Enabling Multicasting for Access Networks

Daniel Duchow, Thomas Bahls and Dirk Timmermann

University of Rostock and Siemens AG Greifswald, Germany

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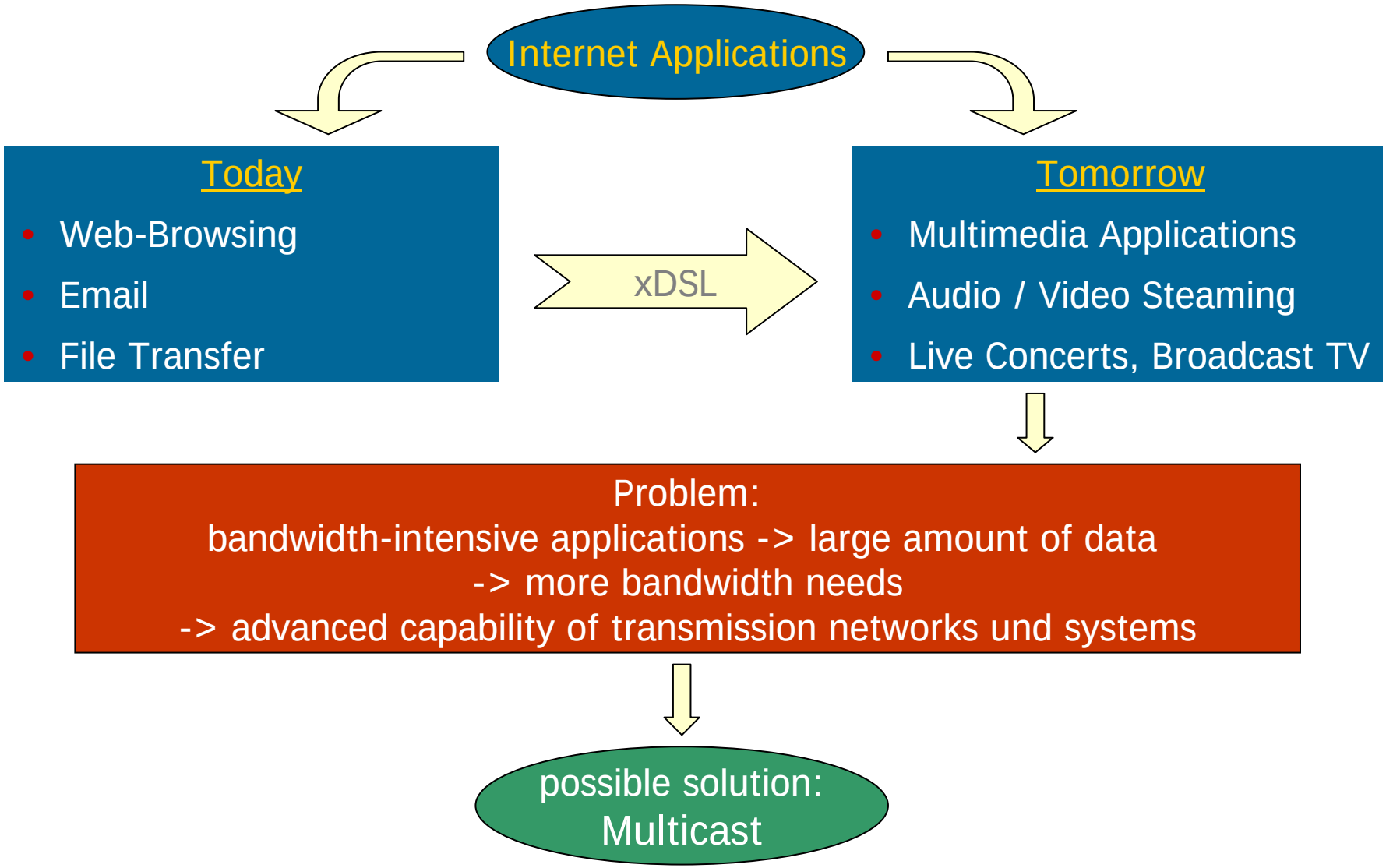
Agenda

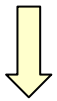
- Motivations
- Multicast Features
- Access Networks
- Concepts for Multicast-capable Access Networks
- Conclusion

