New architectures for high bit rates

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COM21

- **Develop Broadband access system for voice and data (mostly HFC)**
- **Founded 1992, Products in 1997**
- **#1 outside US, #3 Worldwide**
- **ATM, DOCSIS and DVB Products**
- **Development in US (3 sites), Ireland, Israel**
- **400 Employees**
- **15.1 M Homes Passed in 34 countries**
- **1 M+ modems shipped**
- **1500 headends shipped**

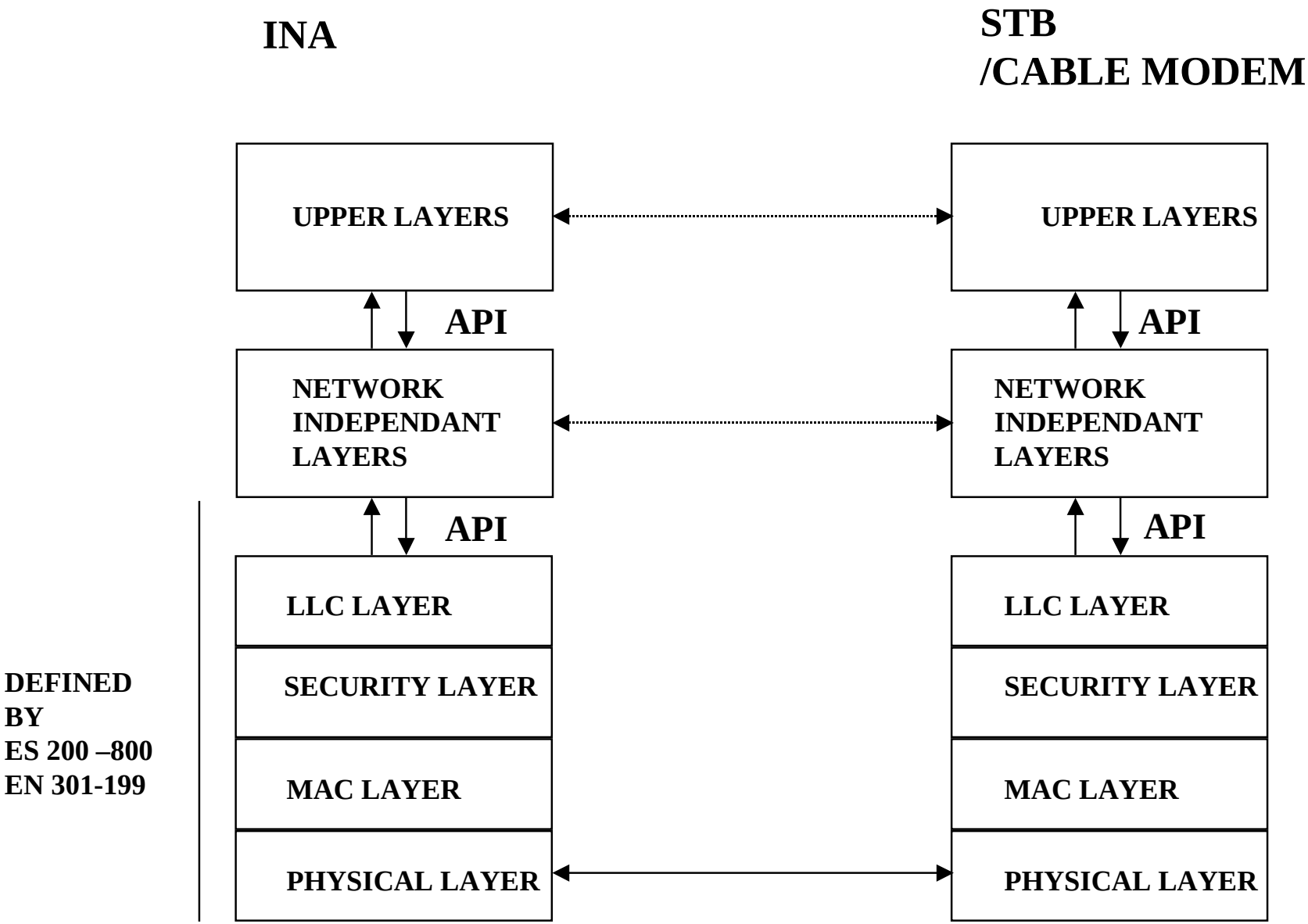
agenda

- DVB RCCL status
- QoS
- HFC architectures evolutions
- Impact on system architecture
- Conclusion

Cable and LMDS status

- **COMMON STANDARD FOR CABLE AND LMDS,**
- **INTEGRATED IN A COMPLETE DVB SYSTEM (SI, Broadcast, MHP,..)**
- **INTEROPERABILITY CERTIFICATION**
- **INTEROPERATE WITH PACKET CABLE ARCHITECTURE FOR VOICE OVER IP**
- **SUPPORTED BY MAJOR PLAYERS OF CONSUMER AND INTERNET (TMM, PHILIPS, NOKIA, CISCO, COM21, TERAYON, ETC.)**
- **Concl : TECHNOLOGY MATURE, IC'S DEVELOPPED, CHEAP PRODUCTS READY**

