



*The DVB Return Channel
Standards:
A Global Solution for
Interactive Services
Introduction on HFC and
LMDS Networks*

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Summary

- **Introduction**
- **DVB RCCL standard description**
- **Voice over DVB**
- **Interoperability/certification**
- **Conclusion**

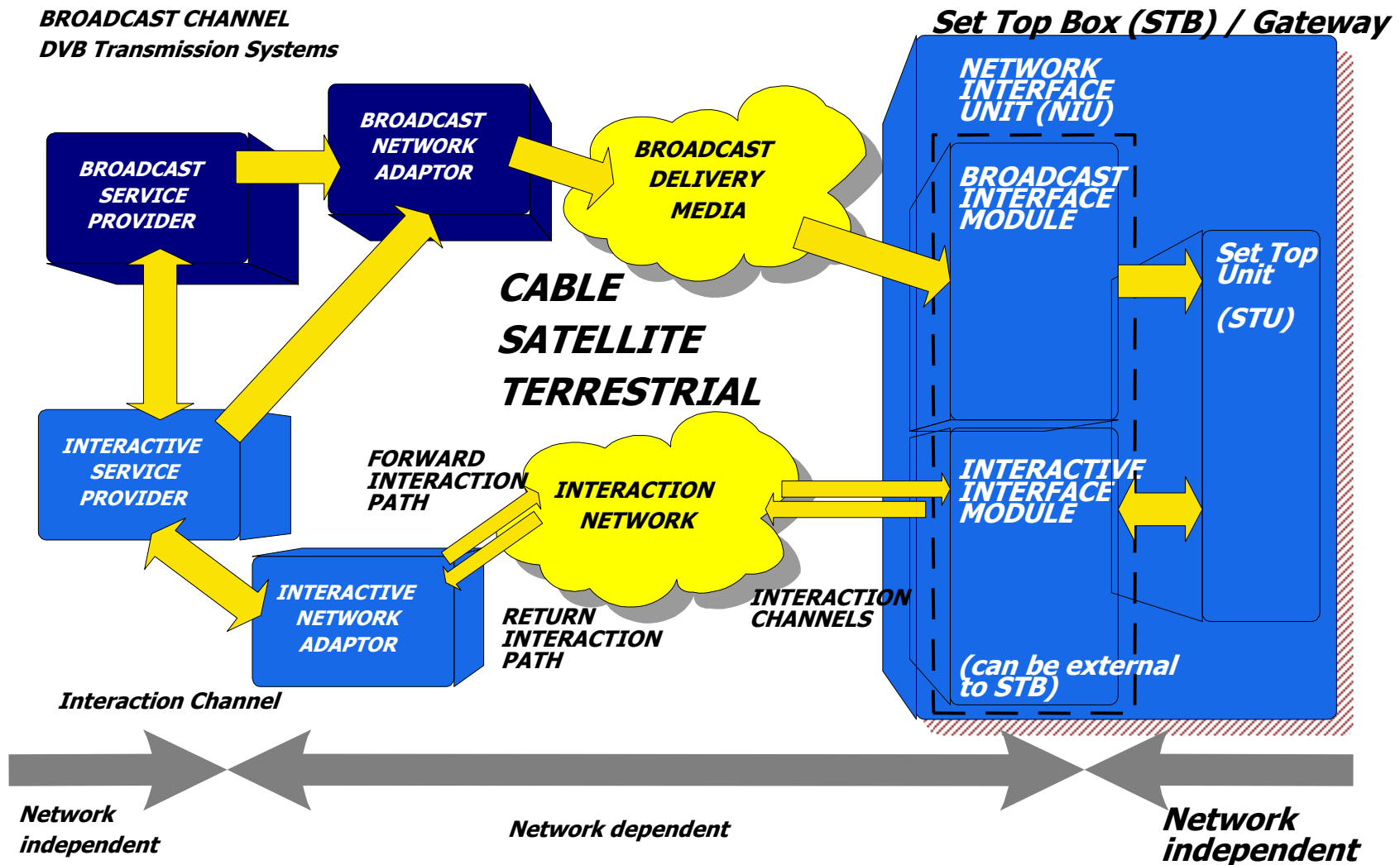
DVB introduction

- **WORDLWIDE CONSORTIUM OF AROUND 300 ORGANISATION (COMPANIES, OPERATORS, UNIVERSITIES)**
- **OBJECTIVE : PROVIDE SPECIFICATIONS FOR INTERACTIVE MULTIMEDIA PROTOCOLS ON EVERY MEDIA**
- **ACHIEVED WORK :**
 - **PROTOCOLS FOR BROADCASTING OF MULTIMEDIA CONTENT**
 - **PROTOCOLS FOR MULTIMEDIA APPLICATIONS ON CABLE, LMDS, SATELLITE; TERRESTRIAL**
 - **MHP PART 1 : API DEFINITION OF FUTURE HOME GATEWAY**

