

MANAGING THE MOBILE WORKFORCE

Deploying solutions globally and harnessing the
power of context-aware mobile devices



SITA

White Paper

Specialists in air transport communications and IT solutions

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Executive overview

At any airport, tasks such as aircraft turnaround and maintenance can be dramatically improved when the precise information field workers need gets delivered straight to their mobile devices – right when it's needed.

The air transport industry (ATI) is characterized by a constantly mobile workforce and a complex, dynamic workflow model, requiring workers to access and act on real-time information. In today's environment, however, many processes on the ground are still static, paper-based and nothing like as efficient as they could be – since they are unable to leverage the power of the information locked in ATI applications and systems.

The answer is a new breed of mobile workforce solutions that can deliver the right information at the right time to mobile field workers – using applications which can anticipate their needs and requirements based on a number of context parameters (such as 'state-of-the-process', location, time, staff certification, network-type, etc).

By bringing contextual information into the picture, applications can adapt information delivery dynamically, to completely transform airport business processes – especially for key on-the-ground staff such as turnaround dispatch teams and maintenance engineers.

With context-aware processes in place, users no longer need to know what they are looking for. Instead, a context engine analyses each user's situation (context), works out what information they need, and delivers it right when they need it, in real-time.

Context-aware processes can improve ATI operations by connecting assets, networks and users to the right information, in the right place, at the right time – increasing productivity and efficiency, and having a direct impact on the bottom line.

Maximum benefits can only be achieved if context-aware processes are in place everywhere you operate – but the challenge is doing this cost-effectively across multiple and often remote locations. One way of reducing or even removing upfront investment from the equation is to consider common-use infrastructure, and to look at innovative and cost-effective provisioning mechanisms – such as application service provider (ASP) mode.

Introduction

Context plays a key role in every decision we make.

We get up in the morning and go to bed at night, responding to the context of time. We drive at different speeds on different roads, taking into account the contexts of weather, speed limits and safety considerations. How we respond to email depends on the contexts of who sent it and the importance of the subject. We upgrade computers and phones in the context of technology advances and business transformation opportunities. And we choose where we live, largely on the basis of the context of location.

What we decide depends on what's happening around us and the information currently available to us. Context affects everything we do.

Context, in at least a limited sense, has long been present in simple automated processes – with thermostats, for example, regulating temperature, programmed timers making sure regular data backups take place, and failover systems switching sources when networks or power supplies drop out.

Workers – business process end-users – still have to do most of the decision-making today, however, and most of the manual work too; and nowhere is that more true than for mobile workers in the air transport industry such as duty managers, ground handlers and maintenance staff.

Imagine how business processes could be transformed if the power of context could be brought to workers' mobile devices. Imagine if local context was taken into account at the user, device and network levels. So that a duty manager only sees information relevant to the immediate departures about to happen. Or a maintenance engineer only sees the instructions for the part being repaired right now. Without scrolling through multiple menus or having to search for the information required to do the job.

That's the power of context-aware applications and mobile devices. Imagine if they were being used everywhere you operate.

The industry issue: right information, right place, right time

The air transport industry (ATI) faces a very specific set of challenges on the ground – with efficiency at a premium, and a large number of mobile assets and workers to be tracked and managed.

Airports, in particular, are characterized by a constantly mobile workforce and a complex, dynamic workflow model, requiring workers to access and act on real-time information.

The challenge of multiple users from multiple stakeholders and the compatibility of their devices at the airport, from the airline's point of view, is how to deploy new processes in multiple airports, without re-defining or re-developing applications for each airport environment.

Field workers, unlike office workers, focus primarily on the task in front of them, not on the computer. They constantly move from one location to another, and need instantaneous, right-time, on-the-spot information. They are usually under considerable time-pressure, and are simply too busy to browse through menus or search for the information they need online. They also often work in difficult physical conditions (cold weather, bright light etc) and may need to wear gloves.

So they need technology which is easy to use and understand, and which offers as little distraction from the task in hand as possible. Choices need to be kept to a minimum, and interfaces and data entry functions need to be designed with the end user in mind.

