Airport Information Technology & Systems (IT&S)

BEST-PRACTICE GUIDELINES FOR THE AIRPORT INDUSTRY

AIRPORT CONSULTANTS COUNCIL

Second Edition – January, 2012

AIRPORT INFORMATION TECHNOLOGY & SYSTEMS (IT&S)

Best-Practice Guidelines for the Airport Industry

Airport Consultants Council

908 King Street, Suite 100

Alexandria, VA 22314

703-683-5900

www.ACConline.org

AIRPORT INFORMATION TECHNOLOGY & SYSTEMS (IT&S)

IMPLEMENTATION GUIDELINES

Note to electronic document users: To access any section from the table of contents, mouse over the section name and press the control key, then click your mouse. You will be taken directly to the section you desire.

1 INTRODUCTION

The introductory section describes the purpose, scope, and background for information technology and systems guidelines. It also lists the professionals and their respective firms who have generously contributed their time and resources to this effort. Finally, this section provides instructions on how to propose enhancements and changes for subsequent revisions of this document.

When considering airports, most people think of the airfield, terminals, people movers, roadways, and rail used to flow passengers to baggage, cargo, large and small aircraft, buses, shuttle vans, automobiles, rental cars, trucks, trains, etc.

Often overlooked, however, is the hidden infrastructure of Information Technology and Systems (IT&S), which enables the airport and all of its intricate facets to efficiently and safely function minute-by-minute and day-to-day.

Airport managers and operators have become increasingly dependent on IT&S to increase their airport's capacity and security. IT&S has become a critical component of airports, supporting all phases of their lifecycle—from development to operations, maintenance, and renewal and replacement.

1.1 Purpose

These guidelines apply to all airports and the key personnel responsible for their proper development, operation, and maintenance. This technical document is intended to serve as best-practice guidelines for the airport industry.

The ACC IT&S Committee seeks to further the proper planning, design, construction, and commissioning of IT&S for airports. These guidelines provide a holistic framework of information technology systems that should be taken into consideration to accommodate the needs of the airport industry and each airport's stakeholders. They emphasize IT&S involvement during the early planning and budgeting phases of airport capital improvement projects (CIP) and describe the appropriate processes used to accomplish successful IT&S implementations alongside an airport's CIP.

Whether it is a refurbishment project or a new terminal project, these guidelines can promote better planning, engineering, construction, and commissioning. They consider requirements not only from an initial deployment standpoint, but also in terms of ongoing operational issues.

1.2 Scope

The purpose of these guidelines is to provide a comprehensive list of systems that should be planned for in an airport and to describe why each has particular relevance. This list includes an overview and description of each system, how these systems fit into airport operations, and how to integrate them into an overall project. These guidelines may be used during:

- ***Planning***
- ***Budgeting***
- ***Design***
- ***Procurement***
- ***Construction***
- ***Deployment***
- ***Commissioning***
- ***Acceptance***

These concepts are intended to assist with the general incorporation of IT&S and are not intended to be perceived as hard-and-fast specification requirements.

Each system may or may not be necessary for a particular project, depending on business goals and objectives. When designing an airport, experienced professionals must evaluate each system, and determine its relevance for a specific airport. In addition, for each IT&S system deemed necessary, the designer should ensure proper application and integration of the hardware, software, and user interface components.

Due to unfunded federal mandates, fluctuating economic environments, and evolving technologies, airports require flexibility to accommodate new security requirements, airline business models, and passenger service expectations, often within short timeframes.

As a result, more airport owners are considering common-use or shared-tenant facilities at their airports to better control and manage their assets. Common-use facilities should strive to provide value and benefit to the tenants at the airport. Common-use facilities can include shared counters, gates, baggage-handling systems, communications, telephone systems, and information-display systems. For many airport operators, the more “common use” facilities become, the better.

Value associated with the proper use of technology is becoming more and more evident in all aspects of the modern airport terminal. A good example is the increasing adoption of Internet check-in and self-service kiosks. This technology affects passenger flow models, terminal designs, dwell times, and many other critical aspects that were previously non-existent, including creating new types of jobs and replacing old business practices.

As the business relationship between airports and airlines changes over time, the most appropriate provisioning (dedicated use, preferential use, or shared use) model for a particular resource may also change. The flexibility to change the use of fixed resources (gates and counters) should be a functional outcome of properly designed IT&S. With this growing use of information technology systems, it has become essential to plan for IT&S at the genesis of the project.

Industry standards are becoming increasingly important as IT&S continues its “convergence,” allowing interactivity and compatibility between traditionally divergent systems. There are several established industry standards available and necessary for the proper design and implementation of technologies. These standards should be used to develop designs that are relevant for efficient operations, industry compatibility, and future IT&S deployments. Industry standards also assist the stakeholders in procuring spares, replacements, ongoing support, and systems integration.

These guidelines serve as a tool to ensure the consideration of all IT&S requirements for an airport project. They provide the rationale and methodology for early planning and sound deployment. They should assist the airport community in making airports the most efficient facilities possible while providing the highest levels of customer service, safety, and security to the traveling public.

1.3 Background

Historically, the airlines, rather than the airport owners, have been the major decision-makers in purchasing IT&S at airports. In fact, during the 1970s and 1980s, airlines procured and installed almost all IT&S systems. This was because airport operators mainly focused on the safety, security, and maintenance of the facilities while the airlines focused primarily on operations.

As unstable airline financial statements became commonplace, airport owners started to take greater control of their facilities and assets. For many years, airport owners in Europe and Asia have managed the operations of an airport, including passenger-processing infrastructure, baggage handling, catering, below-the-wing services, and the communications infrastructure. Now, in the US, airport owners also implement shared tenant services and facilities. IT&S, a key enabler, allows airport operators to manage infrastructure efficiently while providing an increased level of customer care. Technology facilitates changes in business processes and these processes became part of how airlines differentiate themselves. Today, proactive airports support their tenants’ customer-service initiatives and IT&S helps make this possible.

During this transition period, the industry has lacked appropriate IT&S design guidelines. Frequently, airport master plans inadequately mention IT&S requirements, and consequently, during the design phase, isolated and stand-alone designs of IT&S can evolve with no consideration for business requirement support.

As a result, in 2008 the Airport Consultants Council (ACC) commissioned the ACC IT&S Committee to assist the aviation community by developing these IT&S guidelines. They are intended to support an airport owner’s business objectives early in the planning phase. Too many times in the past, the design of new airport facilities have proceeded, giving minimal attention to IT&S. As a result, once it was discovered that IT&S was required, airport owners had to redesign their facilities with insufficient funding and inadequate budgets.

This guide was updated in 2011 by the ACC IT&S Committee to reflect a number of updates in best practices, technology and standards.

1.4 Contributing Professionals

Members of the ACC IT&S Committee developed these guidelines by volunteering their time, knowledge, experience, and resources to help the airport industry achieve the highest quality levels in IT&S at airports.

Air-Transportation IT Service, Inc.
*Mark Sapp

ARINC
Dennis Lengyel

Arora Engineers, Inc.
*Earl Carter, *Samuel Donelson
*Manik Arora, P.E., *Nicholas Ryan,
*Jason Shevrin

Airport Process Design
Ron Hiscox, Rachel Domba

Convergent Strategies Consulting, Inc. (CSC)
Marco Prieto,

Daktronic, Inc.
*Todd Lambert

AECOM
David Tamir, Herb Shipp, Lewis Barnum,
Peter Dallaway

Glover & Associates
Heath C. Kolman, PE

Cisneros Incorporated
David Barron

Paragon Project Resources, Inc.
*Enrique M. Melendez

Roy D. McQueen & Associates
Peter Yip, P.E.

SAIC
Hal Ludwig, Scott Barbier,
Mahil Abeywarna

The Jim Willis Group
*Jim Willis

SITA
John Powell, Adrian Wang, *Jim Willis

Stellar Services
Liang Chen

XIP Consulting, LLC
*Heath C. Kolman, P.E., RCDD

(*) Participated in Revisions 2010-2011

1.5 Proposing Revisions

The ACC IT&S Committee intends to update and enhance these guidelines over time as appropriate. Direct recommended additions and suggested changes should be directed to:

Airport Consultants Council
Information Technology & Systems Committee
908 King Street, Suite 100
Alexandria, Virginia 22314

Phone: 703-683-5900
Fax: 703-683-2564
E-Mail: TJS@ACConline.org

2 AIRPORT IT&S GOVERNANCE

This section of the design guidelines examines the critical elements for effective IT governance and the need for incorporating these frameworks into corporate governance. It also identifies how CIOs/IT Directors need to be prepared to support IT oversight committees at the board level. Even though airports are not necessarily publicly traded companies, the principles behind IT governance and how airports should support such principles will allow for greater airport management and operations efficiencies.

2.1 Introduction

The federal regulatory environment has intensified governance and risk management demands on CEOs, CFOs, and their boards of directors. The significant amount of money that companies spend on information technology, and the strategic opportunities and risks those investments present, necessitate board-level involvement. Hence, IT executives today are judged by their corporate boards on their ability to optimize the outcome of IT—producing cost-effective business results. It is no longer enough to focus on completing IT projects or on managing IT outcomes. That is why leaders embrace effective IT governance strategies to manage the priorities, processes, and people required to run IT like a business.

Three strategic business issues drive the demand for IT governance:

Control – the need for better control over IT costs, risks, and resources to improve credibility

Compliance – the mandate to meet proliferating compliance requirements by harnessing IT to automate processes and controls, manage compliance projects from concept through production, and provide reliable audit trails

Alignment – the need to align IT priorities and activities with business objectives to maximize the business value delivered by IT

2.2 What Is IT Governance?

IT governance is the framework made up of the processes that govern decision making around investment decisions, client relationships, project management, and other IT operational areas.

Effectively governed IT brings control, compliance, and alignment to the enterprise, enabling companies to reduce the cost of day-to-day operations and free up more resources for the strategic initiatives that improve competitiveness. Effectively governed IT brings those strategic initiatives to market faster and with less risk. It documents contributed business value and ensures that the business operates within government-mandated requirements.

A typical large corporate IT budget allocates 20-25 percent for strategic projects. The remainder, 75-80 percent, supports day-to-day activities. At airports, Capital Expense is at 45 percent and Operating Expense is estimated at 55 percent (according to ACI's Airport IT Trends Survey –

2006). As a result, IT governance must ensure the performance and effective management of these operational requirements. Equally important, with IT budgets remaining tight at most airports, reducing expenditures on day-to-day activities can free up additional resources for strategic projects. Thus, for both cost and compliance reasons, both kinds of activities—strategic and routine—must be governed effectively in an integrated fashion, with common visibility and control for both.

IT Supports Corporate Governance:

Corporate and IT governance are now intimately intertwined. In an era where technology is critical to business, corporate governance is incomplete without adequate IT governance.

IT governance is the CIO's responsibility, and it is carried out at the department level. CIOs whose departments practice sound IT governance are better prepared to meet the demands of board-level IT committees. However, CIOs must establish and deliver IT governance whether or not their board operates a technology committee. IT governance helps CIOs ensure that their technology investments and daily IT activities align with top-level objectives. Ideally, boards should have a group dedicated to IT governance. In those cases, the CIO must be prepared to work with and answer to an IT oversight committee—just as the CFO works with and answers to the audit committee.

An effective IT governance framework can be the single most important predictor of getting value from IT. As a result, IT governance must be more coordinated and more transparent. To optimize IT's business outcome, IT governance must reflect and incorporate business language, priorities, and processes to gain buy-in from the business-side leadership. It must also include an engaging, meaningful, and transparent way for business-side leaders to participate. IT must speak the language of the business in describing how IT can improve operating margins and return on investment and how it can help achieve the company's strategic priorities.

2.3 IT Governance Success Factors

Although the model for IT governance varies from airport to airport, an effective framework covers six areas:

2.3.1.1 Effective Decision-Making and a Strong Focus on Process

Devising clearly defined processes represents the most challenging component of IT governance. CIOs and IT managers need to start by defining the goals for each aspect of IT governance. Potential IT governance objectives include: reaching an effective decision on whether a project should be approved; identifying the project's priority in the context of IT and business objectives; and determining how funding will be structured for a new investment. The processes that support those objectives must address the many IT operational areas that investment decisions affect: security policy, business continuity policy, IT architecture, development standards, supplier policies, centralization vs. decentralization of IT management and resources, and ownership and usage policy and processes.

2.3.1.2 IT Project and Systems Portfolios That Align With Business Priorities

The importance of aligning IT projects with business objectives has been well documented. Still, an over-emphasis on project management should not obscure the fact that the majority of work performed by an IT department does not involve projects, but rather operations and maintenance. Although project portfolio management can and should serve as an important process in an IT governance context, CIOs should understand that portfolio management processes also apply to the IT systems and the non-project work that the rest of the business depends on. In doing so, they can make better decisions about the value of systems—and when to replace them.

Key considerations include:

- The alignment and integration of business and IT planning
- The total amount of resources (financial and non-financial) to be devoted to IT
- The allocation of IT spending and resources between business units
- The criteria for assessing the value of proposed investments in IT-related projects
- The relative priorities to be established for investment alternatives
- Accountability for realizing the benefits of investment projects
- New IT investment funding and usage and chargeback policies

2.3.1.3 An Efficient, Cost-Effective IT Department

The size of the IT line item in most airport budgets demands that IT departments operate in a transparent and measurable manner. CIOs must be prepared to demonstrate their departments' efficiency through up-to-date documentation and metrics. IT governance programs can also improve relations between IT and the business. Once the IT governance is in place, the CIO can talk the language of the executives and the CFO. This allows the CIO's planning efforts to be aligned with those which are practiced by other business leaders in the company.

2.3.1.4 Strong Decision Making by High-Performing IT Employees

Effective IT governance includes the assignment of decision-making responsibility. Who is responsible for different IT governance decisions? If IT employees make decisions that support higher-level business objectives, their performances should be evaluated based on the quality of those decisions. IT managers need to clarify when an individual is required to make a decision and when collaboration is necessary. They must also understand what information is required for corporate decision making and how it is communicated.

2.3.1.5 Satisfied Customers

The most client-focused activity that IT managers and employees perform involves the managing and fulfilling of requests from their system users. That work is unpredictable and difficult to manage and guide without clear processes and documentation. Yet those difficult-to-measure, qualitative activities must be managed and measured if CIOs are to understand fully the cost of systems, projects, and the overall effectiveness of operations.

2.3.1.6 Complete Audit Capabilities Supporting Each of These Points

Processes play an important role in effective IT governance, but to bear fruit those processes must be documented and continually monitored. Proper governance requires accountability as well as measurement. In addition, processes and procedures must be both detailed and documented to show that IT has a consistent approach to solving the issues across the company. Finally, essential governance ensures that an enterprise derives maximum value from its IT investments. IT executives should weave personal as well as departmental accountability into any IT governance framework. CIOs must have at their disposal accurate and timely information in order to present themselves well in the boardroom. Just as CFOs are called upon to drill down into the origins of consolidated financial information, so will more CIOs be asked to present high-level measures of IT governance. Boards will ask CIOs to explain how and why they derived specific numbers and how they can more effectively drive top-level objectives. Additionally, CIOs need to justify new investments by presenting detailed information that sheds light on the value of past investments in similar projects and systems.

CIOs must avoid the following pitfalls that commonly weaken IT governance efforts:

- Inadequate participation by business management
- A lack of clearly defined governance processes
- A lack of clearly articulated goals
- The failure to monitor ongoing performance
- Insufficient links to individual performance—Individual IT employees should be evaluated, in part, based on the degree to which their performance supports and furthers IT governance principles.

- Cultural breakdowns—the most common obstacles to effective IT governance. These obstacles include organizational friction, poor communication, weak enforcement, and cumbersome processes. Organizational culture wields a powerful influence on the success or failure of governance mechanisms. Specific governance goals and decision-making criteria must be clearly articulated to individual IT employees.

2.4 Path to Effective IT Governance

Effective IT governance must reflect an individual airport's structure, goals, and styles. What is common, though, is the need to maintain control over IT initiatives and operations, ensure compliance with external and internal mandates, and align IT investments with business priorities while efficiently executing the business of IT.

Governance is most effectively implemented through a single system of records that digitizes workflow. A system-of-record for IT governance shows demand, portfolio, programs, projects, resources, costs, and changes, with digitized processes that enable work to be executed efficiently. Such a system also provides corporate and IT leaders with business intelligence "dashboard" capability, providing instant visibility into initiatives and operations.

So how does one begin the transition to a digitized workflow process? The answer is to do it incrementally. The most common entry points are demand management, IT portfolio management, and project visibility and control.

Note, however, that unless an IT governance structure ultimately incorporates the workflow for routine, day-to-day activities, it will fall short of optimizing overall IT operations since these activities (including IT services, application change management, resource allocations, etc.) constitute 75 percent or more of most IT budgets.

2.5 A Board-Level IT Oversight Committee Outline

The mission of board-level IT oversight committees is straightforward. They need to provide high-level guidance for IT investments and evaluate the degree to which those investments and IT department performance align with business objectives and the strategic planning. IT committees also need to share their evaluations with the rest of the board of directors on a regular basis. Below are examples of objectives for an IT oversight committee:

- Advise senior business and IT management in developing operating and strategic plans that take full advantage of existing and emerging technology
- Review proposals for potential technology investments
- Oversee major IT-related projects and technology architecture decisions

- Monitor the performance of IT throughout the corporation and ensure that it effectively makes a contribution toward stated business and strategic objectives

2.6 Configuration and Change Management (CCM)/IT Reports Problem System

One of the important processes within the IT governance is managing a system engineering process called configuration and change management. Another equally important process is to track IT challenges.

Tracking an airport's infrastructure configuration throughout its lifecycles is key to achieving efficiency in developing, operating, and maintaining an airport. To do so, the airport must track frequent changes to its infrastructure configuration. Today, Configuration and Change Management (CCM) involves tracking and control of information using spatial asset databases integrated with Enterprise Resource Planning (ERP) systems which consist of a financial system, lease management system, gate management system, computerized maintenance management systems (CMMS), cable management system, geographic information system (GIS), electronic drawings and document management systems, human resources management system, etc. The airport's CIO should serve the enterprise as a champion and facilitator for configuration and change management.

Moreover, CCM is critical to managing an airport's IT&S effectively. An airport's IT&S organization must at least establish a configuration and change management business process for its own mission. Additionally, when possible an airport's IT&S organization should set up a dedicated Configuration Management (CM) Department within the organization.

The employment of technology systems intuitively requires their intricate integration. This involves interface between subsystems of larger systems. These subsystems may be the operating systems, software applications, computer hardware, network communication hardware, etc. The complexities of these subsystems present difficulties in coordination and can cause confusion during design, development, integration, test, and deployment if these subsystems are not properly managed, identified, and controlled. Some common problems encountered are listed below:

- Different parts have the same part number
- A part is not built to the engineering drawings
- A program is over cost and behind schedule
- Approved changes are not incorporated
- Products do not meet requirements
- Cannot define what has been built
- Quality problems, high rate of scrap

- "Minor changes" causing major problems
- Suppliers delivering non-compliant hardware and software
- Difficulty maintaining delivered products

CMM is a systems engineering process that controls the arrangement of the interconnected hardware, software, and telecommunications systems or subsystems that form the airport IT&S. The CCM process helps the airport develop and deploy IT&S within cost, schedule, technical, and performance constraints. Ultimately, CCM directly integrates quality in the system built to the approved functional and physical requirements. Conceptually, CCM comprises five key areas:

- Configuration Identification
- Configuration Control
- Configuration Status Accounting
- Configuration Audits
- Configuration Identification

2.6.1 Configuration Identification

Configuration identification activities involve determination of the product/system structure, selection of configuration items, documenting physical and functional characteristics including interfaces and subsequent changes, and allocating identification characters or numbers to the configuration items and their documents. This is the first task of the CCM process and involves the following:

- Creating and Identifying a product/system
- Developing the specification hierarchy
- Establishing configuration baselines
- Numbering and identifying items: part numbers, drawing numbers, serial numbers, numbering systems, location, etc.

2.6.2 Configuration Control

Configuration control defines activities involving changes to a configuration item after formal establishment of its configuration documents. The control includes evaluation, coordination, approval or disapproval, and implementation of changes. The implementation of changes includes engineering changes, deviations, and waivers with impact on the configuration. The objective of configuration control is:

- To establish and maintain a systematic change management process that regulates lifecycle costs

- To allow optimum design and development latitude
- To effectively process and implement changes that maintain or enhance operational readiness, supportability, interchangeability, and interoperability
- To eliminate unnecessary change proliferation

Simple changes must be documented using rigorous change mechanisms, such as a change order/notice form and review by a CCM manager. Major changes must be documented through a change proposal and be regulated by a governing body called a Change Control Board (CCB).

2.6.3 Configuration Status Accounting

Configuration status accounting is the activity involving capture, storage, and access to information that is needed to manage configuration items effectively. This includes:

- A record of the approved configuration documentation and identification numbers
- The status of proposed changes and deviations to the configuration
- The implementation status of approved changes
- The configuration of all units of the configuration item in the operational inventory

Configuration status accounting provides highly reliable sources of configuration information and traceability to support all program/project activities.

2.6.4 Configuration Audits

A configuration audit process verifies the product/system configuration by inspecting documents, products and records, and by reviewing procedures, processes to confirm and document system performance. The objective of an audit is to:

- Ensure that the system integrator has provided the expected performance capabilities
- Ensure that the design documentation provides an accurate representation of the system design being delivered
- Ensure the operation and life cycle support of the system are based upon the requirements and design documentation
- Ensure that items perform as specified
- Ensure future support of the system

A configuration audit consists of the following major audits:

- Functional Configuration Audit (FCA)—verifies that the actual performance of the system meets the requirements stated in its performance specification.
- Physical Configuration Audit (PCA)—shows that system development is complete, the first production item has been built in accordance with its engineering requirements, and all differences between configurations have been reconciled.

