



Multicast for Package A

Glen Kramer, Broadcom

Why do we need this change?

- ❑ Multicast specifications in DPoE 2.0 and in SIEPON-A have diverged.

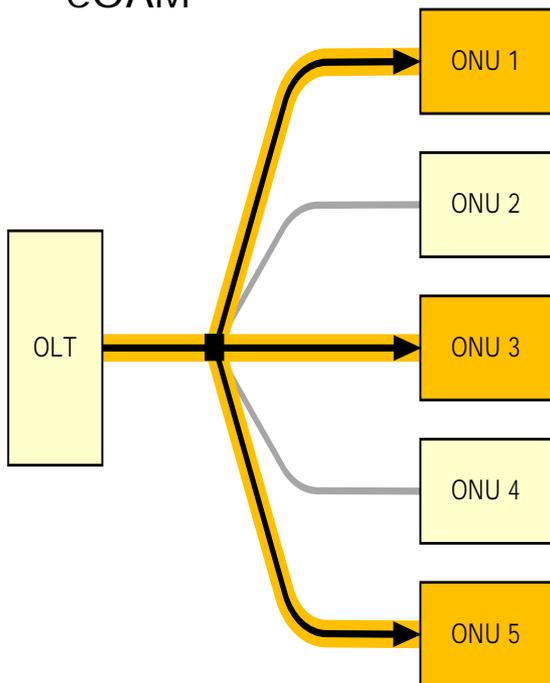
- ❑ Several issues were discovered with DPoE Multicast specification.
 - Refer to presentation “**Motivation For Changes to Package A (and DPoE) Multicast**” by Curtis Knittle to understand problems with current multicast provisioning

- ❑ This MR will fix the technical issues and restore the alignment between DPoE 2.0 and in SIEPON-A.

Many Levels of Multicast in EPON

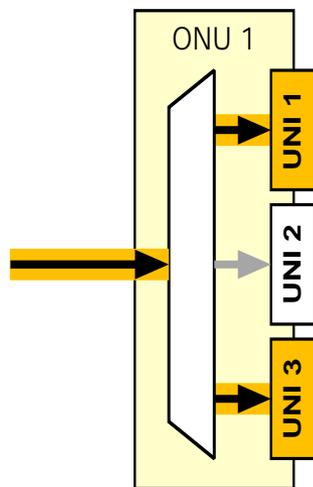
Inter-ONU multicast

- Uses multicast LLID to deliver a copy of a frame to multiple ONUs
- Has no impact on what happens to the frame within ONU
- Managed by EPON eOAM



Intra-ONU multicast

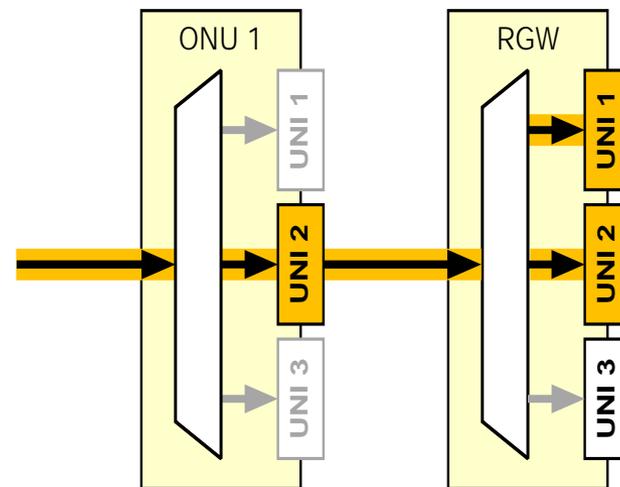
- ONU replicates a frame to multiple UNIs
- Frames may be classified by any fields (L1, L2, L3, L4,...)
- Frames may arrive on unicast or multicast LLID
- Managed by EPON eOAM



IP multicast

- RGW replicates IP packets to multiple ports
- RGW may be an IGMP client or may act as IGMP proxy
- Managed by TR-069 (?)

