Enhancing Synchronous Ethernet Management with ESMC

ITSF 2008 - Munich

Laurent Montini

Technical Leader

Corporate Consulting - Office of the CTO

lmontini@cisco.com

Agenda

- What Is ESMC
- Possible Ways to Extend ESMC Functions
- Possible Extensions
- Beyond ESMC

Introducing ESMC

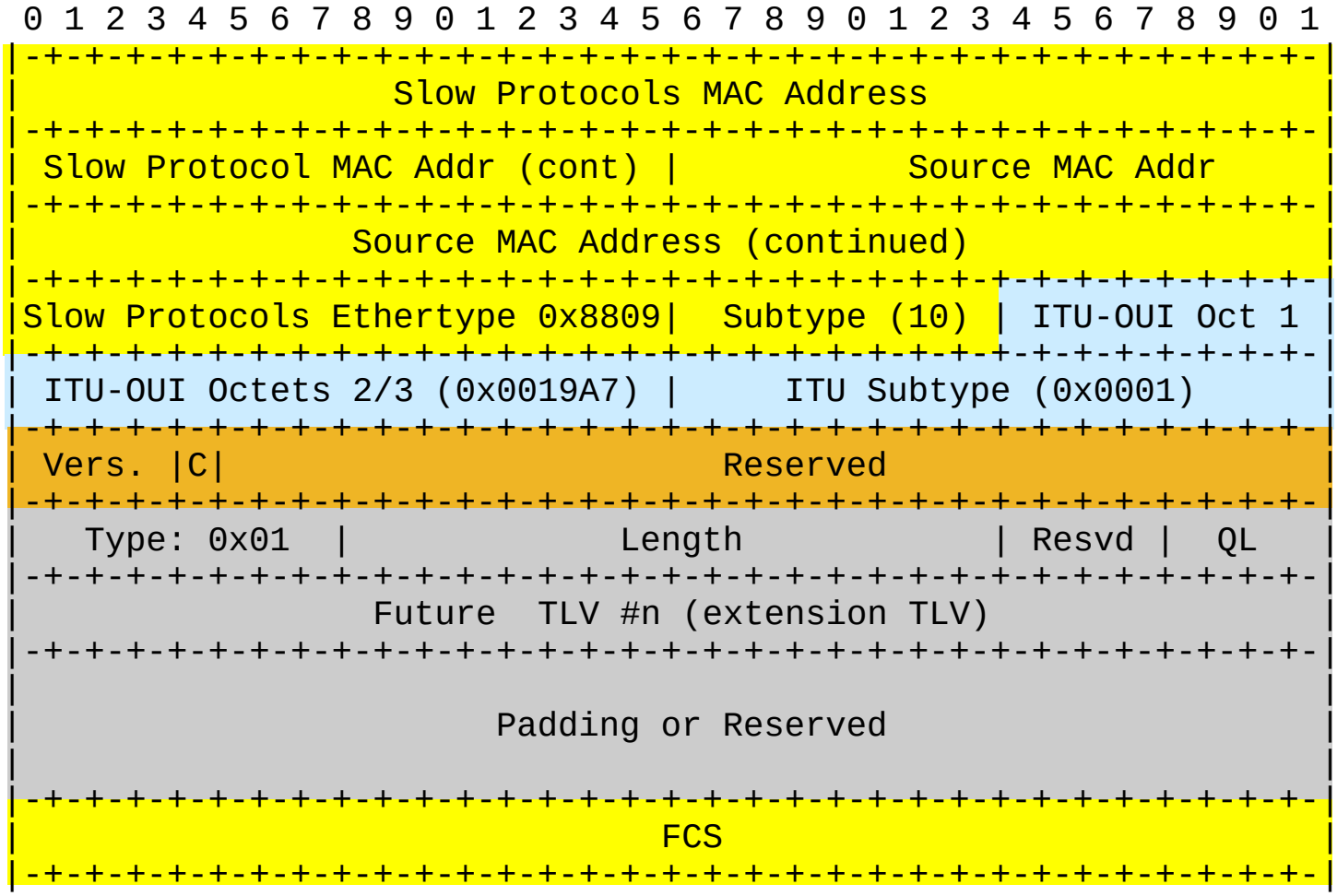
- ESMC: Ethernet Synchronization Messaging Channel
- ESMC has been built first and foremost as the transport channel for SSM (QL) over Synchronous Ethernet link.
- Key outcome: Simple and efficient
- However it has been thought to support some extensions.
- ESMC does not aimed to become a complex protocol.

