

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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INTEL CORPORATION,  
Petitioner,

v.

PACT XPP SCHWEIZ AG,  
Patent Owner.

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IPR2020-00541  
Patent 9,075,605 B2

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Record of Oral Hearing  
Held: June 15, 2021

BEFORE SALLY C. MEDLEY, SCOTT C. MOORE, and  
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

APPEARANCES:

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The above-entitled matter came on for hearing on Tuesday,  
June 15, 2021, commencing at 2:51 p.m. EST, by video/by telephone.

P R O C E E D I N G S

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JUDGE MEDLEY: Good afternoon. This is the hearing for IPR2020-00541 between Intel Corporation and PACT XPP Schweiz AG involving U.S. Patent Number 9,075,605. I am Judge Medley and with me are Judges Moore and Ogden. At this time we'd like the parties to please introduce counsel for the record beginning with the Petitioner.

MR. BROWN: Good morning. This is Brandon Brown for Petitioner, B-R-O-W-N. With me also for Petitioner is Kevin Bendix and Robert Appleby as well as from Intel Corporation Matt Fagan, F-A-G-A-N, and Brad Waugh, W-A-U-G-H.

JUDGE MEDLEY: And Mr. Brown, you will be presenting arguments for Petitioner?

MR. BROWN: Yes, Your Honor.

JUDGE MEDLEY: Okay. Thank you. And for Patent Owner?

MR. TUNG: For Patent Owner my name is Mark Tung, M-A-R-K, last name T-U-N-G. And I will be presenting argument. With me from our team is Ziyong Li, Z-I-Y-O-N-G, L-I, as well as Frederick Lorig, F-R-E-D-E-R-I-C-K, L-O-R-I-G, and Nima Hefazi, N-I-M-A, H-E-F-A-Z-I. Also from the Patent Owner is Mr. Martin Vorbach, M-A-R-T-I-N, and last name is V-O-R-B-A-C-H.

JUDGE MEDLEY: Thank you. Each party has 30 minutes total time to present arguments. Petitioner will proceed first and may reserve some of

1 its argument time to respond to arguments presented by Patent Owner.

2 Thereafter Patent Owner will respond to Petitioner's presentation and may  
3 reserve argument time for surrebuttal.

4 Mr. Brown, do you wish to reserve some of your time to respond and  
5 how much?

6 MR. BROWN: Yes, Your Honor. I'll reserve ten minutes.

7 JUDGE MEDLEY: Thank you. And Mr. Tung, do you wish to  
8 reserve some of your time to respond and how much?

9 MR. TUNG: Yes, I'd like to reserve five minutes for surrebuttal.

10 JUDGE MEDLEY: Okay. Thank you.

11 Petitioner, Mr. Brown, when you're ready you may proceed.

12 MR. BROWN: Thank you, Your Honor. Just beginning at slide 3 of  
13 Petitioner's slide, there's one ground at issue for here. There's only six  
14 claims in play. Grounds 2 and 3 for similar reasons to what we discussed on  
15 the '047 have been streamlined. So we're looking at Nicol this time in view  
16 of a different reference, the Kling reference.

17 In light of our healthy dialogue on the '047 I'm going to bypass the  
18 background of Nicol which I think is now well-known on the record and I'm  
19 going to focus on going to slide 11, claim 1 of the '605 patent, the only  
20 independent claim.

21 There are three elements, three sort of challenged elements in the  
22 claim and they're very similar to the '047 patent except rather than setting in  
23 accordance with a first processor load and a second processor load, the  
24 frequency is set in accordance with a number of pending operations of the

1 first processor and a number of pending operations of the second processor.  
2 So this is a little different than the '047 in that you have the single load of  
3 one processor (indiscernible) identify different processors and we can do  
4 that for the same reasons we showed it in the '047 under PACT's  
5 construction. And then there's an element of basically over-temperature  
6 protection with hysteresis and I'll get to that in a second.

7       So let me just -- moving to slide 12, there's -- Nicol discloses a couple  
8 of different ways in which PEs are set to a minimum based on the number --  
9 a PE is set to the minimum based on its number of pending operations. The  
10 first is that Nicol's system is designed to minimize the frequency of any  
11 given PE in order to avoid that quadratic power loss that we talked about  
12 earlier. So if minimum means the lowest frequency that a processor can  
13 complete its tasks at, it meets it very readily as shown on slide 12 when it  
14 discusses reducing the frequency as much as possible.

15       If however -- and I'll go to slide, excuse me, slide 14. If minimum  
16 means reducing the power completely or reducing it enough to sort of keep  
17 memory alive but otherwise shutdown the PE, Nicol also discloses that. So  
18 regardless of how minimum is construed, and the parties have really just  
19 stuck to the plain and ordinary meaning, I think either of these constructions  
20 would be fine for us here.

21       Nicol discloses what it calls clock gating at line 5 -- at column 5, 52 to  
22 45 -- 42 to 45, excuse me, where if a PE isn't actually assigned any work,  
23 meaning let's say you have five PEs but you only work distributed among  
24 four evenly, this one can be clock gated and shutdown. And the Patent

1 Owner's expert agrees that somebody reading Nicol would know that when  
2 a PE doesn't have a load in it it's put into a low voltage state that will  
3 minimize power consumption and he agrees with that. That's 52:5-17.

4       There's one additional interpretation. It's very similar to the clock  
5 gating on slide 15. Although this is not a reference that we're combining  
6 here, ACPI is something that is well-known to a person of ordinary skill in  
7 the art as we saw in the '047 patent. And so the ACPI standard which is a  
8 well-known software power management standard also defines what's called  
9 a C3 state which we talked about earlier is a low power state that keeps  
10 memory alive. That also meets the minimum requirement and we think that  
11 a person of ordinary skill in the art would know that that could be used in  
12 Nicol either as the same thing as clock gating or in accordance with the  
13 clock gating technique.