Today, however, there is too often a gap between the functional needs of workers in the field and the solutions designed for them by IT departments – particularly as far as ergonomics are concerned. This results in workers returning to paper and voice-based communications instead of adopting more efficient mobile technologies.

Facing the challenges

Even though we are rapidly approaching an era of ubiquitous computing, mobile field workers have yet to see many of the benefits. This is largely because of the lack of sufficiently useable and versatile equipment, but also because software applications have so far not been smart enough to meet their real needs. Indeed, many first generation mobile applications failed because they were simply shrunk-down versions of desktop applications, instead of being specifically-designed for mobile devices. There has also been enormous recent progress in mobile devices themselves, which are becoming smarter and more intuitive with each successive technological advance.

Another issue which has helped prevent the widespread rollout of useful mobile applications to field workers has been the difficulty in connecting different applications using heterogeneous devices and networks. Without leveraging common-use technology – both at the device and the infrastructure level – upfront and ongoing costs can quickly outweigh the benefits of mobile applications.

Just as important will be the need to bring together all of the right information from diverse ATI applications at the right moment, in real-time – so that mobile field workers know about gate changes or flight delays, for example, as soon as they occur. The need for – and complexity of – seamless integration should not be underestimated, and must include catering and fuel suppliers as well as gate management and crew rostering applications.

Today, the ATI is characterized by powerful back-end systems but let down by paper-based processes at the front end. Mobile field workers still use job cards, for example, which are by definition static, rather than having access to the far more useful dynamic information which is – at least in theory – already available within back-end applications and systems.

Mobile workforce trends

The value of being able to communicate with people on the move has been widely recognized ever since the invention of the walkie-talkie during the Second World War, and as mobile devices have become ever-more sophisticated, so too have the applications which run on them.

Until recently, however, there have been a number of constraints preventing a truly efficient use of mobile technology amongst mobile field workers – from simple problems such as small screen size and low battery capacity to more complex issues such as non-intuitive user interfaces and network constraints.

Today, with the massive global adoption of mobile technology and the arrival of new, intuitive device-types – such as the iPhone – there is a growing desire to improve the kind of services and applications available to mobile field workers in airports.

This is not just a question of improving productivity and efficiency, but also a way of reducing costs, at a time when global economic realities are making everyone look more carefully at the bottom line.

Almost four fifths of respondents in the 2009 Airline IT Trends Survey said that improving workforce productivity was a high or very high priority. While mobile devices are not yet widely used by the mobile workforce, over 60% of airlines surveyed are already building a strategy for workforce mobility. And some 53% of airlines expect to implement mobile services for aircraft maintenance and engineering by 2012 – which is more than three times the 2009 level¹.



New mobile workforce solutions

Clearly a new breed of mobile workforce solutions is needed which can deliver the right information at the right time to mobile field workers – using applications which can anticipate their needs and requirements.

The key to success will be applications and services which are able to leverage contextual information, adapting information delivery dynamically, to completely transform airport business processes – wherever you operate – especially for key on-the-ground staff such as turnaround dispatch teams and maintenance engineers.

Leveraging context in the ATI

Context-aware applications and services can be used at airports to improve almost all aspects of ground operations (as well as passenger management and baggage handling, though this is beyond the scope of this paper). In practice, what this means is using a series of context parameters to ensure that the right information is delivered to the right user at the right time – wherever you operate.

The most commonly-cited context-awareness parameter is location, and indeed knowing the location of people and assets is especially useful in the ATI. Many mobile devices, by their very nature (through the use of GPS, Cell-ID or Wi-Fi for example), can tell you where they are located, and therefore where your resources are – allowing you to filter content back on the basis of their location. Technologies such as RFID, for their part, allow assets to tell you what they are as well as where they are – and even where they should be.

Perhaps the most important context parameter in the ATI, however, is not location so much as the ‘state of the process’. Is the flight delayed? Has the aircraft arrived? Has the gate changed? Is the maintenance engineer on the spot?