  It is not a control plane and does not need a control plane.

Ethernet Synchronization Messaging Channel

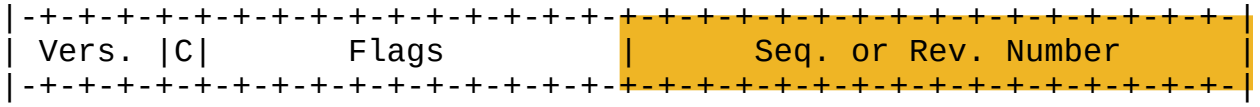
- ESMC uses the Organization Specific Slow Protocol PDU.
  - OSSP is defined in IEEE802.3ay (a revision to IEEE Std 802.3-2005 PAR).
- Event-driven with 2 message types: Event and Information
  - Event message sent when QL value changes.
  - Information message sent every second.
- ESMC payload uses TLVs for content format.
- Currently an unique TLV is defined,.
  - The QL TLV transmits the usual 4-bit SSM (QL) values defined by ITU-T, ANSI and Telcordia.
- ESMC is an unidirectional transmission channel.
  - Tx provides information, states.
  - Rx is fully responsible of receive information, states. It may use or ignore information from Tx.

G.8264: ESMC format

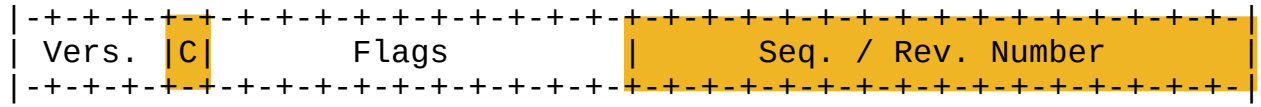


Options For Extensions

- New message types
  - In addition to ESMC Event and Information
  - E.g. through new ITU-T subtypes
- ESMC Header Extensions using reserved bits.
  - Flags
  - Sequence Number
  - Revision Number



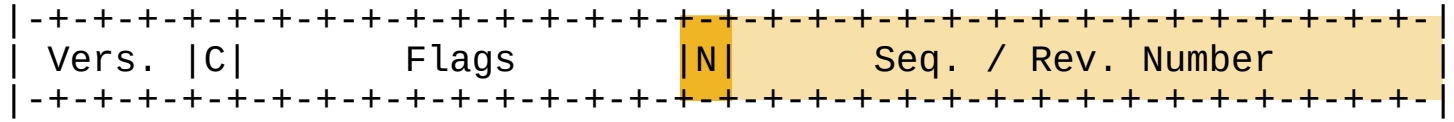
- ESMC payload TLVs
  - Transmitting new data.
- ESMC TLVs and Header Flags can be common or specific to message types.



Possible New Flags

- Announcing ESMC capability

  E.g. Do or Do Not support Sequence Number computation (Tx)

