need only disclose sufficient structure for a person of skill in the field to provide an operative software program for the specified function. I understand that algorithms in the specification need only disclose adequate defining structure to render the bounds of the claim understandable to one of ordinary skill in the art. I understand that the algorithm need only include what is necessary to perform the claimed function.

’576 Patent – Means-Plus-Function Terms

Claim Term	Defendants’ Construction	Proper Construction
“means for requesting use of the digital content stored in	Indefinite	User interface 1305 described at 16:35-44

the storage"		

16. I disagree with Defendants' proposed construction that the term "means for requesting use of the digital content stored in the storage" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being the user interface 1305, shown in Figure 13 and described in prose in the '576 patent at 16:35-44. A person of ordinary skill in the art would understand that a user interface is necessary for a user to request use of the digital content stored in the storage and clearly linked to that function.

Claim Term	Defendants' Construction	Proper Construction
"means for processing a request from the means for requesting"	A computer processor and processor memory containing software that, sequentially, instructs the server repository to check the compatibility of the requester repository and the validity of the requester's identification, instructs the requester and server repositories to perform the common opening transaction steps of determining whether authorization is needed and whether the requested transaction is permitted given the usage rights, instructs the requester and sever repositories to perform a transmission protocol to read and write blocks of data and then instructs the requester repository to render the digital work, instructs the rendering device and the requester repositories to remove the contents, and instructs the requester and server repositories to perform closing transaction steps of updating the usage rights and billing information. Alternatively, indefinite	Processing begins when a requester repository has sent a message to initiate a request. (36:35-40, 37:9-13.)

17. I have reviewed Defendants' proposed construction for the term "means for processing a request from the means for requesting", and have identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. The other

portions of Defendants' proposed construction are not necessary to perform the claimed function, and are therefore not properly included as part of the algorithm for the corresponding structure.

18. A person of ordinary skill in the art would identify the algorithm described by the PTAB as "processing begins when a requester repository has sent a message to initiate a request" as being clearly linked or associated to the recited function. This algorithm is described in the specification at 36:35-40 and 37:9-13, which includes the contents of the requesting message, as cited by the PTAB on page 21. Ex. 1. The claim language is clearly referring to the processing of a request from the means for requesting, which implies a processing of a request message.

19. The remaining portions of the algorithm included in the Defendants' proposed construction are not necessary to perform the recited function. In fact, many of the remaining portions of the algorithm are related to other limitations in claim 1 of the '576 patent.

20. First, the portion of the algorithm included in Defendants' proposed construction "instructs the server repository to check the compatibility of the requester repository and the validity of the requester's identification" is not necessary to perform the recited function. This action is not necessary to perform the processing of the request message, since a request can be processed without checking the compatibility of the requester and the validity of the requester's identification.

21. Second, the portion of the algorithm included in Defendants' proposed construction "instructs the requester and server repositories to perform the common opening transaction steps of determining whether authorization is needed and whether the requested transaction is permitted given the usage rights" is not necessary to perform the recited function. Opening transactions steps are disclosed in the '576 patent as being steps that "may" be performed in the currently preferred embodiment of the present invent, at 5:19-22, and are

described at step 1801 in Figure 18 and at 30:59-31:10. For example, the '576 patent mentions at 31:4-6, "uninstall and delete rights **may** be implemented to require that a requester have an authorization certificate **before** the right can be exercised" [emphasis added]. Such actions are not necessary for processing a request from the means for requesting.

22. Third, the portion of the algorithm included in Defendants' proposed construction "instructs the requester and sever repositories to perform a transmission protocol to read and write blocks of data and then instructs the requester repository to render the digital work" is not necessary to perform the recited function. In claim 1 of the '576 patent, "means for processing a request from the means for requesting" is separate and distinct from "means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content]." The third step included in the Defendants' proposed construction is addressing this latter means element; hence, it should not be included in the means for processing the request from the means for requesting.

23. Fourth, the portion of the algorithm included in Defendants' proposed construction "instructs the rendering device and the requester repositories to remove the contents" is not necessary to perform the recited function. To someone with ordinary skill in the art, processing a request from a means for requesting would not require the rendering device and requester repository to remove the contents. Moreover, the patent discloses a number of possible requests and only a few, like play/print, require removal of the contents by the requester. Others, like copy/loan, explicitly do not require removal by the requester. Thus, it would be unnecessary to remove the contents from the device to perform the function of processing a request.

24. Fifth, the portion of the algorithm included in Defendants' proposed construction "instructs the requester and server repositories to perform closing transaction steps of updating

the usage rights and billing information" is not necessary to perform the recited function. To someone with ordinary skill in the art, processing a request from a means for requesting would not necessarily include the closing transaction steps, which are described in the '576 patent at 32:20-32. Furthermore, copy limitations are mentioned as potentially unlimited at 20:61-64 and fees are described as optional at 24:1-2 and 25:28-29.

Claim Term	Defendants' Construction	Proper Construction
"means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus"	A computer processor and processor memory containing software that, sequentially, instructs the requester repository to determine whether an authorization certificate or a digital ticket is needed, instructs the server repository to generate a transaction identifier, instructs the server repository to determine whether the right is granted and whether time, security, and access based conditions are satisfied, and instructs the server repository to determine whether there are sufficient copies of the work to distribute. Alternatively, indefinite	The server repository determines whether the right is granted and whether any specified time, security, and access based conditions are satisfied. (31:13-33.)

25. I have reviewed Defendants' proposed construction for the term "means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus", and have identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. The other portions of Defendants' proposed construction are not necessary to perform the claimed function, and are therefore not properly included as part of the algorithm for the corresponding structure.

26. A person of ordinary skill in the art would identify the algorithm described by the PTAB as "the server repository determines whether the right is granted and whether time, security, and access based conditions are satisfied" (Ex. 1 p. 22) as being clearly linked or associated to the recited function. This algorithm is described in the '576 patent at 31:13-33,

which describes in prose the functions shown in the flowchart of Figure 18 boxes 1804 through 1807, inclusive. These steps include checks to test if the usage right is granted, whether any time-based conditions are satisfied, and whether security and access conditions are satisfied. The '576 patent makes clear that conditions are optionally specified and are not required: "Each right may also optionally specify conditions which must be satisfied before the right can be exercised." '576 Patent at 18:67-19:2; *see also* Figure 15; 18:25-26. These are essential steps necessary for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus. The remaining portions of the algorithm included in the Defendants' proposed construction are not necessary to perform the recited function.

27. First, the portion of the algorithm included in Defendants' proposed construction, "instructs the requester repository to determine whether an authorization certificate or a digital ticket is needed" is not necessary to perform the recited function. This action is not necessary to perform the processing of the request message, since a request can be checked for whether this is a permitted rendering of the digital content in accordance with rights specified in the apparatus without first checking whether an authorization certificate or a digital ticket is needed.

28. Second, the portion of the algorithm included in Defendants' proposed construction, "instructs the server repository to generate a transaction identifier," is not necessary to perform the recited function. Instructing the server repository to generate a transaction identifier is not required or clearly linked to the function of checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus.

29. Third, the portion of the algorithm included in Defendants' proposed construction, "and instructs the server repository to determine whether there are sufficient copies of the work to

distribute" is not necessary to perform the recited function. Copy limitations are mentioned in the '576 patent as being potentially unlimited at 20:61-64; hence, checking whether there are sufficient copies of the work to distribute cannot be an essential and necessary component of the means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus.

Claim Term	Defendants' Construction	Proper Construction
"means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content]"	A computer processor and processor memory containing software that, sequentially, instructs the requester repository to provide transaction information to the server repository, instructs the server repository to transmit a block of data to the requester repository and to wait for an acknowledgment provided by the requester when the block of data has been received and to repeat that process until there are no more blocks to transmit, and instruct the requester repository to commit the transaction and send an acknowledgment to the server repository. Alternatively, indefinite	First, transaction information is provided to the server repository by the requester repository. (33:3-8.) Second, the server repository transmits a block of data to the requester repository and waits for an acknowledgement provided by the requester when the block of data has been received. (33:9-15.) Unless a communications failure terminates the transaction, that process repeats until there are no more blocks to transmit. (33:16-38, 33:46-49.) Finally, the requester repository commits the transaction and sends an acknowledgement to the server repository. (33:39-45.)

30. I have reviewed Defendants' proposed construction for the term "means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content]", and have identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. To a person of ordinary skill in the art, those portions are identical to those cited above as

"Proper Construction," which are also identical to those given by the PTAB for these means in the '576 patent (see Ex. 1 at pp. 23-24).

Claim Term	Defendants' Construction	Proper Construction
"means for authorizing the repository for making the digital content available for rendering"	A computer processor and processor memory containing software that, sequentially, sets up a communications channel between the server and the remote repository, instructs the server repository to perform a registration process with the remote repository, instructs the server repository to invoke a transaction to acquire an authorization object comprising a digital ticket, instructs the server repository to perform tests on the authorization object, or to execute a script, before signaling that authorization has been granted for rendering content, and allows digital content to be made available for rendering only by an authorized repository. Alternatively, indefinite	First, a communication channel is set up between the server and the remote repository. (41:52-54.) Second, the server repository performs a registration process with the remote repository. (41:55-57.) Third, the server repository invokes a "play" transaction to acquire the authorization object. (41:58-64.) Finally, the server repository performs tests on the authorization object or executes a script before signaling that authorization has been granted for rendering content. (41:65-42:16.)

31. I have reviewed Defendants' proposed construction for the term "means for authorizing the repository for making the digital content available for rendering", and have identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. To a person of ordinary skill in the art, those portions are identical to those cited above as "Proper Construction," which are also identical to those given by the PTAB for these means in the '576 patent (see Ex. 1 at pp. 24-25).

Claim Term	Defendants' Construction	Proper Construction
"means for making a request for an authorization object required to be included within the repository for the apparatus to render the digital content"	A computer processor and processor memory containing software that, sequentially, sets up a communication channel between the server repository and the remote repository, instructs the server repository to perform a registration process with the remote repository,	First, a communications channel is set up between the server repository and the remote repository. (41:52-54.) Second, the server repository performs a registration process with the remote repository.

	and instructs the server repository to invoke a transaction to request an authorization object comprising a digital ticket. Alternatively, indefinite	(41:55-57.) Third, the server repository invokes a "play" transaction to request the authorization object. (41:58-64.)

32. I have reviewed Defendants' proposed construction for the term "means for making a request for an authorization object required to be included within the repository for the apparatus to render the digital content", and have identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. To a person of ordinary skill in the art, those portions are identical to those cited above as "Proper Construction," which are also identical to those given by the PTAB for these means in the '576 patent (see Ex. 1 at p. 25).

Claim Term	Defendants' Construction	Proper Construction
"means for receiving the authorization object when it is determined that the request should be granted"	A computer processor and processor memory containing software that, sequentially, instructs the server repository to transmit a block of data to the requester repository and to wait for an acknowledgment from the requester that the block of data has been completely received, instructs the server repository to repeat that transmission and waiting for acknowledgment until there are no more blocks to transmit, instructs the requester repository to send a completion acknowledgment to the server repository, and instructs both the server and the requester to cancel a transaction if it is interrupted before all the data blocks are delivered, and instructs both the server and the requester to commit to the transaction if all the data blocks have been delivered. Alternatively, indefinite	The remote repository transmits a block of data to the server repository and waits for an acknowledgement, which the server provides when the block of data has been completely received. (33:9-15.) Unless a communications failure terminates the transaction, that process repeats until there are no more blocks to transmit. (33:16-38, 33:46-49.) Finally, the server repository sends a completion acknowledgement to the remote repository. (33:39-45.)

33. I have reviewed Defendants' proposed construction for the term "means for receiving the authorization object when it is determined that the request should be granted", and have

identified the portions of the algorithm disclosed in the specification that are necessary to perform the claimed function. To a person of ordinary skill in the art, those portions are similar to those cited above as "Proper Construction," which are also nearly identical to those given by the PTAB for these means in the '576 patent (see Ex. 1 at p. 26). The PTAB construction incorrectly referred to the "server repository" and "requester repository." However, the PTAB constructions above for the "means for authorizing the repository for making the digital content available for rendering" makes clear that the "authorization object" is transmitted from the "remote repository" to the "server repository." In fact, the PTAB stated that "It is described in the specification that the authorization process invokes a "play" transaction to acquire an authorization object from a remote repository" (see Ex. 1 at p. 26). Accordingly, I have corrected this apparent clerical error in the PTAB construction.

Claim Term	Defendants' Construction	Proper Construction
"means for requesting a transfer of the digital content from an external memory to the storage" ['576, claim 4]	Indefinite	User interface 1305 described at 16:35-44

34. I disagree with Defendants' proposed construction that the term "means for requesting a transfer of the digital content from an external memory to the storage" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being the user interface 1305, shown in Figure 13 and described in prose in the '576 patent at 16:35-44. A person of ordinary skill in the art would understand that a user interface is necessary for a user to request a transfer of the digital content from an external memory to the storage and clearly linked to that function.

'859 Patent – Means-Plus-Function Terms

Claim Term	Defendants' Construction	Proper Construction
"means for communicating with a master repository for obtaining an identification certificate for the repository" ['859, claim 24]	Indefinite	An external interface that provides for a signal connection with another device described at 13:52-59

35. I disagree with Defendants' proposed construction that the term "means for communicating with a master repository for obtaining an identification certificate for the repository" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being an external interface that provides for a signal connection with another device, and described in prose in the '859 patent at 13:52-59. This structure is identical to those given by the PTAB for these means in the '859 patent (see Ex. 2 at p. 16).

Stefik Patents

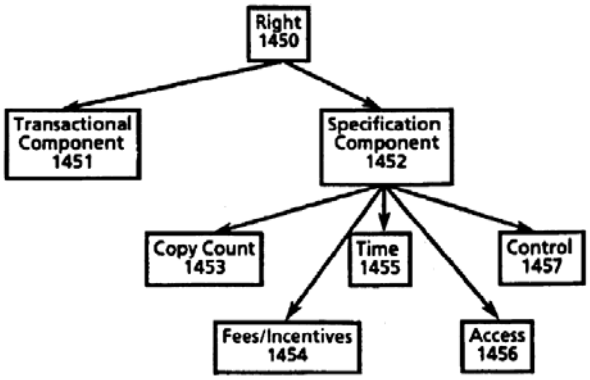
Manner of use

Claim Term	Defendants' Construction	Proper Construction
"manner of use"	"A defined way of using or distributing a digital work (for example, PLAY, COPY, or PRINT), as distinct from conditions which must be satisfied before that way of using or distributing the digital work is allowed."	A way in which [a digital work / digital content / content / a digital document] may be used

36. A person of ordinary skill in the art at the time of the patent would have understood "manner of use" as used in the patent to have its ordinary and customary meaning, i.e., the way in which something may be used. The term "manner of use" is not separately defined in the

Stefik patents, though descriptions of the ways in which content may be used appear frequently. For example, Figure 14 and the accompanying text describe a way to structure a usage right in accordance with the preferred embodiment. Figure 14 and the accompanying text from column 17 of the '859 patent are reproduced below:

Figure 14



The basic contents of a right are illustrated in FIG. **14**. Referring to FIG. **14**, a right **1450** has a transactional component **1451** and a specifications component **1452**. A right **1450** has a label (e.g. COPY or PRINT) which indicate the use or distribution privileges that are embodied by the right. The transactional component **1451** corresponds to a particular way in which a digital work may be used or distributed. The transactional component **1451** is typically embodied in software instructions in a repository which implement the use or distribution privileges for the right. The specifications components **1452** are used to specify conditions which must be satisfied prior to the right being exercised or to designate various transaction related parameters. In the currently preferred embodiment, these specifications include copy count **1453**, Fees and Incentives **1454**, Time **1455**, Access and Security **1456** and Control **1457**. Each of these specifications will be described in greater detail below with respect to the language grammar elements.

37. Transactional component 1451 corresponds to the way in which a digital work may be used or distributed, and is typically embodied in software instructions in the repository. The execution or interpretation of these software instructions by the repository cause the content associated with the usage right to be used or distributed.

38. Because transactional component 1451 may be embodied in the repository software, it is not necessarily a part of the right. Instead, a label in the right 1450, or repository software interpreting that label, must indicate the appropriate transactional component associated with the right and its associated content.

39. I understand that Defendants are arguing that "manner of use" must be distinct from any conditions on which the use is premised, but a person of ordinary skill in the art at the time of the patent would understand the patent to teach conditions embedded within the usage right's language for manner of use. In Figure 15, for example (excerpted below), the right code is used

to identify the manner of use (e.g., rendering), and the render code is used to provide additional specificity (e.g., play or print). The render code also allows for conditions that must be satisfied before the right may be exercised (e.g., the repository may have a specific player-ID or printer-ID). The corresponding description in the Stefik patents makes clear that conditions are an optional component of a manner of use. '859: 18:19-24. A person having ordinary skill in the art would therefore not understand the term "manner of use" to necessarily exclude any conditions on which the use is premised.

