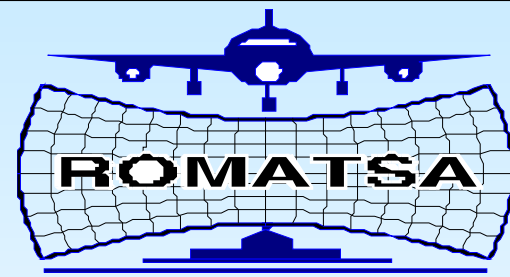


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ROMATSA IP Communications Network



ROMATSA **IP** Communications Network

Presented by Carol SZABO

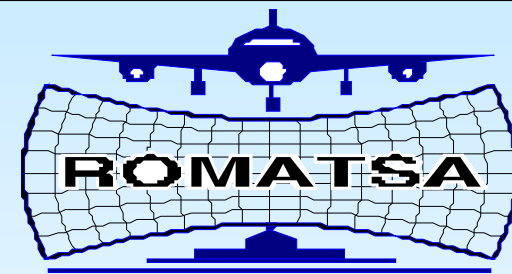
ROMATSA

Romanian Air Traffic Services Administration

carol.szabo@romatsa.ro

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ROMATSA IP Communications Network

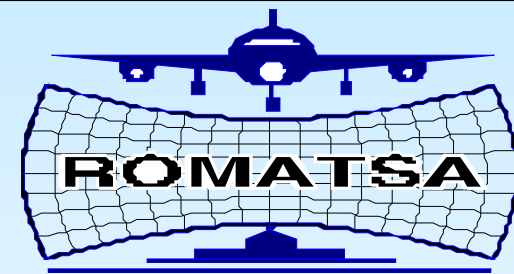


ROMANIA



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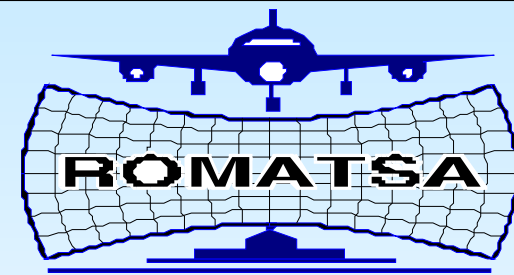
ROMATSA IP Communications Network



ROMANIA



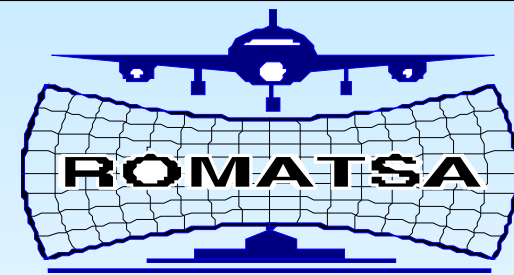
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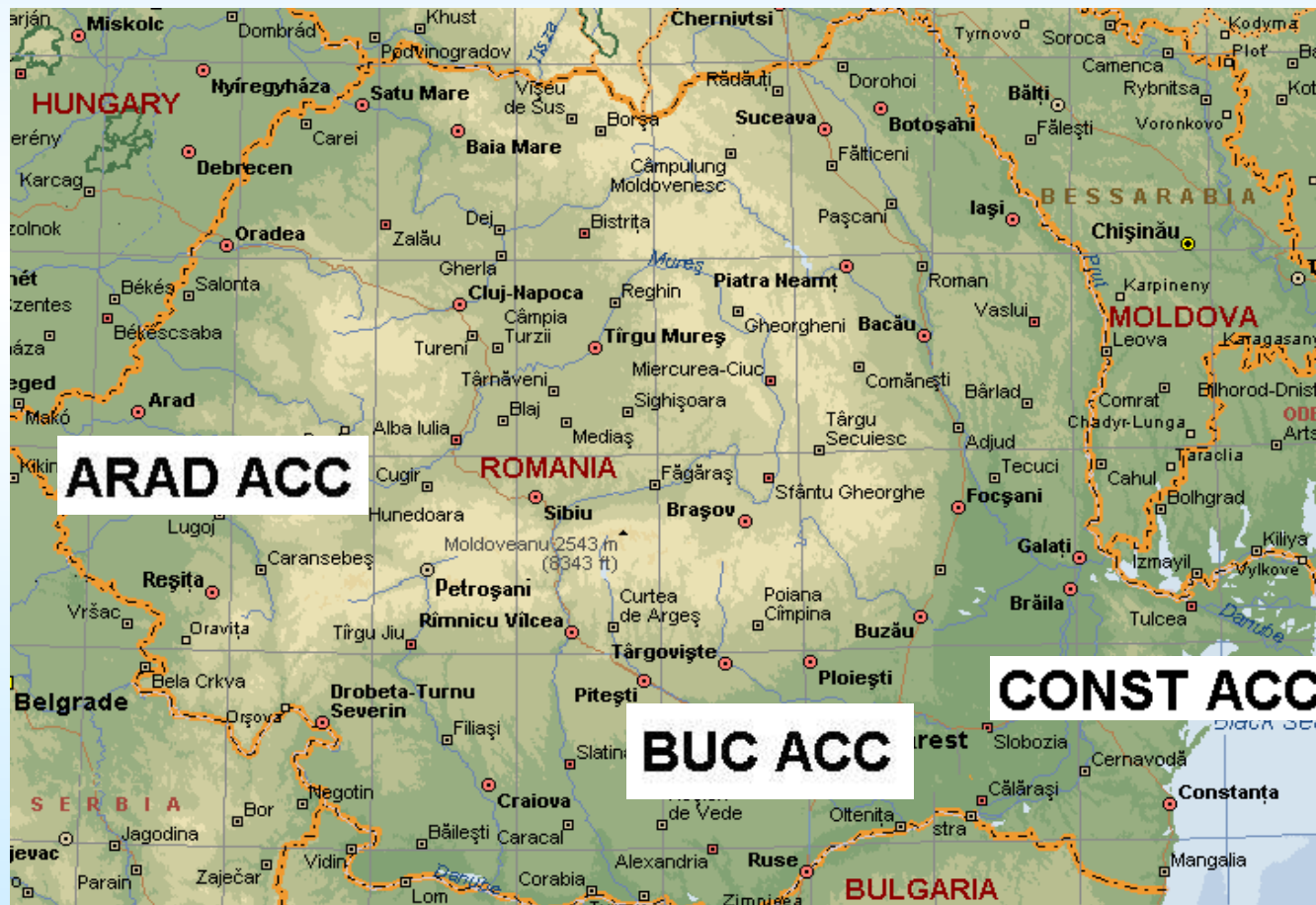
HISTORY: Up to 2003 - 5 ACC's



