POSSIBLE SOLUTION OF THE AIRPORT INFORMATION SYSTEM INTEGRATION

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Abstract

Airport Operational Database is the enabler of airport system integration. The overall information technology strategy within airports comprises multiple specialist application systems, such as Flight Information Display System, Baggage Handling System, Building Management System, Air Traffic Control etc., which are purchased to provide specific application functionality.

The Airport Operational Database integrates the information from these specialist systems and provides:

- Central storage for a wide range of airport data;
- Access to the data from any client user or system;
- Distribution of selected data to any airport system.

This paper provides details on the Airport Operational Database, the latest solutions available at airport information system integration and the current project at Budapest Ferihegy International Airport.

Keywords: air transport, airport operational database, integrated information system.

1. Introduction

An airport today is a microcosm of a big city environment. Multiple tenants including suppliers, airlines, security organisations, retail functions and airside and landside operations create a complex mixture of networks and communication solutions.

An integrated multi-service network enables the operation of every process within an airport environment. With an underlying operational communication infrastructure core processes can be consolidated across core airport operations such as airside, landside, safety and security and operations. These include security surveillance, baggage management, check-in and gate facilities, internet, voice and data access, retail concessions, e-learning and training and airport operational and support services.

2. Airport Operational Database

The main objective of an Airport Operational Database is to provide a single centralized store of airport operation data for use by internal and external business partners to the airport operator. The Airport Operational Database provides standard connections for all users to send and receive data and represents one method for an integration platform in the airport environment.

Other features of an Airport Operational Database typically include operational data replication, global data dictionary, data distribution, store and forward capabilities, data security and archiving.

The airport operational systems integrated into the Airport Operational Database typically include the Flight Information Display System, Baggage Handling System, Building Management System and the Security System. The internal airport users of the Airport Operational Database may be non-operationally critical airport systems such as the financial systems and maintenance management systems. Examples of external users are airlines, cargo handlers and government agencies such as customs and immigration.

Open access and distribution of information to any user is a major feature of the Airport Operational Database Systems. It is a specific design aim that the system should use well accepted industry standard interfaces [1]. As a result, the task of integrating external application systems is simplified and can be easily achieved at minimum cost and risk.

2.1. The Reasons for Establishing an Integrated Information System

Providing efficient and real-time information to all customers and business partners – both internally and externally – and operating the aircraft traffic constitutes the key factors determining the success of a modern airport. The reasons are the followings:

1. continuous rise in the volume of air traffic and consequent data;
2. the growing number of the business partners requiring identical information for the most diverse applications in a more customer-specific way and more rapidly than ever before;
3. furthermore new security requirements mean that an airport must maintain a manageable and fully integrated security network that encompasses passenger security (both airside and landside) and include security, employee access and verification, terminal access for in-terminal monitoring and surveillance. While security systems share the goal of protecting the flying public, most of them operate independently within an airport [2].

Because of the dynamic conditions in air traffic and the attendant changes in business routines, airports require a high degree of flexibility to modify IT systems to address the new challenges. With the modern IT solutions designed to streamline

information flows, vendor companies can help airports to relieve staff from routine tasks while enhancing their competitiveness.

Having accurate operational information at the correct time is vital for every airport, whether operating a new or existing facility. The vendor companies offer two important functions to achieve this goal:

- The primary role of the Airport Operational Database is to act as the central repository for operational data which are typically sourced from different application systems.
- The secondary role is to control information exchange between application systems. This is provided by the so-called Information Manager. Information distribution is a particularly important requirement and allows accurate information to be exchanged between multiple application systems.

2.2. The Integrated Data Model

The most common Airport Operational Database Systems have been designed as the central hub for integration of systems throughout an airport. These systems act as catalysts for achieving airport system integration. They provide highly available data storage and distribution in a controlled and structured way. Informations held in the systems include seasonal, current and historic flight informations as well as informations required for the efficient and cost-effective management of the complete airport environment.

In a well structured Airport Operational System there are stored data for a multiplicity of applications, networks and users: operational data from airline hosts, airports, scheduling conferences, etc. [3].

The followings are the most common data in a well structured Airport Operational Database [4]:

- Data to feed Flight Information Display System, Baggage Handling System, WEB and WAP users,
- Data for planning, operations and statistical analysis.
- Data completed and verified for administrative applications to provide full invoicing of fees and services
- Data for cargo management and fuelling
- Data for schedule, daily operations and historical consolidated files.

Airport Operational Database stores complete and up to date information on flight programs and airport resources: acting as a core knowledge base it disposes of user rules that control the decision logic to program schedules, ramp operations, personnel models for future real or simulated operations. With the capability of real time response the system can face quickly and successfully interruptions and irregularities in the programmed flow of operations and to non-planned events. Airport Operational Database keeps an accurate and reliable historical database of

all past operations as the main resource for the statistical analysis and modelling of the Airport Handling Enterprise.