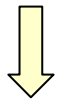
Motivations



Multicast Features

Multicast = Group Communication





Characteristic

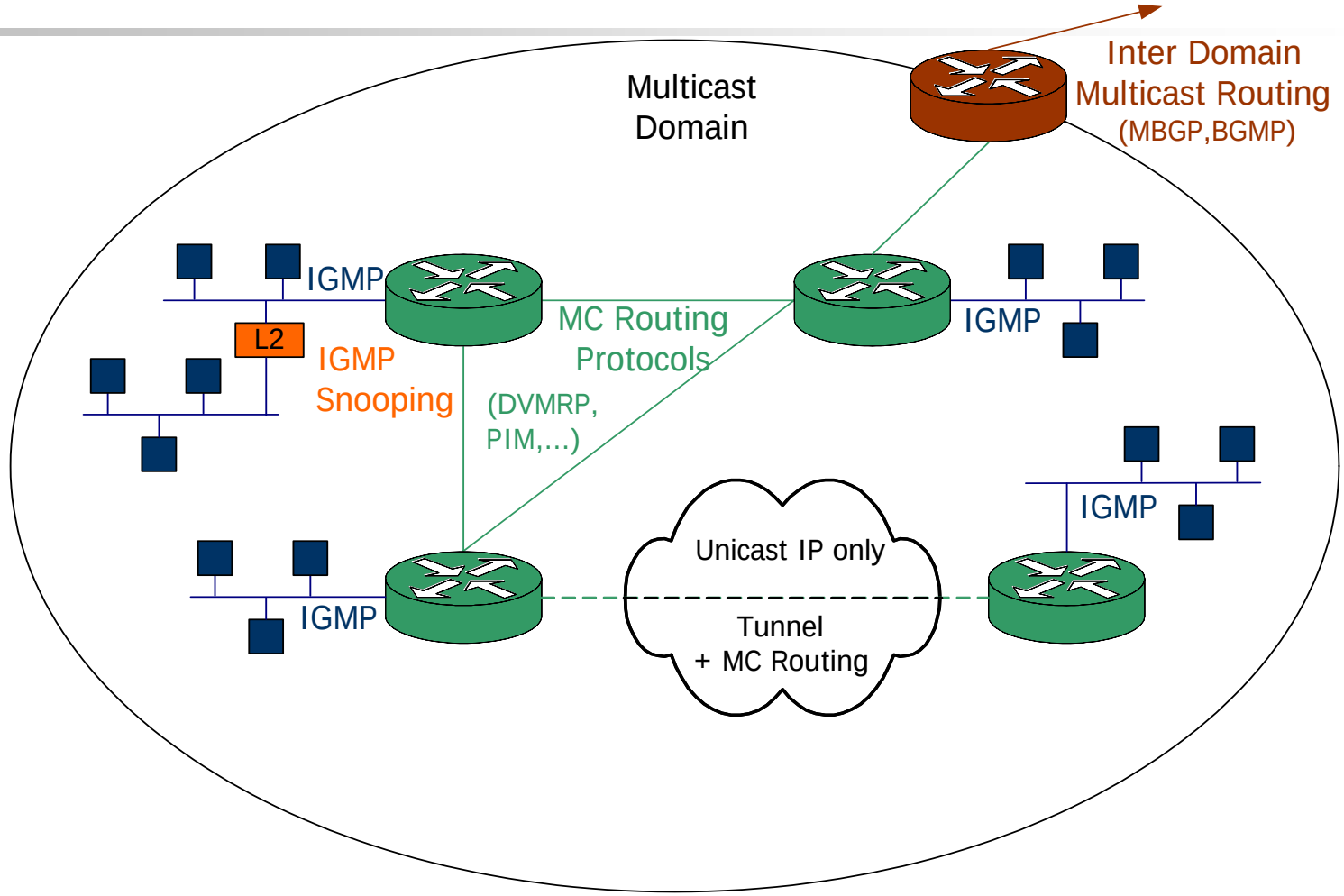
- Sent data only ONCE over a link
- Destination is always a GROUP
- NO needless forwarding

Goals

- Save network resources (bandwidth)
- Decrease switching resp. end-to-end delay
- Good scalability