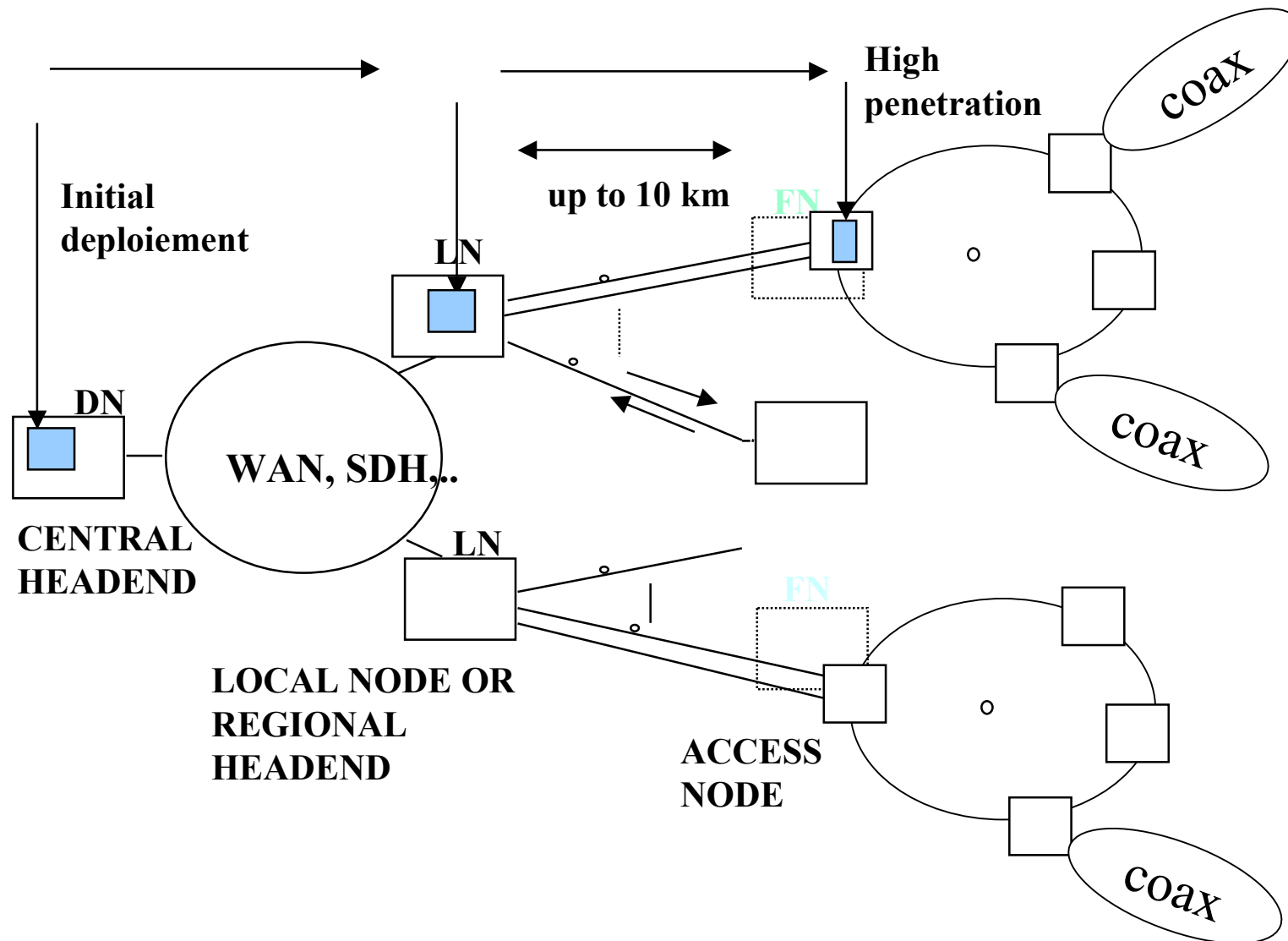
DVB RCCL

- **CREATED IN 95 FOR INTERACTIVE STANDARDS**
- **PRODUCED STANDARDS FOR CABLE AND LMDS INTERACTIVE PROTOCOLS**
 - **ETSI STANDARDS ES 200 800 AND EN 301 199**
 - **RECOMMENDATIONS ITU T J112 AND J116**
- **TARGETED PRODUCTS :**
 - **INTERACTIVE STB (OUT OF BAND SPECIFICATION)**
 - **CABLE MODEM AND LMDS MODEM (IN BAND SPECIFICATION)**
 - **INTERACTIVE GATEWAY (MHP,ETC.)**

