SMART AIRPORTS
Improving Efficiency for Airports with AI and IoT
As the aviation industry evolves and we become ever more connected, we’re at a moment when the air travel experience can be uplifted. Through its investments in technology and its partner ecosystem, Intel is helping power a revolution that will transform the modern airport, by enabling innovative solutions for safer, more cost-effective, and more enjoyable travel experiences.

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INTEL CORPORATION

To learn more, please visit
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Nothing captures the power of human ingenuity like the dream of flight. From ancient tales of Icarus to Orville and Wilbur Wright’s experiments with the first powered airplane, humans have used ingenuity to break the bonds of gravity and soar like birds. But even visionaries like Leonardo da Vinci, who conceptualized the helicopter centuries before one would fly, could not have imagined how modern aviation makes it possible for millions of people and countless goods to traverse the globe.

As populations grow and prosper, the desire to travel persists—for both pleasure and business. In 2018 alone, according to the International Air Transport Association (IATA), an average of 104,000 commercial flights departed daily around the globe, making air travel one of the most popular forms of travel, perhaps because it is the fastest, most economical, and the safest way to travel long distances.

The rate of air travel is expected to double within 20 years, according to the 2018 IATA’s 20-Year Air Passenger Forecast.

Air travel, like other modes of transportation, is already struggling to keep pace with the current demands of our global, connected economic and personal networks. Lines at airports are longer, planes are more crowded, and as airports expand, the walking distance from curb-to-gate seems to be getting longer. Emerging challenges threaten to further complicate the situation, including:

- An aging airport infrastructure. In the U.S. the average terminal building is more than 40 years old
- The need for new airports in China and India
- An anticipated increase in the number of air passengers to 8.2 billion in 2037
- A decline in willingness of travelers to queue for 10 to 20 minutes from 21% in 2012 to 7% in 2015

As airport terminals are expanding and modernizing to keep pace with demand, with more than 75 percent of airlines and more than 50 percent of airports investing in terminal improvement projects, the near-term customer experience is bound to be more chaotic and unsatisfactory due to construction inconveniences.

Even with unprecedented building and remodeling initiatives underway, can airport stakeholders keep up and adequately serve the significant growth in expected air travel volume?

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1 Odds of a Commercial Airplane Crashing, Trip Savvy, 2019
2 Travel Tips: Airplanes are the safest way to travel, Travel and Leisure, 2017
3 Airports of the Future
4 100 New Airports in India by 2024
5 IATA Forecast Predicts 8.2 billion Air Travelers in 2037
6 A Balancing Act: Security and the Seamless Journey
7 SITA Air transport IT Insights 2018
8 Airport projects could hit $70B by 2021
Other unique challenges to the airport sector include:

- Complying with government oversight and regulations
- Managing a constantly evolving landscape of security protocols, screening, and operations
- Ensuring efficient passenger movement through the terminal
- Awarding and maintaining retail shops and concessions
- Addressing environmental issues that arise with any high-use business operation
- Managing changing models of terminal ownership and project funding

As with many sectors of the economy, airports are turning to technology to provide a higher quality, more sustainable experience to customers, and more profitable engagement opportunities for airport stakeholders. Advances in information, communication, Internet of Things (IoT), data analysis, and other technologies give airports the opportunity to enhance every aspect of their business.

Innovations to modernize airport core technology and infrastructure help meet growing demands for an end-to-end experience for airport stakeholders using new disruptive technologies including IoT, 5G, cloud, and artificial intelligence (AI) to develop and deliver unique, more effective experiences.

Airports are data-rich environments. New transformative airport technology takes advantage of this by orchestrating Information Technology (IT) and Operational Technology (OT) systems on the airside and the landside of the industry.

Leveraging these new technologies to share data between the various stakeholders of airport operations, allow airports to both increase revenue and decrease operating costs through enhanced operational performance, passenger experience, and safety improvements.

The transformation is already underway. Globally, both updated and newly constructed airports are embracing the opportunity to modernize their core technology, data collection, and analysis infrastructure. This will help to establish a new (and better) foundation to more capably meet the need for changing customer expectations.
Intel Is Accelerating Innovation for New Airport Solutions

Intel and its partners are working to develop, test, and deploy the technologies and networks necessary to transform the modern airport experience.

Intel is powering a revolution that will transform airports within the existing ecosystem to provide networking and communications, applications, data management, compute, analytics, and security using gateway, edge, and IoT solutions.

IoT-Led Transformations in the Airport Sector

Airports around the world are actively transforming their investment strategies to improve profits and competitive standing, while enhancing their customers' journey from curbside to plane and back again. Because many airports are land-locked with no surrounding property to expand to, their only choice is to become more efficient and effective with their operations. IoT-led transformations towards smart airports help make that happen.
The airport sector faces several unprecedented challenges that impact the bottom line. According to Airports Council International (ACI) World, two-thirds of all airports are loss-making, almost all of which are airports that handle less than 1 million passengers per annum. There is also a clear narrowing of the gap between the income earned by aeronautical and non-aeronautical means. Total cost to the airport per passenger significantly exceeds global aeronautical revenues per passenger.\(^9\)

**Terminal Ownership**

With airports, it is not one ownership or stakeholder model that fits all. Currently, many governments are looking for different ways to provide the funds for infrastructure modernization and expansion. Past models of funding in the U.S., which relied on financing expansion costs through municipal bonds, airport bonds, and government grants, are evolving. Many are turning to public-private partnerships. Some are privatizing. Others are developing unique ways to get the private sector to participate and invest in the changes. In Europe, 39 percent of airports were privately owned in 2016, with the remaining 61 percent were a combination of public and private ownership.\(^{10}\)

Commonly, airport authorities lease various parts of their facilities and charge for specific services such as providing airplane fuel and traveler parking. They are also authorized to charge fees and taxes on airline tickets.

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\(^{10}\) ACI-Europe. The Ownership of Europe’s Airports, 2016
Stakeholder Identification

The lack of a consistent stakeholder structure can add time to the decision-making process, especially for higher-priced initiatives. Typically, key influencers can include IT architecture and engineering stakeholders and c-level executives and directors of departments including sales, marketing, digital services, and analytics.

Governmental Regulations

Almost invariably, governments license airports and regulate on how they operate. Reporting to the government on how airports comply with specific regulations can be time-consuming and difficult for airport and airline management. In the United States, for example, the Code of Federal Regulations Title 14 covers Aeronautics and Space. Currently, there are five volumes of regulations that cover the Federal Aviation Administration office as well as other transportation-related matters including the U.S. Department of Transportation. Some governments also provide enabling technology infrastructure. For example, the Global Positioning System (GPS), essential for many IoT solutions, not to mention critical airside systems, was developed—and continues to be maintained and improved—by the U.S. government.

Customer Experience

Customer experience is a key component of an airport’s reputation and profitability. Travelers experience an airport across many contact points: from parking, to the ticket counter and luggage check-in, through security screening, and then to dining, retail, gate experience, boarding, and more. Along this path, customers engage with stakeholders from airlines, security personnel, concessionaires, and others. Today’s airports seek new ways to provide a consistently high quality of service for every passenger.

