

**What broadband  
.....  
delivery mechanism  
for the future?**

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**Director European Technology  
And Standards**

# Agenda

- **Technical session : introduction**
  - broadband technologies
  - Discussion
- **Coffee break**
- **Case study : VOIP paradigms**
  - Discussion
- **Broadband market perspective : F. Kuypers**
  - discussion

- **Current status**
- **Technology trends**
- **Market trends**
- **Scenario example**
- **Network architecture**
- **FTTH/LMDS/HFC comparison**
- **conclusion**

# Current Status

- **Satellite took advantage of TV program number explosion with digital TV**
- **Digital terrestrial begins**
- **Telco deploy ADSL for Internet access**
- **Cable operators must and will offer multiservice (video+voice+data)**
- **LMDS and Fiber optic appearing**
- **Conclusion :**
  - **Cable only provides currently a multiservice offer..**

# Cable

- **Protocol standardisation :**
  - **Docsis by Cable Labs**
  - **DVB RCCL by DVB : ETSI ratified Standard for cable and LMDS**
  - **Certification organisms**
  - **Packet cable defined over DVB and DOCSIS 1.1**
  - **Supported by major vendors**
  
- **Concl : TECHNOLOGY MATURE, IC'S DEVELOPPED, CHEAP PRODUCTS READY**

# xDSL Access

## Characteristics

- Dedicated line on last drop, shared resources for the rest
- Integrated voice & data
- Coverage potentially every POTS but limited by upgrade of telco network

## Strengths & Weaknesses

- Telcos have cash to rollout such service
- Huge potential customer base
- Bundling of voice and data, but no video (yet)
- Speed dependent on distance; upstream rate limitation
- Higher penetration causes crosstalk (xDSL->xDSL, xDSL->ISDN)

## Players

- Incumbent Telcos, Mannesmann (Deu), Albacom (Ita), Arrakis (Esp) Jazztel (Esp), 9 Telecom (Fra)

# **XDSL : conclusion**

- **SOME PROBLEMS**
  - **INSTALLATION TIME, PERFORMANCES**
- **LIMITED TO DATA+VOICE**
- **ECONOMICAL SOLUTION FOR TELCO**
- **DEPLOYMENT NOT AS FAST AS EXPECTED**

# Fixed Wireless (LMDS)

## Characteristics

- Frq's (28/40 GHz)
- Line of sight
- Coverage (LMDS 1-5km)
- Capacity (LMDS 100+ channels)

## Strengths & Weaknesses

- Fast deployment
- Frequencies limited (license)
- Line on sight

## Players

- Winstar (Deu, Ndl, Bel, UK, Fra?), Banda26 (Dei, Esp, Fra?), Formus(Pol, Deu, Fin, Aut, Ire), Telenordia (Swe)
- Focus mainly on small & medium enterprises (SMEs)

# Technology trends

- **bidirectional bandwidth available**
  - Cable/ADSL offer that to the subscriber
- **Cost of bandwidth reducing in access:**
  - 40 GHz LMDS technology affordable
  - FTTH technology available
- **Bandwidth capacity exploding in backbone :**
  - WDM transport, high speed routers
- **Price of storage exponentially decreasing :**
  - VOD / local storage cost effective

# Market trends

- **Deregulation : Operators struggling to offer multiservice (video/voice/data)**
- **Customer : demand for bandwidth will explode (from .5 Mb/s to 10+ Mb/s) : WHY?**