DVB system model



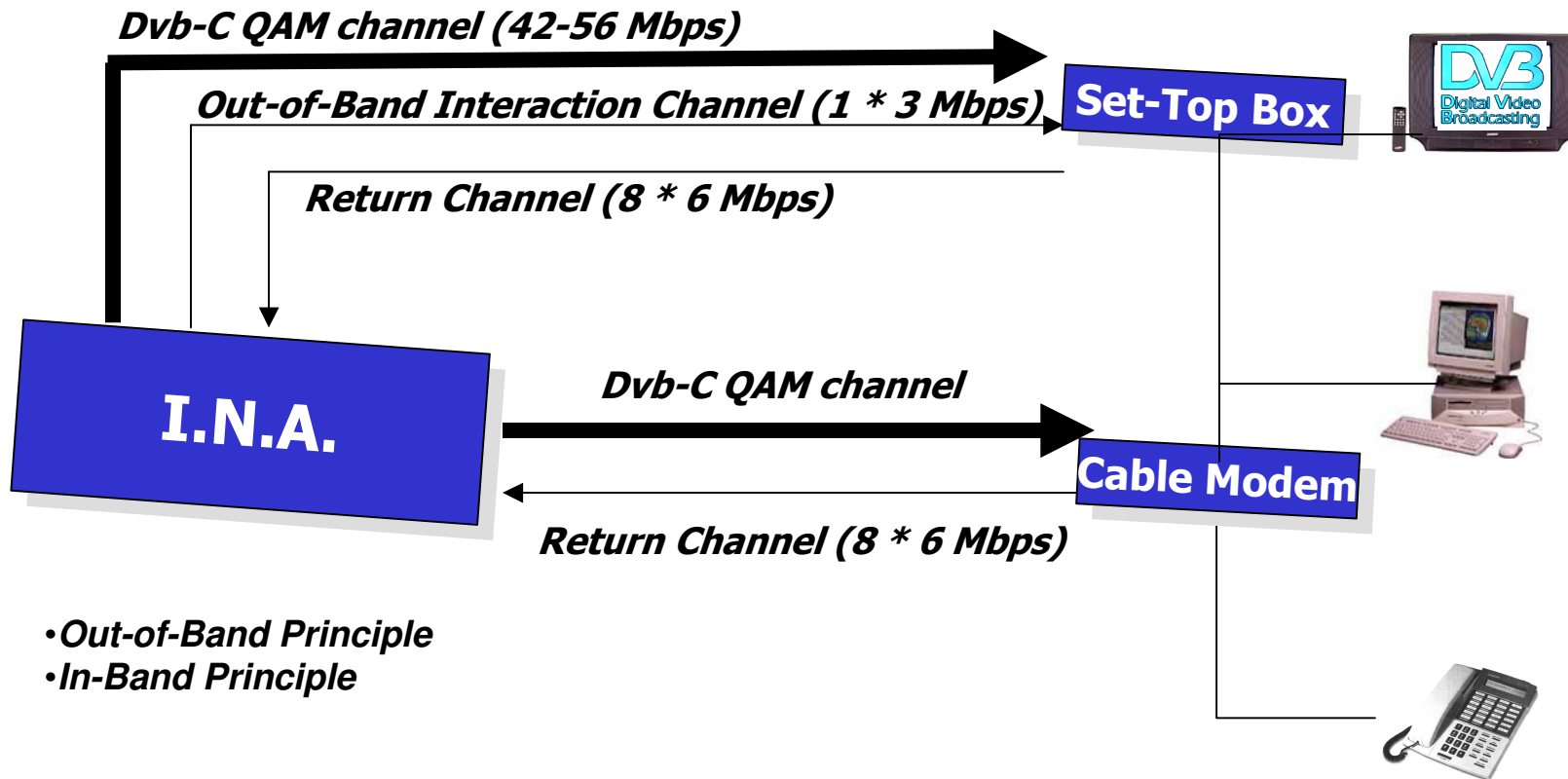
INA locations



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In band / Out of Band principles



DVB-RCC (ETS 300 800), DVB LMDS (EN301 199) and DAVIC 1.2/1.5

DVB standard main features

- **2 VARIANTS : IN BAND AND OUT OF BAND**
- **IN BAND : 40 Mb/s DOWNSTREAM, 6-12 Mb/s UPSTREAM**
- **OUT OF BAND : 3 Mb/s DOWNSTREAM**
- **UPSTREAM FRAMING : ATM**
- **DOWNSTREAM FRAMING : ATM (OOB), DVB MPE (IB)**
- **ACCESS TECHNIQUE :**
 - **TDM In DOWNSTREAM**
 - **TDMA/FDMA IN UPSTREAM**
- **SAME MAC LAYER FOR CABLE AND WIRELESS, FOR IB AND OOB**
- **MAC LAYER FEATURES :**
 - **RANGING / RF REPROVISIONING**
 - **TRAFIC SCHEDULING : SIMULTANEOUS CONTENTION, FIXED RATE, RESERVATION ACCESS**
 - **SECURITY LAYER**
 - **PAYLOAD HEADER SUPPRESSION (FOR VOIP MAINLY)**