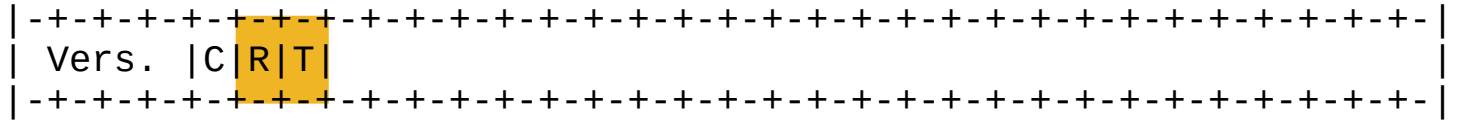


- Limited Synchronous Ethernet support

  Announcing reduced functionality at the interface level

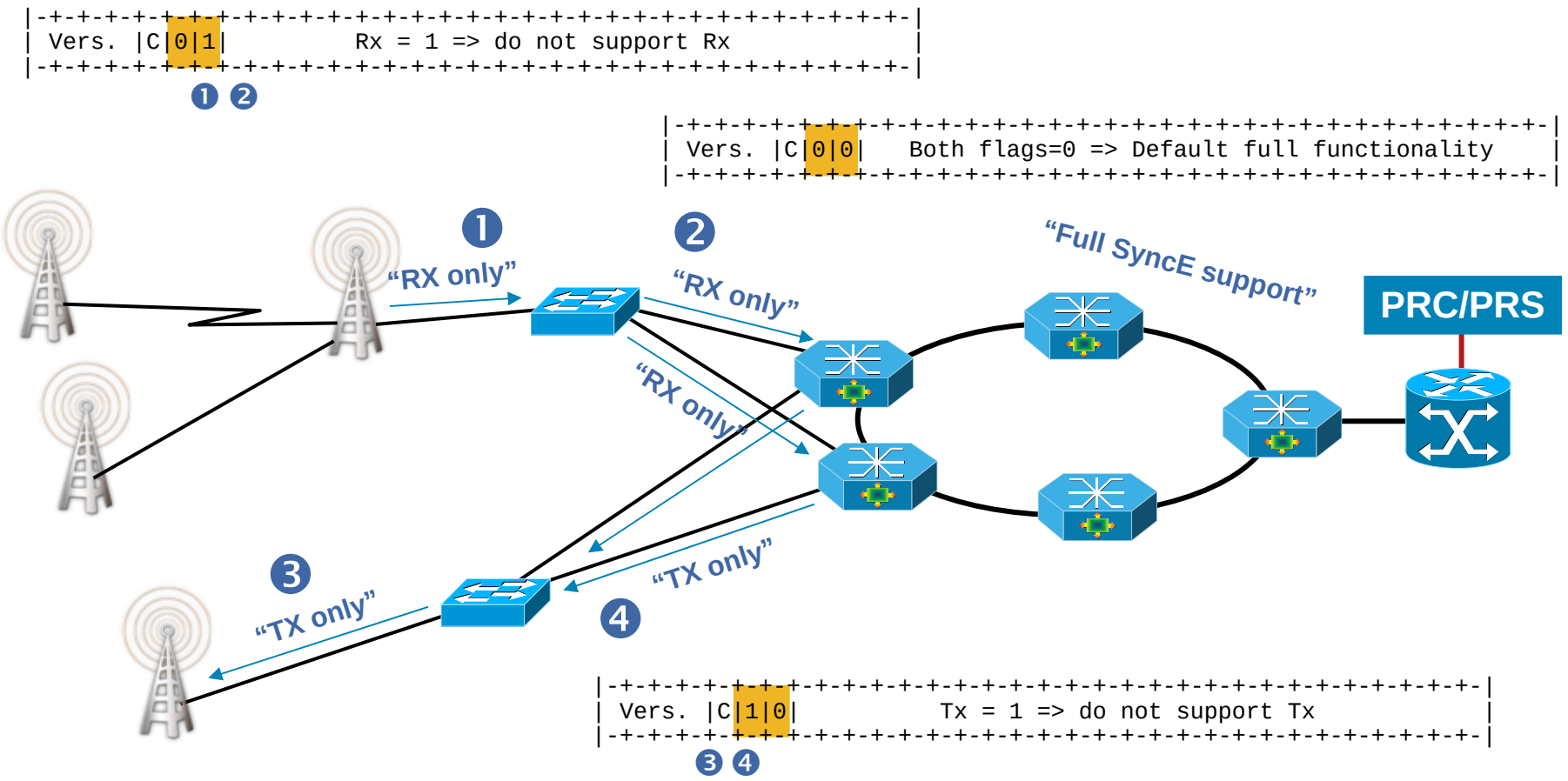
  Either due to hardware limitation or by design

  E.g. unidirectional support (either receive or transmit)



Reduced Synchronous Ethernet Interface

- Flags can announce reduced functionalities of Synchronous Ethernet interfaces.