Interactive layering model



DVB RCCL features

- **FIXED SEGMENTATION IN UPSTREAM AND DOWNSTREAM, CONNECTION ORIENTED**
- **ALLOWS UP TO 50 MB/S IN DOWNSTREAM, 12 MB/S IN UPSTREAM PER RF CHANNEL (TDMA)**
- **MAC Layer ALLOWS Reservation/fixed bit rate**
- **DIFFERENT CONNECTIONS OPENED FOR DIFFERENT QOS PER SUBSCRIBER**
- **HEADER SUPPRESSION ALLOWED TO OPTIMISE THE THROUGHPUT**
- **Layer 2 security providing authentication/ privacy (based on DH / DES/ HMAC SHA1)**

Types of QOS allowed by DVB

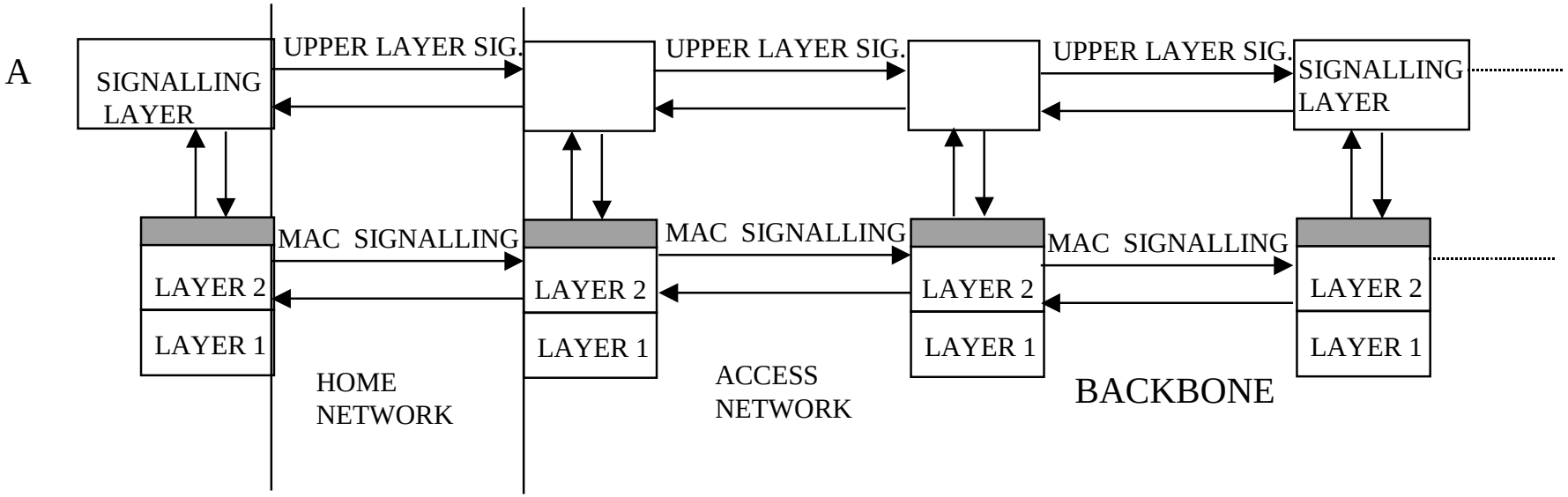
- SAME AS ATM
- MAC LAYERS ALLOWS SIMULTANEOUS CONTENTION/RESERVATION/FIXED BIT RATE ACCESS
- MTA CAN REQUEST GRANTS IN ADVANCE
- INA CAN ALLOCATE GRANTS/GRANTS OPPORTUNITIES
- PIGGYBACKING ALLOWS TO OPTIMISE THROUGHPUT

