

# ***FlexE framework and Signaling***

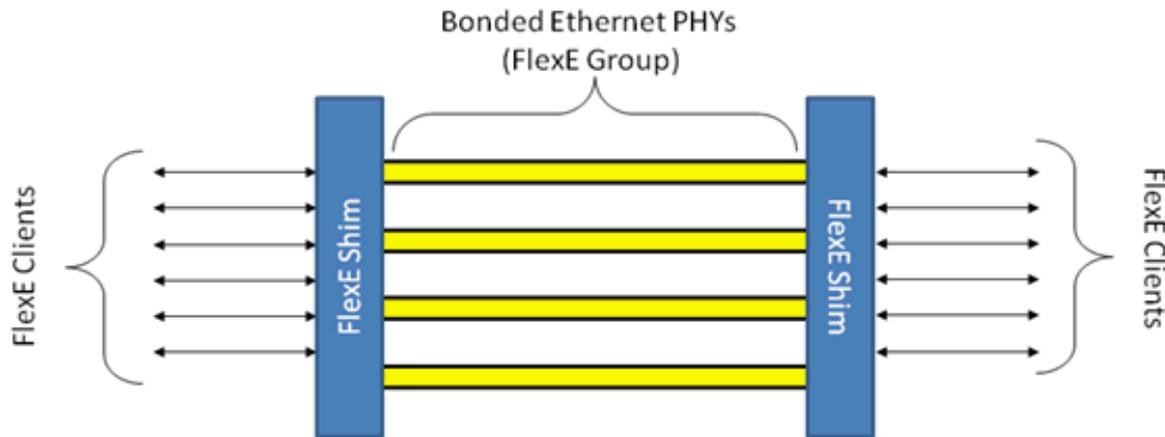
**draft-wang-ccamp-flex-fwk-00**  
**draft-wang-ccamp-flex-signaling-01**