New possible capabilities thru TLVs

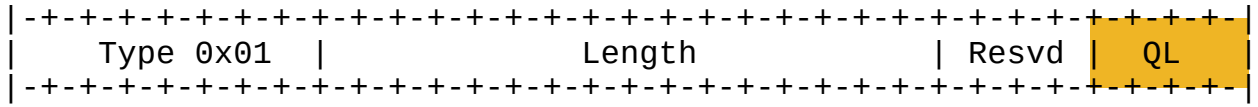
- Identifying
- Counting
- Tracing
- Timestamps
- Others

Identifying

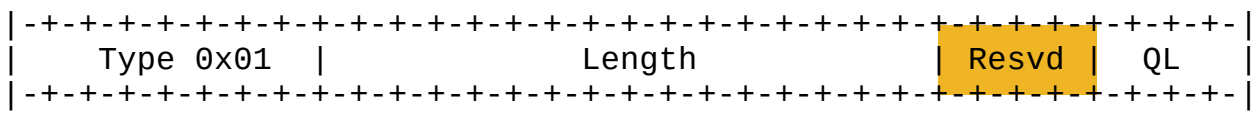
- Synchronization Extended Source Description TLV
  - Provides extended clock source information
- Synchronization Primary Source ID TLV
  - PRS/PRC
- Synchronization Secondary Source ID TLV
  - SSU/TSG with second level source
- Holdover Source ID TLV
  - Identification of the EEC in holdover

