ENGLISH

MULTIFONO®
M800IP®

SITTI
Integrated Solutions
for Air Traffic Control
and Operations Rooms

The voice that guides you.
Always.®

MULTIFONO® M800IP®

Voice Management Solution

M800IP® MULTIFONO® Voice Communication System (VCS) is SITTI's state of the art, top level, most integrated **Voice Over IP (VoIP) VCS system**. It fully meets any Air Traffic Control and Operations Rooms requirements by integrating the most advanced IP features and technologies, combining easy configuration and maintenance procedures with user-friendliness of operators' HMIs (Human Machine Interface).

Interface units, protocols and user requirements have been increasingly more and more demanding over the time. SITTI's M800IP® system integrates them smoothly and seamlessly to the end user, who can fully exploit its power and flexibility to fulfil any technical and functional needs. The support of multiple functional roles and operational scenarios is among the many strenght points of M800IP®.

...wherever secure, reliable and controlled VoIP communication is required

Today's systems applications need different communication technologies to be integrated into one solution to meet the operational requirements for Safety and Mission Critical services. MULTIFONO® M800IP® is the result of the extensive experience and expertise accumulated by SITTI throughout its long-term presence on the ATC market, combined with the company's contribution to International Standardisation Committees and Working Groups. SITTI also assumed an important active role within WG67 – the EUROCAE working group that issued the ED136, ED137, ED138 recommendations and requirements for the standardization of VoIP technology in the Air Traffic Control (ATC) field.

Reliability and Integration

M800IP® is fully VoIP ED137 compliant, as testified by several successful interoperability tests attended by the company and by the large number of systems already in-service around the globe (please note that the world first ever VoIP VCS commissioned by ICAO in 2009 was a SITTI MULTIFONO®). VoIP, digital, analogue and other legacy non-IP interfaces are natively integrated, thus providing the end user with an **all-in-one communication solution**, seamlessly capable of dealing with many different interfaces and protocols.

The system Open Architectural design, ensures a high level of modularity, scalability and process distribution, thus offering an unparalleled reliability ratio of 99.9999%. MULTIFONO® Continuity-of-Service is guaranteed by its System Star Architecture and Distributed Subunits, combined with the Duplicated and Parallel Processing Operations, that ensure fault tolerant functions without single-point-of-failure.

All these features make SITTI's M800IP® the best choice for strategic Civil and Military Missions with Safety Critical Communication requirements.

Operational seamless expandability and full configurability, by means of local and remote Supervision facilities, provide the flexibility to handle with any Customers' needs: from small Airfield Control Towers to big Area Control Centres (ACC) – with hundreds of Controller Working Positions (CWP), Radio equipment and Telephone lines – without affecting the system performances. All this grants the Customers with the best level of flexibility, to face any requirements change or new needs, with an enviable investment return.

Customers currently using legacy technologies, but wanting to take the advantages of VoIP, can keep their current equipment in service and just introduce the appropriate SITTI's Gateways. Such units allow for legacy Radios and Telephone connections to be smoothly interfaced to the M800IP® VCS through any WAN/MPLS Network, according to the ED137 VOIP requirements, granting the compliance with ED136 and ED138 recommendations.