Multicast management of RGW is out of scope for this presentation



Inter-ONU Multicast Configuration

- ❑ Multicast LLID configuration currently uses two messages:
 - Multicast LLID Registration (Opcode = 0x06) OAMPDU assigns a multicast LLID to a D-ONU or deletes it from a D-ONU.
 - Multicast LLID Registration Response (Opcode = 0x07) is sent by the ONU to confirm the operation

- ❑ These messages are sufficient, however they provide no mechanism for the host to query what multicast LLIDs are currently configured in a given ONU. In current spec, an ONU can be queried re. the unicast LLIDs, but not the multicast LLIDs.

- ❑ **Proposal:** It would be a much better approach to define a multicast LLID attribute (*aMulticastLLID*) and a TLV and use it with the generic GetRequest and SetRequest OAMPDUs.
 - Consistent with how other parameters are configured
 - Allows querying the ONU to determine which multicast LLIDs are already set

Intra-ONU Multicast Configuration

Proposal:

Use existing Ingress Rule attribute (0xD7/0x05-01) to configure Intra-ONU Multicast Forwarding

1. Ingress Rule attribute allows chaining of multiple 'results', including the directive to forward to specific port/queue.

IF

Clause 1 and

Clause 2 and

Clause 3

THEN

Result: QUEUE {object type, object instance, queue number} and

Result: QUEUE {object type, object instance, queue number}

2. Ingress Rule attribute allows matching of a frame against many field types.

- 0x00: LINK_INDEX field
- 0x01: DA field
- 0x02: SA field
- 0x03: ETYPE_LEN field
- 0x04: B_DA field
- 0x05: B_SA field
- 0x06: I_TAG field
- 0x07: S_TAG field
- 0x08: C_TAG field
- 0x09: MPLS_LSE field
- 0x0A: IP_TOS_TC field
- 0x0B: IP_TTL_HL field
- 0x0C: IP_PT field
- 0x0D: IPv4_DA field
- 0x0E: IPv6_DA field
- 0x0F: IPv4_SA field
- 0x10: IPv6_SA field
- 0x11: IPv6_NEXT_HEADER field
- 0x12: IPv6_FLOWLABEL field
- 0x13: TCP_UDP_SP field
- 0x14: TCP_UDP_DP field
- 0x15: B_TAG field

“LLID Value” Field



- ❑ Ingress Rules can match a frame based on many fields, including “LLID Index”. LLID Index represents the local index of the logical link instantiated on the ONU. For example, for an ONU supporting 8 LLIDs, the value of LLID Index would range from 0 to 7.
- ❑ But multicast LLIDs are assigned to ONUs by value. The same multicast LLID would have different indices in different ONUs.
- ❑ To match multicast traffic against the multicast LLID value, a new field code should be added to Table 14-220 to represent “LLID Value”

