



MPCP FOR EPOC

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Summary of EPoC MPCP status

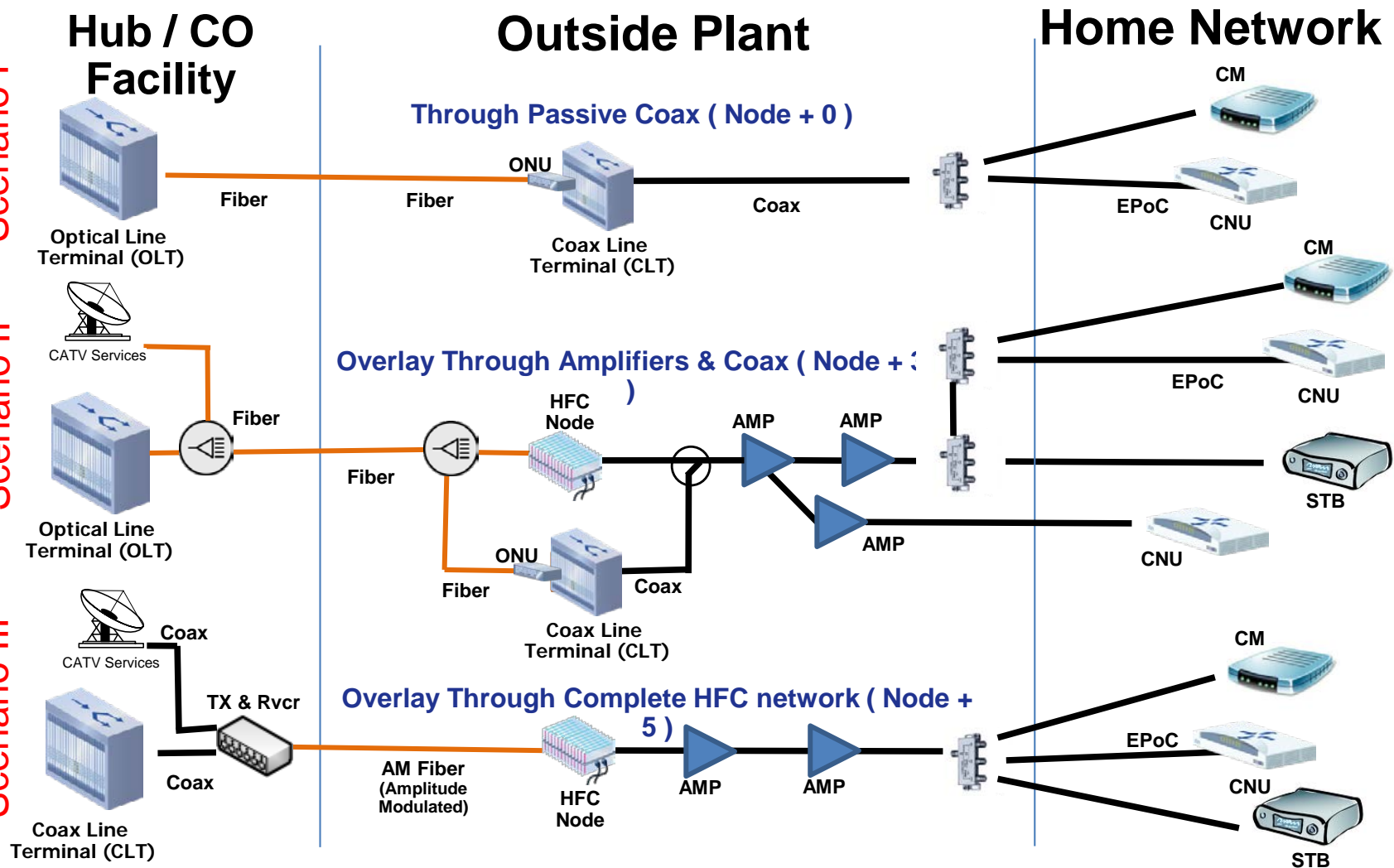
- At the start of the project, EPoC was intended to reuse EPON MPCP with no changes
- However, during recent meetings, we agreed that:
 - 1D scheduling for OFDM channel leads to bandwidth loss
 - 2D-1D-2D scheduling is complex and has its own inefficiencies
 - Current MPCP Discovery process and station registration may need to be substantially augmented to avoid station discovery & registration complexities
 - Full backward compatibility is desirable in some deployment models, while it does not matter in others
- This presentation takes a look at the two target deployment scenarios for EPoC and proposes a solution to EPON MPCP compatibility conundrum

EPoC Deployment Scenarios (i)

