

# Architecture aspects of Optical Transport Networks

ITU-T SG15 Q12

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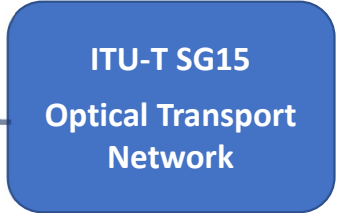
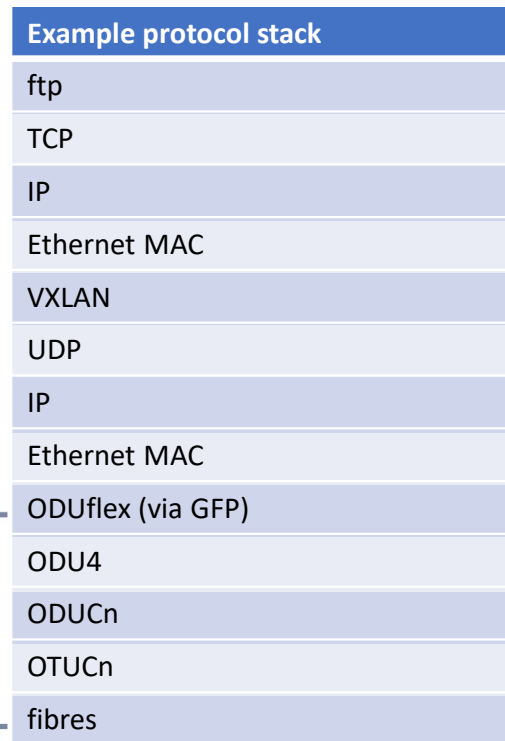
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# Layer architecture of communication networks

- 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



# Client/Server layer architecture

- In SG15, transport networks are modelled as a set of recurring 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.



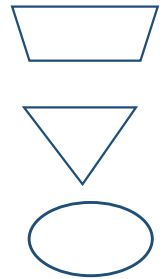
Example protocol stack	
ftp	client
TCP	server
IP	client
Ethernet MAC	server
VXLAN	client
UDP	server
IP	client
Ethernet MAC	server
ODUflex (via GFP)	client
ODU4	server
ODUCn	client
OTUCn	server
fibres	client

# 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

client

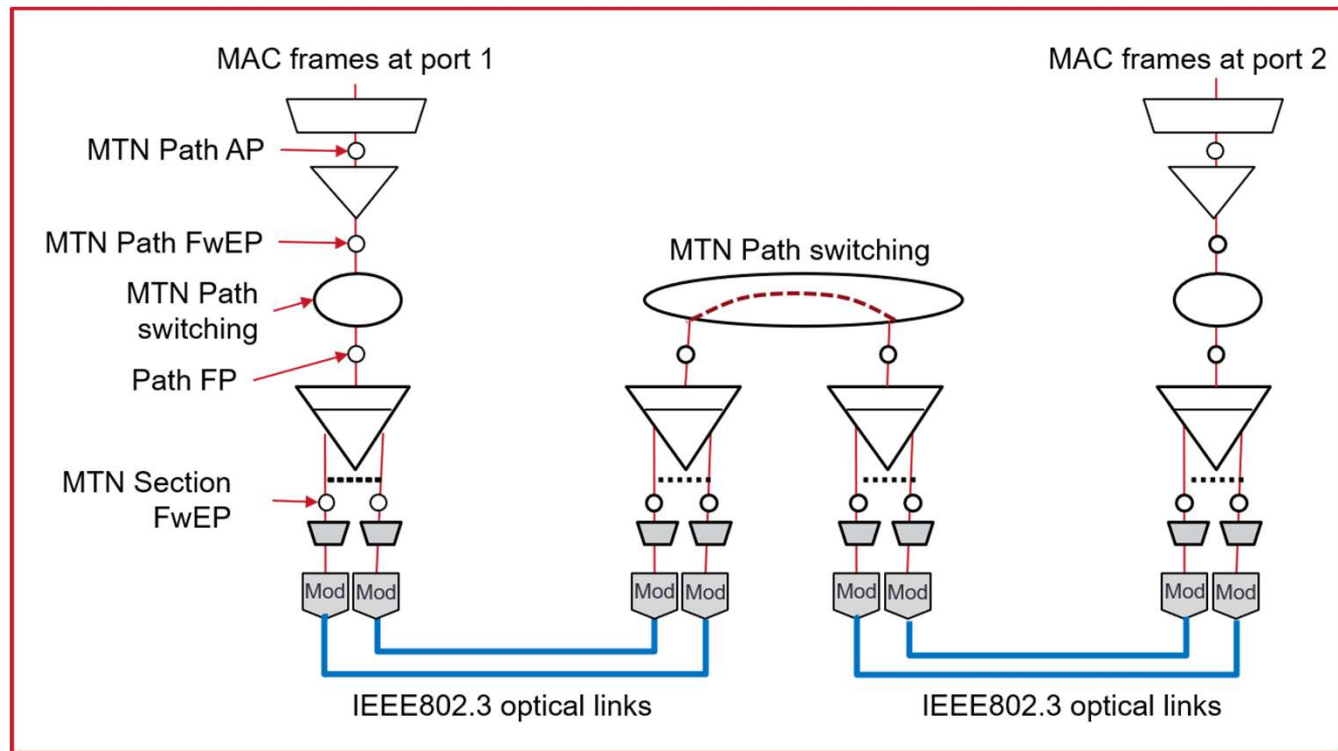
server



## Technology specific architecture Recommendations

- 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”