Today usually supported in LANs and MBone

Multicast Service Model

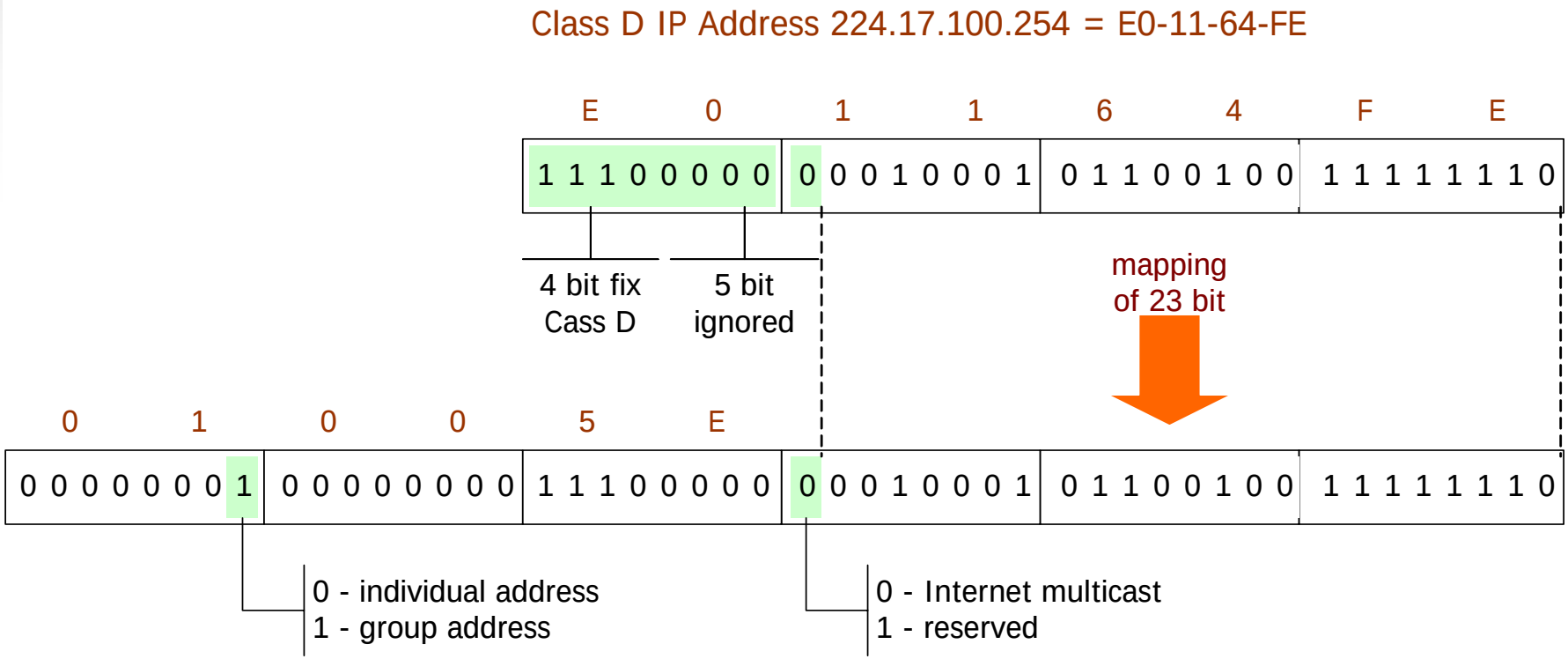


IGMP	Internet Group Management Protocol
DVMRP	Distance Vector Multicast Routing Protocol
PIM	Protocol Independent Multicast

