Series 4100
Integrating HF radios into IP infrastructures

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Tactical Radios, HF-Radios

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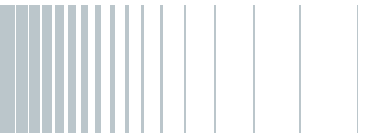▋Radio Interfaces

▋Example1: ATM

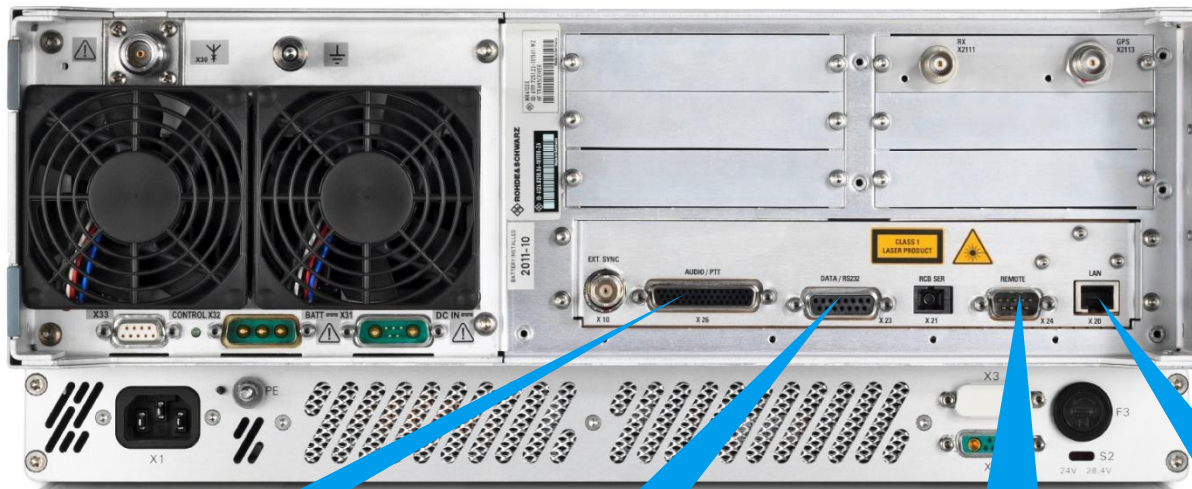▋Example 2: Split Site

▋Integration of Postman III

▋Conclusion

Interfaces at the radio

Analog audio

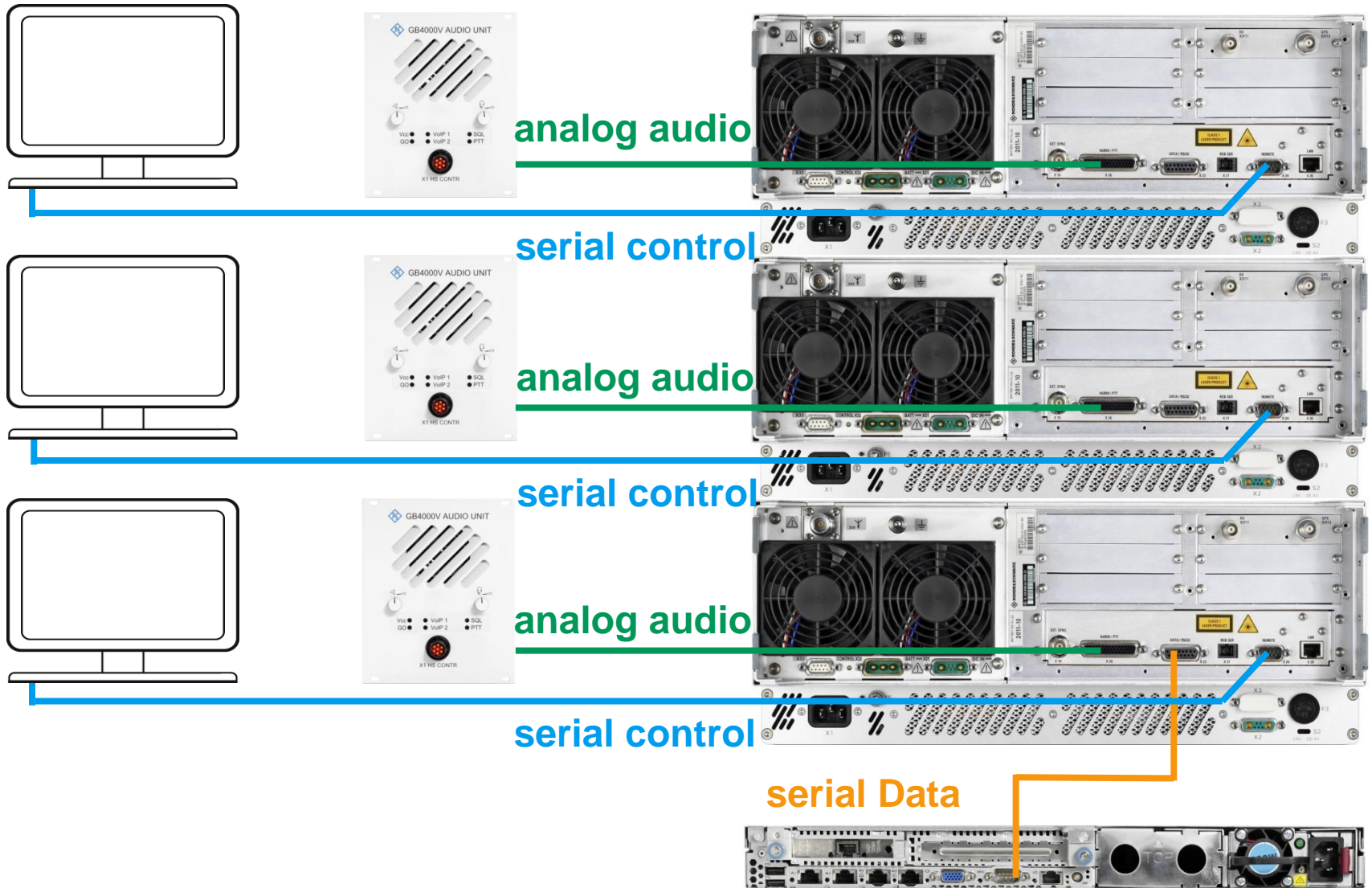Serial Data

Serial Control

Ethernet

Traditional interfaces

analog audio

serial control

analog audio

serial control

analog audio

serial control

serial Data

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One Interface for Control, Data, Audio

IP Control

IP Control

IP Control

VoIP Audio

VoIP Audio

VoIP Audio

Switch

Switch

IP Data

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Example 1: ATM with Voice Over IP