Extension of QL TLVs: Alternatives

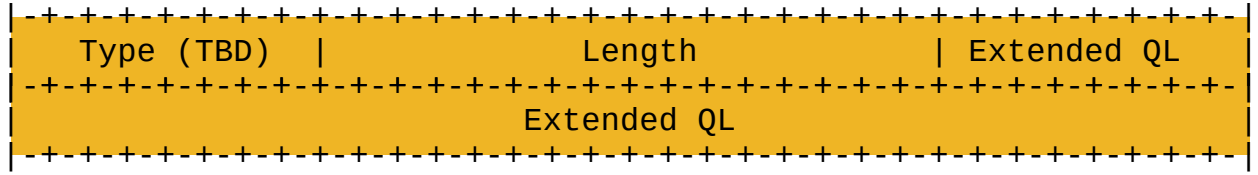
a) Adding new QL values

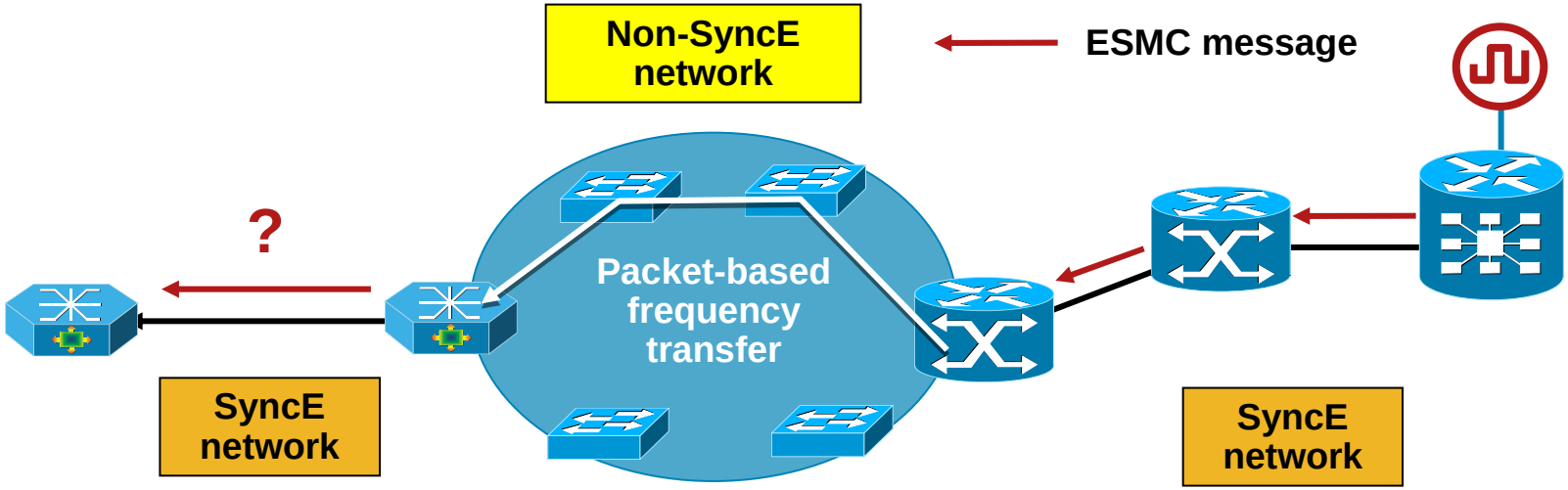


b) Extending QL TLV payload



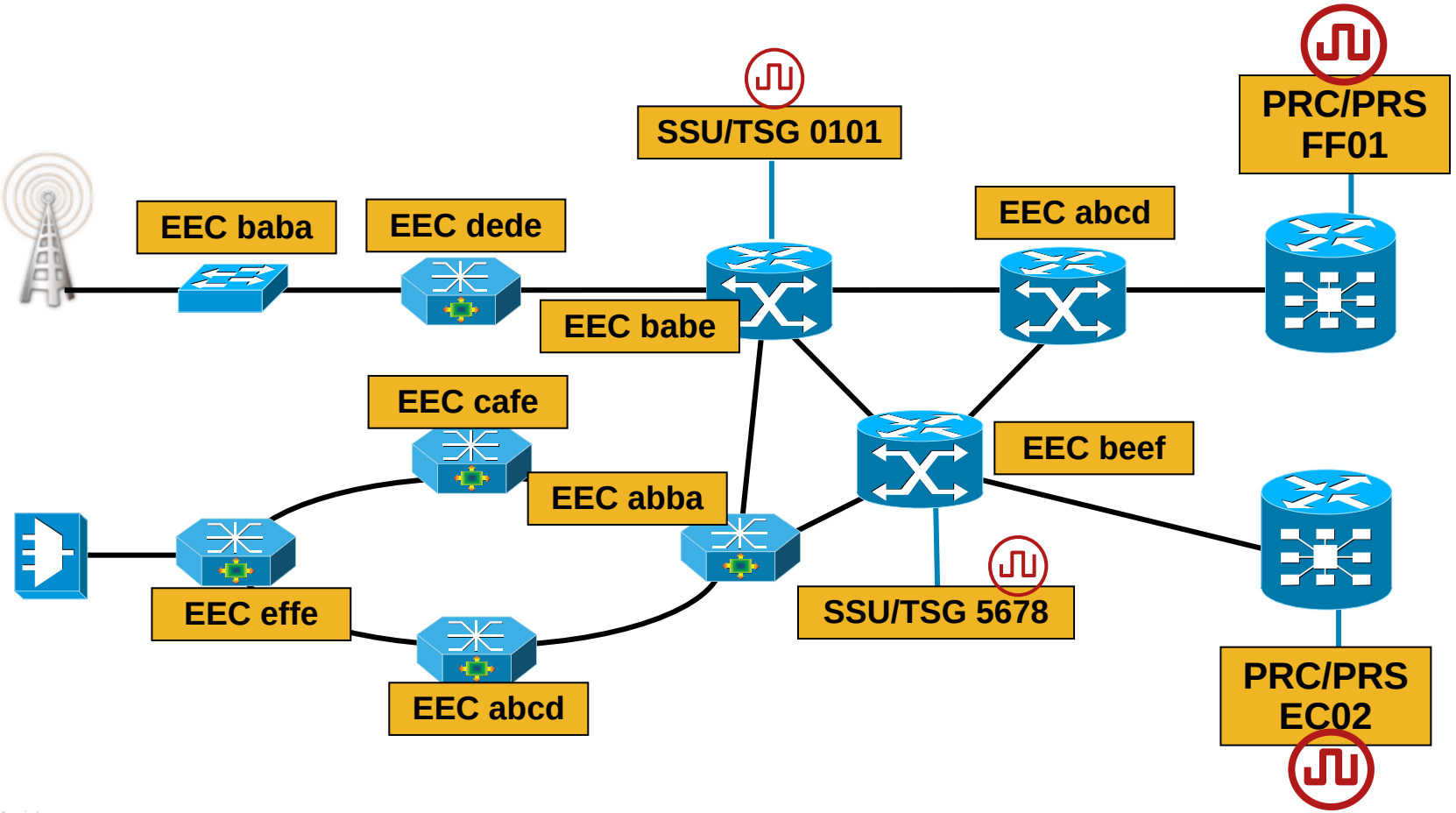
