

# Smart Airports: Transforming Passenger Experience To Thrive in the New Economy

## Authors

Dr. Amir Fattah  
Howard Lock  
William Buller  
Shaun Kirby

July 2009



Cisco Internet Business Solutions Group (IBSG)



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Volatile fuel prices, slumping demand, and the worldwide financial crisis are converging to fundamentally reshape the aviation industry. From airlines and their global alliances, to airports and megahubs, aviation's wide ecosystem of partners is being forced to implement new strategies to survive today's economic realities.

Escalating oil prices triggered unprecedented airline losses in 2008, as fuel costs rose from 10 percent of operating expenses to more than 30 percent.<sup>1</sup> Airlines that hedged their bets by buying future supplies as prices increased found themselves holding vast quantities of overpriced fuel when prices suddenly dropped. Meanwhile, the worsening economy caused businesses and individuals to curtail travel, exacerbating the glut of capacity created by intense competition among too many airlines for too few travelers.

The International Air Transport Association (IATA) forecasts a 3 percent drop in passenger traffic during 2009, while cargo will suffer a more dramatic 5 percent decline. While costs have skyrocketed, decreasing demand has driven prices down. Few airlines remain unscathed. IATA predicts that airlines will experience net losses of more than US\$9 billion in 2009, with U.S. carriers suffering nearly 80 percent of the damage.<sup>2</sup> The revenue outlook is perhaps the worst in aviation history, with losses forecast to continue well into 2010.<sup>3</sup>

Airports, while still profitable, support a high fixed-cost business model, so the precipitous drop in passenger numbers will produce substantially lower revenues and markedly lower profits. Impact on airports will not be uniform, but hubs and origin/destination airports will experience a steep decrease in passenger traffic as both business and leisure traffic continue to decline.

While traffic and demand may eventually return in the next three to four years, as IATA forecasts,<sup>4</sup> radical shifts in the market will likely produce enduring and irrevocable changes. Shifting demographics, new corporate governance requirements, and emerging and maturing communications technologies are driving new travel patterns that will require innovative business models and strategies.

1. Air Transport Association Passenger Airline Cost Index, 2008.

2. International Air Transport Association, 2008. U.S. carriers have incurred the most dramatic losses because they compete in the world's largest, most competitive market—in a country that has experienced the biggest declines during the economic downturn.

3. Ibid.

4. Ibid.

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Further complicating this industry turmoil are the escalating expectations of passengers, who are accustomed to sophisticated, fast-changing technology environments at home and at work. They have grown to expect painless self-service and instant, unfettered access to resources and information. Like customers in other industries, passengers expect better, cheaper, and faster services from airlines and airports. They want real-time information about flight delays, gate changes, and special offers. They demand streamlined processes for check-in, transit, and boarding, and want increasingly higher levels of personalized services.

Today, too many airlines and airports fail to deliver superior customer experience, to segment their customer base in meaningful ways, and to invest wisely in future service models and solutions. Rearchitecting the passenger experience will not come easily. It will require discipline, investment, and a deeper understanding of passengers, in terms of demographics, behaviors, attitudes, and needs. Deeper collaboration among airlines and airports could create a stronger, more complete value proposition for passengers, spanning the entire journey rather than being confined to an airport's boundaries. This kind of collaboration depends on sharing of passenger data by the airlines with airports. While sharing of passenger data by airlines appears to be an anathema, it will give both entities greater insight into passenger needs and help them design and deliver new services and products for which passengers will be willing to pay. The Cisco Internet Business Solutions Group (IBSG) believes this will create a significant opportunity for revenue, growth, and competitive positioning.

## Airport Evolution

Airport operations and business models have evolved dramatically over the last two decades to support the explosive growth of the global airline industry. Regulatory reform and deregulation ushered in a new aviation era in North America, as well as in Europe, Asia, and emerging countries, and produced dramatic traffic growth, diversity, and choice for airline passengers. As airlines refined their operating models to align growth to efficiency, airports evolved in parallel to create massive networks of hubs and feeder systems, which together created an efficient air transportation ecosystem. Airports today are typically classified as global or regional hubs, and as origin and destination (O&D) airports. Hubs and O&D airports have very different operating profiles that influence strategies, business models, and ecosystem partners, including tenants, airlines, and businesses in the surrounding "catchment" area.