14       Moving to 16. The next element is now -- based on the number of  
15 pending operations of a different processor we're going to set the frequency  
16 of our first processor or a first part of the multi-processor system to a  
17 maximum. This occurs in a number of different instances in Nicol. The first  
18 is that in a maximally utilized system in Nicol, and Nicol says this at 2:65-  
19 3:4, all processors are operating at full speed and that's when workload from  
20 the processor that we're on can't be offloaded to another processor because  
21 it's also at its maximum workload. And so it's the work -- the number  
22 of pending operations on the other PEs affects how any one PE's processor  
23 frequency and workload is set and that's shown here on slide 16 and that's  
24 by nature of Nicol's need to distribute work as evenly as possible among  
25 PEs and when it can't everything starts to sort of pile up and get maximized

1 which Nicol describes.

2 And as I showed in the '047 patent on slide 17, Dr. Mangione-Smith  
3 agrees that one of the instances in Nicol that can occur is that this instance  
4 can happen that when the load on other PEs might be taken into account in  
5 allocating tasks.

6 So when we want to distribute work we have to be interrogating the  
7 controller is thinking about looking at the workload on other PEs and  
8 making decisions on what to assign to the what we're calling here PE 1, that  
9 first processor whose frequency is being set.

10 And on slide 16, this is at 54:2–14, agrees that there are circumstances  
11 in Figure 4 where all of the PEs will be maximized and we looked at that a  
12 couple slides ago and he agrees this is possible that a particular load  
13 situation might cause an (inaudible - audio cuts out) at the highest possible  
14 (inaudible - audio cuts out) and that is expressly disclosed in Nicol as well.

15 If we go to slide 19, this is also met by the middle ground embodiment  
16 which, again, we talked about in the '047 so I won't belabor it, but when you  
17 group two PEs together they're now dependent on each other because  
18 they're sharing a clock and the PE with the highest workload is going to  
19 cause that clock to go all the way up. And so on the middle ground  
20 as well Nicol expressly discloses this ground that they're sharing a clock and  
21 they're all going to become dependent on each other. So the number of  
22 pending operations on a second processor will affect the first processor if it's  
23 grouped up together. And again on slide 20 that's admitted to by Dr.  
24 Mangione-Smith at 69:7–16 and 69:18–25.

1           So let me move on then to 22. This is going to get at the last element  
2 of the independent claim which is the hysteresis in combination with the  
3 temperature threshold. As an initial point, and I heard it in the last argument  
4 and Patent Owner agrees, Nicol does disclose tracking temperature and  
5 Patent Owner's expert also agrees that somebody looking at Nicol would  
6 know that that kind of temperature tracking is useful for monitoring -- for  
7 doing thermal management, maintaining the temperature of a system.

8           Kling also contemplates thermal management. Kling is directed to  
9 something that we'll get to a little bit later about also including power  
10 management. It wants to make sure we're not going over an available power  
11 -- whatever a particular maximum power is, but it also contemplates thermal  
12 management in the context of evaluating whether thermal management alone  
13 will meet the requirements it wants for power management and so it  
14 contemplates -- it already includes a system that includes thermal sensors on  
15 it.

16           So if we go to 23, I'll just walk through briefly what -- the part of  
17 Kling here that we're relying on. Kling discloses this Figure 2A which is  
18 essentially two bound and what it basically says -- and this would be easier  
19 if I could point to you as I'm going up the line -- but essentially what Kling  
20 says, it's going to set an upper limit and a lower limit and it's going to wait  
21 until -- and Figure 2A is talking about power -- it's going to wait until the  
22 power gets all the way up to some maximum and as it hits that it's going to  
23 throttle down and it's going to keep throttling it until it hits a lower limit and  
24 it calls that lower limit -- it says it's there for hysteresis.



1           And so an easy way to understand this is going back to the air  
2     conditioning analogy that I explained earlier in that Patent Owner's expert  
3     considers this large example of hysteresis. This is essentially the thermostat.  
4     When you -- you set your upper limit to say 70 degrees. You want to be --  
5     you don't want to go over 70 degrees in your house. When it hits the upper  
6     limit the air conditioner is going to kick in and it's going to stay kicked in  
7     until you hit the lower limit which is going to be 68, 67, 66, something that  
8     isn't going to cause it to have to turn the air conditioner back on  
9     immediately and then once it hits that lower limit it will disconnect the air  
10    conditioner. In Kling it will stop throttling the frequency on the clock and  
11    allow normal operation to resume.

12           So what Kling is basically doing is they're taking the thermostat  
13    example that is admitted as the quintessential example of hysteresis and  
14    they're applying it to power instead of temperature. What we're requesting  
15    or what our Petition advances is that we -- we're saying that a person of  
16    ordinary skill would know that you could take Figure 2A from Kling and use  
17    that with temperature because it is disclosing that large example of  
18    hysteresis with regard to temperature. And this is on slide 27.

19           What I've got on slide 27 is that on the top is the section of our  
20    expert's statement that a person of ordinary skill has found it obvious to  
21    apply the well-known two threshold method providing hysteresis from Kling  
22    and implementing it over-temperature monitoring system in Nicol for the  
23    same well-known reason to reduce oscillation or frequent switching, turning  
24    back and forth between states. And this is confirmed by Dr. Mangione-Smith  
25    who says that this two-level threshold band is a good example of hysteresis

1 and he's particularly talking about it in a thermostat, which as we all know is  
2 a type of thermal management. And so we think that this is very  
3 straightforward as a form of hysteresis for Nicol.

4 And in fact, if we go to 28, the panel -- well, let me pause for a  
5 second. The challenge that Patent Owner makes of this is they use a case,  
6 the *ParkerVision* case, and they allege that nobody -- I think the argument is  
7 that no evidence in the record shows a motivation why somebody would  
8 combine hysteresis with over-temperature protection. Now we take issue  
9 with that because we think there's a lot of evidence in the record about it and  
10 in fact if you go to 28 there's two ways of thinking about this.

11 First, there really is no dispute that a person of ordinary skill in the art  
12 knows that thermal management by reducing the frequency is important and  
13 the panel itself noted that even in the Petition alone there's ample evidence  
14 that processors can overheat and do fail and in fact Kling explains that  
15 thermal monitoring is necessary because the processor may destroy itself by  
16 its own heat. So then the only question is would a person of ordinary skill --  
17 is there evidence in the record that a person of ordinary skill would combine  
18 hysteresis with temperature management?