FCA should be scheduled after the completion of all certification and qualification testing and before the PCA. PCA is the final examination of the system prior to establishing the product baseline. Audits will indicate whether the system is successful, inadequate or pending satisfactory completion of identified action items.

2.6.5 Configuration Management Plan

To achieve a successful CCM process, develop a configuration management plan (CMP). This will help:

- To define and detail how, when, who, what, and where CCM will be performed
- To show interrelationships of product teams or functional organization
- To act as roadmap to policies and procedures
- To provide the framework for proactive CCM activities

The airport executive management must agree to the CCM process and approve the CMP.

2.7 IT&S Problem Report System

A problem report system needs to be installed to improve performance by tracking all IT&S problems. The PR system needs the capability to track the nature and severity of each problem, its impact on other system components, the workaround for the problem, the estimate of time to fix it, and the assignment within the organization to fix the problem. The PR system should also produce a weekly matrix for the IT organization on the progress of the problems being fixed.

3 OVERVIEW OF AIRPORT IT&S COMPONENTS & FUNCTIONS

Airport IT&S encompasses a myriad of systems that can be organized across a spectrum of systems types. These guidelines establish a recommended organization and codification for airport systems through a Systems Breakdown Structure (SBS). The SBS subdivides into seven primary groupings of airport IT&S:

1. Airport IT & Communications Systems
2. Airline & Airside Operations Systems
3. Airport Landside Operations Systems
4. Airport Safety & Security Systems
5. Airport Facilities & Maintenance Systems
6. Airport Development Systems
7. Airport Administration Systems

3.1 Airport IT & Communications Systems

Airport IT & Communications Systems include the entire IT&S infrastructure required to support all IT systems and communications; the physical infrastructure (pathways, cabling, communications rooms, etc.), and the active infrastructure (local area network(s), servers, voice systems, etc.). The following is a recommended SBS for Airport IT & Communications Systems.

3.1	Airport IT & Communications Systems
3.1.1	Communication Systems
3.1.1.1	Integrated 800 MHz Trunked Radio, Land Mobile Radio, TETRA, etc.
3.1.1.2	Private Branch Exchange (PBX) Telephone
3.1.1.3	Cellular Telephone
3.1.1.4	VoIP Telephone
3.1.1.5	VoWiFi Telephone
3.1.2	Premises Distribution (Wiring & Backbone) Systems
3.1.2.1	Passive Infrastructure
3.1.3	Cable Management System
3.1.4	Network Systems
3.1.4.1	Local Area Network (LAN)
3.1.4.2	Wide Area Network (WAN)
3.1.4.3	Virtual Private Networks (VPN)
3.1.4.4	Network Security Management
3.1.4.5	Ethernet
3.1.4.6	WiFi
3.1.4.6.1	Multi Frequency Antennae
3.1.4.6.2	Radio Spectrum Management Systems
3.1.5	Gateways
3.1.5.1	Web Gateways
3.1.5.2	IATA Messaging (Type-B)
3.1.5.3	AFTN Messaging (including FAA & ATC)
3.1.5.4	ACARS Messaging
3.1.5.5	FAA Messaging
3.1.5.6	Intranet
3.1.5.7	Extranet
3.1.5.8	Internet
3.1.6	Interfaces to IT Help Desk
3.1.7	Data Center and Associated Hardware
3.1.8	Master Clock

Each of the above is described below. The numbering format reflects the IT&S Guidelines section.

3.1.1 Airport Communication Systems

These connect stakeholders to each other, their applications and business systems, as well as transport data and voice and video from one point to another throughout an airport campus. Keep in mind the OSI model and the need to plan for the use of IP addressing schemas including IPv6, directories, and user domain management.

It is also useful to view a communications system as mission critical and make provisions during design and implementation to properly configure, test, and stage the implementation to ensure success. In addition, fall back provisions, including resiliency and redundancy must be provided.

The communications systems should meet the business and technical objectives defined and articulated in the airport's IT Master Plan which are aligned with the Airport's overall business goals.

IT and physical security are always important considerations in the development of any communication systems plan, but an airport also needs to consider how it will operate and maintain the communications infrastructure. This will include planning, order provisioning, IT asset tracking, and Moves, Adds, and Changes (MAC), as well as call center/help desk location and associated escalation protocols.

The network should support Quality of Service (page 17) enabled so that it can transport data, voice, video, and signaling information, using the same infrastructure, without degrading latency-sensitive applications. It should be scalable and allow for expansion, both at an infrastructure level (increase number of ports/interfaces on a piece of equipment) and bandwidth level (being able to support increase in number of users, as well increase in application bandwidth usage). Paying particular attention to the asset location of cables will pay dividends in the end. The network infrastructure should be well documented, using drawings and maintaining updated databases.

3.1.1.1 Integrated 800 MHz Trunked Radio, Land Mobile Radio, TETRA, etc.

This allows users to communicate via "walkie-talkie" type radio (i.e., direct, device to device,(s) usually over a short range—0.5 to 5 miles, depending on the power of the system and the environment). Complex user groups can be set up for a single user to monitor and communicate with multiple user groups to satisfy specific operational parameters. Oftentimes at an airport, the Operational Radio system will be part of a larger system that is sponsored by a City or County. In these instances, the airport portion of the system must abide by the standards established by the governing body.

An important consideration is that this will likely be the main medium of interoperation and communication with police, fire, ambulance, mutual aid agencies, etc. in the event of a major incident. This applies to airlines and handling agents, as well as to airport staff.

As new technology is being developed and costs are decreasing, it is possible that other mediums of communication (such as push to talk radio over cellular telephones) will begin to replace or augment trunked radio. However, in the current state trunked radio remains the best option for disaster planning, is currently as its frequencies are managed by the FCC. In addition, these systems are in use in all major airports and cities.

Consider how many users will need to be supported, whether bridging or booster antennae is required (i.e., to eliminate "dead spots" in coverage), and how hand-held and mobile devices are going to be managed.

3.1.1.2 Private Branch Exchange (PBX) Telephone

The PBX has been the industry-dominant system, providing "customer premises equipment" (CPE) voice services over the last several decades. Generally, it is a customer-owned system consisting of centralized hardware and software with dedicated hardwire connections to each station (telephone) and each outside trunk line (dial tone).

This centralized system includes a “matrix” switch that connects telephones to outside lines or to other telephones inside the system. The PBX has the ability to provide extensive features and customization to allow flexibility, diversity, and management control of the system.

The PBX is usually owned or leased by the customer; and a third-party vendor provides all service, maintenance, moves, adds, and changes (MAC). However, in many larger applications, this is often provided in-house.

In addition, the PBX operates on a proprietary operating system with customized software. The performance of routine maintenance and normal MAC on a PBX requires personnel certified from the manufacturer just to permit log-on permission to the system. Non- certification typically voids all manufacturer’s warranties.

Consideration should be given to current and future numbers of users and the ways in which specific tenant functional requirements can be addressed. This should address both internal dialing requirements (i.e., 4-digit dialing from gate areas to back office areas) and external dialing requirements (i.e., long-distance codes, dedicated outbound trunks, etc.). Peak loading should also be forecast, with a plan for handling or diverting calls where the maximum number of lines is exceeded. Arrangements to transfer existing phone numbers from local exchange carriers to a PBX system may be required.

3.1.1.3 Cellular Telephone

Each airport should have a specific method and plan for accommodating cellular telephones. This method and plan should accommodate usage by the Airport staff, tenants, and the traveling public. A technical solution must be implemented to support the chosen business model. This should include accommodations for cellular carriers and their required equipment and distribution systems (cell sites, antennae, etc.), performance of radio propagation studies, etc. and may include an in-building distributed antennae system.

3.1.1.4 VoIP Telephone

VoIP technology treats a voice call as a data transmission. The voice is received, converted to a “packet,” and transmitted over a data LAN instead of through a PBX system matrix. When a call is sent to a location internal to the LAN, it stays under the control of the data network. When a call is sent to an external location (off the LAN), the call is routed to an outside line or trunk. The outside line or trunk can be one or a combination of the following connections:

- Public Switched Telephone Network—Outside the LAN, a VoIP call can go over the PSTN.

- Private Network—A VoIP call can be routed over a private network (owned or leased) to connect to other locations.

- Internet—A VoIP call can be routed over the Internet. By using the Internet Protocol (IP) address, the call can be routed to a specific location outside the LAN.

In order to support IPT (IP telephony), the designer should consider a traffic prioritization schema for the local area network that dedicates bandwidth according to a prioritization table where calls from specific areas or telephone sets (e.g. gates) receive priority over other areas). depending on the specified usage from each area. This will require Quality of Service functionality on the network.

3.1.1.5 VoWiFi Telephone

This is essentially a wirelessly connected IP mobile handset using 802.x, thereby using and interfacing with the airport campus network and operating accordingly. Integration with both the WiFi component of the local area network and the telephony system must be performed to effectively configure a VoWiFi telephone solution. If this solution is deployed, it is important that coordination and planning be performed with the design and configuration of the WiFi system to ensure that appropriate bandwidth and QoS is provided.

3.1.2 Premises Distribution (Wiring & Backbone) Systems

3.1.2.1 Passive Infrastructure

The primary purpose of the passive infrastructure is to provide the physical media that allows for the interconnectivity of all airport-wide communications systems.

More specifically, this interconnectivity is accomplished through the use of fiber optic and/or copper cabling routed between each of the communications rooms throughout the airport's premises and from the telecommunications rooms to the user workstations. The telecommunications rooms, located throughout the airport, serve as the distribution points for the end-users of various airport systems. Examples of such airport systems include: telephone sets, courtesy phones, pay telephones, security, multi-user flight information display system (MUFIDS) monitors, LED devices, common use terminal passenger processing (CUPPS, CUSS) terminals, building management system control units, administrative network workstations, wireless access points, information kiosks, etc.

All of these systems are served from the telecommunications rooms; therefore, it is good practice to properly account for the co-location of these systems when planning cable routing, component placement, power, cooling, and similar future requirements.

With a life span of 15 to 20 years, the passive infrastructure is the longest-lived component of the communications infrastructure and not easily replaced once installed. Therefore, careful design and solid engineering practices should be meticulously employed during the planning and design stages of the passive infrastructure.

The design and planning of the communications infrastructure for an airport should also provide cabling support for in-building wireless distribution systems. This includes both unlicensed wireless (WiFi -802.11x) and licensed wireless (cellular telephones and operational radios).

From an antennae distribution perspective, an airport may also consider which locations could require RFID support and, if so, what type of RFID may need to be supported (active, passive, etc.). This would be needs based.

Below are some additional considerations:

- Cable and pathway design should provide the physical diversity between buildings and communications rooms to provide physical redundancy.
- Cabling design should include diverse paths between the main telecommunications closets and primary and backup server rooms. Network cables should not be daisy-chained to the closets.
- Appropriate cabling types include: Fiber Types—single mode between buildings, multimode between closets, or use single mode throughout; Copper Types—Cat 6 for both data and phones, Cat 6 or higher for gigabit Ethernet (in server farms.)
- The high-count cabling routed between the communications rooms is known as "backbone" cabling. The single-strand fiber and low-pair count (four pair) copper cable runs to the user workstations are referred to as "station" or "horizontal" cabling.

3.1.3 Cable Management System

Managing the passive infrastructure is an essential component of the communications infrastructure. A cable management system (CMS) provides a cable asset database for tracking cable termination and user. Organizations generally move, add, or change (MAC) communications cabling at least 30 percent each year. Eighty percent of the time and cost of such changes is spent in rediscovering cables. Therefore, a CMS provides a return on investment by greatly reducing MAC costs and resource usage.

3.1.4 Network Systems

The purpose of Network Systems is to provide the bandwidth over which various communication systems distribute and share data. Bandwidth refers to the amount of data that can be transmitted over a given network segment during a specific time period. The advent of reliable, secure Virtual Local Area Network (VLAN) technology and Gigabit speeds for bandwidth allow airports to provision a single LAN that services all of its communications systems needs in a cost effective manner.

The network systems should:

- Have high availability and performance to provide communication for all core airports IT systems
- Follow industry-recommended practices and segment the network into core, distribution, and access layers for hierarchical design.

- Configure core and distribution layer network equipment with redundant power supplies/processor cards/interfaces and have multiple access layer equipment at the edge.
- Group different services into separate VLANS, depending on organizational functions (VLANs are Virtual LANs defined over an active infrastructure).
- Separate VLAN for voice.
- Separate VLANs for data.
- Separate VLAN for video (if transporting CCTV video over the network.).
- Support Quality of Service (QoS))
- Deploy appropriate security measures

Four types of area network are generally found. These are:

- LAN (Local Area Network)—usually within one building
- WAN (Wide Area Network)—distributed over a wide area; e.g., state or country
- CAN (Campus Area Network)—linking adjacent buildings, such as at an airport, hospital, or university
- MAN (Metropolitan Area Network)—linking buildings within a metropolitan area (e.g., city.)

3.1.4.1 Local Area Network (LAN)

A local area network (LAN) is typically confined to a single building or a small group of buildings on a campus such as found at an Airport. Several different transport protocols can be provisioned over the active LAN, including Ethernet, ATM, frame relay DWDM, and others. The networking technology implemented determines which data transmission methods can be implemented and the upper limit of the speeds available for transmission. Therefore, the choice of networking technologies in a local area network design is critical to developing an overall system that supports existing (legacy) systems, as well as future systems and applications. The current “standard” for backbone applications is ten gigabit Ethernet.

The active LAN components provide the bandwidth over which various communications systems distribute and share data. Some applications, like video and voice transmission, require dedicated amounts of bandwidth over the entire network. The process of guaranteeing this bandwidth is called assuring quality of service (QOS). QOS is only possible through proper implementation of the active infrastructure.

The emergence of Ethernet, and particularly TCP/IP, as industry standards has hastened the migration of mission-critical applications away from proprietary networks to shared bandwidth provisioned by active infrastructures.

As a result, the demand for bandwidth and guaranteed QOS continues to increase rapidly, and new applications and hardware are being developed with the assumption of high bandwidth availability. Examples of applicable hardware/software systems could include video conferencing, document management, common databases, remote file access, video-based training, broadcast TV, and video/data-conferencing.

3.1.4.2 Wide Area Network (WAN)

The wide area network (WAN) provides the connectivity from the LAN on a campus to points outside the campus, such as data centers located in other cities. Typically, today's WANs use technology similar to LAN-based switches. However, a WAN connection, unless properly configured and managed, could introduce delays and instability, which could affect the user through the reliability or latency of a connection.

Latency is the measure of the round-trip time from and to the remote device or application. A slow round trip will cause operator delays. A noisy line (interference) will drop frames and cause delays.

In the past, dedicated connections such as T1 lines or frame relay circuits provided better performance than commercial Internet connections (DSL, cable modem, etc.) However, many providers (e.g. Local Exchange Carriers) provide WAN connections that utilize Ethernet or other high speed networking protocols that have proven to be extremely reliable. Airports do not generally have to develop WANs as most of their applications and systems will only communicate at the campus level through the LAN.

Virtual Private Networks (VPN)

In virtual private networks, the equivalent of a closed user group, users gather together by virtue of some common characteristics over a common domain. This network can run on dedicated equipment or through a shared infrastructure provider such as a Telco. VPNs provide a secure environment that allows individual groups of users to share data.

3.1.4.3 Network Security Management

An airport should implement layered security solutions with firewalls and intrusion protection (IDP/IPS) systems at the edge and inside the network. The airport should also implement industry-recommended practices in virus protection and patch management.

Security typically already exists at a device level (e.g., workstation), application level (i.e., log-on password), and at a network level. The most vulnerable parts of a network are the interconnections, whether they be VPN connections or wireless access points. Good network design and careful management will mitigate intrusion and unauthorized entry. Several third-party companies can assist in the intrusion-detection arena. It should also be noted that physical security plays a large part in the overall network security plan. Networking equipment should be located in rooms that are physically secure.

3.1.4.4 Ethernet

Ethernet is the most widely accepted and used protocol for networking today. The Internet (as well as most local area networks) use Ethernet. From a planning point of view, consideration should be given to the number of Ethernet ports a wiring closet will need to support so that the local area network can be sized appropriately.

3.1.4.5 WiFi

WiFi is an extension to a wired Ethernet network that uses the FCC-allocated, unlicensed frequency band. As the WiFi is part of the wired Ethernet network, the same security, addressing, and design considerations can be applied. In addition, security techniques should be employed during design and implementation to ensure the network is secure.

3.1.4.5.1 Multi Frequency Antennae

Multi-frequency antennae are used in the wireless distribution system as the connection point from the wireless portion of the network to the wired portion. The placement of antennae needs to be carefully coordinated during design and implementation to adhere to propagation study recommendations and to ensure adequate coverage.

3.1.4.5.2 Radio Spectrum Management Systems

The wireless spectrum is very constrained and requires careful management to ensure that all systems using the wireless frequencies are configured for interoperability. An airport will need to consider how the spectrum can be policed and used efficiently. Third-party companies can perform radio propagation surveys, or alternate methods can be used to develop a radio map of the airport. Consideration should also be given to interference and its impact on airport radio operations.

3.1.4.6 Network Management Systems

Network management is a critical function. It is either reactive or proactive. Reactive presupposes a user reports a fault and then a technician is dispatched. Proactive means that the IT asset is monitored (for which bandwidth needs to be allocated), and the watching agent intervenes without a user calling in the fault. This requires the definition of an operations support model with links to customer and vendor service levels. A wide variety of vendors offer incident management systems.

3.1.5 Gateways

3.1.5.1 Web Gateways

In its most likely iteration, a web gateway will be a dedicated connection (i.e., a T1 line) to the Internet. For larger airports, this could be a direct connection to the Internet; otherwise, it will likely be through a third-party service provider (ISP). Additionally, a web gateway could be either a PC or client running a browser application that can access specific URLs or pages from the Internet and/or intranets.

3.1.5.2 IATA Messaging

This includes SPEC2000 and Type-B messaging (teletype communication based on store-and-forward capability with an audit trail). The development of these formats facilitates edifact interchange, as defined by IATA, i.e., three-letter activity codes, e.g., MVT.

IATA messaging is principally for airlines to talk amongst themselves, to support baggage handling, and to talk to the passenger-handling side of airports.

3.1.5.3 AFTN Messaging

AFTN messaging is a low-voltage teletype used for communicating air traffic flight plans and other aircraft operational and weather messages such a NOTAMs, TAFs, and METARs.

3.1.5.4 ACARS Messaging

ACARS is the use of VHF or satellite communication for the transmission of aircraft and airline operational information. It is used to communicate aircraft status from the aircraft to a ground or satellite station. Air Traffic Control (ATC) is beginning to introduce two-way messaging (i.e. for aircraft releases from ATC prior to takeoff or for weather information).

3.1.5.5 FAA Messaging

FAA messaging, used solely in the U.S., is the FAA's implementation of AFTN.

3.1.5.6 Intranet

A private computer network that uses Internet protocols and network connectivity to share part of an organization's information or operations securely with its personnel. The same concepts and technologies of the Internet, such as clients and servers running on the Internet protocol suite, are used to build an intranet. HTTP and other Internet protocols are commonly used as well.

3.1.5.7 Extranet

An extranet is a private network that connects third parties to an intranet. A user group, such as SPEC2000, employs an extranet.

3.1.5.8 Internet

The Internet is the worldwide, publicly-accessible network of interconnected computer networks that transmit data by packet switching with the standard Internet Protocol (IP). Bandwidth on the Internet is unregulated.

3.1.6 Interfaces to IT Help Desk

Management Information Bulletins (MIBs), HPOV, Netcool data, and other suitable interfaces to the airport service desk are important. Selected systems should support management, monitoring and software distribution. An airport should develop its own concept of a service model before selecting applications so it can judge the fit of any proposed solution. (See also the IATA CUPPS specifications as they relate to workstation and application management. This is in an XML format compatible with ACIIATA's AIDX and OTA.)

3.1.7 Data Center

The data center is a facility used to house normal and mission-critical computer systems and associated components. It generally includes environmental controls (air conditioning, fire suppression, etc.), redundant/backup power supplies, redundant Internet connections, and high security.

3.1.8 Master Clock

The master clock system ensures synchronization of all IT devices on the same LAN. Typically, this is through the use of network time protocol (NTP) on the active portion of the communications infrastructure (local area network).

3.2 Airline & Airside Operations Systems

Airline & Airside Operations Systems include all IT&S required to process passengers, baggage, and aircraft, primarily through the airport's airside. The following is a recommended SBS for Airline & Airside Operations Systems.

3.2	Airline & Airside Operations Systems
3.2.1	Airport Operational Database (AODB)
3.2.2	Resource Management System (RMS)

3.2.1 Airport Operational Database

The principal role of the AODB is to be the primary holder of all data that relates to all operational activity, both flight and facility related. This database supports the real-time data warehousing and retrieval of data from IT systems and provides the mechanism for the integration of systems throughout the campus.

An AODB integrates into other airport systems and receives data feeds from outside sources, such as airlines (receiving, for example, ASM, SSM, and MVT data and IATA Edifact information). Typical data that the AODB will store includes which aircraft arrived when, from where, and departed bound for where, with how many passengers and how much freight, where it parked, and what other airport services it used. The AODB will contain historic, actual, and planned data and feeds enterprise and financial systems. The databases can also drive other systems, such as RMS, dynamic signage, etc. They can also feed airport enterprise systems for purposes such as billing.