There is now even a Customer Experience Accreditation program for airports belonging to the ACI, which compliments its Airport Service Quality program. The CEA program helps member airports manage customer experience. It assesses if airport employees have a common understanding of how to deliver an outstanding customer experience. The program focuses on three areas: departures, arrivals, and commercial activities such as retail and food and beverage services.
Employee Experience

Airlines and other airport stakeholders are beginning to pay more attention to the necessity of meeting employee needs as well. No matter who someone works for—the airport, maintenance contractors, flight crews, security workers, or retailers—the better their work experience is, the more they can positively impact the experience of airport customers as good brand ambassadors. Also, employees must be protected against the ire of out-of-order passengers. To assure this, stakeholders are updating or adding employee assault policies.11

Flight Delays

Sources of flight delays are numerous, including extreme weather, mechanical issues with the plane, aviation systems delays (which can result in the late arrival of a previous flight), pilot and crew availability issues, and more. Only 76 percent of the annual 26 million flights globally average an on-time arrival, which costs the air transport industry approximately $25 billion a year.12

Airport Security and Readiness

When terrorists strike, the effects of these high-profile and devastating tragedies reverberate across the globe. Airports are working to raise the baseline for aviation security worldwide by implementing enhanced security measures, both seen and unseen, at all last-point-of-departure airports. Over $7.28 billion will be spent on security equipment by 2021 to enhance screening capabilities for passengers and personal electronic devices, and to increase security around aircraft and in passenger waiting areas. These measures will help airports reduce security risks and other threats including human trafficking, drug smuggling, civil air emergencies, accidents, and natural disasters.13

Many countries are also updating aviation regulations to enhance security screening protocols. For example, the Real ID Act in the U.S. is a new personal identification (ID) requirement mandated by the federal government. It requires states to issue IDs with features that are difficult to counterfeit. As of October 2019, only 27 percent of Americans have a Real ID-compliant form of personal identification. In a survey by the U.S. Travel Association, 57 percent are unaware of the requirement.14 This could become a significant security problem, with industry-wide, global implications.

Many of today’s screening protocols, including shoe removal, disallowing larger water bottles, and full-body scans, are the consequences of past terrorist attacks. The complexity and inconvenience of these security measures certainly detract from the customer experience but have been deemed necessary by the Transportation Security Administration (TSA) in the U.S. and regulatory agencies worldwide. Airports must comply with these protocols and address rising customer expectations regarding queuing and passenger asset tracking.

Other issues impacting security include worker and systems security and productivity, and interconnectivity with national and international systems. Security systems must be brought up to date to reflect state-of-the-art developments. Fortunately, research indicates that an improvement of 1 percent in passenger experience means that corresponding non-aeronautical revenues will increase by 1.5 percent, according to ACI Europe.15

Future opportunities for improved customer satisfaction are firmly rooted in enabling customer autonomy. Passengers want to control as much of their own experience as possible, using the latest technology to do it.

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11 Assaulting an Airline Airport Employee is now a Federal Offense! 2017
12 How will AI help us predict disruption in air travel?
13 Civil Commandos
14 One Year Before Real ID Deadline, Americans Are Not Prepared for Airport Security Change
15 Consultant Predictions, Martin Neuser, Lufthansa Consulting, Passenger Terminal Today, p. 33
Retail, Dining, and Concessions

For many airports, in-terminal concession, dining, and retail revenue correlates strongly with increases in passenger traffic. However, terminal configuration can dictate concession space layouts that may unfortunately limit sales performance. Airports are seeking new ways to optimize concession revenues by enabling innovative opportunities to engage passengers. By gathering, analyzing, and sharing data about passenger flow,18 digitized airports can understand where and how to engage with passengers across their journey through the airport. This helps passengers more easily find and connect with the retail, dining, or concessions they may desire. Because 45 percent19 of passengers may simply sit and relax or work at the gate, airports can also take advantage of the opportunity to provide information and digital experiences at the gate related to shopping, eating, and other activities to improve the passenger experience.

Environmental Challenges16

Airside, the aviation industry is actively mitigating its global environmental impact by setting standards and policies that address a variety of issues. This effort is led by consortiums of local, national, and global organizations, including the U.S.-based Aerospace Industries Association (AIA), the International Civil Aviation Organization (ICAO), IATA, and others, including aircraft manufacturers. These efforts focus on increasing fuel efficiency through research and development. This includes adopting new technologies such as electrification for shorter flights, using alternative fuels, making operational improvements, and revolutionizing aerodynamic design. Improvements are expected to save 2.8 billion gallons of fuel through 2030.17 In general, the industry is committed to cutting emissions by 2050 to half of what they were in 2005.18 Reducing air and noise pollution around airports is another environmental concern.

Airport Energy Consumption

Many of the largest airports in the world have a physical presence that equals that of a small city. Not only do they have the physical footprint of a small-scale urban area, millions of people can travel through them annually. They also employ thousands of people and operate around the clock, every day of the year, providing services to passengers and employees alike. All of that takes energy. And sometimes, sources of energy can be unreliable, for example at the Hartsfield-Jackson Atlanta International Airport in 2017, there was a power outage that delayed and canceled over 1000 flights and cost Delta Airlines around $50 million.19 Other environmental challenges include conserving water, especially in parts of the globe that are suffering from water scarcity and recycling the various types of waste that are generated on both the landside and the airside of airport operations.

Growing Competition

Competition between airports and methods of travel impact customer decisions. Studies show that customers choose their departure airport first and then book flights leaving from that airport.20 The value of reputation and ease of use mean it is in an airport’s best financial interest to make the customer’s experience enjoyable or risk losing out to other airports or other methods of travel. The trend toward making airports ‘destination experiences’ is demonstrated by changes in policy that open up shopping and eating experiences on the concourse—sometimes beyond security—to the public.

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16 How your flight emits as much CO2 as many people do in a year
17 Industry Issues, Aerospace Industries Association, Environment
18 Ibid.
19 Why airports are embracing renewable energy
OPPORTUNITY

Why should airports invest in digitization?

Investing in digitization is potentially one of the most promising pathways to ensure the global success of airports. Why? Because monitoring, collecting, and analyzing data can lead to better decision-making.

Using a variety of technological solutions can:

- Increase revenue with better operational performance
- Enhance customer experience through personalization
- Improve security measures with surveillance and real-time analytics

Currently 37 percent of airports have established partnerships for IoT, and that number is expected to increase. Not only are 75 percent of airlines expected to invest in terminals, but 50 percent of airports are doing the same. By 2021, 79 percent of terminals will be using predictive analytics and by 2022, 50 percent will be using business intelligence (BI).

It is an exciting time to be initiating or growing the capacity for IoT-enabled projects.

Technological Innovation in Airports is on the Rise

To keep up with how to respond to this expected growth, 795 (79%) airports are using or planning to adopt some form of predictive analytics by 2021.21 This trend will help airports in many ways, particularly improving the process of moving people more efficiently and safely from curbside to airplane seat. Modern wayfinding solutions, to be implemented by 49 percent of airlines by 2021,22 will also help keep customers moving in the right direction and save them time and the hassle of getting lost within airport complexes. Customer satisfaction declines as passenger patience is tested by waiting in one (or more) lines for security clearance, buying food or retail items, or using restroom facilities. Seventy-one percent of airlines and 72 percent of airports have investment planned for biometric identification in the next five years.23 These biometric identity solutions, such as facial recognition or iris scans, guarantee that only ticketed passengers or authorized personnel can enter the boarding terminals. This will help smooth the passenger experience and improve security both within the airport and in the air.

21 How will AI help us predict disruption in air travel?
22 SITA Air transport IT Insights 2018
Connected Transit

Getting from one location to and from—and within—airports can typically involve challenges for customers and airport stakeholders alike. Airports need to move millions of passengers per year under strict security controls. Airport buses (and other transportation modes) need careful and constant logistical management, with dispatchers tracking operational capacity and geographic data for each carrier. Customers appreciate being well informed about where to go next.

Outfitting methods of transportation with sensors and cameras enables real-time data about on-the-ground conditions to be tracked and shared with customers. When problems occur, help can be dispatched so that customers can get to where they need to go, on time and without hassle.

Smart Security

Smart security at airports can use biometric indicators to confirm identity as well as provide alerts about people of interest, or suspects in a crowd in an uncontrolled environment, or for abandoned bag detection. It also protects secured zones such as runways, control rooms, airplane hangars, and more. Alerts for any overcrowding incidents with people-counting based on zones can enhance rescue operations during emergencies. Smart security functions can also detect slips and falls to ensure customer welfare and reduce public liability. In addition, it provides help locating missing children in a crowd and can detect if children climb onto conveyor belts or enter restricted areas. Trollies that have been left where they shouldn't be as well as suspicious behaviors such as loitering, sudden crowd gathering, or man-down problems are also detectable. The need for automated quarantine control can also be identified, as are water spills and smoke and fire detection in an open-air environment.