The integration of all static and dynamic handling data in a unique database allows that any information request is fulfilled only with the most recent certified data.

2.3. The Procedures within an Integrated System

Airport Operational Database represents the foundation on which all applications are based that concur to the Operational management of the Airport, both airside and landside: messaging, integration, co-ordination and data diffusion in the airport area, region and WEB.

Airport Operational Database can be the backbone of all airport applications: Simulation, Communications, Message Controlling, Scheduling, Operations, Resource management, Customer Care, Enterprise Analysis, Administration, Contracts, Cargo Handling etc. External applications as Flight Information System, Baggage Handling System, Departure Control System and local Departure Control System acquire from the Airport Operational Database the forecast and real time operational data. Other applications can easily be connected to the Airport Operational Database via the Message Controlling System or dedicated gateway.
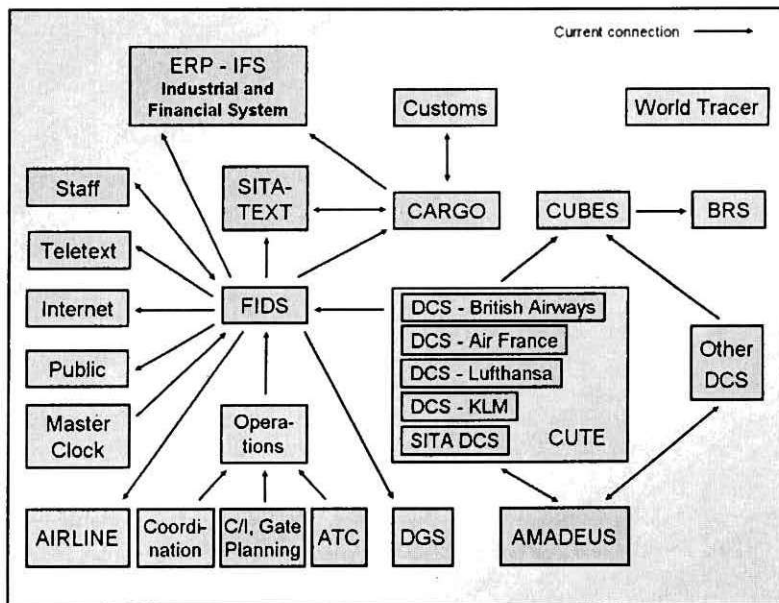

Fig. 1. Current Information System Structure at Budapest Ferihegy International Airport

The best solution is if the Airport Operational Database is seen by users only through client presentation screens. In this case all interactions, commands and relations are input via menus with little if any manual input. All constant and operation data tables as Airport IATA codes, IATA and ICAO Aircraft type codes, Airline descriptors etc. must be stored in tables accessible by all installed applications [5].

Highly reliable security tools should grant that the data are accessed only by authorised personnel with different levels according to the user function, either as data read or modification.

According to international airports' experience an Airport Operational Database can operate with Oracle 8i relational DB for Windows, UNIX or Linux platforms. It is a big advantage, if the structure of the relational database is optimised to grant quick access and optimal performance. All the informations stored in the Airport Operational Database must always be valid and coherent due to formal and content checks performed by the applications that feed the Database.

Through the application interfaces it is possible to exchange data with external systems through standard languages. Any access, input or output must be logged.

All users involved in Flight Data Processing can access data acquired and processed by others: as an example the N-AITEC [6] Application Operations OCS receives data from Clearance and its processed data are immediately available for Resources Management System; Resources Management System receives forecast schedule data from Clearance and updates OCS with data processed by it. All packages then feed the historical database for data analysis and administration for billing.

Another example is FAIS [7]. Their Airport Operational Database has been designed for future expansion and integration into the airports' existing system architecture. It provides services for the collection and transmission of information. These facilitate the flexible connection to external applications (e.g. slot co-ordinators' systems) and smooth operation of diverse communication services and protocols, such as SITA, CUTE or EDIFACT. Consequently, the airport personnel, relieved of repetitive activities can concentrate on essential tasks and operations resulting in an optimum service for all customers at the airport while minimizing staff input.

3. Airport Operational Database Project at Budapest Airport

The purchase and implementation of an Airport Operational Database is often a long and costly project for an airport. Usually, the solution is to delegate to the supplier for the entire project, but this is very dangerous, because the airport can only exercise limited influence on it. That is why the management of Budapest Ferihegy International Airport decided to prepare for an open tender. In the near future experts of Budapest Ferihegy International Airport will work together with the winner tenderer on the detailed analysis of the present information systems and

on the planning and installing of the Airport Operational Database, which meets all the technical and functional requirements of the Airport.