c) Creating a new TLV





Identifying The Source Node

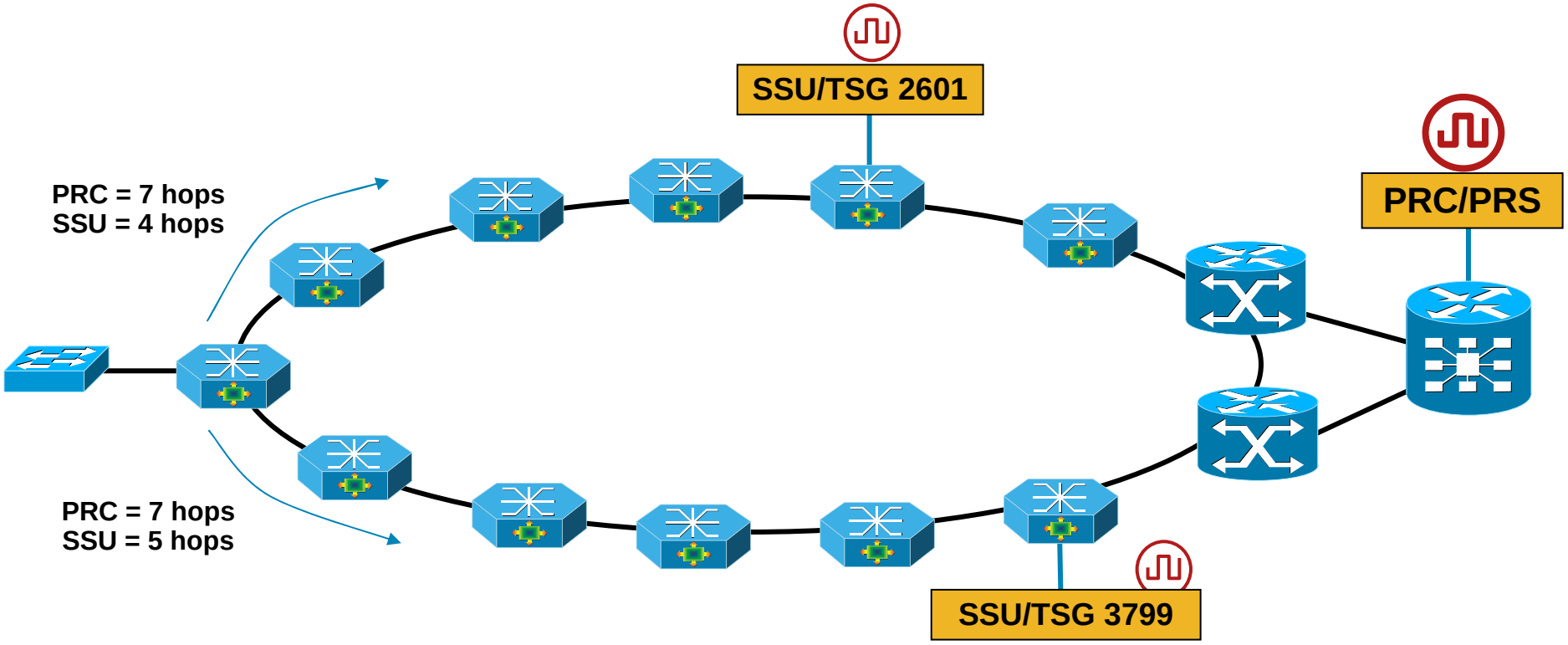
- Either specific ID TLV – can include detailed information
- Or ID in TLV payload – part of a TLV information (e.g. tracing TLV)