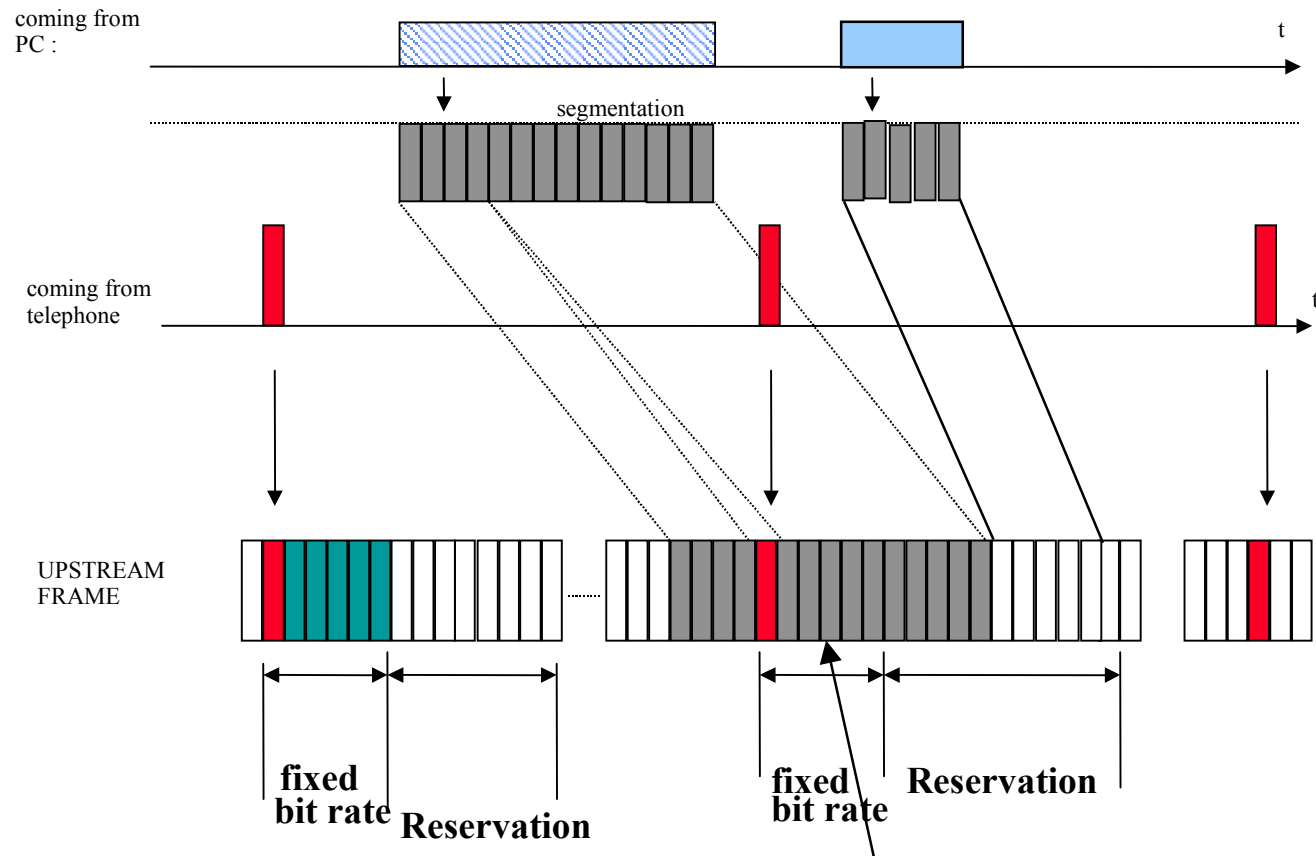
Same MAC layer

- **Allows to share the same upstream RF Channel between CM and STB :**
 - **KEYPOINT WITH FIRST DEPLOYMENTS**
 - **FLEXIBILITY**
- **Allows to build mixed cable / wireless networks**

MAC layer traffic scheduling

- **Contention** : used for small messages (MAC); low efficiency
- **Fixed bit rate** : for default connection, voice or business
- **Reservation** : for bursty IP traffic and voice;
 - Unsolicited grants allows polling
 - Piggybacking optimises throughput (to 100%)
 - continuous piggybacking reduces jitter (for voice)
- **Conclusion** : sophisticated MAC layer to optimise throughput / allow QoS with mix of multimedia services

Scheduling example



UNUSED FIXED RATE SLOTS USED FOR RESERVATION

Voice support

- **With fixed bit rate connections :**
 - Support of VAD by allocating unused slot for data
- **With reservation :**
 - Continuous piggybacking used during speech
 - Unsolicited grants during silence

SECURITY

- **FEATURES :**
 - **PRIVACY IN THE CABLE NETWORK**
 - **CLONE DETECTION**
 - **AUTHENTICATION**
 - **PROTECTION AGAINST THEFT OF SERVICE**
- **DES ENCRYPTION**
- **HASHING HMAC-SHA 5**
- **PUBLIC KEY EXCHANGE : DIFFIE HELMAN**

Ingress Noise Protection

- **Reprovisionning allows to :**
 - **DYNAMICALLY CHANGE UPSTREAM FREQUENCY OF CONNECTION;**
 - **MAINTAIN QOS IN PRESENCE OF INGRESS/TRAFFIC CONGESTION**
- **Ingress Noise Blocker CONCEPT :**
 - **NOISE BLOCKED SUBSCRIBER WHEN NOT TRANSMITTING**
 - **ALLOWS TO AGGREGATE UP TO TEN TIMES MORE SUBSCRIBERS ON THE SAME RF UPSTREAM**