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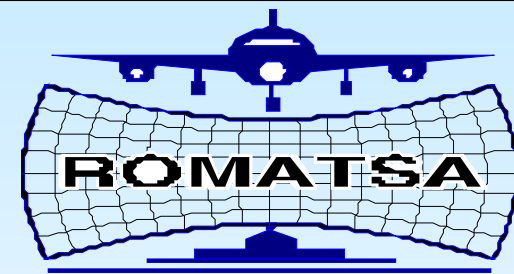


HISTORY: From 2002 - 3 ACC's



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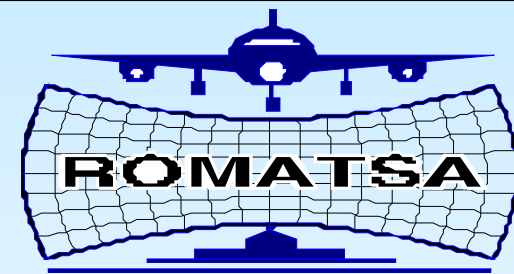


Near future: 1 ACC



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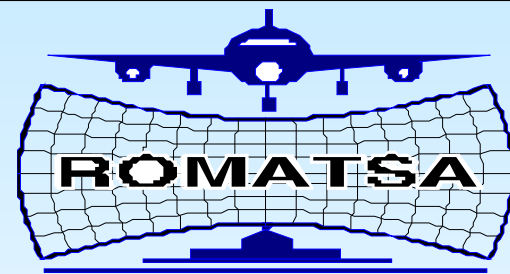


1994 - Comm backbone: Frame Relay VSAT network



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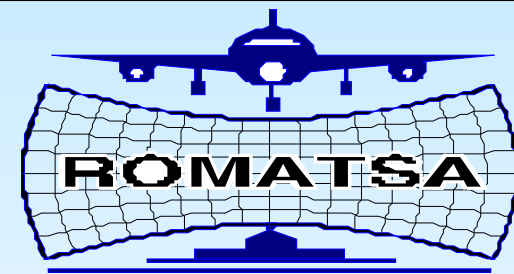