The schedule data in an AODB is important for many reasons, but primarily because it facilitates pre-plan allocation of resources such as gates, check-in desks, parking stands, and ground power, among others. It comes as planned seasonal data from airlines, often using Seasonal Schedule Message (SSM) data, which in turn receives updates nearer the day of operation with Ad-hoc Schedule Messages (ASMs).

Aircraft pairings are important to airports as well as airlines, and these can be input into the AODB via SCRs (Slot Clearance Requests). A pairing identifies the airline’s planned “turn,” showing arriving flight and departing flight. The IATA SSIM Manual gives full details of these schedule messages.

In some cases, AODB schedule data also drives Flight Information Display System (FIDS) or Flight Information Management System (FIMS) displays, which show planned and actual schedules in real time to airport staff, passengers, and visitors.

3.2.2 Resource Management System (RMS)

Resource management systems are key to effective planning for an airport’s operation, especially as a facility reaches capacity. Examples of critical assets that affect an airport’s capacity include fire cover (a function of the number and type of fire engines), runway capacity, stand or gate capacity, passenger concourse standing capacity, numbers of check-in desks, and number and size of security posts.

Underpinning every resource management system is its ability to capture and manage flight schedules. This is the activity around which the airport revolves, as well as a major source of income for specific airports. The real time updating of this information feeds FIDS displays.

A resource management system should also allow users to identify and create their own constraints and define the business rules affecting these constraints. Below are some examples of specialized resource management applications.

3.2.2.1 Gate Management System

This system assigns and allocates passenger and freight flights to specific gates, catering for remote stands, jet ways, gate lounges, buses and other services. Gates can be common use (shared) or dedicated (assigned to one airline).

3.2.2.2 Ticket Counter Management System

This system assigns ticket counters to airlines, whether common use (shared) or dedicated (assigned to one airline).

3.2.2.3 Baggage Carousel Management System

This system assigns incoming flights to baggage breakdown carousels and outbound flights to baggage makeup carousels.

3.2.3 Visual Passenger Information Systems

3.2.3.1 Visual Paging and Emergency Display Systems

Visual paging and emergency display zones should be overlaid with or interoperable with PA zones. The design developed for an airport should take into account unique facility characteristics (size, space available, ambient lighting conditions, etc.). Such a design can use various visual paging devices and screens can overlay the FIDS system. Coordination with local ADA (Americans with Disabilities Act) should be performed during design of these systems. New fire code regulations may require replacing or duplicating paging systems in order to meet UL requirements for emergency notification systems.

3.2.3.2 Public Address (Paging & Notification) Systems

Public address and paging, key elements in the airport, are used for wayfinding in the event of emergencies and for emergency or unusual broadcasts of information. Increasingly, airports run “silent” terminals where boarding calls and other flight-specific announcements are made at the gate only.

Public address comprises two key steps:

- A three-dimensional audio model of the airport (how sound moves around the airport), including what types of speakers go where and for what purpose (since speech is different from music, for example, and fire sounders are different again).
- An understanding of the fire zones so safety messages can be coordinated with the police and fire authorities, ideally with the PA zones overlapping the fire zones and a plan that shows which broadcaster can override which other broadcaster if they are trying to talk to the same place.

3.2.3.3 Flight Information Display Systems (FIDS)

By means of the FIDS, passengers and airport staff obtain real-time flight information from displays placed throughout the airport. FIDS often interoperate with data feeds from airline host systems (to obtain flight information updates) as well as other data feeds such as the Internet (for weather and other information). The FIDS displays can also display advertising, other traveler messaging and wayfinding.

Some airports dedicate display systems on a per-airline basis. Increasingly, MUFIDS (multi-user FIDS) are used, which take feeds from multiple airline sources and display them as one complete list, updating it in real time as new information is received.

There is a direct relationship between FIDS and AODBs, as they often share the same databases and data feeds.

3.2.3.4 Dynamic Backwall Display Systems

3.2.3.5 Check-In Information Display Screens (CIDS) behind the ticket counter display airline branding and, in some instances, separate queues for differentiated check in. Gate Information Display Screens (GIDS) behind the departure podium display specific airline flight and destination information. Ramp Information Display Systems provide ramp-specific data to airline and airport staff pertaining to aircraft turnarounds.

3.2.3.6 Tug Drive Information System

This displays information for tug drivers as to push-back and arriving flight assignments.

3.2.3.7 Baggage Information Display Systems (BIDS)

BIDS display information concerning baggage-belt assignments for each flight.

3.2.3.8 Parking Information Display Systems

These systems display information on how to get to parking areas, where to park, and where to pay for parking.

3.2.3.9 Advertising Information Display Systems

Airport advertising presentations can include static displays, such as posters, or dynamic integration with the FIDS, BIDS, CIDS and GIDS.

3.2.3.10 Wayfinding Information Display Systems

Wayfinding directs passengers around an airport, providing information such as locations of shops, airline lounges, and smoking areas. Passengers may receive this information visually or in paper form.

3.2.3.11 Transportation Information

Signage indicates where passengers should go to board buses, taxis, or coaches; also for rail station, parking, or metro information, and hotel/motel information. This can be web-based; available on mobile devices

3.2.4 Passenger Check-in and Boarding

3.2.4.1 Common Use Passenger Processing Systems (CUPPS)

Common use is the sharing of an airport's operational areas for multiple airlines. Experience shows that a common use environment may increase gate or check-in counter use by 40 percent or more, depending on the specific implementation. It is attractive to airports experiencing capacity constraints and reduces barriers to entry for airlines wishing to provide service at an airport. The key is that airlines must gain access to their back-office systems and preferred front-office passenger processing applications in such areas. IATA provides recommended practices for the specification of such systems and in 2009 released an updated version of this recommended practice (IATA RP 1797).

CUPPS, as defined by the IATA-recommended practice, is the provisioning of a shared airport operational desktop platform that supports all airlines on a single set of common devices including workstations, boarding pass and ticket printers (ATB), bag tag printers (BTP), boarding gate readers (BGR), and others. This allows flexibility in the allocation of airport resources (ticket counters and gates) to individual airlines.

CUPPS may also include IP telephony configuration for the user airlines and may extend to GIDS and other airline signage systems.

This is achieved through the use of a peripheral manager that translates airline-specific bag tag and boarding card printing and reading protocols so they can be used over the shared set of peripheral devices at the gate, transit desk, or check-in counters. Airlines deploy applications known as TEs (terminal emulators) to common use workstations. TEs access airline back-office systems such as DCS. Common-use vendors certify that applications and hardware will function on their platform.

3.2.4.2 Common Use Self-Service (CUSS) Kiosks

IATA has defined a CUSS Recommended Practice (IATA RP 1706a) for airlines to develop and deploy applications on shared kiosks that allow passengers to check in. Usually, an airport (or an airline club) owns a set of common use kiosks and can determine their usage and the associated fees.

3.2.4.3 Self-Service Kiosks

A wide variety of self-service kiosks are available today. Those for airline check-in may be either dedicated or common use. Kiosks also support programs such as CLEAR and US Visit. Determining an effective location for a kiosk is both an art and a science, and this aspect should receive consideration, including the modeling of an airport's passenger flow based on different arrival rates. Kiosks require data ports and electricity, so their potential locations need to be well planned.

Retailers may also use kiosks for selling snacks or newspapers or other sundry items. Some kiosks are able to print baggage tags and an airline may want the airport to provide a fast-bag-drop area nearby. A similar facility may be required to support off-airport baggage and passenger check-in (affiliated hotels or conference facilities).

3.2.4.4 Departure Control Systems (DCS)

An airline uses a departure control system to board passengers (i.e., assign them a seat and redeem the ticket voucher). Usually an airline DCS is a remotely located host application requiring either ALC, X25, or IP connectivity via a gateway. A DCS also provides an airline with the legal weight-and-balance data required for flight operations.

3.2.4.5 Local DCS and Weight and Balance

Charter or low-cost carriers often use a local DCS, an airport system that fulfils the same function as an airline DCS host, except that it operates locally using servers in the airport. A local DCS may need to be deployed over a common-use platform or via kiosks.

3.2.4.6 Common Language Facility (CLF -- translations for Ground Handlers' scripts)

A CLF allows check-in staff to use a single set of transactions or business logic to check in passengers on multiple airline DCS systems. As a result, check-in staff only needs training on one system.

3.2.4.7 Airline Gateway Server Systems

An airline gateway server is usually a PC that acts as a legacy system (X25 or P1024B/C) gateway to a remote DCS system where it feeds a CLF or CUPPS peripheral manager. Such servers are located in an airport data center and are connected to the airport network.

3.2.5 Baggage Handling Systems (BHS)

Of all airport ground systems, the baggage handling system is probably the most critical, since it is responsible for distributing bags from check-in to the aircraft gate loading area and from the aircraft to the arrival belt, as well as facilitating transit bags. If it does not operate properly, flights cannot depart on time and passengers cannot complete their journey.

3.2.5.1 Baggage Sortation System

The sortation system is an electromechanical system for physically transporting bags through an airport. Bags are usually routed according to bag tag information—flight number, destination—as contained in a baggage status message (BSM).

3.2.5.2 Baggage Reconciliation System (BRS)

A BRS (known locally in the US as Passenger Positive Bag Match) ensures that passengers travel with their bags and initiates an off-load command in the event a bag is on a plane without a passenger.

3.2.5.3 Baggage Tracking System

This system tracks bags via IATA-defined baggage messages such as BPM and BPOS, using bar codes and optical readers. In some airports, RFID tags replace or accompany bar codes as the means for carrying baggage data.

3.2.6 Cargo Processing Systems

3.2.6.1 ULD and LD3 – Unit Load Device Tracking

ULD tracking locates ULDs and ensures the appropriate payment of demurrage fees and/or the levying of appropriate storage charges if one airline uses another's ULDs.

3.2.7 Passenger Loading Bridge Systems

These systems ensure the safe operation of passenger loading bridges, including steering and docking. Some bridges contain wiring closets. Such a closet allows the bridge to contain a printer for weight and balance in final documents. This is an airport discretionary feature. Telephones provided in bridges should also have the capability to be added to the airport campus network.

3.2.8 FAA Air Traffic Control & Navigational Aids & Approach Lighting Systems

These systems provide for safe operation of flight movements, in accordance with prevailing FARs, including provision of radar feeds, Instrument Landing Systems (ILS), Microwave Landing System (MLS), DMEs, Navational aids, and approach lighting systems. These systems are not considered to be within the scope of an airport's IT&S guidelines.

3.2.8.1 Apron and Air Bridge Operation

This system provides operational supervision of the airside aspects of an airport, between the passenger and cargo facilities and the taxiways.

3.2.8.2 Visual Guidance and Docking Systems

The use of these systems guides the pilot of an aircraft into and out of a stand and will reflect the size and make of the aircraft. Such systems may include latitude/longitude position indicators for the crew to set their navigation systems to prior to a flight.

3.2.8.3 Daily Operations Log and Emergency Checklists

This system, typically used by an airport duty officer for managing airport operations, includes access to emergency checklists in the event of a ground, air, or other operational incident.

3.2.8.4 Runway Monitoring System

This system monitors the movement and position of aircraft and vehicles on runways and taxiways.

3.2.9 Flight Tracking Systems

These systems record the path of each flight for noise compliance.

3.2.10 Noise Monitoring Systems

These record the noise level of each flight and report against user-established environmental criteria.

3.2.11 Meteorological Information

Airports generally require three types of weather feeds. These are:

a) weather forecasts at passenger origins or destinations;

b) operational aviation weather, such as winds aloft, prognosis charts, METARs, and TAFs for crew briefing, and other aerodrome operational uses, including watches and warnings from sources such as NOAA; and

c) icing forecasts, allowing an airport to plan on usage of de-icing bays and to make sure enough de-icing fluid is available.

3.2.12 Weather Tracking Systems

These, automated weather systems collect and disseminate real-time weather data via VHF so that airport and airline staff may make accurate operational decisions.

3.2.13 Aircraft Refueling Systems

These systems manage the distribution of aviation fuel to the ramp for the refueling of aircraft. Typically, these systems include an Emergency Fuel Shut Off (EFSO) system that requires communications connectivity from the individual gate areas to a central command center.

3.2.14 Aircraft Servicing

Airports are not required to provide aircraft servicing systems. However, in the execution of an aircraft-servicing task, an airline or engineering company will need access to certain back-office systems. The airport may be able to facilitate such connectivity, especially when it is from the ramp. This might be via data networking, 802.x, IP, or trunked radio.

Increasingly, aircraft manufacturers also include RFID tags to certain aircraft components; so in an environment where airlines share gates, an airport also may want to facilitate or provide for this capability.

3.2.15 De-icing Systems

An airport may need to provide for supporting de-icing activities by an airline or handling agent. This may include assignment of aircraft to de-icing bays or the safe deployment of de-icing equipment onto a stand and its environmentally sensitive removal. Furthermore, an airport may wish to track the amount of de-icing fluid released into its drainage systems and, where possible, allow such fluids to be recycled.

3.2.16 Airfield Lighting Control System

The Airfield Lighting Control System (ALCS) is a control system utilized by the FAA Air Traffic Control and airport personnel for control of aprons, runways, and taxiways.

The ALCS interfaces with airport equipment using fiber optic, copper or wireless communication and are typically located within the FAA ATC, maintenance office, airfield lighting vault or control room for Human Machine Interface via a Touchscreen monitor. ALCS systems are generally PLC or PC based, enabling the control and monitoring of generators, constant current regulators, remote air terminals, deicing stations, approach lighting, windcones, marker beacons and airfield lighting (ie., edge/centerline lights, etc.). System features include maintenance/alarm reporting capabilities and remote access. This system is not considered to be within the scope of an airport's IT&S guidelines.

3.3 Airport Landside Operations Systems

Airport Landside Operations Systems include all IT&S required to flow passengers, baggage, and freight to and from the ground transportation, spanning parking revenue control to dynamic roadway signage. The following is a recommended SBS for Landside Operations Systems.

3.3	Airport Landside Operations Systems
3.3.1	Parking Systems
3.3.1.1	Parking Revenue Control
3.3.1.2	Electronic Parking Toll (e.g., E-Pass)
3.3.1.3	License Tag Identification System
3.3.1.4	Parking Space Management System
3.3.2	Automated Vehicle Identification (AVI)
3.3.3	Taxi Dispatch System
3.3.4	Surface Vehicle Monitoring System
3.3.5	Fuel Management
3.3.5.1	Fuel Chargebacks
3.3.5.2	Fuel Reordering and Monitoring of Fuel Levels
3.3.6	Lightning Detection Systems

3.3.1 Parking Systems

Parking is a major aspect of an airport's business activity and a significant revenue generator. Effective management of this activity is therefore critical.

Parking systems cover many aspects, ranging from entry lane control, issuing tickets, tracking the numbers of vehicles in any parking lot, "lot full" indication, guiding drivers to specific areas (i.e. lane control), fee collection (e.g., providing automatic payment terminals and/or their manual alternative), monitoring the egress lanes with CCTV and counters, providing exit barriers, and, of course, keeping track of the associated accounting. Some of these systems are described below.

In addition to normal usage, operators may wish to consider non-standard usage, such as pre-payment, regular or frequent parkers, complimentary parking, valet parking, etc.

3.3.1.1 Parking Revenue Control

Parking Revenue Control provides automatic calculation of the fee based on the ticket presented, time elapsed, and applicable rates. It also supports payment options (via cash, debit or credit card). Oftentimes, parking revenue control systems include Pay on Foot devices that are located in remote areas of the facility and connected via a network to the revenue control head-end system.

3.3.1.2 Electronic Parking Toll (e.g., E-Pass)

This describes systems that allow a car equipped with a transponder to pass through and payment is debited from an account usually managed by an Internet site.

3.3.1.3 License Tag Identification System

This system reads and stores car license plates, at the entry or exit lane, and may allow other databases to review them.

3.3.1.4 Parking Space Management System

This system keeps track of the volume and location of parked cars and can be used to direct cars to areas with vacant spaces.

3.3.2 Automated Vehicle Identification (AVI)

Similar to E-Pass systems, this provides a “tag” that allows vehicles to be processed more quickly at entry and departure from a parking lot. Such systems can also be used to control access to specific areas of a parking lot (i.e., preferred or VIP parking areas or an area for limousines waiting for passengers).

3.3.2.1 Electronic Toll Collection (ETC) System

It is recommended that a electronic toll collection (ETC) transponder based system or “tags”, affixed to windshields by use of velcro, sticker type tags or vehicle bumper tags be utilized for parking facilities and other vehicular areas that potentially could generate revenue. Currently, the more common 915 MHz based systems with a potential predecessor of 5.9 GHz technology, etc. are being used throughout the United States. This ETC Technology permits processing vehicles rapidly at the points of entry and departure from these parking facilities and other potential areas that would generate revenue for airports.

These system technologies, in conjunction with the ancillary equipment necessary for ETC, should provide all the following protocols associated with: All Electronic Tolling (AET), Open Road Tolling (ORT), Road Usage Charges (RUC), Vehicle Miles Travelled (VMT), High Occupancy Travelled (HOT) Lanes, and Interoperability.

In the absence of tags, cash or credit card, a Video Enforcement System (VES) with enhance vehicle license plate recognition will help to ensure that the revenue is collected for the respective vehicle(s). Revenue collection for VES will be processed by billing the customer in a similar manner as that of tag processing.

Usage of Tag(s) and a VES will provide even quicker throughput at points of entry and departure from parking facilities. The consequential result could possibly eliminate barrier gate and ticket devices located at points of entry and departure from parking facilities.

Rental car agencies providing tags should become cognizant of all of these protocols knowing that rental cars may not necessarily return to their respective place of origin when rented. These systems also provide the ability to track vehicles, calculate dwell times on the curbside, etc. which allow airport operators apply the appropriate charges based on their fee schedule.

3.3.3 Taxi Dispatch System

Since few things will decrease passenger satisfaction more than having to wait for a taxi outside after a long flight, the use of this system ensures passengers get authorized, licensed taxis when they need them. This also helps taxis pick up fares more equitably, since some fares are for short journeys and some are for long journeys.

Taxi journeys also provide revenue for the airport, since the taxi company usually pays a commission on a per-journey basis to the airport. Similarly, taxi companies and/or drivers may also pay regular fees for the privilege of serving the airport. Taxi dispatch systems may also keep track of these commercial agreements.

3.3.4 Surface Vehicle Monitoring System

This system can be used airside and landside for tracking the real-time location on the airport of vehicles equipped with an electronic tag or GPS device.

3.3.5 Fuel Management

Airports consume significant amounts of fuel, including diesel, petrol, or propane. The rate of consumption of fuel, therefore, needs to be monitored closely so adequate supplies exist to support operations.

Factors such as temperature, passenger throughput, and number of aircraft movements will affect the rate of consumption of fuel. A fuel management system helps an airport anticipate and meet its operational fuel needs. Cost management techniques, such as carburetor settings, will also help optimize fuel consumption.

3.3.5.1 Fuel Chargebacks

These systems manage personal use chargebacks and surcharges.

3.3.5.2 Fuel Reordering and Monitoring of Fuel Levels

These systems track fuel quantities and place orders for more fuel with suppliers. They can also forecast usage based on historical data.

3.3.6 Lightning Detection System

This system detects lightning through the use of electromagnetic sensors. These systems can triangulate the location of a lightning strike and determine its polarity and amplitude.

Lightning can disrupt aircraft and airport operations since refuelers, maintenance staff, and key equipment may be attached to large metal objects or exposed in the open. Lightning detection warns workers to take cover.

3.4 Airport Safety & Security Systems

Airport Safety & Security Systems include all IT&S required to assure safe and secure airport operations spanning computer-aided dispatch to fire alarms to explosive-detection systems to perimeter-intrusion systems. The emerging science of video analytics is becoming increasingly important as well.

Safety systems are different from security systems, and guidelines already exist for airport security systems. Therefore, this section does not focus on restating security guidelines but on describing the systems for which airport IT and its related infrastructure provide support. This encompasses not only physical safety and security but also data integration and integrity.

The following is a recommended SBS for Airport Safety & Security Systems.

3.4	Airport Safety & Security Systems
3.4.1	Command & Control Center Systems
3.4.2	Mobile Command Post Systems
3.4.3	Computer Aided Dispatch (CAD)
3.4.4	e911
3.4.5	Closed Circuit Television (CCTV)
3.4.6	Camera Systems
3.4.7	In-Line Explosives Detection Systems (EDS)
3.4.8	Screening Systems
3.4.9	Biometrics Systems
3.4.10	Access Control Systems
3.4.11	Badging Systems

3.4.1 Command and Control Center (C&C) Systems

The C&C system manages an airport's response to incidents, using a variety of data sources and providing interoperable communications. Typically, a C&C Center is the brain of numerous systems, and requires a carefully coordinated integration plan to ensure the efficient monitoring of all systems.

These systems, also known as Emergency Operations Centers or Security Operations Centers, may serve not just an airport but also the adjacent metropolitan area.

3.4.2 Mobile Command Post Systems

This is a field-based mobile sub-unit of the C&C Center. These mobile units duplicate the functionality available in the primary C&C Center and are used during emergency situations.

A mobile unit provides forward command and control coordination and is used when an airport operational incident occurs. Such units may be equipped with radio, satellite, and microwave communication systems and should be capable of establishing a communications network with all local police and emergency services, as well as appropriate federal agencies, and with the airport.

3.4.3 Computer Aided Dispatch (CAD)

This includes the automatic handling of events, including SMS, trouble-ticket logging and activation, and paging. These are typically linked to Geographical Information System information to provide even location data to the responders.