Example 1: ATM with Voice Over IP

Controller working position CWP

Series4100 HF radio

VoIP Audio

Series4200 VHF radio

Series4400 V/UHF radio

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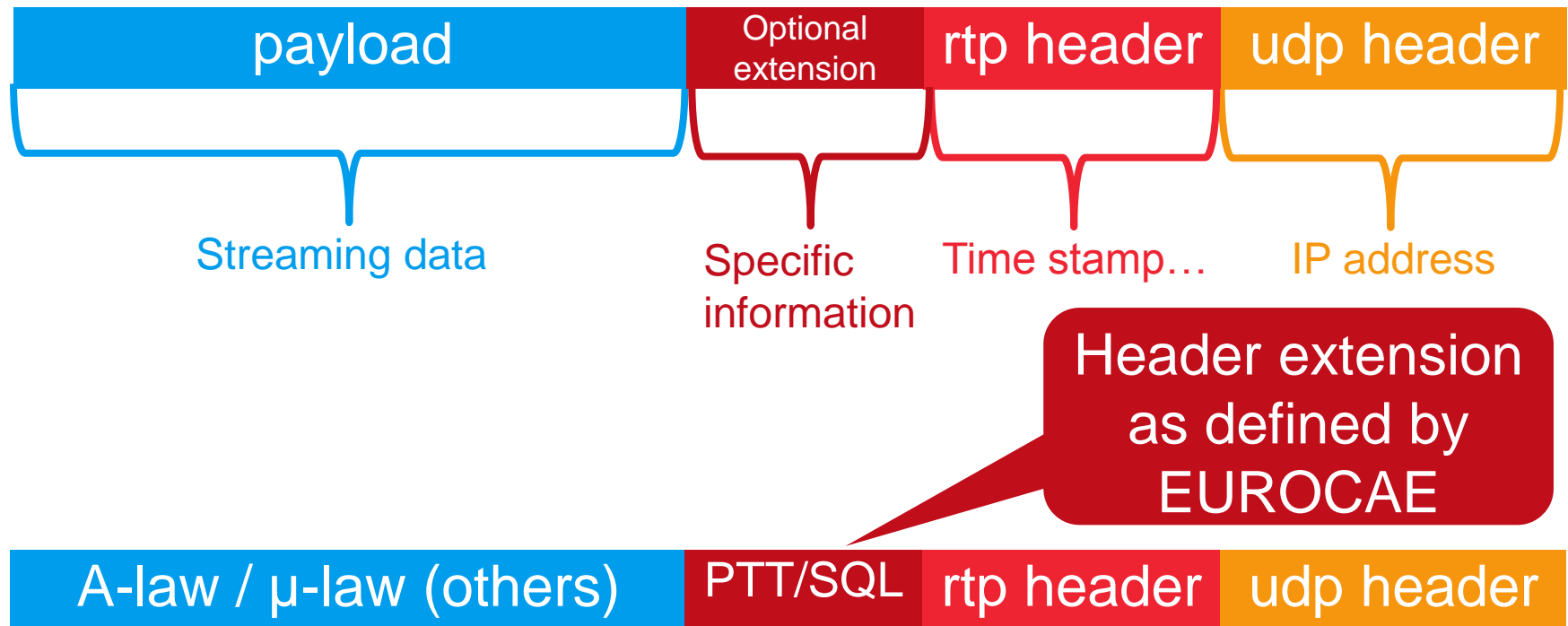
Example 1: ATM with Voice Over IP
Motivation

❚ Network Operators switch their core networks to IP technology
❚ Flexibility to share recourses between ANSPs requires interoperability

❚ EUROCAE WG67 defined IP Voice ATM Systems in ED136-139
❚ R&S is WG67 member

❚ Glossary:
❚ EUROCAE -> European Organization for Civil Aviation Equipment
❚ WG67 -> Working Group 67
❚ ATM -> Air traffic management
❚ ANSP -> Air Navigation Service Provider

Voice Over IP according to EUROCAE
How it works

Based on RTP   -> Works with standard network equipment

payload	Optional extension	rtp header	udp header

Streaming data — Specific information — Time stamp… — IP address

Header extension as defined by EUROCAE

A-law / μ-law (others)	PTT/SQL	rtp header	udp header

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VoIP technology advantages

▌Reduced system costs
- Single shared infrastructure for all types of services (voice, control, other data)

▌Standardized interoperability
- EUROCAE ED-137 standard specifies the use of IP for voice communication in Air traffic management (ATM)
- Systems components of different manufacturers interoperate properly with each another