Over the past two to three decades, airports have gained more stakeholders, with increasingly complex operations. In so doing, they have honed their capabilities to focus on effectiveness rather than mere efficiency. Let's take a closer look at how airports have evolved.

### Airport 1.0: Basic Airport Operations

In the Airport 1.0 phase, airports focus on capabilities necessary for safe and efficient management of landings, departures, and other aircraft operations. They offer basic passenger services, including check-in, boarding, security, baggage pick-up, and moderate retail, food, and beverage services. Typically, these airports operate in a landlord

model, where the airport/landlord provides the real estate, while airlines, concessionaires, and other tenants design and implement their own business environments. Airports exhibit highly evolved operational efficiencies, but pay insufficient attention to passenger experience. Operations, systems, and business units are likely to be highly siloed, making it difficult for different entities to collaborate across business boundaries. While there is always an airport-wide master strategic plan, the airport business units and tenants procure and implement technologies in a stovepipe fashion, with little ability for information sharing and centralized management without costly and often suboptimal systems integration.

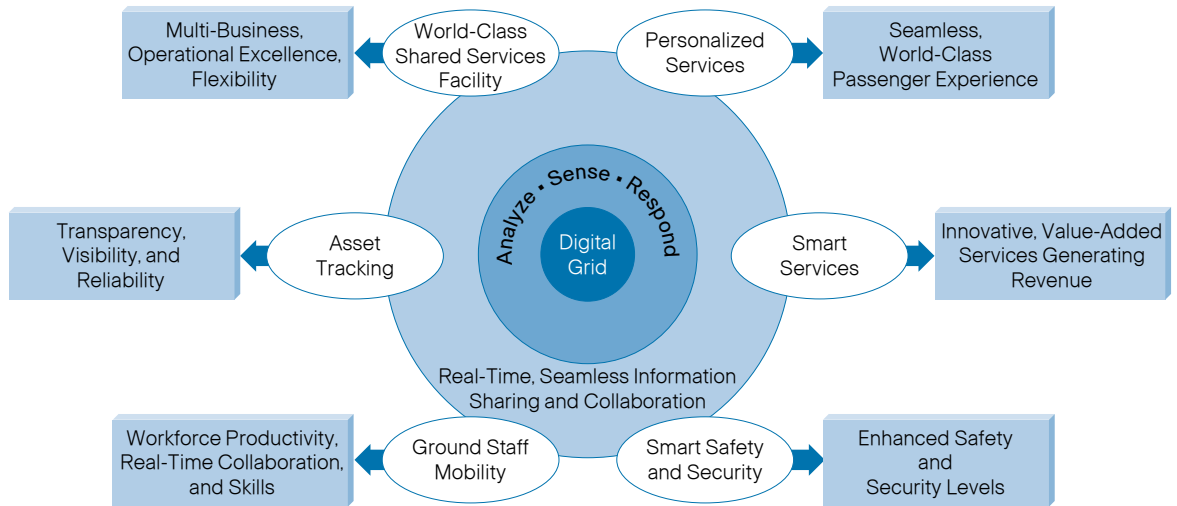
### **Airport 2.0: Agile Airports**

Airport 2.0 features “agile airports” that adapt well to a changing environment and fast-paced operational tempo. Technology-enabled collaboration is highly evolved throughout these airports and is implemented across business units and functional silos. Business entities and ecosystem partners share information quickly and seamlessly, enabling agile airports to respond rapidly to environmental and operational changes. By employing a centralized and shared services strategy, agile airports often preclude tenant deployment of single-use and proprietary technologies. Instead, an airport-wide, converged network architecture offers shared services on a common services platform. Tenants take advantage of services such as managed communications, IP telephony, broadband, Wi-Fi, and video surveillance at competitive market prices, without the need to deploy and maintain their own technology solutions. From a business value perspective, the agile airport offers advanced operational efficiencies, enabling faster turnaround times for airlines, faster set-up times for tenants, and improved passenger experience. Examples of the agile airport include Toronto Pearson International Airport, London Heathrow Airport, Singapore Changi International Airport, Hong Kong International Airport, and McCarron International Airport (Las Vegas).