19 Now putting aside that they already do in thermostats that are admitted  
20 out there as basic prior art and a basic example of hysteresis, I want to take  
21 you to slide 29, which on the top of slide 29 is PACT's surreply where they  
22 make for the first time the *ParkerVision* argument that says no evidence  
23 shows that a person would combine temperature management and hysteresis,  
24 and underneath that the file history from the 605 patent.

1 And the file history -- and this is at Exhibit 1004 at 379 which is in our  
2 Petition at 9 to 10, in trying to traverse an enablement challenge Patent  
3 Owner actually says the opposite of what was in their surreply there. They  
4 say that a person of ordinary skill in the art would understand setting clock  
5 frequency in accordance with the temperature and the hysteresis  
6 characteristic. Because the reason they had to do this is there's no disclosure  
7 of hysteresis in the 605 patent so they had to respond this way and make this  
8 admission in order to traverse the enablement objection.

9 So to claim now that there's no evidence for the motivation that they  
10 specifically admitted was known to a person of ordinary skill in the art  
11 doesn't seem to pass the right tests and in fact the *ParkerVision* case, as Your  
12 Honors know, is really addressing a very different issue. This case is about  
13 whether somebody knows that thermal management and a well-known  
14 technique for applying thermal management could be taken from Kling and  
15 applied to an existing Nicol system. There should be real no challenge to  
16 that.

17 *ParkerVision* is about a very different instance of whether or not a  
18 device in the prior art that never disclosed any reason for hitting a certain  
19 harmonic frequency would actually be able to hit it. And so we're talking  
20 about would somebody have accidentally triggered that prior art in  
21 *ParkerVision* to achieve the goals of the claim method and in that case the  
22 federal circuit said, well, no, there's no indication that somebody would  
23 meet that harmonic frequency.

24 It seems to be -- you'd have to sort of hope they'd stumble upon it.  
25 Whereas here there should be no doubt, and there really isn't in the record,

1 that hysteresis and over-temperature protection are both well-known, they go  
2 together, that's the quintessential example of hysteresis, and Patent Owner's  
3 expert and apparently the prosecution counsel also agree with that position.

4 I'll move on, unless there's any questions, to -- briefly to sequentially  
5 processing data just to make one point on slide 31. There is -- on slide 31  
6 I've got Nicol on the right talking about this sequential data argument that  
7 we were having in the previous patent and what I want to emphasize is that  
8 Nicol is express that when there is a need to communicate data between PEs  
9 we use the synchronization scheme. It is saying expressly that data is  
10 communicated between PEs. That is different than what Patent Owner said  
11 on the record in surreply and I just want to highlight that so Your Honors  
12 have it in front of you. It says it twice in that same paragraph that it needs to  
13 synchronize the exchange of data among the PEs. It's clearly laying out that  
14 need.

15 Let me move on then to slide 32. These are dependent claims. The  
16 next five dependent claims all generally address what goes into the upper  
17 limit in Kling. Claim 2 says that the clock frequency is determined in part  
18 by processor voltage. That is expressly disclosed in Kling. It's taking Kling  
19 out of the context of how we're applying this Figure 2A to temperature and  
20 now Kling -- taking the teaching as Kling lays out for this according to  
21 power, Kling also teaches that there's an upper limit in Kling that is set by  
22 what it calls consumed power, which I've highlighted in red, and it says that  
23 you can get there through a number of ways including voltage. And so the  
24 consumed power calculation can include the voltage on the entire chip and

1 perform -- basically when the clock frequency, or excuse me, when the  
2 power consumption hits that certain point the clock frequency is then  
3 throttled back and that's the clock frequency being set by the processor  
4 voltage there.

5 The same argument goes for, on slide 35, for available power. That's  
6 actually a term that Kling uses. And there's no dispute in the record that  
7 Kling sets the frequency, makes decisions about frequency based on  
8 available power. You can see Dr. Mangione-Smith agree, 150:3–13, and I  
9 invite the panel to review the context of that conversation as any of them.  
10 There's no hypothetical being built on or that we're excerpting out. This is  
11 the Patent Owner's expert's own words being just put on the screen here.

12 The same for 36. On slide 36 there's a concept of a user setting.  
13 Again, Kling also discloses that its upper threshold, which helps determine  
14 the clock frequency, can be modified by a user. So there's the user setting  
15 which again at 152:17–22, Dr. Mangione-Smith agrees with.

16 And then claim 5 takes available power and a user setting and puts  
17 them together. Claim 5 also takes available power and a user setting. Kling  
18 actually expressly discloses this combination as well in that a user defined  
19 value can be set that's associated with the available power, the power that's  
20 available out of a wall socket, and it discloses that in claim 12. That's  
21 Kling's claim 12 as well as Dr. Mangione-Smith agreeing to it at 156:2–8.

22 The arguments that Patent Owner makes on this, and I'll come back to  
23 them on rebuttal as well because I know I'm a little short on time, but the  
24 argument that they make is essentially if we go back to slide 32, they argue  
25 that there's an incompatibility between using these thresholds in Kling

1 with Nicol. And what I'll say now and come back to it when we hear  
2 specifically what Patent Owner is going to say is that's an apples and  
3 oranges comparison.

4 What we are proposing is that these threshold limits for consumed  
5 power, not individual voltage of PEs like in Figure 3 but consumed power of  
6 which voltage plays a role, be applied again just like we did in the '047 as  
7 safeguard which is what they're intended to do in Kling. These are  
8 safeguards for when we're going to consume too much power or if overall  
9 we're consuming too much voltage across the entire system, and they will in  
10 the same way with the same admissions I pointed to in the '047, they will  
11 generate interrupt that will throttle or slow down Nicol so that it can equalize  
12 back at a normal power consumption, normal frequency, normal  
13 temperature, normal voltage, and then once that sort of threshold issue is  
14 cleared Nicol will continue with its standard operation.