Smart Parking

With smart parking, which can include an airport mobile app, passengers can more easily find parking by being directed to available spaces. Airport operators can gain greater visibility into their current capacity and predict near-future capacity. The app can also be integrated with e-ticketing for parking to provide a seamless passenger experience and improve operations efficiency and reliability resulting in greater revenue generation at lower cost. License plate recognition is also available and can be used to help find a car and determine whether it’s been stolen or used for any criminal activity. Vacancy information can also be provided on the app and drive cost efficiency, reliability, customer experience improvement, and rate management. Smart parking solutions can help increase parking utilization to a significantly higher level, often eliminating the need for construction of additional garages.

Passenger Information System (PIS) and Wayfinding

Digital signage can shorten queues, optimize people flow and wayfinding, improve labor efficiency, and improve passenger experience through digital signage. High-performance, environment-sensing display technology allows advertisers, retailers, and airport operators to effectively monetize visual communications, engage consumers, and boost commercial revenue. Optimized real-time displays improve customer experience by providing PIS and wayfinding support. Modern digital infrastructure at the network edge helps deliver actionable, data-driven insight and support for applications and experiences.

Indoor/Outdoor Kiosks

Airport customers expect exceptional experiences and immediate value. New interactive kiosks in airports are built on high-performing Intel® processors that empower customers to customize their own experience—curbside, terminal-side, and airside.
Interactive kiosks can help airline, security, food and beverage storefronts, and other airport stakeholders to display vital information to help educate customers about their choices while empowering stakeholders to make reactive and proactive changes in strategy.

Interactive kiosks with data gathering and analytics capabilities give airports the power to improve services and engagement at the point of transaction. Outside the terminal, they can facilitate entering and exiting garages, as well as giving customers the chance to check baggage at curbside departure drop-off points. Inside the terminal, interactive kiosks not only display information to passersby (e.g., schedules, maps, news, or weather), but can be used to check in, check out, purchase, or print tickets and information. These self-service features save time and give customers choices in real-time without queuing or waiting. Stakeholders can use kiosks to promote special deals or experiences, or target promotions based on anonymous shopper analytics.

Interactive kiosks help make the buying experience better by giving customers the control and convenience they crave. Stakeholders can also identify trends and efficiencies across the physical and digital retail supply chain and learn more about customers so that they can serve them better.

**Smart Energy Management**

Energy delivery and use are getting more efficient and sustainable with IoT-enabled sensors, devices, and data analytics. These help provide visibility into the energy consumption of airports, enabling operators with intelligence that helps to manage energy consumption to increase the efficiency of equipment and operations, decrease costs with just-in-time maintenance, and improve customer and worker safety.

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**SMART AIRPORT REPRESENTATION**

**Landside**

**Terminal**

**Airside**

**Visual**

**Visual Solutions**

**Digital Signage**

**Interactive Kiosks**

**Intelligent Self-Service**

**Vision**

**Smart Parking**

**Biometric Recognition**

**Passenger Flow Measurement**

**Real-Time Security Surveillance**

**Mobility**

**Autonomous Mobility**

**Operational**

**Intelligent Building Operation**

**Real-Time Asset Tracking**

**Aircraft Tracking and Maintenance**

**Smart Staff Management**

**Connected Retail**

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**SMART AIRPORT**

**Representations**

**VisuAl Solutions**

**Smart Parking Biometric Recognition**

**Passenger Flow Measurement**

**Real-Time Security Surveillance**

**Autonomous Mobility**

**Intelligent Building Operation**

**Real-Time Asset Tracking**

**Aircraft Tracking and Maintenance**

**Smart Staff Management**

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**OVERVIEW**

**CHALLENGES**

**OPPORTUNITY**

**USE CASES**

**SOLUTION SPOTLIGHTS**

**TECHNOLOGY SUMMARY**

**AIRPORT SOLUTIONS**

**GETTING STARTED**
SOLUTION SPOTLIGHTS

Airports typically use multiple systems to provide travelers with many different services and to communicate information to airport staff. The efficiency and sustainability of these services can be significantly improved with the use of new technologies to create a digitally enabled set of airport services that improve communications, share information, and automate processes.

The airport partner ecosystem provides everything from hardware, software, and utilities to device, sensor types, and an array of computing solutions to transform airports. Airport authorities and leaders should evaluate the existing services their airports utilize, as well as net-new services they need to meet goals for modernization.

VISION ANALYTICS SPOTLIGHT

Taiwan Taoyuan International Airport
Gorilla Smart Surveillance

Challenge
Taiwan Taoyuan International Airport is the tenth busiest airport by international passenger traffic. Founded in 1978, it is Taiwan’s largest international airport today, handling 42.3 million passengers and 2.1 billion kilograms of freight annually. With 6,000 workers and 5,000 vehicles, Taiwan Taoyuan International Airport needed an improved way to monitor suspicious event alerts, search and track travelers and vehicles, and manage people and vehicle access in restricted areas.

Solution
Taiwan Taoyuan International Airport implemented Gorilla Smart Surveillance to monitor people and vehicle activity.

Solution Components
Gorilla Smart Surveillance

Result
The Gorilla Smart Surveillance solution enables Taiwan Taoyuan International Airport to monitor suspicious activities and track blacklisted suspects, manage outsourced vendors using facial recognition-based attendance systems, search late-boarding travelers, and regulate registered vehicles using license plate recognition in restricted areas.
Phoenix Sky Harbor International
22Miles Wayfinding

Challenge
Spread across 3,200 acres, Phoenix Sky Harbor International (PHX) caters to over 120,000 arriving and departing passengers. It is Arizona's largest economic engine. Originally built in 1979, Terminal 3 was antiquated and old. Needing a major re-model, PHX was in search of a next-generation solution that would provide their customers with an enhanced travel experience that was efficient and convenient. PHX was on a mission to offer world-class service to every customer, every day. They wanted a comprehensive solution that would enhance their existing signage so travelers could better locate terminals, stores, bathrooms, and other amenities throughout the terminals.

Solution
PHX implemented 22Miles as part of their T3 & T4 award-winning 2017 airport renovation project. With seventeen 46” bolted-down interactive wayfinding digital signage kiosks from Forge Media designs, PHX implemented interactive point-to-point wayfinding kiosks with visual communication and real-time flight information. 22Miles Publisher Pro 5.0 Digital Signage Software powers all the systems deployed. The True-User design and editing capabilities of Publisher Pro provides PHX with an intuitive real-time map creation module that enables PHX staff to edit mapping routes and pathways to gates, shops, hotspots, and other listed locations.

Solution Components
- Intel® Xeon®
- Intel® Next Unit of Computing (NUC)
- 2Miles Publisher Digital Signage Software
- 22Miles Wayfinding Digital Signage
- 22Miles Analytics
- 22Miles Certified Digital Signage Media Player
- Touch Screen Displays
- Custom Designed Wayfinding Digital Signage Kiosks
- Collaborating Partner Forge Media

Result
The free-standing interactive digital signage wayfinding kiosks include a QR code reader allowing for passengers to scan their boarding pass to receive turn-by-turn directions to their gate. Built into the kiosk user interface (UI) is an intuitive, question-oriented menu that encourages travelers to discover what all PHX can offer. Users can browse through store and restaurant listings and even read a short description of the location. The kiosks support ADA requirements with built-in display adjustment capabilities, magnifier feature, and wheelchair-accessible routing. To improve efficiency 22Miles added near real-time automation of any gate changes with a direct integration to the flight information display system (FIDS) live data interface. This eliminated the need for PHX staff having to update gate changes manually. When a change to a gate occurs in FIDS, the listings on the kiosks automatically update. This integration by 22Miles dramatically improved efficiency and saved PHX staff time.
**SMART ENERGY MANAGEMENT SPOTLIGHT**

**Gatwick Airport**
SAVORTEX

**Challenge**

Gatwick Airport is the largest single-runway airport in the world and the second-busiest airport in the UK by passenger traffic, with a volume of annual passengers around 45 million. The airport owners, Global Infrastructure Partners (GIP) wanted to meet their sustainability targets to reduce the energy consumption of their facilities and introduce operational efficiencies throughout the airport. The airport washrooms used a mixed range of high-speed hand dryers, with power ratings ranging between 1600 and 2300 watts. These energy-hungry dryers cost the airport £0.0044 to £0.00192 per dry, and the units had a high motor failure rate. Further, the airport manager had no way of remotely monitoring washroom hand dryer usage for responsive cleaning against sudden-and peak-usage surges.