Broadly speaking, the main context parameters which make up context-awareness as a whole can be divided up into:

- User context parameters: eg profile, language, location, time, presence, etc
- Device context parameters: eg screen size, operating system, processor power, memory, battery-life, etc
- Asset context parameters: eg temperature, pressure, capacity, power, orientation, next service date, etc
- Network context parameters: eg wireless radio technology, range, quality of service, bandwidth, etc

To be effective, context-aware systems must be capable of collecting all the relevant contextual information and processing it intelligently, so that applications and services running on the end-user device remain as simple and as useful as possible. The underlying philosophy should be to deliver (push) a short series of context-relevant options to the user, and then allow the user to select (pull) the content as needed.

Context-aware computing means that the current situation is analyzed in order to decide what services are presented to the user, and when services are launched or stopped. This is very different from traditional desktop systems where direct user interaction is required.

Context-aware applications and services can also be beneficial in disruption management and will play an increasing role in managing passengers and their baggage, too – though this is beyond the scope of the present paper².

Implementing context-aware services

Context-aware services revolutionize how information is delivered, received and presented on mobile devices. Users no longer need to know what they are looking for. Instead, the context engine (see box) analyses each user's situation (context), works out what information they need, and delivers it in real-time.

The technology works by distilling information down to only that which is necessary, using a collection of web services and similar processes running on a distributed intranet, which needs to be tightly-integrated with back-end applications and business process modelling tools.

In order to cope with a wide range of functional needs coming from multiple business units, a common-use platform can be used to connect heterogeneous back-end systems to mobile devices via a variety of network technologies. This also has the added advantage of saving airlines from having to deploy their own solutions at each and every airport, and saving airports from having to install airline-specific infrastructure.

With a common-use context-aware platform (see box) at the airport, all the necessary contextual information can be collected from different systems, and managed and processed intelligently to allow applications and services running on user devices to remain as simple and as useful as possible.

In the airport environment, this contextual information might include data such as location, time, user profile, device type, status, flight number, gate details, available bandwidth, etc.

The common-use context-aware platform would allow airlines to use their applications in any readily-equipped airport, without further development or capex investment.

Mobile middleware services will be needed to connect back-end systems where workforce applications are deployed to the context-aware platform, enabling a range of wireless applications to be accessible to different stakeholders.

This should allow airports to reduce information overload, and airlines, ground handlers and other airport customers to escape dependence on manual processes, voice communications and back-office reporting for a wide range of critical operational functions.

How do context-aware services work?

Precise information about the end user's context is collected from various sources and stored in a context engine. Location information, for example, can come from different sources, such as GPS, Cell-ID or pinpoint indoor Wi-Fi triangulation, while information about the 'state-of-the-process' can be drawn from other ATI applications, and user information from the stored user profile.

When a specific request is made – such as the need for a maintenance engineer to perform a specific task – the context engine validates it against a rules-based engine that sits at its core, and delivers the appropriate information and applications.

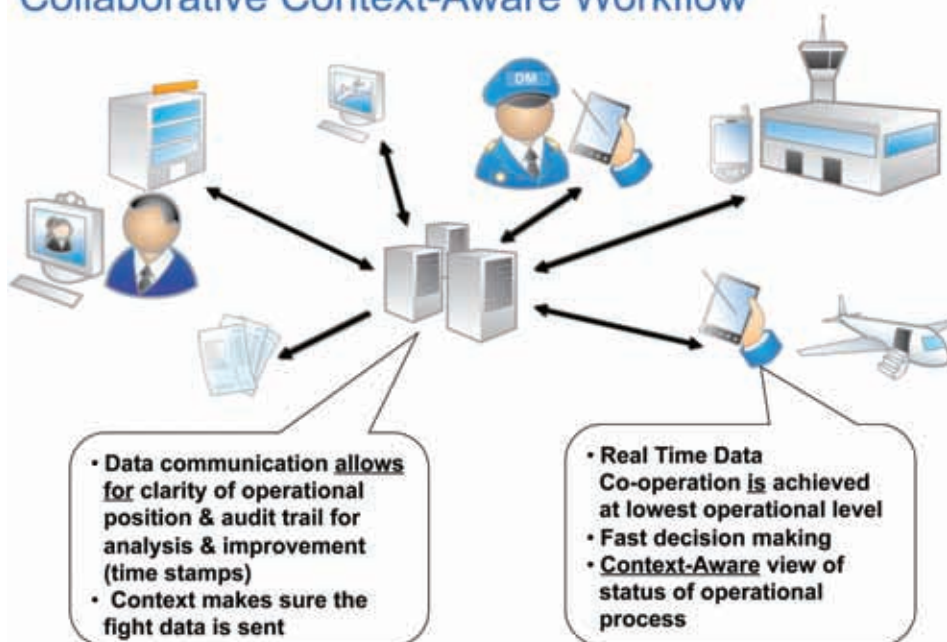
The context engine allows applications and services to be built and delivered in a modular fashion. This allows users to access relevant information through simple icons at a certain time depending on their contextual information.