### **Airport 3.0: Smart Airports**

Airport 3.0 comprises “smart airports” that fully exploit the power of emerging and maturing technologies, with advanced and pervasively deployed sense-analyze-respond capabilities. Systems are built around a “digital grid”: a single, converged, often carrier-class IP network that enables high-speed broadband traffic throughout the entire ecosystem, including the airport, airport city, airlines, seaport, logistics, authorities, and other parties. The digital grid is the airport’s nervous system, touching and managing every point of interaction (see Figure 1). By enabling the exchange of real-time information, deep cross-silo collaboration, and airport-wide process integration, smart airports significantly improve operational efficiencies, passenger services, and advanced security capabilities. They also take passenger experience to new heights by delivering a range of personalized services enabled by seamless exchange of passenger data to anticipate needed services. Broad process integration among airlines, retailers, fuel providers, caterers, and other ecosystem partners creates new benefits along the entire value chain.

Figure 1. Smart Airport Vision



Digital grid enables real-time operations and process integration, new revenue streams, and improved passenger experience.

Source: Cisco IBSG, 2009

## Smart Airports Enhance Experience, Operations, Value

Smart airports will usher in a new era for both airport operations and passenger experience. Airports, airlines, and partners will use Web 2.0 and 3.0 technologies, sensors, processors, and always-on communications to produce a new, foundational framework, enabling real-time sense-analyze-respond capabilities.

Passenger touchpoints will no longer be defined by key information interchanges at check-in, security check, or boarding. Instead, a pervasive and persistent connection to the passenger will permit continuous, real-time communications anytime, anywhere. Such capabilities will enable all airport stakeholders—airlines, security, operations, concessionaires, and other service providers—to engage the passenger with relevant and compelling information and offers. As capabilities evolve over time, these conversations will be personalized, media-rich, and value-laden.

Airports may also reach beyond their physical boundaries to enhance the experience for passengers at all stages of their trip. For example, airports should offer information on the status of roads and parking, based on predefined parameters, to help passengers plan their departure time and make choices about parking and other services.

Some airports are already experimenting successfully with Web 2.0 services. For example, the Baltimore Washington International (BWI) Airport is using Twitter to alert passengers of changes to airport, weather, and flight status. While this is a somewhat modest initiative, BWI's efforts mirror social networking behavior already permeating air travel. Seasoned and tech-savvy travelers use Twitter and other Web 2.0 capabilities to share real-time information about traffic, flights, and airports—often before information is available through official channels.



These new, smart airport capabilities enable new business models, including better integration with the broader, city-based ecosystem of companies and organizations that interact in a meaningful way with the airport. The surrounding catchment area—the “airport city”—will generate an increasing portion of the airport’s revenue.

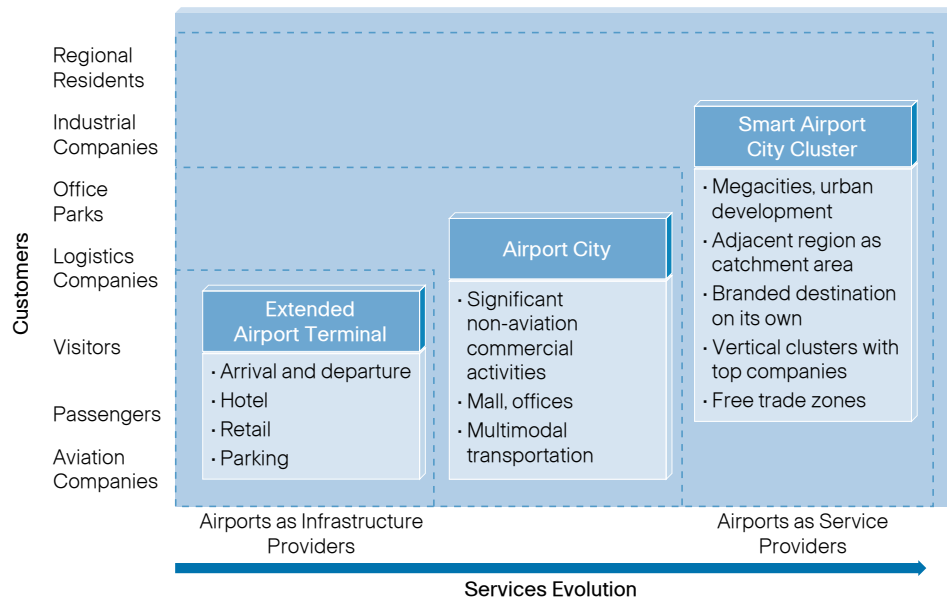
In some cases, a mega-airport city—or “aerotropolis”—may have a significant impact on urban development for an entire region. This emerging breed of airport is attracting new segments of commercial customers and may even develop a unique brand identity as it offers smart services for various industry clusters, or free-trade zones. Accordingly, smart airports will extend their value chain beyond traditional airport borders into the airport city, where they can create innovative services that enable value creation among partners in information-intensive businesses such as logistics or maintenance-repair-overhaul (MRO) services.