Multicast Communication Layer Dependency

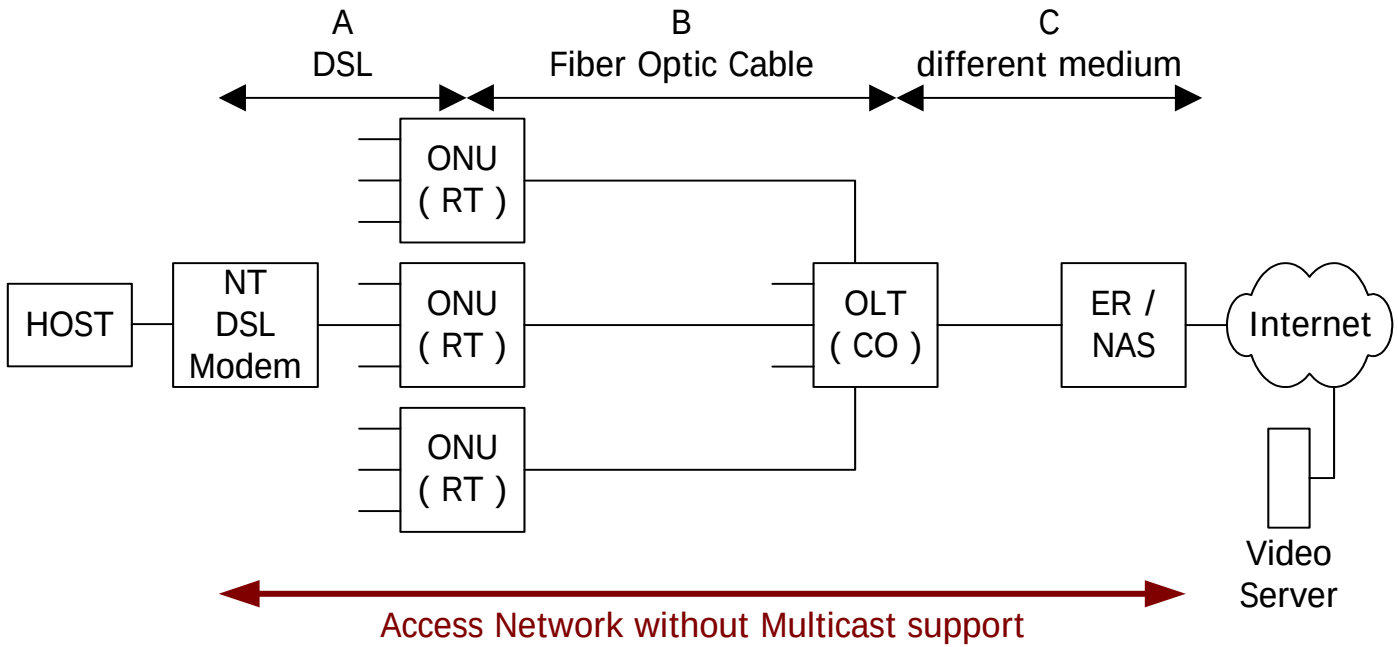
Data Link and Network Layer

Relationship between IP and Ethernet Multicast addressing



