



White paper: Leveraging data centres to drive IT transformation in ATM voice communication

Embracing a new model for voice communications that delivers on performance, cost-efficiency and scalability

Providing reliable, high-quality voice communications is one of the pillars of successful Air Traffic Management (ATM). In the past, Air Navigation Service Providers (ANSPs) tended to deploy highly specialised voice communications technology to meet operational needs, resulting in silos in infrastructure and administration teams. After the introduction of Voice over Internet Protocol (VoIP) solutions, ANSPs now also have the opportunity to run voice communications as a standard IT service in their data centre. By opening up the silo of voice communications systems so that they run alongside other modern ATM systems such as navigation and surveillance services, ANSPs can also increase ease-of-use for air traffic controllers.

To enable their new open infrastructure, ANSPs can deploy an ATM-grade network at its core. This approach lays the foundations for an 'any-to-any' concept, whereby any controller can use any frequency from any site, which increases flexibility in general and facilitates contingency operations.

By combining distributed voice communication services with an ATM-grade network, ANSPs can clear the path to more flexible ways of working, in which resources are better utilised and different sites can share technology assets. The result is a new, open and dynamic era for the aviation industry.

From specialised to optimised

Voice communications are an essential part of effective ATM. In the pursuit of the performance, availability and reliability required by increasingly demanding use cases, many ANSPs have invested over the years in specialised technology to support this facet of their operations. As a result, they have ended up with specialised technology and dedicated teams for voice communications.

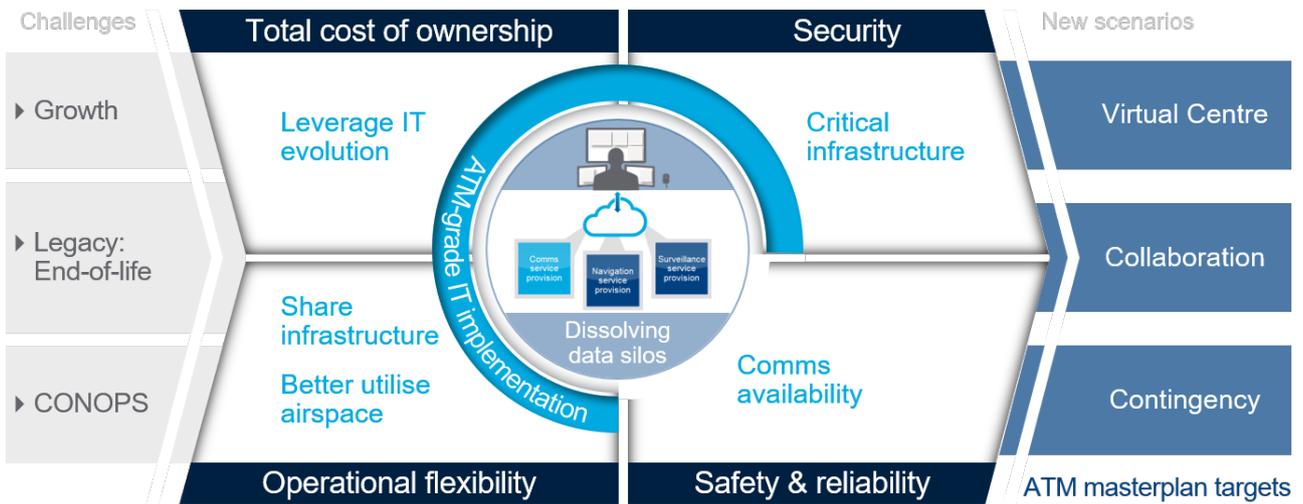
More ANSPs are initiating a data centre strategy that starts with business applications to eventually comprise of mission-critical services too. As they move to centrally managed and operated computing resources that are shared across the organisation, voice communication is often one of the last components to remain in isolation. Here, ANSPs are missing out on potential benefits that

range from greater efficiency to easier scalability. By decoupling control room operations from technical operations, they will increase flexibility and utilisation of resources. In addition, they could reduce their dependence on engineers with specific expertise, thereby minimising risk and decreasing costs.

So, what is stopping ANSPs from taking the plunge? Until something breaks, it can be tempting to avoid replacing it for as long as possible. Many ANSPs are in this position when it comes to voice communications infrastructure, having legacy solutions in place that still function adequately.