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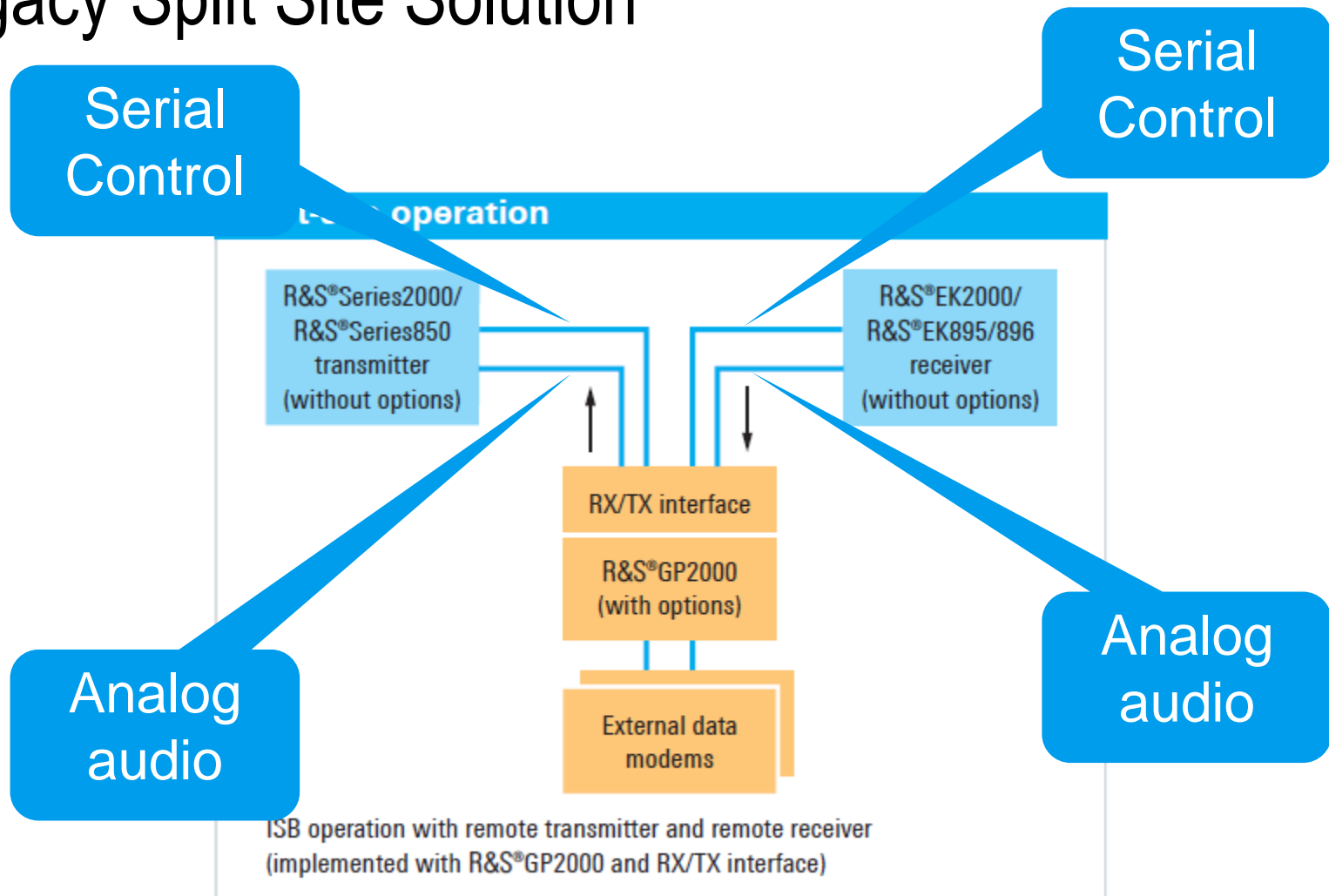