Extension in 1999 of the Frame Relay VSAT network

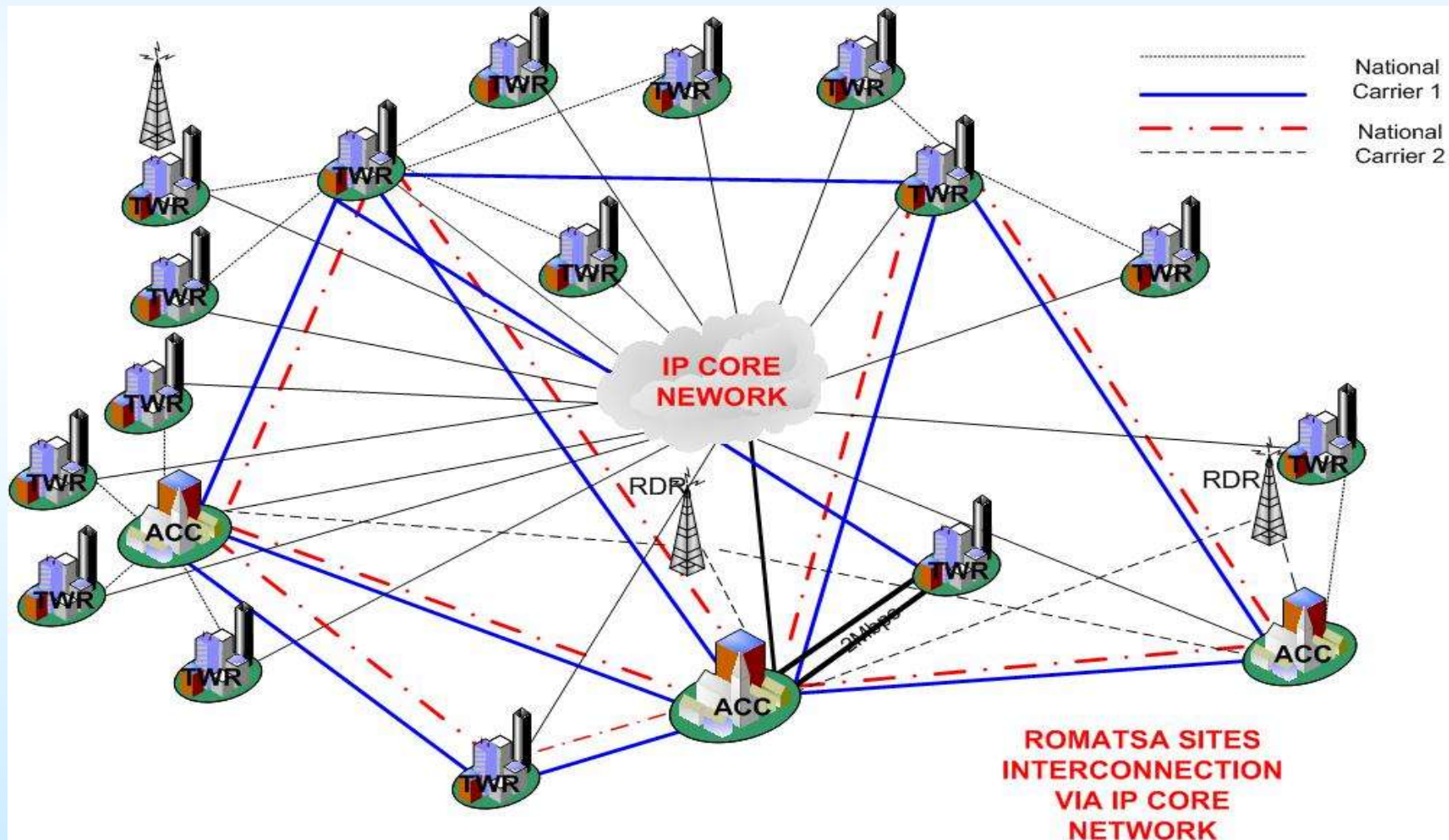


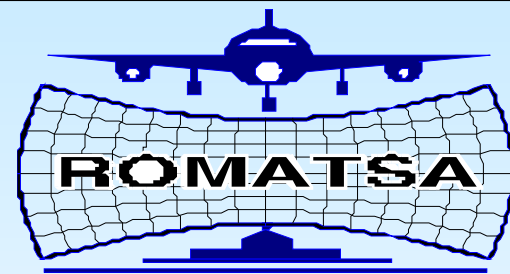
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ROMATSA IP Communications Network



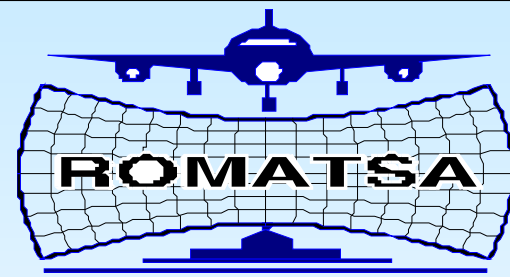
The ROMATSA IP Network in 2005





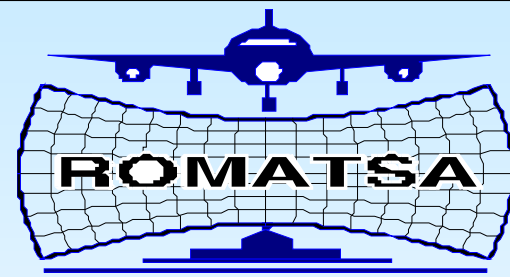
The implementation:

- Started in 2000, designed together with DATANET-SYSTEMS, a Romanian CISCO based solution provider
- December 2001 the core network ready for tests
- 2002 - Implementation and training
- 2003 - Approved by RCAA for operational use
- Continuously monitored and enhanced for better performances
- Network simulator in laboratory, tests and optimal parameter adjustments



The key points:

- Enables ATM compliant services, securely and reliably
- IP core network transporting data and voice
- The network has the required level of QoS to support critical applications such as Radar, A/G & G/G Voice
- Easy to manage communications network: one network instead of multiple separate networks
- Great flexibility of communication protocols: IP transports everything



The key points (cont):

- Open architecture
- The system **is not proprietary** by any means:

Technologies

Communication Protocols

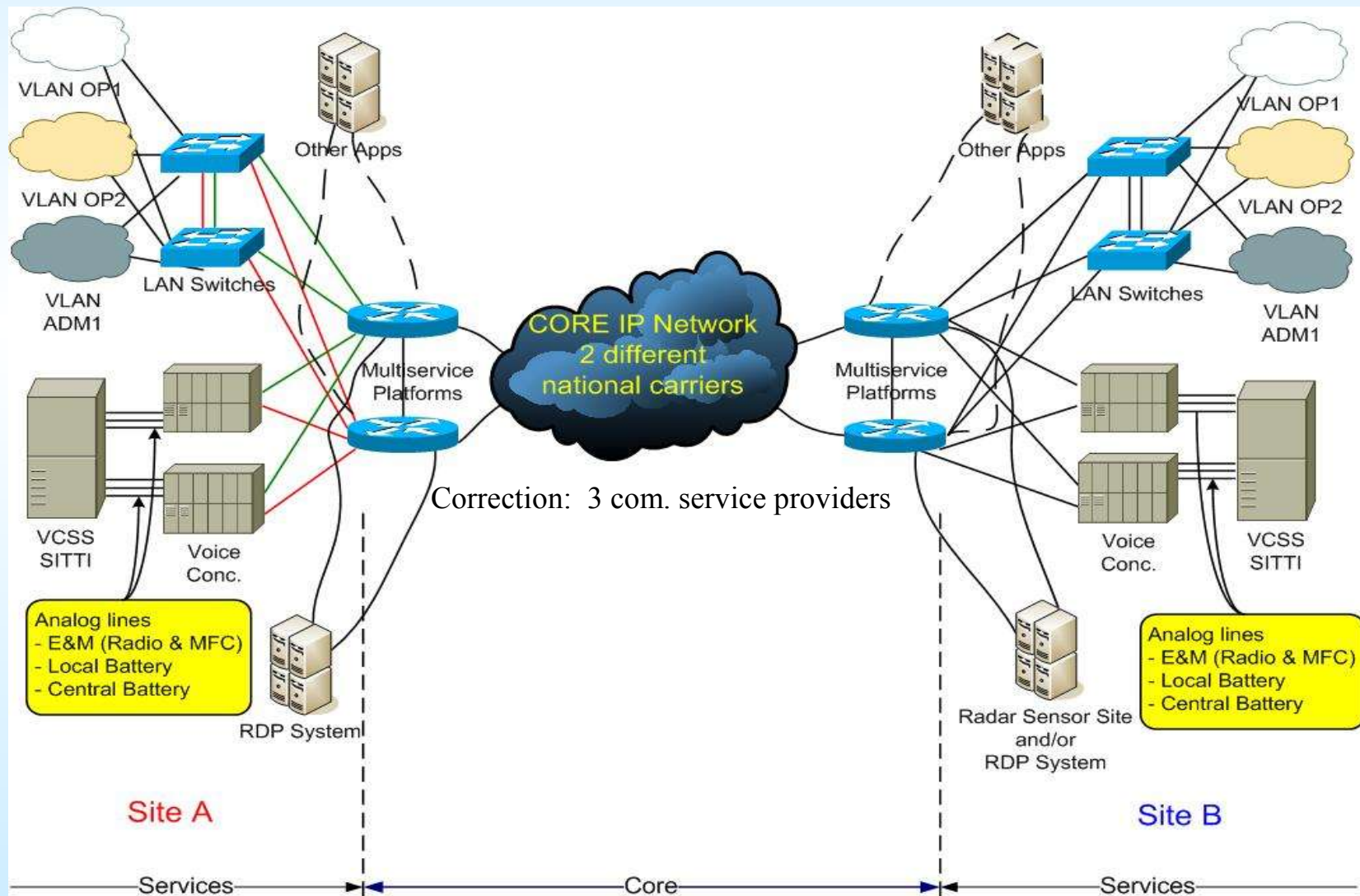
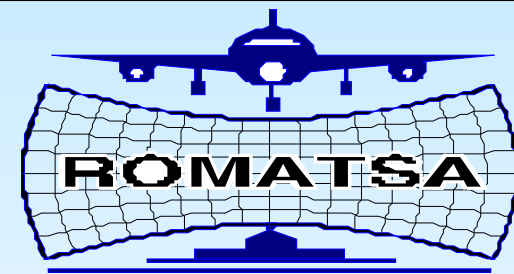
Routing Protocols