3.4.4 e911

This is a provision of emergency telephone service from anywhere within the airport perimeter to a 911 operator who can then expedite the call to the appropriate agency. Depending on the specific Airport e911 calls may be responded to by Airport personnel or local City or County agencies.

Additionally, airports may provide “511” services within their perimeters. These are transportation-related inquires of a non-critical nature.

3.4.5 Closed Circuit Television (CCTV)

This is a collection of CCTV cameras, remotely managed, including, where appropriate, PTZ (pan, tilt, zoom) capability. Some key considerations for CCTV include storage of video footage, means of retrieval, low-light-handling capability (i.e., how does it respond if an aircraft taxi light hits the camera at night), and ability to deploy with movement-alerting and threat-assessment software.

The careful design of the CCTV monitoring room’s set-up must include consideration of how many operators are required to monitor a given number of CCTV cameras.

Digital cameras provide more flexibility than analog cameras by adding screening functionality. CCTV is one of the biggest users of a campus network’s available bandwidth, and the current and future bandwidth requirements of the CCTV system should be considered in campus area network design and capacity planning.

As well as internal cameras, CCTV should include perimeters, access roads, and entry/exit posts, ramps, parking lots, and any other airport operational area where members of the public have access. It is common practice to provide a CCTV camera to observe an entry point controlled by an access control system and all airside/landside egress points.

3.4.6 Camera Systems

Other camera systems, such as triggered cameras (like those associated with trip wires, real or electronic) and speed cameras can augment CCTV. Normal light and other spectra can be used (e.g., infra-red). Camera systems may also be deployed using video analytics.

3.4.7 In-Line Explosive Detection Systems (EDS)

The EDS performs screening of passenger-checked luggage for explosives and other threat elements. The system typically integrates into baggage handling systems, as applicable; and the passive communications infrastructure is used to interconnect the systems’ electronic components.

3.4.8 Screening Systems (Passenger Carry-on Baggage)

Airport security officials use screening systems to screen passengers prior to allowing them into the secure area of the airport.

3.4.9 Biometrics Systems

Biometrics is a means of capturing data about an individual (for example, a fingerprint, face geometry, iris, etc.). To an IT&S system, a biometric device is a peripheral that will use the IT&S infrastructure to pass a file from the point of collection to a local or remote system that compares the biometric to a database and takes action according to the software in use.

If an airport deploys biometric systems, then a configuration of at least two biometric devices versus a single device will provide a more accurate validation technique and thereby reduce the number of "false positives."

3.4.10 Access Control Systems

Airport operators are required to control access to and from various airside and landside areas of the airport for safety and security reasons. Access control systems accomplish this task. All doors and access entry points to a particular area of the airport defined by the FAA called the security identification display area (SIDA) require an access control system.

The access control system controls staff and vehicle access to secure and sterile areas throughout the facility. These systems support an operation to meet the requirements of the federal regulations, specifically, the Part 1540 and CBP requirements and RTCA 230-B. Please also refer to the ACC Security Design Guidelines.

A computer-controlled access system is used at the identified doors and portals. Not all doors and portals need covering by such a system. Alternative, non-automated mechanisms can be used. The selection of monitored doors and those handled by other means is the responsibility of the airport police and the airport security officials. Biometric readers or two-factor authentication (card plus PIN) readers are recommended for controlling access to sensitive areas. The readers should archive information on failed access attempts as well as passed authentications.

Some access control systems have the capability to integrate with the CCTV systems to bring up a video feed for a particular alarm, and systems with this kind of technology should be considered

3.4.11 Badging Systems

Badging systems provide for airport ID cards that integrate with the access control system so that staff may be authorized to enter and leave particular areas in an airport. It is important that the management of such a system be secure.

3.4.12 Perimeter Intrusion Detection Systems (PIDS)

These systems detect alarms and initiate a response for breaches of perimeter security. This may include trip wires, CCTV, infrared detection, or other systems.

3.4.13 Fire Fighting & Alarm Systems

Sometimes part of a Building Management System (BMS), these systems detect smoke and/or heat and initiate an alarmed response to the command and control center.

These systems include smoke- and heat-monitoring devices that trigger alarms and sounders and audio and visual paging notifications upon smoke and/or heat detection. The system can also be configured to unlock emergency evacuation doors and to notify civil emergency authorities.

The fire-fighting or suppression system includes water sprinklers and other devices to extinguish a fire. Different suppression systems are required for different types of fires, e.g., electrical fires as opposed to wood or fabric. For IT rooms, dry-type fire-suppression systems are preferred, if allowable by local fire codes.

3.4.14 Natural Disaster Operation

This includes methodologies and supporting systems for handling catastrophic events such as hurricanes, floods, tornadoes, earthquakes, and ice storms.

3.4.15 Emergency Response System

These methodologies and systems coordinate an airport's response to major incidents. These include air crashes, both on and off the airport, terrorist and criminal activity, and other incidents such as fatal wrecks or accidents involving staff, passengers, or members of the public. This system should also integrate with natural disaster responses and fires.

3.4.16 Customs/Immigration

These agencies operate within the airport campus; however, they typically use separate communications systems. As such, they require electronic and physical access to their own discrete systems and also require cooperation from the airport in their own handling of incidents.

Where practical, they should be encouraged to use the airport's passive and active IT&S infrastructure.

3.4.17 Passenger Screening Systems

These systems include metal detection (walk through and wand devices), x-ray, and other optional screening or scanning devices. The security agencies will require electronic and physical access to their own discrete systems and require cooperation from the airport in the handling of incidents.

Airlines and handling agents are also required to ensure that passengers on certain types of flights carry correct documentation. This can be verified manually or through electronic systems, in which case, airlines and agencies will need access to these from agreed-upon check points.

Passenger health is also a consideration for screening. Some airports support SARS scanning devices such as those that record a passenger's thermal image or those that require a passenger to walk through a chemical bath (also applies to foot and mouth disease). Special disinfection responses may also be required for certain types of biohazards.

TSA regulations will apply to passenger screening and may be coordinated with EDS scanning.

3.4.18 Baggage Screening Systems – EDS

Baggage, cargo, and mail screening systems cover an array of technologies and devices. Some are small and others can be physically very large and/or heavy, requiring special floor loading considerations. X-ray or EDS devices exist, for example, to scan an entire tractor/trailer rig or container.

3.4.19 APIS—for Inbound, International Flights

Airports may wish to help their tenant airlines and passengers comply with US government data collection requirements such as APIS (Advanced Passenger Information System) which is managed by the U.S. Customs and Border Control. Often the airlines collect this, in which case appropriate access to the relevant airline system will be required.

3.4.20 US Visit Systems

The US Visit program captures a departing passenger's passport & I94 data through a kiosk-based scanner. Such kiosks are deployed at designated locations around the airport for entry and exit applications.

3.4.21 Perimeter Security

The first line of defense in airport security, the perimeter boundary, includes fences, barriers, and walls. Fences and walls should be tall and difficult for people to climb over. Ideally, they should also be able to withstand the force of a vehicle trying to drive through them. An airport with sea, lake, or river boundaries, needs to consider restricting access from the water.

Security personnel should patrol the area regularly to keep watch for people trying to cut through the fence and surveillance technology, intrusion-detection technology, and other IT solutions should complement perimeter security. Surveillance cameras should be at all entry points, as well as in sensitive areas such as fuel depots for 24/7 monitoring at a Security Operations Center.

3.4.22 Video Surveillance

Integrated video surveillance technology using CCTVs is an integral part of monitoring physical security for any airport. This can be integrated with fire and perimeter alarms.

3.5 Airport Facilities & Maintenance Systems

Airport Facilities & Maintenance Systems include all IT&S required to sustain the airport facilities' operations, spanning HVAC and electrical systems to computerized maintenance management systems. The following is a recommended SBS for Airport Facilities & Maintenance Systems

3.5.	Airport Facilities & Maintenance Systems
3.5.1.	Building Management Systems
3.5.1.1.	Electric Power
3.5.1.2.	HVAC
3.5.1.3.	Lighting
3.5.1.4.	Supervisory Control and Data Acquisition (SCADA)
3.5.2.	Utilities Metering Systems
3.5.3.	Computerized Maintenance Management System (CMMS)
3.5.4.	Signage Management System
3.5.5.	People Mover Systems
3.5.5.1.	Elevators
3.5.5.2.	Escalators
3.5.5.3.	Moving Walkways
3.5.5.4.	Light Rail
3.5.5.5.	Turnstiles
3.5.6.	Material Management
3.5.6.1.	Maintenance and Construction Management
3.5.7.	Energy Management
3.5.8.	Air Bridge Maintenance
3.5.9.	Vehicle Parking Access Maintenance
3.5.10.	Waste Management
3.5.10.1.	Sewage Processing
3.5.10.2.	Waste Burning Management
3.5.10.3.	Storm Water Run-off
3.5.11.	Airport Vehicle Maintenance

3.5.1 Building Management Systems

Building management systems (BMS) manage the electromechanical systems in a facility, including security, lighting, cooling, heating, and ventilation. These are also known sometimes as HVAC (heat, ventilation & air conditioning) systems. Sensors and other devices used by a BMS are called "points." These include thermostats, fire detection sensors, sprinklers, etc.

Modern building management systems use IP for transport so the airport campus LAN can be used for the transport and interconnection of such systems.

Building management is a key component of intelligent building design, where several sub-systems tightly integrate so that they can operate with much greater efficiency, anticipating changes in weather and adjusting for the number of people in a given location, etc. Building management can also include rent and fees based on tenant occupancy and utilization.

Several of the major sub-systems are discussed below:

3.5.1.1 Electric Power

Electric power is vital for the operation of all airport facilities. A variety of sources, including external transmission, provide electric power usually via a dedicated sub-station, internal generation, standby generators, and in some circumstances, battery power.

The power supply should be rectified or regulated to prevent voltage spikes and power surges. Consider using UPS to protect vital or sensitive equipment. In addition, implement adequate protection from lightning.

3.5.1.2 HVAC

The HVAC (heat, ventilation, & air conditioning) system is responsible for the environment and air quality within a building.

3.5.1.3 Lighting (also Facility Lighting)

Effective facility lighting is vital for a wide variety of reasons. Lights consume power, generate heat, prevent accidents, and impact worker productivity. Modern techniques for managing lighting include motion sensor control, multi-level switching, and the use of meters to verify ambient and required light levels.

3.5.1.4 Supervisory Control and Data Acquisition (SCADA)

SCADA, a mature system developed in the 1960s, is an instrumentation system used to control, collect, and forward building management monitoring data to a control center. SCADA can handle alerts.

3.5.2 Utilities Metering Systems

These are systems used for metering gas, electricity, and water. They can also meter steam and oil. Metering gauges consumption of the utility. Airports may be consumers of these resources and may also wish to meter their consumption by tenants for recharging purposes.

3.5.3 Computerized Maintenance Management System (CMMS)

A CMMS software package maintains a computer database of information about an organization’s maintenance operations. CMMS organizes planned (preventative) and unplanned (corrective) maintenance tasks, usually referred to as tickets or work orders. A CMMS can also perform inventory and asset management and will produce a wide variety of reports. A CMMS is sometimes referred to as an enterprise asset management system. The asset database may also track service entitlement and SLAs.

3.5.4 People Mover Systems or Automated People Movers

People mover systems include a wide variety of electromechanical devices that are deployed in a coordinated manner across an airport. Several of these systems are described below.

3.5.4.1 Elevators

These devices move people and goods vertically between different floors in a building.

3.5.4.2 Escalators

An escalator is a moving staircase that moves people between floors. These are widely deployed around an airport.

3.5.4.3 Moving Walkways

A moving walkway, also known as a moving sidewalk or travelator, moves people horizontally rather than vertically. They are widely used in airports to speed the flow of people where long distances need to be walked.

3.5.4.4 Light Rail

Light rail moves passengers in larger or busier airports between different buildings. They might be between adjacent concourses, car rental facilities, main-line rail, bus stations, or parking lots.

Several different types of light rail exist, including Maglev monorail, guide way, and duo rail.

3.5.4.5 Turnstiles

To facilitate moving people around a large facility, it is sometimes necessary to check that they have the appropriate authority to proceed. Devices such as turnstiles achieve this. These can read a wide variety of documents and permit or deny access based on the validity of the document. Contact-less tokens can also be used

3.5.5 Material Management

Material management is a logistical discipline that provides management guidance for major items as well as repair parts and procedures for buildings and related civil engineering projects.

3.5.5.1 Maintenance and Construction Management

These are the processes and supporting systems used for implementation of capital projects, renovation, and reconstruction projects, including the implementation of all building sub-systems, such as BMS. It encompasses not only construction but also essential services such as plumbing, painting, labor management, and contracting.

3.5.6 Energy Management

This seeks, preferably as a continuous business process, both efficiency and economy in the deployment and consumption of energy given the functional constraints and operational needs of the airport. The growing interest in the socially responsible way to obtain and consume energy has increased the environmental aspects of this task.

3.5.7 Air Bridge Maintenance

This system maintains air bridges and jet ways.

3.5.8 Vehicle Parking Access Maintenance

These systems maintain the roadway and barrier controls that govern the use of parking areas.

3.5.9 Waste Management

An airport generates substantial amounts of waste material. Waste management systems help airports dispose of waste or recycle it in an environmentally acceptable way and in compliance with local regulations and ordinances.

3.5.9.1 Sewage Processing

This system manages the treatment of sewage. Larger airports have their own treatment facilities capable of producing treated effluent and sludge in order to deposit treated sewage back into the environment. Smaller airports will use public facilities.

3.5.9.2 Waste Burning Management

Waste burning management systems are available for airports, since some waste needs to be burned on site.

3.5.9.3 Storm Water Management

The initial construction program will have anticipated handling surface run-off water. However, there are necessary actions associated with these facilities to keep them functioning, including cleaning grilles and removing branches, plastic bags, and other items capable of blocking run-off access.

Sophisticated systems exist for monitoring water levels and rates of water flow.

3.5.10 Airport Vehicle Maintenance

Airports use a wide variety of vehicles and need a vehicle maintenance facility that can maintain, repair, and service vehicles.

Such vehicles range from ground handling equipment, de-icing equipment, fire engines, police cars, and autos to golf carts, forklift trucks, cherry pickers, and extendable devices for accessing high internal ceilings.

3.6 Airport Development Systems

Airport development systems include all IT&S required to support airport planning, engineering, construction, and environmental compliance, spanning project controls systems to geographic information systems. The following is a recommended SBS for Airport Development Systems.

3.6.	Airport Development Systems
3.6.1	Project Management System
3.6.2	Drawings Management System
3.6.3	Environmental Management System
3.6.4	Pavement Management System
3.6.5	Airspace & NAVAID Obstruction Management System
3.6.6	Computer Aided Design & Drafting (CADD)
3.6.7	Geographic Information System (GIS)
3.6.8	Three Dimensional Visualization System
3.6.9	Circulation Flow Analysis & Simulation System
3.6.10	Marketing
3.6.10.1	Marketing – Community Outreach Support
3.6.10.2	Marketing – Passenger Outreach Support
3.6.10.3	Marketing – Tenant Outreach Support
3.6.10.4	Marketing – Business Intelligence Support
3.6.10.5	Marketing – Advertising Decision-making Systems
3.6.10.6	Certification Laboratory (for applications and hardware under consideration)

3.6.1 Project Management System (PMS)

A PMS is a tool for defining and managing the entire lifecycle of a project or multiple projects. It should include a work breakdown structure (WBS), resource plan, governance, scope, budget and other financials, including a project P&L, and track dated milestones against plan and actual.

3.6.2 Drawing Management System

Drawing management systems provide check-in, check-out, storage, and retrieval of drawings.

3.6.3 Environmental Management System

Airports create many environmental hazards, including noise and pollution (such as de-icing run-off). An EMS system drives a methodology for minimizing the environmental impact of an airport and ensures compliance with appropriate regulatory standards and, where desirable, appropriate ISO certification.

3.6.4 Pavement Management System

A pavement management system is a set of tools or methods that can evaluate and maintain pavements (such as roads, aprons, taxiways, and runways) in a serviceable condition. A PMS consists of two basic components. One is a comprehensive database that contains current and historical information on pavement condition, pavement structure, and traffic. The second component is a set of tools that allows an airport to determine existing and future pavement conditions, predict financial needs, and identify and prioritize pavement preservation projects.

3.6.5 Airspace & NAVAID Obstruction Management System

This system allows an airport to maintain and promulgate (including via NOTAM and obstacle charts) its obstacle database and to run evaluations against proposed incursions into safety zones.

3.6.6 Computer Aided Design & Drafting (CADD)

CADD is a design and drafting software tool for planners, architects, and engineers, Used in architecture, construction and even manufacturing to assist in the preparation of design drawings and other contract documents. While CAD has the capability for 3-dimemnsional design, it is typically used for 2-dimensional plan sheets.

AutoCAD comes with a complete set of powerful drafting and detailing tools for delivering the most efficient solutions in engineering design. Many of the benefits AutoCAD are as follows:

1. Save time, money and reduce errors with faster editing capabilities.
2. Increases value to clients by delivering more design alternatives in less time.
3. Creates production sheets faster.
4. Production drafting is always in sync with the engineering design.
5. Complete projects faster and reduces the chance of coordination errors.

6. Clearly communicates design intent.

3.6.6.1 Building Information Modeling (BIM)

Building Information Modeling (BIM) is the process of generating, coordinating and managing building information during its designing cycle. Typically, it uses three-dimensional, real-time, dynamic building modeling software to increase productivity in building design and construction. The process produces a 3-dimensional “Model”, which encompasses building geometry, spatial relationships, and quantities and properties of model components.

Many of the benefits of Modeling software technology are as follows:

1. **Multi-discipline Coordination and Interference Checking-** Modeling options include mechanical systems; duct layout; heating and cooling; load analysis; lighting; wire path layout and circuit layout; power load balancing; wire sizing and panel schedule generation; plumbing systems; fire protection systems; fire alarm systems; and special systems modeling. Engineers and CAD Technicians work simultaneously within the model and conflicts are instantaneously identified and corrected, saving time and minimizing rework.

2. **Design for Constructability, Support for Sustainable Design and Load Analysis-** Provides the ability to produce load calculations using gbXML to compare with other methods used by engineers to determine how much heating or cooling is necessary to keep rooms comfortable. gbXML was developed to facilitate the transfer of building information stored in CAD building information models, enabling integrated interoperability between building design models and a wide variety of engineering analysis tools and models available today.

3. **Proprietary Content Design and Building-** Revit is still in its infancy and while a good deal of 3D content is available on the internet and for free, many of the devices and equipment used in designs are unavailable and have to be created in-house. All devices are created with the dual purpose of 3D interoperability and 2-dimensional display for plotted sheets.

3.6.7 Geographic Information System (GIS)

GIS data records and represents existing and potential real world objects (roads, land use, elevation) with digital data. Physical objects can be split into two types: discrete objects (i.e. a hanger) and continuous fields (i.e. rain fall or elevation). There are two methods used to record data in a GIS for both cases—Raster and vector. Raster uses discrete data points, and vector uses geometry.

3.6.8 Three Dimensional Visualization System

This system represents plans in three dimensions. Such a system is used for constructing 3D computer models of the interior space of an airport, including concourses, baggage, and employee inspection areas. Some airports may develop a library of 3D computer models describing the facility.

3.6.9 Circulation Flow Analysis & Simulation System

These analysis and system tools develop a model that consists of a series of worksheets that estimate the number of people (or aircraft or buses or other vehicles) who would pass through each user-defined element or zone, the number who pause in the zones and for how long, and take into account different arrival rates. Airports use these to evaluate different configurations of check-in positions.

3.6.10 Marketing

3.6.10.1 Marketing – Community Outreach Support

These systems manage airport-related issues of importance to the community, including educational programs. They can be developed in partnership with local school districts.

3.6.10.2 Marketing – Passenger Outreach Support

This system manages airport-related issues of importance to passengers, including familiarization programs, airport tours, and fear-of-flying programs.

A customer-loyalty scheme may also be considered an outreach program. It may provide frequent flyer privileges such as free WiFi and preferential parking.

3.6.10.3 Marketing – Tenant Outreach Support

This system manages airport-related issues of importance to tenants. There are several schemes available for this, including those sanctioned by IATA that define a methodology for running airport operator committees. These have a stated term of reference and meet on a regular basis.

3.6.10.4 Marketing – Business Intelligence Support

Business intelligence can help an airport optimize its use of resources and provide insights into the way its tenants and passengers use its facilities. Such information, when fed back into the airport planning process, can help update the master plan. A wide variety of sources, including point of sale retail devices and common-use self-service kiosks can provide business intelligence.

An airport may develop its own data repository or use third-party systems.

3.6.10.5 Marketing—Advertising Decision-Making Systems

There are two approaches to this topic: one is consumer-based decision-making; and the other is enterprise based, leveraging data from the AODB in order to position targeted messages to specific customers. Discrete systems exist to support both approaches.

3.6.10.6 Disaster Marketing Management

These are systems and controls for handling emergencies at an airport.

3.6.11 Certification Laboratory for Applications and Hardware Under Consideration

Airports may need to plan for the use of a certification or staging facility or laboratory, sometimes called a pre-production center. Vendors or consultants help design these, and they simulate the operational airport environment. They make sure a new or changed system will not disrupt operations.

3.7 Airport Administration Systems

Airport administration systems include all IT&S required for "back office" airport business administration, from financial management to human resources. The following is a recommended SBS for airport administration systems.