Packet Cable

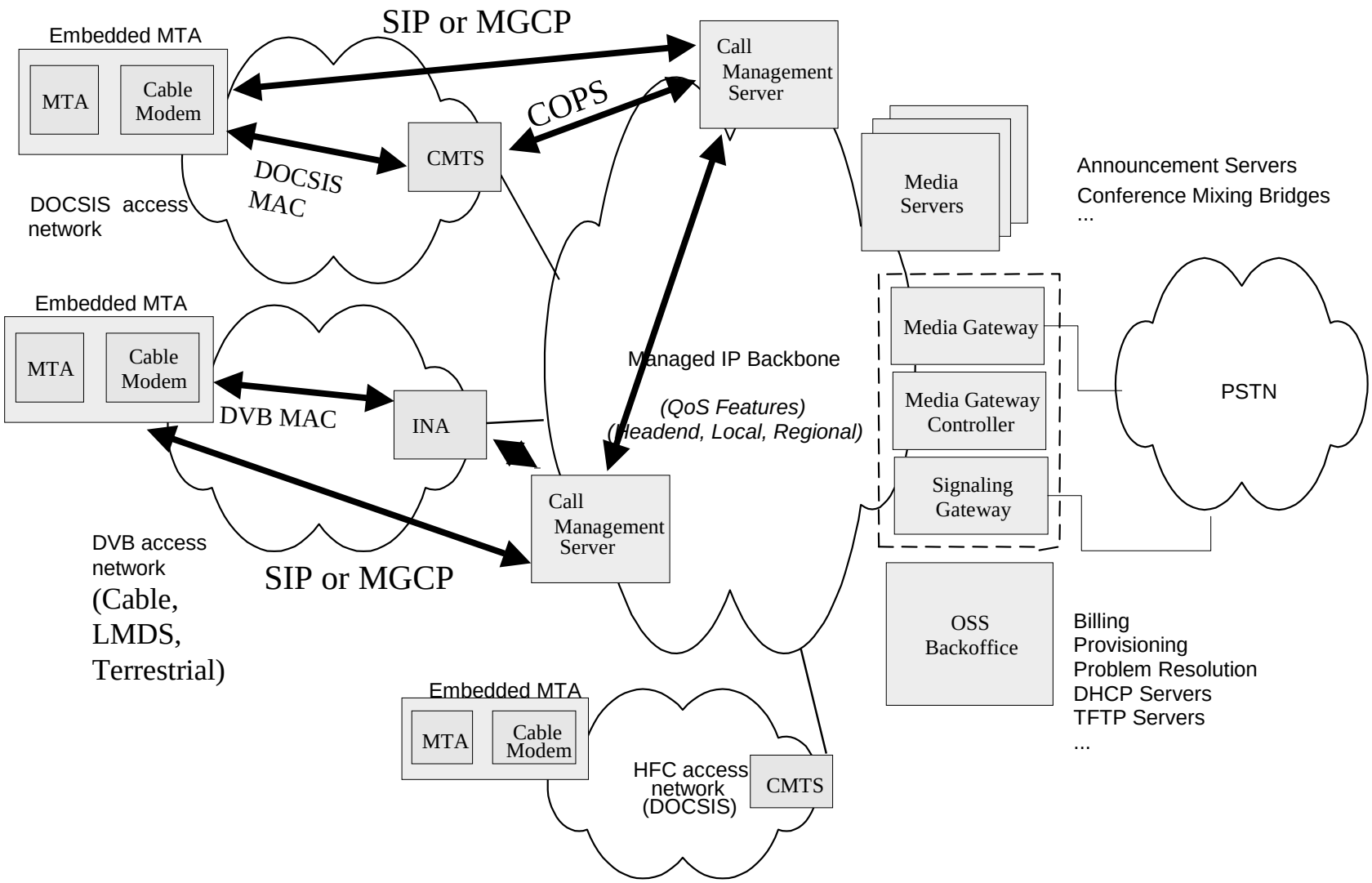
- Defines Upper Layer protocols for time sensitive interactive services over IP
- API defined with DVB-RCCL
  - Linkage between upper layer signaling and DVB Mac layer QoS
  - Defines a complete security architecture
- Allows to build completely standardised systems for VOIP and further services (visiophony, etc.)