# Bandwidth demand increase

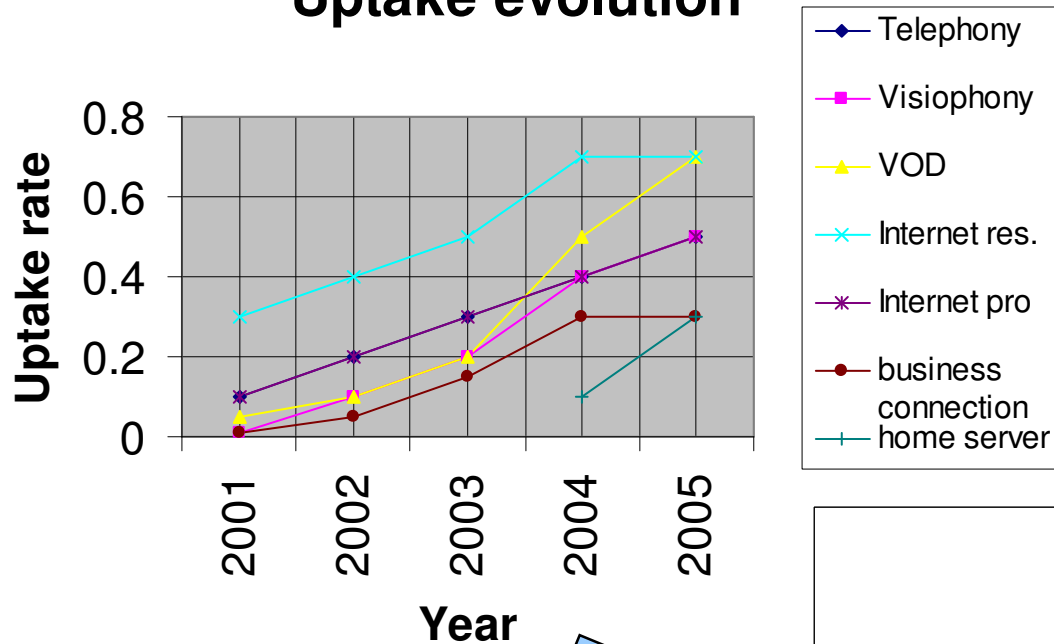
- **Customer has access to higher bit rate with Cable/DSL, and becomes bandwidth demanding**
- **Applications begin to appear :**
  - **Multicast events**
  - **“NOD/VOD” becomes available**
  - **VOD trials show positive customer reaction**
  - **Content exchange applications appearing (Napster, etc.); can extend to video**

# conclusion

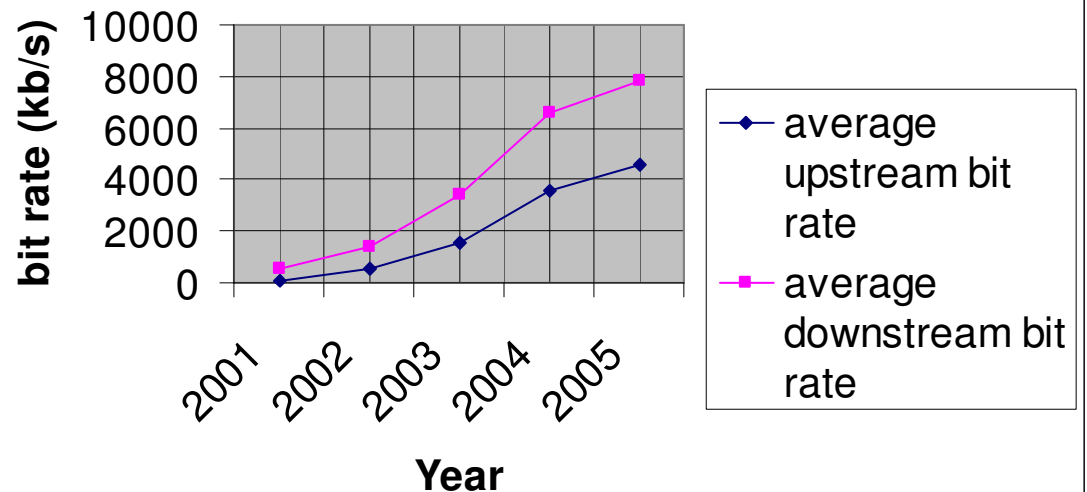
- **Technology is ready**
- **Applications are there**
- **Customer has an enthusiastic reaction**

