TRiDiUM™

Case Study

Changi Airport

Singapore adopts integrated, IP-based supervisory building control

The Civil Aviation Authority of Singapore (CAAS) is harnessing the power and capabilities of Tridium's NIAGARA Framework™ united with Cisco's IP router and switching technology in the development of the new Terminal 3 building at Changi Airport.

The result is a fully integrated IP-based supervisory system for the many different controls and environmental monitoring sub-systems being installed as part of the project. Tridium's versatile web-serving, building services control solution is also being applied to cover the existing Terminal 1 and Terminal 2 facilities at the Airport, achieving vastly improved and integrated site-wide building management.

> " NIAGARA Framework™ unites with Cisco's IP router and switching technology to create an irresistibly powerful solution. "

The new Terminal 3 at Changi Airport is a $1.5 billion project scheduled for completion in early 2008. It will add a capacity of 20 million passengers a year, bringing the total annual capacity to 64 million and adding another 28 aerobridge gates to the Airport. The installation of Tridium's NIAGARA Framework™ will ensure rapid, comprehensive and successful integration of the Terminal's range of building services equipment, including chillers, pumps, access control, fire alarm and other systems without the need for any special gateways, expensive programming or BMS supervisors. At the same time, the project's systems integrator, CHA, is extending this winning Tridium / CISCO approach to the other two Airport Terminal's which were originally constructed in 1982 and 1990 respectively.

Changi Airport's complex array of multi-vendor control sub-systems, featuring devices from Cylon, Andover, Singapore Technologies, Invensys and Barber Colman, comprise in total over 50,000 control points on Terminal 3 and a further 60,000 control points across Terminals 1 and 2. Thanks to Tridium's NIAGARA Framework™ and high performance CISCO routers and switches, these sub-systems will all be connected by a Giganet Fiber Optic backbone network in

Continued overleaf

The Tridium Solution

The project
- Changi Airport, Singapore, home to over 70 airlines flying to more than 160 cities in 53 countries.
- New $1.5 billion Terminal 3 development, scheduled for completion in early 2008, requiring rapid, comprehensive and integrated building services control.
- Additional capability to extend control to existing Terminals 1 and 2 to offer a comprehensive controls solution.

The requirement
- Complex array of multi-vendor control and environmental monitoring sub-systems, featuring devices from Cylon, Andover, Singapore Technologies, Invensys and Barber Colman.
- Over 50,000 control points on Terminal 3 and a further 60,000 control points across Terminals 1 and 2.
- A reliable, easy to access and integrated site-wide building management solution for the CAAS.

Tridium provides
- Market-leading NIAGARA Framework™ as the system architecture united with Cisco's IP router and switching technology, providing a fully integrated IP-based supervisory system for all three Terminals delivered by systems integrator, CHA.

The results
- All sub-systems will be connected by a Giganet Fiber Optic backbone network in a single, open, fully interoperable and web-based control environment running on HP Servers.
- Solution will allow the full fiber ring bandwidth to be utilized, facilitating information and application sharing across the site and guaranteeing the highest standards of network reliability.
- NIAGARA Framework™ will talk to each controller using its native protocol and respective network in one environment, irrespective of controller type and manufacturer, ensuring complete freedom of equipment specification.
- Each Terminal will feature a dedicated NIAGARA System, equipped with Marathon Hot Standby Functionality on all servers. In the event of one system failing, either of the other two systems can handle the increased load and automatically take over within five seconds.

Conclusion
- A versatile, fully integrated IP-based and web-enabled supervisory system for the many different controls and environmental monitoring sub-systems will achieve improved and integrated site-wide building management.

Powered by

niagara FRAMEWORK™

> *A single, open, fully interoperable and web-based control environment will be created running on HP Servers.*