GENERIC PROBLEM

- 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



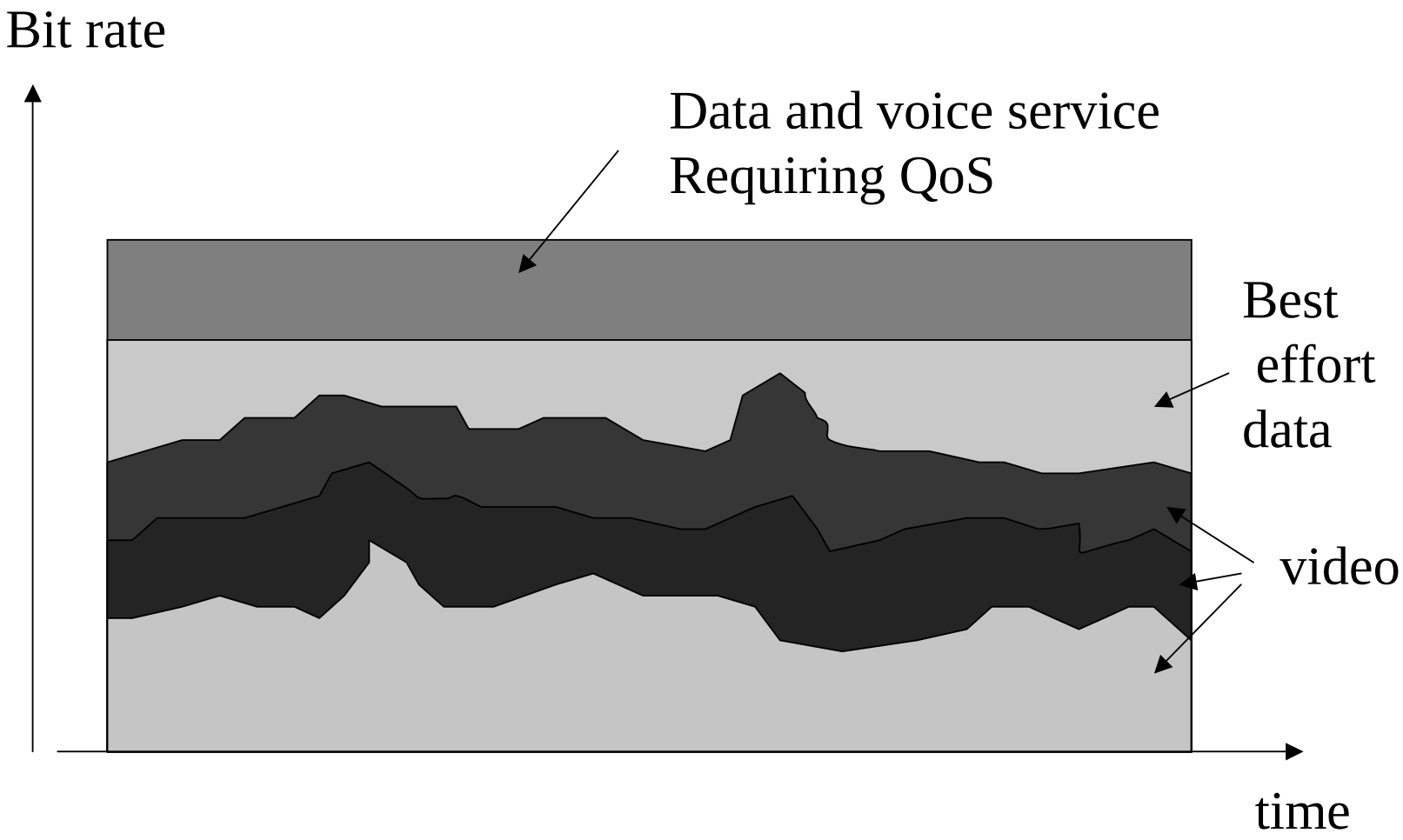
P. C. Architecture



Service integration on one RF carrier

- **DOWNSTREAM :**
  - **Use of the DVB mechanisms :**
    - **MPEG CLASSICAL TRANSPORT**
    - **BEST EFFORT DATA FILLING THE HOLES**
    - **FIX BIT RATE STREAM FOR QoS SERVICES (VOICE,..)**
- **UPSTREAM :**
  - **FIXED BIT RATE / RESERVATION CAPABILITIES**
    - **DATA USES RESERVATION ACCESS**
    - **VOICE USES FIXED BIT RATE (WITH VAD)**
    - **VIDEO USES FIXED BIT RATE OR RESERVATION**