When the context engine is integrated into a mobility platform, common features such as device management, synchronization, provisioning and notification are greatly enhanced, creating an intelligent mobility environment.

The common-use context-aware platform is in essence a collection of software technologies that enables the sensing, processing, distribution and administration of context, whether in a closed network, such as an enterprise's intranet space, or within an open architecture, such as in a Web 2.0 environment.

The common-use context-aware platform can be seen as being the context engine together with the relevant hardware and network components needed to allow it to run. These may be dedicated, or simply 'loaned' (a context engine running within a web client or on a corporate server).

Collaborative Context-Aware Workflow



Guidelines & recommendations

Mobile workforce solutions can offer clear benefits in terms of increased efficiency and productivity as well as reduced costs – but if pitfalls are to be avoided there are a number of guidelines / recommendations worth considering when implementing context-aware services and applications.

- **Analyze your business processes.** Look at how processes are managed today and what can be improved by reducing paper and voice communication. Only with a clear understanding of what you want to achieve with business processes will you be able to realize savings and optimization.
- **Keep the end-users in mind.** What conditions are they working in? How will they use their devices and access applications? With what device? Over what sort of network? Mobile devices need to be a support tool for end-users, not another technical hurdle in the way of their daily work. Poor ergonomics may lead to devices being rejected by end users and can put your whole mobile project at risk.
- **Leverage middleware to support as many applications as possible.** Avoid having one device per application with no integration between them. Avoid duplicating software support layers for different vertical applications. Instead, aim to deploy multiple, integrated applications over one mobile device via a common middleware layer.
- **Prove the business case.** Focus on a small number of main areas – such as turnaround, maintenance, and airport operations and asset management. Look at innovative and cost-effective provisioning mechanisms – such as application service provider (ASP) mode – to reduce capital and operational expenditure. Target multiple business processes to create a stronger business case over a larger population.
- **Think integration.** Ensure the context-aware technology is interfacing with as many ATI applications as possible. Today, with standards such as HTTP, XML and architectural models such as SOA, ATI applications no longer have to live in separate silos.
- **Look at the processing power needed.** Context-aware applications need a lot of processing power, particularly when many different context parameters are being used. For this reason a distributed architecture is recommended, with power at the edge of the network (using proxy or edge servers).
- **Look at common-use infrastructure.** Airlines want consistency in levels of service, but it can be hard to justify investment in multiple and remote locations – unless common-use infrastructure is considered, which can reduce or remove upfront investment. Today the ATI is working together to deploy a common-use platform which will provide ATI - required levels of security, privacy and performance while meeting tight budget constraints.



