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GUANZHOU AIRPORT CENTRAL INTEGRATION INFORMATION MANAGEMENT SYSTEM

2005 COMPUTERWORLD HONORS CASE STUDY

TRANSPORTATION

THE TRAVELING PUBLIC AND AIRPORT PERSONNEL MOVE RAPIDLY THROUGH CHINA'S NEWEST AIRPORT, KNOWING THAT THE FLIGHT INFORMATION THEY RECEIVE IS IN REAL TIME AND ACCURATELY REFLECTS THE MOST UP TO DATE STATUS REGARDING THEIR FLIGHTS. **[20055339]**

SUMMARY

China's new Guangzhou Baiyun International Airport opened for business in August 2004, promising to be the most technologically advanced airport in the world. Powered by a state-of-the-art airport operational database and integration system, the new airport streamlines operations management while simultaneously improving the airport experience for passengers. The airport was designed for a yearly passenger-handling capability of 25 million people, apron space for 66 aircraft and a freight-handling capacity of 1.1 million tons. Aviation experts have acknowledged the airport as one of the best operations and management systems ever built because of an integrated system developed by Unisys: the Central Integrated Information Management System (CIIMS). Typical airports today operate multiple heterogeneous systems and every airport implementation project is faced with the challenge of integrating these systems efficiently. CIIMS has now eliminated this complexity forever. CIIMS integrates information flows from systems around the airport, collating and storing data in a central airport database and supplying real time information to the airport community. The Unisys CIIMS Airport Solution is a wide-ranging suite of airport operational systems that caters to the complex requirements of schedule management, daily operations management, resource allocation, centralised accounting and management reporting needs of a modern hub airport. Not only do travelers benefit from CIIMS, but also airport operations are inestimably more efficient. The traveling public and airport personnel may now move rapidly through the airport, knowing that the flight information they receive is in real time and accurately reflects the most upto date status regarding their flights. Agents can better service passengers with check-in information. Contact stands are allocated automatically -- eliminating wait time for in-coming aircraft. Airport power requirements are controlled and costs reduced. Pro-active alerts control apron activity if critical tasks fall behind schedule and are likely to impact flight departure. This includes baggage and cargo loading and unloading, aircraft cleaning, loading meals , refueling, etc. The Guangzhou Baiyun International Airport has changed the paradigm for airport operations around the world, helping to fulfill the promise of simplified passenger travel combined with smooth ground operations.

APPLICATION

Problem: Deliver, to keep pace with progress or die

China's economy in general and the Chinese aviation sector in particular had grown manifold in the past decade. Guangdong Province in South China was fast emerging as an important business and industrial hub. At the same time the old airport in the region's capital, Guangzhou, was rapidly becoming outdated. To keep pace with progress in the region and the country's overall development, the Chinese Government set upon an ambitious project to relocate the 72 year old Guangzhou Baiyun Airport.

In early 2001 construction began for a new world-class airport called Guangzhou Baiyun International Airport. A critical objective of the project was to ensure the simplification of passenger travel while developing a cost-effective airport operation. That meant deploying world-class systems and technologies that would meet and exceed the new airport's requirements, including smooth integration and functioning.

Airport objectives had been promoted and expectations were high. Success hinged on the acquisition of appropriate systems, technologies and, most importantly, a systems integrator that could bring it all together. Based on proven technical expertise, complex project execution track record and a long presence in the Chinese Transportation industry, Unisys was entrusted with the important role of Master Systems Integrator for the new airport.

As the Master Systems Integrator, Unisys had the overall responsibility of supplying complex airport systems and applications, providing the airport communication backbone, ensuring smooth integration of all Airport IT systems and project managing the whole systems integration effort, efficiently and securely -- while also meeting an aggressive schedule.

Solution: A World-Class, Technology Rich Solution Suite Combined with a Carefully Managed Project Delivery Capability

In view of the overall complexity of the project, Unisys chose a controlled, phased approach toward the final solution.