15 So again, not a bodily incorporation. We're just taking the basic  
16 concept well-known in the art of monitoring temperature, monitoring  
17 voltage and power consumption, and using that to create barriers for how  
18 Nicol functions which, and we put this forward, is a well-known concept  
19 that any person implementing Nicol into an actual system, a complete  
20 system, would know these would be basic functionalities that would be  
21 included (indiscernible).

22 Finally, there's one dependent claim that's a little different but we  
23 touched on it a little bit earlier in the '047. This is slide 38. Claim 6 states  
24 that the number of pending operations on any given PE -- this refers to how  
25 much work any one processing element has -- is determined by the fill level

1 of one or more buffers. This is met readily by Nicol which discloses local  
2 cache memories for each of the PEs and the number of pending operations  
3 that's sitting on any PE is stored in that cache memory in a buffer and it is  
4 well-known that that number of instruction which matches the language of  
5 claim 6 and is in Nicol at 3:13–18 would be used to calculate how much  
6 work is sitting on a given PE at any point.

7 Unless there's any questions I'll reserve the what I think is last ten  
8 seconds of my time and come back on rebuttal.

9 JUDGE MEDLEY: Okay. No questions from me. So you have  
10 approximately ten minutes left. Let me restart this before we get going with  
11 Mr. Tung.

12 Okay, Mr. Tung. When you're ready, we're ready.

13 MR. TUNG: Okay. So let me start with slide 2. I know that we  
14 looked at the same disclosure in the '047. So let me be brief. So this again  
15 is looking at the ACPI standard, but I hear Petitioner still saying that these  
16 concepts are well-known but Petitioner is isolating the concepts and not  
17 looking at the system. And in this case it's particularly problematic because  
18 there's only one ground at issue and that's Nicol in view of Kling. And  
19 Nicol in view of Kling has a particular problem because Kling actually  
20 teaches not to use thermal sensors. In fact, Petitioner is using -- again,  
21 they're saying they're using the concept of Kling in the thresholds, but the  
22 concept of the thresholds is a far cry from constructing a power management  
23 system.

24 So I'm going to go fairly quickly over the idea of Nicol but let me  
25 start with claim 1 and the overall structure. This is on slide 12. So claim 1

1 has a number of limitations and I think most of the argument will center on  
2 the limitations of claim 1. And since there's only one independent claim the  
3 failure to show any of these limitations is fatal to all six claims. The  
4 problem with Petitioner's positions on these claim limitations is that they  
5 again mix different embodiments of Nicol and then for other limitations  
6 they try to combine Kling in a way that's not actually taught by Kling.

7       So I think that at this point the panel probably is fairly familiar with  
8 Nicol. I'll just say that Nicol again stands for -- in terms of how it sets its  
9 clock frequency really stands for setting the clock frequency so that the  
10 tasks complete within the required completion time. That's the fundamental  
11 -- in fact, the only teaching of how Nicol sets the clock frequency. It doesn't  
12 actually talk about alternate methods or other types of scheduling.

13       Now let's look at Kling. So Kling, looking at slide 25, this is Exhibit  
14 1010 of Kling, and you can see the title. It's measuring current, voltage, or  
15 duty cycle of a power supply to manage power consumption. So Kling is  
16 talking about power management. It's not talking about thermal  
17 management because it doesn't try to measure temperature. In fact, as we'll  
18 see, Kling teaches away from using thermal sensors. This abstract says,  
19 "The meter takes a measurement of a parameter that is approximately  
20 proportional to the power." And then the next sentence says, "This  
21 parameter may include, for example, the current or voltage between the  
22 power supply and the portion of the computer system, or the duty cycle." So  
23 again, it does not talk about temperature. It talks about measuring the  
24 current, voltage, or voltage.



1           Now Petitioner points to certain disclosures in Kling about thermal  
2 issues. And if you look in the background section, and this is what  
3 Petitioner relies on, I'm looking at slide 26, Exhibit 1010 at column 1, lines  
4 38 to 46. This disclosure is actually talking about the prior art and talks  
5 about the harms of overheating, but when you actually read what Kling does  
6 and you look at the detailed description, this paragraph -- and again, I want  
7 to really highlight this paragraph in column 2, lines 55 to 64, which is part of  
8 the detailed description of Kling. And it says, "By directly monitoring  
9 power consumption or value proportional thereto temperature measurement  
10 inaccuracies related to poor positioning of thermal sensors in proximity to  
11 the processor are avoided."

12           So Kling is actually teaching to kind of avoid using temperature --  
13 thermal sensors for temperature measurement. You have problems related to  
14 poor positioning of these thermal sensors. Kling says that directly in its  
15 disclosure. And it says, In addition, the response time between detecting a  
16 high power condition and reducing the power consumption of the computer  
17 system is greatly improved over the use of thermal sensors to detect the high  
18 power condition. So Kling is very explicit. It says that there is an advantage  
19 to measuring the power parameter directly. It's not using thermal sensors.  
20 It's using -- measuring current, voltage, or duty cycle.

21           This is important because if you come back to the claim language,  
22 remember the claim language in claim 1, and for example you can see it in  
23 line 4, at the very end it talks about reducing the clock frequency in  
24 accordance with an operating temperature threshold preventing  
25 over-temperature.

1 You have to use an operating temperature threshold. This is not a power  
2 measurement. This is a temperature threshold preventing over-temperature.  
3 Kling doesn't disclose that. Kling talks about measuring a power parameter.

4 That's -- Petitioner tries to argue that the concept of temperature  
5 threshold was known in the prior art but the ground that Petitioner is  
6 proposing in this IPR is specifically Nicol plus Kling, and Kling doesn't  
7 disclose the temperature threshold. This is not something that one would  
8 combine. In fact, if you read Kling it would -- you would avoid using  
9 thermal sensors. There's many advantages to measuring the power  
10 parameter directly. And since Nicol and Kling is the only combination  
11 proposed at issue in this IPR, the failure to combine Nicol with Kling leads  
12 to failure to show the invalidity of all the patent claims.