a single, open, fully interoperable and web-based control environment running on HP Servers. This solution will allow the full fiber ring bandwidth to be utilized, facilitate information and application sharing across the site and guarantee the highest standards of network reliability for the CAAS.
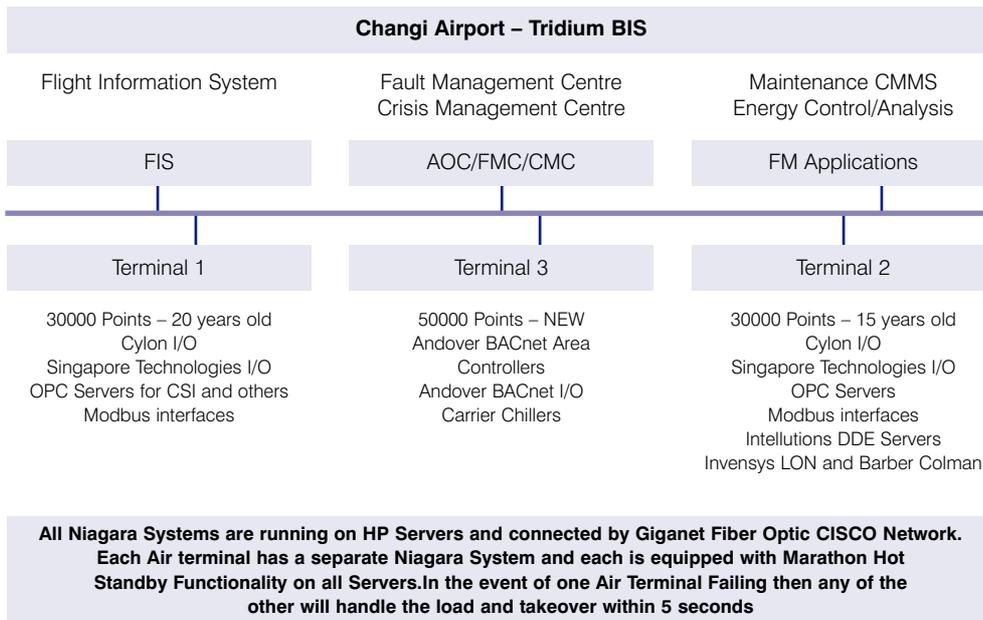
The NIAGARA Framework™ will talk to each controller using its native protocol and respective network in one common, distributed and genuinely open environment, irrespective of controller type and manufacturer. No fewer than eight independent communication protocols are used by devices at Changi Airport, including BACnet, LONWORKS®, and Modbus. By supporting multiple open field bus protocols, this Tridium approach is ensuring complete freedom of equipment specification through best in breed selection on the project. The issue of controls protocol compatibility is rendered irrelevant.

Graphical information will be served up via the NIAGARA Framework™ as web pages to ensure that supervisory actions can

easily take place through any secure access internet connection. These will include data viewing, collection, trend logging and archiving, centralised operation and adjustment of sub-systems, and equipment maintenance, fault-finding, alarm handling and time scheduling.

Each Air Terminal at Changi features a dedicated NIAGARA System which is equipped with Marathon Hot Standby Functionality on all servers. This ensures that in the event of one system failing, either of the other two systems will be able to handle the increased load and automatically take over within five seconds.

The NIAGARA Framework™ will be embedded within Tridium JACEcontrol units installed at different points throughout the Airport complex. Because the control system can be engineered via a web-browser, it is able to support multiple access and parallel binding locations, helping to speed up installation and commissioning time.

Changi Airport – Tridium BIS		
Flight Information System	Fault Management Centre Crisis Management Centre	Maintenance CMMS Energy Control/Analysis
FIS	AOC/FMC/CMC	FM Applications
Terminal 1	Terminal 3	Terminal 2
30000 Points – 20 years old Cylon I/O Singapore Technologies I/O OPC Servers for CSI and others Modbus interfaces	50000 Points – NEW Andover BACnet Area Controllers Andover BACnet I/O Carrier Chillers	30000 Points – 15 years old Cylon I/O Singapore Technologies I/O OPC Servers Modbus interfaces Intellutions DDE Servers Invensys LON and Barber Colman

All Niagara Systems are running on HP Servers and connected by Giganet Fiber Optic CISCO Network. Each Air terminal has a separate Niagara System and each is equipped with Marathon Hot Standby Functionality on all Servers.In the event of one Air Terminal Failing then any of the other will handle the load and takeover within 5 seconds

> *The Tridium CISCO partnership will deliver vastly improved and integrated site-wide building management.*

About Tridium

Tridium is a US based privately held company with their European headquarters in Buckinghamshire and Asia Pacific headquarters in Singapore.

The company has established key strategic alliances with leading corporations in the energy services, building automation and data management industries.

Tridium markets its Framework solutions to a wide range of controls manufacturers, HVAC equipment manufacturers, and a network of Tridium Systems Integrators.

Additional information about Tridium is available at www.tridium.com

TRIDIUM™

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