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1501 ~Digital Work Rights:= (Rights*)
1502 ~Right := (Right-Code {Copy-Count} {Control-Spec} {Time-Spec }
        {Access-Spec} {Fee-Spec})
  1503 ~Right-Code := Render-Code | Transport-Code | File-Management-
        Code| Derivative-Works- Code | Configuration-Code
    1504 ~Render-Code := [ Play : {Player: Player-ID} | Print: {Printer: Printer-ID}]
```

40. I also understand Defendants are taking the position that the manner of use must apply to digital works. A person of skill in the art at the time of the patent would not understand anything within the term "manner of use" to indicate what is being used. Accordingly, the subject of the "manner of use" derives from the claim where the term is found. In the case of the '859 patent, it is the way in which "content" may be used. In the case of the '160 patent, it is the way in which a "digital work" may be used. In the case of the '072 patent, it is the way in which a "digital document" may be used.

Random Registration Identifier / Nonce

Claim Term	Defendants' Construction	Proper Construction
"random registration identifier" "nonce"	"Random and variable information used only once to establish a cryptographic connection." Alternatively, "random registration identifier" is indefinite	random or variable information generated to establish a cryptographic connection

41. A person of ordinary skill in the art at the time of the patent would have understood that both the Random Registration Identifier and the Nonce are random or variable messages generated for use during a single cryptographic session. These messages, generated based on random or variable information, are used in the preferred embodiment to detect and prevent replay attacks during a registration transaction. A replay attack is an attempt to access a secure system by replaying a previously recorded successful session initiation. Random or variable information is useful in preventing or detecting such attacks because the repository that generates the nonce or random registration identifier knows and remembers which number it is using for that session, and if a counterparty attempts to use a different number, then the repository knows its communication session is compromised. The purpose for the randomness or variability of the nonce or registration identifier is not to make every session absolutely unique. This would be impossible to guarantee with finite length nonces and random registration identifiers. Instead, the nonces and random registration identifiers make it exceedingly unlikely that an impostor could guess the relevant numbers or witness a repeat of the same numbers in a reasonable time.

42. I understand Defendants have proposed a construction for both "random registration identifier" and "nonce" that requires these terms to be "random and variable," and to require that each "random registration identifier" or "nonce" to be used "only once." Although both terms are reasonable in a cryptographic setting, a juror may not understand that a number derived from time or temperature may be considered "random" or that a number that is used multiple times for multiple purposes in a single session, and may by happenstance be separately generated for more than one session, would be considered to be used "only once." For this reason, I believe defendants' construction would be misleading.

43. Truly random numbers are hard if not impossible to generate in deterministic systems. Computers are machines that do exactly as they are instructed, and there is no feasible way to instruct a computer to generate a random number without it sampling from a truly random source in its environment. For most purposes, however, a nearly random or "pseudorandom" number will do. These numbers are generated using a complicated function (such as a cryptographic hash function) and an input that is not likely to be repeated exactly. Because the function can output highly divergent values to nearly identical inputs, they may be used to create seemingly random numbers from inputs that are not random at all. The specification gives examples of what kind of "random and variable" information may be used to generate the nonce: time and temperature. The jury likely would not consider time or temperature to be random. Time and temperature change values quickly, however, especially when measured in small intervals. A person having ordinary skill in the art would have understood that the variability of time or temperature could be used to approximate randomness, and that generating a number based on such variable inputs could create a seemingly random output.

44. Defendants' requirement that a nonce or random registration identifier be used "only once" is also potentially misleading. Figure 16 of the '859, marked up below, shows the steps of the disclosed registration transaction where the random registration identifier or nonce is used in some way, with random registration identifier uses marked in red and nonce uses marked in green. As is evident, both the nonce and the random registration identifier are used multiple times as part of the protocol. To the extent Defendants' "only once" construction could be understood to exclude such uses, a person of skill in the art at the time of the patent would not understand defendants' construction to comport with the teachings of the Stefik patents.

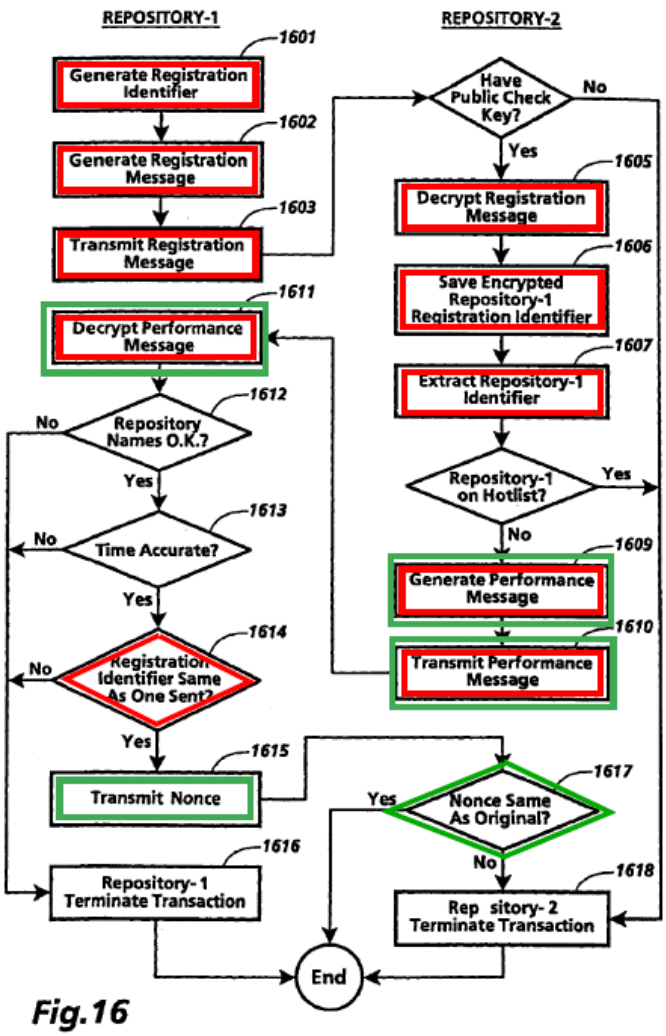


Fig.16

45. Additionally, the nonce and random registration identifier are finite numbers generated by a computer system, and are not guaranteed to be used "only once." Over time, previously generated nonces and random registration identifiers could be reused as the same numbers are randomly (or pseudorandomly) generated by other machines. Consecutive nonces or random registration identifiers generated by the same machine could possibly (though very improbably) repeat. The patent recognizes this as a concern, and so includes other indicia within the message to make useful repeats of nonces or random registration identifiers unlikely. For example, the performance message returned by repository 2 to repository 1 contains the time, the names of both the repositories, and the random registration identifier. Repository 1 checks both the

repository names and the time before confirming the random registration identifier. This combination of information, and not the uniqueness of the random registration identifier by itself, should make the session distinct from any other session and allow repository 1 to detect replay attacks. Accordingly, defendants' proposed constructions for the nonce and random registration identifier are more restrictive than the embodiments taught in the patent.

Usage Rights

Claim Term	Defendants' Construction	Proper Construction
"rights" "usage rights" "usage rights information"	"A language for defining the manner in which a digital work may be used or distributed, as well as any conditions on which use or distribution is premised. Usage rights must be permanently attached to the digital work."	An indication of the manner in which a [digital work / digital content / content / a digital document] may be used or distributed as well as any conditions on which use or distribution is premised

46. The Stefik patents teach that a usage right is "permanently 'attached'" to a digital work, but make clear that "permanently" and "attached" are not used in their typical manner. For example, the Stefik patents teach that digital works and the rights that, with appropriate repository software, mediate access to the works may be stored in separate, distinct files. For example, figures 5 and 6, reproduced below, show a digital work stored in accordance with the preferred embodiment of the Stefik disclosure. Figure 5 shows a digital work in the form of a magazine, and Figure 6 shows a digital work in the form of Story A from the magazine of Figure 5. The illustrated digital work contains no usage rights, no reference to usage rights, and no attachment to usage rights.

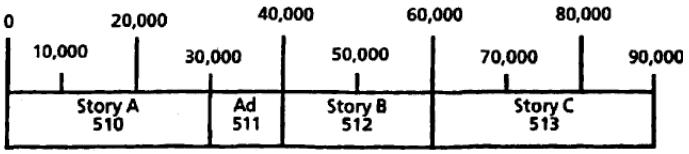


Figure 5

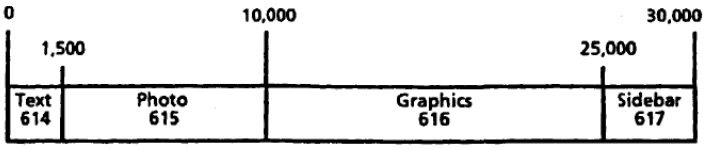
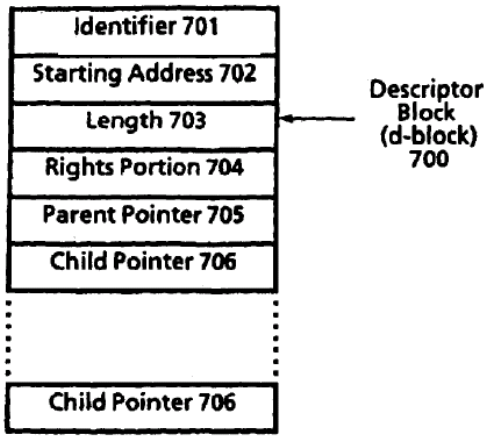


Figure 6

47. Instead, usage rights in the preferred embodiment associated with the digital works illustrated in Figures 5 and 6 are maintained in separate files called descriptor blocks. An example descriptor block is illustrated in Figure 7, reproduced below. Descriptor blocks contain two references to their associated digital work: an identifier (701) that corresponds with the work and the starting address and length (702 and 703) that identify the digital work in storage. The descriptor block also contains a rights portion 704 that contains description of the usage rights provided for the work.

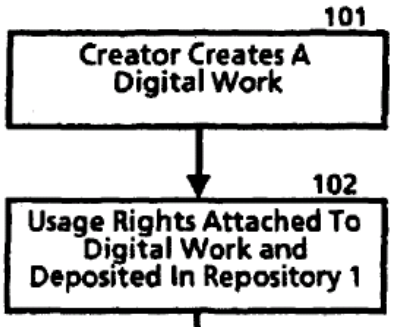
Figure 7



48. Thus, a person of skill in the art would understand the attachment to be a reference associating the right to the work. Additionally, because the right is fundamentally derivative of the work that it describes, it makes no sense to think of the right being transferrable to another work. In that way, the connection between a right and the work it describes is permanent, in that it lasts as long as the usage right is operative.

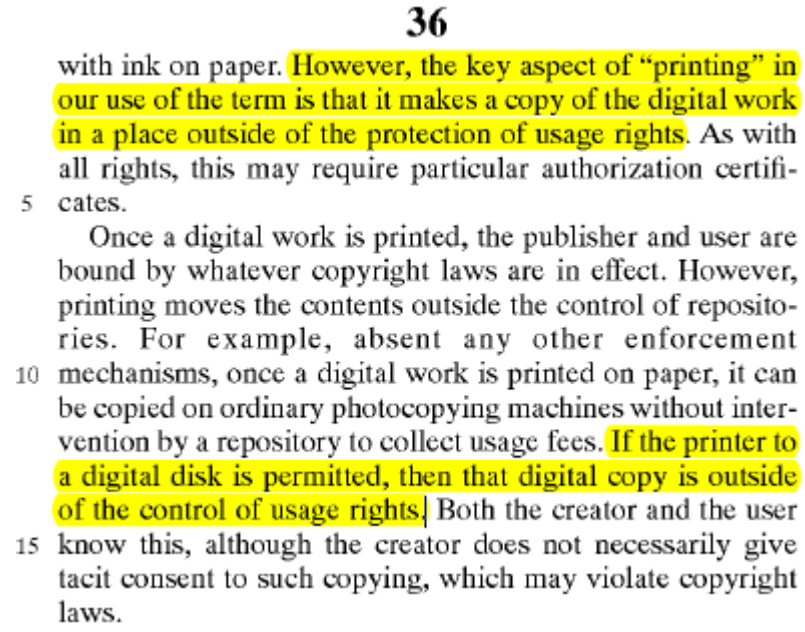
49. However, a person of skill in the art would not understand a work to be attached to a usage right. The work exists independently of the usage right, and the attachment is in only one direction (i.e., from the right to the work). The patent teaches that a work without any usage rights may be introduced into a repository and have usage rights attached. Figure 1 of the patent excerpted below illustrates this.

Figure 1



50. The patent also teaches that usage rights may be employed to create copies of digital works without usage rights. Specifically, the "print" transaction may be used to make digital copies of the digital work outside the protections of the repository. Column 36, lines 1-17 (reproduced below) explain that the repository may be used to create a digital work without any usage rights limitations once a right to make such digital copies is granted. Accordingly, any construction of digital work, digital content, content, or digital document that requires usage rights to be attached to the digital work, digital content, content, or digital document would not

comport with the teachings of the Stefik patent as understood by a person of ordinary skill in the art at the time of the patent.

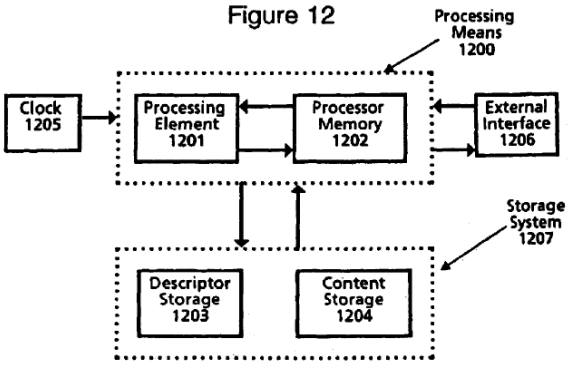


36

with ink on paper. However, the key aspect of "printing" in our use of the term is that it makes a copy of the digital work in a place outside of the protection of usage rights. As with all rights, this may require particular authorization certificates.

Once a digital work is printed, the publisher and user are bound by whatever copyright laws are in effect. However, printing moves the contents outside the control of repositories. For example, absent any other enforcement mechanisms, once a digital work is printed on paper, it can be copied on ordinary photocopying machines without intervention by a repository to collect usage fees. If the printer to a digital disk is permitted, then that digital copy is outside of the control of usage rights. Both the creator and the user know this, although the creator does not necessarily give tacit consent to such copying, which may violate copyright laws.

51. The Stefik patents also teach that the descriptor blocks associated with digital works or content may be stored separately, and that the associated content may be stored on optical (i.e., removable) media. Figure 12 and the accompanying text describing separate storage of usage rights and content ('859: 13:37-47) are reproduced below. Thus, while the patents contemplate a relationship between usage rights and their associated content, the relationship does not even require usage rights and content to be distributed together. The repository software is relied upon to prevent access to content where a repository has content in its content storage, but lacks the usage rights necessary to use it.



The storage system **1207** is further comprised of descriptor storage **1203** and content storage **1204**. The description tree storage **1203** will store the description tree for the digital work and the content storage will store the associated content. The description tree storage **1203** and content storage **1204** need not be of the same type of storage medium, nor are they necessarily on the same physical device. So for example, the descriptor storage **1203** may be stored on a solid state storage (for rapid retrieval of the description tree information), while the content storage **1204** may be on a high capacity storage such as an optical disk.

52. I also understand that Defendants may attempt to argue that conditions or fees are a required feature of either a digital work or a usage right. A person of ordinary skill in the art would not understand this to be the case. For example, the patent makes clear that, in describing the preferred embodiment, "braces { } are used to indicate optional items." '859: 17:47-48. All conditions and fees are enclosed in braces, thus all conditions and fees are optional in the preferred embodiment. The specification also explains that, in the preferred embodiment, there are no fees by default. '859: 18:25-29. Accordingly, one having ordinary skill in the art at the time of the patent would not understand either usage rights or digital works to require conditions or fees.

53. I also understand that Defendants' construction states that usage rights are a language. A person of ordinary skill in the art would not understand usage rights to be a language. The specification makes clear that usage rights may be expressed in a language, and describes a language suitable for the expression of usage rights contemplated in the preferred embodiment. A person with skill in the art reading the specification would understand that the glossary definition at the end of the '859 patent was intended to define usage rights language rather than usage rights given the descriptions of both usage rights and usage rights language in the specification.

Digital Document

Claim Term	Defendants' Construction	Proper Construction
"digital document" "document"	"A type of digital work that is written in or viewable as text, for example a book, magazine article, or a message." Where "digital work" is construed to mean: "Any encapsulated digital information. Such digital information may represent music, a magazine or book, or a multimedia composition. Usage rights and fees are attached to the digital work."	Any work that has been reduced to a digital representation

54. I understand that Defendants' construction states that a "document" or "digital document" as used in the '072 patent should be limited to content viewable as text. This is contradicted by the specification, which describes a document *playback* platform for viewing *or executing* documents ('072: 25:25-26, emphasis added) and a document repository for storing first-run movies (14:42-43; 54). Several dependent claims of the '072 patent (3, 11, 19) also require the digital document to be software. In view of this, a person of ordinary skill in the art at the time of the patent would not understand the term "digital document" to be limited to any particular kind of content, and certainly would not understand the term to be limited to text.

Distributed Repository

Claim Term	Defendants' Construction	Proper Construction
"distributed repository"	Indefinite	A repository adapted for use in a distributed system

55. A person of ordinary skill in the art would understand a distributed repository to be a repository adapted for use in a distributed system. A distributed system is a networked system

where different nodes in the network communicate with each other. The repositories described in the specification are connected as part of a distributed system by a network. '859: Fig. 2; 6:66-7:17. The Stefik patents teach a variety of ways in which repositories may be adapted to operate in a distributed system while maintaining communications, physical, and behavioral integrity. For example, the registration transaction described by the Stefik patents contemplates establishing a new connection with a previously unknown repository over an untrusted network. '859: Figures 16 and 17; 26:30-28:56. These measures are necessary for systems that are distributed over a network. A person of ordinary skill in the art at the time of the patent would understand a distributed repository to be capable of communicating with other repositories over a network, such as the Internet. The preamble of Claim 1 of the '859 makes clear that this is the distributed repositories recited in the body of the claim to be repositories capable of such communication.

Document Platform

Claim Term	Defendants' Construction	Proper Construction
"document platform"	Indefinite	"any computing system that holds a digital document, such as software"

56. "Document platform" was construed by the PTAB to be "any computing system that holds a digital document, such as software." Ex. 3 at 17. The PTAB declined to import limitations from the remainder of the claims of the '072 patent into the term "document platform," reasoning that limitations on an alleged document platform necessitated by the claims need not be read into the term itself. As a practical matter, I agree. "Document platform" by itself would be understood by a person of ordinary skill in the art to be a computer system that holds digital documents. The claims of the '072 patent require the recited document platform to

also be a rendering repository, as it receives access to content from a repository, receives usage rights from a repository, interprets and enforces usage rights, and renders content when permitted by the usage rights.

Determining by the document platform

Claim Term	Defendants' Construction	Proper Construction
"determining, by the document platform"	Indefinite	"determining by the document platform" should be corrected to: "determining, by the document repository"

57. A person of ordinary skill in the art would recognize an error in claim 10 of the '072 patent where the document platform of the claim is required to determine whether a request the document platform made in the previous step should be granted. When the determining step is performed, the request subject to the determining step has just been received *from* the document platform. The determining step requires the determining entity (document platform or document repository) to determine whether a usage right includes a manner of use that allows a digital document to be transferred *to* the document platform. The document platform does not possess the subject usage right until, later in the claim, only after the determining step has been resolved in favor of granting the request; the usage right is transferred *to* the document platform with the digital document. Prior to the "receiving" step, claim 10 introduces the digital document and the usage right as being stored by the document repository. Accordingly, one having ordinary skill in the art would understand that the determining step should be performed by the document repository (which is storing the right used to perform the determining step) and not the document platform (which cannot store the usage right until after the determining step). The determining step of claim 10 at issue is reproduced below.

determining, by the document platform, whether the request may be granted based on the at least one usage right, the determining step including authenticating the document platform and determining whether the at least one usage right includes a manner of use that allows transfer of the digital document to the document platform;

Description Structure

Claim Term	Defendants' Construction	Proper Construction
"Description Structure" ['160, claim 1]	Any acyclic structure that represents the relationship between the components of a digital work	A structure which describes the location of content and the usage rights for a digital work that is comprised of description blocks, each of which corresponds to a digital work or to an interest in a digital work

58. The '160 patent contains a glossary definition of the term "description tree" to mean "a structure which describes the location of content and the usage rights" for a digital work and that "is comprised of description blocks," where "[e]ach description block corresponds to a digital work or to an interest . . . in a digital work." '160 at 32-36. By contrast, the detailed description of a preferred embodiment refers to description trees as "any acyclic structure that represents the relationship between the components of a digital work."

59. A person of ordinary skill in the art at the time of the patent would have understood "description structure" as used in the '160 patent to cover "description tree" in its broadest sense and would have understood this to mean the definition in the glossary. In addition, the detailed description of the '160 patent uses the word "structure" to refer to tables or non-hierarchical data organizations ('160 at 8:42-44, 8:67-9:3, and 9:45-47), and a person of ordinary skill in the art would have understood "description structure" to encompass these structures.

60. I understand that the PTAB construed "description tree" to mean "any acyclic structure that represents the relationship between the components of a digital work" on the ground that the specification sets forth two meanings for a description tree (one in the glossary definition and one in the detailed description) and that the broader meaning should control, which, according to the PTAB, was in the detailed description. Ex. 4 at 22. I also understand that Defendants may attempt to argue that a "description tree" must have an "acyclic" structure based on this determination.

61. However, a person of ordinary skill in the art would recognize that the PTAB erred when it said that the detailed description discussion of an "acyclic" structure is broader than the glossary definition of "description tree." An "acyclic" structure is one that can be represented with a directed graph having no cycles, which is not something that is included or required by the glossary definition of "description tree." Moreover, the word "acyclic" is mentioned in only one place in the '160 patent ('160 at 7:54-8:9), which specifically notes that the structure of composite digital works "may be" organized into an acyclic structure, and other portions of the patent use the word "structure" to refer to tables or non-hierarchical data organizations ('160 at 8:42-44, 8:67-9:3, and 9:45-47). A person of ordinary skill in the art would therefore understand that "description structure" would be defined in accordance with the glossary definition of "description tree" and the disclosures of other "structures" throughout the patent, and not limited to the discussion of "acyclic structure" in the detailed description of an embodiment.

62. A person of ordinary skill in the art would also understand that the PTAB erred in adopting the singular term "relationship," whereas a description structure as used in the '160 patent can represent multiple relationships. For example, the detailed description states that "[t]he description tree for a digital work is comprised of a set of related descriptor blocks (d-

blocks)," where each d-block relates "a unique identifier for the work" and "a rights portion," among other information. '160 at 8:28-36.

63. The specification also states that a purpose of a description tree or description structure is that it "makes it possible to examine the rights and fees for a work without reference to the content of the digital work." '160 at 8:4-6. A person of skill in the art would therefore understand that the purpose of a description tree or description structure does not require an "acyclic" organization for "description structure."

64. Thus, a person of skill in art would understand "description structure" to mean "a structure which describes the location of content and the usage rights for a digital work that is comprised of description blocks, each of which corresponds to a digital work or to an interest in a digital work."

Grammar

Claim Term	Defendants' Construction	Proper Construction
"grammar" ['160, claim 1]	"A manner of defining a valid sequence of symbols consisting of brackets, bars and braces used to describe the language of usage rights sentences, parentheses used to group items together in lists, keywords followed by colons used to indicate a single value, typically an identifier or list of identifiers, and the suffix 'ID.'" Alternatively, indefinite.	A manner of defining a valid sequence of symbols for a language

65. I disagree with Defendants' proposed construction that the term "grammar" is indefinite unless construed to include the limitation of a notation "consisting of brackets, bars and braces

used to describe the language of usage rights sentences, parentheses used to group items together in lists, keywords followed by colons used to indicate a single value, typically an identifier or list of identifiers, and the suffix 'ID.'" The term "grammar" in computer science has been well understood for decades to comprise a set of rules for a language that govern what constitutes valid or permissible strings or sequences of symbols in that language. For example, as explained in a review article in the journal Nature reflecting decades of prior research on grammars, "a grammar is a finite list of rules specifying a language." (See Ex. 5 at 612.) Other dictionaries are consistent with this definition. For example, the Google.com computing dictionary defines "grammar' to mean: "COMPUTING: a set of rules governing what strings are valid or allowable in a language or text." (Ex. 6.) And the American Heritage College Dictionary defines "grammar" as "a normative or prescriptive set of rules setting forth a standard of usage." (Ex. 7 at 602.)

66. Grammars are imposed to ensure that statements in a language are generated in a predictable manner that can be interpreted by corresponding parsers. Grammars and parsers have been used in a variety of applications that involve computer or machine languages going back decades, including compiling (transforming source code written in a programming language into another computer language, often having a binary form known as object code), communications (between a client and server, for example), and databases (which are typically implemented using database schemas comprised of statements expressed in a data definition language that describe the structure of the database).

67. It is well understood in computer science that grammars can be expressed using forms such as Extended Backus-Naur Form (EBNF), a family of metasyntax notations, any of which can be used to express a context-free grammar. In other words, the grammar of a language can

be expressed using any of the notations in the EBNF family. Grammars described in EBNF can also be represented using other notations, such as the original Backus-Naur Form (BNF) and many variants thereof, or through the use of regular expressions. Some of these notations use a bracket notation "[]" while others do not, even though they can encode the same grammars. Thus, to a person of ordinary skill in the art, the claim element requiring that statements be expressed from a "language having a grammar" would be well understood to require that statements in that language be generated and interpreted according to a set of rules making up the grammar, which as noted above could be represented using a variety of notational techniques, and would not include the limitation of a particular notation "consisting of brackets, bars and braces," or the like.

'053 Patent

Claim Term	Defendants' Construction	Proper Construction
"the at least one state variable identifies a location where a state of rights is tracked"	Indefinite	Ordinary and customary meaning.

68. I disagree with Defendants' proposed construction that the phrase "the at least one state variable identifies a location where a state of rights is tracked" is indefinite. The specification contains specific examples of "state variables" that are used to store location information in the form of a Uniform Resource Location (URL), such as an embodiment where "usage is tracked by a state variable 1504, e.g., 'www.foou.edu.'" '053 at 18:14-21. Thus, to a person of ordinary skill in the art, the limitation "at least one state variable identifies a location where a state of rights is tracked" would be understood to mean a variable in accordance with this example. In other words, a variable that stores location information such as a URL that points to a server where a state of rights is tracked would be understood to satisfy the limitation of "state variable identifies a location where a state of rights is tracked."

'280 Patent – Means-Plus-Function Terms

Claim Term	Defendants' Construction	Proper Construction
"means for obtaining a set of rights associated with an item"	Indefinite	A client environment 30 capable of connecting to a web server 80 and storing a license 52 including meta-rights and/or usage rights in a license repository 818, which can be interpreted by a license interpreter 802 (4:67-5:13; 10:44-45).

69. I disagree with Defendants' proposed construction that the term "means for obtaining a set of rights associated with an item" is indefinite. I have identified the structure disclosed in the

specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction" as being a client environment 30 capable of connecting to a web server 80, a license repository 818 and a license interpreter 802, as shown in Figures 1 and 8, and described in prose in the '280 patent at 4:67-5:13, and 10:44-45. The license repository 818 stores license 52 including meta-rights and/or usage rights, and the license interpreter 802 can interpret license 52. A person of ordinary skill in the art would understand that the ability to connect to a web server and to store and interpret licenses embodying a grant of rights is necessary to obtain a set of rights associated with an item, and clearly linked to that function.

Claim Term	Defendants' Construction	Proper Construction
"means for determining whether the rights consumer is entitled to the right specified by the meta-right"	Indefinite	Authorization manager 508 that authenticates the rights consumer 304 and verifies that the conditions 306 of the license 52 have been satisfied (8:66-9:8; 9:15-18; 9:63-10:2)

70. I disagree with Defendants' proposed construction that the term "means for determining whether the rights consumer is entitled to the right specified by the meta-right" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being the authorization manager 508 shown in Figures 5 and 7 and described in prose in the '280 patent at 8:66-9:8, 9:15-18, and 9:63-10:2. The authorization manager 508 authenticates the rights consumer 304 and verifies that the conditions 306 of the license 52 have been satisfied. A person of ordinary skill in the art would understand that authenticating the rights consumer and verifying that the conditions of the license have been satisfied is necessary

to determine whether the rights consumer is entitled to the right specified by the meta-right and clearly linked to that function.

Claim Term	Defendants' Construction	Proper Construction
"means for exercising the meta-right to create the right specified by the meta-right"	Indefinite	Meta-rights manager module 510 that derives new rights from meta-rights 302 in accordance with a set of rules or other logic and updates the state of rights and the current value of the conditions in a state of rights repository (9:9-13; 9:33-50.)

71. I disagree with Defendants' proposed construction that the term "means for exercising the meta-right to create the right specified by the meta-right" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being the meta-rights manager module 510, shown in Figure 5 and described in prose in the '280 patent at 9:9-13 and 9:33-50. The meta-rights manager module 510 derives new rights from meta-rights 302 in accordance with a set of rules or other logic and updates the state of rights and the current value of the conditions in a state of rights repository. A person of ordinary skill in the art would understand that deriving new rights from meta-rights and updating the state of rights and the current value of the conditions in a state of rights repository is necessary in exercising the meta-right to create the right specified by the meta-right, and clearly linked to that function.

Claim Term	Defendants' Construction	Proper Construction
"means for generating a license including the created right"	Indefinite	License Server 50/License Manager 803 (4:5-14; 5:6-13; 10:35-45; 10:62-11:16)

72. I disagree with Defendants' proposed construction that the term "means for generating a license including the created right" is indefinite. I have identified the structure disclosed in the specification that is clearly linked and associated with the claimed function. Those portions are identical to those cited above in "Proper Construction", as being the License Server 50/License Manager 803 that creates licenses that embody the grant of usage rights and/or meta-rights, shown in Figures 1 and 8 and described in prose in the '280 patent at 4:5-14, 5:6-13, 10:35-45, and 10:62-11:16. A person of ordinary skill in the art would understand that a license server/license manager is necessary to generate a license including the created right and clearly linked to that function.

73. I confirm that the contents of this Declaration are true to the best of my knowledge and belief insofar as it states facts and that it contains my honest opinions on the matters upon which I have been asked to give them.

DATED: November 25, 2014

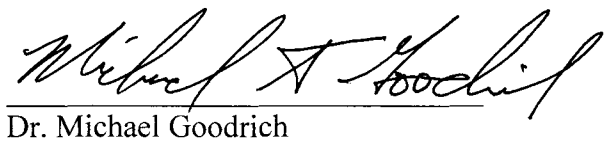


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Exhibit 1

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Paper 15
Entered: July 9, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE CORPORATION AND ZTE (USA) INC.
Petitioners

v.

CONTENTGUARD HOLDINGS, INC.
Patent Owner

Case IPR2013-00139
Patent 7,269,576

Before JAMESON LEE, MICHAEL W. KIM, and MICHAEL R. ZECHER, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

ZTE Corporation and ZTE (USA) Inc. ("ZTE") filed a petition requesting an *inter partes* review of claims 1-36 of U.S. Patent No. 7,269,576 (Ex. 1001, "the '576 patent"). (Paper 2.) ZTE also filed a corrected petition. (Paper 9, "Pet.") The patent owner, ContentGuard Holdings, Inc. ("ContentGuard") filed a preliminary response. (Paper 14, "Prel. Resp.") We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a) which provides as follows:

> THRESHOLD -- The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

Upon consideration of the corrected petition and ContentGuard's preliminary response, we determine that the information presented by ZTE establishes that there is a reasonable likelihood that ZTE would prevail in showing the unpatentability of claims 18-21, 25-28, and 31-36 of the'576 patent. Accordingly, we grant the petition and only institute an *inter partes* review of claims 18-21, 25-28, and 31-36 of the '576 patent.

A. Related Proceedings

ZTE indicates that the '576 patent is involved in co-pending litigation captioned *ContentGuard Holdings Inc. v. ZTE Corp. et al.*, Case No. 3:12-cv-01226 (S.D. Cal.). (Pet. 1.)

ZTE also filed five other petitions seeking *inter partes* review of the following patents: U.S. Patent No. 7,523,072 (IPR2013-00133); U.S. Patent No. 7,225,160 (IPR2013-00134); U.S. Patent No. 7,359,884 (IPR2013-00136); U.S. Patent No. 6,963,859 (IPR2013-00137); and U.S. Patent No. 7,139,736 (IPR2013-00138). (Pet. 1.)

B. The '576 Patent

The subject matter of the '576 patent relates to the distribution of digitally encoded works and the enforcement of usage rights. (Ex. 1001, 1:5-6.) According to the '576 patent, an issue facing the publishing and information industries is how to prevent the unauthorized and unaccounted distribution or usage of electronically published materials. (Ex. 1001, 1:10-13.) In particular, a major concern, according to the '576 patent, is the ease with which electronically published works can be "perfectly" reproduced and distributed. (Ex. 1001, 1:24-25.) According to the '576 patent, one way to curb unaccounted distribution is to prevent unauthorized copying and transmission. (Ex. 1001, 1:44-46.) Another way, according to the '576 patent, is to distribute software which requires a "key" to enable its use. (Ex. 1001, 1:60-61.) The '576 patent discloses that while such distribution and protection schemes prevent unauthorized distributions, they do so by sacrificing the potential for subsequent revenue bearing uses. (Ex. 1001, 2:56-60.) For example, the '576 patent discloses that it may be desirable to allow the lending of a purchased work to permit exposure of the work to potential buyers, permit the creation of a derivative work for a fee, or permit copying the work for a fee. (Ex. 1001, 2:60-65.) The '576 patent discloses that it solves these problems

by both permanently attaching usage rights to digital works, and by placing elements in repositories, which store and control the digital works and enforce the usage rights associated therewith. (Ex. 1001, 3:53-4:15.)

Figure 1 of the '576 patent illustrates the basic operations of the disclosed invention. (Ex. 1001, 4:31-34, 6:66-7:1). Figure 1 of the '736 patent is reproduced below:

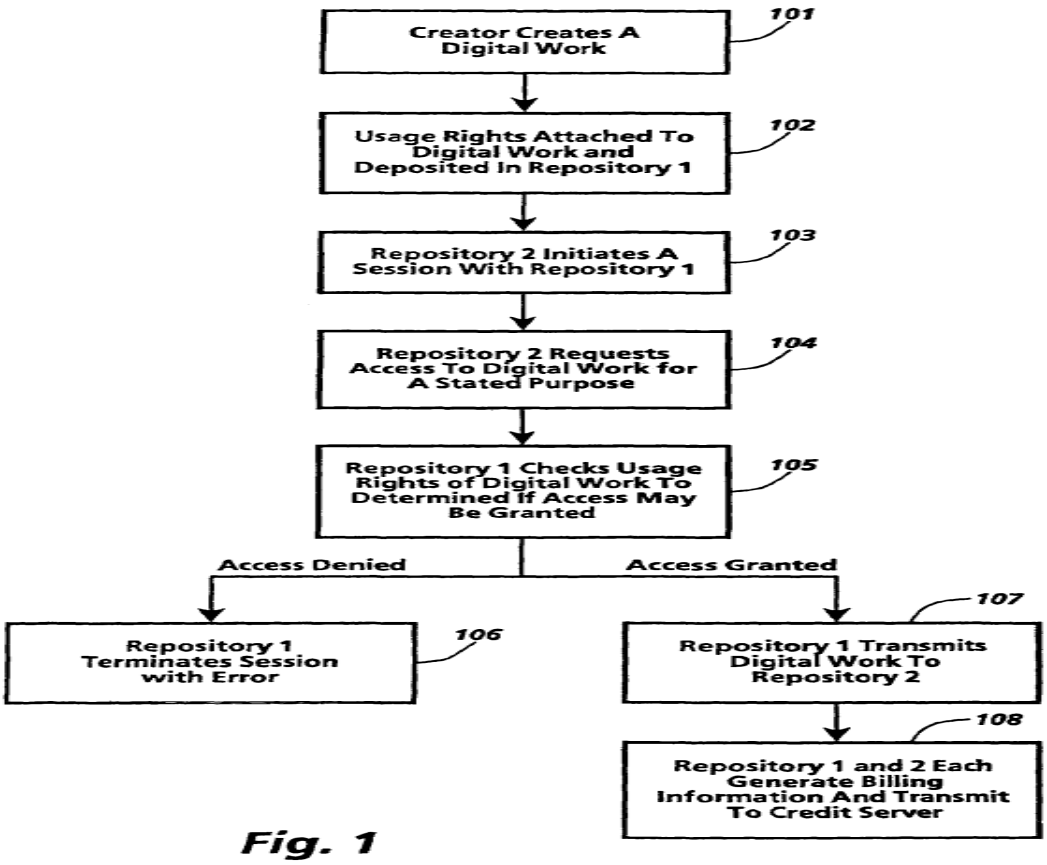

Fig. 1

Figure 1 illustrates the basic operations of repositories 1 and 2.

According to the embodiment of Figure 1, at step 101, a creator creates a digital work. (Ex. 1001, 7:1-2.) At step 102, the creator determines the

appropriate usage rights and fees, attaches them to the digital work, and stores the digital work with the associated usage rights and fees in repository 1. (Ex. 1001, 7:2-7.) At step 103, repository 1 receives a request to access the digital work from repository 2. (Ex. 1001, 7:7-9.) Such a request, or session initiation, includes steps that help ensure that repository 1 and repository 2 are trustworthy. (Ex. 1001, 7:7-12.) At step 104, repository 2 requests access to the digital work stored in repository 1 for a stated purpose, *e.g.*, to print the digital work or obtain a copy of the digital work. (Ex. 1001, 7:13-17.) At step 105, repository 1 checks the usages rights associated with the digital work stored therein to determine if access to the digital work may be granted. (Ex. 1001, 7:17-24.) At step 106, if access is denied, repository 1 terminates the session with repository 2 by transmitting an error message. (Ex. 1001, 7:24-25.) At step 107, if access is granted, repository 1 transmits the digital work to repository 2. (Ex. 1001, 7:25-27.) At step 108, both repository 1 and 2 generate billing information prior to transmitting the billing information to a credit server. (Ex. 1001, 7:27-30.) The use of both repositories 1 and 2 for billing prevents attempts to circumvent the billing process. (Ex. 1001, 7:30-31.)

One embodiment described in the ’576 patent relates to enforcing usage rights in rendering systems. (Ex. 1001, 8:16-67.) Rendering systems are systems that can render a digital work into its desired form, such as by printing a file on a printer or executing a software program in a processor. (Ex. 1001, 8:19-22, 8:37-38, 8:53-55.) Other examples of rendering systems include display, video, or audio systems. (Ex. 1001, 51:65-67.) Rendering systems include repositories that store digital works and maintain the security features of the ’576 patent. (Ex.

1001, 8:22-23, 12:25-34.) Repositories in rendering systems can request to perform various usage transactions, such as play or print transactions, that obtain a digital work from a remote repository and then provide it to an attached rendering device to be rendered. (Ex. 1001, 30:23-35, 36:18-37:26.)

Figure 4a of the '576 patent is reproduced below:

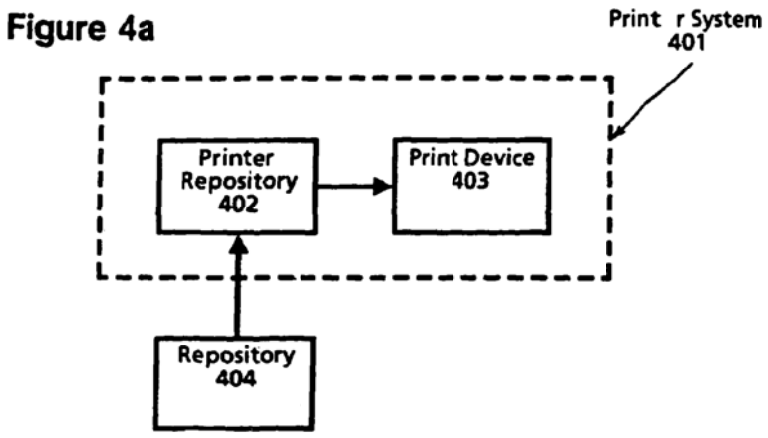

Figure 4a illustrates an example of a rendering system

According to the embodiment of Figure 4a, a printer system (401), including a print device (403) and a printer repository (402), is attached to an external repository (404) that contains digital works. (Ex. 1001, 8:26-29, 48-51.) The printer repository can obtain a copy of the digital work to be provided to the rendering device. (Ex. 1001, 8:36-38.) That is accomplished by invoking a specific type of usage transaction called a print transaction. (Ex. 1001, 36:55-37:26.) A print transaction begins with a requestor repository sending a message requesting permission to obtain and print a specified digital work that is stored in a server repository. (Ex. 1001, 36:55-37:26.) Certain rendering transactions require

the presence of a digital ticket or an authorization object in a repository requesting a digital work before the digital work can be provided. (Ex. 1001, 36:45-46, 37:18-19, 31:6-9.) Repositories acquire digital tickets through authorization transactions that request authorization objects from a remote authorization repository. (Ex. 1001, 41:31-42:16.) If the repository requesting the digital work is in possession of an authorization object, the server repository determines whether the requestor is permitted to perform the transaction based on usage rights related to the digital work. (Ex. 1001, 36:45-46, 37:18-19, 30:59-31:49.) Once the transaction is determined as being permitted, the digital work is transmitted to the repository requesting the digital work, and then the digital work is rendered. (Ex. 1001, 36:47-50, 37:20-22.)

C. Exemplary Claims

Claims 1 and 18 are independent claims and are directed, respectively, to an apparatus and a method. Claims 2-17 directly or indirectly depend from claim 1, and claims 19-36 directly or indirectly depend from claim 18. Claims 1 and 18 are reproduced below, with a key term bolded for emphasis:

> 1. An apparatus for rendering digital content in accordance with rights that are enforced by the apparatus, said apparatus comprising:
>
> a rendering engine configured to render digital content;
>
> a storage for storing the digital content;
>
> means for requesting use of the digital content stored in the storage; and

a **repository** coupled to the rendering engine,

wherein the repository includes:

means for processing a request from the means for requesting,

means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus,

means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital; and

means for authorizing the repository for making the digital content available for rendering, wherein the digital content can be made available for rendering only by an authorized repository, the repository comprising:

means for making a reauest [sic] for an authorization object required to be included within the repository for the apparatus to render the digital content; and

means for receiving the authorization object when it is determined that the request should be granted.

18. A method for controlling rendering of digital content on an apparatus having a rendering engine configured to render digital content and a storage for storing the digital content, said method comprising:

specifying rights within said apparatus for digital content stored in said storage, said rights specifying how digital content can be rendered;

storing digital content in said storage;

receiving a request for rendering of said digital content stored in the storage;

checking whether said request is for a permitted rendering of said digital content in accordance with said rights specified within said apparatus;

processing the request to make said digital content available to the rendering engine for rendering when said request is for a permitted rendering of said digital content;

authorizing a **repository** for making the digital content available for rendering, wherein the digital content can be made available for rendering only by an authorized repository, the repository performing the steps of:

making a request for an authorization object reguired [sic] to be included within the repository for rendering of the digital content; and

receiving the authorization object when it is determined that the request should be granted.

D. Prior Art Relied Upon

ZTE relies upon the following prior art references:

Eur. Pat. Publ'n	0 268 139 ("EP '139")	May 25, 1988	(Ex. 1012)
Eur. Pat. Publ'n	0 464 306 ("EP '306")	Jan. 8, 1992	(Ex. 1010)
Hendricks	U.S. Patent 5,986,690	Nov. 16, 1999	(Ex. 1013)
Walker	U.S. Patent 4,868,736	Sept. 19, 1989	(Ex. 1011)
Wyman	U.S. Patent 5,260,999	Nov. 9, 1993	(Ex. 1014)

E. The Alleged Grounds of Unpatentability

ZTE contends that the challenged claims are unpatentable based on the following grounds:

1. Claims 1-4, 8-11, 14-21, 25-28, and 31-36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP ’139;
2. Claims 1, 2, 4-9, 12-15, 17-19, 21-26, 29-32, and 34-36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker;
3. Claims 1-4, 7-15, 17-21, 24-32, and 34-36 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks;
4. Claims 1, 2, 4-6, 8-12, 15, 16, 18, 19, 21-23, 25-29, 32, 33, 35, and 36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP ’306; and
5. Claims 5, 6, 22, and 23 are unpatentable under 35 U.S.C. § 103(a) as obvious over Hendricks in view of Wyman.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). Also, claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). An inventor may rebut that presumption by providing a definition of the term in the specification with

reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

ContentGuard submits a proposed construction for the claim term "repository." (Prel. Resp. 20-23.) We also note that in independent claim 1 there are numerous elements recited in means-plus-function format under 35 U.S.C. § 112, sixth paragraph, within the repository. We will construe each of these claim limitations in turn.

1. "Repository" (Independent Claims 1 and 18)

ContentGuard contends that the term "repository" should be interpreted as "a trusted system for supporting usage rights." (Prel. Resp. 21.) ContentGuard cites several portions of the specification which support that construction. (Prel. Resp. 21-23, *citing* Ex. 1001, 4:6-7, 6:50-54, 12:25-34, , 13:25-33, 13:51-56, 52:1-6.) ZTE does not provide an explicit construction for "repository."

