

# Application of FlexE Configuration Model

draft-xiaobn-ccamp-application-flexecm-00

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## Objective of This Contribution

- Provides some FlexE configuration requirements
- Provides some configuring illustration of FlexE group/clients based on FlexE-cm model

# Standards and drafts

- OIF FlexE IA 1.1~2.2

FlexE group, FlexE client, bonding PHYs, calendar slot, 100G/200G/400G/50GBASE-R

- ITU-T G.8023

Characteristics of equipment functional blocks supporting Ethernet physical layer and Flex Ethernet interfaces

- IETF FlexE drafts

FlexE framework, controls, and configurations YANG data model

[FlexE-cm] draft-wang-ccamp-flex-e-yang-cm

# Requirements of FlexE configuration

## FlexE group

R-Group-01 The model SHALL support the management of the FlexE group, consisting of one or more Ethernet PHY(s).

R-Group-02 The model SHOULD be able to verify that the collection of Ethernet PHY(s) included in a FlexE group have the same characteristics (e.g. number of PHYs, rate of PHYs, etc.) at the local FlexE shims. If inconsistency exists, notifications (e.g. errors) SHOULD be invoked.

## FlexE calendar

R-Calendar-01 The model SHALL support the updates of usage of calendar slots in the FlexE calendar, and support the notification of the usage.

R-Calendar-02 The model SHALL support the verification of assignment of calendar slots in the FlexE calendar. If inconsistency exists, notifications (e.g. errors) SHOULD be invoked.

R-Calendar-03 The model MAY support the configuration of calendar A and B.

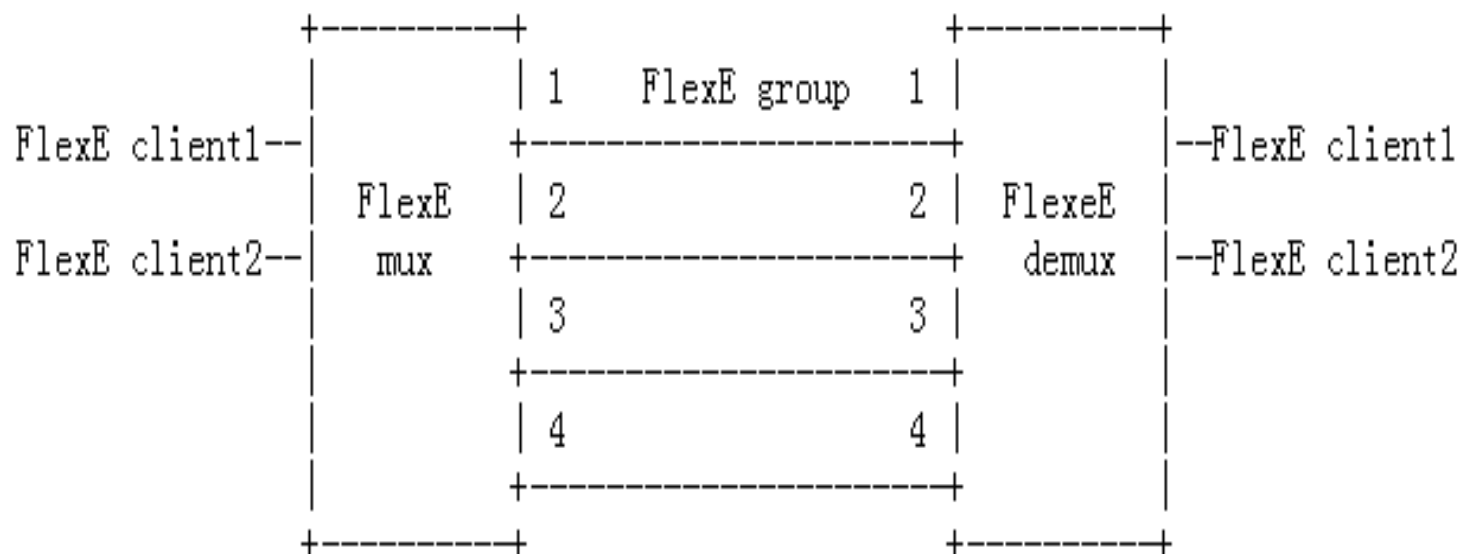
R-Calendar-04 The model MAY support the switching of a calendar configuration between calendar A and B.

## FlexE client

R-Client-01 The model SHALL support to assign required calendar slots to transport the FlexE clients. The assigned calendar slots MAY be in different FlexE calendars with different ETH PHYs.

R-Client-02 The model SHALL support to add FlexE client(s) into or remove FlexE client(s) from the FlexE group, without affecting the other existing FlexE clients whose size and calendar slot assignments are not changed.

# FlexE configuration model and configuration illustration



A FlexE group must be configured first before any client signals are carried over it. The initial configuration commands could be from external management system, SDN controller etc.

Currently, the FlexE configuration model [**FlexE-cm**] shows the necessary parameters about the FlexE group and the FlexE client. That is the base model for further augments or extensions.

