First Mile OAM&P Requirements

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Outline

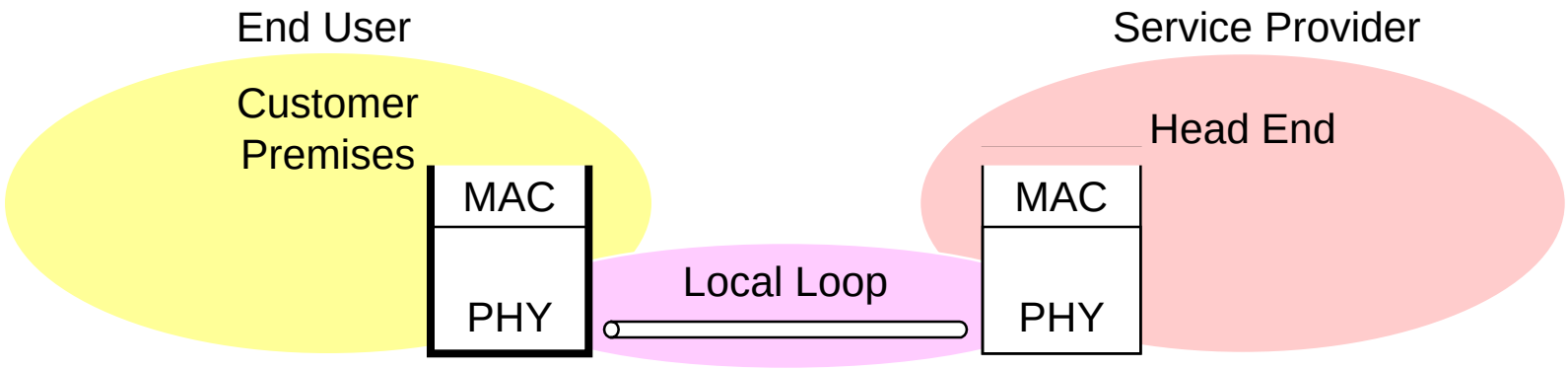
- OAM&P* Standardization – Providers' perspective
  - Complement to March '01 presentation 'First Mile OAM&P Objective' http://www.ieee802.org/3/efm/public/mar01/ishida_1_0301.pdf
- First Mile OAM&P Requirements
  - Essence of ITU-T Recommendations for DSL/SDH/PON

* OAM&P: Operations, Administration, Maintenance, and Provisioning

EFM Standardization Benefits

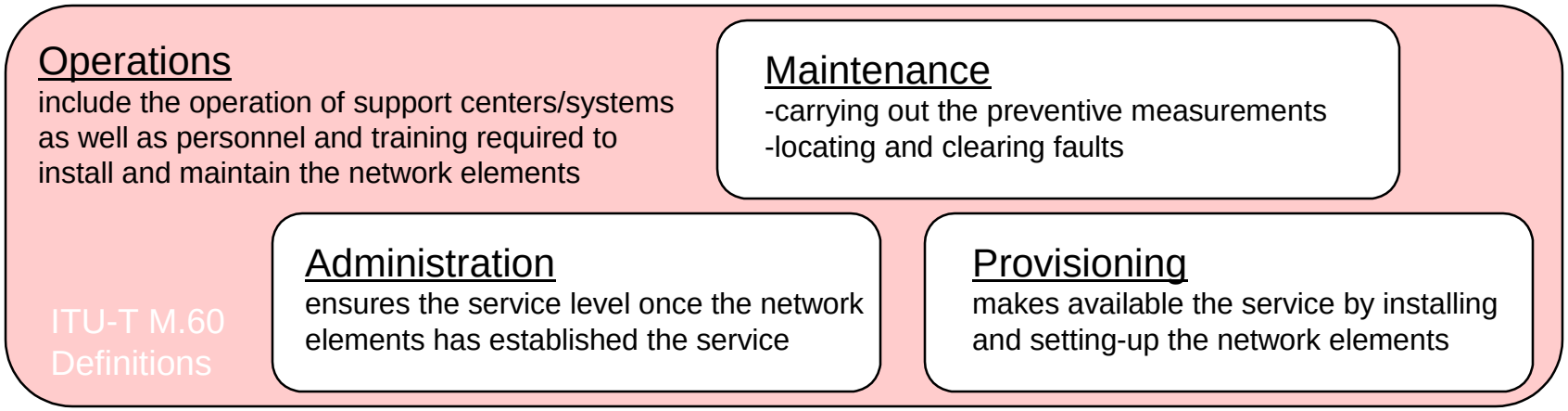
- Two Ethernet-user camps meet at the First Mile Arena
  - End Users prepare their CPE (Customer Premises Equipment)
  - Service Providers are responsible for Local Loop plant and Head End Equipment