Smart airport cities target many customer segments, including passengers, retail and hospitality tenants, and logistics companies. They require an extended approach to customer experience that takes these different customer segments, experience levels, and journeys into consideration. Thus, a view to the end-to-end customer experience is even more important.

For example, imagine a business traveler arriving at an airport on an inbound flight. She checks into an airport hotel, and proceeds to visit her client, a logistics company located in the airport city. At every stage of her journey, she is offered personalized, real-time information to create a completely seamless experience from the airport to her lodging and place of work. Using smart, integrated solutions, ecosystem partners inside and outside the airport receive real-time updates on the progress of her journey, and are able to offer goods, services, and transportation based on her travel status. Hotel, car rental, and taxi companies receive alerts on travel delays and make adjustments to their operations in real time. With visibility into the passenger’s end-to-end journey, these companies are able to enhance the services they offer, and to improve passenger satisfaction.

The airport service portfolio will change as airports evolve into “virtual service providers” (VSPs) that offer an integrated value proposition for different customer segments throughout the airport, airport city, or airport city cluster (see Figure 2). The service portfolio will include traditional horizontal services such as IT, human resources, and facilities management, and can extend to vertical services targeting specific sectors such as intelligent transportation, traffic management, and lean retail. This next generation of airport services will spawn new revenue streams for the airport operator, and the role of “service innovation” will become increasingly central to airport operations.

Figure 2. Airports Becoming Virtual Service Providers



Source: Cisco IBSG, 2009

## The Opportunity: Transform Business Models To Create New Revenue Streams

Non-aeronautical income from parking, real estate, retail, advertising, and food-and-beverage providers has been an important component of an airport’s revenue mix for decades. Recently, however, declining airline economics have required airports to become more reliant on non-aeronautical revenues, with many airports deriving more than half of total revenues from such sources.

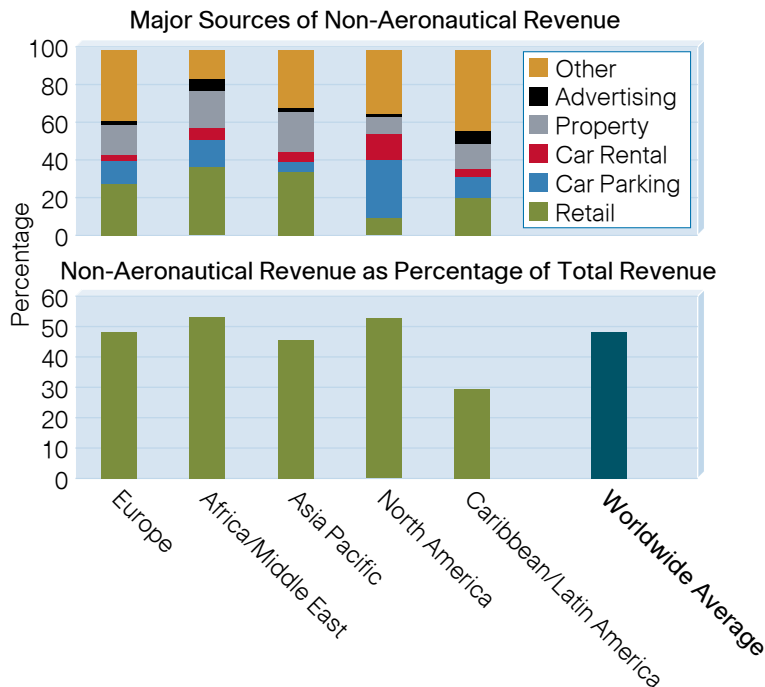


“The industry is experiencing a revenue renaissance of sorts. Airports are mixing creativity with good business sense...and new financial profiles are emerging that include revenues from cogeneration plants, multimillion dollar retail developments, expansive industrial parks, and golf courses. As airports develop these revenue sources, airline fees can stay lower, making the airports more competitive in attracting air service for travelers. This, in turn, benefits the whole community.”