Signalling Protocols

... all of them follow existing standards

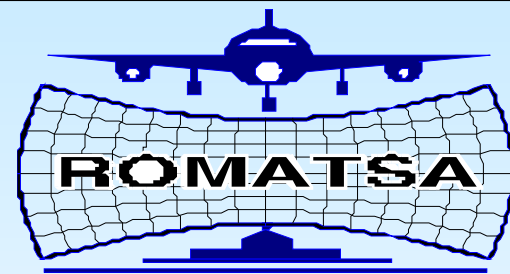
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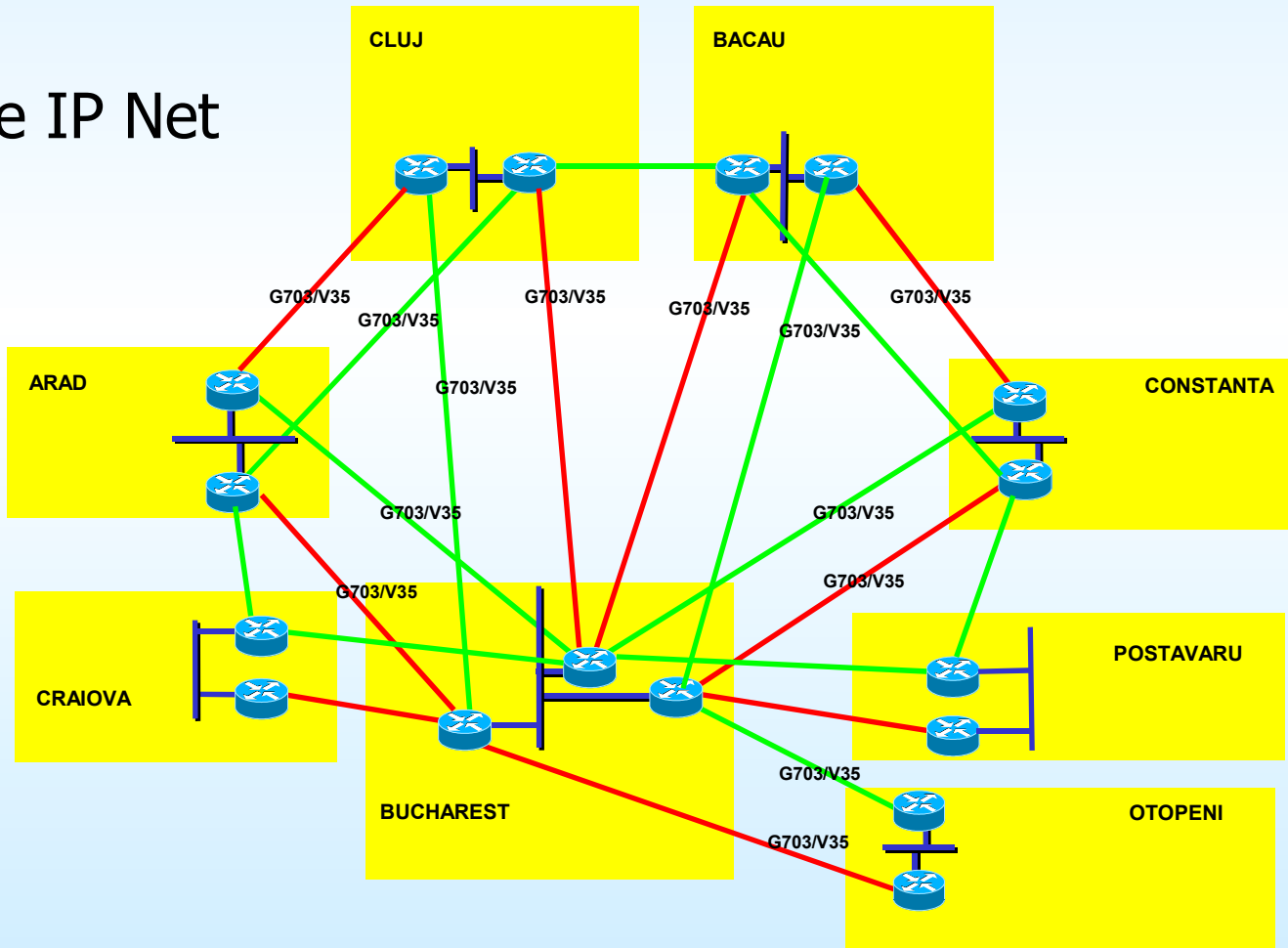


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ROMATSA IP Communications Network