**Solution**

SAVORTEX deployed its EcoCurve 550D Smart hand dryer on a trial basis in the male washrooms in the South Terminal where there was high traffic. The EcoCurve Smart uses an advanced digital brushless motor technology, which consumes power of just 550W and offers 10x more operational life than traditional dryers. The EcoCurve smart dryer uses its patented in-built sensors wirelessly reporting energy usage per dry to the SAVORTEX web portal, allowing estates managers remote access to manage washroom facilities.

**Solution Components**

SAVORTEX EcoCurve 550D Smart Hand Dryer

**Results**

Over the trial period the airport manager was able to monitor hand dryer usage and washroom traffic of 14,100 pairs of hands being dried, resulting in a consumption of 14.90 KG of CO2, and run responsive cleaning schedules based on traffic, introducing new operational efficiencies throughout the airport. The airport achieved 2/3rd less power and 58.75 percent energy reduction from the SAVORTEX trial, translating to 44.76kg of CO2 savings. The demonstrated savings and operational efficiencies resulted in the Gatwick deploying the dryers throughout the Gatwick Airport.
OPERATIONAL EFFICIENCY SPOTLIGHT

Incheon International Airport
Honeywell Building Solutions

Challenge

Since its opening in 2001, the Incheon International Airport in South Korea has been awarded by the Airports Council International (ACI) with 12 consecutive awards for the world’s best airport—an honor received within ACI's Airport Service Quality program. As global airport traffic continues to increase, Incheon sought to exceed expectations related to passengers and cargo, standing by its commitment to offer best-in-class services for visitors. This required enhancing air safety and optimizing operations, while also enabling more convenient services based on mobile applications.

Solution

With a relationship dating back to 1997, Honeywell was selected by Incheon to incorporate the Terminal 2 apron area with the existing Airfield Ground Lighting Control and Monitoring System—including an Advanced-Surface Movement Guidance Control System (A-SMGCS) upgrade for enhanced safety and efficiency. Honeywell also implemented a building management system for Passenger Terminal 1, along a traffic monitoring center and an annex.

Solution Components

Honeywell Building Solutions

Results

With the completed enhancements, Incheon was able to reduce risk and enhance system reliability. Remote monitoring has increased system resiliency. Integrated systems now help manage multiple platforms for more efficient operations. The customized, user-friendly interface helps meet Incheon's needs. The airport is also achieving enhanced energy efficiency.
TECHNOLOGY SUMMARY

Simplify the path to smarter airports with end-to-end solutions based on Intel® technology. Intel powers every segment of the smart, connected world from the device, to the network to the cloud to insights. Intel® technologies and the vast set of ecosystem partners and solutions create a more vibrant, extensible, and sustainable way for airports to implement intelligent strategies. Additionally, Intel helps protect connected systems from the inside out with a foundation of security technologies designed to harden and protect the entire device stack against a wide range of attacks.

In addition to technology, Intel contributes to the development and adoption of many standards which support Intel business objectives. These include standards which address global environment issues and best practices for corporate governance and business operation as well as product safety. Intel participates in hundreds of standards bodies and industry groups worldwide and has played a significant role in bringing about globally adopted standards such as Ethernet, USB, and WiFi. Whether you look to the future of cloud computing, IoT, cybersecurity technology, autonomous systems or AI, standards are the common tool to bring new innovations to global mass-markets.

For decades, Intel has been at the forefront of technology research, innovation, and development ranging from advanced compute, storage, and networking technologies that power many of the world’s data centers to advanced innovations and designs for emerging technologies and platforms such as autonomous driving vehicles and 5G communications. At every step, Intel takes a deeply integrated approach with technology to provide a strong set of compatible solutions, platforms, products, technology innovations, and architectures to complement one of the world’s most dynamic set of ecosystem partners.

Intel® Compute Technologies

As airports connect more infrastructure to the cloud, they’re seeing a greater need to place high-performance compute at (or near) the edge to perform predictive analytics and AI using data from sensors, cameras, and other sources. This can reduce latency, improve near real-time responses, and relieve demand on network bandwidth for performance-hungry tasks like vision. Solutions based on Intel® platforms deliver high performance at the edge. Airports can use Intel® platforms with specialized technologies to consolidate multiple systems into one while leaving enough room to add new functionalities as needed.

Intel is helping IoT innovations get to market faster, reducing solution complexity, and defining how to derive actionable intelligence more quickly and securely. Intel® Compute technologies are hardened to support today’s IoT scenarios for airports.

The Intel® IoT Platform breaks down barriers to IoT adoption by offering a defined, repeatable foundation for how devices will connect and deliver trusted data to the cloud. It allows original equipment manufacturers (OEMs), systems integrators (SIs), and vertical industries to develop and deploy solutions using building blocks on the Intel® IoT Platform.

Intel is deeply integrated and committed to the research and design of advanced computing for data centers running intelligent transportation applications using new and emerging technologies, such as 5G, AI, autonomous vehicles, and advanced IoT sensors and data collection technologies. Intel® architecture helps intelligent airport systems scale through a wide range of product offerings. Intel Atom®, Intel® Core™, and Intel® Xeon® processors each support a wide range of performance points with a common set of code.

Intel® Artificial Intelligence

Intel has the industry’s most comprehensive suite of hardware and software technologies that deliver broad capabilities and support diverse approaches for AI—including today’s AI applications and more complex AI tasks in the future. Intel’s AI portfolio helps customers enable AI model development and deployment at any scale from massive clouds to tiny edge devices, and everything in between. Intel
is leading the next wave of AI with new products designed to accelerate AI system development and deployment from cloud to edge. The broadest in breadth and depth in the industry.

**Intel® Nervana™ Neural Network Processor (NNP)**

The Intel® Nervana™ Neural Network Processors (NNP) for training (NNP-T1000) and inference (NNP-I1000) are Intel's first purpose-built ASICs for complex deep learning with incredible scale and efficiency for cloud and data center customers. These new Intel Nervana NNPs are part of a systems-level AI approach offering a full software stack developed with open components and deep learning framework integration for maximum use.

The Intel Nervana NNP-T strikes the right balance between computing, communication and memory, allowing near-linear, energy-efficient scaling from small clusters up to the largest pod supercomputers. The Intel Nervana NNP-I is power- and budget-efficient and ideal for running intense, multimodal inference at real-world scale using flexible form factors. Both products were developed for the AI processing needs of leading-edge AI customers like Baidu and Facebook.

**Intel® Movidius™ Myriad™ Vision Processing Unit (VPU)**

Intel’s next-generation Intel® Movidius™ VPU is designed for edge media, computer vision, and inference applications. The technology incorporates unique, highly efficient architectural advances that are expected to deliver leading performance—more than 10 times the inference performance as the previous generation—with up to six times the power efficiency of competitor processors.