Greg Principato, President, Airports Council International  
*Aviation Insight*, Winter 2007

Figure 3 offers additional details about non-aeronautical revenues and relative success of non-aeronautical strategies based on airport geography. There are significant regional differences in revenue streams for retail and car parking/rental. Origin and destination airports generate a far larger share of revenues from parking than hub airports, whose passengers simply transfer from one aircraft to another. Smart airports can boost these revenue opportunities by offering innovative services that elevate the overall passenger experience. With an integrated value chain, airports and airlines can up-sell and cross-sell to the passenger, providing personalized services that increase revenues, customer satisfaction, and wallet share.

Figure 3. Non-Aeronautical Revenue as Percentage of Total, by Source and Region



Source: ACI and University of Westminster, 2006

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## An End-to-End Framework for Passenger Experience

Airports can grow non-aeronautical commercial revenue simply by expanding services in areas such as retail, hospitality, parking, and real estate. To truly maximize the value of these services, however, airports need to adopt a customer-centric approach focused on enhancing the passenger experience. Since airlines largely own passenger relationships today, airports need to find ways of partnering with airlines to create an end-to-end passenger journey.

A few leading airlines provide innovative, personalized passenger experiences, at least for their high-value customers, by offering enhanced, onboard amenities as well as premium airport lounge services. Declining economics and intensified security requirements, however, have taken their toll on the quality of the travel experience for most passengers. Heightened security measures mean that passengers may have to deal with long lines, missed connections, and changed gates. The trend toward larger aircraft may produce more efficient airline operations, but it is likely to create headaches for passengers at the gate and during boarding.

There are clear benefits from developing an end-to-end passenger experience framework, for both airlines and airports:

- Greater ability to up-sell and cross-sell personalized services based on real-time information and status of the travel environment; for example, offering valet parking to travelers arriving late for a flight, or hospitality services in the event of a delay
- Additional retail revenue through destination-specific shopping offers and pre-trip information designed to move “High Street” shopping into the terminal; for example, offering loyalty discounts and information on availability of merchandise especially suited to the passenger’s destination or travel purpose
- Ability to use integrated passenger information linked to events and conditions such as weather, traffic, and seasonal trends over time to model the future and improve the travel experience
- Creation of intelligent, location-based services, including way-finding to move people through an airport at an optimum rate to maximize spend and minimize delay; ability to provide trusted travel advice and preferential treatment based on passenger segmentation

Figure 4. The End-to-End Passenger Journey

Home	Transit	Airport and Journey						Transit	Destination	
		Departure		Flight		Arrival				
Research	Taxi	Check-In	Food	Gate	Retail	Immigration	Banking	Taxi	Hotel	
Booking	Car	Baggage	Retail	Boarding	Catering	Baggage	Retail	Hire Car	Resort	
Payment	Metro/Train/Bus	Passports	Entertainment			Customs		Metro/Train/Bus	Retail	
Check-In	Parking	Security	Banking							Dining
Way-Finding, Flight Information, and Alerts										
Passenger Decision Points										
Which route, airport, services, and airline do I choose?		Customer Loyalty		Have my experiences changed my future travel and purchase choices?						
Which transport options do I choose?		Transport and Parking		How do I get to my destination?						
How do I prepare for check-in and security?	Where do I go next? Am I on time? Do I need special services?		Which Route, Airport, Services, and Airline Do I Choose?			What do I do as a result of delay or cancellation?		Where are my bags? Do I need to register lost bags?		
Do I buy at the airport or somewhere else?		Retail, Hospitality, and Entertainment		Where can I go to get the best retail or hospitality options?						
What entertainment do I need now, in flight, and at my destination?										

Airports, airlines, and other stakeholders can provide a superior passenger experience by taking an integrated approach to every touchpoint along the passenger’s end-to-end journey.