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Packet Cable objective

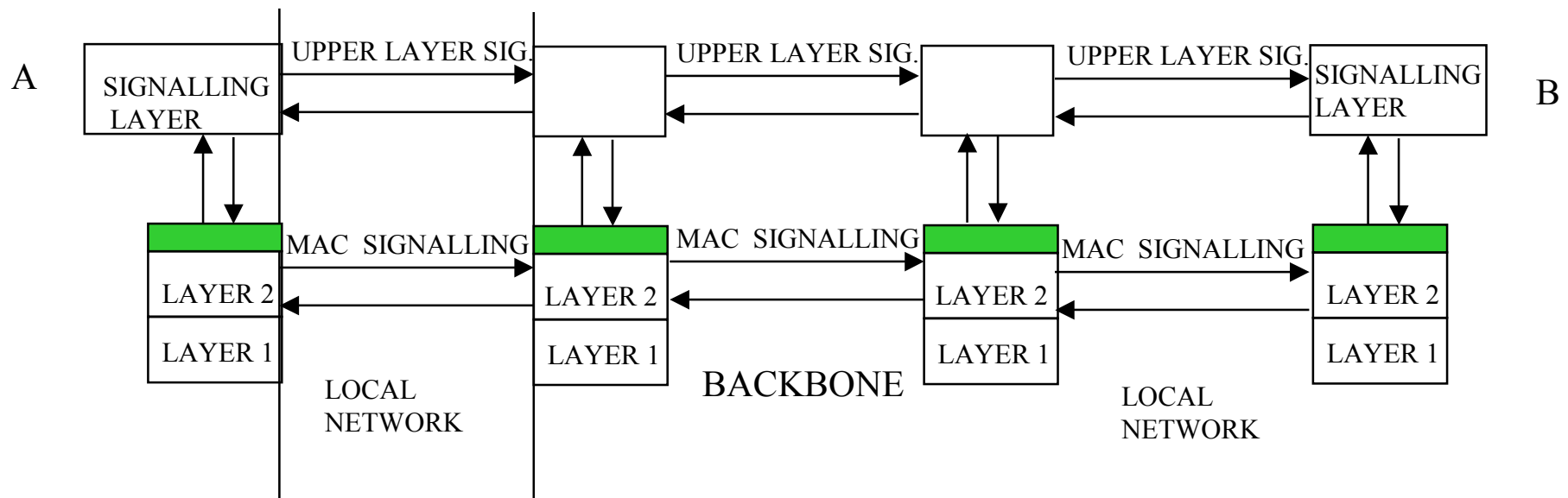
- **Definition of upper layer protocol for Multimedia services over IP**
- **Defined for IP telephony**
- **NCS uses MGCP, DCS based on SIP**
- **Runs over Cable networks using DOCSIS 1.1 for layers 1 and 2**
- **Not defined for DOCSIS 1.0 as Docsis 1.0 doesn't support QoS**