*Qilei Wang (wang.qilei@zte.com.cn)*

**ZTE**

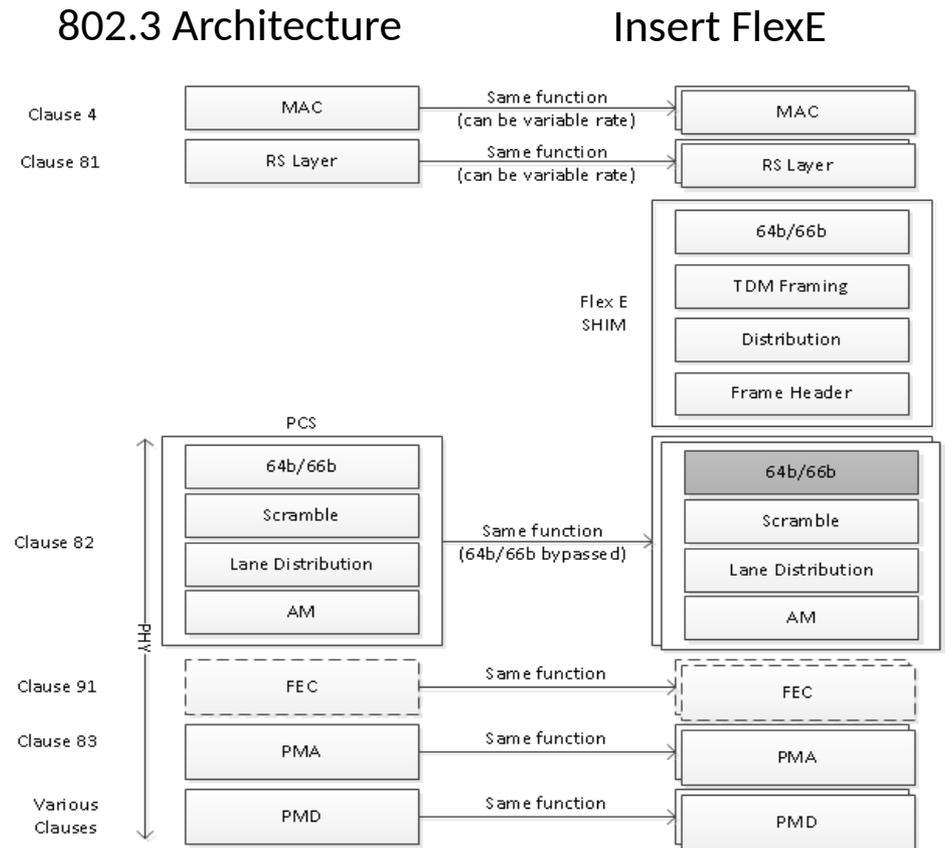
# Background

- OIF has released Flex Ethernet Implementation Agreement 1.0.
- FlexE is a new kind of data plane technology and can be used to support a variety of Ethernet MAC rates that may or may not correspond to any existing Ethernet PHY rate.
- Currently, the Ethernet PHY used by FlexE is 100 GE PHY. Every PHY is modeled by the FlexE shim as 20 slots. Each slot has a granularity of 5G.



# Background

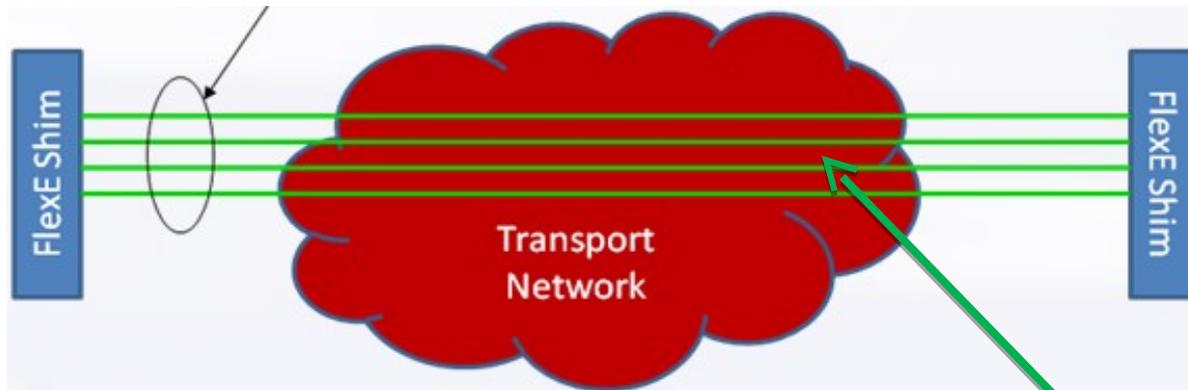
- Relationship to IEEE 802.3 Stack
- FlexE shim can be envisioned as being in the middle of the 100GBASE-R stack.



Note: 40/100GE clauses used for example

# Scenarios and Layer Model

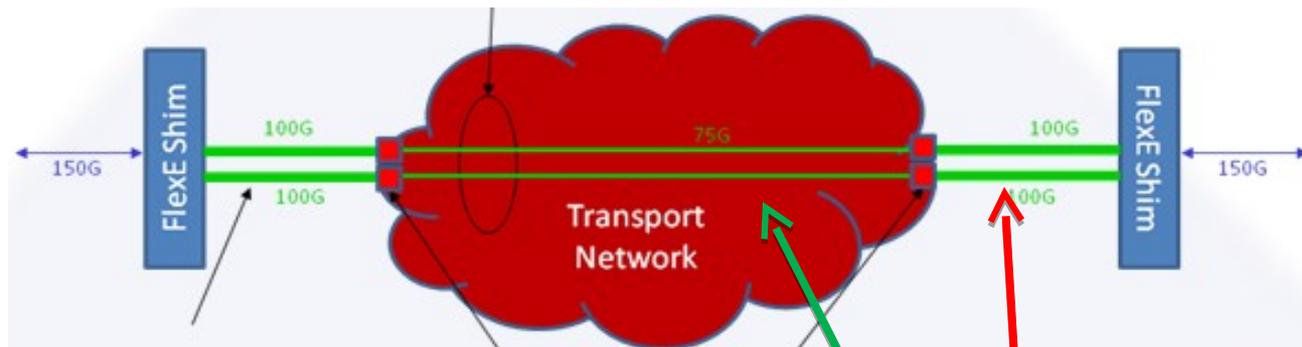
- Unaware case: this may be used with legacy transport equipment that provides no special support for FlexE.