The specification provides a glossary which recites the following meaning for "repository":

> Conceptually a set of functional specifications defining core functionality in the support of usage rights. **A repository is a trusted system in that it maintains physical, communications and behavioral integrity.**

(Ex. 1001, 52:1-6, emphasis added.) By setting forth the term in a glossary and using the verb "is" following "repository" in the second sentence, the specification sets forth an explicit definition of "repository" as "a trusted system in that it maintains physical, communications and behavioral integrity." The first sentence is also relevant to the definition of "repository" because it elaborates that the

repository supports usage rights. Accordingly, we construe "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights."

Our analysis does not end here. In order to understand "a trusted system" it is necessary to construe "physical integrity," "communications integrity," and "behavioral integrity." Those terms are described in a section of the specification labeled "[r]epositories." For "physical integrity," the specification describes:

> Physical integrity refers to the integrity of the physical devices themselves. **Physical integrity applies both to the repositories and to the protected digital works.** Thus, the higher security classes of repositories themselves may have sensors that detect when tampering is attempted on their secure cases. **In addition to protection of the repository itself, the repository design protects access to the content of digital works.** In contrast with the design of conventional magnetic and optical devices-such as floppy disks, CD-ROMs, and videotapes-**repositories never allow non-trusted systems to access the works directly.** A maker of generic computer systems cannot guarantee that their platform will not be used to make unauthorized copies. The manufacturer provides generic capabilities for reading and writing information, and the general nature of the functionality of the general computing device depends on it. Thus, a copy program can copy arbitrary data. This copying issue is not limited to general purpose computers. It also arises for the unauthorized duplication of entertainment "software" such as video and audio recordings by magnetic recorders. Again, the functionality of the recorders depends on their ability to copy and they have no means to check whether a copy is authorized. In contrast, **repositories prevent access to the raw data by general devices** and can test explicit rights and conditions before copying or otherwise granting access. **Information is only accessed by protocol between trusted repositories.**

(Ex. 1001, 12:35-61; emphasis added.) Much of the above description makes use of permissive terms such as "may" and "can" and, thus, do not reflect or indicate a required limitation for physical integrity. The specification also appears to use the terms or phrases in each of the following three groups interchangeably:

1. data, content, digital work, information;
2. non-trusted system, general device; and
3. "never allow access" and "prevent access."

When referring to the relationship between the repository and data, the specification uses absolute terms such as "never" and "only."

In light of the foregoing, we construe "physical integrity" as "preventing access to information by a non-trusted system."

For "communications integrity," the specification describes the following:

> Communications integrity refers to the integrity of the communications channels between repositories. Roughly speaking, communications integrity means that repositories cannot be easily fooled by "telling them lies." Integrity in this case refers to the property that **repositories will only communicate with other devices that are able to present proof that they are certified repositories**, and furthermore, that the repositories monitor the communications to detect "impostors" and malicious or accidental interference. Thus **the security measures involving encryption, exchange of digital certificates, and nonces described below are all security measures aimed at reliable communication** in a world known to contain active adversaries**.**

(Ex. 1001, 12:62-13:7; emphasis added.) We construe "communications integrity" as "only communicates with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption,

exchange of digital certificates, and nonces." The Encyclopedia of Cryptography defines "nonce" as "[a] number used in a cryptographic protocol to indicate the unique character of a message." Newton, David E., Encyclopedia of Cryptography 197 (1997).

For "behavioral integrity," the specification describes:

> Behavioral integrity refers to the integrity in what repositories do. What repositories do is determined by the software that they execute. The integrity of the software is generally assured only by knowledge of its source. Restated, a user will trust software purchased at a reputable computer store but not trust software obtained off a random (insecure) server on a network. **Behavioral integrity is maintained by requiring that repository software be certified and be distributed with proof of such certification, i.e. a digital certificate.** The purpose of the certificate is to authenticate that the software has been tested by an authorized organization, which attests that the software does what it is supposed to do and that it does not compromise the behavioral integrity of a repository. **If the digital certificate cannot be found in the digital work or the master repository which generated the certificate is not known to the repository receiving the software, then the software cannot be installed.**

(Ex. 1001, 13:8-33; emphasis added.) We construe "behavioral integrity" in the context of a repository as "requiring software to include a digital certificate in order to be installed in the repository."

The record is not without evidence in contrary to our interpretation. That is not unusual. The nature of interpretation is to come to the appropriate conclusion in light of all of the evidence. All of the evidence does not have to point uniformly in a single direction.

The specification in Table 2 indicates ten different levels of security for repositories, and the lowest level, *i.e.*, level "0," is described as follows:

> Open system. Document transmission is unencrypted. No digital certificate is required for identification. The security of the system depends mostly on user honesty, since only modest knowledge may be needed to circumvent the security measures. The repository has no provisions for preventing unauthorized programs from running and accessing or copying files. The system does not prevent the use of removable storage and does not encrypt stored files.

(Ex. 1001, 15:30-41.) Thus, according to Table 2, repositories are not all trusted systems. Level "0" security means having an open system lacking in physical, communications, and behavioral integrity, and without support for managing usage rights. That is directly contrary to the meaning of "repository" as defined in the glossary. For reasons discussed below, we adhere to the definition provided in the glossary. The contrary evidence based on level "0" security shown in Table 2 is insufficient to outweigh the rest of the evidence including, in particular, the explicit definition provided in the glossary. We make our determination based on the totality of the evidence.

As noted above, the disclosed invention is about distribution of and usage rights enforcement of digital works. The problems described in the background portion of the specification concerns unauthorized and unaccounted distribution or usage of electronically published materials. (Ex. 1001, 1:24-43.) The '576 patent states that it solves preexisting problems by both permanently attaching usage rights to digital works and placing elements in repositories which enforce those usage rights. (Ex. 1001, 3:53-4:15.)

Here, the definition set forth in the glossary for "repository" is fully consistent with the description of the acknowledged prior art and the objective or goal to be achieved by the invention. The specification also contains detailed preferred embodiments utilizing repositories which are trusted systems to provide usage control for digital works. (Ex. 1001, 12:25-34, 26:20-44, 43:36-50:26.)

The bulk of the disclosure consistently is directed to repositories which are trusted systems for providing usage control for digital works. For example, the specification states:

> **The enforcement elements of the present invention are embodied in repositories.** Among other things, repositories are used to store digital works, control access to digital works, bill for access to digital works and maintain the security and integrity of the system.

(Ex. 1001, 6:50-54, emphasis added.) Other references to "repository" in the specification that recite necessary features of repositories also support the definition in the glossary that a repository is a trusted system.

> The core repository services 1302 comprise a set of functions **required by each and every repository**. The core repository services 1302 include the session initiation transactions which are defined in greater detail below. This set of services also includes a generic ticket agent which is used to "punch" a digital ticket and a generic authorization server for processing authorization specifications.

(Ex. 1001, 14:45-51, emphasis added.) In another example, the specification discloses that "[a]s a prerequisite to operation, a repository will require possession of an identification certificate" and that "identification certificates 1306 are required to enable the use of the repository." (Ex. 1001, 13:42-44, 14:56-57.)

Indeed, by using words such as "require" and "required," such examples amply support the definition provided in the glossary that a repository is a trusted system.

In summary, the weight of the evidence supports the definition provided in the glossary, even applying the rule of broadest reasonable construction consistent with the specification. We regard as significant that the definition states in no equivocal manner that a repository "is a trusted system."

2. Repository "means for …" (Claim 1)

Independent claim 1 recites a repository including six different means-plus-function claim elements. The meaning of a means-plus-function limitation is governed by 35 U.S.C. § 112, sixth paragraph, which provides:[1]

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The above-quoted requirement applies regardless of the context in which the meaning of a means-plus-function claim element arises, *i.e.*, whether in a proceeding before the Patent and Trademark Office, or in validity or infringement litigation before the courts. *In re Donaldson,* 16 F.3d 1189, 1193 (Fed. Cir. 1994)(en banc). More importantly, the established law regarding 35 U.S.C. § 112,

[1] Section 4(c) of the America Invents Act ("AIA") re-designated 35 U.S.C. § 112, ¶ 6, as 35 U.S.C. § 112(f). Because the '576 patent has a filing date prior to September 16, 2012, the effective date of AIA, we refer to the pre-AIA version of 35 U.S.C. § 112.

sixth paragraph, as applied to computer-implemented means-plus-function elements, is articulated in *Finisar Corp. v. DirecTV Group, Inc*., 523 F.3d 1323, 1340 (Fed. Cir. 2008):

> For computer-implemented means-plus-function claims where the disclosed structure is a computer programmed to implement an algorithm, "the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm." *WMS Gaming, Inc. v. Int'l Game Tech*., 184 F.3d 1339, 1349 (Fed. Cir. 1999). Thus the patent must disclose, at least to the satisfaction of one of ordinary skill in the art, enough of an algorithm to provide the necessary structure under 35 U.S.C. § 112, ¶ 6. This court permits a patentee to express that algorithm in any understandable terms including as a mathematical formula, in prose, *see In re Freeman*, 573 F.2d 1237, 1245-46 (CCPA 1978), or as a flow chart, or in any other manner that provides sufficient structure.

The above-quoted law of 35 U.S.C. § 112, sixth paragraph, is well established. In *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech*., 521 F.3d 1328, 1333 (Fed. Cir. 2008), the Court of Appeals for the Federal Circuit stated:

> **In cases involving a computer-implemented invention in which the inventor has invoked means-plus-function claiming, this court has consistently required that the structure disclosed in the specification be more than simply a general purpose computer or microprocessor.** The point of the requirement that the patentee disclose particular structure in the specification and that the scope of the patent claims be limited to that structure and its equivalents is to avoid pure functional claiming.

(Emphasis added.)

More recently, the Federal Circuit also indicated that generally disclosing software without providing detail is not enough disclosure of structure. *Function Media, L.L.C. v. Google Inc.*, 708 F.3d 1310, 1318 (Fed. Cir. 2013). In that regard, the Federal Circuit stated that when dealing with a special purpose computer-implemented means-plus-function limitation, the specification must disclose the algorithm for performing the function and that the specification can express the algorithm in any understandable terms, such as mathematical formula, prose, or flow chart. *Id.*

Claim 1 is directed towards a system including a repository comprising, within it, six means-plus-function claim elements. Each of these claim elements is recited in the form of a means for performing a function without recital of any structure. As such, they are presumed to have invoked 35 U.S.C. § 112, sixth paragraph. *Personalized Media Communications LLC v. Int'l Trade Comm'n*, 161 F.3d 696, 703-04 (Fed. Cir. 1998); *Sage Prods. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427-28 (Fed. Cir. 1997).

For each of the six means-plus-function elements, ZTE points to processing means 1200 as the corresponding structure disclosed in the specification, with the sixth means also including external interface 1206. (Pet. 9.) Processing means 1200 as disclosed in the specification of the '576 patent is comprised of processor element 1201, which may be a microprocessor or other suitable computing component, and processor memory 1202 which contains software used by the processor. (Ex. 1001, 13:59 to 14:10.) As presented by ZTE, the corresponding computing structure for each of the computer-implemented means is no more than

a general purpose computer with generally referenced software. That, however, is incorrect.

A general purpose computer executing generally referenced software is insufficient to constitute corresponding structure of a claim element expressed in means-plus-function form under 35 U.S.C. § 112, sixth paragraph. *Finisar*, 523 F.3d at 1340; *Aristocrat*, 521 F.3d at 1333; *see also Function Media*, 708 F.3d at 1318. Instead, the structure of a computer-implemented means must be a "special purpose computer programmed to perform [a] disclosed algorithm." *Finisar*, 523 F.3d at 1340. In that regard, the specification must disclose the computer executed algorithm for performing the recited function, and the specification can express the algorithm in any understandable terms, such as mathematical formula, prose, or flow chart. *Function Media*, 708 F.3d at 1318.

Hereinbelow, we consider each of the six means-plus-function claim elements and find algorithms sufficiently expressed in prose, which, in combination with the disclosed processor, form their corresponding structures.

a. means for processing a request from the means for requesting;

Claim 1 recites that the repository includes "means for processing a request from the means for requesting." In the context of claim 1, the request to be processed is a request to use digital content from storage because claim 1 leads with (1) rendering engine configured to render digital content; (2) storage for storing digital content; and (3) means for requesting use of the digital content stored in storage.

The specification discloses that "rendering" a digital work turns it into a desired form, and that rendering systems include printing, display, video, audio, or general purpose computer systems. (Ex. 1001, 8:19-22, 8:37-38, 8:53-55, 51:65-67.) Thus, rendering a digital work constitutes using the digital content of that work.

The '576 patent states that "[t]he usage transactions handler 1303 comprise[s] functionality for processing access requests to digital works." (Ex. 1001, 14:58-59.) The specific actions taken for a given usage transaction depend on the specifications assigned for a given usage right. (Ex. 1001, 26:20-24, 34:25-26.) For rendering operations such as executing or displaying, the '576 patent discloses a "play" transaction which renders a digital work by displaying or executing it. (Ex. 1001, 36:18-54.) For rendering operations such as printing, the '576 patent discloses a "print" transaction which renders a digital work by printing it. (Ex. 1001, 36:55-37:26.) In both cases, a requestor repository attached to a rendering device requests to render an object held by a server repository. (*See* Ex. 1001, 30:25-30.) Both of those transactions involve similar steps, but with a difference in the form of how a digital work is rendered.

Processing begins when a requester repository has sent a message to initiate a request. (Ex. 1001, 36:35-40, 37:9-13.) First, the server repository checks the compatibility of the requester repository and the validity of the requester's identification. (Ex. 1001, 36:41-44, 37:14-17.) Second, the requester and server repositories perform the common opening transaction steps of determining whether authorization is needed, and whether the requested transaction is permitted given the usage rights. (Ex. 1001, 36:45-46, 37:18-19, 30:59-31:49.) Third, requester

and server repositories perform a transmission protocol to read and write blocks of data, and then the requester repository renders the digital work. (Ex. 1001, 36:47-50, 37:20-22.) Fourth, the contents are removed from the rendering device and the requester repository. (Ex. 1001, 36:51-52, 37:23-24.) Finally, the requester and server repositories perform the common closing transaction steps of updating the usage rights and billing information. (Ex. 1001, 36:53-54, 37:25-26, 32:20-31.)

The above-noted description constitutes a sufficiently disclosed algorithm, expressed in prose, which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for processing a request from the means for requesting."

> *b. means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus;*

Claim 1 recites that the repository includes "means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus." The '576 patent states that the print and play transactions both use the common opening transaction steps to determine whether the requested transaction is permitted. (Ex. 1001, 36:45-46, 37:18-19, 30:59-31:49.)

First, the requester repository determines whether an authorization certificate or a digital ticket is needed. (Ex. 1001, 31:3-9.) Second, the server repository generates a transaction identifier. (Ex. 1001, 31:10-13.) Third, the server repository determines whether the right is granted and whether time, security, and access based conditions are satisfied. (Ex. 1001, 31:13-33.) Finally, the server

repository determines whether there are sufficient copies of the work to distribute. (Ex. 1001, 31:34-49.) The above-noted description constitutes a sufficiently disclosed algorithm, expressed in prose, which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for checking whether the request is for a permitted rendering of the digital content in accordance with rights specified in the apparatus."

> *c. means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content];*

Claim 1 recites that the repository includes "means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content]." The '576 patent states that the print and play transactions, when permitted, each transfer data from the server repository to the requester repository and the rendering device, and that the transfer is accomplished through the use of a transfer protocol. (Ex. 1001, 36:46-49, 37:20-22.)

First, transaction information is provided to the server repository by the requester repository. (Ex. 1001, 33:3-8.) Second, the server repository transmits a block of data to the requester repository and waits for an acknowledgement provided by the requester when the block of data has been received. (Ex. 1001, 33:9-15.) Unless a communications failure terminates the transaction, that process repeats until there are no more blocks to transmit. (Ex. 1001, 33:16-38, 33:46-49.) Finally, the requester repository commits the transaction and sends an acknowledgement to the server repository. (Ex. 1001, 33:39-45.) The above-noted

description constitutes a sufficiently disclosed algorithm, expressed in prose, which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for processing the request to make the digital content available to the rendering engine for rendering when the request is for a permitted rendering of the digital [content]."

d. means for authorizing the repository for making the digital content available for rendering,

Claim 1 recites that the repository includes "means for authorizing the repository for making the digital content available for rendering." According a disclosed embodiment in the specification, certain rendering transactions require the presence of a digital ticket in a server repository before a digital work can be provided to a requester repository. (Ex. 1001, 36:45-46, 37:18-19, 31:6-9.) In that regard, digital tickets are acquired by a repository through authorization transactions that request authorization objects (digital tickets) from a remote authorization repository. (Ex. 1001, 41:31-42:16.)

First, a communication channel is set up between the server and the remote repository. (Ex. 1001, 41:52-54.) Second, the server repository performs a registration process with the remote repository. (Ex. 1001, 41:55-57.) Third, the server repository invokes a "play" transaction to acquire the authorization object. (Ex. 1001, 41:58-64.) Finally, the server repository performs tests on the authorization object or executes a script before signaling that authorization has been granted for rendering content. (Ex. 1001, 41:65-42:16.) The above-noted description constitutes a sufficiently disclosed algorithm, expressed in prose,

which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for authorizing the repository for making the digital content available for rendering."

> *e. means for making a [request] for an authorization object required to be included within the repository for the apparatus to render the digital content;*

Claim 1 recites that the repository includes "means for making a [request] for an authorization object required to be included within the repository for the apparatus to render the digital content." As noted above, according to a disclosed embodiment in the specification, certain rendering transactions require the presence of a digital ticket in a server repository before a digital work can be provided to a requester repository. (Ex. 1001, 31:6-9, 41:31-42:16.) In that regard, digital tickets are acquired by a repository through authorization transactions that request authorization objects (digital tickets) from a remote repository. (*Id.*) First, a communications channel is set up between the server repository and the remote repository. (Ex. 1001, 41:52-54.) Second, the server repository performs a registration process with the remote repository. (Ex. 1001, 41:55-57.) Third, the server repository invokes a "play" transaction to request the authorization object. (Ex. 1001, 41:58-64.) The above-noted description constitutes a sufficiently disclosed algorithm, expressed in prose, which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for making a [request] for an authorization object required to be included within the repository for the apparatus to render the digital content."

f. means for receiving the authorization object when it is determined that the request should be granted.

Claim 1 recites that the repository includes "means for receiving the authorization object when it is determined that the request should be granted." It is described in the specification that the authorization process invokes a "play" transaction to acquire an authorization object from a remote repository. (Ex. 1001, 41:50-65.) Sending and receiving of objects through a "play" transaction follow a particular transmission protocol. (Ex. 1001, 32:33; 36:47-50.)

According to that protocol, the server repository transmits a block of data to the requester repository and waits for an acknowledgement, which the requester provides when the block of data has been completely received. (Ex. 1001, 33:9-15.) Unless a communications failure terminates the transaction, that process repeats until there are no more blocks to transmit. (Ex. 1001, 33:16-38, 33:46-49.) Finally, the requester repository sends a completion acknowledgement to the server repository. (Ex. 1001, 33:39-45.) In that regard, the specification states (Ex. 1001, 33:45-48): "The key property is that both the server and the requester cancel a transaction if it is interrupted before all of the data blocks are delivered, and commits to it if all of the data blocks have been delivered." The above-noted description constitutes a sufficiently disclosed algorithm, expressed in prose, which, in combination with processor 1200, constitutes a corresponding structure for the claimed "means for receiving the authorization object when it is determined that the request should be granted."

B. EP '139

ZTE contends that claims 1-4, 8-11, 14-21, 25-28, and 31-36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '139. (Pet. 15-27.) ZTE relies on claim charts describing how EP '139 allegedly describes the claimed subject matter, and also on the Declaration of Dr. Vijay K. Madisetti. (Ex. 1015.) We have considered ZTE's analysis and supporting evidence as well as ContentGuard's arguments, and are persuaded that ZTE has demonstrated a reasonable likelihood that it would prevail with respect to claims 18-21, 25-28, and 31-36, but not with respect to claims 1-4, 8-11, and 14-17.

Because ZTE's analysis of what is covered by the six means-plus-function elements recited in independent claim 1 within the "repository" is incorrect, ZTE has not properly applied those elements onto the disclosure of EP '139. Accordingly, for that reason alone, ZTE has not demonstrated a reasonable likelihood that it would prevail with respect to claims 1-4, 8-11, and 14-17.

EP '139 discloses a data processing system with a software copy protection mechanism. (Ex. 1012, 1:4-6.) To provide security, each computer or host that runs a protected software application is associated with a logically and physically secure coprocessor. (Ex. 1012, 1:25-29.) Figure 1 of EP '139 describes the important components of the software asset protection mechanism and how they interact. (Ex. 1012, 21:29-31). Figure 1 is reproduced below:

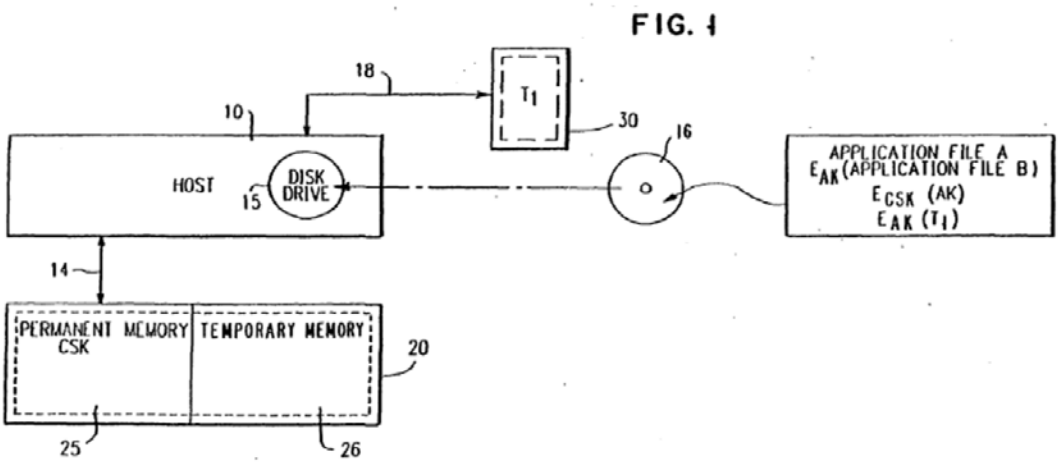

Figure 1 illustrates a composite computing system.

According to the embodiment of Figure 1, EP '139 discloses a software asset protection mechanism embodied in a composite computing system. (Ex. 1012, 21:58-22:5.) This composite computer system includes host 10 and coprocessor 20 connected via communication link 14. (Ex. 1012, 22:3-6.) Coprocessor 20 also includes permanent, non-volatile memory 25 and temporary memory 26. (Ex. 1012, 22:19-21.) In order for a user to execute a protection application, they must install a right to execute the application in the form of a software decryption key in permanent memory 25. (Ex. 1012, 22:22-32.) To install this right to execute, the user receives from a software vendor hardware cartridge 30 and distribution disk 16. (Ex. 1012, 22:32-36.) In one embodiment, distribution disk 16 stores three files: (1) the software decryption key, encrypted by a different decryption key provided by the vendor and also stored in coprocessor 20; (2) a protected application file encrypted with the application decryption key; and (3) and encrypted token data. (Ex. 1012, 22:23-27, 36-48.) To install the right to execute,

coprocessor 20 decrypts the software decryption key in temporary memory, and then verifies that the hardware cartridge is authentic by querying the token data included in the cartridge. (Ex. 1012, 23:1-8.) Once a token has been used, it cannot be used again. (Ex. 1012, 23:8-11.) After verifying that the hardware cartridge is authentic and unused, coprocessor 20 will accept the right to execute and store the software decryption key in permanent memory 25. (Ex. 1012, 23:11-16.) With access to the software decryption key, the protected application file can be decrypted and stored in temporary memory 26 so that it may be executed by coprocessor 20. (Ex. 1012, 23:16-21.)

In one embodiment, EP ’139 discloses a source composite processor, including source host 10 and coprocessor 20, that can communicate with a sink composite processor, including sink host 110 and sink coprocessor 120. (Ex. 1012, 25:49-52.) The source and sink processors are interconnected via communication link 200. (Ex. 1012, 26:5-6.) EP ’139 discloses that source coprocessor 20 and sink coprocessor 120 exchange encrypted information. (Ex. 1012, 26:10-20.) Only coprocessors that are “member[s] of the family” are capable of decrypting and recognizing the information transmitted thereto. (Ex. 1012, 26:7-10, 20-23.) EP ’139 also discloses that the source coprocessor 20 can encrypt a right to execute a particular software program and send it to the sink coprocessor 120. (Ex. 1012, 26:32-35.)

First, ContentGuard argues that EP ’139 does not disclose a “repository.” (Prel. Resp. 32-33). We disagree. ZTE relies on coprocessor 20 in combination with permanent memory 25 and temporary memory 26 as constituting that repository. (Pet. 20, 25.) As noted above, “repository” is construed as “a trusted

system which maintains physical, communications and behavioral integrity, and supports usage rights." "Physical integrity" is construed as "preventing access to information by a non-trusted system." "Communications integrity" is construed as "only communicates with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces." "Behavioral integrity" is construed as "requiring software to include a digital certificate in order to be installed in the repository."

EP '139 does disclose a repository. EP '139 discloses that coprocessor 20 maintains physical integrity by being "provided with physical security which is effective to prevent mechanical tampering or access to the interior of the coprocessor 20 by a user or a pirate." (Ex. 1012, 22:14-17.) EP '139 also discloses that coprocessor 20 possesses communications integrity. In order to communicate, proof is required that sink coprocessor 120 is a "member of the family" by exchanging encrypted information via communication link 200. (Ex. 1012, 26:5-6, 26:7-23.) EP '139 also discloses that coprocessor 20 possesses behavioral integrity by requiring source coprocessor 20 to transmit an encrypted right-to-execute for a protected software application before a sink coprocessor 120 can properly execute the application. (Ex. 1012, 26:32-35.) Thus, coprocessor 20, in combination with permanent memory 25 and temporary memory 26, fulfill all the requirements of a repository.

Claim 18 includes the steps of "authorizing a repository for making the digital content available for rendering," and "making a request for an authorization object [required] to be included within the repository for rendering of the digital

content." ContentGuard argues that EP '139 does not disclose either one of those steps. (Prel. Resp. 33-35.) With regard to those steps, ZTE cites to EP '139's disclosure of a right-to-execute software decryption key being installed based on the presence of a hardware cartridge containing unused tokens. (Pet. 21-22, 25-26.) ContentGuard identifies two possible interpretations of ZTE's position regarding what satisfies the claimed authorization object, and argues that neither the tokens nor the right-to-execute keys can fulfill the requirement of an authorization object. (Prel. Resp. 34-35.) We have reviewed the charts presented by ZTE with regard to the request for an authorization object, and conclude that ZTE reasonably relied on the software decryption key as satisfying the authorization object.

EP '139 discloses that executing a protected application on coprocessor 20 requires the possession of a right-to-execute represented by a software decryption key (AK). (Ex. 1012, 22:27-32.) That key must be installed in permanent memory 25 before the application can be executed. (Ex. 1012, 22:27-30.) Before accepting the key into permanent memory 25, coprocessor 20 must verify that a hardware cartridge 30 containing unused tokens is attached and authentic. (Ex. 1012, 23:3-8.) The authentication is performed by querying the contents of the cartridge. (Ex. 1012, 22: 46-48, 23:5-8, 20:52-56.) Once the cartridge is verified, then the software decryption key is stored in permanent memory 25. (Ex. 1012, 23:11-16.)

The above-described sequence of operations implements and satisfies both the step of "authorizing a repository for making the digital content available for rendering," and "making a request for an authorization object [required] to be

included within the repository for rendering of the digital content." In this case, the software decryption key is the authorization object.

ContentGuard argues that the right-to-execute represented by the software decryption key cannot fulfill the claimed "authorization object" because ZTE also relies upon the software decryption key to fulfill the claimed "usage rights." (Prel. Resp. 34-35.) That argument is misplaced for two separate reasons. First, ContentGuard has not explained why the claim precludes a single element from satisfying both features. Secondly, based on the chart presented by ZTE with respect to claim 18, the decryption key need not be relied on as specifying how digital content can be rendered. (Pet. 24.) EP '139 states that the right-to-execute can be conditioned, and describes dates, times, and number of executions as conditions on how digital content can be rendered. (Ex. 1012, 23:30-40.)

For the foregoing reasons, we conclude that ZTE has demonstrated a reasonable likelihood that it would prevail with respect to claims 18.

Claims 19-21, 25-28, and 31-36 each depend directly or indirectly from claim 18. We have considered the rationales presented by ZTE with respect to those claims and are persuaded thereby. ContentGuard has not submitted arguments specifically directed to ZTE's positions with regard to those dependent claims.

C. Walker

ZTE contends that claims 1, 2, 4-9, 12-15, 17-19, 21-26, 29-32, and 34-36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker. (Pet. 28-38.) ZTE relies on claim charts describing how Walker allegedly describes the claimed

subject matter, and also on the Declaration of Dr. Vijay K. Madisetti. (Ex. 1015.)

We have considered ZTE's analysis and supporting evidence as well as ContentGuard's arguments, and are not persuaded that ZTE has demonstrated a reasonable likelihood of success with respect to claims 1, 2, 4-9, 12-15, 17-19, 21-26, 29-32, and 34-36.

Because ZTE's analysis of what is covered by the six means-plus-function elements recited in independent claim 1 within the "repository" is incorrect, ZTE has not properly applied those elements onto Walker's disclosure. Accordingly, for that reason alone, ZTE has not demonstrated a reasonable likelihood that it would prevail with respect to claims 1, 2, 4-9, 12-15, and 17.

With regard to all claims 1, 2, 4-9, 12-15, 17-19, 21-26, 29-32, and 34-36, we are not persuaded that Walker discloses a "repository." As noted above, we construe a "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights." "Communications integrity" is construed as "only communicates with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces."

Walker discloses a system for controlling access to a store of information in divisible form using a unique code and, specifically, discloses controlling the length of time a computer program is used. (Ex. 1011, 1:7-11.) In one embodiment, a control system includes operating device 10, interface 16, and key storage unit 18, each of which is connected to control device 12. (Ex. 1011, 4:13-21.) Storage unit 18, operational device 10, control device 12, and interface 16 can

be interlinked by electrical, optical, radio frequency, or other signal carrying means. (Ex. 1011, 5:17-20.) At the beginning of operation, control device 12 requests a data unit provided by a user and compares it to one stored in an area of key storage unit 18. (Ex. 1011, 4:46-49.) If a match is found, control device 12 allows operation of operating device 10 until a remaining amount of time becomes zero. (Ex. 1011, 4: 16-19, 4:51-57.)

To satisfy the claimed "repository", ZTE relies on Walker's control device 12 in combination with key storage unit 18. (Pet. 31-32, 36.) Walker discloses that the elements that control device 12 and key storage unit 18 communicate with are clock 14, operating device 10, and interface to control device 16. (Ex. 1011, 4:13-22.) There is no disclosure that any of these communication connections maintain any sort of security measures. Walker discloses that if key storage unit 18 is removed, then further operation of operational device 10 is prevented. (Ex. 1011, 5:10-16.) That, however, does not satisfy the requirements of communications integrity. Walker does not disclose that control device 12 and key storage unit 18 as a combined system operates with "security measures such as encryption, exchange of digital certificates, and nonces," so that it "only communicates with other devices that are able to present proof that they are trusted systems," which is required for "communications integrity."

Because Walker as discussed by ZTE does not meet the requirements of the claimed "repository," ZTE has not shown a reasonable likelihood that it would prevail in showing that independent claims 1 and 18 of the '576 patent are anticipated under 35 U.S.C. § 102(b) by Walker. Claims 2, 4-9, 12-15, 17, 19, 21-26, 29-32, and 34-36 each depend directly or indirectly on claim 1 or claim 18.

For the same reason discussed above in connection with claims 1 and 18, ZTE has not shown a reasonable likelihood that claims 2, 4-9, 12-15, 17, 19, 21-26, 29-32, and 34-36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker.

D. Hendricks

ZTE contends that claims 1-4, 7-15, 17-21, 24-32, and 34-36 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks. (Pet. 38-49.) ZTE relies on claim charts describing how Hendricks allegedly describes the claimed subject matter, and also on the Declaration of Dr. Vijay K. Madisetti. (Ex. 1015.) We have considered ZTE's analysis and supporting evidence as well as ContentGuard's arguments, and are not persuaded that ZTE has demonstrated a reasonable likelihood of success with respect to claims 1-4, 7-15, 17-21, 24-32, and 34-36.

Because ZTE's analysis of what is covered by the six means-plus-function elements recited in independent claim 1 within the "repository" is incorrect, ZTE has not properly applied those elements onto Hendricks' disclosure. Accordingly, for that reason alone, ZTE has not demonstrated a reasonable likelihood that it would prevail with respect to claims 1-4, 7-15, and 17.

With regard to all claims 1-4, 7-15, 17-21, 24-32, and 34-36, we are not persuaded that Hendricks discloses a "repository." As noted above, we construe a "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights." "Communications integrity" is construed as "only communicates with other devices that are able to present proof

that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces."

Hendricks discloses an electronic book selection and delivery system. (Ex. 1013, 1:27). In particular, Hendricks discloses a viewer 266 that allows books to be stored, read, and erased, and includes the capability to order books and retain them in memory for a predetermined period of time. (Ex. 1013, 12:1-6.) The viewer 266 requests information from library 262. (Ex. 1013, 10:18-19.) Information requests from viewer 266 are received either through a cable connecting viewer 266 to library 262, or through wireless transmissions such as radio frequency. (Ex. 1013, 10:18-22.) When viewer 266 requests a specific book from library 262, library 262 opens an electronic file for the specific book requested by viewer 266 and transmits the information on a packet-by-packet basis. (Ex. 1013, 10:37-41.)

To satisfy the claimed "repository", ZTE relies on the non-display related internal components of Hendricks' viewer, such as microprocessor 621, instruction memory 732, and digital logic coupled to the video graphics controller. (Pet. 42, citing Ex. 1013, 11:8-9.) Hendricks does disclose encrypting certain communications to the viewer, but that does not mean the viewer only communicates with trusted systems. (Ex. 1013, 11:8-16, 12:9-12.) Hendricks also performs ID matching, where incoming data includes an ID that is compared to the ID of the viewer; only if these IDs match is the data stored to the viewer. (Ex. 1013, 11:8-13.) The ID matching protects the integrity of textual data and locks a given work to a single viewer, but does not ensure that the viewer only communicates with trusted systems. (Ex. 1013, 9:5-8.) Hendricks does not

disclose that viewer 266 "only communicates with other devices that are able to present proof that they are trusted systems." Therefore Hendricks does not disclose a "repository." As presented by ZTE, Hendricks' system lacks "communications integrity."

Because Hendricks as discussed by ZTE does not meet the requirements of the claimed "repository," ZTE has not shown a reasonable likelihood that it would prevail in showing that independent claims 1 and 18 of the '576 patent are anticipated under 35 U.S.C. § 102(e) by Hendricks. Claims 2-4, 7-15, 17-21, 24-32, and 34-36 each depend directly or indirectly on claim 1 or claim 18. For the same reasons discussed above in connection with claims 1 and 18, ZTE has not shown a reasonable likelihood that claims 2-4, 7-15, 17-21, 24-32, and 34-36 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks.

E. EP '306

ZTE contends that claims 1, 2, 4-6, 8-12, 15, 16, 18, 19, 21-23, 25-29, 32, 33, 35, and 36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306. (Pet. 49-59.) ZTE relies on claim charts describing how EP '306 allegedly describes the claimed subject matter, and also on the Declaration of Dr. Vijay K. Madisetti. (Ex. 1015.) We have considered ZTE's analysis and supporting evidence as well as ContentGuard's arguments, and are not persuaded that ZTE has demonstrated a reasonable likelihood that it would prevail with respect to claims 1, 2, 4-6, 8-12, 15, 16, 18, 19, 21-23, 25-29, 32, 33, 35, and 36.

Because ZTE's analysis of what is covered by the six means-plus-function elements recited in independent claim 1 within the "repository" is incorrect, ZTE

has not properly applied those elements onto the disclosure of EP '306. Accordingly, for that reason alone, ZTE has not demonstrated a reasonable likelihood that it would prevail with respect to claims 1, 2, 4-6, 8-12, 15, and 16.

With regard to all claims 1, 2, 4-6, 8-12, 15, 16, 18, 19, 21-23, 25-29, 32, 33, 35, and 36, we are not persuaded that EP '306 discloses a "repository." As noted above, we construe a "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights." "Communications integrity" is construed as "only communicates with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces."

EP '306 discloses managing display and printing operations for a document by a data processor to comply with proprietary and security restrictions of the document. (Ex. 1010, 1:5-10.) In particular, EP '306 discloses that online books may be rendered on a variety of display devices. (Ex. 1010, 2:2-4.) The electronic books may be communicated, stored, displayed, and modified. (Ex. 1010, 2:12-14.) EP '306 provides a book data stream in an intermediate format for storing on-line information that is specifically designed to be used by a book display program on the display device. (Ex. 1010, 1:54-57.) The book display program may be a document manager system including a processor 20 connected to a display 26, memory 22, printer 44, disk drive 46, communications adapter 48, and enunciator 52. (Ex. 1010, 6:48-52.)

ZTE regards EP '306's memory 22 in combination with processor 20 as constituting a repository. (Pet. 52, 56.) As disclosed in EP '306, however, the

combination of memory 22 and processor 20, does not possess "communications integrity." While EP '306 discloses that processor 20 and memory 22 are capable of communicating with an outside device via communications adaptor 48, EP '306 does not disclose using security measures between the outside device and a combination of processor 20 and memory 22 via communications adaptor 48, as is required for "communications integrity."

Because EP '306 does not properly account for the claimed "repository," ZTE has not shown a reasonable likelihood that it would prevail in showing that independent claims 1 and 18 are anticipated under 35 U.S.C. § 102(b) by EP '306. Claims 2, 4-6, 8-12, 15, 16, 19, 21-23, 25-29, 32, 33, 35, and 36 each depend directly or indirectly on claim 1 or claim 18. For the reasons set forth above for claims 1 and 18, ZTE has not shown a reasonable likelihood that claims 2, 4-6, 8-12, 15, 16, 19, 21-23, 25-29, 32, 33, 35, and 36 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306.

F. Hendricks in view of Wyman

ZTE contends that claims 5, 6, 22, and 23 are unpatentable under 35 U.S.C. § 103(a) as obvious over Hendricks in view of Wyman. (Pet. 59.) We have considered ZTE's analysis and supporting evidence as well as ContentGuard's arguments, and are not persuaded that ZTE has demonstrated a reasonable likelihood of success with respect to claims 5, 6, 22, and 23.