• First, realizing the importance of proven technology, Unisys carefully selected state-of-art applications and systems already deployed successfully in several large airports, such as Paris, France, and Manchester, U.K, to meet Guangzhou's unique requirements. The Unisys solution consisted of five complex airport application suites, three of which were existing airport applications while two were custom-built for Guangzhou. Unisys also provided a unique, intelligent middleware platform to address highly complex integration needs.
• Unisys then worked to clearly define application system interfaces, forecast their interactions in a live airport environment and then develop an appropriate integration strategy. Unisys used a unique project management methodology to ensure effective coordination amongst a large number of systems providers. This proved to be the most complex part of the project and indeed the most critical element.
• Next, Guangzhou's customization requirements needed to be identified, all the applications tailored for Guangzhou, new application modules had to be developed where appropriate, and the entire application suite Chinese-enabled. All the above activities were carried out for multiple systems in parallel for commissioning. This culminated in a thorough internal factory test that quality-certified the applications for delivery before the systems were deployed.
• Unisys then created the entire airport solution in a test lab staging environment. This helped orchestrate the entire airport operation on a mini-scale and also acted as the base platform for End User Training. This exercise provided the necessary confidence to project progress and was an important milestone.
• Ultimately Unisys undertook the large-scale deployment of network, hardware and systems in a production site. This was followed by replicating the proven test lab setup in production, conducting Master Integration Tests and supporting airport organized Trial Runs prior to cutover.

Using this approach, coupled with a relentless team spirit among team members from Unisys and their counterparts from Guangzhou Airport, the world-class airport was 100 percent operational and ready for opening on August 5, 2004. Not only was the cutover successful, but airport operations have been running smoothly ever since.

BENEFITS

The airport -- and its millions of travelers -- continue to reap rich benefits from the world-class solution comprising multiple, complex systems to simplify and automate airport processes, such as schedule management, resource planning, apron management, and flight information distribution.

Some examples of key benefits include:

• The airport can collate, crosscheck, correct and finally distribute accurate Daily/Seasonal Flight Rosters to all airport-automated systems. This information is fundamental for day-to-day operations of all the IT systems in the airport and enables all systems to use this schedule information as the basis for daily planning and subsequent execution. This capability is provided by the Unisys FIMS (Flight Information Management System) application.
• Passengers, airline agents and airport staff are able to receive accurate flight information in real time. Airport staff are now able to use this updated information to re-plan operations if required. Passengers have also benefited from availability of accurate information from systems such as Flight Information Display System (FIDS) and Call Centre. This capability is managed by the Unisys Airport Operations Management System, a database that feeds all airport systems via the custom built Unisys middleware backbone
• Using the Unisys Operations Resource Management System, the airport is able to efficiently allocate fixed resources such as aircraft parking stands, boarding gates, baggage belts, check in desks, etc, based on custom criteria. This has eliminated or substantially reduced the time that incoming aircraft have to wait on the taxiway for parking slots to be assigned. Passengers are able to quickly collect their bags at optimally assigned carousels, thus avoiding long queues and delays.

• The Unisys Airport Operations Management System publishes real time resource allocation and usage information (such as gates, check in desks) to the Airport Building Management System. Building Management System in turn uses this information intelligently to turn on/off electrical equipment enabling the airport to reduce operating expenses by optimizing power consumption.
• Another Unisys system, Apron Management System, allows Ground Handlers to plan their aircraft and field handling services, determine resource requirements, monitor servicing activities, and collects statistics and other data leading to better airport performance. For example, by comparing the First Bag loading versus Last Bag handling times of an arrival flight, the airport can enforce performance monitoring on baggage handling and identify poor performers. Airport staff can closely monitor and record data for detailed tasks such as aircraft cleaning, loading meals, loading and unloading bags and cargo, refueling, air bridge attachment, and more. This allows staff to pinpoint reasons for delays, if any.

By using the Unisys CIIMS airport solution, Guangzhou airport provides on time flight operations, smooth ground handling, efficient resource management and an enhanced passenger experience at the airport.

Deploying user-friendly systems with highly intuitive man-machine interfaces and specialized usability features has enabled the airport's operations staff to adapt to the complex automation systems relatively easily and allows them to perform day-to-day operations efficiently. This has been a major factor in the continued smooth operations of the airport since the systems were enabled.

IMPORTANCE

Guangzhou Airport management envisioned modern airports as a community organizations run along a business enterprise model. They understood that the key enabler for the transformation from a traditional airport to modern hub airport would be information technology solutions.

By entrusting Unisys, an experienced and reliable player in the global transportation market, with the key responsibility of information systems design and development, integration, commissioning and project management, the airport was able to focus entirely on the their core business -- how to run an airport efficiently, effectively and safely.

Each IT application supplied by Unisys provides simple easy-to-use solutions to complex day-to-day airport operational problems. As an example, deciding which parking stands to use, for which aircraft, for how long, etc, is a complex optimization problem that relies on numerous factors. Efficient parking resource management is vital to ensure that aircraft do not stall on taxiways while waiting for available parking space. To solve this problem, Unisys delivered a world-class Expert System called Operations Resource Management System, which is currently operational at Aeroports de Paris. This system uses advanced algorithms, rule based computing and optimization techniques to automatically derive the most efficient resource plan for the airport on a daily basis. Similarly Unisys applications help distribute critical flight movement information instantaneously from Air Traffic Control to Passenger facing applications like FIDS (Flight Information Display System), DCS (Departure Control System) that helps provide better, more efficient, passenger service.

