Smart City IoT Solution Brings Data Insight to Transportation

Cisco, Davra Networks, and Intel deliver edge analytics to San Diego Metropolitan Transit System

> "Our agency is very customer-centric. The expectation is that the train will show up when we say it's going to be there on the sign, and we wanted an accurate solution to provide that information."
>
> Sandy Bobek, CIO, San Diego MTS

Executive summary

The San Diego Metropolitan Transit System (MTS) provides transport to a large resident population each day, as well as hosting visitors and large events. The MTS worked with Cisco and Davra Networks on an Intel® architecture-based solution that provides edge intelligence for sharing near-real-time scheduling information with citizens on dynamic signage. The solution has not only improved rider experiences, it has gathered data for a range of key operational functions—from proactive diagnostics and maintenance to cross-system monitoring to increased security. The MTS estimates that riders will take 92 million trips in the next year—relying on this as their method of transportation throughout the county.

Challenges

As in other large urban transit systems, the San Diego MTS faces challenges ranging from maintenance and management to service and security. It operates out of multiple locations over a large service area. Some of its bus routes travel 100 miles from the downtown and back. Security and safety are paramount, as is offering a high level of customer service. San Diego MTS CIO, Sandy Bobek, speaks to one of the transit system's primary goals, "Our agency is very customer-centric. The expectation is that the train will show up when we say it's going to be there on the sign, and we wanted an accurate solution to provide that information." The agency sought to take advantage of data analytics to increase visibility and control and keep citizens informed of evolving transit schedules.

Solution

San Diego partnered with Cisco, Davra Networks, and Intel on an innovative solution that brings new levels of connected intelligence to the transit system. On board each train and bus, Davra Networks' algorithms are calculated on a Cisco router powered by an Intel® processor. Up-to-date schedules are then transmitted directly to digital signs.

Robert Borowski, enterprise business solutions manager at the San Diego MTS sums up the functionality and efficiency of the integrated solution: "Quite simply, the process works by using the devices on the trains. They have a GPS antenna and they're also linked to a cellular network. We're capturing GPS information every five seconds, as well as information from the trolley that lets us know where it's going, the destination, what route it's on. That information is sent over the cellular backhaul to our back office and put into a database. Within almost real time, we're then processing that information through our algorithm in the Davra Networks software that creates accurate ETAs. And, literally, within about 10 seconds, we're able to send that information out to the platforms or out to people's mobile devices and let them know up-to-the-second information on where things are."

davra networks

Rajiv Gupta, Intel's global account manager for digitization IoT, speaks to the value of the collaboration: "Cisco, Davra Networks, and Intel have formed a strong partnership to bring together different pieces of the value chain to enable business outcomes for the San Diego MTS. Davra brings the software element, the analytics algorithms; Intel brings the compute engine that is running the Cisco ruggedized gateway routers."

Because the data-driven Internet of Things (IoT) system requires interoperability, integration, and connectivity between disparate hardware and software components, as well as the transit system assets (from trains and buses to legacy infrastructure), the multiplayer ecosystem collaboration was critical to developing and piloting the smart city solution.