Additional technologies supporting AI include:

- **Intel® Xeon® Scalable processors**: powerfully designed to handle the broadest range of AI workloads including deep learning.
- **Intel® FPGA**: Near real-time, programmable acceleration for deep learning inference workloads.
- **Intel® Vision Accelerator Design products**: Based on Intel® Movidius™ VPUs and Intel® Arria® 10 FPGAs, the Intel® Vision Accelerator Design products provide powerful, deep, neural network inference for fast, accurate video analytics to meet the demands of computer vision applications at the edge and to enable solution providers and their customers to take advantage of a wide spectrum of video analytics-based use cases.

**Computer Vision with Intel® Distribution of OpenVINO™ Toolkit**

The **Intel® Distribution of OpenVINO™ Toolkit** is a comprehensive toolkit for quickly developing multiplatform applications and solutions that emulate human vision. Based on Convolutional Neural Networks (CNNs), the toolkit extends Computer Vision workloads across Intel® hardware, maximizing performance. Airports can accelerate and deploy CNNs on Intel platforms with the Intel® Deep Learning Deployment Toolkit that’s available in the OpenVINO™ toolkit and as a stand-alone download. Together with the new Intel® DevCloud for the Edge, OpenVINO addresses a key pain point for developers — allowing them to try, prototype and test AI solutions on a broad range of Intel processors before they buy hardware. The OpenVINO™ toolkit:

- Enables CNN-based deep learning inference on the edge.
- Supports heterogeneous execution across computer vision accelerators—CPU, GPU, Intel® Movidius™ Neural Compute Stick, and FPGA—using a common API.
- Speeds time to market via a library of functions and preoptimized kernels.
- Enables development and optimization.

**Intel® Networking Technologies**

Intel is a leader in driving network transformation and enabling edge compute that’s needed to bring 5G to life. Intel is transforming purpose-built networks to become more agile, flexible, and scalable with Software Defined Networking (SDN) and Network Function Virtualization (NFV)—setting the stage for 5G.
For Intel’s communications service provider customers, the work is already underway as they lay the foundation for 5G and transform their communications infrastructure to SDN. This enables more seamlessly connected, powerful, and intelligent 5G-ready networks in comparison to previous networks that were hardware-based. Leading service providers around the globe have made incredible progress in advancing SDN and NFV with solutions across the core network.

With the move to 5G, Intel is transforming the fundamental economics of service providers and enterprise. Intel powered networks are AI ready—with the compute power to handle networking, cloud, and AI workloads. Transformed networks with powerful computing resources at the edge enable operators and cloud providers to intelligently deliver highly personalized services for airports today and in the 5G future.

Networking is key to connecting devices to the cloud and making them smart or autonomous. A variety of network technologies are used in airports, such as ethernet which connects sensors and edge devices, WiFi and wireless networks to provide connectivity without cables, and cellular connections for edge computing and cloud services. Intel provides solutions to support each of these needs.

- **Intel® 10/40GbE** reduces expenses, increases throughput, and increases flexibility by using Ethernet interfaces instead of dedicated SAN networks. This reduces the number of switch ports, decreases cabling, and lowers power for data centers, which helps reduce costs.

- **Single-Root Input/Output Virtualization (SR-IOV)** is a multi-instance host interface that lets a single physical PCI Express device be shared on a virtual environment. This allows the direct assignment and isolation of the PCI Express device in resources for improved manageability and performance.

- **Orchestration Ready Network (ORN)** is a trusted-scalable-flat network originating and terminating in the Intel® server itself. ORN provides for spinning up and spinning down of networks on demand, like a VMNetwork Function Virtualization (NFV). As airports move toward software defined networks, network functions can be virtualized, rather than hardware based. This speeds up network management and the change cycle. NFV performance is enhanced through Intel® QuickAssist Technology (Intel® QAT), which accelerates bulk encryption, public key cryptography and compression.
**Open Network Edge Services Software (OpenNESS) Toolkit** offers cloud and IoT developers an easy-to-use toolkit to develop and deploy applications at the network edge or on-premises edge locations. By abstracting out complex networking technology, OpenNESS exposes standards-based APIs from 3GPP and ETSI Multi-access Edge Computing (MEC) industry group to application developers. Using this software toolkit, applications can steer data traffic intended for the edge at 5G latencies.

**Intel® Storage Technologies**

The rapid and exponentially increasing rate of data growth is creating enormous needs in data storage technologies, particularly for airports. Intel research and innovation is leading the way with advanced technologies for data centers including:

- **Intel® Optane™ SSDs**: SSDs based on 3D XPoint and Apache Pass technologies is a simple, stackable, and transistor-less design that will create fast, nonvolatile storage memory with low latency to unleash a processor’s true potential and improve service capabilities.

- **Intel® ISA-L**: Libraries that can be used with Ceph to provide erasure coding to minimize disk space usage while reducing the latency/penalty imposed by calculations and data manipulation. This results in faster and more efficient deduplication and compression for storage when combined with Intel® Advanced Vector Extensions (Intel® AVX) with ISA-L.

- **Intel® 3D NAND SSDs with Non-Volatile Memory Express (NVMe)**: This technology outperforms SATA SSDs, running demanding workloads simultaneously while lowering costs and increasing system utilization for greater responsiveness.

- **Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)**: This technology allows for efficient encryption/decryption operations on data traveling to/from storage with a minimum impact on performance.

**Intel®-Based Visual Solutions: Digital Signage and Interactive Kiosks**

To improve travel experiences, airports are deploying Internet of Things (IoT) nodes to impart value-added services and collect data that will deliver insights. Airports are replacing outdated infrastructure, such as phone booths and static signage, with digital signage and kiosks. These solutions provide valuable services—such as wayfinding, transit routes, emergency alerts, and free WiFi—too. In addition, digital signs and kiosks can pay for themselves through advertising, giving brands an attention-grabbing way to reach consumers in high-traffic locations.

Intel delivers engaging, effective digital signage experiences with turnkey solutions that speed development and reduce maintenance needs. When digital signage and kiosks are installed in crowded locations, it can be difficult and expensive for airport repair crews to dismantle or repair them. Remote management allows network operators to maximize uptime while reducing operating costs.

With Intel® Active Management Technology (Intel® AMT), network operators can remotely manage indoor and outdoor kiosks, both out of band and in band, and maintain a large network of kiosks. This includes managing and updating content remotely, in near real time, with tightly integrated Intel or third-party content management software. Network operators can remotely diagnose issues and reboot the operating system, even if the media player in the sign or kiosk has gone down. Energy-saving features allow network operators to turn off displays during low-traffic-flow periods, such as nighttime.

Protecting data and devices is critical when it comes to deploying indoor and outdoor kiosks. Security technologies in Intel® Core™ vPro™ processors help protect kiosks, data, and content with Intel® Trusted Execution Technology, whitelisting, encryption, secure payments, and other features. These industry-leading Intel® security technologies help prevent unauthorized copying, duplication, dissemination, or playback.
Through an integrated, modular architecture for digital signage and kiosks, Intel brings together multiple workloads on one platform, along with technologies that attract advertisers. This helps network operators and airports boost their return on investment. Digital signage and kiosks powered by Intel® technologies can support demanding workloads for one-on-one engagement, including 4K displays and gesture recognition, while delivering near-real-time audience analytics. Airports can monitor air quality, sound, and other environmental data with enhanced sensor integration.

With Intel-based kiosks and digital signs for airports, system integrators can streamline the development and deployment of feature-rich, scalable solutions that provide unprecedented levels of performance, reliability, standardization, remote manageability, accountability, and security. As a result, airports can improve traveler experiences and support tourism, while network operators maximize their returns.

Airport Benefits of Visual Solutions: Digital Signage and Interactive Kiosks

**Passenger Experience**
Interactive platforms provide valuable real-time information to travelers including 3D wayfinding within the airport, event details, points of interest, and multi-modal transit information. Travelers can also connect directly to airport officials and talk to a live person on the screen.

