Optimizing VoIP for Air Traffic Control

The ATC market is starting to replace proprietary, time-division multiplexing (TDM) communications hardware with standards-based, VoIP-enabled systems. The challenge is to deliver the same quality of service for voice communictions in this convereged infrastructure outside of the Local Area Network

Optimizing Voice over IP for Air Traffic Control

The ATC world is starting to embrace big changes in its voice communications infrastructure. There are a number of key factors driving this change.

- Telecom service providers are now phasing out their leased line TDM services
- Eurocontrol, the Federal Aviation Administration and other organizations are mandating interoperability requirements in order to handle increased air traffic
- Increased move towards Remote Controlled Air Traffic Control Towers

Mitigation of these issues through the introduction of new IP technologies presents a challenge for ATC authorities and organisations as it will alter the way they provision and manage their business. With this in mind, they will need to make plans now to ensure cost effective provision and effective management of the new technologies whilst maintaining all important resilience and system interoperability.

IP as a key ATC technology

The challenges now facing the ATC organizations will be met with the increasing use of IP technology. VoIP for Radio and Telephony offers operational functionality and flexibility which would have been unthinkable with the TDM systems.

This flexibility does not come without concerns and drawbacks, however. Whilst VoIP can provide savings in terms of operational costs due to the sharing of different services on the IP network, major attention needs to be paid to resilience and quality of service to ensure that no critical voice communications are lost or corrupted due to contention issues related to these other data services using the IP network.

Convergence will drive down costs

Many ATC system operators are already using IP networks to transmit radar and flight plan data. Using this IP infrastructure for voice as well creates synergies in procurement, operation and maintenance; all of which can lead to significant savings. In the past, TDM-based systems relied on large, centralized switching nodes. In contrast, modern IP-based systems make use of distributed network intelligence and do not require a central switching system. These cost savings can however be harder to achieve during the transition phase as 'legacy' TDM and 'new' IP networks will have to be run side by side.
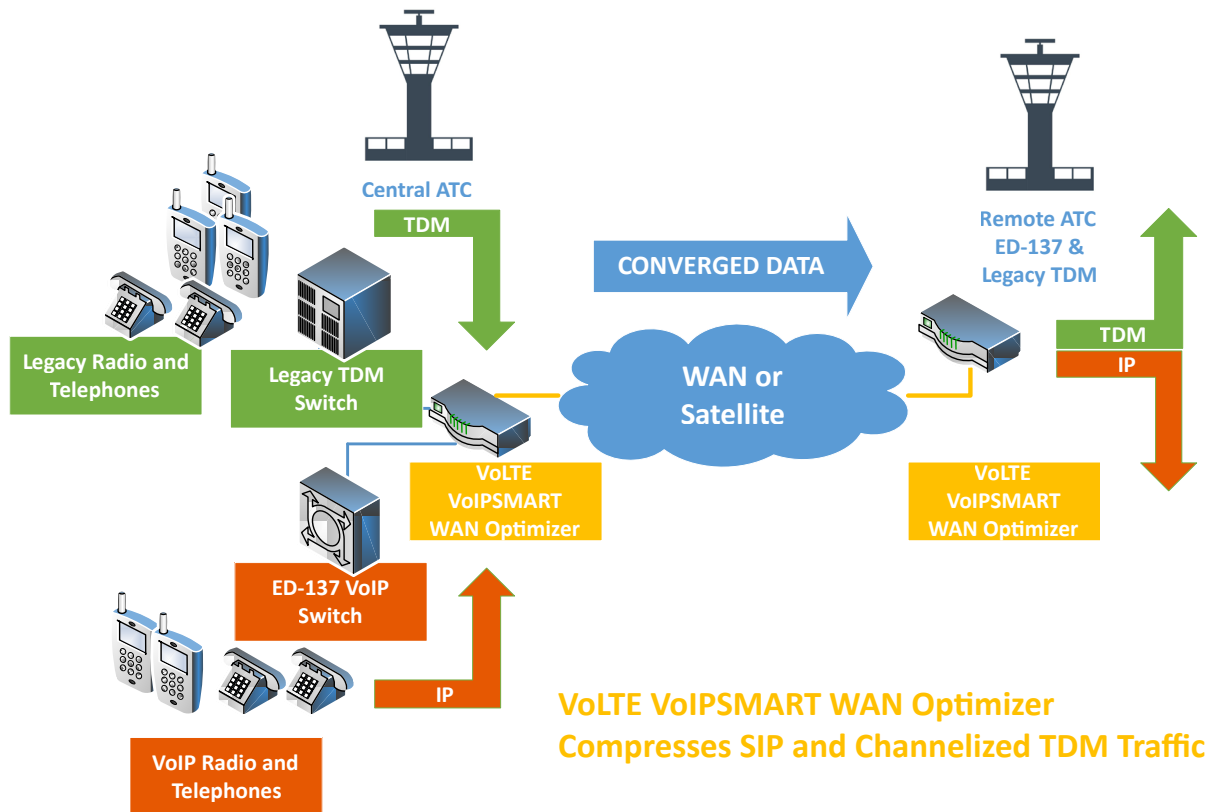
Increased reliability