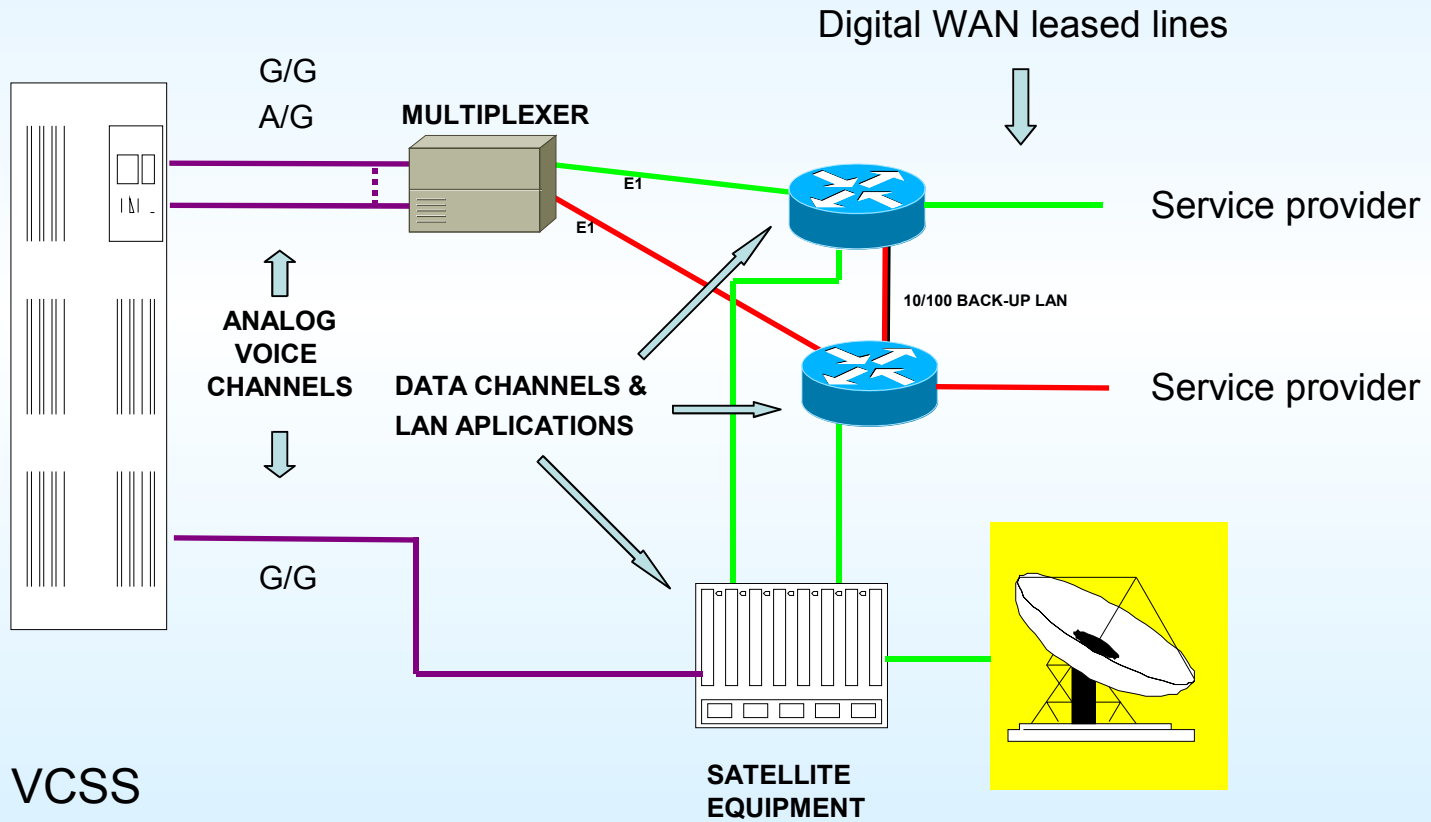
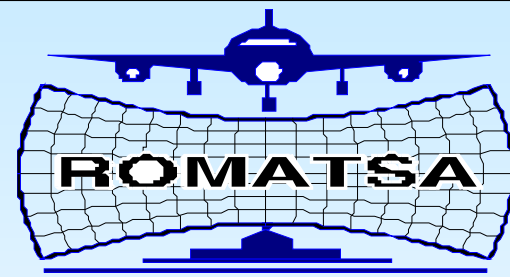


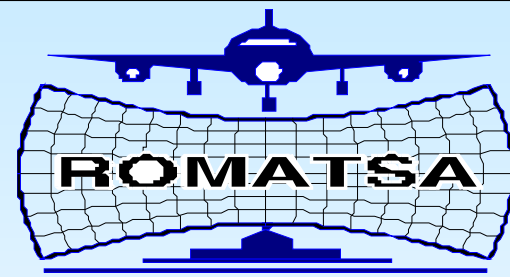
Core IP Net



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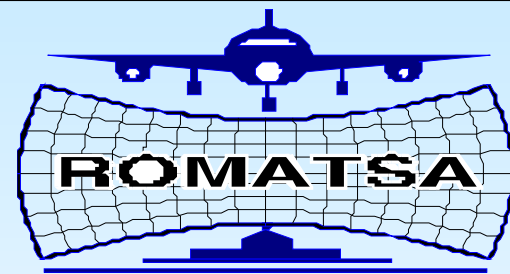
ROMATSA IP Communications Network





Main characteristics of ROMATSA IP network

- Based on CISCO multi-service access platforms implemented on each of the sites, which enable the integration of data and voice (CISCO 3600 and 3700 series)
- Partial mesh topology
- High redundancy, no single point of failure
- Three service providers for WAN links
- Connection between local routers for re-routing
- Dual connection between multiplexers and routers in each site



Services

Radar Data:

from sensors to centers and between centers

Air-Ground (A/G) Voice between centers and radio sites

ZERO call setup time

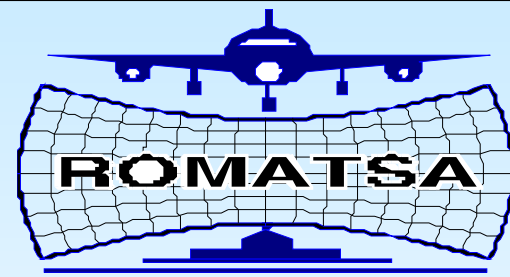
Emulates traditional analog/digital leased lines

Ground-Ground (G/G) Voice national and cross border

MFC-R2 ATS signalling transparently carried over IP
(with special adapter developed by ROMATSA and
TOPEX SRL)

ZERO call setup time

Emulates traditional analog/digital leased lines



Services (continued)

OLDI – Flight Data Messages:

between centers, via the same IP core network, and international (with Sofia, Bulgaria)