**Public Safety**
Digital signage and kiosks can display real-time public safety messages to warn travelers about evacuations, toxic gases, or other emergencies within a particular area. Travelers can also use kiosks to make emergency calls. Airport officials can use kiosk cameras to analyze vehicular and pedestrian traffic for improving airport road safety for traveler departures and arrivals.

**Connectivity**
In many airports where lower-cost broadband internet infrastructure is under-developed or unavailable, free public WiFi provided by kiosks helps airports bridge the digital divide. Kiosks can also provide VoIP phone calling or accommodate a small cell to enhance cellular coverage for service providers where coverage is weak.

**Efficiency**
As a screen hub in an airport, kiosks can be a data center on the edge of a dispersed network—with edge computing, virtual servers, and data storage running locally. Data can be aggregated from a variety of IoT nodes nearby, via wireless connection, and then analyzed before sending insights or relevant data to the cloud for exhaustive analysis.

**Revenue**
Partnerships between airports and media companies help fund digital signage and kiosk installations, often replacing phone booths or outdated infrastructure. Airports collect a share of the advertising revenue and employ technicians to manage and maintain the kiosks. The dynamic displays attract businesses and travelers, while the content connects visitors with local businesses and events. Intel® Visual Solutions teams are working with advertising industry and media companies to make these digital signage and kiosk installations Addressable, Accountable, and Attributable (3A). This 3A initiative helps brands target the right audience anytime and programmatically.
SOLUTIONS FOR AIRPORTS

Intel® Market Ready Solutions

The Intel® IoT Market Ready Solutions program is designed to help members of our broad ecosystem of partners strengthen their delivery of solutions through unique support and scaling opportunities. These solutions give airports scalable, repeatable, end-to-end solutions. That means less time, cost, and risk. These solutions are made up of sensors, edge hardware, software, cloud, and analytics from across the IoT ecosystem. By choosing Intel® IoT Market Ready Solutions, airports get scalable, repeatable solutions designed to solve key challenges in vision technology, mobility, traffic management, and more. Intel has already vetted these solutions, so airports can move forward with the assurance of intelligent connectivity, exceptional performance, and easy manageability.

Intel® IoT RFP Ready Kits

Intel® IoT RFP Ready Kits are focused technology offerings that solve a class of market problems, have been deployed and tested in the field, and provide bundled hardware, software, and support. The technology is scalable and designed to grow with customer requirements, enabling accelerated development and time to market.

Intel® IoT Solutions Alliance

Airports can also find optimized solutions through the Intel® IoT Solutions Alliance, one of the world’s most trusted ecosystems for hardware, software, systems, and services. The Intel® IoT Solutions Alliance helps providers deliver first-in-market IoT solutions. A global ecosystem of more than 800 industry leaders, the Alliance offers its members unique access to Intel® technology, expertise, and go-to-market support. By accelerating the design and deployment of intelligent devices and analytics, technology providers can win greater market share. With more than 6,000 solutions, from hardware and software to systems and services, Intel® helps fulfill nearly every requirement in a range of markets. Early access to Intel® road maps and design support enables Alliance members to stay ahead of the competition, as well as reduce risk and development costs.
In airports, digital signage and connected kiosks provide a wide variety of benefits to travelers, retailers, airport staff, and security personnel.

- **Interactive Wayfinding**: Visually relieve the directional frustration of travelers. Using Beacon or MSE indoor positioning technology for a real-time turn-by-turn mobile wayfinding experience.

- **Intelligent self-service**: Like self-ticketing and quick payment service, interactive customer engagement to gain data-driven customer insights as well as quick-service in retail. To streamline operation, cut cost and reduce customer wait time.

- **Standing alone or video wall**: Support the content design and deployment on dual-screen, multi-orientation, and multi-touch 4K video walls.

- **Real-Time Information Display**: Provides passengers with real-time updates for their flight, baggage, and Gate. With boarding pass scanners for quick information access to any flight times, gate finders, or walking speeds.

- **Connected to city**: Making it even easier to get to and from your airport by taking local public transportation.

- **Advertising and Promotion**: Drive ancillary revenue by offering your sponsorship partners impactful advertising opportunities on your facility's screens.

### 22MILES INTERACTIVE WAYFINDING KIOSK

Powered by Intel® NUCs, the 22Miles Interactive Wayfinding Kiosk is a powerful digital signage solution that improves the wayfinding experience by helping end-users navigate busy, complex transportation hubs and buildings. The solution features interactive, near real-time navigation, mapping, and information, all easily managed from the 22Miles Publisher Pro CMS.

22 Miles is flexible, multi-function cross-platform software solution providing airports with 3D Wayfinding, 4K Video Walls, mobile indoor positioning, dynamic signage, and more, powered by Intel® NUCs. The interactive wayfinding and digital signage software can be embedded into a variety of devices like kiosks and video walls.

**Key capabilities**

- Provide wayfinding with near real-time turn-by-turn mobile wayfinding experience.
- Enable dynamic map pop ups.
- Deliver quick information access combined with boarding pass scanners.
- Offer travelers a self-service kiosk.
• Provide dynamic content updates based on click behavior analytics.
• Utilize modular kiosk design to maximum space and foot traffic.

Key benefits
• Inform and engage travelers with dynamic proximity-based pop-up messaging, augmented reality content, and 3D map views.
• Improve the wayfinding experience by using smart pathway algorithms with automatic destination routing, unique construction pathway rerouting, and ADA compliance.
• Simplify signage management through a centralized content management system that wirelessly updates kiosks within minutes and supports third-party schedules and promotions.

For more information: Case Studies • Solution • Website

FOUR WINDS INTERACTIVE ENGAGE

FWI ENGAGE, powered by Intel, combines purpose-built digital signage solutions and a mobile app, enabling airports to reach travelers and the airport workforce where they are, at the right times, and with the right information to create a better airport experience. The solution provides purpose-built digital signage applications supporting FIDs, BIDs and GIDs through wayfinding, advertising, and more.

Key capabilities
• Delivers strong computing power in a compact package with the Intel® NUC Windows*-based platform.
• Features 22 different content applications and a mobile application.
• Provides a library of training documentation and video tutorials using its Visual Communications platform.
• Hosts all visual content scheduled for display in the FWI cloud.
• Holds hundreds of pre-built templates, apps, and other content items in the FWI Store.

For more information: Website

INTERSECTION IXNCONNECT DISPLAY

Intersection IxNConnect is an end-to-end information platform to improve customer engagement in public paces with contextual information, feedback, and monetization opportunities. Displays give travelers a wide range of features and information, including wayfinding, location-specific information, and near real-time alerts.

Key capabilities
• Near real-time transit arrival information.
• Public alerts and critical location or system update.
• Interactive wayfinding and map displays.
• Targeted and relevant advertising.

For more information: IxNTouch and IxNSight • IxNConnect • Website
LG-MRI BoldVu® Signage and LG-MRI Wayfinding Kiosks are an effective way to enhance airport traveler experience while achieving greater environmental and economic sustainability. Designed with Intel® RealSense™ technology, LG-MRI BoldVu® Signage and LG-MRI Wayfinding Kiosks can integrate multiple connected devices to deliver a public kiosk solution in airports. The displays provide unparalleled luminance and visual clarity in the most challenging and unforgiving indoor and outdoor environments.

**Key capabilities:**
- Provides 3500 nit luminance, high contrast, and a wide viewing angle.
- Guarantee ten years of operation in the end-use environment without image degradation.
- Outdoor ready with an IP56 design, weatherproof, filter-less, and thermal management system.
- Vandal protected, including laminated, ballistic-resistant vandal glass, and anti-tamper locks.
- Self-monitoring and control of over 150 operating parameters.
- Integrator-friendly: house cool and power peripheral devices inside the display chassis.
- Multiple sizes & options: 55”, 75”, 86” sizes, single or double-sided, touchscreen option, custom mounts and fascia.
- Turnkey availability: can be completely integrated in factory for plug-and-play deployments.