3.7	Airport Administration Systems
3.7.1	Financial Management System
3.7.2	Procurement Management System
3.7.3	Asset Inventory Management System
3.7.3.1	Financial Assets
3.7.3.2	Intellectual Property Assets
3.7.3.3	IT Assets
3.7.3.4	Cable Locations and Asset Management
3.7.4	Human Resources Management System
3.7.4.1	Airport Staff Rostering
3.7.4.2	Payroll
3.7.4.3	Insurances and Benefits Management
3.7.4.4	Staff Records Management
3.7.4.5	Recruitment Management Systems
3.7.5	Space & Lease Management System
3.7.6	Property Management System
3.7.7	Time and Attendance

3.7.1 Financial Management System

This computerized management and cost accounting system allows costs and revenues to be identified and tracked on a per-product, per-project, and/or per-customer basis, developing customized reports as required. The system needs to perform customer billing and to hold and track budgets and forecasts. All normal ledgers should be supported, and the system should comply with prevailing financial accounting standards.

3.7.2 Procurement Management System

Procurement management should facilitate the creation or import of vendor and supplier catalogs and allow purchase orders to be administered for the supply of catalog items. Adequate management reporting should be provided. Operation and tracking of bids and RFPs should also be supported.

3.7.3 Asset Inventory Management Systems

An asset management system is important for a number of reasons, not the least of which is that this drives the linking of the asset to its service entitlement. It tracks who owns it and who repairs it and under what service agreement. It is like a catalog of everything in the airport. Careful consideration needs to be given to how assets are identified—by location, ownership, value, etc.

It is also vital to keep an asset register up to date.

3.7.3.1 Financial Assets

This is a register of financial assets to feed the general ledger, with associated depreciation regimes.

3.7.3.2 Intellectual Property Assets

These are asset registers of intellectual property owned by the airport. This also prompts the question of whether or not the airport has any unique processes or products that should be capitalized.

3.7.3.3 IT Assets

This register of IT assets should interface with the financial asset system. It ideally links to the service desk so that service entitlement by asset can be retrieved, and it should support a full Install, Move, Add, Change & Delete (IMACD) process.

3.7.3.4 Cable Locations and Asset Management

This is a specialized cable management system that includes asset management.

3.7.4 Human Resources Management System

Human resources are critical to an airport. An HR system should be able to interface with other systems as required (e.g., staff rostering, payroll, ID card issuing, recruitment, etc). It should also be capable of tracking personnel certifications and training requirements.

3.7.4.1 Airport Staff Rostering

A staff rostering system takes the variable resource load, driven by peak and trough demands, and converts it into a manpower-staffing grid. This becomes a roster.

Because airports operate shifts, this is an important system. Its use will permit optimization of employee workforce productivity and minimize overtime. A staff rostering system needs to be flexible enough to incorporate user-defined business rules and collective agreements. The system should interface with the HR, payroll, and time and attendance systems. This is for overtime payment calculation and absence management and, when used in association with future seasons, for manpower planning and forecasting.

3.7.4.2 Payroll

Payroll can be handled either with an in-house solution or through a bureau service. The system needs to interface with rostering, time and attendance, and HR systems.

3.7.4.3 Insurances and Benefits Management

This system should address staff, contractor, and general airport insurance requirements, including liability insurance, medical benefits, and other insurances as required.

3.7.4.4 Staff Records Management

Staff records will drive training requirements and some staff rostering activities (recurrent training and certification, for example).

3.7.4.5 Recruitment Management Systems

This system manages and tracks job vacancy postings and recruitment progress.

3.7.5 Space & Lease Management System

This system aims to optimize rentable space, create in-house lease exhibits describing the space being leased, and to track tenant performance and history. The system should be able to use drawings from a CADD system. Good management reporting, important to this system, should include items such as revenue per square foot, occupancy costs, sales trends, etc. The system should address all aspects of the airport's business including retail, office, and industrial uses.

3.7.6 Property Management System

A property management system (also referred to as a PMS, but not to be confused with a pavement management system) processes and maintains records for the full accounting of property management needs, including interfaces with the general ledger. It should also include a property payables function. This is also the means to maintaining the physical airport environment. It should include or interface with a service desk capability to allow problems and faults to be called in, trouble tickets opened, and appropriate action taken against SLAs and contractual service entitlement where appropriate. It should also cover both planned maintenance and ad-hoc fault repairs. This system may integrate with a spatial display system, such as GIS.

3.7.7 Time and Attendance

A time-and-attendance system tracks employee clocking and records work start and end times. It should interface with the staff rostering system and payroll, as well as the HR system.

3.7.8 Meeting Management (Events Scheduling)

These record, plan, and manage the use of defined airport facilities and spaces for meetings and events. In addition to meeting rooms facilities may include conference centers, gates, open areas, tours, etc.

3.7.9 Library and Regulation Management

A library and regulation management system automates, manages, and administers the overall processing of large-scale libraries, such as those employed in an airport, to meet local legislation and FAR requirements. This system should also manage issues, returns, magazine/newspaper subscriptions, and, if appropriate, calculate and manage fines and balances of payments due from users of the library.

3.7.10 Noise Monitoring Systems

An airport noise monitoring system provides measurement of aircraft noise levels in and around the airport, including neighborhoods and suburban communities. This integrated system includes many components, such as a network of permanent noise monitors and, where possible, directly connects to air traffic control radar so that it collects aircraft flight tracks and measures the noise associated with each track.

3.7.11 Airport Revenue Management

This system automates fee calculation and its subsequent invoicing. It is useful for landing and handling fee calculation and increasingly interests airports as they seek to manage ways to charge tenants for use of IT&S facilities.

3.7.12 E-Commerce Website for Airport and Tenants

This allows an airport to operate several facets of its business in an automated manner. There are different E-commerce models; for example, B-B (business to business, i.e., airline to airport), and B-C (business to consumer, i.e., a member of the public buying a T-shirt or pre-paid card for wireless access). The B-B aspect can include bill paying and invoicing, landing and handling requests, ordering, managing purchasing or running RFPs, etc. In this instance, the airport is likely to establish an Extranet to connect invited suppliers to join.

3.7.13 Tenant Relations – Business Services

These business applications allow an airport to manage its tenants

3.7.13.1 Tenant Relations – Contract/Lease Administration

This manages a database that includes contract and lease information. It includes parties to the contract, type of contract, lease information (location, square footage, rates, etc.), start and end dates, and other pertinent information relating to contracts and leases.

3.7.13.2 Tenant Relations – Product Catalog Management

Airports should consider productizing the services they provide to their tenants and maintaining a product catalog. Some airports already do this and do it well. Examples include telephony services (cost of a phone line, how long it takes to provision, etc.) or the use of a data port for accessing the Internet at a given access rate.

3.7.13.3 Tenant Relations – Product Provisioning

This is an ordering process for tenants to request services from the airport. It includes product catalog, lead times, and rates where applicable.

3.7.13.4 Tenant Relations – Electronic Bill Payment

This is a facility or portal to allow tenants to pay bills using Internet-based banking or other electronic methods to transfer funds. Airports may wish to consider a clearinghouse approach for larger customers.

3.7.13.5 Tenant Relations – Point of Sale & Revenue Management Systems

These include inventory management and point of sale systems that correlate the receipts data to the inventory system to manage inventory and to perform the appropriate billing and crediting.

3.7.14 Database Management Systems

There are a large number of databases active within the airport at any one time. These systems may be discrete or integrated into an array, main-frame style, or using a blade server configuration. Specific tools are available for the management of such databases. This is an important critical task.

Consideration should be given to disaster recovery and off-airport storage for data files.

3.7.14.1 Spatial Database

A spatial database is a collection of spatially-referenced data that acts as a model of the airport and its environs. It may be arranged in time slices as necessary.

3.7.14.2 Enterprise Content Management System (ECMS)

A content management system (CMS) is an application for organizing and facilitating collaborative creation of documents and other published materials.

3.7.14.2.1 Documentation Management Systems

Document management systems provide check-in, check-out, storage, and retrieval of electronic documents.

3.7.14.2.2 Drawings Management Systems

Drawings management systems provide check-in, check-out, storage, and retrieval of drawings.

3.7.14.2.3 Graphics/Photos Management Systems

Document management systems provide check-in, check-out, storage, and retrieval of graphics and photos.

3.7.14.2.4 Video Management Systems

These include the use of software and hardware to capture, record, compress, mix, and store video data.

3.7.14.2.5 Audio Management Systems

These systems use software and hardware to capture, record, compress, mix, and store audio data.

3.7.14.2.6 E-Mail Management Systems

E-mail management systems manage an enterprise's e-mail, establishing e-mail addresses, e-mail servers, and company intranets and extranets.

3.7.14.3 Tourism and Hotel Information

This includes a service desk, Web content, or hot key access to tourism and hotel information, perhaps through a third party like Expedia, Priceline, Travelocity, or Hotels.com.

3.7.15 CNN News TV Monitor

This is a digital cable feed through satellite for use around the airport, e.g., gate areas, airline lounges, etc.

4 PROCESS OF IMPLEMENTING AIRPORT IT&S

Implementing airport IT&S should involve four major integrated processes— planning, design, construction, and commissioning.

Figure-4 illustrates the overall relationship between these integrated processes. While planning, design, and construction are consecutive processes, commissioning is not.

Commissioning should start during the planning process and continue in parallel through design and construction, serving essentially as an overall quality assurance for the integrated implementation processes. The following sections describe each of these processes.

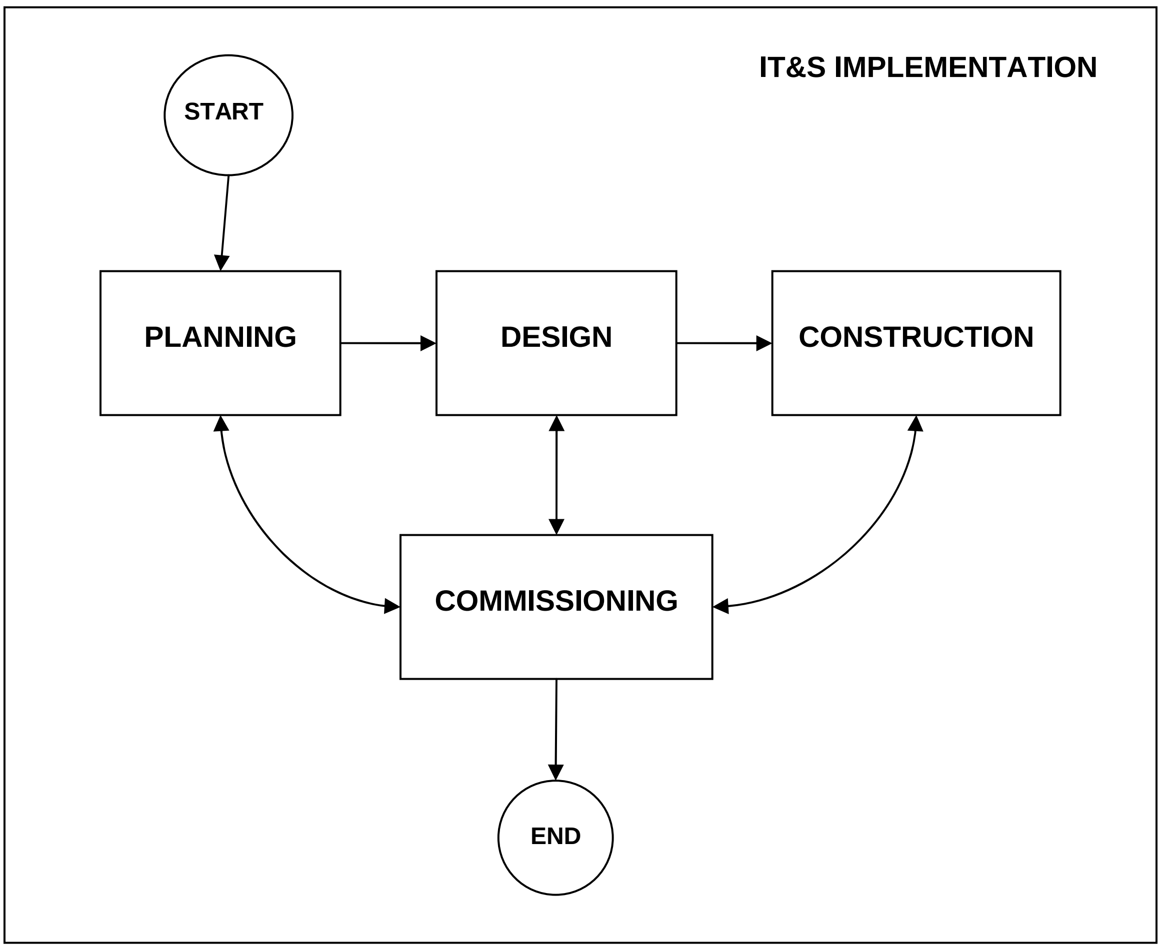


Figure-4: Integrated Implementation Processes

The process of implementing airport IT&S projects involves a natural sequence of activities. Like most implementation projects:

1) requirements must be identified;

2) strategies must be designed to implement the requirements;

3) a strategy must be built to best implement the design;

4) a deployment/installation/test strategy must be developed, and 5) a strategy on how to best operate and maintain the IT solution must be developed.

The process of using consultants and vendors in implementing IT&S can involve a variety of alternatives, depending on the airport and its procurement approach. For example, the traditional procurement strategy has one consultant assist with planning, one or two doing the design, and perhaps another consultant performing construction oversight with individual vendor(s) providing the implementation.

If there is a significant amount of systems integration, the requirements can get lost if the implementation vendor(s) does not have a say in the design phase, specifically the final design phase. For projects involving multiple integrated systems, a potential procurement strategy includes having one contractor for planning, one for preliminary and detailed design, and a system integrator (to procure multiple vendor systems) for final design/implementation. The initial design consultant can remain as the construction oversight consultant, or the airport can select yet another consultant for this function.

Another option is for the planning consultant to take on the preliminary design and even detailed design. Again, different strategies are available for each specific airport and its project-specific requirements to determine the best implementation process based on time, budget constraints, and technical risks.

This section of the design guideline highlights the typical processes for implementing airport IT&S projects.

4.1 Planning

Changes in requirements for airport capacity and safety will naturally affect the airport's operational environment, including airfield, roadways, parking, terminals, automated people movers, and other support facilities. This operational environment depends heavily on various information technology and systems (IT&S) and their corresponding infrastructure, which directly affect the airport's capacity and safety. IT&S includes dozens of critical airport systems often taken for granted during planning, budgeting, and even design phases.

IT&S support for efficient airport capacity and safety must be included early in the process by airport planners, as a significant, dedicated component of an airport's Master Plan. The IT&S portion of the Master Plan should:

- Focus on requirements of passengers, airlines, non-airline tenants, and airport staff. Planning, budgeting, and specification of IT&S should include all critical infrastructure and operational business computer applications.

- Describe and establish a long-term plan for flexible IT&S that can best support airport operations and management efficiencies in a dynamically fluctuating business environment.

- Provide a framework for future IT&S implementation decisions.

Within the overall Master Plan, the IT&S portion should also include:

- Inventory of the airport's existing IT&S being used to support safe and efficient passenger processing

- Quantification of existing IT&S capacity in terms of Million Annual Passengers (MAP)

- Required IT&S expansion/upgrades to support efficient and safe processing of airport MAP levels projected at the various planning horizons (e.g., 5, 10, and 20 years).

Airport planners should utilize the proven expertise of airport IT&S consultants to develop the IT&S portion of the Master Plan. However, the IT&S planning must be in response to the overall airport's organizational and business goals, not IT&S goals.

The security features to support the business functions of the airport of the future must be planned into the IT&S architecture from the very beginning, not as an afterthought. Keep in mind that the airport of the future will be the hub of an integrated travel experience. Baggage will be secured and tracked, portal-to-portal. Passengers will be ticketed and screened at remote drop-off and check-in locations. Access to the central terminal from the remote drop-off locations will be via secure airport bus/train/light rail. Identity authentication for passengers will be interoperable across other modes of transportation. Ingress to and egress from the central terminal will be seamless and efficient but constantly monitored for security. Smart parking garages will provide both efficient and secure parking and surveillance. Security will be ubiquitous and non-intrusive.

The IT&S portion of the Airport Master Plan should analyze the IT&S at the airport, including airport telecommunications systems, network infrastructure, and key airport business computer applications. This analysis should be organized as follows:

1. Current conditions

2. Industry standards and best practices

3. Gap analysis

4. Phasing recommendations for closing any identified gaps

5. Budget level cost estimates for any recommendations

The IT&S portion of the Airport Master Plan should also include at a minimum:

1. A discussion of the airport organization's business goals for the near term, mid term and long term
2. A "snapshot" of the current situation at the airport—an inventory of the airport's existing IT&S being used to support safe and efficient passenger processing, including quantification of existing IT&S capacity in terms of Million Annual Passengers (MAP). This component should be updated on at least an annual basis to keep the IT&S Master Plan relevant.
3. Recommendations for IT&S expansion/upgrades to support efficient and safe processing of airport MAP levels projected at the various planning horizons (e.g., 5, 10, and 20 years)
4. Recommendations for systems and/or applications requiring further study.
5. Data security policy that embraces the Sensitive Security Information requirements of 49 CFR 1520.
6. Data security classifications and restrictions that protect vulnerabilities without overly restricting use.
7. Standards and usage policy for airport and public access wireless networks.
8. Data standards that promote the exchange of consistent quality data between airport, contractor, FAA, and TSA personnel.
9. Requirement for open architecture, standards-compliant databases.
10. Approach to application design, development, and testing.
11. Need for systems operational and maintenance plans.
12. IT&S disaster recovery plan(s).
13. Help desk and user training resources.
14. Systems upgrade budget and schedule.
15. Compatibility of critical safety systems including fire alarms, security alarms, CCTV, building control systems, and computer-automated dispatch.
16. Compatibility of CCTV and access control device systems.

17. Integration of airport billing and financial systems.

18. Availability of FAA or third-party aircraft tracking information.

19. Policy for using airport IT&S infrastructure to support tenant CUPPS, CUSS, MUFIDS, BIDS, and POS systems.

20. Radio system technology and frequency use.

21. Parking and AVI system compatibility with financial systems.

22. Availability of airport kiosks.

23. Off-airport check-in.

24. Methodology and system support for creation and implementation of IT&S business services to tenants, including product definition, provisioning, and billing.

25. E-commerce strategy, including web-portals, financial clearing house, and ability to sell and promote local businesses and attractions.

26. Community relations.

4.1.1 Identify Stakeholders

Stakeholders may be defined as parties who have a strong business relationship with the airport. Typical stakeholders include airport owner, airport operator, airlines, ground handling agencies, and freight operators, as well as tenants, and the surrounding community.

It should also be clear what the agreed objective of the main stakeholders is, as this will drive the IT strategy. Technology can play two critical roles in an airport: either (a) as an enabler of desired business outcomes, driving flexibility and allowing customers to select the means and the nature of their interaction with the airports systems, or (b) as a tool to drive cost and inefficiency out of the logistics supply chain, bolstering productivity and cost reduction.

The Airport Master Plan should provide the best frame of reference for IT planning. If the IT plan supports and aligns with the Master Plan, the budget is adequate, and expectations are realistic, the stakeholders will be well served. If the IT plan does not support the Master Plan, the resulting disconnect will hinder successful implementation.

Each system will have its own set of stakeholders since the business footprint of each IT system will be different. It is helpful to map out and understand these stakeholders and their desired outcomes.

Consider tenant representation. In most airports, stakeholder opinions are reflected through committees, such as in an Airport Operators Committee (AOC), that has limited governance and empowerment. Care should be exercised to ensure the consideration of local community interests.

Airlines will have different requirements based on several criteria. First, it is important to understand whether an airline representative reflects the head office, passenger service and IT views. Next, the airline operating model will also influence the requirements, depending on if they are a charter operator, regional airline, mainstream carrier, or low-cost carrier, with or without packages, mail, and freight.

4.1.2 Objectives

The purpose of planning is to lay out the system requirements of the IT&S project. Airport consultants must work closely with the airport operator and other relevant stakeholders to determine the overall performance and functional requirements. The requirements focus on needs of the relevant operators and users of the system. The consultants may want to inquire if an overall IT Master Plan exists at the airport and assess its usefulness on the IT&S project.

4.1.3 Key elements

The planning phase consists of three key activities, including:

- Identification of user and operator system requirements and interviewing airport stakeholders to determine needs requirements
- Assessment of existing applicable legacy systems regarding interoperability and integration requirements
- Assessment of impact requirements to existing system architecture

4.1.4 Product Deliverables

The planning phase may involve an assortment of planning documents. At a minimum, the product deliverable of the planning phase needs to document the overall system requirements for the IT&S project. Planning documents may include non-technical items such as budget and schedule baselines for the proposed IT&S project. Meetings should include all the necessary parties to assist in facilitating the development of a system requirements document.

4.2 Design

Naturally each airport or IT partner will have their own established way of addressing an airport's requirements and developing those requirements into what will be a contracted solution. However, an airport requires a rigorous, legal, and fair way of evaluating different designs and proposals so that it can select the most effective design for its own purpose.

To get the best out of any vendor's bidding team, the more creativity that can be encouraged, the better. This lends itself well to specifying a functional solution, rather than specifying a particular design with pre-identified components.

The more a vendor sees that a design is built around a specific component, the less the chance you have of getting a fair market price for the functionality.

4.2.1 The End-to-End Process

In order to develop a good design, keep the end game in sight. This is the desired outcome that is ideally expressed in terms of metrics that signify success, e.g., 10,000 passengers an hour throughput, with each passenger boarded costing $5 for IT&S, 50,000 bags an hour, 1,000 vehicles an hour, etc. The more an IT project ties to a business outcome, the better the chance of successfully implementing it.