Interest of DVB-Packet Cable collaboration

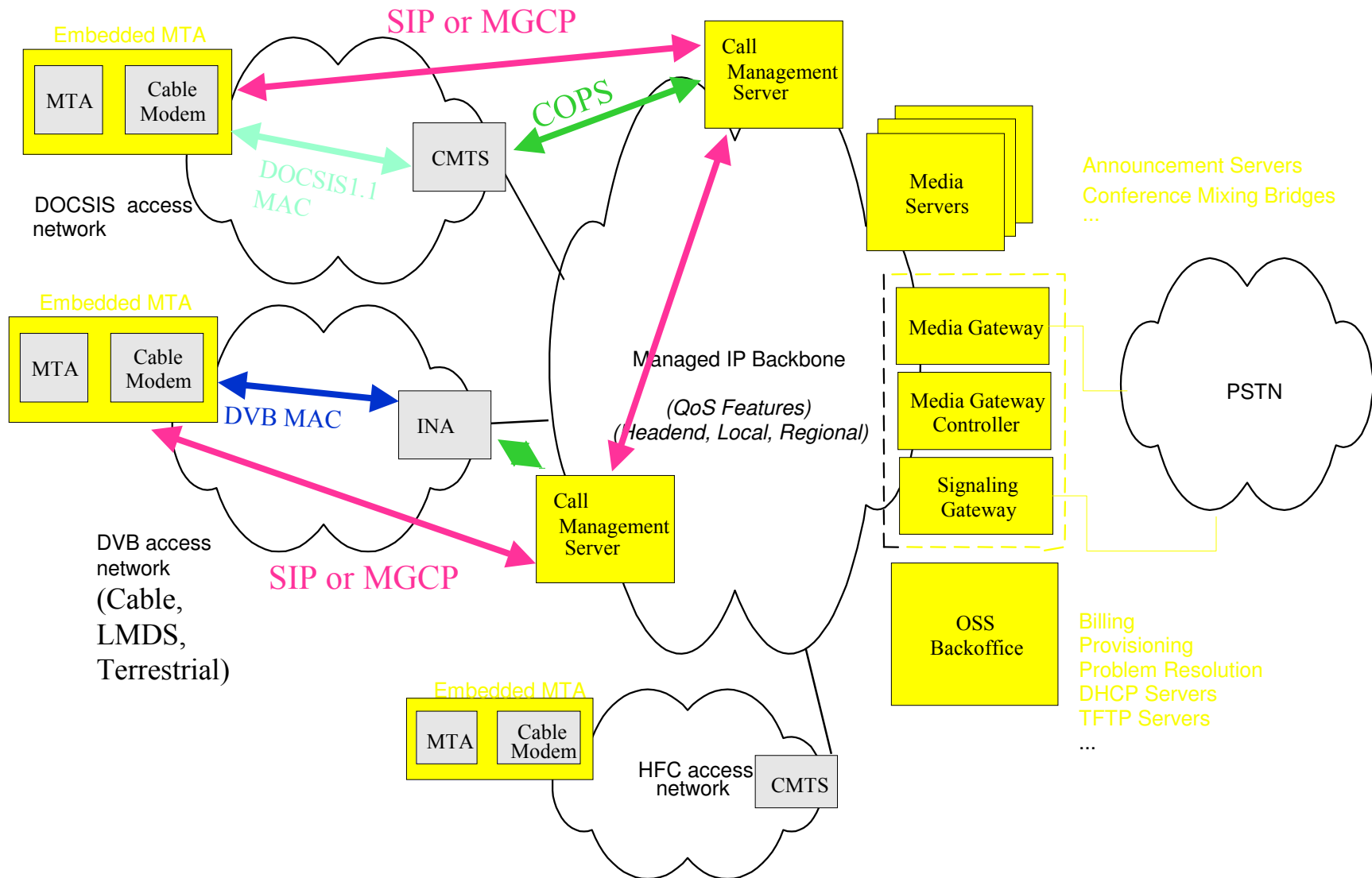
- Provide a seamless architecture for IP telephony over cable
- define extensions for European cases
- Provide interoperability with LMDS/satellite/terrestrial DVB systems
- Define future interoperable extension for any multimedia application requiring QoS

GENERIC PROBLEM for QOS

- LAYER 3 AND ABOVE COPE ABOUT END TO END TRANSMISSION
- LAYER 2 MANAGES THE TRAFFIC IN THE LOCAL NETWORK
- AN EXCHANGE OF INFORMATION MUST EXIST BETWEEN LAYERS IN ORDER TO TRANSMIT :
 - COMMUNICATION OR SESSION OPENING REQUEST
 - REQUIRED QOS INFO + ADDITIONAL FEATURES