13 But there's actually a further problem. Okay. Looking at slide 29,  
14 slide 29 shows the Nicol reference Exhibit 1009, the left, and Kling Exhibit  
15 1010 on the right. So if you look at Nicol, you know, we've talked about  
16 how to adjust the clock frequency, but there's a sentence following that  
17 disclosure about setting the clock frequency and it says, "Once the frequency  
18 is thus determined a minimum supply voltage can be determined." So that is  
19 the sequence of Nicol is figure out your task, divide them up, and then set  
20 the clock frequency. After you set the clock frequency then you can  
21 determine the voltage. Most importantly, Nicol determines a voltage.

22 Now if you try to combine that with Kling, remember Kling discloses  
23 using a power parameter such as voltage. And here's the important question.  
24 You know, if Nicol already sets a voltage why would you combine it with a  
25 system that monitors the voltage level? I mean you set the voltage to a

1 level that's either above or below the threshold. There is no monitoring  
2 necessary. I mean if you're looking at a Nicol system where you determine  
3 the clock frequency and then you set the voltage, there's no reason to  
4 continue to monitor that voltage threshold. I mean you can just, you know,  
5 prevent -- if you want it to not be too high you just make sure -- in your  
6 system of Nicol you just don't set it too high.

7 This is not -- again, Kling is not a temperature threshold system and  
8 the claims talk about a temperature threshold which makes sense. It doesn't  
9 make sense to combine Nicol with a system like Kling which monitors a  
10 voltage threshold and specifically Petitioner relies for claim 2 that Kling  
11 discloses a voltage threshold. Okay. So now I'd like to move onto some of  
12 the other limitations, but that fundamental problem with Nicol and Kling  
13 shows -- is basically fatal to Petitioner's position.

14 So sequentially processing data. This is starting on slide 36. This is a  
15 limitation that we covered earlier. I think the one point I want to make --  
16 I'm looking at slide 39 which is the disclosure of the asynchronous  
17 communication network passage. This is Nicol at column 6, lines 14 to 33.  
18 Now Petitioner points to this need to communicate data between PEs and  
19 says that therefore there must be data passed from one PE -- the results  
20 passed from the data processor to another data processor, but Nicol just  
21 simply does not disclose that. I mean it actually says -- in looking at this  
22 sentence it says that is a synchronization scheme that must be implemented  
23 when there is a need to communicate data between PEs that operate  
24 at different frequencies.

1           The key is that there are different frequencies and so you need  
2 communication in order for the system to know when certain calculations  
3 are done. There's nothing here that says there is a data dependence. If you  
4 look at this entire passage it started -- it starts with a description of saying  
5 that the frequencies differ from one another. This entire section is about how  
6 to synchronize and there's no further disclosure of the data dependence  
7 that's necessary for this sequentially processing data limitation.

8           Okay. So I want to move on to the hysteresis limitation. Looking at  
9 slide 47 this shows claim 1 again. The hysteresis limitation appears at the  
10 very end of claim 1 and it says, letter B, a hysteresis characteristic. So for  
11 this limitation, looking at slide 50, Petitioner points to the two thresholds of  
12 Kling, and these two thresholds are power thresholds. Right. I mean look at  
13 Figure 2A. It says power and, as we've been saying, what Kling discloses is  
14 really a measurement of a power parameter.

15           And as Petitioner points out, and they rely on this disclosure that the  
16 lower threshold may be set to a predetermined value selected to provide  
17 hysteresis to reduce the occurrence of power oscillation between the upper  
18 and lower thresholds. So they're relying on this power oscillation  
19 disclosure. But the issue is -- remember that they're -- Petitioner is  
20 interpreting Kling as voltage thresholds, or that's what Kling discloses.  
21 These are power parameters.

22           Since Nicol -- looking at slide 51, Nicol Figure 3, it explicitly sets the  
23 voltage. You can see the steps in Figure 3. It sets the voltage. There isn't a  
24 need to put in the power oscillation protection because this is -- again,

1 it's not like the temperature which you might trigger it at kind of an  
2 unknown time. This is something that's explicitly set in Nicol. You won't  
3 have the power oscillation problem when you set the voltage deliberately  
4 based on setting the frequency. So again, this motivation is not there, not for  
5 the hysteresis.

6 So Nicol -- looking at slide 53, Nicol uses an alternate method to  
7 prevent noise. Nicol, as has been discussed, uses the stepped sequence  
8 where it introduces the frequency and the voltage in steps. It doesn't rely on  
9 this multiple threshold issue and in fact there isn't a reason to think that you  
10 need something like Kling to monitor the voltage thresholds of Nicol  
11 because these are just values that Nicol sets when it determines the  
12 frequency.

13 Now looking -- moving ahead to kind of the interaction between  
14 operating temperature threshold and hysteresis characteristic. Now I'm  
15 looking at slide 55. This again shows claim 1 and it shows that there's an  
16 and between the two which means that both are requirements of the claim.

17 So I want to look at slide 58. Okay. This is in Petitioner's reply,  
18 Paper 27, at page 5. It says that the same amount of power consumed by the  
19 system, e.g. a chip, may not be high enough to trigger a power measurement  
20 trip point but still could cause a local temperature to rise to an unsafe level.  
21 All right. So what Petitioner is arguing is that the power measurement trip  
22 point certainly may not be the same as when the temperature rises to an  
23 unsafe level.

1 Put another way, looking at slide 59, the over-temperature threshold  
2 could be triggered before you even get to the threshold that Petitioner is  
3 relying on for the hysteresis. Petitioner relies on this because they want to  
4 show that both of these things exist. The problem is if you're reducing your  
5 temp -- reducing your clock frequency once you hit the temperature  
6 threshold, which is required by the claim, you're not going to reach the  
7 threshold that Petitioner is relying on for the hysteresis. So not only has  
8 Petitioner not shown that individually the claim does not show the  
9 temperature threshold or the hysteresis characteristic, there isn't a showing  
10 that both are met in claim 1.