4.2.2 Benchmarking

Another thing that is often overlooked in IT&S systems, is the ongoing running costs. This is often referred to as the Total Cost of Ownership (TCO). The goal is to identify an acceptable cost of operation. Airports should not be shy in benchmarking costs with similar industries or concerns and using this as a target when developing a scope of work. This will help plan for vendor costs and internal costs, as well.

This is also an important point for airport CFOs. If this type of objective is not set correctly, then an airport's IT department could become a large entity in its own right—it is unlikely the CIO will suggest outsourcing it.

4.2.3 Setting the Baseline, Including Glossary & Terminology

All good designs need a consistent frame of reference. This will allow different parties to communicate effectively with each other and prevent misunderstandings. A glossary of terms should be published with pre-identified units of measures (e.g., Kva, etc.) and the acceptable quality standards (e.g., UL, BSA, etc).

4.2.4 System Requirements/Design Specification Guidelines

IT&S projects should start out meeting system requirements which reflect the business objectives for the system/solution. System requirement specifications ensure building needs are met and design guidelines and specifications are in line.

The following is an outline to assist IT&S in developing these specifications:

The typical contents of a system requirements specification include:

- Front Matter:
  - Title Page:

- Name
- Version
- Customer Organization
- Development Organization
- Executive Overview
- Information Page:
  - Revision History
  - Approval Signatures
  - Location of Signed Original
  - Distribution List
- Table of Contents
- Table of Figures

- Introduction:
  - Document Definition
  - Document Objectives
  - Intended Audience
  - References
  - Document Overview
- System Overview:
  - System Definition
  - Business Goals
  - Business Objectives
  - System Context
  - Summary of System Capabilities
- Functional Requirements:
  - External (Actor) Types:
    - Externals (e.g., Actors):
      - Essential Use Cases:
        - Essential Use Case Paths
- Data Requirements:
  - Requirements Data Model (e.g., Business Object Model or Logical Data Model)
  - Required Data Type Descriptions (e.g., data dictionary with textual definitions and associated data expressions, XML DTDs)
- Quality Requirements:
  - Developer-Oriented Quality Requirements:
    - Maintainability
    - Correct ability
    - Extensibility
    - Portability
    - Reusability
    - Scalability
    - Testability
  - User-Oriented Quality Requirements:
    - Audit Ability
    - Branding
    - Capacity
    - Configurability:
      - Internationalization

        - Personalization
        - Variant Capabilities
    - Correctness:
        - Latent Defect
        - Accuracy
        - Precision
        - Timeliness
    - Dependability:
        - Defensibility:
            - Safety
            - Security:
                - Access Control:
                    - Identification
                    - Authentication
                    - Authorization
                - Immunity
                - Integrity
                - Intrusion Detection
                - Non-repudiation
                - Privacy
                - Security Auditing
                - Survivability
                - Physical Protection
                - System Maintenance Security
        - Operational Availability
        - Reliability
        - Robustness
    - Efficiency
    - Interoperability
    - Operational Environment Compatibility
    - Performance:
        - Jitter
        - Latency
        - Response Time
        - Schedulability
        - Throughput
    - Utility:
        - Accessibility
        - Installability
        - Operability
        - Transportability
        - Usability
- Constraints:
    - Physical Constraints
    - Business Rules:
        - Calculations
        - Logical Constraints
        - Logical Inferences
        - Physical Facts
        - Triggering Events

- o System Component Specific Constraints:
  - Data and Content Constraints
  - Hardware Constraints
  - Software Constraints
  - Personnel Constraints
- o Industry Standards
- o Legal and Regulatory Constraints
- o Production Environment Constraints

- Appendices:
  - o Envisioned Future Enhancements
  - o Tentative Requirements
  - o Desirable Functional and Nonfunctional Capabilities (“should”)
  - o Nice to Have Capabilities
  - o Permitted Capabilities (“may”, if any)
  - o Rejected “Requirements” (e.g., out of scope or inconsistent)
  - o Major Issues
  - o Major Items To Be Determined
  - o Assumptions

The following is a generic outline that could be used for an IT&S Design Specification. It is not intended to be complete but provides the key areas which the specification needs to address:

- Introduction
- System Overview
  - o Design Considerations
  - o Assumptions and Dependencies
  - o General Constraints
  - o Goals and Guidelines
  - o Development Methods
- Architectural Strategies
  - o Strategy 1 name or description
  - o Strategy 2 name or description
  - o ...
- System Architecture
  - o Component 1 name or description
  - o Component 2 name or description
  - o ...
- Design Policies and Tactics
  - o Policy/Tactic 1 name or description
  - o Policy/Tactic 2 name or description
  - o ...
- Detailed System Design
  - o Module 1 name or description
  - o Module 2 name or description

4.2.5 Objectives

The purpose of the design phase is to develop the most efficient and productive design solution for the airport IT&S project based on the baseline system requirements document. The design effort can be broken into phases reflecting the progress of the design effort, such as 30, 60, 90, and 100 percent design completion phases. Actual phasing definition is left up to the airport operator, based on specified requirements. The more complex the project, the better it may be to use a phased-design approach.

4.2.6 Key Elements

The key elements of the design effort of an IT&S project focus on functional and performance systems requirements and decomposition of the system architecture. As a result, the typical IT&S project will include the following design elements:

1. System Design Phase (30 percent)
2. Preliminary Design Phase (60 percent)
3. Detailed Design Phase (90-100 percent)

4.3 Project Deliverables

During the design phase, the product deliverables focus on the detailed design specifications of the IT&S solution for the project. The specifications need to define detailed design parameters sufficient to procure the products as Commercially Off-The-Shelf (COTS) products and/or customized for unique use.

It will be important to schedule and hold key system engineering reviews to ensure traceability back to the systems requirements specifications. Reviews with stakeholders must be conducted after every major design phase—this has become an industry best practice.

During the design phase, the airport consultant, working with his airport customer, should identify the specific test, maintenance, and training plans that need to be developed. In addition, any other QA/QC requirements for the project should be identified at this stage.

4.4 Construction

The purpose of this phase is to oversee, on behalf of the airport operator, the procurement/building, deployment, and installation activities of the IT&S solution by the vendor(s). Depending on the actual scope and level of integration of the IT&S solution, the complexity of the construction oversight phase will vary.

When completed, the airport consultant should be able to validate, prior to commissioning, that installed IT&S systems have successfully passed Factory Acceptance and On-site Systems Integration and Test as required.

4.4.1 Key Elements

The construction oversight phase, at a minimum, should address the following:

1. System Procurement Package Preparation
2. Vendor Evaluation/Selection/Award
3. Vendor Oversight
4. General Contractor (or other systems contractor coordination, if applicable, due to level of interfacing and integration with other systems)
5. Test Procedures (development for Factory Acceptance and Systems Integration and Test, and Customer Acceptance)
6. Maintenance and Training Procedures Development
7. Demonstration Test Milestones
8. Factory Acceptance Test
9. System Deployment/Installation
10. On-site Unit Testing and Systems Integration and Test (as applicable)
11. Physical and Functional Configuration Audit
12. Test Readiness Review
13. Draft User and Operator Manuals

4.4.2 Project Deliverables

The key deliverables for this phase should include the documentation that reflects the physical and functional configuration audit of the fielded IT&S solution along with any hardware and software deliverables.

The documentation for this phase should include the development of the system testing, customer acceptance, maintenance, and training procedures as required. The construction oversight phase should also include milestone reviews such as demonstration test milestones, factory acceptance, on-site unit and systems integration testing as required. System Test

Problem Reports (STPRs) should be developed along with documented corrective actions during testing activities. In addition, a Test Readiness Review should be conducted prior to entering into the commissioning phase.

Draft user and operator documentation should also be made available prior to the completion of this phase.

4.5 Commissioning

The IT&S systems commissioning process has become an increasingly important practice in project planning and delivery. It involves the systematic process of ensuring and documenting that all systems and components perform according to specification and project intent or owner/agency project requirements, as well as the owner's operational needs.

The goals of the commissioning process are to assist the project delivery team in defining performance-based project requirements, reduce operating costs, ensure adequate Operations and Maintenance (O&M) staff orientation and training, and improve systems documentation. However, the primary purpose of the commissioning process is to provide a quality-based process for the delivery of IT&S projects that will reduce delivery costs and enhance the project's long-term value to the agency/owner.

As IT&S systems have become more complex and contractors more specialized, the traditional methods for system start-up and final acceptance have proven inadequate. The commissioning process smooths the project planning, design, construction, turnover, and occupancy processes and ensures the designed systems operate as intended and can be maintained in their delivered state by O&M personnel.

The key elements of a comprehensive commissioning process include:

- Phased development of a commissioning plan that addresses key planning and design-phase commissioning activities and construction-phase commissioning activities and provides documentation after systems have been developed
- Thorough documentation of the planned systems' project intent
- Closely coordinated delivery team effort in the design phases to assure integration of the designed systems
- Rigorous testing and inspecting of commissioned systems and operating sequences during construction
- Verification of system performance based on documented functional testing and measurement
- Preparing and submitting O&M manuals (and sometimes videos) and the training of building operations staff in system operations and maintenance procedures

- Ongoing monitoring of system performance

The extent and use of the commissioning process must be tailored to the needs of each particular project. For projects that do not use, or have limited use of Construction Management (CM) services, commissioning may help resolve communication problems that could occur between the planning, design, and construction phases.

Some project owners who typically use CM services may perceive commissioning as either complementing or being redundant to normal CM responsibilities.

However, if the original IT&S design does not accurately reflect the client's needs and requirements, then regardless of the proper implementation of a commissioning process, the systems will not achieve the efficiency and performance desired. The commissioning process is not a substitute for good systems engineering design and coordination.

The airport IT&S Benchmark Test Lab (BTL) is a key ingredient for the construction and commissioning of IT&S. When developing an IT&S project, it is important to utilize BTLs for several reasons, including:

- Testing unit and systems integration testing
- Allowing team members to test and integrate their systems in a controlled environment
- Shaking down the systems before actual on-site systems integration and test
- Testing out software patches and systems upgrades before cut-over onto the actual on-site production system

The purpose of this phase is to coordinate all activities to ensure successful operation of the IT&S solution. The extent of activities can vary depending on whether the IT&S project is a standalone project or is part of an overall airport modernization or terminal expansion/upgrade project.

4.5.1 Key Elements

The commissioning phase, at a minimum, will address the following activities:

1. Conduct Maintenance Training
2. Conduct User and Operator Training
3. Perform Customer Acceptance Testing
4. Conduct Shakedown Test

5. Conduct Cutover Readiness Review

6. Conduct Actual Systems Commissioning and Cutover

4.6 Operations and Maintenance

4.6.1 Objectives

The purpose of this phase is to ensure that the IT&S solution operates in the manner intended and is maintained as appropriate per the requirements' specification. The consultant needs to ensure all policies and procedures are in place for the defined level of system availability.

4.6.2 Key Elements

During the O&M phase, the project should support, at minimum:

1. Hours of operation support and on-site support as required

2. Meet the reliability requirements, such as Mean Time To Repair and Mean Time Between Failures

3. Measurement of system availability on a regular recurrence basis as applicable (daily if required)

4. Help Desk support/Trouble ticketing procedures

5. Escalation procedures for critical failure

4.6.3 Product Deliverables

The deliverable in this phase should include, at a minimum, periodic system performance metrics of the IT&S system.

4.7 Configuration Change Management

See Section 2.6.

5 APPLICATION OF INDUSTRY STANDARDS

IT&S at an airport involves multiple systems and multiple engineering professions, each with its own set of standards. Consequently, there are many to choose from. This section identifies the most common applicable standards but in no way intends to reflect a complete list. Airport IT&S consultants should attempt to keep abreast of the latest industry standards and interpret accordingly their applicability to the airport industry.

An airport normally adopts industry standards rather than creating them from scratch. While there are exceptions to every rule, standards may need to be adjusted to an airport's specific requirements. Standards should be implemented with the users' input, allowing for fine-tuning. Any such adjustments to industry-established standards should be documented and supplied to consultants and contractors working at the airport.

The following is a list of IT&S-related standards and related standards organization:

- Construction Specification Institute (CSI) Master Format 2004 Specifications
- BiCSi Division 17
- International Air Transport Association (IATA)
- Capability Maturity Model Integration (CMMI)
- National Institute of Science & Technology (NIST)
- IT Infrastructure Library (ITIL)
- International Standards Organization (ISO)
- Federal Aviation Administration (FAA)
- Institute of Electrical and Electronics Engineers (IEEE)
- ANS/TIA/EIA

It should be noted that, in the IT arena, there are many de facto platform standards used for operations systems and hardware and these should be evaluated. The intent of adhering to standards is to ensure that IT&S solutions are not proprietary, but rather are open systems.

The following sections highlight key guidelines/standards documents, common in the airport industry.

5.1 CSI MasterFormat 2004

Construction Specification Institute (CSI)'s MasterFormat is the specifications-writing standard for most nonresidential building design and construction projects in North America, including airports. It lists titles and section numbers for organizing data about construction requirements, products, and activities. By standardizing such information, MasterFormat facilitates communication among architects, engineers, contractors, and suppliers, helping them better meet building owners' requirements. The 2004 revision is the most significant in the standard's 40-year history and reflects the growing volume and complexity of information generated for nonresidential construction projects. This revision increased the standard's previous 16 divisions to 50, although most of these divisions are reserved for later use. As information technology has grown in use by various systems making up airport facilities, the MasterFormat 2004 standard includes several divisions which may be applicable to IT&S (see highlighted divisions in Table 5.1 below). Some of these are only applicable from an instrumentation and control perspective (e.g., 21, 22, 23).

5.2 Division 17/CLA

Before the 2004 revision to the previously established 16 divisions of the MasterFormat Specifications, there was a "Division 17" standard initiative led by BiCSi. It began in 1998 with the objective of ensuring that telecommunication systems were "designed into" a building during the design phase of the project versus the more traditional method of "retrofitting" systems into the building during construction. The new 2004 MasterFormat has Sections 25 - Integrated Automation, 27 – Communications and 28 - Electronic Safety and Security, incorporated from the Division 17 standard, also known as the Communications Life-safety and Automation (CLA) initiative. Reviewing the previous Division 17 standard in concert with the application of the newer MasterFormat 2004, may be beneficial to ensure that all IT&S issues are covered in the airport's specifications.

Table 5.1

Comparison Between MasterFormat Versions

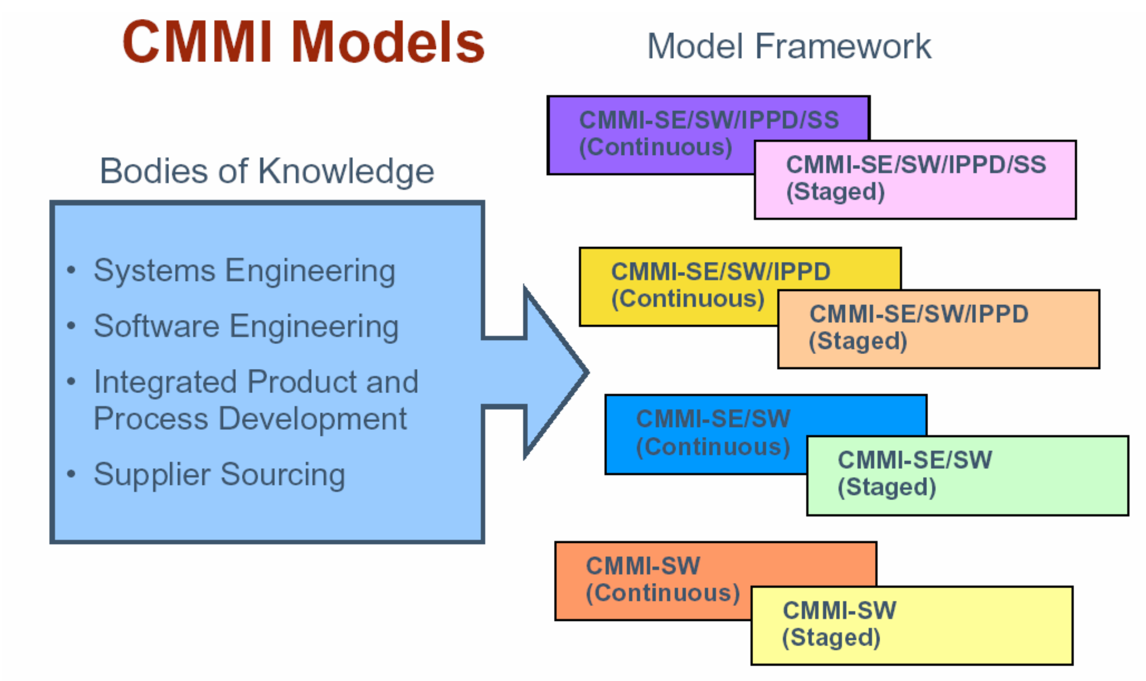
MasterFormat 1995	1995 Equiv.	MasterFormat 2004
	1	Division 00 Procurement and Contracting Requirements
Division 1 General Requirement	1	Division 01 General Requirements
Division 2 Site Work	2	Division 02 Existing Conditions
Division 3 Concrete	3	Division 03 Concrete
Division 4 Masonry	4	Division 04 Masonry
Division 5 Metals	5	Division 05 Metals
Division 6 Carpentry	6	Division 06 Wood, Plastics, and Composites
Division 7 Moisture Control	7	Division 07 Thermal and Moisture Protection
Division 8 Doors, Windows	8	Division 08 Openings
Division 9 Finishes	9	Division 09 Finishes
Division 10 Specialties	10	Division 10 Specialties
Division 11 Equipment	11	Division 11 Equipment
Division 12 Furnishings	12	Division 12 Furnishings
Division 13 Special Construction	13	Division 13 Special Construction
Division 14 Conveying Systems	14	Division 14 Conveying Equipment
Division 15 Mechanical	13	Division 21 Fire Suppression
Division 16 Electrical	15	Division 22 Plumbing
	15	Division 23 Heating, Ventilating, and Air Conditioning
	New	Division 25 Integrated Automation
	16	Division 26 Electrical
	16	Division 27 Communications
	16	Division 28 Electronic Safety and Security
	2	Division 31 Earthwork
	2	Division 32 Exterior Improvements
	2	Division 33 Utilities
	New	Division 34 Transportation
	New	Division 35 Waterway and Marine Construction
	New	Division 40 Process Integration
	New	Division 41 Material Processing and Handling Equipment
	New	Division 42 Process Heating, Cooling, and Drying Equipment
	New	Division 43 Process Gas & Liquid Handling, Purification, & Storage Equipment
	New	Division 44 Pollution Control Equipment
	New	Division 45 Industry-Specific Manufacturing Equipment
	New	Division 48 Electrical Power Generation

5.3 International Air Transport Association (IATA)

IATA is the International organization that represents the airline industry around the world. IATA's "Simplifying the Business" initiative seeks to help airlines simplify processes and increase passenger convenience while reducing costs and improving efficiency. IATA's Operational Safety Audit (IOSA) provides a series of checklists, standards and auditor reports that can be applied to IT&S.

5.4 Capability Maturity Model Integration (CMMI)

The Capability Maturity Model® Integration (CMMI) standard was developed for IT&S service providers.



5.5 IT Infrastructure Library (ITIL)

The Office of Government Commerce in Great Britain maintains the ITIL standard. ITIL provides a complete set of documents for IT services, including guides to best practices in organizational change, risk management, project and program management, and service delivery.

5.6 International Standards Organization (ISO)

For working in the international market place, ISO has created a certification process that follows a rigid set of standards through business process improvement.

6 TRENDS AND ADVANCEMENTS IN AIRPORT TECHNOLOGY

This section addresses key and emerging technologies, describing their possible impact and the consideration that should be given to their use in the airport business environment.

6.1 Common Use Passenger Processing Systems (CUPPS)

6.1.1 Overview

IATA Recommended Practice ("RP") 1797, known as Common Use Terminal Equipment ("CUTE"), was introduced in 1994. While it defined the functional requirements of what a CUTE system should do, it did not provide any technical specifications that defined how airlines' check-in and boarding applications should communicate with peripherals such as boarding pass printers, bag tag printers, and boarding gate readers. As a result, various common use platform providers introduced their own version of CUTE, each with their unique Application Programming Interface ("API"). Airlines therefore had to develop different versions of their applications, one for each CUTE platform.

In 2007, IATA re-wrote RP 1797 and re-named it Common Use Passenger Processing Systems ("CUPPS"). Following a Pilot program to de-bug the draft version of the CUPPS Technical Specification, IATA released CUPPS Technical Specification v1.01 in November 2009. CUPPS describes the range of services, specifications and standards developed to enable multiple airlines, or other users to share physical check-in or gate podium positions.

Other key CUPPS criteria include:

- CUPPS compliant (IATA RP 1797) CUPPS facilitates rather than mandates business processes
- Affordability
- Serviceability
- Predictability

Flexible provisioning environments (FPE) and a web based application solution are recognized as mature common use solutions as well, however, standards and technical specifications specifically for FPE have not been developed at this time by IATA.

A common use solution should vary by site, customer and conditions maintaining the same goals; leverage technology and infrastructure to provide the airport and airlines with the solution necessary to support common check-in and or boarding areas.

6.1.1.1 Selection Considerations

6.1.1.1.1 Airline Participation in the Selection Process

Common use check-in and boarding platforms, whether it be CUPPS, CUTE or FPE, are designed around the concept of enabling multiple airline applications to use a “common” set of peripherals, such as boarding pass printers (ATBs), bag tag printers (BTPs), and boarding gate readers (BGRs). While different platform providers may tout specific technologies or architectures, the net objective is still the same: provide airlines with the infrastructure necessary to support their check-in and boarding processes. Therefore, while airports may be the ones paying for the common use platforms, it is essential to include the airline stakeholders in the selection process as it is they who will be using the selected common use platform.