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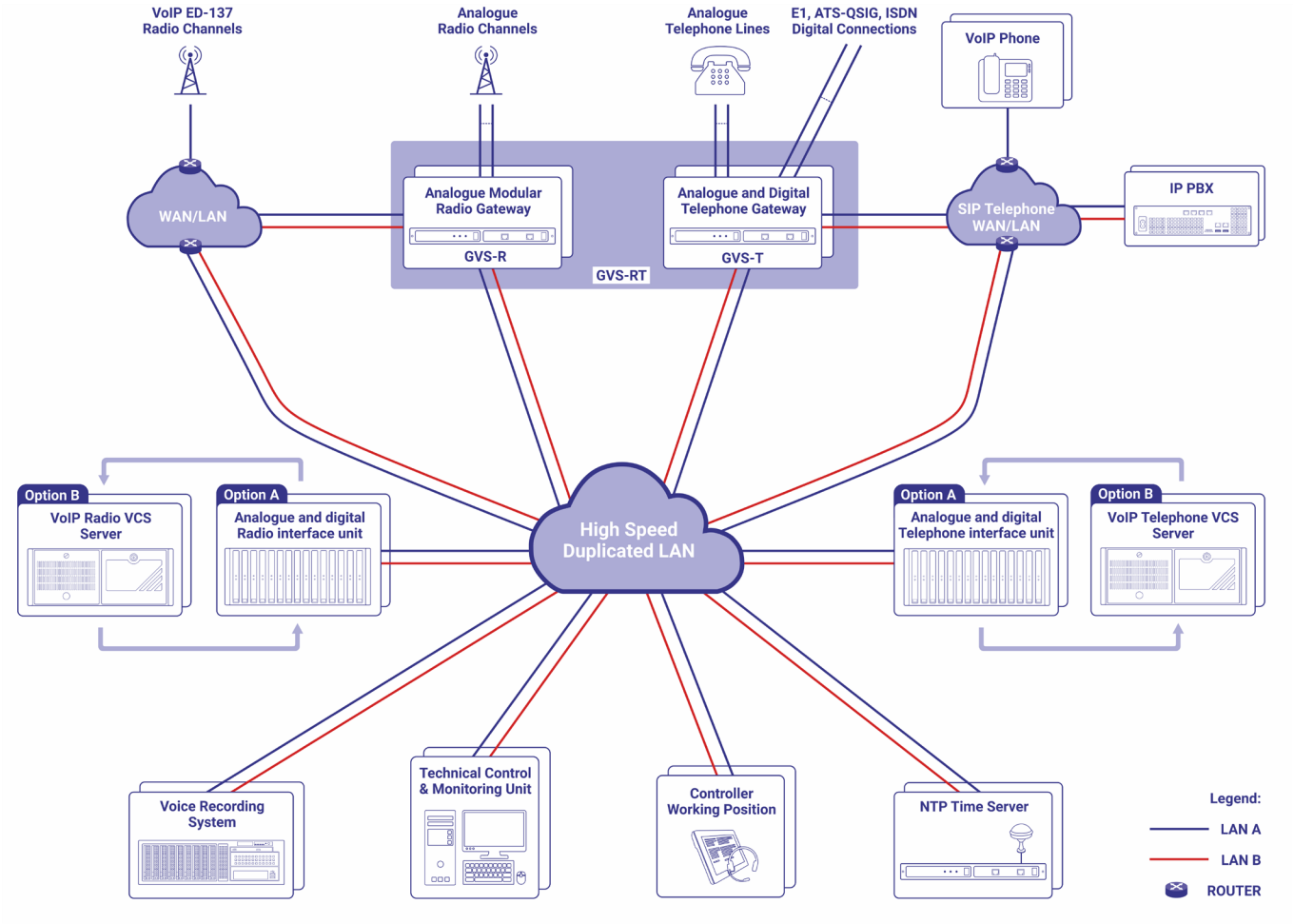

System Distributed Architecture

The design of SITTI's M800IP® VCS solution takes full advantage from the huge experience and expertise accumulated by SITTI during its long and successful presence in the ATC market all over the world. M800IP® is characterized by an extremely high level of flexibility and by an outstanding quality of the performances, supported by its innovative architecture allowing easy addition of new features and connections at any time, without impact on running operations.

M800IP® is a full IP technologically advanced VCS, providing users with top level usability, high performances, enviable reliability, strong security and efficient scalability. These qualities are further strengthened by the capability of the system to interface any kind/model of Radio equipment and Telephone lines, whatever technology involved – from modern VoIP to Legacy Analogue/TDM. SITTI modular Gateways units give the final user seamless access to any communication links, providing the Operators with the most user-friendliness HMIs and granting the system Administrators the most comfortable Configurability and Maintainability processes.

M800IP® represents the de-facto reference point for any Voice Communication System that must meet the strict requirements of ANSPs (*Air Navigation Service Providers*) and Military Air Forces applications, worldwide.