**Key benefits:**
- Integrate and communicate with smart lighting, traffic cameras, parking meters.
- Communication center using real-world user-interfaces for two-way calling, public connectivity, citywide alerts, and concierge information, including points-of-interest and interactive wayfinding.
- Revenue opportunity based on locations with large volumes of pedestrian and vehicular traffic can prove attractive to media buyer looking to make advertising impressions.
- Data and analytics - using connected sensors, cameras, traffic counters, Wi-Fi beacons, and other IoT devices, smart city kiosks can gather data for invaluable insights.
- Ad content always looks as intended on a Bold Vu® LCD display—a core advantage for big brands and advertisers.

For more information: [Website](#)
VENDRON SMART VENDING AND AUTOMATED RETAIL

Vendron Smart Vending and Automated Retail is an end-to-end smart solution that enables powerful and customizable smart vending capabilities. Airports can capture the growing automated retail market segment with a world-class, smart vending solution powered by Intel.

Key capabilities

- Increase revenue with a 24-hour revenue stream that accepts all payment types.
- Expand customer reach with an engaging and interactive user experience that includes digital signage, social networking, and a mobile application.
- Optimize operational efficiency with cloud-based remote manageability for simplified stock replenishment, reduced operating costs, and optimized storage.

For more information: Solution • Video • Website

ZIVELO ENDLESS AISLE

The ZIVELO Endless Aisle solution helps capture revenue at the point of inspiration by providing airport retail customers with in-store access to the entire inventory. Powered by Intel and paired with purpose-specific software, this digital kiosk solution delivers a complete, inviting, and empowering user experience for customers to discover, explore, and order products.

Key capabilities

- Bring intelligent self-service to retail spaces, connecting through either WiFi, Ethernet, Bluetooth, 3G, or 4G.
- Kiosks compute from Dell OptiPlex 3040* PCs built on Intel® Core™ i5 processors.
- Retail end customers place orders on the kiosk via Honeywell Vuquest 3320g barcode scanner and Magtek SureSwipe 21040145 magnetic card reader.
- Transaction information is sent to the store operator’s preferred cloud and analytics can be performed at the edge in near real-time.
- Through high-volume Intel® SSDs, store operators can choose to store the information either on the local device or in the cloud.

For more information: Solution
Vision applications help airports enhance security and surveillance, measure the flow of people, enable smart parking, and provide automated access control. Key benefits include:

- **Interactive Wayfinding**: Visually relieve the directional frustration of travelers. Using Beacon or MSE indoor positioning technology for a real-time, turn-by-turn mobile wayfinding experience.

- **Perimeter Security**: Use video surveillance, thermal detection, alarm systems, and system linkage to protect the perimeter.

- **Runway Monitoring**: Monitor landing and taking off flights with video surveillance, thermal detection, long range viewing, and panoramic mode.

- **Parking Lot Security**: Help protect parking lots and control entrances using license plate recognition, video surveillance, and parking guidance.

- **Roads to Airport**: Control traffic and monitor vehicles using video surveillance, license plate recognition, suspect car alarm, information issuing, and traffic incident detection.

- **Terminal Monitoring**: Monitor retail sites, passenger behavior, e-passport gates, and luggage systems.

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**ACER SMART PARKING AND TRANSPORTATION E-TICKETING SOLUTION**

The smart parking solution is a market first intelligent smart transportation solution that provides efficient parking management with an integrated payment system. Acer ITS provides the turnkey solution and API for local customization, enabling sales through partnered SIs, SPs, and resellers.

Acer ITS combines e-ticketing, license plate recognition, image recognition, cloud service, and a mobile parking app to form an intelligent parking cloud service. The cutting-edge parking system, the Smart Parking Meter, can automate the entire parking management process for an airport. Equipped with an array of sensors, the Smart Parking Meter detects when a car enters a parking spot, identifies the vehicle's license plate number, and sends the data to the cloud system connected to the database of the parking app to update the parking vacancy information. Parking tickets issued manually and collected through various service channels are costly and run the risk of human error. This system improves parking space efficiency and rate management results for roadside parking operators.

For off-street parking, drivers can use the app service to locate available parking spaces, which are sorted by categories such as pricing, distance, and remaining spaces. The navigation service can guide the driver to the right spot. In a parking lot with a license plate recognition system, a driver can
simply park in the parking lot and leave without getting a token or paying a fee. As the driver leaves the parking lot, s/he will receive a payment notification from the parking app. The entire parking experience is streamlined and automatic. Car parking becomes an easy thing to do in the city using Smart Parking Meter.

**Key capabilities**

- Complete E-ticketing System supports multiple methods of payment.
- Smart Off-Street Parking delivers near real-time transactions, back-end data analytics, and an integrated payment system.
- Smart On-Street Parking provides actionable data to understand turnover rate, timing, and rate adjustments for future planning of roadside parking system.
- Analyze parking lots for parking assistance.
- Recognize vehicles based on license plates or e-tags for location tracking and easy access into off-street parking.

For more information: [Website](#)

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**GORILLA INTELLIGENT VIDEO ANALYTICS RECORDER**

Gorilla Technology’s Gorilla Intelligent Video Analytics Recorder (IVAR) solution utilizes groundbreaking near real-time intelligent video analytics to extract business and operational insights across all facilities to a single dashboard, enabling users to improve facility security and business operations. Interactive wayfinding and digital signage software can be embedded into a variety of devices, including kiosks and video walls.

**Key capabilities**

- Facial detection with data analytics and data correlation for airport security, airlines, government agencies, and customs/border control.
- Video analytics can detect abnormal behavior and alert security teams.
- Gorilla FVS can help track and route people to the correct airport gate or other locations.

For more information: [Solution](#) • [Website](#)
MOBILITY SOLUTIONS

Autonomous, electric, and driverless mobility solutions improve airport performance by increasing service availability and route frequency, improving passenger comfort and reducing their stress, and enhancing safety.

- **Automated & Smart Operations**: Running on a planned route, autonomous shuttles can detect changes in the environment (obstacles, pedestrians, etc.) in safe distance.

- **Environment Friendly**: With 100-percent electric and driverless Level 4 intelligent vehicles, airports can reduce emissions and increase sustainability.

- **Pod on Demand**: Autonomous vehicles can support Pod on Demand to transport airport freight.

- **Fleet Management**: Autonomous vehicles can communicate with each other and respond to schedule updates delivered from the airport control room.

- **Transit Flexibility**: Airports can enable stops dynamically at planned stations based on passenger requests and on-demand service.

- **Accessibility**: Accessibility features allow ease of use for elderly and visually impaired.

**PERFECTRON EZ10 AUTONOMOUS SHUTTLE**

The EZ10, a smart and autonomous shuttle developed by Perfectron and powered by Intel, navigates autonomously using radar, Lidar, GPS, odometry, and computer vision. Its eco-innovation and noiseless design can improve traveler experience while maintaining a high level of safety.

The Perfectron EZ10 Self-Driving Shuttle navigates 100 percent without human input. The shuttle sensory system acts as “eyes” by providing driverless bus ability to identify appropriate navigation paths, as well as obstacles and relevant signage. The autonomous vehicle “brain” allows connection of diverse subsystems involving sensor, positioning, navigation, locomotion, motion control, energy, and communication. The system enables the vehicle to recognize, analyze, and operate automatically, enabling shuttles to execute obstacle avoidance, passing, overtaking and giving way, to enhance transporting efficiency and safety.

During rush hour, EZ10 shuttles can run according to the fixed route every three minutes at all stations. In off-peak hours, shuttles support on-demand service through APP ordering. This kind of fleet management system provides convenient, green, low-cost, even flexible traffic network.
Operational Management Solutions

Intelligent solutions for airport operational management help to drive efficiency, increase safety, and reduce costs.