Aeronautical Messaging

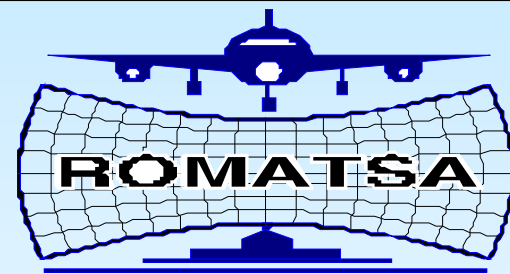
AFTN (with Sofia, Bulgaria)

CIDIN (also with Sofia, Bulgaria)

Aeronautical Meteo Related Messages

OPMET, T4MAPS, Radar & Satellite Images

RCO – Flight Messages for CRCO



Services (continued)

CFMU

Civil - Military Coordination Messages

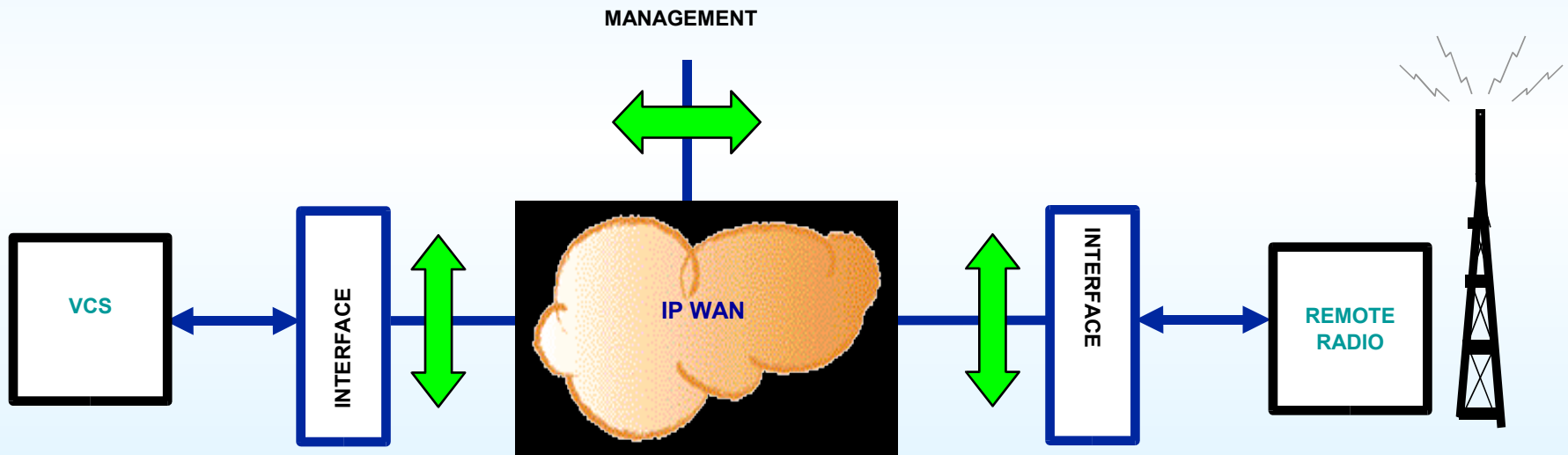
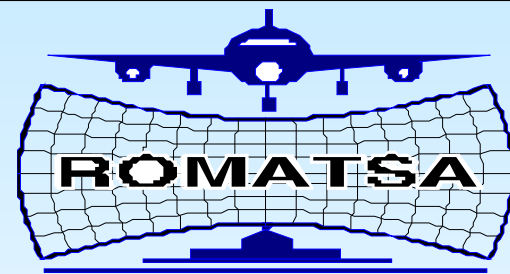
AIS Messages

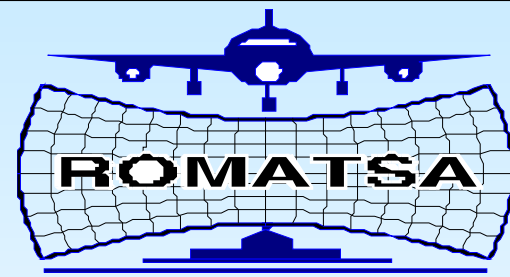
ROMATSA email service to 17 locations

Administrative Voice

And any other kind of administrative messaging applications easy to accommodate over the same core **IP** network

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ROMATSA IP Communications Network





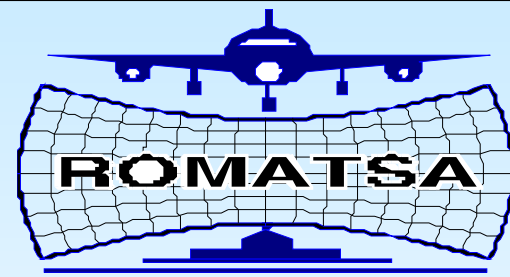
VOICE over IP

The IP problems:

- Large delays and large delay variations in packet delivery
- Packet ordering problems may occur.

Solutions to overcome delay and jitter:

- packet prioritization
- resource reservation
- packet fragmentation



VOICE over IP (cont)

Voice coding

CISCO platforms have a broad range of choices supported.