11 So I wanted to kind of show a little more detail on these, the  
12 interaction of Nicol's voltage and Kling's voltage threshold. And I want to  
13 again turn your attention back to claim 1. This is back on slide 4. And if  
14 you look at claim 1, it has multiple parts. The first two sub-limitations about  
15 the minimum and the maximum, these are setting the clock frequency in  
16 accordance with number of pending operations of a first and a second  
17 processor. Petitioner relies on the disclosures in Nicol for those limitations.  
18 And then when you get to the last limitation with the operating temperature,  
19 and threshold, and the hysteresis, Petitioner relies on Kling. But again,  
20 because Kling is really a voltage, it discloses a voltage as a parameter, the  
21 interaction between the two doesn't work.

22 So here I'm jumping to slide 66. We illustrate kind of three cases. If  
23 the voltage that Nicol sets, you know, they're so-called maximum to is  
24 actually lower than Kling's voltage threshold, that maximum -- which the  
25 word "maximum" as Petitioner points to is kind of the maximum frequency

1 in the system -- that won't trigger Kling's upper limit threshold if it's less  
2 than the threshold of Kling. And if that's the case then Petitioner hasn't  
3 shown that that part of the claim limitation is met. And remember, this is a  
4 method claim so all the limitations need to be practiced. It's not just the  
5 capability.

6 Looking at slide 67, in the second case if Nicol's voltage setting is  
7 greater than Kling's voltage threshold you'll never reach that maximum  
8 threshold in Nicol if you hit Kling's threshold first. And so because Nicol  
9 and Kling are both looking at voltage there is a problem in the way that  
10 Petitioner is trying to combine them that you can't show how they're both  
11 met.

12 The last slide in case 3 is when Nicol's voltage and Kling's voltage  
13 threshold are the same. The problem here is that, as we noted earlier, that  
14 the temperature threshold may be triggered before the Kling's upper limit is  
15 reached. And furthermore, there is a -- there's a response time issue.  
16 This is illustrated in slide 69. Kling actually points out this as a problem that  
17 the response time when you get to the upper limit of the voltage, that may be  
18 faster than the thermal sensor. So in either case the voltage limit and the  
19 thermal sensors, those two limits are not met at the same time.

20 So now moving onto the dependent claims. For the dependent claims  
21 I'm going to lump them all together because for claims 2, 3, 4, and 5  
22 Petitioner is relying on Kling for the dependent limitation. And so the same  
23 analysis that I just walked through with comparing the limits of Nicol's  
24 voltage with Kling's voltage limit apply and the same problems  
25 result in the combination for dependent claims 2, 3, 4, and 5.

1           So now I want to go to claim 6. Claim 6 is shown on slide 95. So  
2 claim 6 is dependent on claim 1 and it refers to said number of pending  
3 operations. And so what is this number of pending operations? It refers  
4 back to the number of pending operations in claim 1. And this is the number  
5 of pending operations of a first processor and of a second processor. And  
6 here's the issue with the read by Petitioner. What Nicol shows -- okay.  
7 Nicol shows -- looking in the controller before you assign the task to  
8 individual PEs you figure out how to evenly divide the tasks and then you  
9 split them up. So the number of operations that Nicol looks at is not the  
10 number of pending operations of a first processor or a second processor. It's  
11 looking at the overall operations. It's the ones that come into the controller.  
12 But what Petitioner then points to is the number of pending operations of  
13 each individual processor. That's not what Nicol is showing.

14           If you look at slide 97 you see that Petitioner actually points to the  
15 number of pending operations of each of the PEs, but what Nicol does is  
16 Nicol looks at the entire set of operations and then divides them up. It's not  
17 looking at the fill level of each individual processor. And with that I will  
18 stop here and reserve the rest of my time for rebuttal.

19           JUDGE MEDLEY: Okay. Thank you. You have approximately eight  
20 minutes left.

21           And Mr. Brown, just one minute. I'll reset the clock for you. You  
22 have ten minutes and when you're ready you may begin.

23           MR. BROWN: Thank you, Your Honor. I want to address two  
24 fundamental disagreements that we have with patent owner over what was  
25 just argued. The first is that Kling teaches away from temperature sensors,



1 which it doesn't. And the second is that we're relying on some sort of  
2 voltage limit or voltage threshold in Kling, which again we're not. So let  
3 me start with the first part about teaching away from temperature sensors.

4 If you look -- one place to go would be our slide 23 but really  
5 anything about the background of Kling is a good start. Kling sets out by  
6 explaining that temperature sensors are well-known, they're used, and they  
7 layout specifically what the prior art is which is everything we've been  
8 saying exists that when the temperature exceeds the threshold bring the  
9 frequency down. That's undisputed that that's out there in the prior art.  
10 What Kling says about temperature sensors is not that temperature sensors  
11 are bad for measuring temperature. What Kling says is temperature sensors  
12 are bad for measuring power consumption. These are two different  
13 concepts. And the reason is because sometimes you can have  
14 over-temperature conditions but be under power or sometimes you can have  
15 over-power conditions but you aren't triggering temperature sensors.

16 Although these two things are related, power and temperature can kind  
17 of correlate with each other, there's a lot of other environments -- a lot of  
18 other instances that come into that equation: the temperature of the room,  
19 how good your fans are, whether the air conditioning is on, whether you're  
20 in a hot environment. All those things cause temperature to deviate  
21 differently than how power will.

22 And so what Kling says is relying only on thermal sensors for power  
23 consumption is what it says you shouldn't do and so it proposes using a  
24 processor -- power monitors in order to directly measure the consumed  
25 power and use that to watch for over-power conditions. It doesn't say don't

1 use thermal management and any person of ordinary skill in the art would  
2 know as we put forward that Kling is saying you need temperature sensors  
3 for temperature management and that's something that's admitted prior art.  
4 It's in Nicol. It's cited to by Patent Owner's expert. So it's incorrect that  
5 Kling teaches away from that.

6 So then our argument -- and this is on slide 27 -- is that taking  
7 everything a person of ordinary skill knows about temperature management  
8 and hysteresis, somebody would know that Nicol needs temperature and  
9 thermal management, that's something Patent Owner's expert agrees with,  
10 and could use the hysteresis system disclosed in Kling which is identical to  
11 the known thermostat approach and use that for temperature. And that's the  
12 use of Kling's Figure 2A for temperature management. And Kling doesn't  
13 teach away from that. It's simply building on the hysteresis concept for a  
14 thermostat and now applying it to power management and we're saying well  
15 we're going to also use it for the more prior art temperature management  
16 claim.