6.1.1.1.2 Total Cost of Ownership

In addition to hardware and software considerations, constantly evolving industry standards and business process drive the need for airlines to continuously update their applications. Some platform providers provide an all-inclusive price to the airport that includes airline application distribution, whereas others charge the airlines separately for this service. Therefore, the total cost of ownership by both the airport and the airlines should be considered. In addition to soft costs, the airport should be made aware of the possible increase in hard costs to maintain common use systems such as increased staff to repair or replace equipment. Additionally, increased bandwidth on the airport owned and maintained infrastructure should be identified.

6.1.1.1.3 Integrated WAN Infrastructure

Where possible, a robust common use platform should utilize a cost effective, integrated WAN facility to ease the interface between the common use infrastructure and the airlines’ DCS’s.

6.1.2 Emerging Standards: PCI DSS Compliance

PCI DSS (“Payment Card Industry Data Security Standard”) is a set of comprehensive requirements for enhancing payment account data security and was developed by the founding payment brands of the PCI Security Standards Council (including American Express, Discover, JCB, MasterCard and Visa) to help facilitate the broad adoption of consistent data security measures on a global basis.

The PCI DSS is a multi-faceted security standard that includes requirements for security management, policies, procedures, network architecture, software design and other critical protective measures. Compliance with this standard is required of any merchant that receives payment from credit cards. Airports and airlines that collect credit/debit card payments via Magnetic Stripe Readers (MSRs) are required to ensure that their IT infrastructure is PCI DSS compliant. As providers of the airport IT infrastructure used by airlines, PCI-DSS compliance is extended to both common use platform providers and airports.

When selecting a common use solution, thorough inspection of their compliance testing documents and documented processes to enable the common use platform to meet the ongoing PCI DSS requirements must take place.

6.1.3 Emerging Technologies

Many airports and common use platform providers seek to use the latest IT innovations to differentiate themselves from their competitors. However, many of these technologies are designed for single enterprises and do not necessarily lend themselves to the common use airport environment. Therefore, when defining the functional and technical specifications for a common use platform, it is worth the additional time and effort to work with the airline stakeholders since many new technologies are constrained by the 1960s era mainframe technologies still in use by the airlines. Input from the common use platform providers is also advisable since they have worked directly with the airlines to develop their platforms.

6.1.3.1 The "Latest" is not always the "Greatest"

The following examples illustrate how incorporating the latest technology can lead to an increase in price rather than obtaining the best solution at the best price.

6.1.3.1.1 Minimum Specifications

Although minimum specs for workstations have been included in CUPPS, minimum specs such as CPU speed, hard drive capacity, clustered drives, etc., should be avoided since not all providers require the same amount of workstation and/or server resources and can potentially provide their solution at a lower cost.

Furthermore, minimum specifications rapidly become obsolete, and the temptation to "cut and paste" hardware specifications from one RFP to the next can potentially call the competency of the consultant into question.

6.1.3.1.2 IP Printers

IP printers work in an office where single printers are typically shared among 20-30 users. In an airport environment, this is not practical since each agent must have a printer that is within easy reach; i.e., agents cannot walk away from their position to retrieve boarding passes or bag tags from a printer located several positions away.

Furthermore, IP printers require their own LAN ports, and in the airport environment, using IP boarding pass and bag tags printers can potentially triple the total number of LAN ports and cabling needed.

Therefore, while IP printers may be the standard in an office environment, serial (or even USB) printers are still the most cost effective solution in an airport environment.

6.1.3.2 New Technologies: Virtualization

Virtualization may or may not be suitable for every airport environment and requires more consideration from and coordination with stakeholders before implementation.

6.1.3.2.1 Desktop Virtualization

With desktop virtualization, technology has gone full circle from mainframes with centralized processing to PCs with distributed processing and now back to virtual desktops with centralized processing using virtual desktop servers. Desktop virtualization is popular among large, multi-location enterprises, and most business cases for desktop virtualization (and thin clients) are built around the premise that the additional cost for virtualization software can be offset through energy savings, user licenses and maintenance costs. Below are advantages and disadvantages of desktop virtualization:

Advantages:

- Simple provisioning of new workstations
- Lower application deployment costs
- Reduced downtime in hardware failure events
- Secure remote access

Limitations:

- Increased network management capabilities required by the owner
- Loss of user autonomy
- Increased downtime in network failure events
- High costs of virtual desktop infrastructure management

An airport environment where each airline is an enterprise in its own right, the management of a virtual desktop environment is much more complex since there are many owners: the airlines, the common use platform provider, and the airport if it chooses to provide the virtual desktop infrastructure (e.g., servers and virtualization software). Careful consideration must be taken when developing an RFP around common use platforms that do or do not implement virtualization, it is critical that the stakeholders have input during the RFP writing process and the owners existing technology and infrastructure are leveraged to develop the best solution for the end users.

6.1.3.2.2 Server Virtualization

Similar to desktop virtualization, server virtualization is popular at the enterprise level where it is cost effective to consolidate multiple servers for multiple solutions onto fewer physical machines. The servers required for common use platforms do not warrant the cost of a stand-alone virtual server infrastructure, which is often called for in an RFP.

An airport's business case should provide a virtual server infrastructure for all of its server-based solutions; however, an important caveat is that the airport must now provide SLAs for the performance of the virtual infrastructure, especially if the airport imposes SLAs of its own on the common use platform providers.

6.2 Common Use Self Service (CUSS)

6.2.1 Overview

The concept behind Common Use Self-Service (CUSS) is to enable the airlines to provide passenger facilities at a shared kiosk. In other words, CUSS allows passengers to access many different airlines' self-service check-in applications from a single unit.

This paradigm is different from the concept of proprietary kiosks, which are airline specific and require a greater total number of installations at an airport because they cannot be shared.

The need for more kiosks is difficult to accommodate because of space constraints, especially in the ticketing areas that have new TSA requirements. Common-use kiosks help to alleviate some of the congestion caused by proprietary kiosks.

Some of the major benefits of CUSS include:

- Customer interaction with various airline check-in/boarding applications at a single location
- Optimal use of airline facilities with no need to dedicate special areas for different airlines. In common-use areas, airports only have to provide space for CUSS kiosks which, in turn, reduces the amount of total ticket lobby space an airport needs to set aside for kiosks.
- Shared operating costs
- Permits airlines to deliver a proprietary self-service check-in product through the use of a shared host
- Kiosks typically enable passengers to check-in in less than 60 seconds, thus alleviating some congestion and improving customer satisfaction
- Kiosk technology is estimated to boost productivity by 40 percent through speeding passenger processing, while also reducing handling costs
- Airlines report that for every two kiosks deployed they can free up one agent position that can then focus on delivering additional customer services

IATA developed the Common Use Self Service (CUSS) standard (RP1706) so airlines can develop and run self-service check-in applications on shared kiosks used within any airport environment.

Other forms of airline service fulfillment are possible using this platform, including reissuing boarding cards and printing hotel and meal vouchers in the event of irregular operations (IROPS). This means CUSS can be deployed not just in check-in areas but also in passenger concourses and gates.

In the wider context of self-service, it is also possible for an airport to develop its own self-service strategy within the context of its IT&T Master Plan to support the main Airport Master Plan. Self-service extends not just to check-in and IROPS but also gate, boarding, and way finding. In addition to passenger self-service, there are opportunities for airports to develop CRM-based self-service strategies encompassing employees, public transport, parking, hotel check-in, retail, and fast food. In this context, the usability and usefulness of the CUSS footprint can dramatically widen.

6.3 Common Use Bag Drop

6.3.1 Airport Passenger Processing, Common Baggage Drop-off

Common baggage drop-off is a process that can bring enormous benefits for airport infrastructure efficiency and improved throughput. It builds on the systems and applications created for common use check-in, baggage sortation, and self-service and emerging relationship changes between airports, airlines, ground handlers, and other services.

The common baggage drop-off is designed to accept already-tagged baggage presented by the passenger where such tagging is performed outside the normal check-in process, usually by a common-use kiosk.

Common drop-off multiplies the efficiencies of self-service for the whole community by sharing installations and staff for the bulk of passenger volume. These savings can translate into higher service levels and lower costs per passenger for individual airlines.

This model combines the known savings from kiosks, the projected throughput for a full self-service path, and the cost-sharing benefits of the current common-use system. It has benefits for all airlines, regardless of size or technical system, and is compatible with the strategic direction taken by most major airlines.

Work towards a new baggage process is under way in several airports. IATA and ACI support these developments through several working groups, including the Common Use Self-Service (CUSS) Management and Technical Groups and the Baggage Working Group (BWG).

6.3.2 Active/Inactive Baggage Tags

Work has been done with the government regulatory authorities in both Canada and the United States to develop a new approach to baggage tags that will permit more self-service and other channels for baggage tagging. This includes the development of the Active/Inactive tag concept, which IATA has supported with new standards for bag tag status and messaging and which was pioneered in Montreal.

Baggage tag lifecycle has three steps: Printing, Application, and Acceptance. In a traditional process, all steps are completed at the same process point. Self-tagging and acceptance of the baggage at a common drop-off requires that the steps be done individually.

In order to do this and meet security requirements, the baggage handling system (BHS) must be able to distinguish between tags correctly applied to the passenger's luggage and dropped off and tags printed but not required by the passenger. These tags must be recognized by the BHS if they are introduced into the sortation system and segregated from the bags to be loaded onto aircraft.

Within the drop-off process, the air carriers' responsibility for the baggage begins at the acceptance point, not at the time of printing. This means that the baggage tag itself becomes an uncontrolled document that may be discarded if not required. The assignment of the Active/Inactive status is available for all airlines using the common drop-off point and is a function of the acceptance application. IATA has approved this process, and the Inactive indicator has been added to the standard for bag messages (BSM).

The airline industry is already at the stage where 75-80 percent of check-in activity could be handled by a common self-service system and supported by a generic technology, with potentially a common pool of staff to support that technology. This new traffic split, based on transaction type rather than airline brand, enables the airport to achieve greater efficiencies for the whole community. A common baggage drop-off point is therefore an essential element of the new airport design, with enormous effect on the infrastructure costs.

With such systems, the realization of the benefits from these changes now requires direct involvement of the airport authority for infrastructure design and coordination of services. The role of the airport is no longer a simple landlord function on behalf of airline tenants who define and provide their own individual processes and systems. Common baggage drop-off is a powerful tool the airport can deploy to benefit the whole community.

6.4 Biometrics and Access Control

Biometrics offers potentially significant benefits to the air transport industry. Biometric authentication refers to technologies that read biometric measurements, compare the information against stored information, and either accept or deny an individual based on the comparison.

Potential uses for biometrics in air transportation include access control, single sign-on, check-in, boarding, immigration, payment, and baggage retrieval. Some countries have mandated the use of ePassports, passports with chips that contain one or more biometric, and airports may also use these.

ICAO has accordingly adopted a global standard for the use of biometrics in machine-readable travel documents. While many different standards and biometrics are already in use, the industry is focusing increasingly on three main types of biometric: fingerprint, iris, and facial recognition.

To use biometrics effectively, an individual's identity needs to be recorded securely. The two key steps to this are enrollment and authentication. Biometric enrollment is any means by which a person can be uniquely identified using at least one distinguishing biological trait. This information is then stored in a database and used to support biometric authentication. How enrollment is undertaken and how the data is stored and accessed are therefore key issues.

Today, airline applications as a rule do not include biometrics. However, in the future, this may change, offering the potential for convergence between airport security processing and airline passenger and crew processing. This would offer major time- and space-saving possibilities.

6.5 Intelligent Signage and Multi-Use Flight Information Display Systems (MUFIDS)

The dissemination of flight information data to the traveling public is one of the most critical functions of the airport from a customer service perspective. A wide variety of formats, both on and off airport property, can display flight information.

On-airport display types include traditional flight information monitors, baggage information screens, dynamic signage for gates and ticket counters, ramp information displays, and airline-specific back-of-house display devices. Off-airport flight information can be displayed in a number of locations, including hotels and convention centers, as well as via the Internet.

Dynamic visual information displays are a critical component of the airport's wayfinding system and should be coordinated with static signage to facilitate passenger movement and minimize confusion.

Old terminal design in the US did not include a single, centralized system for the display of flight information. Each airline had its own isolated Flight Information Display System (FIDS), some of which might be electronic and others were static signage or clap boards. These proprietary systems only showed data relating to a particular airline (and, in some cases, that airline's partners/code shares). In addition, these proprietary airline FIDS were installed with no standardization among the types of displays used and their placement throughout the facilities.

Now, a unified system allows the airport to present flight information in a consistent manner throughout the facility. Screens display a common look, which helps passengers easily find the information they need.

The airport can coordinate screen placement and content with other way-finding devices to facilitate customer flow. For example, with the recent changes in airport security, "Meeters and Greeters" are currently no longer able to proceed past airport checkpoints. As a result, the need for strategic placement of detailed information displays in waiting areas is critical to these airport patrons. International terminals also need to have this information presented with multi-lingual capabilities.

The accuracy of the data on flight information displays is an area of concern as well.

Flight information data is gathered primarily from two sources: directly from the respective airlines or from the FAA. Airline-provided data can be either input manually on-site or fed to the system via automated interface with the airlines' systems. FAA feeds (which can be obtained commercially) cover in-bound flights only.

Airlines prefer the data to come from their systems because they maintain the highest possible level of control. The airport, in this scenario, has no ability to edit data (for example, to change a flight's status to "delayed" or "canceled"). FAA feeds are generally considered the most accurate and real-time source of data but have the drawback of leaving the airlines with no control over what information is displayed.

With an FAA feed, however, the airport gains input and override capabilities of the displayed data.

The US domestic airport industry has been moving rapidly to unified flight information display functionality as the preferred design paradigm for passenger information. Systems are typically owned and maintained by the airport with data input from the airlines (either local manual or automated feeds).

The current industry trend is toward robust systems which do more than just show flight arrival and departure times. Proprietary, hard-wired systems are being replaced by systems that use the open standards-based Ethernet and TCP/IP protocols.

Client-server or web-based technologies provide the actual video output to the display devices, allowing for centralized system administration and management.

The latest systems allow for display of a wide range of information, including weather data, video advertising, visual paging, and even graphical display maps showing airplane position (which may be a plus for the "Meeters and Greeters"). With open standards-based technologies, a wide variety of unique display options is possible.

Several factors drive the advancement of airport signage systems, including:

- Better and bigger signs offering wider choice of display characteristics and styles, with more attention being paid to a closer fit with the architectural and functional concepts employed in the building design
- Widening use of silent paging, including for fire and emergency evacuation
- Integration of signage with audio/PA and fire zones
- Common-use areas necessitating availability of MUFIDS and BIDS information (Flight Information and Baggage Information)
- Use of signage to manage passenger and staff flows, especially wayfinding
- Extension of signage to new areas, including parking, park-n-wait/cell phone lot, adjacent airport hotels, railway platforms, and ferry terminals
- Use of airport display systems for advertising, usually interwoven with passenger information
- Integration with other data feeds, including weather and cable news

- Use of signs by airlines for branding purposes and passenger gate procedures such as boarding zones, stand-bys, upgrades, etc.

- Signage to support handling of passengers through security and other control authority agencies' check-points (e.g., TSA)

6.6 Campus & Wireless Networks

Campus networks are the IT backbone of an airport; therefore, their design, provisioning, and management are critical factors. The technology available for campus networks is rapidly advancing, and airports should take care to future-proof designs where possible. Underpinning a campus is the physical fiber network, so ducting and "dark fiber" are important to consider in anticipation of future civil works.

Campus networks provide distribution to end users through secondary and tertiary levels of access (i.e., through wiring closets). Along with providing data access through structured cabling, wireless is now an increasingly important element of transport.

Wireless usually covers one or all four different technologies; namely, the use of telephony (GSM, CDMA, GPRS, 3G), 802.x, Bluetooth, and Satellite. New wireless technologies are also emerging, such as WiMAX (802.16) and UWB (Ultra Wide Band).

Wireless is an access media for networking that will support a multiplicity of different data transmission speeds, depending on distance, power; and the medium through which the signal is expected to travel.

A wireless access point (WAP or AP) is a device that connects wireless communication devices together to form a wireless network. The WAP usually connects to a wired network, and can relay data between wireless devices and wired devices. Several WAPs can link together to form a larger network that allows roaming.

Another key consideration for wireless is spectrum management. Frequencies will become in short supply as the number of wireless networks grows. While wireless brings great flexibility, it also brings security challenges. Airports and airlines should have detailed IT & IP security policies where wireless is deployed, along with an understanding of who actually has the right to deliver which wireless service in any given location.

Airports should also consider implementing methodologies for predicting bandwidth requirements and provide provisioning plans to meet those forecasted needs, suggesting a flexible, scalable approach to bandwidth availability and its associated traffic prioritization plans.

Because airports are becoming centers of excellence for IT management and support, cities or counties increasingly consider them as critical elements of their emergency response capability. To support this, an airport campus may need to integrate with a wider, metropolitan area network (MAN). In this way, emergency response centers using airport knowledge and capability can be established for a broader user in the local community.

i. Outdoor Signage in the Airport Environment

Providing both static and dynamic (up-to-the-minute) passenger information is more important than ever to the successful operation of today's airport. Customer see signage from the first moment they enter the airport property to the last visual contact between the airport/airline and crew. Outdoor signage provides information for everyone from airport passengers, visitors, vendors, security personnel and employees.

An airport's outdoor environment can be made up of two types of designated areas of operation: Lanside and airside. A landside operation is anything located on the general public roadway (or airport entrance) side of the airport, while an airside operation is considered anything on the secure airplane/runway side of the airport.

Signage is available for these outdoor applications:

Landside Operations:

- **Roadway signage:** to provide traffic flow and congestion control. Wayfinding, variable speed limits, security and welcome messages.
- **Parking signage:** to provide pricing, space counts, wayfinding, advertising, and security.
- **Taxi dispatch signage:** to provide traffic and congestion control, vendor identification, and security.
- **Park-and-wait (a.k.a. cell phone lot)_signage:** to provide FIDS (Flight Information Display Systems) information and control traffic flow and congestion.
- **Curbside signage:** to provide wayfinding, traffic and congestion control, and security.
- **Rental car signage:** to provide wayfinding, traffic and congestion control, and security.
- **Entrance welcome signage:** to provide security information and to acknowledge and welcome special groups or events.

Airside Operations:

- **Ramp signage:** to provide RIDS (Ramp Information Display Systems) information.
- **Tug signage:** to provide BIDS (Baggage Information Display Systems) information.

Outdoor airport signage provides flight information, baggage information, ramp information, wayfinding, general information, advertising and security information. The dynamic information can be controlled by a number of groups: airport or airline personnel, FIDS/BIDS/RIDS integrators, county/state/federal personnel and/or advertisers.

Outdoor signage has grown as the airport itself has grown, with increased passenger numbers arriving and departing and with the level of security increasing with impending threats, outdoor signage is going to continue to be a key tool for the aviation industry.

6.7 Video & Voice Overo IP (VoIP) and Over WiFi (VoFi)

VoIP (Voice over Internet Protocol) is an IP telephony term for a set of facilities used to manage the delivery of voice information to an end user over a local area network using the Internet Protocol (IP). VoIP involves sending voice information in digital form in discrete packets rather than by using the traditional circuit-committed protocols of the public switched telephone network (PSTN). VoIP uses the real-time protocol (RTP) to help ensure the delivery of packets in a timely manner.

VoIP essentially replaces traditional “POTS” telephony with data packet switching over digital networks. This allows many benefits, including convergence and transportation of voice, video, and data. This also allows the significant reduction of the cost of voice. It also ends the monopoly that Local Exchange Carriers (LEC) had on voice provisioning, allowing airports and airlines to build and operate their own voice networks.

This technology also encourages the wider use of streaming video with voice. In an airport context, an IP voice implementation allows a gate to be dynamically configured with an individual airline’s calling plan, depending on which airline is using a specific gate or resource.

Voice over Wireless IP (VoWIP) combines VoIP with 802.11 wireless LANs to create a wireless telephone system that enables companies to leverage their wireless LANs to add voice communications, enabling companies to deploy and manage voice and data over a single wireless backbone.

From a network perspective, VoWIP applications require some reservation of bandwidth to support the real-time nature of voice. Proprietary standards are today's solution; however, the IEEE is developing the 802.11e standard for quality of service as a long-term solution.

A key consideration of VoIP is the need to establish suitable traffic prioritization patterns and appropriate bandwidth management to ensure voice packets do not get dropped, allowing for sustainable quality of service.

Since VoIP is a digital media, it does not always meet emergency management criteria, such as fire regulations, as it would not function where there was a power failure or a LAN or WAN failure. Normal telephony will work unless the line is broken, because it has its own independent power supply.

6.8 Radio Communications

The primary purpose of any communications system is to provide efficient and reliable communications between the users of the system. Airport operations encompass a broad scope of functions and activities, and the reliable operation of the radio network is crucial to these operations. At airports, many different organizations require radio connections for their internal communications.

The concept of 800 MHz radio evolved from the need to provide more radio frequencies (channels) for public safety users. Over the years, public safety allocations have moved up the spectrum from VHF to UHF, then displaced some unused UHF television frequencies, and finally into the 800 MHz band. Advances in radio technology allowed this movement to continue to higher and higher frequencies.

Eventually, the FCC allocated a portion of the 800 MHz band to public safety. The FCC established 240 channel pairs for police, fire, and related agencies with 25 KHz spacing in the 821-824 and 866-869 MHz bands. They also established five specific channels that all agencies must have for mutual aid and coordination. To ensure maximum use of the frequencies, the FCC mandated a complex regional planning process for each region of the country requesting frequency usage in the new band.