The continued smooth running of the airport, based on Unisys supplied systems and applications, is testament to the reliability, stability and dependability of the Unisys solution as well as the importance of information systems in day-to-day airport operations.

ORIGINALITY

Though some of the applications in the Unisys solution were selected from Unisys applications deployed at other major airports across globe, there were several original applications and techniques in the current solution put together by Unisys specifically for Guangzhou Airport. These include:

Technical:
A state-of-art, first of its kind Airport middleware backbone called CIIMS (Central Integrated Information Management System) middleware running on award winning technologies, including CORBA, MQ Series and Java. Incorporating features such as advanced routing, resiliency and message distribution features, this is the “information highway” that facilitates communication and collaboration among all the IT systems (Unisys and non Unisys supplied) of the Guangzhou Airport today.

Unisys also developed a unique XML-based messaging framework for the data exchange needs of

airport IT systems. This is a comprehensive set catering to varied data items like Schedule Data, Operational Data, Resource Information, Topology Data, Aviation Data etc and comes with its own well defined set of Rules, Constraints in a Schema Definition.

Business:
A state-of-art, one of its kind Apron Management System (AMS) helps manage Airport Ground Handling Services. Its features include Ground Handler Contract Management, Daily/Seasonal Service Planning, Service Resource Allocation including personnel and equipment, Service Execution Monitoring in real time, Service data collection and Performance Reporting. This system designed for operation in an airport community environment is essential for efficient Ground Handler Operations. It promotes a decentralized airport operations model, in which the Airport serves as a Supervisor/Coordinator of Ground Handling companies, monitoring their performance. The onus is on the individual Ground Handler to perform day-to-day operations and that also fosters a healthy competitive atmosphere.

Project Management:
A unique Systems Integration Strategy built around well-defined project specific processes and published using Unisys documentation standards. The project execution was aided by a unique and simple Project Management Office (PMO) Application that helped various project activities including agendas, meeting minutes, project records, action items, application defects, change control records, deliverable tracking and project communications. This was extremely useful in ensuring the multitude of project members located across the globe interacted in a meaningful and collaborative manner, thus contributing to project success.

SUCCESS

Entire live airport operations (including real passenger and cargo flights) were transitioned from the old airport to the new airport premises “overnight.” This "cutover" was one of the most critical milestones of the project and was extensively observed/covered event of the region. To the credit of Guangzhou Airport management and the Unisys delivery team, the transition was smooth and completely incident free. This is no mean achievement considering the fiascos of similar scale airport projects around the world.

Thanks to Unisys Solution, the new airport already handles about 20,000 flight movements and 2 million passengers on a monthly basis and this is a constantly growing number. These capabilities elevate the airport to the same class of international hub airports of the region including Hong Kong, Beijing and Singapore. And it is now well positioned for further growth and transformation into a major international transportation hub of South East Asia.

“By delivering a world-class solution, Unisys has enabled Guangzhou International Airport to be equipped with the best information systems infrastructure amongst Chinese Airports”
Mr Cui ZiHui Deputy Director, MIS, Guangzhou Baiyun International Airport.

DIFFICULTY

A long duration systems integration project is more difficult from a project management perspective than from a technical perspective. There were several challenges that taught valuable lessons in the course of the project.

Coordinating multiple parties, assisting them to agree on a common agenda and decision making without compromising quality was the key challenge. To realize project integration needs, Unisys had to interface with numerous external parties either along with or on behalf of Guangzhou Airport. These included State-owned organizations, such as air traffic control, i.e., TravelSky; private airlines, such as China Southern; external airport system suppliers, such as SITA, Info Logic, Crisplant and Johnson Controls; and many others.

Adding to the complexity, these parties came from varied geographical and cultural backgrounds including China, Singapore, France, India, Denmark and the UK. Unisys tackled this problem by enforcing strict adherence to project processes, mutually agreed-upon documentation guidelines and standards, and using efficient communication mechanisms to constantly control the project.

Next, was the task of eliciting true project requirements. And having to interact with multiple parties to gather overall requirements made the task even more difficult. Unisys overcame these types of problems by educating the customer on Unisys processes, and by publishing well-defined requirement

baselines agreeable to all parties. Any issues were resolved amicably with the interest of the project and the "need to succeed as a team" dictating ultimate decisions.

The vision of having a large pool of technical resources on ground proved invaluable during the most trying phases of Master Integration Testing and Trial Run in production environment, where every system from every vendor was first subjected to real life situations.