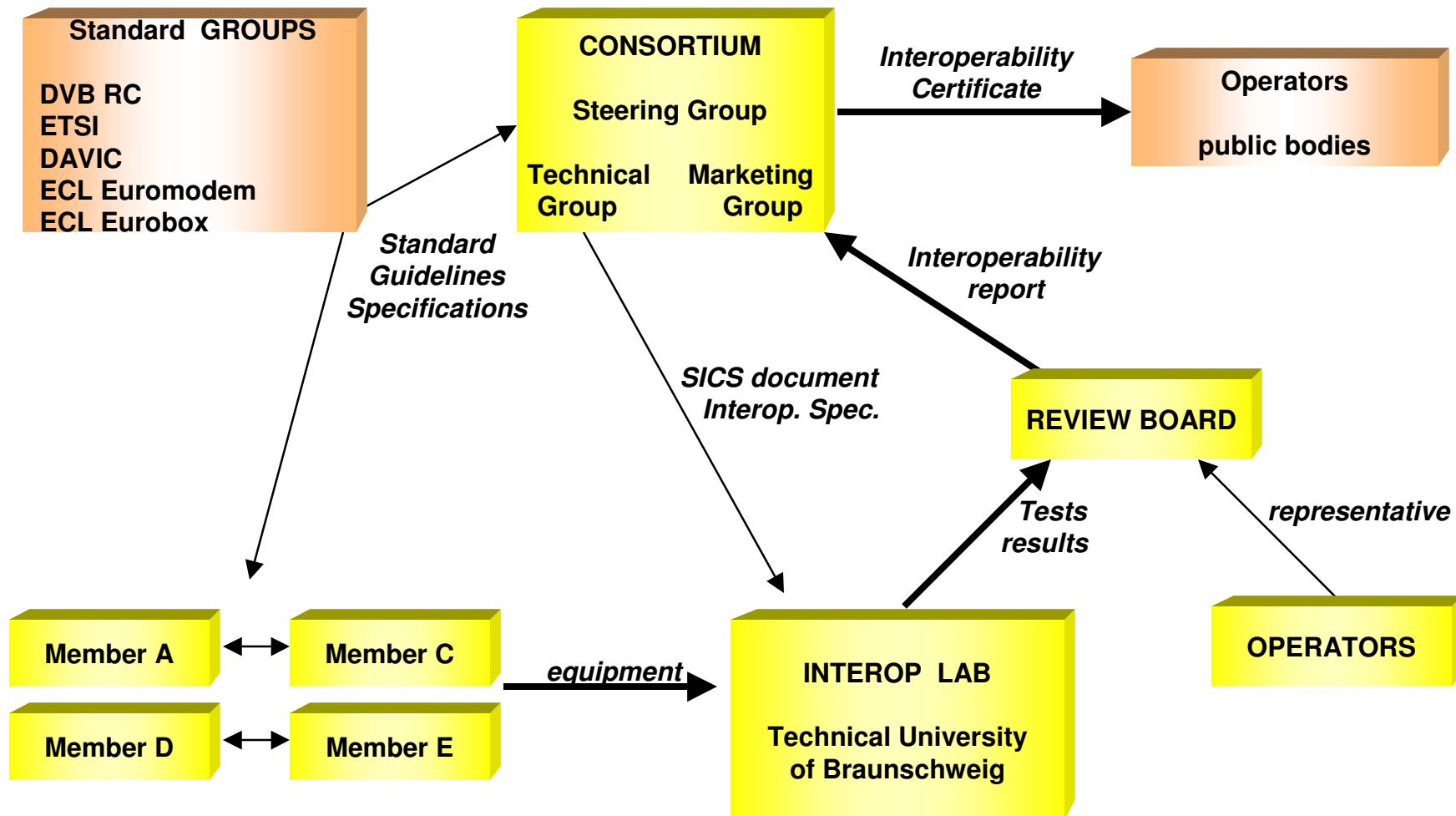
P. C. Architecture evolution



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Interoperability Process and validation



Main vendors

- Alcatel
- Broadcom
- Cisco
- Com21
- Conexant
- Harmonic Inc.
- Hughes Network Systems
- Iccable system
- Infineon
- Kathrein
- Nokia
- PACE Micro Technology
- Philips
- Philips Semi-Conductors
- Roax
- Sagem
- Samsung
- ST
- Terayon
- The industree B.V.
- Thomson Broadcast Systems
- Thomson Multimedia
- + Many STB/CM manufacturers

Com21

Founded 1992, Products in 1997

#1 outside US, #3 Worldwide

ATM, DOCSIS and DVB Products

Development in US (3 sites), Ireland, Israel

420 Employees

15.1 M Homes Passed in 34 countries

700k modems shipped (to Q3/00)

1200 headends shipped (to Q3/00)

1999 - USD95m turnover (Q1/00 - USD41.6m)

Conclusion

- DVB RCCL allow integration of voice/data/video with the same system
- Full QoS support **FROM THE BEGINNING**
- VOIP architecture is fully defined
- Certification process allows full interoperability
- Main manufacturers support the standard
- Massive deployments performed from Interactive video/in progress for data/voice



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