Trunked radio systems allow a more efficient use of an increasingly limited radio spectrum and generally permit a larger number of users on the system. The key to this capability lies in the ability of a trunked radio system to use a pool of frequencies for any of the system's users. Most trunked systems incorporate several jurisdictions or agencies.

Terrestrial Trunked Radio (TETRA) is an emerging standard to be included in the modern airport's ability to switch data as well as voice. Modern radio networks also support the use of SDS (Short Data Services), as well as IP and Packet data. This opens the door for complete interoperability between airline, airport, and local county/city emergency services, using a variety of media.

Airports should also consider the deployment of IPICS to allow interoperability of radio with IP and other data networking protocols so that command nets may be set up in the event of emergencies or other operational incidents, supporting interoperability and communication between airport and metropolitan or state, civil defense, and military networks.

6.9 Radio Frequency Identification Tags (RFID)

Radio Frequency Identification (RFID) is a method that can be used to identify unique items including people, baggage, mail, or cargo using radio waves. Typically, a reader communicates with a tag, which holds digital information in a microchip. RFID facilitates the use of real-time location sensing. RFID tags have been used throughout the airport industry to improve baggage systems and track buried cables, and another project is under construction for RFID tags to track people within an airport.

There are two types of RFID tags: active and passive. Passive tags re-transmit their data when illuminated by a nearby electromagnetic source. Active tags transmit data using internal power supplies. RFID tags can be used in three ways: read only (Class 0 tags), write once and read many (Class 1 tags), and write and read many (Class 2 tags). The least-cost implementation of RFID works in the following manner:

- Class 0 tags can hold the 96-bit EPC and store product data in a database using an Object Name Service (ONS).
- A mapping service will map the EPC to a DNS and information about EPC will be stored using PML (Physical Mark-ups Language).
- Organizations of interested users will query the ONS registry to find out the owner of the tag and then query the owner organization for information on the tag.

More expensive implementations (e.g., Class 2 tags) can be used for holding information such as the history of an aircraft spare part or other expensive items that are assigned to different users in different locations.

6.10 Baggage Handling Systems (BHS) & Explosives Detection Systems (EDS)

Baggage Handling Systems can be thought of as the circulation system of a modern large airport, with the campus network being its nervous system.

Efficiency in baggage handling may provide an airline or airport with a key competitive advantage, permitting faster flight connections and more satisfied customers.

New BHS utilize RFID technology in bags and pallets to permit a faster throughput than traditional optical bar code readers. Therefore, a distributed network is vital to support such systems, allowing for adequate wireless access points and RFID scanners. This should be provided by the airport campus.

Consideration should also be given to assure that all airlines provide Baggage Status Messages (BSM) into the system in a timely manner so that bags can be sorted accurately. This is also important to support a parallel Passenger Positive Bag Match (PPBM), also known as Baggage Reconciliation, infrastructure to meet security needs.

Explosive Detection Systems (EDS) are a range of devices to inspect baggage going into the sortation system. These can be either in-line or stand-alone. In-line is preferable as there is less delay in inspecting bags and no break in the sortation path. Consideration should be given to the weight of such devices and floor loading is a key consideration here, along with adequate ventilation and power supply. Only approved EDS devices should be used.

6.11 Enterprise Airport Asset and Resource Management Systems

This section is about tagging, what data labels an airport will assign to its assets and how these will be managed. Generally, there are three types of assets that require management: financial assets, fixed assets, and operational assets.

Financial assets include bonds or stocks or other financial instruments associated with the financial management of an airport.

Fixed assets are capitalized items recorded in an airport's general ledger and subject to depreciation. They are used by an airport to undertake its business and generate revenue. Key information is recorded, including the asset's location and current value and condition. Other fixed assets include the airspace, navigational aides, airfield, terminals, roadways, parking, utilities, etc., which provide the airport's capacity. These assets are recorded using FAA-required Airport Master Plan Inventories, Airport Layout Plans (ALP), and Exhibit-A Property Maps. Other fixed assets details are recorded using as-built drawings, various basemaps, and floor plans.

Operational assets include the human resources required to operate them. An airport's resource management system plans the deployment of the airport's assets, and their operators, to meet a pre-planned workload, usually linked to a timetable. This includes gates, jet ways or air bridges, check-in counters, offices, ramp equipment, aircraft parking stands, HVAC, lighting, electric power, etc. Operational assets also include IT assets. Information is recorded on the IT asset's location, operational configuration, image build, software version, hardware build, and preventative maintenance scheme. An IT asset's service entitlement is recorded against the asset so that a help desk can effect an appropriate response.

IT&S technologies available for airport asset and resource management include integrated enterprise resource planning (ERP) systems which consist of a financial system, lease management system, gate management system, computerized maintenance management systems (CMMS), cable management system, geographic information system (GIS), electronic drawings and document management systems, human resources management system, etc.

An acceptable asset-tagging schema is important and should be defined early on in an airport's development cycle. Also, consideration should be given to the type of asset tag to be used, which may include bar codes or RFID tags.

6.12 Web Services

Web services facilitate the integration of Web-based applications using open standards such as SOAP, UDDI, WSDL, and XML. The key advantage is that they permit organizations to communicate with each other without needing to have specific application or database architecture knowledge and deal instead with data outside a firewall.

These Web services can be added to a graphical interface such as a Web page so that another company's content can be added to a third party's application. It is a way of pooling business information and sharing business processes across a range of stakeholders. Such communication is enabled by middleware and is a key component of systems integration.

Airline data feeds for MUFIDS are a good example of how Web services can improve on older electronic data interchange (EDI) standards. Web services will replace older EDI standards as more airport stakeholders migrate to from older legacy data structures. Providers of Web services are also known as application service providers (ASP) or software as a service (SAAS).

6.13 Systems Integration, Interoperability, IPv6 & XML

Systems integration is the linking of different discrete systems (rules, physical infrastructure, or business applications) in such a way that they can communicate seamlessly with each other, and in that way, drive synergistic benefits to the end users of the complete system in terms of completeness of view and quality and speed of data.

Systems integration allows discontinuous islands of technology and otherwise disconnected business processes to join, removing the “wait for an operator” and “operator processing” delays where these processes would otherwise have to be bridged. Increasingly, companies and entities approach systems integration from the perspective of developing standard interfaces such as APIs and/or XML.

For example, an airport could publish a set of XML interfaces it wants vendors to use for pre-identified data elements so that it does not have to pay for integration work. Business domain mapping is useful in this context to make sure the systems underneath support the business from end to end. (Note: A standard set of XML interfaces has been defined for airline and airport use, published by the OLA.)

IPV6 is an emerging standard. Potentially, this will allow almost any item (such as a passenger, a checked or even unchecked bag, a boarding card, cargo, catering carts, or even an aircraft) to be assigned its own unique IP address.

Used appropriately, this technology could be tied to domain management in such a way that all assets with an IP address can be routed much in the way a data packet is today.

Certain entitlements can be associated with particular domains, managed by means of an authentication engine, provided perhaps as part of the airport’s campus network management, which would also mean real-time usage data can flow into a billing engine.

One interesting implication of IPV6 is that, instead of managing assets by collecting all the information available on them and analyzing their behavior, only the exceptions to pre-planned routing are noted and flagged for action or resolution.

7 RELATIONSHIP OF IT&S TO CONSTRUCTION PROJECTS

A question frequently raised is "How does IT&S relate to construction design and program management?" The answer to this will vary from case to case, situation to situation. A key message to architects and construction designers is to stay coordinated with systems designers throughout the design process. The following is an example of an approach.

7.1 Concept Phase

Systems only need broad brush strokes at this phase. This phase will typically be three to five years out, and the underlying technology will develop in any case. The key is to obtain some measure of what it is that the client is trying to achieve so it can be expressed as a functional requirement. The technology can be wrapped around it later, but don't forget that roadways and runways may need ducts for fiber rings.

7.2 Programming Phase

This phase starts to set the scopes and budget for the IT&S elements. During this phase, systems are identified and budget outlines are allocated. Many numbers are used for IT, but a rough guide would be to make sure that somewhere between 10 and 15 percent of the anticipated system price is secured for design work.

Why not 8 percent or 5 percent? It is a truism that the less you invest in IT design, the less capable airport buildings will be and the more expensive to operate. Also, tenants will be more frustrated because services they would have expected to find are simply not there or only half present. Conventional wisdom contends that $1 spent in design saves $10 in building and operating costs.

7.3 Design Phase

There are four key steps that systems designers need:

7.3.1 Obtaining the Client's Needs in Detail

This includes vision, mission, objectives, and any other useful information to guide the design process. Try to obtain as many stakeholders' inputs as possible. Also, check to see if the Master Plan is up to date and is there an IT Master Plan to follow or update.

7.3.2 Systems Design

Systems design is conditional on the construction design. Construction teams may not appreciate that for the commencement of systems installation, a roof, all the wiring closets, and a reliable power supply are needed. Often, systems work cannot begin until all other work is almost complete. The same holds true for the start of a project, because systems design requires site layout plans, detailed drawings with dimensions, and an idea of the space usage.

Think of construction designers and systems designers as being planes flying in formation, with construction being the leader and systems the wingman. Systems cannot get beyond about 20-40 percent design without site and facility drawings.

7.3.3 What Type of Design?

It is important to try to design with a functional solution in mind and plan on the vendor supplying the technical detail using the latest available technology within a specified budget. Why? The design process will take perhaps two years, maybe three. In that period of time, hardware will likely have been changed or operating systems updated. Imagine if a new airport opened with PCs using 386 processors supporting Windows 98.

Where possible, the IT&S should rely on functional specifications rather than technical specifications and data sheets. To allay concern, remember that unit prices usually reduce over time, so solutions will get cheaper, not more expensive. Also, remember that someone has to operate these systems. Think through who will service and support a system and what documents and data they will need and insist on it being part of the construction phase deliverable. Do not rely on a warranty for support.

Workflow is also another important design area that should be pre-planned. If a functional system is specified without a workflow in mind, software vendors will grasp for driving variations. Again, $1 spent in design will save $10 in execution.

7.3.4 Integration

It is useful to treat integration as a separate piece of work, uniting all the other systems and providing a single view across an airport's IT operations. This supports an enterprise-wide view of a service-oriented architecture. Integration can also be used as the "bucket" into which missing design pieces from other work packages can be placed.

7.4 Construction Documents

In this phase, it is important to help the client by requiring that an IT asset register be established and that all systems are properly documented, including user guides, manuals, workflows, and IP-addressing schema.

Keep checking that nothing has fallen out of scope. Systems depend on a broad spectrum of things, including some as mundane as ducts and cable runs.

7.5 Bidding & Implementation

Systems engineers and designers should stay engaged with the client throughout these phases. Software vendors, in particular, will argue process and workflow issues at this point and try to establish new integration points. If they are not in the initial design, then insist on an ROI model to justify any change.

8 GLOSSARY OF AIRPORT IT&S TERMS AND ACRONYMS

AAR – Authority's Authorized Representative
ACARS – the use of VHF or satellite communications for the transmission of aircraft and airline operational information
AFTN – Low-voltage teletype messaging used for communicating air traffic flight plans and other operational and weather messages
AIP – Airport Improvement Program
AIT – Automated Identification Technology
ALC – Asynchronous Layered Communications
ALP – Airport Layout Plans
ANDS – Airline Names Display System
AODB – Airport Operations Database
API – Application Programming Interface
APIS – Advance Passenger Information System
ASM – Ad hoc Schedule Message
ASP – Application Service Provider
ATB – Ticket/Boarding Pass Printer
ATC – Air Traffic Control
AVI – Automated Vehicle Identification
AWOS – Automated Weather Tracking System

B2B – Business to Business
B2C – Business to Consumer
BCD – Baggage Claim Directory
BHS – Baggage Handling System
BIDS – Baggage Information Display System
BGR – Boarding Gate Reader
BLD – Baggage Loading Directory
BMS – Building Management Systems
BPM – Business Process Management/Business Process Modeling. Business Performance Management
BPOS – Page 28
BRS – Baggage Reconciliation System
BSA – Page 62
BSM – Baggage Status Message
BTL – Benchmark Test Lab
BTP – Bag Tag Printer

C&C – Command and Control
CAA – Civil Aviation Authority
CAD – Computer Aided Dispatch
CADD – Computer Aided Design & Drafting
CAN – Campus Area Network
CBP – Page 37
CCM – Configuration and Change Management
CCTV – Closed Circuit Television
CDMA – Code Division Multiple Access – Wireless Multiplexing Methodology
CFR 1520 – Page 59
CIP – Capital Investment Plan
CLA – Communications Life - safety initiative
CLF – Common Language Facility (translations for Ground Handler's scripts)
CM – Configuration Management
CMMS – Computerized Maintenance Management System
CMP – Configuration Management Plan
CMS – Cable Management System
CPE – Customer Premises Equipment
CRM – Customer Resource Management
CRT – Cathode Ray Tube – Technology used in most televisions and computer display screens
CUTE – Common Use Terminal Equipment
CUPPS – Common Use Passenger Processing System
CUS – Common Use System
CUSS – Common Use Self Service
CUSSK – Common Use Self Service Kiosk

DCP – Document Printer
DCS – Departure Control System
DISPLAY DEVICES – CRT, LCK, LED and Plasma Display Devices
DME – Page 29
DNS – Domain Name System stores and associates information with Domain Names
DSL – Digital Subscriber Line
DTD – Page 63
DVC – Data to Video Converters

ECMS – Enterprise Content Management System
EDI – Electronic Data Interchange
EDS – Explosive Detection Systems
EL – Electro Luminescent Display Technology
EP – Electro Polymer Display Technology
EPC – Page 89
ERP – Enterprise Resource Planning
ET – Electronic Ticketing
EVDO – Evolution Data Only
EVIDS – Electronic Visual Information Display System
Extranet – A private network that connects third parties to an intranet

FAA – Federal Aviation Administration
FAA Messaging – the FAA's implementation of AFTN, solely used in the US

FARs – Page 29
FCA – Functional Configuration Audit
FCC – Federal Communications Commission
FIDS – Flight Information Display System
FIPS 201 – Personal Identify Verification Standard
FIS – Federal Inspection Service
FO – Fiber Optics Display Technology
FPE – Flexible Provisioning Environment

GIDS – Gate Information Display System
GIS – Geographic Information System/Global Information System
GPS – Global Positioning Satellite
GPRS – General Packet Radio Services
GPWS – Gate Podium Work Station
GSM – Global System for Mobile Communications
GTIDS – Ground Transportation Information Display System

HARDWARE – Objects that you can actually touch, like servers, workstations, disk drivers, Display Devices, keyboards, tape drives, and chips
HPOV – HP Open View
HR – Human Resources
HTTP – Hypertext Transfer Protocol
HVAC – Heating, Ventilation and Air Conditioning

IATA – International Air Transport Association (The governing Body that creates regulation for international air transport)
ICAO – International Civil Aviation Organization
IDP/IDS/IPS – Intrusion Detection and Response Technology
IEEE – Institute of Electrical and Electronic Engineers
IIS – Interactive Information System
IL – Incandescent Lamp Display Technology
IMACD – Install, move, add, change or delete
INS/FISIDS – INS/FIS Information Display System
IP – Internet Protocol
IPICS – Page 88
IPT/IP Tel/IP Telephony – IP voice (usually local – not long distance, which is VoIP)
IPV6 – Internet Protocol Version 6, this will add additional addresses
IRROPS – Irregular Operations
IS – Information System
ISD – Immigration Stations Directory
ISP – Internet Service Provider
IT – Information Technology

KVA – Volt ampere in electrical terms means the amount of apparent power in an alternating current circuit

LAN – Local Area Network
LEC – Local Exchange Carrier
LD3 – Another name for an ULD (Unit Load Device)

LIGHT EMITTING DIODE (LED) – An electric device that lights up when electricity passes through it. They are good for displaying images because they can be relatively small and they do not burn out.
LIQUID CRYSTAL DISPLAY (LCD) – A type of display used in digital watches and many portable computers
LIST-OF-VALUES – A scrollable pop-up window that provides the end user with a single multi-column selection list

MAC – Moves, Adds, Changes
MAN – Metropolitan Area Network
MAP – Million Annual Passengers
MCS – Master Clock System
METARs – Format for reporting weather information used by pilots in pre-flight briefings
MIBS – Management Information Bulletins
MLS – Microwave Landing System
MUFID – Multi-User Flight Information Display
MUFID EQUIPMENT – Multi-User Flight Information Display Equipment
MUFID SYSTEM – The hardware and software components that run the servers, workstations, and Display Devices; having the ability to collect, store, and display flight information (arrival/departure, gate, and related information)
MUFID SYSTEM APPLICATION – A program or group of programs designed for end users. This includes report generation programs, input/entry programs, and database management systems
MUFID SYSTEM DATABASE – A relational database management system (RDBMS) that stores data in the form of related tables. Relational databases are powerful because they require few assumptions about how data is related or how it will be extracted from the database. As a result, the same database can be viewed in many different ways.
MVT – multiprogramming with a variable number of tasks, part of the OS/360 Operating System

NAVAID – Navigational Aid System
NETWORK BASIC INPUT OUTPUT SYSTEM (NetBIOS) – An API that augments the DOS BIOS by adding special functions for local-area networks (LANs)
NOAA – National Oceanic and Atmospheric Administration
NOTAM – Notice to Airmen
NTP – Network Time Protocol

OAR – Owner's Authorized Representative
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) – The department of the US government with the responsibility to ensure safety and healthful work environments
ONS – Object Name Service
O&M – Operations and Maintenance
OSI Model:

1. Layer 1 – Physical Layer, e.g., cabling
2. Layer 2 – Data Link Layer, e.g., network interface cards
3. Layer 3 – Network Layer, e.g., routers, layer 3 switches
4. Layer 4 – Transport Layer, e.g., TCP, UDP, etc.
5. Layer 5 – Session Layer, e.g., TTL, SCP, etc.
6. Layer 6 – Presentation Layer, e.g., CODECs

7. Layer 7 – Application Layer, e.g., telnet, SMTP, FTP, etc.

PADS – Parking Availability Display System
Part 1540 – Page 37
PBX – Private Branch Exchange
PCA – Physical Configuration Audit
PDA – Personal Digital Assistant
PFC – Passenger Facility Charge
PIDS – Perimeter Intrusion Detection Systems
PLASMA – A type of flat-panel display that works by sandwiching a neon/xenon gas mixture between two sealed glass plates with parallel electrodes deposited on their surfaces
PML – Physical Mark Up Language
PMS – Project Management System
POS – Point of Sale
POTS – Plain Old Telephone Service
PPBM – Passenger Positive Bag Match
PR – Problem Report
PRS – Problem Report System
PTSN – Public Switched Telephone Network
PTZ – Pan, Tilt, Zoom

QOS—Quality of Service

RD – Reflective Disc Display Technology
RFID – Radio Frequency identification
RFP – Request for Proposal
RGU – Report Generator Utility
RIDS – Ramp Information Display System
RMS – Resource Management System
Roaming Agent Check In – Portable Kiosks
RT – Registered Traveler
RTP – Real Time Protocol
RTCA – Radio Technical Commission for Aeronautics

SA – System Administrator
SAAS – Software as a Service
SARS – Severe Acute Respiratory Disease
SBS – System Breakdown Structure
SCR – Slot Clearance Requests
SCADA – Supervisory Control and Data Acquisition
SDS – Short Data Services
SF – Split Flap Display Technology
SIDA – Security Identification Display Area
SLA – Service Level Agreement
SMS – Short Message Service
SOAP – Page 90
Spec2000 – Page 20
SS – Scroll Sign Display Technology
SSIM – Structural Similarity Index is a method for measuring the similarity of two images
SSM – Seasonal Schedule Message

STB – Simplifying the Business – IATA Initiative
STPR – System Test Problem Reports
SUTE – Shared Used Terminal Equipment

TAF – Terminal Aerodrome Forecast, an encoded format for weather reports
TCO – Total Cost of Ownership
TCP/IP – Transport Control Protocol/Internet Protocol
TCWS – Ticket Counter Work Station
TE – Terminal Emulator
TETRA – Terrestrial Trunked Radio
TSA – Travel Safety Administration
Tugman Input – Device for input of baggage claim flight information
TWCS – Two Way Communications System
Type B Messaging – Teletype communication based on store-and-forward capability with an audit trail

UDDI – Universal Description Discovery and Integration is a platform-independent, XML- based registry for businesses to list themselves on the Internet
UL – Page 62
ULD – Unit Load Device
UPS – Page 41
US Visit – Program which captures a departing passenger's passport and I94 data via a kiosk
UWB – Ultra Wide Band

VDC – Video Display Controllers
VHF – Page 20
VLANS – Virtual Local Area Networks
VoWiFi – Voice over WiFi
VPDS – Visual Paging Display System
VPN – Virtual Private Network

WAN – Wide Area Network
WAP – Wireless Access Point
WAP CAPABILITIES – Wireless Application Protocol
WAYFINDING – Enabling a person to find his or her way to a given destination through the use of effective signage
WBS – Work Breakdown Structure
WEB FIDS SYSTEM – A part of the MUFIDS System that provides the public with real-time flight information via the Internet
WiFi – Wireless LANs using 802.11 protocols
WiMax – Wireless LANs using 802.16
WIRELESS TRANSMISSION SYSTEM – Proprietary wireless protocol whose function is to transmit flight information to taxi hold areas and hotels, but it is not on the MUFID System LAN
WSDL – Web Services Description Language
WTADS – Welcome To Airport/city Display System

X.25 – Protocol suite for Wide Area Networks
XML – Extensible Markup Language

NOTES:

AIRPORT CONSULTANTS COUNCIL