Access Networks

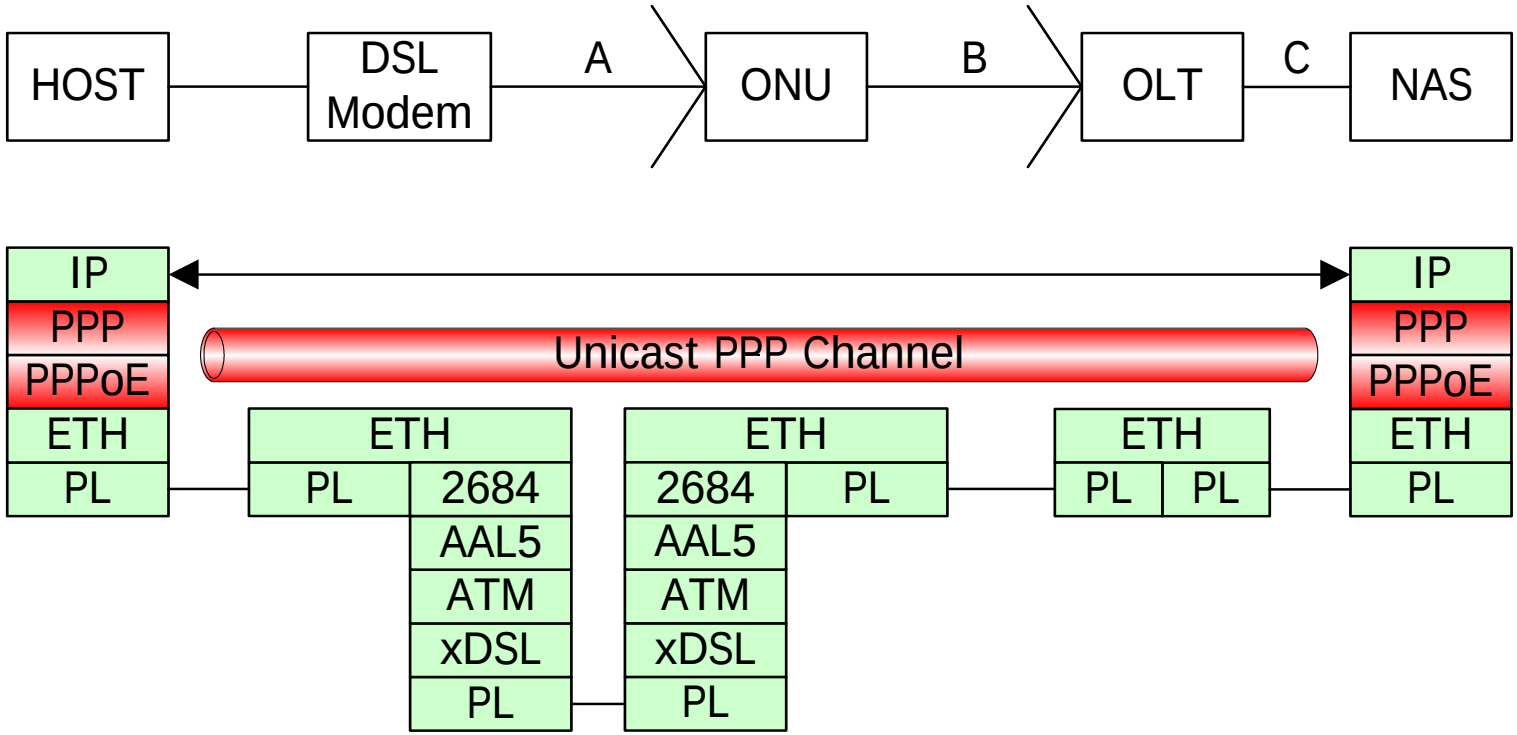
- Access Network, Last Mile, Local Loop
- Services: Internet, xDSL, ISDN, POTS



