# Architecture aspects of Optical Transport Networks

ITU-T SG15 Q12

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# Layer architecture of communication networks

- OSI 7 layer model (X.200)

| | OSI layer | Example Protocol |
|---|---|---|
| 7 | Application | ftp |
| 6 | Presentation | |
| 5 | Session | |
| 4 | Transport | TCP |
| 3 | Network | IP |
| 2 | Data Link | Ethernet MAC |
| 1 | Physical | IEEE802.3 PHY |

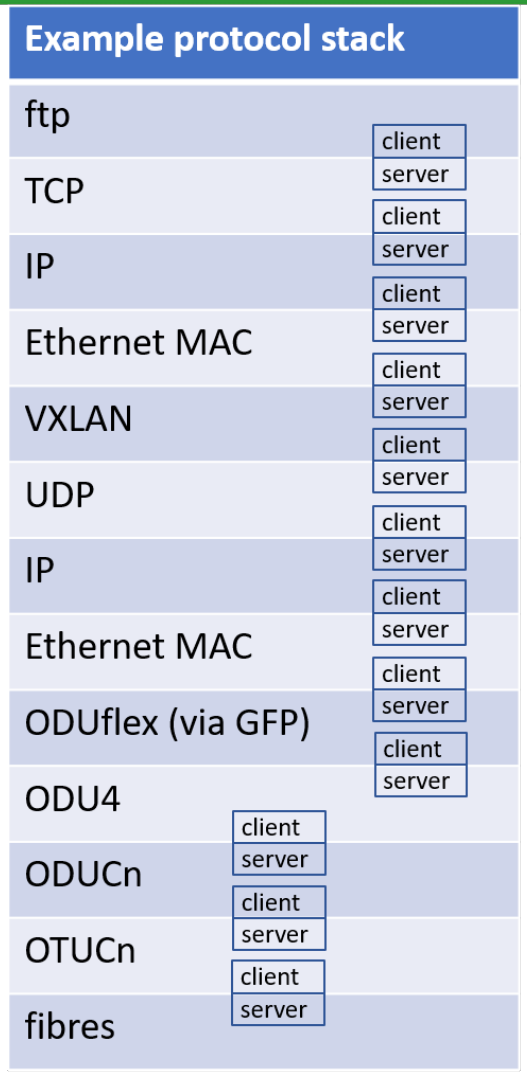
- Current communication stack

| Example protocol stack |
|---|
| ftp |
| TCP |
| IP |
| Ethernet MAC |
| VXLAN |
| UDP |
| IP |
| Ethernet MAC |
| ODUflex (via GFP) |
| ODU4 |
| ODUCn |
| OTUCn |
| fibres |

**ITU-T SG15**
**Optical Transport Network**

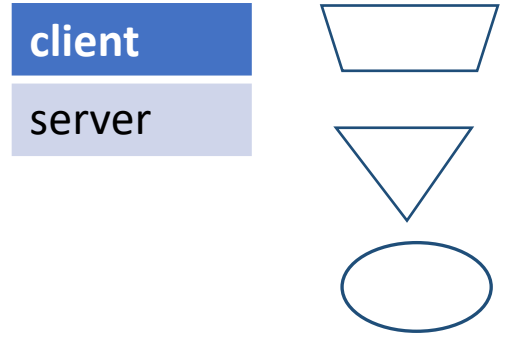
# Client/Server layer architecture

- In SG15, transport networks are modelled as a set of recuring layer networks each of which offers the same service using a specific protocol (the characteristic information).
- A client layer is supported by a server layer. e.g., Ethernet MAC over ODUFlex.
- The pattern is repeated as many times as needed.