Intra-ONU Multicast Options

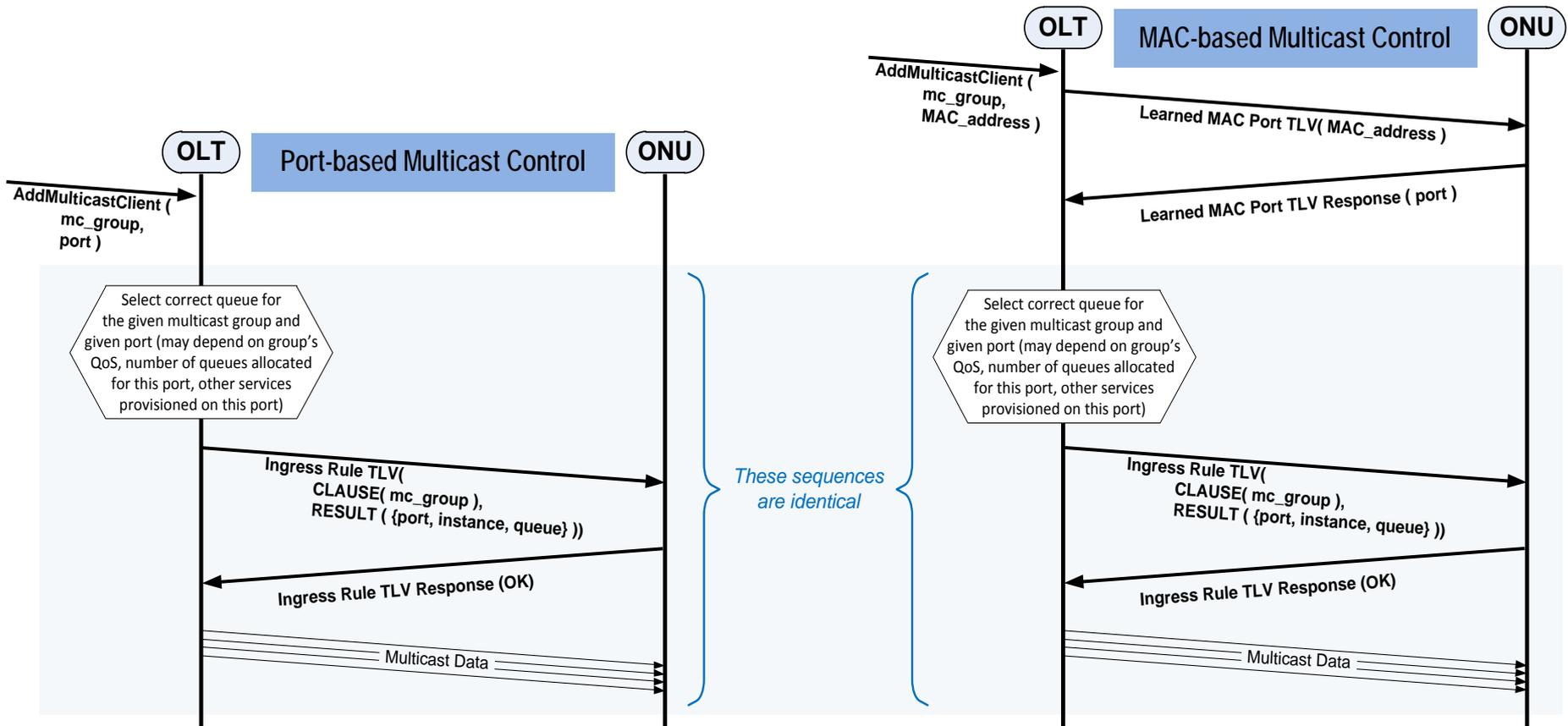
- ❑ Port-based Intra-ONU multicast control
 - If the OLT knows to which UNIs the multicast clients are connected, it can configure an ONU to forward multicast traffic to these exact ports.

- ❑ MAC-based Intra-ONU Multicast Control
 - If the OLT knows only multicast clients' MAC addresses, it needs the ONU to map these addresses to specific UNIs.

- ❑ Different UNIs may have different numbers of egress queues. OLT should be able to specify which queue to use at each UNI for the given multicast group.
 - This is easy to accomplish in Port-based multicast control because the OLT knows queue configurations for each UNI and it knows which UNIs are part of a given multicast group.
 - But in case of MAC-based Multicast Control, the OLT does not know a priori which UNIs are part of a given multicast group, so it cannot specify the proper queues.

MAC-Based Multicast Control

- Define an attribute *aLearnedMacPort* that will allow the OLT to query the port number on which a specific MAC address was learned.
- When the OLT receives a request to add MAC address X to a multicast group, it first queries the ONU to find out on which port MAC address X was learned and then uses Port-Based Multicast Control method (Ingress rule TLV)



Modify Multicast specifications in SIEPON-A as follows:

1. Replace *Multicast LLID Registration* and *Multicast LLID Registration Response* messages with a *aMulticastLLID* attribute that is to be used with the generic *GetRequest* and *SetRequest* messages (see slide 5)
2. Remove *Static IP Multicast Control* message. Specify the implementation of port-based intra-ONU multicast using the existing *Ingress Rule (0xD7/0x05-01)* and a new field code for “*LLID Value*” (see slides 6 and 7)
3. Specify the implementation of NAC-based intra-ONU multicast control as a 2-step process using a new read-only attribute *aLearnedMacPort* and the existing *Ingress Rule (0xD7/0x05-01)* (see slide 9)



Thank You