# Configuration of FlexE Group based on FlexE-cm YANG data model

```
type
+--rw flexe-groups
  +--rw flexe-group* [group-index]
    +--rw index          uint32
    +--rw group-num      uint32
    +--rw negotiation-mode negotiation-mode-

  +--ro total-bandwidth  string
  +--ro free-bandwidth?  string
  +--ro sync-phy-number  uint32
  +--rw flexe-phys
    +--rw flexe-phy-list* [port-name]
      +--rw port-name     if:interface-ref
      +--rw phy-number    uint32
      +--ro free-timeslot-list string
      +--ro used-timeslot-list string
```

- a. The leaf **index** provides an index to the FlexE group. The value of the index may be generated by local network device or network management system, so the values in FlexE mux and demux may be different.
- b. The leaf **group-num** is transported between FlexE mux and FlexE demux.
- c. The leaf **negotiation-mode** includes dynamic mode and static mode, and the fault value is dynamic mode. For the dynamic mode, the calendar slot information for the FlexE client is only sent to the FlexE mux. While for the static mode, the calendar slot information for the FlexE client is configured both to the FlexE mux and demux.
- d. The leaf **sync-phy-number** is used for the synchronization management channel.
- e. The list **flexe-phys** includes all the PHYs bonded in a FlexE group. Each of the PHYs is identified by the port-name and phy-number in the group. Both ends of each PHY in the FlexE group should use the same PHY number.

# Configuration of FlexE Group

## FlexE Mux

```
<flexe-group>
  <index>20221</index>
  <group-num>2222</group-num>
  <negotiation-mode>static</negotiation-mode>
  <sync-phy-number>1</sync-phy-number>
  <flexe-phys>
    <flexe-phy-list>
      <port-name>ifa001</port-name>
      <phy-number>1</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifa002</port-name>
      <phy-number>2</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifa003</port-name>
      <phy-number>3</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifa004</port-name>
      <phy-number>4</phy-number>
    </flexe-phy-list>
  </flexe-phys>
</flexe-group>
```

## FlexE Demux

```
<flexe-group>
  <index>3001</index>
  <group-num>2222</group-num>
  <negotiation-mode>static</negotiation-mode>
  <sync-phy-number>1</sync-phy-number>
  <flexe-phys>
    <flexe-phy-list>
      <port-name>ifb001</port-name>
      <phy-number>1</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifb002</port-name>
      <phy-number>2</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifb003</port-name>
      <phy-number>3</phy-number>
    </flexe-phy-list>
    <flexe-phy-list>
      <port-name>ifb004</port-name>
      <phy-number>4</phy-number>
    </flexe-phy-list>
  </flexe-phys>
</flexe-group>
```

# Configuration of FlexE Clients based on FlexE-cm YANG data model

```
augment /if:interfaces/if:interface:
+--rw flexe-client
  +--rw client-index      uint32
  +--rw group-index       leafref
  +--rw client-num        uint32
  +--rw timeslot-lists
    +--rw timeslot-list*  [port-name]
      +--rw port-name     if:interface-ref
      +--rw time-slot     string
```

- a. The leaf **client-index** provides an index to the FlexE client. The value of the client-index may be configured by the network device or network management system or controller, and the values in FlexE mux and demux may be different.
- b. The leafref **group-index** references the FlexE group with the specific group index. It means that the FlexE group should be created before configuring the FlexE client, and the FlexE client will be transported by the specific FlexE group.
- c. The leaf **client-num** is used to indicate the FlexE client. The value of the client-num should be configured by the network management system or controller, and the values in FlexE mux and demux should be the same.
- d. The container **timeslot-lists** shows all the calendar slots assigned to the FlexE client. In the list timeslot-list, the total assignment of slots in each PHY, which is indicated by the leaf port-name, are indicated by the slots in the leaf time-slot.



# Configuration of FlexE Clients

## FlexE Mux

FlexE Client1

```
<flexe-client>
  <client-index>6001</client-index>
  <group-index>20221</group-index>
  <client-num>1001</client-num>
  <timeslot-lists>
    <timeslot-list>
      <port-num>ifa001</port-num>
      <time-slot>1-2</time-slot>
    </timeslot-list>
  </timeslot-lists>
</flexe-client>
```

FlexE Client2

```
<flexe-client>
  <client-index>6002</client-index>
  <group-index>20221</group-index>
  <client-num>1002</client-num>
  <timeslot-lists>
    <timeslot-list>
      <port-num>ifa002</port-num>
      <time-slot>1-20</time-slot>
    </timeslot-list>
    <timeslot-list>
      <port-num>ifa003</port-num>
      <time-slot>1-20</time-slot>
    </timeslot-list>
  </timeslot-lists>
</flexe-client>
```

## FlexE Demux

```
<flexe-client>
  <client-index>7001</client-index>
  <group-index>3001</group-index>
  <client-num>1001</client-num>
  <timeslot-lists>
    <timeslot-list>
      <port-num>ifb001</port-num>
      <time-slot>1-2</time-slot>
    </timeslot-list>
  </timeslot-lists>
</flexe-client>
```

```
<flexe-client>
  <client-index>7002</client-index>
  <group-index>3001</group-index>
  <client-num>1002</client-num>
  <timeslot-lists>
    <timeslot-list>
      <port-num>ifb002</port-num>
      <time-slot>1-20</time-slot>
    </timeslot-list>
    <timeslot-list>
      <port-num>ifb003</port-num>
      <time-slot>1-20</time-slot>
    </timeslot-list>
  </timeslot-lists>
</flexe-client>
```

## Next Step

- Update the draft according to WG feedbacks
- Propose to merge this draft into the [FlexE-cm] draft
- Hope the merged draft would be adopted as WG draft in near future

**Thank you!**