Claim 5 depends on claim 1 and claim 6 depends on claim 5. Claim 22 depends on claim 18 and claim 23 depends on claim 22. With respect to these claims, the above-noted deficiencies of Hendricks with respect to independent

claims 1 and 18 are not cured by ZTE's reliance on and application of Wyman. Accordingly, ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 5, 6, 22, and 23 are unpatentable under 35 U.S.C. § 103(a) as obvious over Hendricks in view of Wyman.

G. Declaration of Dr. Vijay K. Madisetti (Ex. 1015)

ContentGuard contends that Dr. Madisetti's declaration is entitled to little or no weight because it merely parrots the arguments made by ZTE in the petition. (Prel. Resp. 48-49.) The current situation does not require us to assess the strength of ContentGuard's argument. Even if we were to give Dr. Madisetti's declaration little or no weight, the content of EP '139 and the arguments of the parties nonetheless demonstrate a reasonable likelihood that ZTE will prevail on its assertion that claims 18-21, 25-28, and 31-36 of the '576 patent are unpatentable.

III. CONCLUSION

For the forgoing reasons, we determine that the information presented in the petition establishes that there is a reasonable likelihood that ZTE would prevail with respect to claims 18-21, 25-28, and 31-36 of the '576 patent.

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claims 18-21, 25-28, and 31-36 under 35 U.S.C. § 102(b) as anticipated by EP '139;

FURTHER ORDERED that an *inter partes* review is not instituted with respect to the following alleged grounds of unpatentability:

A. Claims 1-4, 8-11, and 14-17 as anticipated by EP '139 under 35 U.S.C. § 102(b);

B. Claims 1, 2, 4-9, 12-15, 17-19, 21-26, 29-32, and 34-36 as anticipated by Walker under 35 U.S.C. § 102(b);

C. Claims 1-4, 7-15, 17-21, 24-32, and 34-36 as anticipated by Hendricks under 35 U.S.C. § 102(e);

D. Claims 1, 2, 4-6, 8-12, 15, 16, 18, 19, 21-23, 25-29, 32, 33, 35, and 36 as anticipated by EP '306 under 35 U.S.C. § 102(b); and

E. Claims 5, 6, 22, and 23 as unpatentable over Hendricks and Wyman under 35 U.S.C. § 103(a);

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial. The trial will commence on the entry date of this decision;

FURTHER ORDERED that an initial conference call with the Board is scheduled for 3:30 PM, on July 29, 2013. The parties are directed to the Office Trial Practice Guide, 77 *Fed. Reg.* 48756, 48765-66 (Aug. 14, 2012) for guidance

in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial.

Case IPR2013-00139
Patent 7,269,576

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Venice, Naples, Mantua, Florence, and other city-states, along with the political intrigue and plotting that developed as a consequence of this economic interchange. David Kahn reports that, by the end of the sixteenth century, cryptology had become important enough for most Italian city states to employ full-time cipher secretaries. These officials were responsible for developing new nomenclators, enciphering plaintexts, deciphering incoming messages, and breaking captured cryptograms.

A nomenclator is actually a hybrid of code and cipher systems. In its earliest form, it consisted of a relatively short list of names alluded to in secret documents, along with codewords representing the names. In one nomenclator, for example, "Naples" was represented by the word *nobile* (noble), while "Florence" was represented by the word *terra* (land).

Before long, a simple monosubstitution cipher alphabet was added to the list of names. The nomenclator mentioned above, for example, used the symbol g for the letter C and the symbol T for the letter O. Over time, both the codenames and cipher alphabets used in nomenclators became more extensive and complex. Rather than a few dozen codewords, they often contained a few thousand. In place of a monosubstitution alphabet, these nomenclators employed multiple substitutes, or homophones. Nomenclators also commonly included symbols for nulls, or *nihil importantes* (nothing important), to confuse prospective cryptanalysts.

An example of a message encrypted by means of a nomenclator (using modern symbols and language) might look like the following:

PLAINTEXT:	S	E	N	D		M	O	N	E	Y		T	O		S	M	I	T	H
nomenclator:	x	t	v	i	k	j	c	v	e	a	b	p	c		t	u	l	i	p

See also: cipher; code; homophones; monoalphabetic substitution; null.

For further reading: David Kahn, *The Codebreakers: The Story of Secret Writing,* New York: Macmillan, 1967, ch. 3.

Nonce

A number used in a cryptographic protocol to indicate the unique character of a message. Nonces are essential when the same protocol is used many times with the same set of participants. Theoretically, it would be simple for a third party to alter any particular transmission using the protocol if no change were made in its use each time. A number of different devices can be used as nonces, including large random numbers and time-stamps.

See also: random number; time-stamp.

For further reading: Charlie Kaufman, Radia Perlman, and Mike Speciner, *Network Security: Private Communication in a Public World,* Englewood Cliffs, NJ: Prentice-Hall, 1995, pp. 244, 254-256.

Nonrepudiation

Proof that a particular person or organization has made some type of agreement with one or more other people or organizations. Nonrepudiation means that a person or organization cannot say at some time in the future that he, she, or it never really agreed to some arrangement with another party.

Nonrepudiation is a normal and common feature of agreements in everyday life. For example, when someone wants to borrow money from a bank, he or she signs an agreement indicating that the money really was borrowed and that it will be paid back. The person cannot later say that the money was never really obtained and/or that there was never any intent to pay the money back.

Nonrepudiation is normal in business transactions also. Alice may sign an agreement with Bob to buy 10,000 shares of stock in the ABC Company for $1 million. Her signature on the agreement is accepted as proof that she made the agreement in the first place.

For many everyday transactions, a personal signature is sufficient evidence for later nonrepudiation of an agreement. In many cases, the signature may need to be witnessed by a trusted third party,

Exhibit 2

Trials@uspto.gov
571-272-7822

Paper 17
Entered: July 1, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE Corporation and ZTE (USA) Inc.
Petitioner,

v.

ContentGuard Holdings, Inc.
Patent Owner.

Case IPR2013-00137
Patent 6,963,859

Before JAMESON LEE, MICHAEL W. KIM, and MICHAEL R. ZECHER, *Administrative Patent Judges*.

KIM, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

ZTE Corporation and ZTE (USA) Inc. ("ZTE") filed a corrected petition requesting an *inter partes* review of claims 1-84 of U.S. Patent No. 6,963,859 (Ex. 1001, "the '859 patent"). (Paper 12, "Pet.") The patent owner, ContentGuard Holdings, Inc. ("ContentGuard") filed a preliminary response. (Paper 16, "Prel. Resp.") We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a) which provides as follows:

> THRESHOLD -- The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

Upon consideration of the petition and ContentGuard's preliminary response, we determine that the information presented in the petition establishes that there is a reasonable likelihood that ZTE would prevail in showing the unpatentability of claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 46, 48-62, 66, 67, 71-73, 75, and 77-84 of the '859 patent. Accordingly, we grant the petition and institute an *inter partes* review of those claims of the '859 patent.

A. Related Proceedings

ZTE indicates that the '859 patent is involved in co-pending litigation captioned *ContentGuard Holdings Inc. v. ZTE Corp. et al.*, Case No. 3:12-cv-01226 (S.D. Cal.). (Pet. 1.)

ZTE also filed five other petitions seeking *inter partes* review of the following patents: U.S. Patent No. 7,523,072 (IPR2013-00133); U.S. Patent No. 7,225,160 (IPR2013-00134; U.S. Patent No. 7,359,884 (IPR2013-00136); U.S. Patent No. 7,139,736 (IPR2013-00138); and U.S. Patent No. 7,269,576 (IPR2013-00139). (Pet. 1.)

B. The '859 Patent (Ex. 1001)

The subject matter of the '859 patent relates to distribution of and usage rights enforcement for digitally encoded works. (Ex. 1001, 1:12-13.) According to the '859 patent, an issue facing the publishing and information industries is how to prevent the unauthorized and unaccounted distribution or usage of electronically published materials. (Ex. 1001, 1:16-19.) In particular, a major concern, according to the '859 patent, is the ease in which electronically published works can be "perfectly" reproduced and distributed. (Ex. 1001, 1:30-31.) According to the '859 patent, one way to curb unaccounted distribution is to prevent unauthorized copying and transmission. (Ex. 1001, 1:49-51.) Another way, according to the '859 patent, is to distribute software, which requires a "key" to enable its use. (Ex. 1001, 1:65-66.) However, the '859 patent discloses that while such distribution and protection schemes prevent unauthorized distributions, it does so by sacrificing the potential for subsequent revenue bearing uses. (Ex. 1001, 2:61-65.) For example, the '859 patent discloses that it may be desirable to allow the lending of a purchased work to permit exposure of the work to potential buyers, permit the creation of a derivative work for a fee, or permit copying the work for a fee. (Ex. 1001, 2:65-3:3.) The '859 patent discloses that it

solves these problems by both permanently attaching usage rights to digital works, and by placing elements in repositories, which store and control the digital works, that enforce these usage rights. (Ex. 1001, 6:11-21.)

C. Exemplary Claims

Of the challenged claims, claims 1, 29, and 58 are independent claims. Independent claims 1, 29, and 58 are respectively directed to a system, a method, and a computer readable medium. Claims 2-28 directly or indirectly depend from claim 1, claims 30-57 directly or indirectly depend from claim 29, and claims 59-84 directly or indirectly depend from claim 58. Claims 1, 29, and 58 are reproduced below, with similar and key features bolded for emphasis:

> 1. A rendering system adapted for use in a distributed system for managing use of content, said rendering system being operative to rendering content in accordance with usage rights associated with the content, said rendering system comprising:
>
> a rendering device configured to render the content; and
>
> a distributed ***repository*** coupled to said rendering device and including a requester mode of operation and server mode of operation,
>
> wherein the server mode of operation is operative to enforce usage rights associated with the content and permit the rendering device to render the content in accordance with a manner of use specified by the usage rights,
>
> ***the requester mode of operation is operative to request access to content from another distributed repository***, and
>
> said distributed repository is operative to receive a request to render the content and permit the content to be rendered only if a

manner of use specified in the request corresponds to a manner of use specified in the usage rights.

29. A rendering method adapted for use in a distributed system for managing use of content, and operative to render content in accordance with usage rights associated with the content, said method comprising:

configuring a rendering device to render the content;

configuring a distributed ***repository*** coupled to said rendering device to include a requester mode of operation and server mode of operation;

enforcing usage rights associated with the content and permitting the rendering device to render the content in accordance with a manner of use specified by the usage rights, when in the server mode of operation;

requesting access to content from another distributed repository, when in the requester mode of operation; and

receiving by said distributed repository a request to render the content and permitting the content to be rendered only if a manner of use specified in the request corresponds to a manner of use specified in the usage rights.

58. A computer readable medium including one or more computer readable instructions embedded therein for use in a distributed system for managing use of content, and operative to render content in accordance with usage rights associated with the content, said computer readable instructions configured to cause one or more computer processors to perform the steps of:

configuring a rendering device to render the content;

configuring a distributed ***repository*** coupled to said rendering device to include a requester mode of operation and server mode of operation;

enforcing usage rights associated with the content and permitting the rendering device to render the content in accordance with a manner of use specified by the usage rights, when in the server mode of operation;

requesting access to content from another distributed repository, when in the requester mode of operation; and

receiving by said distributed repository a request to render the content and permitting the content to be rendered only if a manner of use specified in the request corresponds to a manner of use specified in the usage rights.

D. Prior Art Relied Upon

ZTE relies upon the following prior art references:

Hendricks	U.S. Patent 5,986,690	Nov. 16, 1999	(Ex. 1013)
Walker	U.S. Patent 4,868,736	Sept. 19, 1989	(Ex. 1014)
Leroux	U.S. Patent 5,588,146	Dec. 24, 1996	(Ex. 1011)
Wyman	U.S. Patent 5,260,999	Nov. 9, 1993	(Ex. 1015)
European Patent Pub. 0 268 139 A2 ("EP '139")		May 25, 1988	(Ex. 1012)
European Patent Pub. 0 464 306 A2 ("EP '306")		June 29, 1990	(Ex. 1010)
Henry H. Perritt Jr., "*Knowbots, Permissions Headers and Contract Law*," Papers for the Conference on Technological Strategies for Protecting Intellectual Property in the Networked Multimedia Environment, (Retrieved from http://archive.ifla.org/documents/infopol/copyright/perh2.txt on January 4, 2013) ("Perritt")		Apr. 30, 1993	(Ex. 1006)

E. The Asserted Grounds

ZTE contends that the challenged claims are unpatentable based on the following grounds:

1. Claims 1-5, 8-11, 13-15, 19-33, 36-38, 40-42, 46-62, 65-67, 69-71, and 75-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks[1];
2. Claims 1-5, 9-11, 15-17, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, and 77-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '139;
3. Claims 1-5, 7-23, 25-33, 35-50, 52-62, 64-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker;
4. Claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 46, 48-62, 66, 67, 71-73, 75, and 77-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Leroux[2];

[1] The '859 patent claims priority to application No. 08/344,760, filed Nov. 23, 1994. Hendricks was published on Nov. 16, 1999, and was filed on Nov. 7, 1994. Accordingly, even though the Petition contends that Hendricks is prior art to the '859 patent under 35 U.S.C. § 102(b), Hendricks is actually only prior art to the '859 patent under 35 U.S.C. § 102(e). *Accord* Pet. 11-12 (confirming that Hendricks only qualifies as prior art to the '856 patent under 35 U.S.C. § 102(e)).

[2] The '859 patent claims priority to application No. 08/344,760, filed Nov. 23, 1994. Leroux was published on December 24, 1996, and was filed on Oct. 21, 1993. Accordingly, even though the Petition contends that Leroux is prior art to the '859 patent under 35 U.S.C. § 102(b), Leroux is actually only prior art to the '859 patent under 35 U.S.C. § 102(e). *Accord* Pet. 11, 40 (confirming that Leroux only qualifies as prior art to the '859 patent under 35 U.S.C. § 102(e)).

5. Claims 1-7, 9-12, 14-16, 18-23, 25-35, 37-39, 41-43, 45-50, 52-64, 66-68, 70-72, 74-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306; and
6. Claims 1-3, 5-11, 15-17, 21, 22, 25, 27-31, 33-38, 42-44, 48, 49, 52, 54-60, 62-67, 71-73, 77-78, and 82-84 are unpatentable under 35 U.S.C. § 103(a) as obvious over Perritt and Wyman.

II. ANALYSIS

A. Claim Construction

As a first step in our analysis for determining whether to institute a review, we determine the meaning of the claims. In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). Under that standard, claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). An inventor may rebut that presumption by providing a definition of the term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

ContentGuard submits its proposed construction for the claim term "repository." (Prel. Resp. 17-20.) ZTE provides its construction for three terms recited in dependent claims, all of which are in a means-plus-function format: "means for storing the content," "means for communicating with an authorization repository for authorizing a condition," and "means for communication with a

master repository for obtaining an identification certificate." (Pet. 7.) For this decision, we will construe each of these claim limitations in turn.

1. "Repository" (Independent Claims 1, 29, and 58)

ContentGuard contends that the term "repository" should be construed as "a trusted system for supporting usage rights." (Prel. Resp. 17.) ContentGuard cites several portions of the specification which support that construction. (Prel. Resp. 17-21 citing Ex. 1001, 3:57-62, 6:17-21, 11:52-61, 12:57-59, 13:10-15, 50:47-52.) ZTE does not provide a claim construction for "repository." *See generally* Pet. 5-6 and 15, FN 2.

The specification provides a glossary which recites the following for "repository":

> Conceptually a set of functional specifications defining core functionality in the support of usage rights. **A repository is a trusted system in that it maintains physical, communications and behavioral integrity**.

(Ex. 1001, 50:47-51, emphasis added.) By setting forth the term in a glossary and using the verb "is" following "repository" in the second sentence, we find that the specification sets forth an explicit definition of "repository" as "a trusted system in that it maintains physical, communications and behavioral integrity." However, the first sentence is also relevant to the definition of "repository" because it elaborates that the repository supports usage rights. Accordingly, we construe "repository" as a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights.

Our analysis does not end here. In order to understand "a trusted system," it

is necessary additionally to construe "physical integrity," "communications integrity," and "behavioral integrity." These terms are described in a section of the specification specifically labeled "[r]epositories." (Ex. 1001, 11:51-14:28.) For "physical integrity," the specification discloses the following:

> Physical integrity refers to the integrity of the physical devices themselves. ***Physical integrity applies both to the repositories and to the protected digital works.*** Thus, the higher security classes of repositories themselves may have sensors that detect when tampering is attempted on their secure cases. ***In addition to protection of the repository itself, the repository design protects access to the content of digital works.*** In contrast with the design of conventional magnetic and optical devices-such as floppy disks, CD-ROMs, and videotapes-***repositories never allow non-trusted systems to access the works directly.*** A maker of generic computer systems cannot guarantee that their platform will not be used to make unauthorized copies. The manufacturer provides generic capabilities for reading and writing information, and the general nature of the functionality of the general computing device depends on it. Thus, a copy program can copy arbitrary data. This copying issue is not limited to general purpose computers. It also arises for the unauthorized duplication of entertainment "software" such as video and audio recordings by magnetic recorders. Again, the functionality of the recorders depends on their ability to copy and they have no means to check whether a copy is authorized. In contrast, ***repositories prevent access to the raw data by general devices*** and can test explicit rights and conditions before copying or otherwise granting access. ***Information is only accessed by protocol between trusted repositories.***

(Ex. 1001, 11:62-12:20; emphasis added.) Many of the above aspects that are associated with "physical integrity" are described using permissive terms such as "may" and "can" and, thus, are inappropriate to include in this broadest reasonable construction as necessary limitations. The specification also appears to use the

terms or phrases in each of the following three groups interchangeably: (1) data, content, digital work, information; (2) non-trusted system, general device; and (3) "never allow access" and "prevent access." When referring to the relationship between the repository and data, the specification uses absolute terms such as "never" and "only."

In light of the foregoing, we construe "physical integrity" as "preventing access to information by a non-trusted system."

For "communications integrity," the specification discloses the following:

> Communications integrity refers to the integrity of the communications channels between repositories. Roughly speaking, communications integrity means that repositories cannot be easily fooled by "telling them lies." Integrity in this case refers to the property that ***repositories will only communicate with other devices that are able to present proof that they are certified repositories***, and furthermore, that the repositories monitor the communications to detect "impostors" and malicious or accidental interference. Thus ***the security measures involving encryption, exchange of digital certificates, and nonces described below are all security measures aimed at reliable communication*** in a world known to contain active adversaries**.**

(Ex. 1001, 12:21-33; emphasis added.) We construe "communications integrity" as "only communicating with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces." The Encyclopedia of Cryptography defines "nonce" as "[a] number used in a cryptographic protocol to indicate the unique character of a message." Newton, David E., Encyclopedia of Cryptography 197 (1997).

For "behavioral integrity," the specification discloses the following:

> Behavioral integrity refers to the integrity in what repositories do. What repositories do is determined by the software that they execute. The integrity of the software is generally assured only by knowledge of its source. Restated, a user will trust software purchased at a reputable computer store but not trust software obtained off a random (insecure) server on a network. ***Behavioral integrity is maintained by requiring that repository software be certified and be distributed with proof of such certification, i.e. a digital certificate.*** The purpose of the certificate is to authenticate that the software has been tested by an authorized organization, which attests that the software does what it is supposed to do and that it does not compromise the behavioral integrity of a repository. ***If the digital certificate cannot be found in the digital work or the master repository which generated the certificate is not known to the repository receiving the software, then the software cannot be installed.***

(Ex. 1001, 12:34-50; emphasis added.) We construe "behavioral integrity" in the context of a repository as "requiring software to include a digital certificate in order to be installed in the repository."

The record is not without evidence contrary to our construction. The nature of construction is to come to the appropriate conclusion in light of all of the evidence. All of the evidence does not have to point uniformly in a single direction.

The specification in Table 2 (Ex. 1001, 14) indicates ten different levels of security for repositories, and the lowest level, *i.e.*, level "0," is described as follows:

> Open system. Document transmission is unencrypted. No digital certificate is required for identification. The security of the system depends mostly on user honesty, since only modest knowledge may

> be needed to circumvent the security measures. The repository has no provisions for preventing unauthorized programs from running and accessing or copying files. The system does not prevent the use of removable storage and does not encrypt stored files.

(Ex. 1001, 14:58-64.) Thus, according to Table 2, repositories are not all trusted systems. Level "0" security represents having an open system lacking in physical, communications, and behavioral security, and without support for managing usage rights. That is directly contrary to the meaning of "repository" as defined in the glossary. For reasons discussed below, we adhere to the definition provided in the glossary. The contrary evidence based on level "0"security shown in Table 2 is insufficient to outweigh the rest of the evidence including, in particular, the explicit definition provided in the glossary. We make our determination based on the totality of the evidence.

As noted above, the disclosed invention is about distribution and usage rights enforcement of digital works. The problems described in the background portion of the specification concern unauthorized and unaccounted distribution or usage of electronically published materials. The '859 patent states that it solves preexisting problems by both permanently attaching usage rights to digital works and placing elements in repositories that enforce those usage rights.

The glossary is an important part of the patent specification because important or key terms are defined in the glossary. Here, the definition set forth in the glossary for "repository" is fully consistent with the description of the acknowledged prior art and the objective or goal to be achieved by the invention of the '859 patent. The specification also contains detailed preferred embodiments utilizing repositories which are trusted systems to provide usage control for digital

works. (Ex. 1001, 3:57-62, 6:66-7:37, 7:54-55, 13:1-9, 16-18; 14:3-15, 17:30-32; 25:62-28-56; 40:42-41:44.)

The bulk of the specification consistently is directed to repositories which are trusted systems for providing usage control for digital works. For example, the specification states:

> The enforcement elements of the present invention are embodied in repositories. Among other things, repositories are used to store digital works, control access to digital works, bill for access to digital works and maintain the security and integrity of the system.

(Ex. 1001, 6:17-21.)

Other references to "repository" in the specification that recite necessary features of repositories also support the definition in the glossary that a repository is a trusted system. For example, the specification states:

> The core repository services 1302 comprise a set of functions ***required by each and every repository***. The core repository services 1302 include the session initiation transactions which are defined in greater detail below. This set of services also includes a generic ticket agent which is used to "punch" a digital ticket and a generic authorization server for processing authorization specifications.

(Ex. 1001, 14:3-9; emphasis added.) In another example, the specification discloses that "[a]s a prerequisite to operation, a repository will ***require possession of an identification certificate***" and that "***identification certificates 1306 are required*** to enable the use of the repository." (Ex. 1001, 13:1-2, 14:14-15; emphasis added.) In further example, the specification states ***"[p]rovisions for security and privacy are part of the requirements*** for specifying and implementing repositories and thus form the need for various transactions." (Ex. 1001, 25:59-61;

emphasis added.) Indeed, by using words such as "required" and "requirements," such disclosures amply support the definition provided in the glossary that a repository is a trusted system. In summary, the weight of the evidence supports the definition provided in the glossary, even applying the rule of broadest reasonable construction consistent with the specification. We regard as significant that the definition states in no equivocal manner that a repository "is a trusted system."

2. "Means for storing the content" (Claims 3 and 4)

Claim 3 recites "means for storing content." Claim 4 depends from claim 3 and recites "wherein said means for storing is means for storing ephemeral copies of the content."

Under 35 U.S.C. § 112, sixth paragraph, a claim element may be expressed as a means or a step for performing a specified function without the recital of structure, material, or acts in support thereof, and such an element would cover the corresponding structure, material or acts described in the specification and equivalents thereof. To determine what is covered by a means-plus-function element, we look to the specification to identify the corresponding structure, material, or acts which are described as performing the recited function. 35 U.S.C. § 112, 6th paragraph; *In re Donaldson Co.*, 16 F.3d 1189, 1193 (Fed. Cir. 1994) (en banc). The "means for storing . . ." recitations in claims 3 and 4 are a means-plus-function elements under 35 U.S.C. § 112, sixth paragraph. Accordingly, we look to the specification of the '859 patent to identify the structure, material, or acts which are described as performing the recited functions.

ZTE contends the following:

> With respect to dependent claims 3 and 4, the corresponding structure for performing the claimed function of means for storing the content is content storage 1204 (Fig. 12; 13:40-41: "The content storage will store the associated content."). The specification describes that the content storage may be an optical disk (13:46-47), a magneto-optical storage system or magnetic tape (37:11-15) or a solid state storage (13:41-47).

(Pet. 7). We agree. The "means for storing . . ." covers content storage, such as an optical disk, a magneto-optical storage system, a magnetic tape, or a solid state storage, and equivalents thereof.

3. *"Means for communicating with an authorization repository for authorizing a condition" (Claim 23) and "means for communication with a master repository for obtaining an identification certificate" (Claim 24)*

Claim 23 recites "means for communicating with an authorization repository for authorizing a condition." Claim 24 recites "means for communication with a master repository for obtaining an identification certificate."

For corresponding structure, ZTE contends the following:

> Claim 23 requires means for communicating with an authorization repository for authorizing a condition, and claim 24 requires means for communication with a master repository for obtaining an identification certificate. The corresponding structure for performing the claimed function of means for communicating is external interface 1206 (Fig. 12; 13:52-59: "The external interface means 1206 provides for the signal connection to other repositories.").

(Pet. 7) We agree. Each of the "means for communicating . . ." covers an external interface that provides for a signal connection with another device and equivalents thereof.

B. 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, 75, and 77-84 – Anticipated by Leroux

ZTE contends that claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, 75, and 77-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Leroux. (Pet. 40-46.) We are persuaded by ZTE's analysis and supporting evidence.

Leroux discloses a method of acquiring software programs by microcomputers. (Ex. 1011, 1:8-9.) Leroux discloses a data base service center 1 that stores application software programs 10, a microcomputer 2 connected to the service center by interface 3, and a removable electronic memory carrier 4. (Ex. 1011, 3:42-46.) Leroux discloses that memory carrier 4 includes interface 40 for connecting memory 41 to the drive 24 of microcomputer 2. (Ex. 1011, 3:53-55.) Leroux discloses that microcomputer 2 is fitted with corresponding drives to read memory carrier 4. (Ex. 1011, 4:60-64.) Leroux discloses that memory 41 may comprise programmed security circuitry 410, which monitors access to memory 41 and manages external access to memory carrier 4. (Ex. 1011, 4:64-5:3.) Leroux discloses that to carry out acquisition of application software program 10, communication is set up between microcomputer 2 and data base service center 1. (Ex. 1011, 3:61-66.) Leroux discloses that after the user chooses which application software programs 10 that they wish to acquire, service center 1 will check the right of access to the application software programs 10 by interrogating carrier 4 through microcomputer 2. (Ex. 1011, 4:1-5.) According to Leroux, the check is made by using security methods, such as with identification and authentication procedures that use enciphering and deciphering algorithms. (Ex. 1011, 4:5-8.) If

the check is positive, according to Leroux, service center 1 remotely loads application software program 10 in the internal memory of the microcomputer 2. (Ex. 1011, 4:13-16.)

ContentGuard contends that a combination of microcomputer 2 and removable carrier 4 of Leroux cannot correspond to a "repository." (Prel. Resp. 44-45.) We disagree. Independent claims 1, 29, and 58 each recite a "repository." As set forth above, we have construed a "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights," where physical integrity is "preventing access to information by a non-trusted system," communications integrity is "only communicating with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces," and behavioral integrity is "requiring software to include a digital certificate in order to be installed in the repository."

Leroux discloses that combination of microcomputer 2 and removable carrier 4 possesses physical integrity by "preventing access to information by a non-trusted system." That is, Leroux discloses that memory 41 of removable carrier 4 may comprise programmed security circuitry 410, which monitors access to memory 41 and manages external access to memory carrier 4. (Ex. 1011, 4:64-5:3.) Leroux also discloses that combination of microcomputer 2 and removable carrier 4 possesses communications integrity by "only communicating with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces." Leroux discloses that microcomputer 2 and removable carrier 4

communicate with service center 1 using security methods, such as identification and authentication procedures that use enciphering and deciphering algorithms. (Ex. 1011, 3:61-4:8.) Leroux further discloses that a combination of microcomputer 2 and removable carrier 4 possesses behavioral integrity by "requiring software to include a digital certificate in order to be installed." Leroux discloses that service center 1 will check the right of access to software programs 10 by interrogating carrier 4 through microcomputer 2. (Ex. 1011, 4:1-5.) According to Leroux, only if the check is positive will service center 1 remotely load application software programs 10 in the internal memory of the microcomputer 2. (Ex. 1011, 4:13-16.)

We are also similarly persuaded that ZTE has demonstrated a reasonable likelihood that claims 2-5, 9-11, 15-17, 19, 21-28, 30-33, 37, 38, 42-44, 48-57, 59-62, 66, 67, 71-73, 75, and 77-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Leroux. (Pet. 40-46.)

ZTE has shown a reasonable likelihood that it would prevail in showing that claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 46, 48-62, 66, 67, 71-73, 75, and 77-84 of the '859 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Leroux.

C. Claims 1-5, 8-11, 13-15, 19-33, 36-38, 40-42, 46-62, 65-67, 69-71, and 75-84 – Anticipated by Hendricks

ZTE contends that claims 1-5, 8-11, 13-15, 19-33, 36-38, 40-42, 46-62, 65-67, 69-71, and 75-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks. (Pet. 12-21.) We have considered ZTE's analysis and supporting evidence, but are unpersuaded in light of ContentGuard's submissions.

ContentGuard contends that Hendricks does not disclose a "repository." (Prel. Resp. 28-32.) We agree. Independent claims 1, 29, and 58 each recite a "repository." All other claims depend from one of independent claims 1, 29, and 58.

ZTE cites viewer 266 of Hendricks as the required "repository." ZTE is incorrect because viewer 266 does not possess "communications integrity." Hendricks discloses an electronic book selection and delivery system. (Ex. 1013, Title.) Hendricks discloses a viewer 266 that allows books to be stored, read, erased, and includes the capability to order books and retain them in memory. (Ex. 1013, 12:1-6.) Hendricks discloses that viewer 266 requests information from library 262. (Ex. 1013, 10:18-19.) Hendricks discloses that information requests from viewer 266 are received either through a cable connecting viewer 266 to library 262, or through wireless transmissions such as radio frequency ("RF"). (Ex. 1013, 10:18-23.) Hendricks discloses that when viewer 266 requests a specific book from library 262, library 262 opens an electronic file for the specific book requested by viewer 266 and transmits the information on a packet-by-packet basis. (Ex. 1013, 10:37-41.) While Hendricks does disclose that the information itself is encrypted (Ex. 1013, 11:8-10.), Hendricks does not disclose that the connection between viewer 266 and library 262 uses "security measures such as encryption, exchange of digital certificates, and nonces," so as to show that viewer 266 "only communicates with other devices that are able to present proof that they are trusted systems," as required for "communications integrity."

ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 1-5, 8-11, 13-15, 19-33, 36-38, 40-42, 46-62, 65-67, 69-71, and 75-84

of the '859 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks.

D. Claims 1-5, 9-11, 15-17, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, and 77-84 – Anticipated by EP '139

ZTE contends that claims 1-5, 9-11, 15-17, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, and 77-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '139. (Pet. 21-30.) We have considered ZTE's analysis and supporting evidence, but are unpersuaded in light of ContentGuard's contentions.

ContentGuard contends that EP '139 does not disclose "requesting access to content from another distributed repository," as recited in independent claims 29 and 58. (Prel. Resp. 35-37.) We agree. Independent claim 1 similarly recites "the requester mode of operation is operative to request access to content from another distributed repository." All other claims depend from one of independent claims 1, 29, and 58.

ZTE proposes two alternative readings of EP '139, each of which would satisfy the limitation at issue. However, we agree with neither reading. EP '139 is directed to data processing in connection with a software copy protection mechanism. (Ex. 1012, 1:4-6.) EP '139 discloses a source composite processor including host 10 and coprocessor 20, and a sink composite processor including sink host 110 and sink coprocessor 120. (Ex. 1012, 25:49-52.) EP '139 discloses that host 10 and coprocessor 20 are connected via some communication link or path 14. (Ex. 1012, 22:5-6.) EP '139 discloses that the source and sink processors are interconnected via communication link 200. (Ex. 1012, 26:5-6.) EP '139 discloses that source coprocessor 20 and sink coprocessor 120 exchange encrypted

information. (Ex. 1012, 26:10-20.) EP '139 discloses that the source coprocessor can encrypt a right to execute and send it to the sink coprocessor. (Ex. 1012, 26:32-35.)

For one proposed reading of EP '139, ZTE contends that the following disclosure meets the limitation at issue:

> The source computing system (10, 20) is part of a network of computers through which software can be requested and transferred from another computing system, e.g., via a communication link 200. (EP 139, 26:48-56; 27:52-28:4.)

(Pet. 26-27). We disagree. While the cited portions of EP '139 disclose transferring the right to execute between the source and sink processors, they do not disclose one of the source and sink processors requesting the right to execute from the other. ZTE acknowledges as much by stating that in EP '139 that "software ***can*** be requested" (emphasis added). (Pet. 26.) A disclosure that does not preclude a recited operation is not the same as a disclosure which discloses performing the operation.

In an alternative reading, ZTE contends that the following disclosure meets the limitation at issue:

> Alternatively, the coprocessor 20 requests a right to execute and software from another computing device in a network of computers. (EP 139, 26:48-56; 27:52-28:4; 26:31-47.)

(Pet. 27; emphasis omitted). We disagree. While EP '139 discloses that source coprocessor 20 and sink coprocessor 120 exchange encrypted information, the cited portions of EP '139 do not disclose one coprocessor 20 or120 requesting this information from the other, as required in independent claims 1, 29., and 58

ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 1-5, 9-11, 15-17, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, and 77-84 of the '859 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '139.

E. Claims 1-5, 7-23, 25-33, 35-50, 52-62, 64-80, and 82-84 – Anticipated by Walker

ZTE contends that claims 1-5, 7-23, 25-33, 35-50, 52-62, 64-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker. (Pet. 30-40.) We have considered ZTE's analysis and supporting evidence, but are unpersuaded in light of ContentGuard's contentions.

ContentGuard contends that Walker does not disclose a "repository." (Prel. Resp. 38-40.) We agree. Independent claims 1, 29, and 58 each recite a "repository," which we have construed above. All other claims depend from one of independent claims 1, 29, and 58.

ZTE proposes three alternative readings of Walker as satisfying the aforementioned "repository." We are unpersuaded by all three proposed readings because none of the structures identified in Walker as corresponding to the recited "repository" have "communications integrity." Figure 9 of Walker is shown below, and illustrates an exemplary system for controlling access to a store of information stored in divisible form in machine readable media using a unique code. (Ex. 1014, 1:7-10.)

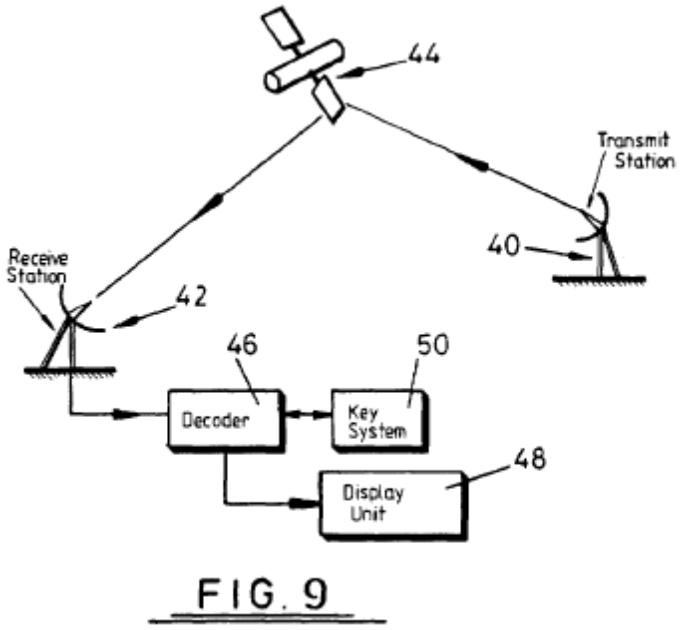

FIG. 9

Figure 9 illustrates a satellite information transmission system (Ex. 1014, Fig. 9.) Figure 9 of Walker discloses ground transmission station 40 transmitting information to ground receiving station 42 via satellite 44. (Ex. 1014, 7:27-30.) Walker discloses that the information is then passed to decoder 46 associated with display unit 48. (*Id*.) Walker discloses that key unit 50 is coupled to decoder 46, and information transmitted over the satellite link cannot be accessed until a user obtains "key codes," which provides control of access to the information. (Ex. 1014, 7:30-35.)

Figure 1 of Walker is shown below, and illustrates another exemplary embodiment that is similar to the system of Figure 9.

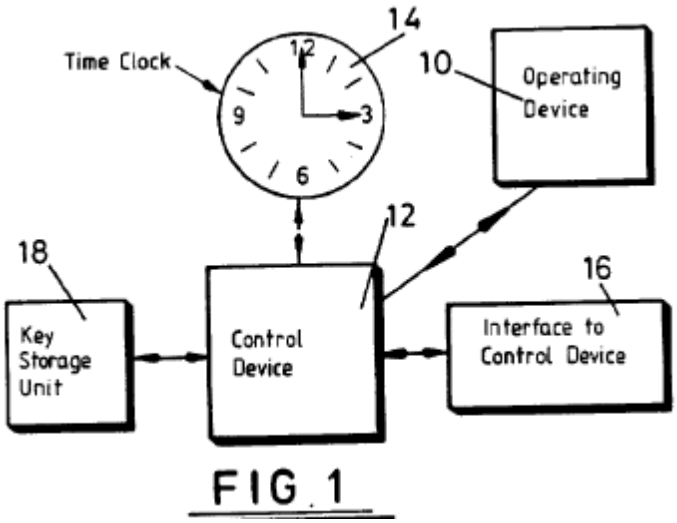

Figure 1 illustrates a control system

(Ex. 1014, Fig. 1.) Figure 1 of Walker discloses a control system including operating device 10, interface 16, and key storage unit 18 that are each connected to control device 12. (Ex. 1014, 4:14-21.) Walker discloses that storage unit 18, operational device 10, control device 12, and interface 16 can be interlinked by electrical, optical, radio frequency, or other signal carrying means. (Ex. 1014, 5:17-20.) Walker discloses that at the beginning of operation, control device 12 requests a matching of a unit of data provided by a user to one stored in an area of key storage unit 18. (Ex. 1014, 4:46-49.) If a match is found, according to Walker, control device 12 is allowed access to key storage unit 18. (Ex. 1014, 4:51-53.)

Based on all three proposed readings, ZTE contends that at least one of the systems illustrated in Figures 1 and 9 of Walker corresponds to the recited "repository." ZTE is incorrect. While Walker discloses that both systems are connected to other systems, Walker does not disclose that either system, when communicating with other systems, uses "security measures such as encryption,

exchange of digital certificates, and nonces," so as to show that each system "only communicates with other devices that are able to present proof that they are trusted systems," as required for "communications integrity." For example, assume a system similar to the system attached to receive station 42 is attached to transmit station 40 in Figure 9 of Walker. In that scenario, Walker does not disclose any security measures employed between those two systems via receive station 42, satellite 44, and transmit station 40.

ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 1-5, 7-23, 25-33, 35-50, 52-62, 64-80, and 82-84 of the '859 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker.

F. Claims 1-7, 9-12, 14-16, 18-23, 25-35, 37-39, 41-43, 45-50, 52-64, 66-68, 70-72, 74-80, and 82-84 – Anticipated by EP '306

ZTE contends that claims 1-7, 9-12, 14-16, 18-23, 25-35, 37-39, 41-43, 45-50, 52-64, 66-68, 70-72, 74-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306. (Pet. 46-53.) We have considered ZTE's analysis and supporting evidence, but are unpersuaded in light of ContentGuard's submissions.

ContentGuard contends that EP '306 does not disclose a "repository." (Prel. Resp. 46-47.) We agree. Independent claims 1, 29, and 58 each recite a "repository," which we have construed above. All other claims depend from one of independent claims 1, 29, and 58.

ZTE cites a combination of processor 20 and memory 22 of EP '306 as corresponding to the recited "repository." ZTE is incorrect because the combination of processor 20 and memory 22 does not possess "communications

