

PROMINA®

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Network Equipment Technologies, Inc.



## BART and net.com update train control system via Promina multi-service platform

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| <b>Customer</b>         | Bay Area Rapid Transit (BART)  |
| <b>Location</b>         | San Francisco Bay Area, U.S.A.   |
| <b>Needs</b>            | Upgrade train control system from copper to fiber                            |
| <b>Services</b>         | Analog serial to optic conversion<br>Improved network and traffic monitoring |
| <b>net.com Products</b> | Promina  |

### SITUATION

BART carries more than 300,000 passengers around the San Francisco Bay Area each day. The train system connects the cities and suburbs of the San Francisco-Oakland-San Jose metropolitan area. The 104-mile, 43 station system was constructed in the 1960's, opening for business in 1972. The system is still growing, with line extensions to Pleasanton and Pittsburg-Antioch in the North and East Bay completed, and an extension added to the San Francisco airport in 2003.

BART is known worldwide for its fully automated train management system. At the heart of this train control system is the Operation Control Center (OCC). A computer imaging and video projection system displays the entire track network, combining information on train identification and location. While many improvements have been made over time, the basic train control equipment is 30 years old. Some parts of the communication and control network are based on technology that's outdated.

BART officials decided to upgrade the train control communications network, unifying the legacy multiplexers and other equipment to a standard platform. The legacy copper network was limited in capacity and flexibility for new services, and a decision was made to upgrade to a fiber based network.

An optical network offered two important benefits for BART engineers. First, a new fiber network alleviated many of the issues associated with copper, specifically maintenance, connectivity and electro-magnetic noise. But second, and just as important, fiber offered a dramatic increase in bandwidth in the network.

### CONSIDERATIONS

There were three primary considerations for BART engineers when they began looking to upgrade the network infrastructure: reliability, redundancy, and flexibility of equipment.

Some of the legacy equipment in the train control system uses RS232 and RS530 low speed serial interfaces. Hence it was important for the replacement platform to be able to consolidate and carry these serial legacy interfaces over the new high speed optical network. Flexibility in handling the different interfaces of the legacy data network equipment, and the ability to inter-work with the latest high speed technology was key.

### SOLUTION

BART selected net.com's Promina multiservice platform after reviewing equipment from three vendors. "We tested all the platforms in a lab environment, which simulated the actual network, and net.com's Promina platform stood out for its quality, reliability, and redundancy," said BART senior train control engineer Tommy Tran. The redundancy in the Promina platform is provided by dual processors and dual power supplies. Promina is renowned for its reliability, and is used in the most mission critical civilian and military networks around the world.

As a multiservice platform, Promina has more than 80 standard cards for various interfaces, including RS232 and RS530. This allows Promina to incorporate BART's 30-year old legacy train control system into its network. The BART nodes were bundled with a net.com optical trunk card, allowing the single mode optical fiber to be



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plugged right into the platform. "Promina was the only platform on the market that could handle both RS232 and RS530 to optical conversion within a single system, reducing the amount of equipment we need to manage, cutting maintenance and management costs," said Tommy Tran.

net.com's history with Promina networks deployed in many mission critical applications around the world was an important consideration. Promina has a long history of providing unparalleled reliability in networks where failure is not an option. "Companies like Visa and Reuters count on Promina to deliver data reliably and accurately," said account manager Dennis Ringland. "BART's train control communications must also be completely reliable and redundant."

The Federal Aviation Administration (FAA) and many other civilian aviation authorities around the world use Promina networks to deliver critical flight data at airports. And every branch of the United States military relies on Promina to deliver voice, video and data communications in advanced tactical deployment.

The first phase of the deployment began with the installment of 28 Promina nodes. Some of BART's 43 stations are "satellites", meaning they are managed from neighboring stations. One of the benefits offered by the Promina platform is that each node contains an updated view of the network topology allowing it to intelligently re-route data within milliseconds in the event of a node or fiber link failure. The optical fiber connects each station in loops, allowing Promina nodes to connect to each other and bypass problem points within the network.

An added benefit of net.com's Promina platform is that it consolidates both the vital and non-vital BART station to station signals in a single platform.

Automation in BART is extensive for the efficient operation of the transit

system. As a train approaches a station, it signals to a sensor on the track, causing the train to stop at exactly the right spot in the station. Once it exits a station, the train routing is also controlled automatically based on the train ID, routing the train to the appropriate destination. All this information is carried from station to station by the Promina platform.

### EVALUATION

BART officials have been pleased with the deployment thus far, and excited by the possibilities for the future. "The quality of the equipment and the cards has been excellent," said Tommy Tran. "All the station to station train control signals are now carried by the Promina platform, and we need to be confident that this equipment is extremely reliable. We have built in all sorts of redundancy features to make sure that the system works at all times."

### FUTURE DEVELOPMENTS

Promina's flexibility means that many future services can also be carried over the same platform, although data services alone can also provide passengers with valuable information. For instance, BART now has the option to display the arrival and departure information for the Oakland and San Francisco airports on monitors within its system.



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