17 The other key place that we disagree is on the idea -- and Patent  
18 Owner had a bunch of slides that tried to show that Figure 3 of Nicol is  
19 somehow -- can line up with Figure 2A of Kling, that these are all voltage  
20 calculations. They're not. Figure 3 is voltage. Absolutely. Voltage and  
21 frequency is what's in Figure 3 of Nicol. Kling however is not about voltage  
22 threshold. It never says that. It doesn't have to say that because claim 2,  
23 although Patent Owner said it does, claim 2 doesn't say processor voltage  
24 threshold. It just says the clock frequency is determined by processor  
25 voltage.

1           And so what Kling says is that upper limit line is consumed power.  
2   It's power consumption. And it uses a number of different ways to get at  
3   that and if you look at our slide 33 you can see that on the top there 243 to  
4   54 of Kling talks about once the consumed power as determined by a power  
5   controller reaches a threshold a throttle signal is engaged. That's that upper  
6   limit threshold. It's always consumed power.

7           That is very different than what's in Figure 3 of Nicol. Nicol's Figure  
8   3 is not consumed power. It's voltage of one particular PE. And I'm on  
9   slide -- I'm using slide 38 if I -- slide 32, excuse me, if I didn't say that.  
10   What Nicol is saying is that one particular PE in Figure 3 has its voltage set  
11   at 2.7 or whatever it ends up getting set in Figure 3, but that's not what  
12   Kling is saying we're using as a threshold. What Kling is saying is for the  
13   entire chip, for all of those PEs we're going to set a limit on consumed  
14   power, not voltage, consumed power.

15           And so it's an apples to orange comparison that PACT is trying to  
16   make because this isn't a voltage threshold in Kling. And that's important  
17   here for a couple of reasons. First, because claim 2 doesn't require a voltage  
18   threshold. It only requires that the clock frequency be determined in part by  
19   processor voltage, which is it. Consumed power is PE equals  $V \times I$ . It's  
20   current times voltage and so voltage is part of what's being calculated in  
21   how that frequency is analyzed when you're analyzing the total power and in  
22   fact Kling lays that out at 231 to 37. So for that particular claim, for claim 2,  
23   it's not a voltage threshold and it doesn't have to be.

24           For claims 3, 4, and 5 there's no mention of voltage. And so Patent  
25   Owner's argument that all of those rise and fall with the same argument

1 about voltage threshold (inaudible - audio cuts out) is wrong. Those claims  
2 are about available power and now we're expressly apples to oranges with  
3 Figure 3 of Nicol and so they are additionally -- patent owner's argument  
4 doesn't even apply to those additional claims and there really then is no  
5 dispute that 3, 4, and 5 are squarely met by the claim and the only dispute  
6 then is whether or not for claim 2, if claim 2 requires a voltage threshold,  
7 which we don't say it does. Patent Owner has not offered that construction.  
8 And so if the claim reads as it says that it's determined in part by processor  
9 voltage there can be no dispute that the consumed power in Kling does meet  
10 that.

11 Two other brief points. On sequential data processing, we seem to be  
12 going back and forth on this quite a bit. The only argument that I heard from  
13 Patent Owner was that this is synchronization scheme. This isn't for  
14 passing -- for doing sequential data processing. I don't think that's an  
15 argument that counters our point. We agree that this is -- that Nicol discloses  
16 a synchronization scheme that allows you to communicate data between PEs  
17 and that communication of data between PEs is the sequential data  
18 processing that we're pointing to. Whether it's contained in a  
19 synchronization scheme, which is necessary because they're operating at  
20 different frequencies, is really just a how of how the sequential data  
21 processing is occurring, which Nicol says is to pass data in between the PEs.  
22 So we don't think that that argument really addresses our point or changes  
23 the argument.

24 Finally, the last argument made by Patent Owner was specifically on  
25 this number of pending operations and it sounds a lot like the argument

1 we're having on state in the '047 patent. Now I'll take you to our slide 38,  
2 Petitioner's slide 38. The number of pending operations is determined  
3 by -- the number of pending operations that's used to determine the clock  
4 frequency in Nicol is indisputably the number of pending operations on any  
5 given PE. We don't -- Figure 4 and the middle ground, the frequency that's  
6 set for any given PE is specific to the number of pending operations on that  
7 PE. It's not an analysis made of the whole chip. It's made after that work is  
8 assigned to each individual PE and then the clock frequency is set. So the  
9 argument that this is -- that the number of instructions identified in Nicol is  
10 somehow only for the entire chip is incorrect. That is not how Nicol works.  
11 That's not how Figure 4 works.

12 And finally, to the extent that there's any argument that this is  
13 different than the state argument that number of pending operations is  
14 different than the load of processor, I'll take you to our slide 39 which is  
15 points of the file history of the 605 patent. Exhibit 1004 at 376 to  
16 77, in traversing a rejection Patent Owner specifically said that the fill level  
17 of a data buffer representative of the number of waiting operations is  
18 processor load. They say it right there. One of ordinary skill would  
19 understand a number of waiting operations or the processor load which is the  
20 same argument we were having back and forth on the '047 that load and  
21 number of pending operations are in the mind of the patent owner the same  
22 here.

23 So finally -- well, actually I think that's it unless there's any questions  
24 then I'm done.

25 JUDGE MEDLEY: No. Thank you.

1 MR. BROWN: Thank you, Your Honors.

2 JUDGE MEDLEY: Okay. Mr. Tung, you have eight minutes and  
3 when you're ready.

4 MR. TUNG: Okay. Thank you, Your Honor. Let me just take these  
5 arguments in order. So for the first thing that I heard Petitioner say that I  
6 wanted to note was he said that other things matter for temperature such as  
7 the temperature of the room, their alternatives. I think Petitioner  
8 acknowledges that there are other temperature control methods and certainly  
9 Kling is not the only approach and, as we've argued in our papers, the use of  
10 Kling which interrupts the clock frequency of Nicol is problematic.