# Scenario example

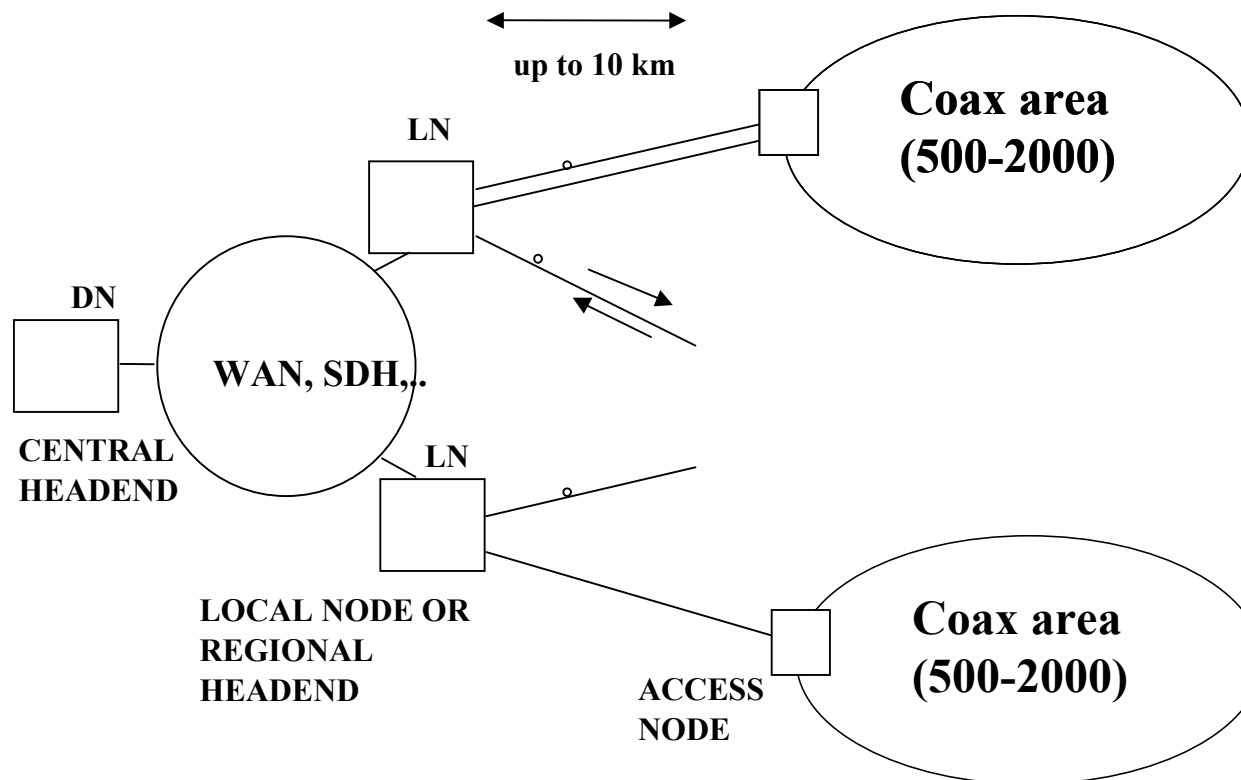
## Uptake evolution