Scenario I

Scenario II

Scenario III



EPoC Deployment Scenarios (ii)

- There are essentially two deployment scenarios for EPoC that are of interest for MSOs
 - EPoC as EPON extension, with CLT function housed in Fiber Coax Unit (FCU) deployed in the field in the location occupied today by one of the nodes. CLT and CNU are separated with active or passive coax (no fiber). This is **Scenario I** or **Scenario II** on slide 2
 - Standalone EPoC, with CLT at the hub and CNU at customer premises, with active or passive coax in between (with potential analog fiber) This is **Scenario III** on slide 2
- In Scenario I or Scenario II, a media converter (so-called Repeater FCU) can be deployed in the location of the CLT, featuring simple conversion between fiber and coax media.
 - With Repeater FCU, individual CNUs are registered at and granted by the existing OLT already deployed in the local hub
 - These are the only scenarios which support the “transparency wish”

EPoC Deployment Scenarios (iii)

- In Scenario I or Scenario II, a more advanced FCU can be deployed, featuring a full CLT functionality, effectively terminating EPON and starting EPoC (Bridge FCU)
 - FCU can have a separate scheduler from OLT (no “transparency wish”)
- In Scenario III, CLT is deployed at the hub, and connects to individual CNU's directly over coax
 - There is no FCU in here (no “transparency wish”)
- Different scenarios may be used by different MSOs
 - Depends really on target EPoC deployment model: EPoC as intermediate step to full FTTX or EPoC as end-game solution for coax access
 - Operators should be able to pick and choose deployment scenarios, without worrying about picking specific CNU implementation options
- If CNU's can autonomously detect which deployment scenario they operate with, an MSO does not need to worry with potential deployment (wrong CNU model gets connected to wrong access port) or misconfiguration problems (wrong CNU's gets configured to operate in the wrong mode).

So what's with MPCP compatibility?

- In scenarios where a single scheduler for ONUs and CNU is needed (“transparency wish” needs to be supported), CNU has to be discovered, registered, and granted by an OLT (connected via a Repeater FCU)
 - Here, we have to make sure that the CNU can support Clause 77 MPCP as defined today, including 1D bandwidth granting.
 - These are the only scenarios where we need compatibility with existing OLTs, Clause 77 MPCP, and associated bandwidth reporting / granting.
 - In this mode, upstream transmission efficiency is secondary to being able to connect CNU to existing OLT via Repeater FCU
- In scenarios where “transparency wish” is not supported, CNU is discovered, registered, and granted by a CLT (either connected directly, or via a Bridge FCU).
 - Here, we CNU may support Clause 102 MPCP with all necessary extensions to support 2D scheduling, EPoC-specific device discovery & registration process, etc.
 - In this mode, upstream transmission efficiency is important.

EPoC MPCP going forward

- The CNU shall support Clause 77 MPCP
 - When operating in this mode and responding to Clause 77 Discovery GATE MPCPDU, a CNU will effectively have to “emulate” a 10G-EPON ONU and schedule its upstream transmission accordingly.
 - 2D-1D-2D conversion will have to be supported on the CNU in this mode.
- The CNU shall support Clause 102 MPCP
 - When responding to Clause 102 Discovery GATE MPCPDU, CNU will take full advantage of 2D scheduling (time and frequency), optimized discovery process, simpler upstream transmission scheduling, etc.
- This allows the existing 10G-EPON OLTs operate with CNUs (via Repeater FCU) as if they were regular ONUs
- The new CLT can be developed by optimizing MPCP for EPoC to reap all the benefits from OFDM channel
- Operators will pick which model they want to choose for their deployments, depending on what is critical to them: EPoC efficiency (full CLT and subtended CNUs) or compatibility with deployed 10G-EPON OLTs (lower efficiency, and lower CAPEX)

Clause 102 MPCP

- Clause 102 MPCP needs to be developed based on Clause 77 concepts, but adapted to the specifics of EPoC, including:
 - 2D scheduling capabilities
 - specific station discovery & registration requirements, including TQ definition, station capabilities, etc.
- Clause 102 MPCP should be optimized to EPoC, allowing the CNU's registering at the CLT achieve the full flexibility and high downstream / upstream transmission efficiency
- Clause 77 MPCP support should be focused on “no changes” to existing 10G-EPON OLTs, rather than performance
- Separation between Clause 77 and Clause 102 MPCP
 - New opcodes to be allocated to Clause 102 MPCPDUs
 - Solves backward compatibility problem and allows CNU's to discover in what mode to operate on (10G-EPON emulation = Clause 77 or EPoC = Clause 102)

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THANKS !