Counting & Tracing

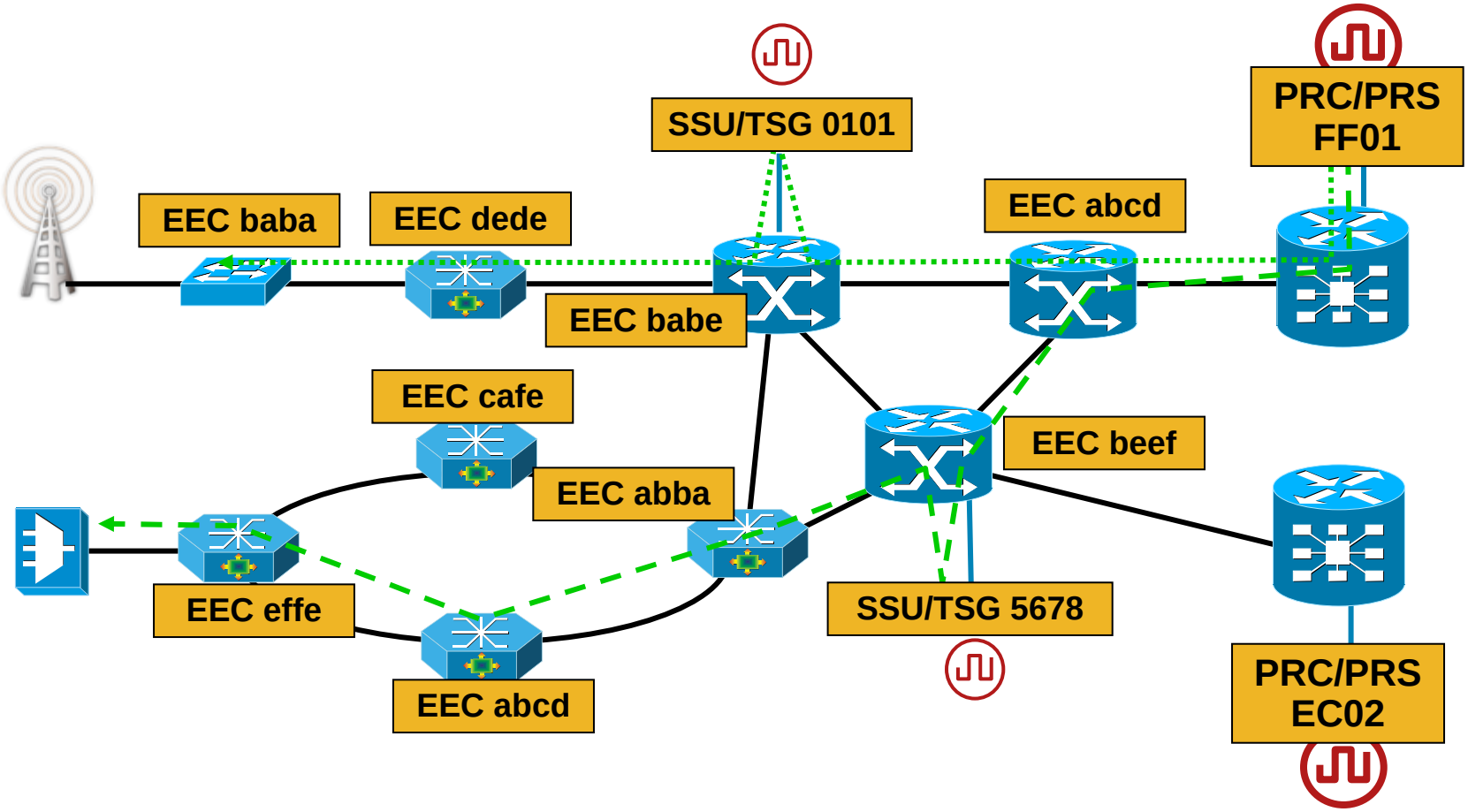
- Primary Source Hop Count TLV
  - Record the number of EEC and L2 SSU/TSG from PRC/PRS
- Secondary Source Hop Count TLV
  - Record the number of EEC from nearest SSU/TSG
- Primary Source Route TLV
  - Record EEC and SSU/TSG IDs from PRC/PRS
- Secondary Source Route TLV
  - Record EEC IDs from nearest SSU/TSG

Counting Hops From Sources



- Can improve clock selection process by looking at
  - Nearest PRC/PRS,
  - Nearest SSU/TSG
  - and/or at lowest number of EECs in timing path.