- Interoperability benefits
  - End Users enjoy their choice of CPE on the open market
  - Service Providers no longer worry about CPE maintenance
    - CPE Failure is NOT considered as 'Service' interruption



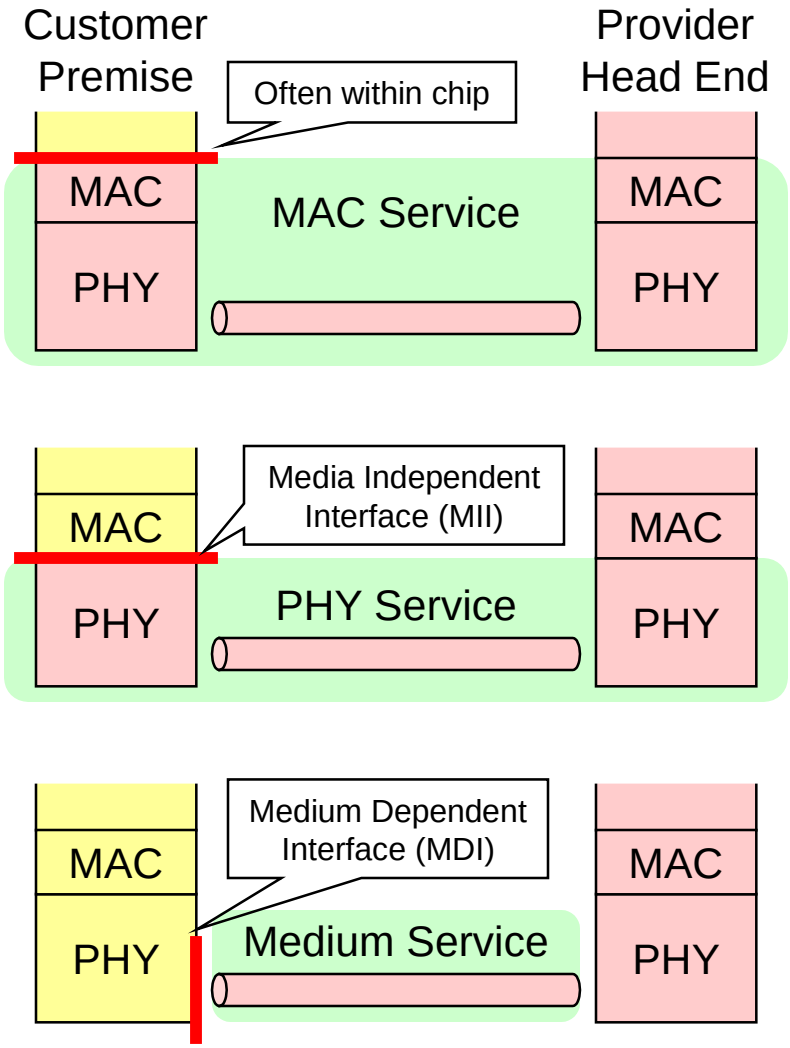
Why OAM&P? - Provider's View

- Basis for Service Level Agreement (SLA)
  - 'Service level' monitoring necessary
  - In EFM, service demarcation point is the key issue
- Facility in equipment and cable plant management
  - Fault localization desired for efficient maintenance action
  - In EFM, far-end OAM&P is the key issue