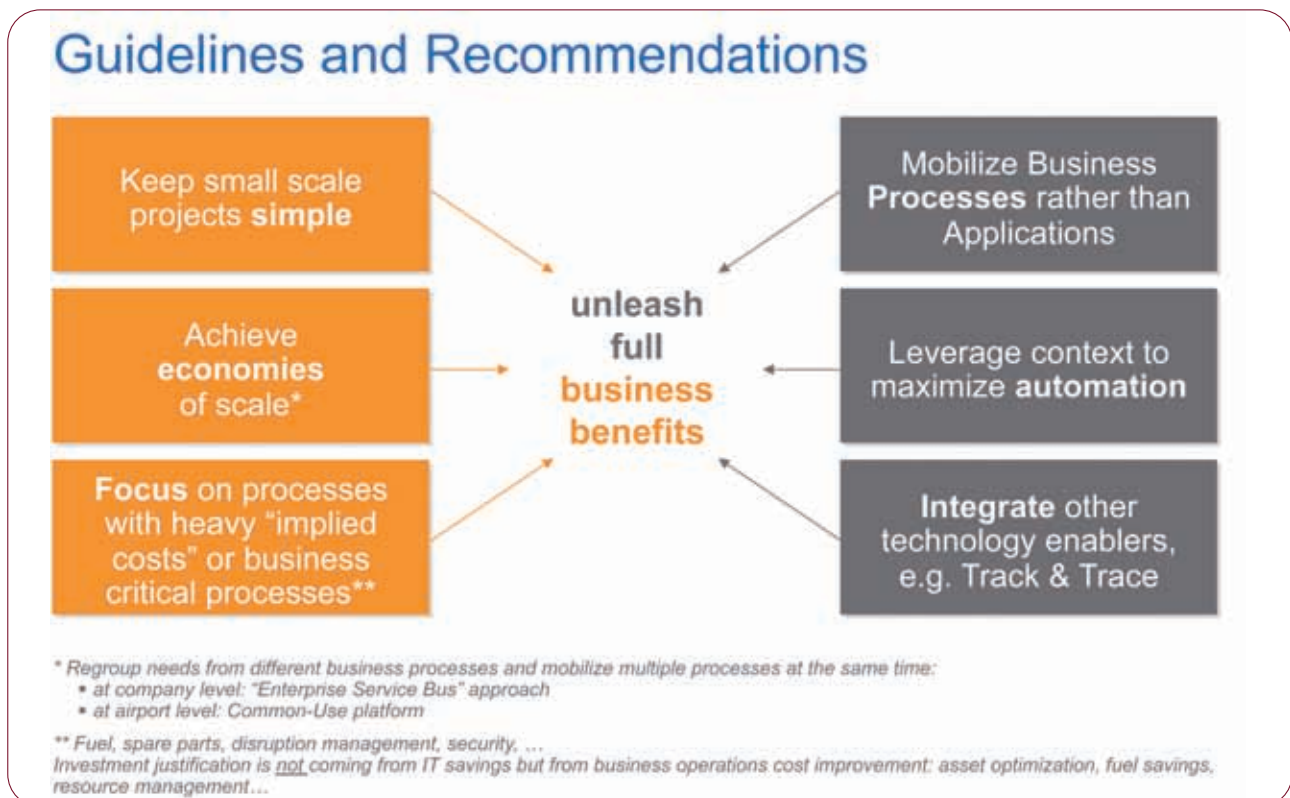
Common-use context-aware benefits

Common-use context-aware platforms can improve ATI operations by connecting assets, networks and users to the right information, in the right place, at the right time. They can have a significant impact in improving security and emergency responses, and are well-suited for tracking assets of all kinds – from individual items of cargo and food trolleys to security equipment and aircraft parts.

Typical business process or applications that can benefit from common-use context-aware platforms and deliver increased productivity include specific activities such as ramp management (optimizing resource allocation and aircraft turnaround) and generic ones such as workforce management (improving staff efficiency).

Benefits include:

- Reduced costs;
- More efficient resource allocation through access to the right information at the right time – from electronic task-lists, to work schedules and rule-based alerts;
- Elimination of information overload;
- Optimization of workflow processes through remote data entry of completed work and digital push of daily tasks;
- Real-time access to process status via handheld devices;
- Ad-hoc staff re-allocation as necessary;
- Automatic sending of alerts and status updates;
- Faster response to disruptions and incidents;
- More efficient / traceable contract billing.



Common-use context-aware examples

Specific areas where a proof of concept exercise has already been undertaken include aircraft turnaround, maintenance and airport operations mobile asset management.