However, the emergence of new VoIP solutions is putting pressure on ANSPs to make a change. VoIP technology

Figure 1: Drivers of change: from challenges to new scenarios





also gives organisations the option of simplifying the move of voice communications services to the standard data centre, enabling their provision using centralised infrastructure without compromising on quality.

Indeed, the move to VoIP is inevitable for ANSPs, as telecommunications providers phase out legacy technology in favour of VoIP. Since these providers are winding down maintenance for non-VoIP solutions, ANSPs could soon find themselves with out-of-support voice communications technology, increasing risk and cost. Moreover, aviation organisations around the world are also issuing target dates for the migration to IP-based networks. These include the European Single European Sky ATM Research (SESAR) project, which called for transition by 2020. In the U.S., the Federal Aviation Administration (FAA) launched a Time Division Multiplexing (TDM) to IP initiative that started with the roll out of VoIP-based Air Traffic Control (ATC) radios. Meanwhile, countries in Asia and in Central and South America have also begun replacing TDM with IP solutions.

Rather than feeling compelled to adopt VoIP, ANSPs should see this as an opportunity to create new efficiencies by embracing a shared-services model at the same time. This paper will now explore the positive impact that taking a shared-services approach could have on ANSPs' operations.

Choosing the right approach

The 'any-to-any-to-any' concept promises to provide unprecedented flexibility for ANSPs, by enabling any controller to use any frequency from any site; a model that has modern voice communications solutions at its heart. Previously, realising this concept required the implementation of switched networks between voice communication services systems and radios. However,

today's network solutions allow for a much more straightforward approach.

If all peripheral systems are connected to an ATM-grade IP network either natively or via gateways, any IP-enabled controller working position can access any voice source as needed. In response, some vendors are offering solutions branded as pure-IP systems to support simple, small installations. Since controller working positions have direct access to the periphery, the only mission-critical part of the deployment is the network, so redundancy is only required here.

However, these simple solutions do not scale up well to satisfy use cases where many positions need to access the same radio simultaneously. Even for small installations, pure-IP solutions are not optimised for bandwidth, as the network must be designed in a way to offer sufficient bandwidth for non-blocking voice connections between all positions and peripherals. Naturally, if all peripherals and positions are connected to same local area network (LAN) and the mode of operation is known in advance, this is not an issue. However, if the ANSP adopts a wide area network (WAN) in order to integrate radios at a distance or to operate a tower remotely, the picture changes. As a result, pure-IP systems do not deliver greater flexibility – instead, they cause the network to become a bottleneck, limiting their advantages over traditional voice communication service systems.

To overcome these shortcomings, ANSPs now have the possibility to add frequency services to act proxy-like between controller working positions and radios, enabling much better frequency access. Since these elements are mission-critical, they must be built with high redundancy. By replacing traditional voice communication systems with an ATM-grade network and distributed voice communication services, ANSPs

can increase the flexibility of their operations, boost the utilisation of communication channels, and simplify asset sharing between different ATM locations and even partner ANSPs.

Moving to open architecture

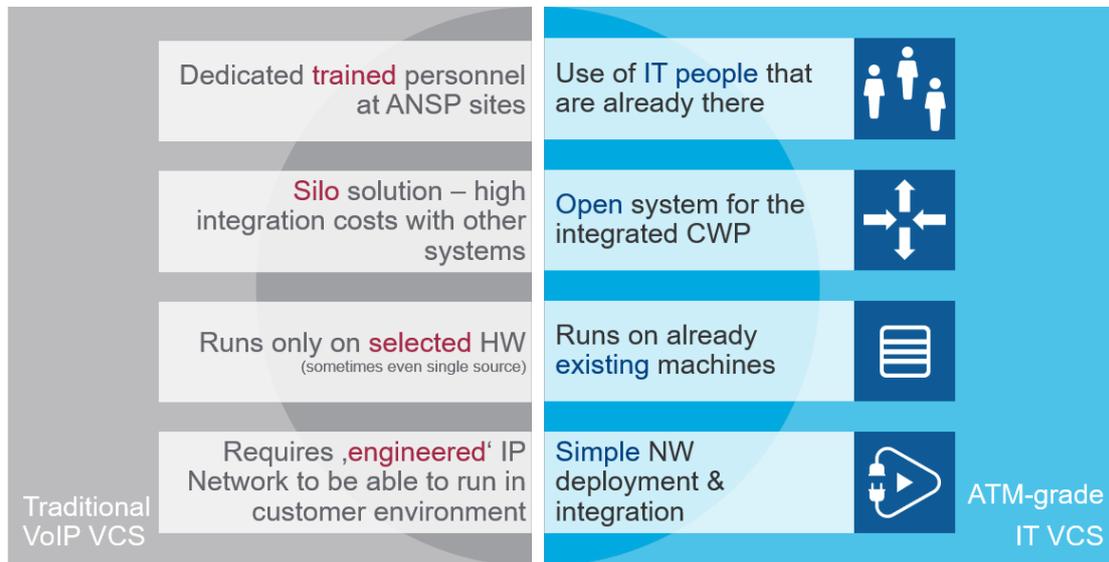
In adopting the 'any-to-any-to-any' operating model discussed above, ANSPs can open up the benefits of voice communication systems technology to other ATM systems, including surveillance and navigation. ANSPs can now separate the control room, data centre and frequency services, deploying clear, open interfaces between these elements. By designing a controller working position that integrates controls for voice communication systems into other applications, such