With its Duplicated and Parallel-Processing Operations, Star Architecture and Distributed Subunits, MULTIFONO® M800IP® guarantees the absence of any single-point-of-failure, providing uninterruptable service and fault tolerant operations. The system distributed intelligence and independent units, cooperate to prevent failures, which could jeopardize the behaviour of any part of the system. VoIP Data and Voice packets are distributed through independent, over-redundant and duplicated high speed LAN networks.

SITTI designed different deliverable solutions to fulfil the needs of any Customers in the most suitable way. **MULTIFONO® M800IP® can be provided with two architecture configurations** that both permit to manage the same types of Radio and Telephone connections:

- **M800IP® Server**
  Based on COTS Multiple-Servers Architecture

- **M800IP® Distributed Cards**
  Utilizing Multi-Redundant Blades

M800IP® Server

The MULTIFONO® M800IP® Server provides Customers with the same outstanding features and capabilities of any other SITTI's MULTIFONO® model. It integrates the most advanced IP features and technological solutions, allowing the same deployment concepts, permitting geographical distribution of the Operative Positions (CWPs) and of the VCS resources, guaranteeing the most enhanced Safety and Security level.

The Architecture

M800IP® Server is implemented with software applications running on COTS (*Commercial Off-The-Shelf*) hardware provided by SITTI or acquired directly by the Customer under SITTI recommendations.

All system components – CWPs (Controller Working Positions), Radio and Telephone Gateways, etc. – are connected to a Duplicated, Fast-Recovery and Over-Redundant High-Speed Network by dual independent Ethernet cables (Copper or Fiber, depending on the System requirements) in "star" configuration. The System LAN/WAN Network makes use of duplicated Switches that are geographically distributable to allow any deployment scenario required by the Customer.

The core of the VCS can be split onto different machines, physically installable at different sites, thus dramatically improving the system reliability and availability figures. This outstanding deployment flexibility, capable of distributing the intelligence over a large network, allows for many different architectural solutions that include Duplicated (or even Multiple) configurations of the following units & functions:

- **Radio Servers** – Logical component handling Radio connections.
- **Telephone Servers** – Logical component handling Telephone connections.
- **Radio-Telephone Servers** – Logical component handling both Radio and Telephone connections.
- **Radio and Telephone Gateways** – Devices converting Analogue and any Non-VoIP Radio and Telephone connections to VoIP, and vice versa.
- **Controller Working Positions CWP** – HMI (Human Machine Interface) Operative Positions equipment permitting Operators to interact with the system to access local and remote resources.

Multiple Redundancy capability

M800IP® Radio and Telephone servers can be provided with different hardware organisations: from simple duplication of the All-in-One Server to a Multi Redundant arrangement.

The simplest solution foresees the installation of all software applications on two physical machines configured in redundant mode. On the other hand, Radio and Telephone servers can be installed on different machines, each configured with its own backup unit that can be placed nearby, or in a different room/building, or even at another remote location.

For both configurations, in case of failure, the second unit will take over seamlessly for the users. No disruption will be felt on the ongoing communications and the service will not be affected.

All the units belonging to SITTI's M800IP® are connected to the same IP network, so permitting their physical positioning at different sites, regardless the distances involved. Regional or National Installations are therefore allowed, as well as geo-redundant configurations, without detriment to the overall system performances. In case of unavailability of a site, another one will be able to take over, seamlessly.

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Radio and Telephone Servers

The VoIP communications of MULTIFONO® M800IP® are managed by the Radio and the Telephone servers (whichever architectural solution is being used), through the Duplicated and High Performance LAN/WAN connecting all components of the VCS.

Radio Servers are used to manage VoIP connections to both local and remote radio stations, directly – through appropriate Routers – and/or by means of SITTI's Radio Gateways in case Legacy equipment would be present.

VoIP Radios can handle a limited number of simultaneous accesses from different VCSs and their CWPs. In order to limit the quantity of active sessions, regardless of the number of CWPs belonging to the VCS, the Radio Server opens a single session to any radio. A unicast link is opened towards each radio equipment (one-to-one session), while communications towards internal VCS CWPs are handled via Multicast addressing (one-to-many session).

