The fast lane to building a smarter city

Fujian University of Technology leverages real-time data to reduce congestion and meet the challenges of rising vehicle ownership using a high-performance cloud platform.

Business need
Fujian University of Technology wanted to create a high-performance cloud platform to mine and analyze real-time data on local road usage, and deliver it to residents and government offices.

Solution
The university built an end-to-end Dell cloud platform based on Dell PowerEdge blade and rack servers featuring Intel® Xeon® processors, Dell Storage with Intel Xeon processors, Dell Networking switches and VMware® vCloud®. Performance of the solution is optimized through the support of Dell Deployment Services and Dell ProSupport Plus.

Benefits
• Successfully drives a Smart City strategy to manage rising vehicle numbers
• Helps residents travel more efficiently by reducing congestion
• Delivers transportation updates in real time with in-memory database
• Reduces running and management costs by using a modular IT platform
• Maximizes performance with highly responsive support

Solutions at a glance
• Big Data
• Cloud Solutions
• Modular Infrastructure
• Enterprise Deployment
• Enterprise Support

“We are helping Fujian province develop its Smart City Transportation strategy with Dell’s end-to-end cloud platform. The data shows how our roads are being used and will help shape transportation policy and services at a time when the number of vehicles is rapidly increasing.”

Professor Zou Fumin, Vice Dean, College of Information Science and Engineering, Fujian University of Technology
How to move people efficiently around supercities, which are densely populated urban areas with a headcount of over tens of millions of people, will be a major dilemma as many roads are already suffering under the weight of traffic.

In China, vehicle ownership is rising rapidly. As of 2014, the national car ownership has exceeded 150 million, and in Fujian province, residents are seeing a reflection of the same trend.

The need for Smart City performance

To cope with the rapid increase of vehicles in the cities, the province launched its Smart City Transportation strategy with technical support provided by the Fujian University of Technology and the Fujian Traffic Information and Communication Center. The university, opened in 1896, was tasked with creating a big data platform to give a real-time picture of road usage in Fujian. However, the existing IT infrastructure lacked the performance to support the Smart City scheme.

The solution was to create a cloud platform to support the big data infrastructure. Professor Zou Fumin, Vice Dean of the College of Information Science and Engineering at Fujian University of Technology, says, “We knew it would be easier to manage a cloud platform. We saw the benefits in terms of higher rates of hardware utilization and greater reliability. In terms of expandability, a cloud is far more elastic — enabling instant scaling of CPU, memory and entire processing clusters. The challenge for us was to create a cloud platform that was both reliable and easy to administer.”

A consolidated end-to-end cloud solution for data processing

The university considered proposals from IBM, HP, Huawei and Dell. Professor Zou says stakeholders were immediately impressed by the support from Dell. “It showed a lot of commitment to our project, and the Dell solution offered the right balance between price and

“We are helping to reduce congestion on our road network using our Dell solution.”

Professor Zou Fumin, Vice Dean, College of Information Science and Engineering, Fujian University of Technology

Around the world, people are moving to urban areas. According to the United Nations, 80 percent of the world’s population will be living in cities by 2050, leaving governments with a number of challenges to address — a key one being transportation.

Products & Services

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performance.” After conducting some tests, stakeholders of the project saw that the Dell solution could reliably support the VMware® vCloud® Suite software. “We had no doubts that Dell running VMware would ensure the stability and performance for our cloud solution,” remembers Professor Zou.

**In-chassis switching for cloud scalability**
Next, the university adopted a Dell end-to-end consolidated cloud platform that consolidates servers and switching. With the support of the Dell Enterprise Deployment Services team, Fujian University deployed Dell PowerEdge M620 blade servers featuring Intel® Xeon® processors, each with 128 gigabytes (GB) of memory, running VMware vSphere® 5.5. The blades were situated in a Dell PowerEdge M1000e modular blade enclosure along with 10 Gigabit Ethernet (GbE)/40GbE Dell Networking MXL switches. Dell designed the switches to support cloud environments with large numbers of virtual machines per physical server. Because the switches are chassis-based, management is much easier, and with the 10/40GbE connectivity data moves fast.

