

Airport's Common Use Model Relies on Modular Switches



Greater Toronto Airports Authority achieves greater flexibility and efficiency using Cisco modular switching.

EXECUTIVE SUMMARY

GREATER TORONTO AIRPORTS AUTHORITY

- Transportation
- Toronto, Ontario
- 1227 employees
- More than 80,000 people employed at Toronto Pearson International Airport

BUSINESS CHALLENGE

- Expensive, inefficient use of airport resources resulting from airline-assigned gates
- Moves, adds, and changes requiring costly and time-consuming recabling

NETWORK SOLUTION

- Cisco Catalyst 6500 switches in the wiring closet and throughout the network enable the convergence of data, voice, and video, and provide virtualization to support a Common Use environment

BUSINESS RESULTS

- Easy management of gate configuration, check-in counters, overhead flight displays, and IP phones for each tenant using MPLS
- Forwards and backwards compatibility of Catalyst switches allows the GTAA to migrate to new technologies, like Power over Ethernet, quickly and easily
- Complete upgrade of all Catalyst switch supervisors without disruption to operations
- Increased revenue due to sale of IT services to airlines and tenants

Business Challenge

The extraordinary vision of the Greater Toronto Airports Authority (GTAA) has transformed Toronto Pearson International Airport into one of the most technologically advanced airports in the world. This once traditional airport is now a showcase for a more efficient Common Use environment that eliminates tenant equipment at gates and check-in counters and competing communications networks. The new infrastructure allows more than 75 airlines to use airport facilities with greater ease and flexibility and at a lower cost. It has also enabled better services for other tenants, like restaurants and shops, and improved travel-related services, such as baggage handling and customer assistance.

The project has received several awards, and other airport authorities frequently tour the airport to see how this new model has enhanced the traveler experience, contributed to greater airline efficiency and profitability, and increased the GTAA's revenues.

The modern campus area network, based on Cisco® solutions and validated designs, consolidated 14 separate networks owned by different entities into a single infrastructure providing voice, data, video, security, wireless, and other services. The end-to-end Cisco-switched network consists of a high-capacity optical backbone across the 1800 hectare (18 square kilometer) campus, and core, distribution and access layer switches located in each terminal.

One of the earliest strategic decisions was to replace all of the old stackable switches in the wiring closets and create a more feature-rich, manageable access layer. To implement the Common Use model, the GTAA needed a way to cost-effectively implement virtualization at the access layer using VLANs. The entire network is fully redundant to meet the airport's 24-hour operational requirements, so the access layer switches also had to support full redundancy. In addition, the GTAA wanted switching technology that would provide in-line power for more than 700 wireless access points and more than 1200 IP phones around the campus.

According to Clarence Leonard, Manager of Network and Voice, "We had a formidable list of requirements for the wiring closets in order to deliver all of the services that we envisioned, and only the Catalyst 6500 met all of those needs."

Network Solution

To enable the Common Use model, each tenant is assigned a secure Multiprotocol Label Switching (MPLS) VPN routing and forwarding (VRF) instance in the Catalyst® 6500 at the distribution layer. The MPLS VPNs are associated with various VLANs, over 1000 currently, in the Catalyst 6500s at the access layer.

For example, Airline A might be assigned to VLAN 100 at the access layer, which maps back to VRF 100 at the distribution layer. To "activate" a gate, Airline A logs in through the Common User Passenger Processing System (CUPPS) application, which identifies the appropriate tenant for Airline A. All of Airline A's profiles are then downloaded for the PC workstation applications, boarding pass printers, and overhead flight displays. The Cisco IP phones at the gate, bridge, and ramp also switch over to their Airline A profiles.

If the next tenant to use the gate is Airline B, the same procedure connects Airline B to its designated VLAN, and the gate, counter, and phone information are all downloaded from Airline B's database.

With the old network and operational model, each airline had dedicated gates and hardwired networks. An airline could not simply "swap" gates with another airline. Now assigning gates is done virtually, within minutes.

"The network is so much more powerful, flexible, and resilient than it was previously, yet at the same time it is so much easier to manage."