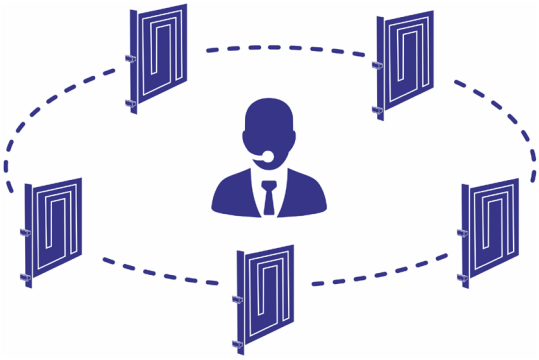
This approach (fully compliant with EUROCAE ED-137 provisions) preserves the sessions handling capacity on the radios while saving bandwidth and associated costs, without reducing the capability of many CWPs to access any connected radio.

Telephone Servers are devoted to providing M800IP® with IP telephony communications and proxy facilities. These encompass the management of the calls originating from or directed to local Controller Working Positions as well as from/to other telephone resources, also including other VCSs.

M800IP® Distributed Cards

The same features and performance offered by the M800IP® Server architecture can be obtained by means of the M800IP® Distributed Cards architecture. This latter is characterized by the use of distributed intelligent blades housed in racks and sub-racks.

The use of distributed cards gives the Customer the same features obtainable by means of the Server architecture, allowing operators to access all communication assets from their Controller Working Positions (CWP), regardless of the protocols and interfaces used for reaching radio and telephone links and lines of any kind.



Gateways

For all those situations where the Customers must make legacy non-VoIP (analogue or digital) radio or telephone connections live together with modern VoIP links and lines, SITTI can provide appropriate Gateways. These convert the "old" environment to the new one, thus allowing Customers and operators to take benefit from the advantages of the VoIP technology.

All the data and voice conversions are carried out in full accordance with the requirements, the performances and the timings recommended by the EUROCAE ED136, ED137 standards, thus permitting communications to comply with the ED138 specifications for VoIP communications in the Air Traffic Control field.

GVS-R Radio Gateways

Radio Gateways have been designed by SITTI to convert legacy equipment/connectivity to the VoIP technology, according to the ED-137 standard. This permits their management by any VoIP VCS complying with the ED-137 standard, as if they were VoIP native radios.

GVS-R Radio Gateways can be installed locally, close to the VCS, or remotely, where non-VoIP radios are installed, according to the Customer needs. These gateways are in fact stand-alone units capable of interfacing legacy radios to any standard ED-137 device.

SITTI's Radio Gateways are made of a configurable number of independent cards, each capable of handling up to 4 simultaneous sessions to the same radio from different VCSs and relevant CWPs. Each GVS-R card is equipped with a duplicated ED137 VoIP connectivity (for redundancy) to the WAN Network.

GVS-R cards are independent from each other, but can be configured in a M+N redundancy pool: M active cards are backed-up by N standby cards that take over in case of failure of any of the active ones.

G729 Audio Compression, Delay Compensation management, Signal Quality evaluation (to allow the BSS – Best Signal Selection – feature at the VCSs sites) are among the numerous facilities/applications configurable on the GVS-R equipment.

SITTI has also delivered GVS-R solutions to be used the "other way round", with the aim of providing VoIP-to-Analogue conversion to-and-from Legacy VCSs.

GVS-T Telephone Gateways

SITTI applied the same concepts developed for legacy Radios to legacy Telephone connections, too. Following this same approach, GVS-T Telephone Gateways are made of stand-alone units capable of interfacing non-VoIP connections to standard ED-137 devices.

Depending on the configuration required, GVS-T is capable of handling FXS, FXO, LB, 4 wires E/M, MFC-R2, MFC-no.5, E1, nx64Kb/s, QSIG, ISDN, etc. converting them to the ED137 VoIP protocols.

Recording

The ED-137 standard also defines how to deal with legal recording, when IP for transporting data and voice in the ATM/ATC field is required.

Taking advantage from the long experience acquired, SITTI has complemented its offer by developing the VRS800S Recording and Playback System. Fully compliant with the ED137 recommendations, the system is perfectly aligned with the criteria that have driven the development of the M800IP® VCS, including Security and Redundancy features that make VRS800S the best choice when it comes to complete and integrate the package of equipment for the Customers.