Source: Cisco IBSG, 2009

Airlines’ customer relationship management (CRM) initiatives typically focus on frequent-flyer programs and narrow up-sell and cross-sell features in various flight classes. There is often little attempt to manage and enhance the overall, end-to-end journey relative to passenger touchpoints (see Figure 4). Airports and airlines have a significant opportunity to build an integrated, high-value experience for travelers—from booking the reservation, to traveling to and through the airport, on to journey’s end.

In creating this unified customer journey, the airport’s role must evolve from passive landlord to active participant, enriching the passenger journey as a key ecosystem partner.

As airport/airline roles and service models evolve, passengers have an increased expectation for personalized services. These should be tied to a reward system built on combined airport and airline spend, not just airline spend. A superior, integrated passenger experience will become the key differentiator for both airlines and airports, raising appeal and—where there is choice—improving passenger loyalty.

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## Smart Services Enhance Both Airport Revenues and Passenger Experience

As examples of portfolio expansion, Cisco IBSG has identified five “smart-service” categories that airports can build on top of a converged smart airport infrastructure. These services use emerging technology capabilities and advanced web technologies to improve customer experience, create new revenue streams, enhance operational excellence, and improve security. Each airport’s priorities will depend on its specific business model. For example, retail revenues tend to be critical for hub airports, and parking may be more important to origin and destination airports. By delivering high-quality customer experiences in any or all of these five areas, airports can raise revenue, reduce costs, and meet performance targets.

### 1. Smart Transport and Parking Services

**Real-time travel services** keep passengers informed of any travel problems and offer premium services, such as valet parking or route switching, if the passenger is at risk of being late. **Intelligent transport** services, a location-sensitive version of this solution, can track a traveler via a GPS-enabled smartphone and provide pre-trip travel information, route advice based on traffic conditions, and flight status. Value-added services such as porters and nearby or valet parking can be offered to passengers based on their loyalty and on-time travel status.

A **trip concierge** provides details and flight status of all trip stages on a smartphone, or via an airport kiosk. It can also provide location-based services and alerts to help passengers through the terminal to the gate, plus personalized hospitality and retail offerings. When accessed on a mobile phone, it can operate as an e-boarding pass as well.

### 2. Smart Retail, Hospitality, and Entertainment Services

**Passenger-specific retail and hospitality** offers can be provided to the passenger’s mobile phone based on customer information gathered by the airport. These offers can be tailored to passenger demographics, flight purpose (business, recreation, tourism, etc.), or destination.

**Intelligent advertising** allows destination- or status-specific messages to be displayed based on flight stage, location within the airport, and the passenger’s reason for travel. Digital signs can display ads for various local services, and can even be used for product testing. They can also display travel information, or vital information in the event of an emergency.

**Lean retail solutions** help minimize lines, allowing retailers to increase sales while reducing wait times and abandoned shopping baskets. Various stock management solutions can improve stock flow for limited storage formats.

**Telepresence** rooms within the airport offer high-end, life-size virtual conferencing on a per-hour basis to enable “face-to-face” business meetings around the world. Gartner predicts that high-definition video meeting solutions will replace 2.1 million

airline seats annually, costing the travel and hospitality industry US\$3.5 billion per year.<sup>5</sup> Airports and airlines need to establish a business model and smart services portfolio to quickly capture this revenue opportunity.

### 3. Smart Workplace Services

**Equipment telematics** solutions use radio frequency identification (RFID) to keep track of movable equipment to improve equipment availability and utilization. For example, an airport can track wheelchairs with RFID to help reduce the wait for incoming passengers requesting wheelchair support. Linking equipment location to operational information also improves maintenance timing.

A **mobile worker and expert locator** can deliver the right information to the right person at the right time, enabling staff to quickly and effectively deal with airport problems that impact the passenger. This includes customer relations, maintenance, and security staff.

### 4. Smart Airport Processes

**Location-based services** use passenger entry and destination details, along with location information and terminal zones, to direct people through the airport in a way that reduces stress, minimizes queues, and increases retail sales.

**RFID baggage tagging** enables airports to detect luggage at a distance or out of sight, making it easier to find misplaced or missing bags and provide up-to-date location information to passengers.

**No-queue check-in** solutions speed passengers through the airport to their flights by using RFID-tagged boarding passes or mobile, smart-code-enabled phones. When combined with remote bag-drop capabilities, this allows passengers to check in and leave their bags at a hotel or other remote location, enabling them to go straight to security and boarding when they arrive at the airport.