11 Now I want to turn to slide 4 of Patent Owner. This again shows the  
12 claim language and the claim language specifically says in operating  
13 temperature threshold and that's not Kling's approach. Kling just doesn't  
14 use a temperature threshold. Petitioner seems to say that there is in the prior  
15 art use of a temperature threshold but that's not what the proposed ground is.  
16 The proposed ground is Nicol plus Kling. And if you want to combine with  
17 Kling, Kling actually says you want to measure the power of parameter  
18 directly.

19 And this actually leads to my next point which is go look at the actual  
20 title of Kling. You can see this for example in our slide 25. All right. It  
21 says measuring current, voltage, or duty cycle. That's in the title itself.  
22 So, you know, Petitioner makes the point that Kling is about the consumed  
23 power but it does that through measuring a parameter directly. And it says  
24 that in the abstract. It's measurement of a parameter that's approximately

1 proportional to the power consumed. And so, you know, you can try to  
2 make a distinction between what power consumed and voltage is, but  
3 voltage is the way you get there. I mean it's explicit in the title that it's  
4 measuring voltage.

5 Now I want to turn to the claim 2 argument that Petitioner makes. So  
6 Petitioner says that the claim 2 in accordance -- determined in part by a  
7 processor voltage that claim 2 is not necessarily a voltage limit. Well, first  
8 of all, this is a new argument. In the original Petition Petitioner relies on  
9 Kling for this disclosure and doesn't look at the disclosure of Nicol. So  
10 Petitioner actually pointed to Figure 1 of Nicol.

11 But the clock frequency in Nicol is not determined by processor  
12 voltage. If you look at Nicol -- and let me just find the passage. You look at  
13 our slide 29. This shows the passage from Nicol of how the clock frequency  
14 and the voltage are set. It says that once the frequency is thus determined a  
15 minimum supply voltage can be determined. So Nicol doesn't look at the  
16 supply voltage to set the frequency. Nicol sets the frequency first and then  
17 after that's set then supply voltage can be determined. And so if you're  
18 trying -- if you're looking at the claim language which requires setting  
19 the clock frequency, that's already been done by the time it goes to -- Nicol  
20 does the determination based on supply voltage.

21 On the sequentially processing data point, you know we have been  
22 going back and forth. The one thing I didn't hear Petitioner say in their  
23 response is the concept of data dependence. I wanted to just again point  
24 Your Honors to the testimony from our expert. This is on slide 40, Exhibit  
25 1052, which is Dr. Mangione-Smith's deposition testimony at page 47,

1 lines 15 to 20. He says, In a case of communications among the PEs there's  
2 a whole world of scheduling aspects, scheduling issues that would have to be  
3 addressed because one task is now dependent on another, none of which are  
4 discussed in Nicol. So the fact there's communication between PEs does  
5 not mean that there's data dependence. This is not addressed in Nicol. And  
6 that whole section on communication doesn't talk about that.

7 The last argument that Petitioner makes talks about the middle ground  
8 in Figure 4. And we're getting to claim 6 and I guess to set the stage we  
9 look at claim 6. And it's probably helpful to see the claim language on slide  
10 95. So Petitioner says here that they're relying on Figure 4 or the middle  
11 ground where the number of pending operations is determined by the PE  
12 itself. The problem is look at claim 6. It depends on claim 1. In claim 1 --  
13 and it actually refers to this number of pending operations of a first  
14 processor and of a second processor.

15 So if Petitioner is going and relying on claim 6 in Figure 4 they don't  
16 meet the limitations in claim 1 because in order to get this setting the clock  
17 frequency in accordance with the number of pending operations of a first  
18 processor or a second processor they have to point to the Figure 2  
19 embodiment where you look at the other PEs. So you can't at the same time  
20 say for Figure 6 I'm going to look at only the PE itself and then for Figure 1  
21 then say I'm going to look at the other embodiment.

22 As we noted earlier, the different embodiments in the Nicol reference,  
23 they're distinct because, first of all, they have different hardware. The  
24 connections to the voltage supplies are different in Figure 2 and Figure 4.  
25 Because of that the way you set the clock frequencies is going to be



1 different. So you can't just unify them with just general ideas of  
2 conceptually we're borrowing concepts. The tradeoffs are fundamentally  
3 different and so by trying to kind of get the best of both worlds by using  
4 Figure 4 for one, Figure 2 for the other, Petitioner is relying on something  
5 that doesn't actually exist in Nicol. You can't have half a connection to  
6 a voltage supply and say well it's somewhat like Figure 4 and Figure 2.

7 Now the last thing I want to point to, I think I have about a minute  
8 left, is the Petitioner points to the middle ground. The first response is that's  
9 completely a new argument. You can search for middle ground in the  
10 original Petition and it's not even mentioned. But even the middle ground  
11 doesn't have -- has a problem because the middle ground has a mixture of  
12 some part of Figure 2 and some parts of Figure 4. So maybe some parts of  
13 Figure 4 might satisfy one part of it and Figure 2 might satisfy another part  
14 but the problem is Figure -- claim 6 actually links together using the word  
15 said. It's referring to the same operations and you can't use the same -- you  
16 can't use different parts of your embodiment to satisfy the same -- the very  
17 same limitation. I mean the said number of pending operations refers back  
18 to claim 1.

19 And so this mixing and matching is done and you can -- this has other  
20 issues which I'll just mention because I think I'm out of time. There's other  
21 issues with the way sequentially processing data which requires multiple  
22 clock domains as well as the claim 6 limitation along with the pending  
23 operations in claim 1. The way they all interact you can't -- Petitioner's read  
24 is not on a coherent embodiment of Nicol.

1 JUDGE MEDLEY: Okay. Thank you, Mr. Tung. You're out of time.  
2 Thank you both for your presentations. We will take the case under  
3 advisement and issue a written decision in due course. We are adjourned.  
4 (Off the record at 3:53 p.m.)

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