integrity." EP '306 discloses management of display and printing operations for a document by a data processor, so as to comply with proprietary and security restrictions of the document. (Ex. 1010, 1:5-10.) EP '306 discloses that online books may be rendered on a variety of display devices. (Ex. 1010, 2:2-4.) EP '306 provides a book data stream in an intermediate format for storing on-line information that is specifically designed to be used by a book display program on the display device. (Ex. 1010, 1:54-57.) EP '306 discloses that electronic books are communicated, stored, displayed, and modified. (Ex. 1010, 2:12-14.) EP '306 discloses that the book display program may be a document manager system including a processor 20 connected to a display 26, memory 22, printer 44, disk drive 46, communications adapter 48, and enunciator 52. (Ex. 1010, 6:48-52.) While EP '306 does disclose processor 20 and memory 22 communicating with an outside device via communications adapter 48, EP '306 does not disclose using security measures between the outside device and a combination of processor 20 and memory 22 via communications adapter 48, as required for "communications integrity."

ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 1-7, 9-12, 14-16, 18-23, 25-35, 37-39, 41-43, 45-50, 52-64, 66-68, 70-72, 74-80, and 82-84 of the '859 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306.

G. Claims 1-3, 5-11, 15-17, 21, 22, 25, 27-31, 33-38, 42-44, 48, 49, 52, 54-60, 62-67, 71-73, 77, 78, and 82-84 – Obvious over Perritt and Wyman

ZTE contends that claims 1-3, 5-11, 15-17, 21, 22, 25, 27-31, 33-38, 42-44, 48, 49, 52, 54-60, 62-67, 71-73, 77, 78, and 82-84 are unpatentable under

35 U.S.C. § 103(a) as obvious in view of Perritt and Wyman. (Pet. 53-59.) We have considered ZTE's analysis and supporting evidence, but are unpersuaded because neither Perritt nor Wyman discloses a "repository" with "physical integrity." Independent claims 1, 29, and 58 each recite a "repository," which we have construed above as including "physical integrity." All other claims depend from one of independent claims 1, 29, and 58.

ZTE contends that each of Perritt and Wyman discloses the claimed "repository." (Pet. 54.) Specifically, ZTE contends that the client workstations of Perritt and delegatee servers 13 of Wyman each correspond to the recited "repository." (*Id*.) We disagree.

Perritt discloses a digital library infrastructure where a set of information resources is distributed through an electronic network. (Ex. 1006, p. 3.) Perritt discloses that the information resides on servers and can be retrieved remotely by using client workstations. (Ex. 1006, p. 3.) Perritt discloses that to obtain information, a client workstation sends a query indicating a desire to download the information with certain conditions. (Ex. 1006, p. 4.) Perritt discloses that software attempts to match the conditions with data in permission headers associated with the desired information, and if they match, the desired information is transmitted. (Ex. 1006, pp. 4-5.) Perritt discloses that security in a transfer of rights would be provided by digital signatures using public key encryption. (Ex. 1006, p. 4.) While this infrastructure of Perritt may possess both "communications integrity" and "behavioral integrity," Perritt does not disclose that the client workstation itself "prevents access to information by a non-trusted system," as required for "physical integrity." "Physical integrity" would be a feature of the

client workstation alone, while Perritt's security features are directed only to the transfer of information to the client workstations from the perspective of the servers.

Wyman discloses managing licensing of software executed on computer systems. (Ex. 1015, 1:23-26.) Wyman discloses license server 10, which communicates with delegatee servers 13. (Ex. 1015, 9:25-35.) Wyman discloses that license server 10 includes license management program 14. (Ex. 1015, 9:30-35.) Wyman discloses that license management program 14 stores product use authorizations on database 23, which is connected to license server 10. (Ex. 1015, Fig. 1, 11:12-16.) Wyman discloses that license management program 14 may distribute parts of these product use authorizations to delegatee servers 13. (*Id*.) Wyman discloses that license server 10 communicates with delegatee servers 13 over a network via interserver interface 34. (Ex. 1015, 9:60-62, 11:44-49.) Wyman discloses that delegatee servers 13 are in turn servers for user nodes 16, which are where licensed programs are actually executed. (Ex. 1015, 9:40-42.) As both license server 10 and user nodes 16 have access to the information on delegatee servers 13, and Wyman does not set forth enough information to determine whether license server 10 and user nodes 16 are trusted systems, Wyman does not disclose that delegatee servers 13 meet "preventing access to information by a non-trusted system," as required for "physical integrity."

ZTE has not shown a reasonable likelihood that it would prevail in showing that claims 1-3, 5-11, 15-17, 21, 22, 25, 27-31, 33-38, 42-44, 48, 49, 52, 54-60, 62-67, 71-73, 77, 78, and 82-84 of the '859 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Perritt and Wyman.

H. Declaration of Dr. Vijay K. Madisetti (Ex. 1016)

ContentGuard contends that Dr. Madisetti's declaration is entitled to little or no weight because it merely parrots the arguments made by ZTE in the petition. (Prel. Resp. 53-54.) The current situation does not require us to assess the strength of ContentGuard's argument. Even if we were to give Dr. Madisetti's declaration little or no weight, the cited prior art references still constitute sufficient evidence supporting a reasonable likelihood that ZTE will prevail on its assertion that claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, 75, and 77-84 of the '859 patent are unpatentable.

III. CONCLUSION

For the forgoing reasons, we determine that the information presented in the petition establishes that there is a reasonable likelihood that ZTE would prevail with respect to claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, 75, and 77-84 of the '859 patent.

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314, an *inter partes* review is hereby instituted as to claims 1-5, 9-11, 15-17, 19, 21-33, 37, 38, 42-44, 46, 48-62, 66, 67, 71-73, 75, and 77-84 of the '859 patent under 35 U.S.C. § 102(e) as anticipated by Leroux;

FURTHER ORDERED that inter partes review is not instituted with respect to the following claims and alleged grounds:

- Claims 1-5, 8-11, 13-15, 19-33, 36-38, 40-42, 46-62, 65-67, 69-71, and 75-84 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hendricks;
- Claims 1-5, 9-11, 15-17, 21-33, 37, 38, 42-44, 48-62, 66, 67, 71-73, and 77-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '139;
- Claims 1-5, 7-23, 25-33, 35-50, 52-62, 64-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Walker;
- Claims 1-7, 9-12, 14-16, 18-23, 25-35, 37-39, 41-43, 45-50, 52-64, 66-68, 70-72, 74-80, and 82-84 are unpatentable under 35 U.S.C. § 102(b) as anticipated by EP '306; and
- Claims 1-3, 5-11, 15-17, 21, 22, 25, 27-31, 33-38, 42-44, 48, 49, 52, 54-60, 62-67, 71-73, 77, 78, and 82-84 are unpatentable under 35 U.S.C. § 103(a) as unpatentable over Perritt and Wyman.

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(d) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial is commencing on the entry date of this decision; and

FURTHER ORDERED that an initial conference call with the Board is scheduled for 3:00 PM Eastern Time on July 29, 2013; the parties are directed to the Office Trial Practice Guide[3] for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial.

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[3] *Office Patent Trial Practice Guide*, 77 *Fed. Reg*. 48756, 48765-66 (Aug. 14, 2012).

Case IPR2013-00137
Patent 6,963,859

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Venice, Naples, Mantua, Florence, and other city-states, along with the political intrigue and plotting that developed as a consequence of this economic interchange. David Kahn reports that, by the end of the sixteenth century, cryptology had become important enough for most Italian city states to employ full-time cipher secretaries. These officials were responsible for developing new nomenclators, enciphering plaintexts, deciphering incoming messages, and breaking captured cryptograms.

A nomenclator is actually a hybrid of code and cipher systems. In its earliest form, it consisted of a relatively short list of names alluded to in secret documents, along with codewords representing the names. In one nomenclator, for example, "Naples" was represented by the word *nobile* (noble), while "Florence" was represented by the word *terra* (land).

Before long, a simple monosubstitution cipher alphabet was added to the list of names. The nomenclator mentioned above, for example, used the symbol g for the letter C and the symbol T for the letter O. Over time, both the codenames and cipher alphabets used in nomenclators became more extensive and complex. Rather than a few dozen codewords, they often contained a few thousand. In place of a monosubstitution alphabet, these nomenclators employed multiple substitutes, or homophones. Nomenclators also commonly included symbols for nulls, or *nihil importantes* (nothing important), to confuse prospective cryptanalysts.

An example of a message encrypted by means of a nomenclator (using modern symbols and language) might look like the following:

PLAINTEXT:	S	E	N	D		M	O	N	E	Y		T	O		S	M	I	T	H
nomenclator:	x	t	v	i	k	j	c	v	e	a	b	p	c		t	u	l	i	p

See also: cipher; code; homophones; monoalphabetic substitution; null.

For further reading: David Kahn, *The Codebreakers: The Story of Secret Writing,* New York: Macmillan, 1967, ch. 3.

Nonce

A number used in a cryptographic protocol to indicate the unique character of a message. Nonces are essential when the same protocol is used many times with the same set of participants. Theoretically, it would be simple for a third party to alter any particular transmission using the protocol if no change were made in its use each time. A number of different devices can be used as nonces, including large random numbers and time-stamps.

See also: random number; time-stamp.

For further reading: Charlie Kaufman, Radia Perlman, and Mike Speciner, *Network Security: Private Communication in a Public World,* Englewood Cliffs, NJ: Prentice-Hall, 1995, pp. 244, 254-256.

Nonrepudiation

Proof that a particular person or organization has made some type of agreement with one or more other people or organizations. Nonrepudiation means that a person or organization cannot say at some time in the future that he, she, or it never really agreed to some arrangement with another party.

Nonrepudiation is a normal and common feature of agreements in everyday life. For example, when someone wants to borrow money from a bank, he or she signs an agreement indicating that the money really was borrowed and that it will be paid back. The person cannot later say that the money was never really obtained and/or that there was never any intent to pay the money back.

Nonrepudiation is normal in business transactions also. Alice may sign an agreement with Bob to buy 10,000 shares of stock in the ABC Company for $1 million. Her signature on the agreement is accepted as proof that she made the agreement in the first place.

For many everyday transactions, a personal signature is sufficient evidence for later nonrepudiation of an agreement. In many cases, the signature may need to be witnessed by a trusted third party,

Exhibit 3

Trials@uspto.gov
571-272-7822

Paper 15
Entered: July 1, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE CORPORATION AND ZTE (USA) INC.
Petitioners

v.

CONTENTGUARD HOLDINGS INC.
Patent Owner

Case IPR2013-00133
U.S. Patent No. 7,523,072

Before JAMESON LEE, MICHAEL W. KIM, and MICHAEL R. ZECHER, *Administrative Patent Judges*.

ZECHER, *Administrative Patent Judge*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

ZTE Corporation and ZTE (USA) Inc. ("ZTE") filed a corrected petition ("Pet.") requesting *inter partes* review of claims 1-25 of U.S. Patent No. 7,523,072 ("the '072 patent"). Paper 10. In response, Patent Owner, ContentGuard Holdings Inc. ("ContentGuard"), filed a preliminary response ("Prel. Resp."). Paper 13. We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides:

> THRESHOLD -- The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

For the reasons set forth below, we conclude that the information presented in the petition demonstrates that there is a reasonable likelihood that ZTE will prevail in establishing claims 1-25 as unpatentable. Pursuant to 35 U.S.C. § 314, we hereby authorize an *inter partes* review to be instituted as to claims 1-25 of the '072 patent.

A. Related Matters

ZTE indicates that the '072 patent was asserted against it in *ContentGuard Holdings Inc. v. ZTE Corp. et al.*, Civil Action No. 1:12-cv-0206-CMH-TCB, filed in the U.S. District Court for the Eastern District of Virginia on February 27, 2012. Pet. 1. According to ZTE, this patent infringement lawsuit was transferred to the U.S. District Court for the

Southern District of California on May 21, 2012. *Id*. ContentGuard does not dispute that it asserted the '072 patent against ZTE.

ZTE also filed five other petitions seeking *inter partes* review of the following patents: U.S. Patent No. 7,225,160 (IPR2013-00134); U.S. Patent No. 7,359,884 (IPR2013-00136); U.S. Patent No. 6,963,859 (IPR2013-00137); U.S. Patent No. 7,139,736 (IPR2013-00138); and U.S. Patent No. 7,269,576 (IPR2013-00139). Pet. 1.

B. The Invention of the '072 Patent (Ex. 1001)

The invention of the '072 patent generally relates to distributing and enforcing usage rights for digital works. Ex. 1001, 1:27-28. A digital work refers to any work that has been reduced to a digital representation, including any audio, video, text, or multimedia work, and any accompanying interpreter, *e.g.*, software, which may be required to recreate or render the content of the digital work. Ex. 1001, 6:3-7. Usage rights refer to rights granted to a recipient of a digital work that define the manner in which a digital work may be used and distributed. Ex. 1001, 4:13-16; 6:9-12. According to the '072 patent, the disclosed invention: (1) provides the owner of a digital work the flexibility to distribute the digital work as desired; and (2) includes a distribution system that transports a means for billing with the digital work. Ex. 1001, 3:15-17; 4:1-3.

The '072 patent discloses permanently attaching usage rights to the digital work. Ex. 1001, 6:16-17. Copies of the digital work also will have the usage rights attached thereto. Ex. 1001, 6:17-18. Therefore, any usage

rights and associated fees assigned by the creator and subsequent distributor of the digital work always will remain with the digital work. Ex. 1001, 6:18-21. The ’072 patent further discloses that repositories enforce the usage rights of digital works. Ex. 1001, 4:26-27; 6:22-23. In particular, repositories store digital works, control access to digital works, bill for access to digital works, and maintain the security and integrity of the digital works stored therein. Ex. 1001, 6:23-26.

Figure 1 of the ’072 patent illustrates the basic operations of the disclosed invention. Ex. 1001, 4:52-54; 6:38-40. Figure 1 of the ’072 patent is reproduced below:

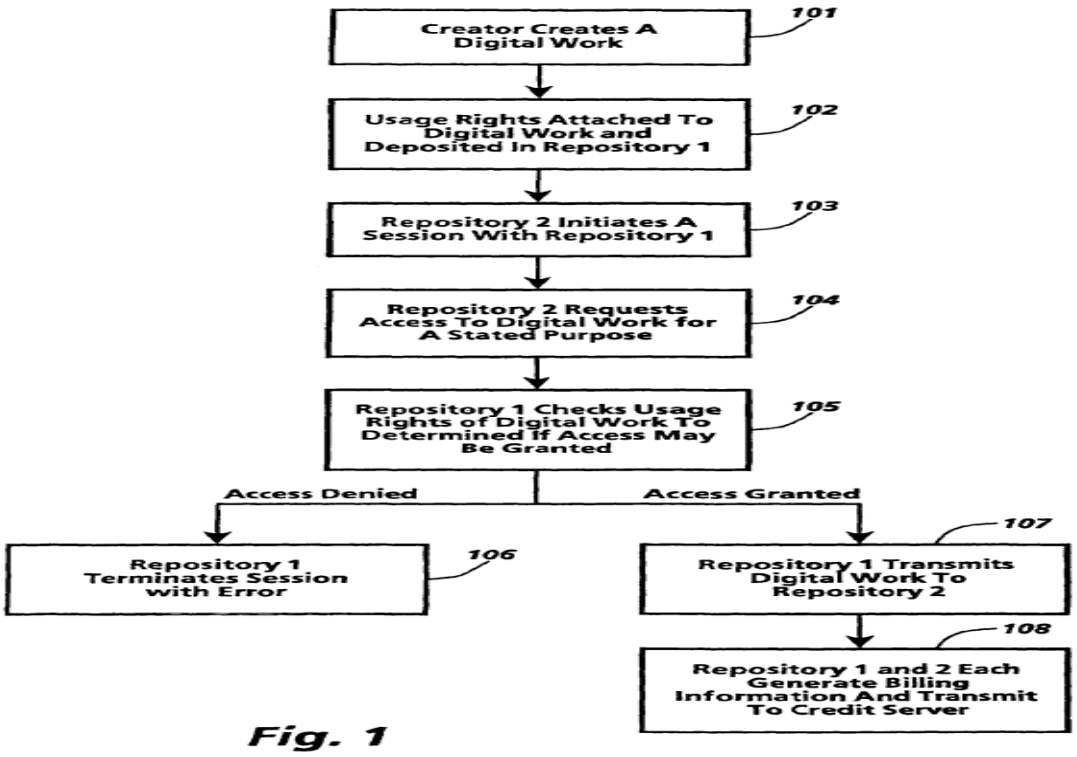

Figure 1 illustrates the basic operations of repositories 1 and 2.

At step 101, a creator creates a digital work. Ex. 1001, 6:40-41. At step 102, the creator determines the appropriate usage rights and fees, attaches them to the digital work, and stores the digital work with the associated usage rights and fees in repository 1. Ex. 1001, 6:41-43. At step 103, repository 1 receives a request to access the digital work from repository 2. Ex. 1001, 6:46-48. Such a request, or session initiation, includes steps that help ensure that repository 1 and repository 2 are trustworthy. Ex. 1001, 6:48-51. At step 104, repository 2 requests access to the digital work stored in repository 1 for a stated purpose, *e.g.*, to print the digital work or obtain a copy of the digital work. Ex. 1001, 6:51-55. At step 105, repository 1 checks the usages rights associated with the digital work stored therein to determine if access to the digital work may be granted. Ex. 1001, 6:56-58. At step 106, if access is denied, repository 1 terminates the session with repository 2 by transmitting an error message. Ex. 1001, 6:62-63. At step 107, if access is granted, repository 1 transmits the digital work to repository 2. Ex. 1001, 6:63-65. At step 108, both repository 1 and 2 generate billing information prior to transmitting the billing information to a credit server. Ex. 1001, 6:65-7:1. The use of both repositories 1 and 2 for billing prevents attempts to circumvent the billing process. Ex. 1001, 7:1-2.

Figure 2 of the ’072 patent illustrates the various types of repositories and the transaction flow between them. Ex. 1001, 4:55-57; 7:3-6. Figure 2 of the ’072 patent is reproduced below:

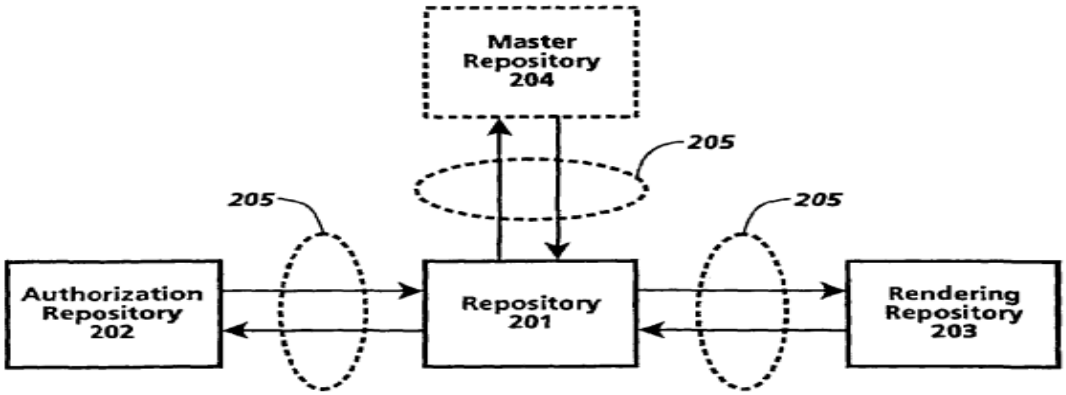

Fig. 2

Figure 2 illustrates various types of repositories and their corresponding functions.

Repository 201 represents the general instance of a repository having two modes of operation: (1) a server mode; and (2) a requester mode. Ex. 1001, 7:8-10. When repository 201 is in server mode, it receives and processes access requests for digital works. Ex. 1001, 7:11-12. When repository 201 is in requester mode, it initiates requests to access digital works. Ex. 1001, 7:12-14

During the course of operation, repository 201 may communicate with a plurality of other repositories, including rendering repository 203. Ex. 1001, 7:16-21. Communication with rendering repository 203 occurs in connection with rendering a digital work. Ex. 1001, 7:31-32. According to the ’072 patent, rendering repository 203 is coupled to a rendering device, *e.g.*, a printer device, to comprise a rendering system. Ex. 1001, 7:32-35.

C. Illustrative Claim

Claims 1, 10, and 18 are independent claims. Independent claim 1, which is illustrative, is reproduced below:

> 1. A method for securely rendering digital documents, comprising:
>
> retrieving, by ***a document platform***, a digital document and at least one usage right associated with the digital document from ***a document repository***, the at least one usage right specifying a manner of use indicating the manner in which the digital document can be rendered;
>
> storing the digital document and the at least one usage right in separate files in the document platform;
>
> ***determining, by the document platform, whether the digital document may be rendered based on the at least one usage right***; and
>
> if the at least one usage right allows the digital document to be rendered on the document platform, rendering the digital document by the document platform.

Ex. 1001, Claims—52:8-22 (emphasis added).

D. Prior Art Relied Upon

ZTE relies upon the following prior art references:

Walker	US 4,868,736	Sept. 19, 1989	Ex. 1014
Hendricks	US 5,986,690	Nov. 16, 1999 (filed Nov. 7, 1994)	Ex. 1013
Comerford (hereinafter "EP '139")	EP 0268139 A2	May 25, 1988	Ex. 1012
Hartrick (hereinafter "EP '306")	EP 0464306 A2	Jan. 8, 1992	Ex. 1010
Hartrick (hereinafter "EP '800")	EP 0567800 A1	Nov. 3, 1993	Ex. 1011

E. Alleged Grounds of Unpatentability

ZTE seeks to cancel claims 1-25 of the '072 patent based on the following alleged grounds of unpatentability:

1. Claims 1-25 as anticipated under 35 U.S.C. § 102(b) by EP '139. Pet. 11-27.

2. Claims 1, 2, 5-8, 10, 13-16, 18, and 21-24 as anticipated under 35 U.S.C. § 102(e) by Hendricks. *Id*. at 27-36.

3. Claims 1-9 as anticipated under 35 U.S.C. § 102(b) by Walker. *Id*. at 36-40.

4. Claims 1, 5, 7, 8, 10, 13, 15, 16, 18, 21, 23, and 24 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and EP '800. *Id*. at 40-53.

II. CLAIM CONSTRUCTION

Consistent with the statute and legislative history of the Leahy-Smith America Invents Act, Pub. L. 112-29, 125 Stat. 284, 329 (2011) ("AIA"), we construe claims by applying the broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b); *see also* Office Patent Trial Practice Guide, 77 *Fed. Reg.* 48756, 48766 (Aug. 14, 2012). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). However, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition

of the disputed claim term in either the specification or prosecution history." *Id*. "Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

A. "Repository" (Claims 1, 10, and 18)

ZTE does not provide a claim construction for the claim term "repository." However, ContentGuard contends that the claim term "repository" should be construed as a "trusted system for supporting usage rights." Prel. Resp. 18-19. ContentGuard then cites to several portions of the specification of the '072 patent that allegedly support its proposed claim construction. *Id*. at 19-21 (citing to Ex. 1001, 11:58-67; 12:63-64; 13:15-20; 51:33-37).

The specification of the '072 patent provides a glossary that explicitly sets forth a definition for the claim term "repository." For convenience, that glossary definition is reproduced below:

> Conceptually a set of functional specifications defining core functionality in support of usage rights. A repository is a trusted system in that it maintains physical, communications and behavioral integrity.

Ex. 1001, 51:34-37. By setting forth the term in a glossary and using the verb "is" following "repository" in the second sentence, we find that the specification explicitly sets forth a definition of "repository" as "a trusted system in that it maintains physical, communications and behavioral integrity." However, the first sentence is also relevant to the definition of

"repository" because it elaborates that the repository supports usage rights. Accordingly, we construe "repository" as "a trusted system, which maintains physical, communications and behavioral integrity, and supports usage rights."

Our analysis does not end here. In order to understand "a trusted system," it is necessary to construe "physical integrity," "communications integrity," and "behavioral integrity." These terms are described in a section of the specification labeled "Repositories." Ex. 1001, 11:58-14:32. For "physical integrity," the specification discloses the following:

> Physical integrity refers to the integrity of the physical devices themselves. ***Physical integrity applies both to the repositories and to the protected digital works.*** Thus, the higher security classes of repositories themselves may have sensors that detect when tampering is attempted on their secure cases. ***In addition to protection of the repository itself, the repository design protects access to the content of digital works.*** In contrast with the design of conventional magnetic and optical devices–such as floppy disks, CD-ROMs, and videotapes–***repositories never allow non-trusted systems to access the works directly.*** A maker of generic computer systems cannot guarantee that their platform will not be used to make unauthorized copies. The manufacturer provides generic capabilities for reading and writing information, and the general nature of the functionality of the general computing device depends on it. Thus, a copy program can copy arbitrary data. This copying issue is not limited to general purpose computers. It also arises for the unauthorized duplication of entertainment "software" such as video and audio recordings by magnetic recorders. Again, the functionality of the recorders depends on their ability to copy and they have no means to check whether a copy is authorized. In contrast, ***repositories prevent access to***

> ***the raw data by general devices*** and can test explicit rights and conditions before copying or otherwise granting access. ***Information is only accessed by protocol between trusted repositories.***

Ex. 1001, 12:1-26 (emphasis added). Many of the above aspects that are associated with "physical integrity" are described using permissive terms such as "may" and "can" and, thus, are inappropriate to include in this broadest reasonable construction as necessary limitations. The specification also appears to use the terms or phrases in each of the following three groups interchangeably:

(1) data, content, digital work, information;

(2) non-trusted system, general device; and

(3) "never allow access" and "prevent access."

When referring to the relationship between the repository and data, the specification uses absolute terms such as "never" and "only." In light of the foregoing, we construe "physical integrity" as "preventing access to information by a non-trusted system."

For "communications integrity," the specification discloses the following:

> Communications integrity refers to the integrity of the communications channels between repositories. Roughly speaking, communications integrity means that repositories cannot be easily fooled by "telling them lies." Integrity in this case refers to the property that ***repositories will only communicate with other devices that are able to present proof that they are certified repositories***, and furthermore, that the repositories monitor the communications to detect "impostors" and malicious or accidental interference. Thus ***the security***

> ***measures involving encryption, exchange of digital certificates, and nonces described below are all security measures aimed at reliable communication*** in a world known to contain active adversaries**.**

Ex. 1001, 12:27-39 (emphasis added). We construe "communications integrity" as "only communicates with other devices that are able to present proof that they are trusted systems, *e.g.*, by using security measures such as encryption, exchange of digital certificates, and nonces." The Encyclopedia of Cryptography defines "nonce" as "[a] number used in a cryptographic protocol to indicate the unique character of a message." Newton, David E., Encyclopedia of Cryptography 197 (1997).

For "behavioral integrity," the specification discloses the following:

> Behavioral integrity refers to the integrity in what repositories do. What repositories do is determined by the software that they execute. The integrity of the software is generally assured only by knowledge of its source. Restated, a user will trust software purchased at a reputable computer store but not trust software obtained off a random (insecure) server on a network. ***Behavioral integrity is maintained by requiring that repository software be certified and be distributed with proof of such certification, i.e. a digital certificate.*** The purpose of the certificate is to authenticate that the software has been tested by an authorized organization, which attests that the software does what it is supposed to do and that it does not compromise the behavioral integrity of a repository. ***If the digital certificate cannot be found in the digital work or the master repository which generated the certificate is not known to the repository receiving the software, then the software cannot be installed.***

Ex. 1001, 12:40-56 (emphasis added). We construe "behavioral integrity" in

the context of a repository as "requiring software to include a digital certificate in order to be installed in the repository."

The record is not without evidence contrary to our interpretation. The nature of interpretation is to come to the appropriate conclusion in light of all of the evidence. All of the evidence does not have to point uniformly in a single direction.

Table 2 in the specification of the '072 patent (Ex. 1001, 14) indicates ten different levels of security for repositories, and the lowest level, *i.e.*, level "0," is described as follows:

> Open system. Document transmission is unencrypted. No digital certificate is required for identification. The security of the system depends mostly on user honesty, since only modest knowledge may be needed to circumvent the security measures. The repository has no provisions for preventing unauthorized programs from running and accessing or copying files. The system does not prevent the use of removable storage and does not encrypt stored files.

Ex. 1001, 14:64-15:15. Thus, according to Table 2, repositories are not all trusted systems. Level "0" security means having an open system lacking in physical, communications, and behavioral integrity and without support for managing usage rights. That is directly contrary to the meaning of "repository" as defined in the glossary. For reasons discussed below, we adhere to the definition provided in the glossary. The contrary evidence based on level "0"security shown in Table 2 is insufficient to outweigh the rest of the evidence including, in particular, the explicit definition provided in the glossary. We make our determination based on the totality of the

evidence.

As noted above, the disclosed invention is directed to distributing and enforcing usage rights for digital works. The problems described in the background portion of the specification concern unauthorized and unaccounted distribution or usage of electronically published materials. *See generally* Ex. 1001, 1:32-3:17. The ’072 patent states that it solves preexisting problems by both permanently attaching usage rights to digital works and placing elements in repositories that enforce those usage rights. Ex. 1001, 6:16-27.

Here, the definition set forth in the glossary for “repository” is consistent with the description of the acknowledged prior art and the objective or goal to be achieved by the invention of the ’072 patent. The specification also contains detailed preferred embodiments utilizing repositories that are trusted systems to provide usage control for digital works. Ex. 1001, 7:3-41; 7:60-61; 13:7-14, 21-23; 14:8-20; 18:11-13; 26:40-29:20; 41:9-42:12.

The bulk of the disclosure consistently is directed to repositories, which are trusted systems for providing usage control for digital works. For example, the specification states:

> ***The enforcement elements of the present invention are embodied in repositories***. Among other things, repositories are used to store digital works, control access to digital works, bill for access to digital works and maintain the security and integrity of the system.

Ex. 1001, 6:23-27 (emphasis added). Other references to "repository" in the specification that recite necessary features of repositories also support the definition in the glossary that a repository is a trusted system. For example, the specification states:

> The core repository services 1302 comprise a set of functions ***required by each and every repository***. The core repository services 1302 include the session initiation transactions which are defined in greater detail below. This set of services also includes a generic ticket agent which is used to "punch" a digital ticket and a generic authorization server for processing authorization specifications.

Ex. 1001, 14:8-14 (emphasis added). In another example, the specification discloses that "[a]s a prerequisite to operation, a repository will ***require possession of an identification certificate***" and that "identification certificates 1306 are required to enable the use of the repository." Ex. 1001, 13:7-8, 14:18-20 (emphasis added). In yet another example, the specification states ***"[p]rovisions for security and privacy are part of the requirements*** for specifying and implementing repositories and thus form the need for various transactions." Ex. 1001, 26:35-38 (emphasis added). Indeed, by using words such as "require" and "requirements," these disclosures amply support the definition provided in the glossary that a repository is a trusted system.

In summary, even applying the broadest reasonable interpretation consistent with the specification, the weight of the evidence supports the definition provided in the glossary. We regard as significant that the definition states in no equivocal manner that a repository "is a trusted

system."

B. "Digital Document" (Claims 1, 10, and 18)

ZTE contends that the claim term "digital document" may be construed as software. Pet. 6 (citing to Ex. 1001, 6:3-7; 8:21-25; *see also* Ex. 1015, ¶ 85). ContentGuard does not challenge ZTE's claim construction with respect to that claim term. Because ZTE's claim construction is consistent with the specification of the '072 patent, we agree with ZTE's claim construction.

C. "Document Platform" (Claims 1, 10, and 18)

ZTE contends that the claim term "document platform" does not appear in the specification of the '072 patent, other than in the claims themselves. Pet. 6. ZTE then proceeds to construe the claim term "document platform" based on the claim limitations recited in independent claim 1. *Id.* In response, ContentGuard does not provide a claim construction for the claim term "document platform." For purposes of this decision, it is necessary to construe the claim term "document platform."

ZTE's argument with respect using the claim limitations recited in independent claim 1 to construe the claim term "document platform" is misplaced. While a claim may recite other claim features which further limit a "document platform," the pivotal issue is the meaning of the claim term "document platform." The additional claim features recited in independent claim 1 narrow the scope of that claim, but do not convey a definition for the claim term "document platform." At issue is the meaning of claim term

"document platform," not the methods steps performed by the document platform that fall within the scope of independent claim 1.

Upon reviewing the disclosure of the '072 patent in its entirety, we note that the term "document platform" only is discussed in the abstract and the original claims as filed. The discussion of a "document platform" in the abstract does not provide sufficient context for construing the claim term "document platform," because the abstract merely summarizes the claim limitations recited in independent claims 1, 10, and 18.

The specification of the '072 patent does, however, discuss "a document playback platform" in the section labeled "Repository Transactions." That section of the specification discloses the following:

> Transactions occur between two repositories (one acting as a server), between a repository and ***a document playback platform (e.g. for executing or viewing)***, between a repository and a credit server or between a repository and an authorization server.

Ex. 1001, 26:25-29 (emphasis added). In our view, the discussion of "a document playback platform" set forth above provides sufficient context for construing the claim term "document platform."

Accordingly, applying the broadest reasonable interpretation consistent with the specification, we construe the claim term "document platform" as "any computing system that holds a digital document, such as software." For example, a "document platform" may be a computing system that executes or views software.

D. Remaining Claim Terms

All remaining claim terms recited in claims 1-25 are given their ordinary and customary meaning as would be understood by one with ordinary skill in the art and need not be further construed at this time.

III. ANALYSIS

A. 35 U.S.C. § 102(b) Ground of Unpatentability—EP '139 Claims 1, 10, and 18

ZTE contends that claims 1-25 are anticipated under 35 U.S.C. § 102(b) by EP '139. Pet. 11-27. In particular, ZTE relies upon claim charts to explain how EP '139 allegedly describes the subject matter recited in these claims, and the Declaration of Dr. Vijay K. Madisetti (Ex. 1015) to support its positions. *Id*. We are persuaded by ZTE's analysis and supporting evidence.

EP '139 is directed to data processing in connection with a software copy protection mechanism. Ex. 1012, 1:4-6. In order to implement the software copy protection mechanism, EP '139 discloses that each computer or host that runs a protected software application is associated with a logically and physically secure coprocessor. Ex. 1012, 1:25-29. For instance, EP '139 discloses a source composite processor that includes source host 10 and source coprocessor 20, and a sink composite processor that includes sink host 110 and sink coprocessor 120. Ex. 1012, 25:49-52. The source host 10 and source coprocessor 20 are connected via communication link or path 14. Ex. 1012, 22:5-6. The source and sink

processors 10, 120 are interconnected via communication link 200. Ex. 1012, 26:5-6. EP '139 provides that only coprocessors that are "member[s] of the family" are capable of decrypting and recognizing the information transmitted thereto. Ex. 1012, 26:7-10, 20-23. EP '139 then proceeds to disclose that source coprocessor 20 and sink coprocessor 120 exchange encrypted information. Ex. 1012, 26:10-20. EP '139 also discloses that the source coprocessor 20 can encrypt a right to execute and send it to the sink coprocessor 120. Ex. 1012, 26:32-35.

ContentGuard contends that EP '139 does not disclose a "repository," as recited in independent claim 1, 10, and 18. Prel. Resp. 31-33. ZTE proposes two alternative readings of EP '139, only one of which properly accounts for the claimed "repository." Pet. 13-14, 18. In particular, ZTE takes the position that either disk 16 or, alternatively, source computing system 10, 20 constitutes the claimed "repository." *Id*. We agree with the latter position.

As set forth above, we have construed a "repository" as "a trusted system which maintains physical, communications and behavioral integrity, and supports usage rights." According to our claim construction, physical integrity is "preventing access to information by a non-trusted system;" communications integrity is "only communicates with other devices that are able to present proof that they are trusted systems, for example, by using security measures such as encryption, exchange of digital certificates, and nonces;" and behavioral integrity is "requiring software to include a digital certificate in order to be installed in the repository."

EP '139 discloses that source computing system 10, 20 possesses physical integrity by "preventing access to information by a non-trusted system." That is, EP '139 discloses that each computer or host that runs a protected software application is associated with a logically and physically secure coprocessor—in this case, source computing system 10, 20. Ex. 1012, 1:25-29. EP '139 also discloses that source computing system 10, 20 possesses communications integrity because it "only communicates with other devices that are able to present proof that they are trusted systems, *e.g.*, by using security measures such as encryption, exchange of digital certificates, and nonces." Source coprocessor 20 ensures that sink coprocessor 120 is a "member of the family" by exchanging encrypted information therebetween. Ex. 1012, 26:7-23. EP '139 further discloses that source computing system 10, 20 possesses behavioral integrity by "requiring software to include a digital certificate in order to be installed." Source coprocessor 20 encrypts a right to execute the protected software application prior to sending it to sink coprocessor 120. Ex. 1012, 26:32-35.

ContentGuard also contends that EP '139 does not disclose a "document platform" that performs the "determining" method step recited in independent claims 1 and 10. Prel. Resp. 33-35. ZTE proposes two alternative readings of EP '139, each of which properly accounts for the claimed "document platform" that performs the "determining" method step recited in independent claims 1 and 10. Pet. 15-16, 18-19. In particular, ZTE takes the position that source computing system 10, 20 or, alternatively, sink computing system 110, 120 constitutes the claimed "document

platform" that performs the "determining" method step. We agree with both positions.

As set forth above, we have construed a "document platform" as "any computing system that holds a digital document, such as software." For example, a "document platform" may be a computing system that executes or views software. EP '139 discloses that as long as the right to execute associated with the protected software application is retained in the memory of either source coprocessor 20 or sink coprocessor 120, the protected software application may be executed on either source computing system 10, 20 or sink computing system 110, 120. Ex. 1012, 1:32-37. Therefore, consistent with our claim construction above, source computing system 10, 20 or, alternatively, sink computing system 110, 120 constitute the claimed "document platform" because both computing systems may execute the protected software application using the right to execute stored in their respective memories.

EP '139 further discloses that each time the protected software application is run on source coprocessor 20 prior to authorizing execution, the protected software application uses the criterion stated in the right to execute to determine whether the current date and/or time is later than the terminal date and/or time, and, if that criterion is satisfied, authorizes execution of the software application. Ex. 1012, 24:8-14. In order to determine if the criterion is satisfied, EP '139 discloses that source coprocessor 20 supplies the current date and/or time to the executing software application on demand. Ex. 1012, 24:14-16. Therefore, contrary to

ContentGuard's argument that it is the protected software application in EP '139 by itself which authorizes execution based on at least one criterion, rather than source computing systems 10, 20 or, alternatively, sink computing system 110, 120 (Prel. Resp. 33-35), the protected software application is not solely responsible for using the criterion to determine the execution of the software and enforce the terminal date and/or time. Instead, ZTE presents sufficient evidence to warrant a finding that source computing system 10, 20 or, alternatively, sink computing system 110, 120 works in conjunction with the protected software application to determine whether the software may be executed based on at least one criterion stated in the right to execute.

Because EP '139 properly accounts for both the claimed "repository" recited in independent claims 1, 10, and 18, and the claimed "document platform" that performs the "determining" method step recited in independent claims 1 and 10, ZTE has demonstrated a reasonable likelihood of prevailing on its assertion that these claims are anticipated under 35 U.S.C. § 102(b) by EP '139.

Claim 2-9, 11-17, and 19-25

To rebut the grounds of unpatentability asserted by ZTE against dependent claims 2-9, 11-17, and 19-25, ContentGuard relies upon the same arguments it presented in rebutting the grounds of unpatentability asserted by ZTE against independent claims 1, 10, and 18. Prel. Resp. 29-35. As discussed above, those arguments are not persuasive. In addition, the explanations provided by ZTE as to how EP '139 describes the claimed

subject matter recited in dependent claims 2-9, 11-17, and 19-25 have merit and are otherwise unrebutted. As a result, ZTE has demonstrated a reasonable likelihood of prevailing on its assertion that dependent claims 2-9, 11-17, and 19-25 of the '072 patent are anticipated under 35 U.S.C. § 102(b) by EP '139.

B. 35 U.S.C. § 102(e) Ground of Unpatentability—Hendricks Claims 1, 10, 18

ZTE contends that claims 1, 2, 5-8, 10, 13-16, 18, and 21-24 are anticipated under 35 U.S.C. § 102(e) by Hendricks. Pet. 27-36. In particular, ZTE relies upon claim charts to explain how Hendricks allegedly describes the subject matter recited in these claims, and the Declaration of Dr. Madisetti (Ex. 1015) to support its positions. *Id*. In response, ContentGuard contends that Hendricks does not disclose a "repository," as recited in independent claim 1, 10, and 18. Prel. Resp. 36-38. We have considered ZTE's analysis and supporting evidence, but we are not persuaded that Hendricks properly accounts for the claimed "repository."

Hendricks discloses an electronic book selection and delivery system. Ex. 1013, Title. In particular, Hendricks discloses a viewer 266 that allows books to be stored, read, and erased and includes the capability to order books and retain them in memory for a predetermined period of time. Ex. 1013, 12:1-6. The viewer 266 requests information from library 262. Ex. 1013, 10:18-19. Information requests from viewer 266 are received either through a cable connecting viewer 266 to library 262 or through wireless transmissions such as radio frequency ("RF"). Ex. 1013, 10:18-23.

When viewer 266 requests a specific book from library 262, library 262 opens an electronic file for the specific book requested by viewer 266 and transmits the information on a packet-by-packet basis. Ex. 1013, 10:37-41.

ZTE takes the position that library 262 of Hendricks amounts to the claimed "repository." Pet. 30. ZTE is incorrect because Hendricks' library 262 does not possess "communications integrity." Hendricks does not disclose that the connection between viewer 266 and library 262 uses "security measures such as encryption, exchange of digital certificates, and nonces," so as to show that library 262 "only communicates with other devices that are able to present proof that they are trusted systems," as required for "communications integrity." Because Hendricks does not properly account for the claimed "repository," ZTE has not shown a reasonable likelihood of prevailing on its assertion that independent claims 1, 10, and 18 of the '072 patent are anticipated under 35 U.S.C. § 102(e) by Hendricks.

Claims 2, 5-8, 13-16, and 21-24

Claims 2, 5-8, 13-16, and 21-24 each depend directly or indirectly from independent claims 1, 10, or 18. For the same reasons set forth above with respect to independent claims 1, 10, and 18, ZTE has not shown a reasonable likelihood of prevailing on its assertion that dependent claims 2, 5-8, 13-16, and 21-24 of the '072 patent are anticipated under 35 U.S.C. § 102(e) by Hendricks.

C. 35 U.S.C. § 102(b) Ground of Unpatentability—Walker Claim 1

ZTE contends that claims 1-9 are anticipated under 35 U.S.C. § 102(b) by Walker. Pet. 36-40. In particular, ZTE relies upon claim charts to explain how Walker allegedly describes the subject matter recited in these claims, and the Declaration of Dr. Madisetti (Ex. 1015) to support its positions. *Id.* ContentGuard contends that Walker does not disclose a "repository," as recited in independent claim 1. Prel. Resp. 41-44. We have considered ZTE's analysis and supporting evidence, but we are not persuaded that Walker properly accounts for the claimed "repository."

Figure 1 of Walker illustrates an exemplary embodiment of a control system. Ex. 1014, 3:56-57, 4:11-13. Figure 1 of Walker is reproduced below:

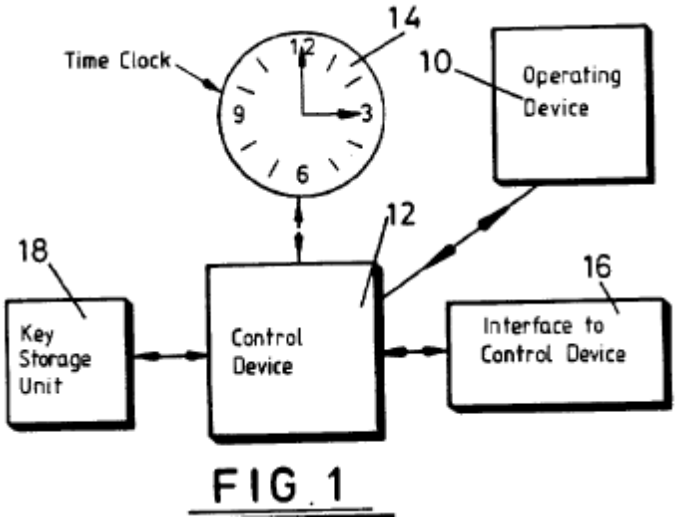

Figure 1 illustrates a control system.

The control system illustrated above includes operating device 10, interface 16, and key storage unit 18, each of which are connected to control

device 12. Ex. 1014, 4:14-21. Key storage unit 18, operational device 10, control device 12, and interface 16 can be interlinked by electrical, optical, RF, or other signal carrying means. Ex. 1014, 5:17-20. At the beginning of operation, control device 12 ensures that a valid storage device is present by requesting a matching of a data unit, or key, provided by a user to one stored in an area of key storage unit 18. Ex. 1014, 4:46-49. If a match is found, the control device 12 allows the storage device to access the area of the key storage unit 18 that contains the current allowable operational time for a requested program. Ex. 1014, 4:51-53.

ZTE takes the position that a storage device, *e.g.*, compact disc-read only memory ("CD-ROM") (Ex. 1014, 8:8-20), within or attached to the control system illustrated in Figure 1 of Walker, amounts to the claimed "repository." Pet. 37-38. ZTE is incorrect because the storage device identified in Walker that allegedly corresponds to the claimed "repository" does not have "communications integrity." While Walker discloses that the control system connects to a storage device, Walker does not disclose that the storage device, when communicating with the control system, uses "security measures such as encryption, exchange of digital certificates, and nonces," so as to show that it "only communicates with other devices that are able to present proof that they are trusted systems," as required for "communications integrity." For example, assume a CD-ROM is within or attached to the control system illustrated in Figure 1 of Walker. In that scenario, Walker does not disclose any security measures employed between the CD-ROM and the control system.

Because Walker does not properly account for the claimed "repository," ZTE has not shown a reasonable likelihood of prevailing on its assertion that independent claim 1 of the '072 patent is anticipated under 35 U.S.C. § 102(b) by Walker.

Claims 2-9

Claims 2-9 each depend directly or indirectly from independent claim 1. For the same reasons set forth above with respect to independent claim 1, ZTE has not shown a reasonable likelihood of prevailing on its assertion that dependent claims 2-9 of the '072 patent are anticipated under 35 U.S.C. § 102(b) by Walker.

D. 35 U.S.C. § 103(a) Ground of Unpatentability—Combination of EP '306 and EP'800

Claims 1, 10, and 18

ZTE contends that claims 1, 5, 7, 8, 10, 13, 15, 16, 18, 21, 23, and 24 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and EP '800. Pet. 40-53. In particular, ZTE relies upon claim charts to explain how the combination of EP '306 and EP '800 allegedly describes the subject matter recited in these claims, and the Declaration of Dr. Madisetti (Ex. 1015) to support its positions. *Id*. ContentGuard contends that neither EP '306 nor EP '800 discloses a "repository," as recited in independent claims 1, 10, and 18. Prel. Resp. 44-46. We have considered ZTE's analysis and supporting evidence, but we are not persuaded that either EP '306 or EP '800 properly accounts for the claimed "repository."

EP ’306 discloses a data processor that manages display and printing operations for a document so as to comply with proprietary and security restrictions of the document. Ex. 1010, 1:5-10. In particular, EP ’306 discloses that online books may be rendered on a variety of display devices. Ex. 1010, 2:2-4. The electronic books may be communicated, stored, displayed, and modified. Ex. 1010, 2:12-14. EP ’306 provides a book data stream in an intermediate format for storing on-line information that specifically is designed to be used by a book display program on the display device. Ex. 1010, 1:54-57. The book display program may be a document manager system including a processor 20 connected to a display 26, memory 22, printer 44, disk drive 46, communications adapter 48, and enunciator 52. Ex. 1010, 6:48-52.

ZTE takes the position that the online source of the formatted text stream received by the document manager system constitutes the claimed “repository.” Pet. 41-42, 44. ZTE is incorrect because EP ’306’s online document source does not possess “communications integrity.” While EP ’306 discloses that the document manager system is capable of communicating with the online document source via communications adapter 48, EP ’306 does not disclose using “security measures, such as encryption, exchange of digital certificates, and nonces,” between the online document source and the document manager system, as required for “communications integrity.”

As applied by ZTE, EP ’800 does not remedy the above-noted deficiency in EP ’306. Because neither EP ’306 nor EP ’800 properly

account for the claimed "repository," ZTE has not shown a reasonable likelihood of prevailing on its assertion that independent claims 1, 10, and 18 of the '072 patent are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and EP '800.

Claims 5, 7, 8, 13, 15, 16, 21, 23, and 24

Claims 5, 7, 8, 13, 15, 16, 21, 23, and 24 each depend directly or indirectly from independent claims 1, 10, or 18. For the same reasons set forth above with respect to independent claims 1, 10, and 18, ZTE has not shown a reasonable likelihood of prevailing on its assertion that dependent claims 5, 7, 8, 13, 15, 16, 21, 23, and 24 of the '072 patent are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and EP '800.

E. Declaration of Dr. Vijay K. Madisetti (Ex. 1015)

ContentGuard contends that Dr. Madisetti's declaration is entitled to little or no weight because it merely parrots the arguments made by ZTE. The current situation does not require us to assess the strength of ContentGuard's argument. Even if we were to give Dr. Madisetti's declaration little or no weight, the content of EP'139 and the arguments of the parties nonetheless demonstrate a reasonable likelihood that ZTE will prevail on its assertion that claims 1-25 of the '072 are unpatentable.

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claims 1-25 of the '072 patent as anticipated under 35 U.S.C. § 102(b) by EP '139;

FURTHER ORDERED that an *inter partes* review is not instituted with respect to the following grounds of unpatentability:

A. Claims 1, 2, 5-8, 10, 13-16, 18, 21-24 as anticipated under 35 U.S.C. § 102(e) by Hendricks;

B. Claims 1-9 as anticipated under 35 U.S.C. § 102(b) by Walker;

C. Claims 1, 5, 7, 8, 10, 13, 15, 16, 18, 21, 23, and 24 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and EP '800;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial. The trial will commence on the entry date of this decision;

FURTHER ORDERED that an initial conference call with the Board is scheduled for 2 PM on July 29, 2013. The parties are directed to the Office Trial Practice Guide, 77 *Fed. Reg*. 48756, 48765-66 (Aug. 14, 2012) for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial.

Case IPR2013-00133
U.S. Patent No. 7,523,072

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Venice, Naples, Mantua, Florence, and other city-states, along with the political intrigue and plotting that developed as a consequence of this economic interchange. David Kahn reports that, by the end of the sixteenth century, cryptology had become important enough for most Italian city states to employ full-time cipher secretaries. These officials were responsible for developing new nomenclators, enciphering plaintexts, deciphering incoming messages, and breaking captured cryptograms.

A nomenclator is actually a hybrid of code and cipher systems. In its earliest form, it consisted of a relatively short list of names alluded to in secret documents, along with codewords representing the names. In one nomenclator, for example, "Naples" was represented by the word *nobile* (noble), while "Florence" was represented by the word *terra* (land).

Before long, a simple monosubstitution cipher alphabet was added to the list of names. The nomenclator mentioned above, for example, used the symbol g for the letter C and the symbol T for the letter O. Over time, both the codenames and cipher alphabets used in nomenclators became more extensive and complex. Rather than a few dozen codewords, they often contained a few thousand. In place of a monosubstitution alphabet, these nomenclators employed multiple substitutes, or homophones. Nomenclators also commonly included symbols for nulls, or *nihil importantes* (nothing important), to confuse prospective cryptanalysts.

An example of a message encrypted by means of a nomenclator (using modern symbols and language) might look like the following:

PLAINTEXT:	S	E	N	D		M	O	N	E	Y		T	O		S	M	I	T	H
nomenclator:	x	t	v	i	k	j	c	v	e	a	b	p	c		t	u	l	i	p

See also: cipher; code; homophones; monoalphabetic substitution; null.

For further reading: David Kahn, *The Codebreakers: The Story of Secret Writing,* New York: Macmillan, 1967, ch. 3.

Nonce

A number used in a cryptographic protocol to indicate the unique character of a message. Nonces are essential when the same protocol is used many times with the same set of participants. Theoretically, it would be simple for a third party to alter any particular transmission using the protocol if no change were made in its use each time. A number of different devices can be used as nonces, including large random numbers and time-stamps.

See also: random number; time-stamp.

For further reading: Charlie Kaufman, Radia Perlman, and Mike Speciner, *Network Security: Private Communication in a Public World,* Englewood Cliffs, NJ: Prentice-Hall, 1995, pp. 244, 254-256.

Nonrepudiation

Proof that a particular person or organization has made some type of agreement with one or more other people or organizations. Nonrepudiation means that a person or organization cannot say at some time in the future that he, she, or it never really agreed to some arrangement with another party.

Nonrepudiation is a normal and common feature of agreements in everyday life. For example, when someone wants to borrow money from a bank, he or she signs an agreement indicating that the money really was borrowed and that it will be paid back. The person cannot later say that the money was never really obtained and/or that there was never any intent to pay the money back.

Nonrepudiation is normal in business transactions also. Alice may sign an agreement with Bob to buy 10,000 shares of stock in the ABC Company for $1 million. Her signature on the agreement is accepted as proof that she made the agreement in the first place.

For many everyday transactions, a personal signature is sufficient evidence for later nonrepudiation of an agreement. In many cases, the signature may need to be witnessed by a trusted third party,

Exhibit 4

Trials@uspto.gov
571-272-7822

Paper 12
Entered: June 19, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE CORPORATION AND ZTE (USA) INC.
Petitioner

v.

CONTENTGUARD HOLDINGS INC.
Patent Owner

Case IPR2013-00134
U.S. Patent No. 7,225,160

Before JAMESON LEE, MICHAEL W. KIM, and MICHAEL R. ZECHER, *Administrative Patent Judges*.

ZECHER, *Administrative Patent Judge*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

ZTE Corporation and ZTE (USA) Inc. ("ZTE") filed a petition ("Pet.") requesting *inter partes* review of claims 1-38 of U.S. Patent No. 7,225,160 ("the '160 patent"). Paper 3. In response, Patent Owner, ContentGuard Holdings Inc. ("ContentGuard"), filed a preliminary response ("Prel. Resp."). Paper 9. We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides:

> THRESHOLD --The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

For the reasons set forth below, we conclude that the information presented in the petition demonstrates that there is a reasonable likelihood that ZTE will prevail in establishing claims 12-22 and 30-38 as unpatentable. However, we conclude that the information presented in the petition does not demonstrate that there is a reasonable likelihood that ZTE will prevail in establishing claims 1-11 and 23-29 as unpatentable. Pursuant to 35 U.S.C. § 314, we hereby authorize an *inter partes* review to be instituted only as to claims 12-22 and 30-38 of the '160 patent.

A. Related Matters

ZTE indicates that the '160 patent was asserted against it in *ContentGuard Holdings Inc. v. ZTE Corporation et al.*, Civil Action No.

1:12-cv-0206-CMH-TCB, filed in the U.S. District Court for the Eastern District of Virginia on February 27, 2012. Pet. 1. According to ZTE, this patent infringement lawsuit was transferred to the U.S. District Court for the Southern District of California on May 21, 2012. *Id*. ContentGuard does not dispute that it asserted the '160 patent against ZTE.

ZTE also filed five other petitions seeking *inter partes* review of the following patents: U.S. Patent No. 7,523,072 (IPR2013-00133); U.S. Patent No. 7,359,884 (IPR2013-00136); U.S. Patent No. 6,963,859 (IPR2013-00137); U.S. Patent No. 7,139,736 (IPR2013-00138); and U.S. Patent No. 7,269,576 (IPR2013-00139). Pet. 1-2.

B. The Invention of the '160 Patent (Ex. 1001)

The invention of the '160 patent generally relates to distributing and enforcing usage rights for digital works. Ex. 1001, 1:15-16. A digital work refers to any work that has been reduced to a digital representation, including any audio, video, text, or multimedia work, and any accompanying interpreter, *e.g.*, software, which may be required to recreate or render the content of the digital work. Ex. 1001, 5:20-24. Usage rights refer to rights granted to a recipient of a digital work that define the manner in which a digital work may be used and distributed. Ex. 1001, 5:26-30. According to the '160 patent, the disclosed invention permits the owner of a digital work, or other authorized party, to specify a manner of use of the content associated therewith. Ex. 1001, 3:51-54.

The ’160 patent discloses dividing a digital work into two files: (1) a contents file; and (2) a description tree file. Ex. 1001, 7:65-67. The contents file is a stream of addressable bytes, the format of which completely depends on the interpreter or rendering engine used to play, display, or print the digital work. Ex. 1001, 7:67-8:4. The description tree file makes it possible to examine the rights and fees associated with the digital work without reference to the content of the digital work. Ex. 1001, 8:4-6.

Figure 5 of the ’160 patent illustrates a contents file layout for a digital work. Ex. 1001, 4:16-18, 8:10. Figure 5 of the ’160 patent is reproduced below:

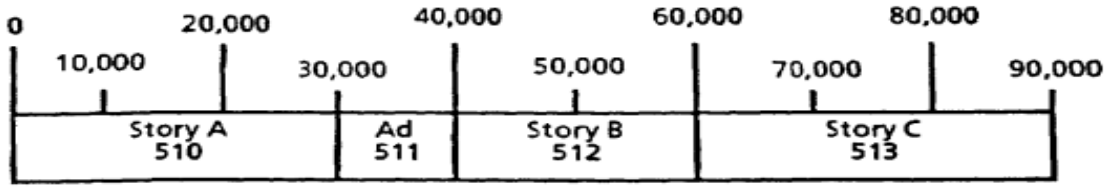

Figure 5

Figure 5 illustrates the format
of the contents file of a digital work.

According to the contents file illustrated above, digital work 509 includes story A 510, advertisement 511, story B 512, and story C 513. Ex. 1001, 8:11-12. Assuming that digital work 509 is stored starting at a relative address of 0, the aforementioned portions of digital work 509 are stored so

that story A 510 occupies the address of 0-30,000, advertisement 511 occupies the address of 30,001-40,000, story B 512 occupies the address of 40,0001-60,000, and story C 513 occupies the address of 60,0001-90,000. Ex. 1001, 8:12-18.

Figure 8 of the '160 patent illustrates the description tree layout or structure of digital work 509. Ex. 1001, 4:26-27, 8:55-56. Figure 8 of the '160 patent is reproduced below:

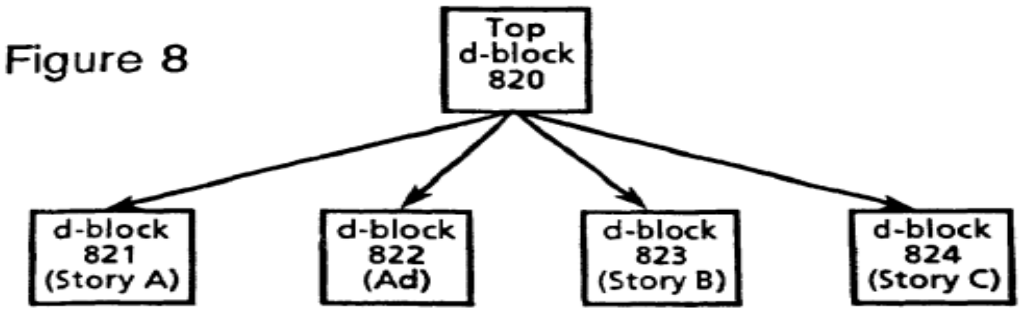

Figure 8 illustrates the structure
of the description tree portion of a digital work.

According to the description tree illustrated above, the top descriptor block ("d-block") 820 of the digital work refers to the various stories and advertisement contained therein. Ex. 1001, 8:56-58. The top d-block 820 points to the following: (1) d-block 821, which represents story A 510; (2) d-block 822, which represents advertisement 511; (3) d-block 823, which represents story B 512; and (4) d-block 824, which represents story C 513. Ex. 1001, 8:58-61.

Figure 9 of the '160 patent further illustrates a portion of the description tree associated with d-block 821, which represents story A 510.

Ex. 1001, 4:28-29, 8:62-63. Figure 9 of the '160 patent is reproduced below:

Figure 9

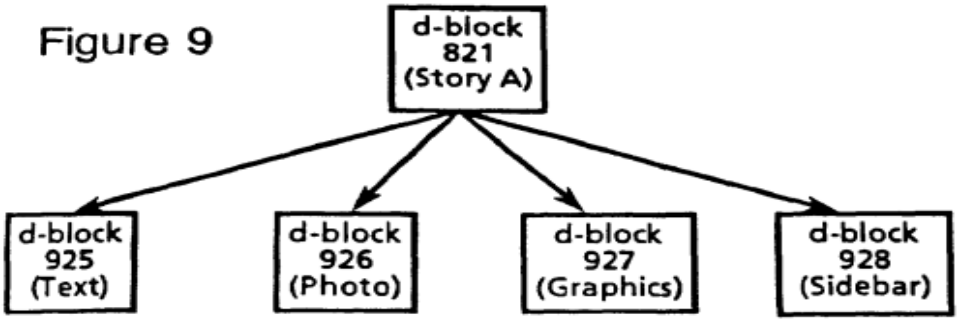

Figure 9 illustrates another level of the description tree associated with d-block 821.

Figure 10 of the '160 patent illustrates the usage rights portions of an individual d-block. Ex. 1001, 4:30-32, 8:66-67. Figure 10 of the '160 patent is reproduced below:

Figure 10

Figure 10 illustrates the usage rights portion of a d-block.

The usage right for each individual d-block has a right code field 1050 and a status information field 1052. Ex. 1001, 9:2-3. The right code field 1050 contains a unique code assigned to the usage right. Ex. 1001, 9:3-4.

The status information field 1052 contains information relating to the state of the usage right and the corresponding digital work. Ex. 1001, 9:4-6.

C. Illustrative Claims

Claims 1, 12, 23, and 30 are independent claims. Independent claims 1 and 12 are illustrative:

> 1. A computer readable medium having embedded thereon a digital work adapted to be distributed within in a system for controlling the use of digital works, said digital work comprising:
>
> a digital content portion that is renderable by a rendering device;
>
> a usage rights portion associated with said digital content portion and comprising one or more computer readable instructions configured to permit or prohibit said rendering device to render said digital content portion, said usage rights portion being expressed as statements from a usage rights language having a grammar defining a valid sequence of symbols, and specifying a manner of use relating to one or more purposes for which the digital work can be used by an authorized party; and
>
> ***a description structure comprising a plurality of description blocks, each of said description blocks comprising address information for a least one part of said digital work, and a usage rights part for associating one or more usage rights portions***.

Ex. 1001, Claims—48:32-51 (emphasis added).

12. A method for creating a digital work to be used in a system for use of the digital work, said method comprising:

obtaining a digital content portion that is renderable by a rendering device;

associating a usage rights portion with the digital content portion, the usage rights portion comprising one or more computer readable instructions configured to permit or prohibit said rendering device to render said digital content portion, said usage rights portion being expressed as statements from a usage rights language having a grammar defining a valid sequence of symbols, and specifying a manner of use relating to one or more purposes for which the digital work can be used by an authorized party;

describing said digital work by a description structure comprising a plurality of description blocks, each of said description blocks comprising addressing information for a least one part of said digital work, and a usage rights part for associating one or more usage rights portions; and

combining the digital content portion and the usage rights portion to create the digital work.

Ex. 1001, Claims—49:16-37 (emphasis added).

D. Prior Art Relied Upon

ZTE relies upon the following prior art references:

Wyman	US 5,260,999	Nov. 9, 1993	Ex. 1013
Porter, Jr. (hereinafter "Porter")	US 5,263,160	Nov. 16, 1993	Ex. 1014
Hartrick (hereinafter "EP '306")	EP 0464306 A2	Jan. 8, 1992	Ex. 1010

Hartrick EP 0567800 A1 Nov. 3, 1993 Ex. 1011 (hereinafter "EP '800")

Henry H. Perritt, Jr., "*Knowbots, Permissions Headers and Contract Law*," Paper for the Conference on Technological Strategies for Protecting Intellectual Property in the Networked Multimedia Environment (Apr. 30, 1993) (retrieved from http://archive.ifla.org/documents/infopol/copyright/perh2.txt on Jan. 4, 2013) (Ex. 1006) (hereinafter "Perritt").

Admitted Prior Art—During the original prosecution, the Examiner rejected dependent claim 8 (now dependent claim 5) because "'mark-up prices' are old and well known to those of ordinary skill in retail." Ex. 1002-001347 (Non-Final Rejection dated July 27, 2004, p. 4). Patent Owner did not traverse the Examiner's position that "mark-up prices" are common knowledge in the retail art. As such, the Examiner's statement regarding "mark-up prices" is taken to be admitted prior art.

E. Alleged Grounds of Unpatentability

ZTE seeks to cancel claims 1-38 of the '160 patent based on the following alleged grounds of unpatentability:

1. Claims 1, 2, 9, 12, 13, 23, 30, and 31 as anticipated under 35 U.S.C. § 102(b) by EP '306. Pet. 12-22.

2. Claims 1-3, 8, 9, 12, 13, 15, 16, 20, 23, 30, and 31 as anticipated under 35 U.S.C. § 102(b) by EP '800. *Id.* at 22-33.

3. Claims 2-4, 6, 7, 15-18, 21, 25, 26, 34, and 35 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306 and Perritt. *Id*. at 34-38.

4. Claims 2-4, 6, 7, 15-18, 21, 25, 26, 34, and 35 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Perritt. *Id*. at 38-39.

5. Claims 2, 10, 14, 24-28, and 32-37 as unpatentable under U.S.C. § 103(a) over the combination of EP '306 and Wyman. *Id*. at 39-44.

6. Claims 2, 10, 14, 24-28, and 32-37 as unpatentable under U.S.C. § 103(a) over the combination of EP '800 and Wyman. *Id*. at 44-46.

7. Claims 5 and 19 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '306, Perritt, and Admitted Prior Art. *Id*. at 47.

8. Claims 5 and 19 as unpatentable under U.S.C. § 103(a) over the combination of EP '800, Perritt, and Admitted Prior Art. *Id*. at 48.

9. Claims 11, 22, 29, and 38 as unpatentable under U.S.C. § 103(a) over the combination of EP '306 and Porter. *Id*. at 48-51.

10. Claims 11, 22, 29, and 38 as unpatentable under U.S.C. § 103(a) over the combination of EP '800 and Porter. *Id*. at 51-53.

II. FINDINGS OF FACT

The following findings of facts are supported by a preponderance of the evidence.

EP '800 (Ex. 1011)

The invention disclosed in EP '800 relates to a data processor that ensures the copying and printing operations for a softcopy book, *e.g.*, electronic book, comply with the royalty payment requirements for making copies of the softcopy book. Ex. 1011, 1:3-8. According to EP '800, the

disclosed invention ensures compliance with the royalty requirements of a softcopy book by providing the following improved methods: (1) managing the softcopy text of a structured document in a data processing system; (2) managing the printing of pages of a structured document; (3) managing the writing of a structured document into a bulk storage medium; and (4) managing the telecommunication of softcopies of a structured document. Ex. 1011, 5:19-38.

Figure 3A of EP '800 illustrates the element tags and associated text of a structured document, such as a softcopy book. Ex. 1011, 7:53-54; *see, e.g.*, 2:21-28 and 3:9-11. Figure 3A is reproduced below:

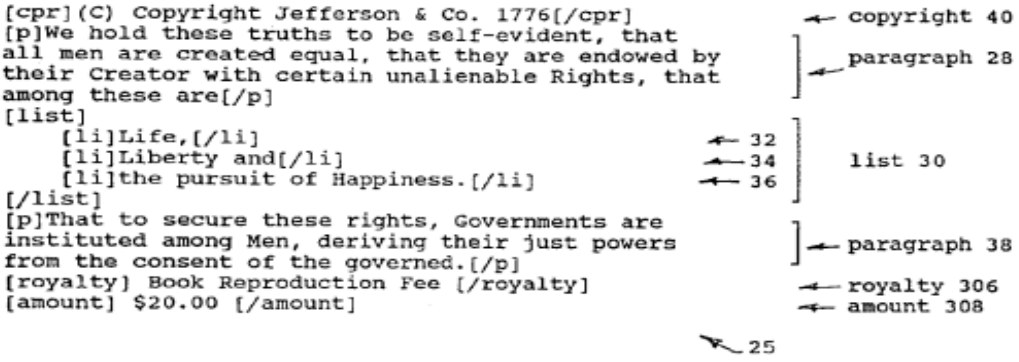

Figure 3A. Example of Control Element Tags and Associated Text

Figure 3A of EP '800 illustrates the organization of document elements 38-42 in a formatted text stream 25 having an ordered sequence. Ex. 1011, 9:35-41. Each element is a structured document element having a begin tag and an end tag. Ex. 1011, 9:43-47. The begin tag and end tag serve to identify the element type. Ex. 1011, 9:47-49. For instance,

paragraph 28 is shown in the structured document notation between begin tag [p] and end tag [/p]. Ex. 1011, 9:41-43.

The invention of the EP '800 embeds special strings, such as royalty message 306, within document elements having special structured document tags in the structured document. Ex. 1011, 10:1-5. In particular, Figure 3A of the EP '800 illustrates that royalty message 306 is embedded between a begin tag [royalty] and end tag [/royalty]. Ex. 1011, 10:5-7. When the processor 20 (illustrated in Figure 1) detects the presence of a special tag, such as a royalty begin tag, it makes a note of its presence within memory 22 (illustrated in Figure 1) so when specific functions are requested by various components of the data processing system, copying of the structured document is inhibited and a royalty payment process is invoked. Ex. 1011, 10:7-14. For instance, if a royalty message 306 is identified in the formatted text stream 25, the data processing system inhibits the printer function so that a prospective user cannot print the structured document containing the royalty element. Ex. 1011, 10:14-18.

Figure 3B of EP '800 illustrates the memory organization of element tags and associated text in Figure 3A. Ex. 1011, 7:55-57. Figure 3B is reproduced below:

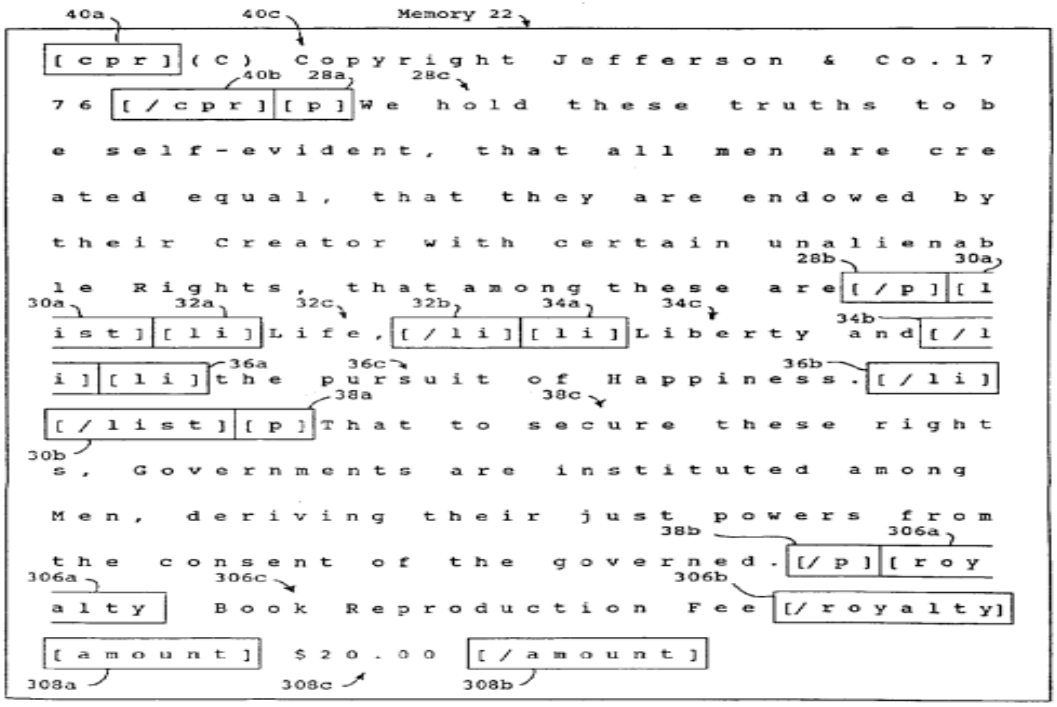

Figure 3B – Memory Organization of Control Element Tags and Associated Text

Figure 3B of EP '800 illustrates storing the structured document and its corresponding tags in memory 22 in a linear sequential order, *i.e.*, the formatted text stream 25. Ex. 1011, 10:24-27. A special copyright notice element is represented by begin tag 40a and end tag 40b, which surrounds copyright notice string 40c. Ex. 1011, 10:38-40. Similarly, the special royalty message element is represented by begin tag 306a and end tag 306b, which surrounds the "Book Reproduction Fee" string 306c. Ex. 1011, 10:41-44.

When the royalty payment program 45 (illustrated in Figure 1) is loaded into the memory 22 of the data processing system, a default parameter table 56 is loaded into memory 22 as well. Ex. 1011, 10:55-11:1.

The default parameter table 56 includes a set of default values. Ex. 1011, 11:2-4. Alternatively, a prospective user can enter a profile of values for the parameter table. Ex. 1011, 11:4-6. The parameter table 56 loaded during the initial program loading stage includes characters representing each special tag, such as the royalty tag "[royalty]". Ex. 1011, 11:6-9. The default parameter table 56 also includes values indicating how the data processing system should respond when particular tagged strings are identified in the document text loaded into memory 22. Ex. 1011, 11:10-14. For instance, if a royalty tag "[royalty]" is detected in the structured document, the default parameter table 56 indicates that if the document is displayed on display 26 (illustrated in Figure 1), then the page displayed should include the royalty message. Ex. 1011, 11:14-19.

Figure 7 of EP '800 illustrates the default parameter table 56 after it has been loaded with information pertaining to the document elements associated with each special tag. Ex. 1011, Ex. 8:13-15. Figure 7 is reproduced below:

Loaded Parameter Table 56L

	360 Special Tags	362 Text String Loaded from Elements with Special Tags	156 Element Coordinates bk	h1	h2	h3	p	el	364 Display Text	366 Book Royalty Flag	368 Chapter Royalty Flag
300L	bk	Book Title	1	0	0	0	0	1	yes		
302L	ed	Second Edition	1	0	0	0	1	1	yes		
304L	cpr	(C) ABC Co. 1990	1	0	0	0	2	1	yes		
306L	royalty	Book Repro...Fee	1	0	0	0	3	1	yes	x	
308L	amount	$20.00	1	0	0	0	3	2	yes		
310L	phone	1-800-123-1234	1	0	0	0	3	3	yes		
312L	public key	13A723F9...6	1	0	0	0	3	4	no		
314L	validation	The Book ... Paid	1	0	0	0	3	5	no		
318L	royalty	Chapt...Repro Fee	1	1	0	0	1	1	yes		x
320L	amount	$ 1.00	1	1	0	0	1	2	yes		
322L	validation	First Chapt...Paid	1	1	0	0	1	3	no		
344L	royalty	Chapt...Repro Fee	1	2	0	0	1	1	yes		x
346L	amount	$ 2.00	1	2	0	0	1	2	yes		
348L	validation	Second Chapt..Paid	1	2	0	0	1	3	no		

Fig. 7

Figure 7 illustrates default table 56 populated with document elements and special tags.

Figure 7 of EP ’800 illustrates that default table 56 includes column 364, which indicates what strings should be displayed on the display 26. Ex. 1011, 11:49-51. For instance, column 364 indicates that royalty message 306, which is represented by the special royalty message string “Book Reproduction Fee” surrounded by being tag [royalty] and end tag [/royalty], should be displayed on display 26. Ex. 1011, 11:46-49.

When the royalty message 306 occurs first in the structured document, and does not occur within a chapter heading, *e.g.*, [h1], it is considered a global element that affects the entire softcopy book. Ex. 1011, 11:51-56. As a consequence, royalty message 306 is flagged in the book royalty flag

column 366 of default parameter table 56. Ex. 1011, 11:56-57. Because royalty message 306 is the first occurring royalty element in the structured document, it represents the royalty message for copying the entire softcopy book. Ex. 1011, 11:57-12:3. In addition, the corresponding royalty information in the special tags that occur immediately following royalty message 306 are considered global elements that apply when the entire book is copied. Ex. 1011, 12:3-7. The special tags associated with royalty message 306 include the following: (1) "[amount] $20.00 [/amount]" 308; (2) "[phone] 1-800-123-1234 [/phone]" 310; (3) "[public key] 13A723F9 . . . 6 [/public key]" 312; and (4) "[validation] The Book Repo Fee Is Paid [/validation]" 314. Ex. 1011, 12:7-12.

III. CLAIM CONSTRUCTION

Consistent with the statute and legislative history of the Leahy-Smith America Invents Act, Pub. L. 112-29, 125 Stat. 284, 329 (2011) ("AIA"), we construe claims by applying the broadest reasonable interpretation in light of the specification. 37 C.F.R. § 42.100(b); *see also Office Patent Trial Practice Guide*, 77 *Fed. Reg.* 48756, 48766 (Aug. 14, 2012). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). However, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *Id*. "Although an inventor is indeed free to define the specific terms used to

describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Also, we must be careful not to read a particular embodiment appearing in the specification into the claim if the claim language is broader than that embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

A. Preambles (Claims 1, 12, 23, and 30)

ContentGuard contends that the preambles of independent claims 1, 12, 23, and 30 are limiting and, therefore, are entitled to patentable weight. Prel. Resp. 18-22. ContentGuard correctly notes that the claim terms "the digital work" and "said digital work" recited in the bodies of independent claims 1 and 23 refer back to the recitation of "a digital work" in the claims' preambles for antecedent basis. *Id*. at 19-20. ContentGuard also correctly notes that the bodies of independent claims 1 and 23 are directed to describing the necessary components of the claimed "digital work." *Id*. at 20. But then ContentGuard asserts that the recitation in the preamble of "a digital work adapted to be distributed within a system for controlling the use of digital works" is a necessary and defining aspect of the claimed invention and, as a consequence, should be treated as a limitation of independent claims 1 and 23. *Id*. at 20-21. As to this assertion, we do not agree with ContentGuard.

In general, a preamble is construed as a limitation "if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim." *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.,*

289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). However, a preamble is not limiting "'where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.'" *Catalina Mktg.*, 289 F.3d at 808 (quoting *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997)); *see also Symantec Corp. v. Computer Assocs. Int'l Inc.*, 522 F.3d 1279, 1288 (Fed. Cir. 2008).

In this case, the recitations in the preambles of independent claims 1 and 23 immediately following "a digital work"—namely "adapted to be distributed within a system for controlling use of digital works"—are mere statements of intended use for an invention that is already structurally complete as defined in the body of each claim. Accordingly, the aforementioned recitations in the preambles of independent claims 1 and 23 provide no patentable significance to the claimed subject matter.

ContentGuard relies upon essentially the same argument presented for independent claims 1 and 23 to assert that all portions of the preambles of independent claims 12 and 30 are limiting and, therefore, are entitled to patentable weight. Pet. 21-22. Once again, we do not agree with ContentGuard.

Similar to our analysis above, the recitations in the preambles of independent claims 12 and 30 immediately following "a digital work"—namely "to be used in a system for use of the digital work"— are mere statements of intended use. The preambles of independent claims 12 and 30 do not recite any essential method steps. Moreover, the claimed method

steps of "obtaining," "associating," "describing," and "combining" are already complete and do not require more from the preamble for meaning. As a result, the aforementioned recitations in the preambles of independent claims 12 and 30 provide no patentable significance to the claimed subject matter.

B. Description Structure (Claims 1, 12, 23, and 30)

ZTE contends that upon reviewing the specification of the '160 patent, the broadest reasonable interpretation of the claim term "description structure" includes at least a description tree, which is "a structure which describes the location of content and the usage rights and usage fees for a digital work." Pet. 6 (citing to Ex. 1001, 47:31-37). In response, ContentGuard contends that ZTE's claim construction for the claim term "description structure" is based on a partial quotation of the "description tree" as disclosed in the glossary of the '160 patent. Prel. Resp. 17. ContentGuard argues that, at best, the claim term "description structure" could include a "description tree," but the specification of the '160 patent does not support that a "description structure" must necessarily include a "description tree." *Id*. Instead, ContentGuard argues that independent claims 1, 12, 23, and 30 explicitly recite the necessary elements that make up the claimed "description structure." *Id*. at 18. For instance, ContentGuard alleges that the "description structure" recited in independent claim 1 must be part of the claimed "digital work" and include "a plurality of description blocks," "address information for at least one part of said

digital work," and "a usage rights part for associating one or more usage rights portions." *Id.*

ContentGuard's argument is misplaced. While a claim may recite other claim features which further limit a "description structure," the pivotal issue is the meaning of the claim term "description structure." The additional claim features recited in independent claim 1, 13, 23, and 30 narrow the scope of each claim, but do not convey a definition for the claim term "description structure." At issue is the meaning of claim term "description structure," not what type of description structure is within the scope of the claim.

ZTE correctly indicates that the glossary of the '160 patent explicitly sets forth a special definition for a "description tree." For convenience, the entire glossary definition for a "description tree" is reproduced below:

> Description Tree—A structure which describes the location of content and usage rights and usage fees for a digital work. A description tree is comprised of description blocks. Each description block corresponds to a digital work or to an interest (typically a revenue bearing interest) in a digital work.

Ex. 1001, 47:31-36.

We agree with ContentGuard that there is not an express indication in the specification of the '160 patent that the claim term "description structure" necessarily encompasses a "description tree." However, upon reviewing the specification of the '160 patent in its entirety, as well as the prosecution history of the '160 patent, we determine that it is unreasonable to accord a meaning to the claim term "description structure" that is different

from the meaning of a "description tree." In the context of the specification as filed and the prosecution history, ContentGuard uses the two terms "description structure" and "description tree" synonymously, *i.e.*, without distinction.

This is evident by the fact that the term "description structure" is not used in the specification as filed. Nor does the term appear in any of the original claims of the application. The term "description structure" was added during prosecution in a claim amendment. Ex. 1002-00335 (Claim Amendment date Feb. 14, 2006). In contrast, the term "description tree" is used throughout the specification as filed. It is simply unclear what is covered by a "description structure," but not covered by a "description tree," and vice-versa. ContentGuard does not identify any written description support for the claim term "description structure" beyond that which also supports a "description tree" and, on this record, we find none.

In addition, the term "description structure," as a claim term, is no less important than a "description tree." Yet, the term "description structure" cannot be found in the glossary, but the glossary does contain a special definition for a "description tree." Moreover, the special definition in the glossary for a "description tree" begins with "***a structure***." Emphasis added. All of the foregoing reasons support the conclusion that the claim term "description structure" has the same meaning as a "description tree." Consequently, we look to the discussion of a "description tree" in the specification of the '160 patent to construe the meaning of the claim term "description structure."

Indeed, the specification of the '160 patent actually provides two meanings for a "description tree." As discussed above, the glossary of the '160 patent explicitly sets forth a special definition for a "description tree." In addition, the specification of the '160 patent states that "the term description tree as used herein refers to any type of acyclic structure used to represent the relationship between the various components of a digital work." Ex. 1001, 8:6-9. Therefore, the specification sets forth two meanings for a "description tree," one broad and one narrow. The two meanings are not contradictory. Rather, they reflect a difference in scope, as one encompasses the other. In view of the foregoing, noting that the second definition is the broader one and, thereafter, applying the broadest reasonable interpretation standard, we conclude that a "description tree"—otherwise known as a "description structure"—is any acyclic structure that represents the relationship between the components of a digital work.

While we agree with ContentGuard that independent claims 1, 12, 23, and 30 provide additional claim features that serve to further limit the claimed "description structure," the claim features recited in each independent claim do not provide a basis for construing the claim term "description structure" as innately or inherently possessing such features. In other words, the claim term "description structure" does not itself require the additional claim features recited in independent claims 1, 12, 23, and 30.

Accordingly, we construe the claim term "description structure" recited in independent claims 1, 12, 23, and 30 as any acyclic structure that represents the relationship between the components of a digital work.

C. Remaining Claim Terms

All remaining claim terms recited in claims 1-38 are given their ordinary and customary meaning as would be understood by one with ordinary skill in the art, and need not be further construed at this time.

IV. ANALYSIS

A. 35 U.S.C. § 102(b) Ground of Unpatentability—EP '800

ZTE contends that claims 1-3, 8, 9, 12, 13, 15, 16, 20, 23, 30, and 31 are anticipated under 35 U.S.C. § 102(b) by EP '800. Pet. 22-33. In particular, ZTE relies upon claim charts to explain how EP '800 allegedly describes the subject matter recited in these claims, and the Declaration of Dr. Vijay K. Madisetti (Ex. 1015) to support its positions. *Id*. In response, ContentGuard presents arguments predicated on two claim groupings—(1) for independent claims 1 and 23, EP '800 does not disclose "[a] computer readable medium having embedded thereon a digital work . . . said digital work comprising . . . a description structure"; and (2) for independent claims 12 and 30, EP '800 does not disclose a "method for creating a digital work" that includes the step of "describing . . . by a description structure." *See* Prel. Resp. 32-35. We will address ContentGuard's arguments with respect to each group of independent claims in turn.

Claims 1 and 23

ContentGuard contends that ZTE has not demonstrated that EP '800 discloses a "description structure" that is part of a "digital work," as required

by in independent claims 1 and 23. Prel. Resp. 35. We agree with ContentGuard.

We begin our analysis by determining the scope and breadth of independent claims 1 and 23. Both independent claims 1 and 23 recite "[a] computer readable medium having embedded thereon a digital work . . . said digital work comprising" three elements: (1) "a digital content portion;" (2) "a usage rights portion associated with said digital content portion;" and (3) "a description structure." Accordingly, the cited prior art must disclose "a digital work" that includes "a description structure" in order to anticipate independent claims 1 and 23.

To establish anticipation, each and every element in a claim, arranged as is recited in the claim, must be found in a single prior art reference. *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001); *see also NetMoneyIn, Inc. v. Verisign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). ZTE takes the position that EP '800 discloses a parameter table that describes a structured document of a softcopy book. Pet. 23-25 and 27-28 (citing to Ex. 1011, Fig. 7; 11:46-12:12 and 13:44-58). However, contrary to ZTE's position, EP '800's parameter table is not included within, or part of, the softcopy book as is required by independent claims 1 and 23.

Figure 3A of EP '800 illustrates a softcopy book in the form of a structured document, *i.e.*, the claimed "digital work," that contains special tags and associated text. Ex. 1011, 7:53-54; *see, e.g.*, 2:21-28 and 3:9-11. EP '800 discloses that the processor in the data processing system loads a

default parameter table with information pertaining to each special tag found in the structured document. Ex. 1011, 8:13-15 and 11:6-9. Figure 7 of EP '800 illustrates a parameter table, *i.e.*, the claimed "description structure," populated with the information pertaining to the document elements associated with each special tag. Ex. 1011, 11:46-12:12. Based on these cited disclosures, EP '800 discloses that the special tags found in the structured document are used to create the parameter table, but the structured document does not itself include the parameter table. In other words, EP '800's parameter table is not included within, or part of, the structured document, but rather is a mutually exclusive data structure created from the document elements and special tags derived from the structured document.

Because ZTE's position with respect to EP '800 does not properly account for "a digital work" that includes "a description structure," ZTE has not demonstrated a reasonable likelihood of prevailing on its assertion that independent claims 1 and 23 are anticipated by EP '800.

Claims 2, 3, 8, and 9

Claims 2, 3, 8, and 9 each depend directly or indirectly from independent claim 1. Therefore, for the same reasons set forth above with respect to independent claim 1, ZTE has not demonstrated a reasonable likelihood of prevailing on its assertion that dependent claims 2, 3, 8, and 9 are anticipated by EP '800.

Claims 12 and 30

To rebut the grounds of unpatentability asserted by ZTE against independent claims 12 and 30, ContentGuard relies upon essentially the

same arguments it presented in rebutting the grounds of unpatentability asserted by ZTE against independent claims 1 and 23. Prel. Resp. 35. In order to determine whether those arguments have merit, we first must determine the scope and breadth of independent claims 12 and 30. Both independent claims 12 and 30 recite "a method for creating a digital work . . . said method comprising" the following method steps: (1) "obtaining a digital content portion;" (2) "associating a usage rights portion with the digital content portion;" (3) "describing said digital work by a description structure;" and (4) "combining the digital content portion and the usage rights portion to create the digital work." In contrast to independent claims 1 and 23, independent claims 12 and 30 do not require that "a description structure" be included within "a digital work." Instead, there need only be "a description structure" that describes "a digital work."

As discussed above, ZTE contends that EP '800 discloses a parameter table that describes a structured document of a softcopy book. Pet. 23-25 and 27-28 (citing to Ex. 1011, Fig. 7; 11:46-12:12 and 13:44-58). We agree with ZTE. Figure 7 of EP '800 illustrates a parameter table, *i.e.*, the claimed "description structure," populated with the information pertaining to the document elements associated with each special tag found in the structured document, *i.e.*, the claimed "digital work." Ex. 1011, 11:46-12:12. Based on that cited disclosure, EP '800's parameter table describes the document elements and special tags derived from the structured document. As such, ZTE has presented sufficient evidence to warrant a finding that EP '800

discloses "a description structure" that describes "a digital work," as required by independent claims 12 and 30.

Because ZTE's position with respect to EP '800 properly accounts for "a description structure" that describes "a digital work," ZTE has demonstrated a reasonable likelihood of prevailing on its assertion that independent claims 12 and 30 are anticipated by EP '800.

Claim 13, 15, 16, 20, and 31

To rebut the grounds of unpatentability asserted by ZTE against dependent claims 13, 15, 16, 20, and 31, ContentGuard relies upon essentially the same arguments it presented in rebutting the grounds of unpatentability asserted by ZTE against independent claims 12 and 30. Prel. Resp. 32-35. As discussed above, those arguments are not persuasive. In addition, the explanations provided by ZTE as to how EP '800 describes the claimed subject matter recited in dependent claims 13, 15, 16, 20, and 31 have merit and are otherwise unrebutted. As a result, ZTE has demonstrated a reasonable likelihood of prevailing on its assertion that dependent claims 13, 15, 16, 20, and 31 are anticipated by EP '800.