Aircraft turnaround

In today's airports, duty managers interact with all the different stakeholders using VHF radio and paper-based processes.

This is both error-prone and inefficient, with voice-based communication often leading to misunderstandings or the need for repetition, and each player having to queue for service on a one-to-one basis. Programming the next task is made more difficult by not knowing the level of completion of the previous task (is fuelling completed?), and it is very hard to manage exceptions and last-minute changes.

Finally, after turnaround is complete, the duty manager has to file a manual report describing all the tasks achieved and the timings, which takes an additional 15-20 minutes.

In a context-aware environment, duty managers should be able to do everything electronically, in real time, including the arrangement and reporting of tasks, and the sharing of essential documents. Reports can be generated automatically when tasks are completed (fuel tanks know when they're full), and the whole process is made more efficient and flexible.

Several airlines now believe that with a common-use context-aware platform in place, one duty manager could manage multiple turnarounds, which would be far more cost-effective than today's norm of one duty manager per aircraft turnaround.

Aircraft maintenance

In today's environment, maintenance engineers spend a lot of time carrying around paper and parts – and they aren't always the right ones. Between tasks, they have to return to base to review the work and collect the next assignment, and a new job card.

In a context-aware environment, however, this can all change. To give an example, health-monitoring systems onboard an aircraft might highlight a specific maintenance task which needs to be performed during the next turnaround.

Machine-to-machine communications can provide an automatic assessment of the type of skills needed and the availability of both parts and a qualified engineer, and a least-cost path analysis. Everything can then be made ready at the right gate at the right time, including pushing the right maintenance documentation and forms to the engineer's handheld device.

With a common-use context-aware platform in place, systems can also adjust for all future segments of an aircraft's journey, thus saving time and money down the line as well as on the spot – since maintenance management is the same as flight management, having to handle exceptions such as late arrivals and cancelled flights.

Just because a flight arrives late doesn't mean the maintenance can be put off, so it's important that schedules are updated in real-time and that the next plane isn't brought into the hangar. Equally, if a flight is cancelled, the maintenance slot can then be re-allocated to another aircraft.

One airline is projecting double-digit reductions in aircraft line maintenance intervention time and critical work-process improvements, once context-aware systems are in place.

Airport operations and asset management

A considerable amount of time is wasted on the ground in today's airports because people and / or assets aren't in the right place at the right time.

A good example is ground power units (GPUs), heaters and coolers, which are spread around the airport, often difficult to locate when needed, and, to make things worse, frequently switched on ahead of arrival and left running – which is particularly wasteful if a flight arrives late, or is subject to a gate change.

With a common-use context-aware platform in place, many assets can be controlled and managed remotely, and reporting can be done automatically, electronically. This not only leads to more efficient asset utilization, but more accurate usage reporting and billing as well.

A recent study by a ground-handling equipment operator in Scandinavia showed that around €1,000 of fuel per month per heater cannot be billed to the customer, either because it was not reported properly or was simply wasted. The operator expects to reduce unbilled fuel to zero by mobile-enabling its fleet of aircraft heaters and placing mobile devices in the hands of its field personnel, so they can remotely view and manage the status of each of the airport's heaters in real-time.

More generally, intelligent airport management means dispatching the right resources (crew, equipment etc) to the right place at the right time.

A good example is passenger handling. If a duty manager notices that the boarding process of a specific flight is running late because of a lack of personnel at the gate, he or she should be able to immediately find the closest agents to the gate who are available to help out.

Today, however, communication is usually via mobile radio, which means that duty managers cannot see the location and status of their colleagues. As a result, many flights are delayed simply because the right people were not dispatched to the gate in time.

With a common-use context-aware platform in place, duty managers can view the location and status of all agents in real time, allowing intelligent dispatch of agents and eliminating unnecessary delays.



SITA & Appear – developing mobile workforce solutions

SITA, the specialist airline IT provider, and Appear, the leader in context-aware software infrastructure, have created a partnership to develop mobile workforce solutions for the ATI.