The rich data and two-way communication system is also informing related MTS initiatives, such as predictive maintenance; increased monitoring of environments for security and safety; new services; and near-real-time display of alerts and notifications. Near-real-time diagnostics gives the MTS maintenance staff a window on train operations and thresholds, and replacements can be installed proactively to prevent major service failures. Security cameras at all stations allow data sharing with police and contribute to a more secure environment for travelers.
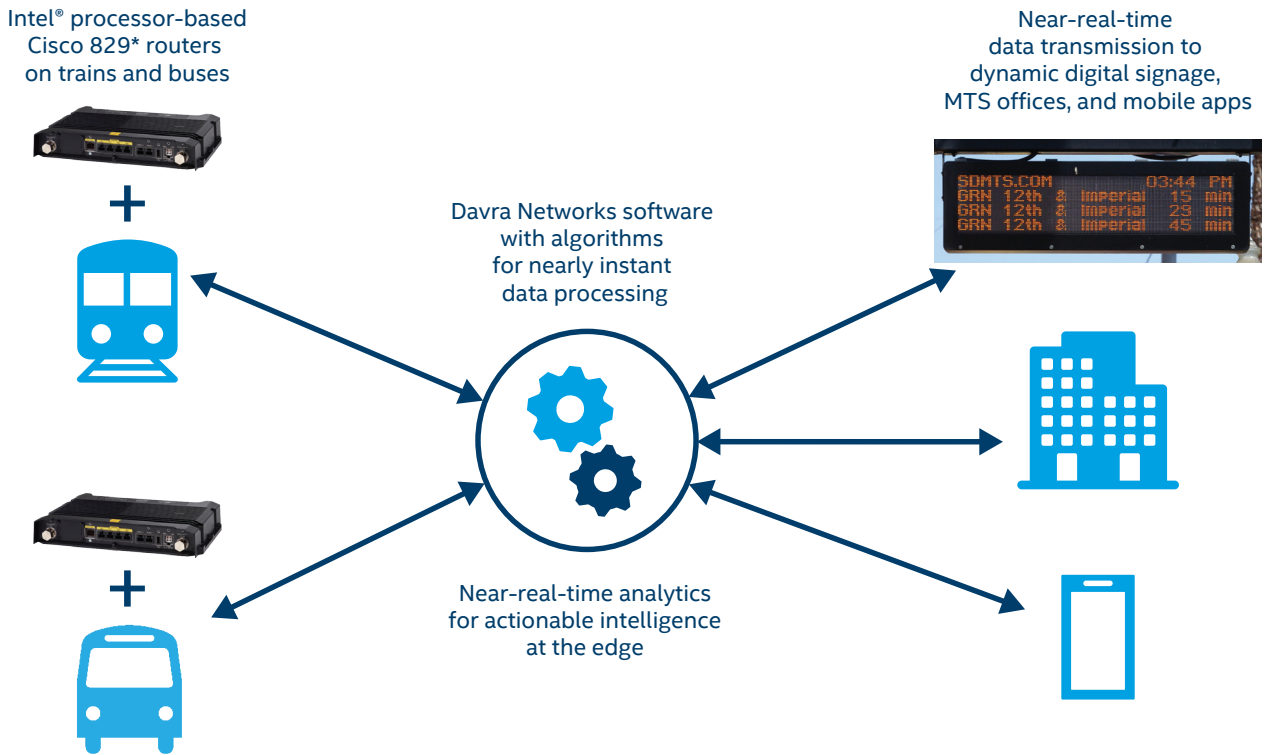
Results

The result is a dynamic estimated time of arrival (ETA) system that responds to changing variables to keep riders informed of schedule changes and arrival times. Information is shared on digital signage at all bus and train stations and on the transit vehicles themselves.

In addition to the ETAs, the configuration supports a passenger announcement (PA) system to all the train depots and stations throughout the city. The MTS is now pursuing additional value-add projects, such as relaying near-real-time diagnostic information to mechanics in its light rail vehicle (LRV) maintenance division.

Says Sandy Bobek, "Before, we had to have an operator call in and try and troubleshoot over the radio. Now, they'll be able to see exactly what the train is saying without a person in the middle trying to explain what they're experiencing. We see tons of potential uses for this and we already have three additional projects building on that same Cisco 829* technology. There are massive gains in being able to provide information to our riders that they wouldn't normally have. It improves the rider experience."

Kyle Connor, Cisco's transportation global business development manager, speaks to the opportunity San Diego represents for other cities getting smarter: "We can solve the problem technically speaking, but trying to find a way for the people to actually take value out of that solution is a real difference. And that's what's going on here in San Diego."