# Architecture of optical transport networks

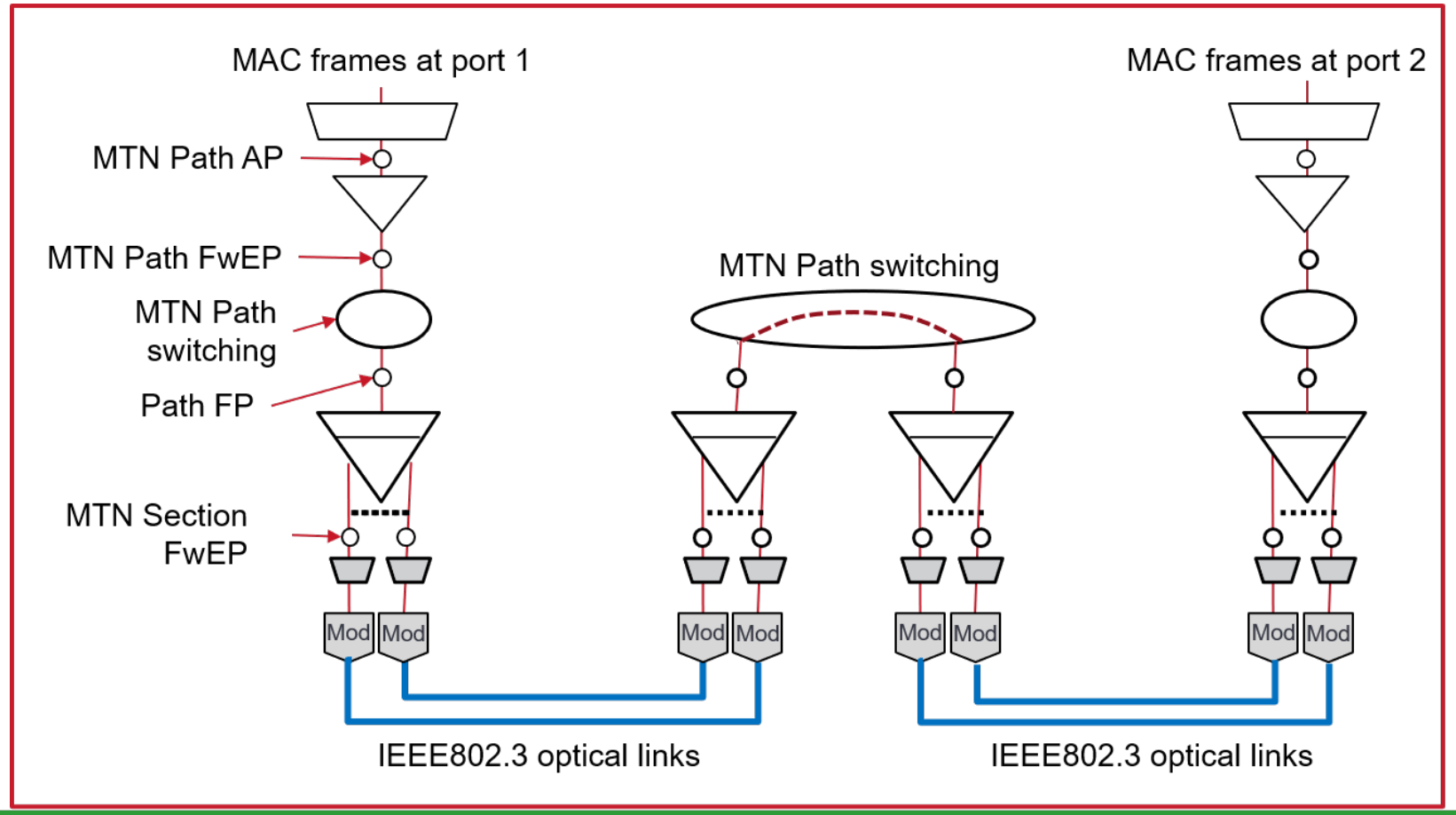
- ITU-T G.800 “Unified functional architecture of transport networks”
  - Describes layer network functions and topology constructs
- ITU-T G.807 “Generic functional architecture of the optical media network”
  - Describes functions and topology of media (e.g., optical fibres) that supports light waves




<u>Technology specific architecture Recommendations</u>

- OTN ITU-T G.872 “Architecture of the optical transport network”
- Ethernet ITU-T G.8010 “Architecture of Ethernet layer networks”
- MPLS-TP ITU-T G.8110 “MPLS layer network architecture”
- MTN ITU-T G.8310 “Architecture of the metro transport network”