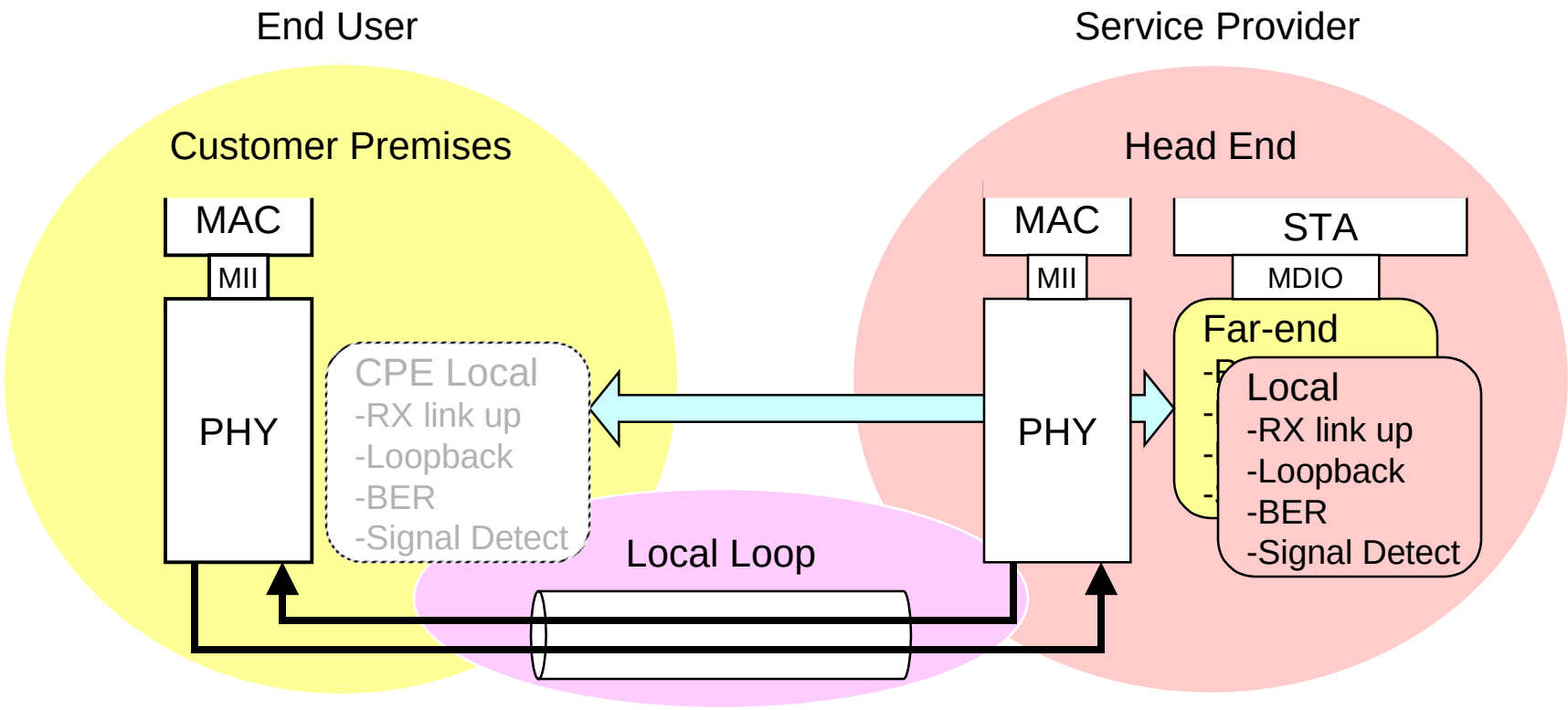
Service Demarcation Point Candidates

- MAC Service
  - provides for MAC bridges
  - requires MAC, PHY, and Medium
  - has no standard interface
    - less efficient in maintenance
- PHY Service
  - provides MAC frame transport
  - requires PHY and Medium
  - may have exposed interface
    - ideal for fault maintenance
- Medium Service
  - provides analog bit-stream transport
  - requires Medium
  - has no digital interface
    - hard for 'service level' monitoring



Far-End OAM&P Image

- CPE local status is read/written by Provider's Head End
  - via STAtion management entity (MIB)