B. 35 U.S.C. § 103(a) Grounds of Unpatentability Based in Part on EP '800

ZTE contends that: (1) claims 2-4, 6, 7, 15-18, 21, 25, 26, 34, and 35 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Perritt (Pet. 35-39); (2) claims 2, 10, 14, 24-28, and 32-37 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Wyman (*id*. at 41-46); (3) claims 5 and 19 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800, Perritt, and Admitted Prior Art

(*id*. at 47-48); and (4) claims 11, 22, 29, and 38 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Porter (*id*. at 50-53). In particular, ZTE relies upon claim charts to explain how EP '800, Perritt, Wyman, Admitted Prior Art, or Porter allegedly describe the subject matter recited in these claims, and the Declaration of Dr. Madisetti (Ex. 1015) to support its positions. *Id*. ZTE also provides articulated reasons with rational underpinnings to combine EP '800 with Perritt, Wyman, Admitted Prior Art, and Porter. *Id*.

In response, ContentGuard contends that ZTE does not provide an articulated reason with a rational underpinning to support each of the alleged grounds of unpatentability based on obviousness. Prel. Resp. 36-38. In particular, ContentGuard directs our attention to ZTE's rationale for combining EP '306 and Perritt, and generally alleges that ZTE does not adequately explain why one with ordinary skill in the art would make the proffered combination. *Id*. at 37. ContentGuard also argues that merely pointing out that the cited prior art references are in the same field of endeavor is insufficient to vitiate patentability. *Id*. at 38.

Similar to our analysis above, we will address ContentGuard's arguments with respect to the claims that depend from each group of independent claims—namely (1) claims that depend from independent claims 1 and 23; and (2) claims that depend from independent claims 12 and 30.

Claims 2-7, 10, 11, and 24-29

Claims 2-7, 10, 11, and 24-29 each depend directly or indirectly from independent claims 1 or 23. As discussed above, ZTE's position with respect to EP '800 does not properly account for "a digital work" that includes "a description structure," as required by independent claims 1 and 23. As applied by ZTE, Perritt, Wyman, Admitted Prior Art, and Porter do not remedy the above-noted deficiency in EP '800. Therefore, for the same reasons set forth above with respect to independent claims 1 and 23, ZTE has not demonstrated a reasonable likelihood of prevailing on its assertion that: (1) dependent claims 2-4, 6, 7, 25 and 26 are unpatentable over the combination of EP '800 and Perritt; (2) dependent claims 2, 10, and 24-28 are unpatentable over the combination of EP '800 and Wyman; (3) dependent claim 5 is unpatentable over the combination of EP '800, Perritt, and Admitted Prior Art; and (4) dependent claims 11 and 29 are unpatentable over the combination of EP '800 and Porter.

Claims 14-19, 21, 22, and 32-38

Claims 14-19, 21, 22, and 32-38 each depend directly or indirectly from independent claims 12 or 30. With respect to these claims, we are not persuaded by ContentGuard's argument that ZTE does not provide an articulated reason with a rationale underpinning to support each of the alleged grounds of unpatentability based on obviousness. Prel. Resp. 36-38. Contrary to ContentGuard's argument, ZTE provides an articulated reason with a rationale underpinning to combine EP '800 with each of the following

prior art references: (1) Perritt; (2) Wyman; (3) Perritt and Admitted Prior Art; and (4) Porter. *See, e.g.*, Pet. 39, 46, and 52-53.

For instance, ZTE contends that dependent claims 15-18, 21, 34, and 35 are unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Perritt. Pet. 35-39. To support combining the teachings of EP '800 and Perritt, ZTE states:

> As EP '800 and Perritt each relate to protecting a copyright owner's interests in a digital work, one of ordinary skill in the art would have been motivated to combine the teaching of EP '800 with Perritt to provide a system that offers increased flexibility in copyright protection by specifying varying economic terms and conditions for using the digital work. (Perritt, pp. 1, 3-6; *see also* Madisetti Decl. ¶¶ 100-102.)

Id. at 39. ZTE's explanation constitutes an articulated reason with a rational underpinning to justify the legal conclusion of obvious. ContentGuard does not provide a sufficient or credible explanation indicating why the proposed combination of EP '800 and Perritt is improper. For example, ContentGuard did not submit credible evidence or argument regarding technological difficulties that might prevent one with ordinary skill in the art from combining EP '800 and Perritt in the manner proposed by ZTE. Nor does ContentGuard provide persuasive evidence or technological reasoning pertaining to why the proffered combination would produce an unexpected result.

As a result, ZTE has demonstrated a reasonable likelihood of prevailing on its assertion that: (1) dependent claims 15-18, 21, 34, and 35 are unpatentable over EP '800 and Perritt; (2) dependent claims 14 and 32-

37 are unpatentable over the combination of EP '800 and Wyman; (3) dependent claim 19 is unpatentable over the combination of EP '800, Perritt, and Admitted Prior Art; and (4) dependent claims 22 and 38 are unpatentable over the combination of EP '800 and Porter.

C. Declaration of Dr. Vijay K. Madisetti (Ex. 1015)

ContentGuard contends that Dr. Madisetti's declaration is entitled to little or no weight because it merely parrots the arguments made by ZTE in the petition. Prel. Resp. 40. ContentGuard's argument is inconsequential. Even if we were to give Dr. Madisetti's declaration little or no weight, the content of cited prior art references and the arguments of the parties still constitute sufficient evidence supporting a reasonable likelihood that ZTE will prevail on its assertion that claims 12-22 and 30-38 of the '160 are unpatentable.

D. Remaining 35 U.S.C. §§ 102(b) and 103(a) Grounds of Unpatentability Based in Whole or in Part on EP '306

Claims 1-7, 9-19, and 21-38

ZTE contends that claims 1-7, 9-19, and 21-38 are unpatentable under 35 U.S.C. §§ 102(b) and 103(a) based in whole or in part on EP '306. Pet. 12-22, 34-37, 39-44, and 47-51. The disclosures for EP '306 and EP '800 are essentially the same. *Compare* Ex. 1010, Figs. 3 and 5, *with* Ex. 1011, Figs. 3B and 7. As such, the alleged grounds of unpatentability proposed for claims 1-7, 9-19, and 21-38 that are based in whole or in part on EP '306 are essentially the same as the alleged grounds of unpatentability proposed for the same claims that are based in whole or in part on EP '800.

For the alleged grounds of unpatentability directed to claims 1-7, 9-11, and 23-29 that are based in whole or in part on EP '306, ZTE has not demonstrated a reasonable likelihood of prevailing on its assertion that these claims are anticipated by, or unpatentable over, EP '306 for essentially the same reasons discussed above with respect to EP '800. For the alleged grounds of unpatentability directed to claims 12-19, 21, 22, and 30-38 that are based in whole or in part on EP '306, these grounds of unpatentability are redundant to the grounds of unpatentability on which we initiate an *inter partes* review for the same claims. Accordingly, we do not authorize an *inter partes* review on the remaining grounds of unpatentability asserted by ZTE against claims 1-7, 9-19, and 21-38 of the '160 patent. *See* 37 C.F.R. § 42.108(a).

V. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claims 12-22 and 30-38 of the '160 patent for the following grounds of unpatentability:

A. Claims 12, 13, 15, 16, 20, 30, and 31 as anticipated under 35 U.S.C. § 102(b) by EP '800;

B. Claims 15-18, 21, 34, and 35 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Perritt;

C. Claims 14 and 32-37 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Wyman;

D. Claim 19 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800, Perritt, and Admitted Prior Art;

E. Claims 22 and 38 as unpatentable under 35 U.S.C. § 103(a) over the combination of EP '800 and Porter;

FURTHER ORDERED that an *inter partes* review is not instituted as to claims 1-11 and 23-29 of the '160 patent;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial. The trial will commence on the entry date of this decision.

FURTHER ORDERED that an initial conference call with the Board is scheduled for 2 PM on July 23, 2013. The parties are directed to the Office Trial Practice Guide, 77 *Fed. Reg*. 48756, 48765-66 (Aug. 14, 2012) for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial.

Case IPR2013-00134
U.S. Patent No. 7,225,160

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Exhibit 5

Computational and evolutionary aspects of language

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Language is our legacy. It is the main evolutionary contribution of humans, and perhaps the most interesting trait that has emerged in the past 500 million years. Understanding how darwinian evolution gives rise to human language requires the integration of formal language theory, learning theory and evolutionary dynamics. Formal language theory provides a mathematical description of language and grammar. Learning theory formalizes the task of language acquisition—it can be shown that no procedure can learn an unrestricted set of languages. Universal grammar specifies the restricted set of languages learnable by the human brain. Evolutionary dynamics can be formulated to describe the cultural evolution of language and the biological evolution of universal grammar.

Biology uses generative systems. Genomes consist of an alphabet of four nucleotides, which, together with certain rules for how to produce proteins and organize cells, generates an unlimited variety of living organisms. For more than 3 billion years, evolution of life on Earth was restricted to using this generative system. Only very recently another generative system emerged, which led to a new mode of evolution. This other system is human language. It enables us to transfer unlimited non-genetic information among individuals, and it gives rise to cultural evolution.

Currently there are many efforts to bring linguistic inquiry into contact with several areas of biology including evolution[1–11], genetics[12–14], neurobiology[15,16] and animal behaviour[17–20]. The aim of this Review is to formulate a synthesis of formal language theory[21,22], learning theory[23–28] and evolutionary dynamics in a manner that is useful for people from various disciplines. We will address the following questions: What is language? What is grammar? What is learning? How does a child learn language? What is the difference between learning language and learning other generative systems? In what sense is there a logical necessity for genetically determined components of human language, such as 'universal grammar'? Finally, we will discuss how formal language theory and learning theory can be extended to study language as a biological phenomenon, as a product of evolution.

Formal language theory

Language is a mode of communication, a crucial part of human behaviour and a cultural object defining our social identity. There is also a fundamental aspect of human language that makes it amenable to formal analysis: linguistic structures consist of smaller units that are grouped together according to certain rules.

The combinatorial sequencing of small units into bigger structures occurs at several different levels. Phonemes form syllables and words. Words form phrases and sentences. The rules for such groupings are not arbitrary. Any native English speaker recognizes that the sentence 'He ran from there with his money' obeys the rules of English, while 'He his money with there from ran' does not. In Bengali the reverse is true.

Individual languages have specific rules. Certain word orders are admissible in one language but not in another. In some languages, word order is relatively free but case marking is pronounced. There are always specific rules that generate valid or meaningful linguistic structures. Much of modern linguistic theory proceeds from this insight. The area of mathematics and computer science called formal language theory provides a mathematical machinery for dealing with such phenomena.

What is language?

An alphabet is a set containing a finite number of symbols. Possible alphabets for natural languages are the set of all phonemes or the set of all words of a language. For these two choices one obtains formal languages on different levels, but the mathematical principles are the same. Without loss of generality, we can consider the binary alphabet, {0,1}, by enumerating the actual alphabet in binary code.

A sentence is defined as a string of symbols. The set of all sentences over the binary alphabet is {0,1,00,01,10,11,000,...}. There are infinitely many sentences, as many as integers; the set of all sentences is 'countable'.

A language is a set of sentences. Among all possible sentences

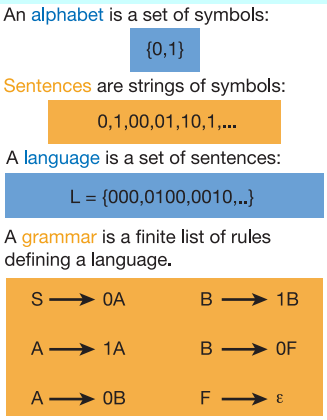


Figure 1 The basic objects of formal language theory are alphabets, sentences, languages and grammars. Grammars consist of rewrite rules: a particular string can be rewritten as another string. Such rules contain symbols of the alphabet (here 0 and 1), and so-called 'non-terminals' (here S, A, B and F), and a null-element, ϵ. The grammar in this figure works as follows: each sentence begins with the symbol S. S is rewritten as 0A. Now there are two choices: A can be rewritten as 1A or 0B. B can be rewritten as 1B or 0F. F always goes to ϵ. This grammar generates sentences of the form 01^m01^n0, which means that every sentence begins with 0, followed by a sequence of m 1s, followed by a 0, followed by a sequence of n 1s, followed by 0.

some are part of the language and some are not. A finite language contains a finite number of sentences. An infinite language contains an infinite number of sentences. There are infinitely many finite languages, as many as integers. There are infinitely many infinite languages, as many as real numbers; they are not countable. Hence, the set of all languages is not countable.

What is grammar?

A grammar is a finite list of rules specifying a language. A grammar is expressed in terms of 'rewrite rules': a certain string can be rewritten as another string. Strings contain elements of the alphabet together with 'non-terminals', which are place holders. After iterated application of the rewrite rules, the final string will only contain symbols of the alphabet. Figures 1 and 2 give examples of grammars.

There are countably infinitely many grammars; any finite list of rewrite rules can be encoded by an integer. As there are uncountably many languages, only a small subset of them can be described by a grammar. These languages are called 'computable'.

Languages, grammars and machines

There is a correspondence between languages, grammars and machines. 'Regular' languages are generated by finite-state grammars, which are equivalent to finite-state automata. Finite-state automata have a start, a finite number of intermediate states and a finish. Whenever the machine jumps from one state to the next, it emits an element of the alphabet. A particular run from start to finish produces a sentence. There are many different runs from start to finish, hence there are many different sentences. If a finite-state machine contains at least one loop, then it can generate infinitely many sentences. Finite-state automata accept all finite languages

Box 1

Statistical learning theory and other approaches

Classical learning theory as formulated by Gold[23] makes a number of somewhat problematic assumptions: (1) the learner has to identify the target language exactly; (2) the learner receives only positive examples; (3) the learner has access to an arbitrarily large number of examples; and (4) the learner is not limited by any consideration of computational complexity. Assumptions (1) and (2) are restrictive: relaxing these assumptions will enable particular learners to succeed on larger sets of languages. Assumptions (3) and (4) are unrestrictive: relaxing these assumptions will reduce the set of learnable languages. In fact, each assumption has been removed in various approaches to learning, but the essential conclusion remains the same: no algorithm can learn an unrestricted set of languages.

Perhaps the most significant extension of the classical framework is statistical learning theory[24–26]. Here, the learner is required to converge approximately to the right language with high probability. Let us consider the following objects that play an important role in the basic framework of statistical learning:

- Languages and indicator functions. Let $\mathscr{L}$ be a set of languages. Every language L of this set defines an indicator function $1_L(s)$ that takes the value 1 if a sentence s is in L and 0 otherwise.
- Linguistic examples. Linguistic examples are provided to the learner according to some distribution P on the set of all sentences. The learner receives both positive and negative examples.
- Distances between languages. The probability measure P has a dual role. In addition to providing sentences, it also defines the distance between two languages, $d(L_1,L_2) = \sum_s |1_{L_1}(s) - 1_{L_2}(s)|P(s)$.
- Learnability. The criterion for learnability is specified as follows. Assume some language $L \in \mathscr{L}$ is the target language. The learner receives a collection of positive and negative example sentences according to the distribution P. On the basis of these empirical data, the learner guesses a language $L_N \in \mathscr{L}$ after N examples have been received. The target L is said to be learnable if for all $\epsilon > 0$ the probability that the distance between L_N and L is greater than ϵ converges to 0 as $N \to \infty$. As a consequence, there exists a finite number of example sentences, such that the probability is greater than $1 - \delta$ (where δ is a small number) that the learner's current estimate is within an ϵ-approximation of the target language.

A deep result, originally due to Vapnik and Chervonenkis[24] and elaborated since, states that a set of languages is learnable if and only if it has finite VC dimension. The VC dimension is a combinatorial measure of the complexity of a set of languages. Thus if the set of possible languages is completely arbitrary (and therefore has infinite VC dimension), learning is not possible. It can be shown that the set of all regular languages (even the set of all finite languages) has infinite VC dimension and hence cannot be learned by any procedure in the framework of statistical learning theory. Subsets of regular languages that are generated by finite-state automata with n states, however, have finite VC dimension, and one can estimate bounds on the number of sample sentences that are needed for learning.

Statistical learning theory in the VC framework removes assumption (1), (2) and (3) of the Gold framework: it does not ask for convergence to exactly the right language, the learner receives positive and negative examples, and the learning process has to end after a certain number of examples. The theory provides bounds for how many example sentences are needed to converge approximately to the right language with high probability; this is the concept of informational complexity.

Valiant[25] also added considerations of computational complexity, thereby removing assumption (4) of the Gold framework: the learner is required to approximate the target grammar with high confidence using an efficient algorithm. Consequently, there are sets of languages that are learnable in principle (have finite VC dimension), but no algorithm can do this in polynomial time. (Computer scientists consider a problem 'intractable' if no algorithm can solve the problem in polynomial time, which means in a number of time steps that is proportional to the size of the input raised to some power.)

Some other models of learning deserve mention. For example, in one form of query-based learning, the learner is allowed to ask whether a particular sentence is in the target language or not. In this model, regular languages can be learned in polynomial time[72], but context-free languages cannot[73]. Other query-based models of learning, with varying degrees of psychological plausibility, have been considered, and none permit all languages to be learnable[74].

Another model of learning follows the classical Gold framework but only requires the learner to identify the target language on almost all texts. Texts are assumed to be generated by a probabilistic process, where sentences are drawn according to some measure μ on the target language. If the learner is to identify the target grammar in a distribution free fashion (that is independent of μ), then the set of learnable languages is no larger than those that are learnable in the classical Gold framework. If constraints are put on the family of measures μ then the set of learnable languages can be enlarged. Such constraints act like a probabilistic form of universal grammar.

In summary, all extensions of learning theory underline the necessity of specific restrictions.

and some infinite languages.

'Context-free' languages are generated by context-free grammars, which can be implemented by push-down automata. These are computers with a single memory stack: at any one time they have only access to the top register of their memory.

'Context-sensitive' languages are generated by context-sensitive grammars. For each of these languages there exists a Turing machine, which can decide for every sentence whether it is part of the language or not. A Turing machine embodies the theoretical concept of a digital computer with infinite memory.

Computable languages are described by 'phrase structure' grammars that have unrestricted rewrite rules. For each computable language, there exists a Turing machine that can identify every sentence that is part of the language. If, however, the Turing machine receives as input a sentence which does not belong to the language, then it might compute forever. Hence, the Turing machine cannot always decide whether a sentence is part of the language or not.

Figure 3 shows the Chomsky hierarchy: finite-state grammars are a subset of context-free grammars, which are a subset of context-sensitive grammars, which are a subset of phrase-structure grammars, which are Turing complete.

The structure of natural languages

With the introduction of the Chomsky hierarchy, there was some interest in placing natural languages within this scheme. Natural languages are infinite: it is not possible to imagine a finite list that contains all English sentences. Furthermore, finite-state grammars are inadequate for natural languages. Such grammars are unable to represent long-range dependencies of the form 'if… then'. The string of words between 'if' and 'then' could be arbitrarily long, and could itself contain more paired if–then constructions. Such pairings relate to rules that generate strings of the form 0^n1^n, which require context-free grammars (Fig. 2). There is a continuing debate whether context-free grammars are adequate for natural languages, or whether more complex grammars need to be evoked[29,30].

The fundamental structures of natural languages are trees. The nodes represent phrases that can be composed of other phrases in a recursive manner. A tree is a 'derivation' of a sentence within the rule system of a particular grammar. The interpretation of a sentence depends on the underlying tree structure. Ambiguity arises if more than one tree can be associated with a given sentence. One can also define grammars that directly specify which trees are acceptable for a given language. Much of modern syntactic theory

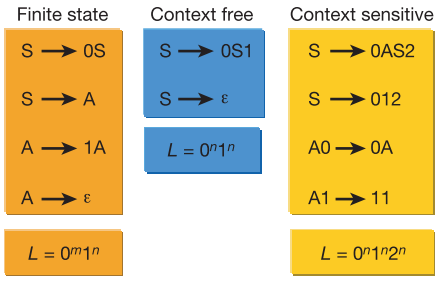


Figure 2 Three grammars and their corresponding languages. Finite-state grammars have rewrite rules of the form: a single non-terminal (on the left) is rewritten as a single terminal possibly followed by a non-terminal (on the right). The finite-state grammar, in this figure, generates the regular language 0^m1^n; a valid sentence is any sequence of 0s followed by any sequence of 1s. A context-free grammar admits rewrite rules of the form: a single non-terminal is rewritten as an arbitrary string of terminals and non-terminals. The context-free grammar in this figure generates the language 0^n1^n; a valid sentence is a sequence of 0s followed by the same number of 1s. There is no finite-state grammar that could generate this language. A context-sensitive grammar admits rewrite rules of the form $\alpha A\beta \rightarrow \alpha\gamma\beta$. Here α, β and γ are strings of terminals and non-terminals. Although α and β may be empty, γ must be non-empty. The important restriction on rewrite rules of context-sensitive grammars is that the complete string on the right must be at least as long as the complete string on the left. The context-sensitive grammar, in this figure, generates the language $0^n1^n2^n$. There is no context-free grammar that could generate this language.

Box 2

Language as mapping between sound and meaning

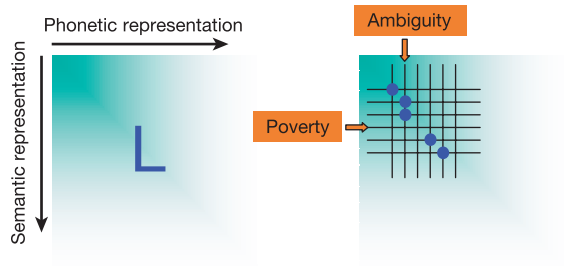
The mathematical formalism of language can be extended to include aspects of communicative behaviour and performance. A language can be seen as a (possibly infinite) matrix, L, that specifies mappings between phonetic forms and semantic forms that are 'sound' and 'meaning' insofar as they are linguistically determined (see Box 2 figure). This matrix defines linguistic competence. For evaluating communicative success, we also need to describe linguistic performance. We assume that the matrix, L, leads to a pair of matrices, P and Q, determining speaking and hearing. The element p_{ij}^l denotes the probability for a speaker of L_l to use sound j for encoding meaning i. The element q_{ij}^l denotes the probability for a hearer to decode sound j as meaning i. A language may not encode all meanings and may not make use of all possible sounds.

Next, we introduce a measure, σ, on the set of all meanings. Let us denote by σ_i the probability that communication is about meaning i. The measure, σ, depends among other things on the environment, behaviour and phenotype of the individuals. It also defines which meanings are more relevant than others.

The probability that a speaker of L_l generates a sound which is understood by a hearer using L_J is given by $a_{lJ} = \sum_{ij} \sigma_i p_{ij}^l q_{ij}^J$. The communicative pay-off between L_l and L_J can be defined as $F_{lJ} = \frac{1}{2}(a_{lJ} + a_{Jl})$. The intrinsic communicative pay-off of L_l is $F_{ll} = a_{ll}$.

In this framework, communicative pay-off is a number between 0 and 1. A pay-off of less than 1 arises as a consequence of ambiguity and poverty. Ambiguity, α_l, of language L_l is the loss of communicative capacity that arises if individual sounds are linked to more than one meaning. Poverty, β_l, is the fraction of meanings (measured by σ) that are not part of L_l. The communicative capacity of L_l can be written as $F_{ll} = (1 - \alpha_l) \times (1 - \beta_l)$.

For language acquisition we need a measure for the similarity, s_{lJ}, between languages L_l and L_J. A possibility is $s_{lJ} = \sum_{ij} \sigma_i p_{ij}^l q_{ij}^J / \sum_{ij} \sigma_i p_{ij}^l$ denoting the probability that a sound generated by a speaker of L_l is correctly interpreted by a hearer using L_J. In this context, the similarity between L_l and L_J declines because of ambiguity, but not because of poverty. Ambiguity implies that a learner holding the correct hypothesis might think he is wrong and change his hypothesis. This has consequences for the notion of consistent learning; a consistent learner does not change his hypothesis if he already holds the correct hypothesis.



deals with such grammars[31–34], which are, of course, also part of the Chomsky hierarchy, and the results of learning theory, to be discussed now, apply to them.

Learning theory

Learning is inductive inference. The learner is presented with data and has to infer the rules that generate these data. The difference between 'learning' and 'memorization' is the ability to generalize beyond one's own experience to novel circumstances. In the context of language, the child will generalize to novel sentences never heard before. Any person can produce and understand sentences that are not part of his previous linguistic experience. Learning theory describes the mathematics of learning with the aim of outlining conditions for successful generalization.

The paradox of language acquisition

Children learn their native language by hearing grammatical sentences from their parents or others. From this 'environmental input', children construct an internal representation of the underlying grammar. Children are not told the grammatical rules. Neither children nor adults are ever aware of the grammatical rules that specify their own language.

Chomsky pointed out that the environmental input available to the child does not uniquely specify the grammatical rules[35]. This phenomenon is known as 'poverty of stimulus'[36]. 'The paradox of language acquisition' is that children of the same speech community reliably grow up to speak the same language[37]. The proposed solution is that children learn the correct grammar by choosing from a restricted set of candidate grammars. The 'theory' of this restricted set is 'universal grammar' (UG). Formally, UG is not a grammar, but a theory of a collection of grammars.

The concept of an innate, genetically determined UG was controversial when introduced some 40 years ago and has remained so. The mathematical approach of learning theory, however, can explain in what sense UG is a logical necessity.

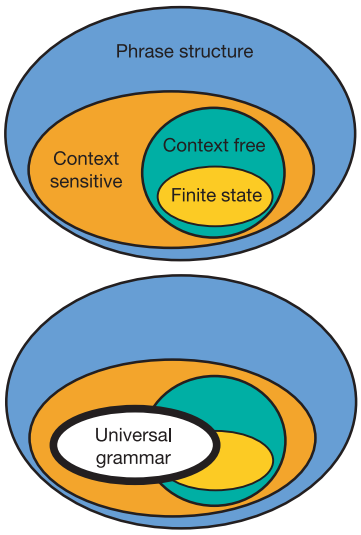


Figure 3 The Chomsky hierarchy and the logical necessity of universal grammar. Finite-state grammars are a subset of context-free grammars, which are a subset of context-sensitive grammars, which are a subset of phrase-structure grammars, which represent all possible grammars. Natural languages are considered to be more powerful than regular languages. The crucial result of learning theory is that there exists no procedure that could learn an unrestricted set of languages; in most approaches, even the class of regular languages is not learnable. The human brain has a procedure for learning language, but this procedure can only learn a restricted set of languages. Universal grammar is the theory of this restricted set.

Learnability

Imagine a speaker–hearer pair. The speaker uses grammar, G, to construct sentences of language L. The hearer receives sentences and should after some time be able to use grammar G to construct other sentences of L. Mathematically speaking, the hearer is described by an algorithm (or more generally, a function), A, which takes a list of sentences as input and generates a language as output.

Let us introduce the notion of a 'text' as a list of sentences. Specifically, text T of language L is an infinite list of sentences of L with each sentence of L occurring at least once. Text T_N contains the first N sentences of T. We say that language L is learnable by algorithm A if for each T of L there exists a number M such that for all $N > M$ we have $A(T_N) = L$. This means that, given enough sentences as input, the algorithm will provide the correct language as output.

Furthermore, a set of languages is learnable by an algorithm if each language of this set is learnable. We are interested in what set of languages, $\mathscr{L} = \{L_1, L_2, ..\}$, can be learned by a given algorithm.

A key result of learning theory, Gold's theorem[23], implies there exists no algorithm that can learn the set of regular languages. As a consequence, no algorithm can learn a set of languages that contains the set of regular languages, such as the set of context-free languages, context-sensitive languages or computable languages.

Gold's theorem formally states there exists no algorithm that can learn a set of 'super-finite' languages. Such a set includes all finite languages and at least one infinite language. Intuitively, if the learner infers that the target language is an infinite language, whereas the actual target language is a finite language that is contained in the infinite language, then the learner will not encounter any contradicting evidence, and will never converge onto the correct language. This result holds in greatest possible generality: 'algorithm' here includes any function from text to language.

Probably almost correct

A common criticism of Gold's framework is that the learner has to identify exactly the right language. For practical purposes, it might be sufficient that the learner acquires a grammar that is almost correct. Box 1 explains various extensions of the Gold framework, and in particular the approach of statistical learning theory. Here, the crucial requirement is that the learner converges with high probability to a language that is almost correct. Statistical learning theory also shows there is no procedure that can learn the set of all regular languages, thereby confirming the necessity of an innate UG. Some learning theories provide more information for the learner and thus allow larger classes of languages to be learnable, but no learning theory admits an unrestricted search space.

Learning finite languages

Some readers might think that the arguments of learning theory rely on subtle properties of infinite languages. Let us therefore consider finite languages. In the context of statistical learning theory, the set of all finite languages cannot be learned. In the Gold framework, the set of all finite languages can be learned, but only by memorization: the learner will identify the correct language only after having heard all sentences of this language. A learner that considers the set of all finite languages has no possibility for generalization: the learner can never extrapolate beyond the sentences he has already encountered. This is not the case for natural language acquisition: we can always say new sentences.

Let us consider a finite set of finite languages. Suppose there are 3 sentences, S_1, S_2, S_3. Hence there are 8 possible languages. Suppose learner A considers all 8 languages, while learner B considers only 2 languages, for example $L_1 = \{S_1, S_2\}$ and $L_2 = \{S_3\}$. If learner A receives sentence S_1, he has no information whether sentences S_2 or S_3 will be part of the target language or not. He can only identify the target language after having heard all sentences. If learner B receives sentence S_1 he knows that S_2 will be part of the language, whereas S_3

will not. He can extrapolate beyond his experience. The ability to search for underlying rules requires a restricted search space.

The necessity of innate expectations

We can now state in what sense there has to be an innate UG. The human brain is equipped with a learning algorithm, A_H, which enables us to learn certain languages. This algorithm can learn each of the existing 6,000 human languages and presumably many more, but it is impossible that A_H could learn every computable language. Hence, there is a restricted set of languages that can be learned by A_H. UG is the theory of this restricted set.

Learning theory suggests that a restricted search space has to exist before data. By 'data' we mean linguistic or other information the child uses to learn language or modify its language acquisition procedure. Therefore, in our terminology, 'before data' is equivalent to 'innate'. In this sense, learning theory shows there must be an innate UG, which is a consequence of the particular learning algorithm, A_H, used by humans. Discovering properties of A_H requires the empirical study of neurobiological and cognitive functions of the human brain involved in language acquisition. Some aspects of UG, however, might be unveiled by studying common features of existing human languages. This has been a major goal of linguistic research during the past decades. A particular approach is the 'principles and parameters theory', which assumes that the child comes equipped with innate principles and has to set parameters that are specific for individual languages[38,39]. Another approach is 'optimality theory', where learning a specific language is ordering innate constraints[40].

There is some discourse as to whether the learning mechanism, A_H, is language specific or general purpose[41]. Ultimately this is a question about the particular architecture of the brain and which neurons participate in which computations, but one cannot deny that there is a learning mechanism, A_H, that operates on linguistic input and enables the child to learn the rules of human language. This mechanism can learn a restricted set of languages; the theory of this set is UG. The continuing debate around an innate UG should not be whether there is one, but what form it takes[41–43]. One can dispute individual linguistic universals[44,45], but one cannot generally deny their existence.

Neural networks are an important tool for modelling the neural mechanisms of language acquisition. The results of learning theory also apply to neural networks: no neural network can learn an unrestricted set of languages[46].

Sometimes it is claimed that the logical arguments for an innate UG rest on particular mathematical assumptions of generative grammars that deal only with syntax and not with semantics. Cognitive[47,48] and functional linguistics[49] are not based on formal language theory, but use psychological objects such as symbols, categories, schemas and images. This does not remove the necessity of innate restrictions. The results of learning theory apply to any learning process, where a 'rule' has to be learned from some examples. Generalization is an inherent feature of any model of language acquisition, and applies to semantics, syntax and phonetics. Any procedure for successful generalization has to choose from a restricted range of hypotheses.

The results of learning theory also apply to learning mappings between linguistic form and meaning. If meaning is to be explicitly considered, then a language is not a set of sentences, but a set of sentence-meaning pairs (Box 2). The task of language acquisition is then to learn grammars that generate sentence-meaning pairs. Such grammars are also part of the Chomsky hierarchy, and there exists no learning procedure that can succeed on an unrestricted set of such languages.

What is special about language acquisition?

Usually when we learn the grammar of generative systems, such as chess or arithmetic, somebody tells us the rules. We do not have to guess the moves of chess by looking at chess games. In contrast, the process of language acquisition occurs without being instructed about rules; neither teachers nor learners are aware of the rules. This is an important difference: if the learner is told the grammar of a language, then the set of all computable languages is learnable by an algorithm that memorizes the rules.

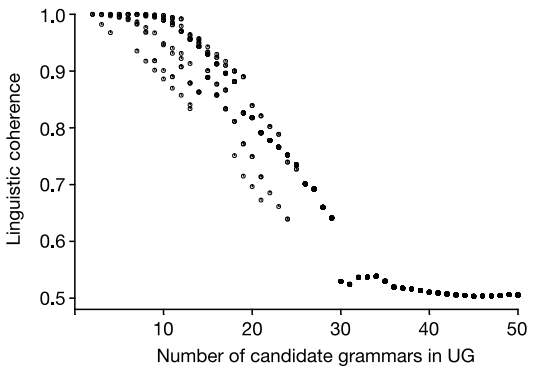


Figure 4 Linguistic coherence evolves if universal grammar (UG) is sufficiently specific. The figure shows equilibrium solutions of the language dynamical equation. Linguistic coherence, ϕ, is the probability that one individual says a sentence that is understood by another individual. UG specifies n candidate grammars. The similarity between any two candidate grammars, s_{ij}, is a random number from a uniform distribution on [0, 1]. The language acquisition device is a memoryless learner receiving $N = 100$ example sentences. For $n > 30$, all candidate grammars are represented in the population with similar frequencies; the linguistic coherence, ϕ, is about 1/2, which means complete randomness. For $n < 30$ the equilibrium is dominated by a single grammar. For each value of n there can be multiple equilibria dominated by different grammars. The equilibrium that is reached depends on the initial condition. Coherence is required for adaptation of language and selection of UG for linguistic function.

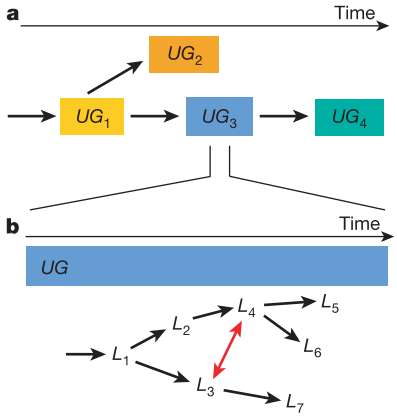


Figure 5 Two aspects of language evolution. **a**, There is a biological evolution of universal grammar (UG) via genetic modifications that affect the architecture of the human brain and the class of languages it can learn. UG can change as a consequence of (1) random variation (neutral evolution), (2) as a by-product of selection for other cognitive function or (3) under selection for language acquisition and communication. At some point in the evolutionary history of humans, a UG arose that allowed languages with infinite expressibility. **b**, On a faster timescale, there is cultural evolution of language constrained by a constant UG. Languages change by (1) random variation, (2) by contact with other languages (red arrow), (3) by hitch-hiking on other cultural inventions, or (4) by selection for increased learnability and communication. Although many language changes in historical linguistics might be neutral, a global picture of language evolution must include selection.

Evolutionary language theory

Humans and chimpanzees separated some 5 million years ago. Chimpanzees have a complex system of conceptual understanding and rich social interactions, but they do not have communication comparable to human language. The central question of the origin of human language is which genetic modifications led to changes in brain structures that were decisive for human language. Given the enormous complexity of this trait, we should expect several incremental steps guided by natural selection. In this process, evolution will have reused cognitive features that evolved long ago and for other purposes.

Understanding language evolution requires a theoretical framework explaining how darwinian dynamics lead to fundamental properties of human language such as arbitrary signs, lexicons, syntax and grammar[50–62]. Here we outline a minimalist program combining formal language theory, learning theory and evolutionary theory.

The basic approach is similar to evolutionary game theory. There is a population of individuals. Each individual uses a particular language. Individuals talk to each other. Successful communication results in a pay-off that contributes to fitness. Offspring inherit—subject to mutations—a mechanism to learn language and a UG. They use this mechanism to learn—subject to mistakes—the language of their parents or others.

Cultural evolution of language with constant universal grammar

From a biological perspective, language is not the property of an individual, but the extended phenotype of a population. Let us consider a population where all individuals have the same UG, and let us assume that UG does not change from one generation to the next. Suppose that (in accordance with principles and parameters theory or optimality theory) UG specifies a finite number of languages $L_1,..L_n$. Each individual in the population will speak one of those n languages.

We need a model of language that allows us to calculate the communicative pay-off, F_{ij}, for an individual using L_i talking to an individual using L_j. Box 2 outlines a fairly general approach, based on the assumption that a language can be seen as an infinite binary matrix linking phonetic forms to semantic forms. The languages, L_i, can differ in their intrinsic communicative pay-off, F_{ii}, which depends on ambiguity and expressive power. Some languages could be finite, others infinite.

Denote by x_i the relative abundance of speakers of L_i. The fitness of L_i is given by $f_i = \sum_{j=1}^{n} x_j F_{ij}$. Individuals leave offspring proportional to their pay-off. The probability that a child will develop L_j if the parent uses L_i is given by Q_{ij}. The 'learning matrix', Q, depends on the learning algorithm and UG. The language dynamical equation[62] is given by:

$$\frac{dx_j}{dt} = \sum_{i=1}^{n} f_i(\mathbf{x}) Q_{ij} x_i - \phi(\mathbf{x}) x_j \quad j = 1,..,n \qquad (1)$$

The term $-\phi(\mathbf{x})x_j$ ensures that $\sum_i x_i = 1$. The variable $\phi(\mathbf{x}) = \sum_i f_i(\mathbf{x}) x_i$ denotes the average fitness of the population, and is a measure for linguistic coherence. The dynamics can also be interpreted in a purely cultural sense: individuals that communicate successfully are more likely to influence language acquisition of others. Equation (1) describes selection of languages for increased communicative function, F_{ii}, and increased learnability, Q_{ii}.

For low accuracy of language acquisition, when Q is far from the identity matrix, there is no predominating language in the population, and the linguistic coherence is low. As the accuracy of language acquisition increases, and Q gets closer to the identity matrix, equilibrium solutions arise where a particular language is more abundant than others. The population has achieved linguistic coherence. The 'coherence threshold' specifies the minimum specificity of UG that is required for linguistic coherence (Fig. 4).

For certain learning mechanisms we can calculate the coherence threshold. The 'memoryless learner' starts with a randomly chosen language and stays with it as long as the input sentences are compatible with this language. If a sentence arrives that is not compatible, then the learner picks at random another language. The learner does not memorize which languages have already been rejected. The process stops after N sentences. Another mechanism is the 'batch learner', which memorizes N sentences, and at the end chooses the language that is most compatible with all N sentences.

If the similarity coefficients between languages, s_{ij} (Box 2), are constant, $s_{ij} = s$ and $s_{ii} = 1$, then the memoryless learner has a coherence threshold $N > C_1 n$, whereas the batch learner has a coherence threshold $N > C_2 \log n$. If the s_{ij} values are taken from a uniform random distribution on the interval [0, 1] and if $s_{ii} = 1$, then the memoryless learner has a coherence threshold $N > C_3 n \log n$, whereas the batch learner has a coherence threshold $N > C_4 n$ (refs 63, 64). C_1 to C_4 are some constants. These conditions provide boundaries for the actual learning mechanism used by humans, which is arguably better than the memoryless learner and worse than the batch learner. The coherence threshold relates a life-history parameter of humans, N, to the maximum size of the search space, n, of UG.