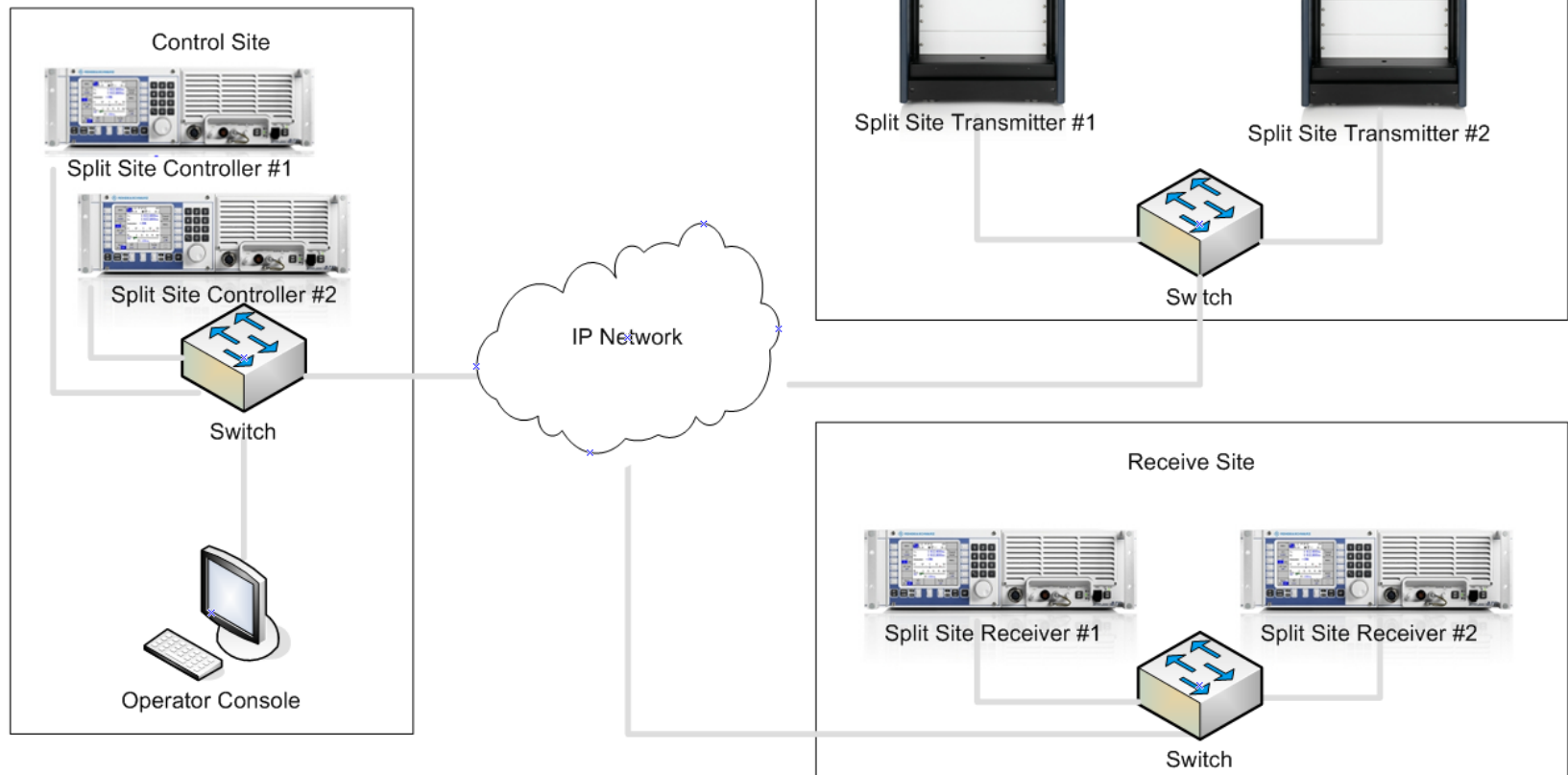
▌Integration of Postman III