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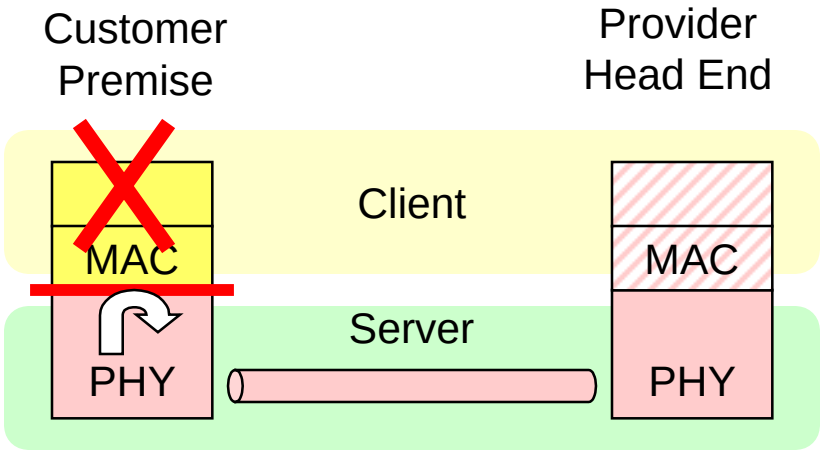
* OAM&P: Operations, Administration, Maintenance, and Provisioning

First Mile OAM&P Requirements

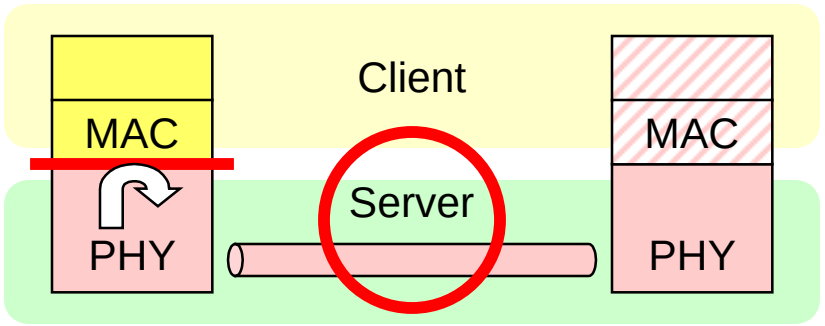
- Define service demarcation point in Customer Premises
  - Remote Loopback necessary for fault localization as well as for provisioning
  - Exposed interface preferred for efficient maintenance action
- Support far-end OAM&P
  - Embedded Link Signaling necessary for far-end 'service level' monitoring as well as for fault localization
    - First Mile often has no alternative route to/from CPE
    - Signaling must be intact to Customer's MAC frame transport

Remote Loopback for PHY Service

- Far-end fault localization
  - Isolation of far-end Client failure
  - no maintenance required
    - PHY Service is OK
    - remote PHY loopback ensures no server fault



- Provisioning
  - confirmation of service availability
    - remote PHY loopback ensures no server fault



Link Signaling for PHY Service

- Allow for far-end 'service level' monitoring and fault localization
- Leverages the far-end PHY OAM&P facility in DSL/SDH/PON Stds
  - abstracted in ITU-T Recommendations;
    G991.1 (HDSL), G992.1 (ADSL), G707 (SDH), and G983.1(PON)
  - Remote Defect Indication (RDI) – far-end RX link up?
    - 10GbE has adopted Remote Fault (RF) Primitive Sequence for RDI
  - Alarm Indication Signal (AIS) – Fault has already been asserted
    - 10GbE has adopted Local Fault (LF) Primitive Sequence for AIS
  - Remote Loss of Power (LPR) – 'dying gasp' from CPE
    - for Receive Alarm Inhibition (R-INH) in Head End
  - Remote Defect Hint – How likely is the Defect within far-end PHY?
    - e.g. What asserts RDI? Loss of Signal (LOS), AIS, or anything else?
  - Remote Anomaly Indication – far-end 'service level' monitoring
    - e.g. bit-error count in far-end PHY for preventive maintenance
  - Embedded Operations Channel (EOC) or Data Communication Channel (DCC)

Summary

- Providers require OAM&P for
  - Service Level Agreement, and
  - Facility in equipment and cable plant management
- The key issues in First Mile OAM&P are
  - Service demarcation point, and
  - Far-end OAM&P
- Initial ‘List of OAM&P Requirements’ extracted
  - from ITU-T Recommendations for DSL/SDH/PON PHY