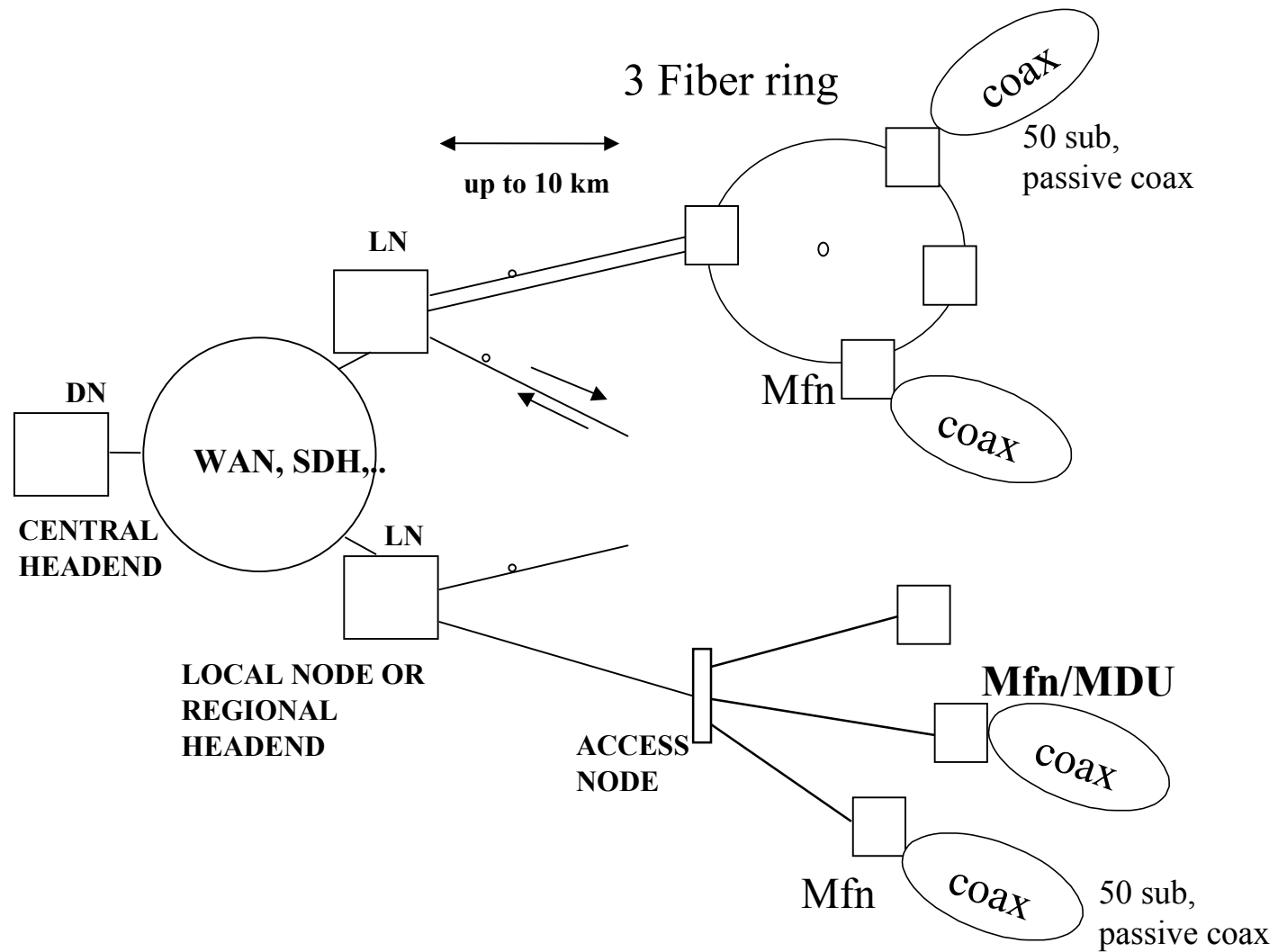
## Average bit rate per sub.