As a first step, they are implementing the first-ever context-aware mobile platform for the industry, which is unique in providing common-use access to ATI applications 'on-demand' over wireless and mobile networks.

Pilot projects are now underway with three airlines in Sweden, Portugal and the Netherlands.

"As mobile devices, networks and applications became ubiquitous, the last and most important piece of the technology ecosystem required by SITA was to provide a common-use platform to enable on-demand mobility services at any airport," says SITA's VP for Innovation, Greg Ouillon. "Appear's context-aware middleware is a fundamental building block of this new offer."

"Context-aware technology enables SITA to provide a range of wireless applications to different stakeholders over a single common-use multi-service architecture," he continues. "Appear has the most robust enterprise platform on the market, with existing deployments for over 10,000 mobile workers in the transportation industry."

"The SITA mobile platform, powered by Appear, is the most significant technology development yet related to airport mobile workforce enablement," adds Xavier Aubry, Appear's Networks' CEO. "For the first time, an entire industry will be able to deploy on-demand mobile workforce services, anywhere in the world, in order to significantly reduce IT costs and optimize business processes. From day one, the solution will be able to reach out to over 250 airports where SITA infrastructure is already in place, and will be able to support tens of thousands of users."

About SITA

We are the world's leading specialists in air transport communications and IT solutions. We deliver and manage business solutions for airline, airport, GDS, government and other customers over the world's most extensive network, which forms the communications backbone of the global air transport industry.

Created and owned by the air transport community, SITA is the community's dedicated partner for information and communications technology. As a team of industry experts, our know-how is based on working with customers across the global air transport community. Almost every airline and airport in the world does business with SITA.

SITA innovates collaboratively with the air transport industry, and the industry itself drives the company's portfolio and strategic direction. Our portfolio includes managed global communications, infrastructure and outsourcing services, as well as services for airline commercial management, passenger operations, flight operations, aircraft operations, air-to-ground communications, airport management and operations, baggage operations, transportation security and border management, cargo operations and more.

With a customer service team of over 1,700 staff around the world, we invest significantly in achieving best-in-class customer service, providing integrated local and global support for both our communications and IT application services.

We have two main subsidiaries: OnAir, which is the leading provider of in-flight connectivity, and CHAMP Cargosystems, the world's only IT company dedicated solely to air cargo. We also operate two joint ventures providing services to the air transport community: Aviareto for aircraft asset management and CertiPath for secure electronic identity management. In addition, we sponsor .aero, the Internet top level domain reserved exclusively for aviation. We are one of world's most international companies. Our global reach is based on local presence, with services for over 550 air transport industry members and 3,200 customers in over 200 countries and territories. In 2009, SITA celebrated 60 years in business. Set up in 1949 with 11 member airlines, today we employ people of more than 140 nationalities, speaking over 70 different languages. SITA had consolidated revenues of over US\$1.47 billion (€1.13 billion) in 2008.

For further information go to www.sita.aero

About Appear

Appear's goal is to build software that makes information truly useful and available when and wherever it's needed, with the primary area of focus being enterprise mobility. Mobile is the one area of business where technology can still be used to deliver a step-change in the way business is conducted – reducing operating costs, improving productivity and enhancing the customer experience.

Appear builds the software infrastructure designed to support mobile applications running in remote locations over a variety of wireless networks. It does this by understanding the user's context, leading to a better user experience and at the same time making best use of the mobile device, network and applications. By addressing both user and system requirements, the Appear software ensures mobile technology investments really do deliver on their promise and pilots really do roll out into production.

Appear's technology has been widely recognized as innovative and successful. Headquartered in Stockholm, Sweden, Appear has partners located around the world to meet global enterprise mobility needs.

For further information go to www.appearnetworks.com



Notes and references

Note 1, Page 7: Source: *The 2009 Airline IT Trends Survey*, published by *Airline Business* [www.airlinebusiness.com] and SITA [www.sita.aero].

Note 2, Page 8: For more information see the article on 'Truth or Hype: The arrival of the digital traveller', available at www.sita.aero/content/truth-or-hype



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