Downstream/upstream

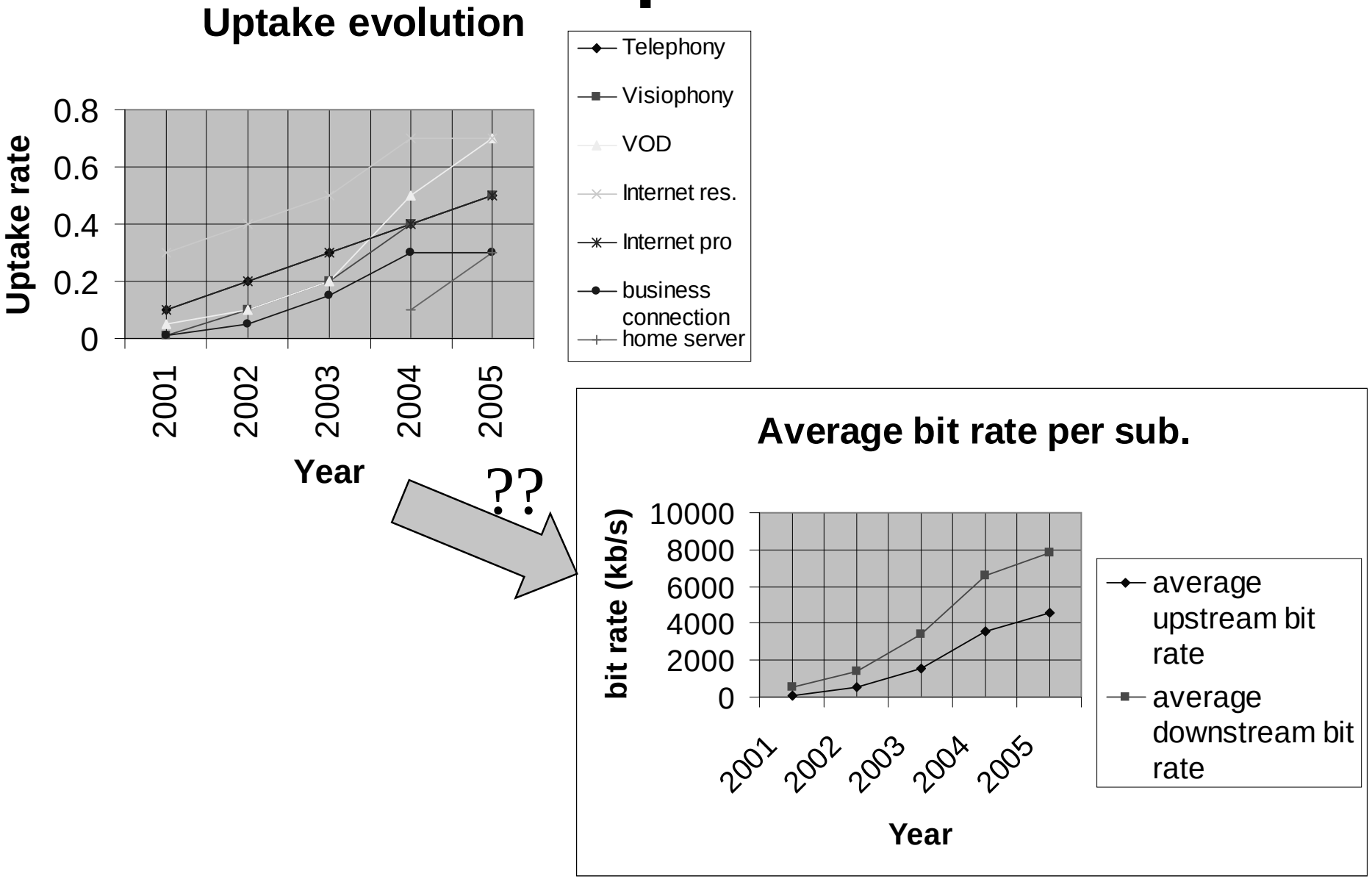


NB : reservation can be used for video with relaxed spec

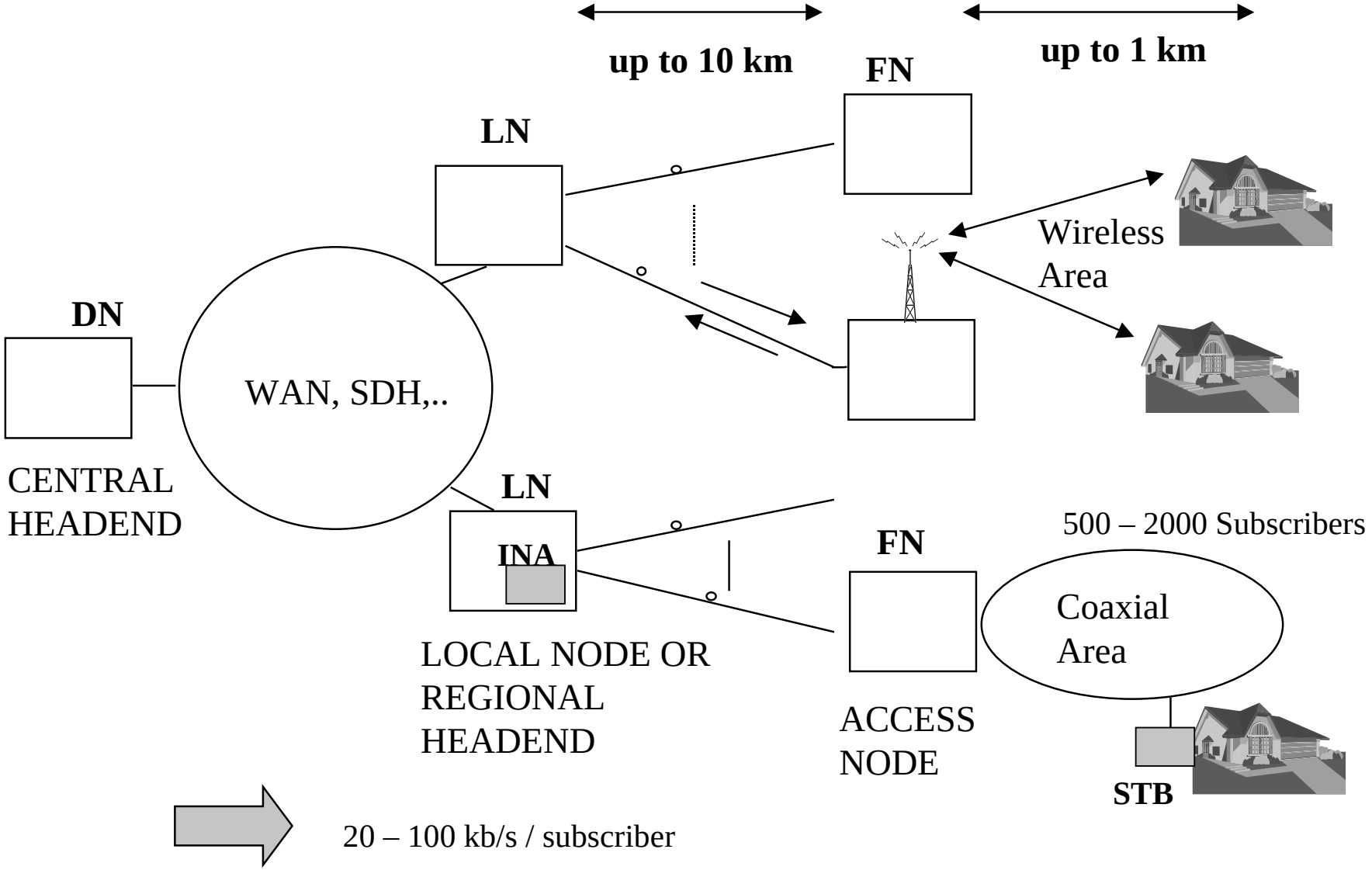
Market & technology trends

- **Deregulation : Operators struggling to offer multiservice (video/voice/data)**
- **Price of bandwidth falling down in access**
- **Price of storage falling down (VOD, etc.)**
- **Bandwidth available in backbone**
- **Cable & DSL make the customer use broadband app. And appreciate**