Reliability in TDM systems has typically depended on duplicating high cost, centralized equipment, while VoIP systems migrate intelligence away from the network core to equipment distributed throughout the network. With the intelligence distributed in this way, a failure at one part of the system may not affect operation in the rest of the system but a failure of a primary IP-wide area link may cause issues in terms of reachability, or more likely, congestion on alternate routes potentially affecting the quality of vital services such as voice.

Interoperability

The EUROCAE issued the standard ED-137 which specifies the use of IP for voice communications in ATC environments. This standard was defined jointly between EUROCAE, ATC authorities and ATC equipment manufacturers. Customers that who select equipment which meets this standard can be assured that the various system components interoperate properly with one another.

VoLTE Systems VoIPSMART

VoLTE Systems offers a wide selection of ED-137 compliant VoIP based products designed specifically for the needs of ATC customers around the world. The **VoLTE VoIPSMART** solution family focuses on optimizing the radio and telephony voice used between towers and ATC management centers by transparently connecting between either IP voice switches or older TDM voice switches and compressing and prioritizing the voice traffic. This optimized voice traffic is then transmitted across the WAN, being decompressed at the receiving end, before being passed on to the receiving IP VoIP switch, TDM switch or handset.

Central ATC
TDM

CONVERGED DATA

Remote ATC
ED-137 &
Legacy TDM

Legacy Radio and
Telephones

Legacy TDM
Switch

WAN or
Satellite

TDM
IP

VoLTE
VoIPSMART
WAN Optimizer

VoLTE
VoIPSMART
WAN Optimizer

ED-137 VoIP
Switch

IP

VoIP Radio and
Telephones

**VoLTE VoIPSMART WAN Optimizer
Compresses SIP and Channelized TDM Traffic**

As this compression technique allows the transmission of VoIP and TDM voice over the same WAN circuits in a single converged network, it allows ATC organizations to move to VoIP at their own pace, whilst maintaining their existing equipment and still benefitting from cost reduction through a single converged network. The **VoLTE VoIPSTART** solution adheres to EUROCAE ED-137 ensuring compatibility with all the equipment implemented within the network.

IP-based cable management for Unmanned ATC assets

Ensuring the security and management of cable patching, the VoLTE VoIPSMART intelligent patch products offer an ideal solution. They offer both local and remotely controlled passive monitoring and bi-directional test functions for patched devices. In addition, the VoLTE VoIPSMART A/B switch offers both locally and remotely controlled automatic A/B fallback switching.

Both patching solutions have a unique sophisticated alarm system that can detect the unplugging of any device connected through the patch panel and will alarm accordingly.
It also boasts high-speed buffered monitoring, bi-directional test and reconfiguration capabilities. The product is well suited to "dark site" installations because the system can detect and automatically route around faulty links. In conjunction with the **VoLTE VoIPSMART** Control Console GUI network management software, the operator can remotely invoke an integral electronic patch either within a single chassis or across multiple chassis.

VoLTE VoIPSMART technical summary

Interoperability is a key element of the **VoLTE VoIPSMART** family, which means that the devices can be integrated with new VoIP switches as well as existing TDM switches. Voice can be managed with user definable prioritisation ensuring that the toll quality of voice communications can be maintained no matter the load.

Optimization is probably one of the most important features for ATC systems which are connected over a WAN or Satellite network, the **VoLTE VoIPSMART** family can compress standard G.711 SIP traffic as well as traditional analogue or digital voice over a standard WAN or satellite connection reducing the bandwidth used by a factor up to 16:1 and reducing the number of packets transmitted by a factor of 30:1 or more.

To further support VoIP based applications over satellite links there are extra features that will counteract line distortion coupled with jitter that can be introduced by the network which usually causes severe degradation to voice quality. The **VoLTE VoIPSMART** solution incorporates sophisticated echo cancellation, extendable jitter buffers and advanced techniques to cover for lost or delayed packets that will result in toll quality voice no matter the connection. These techniques are proven to work reliably over the long delays inherent to multi-hop satellite links.

IP-based remote control and monitoring

The **VoLTE VoIPSMART** configuration and monitoring system serves as a single software solution for remote monitoring of the **VoLTE VoIPSMART** switches. It can also monitor 3rd party SNMP-capable devices, making it the tool of choice for a complete situational overview of remote radio sites.

For more information on how VoLTE Systems can provide secure, optimized WAN managamend for ATC please contact us at:

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