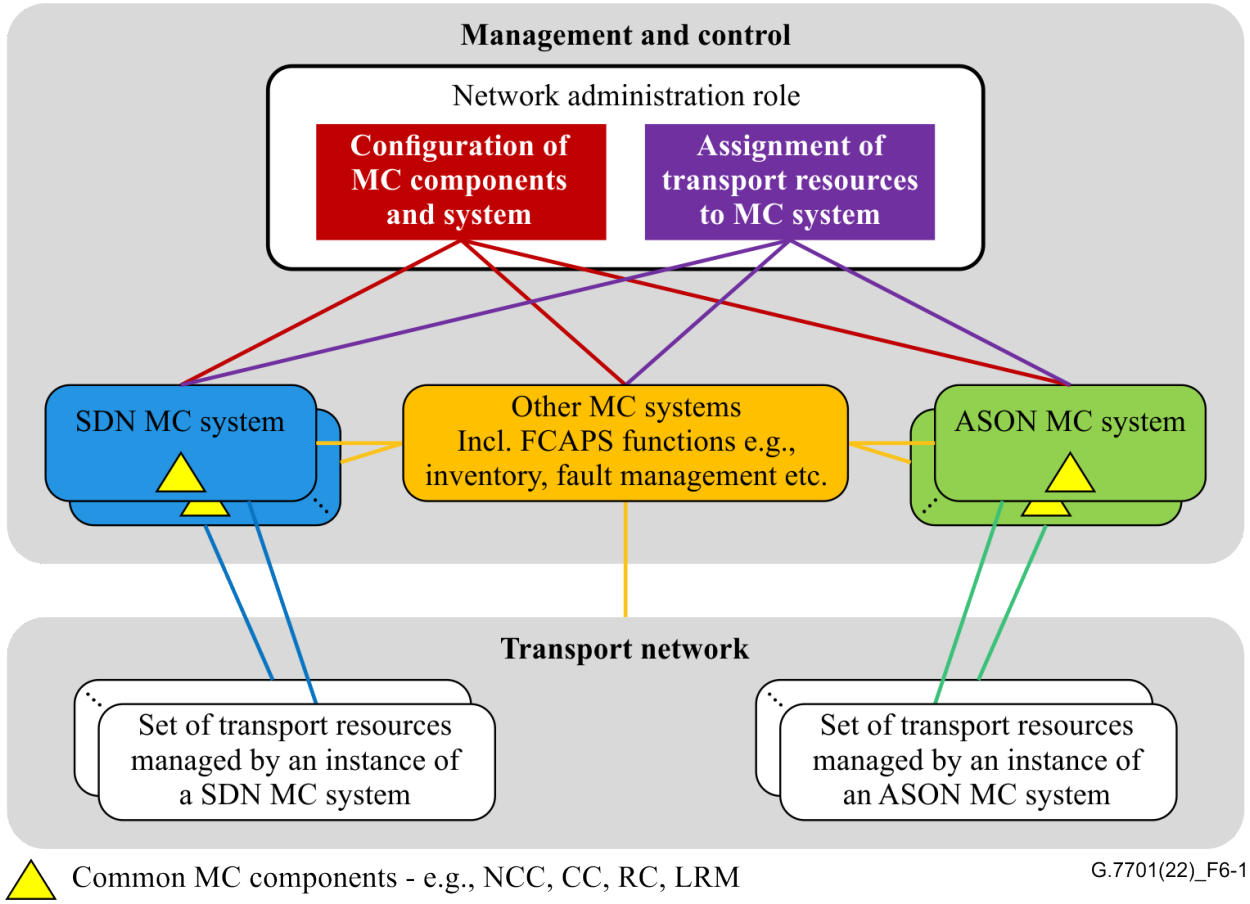
# MTN Example of G.800 and G.807 diagrammatic conventions



# Management and control

- What is the difference between management and control?
  - Management refers to functions that configure equipment to provision and monitor connections. Historically management procedures were manual.
  - Control refers to automation of management functions such as discovery, connection setup, connection monitoring.
- Management and control (MC) can be viewed as functions on the same continuum