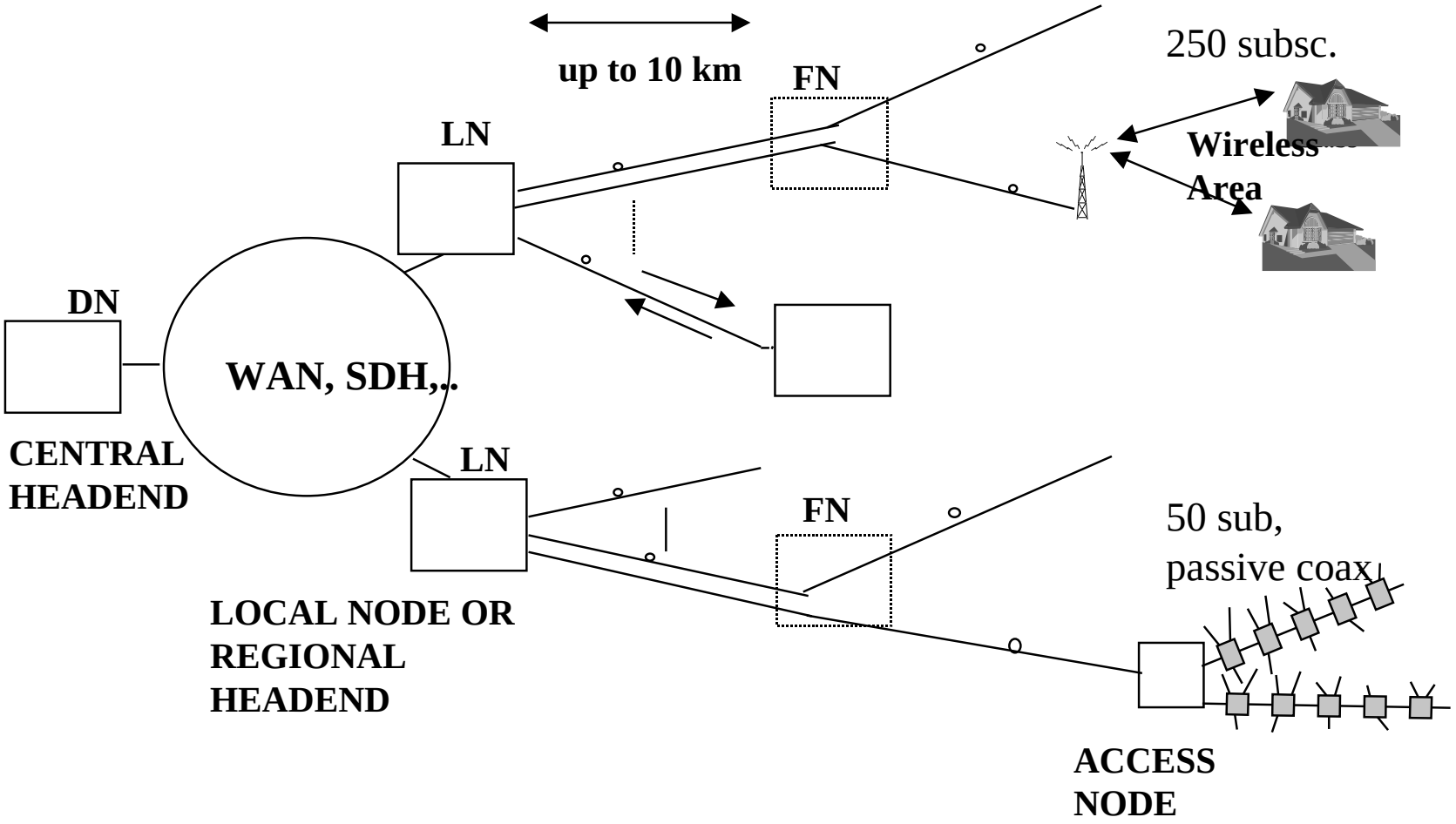
Scenario example



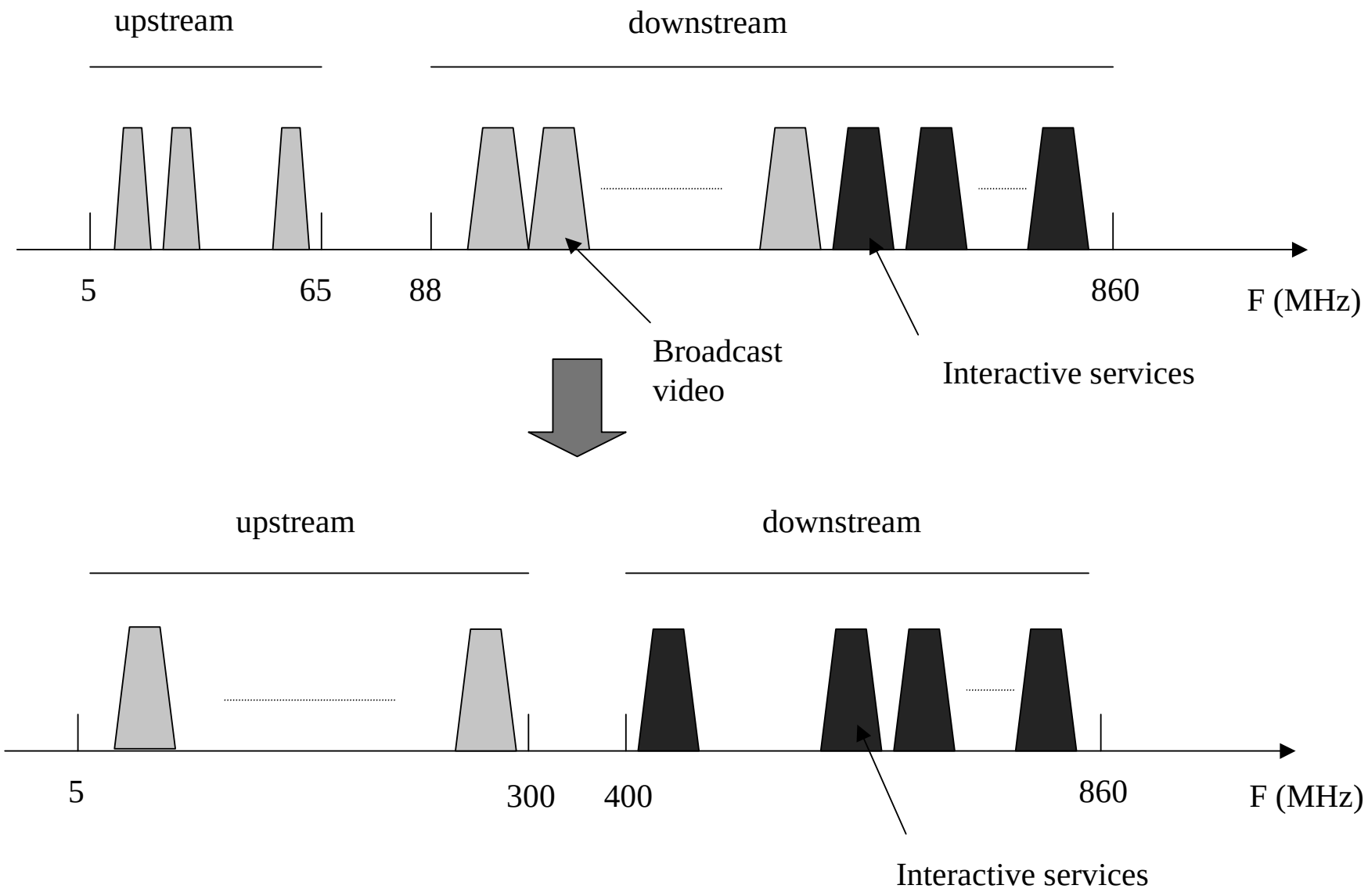
Network architecture



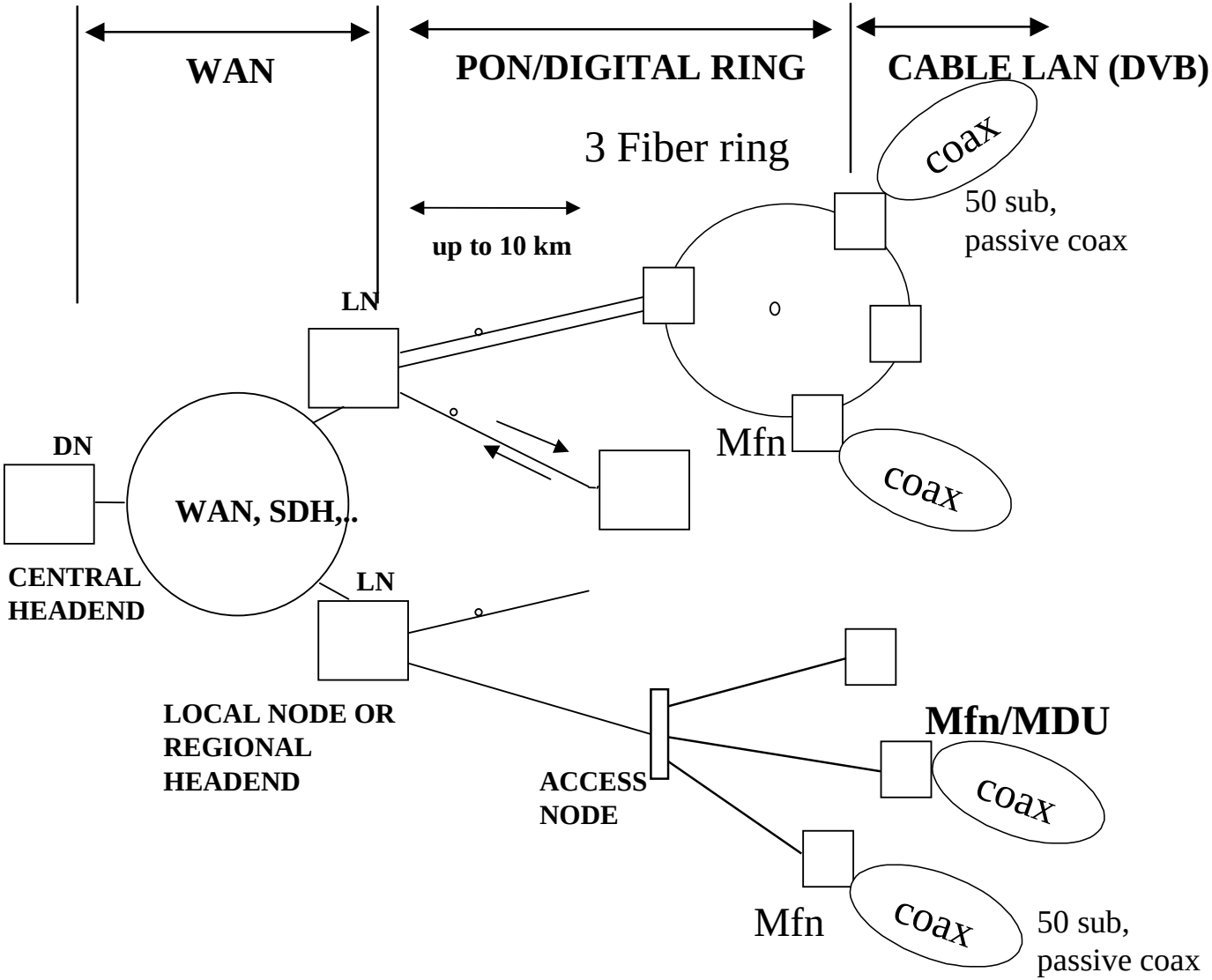
Evolution for 2Mb/s +



Spectrum allocation evol.



Mini Fiber Node



MfN vs Classical HFC

- **Cost / Scalability**
- **Digitisation of transport network**
- **Management simplification**

- **Doesn’t support legacy system**
- **Limited evolution to very high bit rates**

Traffic evolution/ QoS

- From 100 kb/s+ to 4 Mb/s+ (with Midsplit)
- From Broadcast model to virtual Point to point model
- MAC layer simplification (just traffic pipe per subscriber) can be envisaged
- New optimised Physical layers for high bit rate traffic support

Conclusion

- **Interactive protocols fully standardized for both lower and upper layers**
- **QoS / security models well defined**
- **Allow medium bit rate access**
- **Demand for higher bandwidth could modify the picture :**
  - **Singlecast model requires system simplification**
  - **New general high level PHYs could appear**

Imagine the Internet without the wait.