ER/NAS	Edge Router / Network Access Server
OLT (CO)	Optical Line Termination (Central Office)
ONU (RT)	Optical Network Unit (Remote Terminal)
A,B,C	Network Section

Ethernet based Access Network without Multicast Function

- Ethernet as future Access Network technology
- But no native IP/Ethernet Multicast Support possible
- Only Unicast because of PPP(oE) from subscriber to NAS



Concepts for Multicast-capable AN

Problem: PPP blocks multicast between layer 2 and layer 3

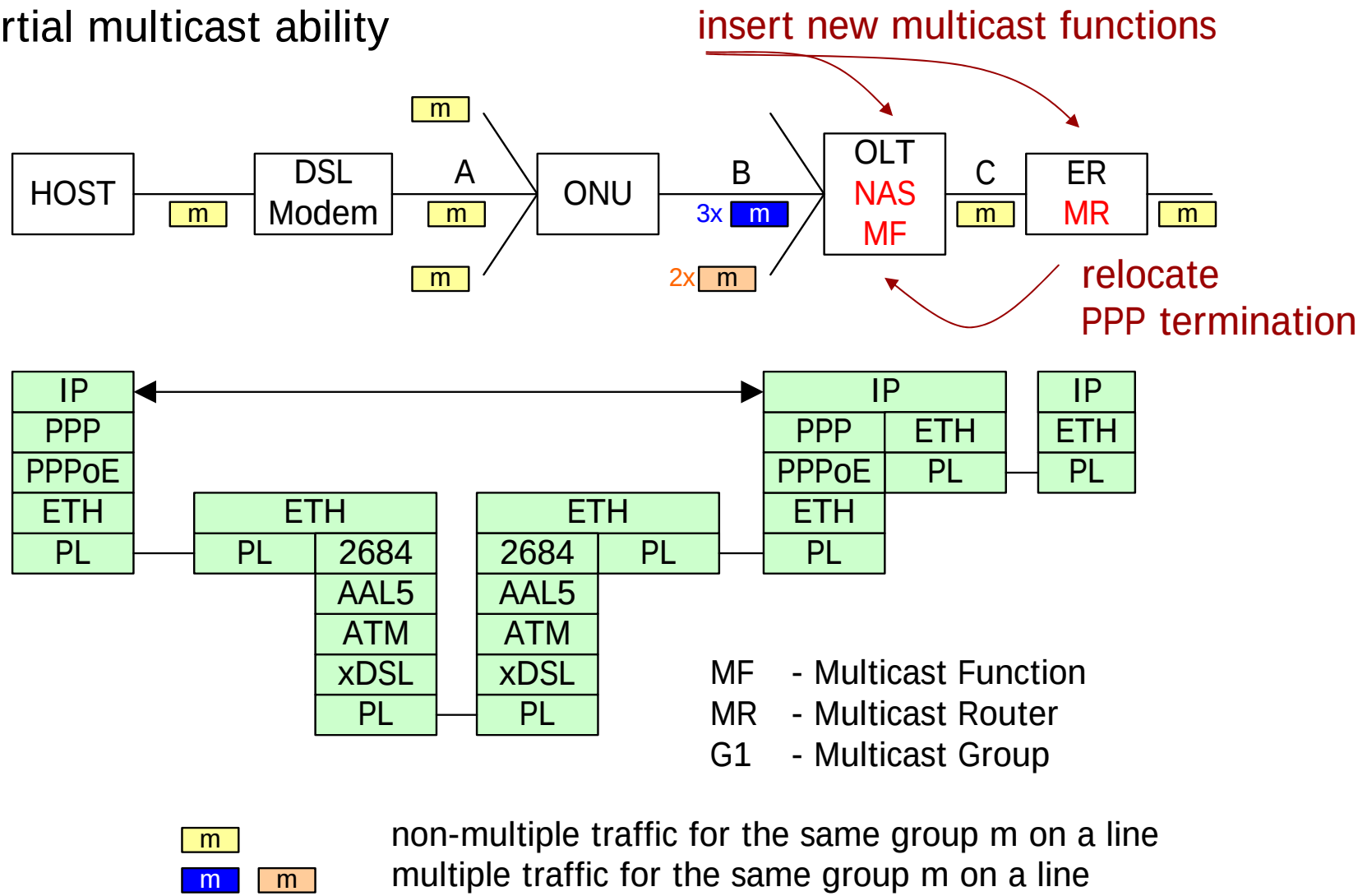
necessary measures for a solutions

1. Changes in network system functions and location
   - either PPP termination (NAS) is moved inside Access Network
   - or PPP is substituted by another method for user authentication and Network Interface Card (NIC) configuration (this are the only features of PPP used in xDSL based access scenarios)
2. Implementation of a multicast functionality
   - either a full-function multicast router (divers standards) for network layer multicast (resp. link layer multicast functions)
   - or a smaller multicast managing and forwarding function (proprietary)