—Clarence Leonard, Engineering and Architecture, Manager Network and Voice, GTAA

Adding or relocating tenants was even more difficult in the old days, requiring new cabling or rewiring existing cabling, and even installing new switches. Today, adding a new airline to the network also takes a matter of minutes, with just a few configuration changes to the switch to set up a new MPLS VPN. The changes can be made remotely, without dispatching a technician to the

wiring closet. “The network is so much more powerful, flexible, and resilient than it was previously,” says Leonard, “yet at the same time it is so much easier to manage. Moves, adds, and changes are remarkably easy. It takes perhaps 20 minutes to configure a new VLAN and VRF and map one to the other, compared to hours or even days with the old network. We can respond more quickly to the needs of our tenants, and we can also use our own IT staff more efficiently.”

The Catalyst 6500s are installed in 106 of the wiring closets around the airport. The GTAA uses a combination of Catalyst 6506s (6-slot chassis), 6509s (9-slot chassis), and 6513s (13-slot chassis) depending on the number of ports required for the tenants in each terminal. “One of the many advantages that we have with the Catalyst 6500s is that we can share spare line cards across any Catalyst switch in the network,” says Leonard. “That helps us optimize supplies and lowers our total cost of ownership.” If a tenant requires greater capacity, the network group can also increase the number of ports in the same chassis by adding a high-density 96-port line card. All of the Catalyst switches at the core, distribution, and access layers use the same Cisco IOS software, which further simplifies management of the large network.

The GTAA has raised the bar for flexibility and efficiency in airport operations, but they have also improved reliability, perhaps the most important requirement in the operation of an airport. Based upon a Cisco Validated Design (documented in the [“High Availability Campus Recovery Analysis Design Guide”](#)), the entire campus-wide network is redundant, right down to the wiring closet. Every access layer switch has the identical configuration, including dual power supplies, dual fan trays, and dual supervisors. Soon, the GTAA will be moving to Stateful Switchover (SSO). Each switch supervisor is dual homed to redundant Catalyst switches at the distribution layer. If one of the distribution switches fails, the access layer switch uses the Hot Standby Routing Protocol and Spanning Tree Protocol to automatically fail over to the other distribution switch.

Business Results

PRODUCT LIST

Routing and Switching

- Cisco Catalyst 6506 Series Switch
- Cisco Catalyst 6509 Series Switch
- Cisco Catalyst 6500 Series Supervisor 32 and Supervisor 720

Voice and IP Communications

- Cisco Unified IP 7900 Series

“One of the things that was important to us in such a long-range, visionary project was forwards and backwards compatibility,” says Ian Grant, General Manager of the GTAA’s Engineering and Architecture group. “Even as we were deploying current technology, we wanted to be able to take advantage of any new technologies that might give us greater efficiencies or support new services.”

One example was in the wireless arena. When they were first installed in 2003, the Catalyst access layer switches used in-line power to power to the IP phones at gates, bridges, and ramps, as well as the Cisco Aironet wireless access points. The airlines, baggage handling, car rental agencies, travelers, and GTAA all take advantage of wireless connectivity throughout the terminals.

In 2006, after the newest terminal at Toronto Pearson opened, the GTAA decided to migrate all of the wiring closet switches to standards-based 802.3af Power over Ethernet (PoE) to give the GTAA the ability to support the new generation of networked-attached devices such as video cameras, security access control (card scanners), and building automation systems. “Changing over to PoE required a simple swapout of line cards,” says Leonard. “And all of Cisco’s existing end devices, including the IP phones and the APs, were compatible with the new standard.”

The forwards and backwards compatibility of the Catalyst switches, as well as the network's resiliency, were put to a substantial test when the GTAA decided to upgrade all of the Catalyst supervisors to take advantage of new virtualization technology, as well as other features in the new generation of switch supervisors. In the wiring closet, the Catalyst switches were upgraded from Supervisor 1s to Supervisors 32s without changing any line cards. Elsewhere, the Catalyst switches were upgraded from Supervisor 2s to Supervisor 720s.

It took several months of careful planning to perfectly execute the cutover, but every switch supervisor, basically the brains of the network, was replaced without a single device or transaction faltering. Gary Long, the GTAA's CIO, likened the upgrade to "changing the tires on a plane accelerating down the runway for take-off."

Leonard says, "We had our entire team standing by and probably a dozen people from Cisco in case there were any problems, but the migration was flawless. It was a testament to good planning, great teamwork, and the stability and adaptability of the Catalyst switches."

For More Information

For more information about Cisco Catalyst Switches, go to: <http://www.cisco.com/go/catalyst>

For more information about Cisco Validated Designs, go to: <http://www.cisco.com/go/cvd>



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