▌Conclusion

Example 2: Split Site
Legacy Split Site Solution
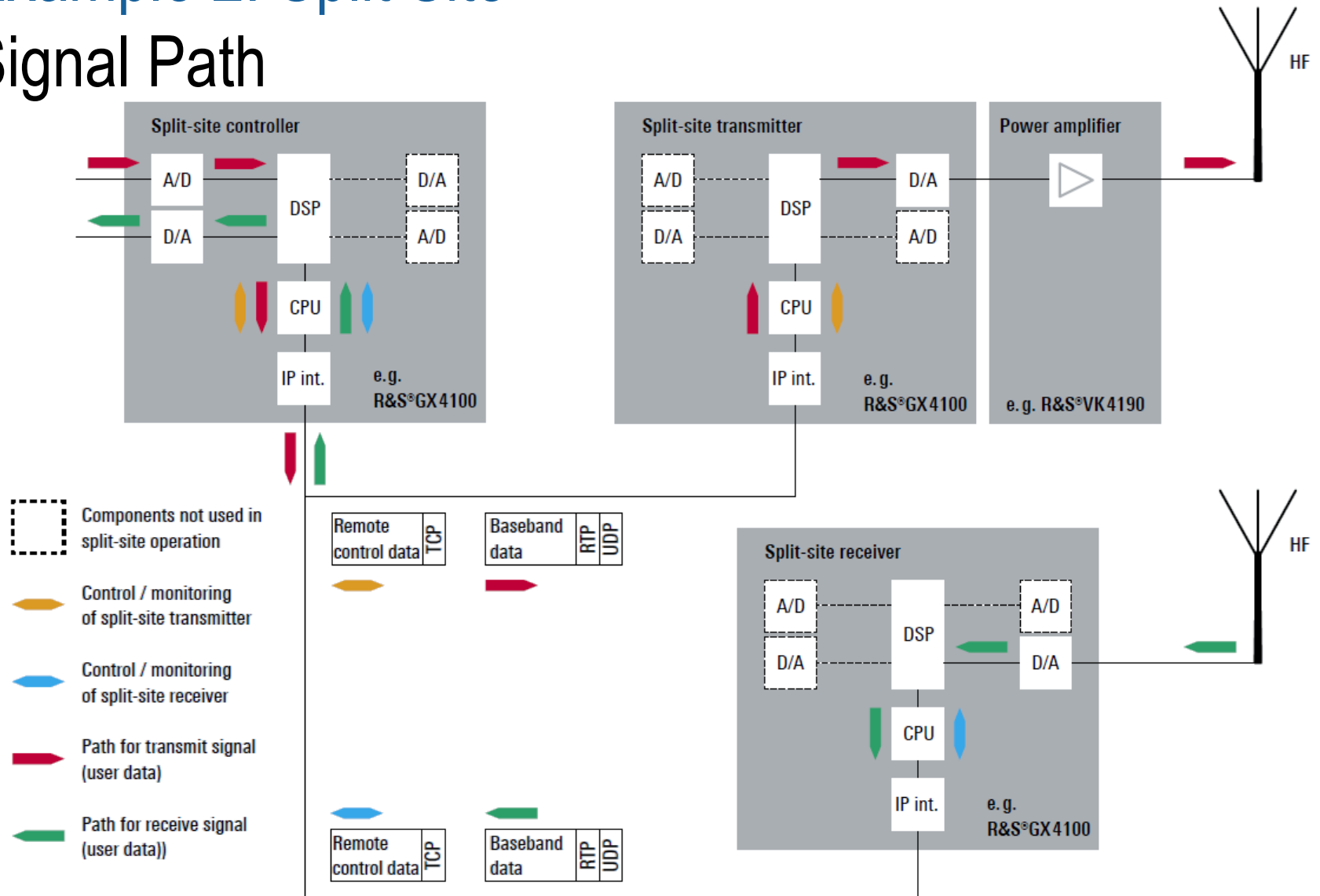

Serial Control

Serial Control

Analog audio

Analog audio

R&S®Series2000/ R&S®Series850 transmitter (without options)

R&S®EK2000/ R&S®EK895/896 receiver (without options)

RX/TX interface

R&S®GP2000 (with options)

External data modems

ISB operation with remote transmitter and remote receiver (implemented with R&S®GP2000 and RX/TX interface)

Example 2: Split Site
IP based

Control Site

Split Site Controller #1

Split Site Controller #2

Switch

Operator Console

IP Network

Transmit Site

Split Site Transmitter #1

Split Site Transmitter #2

Switch

Receive Site

Split Site Receiver #1

Split Site Receiver #2

Switch

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Example 2: Split Site
Signal Path

Example 2: Split Site
Benefits

▮ No <u>additional</u> hardware required

▮ Commonality significantly reduces operational/logistic costs

▮ Only one common IP Infrastructure to be maintained for several services

▮ Flexibility: Dynamic allocation of a TX and RX to a Split-Site Controller

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Example 2: Split Site
Supported Waveforms