Result → Multicast-capable Access Network

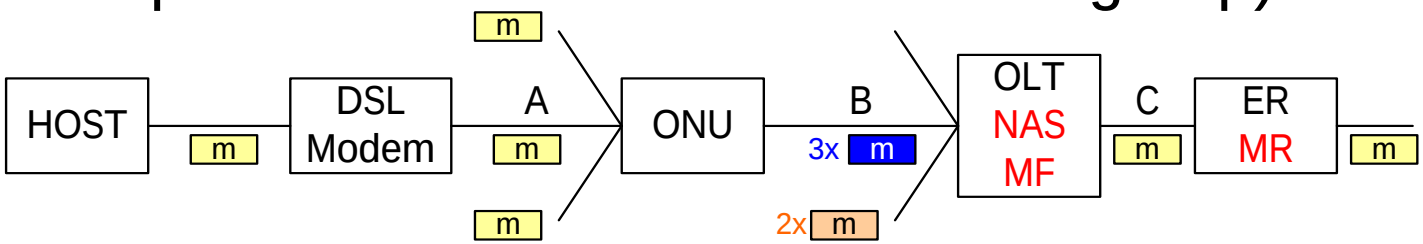
Multicast Support by OLT

Partial multicast ability



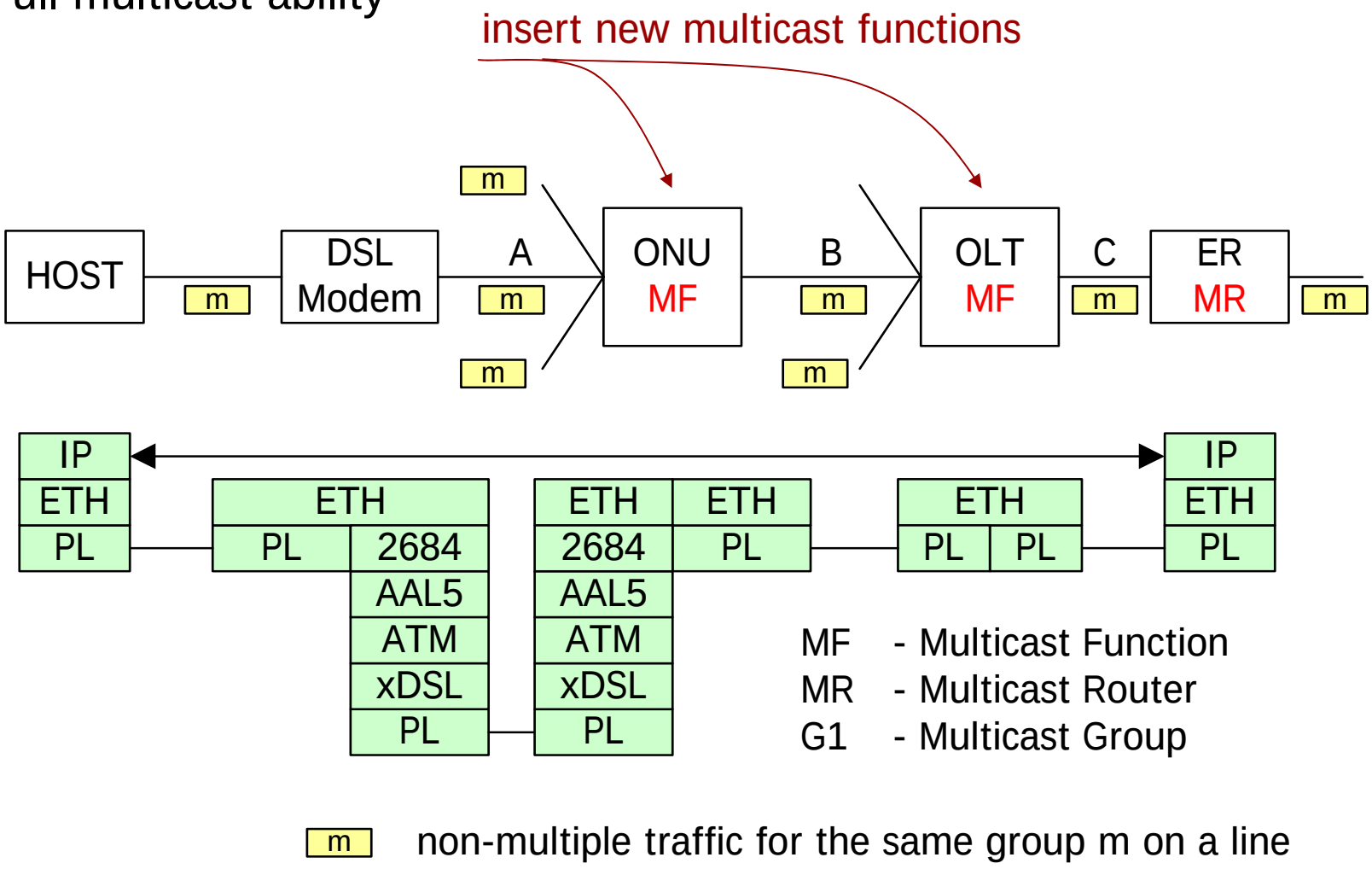
Multicast Support by OLT (2)

- Effort
  - Relocation of PPP termination (NAS) from border of Access Network into the OLT
  - Implementation of multicast functionality in the OLT
- Advantages
  - IP multicast is generally enabled
  - Substantially load rejection of network section C
- Drawbacks
  - No full multicast support (section B is still loaded with multiple multicast traffic for the same group)



MC Support without using PPP(oE)

Full multicast ability



MC Support without using PPP(oE) (2)

- Effort
  - Replacement of PPP with other Ethernet/IP based methods for user authentication and NIC configuration (e.g. DHCP and IEEE802.1X)
  - Implementation of layer 2 multicast functionality (e.g. IGMP snooping) in the OLT and ONU
- Advantages
  - Full multicast support over the entire access network
  - All network sections are loaded by a minimum of traffic
  - Smaller complexity of needed multicast functions (std. link layer multicast possible)
- Drawbacks
  - Requires advanced effort in development and implementation

Other Conceptual Design Ideas

- Multicast support by ONU and OLT with replacement of NAS from border of network into the ONU (instead OLT)
  - full multicast support
  - but very decentral location of NAS
- PPP manipulation
  - No encryption in PPP
  - Snooping of IGMP messages and Insertion of multicast traffic

Conclusion

- Rise of Penetration of xDSL high speed Internet access
- More intensive use of bandwidth-intensive applications
- IP multicast relieves transport networks and systems
- Service-oriented redesign of Access Networks is needed
- Multicast is going to be further developed (e.g. in Inter Domain MC Routing like BGMP)
- Many multicast technologies are already adequate in use

Multicast could be a key technology for the Internet in future, so let‘s enable it for Access Networks!

Thank You.

Questions?