- **Intelligent Building Operation and Energy Management**: Enable airports to create safer, more energy-efficient, higher-performing buildings through better automation, compliance, and management. Airports can minimize energy consumption with remote on/off switches, motion sensors, and power outlet monitors.

- **Air Traffic Control and Management Systems**: Airports can better manage Airport Operational Database (AODB), Flight Information Display Systems and Public Address Systems, and Gate Management Systems.

- **Connected Retail**: Airports can more effectively manage distributed smart assets from edge to cloud data center through near real-time visibility and insights provided by an end-to-end management platform.

- **Remote Asset Monitoring and Predictive Maintenance**: Airports can improve the operational efficiency of physical assets through remote monitoring, specialized analytics, and predictive maintenance.

Key capabilities

- **Automated & Smart Operations**: Running on a planned route, EZ10 can detect the change of environment and respond within a safe distance.

- **Fleet Management**: EZ10 shuttles can communicate with each other; control room arranges the running schedule.

- **Sustainability**: EZ10 is a 100 percent electric driverless A SAE Level 4 high autonomous intelligent vehicle.

- **Accessibility Features**: Passengers can operate door and access ramp functionality with exterior buttons.

- **Flexibility**: For increased transit flexibility, EZ10 can stop at planned stations at regular intervals, or stop on-demand based on passenger requests.

For more information: [Solution](#) • [Website](#)
HONEYWELL BUILDING SOLUTIONS

Honeywell Building Solutions give airports the insight, agility, and automation to coordinate every aspect of complex building management, even in an emergency. As the framework of a digital platform, the solutions integrate the data collected from various connected airport management systems including video surveillance, transport management, traffic management, parking management, waste management, environment monitoring, and lighting, water, and energy management. The solutions offer full multitenancy support and aggregate, store, and analyze the collected data securely to efficiently support airport administrative functions. The architecture is designed to protect data, reduce complexity, and help the IT team be more productive.

Key capabilities

- **Alarm Management:** Alarm management system provides details of the source, type, logging time, and priority of each alarm received from various integrated smart city sub-systems. Operators receive these notifications as audio visual popups.

- **Visualization and Resource Mapping:** Geographic Information System (GIS) visualization enables operators to view all the airport assets (camera, concourse, lighting) on the GIS map as a layer. A unique identification icon is assigned to each asset category. Color coding indicates the health status (functional/non-functional) of the assets.

- **Video Visualization:** Operators monitor the feed from cameras linked with an alarm management system in matrix view to ensure better decision-making. Selection of cameras are based on either maps, jurisdiction, or camera selection from the list.

- **Incident Management:** Incident panel displays information like source, type, and priority of the alarm, incident ID and time, sensor or camera name, and incident response.

For more information: [Brochure](#)

SAVORTEX ADDRYER

Built on Intel® technology, the SAVORTEX AdDryer uses the Internet of Things (IoT) to deliver waste savings, alert cleaners to washroom needs based on usage, and engage travelers with tailored, high-definition video messages, allowing airports to transform costly commercial washrooms into connected, hygienic, and sustainable revenue-producing assets.

Key capabilities

- **Strong performance per watt:** Hand-dryers from SAVORTEX powered by Intel Atom® processors deliver high performance with energy efficiency.

- **Rugged and reliable:** The Intel Atom® processor is a ruggedized compute platform in a sealed environment that can withstand extreme temperatures (-40 to 110 degrees) for excellent longevity.

- **IoT connectivity:** SAVORTEX uses Intel® Dual Band Wireless-N 7260 network adapters, including Intel® Smart Connect Technology, to be able to confidently connect to the cloud.

For more information: [Website](#)
GETTING STARTED

Leading airports through strategic innovation and transformation is a continual journey. Many airport management teams plan their intelligent initiatives across three action areas to:

1. Transform data into new insights in how their airport works with intelligence from edge to cloud.
2. Leverage proven intelligent airport solutions to support stakeholder goals.
3. Consolidate systems at the edge for greater efficiency and value.

Initially, leaders should examine which services may have the most impactful outcomes. Stakeholder identification, participation, and clear priorities are essential foundation points for building your plan. Leveraging experience working with many governments and airport authorities worldwide, Intel is bringing together the right stakeholder organizations and companies to deliver building blocks that airport leaders can use to create and implement an appropriate plan.

Here are the major steps to enable the airport transformation journey:

Identify Stakeholders
Within the complex structure of your airport, identify who the major stakeholders in any digital transformation project would be. Depending on the project, this can include government representatives, members of the airport management team, employee representatives, concessionaires, airport IT team, airport security team, airlines, and passenger advocates.

Assess Current State
Determine where your airport is now, using the same key performance indicators you will use to quantify success. What works? What needs work? How can you improve the satisfaction, security, safety, and success for all stakeholders?

Create a Shared Vision
Establish your ultimate outcomes, expressed in terms of stakeholder benefits. The vision should not be expressed solely as technical achievements but also as experiential improvements that technology can make possible. It is essential to build that vision with stakeholder involvement to achieve better and more diverse suggestions, consensus, and commitment.

Get started in the airport sector
Reputation and previous successful IoT projects in the airport sector are vital. If you are looking to break into this space in the U.S., think about attending conferences such as the Passenger Terminal Expo, which is the top conference globally. It’s a great place to meet potential clients and partners.

Solve for the most common problems
When thinking about your work in airports, think about which use case you want to solve and consider which of these use cases you are equipped to address:

- On-time performance/place turnaround
- Keep pace with other airports
- Increase operational efficiency of:
  - Baggage
  - Customs
  - Security
  - Check-in
  - Boarding
- Asset management tracking
- End-to-end transportation (bus to train to plane....)
- Wheelchair/handicap/special needs monitoring
- Customer self-service
- Trash/toilets/facility monitoring
- Custom mobile and digital signage
Build Blueprints

Develop a priority list and “blueprints” for the most important projects in your technical modernization plan. Possibilities include master plans for:

- Better utilization of current airport space and/or the addition of new space
- Modernization of the current technical infrastructure (communications and computing resources)
- Data collection
- Improvements to all interacting airport systems

Mark Milestones

Identify waypoints at which you measure progress, share lessons learned, discuss course corrections, and strengthen stakeholder commitment to your shared vision.

Select KPIs

Decide on key performance indicators that quantify success and align with your vision.

Exploring Financing and Partnerships

Implementing a comprehensive digitization vision requires committed funding. It is a critical component that should be thoughtfully planned. Innovative funding and financing alternatives can accelerate your projects. Exploring multiple funding sources such as regional economic development; state and federal agency funding for transportation, public safety, environment; and private developer and industry partnerships are a few examples of broadening sources. Developing partnerships to embrace industry knowledge, best practices, plus key solutions and technologies, provides insight from planning to implementation.

Defining and executing a digitization strategy is neither straightforward nor without risks—but the benefits can be significant. Intel believes a successful airport transformation requires certain key components: the right level of stakeholder participation, clear priorities, and methodical planning of technology infrastructure.

Read what others read

Here are some top publications for the airport sector:
- Airport Magazine
- Airport Improvement Magazine
- Airport World Magazine
- Passenger Terminal Today

Reach out

When trying to break into the Airport sector, consider joining these associations to help develop relationships:
- American Association of Airport Executives
- Airports Council International
- Association for Manufacturing Technology

Airport IoT buyers look for solutions that are:
- Cost effective
- Built on superior IoT technologies
- Customizable
- Built through partnerships with local technology companies
This is only a starting point for a transformative airport journey. At Intel, we believe stakeholders can successfully transform their airport by establishing clear priorities, encouraging active stakeholder participation, ensuring methodical technology infrastructure planning, while enabling the right policy and governance. With its core technology solutions and strong partner ecosystem, Intel can help bring your vision to life.

LETS EXPLORE THE POSSIBILITIES TOGETHER

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THINK BIG
...not just smarter, but better cities

START SMALL
Get going with projects and opportunities

MOVE FAST
Learn, adjust, iterate