Tapad Excels in Cross-Platform Advertising with Sub-Millisecond Query Responses

At any given moment, consumers are using their computers, tablets, or smartphones to interact online. As the leader in cross-platform advertising technology, Tapad is helping advertisers achieve a unified view of these consumers and present consistent ads across multiple touch-points.

Tapad maximizes a campaign's impact across multiple screens by leveraging extensive real-time bidding (RTB) enabled supply and data relationships to target the right users, in the right context, on the right device. Its bidding algorithms draw both on predictive learning and historic performance to calculate, in real time, the likelihood of an impression to meet client’s targeting parameters and achieve ROI goals. The result is an unprecedented level of targeting, relevance and impact on a brand's bottom line.

Tapad relies on the Aerospike (formerly Citrusleaf) real-time NoSQL database and key-value store to power its decision engine and manage more than 150 billion ad impressions per month spread across almost 2 billion web browsers, mobile phones, tablets and TVs.

Wanted: NoSQL Database for Multi-Channel RTB

For Tapad, the ability to predict the best placements and correct pricing for advertisers' campaigns, as well as offer RTB to marketers across multiple channels, was critical to the success of its technology. To support this functionality, the company required a database that could reliably process and manage the data linked to billions of mobile display impressions and also respond to inquiries within milliseconds.

The key-value store approach of NoSQL databases was ideally suited for Tapad’s needs, and the company began to investigate several well-known systems. However Tapad found that despite offering high throughput, many products lacked the predictable response times needed to support the platform's users. Only Aerospike stood up to the test of Tapad's proof of concept, demonstrating the performance, reliability and predictability required for their demanding production environment requirements.

“We need real-time, predictable, consistent performance. Because all ad placements are made in real time, we need a database that allows us to query what we know about the user, decide on the ad impression and how much we'll spend—all within 50 milliseconds.”

Dag Liodden
co-founder and CEO, Tapad

“Aerospike, there are no surprises, and in our business, that’s an important metric.”

Dag Liodden
Co-founder & CTO, Tapad

RESULTS

- Manages more than 150 billion ad impressions per month across 2 billion devices.
- Predictably processes queries within sub-milliseconds 95% to 99% of the time while handling 50,000 queries per second per server.
- Automatic rebalancing and fault-tolerance, ensuring that there is no degradation to performance even during upgrades.
- Minimizes IT overhead via flash-optimization and cost-effective use of industry-standard hardware.

COMPANY PROFILE

Website: www.tapad.com
Industry: Mobile Display Adv.
HQ: New York, NY

GOAL

Optimize real-time bidding and data management for cross-channel media platform
“What we do almost always takes the exact same time, so we needed a database that offered predictably consistent response times, and ultimately the predictability of Aerospike is what made the difference,” Mr. Liodden recalls. “We also wanted a solution that had a high degree of fault tolerance, automated partitioning, and automatic rebalancing whenever we scaled the system up or brought a server down for maintenance. Aerospike delivered on all fronts.”

**Predictable Sub-millisecond Performance**

Today, Tapad has five Aerospike server clusters deployed in its data center. The Tapad platform, which is built on a Java Virtual Machine (JVM), uses the Java interface of the Aerospike database to respond to queries by combining real-time data with information from the company’s other big data storage solutions.

Aerospike consistently processes queries within sub-milliseconds, even as it processes some 50,000 transactions per second (TPS) per server. The predictable ultra-fast performance is critical because the 50 millisecond time window for each opportunity includes the network hops between other companies’ data centers, which gives Tapad only about 25 milliseconds to respond with an offer.

“Aerospike is written in C and has a native, none-garbage collected runtime. This leads to very predictable performance with extremely consistent response times – even in the 99th percentiles,” Mr. Liodden observes. “Another factor is that we have our indexes in RAM and run our data off of solid-state drives, so there is no need to tune caches. Every read from the system will be at the same speed. If we chose to store more of our data in RAM, the system might be faster in some cases, but it would be at the cost of more jitter introduced by cache misses.”

**Predictable Performance—Even During Upgrades**

Tapad’s rapidly growing business is driving the demand to manage ever larger amounts data. Recently, Tapad began running large new campaigns with a nearly all-new user base. At Tapad’s request, the Aerospike support team came in to evaluate whether the current system could handle the new load. Testing revealed that while Tapad had the necessary read/write capacity, there was not enough storage disk space. The Aerospike advisors then recommended adding solid-state drives (SSDs) to meet Tapad’s growing storage demands.

As Tapad began to add the hard drives, the company realized the value of Aerospike’s self-managing topology. As Tapad brought down its servers to add the SSDs, there were instances where machines were being rebooted while Aerospike was automatically re-balancing the server clusters, yet it never noticeably affected performance.

“Even when we had only two of our four servers up and running, we didn’t see any jitter on our charts. You might say that means we’re seriously over-provisioned, but that’s primarily due to SSD storage volume, not transaction rates. A lot of NoSQL database vendors promise to rebalance, but I have never seen another system that could do it without hitches, the way Aerospike does. Bottom line, the fault tolerance and automatic rebalancing with Aerospike are amazing,” reports Mr. Liodden.

For Tapad, technical support is nearly as important as the database’s performance. Aerospike’s advisors played an important role in counseling the company on its storage upgrade, but the value is also in the day-to-day interactions.

“The level of support that Aerospike provides is remarkable,” says Mr. Liodden. “With Aerospike support, we always get a response within an hour, even on non-critical issues.”

“An excellent database is critical for our business, and Aerospike delivers on all fronts. It is powerful, fast, predictable, and highly available,” states Mr. Liodden. “Aerospike makes upgrading simple. That’s the beauty of this product. There’s no planning required. You can take servers down, and still have the system running.”

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co-founder and CEO, Tapad