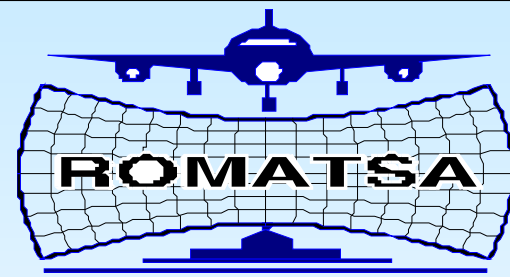
We are using the G.729 algorithm, which provides a good quality of speech, at an affordable data rate.

G.729 is used at 8 kbps voice compression.

Total bandwidth required for one voice channel is

11.2kbps (including the header of data packet)

The MOS (Mean Opinion Score) of \sim **3.92**, versus a PCM MOS of \sim 4.0 (no audible degradation)



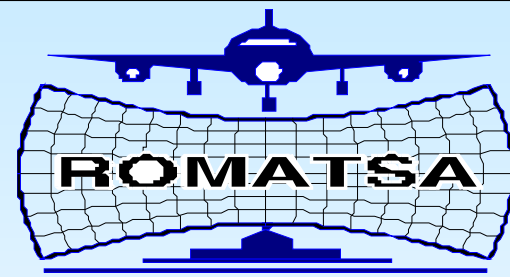
Further voice-com details

The analog voice channels (LB, CB/FXS, E&M) are converted into digital voice channels. These digital voice channels are multiplexed and transparently transported over the network, via the CISCO multiservice access routers.

For A/G voice the 4w E&M type V interfaces are used. The E&M wires are used for Squelch and PTT.

The A/G voice channels are permanently engaged, so there is no call-setup time.

There are three different radio sites for each VHF route frequency.



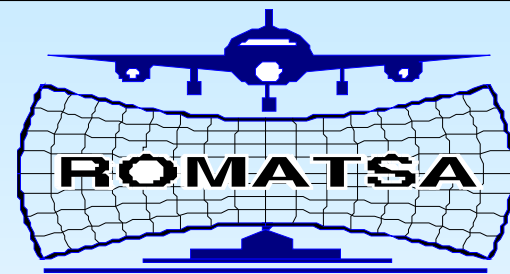
Management & Control

A special software package running on three usual PC's provides the M&C functions for network.

It offers the possibility to:

- configure the network
- monitor the voice channels, data channels and WAN links
- get information regarding to bandwidth consumption for each type of traffic.

Different access levels are established by different passwords. Remote management can be permitted.



For any further details:

Reference contacts at ROMATSA, Romania:

Ion Hornet, Head of Network Maintenance Dept.
ROMATSA HQ

ion.hornet@romatsa.ro.

Cosmin Dumitrescu, Head of COM Technical
Operations - Bucharest Area

cosmin.dumitrescu@romatsa.ro.

Catalin Apostol, COM Expert, ROMATSA HQ

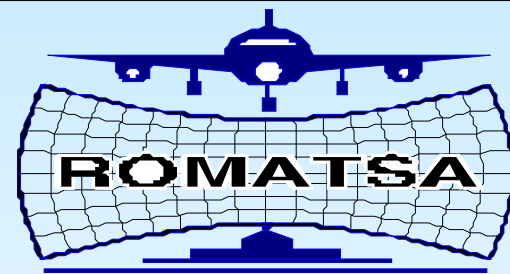
catalin.apostol@romatsa.ro.

Dragos Baloi, Head of COM/DATA Division - Bucharest
Area

dragos.baloi@romatsa.ro.

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COMMUNICATIONS SOLUTIONS

believe in more

DATANET SYSTEMS
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www.datanets.ro



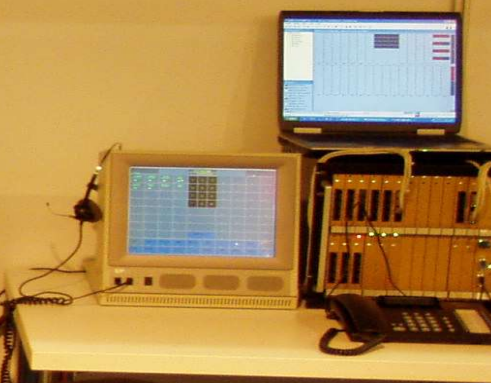
We provide our clients with key benefits, while building solid communication grounds to enable all future plans, wherever they plan on going.

- Telecom and internetworking project implementation
- Service and technical support
- Consulting services
- Training services
- Information Security consulting services

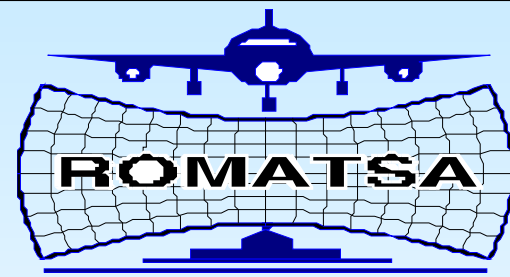
Enterprise IT&C network infrastructure

- Service Provider core network and broadband access
- Network management
- Solutions for security

ISO 9001 QMS
From TUV



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Thank you for your attention

Questions?