Intel® processor-based Cisco 829* routers on trains and buses

Near-real-time data transmission to dynamic digital signage, MTS offices, and mobile apps

Davra Networks software with algorithms for nearly instant data processing

Near-real-time analytics for actionable intelligence at the edge

The San Diego MTS keeps citizens informed with dynamic digital signage based on near-real-time data analytics

How it works in brief

Onboard every train and bus is an Intel processor-powered Cisco 829 Industrial Integrated Services Router. Purpose-built for IoT, the Cisco router is a ruggedized device made for field assets operating in harsh environments, such as trains and trucks. Capabilities include GPS and LTE backhaul. The router collects data on vehicle motion and estimated distance from stops, running an algorithm calculation using the Davra Networks software.

COO of Davra Networks, Brian McGlynn, highlights the integrated nature of the solution: "We connected the trains with Cisco routers, pulled GPS location feeds, and then were able to put that into the IoT application enablement platform (AEP), and calculate estimated time of arrivals, which are pushed out to the signs you see around the city." Using fog computing (processing and analytics that take place at the IoT edge) puts intelligence onto the routers on the trains and this enables collection of telematics.

The Cisco technology enables San Diego MTS to run local analytics on top of a container or a virtual machine (VM) in the gateway. With up-to-the-second accuracy on train locations and arrival times, information is streamed every 10 seconds to the platforms and to citizens' mobile apps. The gateway onboard each train and at every station feeds the digital signage, eliminating back-office calculations.

The 64-bit CPU in the Intel processor brings the performance and reliability to conduct analytics on the device—providing actionable intelligence at the edge—as well as supporting analysis at the MTS. Says Cisco's Kyle Connor, "The local compute function is really Intel's strength in this." Adds Brian McGlynn, "The Intel® CPU is an x86 64-bit CPU, which really allows us to build on top of the fog compute that's inside the router. And it also allows us to containerize and to add functionality both locally on the assets. It really adds a lot of value."

"We can solve the problem technically speaking, but trying to find a way for the people to actually take value out of that solution is a real difference. And that's what's going on here in San Diego."

Kyle Connor, transportation global business development manager, Cisco

Conclusion

Paul Jablonski, CEO of the San Diego MTS, emphasizes the continuing value the solution has brought to the San Diego region: "We now have real-time information at all our stations in our entire system. Real-time diagnostics on our trains allow our maintenance department to see how trains are operating and if we're starting to see issues with thresholds, we can stop a train and do a replacement on it before we experience a major failure. We can watch train movements everywhere through signal blocks. If there are issues on the line, we're now connecting our power systems so that we can control those from one central location. **It's created an environment that gives us maximum flexibility in the job that we do.**"

Cisco's Kyle Connor looks to the future as cities like San Diego take advantage of IoT to prepare for evolving demographics: "I believe many of us are going to see megacities evolving and mass transit will be the only way to move around. San Francisco, LA, and New York are prime examples of that today. You wouldn't want a car there unless it's to get out on the weekend for a drive. I think that's the type of evolution you're getting to in mass transit and this is the start of it— having reliable service that you know you can count on to get to and from your destination."

Learn more

For more information about Intel IoT Technology and the Intel IoT Solutions Alliance, please visit **intel.com/iot**.

Find Cisco IoT solutions for smart transportation at **cisco.com/c/en/us/solutions/industries/transportation/connected-mass-transit.html.**

Learn more about Davra Networks software and analytics capabilities at **davranetworks.com**.

The foundation for IoT

Intel works closely with the ecosystem to deliver smart Internet of Things (IoT) solutions based on standardized, scalable, reliable Intel® architecture. These solutions range from sensors and gateways to server and cloud technologies to data analytics algorithms and applications. Intel provides essential end-to-end capabilities—performance, manageability, connectivity, analytics, and advanced security—to help accelerate innovation and increase revenue for smart cities and transportation, as well as solution and application providers. Intel can help organizations use data to monitor, control, optimize, and benchmark, as well as to share historical and near-real-time information to improve decision-making. Intel also brings a large ecosystem and broad portfolio of processors from low-end to the high-end Intel® Xeon® Scalable processors to support a wide spectrum of IoT implementations for smart cities and smart transportation.

Solution components

- Intel® 64-bit CPU
- Cisco 829 Industrial Integrated Services Routers*
- Davra Networks software and analytics
- Daktronics Dynamic Message Signs*