### 5. Smart Business-to-Business Services

Smart airports and airport cities have the opportunity to provide a variety of value-added services to airport-city commercial customers. These include **traffic and facilities management**, and security services. Additionally, in airport cities that are heavily focused on logistics providers, there is an opportunity to implement **smart supply-chain** and **MRO services**.

**Building-related services** include digital signage for advertising, emergency, and way-finding information; remote check-in at a hotel, office, or other building; real-time flight information throughout the airport city; and centralized building automation, monitoring, and energy optimization to enable a sustainable airport city with optimized carbon footprint.

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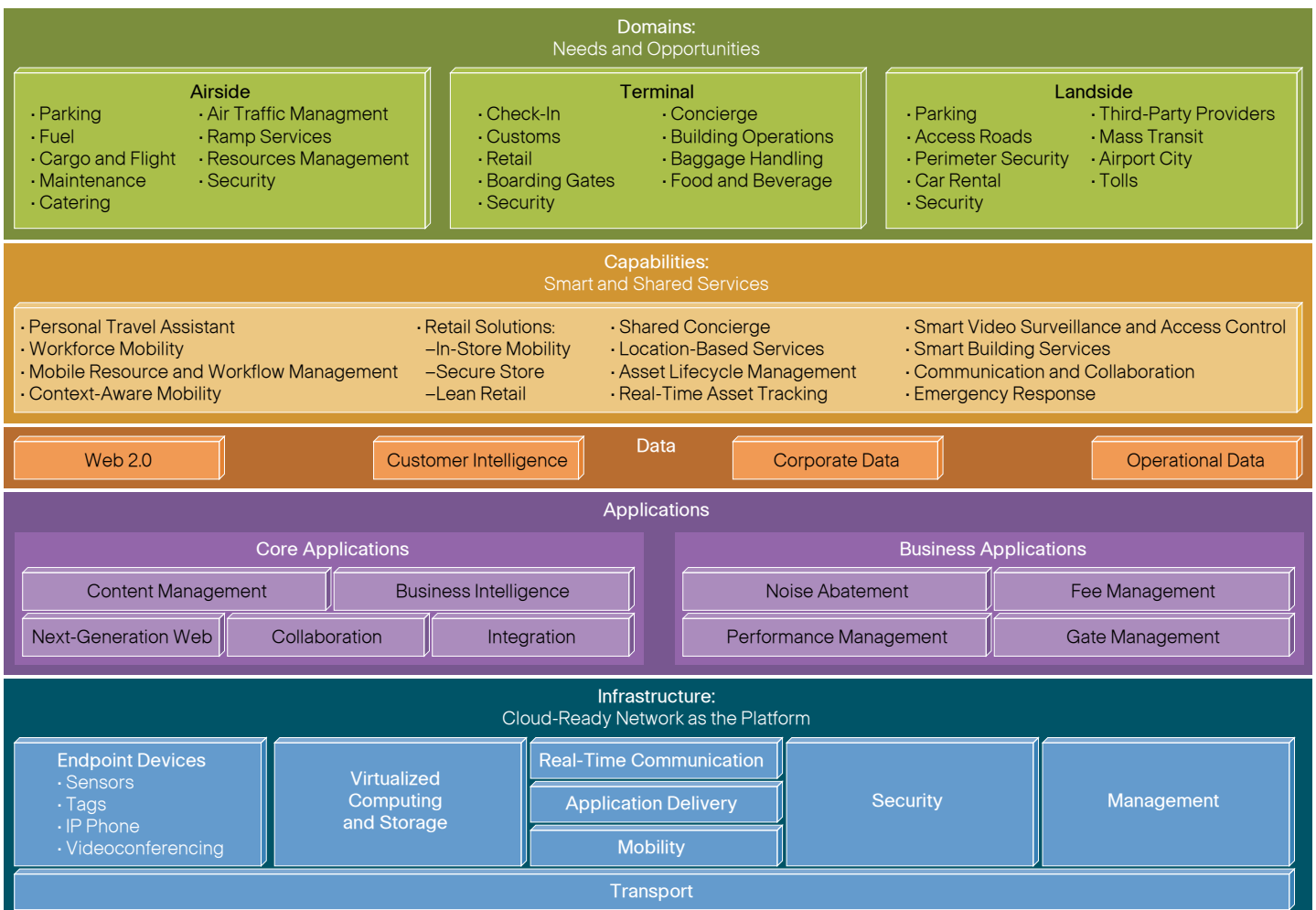
5. Gartner, 2009.