- Signal carried over transport network: Client → FlexE → Ethernet PHY → OTN

# Scenarios and Layer Model

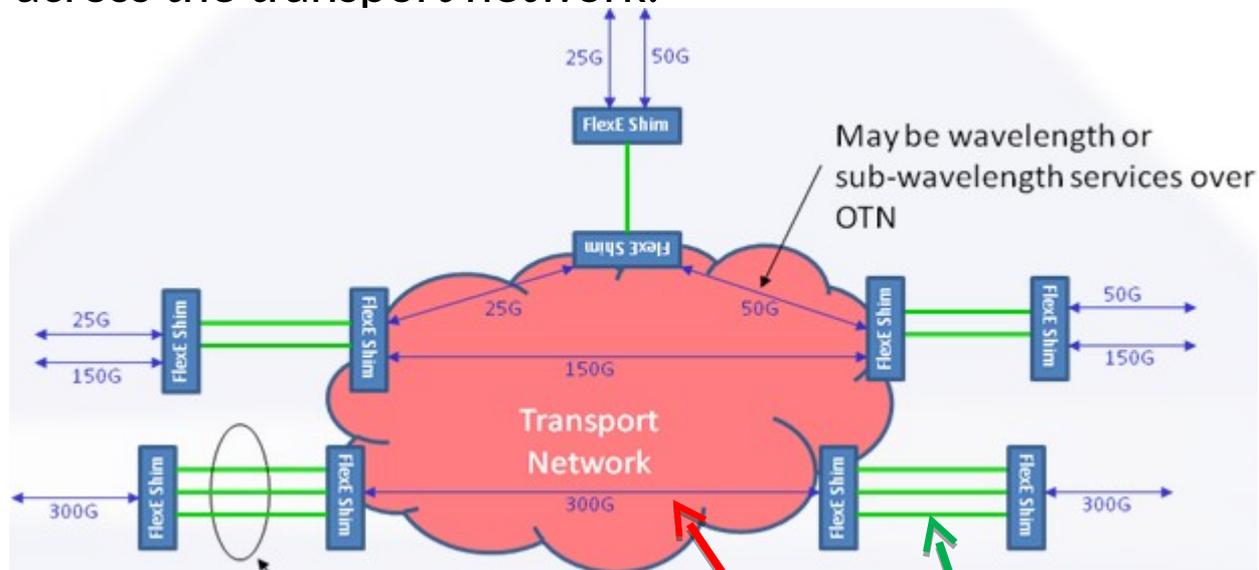
- Aware case: transport equipment is aware that it is carrying FlexE signal, FlexE slots is switched to ODUk slots at slots level. Some slots may be unavailable and will be dropped before mapping (Partial-rate).
- Unavailable slot: due to transport network constraints, that not all of the slots can be used by client.



- Signal carried over Ethernet link: Client → FlexE → Ethernet PHY
- Signal carried over transport network: Client → FlexE → OTN

# Scenarios and Layer Model

- Terminating case: FlexE group is terminated before crossing the transport network and FlexE client is extracted from the FlexE signal and then carried across the transport network.