as ATM automation systems, ANSPs can streamline processes for air traffic controllers.

Introducing a frequency service also helps ANSPs delegate airspace responsibility. Supported by ED-137 interoperability, ANSPs can share a frequency even beyond the boundaries of their own airspace without having to adapt it to local operational procedures for operating radio networks, thanks to the layer of abstraction provided by the frequency service.

Moreover, the 'any-to-any-to-any' concept enables ANSPs to define new contingency scenarios. In the event of disruption to normal operations, controllers will be able to easily resume work in a contingency room, using resources either from the primary data centre

Figure 2: Changing the paradigm from VoIP to IT





(if still available), or from a secondary data centre by taking advantage of multi-homing capabilities of voice communications software.

When designing the architecture for their ATC voice communication solution, ANSPs should allow the needs of Air/Ground (A/G) communications to take precedence. They should avoid introducing a many-to-many relationship between operator positions and radios, as this will result in inefficient use of bandwidth and an unpredictable traffic pattern. Scaling up such an environment to meet increasing demands can cause significant quality-of-service issues and raise costs (since the infrastructure will need to be designed to accommodate peaks in demand).

Instead, an A/G architecture with frequency services located in the network can enable traffic patterns for A/G communications that are deterministic and less demanding of bandwidth. In the transmit direction, for example, this approach can provide lock-out functionality, while in the receive direction it can offer best signal assessment and optional best signal selection, delay compensation and other features. The frequency services can enable coordinated switchover between main and standby, and can facilitate the sharing of the frequency, all without knowing the details of the frequency structure. Introducing frequency services can also minimise required bandwidth to radio sites, limiting maximum data rates for A/G communications to the data centre. The proposed design implements a non-blocking architecture, guaranteeing a constant and deterministic network load and one that does not rely on statistical assumptions to prove compliance.

Enjoying the advantages

The ANSPs that adopt this new operational model alongside state-of-the-art IT data centre technology

for voice communication applications can look forward to many benefits. First, the move will have an impact on their financial bottom line, as easier scalability and straightforward management drives down total cost of ownership (TCO). They will reduce their dependence on highly specialised IT skills, decreasing risk and simplifying the acquisition and retention of technical employees.

Crucially, decoupling control room operations from technical operations will transform the way in which resources can be utilised and shared. By enabling exceptional flexibility, the 'any-to-any-to-any' concept will help ANSPs achieve more with their existing resources and facilitate collaboration with partner organisations. They can introduce new, more reliable contingency scenarios to maintain excellent service continuity.

To enjoy these benefits, ANSPs can work with Frequentis to realise a new concept for voice communications systems as a shared IT service. Frequentis software services enable real-time voice capabilities, built on robust, tried-and-tested technology. To simplify and accelerate deployment, the packaged software solution is based on state-of-the-art container technology.

Frequentis consultants can use their deep expertise to assess ANSPs' existing infrastructure, helping to navigate technological and operational challenges and then design a voice communications solution that delivers maximum benefits to the organisation. By teaming up with Frequentis, ANSPs can develop a business case, plan a step-wise migration that insulates their operations from disruption, and ramp up their contingency plans.

ANSPs: call on Frequentis today and you can embrace today's connected world on your own terms, enabling you to capitalise on change rather than struggling to manage it.

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