Evolution of universal grammar

Evolution of UG requires variation of UG. (UG is in fact neither a grammar nor universal.) Imagine a population of individuals using UGs U_1 to U_M. Each U_I admits a subset of n grammars and determines a particular learning matrix Q^I. U_I mutates genetically to U_J with probability W_{IJ}. Deterministic population dynamics are given by:

$$\frac{dx_{Jj}}{dt} = \sum_{I=1}^{M} W_{IJ} \sum_{i=1}^{n} f_{Ii} Q^I_{ij} x_{Ii} - \phi x_{Jj} \quad j = 1,..,n \quad J = 1,..,M \qquad (2)$$

This equation describes mutation and selection among M different universal grammars. The relative abundance of individuals with UG U_J speaking language L_j is given by x_{Jj}. At present little is known about the behaviour of this system. In the limit of no mutation among UGs, $W_{II} = 1$, we find that the selective dynamics often lead to the elimination of all but one UG, but sometimes coexistence of different UGs can be observed. Equation (2) describes two processes on different timescales: the biological evolution of UG and the cultural evolution of language (Fig. 5).

The ability to induce a coherent language is a major selective criterion for UG. A UG that induces linguistic coherence allows language adaptation and can be selected for linguistic function. There is also a trade-off between learnability and adaptability: a small search space (small n) is more likely to lead to linguistic coherence, but might exclude languages with high communicative pay-off.

Because the necessity of a restricted search space applies to any learning task, we can use an extended concept of UG for animal communication. During primate evolution, there was a succession of UGs that finally led to the UG of currently living humans. At some point a UG emerged that allowed languages of unlimited expressibility. Such evolutionary dynamics are described by equation (2).

Historical linguistics

The language dynamical equation (1) can be used to study language change in the context of historical linguistics[65–68]. Languages change because the transmission from one generation to the next is not perfect. UG limits the type of variation that can occur. In the context of the principles-and-parameters theory, changes in syntax arise because children acquire different parameter settings[66]. Grammaticalization[69] is the process where lexical items take on grammatical function. Creolization is the formation of a new language by

children receiving mixed input[70,71]. All such language changes can be studied mathematically. Many language changes are selectively neutral. Hence, we can use a neutral version of our approach possibly in conjunction with small population sizes and stochastic and spatial population dynamics. These are open problems.

Outlook

We have reviewed mathematical descriptions of language on three different levels: formal language theory, learning theory and evolution. These approaches need to be combined: ideas of language should be discussed in the context of acquisition, and ideas of acquisition in the context of evolution.

Some theoretical questions are: what is the interplay between the biological evolution of UG and the cultural evolution of language? What is the mechanism for adaptation among the various languages generated by a given UG? In terms of the principles-and-parameters theory, can we estimate the maximum number of parameters compatible with the coherence threshold? Some empirical questions are: what is the actual language learning algorithm used by humans? What are the restrictions imposed by UG? Can we identify genes that are crucial for linguistic or other cognitive functions? What can we say about the evolution of those genes?

The study of language as a biological phenomenon will bring together people from many disciplines including linguistics, cognitive science, psychology, genetics, animal behaviour, evolutionary biology, neurobiology and computer science. Fortunately we have language to talk to each other. □

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Exhibit 6

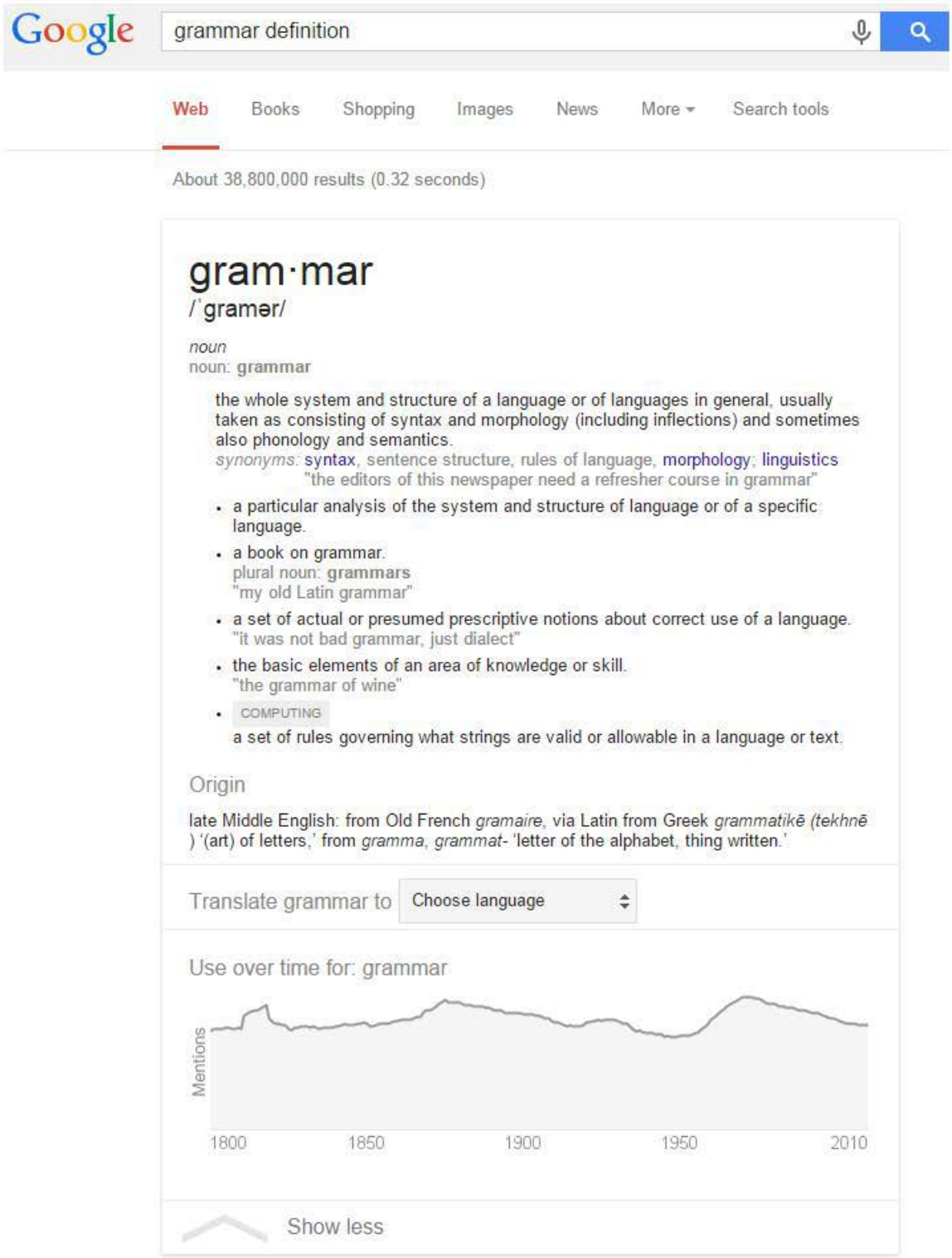

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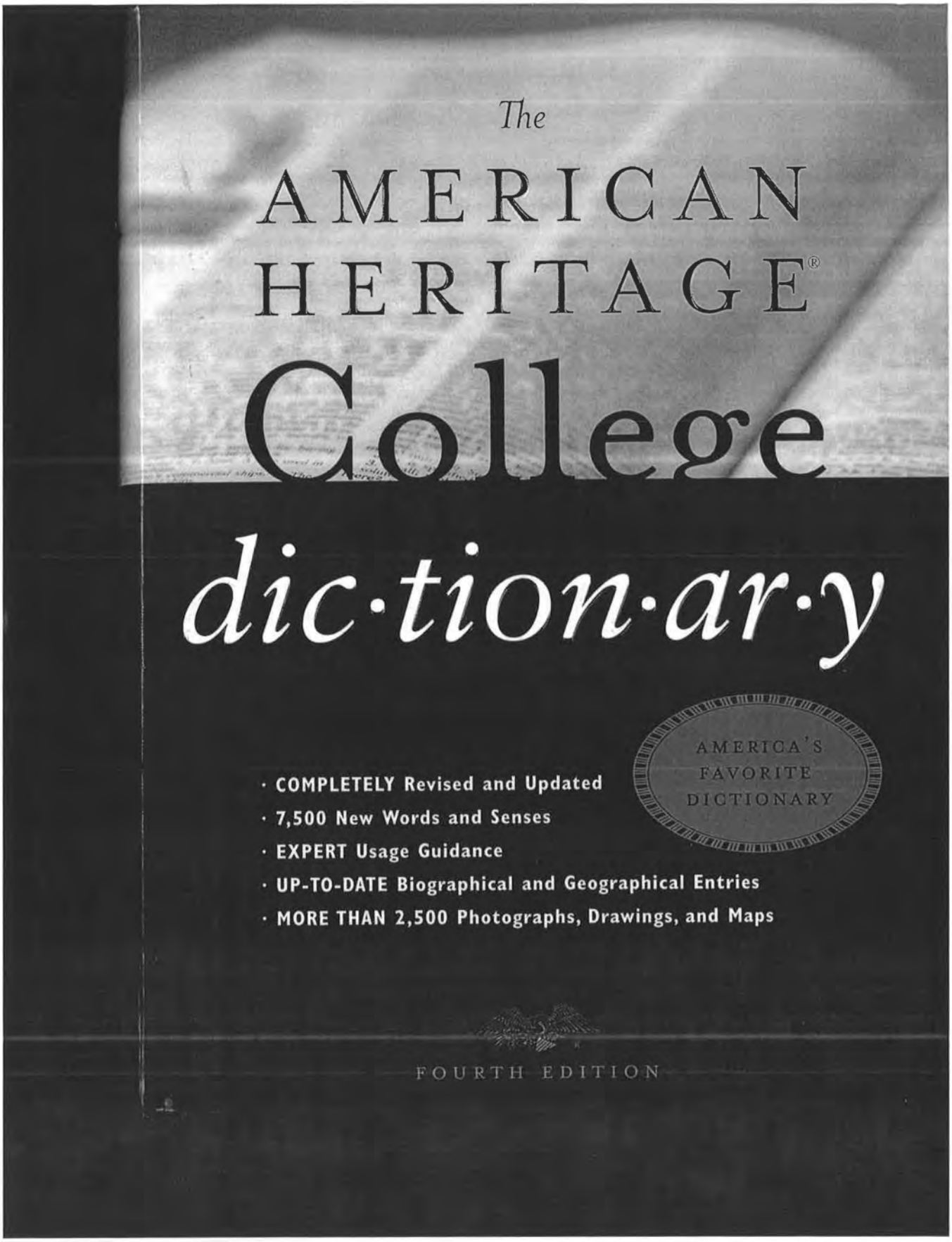
Exhibit 7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Graeco– *pref.* Variant of **Greco–**.

Graf (gräf, gräf), **Stephanie Maria ("Steffi")** b. 1969. German tennis player who in 1988 won the Grand Slam (Wimbledon, French, US, and Australian titles) and an Olympic gold medal.

graf•fi•ti (grə-fē′tē) *n.* (*used with a sing. or pl. verb*) Plural of **graffito.** [Ital., pl. of *graffito.* See GRAFFITO.]

graf•fi•tist (grə-fē′tĭst) *n.* One who produces graffiti.

graf•fi•to (grə-fē′tō) *n., pl.* **-ti** (-tē) A drawing or inscription made on a wall or other surface. Often used in the plural with a singular verb. [Ital., dim. of *graffio,* a scratching, scribble, prob. < *graffiare,* to scratch, scribble, prob. ult. < Lat. *graphium,* stylus < Gk. *grapheion, graphion* < *graphein,* to write. See **gerbh-** in App.]

USAGE NOTE *Graffiti* is a plural noun in Italian. As a loanword in English it is much more common than the singular *graffito,* and is mainly used as a singular noun in much the same way *data* is. Using the etymologically correct singular *graffito* to refer to a particular drawing or inscription, as in *a bold graffito on the wall,* may sound pedantic outside of an archaeological context. There is no substitute for the singular use of *graffiti* as a mass noun referring to wall drawings in general or the related social phenomenon, as in *Graffiti is a major problem for the Transit Authority Police;* it is justified by both utility and widespread precedent.

Martha Graham
performing in
Appalachian Spring

graft[1] (grăft) *v.* **graft•ed, graft•ing, grafts** —*tr.* **1a.** To unite (a shoot or bud) with a growing plant by insertion or by placing in close contact. **b.** To join (a plant or plants) by such union. **2.** To transplant or implant (living tissue, for example) surgically to replace a damaged part or compensate for a defect. **3.** To join or unite closely. —*intr.* **1.** To make a graft. **2.** To be or become joined. ❖ *n.* **1a.** A detached shoot or bud united or to be united with a growing plant. **b.** The union or point of union of a detached shoot or bud with a growing plant by insertion or attachment. **c.** A plant produced by such union. **2a.** Material that is surgically grafted, esp. living tissue or an organ. **b.** The procedure of grafting such material. **c.** The configuration or condition resulting from such a procedure. [ME *graften,* alteration of *graffen,* prob. < OFr. *grafier* < *graffe,* stylus, graft (< its shape) < Lat. *graphium,* stylus; see GRAFFITO. N., ME *grafte,* alteration of *graffe* < OFr.] —**graft′er** *n.*

graft[2] (grăft) *n.* **1.** Unscrupulous use of one's position for profit or advantages; extortion. **2.** Money or an advantage gained by unscrupulous means. ❖ *tr. & intr.v.* **graft•ed, graft•ing, grafts** To gain by or practice graft. [?] —**graft′er** *n.*

graft•age (grăf′tĭj) *n.* The process of making a plant graft.

graft-ver•sus-host disease (grăft′vûr′səs-hōst′, -vər-) *n.* A pathological condition in which cells from the transplanted tissue of a donor initiate an immunologic attack on the cells and tissue of the recipient.

Gra•ham (grā′əm, grăm), **Martha** 1894–1991. Amer. choreographer whose works include *Clytemnestra* (1958).

Graham, William Franklin ("Billy") b. 1918. Amer. religious leader who has led evangelical tours throughout the world.

graham cracker (grăm, grā′əm) *n.* A slightly sweet, usu. rectangular cracker made with whole-wheat flour. [< GRAHAM FLOUR.]

graham flour (grăm, grā′əm) *n.* Whole-wheat flour. [After Sylvester *Graham* (1794–1851), American cleric and social reformer.]

Gra•hame (grā′əm), **Kenneth** 1859–1932. British writer known esp. for *The Wind in the Willows* (1908).

Gra•ham Land (grā′əm, grăm) A region of Antarctica near the tip of the Antarctic Peninsula; part of the British Antarctic Territory and also claimed by Argentina and Chile.

Gra•ian Alps (grā′ən, grī′ən) A section of the W Alps between SE France and NW Italy rising to 4,063.5 m (13,323 ft).

grail (grāl) *n.* **1. Grail** A cup or plate that, according to medieval legend, was used by Jesus at the Last Supper and that later became the object of many chivalrous quests. **2.** often **Grail** The object of a prolonged endeavor. [ME *greal* < OFr. *graal* < Med.Lat. *gradālis,* flat dish.]

grain (grān) *n.* **1a.** A small, dry, one-seeded fruit of a cereal grass, having the fruit and the seed walls united. **b.** The fruits of cereal grasses esp. after having been harvested, considered as a group. **2a.** A cereal grass: *Wheat is grown in Kansas.* **b.** Cereal grasses considered as a group: *grain that grows along the river.* **3a.** A relatively small discrete particulate or crystalline mass: *a grain of sand.* **b.** A small amount or the smallest amount possible: *not a grain of sense.* **4.** *Aerospace* A mass of solid propellant. **5.** A unit of weight in the US Customary System, an avoirdupois unit equal to 0.002285 ounce (0.065 gram). **6.** The arrangement, direction, or pattern of the fibrous tissue in wood. **7a.** The side of a hide or piece of leather from which the hair or fur has been removed. **b.** The pattern or markings on this side of leather. **8.** The pattern produced, as in stone, by the arrangement of particulate constituents. **9.** The relative size of the particles composing a substance or pattern: *a coarse grain.* **10.** A painted, stamped, or printed design that imitates the pattern found in wood, leather, or stone. **11.** The direction or texture of fibers in a woven fabric. **12.** A state of fine crystallization. **13a.** Basic temperament or nature; disposition. **b.** An essential quality or characteristic. **14.** *Archaic* Color; tint. ❖ *v.* **grained, grain•ing, grains** —*tr.* **1.** To cause to form into grains; granulate. **2.** To paint, stamp, or print with a design imitating the grain of wood, leather, or stone. **3.** To give a granular or rough texture to. **4.** To remove the hair or fur from (hides) in preparation for tanning. —*intr.* To form grains. —***idiom:*** **with a grain of salt** With reservations; skeptically. [ME < OFr. *graine* < Lat. *grānum.* See **grə-no-** in App.] —**grain′er** *n.*

grain alcohol *n.* See **alcohol** 1.

Grain Coast A historical region of W Africa along the Atlantic coast, roughly coextensive with present-day Liberia.

grain elevator *n.* A building equipped with mechanical lifting devices and used for storing grain.

grains of paradise (grānz) *pl.n.* **1.** The pungent aromatic seeds of a tropical African plant (*Aframomum melegueta*) used medicinally and in beverages. **2.** The seeds of cardamom.

grain•y (grā′nē) *adj.* **-i•er, -i•est 1.** Made of or resembling grain; granular. **2.** Resembling the grain of wood. **3.** Having a granular appearance. Used of photographs and film. —**grain′i•ness** *n.*

gram[1] (grăm) *n.* A metric unit of mass equal to one thousandth (10^{-3}) of a kilogram. See table at **measurement.** [Fr. *gramme* < LLat. *gramma,* a small weight < Gk., something written, small weight. See **gerbh-** in App.]

gram[2] (grăm) *n.* **1.** Any of several plants, such as the chickpea, bearing seeds used as food in tropical Asia. **2.** The seeds of such a plant. [Obsolete Port. < Lat. *grānum,* seed. See **grə-no-** in App.]

-gram *suff.* **1.** Something written or drawn; a record: *cardiogram.* **2.** A direct mail solicitation or personally delivered message or gift: *candygram.* [Gk. *-gramma* < *gramma,* letter; see **gerbh-** in App. Sense 2 < TELEGRAM.]

gra•ma also **gram•ma** (grä′mə, grăm′ə) *n.* Any of various pasture grasses of the genus *Bouteloua* of western North America and South America. [Am.Sp. < Sp., Bermuda grass, quitch grass < Lat. *grāmen, grāmin-,* grass.]

gram atom *n.* One mole of atoms of an element.

gram-a•tom•ic mass (grăm′ə-tŏm′ĭk) *n.* The mass of one mole of atoms of an element.

gram calorie *n.* See **calorie** 1.

gram equivalent *n.* The amount of a substance whose weight in grams is numerically equal to its equivalent weight.

gra•mer•cy (grə-mûr′sē, grăm′ər-) *interj. Archaic* Used to express surprise or gratitude. [ME *gramerci* < OFr. *grand merci* : *grand,* great; see GRAND + *merci,* thanks; see MERCY.]

gram•i•ci•din (grăm′ĭ-sĭd′ĭn) *n.* An antibiotic produced by the soil bacterium *Bacillus brevis* and used against certain gram-positive bacteria. [GRAM(-POSITIVE) + -CID(E) + -IN.]

gra•min•e•ous (grə-mĭn′ē-əs) *adj.* **1.** Of, relating to, or characteristic of grasses. **2.** Of or belonging to the grass family. [< Lat. *grāmineus,* grassy < *grāmen, grāmin-,* grass.]

gram•i•niv•o•rous (grăm′ə-nĭv′ər-əs) *adj.* Feeding on grasses. [Lat. *grāmen, grāmin-,* grass + -VOROUS.]

gram•ma[1] (grăm′ə) *n. Informal* A grandmother. [Alteration of GRANDMA.]

gram•ma[2] (grăm′ə, grăm′ə) *n.* Variant of **grama.**

gram•mar (grăm′ər) *n.* **1a.** The study of how words and their component parts combine to form sentences. **b.** The study of structural relationships in language or in a language. **2a.** The system of inflections, syntax, and word formation of a language. **b.** The system of rules of a language, viewed as a mechanism for generating all sentences possible in that language. **3a.** A normative or prescriptive set of rules setting forth a standard of usage. **b.** Writing or speech judged with regard to such a set of rules. **4.** A book containing the morphologic, syntactic, and semantic rules for a specific language. **5a.** The basic principles of an area of knowledge: *the grammar of music.* **b.** A book dealing with such principles. [ME *gramere* < OFr. *gramaire,* alteration of Lat. *grammatica* < Gk. *grammatikē* < fem. of *grammatikos,* of letters < *gramma, grammat-,* letter. See **gerbh-** in App.]

gram•mar•ian (grə-mâr′ē-ən) *n.* A specialist in grammar.

grammar school *n.* **1.** See **elementary school. 2.** *Chiefly British* A secondary or preparatory school. **3.** A school stressing the study of classical languages.

gram•mat•i•cal (grə-măt′ĭ-kəl) *adj.* **1.** Of or relating to grammar. **2.** Conforming to the rules of grammar: *a grammatical sentence.* [LLat. *grammaticālis* < Lat. *grammaticus* < Gk. *grammatikos,* of letters. See GRAMMAR.] —**gram•mat′i•cal•ly** *adv.*

gram•ma•tol•o•gy (grăm′ə-tŏl′ə-jē) *n.* The study and science of systems of graphic script. [< Gk. *gramma, grammat-,* letter. See GRAMMAR.] —**gram′ma•to•log′ic** (-tə-lŏj′ĭk), **gram′ma•to•log′i•cal** *adj.* —**gram′ma•tol′o•gist** *n.*

gramme (grăm) *n. Chiefly British* Variant of **gram**[1].

gram-mo•lec•u•lar weight (grăm′mə-lĭk′yə-lər) *n.* See **mole**[3] 2.

gram molecule *n.* See **mole**[3] 1.

Gram•my (grăm′ē) A trademark for an award for excellence in the creation and production of musical recordings.

gram-neg•a•tive or **Gram-neg•a•tive** (grăm′nĕg′ə-tĭv) *adj.* Of, relating to, or being a bacterium that does not retain the violet stain used in Gram's method.

gram•o•phone (grăm′ə-fōn′) *n.* A record player; a phonograph. [Orig. a trademark.]

Grand Canal
Venice, Italy

gramp (grămp) or **gramps** ([Short for GRAMPA.]

gram•pa (grăm′pə) *n.* *Info* GRANDPA.]

Gram•pi•an Mountains (central Scotland extending N rier between the Highlands a

gram-pos•i•tive or **Gram-p** relating to, or being a bacteri in Gram's method.

gram•pus (grăm′pəs) *n.* **1.** A to and resembling the dolph Any of various similar cetace tion. of ME *graspeis* < OFr. *piscis, craspiscis* : Lat. *crassus,*

Gram•sci (grăm′shē), Anto leader and theorist who help party (1921).

Gram's method (grămz) *n.* bacteria in which a bacterial s let, then treated with an iodi hol, and counterstained with (1853–1938), Danish physicia

gra•na (grä′nə) *n.* Plural of **g**

Gra•na•da (grə-nä′də, grä-n doba; founded by the Moors Castilian troops in 1492. Pop.

gran•a•dil•la (grăn′ə-dĭl′ə, - American passionflowers, esp egg-shaped fruit of such a pl granate < Lat. *grānatum* < n GRANATE.]

Gra•na•dos (grə-nä′dōs, g Spanish composer whose worl

gran•a•ry (grăn′ə-rē, grā′nə- ing threshed grain. **2.** A regio *rium* < *grānum,* grain. See **gra**

Gran Cha•co (grän′ chä′kō) America divided among Parag

grand (grănd) *adj.* **grand•er,** in size, scope, or extent; magni Of a solemn, stately, or splen in appearance or effect. **b.** Ne intent; **c.** Lofty or sublime in c *orators.* **4.** Wonderful or very than others of the same categ than others; principal. **7.** Of a including or covering all units A grand piano. **2.** *pl.* **grand** *Sla* < Lat. *grandis.*] —**grand′ly** *ad*

SYNONYMS *grand, magnificen gust, grandiose* These adjectiv scope, or extent. Both *grand* physically or aesthetically im sweep, or eminence: *a grand ho nificent* suggests splendor, sum *nificent cathedral. Imposing* des its size, bearing, or power: *m Stately* refers principally to wh *tately oak. Majestic* suggests lof *Alps. August* describes what insp *august presence of royalty. Gran* ness, affectation, or pompousn

gran•dad•dy (grăn′dăd′ē) *n.*

gran•dam (grăn′dăm′, -dəm) -dəm) *n.* **1.** The mother of *a* mother. **2.** An old woman. [M *dame,* lady; see DAME + *grant,* g

grand•aunt (grănd′ănt′, -änt′

grand•ba•by (grănd′bā′bē, grandchild.

Grand Ba•ha•ma (brə-hä′mə) Atlantic Ocean E of West Palm

Grand Banks An extensive a Ocean off SE Newfoundland, C

Grand Canal 1. An inland wat E China extending from Tianji to 5th cent. B.C. and completed *cipal* waterway of Venice, Italy.

Grand Canary The chief island Ocean ESE of Tenerife I.

Grand Canyon A gorge of the -km (1 mi) deep, from 6.4 to 29 than 321.8 km (200 mi) long.

Grand Cayman See **Cayman Is**

grand•child (grănd′chīld′, grā daughter.

Grand Coulee A gorge, c. 48 carved by the Columbia R.

grand•dad (grăn′dăd′) *n. Info*

Icon
Cretan icon of Mary and Jesus

Icosahedron

ancient Celtic tribe of eastern Britain
ca fought unsuccessfully against the
. *Icent.*] —**i•ce′nic** (-nĭk) *adj.*
ass of compacted ice fragments. **2.** A
ed ice and applied to parts of the body
nation.
r chipping or breaking ice.
dent annual *(Mesembryanthemum*
thern Africa and having fleshy leaves
tening papillae.
re, equal to 0°C (32°F), at which pure
rium in a mixture at 1 atmosphere of

ient consisting of figure skating, ice
nd buffoonery performed on ice.
boot with a metal runner or blade fit-
ting on ice. —**ice′-skate′** (īs′skāt′) *v.*

hich snow or rain freezes on contact,
e surfaces it touches.
chilled water, esp. for drinking, often

onfederation of Free Trade Unions
′) A city of E-central Honshu, Japan,
7,165.
it Chinese book consisting of 64 inter-
e originally used for divination, with
o Confucius. [Chin. (Mandarin) *Yi*
change + *jīng*, classic, book.]
n, -nyo͞o′-) *n.* **1.** A large mongoose
Africa and southern Europe having a
s. **2.** The ichneumon fly. [Lat. *ichneu-*
ly < Gk. *ikhneumōn* < *ikhneuein*, to

arious wasplike insects of the family
rvae are parasitic on the larvae of

ıo•lite (-nō-līt′) *n.* A fossilized foot-
-rīt′.]
ə-fē) *n., pl.* **-phies 1.** The art or proc-
. **2.** A ground plan of a building. [Lat.
rack + Gk. *-graphia*, -graphy.]
n. The branch of paleontology deal-
ed evidence of the activities of organ-
ows. [Gk. *ikhnos*, footprint + -LOGY.]
Greek Mythology The rarefied fluid
gods. **2.** *Pathology* A watery acrid dis-
ulcer. [ME *icor* < LLat. *ichōr* < Gk.
-ər) *adj.*
)f or characteristic of fishes.
Fish: *ichthyophagous.* [Lat. < Gk.

ə-fō′nə) *n.* The fish of a particular

. A fish or fishlike vertebrate. —**ich′-**
ik′thē-oid′ē) *adj.*
ə-jē) *n.* The branch of zoology that
shes. —**ich′thy•o•log′ic** (-ə-lŏj′ĭk),
-ich′thy•ol′o•gist *n.*
thē-ŏl′ə-gəs) *adj.* Feeding on fish.
nīs) *n.* Any of various extinct birds of
xisted during the Cretaceous Period.
me : ICHTHY(O)- + Gk. *ornis*, bird.]
ōr′) also **ich•thy•o•sau•rus** (ĭk′thē-
-sau•ri (-sôr′ī′) Any of various ex-
rder Ichthyosauria of the Triassic Pe-
od, having a porpoiselike head and an
< NLat. *ichthyosaurus* : Gk. *ikhthuo-*,
d.]
) *n.* A congenital, often hereditary
thickened scaly skin.
es; a specialist: *technician.* [ME < OFr.
C + *-ien*, adj. and n. suff.; see -IAN.]
ering spike of ice formed by the freez-
ıter. **2.** *Informal* An aloof or emotion-
ME *isikel* : *is*, ice; see ICE + *ikel*, ici-
App.).]
gold, [< its glistening papillae.]
t glaze made of sugar, butter, water,
ed to cover or decorate baked goods.
ıg. 2. *Sports* A minor rule violation in
er ices the puck, and the puck is not
rm: icing on the cake An additional
y good.
t of Justice
it *Informal* **1.** Disagreeably sticky. **2.**
ck, expression of disgust.] —**ick′i•ly**

l Message Protocol
′) a. An image; a representation. b. A
f a sacred or sanctified Christian per-

onage, traditional to the Eastern Church. **2.** An important, enduring symbol. **3.** The object of great attention and devotion; an idol. **4.** *Computer Science* A picture on a screen representing a specific file, directory, window, option, or program. [Gk. *eikōn* < *eikenai*, to be like, seem.]

i•con•ic (ī-kŏn′ĭk) *adj.* **1.** Of, relating to, or characteristic of an icon. **2.** Conventional or formulaic. Used of memorial statues and busts. —**ī′co•nic′i•ty** (ī′kə-nĭs′ĭ-tē) *n.*

icono- or **icon-** *pref.* Image; icon: *iconolatry.* [Med.Gk. *eikono-* < *eikōn*, image, icon < Gk., likeness. See ICON.]

i•con•o•clasm (ī-kŏn′ə-klăz′əm) *n.* The beliefs, practices, or doctrine of an iconoclast. [Back-formation < ICONOCLAST.]

i•con•o•clast (ī-kŏn′ə-klăst′) *n.* **1.** One who attacks and seeks to overthrow traditional or popular ideas or institutions. **2.** One who destroys sacred religious images. [Fr. *iconoclaste* < Med.Gk. *eikonoklastēs*, smasher of religious images : *eikono-*, icono- + Gk. *-klastēs*, breaker (< *klan*, *klas-*, to break).] —**i•con′o•clas′tic** *adj.*

i•co•nog•ra•phy (ī′kə-nŏg′rə-fē) *n., pl.* **-phies 1a.** Pictorial illustration of a subject. **b.** The collected representations illustrating a subject. **2.** A set of specified or traditional symbolic forms associated with the theme of a stylized work of art. **3.** A treatise or book dealing with iconography. [LLat. *iconographia*, description < Med.Gk. *eikonographiā* : *eikono-*, icono- + Gk. *-graphiā*, -graphy.] —**ī′co•nog′ra•pher** *n.* —**i•con′o•graph′ic** (ī-kŏn′ə-grăf′ĭk), **i•con′o•graph′i•cal** *adj.*

i•co•nol•a•try (ī′kə-nŏl′ə-trē) *n.* Worship of icons or images. —**ī′co•nol′a•ter** *n.* —**ī′con•o•lat′ric** (ī′kŏn-ə-lăt′rĭk) *adj.*

i•co•nol•o•gy (ī′kə-nŏl′ə-jē) *n.* The branch of art history that deals with the description, analysis, and interpretation of icons or iconic representations. —**i•con′o•log′i•cal** (ī-kŏn′ə-lŏj′ĭ-kəl) *adj.* —**ī′co•nol′o•gist** *n.*

i•con•o•scope (ī-kŏn′ə-skōp′) *n.* An early form of a television-camera tube, equipped for rapid scanning of a photoactive mosaic. [Orig. a trademark.]

i•co•nos•ta•sis (ī′kə-nŏs′tə-sĭs) *n., pl.* **-ses** (-sēz′) The screen with icons that divides the sanctuary from the nave of an Eastern Orthodox church. [< Med.Gk. *eikonostasion*, shrine : *eikono-*, icono- + Gk. *stasis*, a standing; see stā- in App.]

i•co•sa•he•dron (ī-kō′sə-hē′drən, ī-kŏs′ə-) *n., pl.* **-drons** or **-dra** (-drə) A polyhedron having 20 faces. [Gk. *eikosaedron* : *eikosi*, twenty; see wikrnti in App. + *-edron*, -hedron.] —**i•co′sa•he′dral** (-drəl) *adj.*

ICRC *abbr.* International Committee of the Red Cross

-ics *suff.* **1.** Science, art, study, or knowledge of, or skill in: *phonics.* **2.** Actions, activities, or practices of: *athletics.* **3.** Qualities or operations of: *mechanics.* [-IC + -S¹ (transl. of Gk. *-ika* < neut. pl. of *-ikos*, adj. suff.).]

ic•ter•ic (ĭk-tĕr′ĭk) *adj.* **1.** Relating to or affected with jaundice. **2.** Used to treat jaundice. ❖ *n.* A remedy for jaundice. [Lat. *ictericus* < Gk. *ikterikos* < *ikteros*, jaundice.]

ic•ter•us (ĭk′tər-əs) *n.* See **jaundice.** [NLat. < Gk. *ikteros.*]

Ic•ti•nus (ĭk-tī′nəs) fl. 5th cent. B.C. Greek architect and the chief designer of the Parthenon at Athens.

ic•tus (ĭk′təs) *n., pl.* **ictus** or **-tus•es 1.** *Medicine* A sudden attack, blow, stroke, or seizure. **2.** The accent that falls on a stressed syllable in a line of scanned verse. [Lat., stroke < p. part. of *icere*, to strike.]

ICU *abbr.* intensive care unit

ic•y (ī′sē) *adj.* **ic•i•er, ic•i•est 1.** Containing or covered with ice. **2.** Bitterly cold. See Syns at **cold. 3a.** Resembling ice. **b.** Chilling in manner. —**ic′i•ly** *adv.* —**ic′i•ness** *n.*

id (ĭd) *n.* In Freudian theory, the unconscious part of the psyche that serves as the source of instinctual impulses and demands immediate satisfaction of primitive needs. [NLat. (transl. of Ger. *Es*, a special use of *es*, it, as a psychoanalytic term) < Lat., it. See i- in App.]

ID¹ (ī′dē′) *Informal n.* A form of identification, esp. an ID card. ❖ *tr.v.* **ID'ed, ID'ing, ID's** To check the identification of, esp. in order to verify legal age; card.

ID² *abbr.* **1. Id.** Idaho **2.** identification **3.** Intelligence Department

id. *abbr.* idem

-id *suff.* Body; particle: *chromatid.* [Lat. *-is*, *-id-*, fem. patronymic suff. < Gk.]

I'd (īd) **1.** Contraction of *I had.* **2.** Contraction of *I would.*

I•da (ī′də), **Mount** A peak, 2,457.7 m (8,058 ft), of central Crete; associated with the worship of Zeus in ancient times.

I•da•ho (ī′də-hō′) A state of the NW US; admitted as the 43rd state in 1890. The region was held jointly by Great Britain and the US from 1818 to 1846. Cap. Boise. Pop. 1,293,953. —**ī′da•ho′an** *adj. & n.*

Idaho Falls A city of SE ID NNE of Pocatello. Pop. 50,730.

'Id al-Fiṭr also **Eid al-Fitr** (ĭd əl-fĭtr′əz) *n. Islam* A festival that ends the fast of Ramadan. [Ar. *'id al-fiṭr*, Feast of Breaking the Fast : *'id*, feast (< Aram. *'ed*, day of assembly < *'ad*, to fix a time) + *al-*, the + *fiṭr*, breaking the fast (< *faṭara*, to split, break, break the fast).]

ID card *n.* A card, often bearing a photograph, that gives identifying data, such as name and age, about a person.

-ide *suff.* **1.** Group of related chemical compounds: *diglyceride, monosaccharide.* **2.** Binary compound: *sodium chloride, hydrogen cyanide.* **3.** Chemical element with properties similar to another: *actinide, lanthanide.* [< (OX)IDE.]

i•de•a (ī-dē′ə) *n.* **1.** Something, such as a thought, that potentially or actually exists in the mind because of mental activity. **2.** An opinion, conviction, or principle. **3.** A plan, scheme, or method. **4.** The gist of a specific situation; significance. **5.** A notion; a fancy. **6.** *Music* A theme or motif. **7.** *Philosophy* **a.** In the philosophy of Plato, an archetype of which a corresponding being in phenomenal reality is an imperfect replica. **b.** In the philosophy of Kant, a transcendent but nonempirical concept of reason. **c.** In the philosophy of Hegel, absolute truth; the complete and ultimate product of reason. **8.** *Obsolete* A mental image of something remembered. [ME < Lat. < Gk. See **weid-** in App.]

SYNONYMS *idea, thought, notion, concept, conception* These nouns refer to what is formed or represented in the mind as the product of mental activity. *Idea* has the widest range: *"Human history is in essence a history of ideas"* (H.G. Wells). *Thought* is distinctively intellectual and thus stresses contemplation and reasoning: *"Language is the dress of thought"* (Samuel Johnson). *Notion* often refers to a vague, general, or even fanciful idea: *"She certainly has some notion of drawing"* (Rudyard Kipling). *Concept* and *conception* are applied to mental formulations on a broad scale: *no concept of time; ancient conceptions of divinity.*

i•de•al (ī-dē′əl, ī-dēl′) *n.* **1.** A conception of something in its absolute perfection. **2.** One seen as a standard or model of perfection or excellence. **3.** An ultimate object of endeavor; a goal. **4.** An honorable or worthy principle or aim. ❖ *adj.* **1a.** Of, relating to, or embodying an ideal. **b.** Conforming to an ultimate form or standard of perfection or excellence. **2.** Considered the best of its kind. **3.** Completely or highly satisfactory. **4a.** Existing only in the mind; imaginary. **b.** Lacking practicality or the possibility of realization. **5.** Of, relating to, or consisting of ideas or mental images. **6.** *Philosophy* **a.** Existing as an archetype or pattern, esp. as a Platonic idea. **b.** Of or relating to idealism. [< ME, of divine archetypes < LLat. *idealis* < Lat. *idea*, idea. See IDEA.]

i•de•al•ism (ī-dē′ə-lĭz′əm) *n.* **1.** The act or practice of envisioning things in an ideal form. **2.** Pursuit of one's ideals. **3.** Idealized treatment of a subject in literature or art. **4.** *Philosophy* The theory that the object of external perception consists of ideas.

i•de•al•ist (ī-dē′ə-lĭst) *n.* **1.** One whose conduct is influenced by ideals that often conflict with practical considerations. **2.** One who is unrealistic and impractical; a visionary. **3.** An artist or writer whose work shows idealism. **4.** An adherent of any system of philosophical idealism.

i•de•al•is•tic (ī-dē′ə-lĭs′tĭk) *adj.* Of, relating to, or having the nature of an idealist or idealism. —**ī′de•al•is′ti•cal•ly** *adv.*

i•de•al•i•ty (ī′dē-ăl′ĭ-tē) *n., pl.* **-ties 1.** The state or quality of being ideal. **2.** Existence in idea only.

i•de•al•ize (ī-dē′ə-līz′) *v.* **-ized, -iz•ing, -iz•es** —*tr.* **1.** To regard as ideal. **2.** To make or envision as ideal. —*intr.* **1.** To render something as an ideal. **2.** To conceive an ideal. —**ī•de′al•i•za′tion** (-ə-lĭ-zā′shən) *n.* —**ī•de′al•iz′er** *n.*

i•de•al•ly (ī-dē′ə-lē) *adv.* **1.** In conformity with an ideal; perfectly. **2.** In theory or imagination; theoretically.

i•de•ate (ī′dē-āt′) *v.* **-at•ed, -at•ing, -ates** —*tr.* To form an idea of; imagine or conceive. —*intr.* To conceive mental images; think. —**ī′de•a′tion** *n.* —**ī′de•a′tion•al** *adj.*

i•dée fixe (ē-dā fēks′) *n., pl.* **i•dées fixes** (ē-dā fēks′) A fixed idea; an obsession. [Fr. : *idée*, idea + *fixe*, fixed.]

i•dem (ī′dĕm′) *pron.* Something that has been mentioned previously, the same. [Lat. < *id*, it. See i- in App.]

i•den•tic (ī-dĕn′tĭk) *adj.* **1.** Being or constituting a diplomatic action or language in which governments agree to use the same forms in their relations with other governments. **2.** Identical. [Med.Lat. *identicus*, identical. See IDENTICAL.]

i•den•ti•cal (ī-dĕn′tĭ-kəl) *adj.* **1.** Being the same. **2.** Exactly equal and alike. **3.** Having such a close similarity or resemblance as to be essentially equal or interchangeable. **4.** *Biology* Of or relating to a twin or twins developed from the same fertilized ovum and having the same genetic makeup and closely similar appearance; monozygotic. [< Med.Lat. *identicus* < LLat. *identitās*, identity. See IDENTITY.] —**ī•den′ti•cal•ly** *adv.* —**ī•den′ti•cal•ness** *n.*

USAGE NOTE Either *with* or *to* is acceptable after *identical.*

identical rhyme *n.* **1.** Repetition of the same word in the rhyme position. **2.** See **rime riche.**

i•den•ti•fi•ca•tion (ī-dĕn′tə-fĭ-kā′shən) *n.* **1a.** The act of identifying. **b.** The state of being identified. **2.** Proof or evidence of identity. **3.** *Psychology* A person's association with the qualities, traits, or views of another person or group.

identification card *n.* An ID card.

i•den•ti•fy (ī-dĕn′tə-fī′) *v.* **-fied, -fy•ing, -fies** —*tr.* **1.** To establish the identity of. **2.** To ascertain the origin, nature, or characteristics of. **3.** *Biology* To determine the taxonomic classification of (an organism). **4.** To consider as identical or united; equate. **5.** To associate or affiliate (oneself) closely with a person or group. —*intr.* To establish an identification with another or others. [Med.Lat. *identificare*, to make to resemble : LLat. *identitās*, identity; see IDENTITY + Lat. *-ficāre*, -fy.] —**ī•den′ti•fi′a•ble** *adj.* —**ī•den′ti•fi′a•bly** *adv.* —**ī•den′ti•fi′er** *n.*

ă	pat	oi	boy
ā	pay	ou	out
âr	care	o͝o	took
ä	father	o͞o	boot
ĕ	pet	ŭ	cut
ē	be	ûr	urge
ĭ	pit	th	thin
ī	pie	*th*	this
îr	pier	hw	which
ŏ	pot	zh	vision
ō	toe	ə	about, item
ô	paw		

Stress marks:
ˈ (primary);
ˌ (secondary), as in **lexicon** (lĕkˈsə-kŏnˌ)

nd used by aircraft for landing and

nents of an aircraft or a spacecraft
craft and its load and give it mobil-

runway without airport facilities.
A woman who owns and rents land,
2. A woman who runs a rooming
r.
ing or having no land.
j. **1.** Entirely or almost entirely sur-
d country. **2.** Confined to inland wa-

One that owns and rents land, build-
man who runs a rooming house or

n. A person unfamiliar with the sea
per•ly *adj.*
1. A prominent identifying feature
arker, such as a concrete block, that
b. An event marking an important
rning point in history. **4.** A building
tance, esp. one officially designated
ving great import or significance: *a*

large unbroken area of land.
mine laid usu. just below the surface
concealed yet incipient crisis.
t office that handles and keeps re-
of public land.
dʹôʹfis, -ôfʹis) *n.* A thriving, exten-
ne of trade.
Olmsman ("Alf") 1887–1987. Amer.
ernor of KS (1933–37) and ran un-
1936.
n. One that owns land. **—land′-**
n′ing *adj. & n.*
lān-dôfʹskə), **Wanda** 1879?–1959.
who was largely responsible for the
the harpsichord.
Owning much unprofitable land but
e or maintain it.
ken to bring about an equitable ap-
land.
of various satellites used to gather
's land surface and coastal regions.

1. An expanse of scenery that can be
ture depicting an expanse of scenery.
g with the representation of natural
land characteristic of a particular re-
been landscaped. **6.** An extensive
spect: *"They occupy the whole land-*
Thurber). **7.** The orientation of a
ide runs from top to bottom. ❖ *v.*
s —*tr.* To adorn or improve (a sec-
ng and by planting flowers, shrubs,
grounds artistically as a profession.
dscap, region : *land,* land + *-scap,*
iff.).] **—land′scap′er** *n.*
e whose profession is the decorative
nd planting of grounds, esp. at or
ndscape architecture *n.*
e whose occupation is the decoration
nd shrubs and designing gardens.

t) *n.* A painter of landscapes.
(ländz) A peninsula of SW England

: flat side of a plow opposite the fur-

tal of landsman², [Yiddish *landslayt*
, compatriots : *lant,* land; see LANDS-
son, people.[<-OHGer.; see **leudh-**

a. The downward sliding of a rela-
rock. **b.** The mass that slides. **2a.** An
otes for a political party or candidate.
party or candidate into office. **3.** A
ig *n.*
landslide 1.
See **New Norwegian.** [Norw. : *land,*
ch (< ON *mál*).]
One who lives and works on land.
., pl. **lands•leit** (-līt′) A Jew from
Eastern Europe. [Yiddish < MHGer.
nt, land (< OHGer.) + *man,* man
pp.).]
r, länt′shtī′-), **Karl** 1868–1943. Aus-
won a 1930 Nobel Prize.
he legislative assembly of some Ger-

man states. **2.** A diet or assembly in some German states in the 19th century. [Ger. : *Land,* country (< MHGer. *lant;* see LANDSMAN¹) + *Tag,* day, diet, assembly (< MHGer. < OHGer., influenced by Med.Lat. *dieta,* diet; see **agh-** in App.).]

land•ward (länd′wərd) *adv. & adj.* To or toward land: *sailing landward; the landward side.* **—land′wards** *adv.*

lane (lān) *n.* **1a.** A narrow country road. **b.** A narrow way or passage between walls, hedges, or fences. **2.** A narrow passage, course, or track, esp.: **a.** A prescribed course for ships or aircraft. **b.** A strip delineated on a street or highway for a single line of vehicles. **c.** *Sports* One of a set of parallel courses marking the bounds for contestants in a race, esp. in swimming or track. **d.** *Sports* A wood-surfaced passageway or alley along which a bowling ball is rolled. **e.** *Basketball* The rectangular area marked on a court from the end line to the foul line. [ME < OE.]

lang (läng) *adj. Scots* Long.

Lang (läng), **Andrew** 1844–1912. British writer and anthropologist best known for *The Blue Fairy Book* (1889).

Lang, Fritz 1890–1976. Austrian-born Amer. filmmaker whose films include *Metropolis* (1927) and *Fury* (1936).

lang•bein•ite (läng′bī-nīt′, läng′-) *n.* An evaporite mineral, $K_2Mg_2(SO_4)_3$, used as a source of potassium sulfate for fertilizer. [After A. *Langbein,* 19th-cent. German chemist.]

Lange (läng), **Dorothea** 1895–1965. Amer. photographer noted for her portraits of rural workers during the Depression.

Lang•land (läng′land), **William** 1332?–1400. English poet credited with the authorship of *Piers Ploweman.*

lang•lauf (läng′louf′) *n.* **1.** The sport of cross-country skiing. **2.** A cross-country ski run or race. [Ger. : *lang,* long (< MHGer. < OHGer.; see **del-** in App.) + *Lauf,* race (< MHGer. *louf* < OHGer. *hlouf*).] **—lang′lauf′er** *n.*

lang•ley (läng′lē) *n., pl.* **-leys** A unit equal to one gram calorie per square centimeter of irradiated surface, used to measure solar radiation. [After Samuel Pierpoint LANGLEY.]

Langley, Mount A peak, 4,227.9 m (14,026 ft), in the Sierra Nevada of S CA.

Langley, Samuel Pierpoint 1834–1906. Amer. astronomer who built the first successful heavier-than-air flying machines.

Lang•muir (läng′myōōr′), **Irving** 1881–1957. Amer. chemist who won a 1932 Nobel Prize.

Lan•go•bard (läng′gə-bärd′) *n.* See **Lombard** 1. [Lat. *Langobardus.* See LOMBARD.] **—Lan′go•bar′dic** *adj.*

lan•gouste (län-gōōstʹ) *n.* See **spiny lobster.** [Fr. < OFr. < O Provençal *langosta* < VLat. **lacusta* < Lat. *locusta,* lobster, locust.]

lan•gous•tine (läng′gə-stēn′) *n.* A large edible prawn. [Fr., dim. of *langouste,* langouste. See LANGOUSTE.]

lan•grage (läng′grij) *n.* A type of shot consisting of scrap iron loaded into a case and formerly used in naval warfare to damage sails and rigging. [?]

lang•syne also **lang syne** (läng-zīnʹ) *Scots adv.* Long ago; long since. ❖ *n.* Time long past; times past. [Sc. *lang syne* < ME *lang sine* : *long, lang,* long; see LONG¹ + *sine,* since (contraction of *sithen, sithens;* see SINCE).]

Lang•try (läng′trē), **Lillie** Known as "the Jersey Lily." 1853–1929. British actress famous for her love affair with Edward VII.

lan•guage (läng′gwij) *n.* **1a.** Communication of thoughts and feelings through a system of arbitrary signals, such as voice sounds, gestures, or written symbols. **b.** Such a system including its rules for combining its components, such as words. **c.** Such a system as used by a nation, people, or other distinct community; often contrasted with *dialect.* **2a.** A system of signs, symbols, gestures, or rules used in communicating: *the language of algebra.* **b.** *Computer Science* A system of symbols and rules used for communication with or between computers. **3.** Body language; kinesics. **4.** The special vocabulary and usages of a scientific, professional, or other group. **5.** A characteristic style of speech or writing. **6.** A particular manner of utterance: *persuasive language.* **7.** The manner or means of communication between living creatures other than humans. **8.** Verbal communication as a subject of study. **9.** The wording of a legal document or statute as distinct from the spirit. [ME < OFr. *langage* < *langue,* tongue, language < Lat. *lingua.* See **dŋghū-** in App.]

language arts *pl.n.* The subjects, including reading, spelling, and composition, aimed at developing reading and writing skills, usu. taught in elementary and secondary school.

language isolate *n.* A language that has no known linguistic affiliation with any other language, such as Basque or Tarascan.

language laboratory *n.* A room for learning foreign languages, having equipment such as tape recorders connected to monitoring devices.

langue (läng, läNG) *n.* Language viewed as a system including the vocabulary, grammar, and pronunciation of a particular community. [Fr. < OFr. See LANGUAGE.]

Lan•gue•doc (läng-dôkʹ, läNG-) A historical region and former province of S-central France on the Gulf of Lions; included in the French royal domain in 1271.

langue d'oc (dôkʹ) *n.* The Romance language formerly spoken in and around Provence and Roussillon, developing into Provençal. [Fr. < OFr. : *langue,* language; see LANGUAGE + *de,* of (< Lat. *dē;* see DE-) + O Provençal *oc,* yes; see OCCITAN.]

langue d'o•il (dōilʹ, doiʹ, dō-ēlʹ) *n.* The Romance language of medieval France north of the Loire River, on which modern French is based. [Fr. < OFr. : *langue,* language; see LANGUAGE + *de,* of; see LANGUE D'OC + *oil,* yes (ult. < Lat. *hoc ille (fecit),* he (did) this : *hoc,* this; see OCCITAN + *ille,* he; see **al-** in App.).]

lan•guet (läng′gwit, läng-gwetʹ) *n.* One that functions or is shaped like a tongue. [ME < OFr. *languete,* dim. of *langue,* tongue < Lat. *lingua.* See **dŋghū-** in App.]

lan•guid (läng′gwid) *adj.* **1.** Lacking energy or vitality; weak: *a languid wave.* **2.** Showing little or no spirit or animation; listless. **3.** Lacking vigor or force; slow: *languid breezes.* [Fr. *languide* < Lat. *languidus* < *languēre,* to be languid.] **—lan′guid•ly** *adv.* **—lan′guid•ness** *n.*

lan•guish (läng′gwish) *intr.v.* **-guished, -guish•ing, -guish•es** **1.** To be or become weak or feeble; lose strength or vigor. **2.** To exist or continue in miserable or disheartening conditions: *languished away in prison.* **3.** To remain unattended or be neglected: *legislation that languished in committee.* **4.** To become downcast or pine away in longing. **5.** To affect a wistful or languid air, esp. to gain sympathy. [ME *langurishen* < OFr. *languir, languiss-* < Lat. *languēre,* to be languid.] **—lan′guish•er** *n.*

lan•guor (läng′gər, läng′ər) *n.* **1.** Lack of physical or mental energy; listlessness. **2.** A dreamy, lazy mood or quality. **3.** Oppressive quiet or stillness. [ME < OFr. < Lat. < *languēre,* to be languid. See LANGUISH.] **—lan′guor•ous** *adj.* **—lan′guor•ous•ly** *adv.* **—lan′guor•ous•ness** *n.*

lan•gur (läng-gōōrʹ) *n.* Any of various slender long-tailed Asian monkeys of the genus *Presbytis* and related genera that eat leaves, fruits, and seeds and have a chin tuft and bushy eyebrows. [Hindi *laṅgūr,* perh. < Skt. *lāṅgūlam,* tail.]

lan•iard (lānʹyərd) *n.* Variant of **lanyard.**

La•nier (lə-nērʹ), **Sidney** 1842–81. Amer. writer and musician noted for his melodic poems and his novel *Tiger Lilies* (1867).

la•nif•er•ous (lə-nifʹər-əs) *adj.* Having wool or woollike hair. [Lat. *lānifer* (*lāna,* wool + *-fer,* -fer) + -OUS.]

La Ni•ña (lä nēnʹyä) *n.* A cooling of the ocean surface off the western coast of South America, occurring periodically every 4 to 12 years and affecting Pacific and other weather patterns. [Am.Sp., the girl (to distinguish it from El Niño) : Sp. *la,* the (< Lat. *illa;* see **al-**[1] in App.) + *niña,* daughter (< OSpan. *ninna* < VLat. **nīnna*).]

lank (längk) *adj.* **lank•er, lank•est** **1.** Long and lean. See Syns at **lean². 2.** Long, straight, and limp: *lank hair.* [ME < OE *hlanc.*] **—lank′ly** *adv.* **—lank′ness** *n.*

lank•y (läng′kē) *adj.* **-i•er, -i•est** Tall, thin, and ungainly. See Syns at **lean².** **—lank′i•ly** *adv.* **—lank′i•ness** *n.*

lan•ner (lānʹər) *n.* **1.** A falcon *(Falco biarmicus)* of Africa, the Mediterranean, and southern Asia. **2.** A female of this species, used in falconry. [ME *laner* < OFr. *lanier,* woolweaver, coward < Lat. *lānārius,* woolworker < *lāna,* wool.]

lan•ner•et (lānʹə-rētʹ) *n.* A male lanner, smaller than the female, used in falconry. [ME *laneret* < OFr., dim. of *lanier,* lanner. See LANNER.]

lan•o•lin (lānʹə-lin) *n.* A fatty substance obtained from wool and used in soaps, cosmetics, and ointments. [Ger. : < Lat. *lāna,* wool + Lat. *oleum,* oil.]

la•nose (lāʹnōs′) *adj.* Woolly. [Lat. *lānōsus* < *lāna,* wool.]

Lan•sing (lānʹsing) The cap. of MI, in the S-central part NW of Detroit. Pop. 119,128.

lan•ta•na (lān-tāʹnə, -tänʹə) *n.* Any of various aromatic, chiefly tropical shrubs of the genus *Lantana,* having dense spikes or heads and small colorful flowers. [NLat. *Lantana,* genus name < Ital. dialectal *lantana,* wayfaring tree, viburnum, perh. < VLat. **lentāgō,* **lentāgin-* < Lat. *lentus,* light, flexible.]

lan•tern (lānʹtərn) *n.* **1a.** An often portable case with transparent or translucent sides for holding and protecting a light. **b.** A decorative casing for a light, often of paper. **c.** A light and its protective or decorative case. **2a.** The room at the top of a lighthouse where the light is located. **b.** *Obsolete* A lighthouse. **3.** A structure built on top of a roof or dome with open or windowed walls to admit light and air. [ME < OFr. *lanterne* < Lat. *lanterna* < Gk. *lamptēr* < *lampein,* to shine.]

lantern fish *n.* Any of numerous small deep-sea fishes of the family Myctophidae, having phosphorescent light organs along each body wall.

lantern fly *n.* Any of various chiefly tropical insects of the family Fulgoridae, having an enlarged elongated head, once thought to be luminescent.

lantern jaw *n.* **1.** A lower jaw that protrudes beyond the upper jaw. **2.** A long thin jaw that gives the face a gaunt appearance. **—lan′tern-jawed′** (lānʹtərn-jôdʹ) *adj.*

lantern wheel *n.* A small mechanical pinion consisting of circular disks connected by cylindrical bars that serve as teeth.

lan•tha•nide (lānʹthə-nīdʹ) *n.* See **rare-earth element.** [LANTHAN(UM) + -IDE.]

lanthanide series *n.* The set of chemically related elements with properties similar to those of lanthanum, with atomic numbers from 57 to 71; the rare-earth elements.

lan•tha•num (lānʹthə-nəm) *n. Symbol* **La** A soft malleable metallic rare-earth element, obtained chiefly from monazite and bastnaesite and used in glass manufacture. Atomic number 57; atomic weight 138.91; melting point 920°C; boiling point 3,469°

lane
swimming lanes

langur
Hanuman langur
Presbytis entellus

ă	pat	oi	boy
ā	pay	ou	out
âr	care	o͝o	took
ä	father	o͞o	boot
ĕ	pet	ŭ	cut
ē	be	ûr	urge
ĭ	pit	th	thin
ī	pie	*th*	this
îr	pier	hw	which
ŏ	pot	zh	vision
ō	toe	ə	about, item
ô	paw		

Stress marks:
ˈ (primary);
ˌ (secondary), as in **lexicon** (lĕkʹsĭ-kŏnˌ)