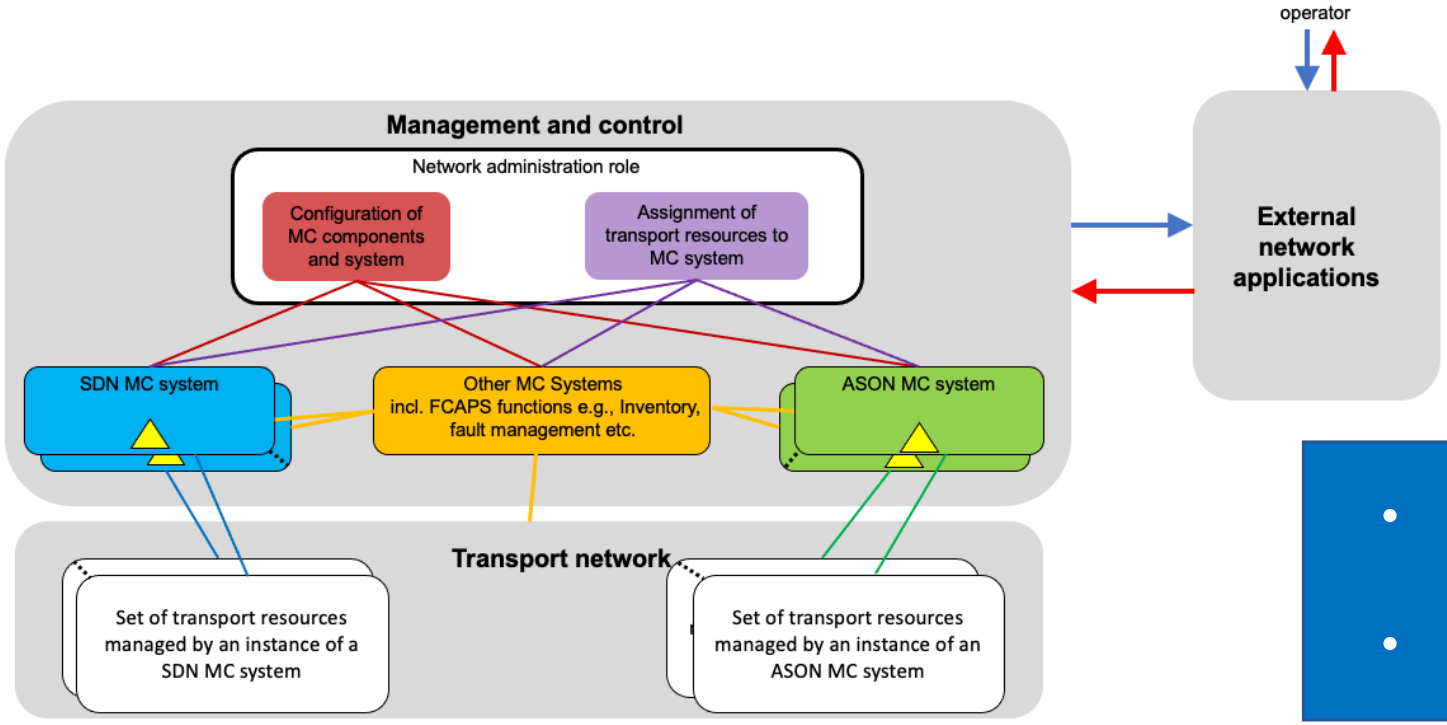
# Management and control architecture




- Management and control continuum
  - Simplify the MC system architecture to avoid the duplication of MC functions
  - Flexible deployment, i.e., centralized, distributed or hybrid
  - Real-time monitoring of resource status and dynamic network control
- Series of MC architecture Recommendations
  - G.7701: Common control aspects
  - G.7702: SDN architecture
  - G.7703: ASON architecture

# Application of ML/AI to optical transport networks

- A typical area of AI/ML application is to enhance the intelligence of transport network management and control.
- AI/ML applications can be viewed as a type of external network applications that use the data from a transport MC system.




- Operation efficiency ↑ OPEX ↓
- Resource utilization ↑ CPEX ↓

# External collaborations on management and control

- Management and control architecture (ONF OIMT)
- Core information models, Lifecycle states of transport resources (ONF OIMT)

- Coordination on the management of Synchronization (IEEE 1588)
- Coordination on Ethernet OAM model (IEEE 802.1)

- Management and control architecture (OIF networking and operations WG)

# Q&A