## A High-Level Architecture for Smart Airport Operations

Smart services supporting efficient airport operations and the end-to-end passenger journey experience require an end-to-end Smart Airport architecture. The high-level reference architecture shown in Figure 5 supports the needs and opportunities in each airport “domain”—including airside, the terminal, and the larger airport and airport city environment—with capabilities, data, and applications fully integrated into the network as the platform.

In the highest layer, the Smart Airport vision addresses needs and opportunities to enable a transformed passenger experience. An integrated approach incorporating every touchpoint on the passenger’s journey enables airports to offer the richest and most consistently satisfactory passenger experience.

Figure 5. Smart Airport High-Level Reference Architecture



The Capabilities layer depicts the main categories of enablers to meet the needs and opportunities in each airport functional domain. These smart and shared services include enablers across airport functions and business units to provide a complete, end-to-end passenger experience. They address all aspects of the journey in concert

with airport-related services available anytime, anywhere, making the airport an effective virtual service provider.

The Data layer outlines the main categories of information and content supporting the capabilities. This layer includes airport operational and corporate data, as well as information collected about the passenger from all angles, perspectives, touchpoints, and channels throughout the passenger journey. The Data layer also taps into the vast and organically growing sources of Web 2.0 data, such as social networks and web services covering topics of potential relevance to the end-to-end passenger journey.

At the next layer are the applications that manage the data and support the capabilities. Core applications include:

- A portfolio of next-generation web applications and tools empowering a rich passenger interaction experience
- Collaboration applications that enable real-time personal interaction among all stakeholders
- Content management to orchestrate the impending avalanche of rich media
- Business intelligence to support continuous improvement of the Smart Airport experience by tapping both traditional sources of intelligence and newer realms such as social media
- A set of integration applications, including an Intelligent Interaction Manager that can foresee, sense, and respond to passenger needs in ways that surprise and delight

Business applications include existing, airport-related applications, integrated seamlessly. Illustrative examples are noise abatement, performance management, fee management, and gate management.

The foundation for the above layers relies on the hardware, devices, and service-level software that constitute the underlying infrastructure. With an approach adopting the network as the platform, the infrastructure layer provides an open, cost-effective, robust, agile, and highly scalable foundation upon which to build and evolve the Smart Airport vision. New applications and data can be added quickly, enabling new capabilities and even expanding the domains in which the Smart Airport solution transforms passenger experience and airport operation. The infrastructure can be implemented through a variety of approaches, including traditional in-house delivery, as well as internal and external cloud services, outsourcing, hosting, or a combination that best suits the needs of stakeholders.

## Getting Started

Airports are on the threshold of a bold new era that offers unprecedented opportunities for transformation and growth. In recent years, rising costs and a surplus of capacity have taken their toll on both aviation profits and passenger experience. At the same time, new developments in consumer technology have fueled passenger expectations for unfettered access to real-time information and personalized services.

Airports should invest in an integrated operations and information infrastructure that enables them to have an end-to-end view of the passenger experience, thus broadening the value chain to more players and increasing non-aeronautical revenues. To begin this process, airport managers should think about new strategies in the following areas:

**New airport value chain:** Expand the value chain by considering passenger experience in an integrated, end-to-end framework that includes the airport, airlines, concessionaires, tenants, governments, businesses in the airport city, and other stakeholders.

**New services:** Define and develop innovative services based on customer segments, preferences, and experience. Consider a service provider model for airport infrastructure and application services to tenants.

**Experience architecture:** Explore concepts and enablers for the end-to-end passenger experience architecture.

**Passenger experience focus:** Make targeted investments in experience. Evaluate current guest and passenger experience and identify top priorities for improving it.

**Governance model:** Establish a governance model to manage the innovation process throughout the airport and airport city. This will lead to innovative services on a continuous basis across all stakeholders.

For more information about enhancing airport revenues through an integrated approach to passenger experience, contact **Howard Lock** ([hlock@cisco.com](mailto:hlock@cisco.com)) or **Amir Fattah** ([afattah@cisco.com](mailto:afattah@cisco.com)) in Cisco IBSG.

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