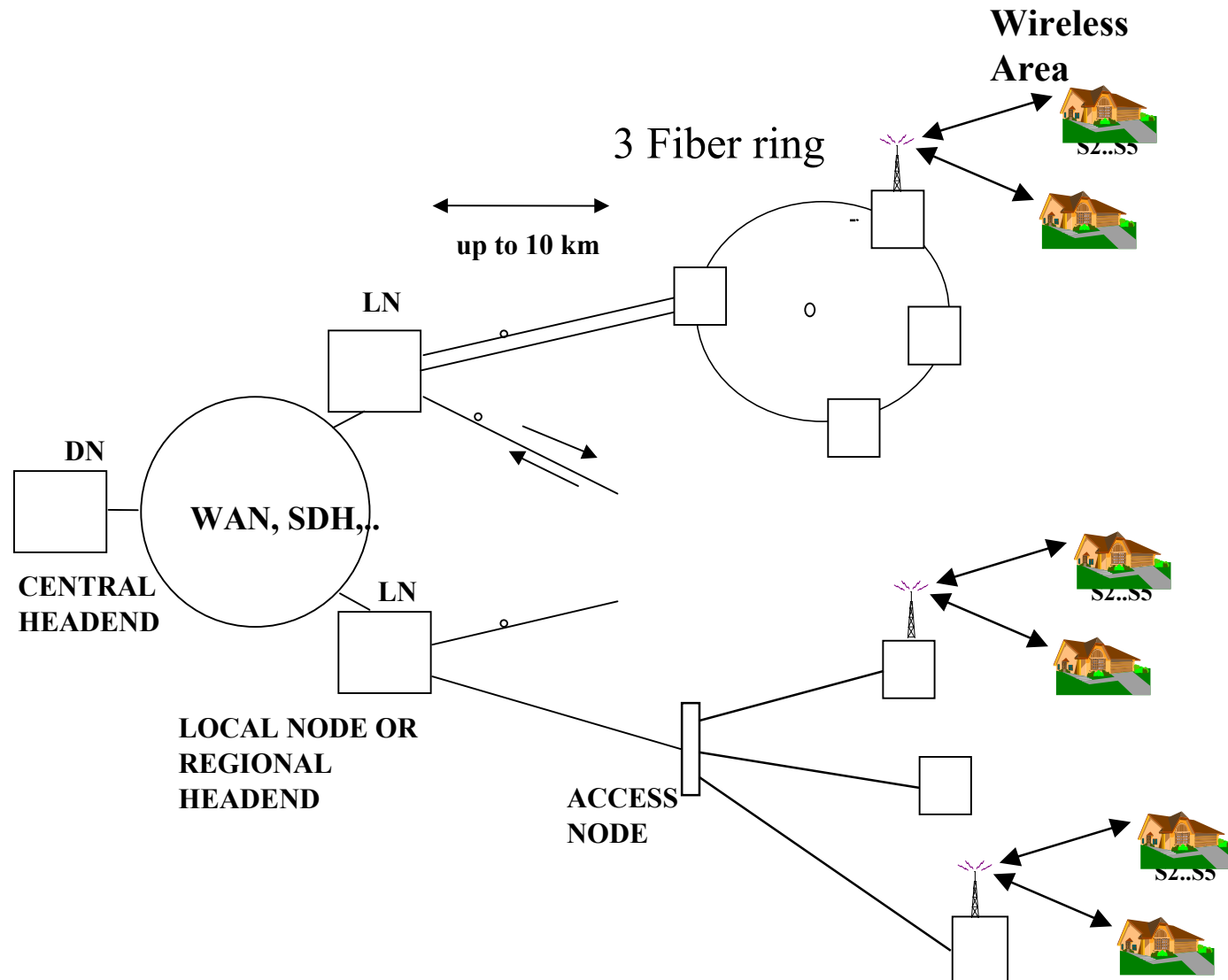
# Architectures examples



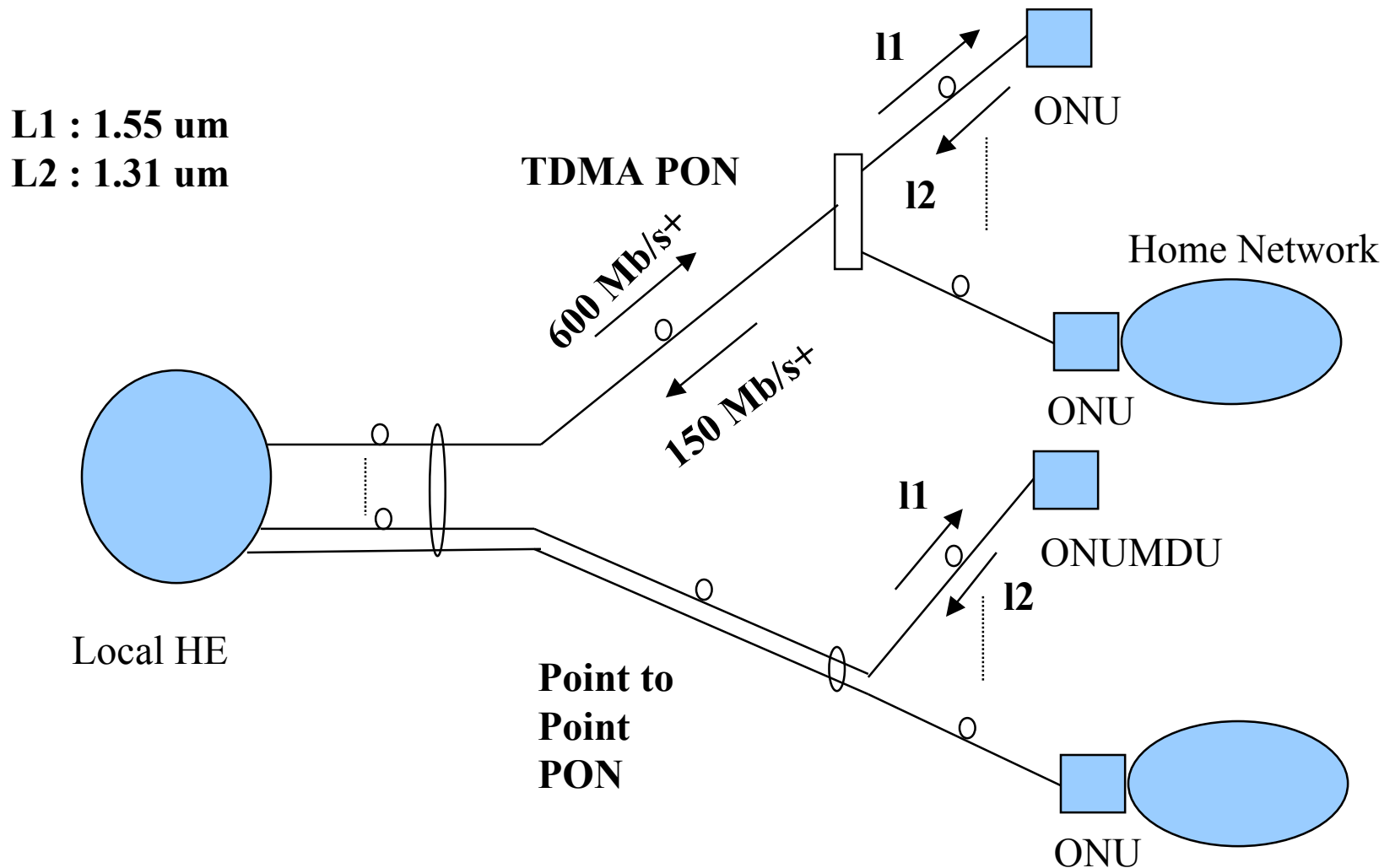
# Architectures examples : MfN



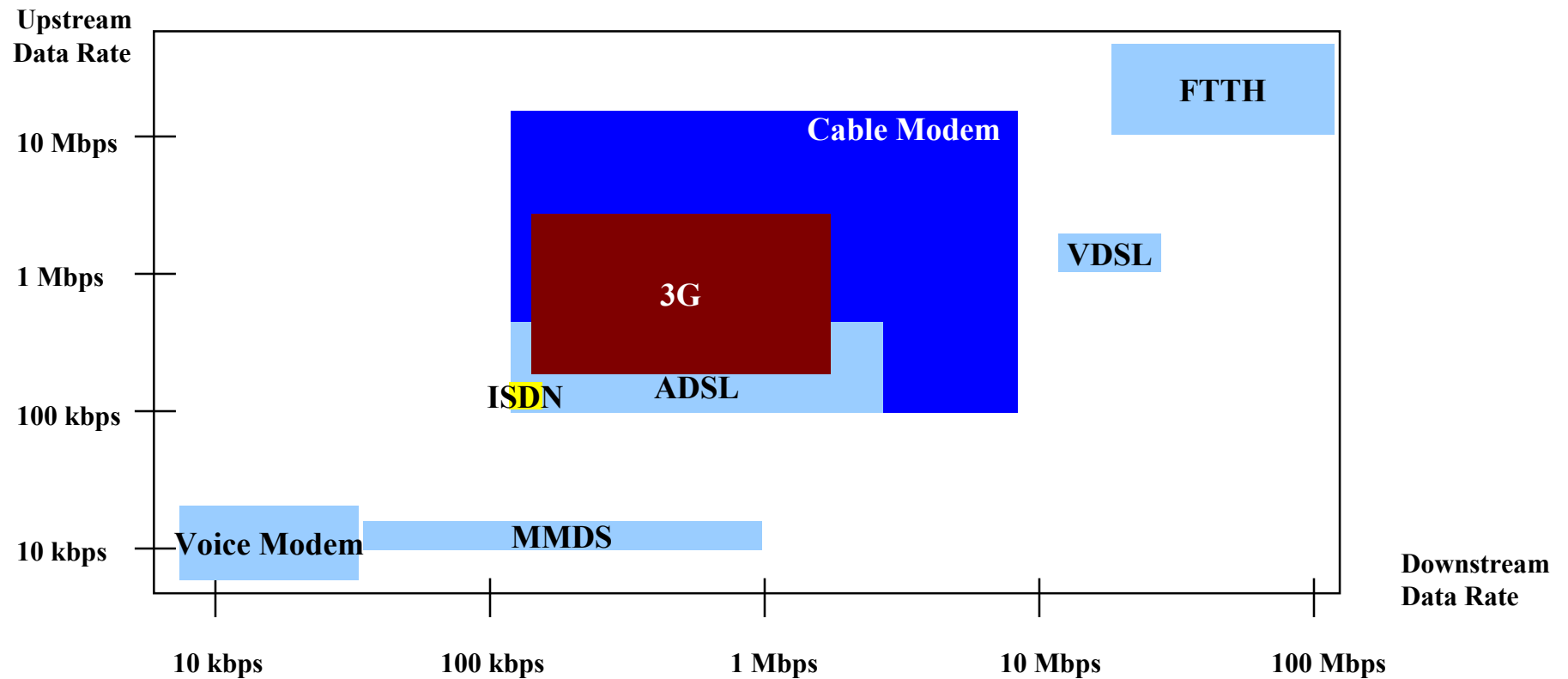
# Alternative : HFW



# PON PTMP/PTP architectures



# Broadband Utilisation



# Access techniques features

	FTTH	LMDS	CABLE
IFC/SUB, 100% up	1.8	0.8	1
installation	slow	fast	Slow
scalability	best	medium	Medium
Maintenance issues	Fiber cut	EMC, cell to cell, line of sight	EMC, ingress, ageing
security	Needs layer 2 sec.	Need layer 2 sec.	Need layer 2 sec.
unbundling	simple	Medium	Medium
issues	Need high uptake	Licence cost, channel standard	Need high uptake
Bandwidth	10 Mb/s+	2Mb/s	2Mb/s

# Conclusion

- **High bit rate capability of backbone and access network will privilege real time access over push**
- **Cable/LMDS are very competitive compared to XDSL**
- **FTTH is a realistic option if bandwidth demand explodes**
- **Satellite/terrestrial :**
  - **Cellular networks for terrestrial?**
  - **Mixed broadcast/ interactive network for satellite?**