❚ Fixed Frequency modes (voice, data, encrypted voice)

❚ Automatic Link Establishment
  ▪ ALE-2G (FED-STD-1045-1046-1049)
  ▪ ALE-3G/STANAG4538 (FLSU,LDL,HDL,HDL+, LP, OD)

❚ Embedded HF modem waveforms
  ▪ STANAG 4285
  ▪ STANAG 4539
  ▪ MIL-STD-188-110B Appendix F
  ▪ STANAG 4481
  ▪ STANAG 5065 (only RX)
  ▪ STANAG 4529

Example 2: Split Site
Supported R&S applications

- Seamless integration into R&S applications e.g.
  - Radio Network Management System (R&S®RNMS3000)
  - R&S®STANAG5066
  - R&S®MMHS in accordance with STANAG4406
    (incl. Annex E Tactical Gateway)
  - R&S®Postman III

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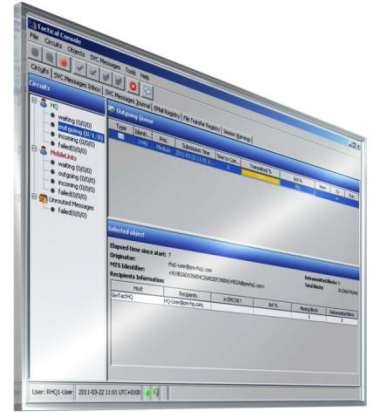
▮ Example1: ATM

▮ Example 2: Split Site

▮ **Integration of Postman III**

▮ Conclusion

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R&S®Postman III – radio communications

Communications system for state of the art IP data transfer via HF and V/UHF radio networks

❚ V/UHF and HF radio protocols cope
with limitations of small bandwidth radio networks

❚ Effective point to point and point to multipoint radio communication

❚ Message routing via relay stations

❚ Seamless integration of R&S radios
(others can also be supported)

❚ ……

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Comparison R&S®Postman III / R&S®MMHS

R&S®MMHS
(military message handling system)

- Fully compliant to S4406 including Annex E
- Tactical messaging including attachments
- Public key infrastructure capabilities for message encryption, digital signatures and user authentication
- MMHS client to support additional information
- ACP127 conversion

R&S®Postman III

- Informal messaging
  - Email
  - Chat
- Fax and voicemail service
- File transfer
- Situation awareness
- Support of standard e-mail client
- Remote control of R&S radios

R&S®Postman III – Applications
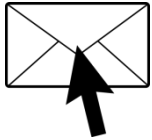
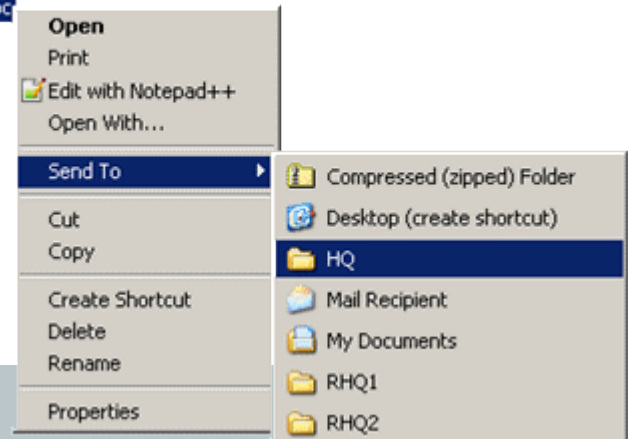E-mail
   Support of standard e-mail clients