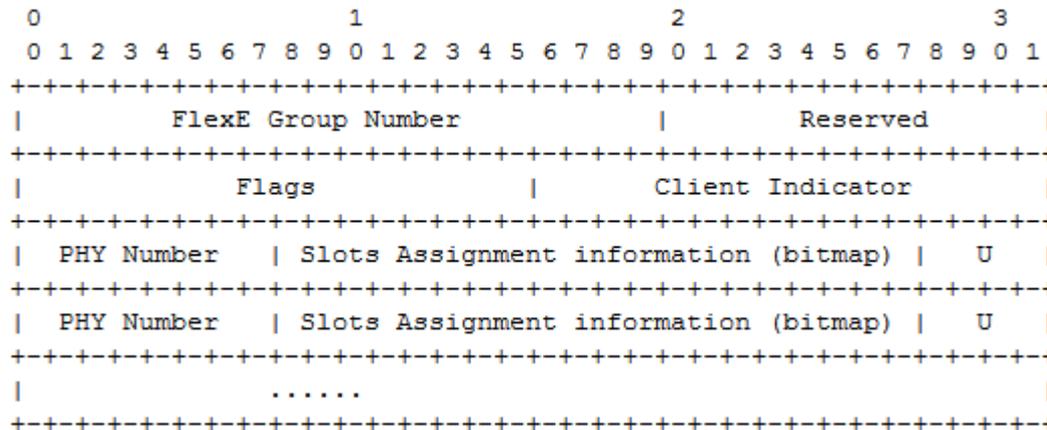
- Signal carried over Ethernet link: Client → FlexE → Ethernet PHY
- Signal carried over transport network: Client → OTN

# Control-Plane Requirements

- Signaling shall be able to assign FlexE group number, PHY number, slots for client. Signaling should also be able to indicate where partial-rate happened.
- The routing protocol SHALL update its advertisements of available resources and capabilities, including the partial-rate support information and unused slot information on each Ethernet PHY port.
- Control plane SHOULD allow the nodes at opposite ends of a link to correlate the unavailable slot information that applied to the link.

# Signaling Extension

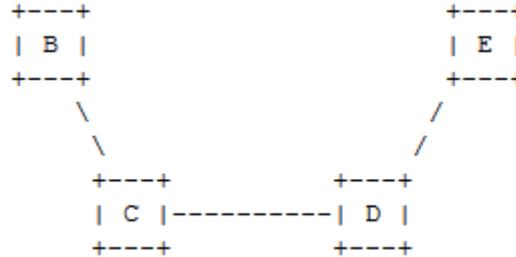
- Label Extension:



- A new FlexE Link Available Slot Number TLV is extended in the LSP\_ATTRIBUTES object to calculate the number of end-to-end available slots during the signaling process.

# Signaling Procedure

- Unaware case:



- B and E are FlexE capable nodes, C and D are traditional OTN ODUflex/ODU4 switch capable nodes.
- Procedure:
  - 1. B receives a request to set up a FlexE client connection from B to E.
  - 2. B prepares signaling for the FlexE connection from B to E. Before FlexE signaling, Ethernet PHYs must be set up from B to E first.
  - 3. When the Ethernet PHYs RSVP-TE path message arrives at C, ODU level path must be set up first and then used to carry Ethernet PHYs path.
  - 4. After the setup of Ethernet PHY LSPs, B restart the FlexE signaling to finish the FlexE connection setup with the label extended, and then assign the slots for FlexE client.

# Signaling Procedure

- Aware case:
- The network scenario is the same as that in the previous slide.
- Procedure:
  - 1. B receives a request to set up a FlexE client connection from B to E.
  - 2. B prepares signaling for the FlexE connection from B to E. Before FlexE signaling, Ethernet PHYs must be set up from B to C first. FlexE signaling is then sent to C.
  - 3. C first sets up partial-rate ODU LSP from C to D by dropping the unavailable slots, and then C sends the FlexE signaling message towards D.
  - 4. D first sets up Ethernet PHY LSPs from D to E, and then D sends the FlexE signaling message towards E.
  - 5. During the FlexE signaling process, path message should carry FlexE Link Available Slot Number TLV to collect available slots information. Resv message is then sent from E to B to finish the setup of FlexE connection for FlexE client.

- Comments?