When a Recording System is not required or already exists, MULTIFONO® M800IP® is provided with embedded ED137 VoIP Recording applications and Analogue and Digital interfaces towards non-VoIP legal recorders.

SITTI's M800IP® grants a true and faithful provision of the audio signals being presented at each source. The quality of the audio is not interfered – degraded or in any way manipulated – by the VCS before of its delivered to the Recorder.

Hereinafter a list of MULTIFONO® M800IP® Recording capabilities:

- VoIP standard recording according to ED-137
- E1 digital streams
- Analogue connections
- Individual or integrated radio/telephone audio

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// M800IP® in short

- Future-oriented, top performing VCS solution
- EUROCAE ED137 full standard compliance
- SNMP configuration and alarm reporting
- Independent & cooperative building blocks
- 24/7 Operational Service, 365 days a year
- Non-Blocking with Very High System Performance
- Duplicated, independent, parallel operations
- Fault tolerant operations
- No Single Point of Failure (SPOF)
- Voice distributing within the system using RTP protocol
- Parallel routing of voice packets on duplicated LANs
- Seamless expandability without affecting ongoing operations
- Bandwidth optimisation with intelligent unicast and multicast audio distribution (patented)
- Radio & Telephone Gateways for legacy non-IP links
- Scalability from small Air Field Control Towers to large ACC Centres and Operational Control Rooms
- VoIP linked CWPs in “star” configuration
- CWP access to Telephone lines & Radio frequencies through analogue, digital and VoIP interfaces
- Access to radios, telephones and CWPs belonging to remote VCS systems via VoIP/digital links or analogue interfaces
- Embedded Intercom facilities between local and remote CWPs
- Support of standard and legacy protocols
- Controlled Resource Sharing
- Software upgrade by direct upload, without manual intervention and without affecting operations of other parts of the system
- “Black” and “Red” Military applications

// M800IP® Technical details

Telephone Digital Interfaces

VOIP according to EUROCAE ED137 standard
QSIG, ATS-QSIG
ISDN Primary + Basic Rate
MFC
E1, nx64

Telephone Analogue Interfaces

FXS/FXO
2/4 wires in-band + E&M
Local Battery (LB)
Central Battery (CB)
PABX / PSTN / PBX
MFC R2 + no.5 (analogue)
DTMF
Satellite

Radio Management

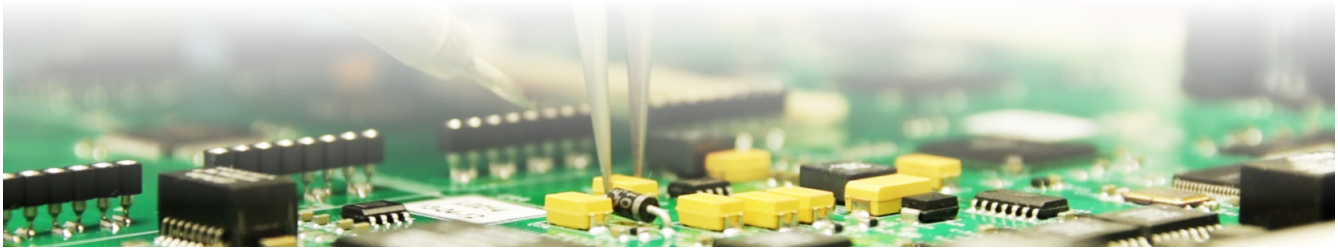
Best Signal Selection (BSS)
Multi-Site Voting
Delay compensation
Echo suppression
Automatic new radio search in case of failure
Legacy protocols from different radio manufacturers
SNMP radio management

Radio Interfaces

VOIP according to EUROCAE ED137
4 wires standard E&M analogue links
E1, Nx64, ATS-QSIG digital links
In Band Signalling (IBS)
Phantom Signalling

Recording

Analogue, digital and VOIP recording
Synchronous playback



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ENVIRONMENTAL SYSTEM CERTIFICATION DNV·GL ISO 14001

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

INFORMATION SECURITY MANAGEMENT SYSTEM DNV·GL ISO/IEC 27001