Chat
   Orderwire chat between stations

MapTrack
   GPS data transport and display
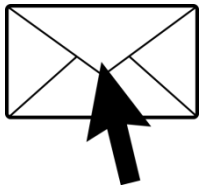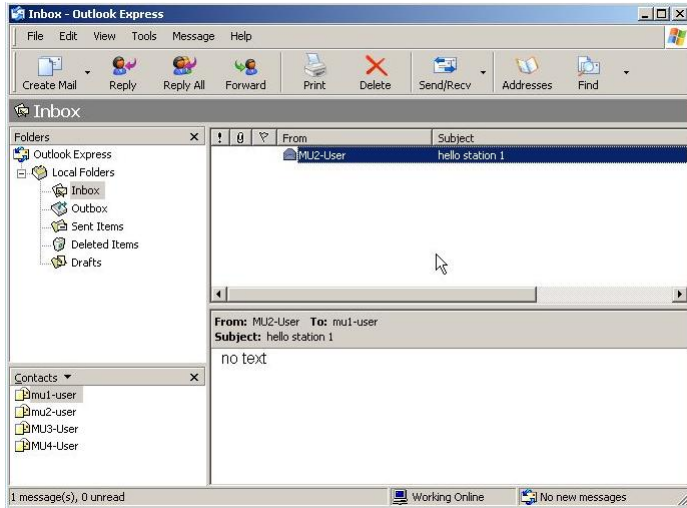
File Transfer
   Push mechanism for files

Report.doc

| Open |
| Print |
| Edit with Notepad++ |
| Open With... |
| Send To ▶ |
| Cut |
| Copy |
| Create Shortcut |
| Delete |
| Rename |
| Properties |

Send To:
- Compressed (zipped) Folder
- Desktop (create shortcut)
- HQ
- Mail Recipient
- My Documents
- RHQ1
- RHQ2

Fax / Voice service
   Fax and Voice mail

Example 3: E-mail, Feedback messages

HDL

Standard Email client

Buffer

E-Mail

Data packets

4/5
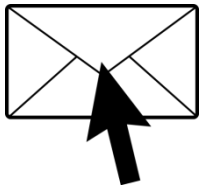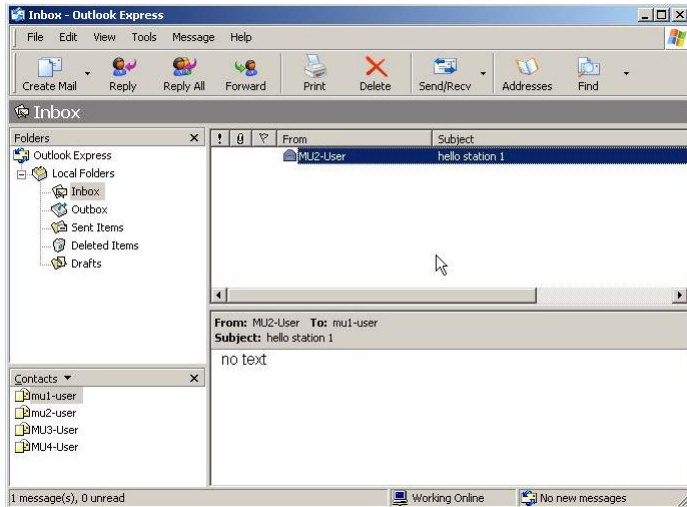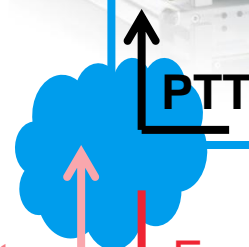
Postman III SMTP Server

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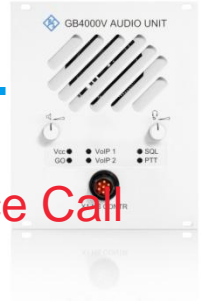# Example 3: E-mail, Voice priority Feedback messages

Secure Voice

PTT

Data packets

Feedback: Voice Call

E-Mail

Postman III SMTP Server

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IP technology advantages

■ **Reduced system cost**
- Single shared infrastructure for all types of services (voice, control, other data)
- IP-based systems with distributed network intelligence do not require a central switching entity thereby providing pay-as-you-grow scalability

■ **Increased reliability**
- A failure at one part of the system does not affect operation in the rest of the system.

■ **Future proof technology**
- Ready for new advanced IP based services, e.g. messaging, presence and video

Thank you for your attention!

Any questions?

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