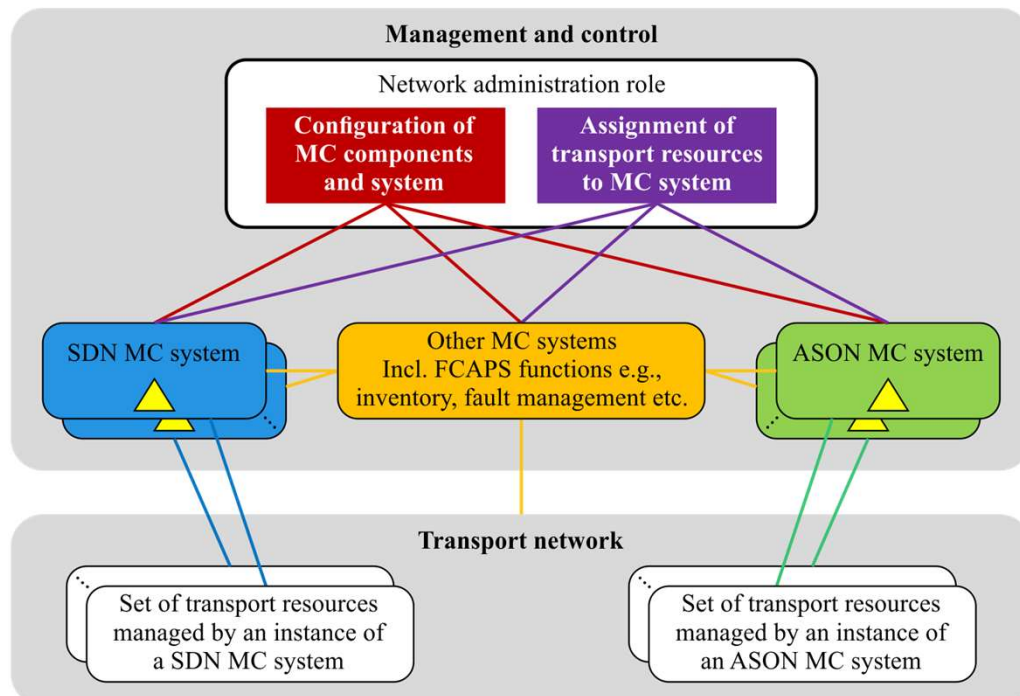
# MTN Example of G.800 and G.807 diagrammatic conventions



# 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



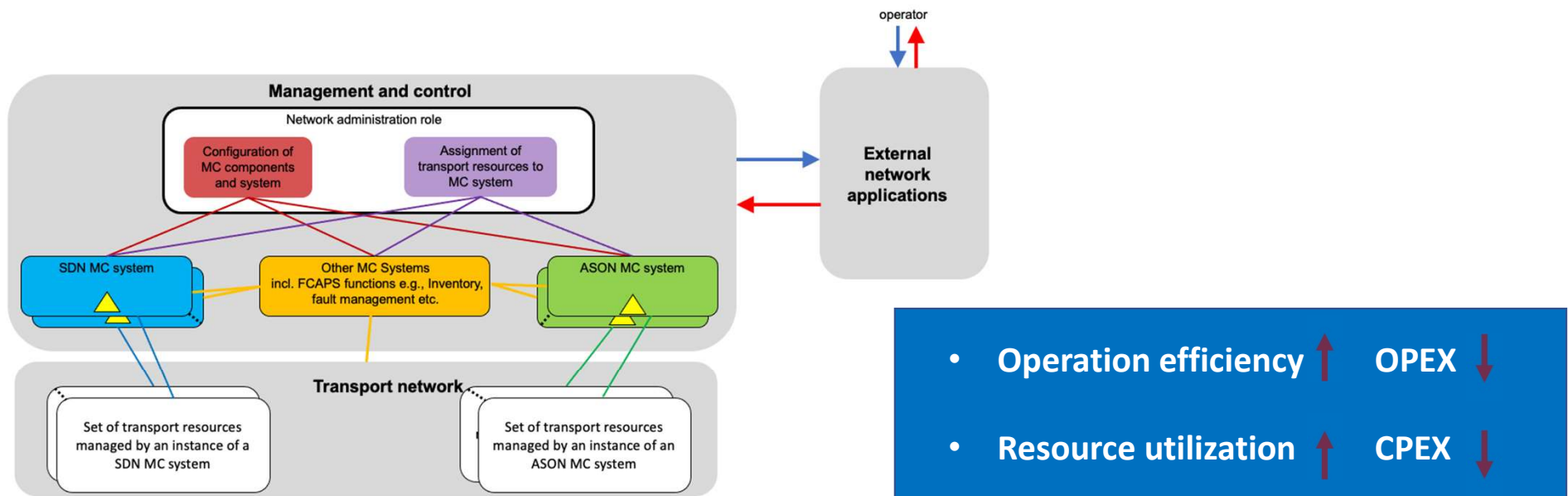
▲ Common MC components - e.g., NCC, CC, RC, LRM

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- 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.





# 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