The present system architecture at Budapest Ferihegy International Airport can be seen in *Fig. 1*. Flight Information Display System (FIDS) is in the centre: the passengers and the staff person, the airlines and the Docking Guide System (DGS) can get information from the FIDS. FIDS is collecting data from Air Traffic Control (ATC), from Coordination and Check-in and Gate Planning through the Operation Control and from the DCS (Departure Control System). Budapest Airport operates plenty of DCS through CUTE (Common Use Terminal Equipment). The baggage is controlled by BRS (Baggage Reconciliation System), fed with data through CUBES (Common Use Baggage Enterprise System). World Tracer is for seeking of lost baggage. The total system is very complex; furthermore we have to keep in mind that there are plenty of internal connections to other international airports as well.

The planned Airport Operational Database with its software will handle the processing, storage and distribution of all flight information and operational data for Terminal 2/A and Terminal 2/B. The data input will take place via an automatic interface with the central system of Terminal 1. The flight information will be displayed on more than 400 LCD monitors at the check-ins, transfer desks, gates and other areas and on almost 200 overview monitors all over the entire terminal 2 building. The information will also be distributed to split flaps and kiosk terminals.

Plenty of subsystems will be connected directly to the Airport Operational Database as it can be seen in *Fig. 2*.

According to Budapest Ferihegy International Airport's strategy the first step will be the Flight Schedule Planning module, which will enable smooth processing of flight schedules and their expansion with all flight-event relevant information. All scheduling and operative processes will be handled, ranging from the automatic transfer of the Seasonal Flight Schedule data, the generation of Daily Flight Schedules to the processing and provision of billing data. It will be possible to ensure user-friendly operation with graphical user-interface. Particular emphasis has to be placed on implementing plausibility checks to facilitate early identification and avoidance of operator errors.

Later on other modules of the system will be put into operation step by step. With the installation of complete Airport Operational Database Budapest Ferihegy International Airport will have manifold benefits [8]:

- Easy management of the main database, a graphical interface for managing the entire database.
- Support and fulfilment of all terminals' operational and commercial data needs.
  Secure, easily-maintained and managed procedures.
- Incorporation hardware and software platforms for data collection, processing and distribution.
- Practical, cost-effective and capable of easy expansion and simple interfacing with other systems.
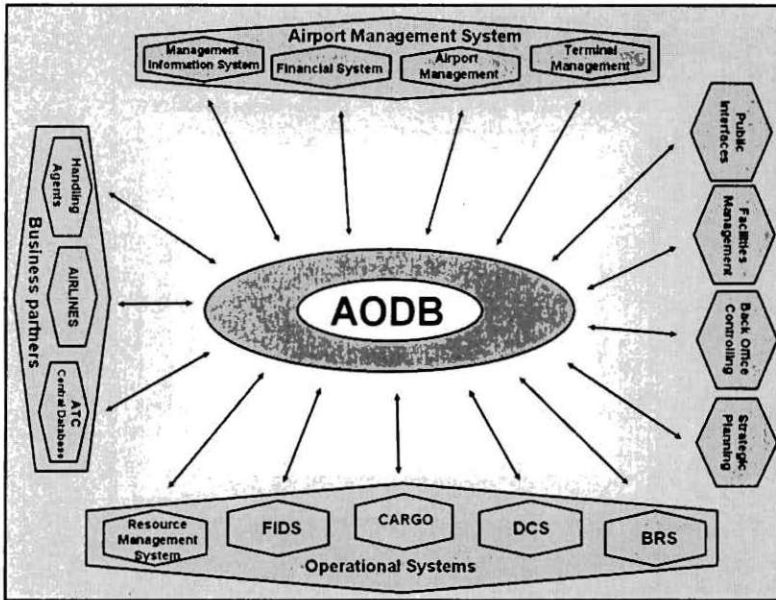- User-friendly interfaces, documentation, and standard operation.

Fig. 2. Budapest Ferihegy International Airport's Vision about Airport Operational Database and the Supporting Systems

- Full integration with existing terminal data networks and related facilities.

- Integration of a centralised infrastructure for the operation, administration and management of the airport.

- Efficient and automated allocation of airport resources, such as gates and stands, check-in counters, baggage carousels, and so on.

- Display of flight and airport facilities allocation data to the airport's flight information display system.

- Provision of information to terminal retail tenants including data for seasonal planning, forecast and real time passenger flow profiles.

- Storage of statistical data and generation of reports.

- Provision of a database for the storage of historical data for further analysis, future simulation and comparison.

Nevertheless the Airport Operational Database will be continually developed with new modules based on the continuously arising needs of the airport and of course the passengers.

4. Conclusion

Conceived and developed as the core system of our integrated information systems, Airport Operational Database with its supporting systems operates optimally in conjunction with other system solutions for display management, resource management, airspace information monitoring, flight-noise monitoring, cargo handling and communications in the world-wide SITA network [9].

Overall, the Airport Operational Database with its supporting systems has to handle the several airport areas and provides the bases for subsystems, which can communicate and exchange real-time information in a secure and reliable manner.

In the near future effective information management will become an ever-more important competitive factor. That is why it is indispensable for the Budapest Ferihegy International Airport to develop an Airport Operational Database.

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