From the outset, the university saw the advantage of connecting the servers to the switches inside the chassis. Says Professor Zou, “Right now the Dell Networking MXL switches are connected using 10GbE links, and the performance has been excellent. The big advantage of choosing the Dell MXL Networking switch was that we could reduce the number of interfaces connecting to the core switches. We also increased the bandwidth and reliability of the link through aggregation. Looking ahead, it was clear to us that we could scale our solution very easily with the architecture based on the Dell Networking MXL switch.”

**High-performance storage for the cloud**
For storage, the university deployed a Dell Compellent SC8000 array with Intel Xeon processors with a mix of 600GB and 700GB SAS drives with data tiering. Both the performance and seamless scalability of the storage were important to the university. Professor Zou adds, “We also gained the option of including a flash-optimized storage tier at a later date. We felt as though we could meet our long-term storage requirements, thanks to the flexibility of a Dell Compellent solution.” To complete the cloud infrastructure, the IT team also implemented Dell PowerEdge R730 and R720 servers featuring Intel Xeon processors to build the website and a separate cloud platform for campus information.

Dr. Zhu Quan, a teacher at the School of Information Science and Engineering at Fujian University of Technology, says, “We have the ability to constantly process data really fast thanks to the stability of the Dell cloud platform. During the project, it was clear to see the excellent end-to-end cloud capabilities from Dell.”

**Driving a Smart City transportation strategy to better manage urbanization**
Today, the government and residents of Fujian province have real-time data on travel conditions, and government offices can use the information to improve transportation policy. Currently, approximately 120,000 public vehicles in Fujian province are equipped with GPS devices. Each vehicle uploads its position and speed every 30 seconds. This data, along with the video-monitoring data from major traffic lights would come in a continual stream.

From midnight into the early hours of the morning, the platform studies the data from the previous day to discover driving patterns. For example, it looks at taxicab journeys and the most popular routes. Professor Zou comments, “We are helping Fujian province develop its Smart City Transportation strategy with Dell’s end-to-end cloud platform. The data shows how our roads are being used and will help shape transportation policy and services at a time when the number of vehicles is rapidly increasing.”
Cutting congestions by delivering transportation updates in close to real time

Data on cloud platform is analyzed and processed by two main compute clusters. One cluster runs open-source Apache Spark™ — a computing framework for sophisticated analysis of large data sets — and the other cluster runs Pivotal® GemFire®, which creates an in-memory data pool. Both solutions run on the cloud’s virtual machines. Day to day, the Apache Spark software processes the large data sets and ArcGIS software manages the geodata. Every 30 seconds, the servers process the stream of massive data. The servers’ memory database stores no more than the last 10 minutes of data before it’s moved to the Dell Compellent array. Of the 83TB of capacity available on the array, around 40TB have already been used. “We are helping to reduce congestion on our road network using our Dell solution,” says Professor Zou.

Already, the university has migrated many of its applications to the cloud environment. Confirms Professor Zou, “Most of the applications within the campus network have been moved to the cloud platform. Now, we have only a few physical servers running the Oracle database.”

Reducing running and management costs using a modular IT platform

According to Professor Zou, the university meets its commitment to the Smart City Transportation scheme safe in the knowledge it is operating a cost-effective cloud platform. Despite the high performance of the cloud, he believes the platform consumes relatively little energy.

For security and compliance, Professor Zou prefers the cloud option. He says, “IT administrators gain tighter control by moving to a cloud solution. For one thing, they can monitor the performance of the infrastructure more easily using fewer tools and take preventive action before issues become problems. And for another thing, cloud security is keeping pace with the development of software-defined architectures, meaning we can keep data in secure zones. We are looking at options around software-defined networking and software-defined firewalls to address cloud security.”

Maximizing performance with highly responsive support

To date, the cloud solution has performed well, and the university has Dell ProSupport Plus for Enterprise to help optimize its operation. Comments Professor Zou, “The cloud platform is easy to manage, and we feel confident about the technical assistance from Dell ProSupport Plus. We look to scale the platform and connect it to other systems to support similar Smart City schemes in the future.”

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Dr. Zhu Quan, Teacher, School of Information Science and Engineering, Fujian University of Technology

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