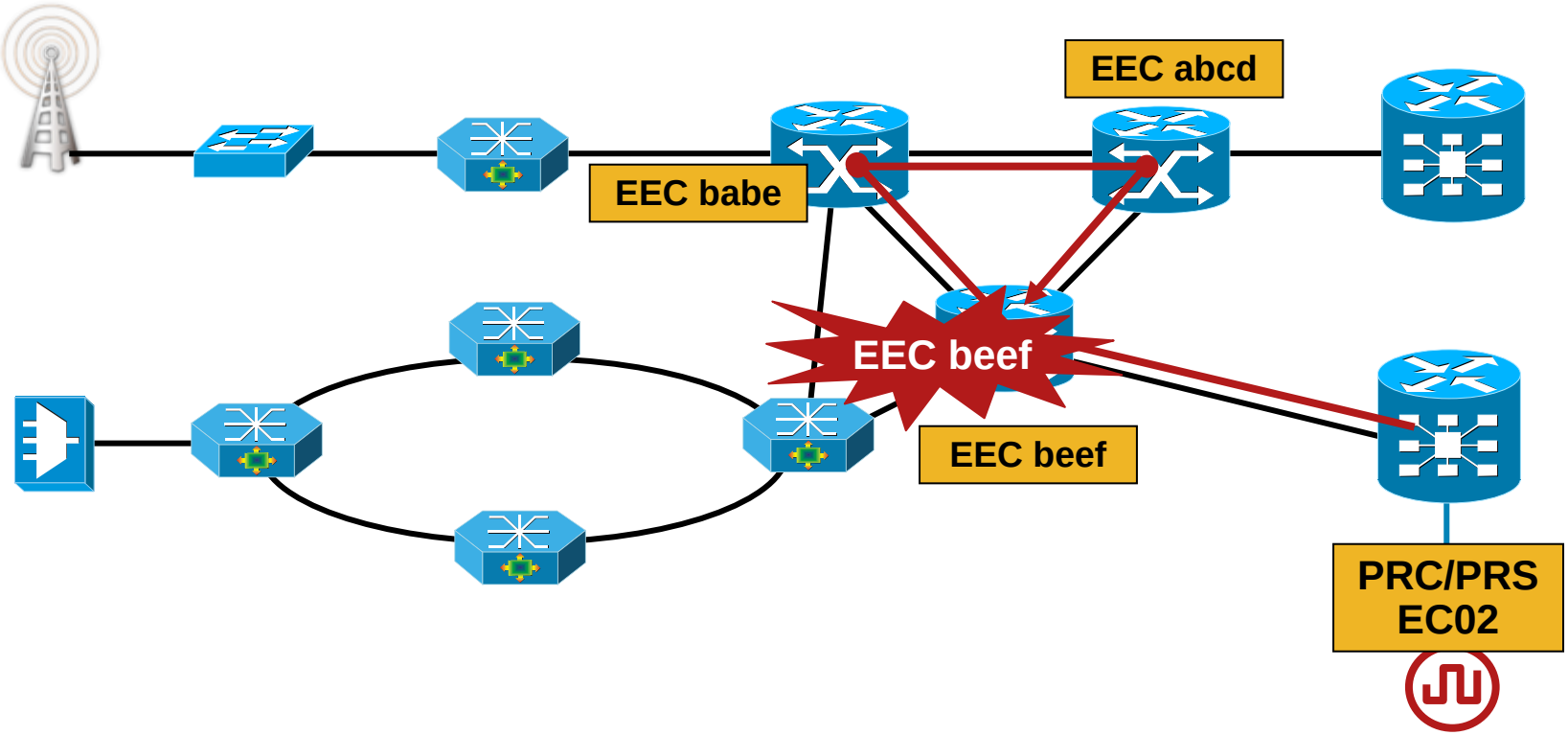
Traceability Thru TLVs



- Traceability would help monitoring.

Traceability Thru TLVs

- By adding EEC node ID along the ESMC path…



- … Traceability would help detect timing loop.

Timestamp & Others

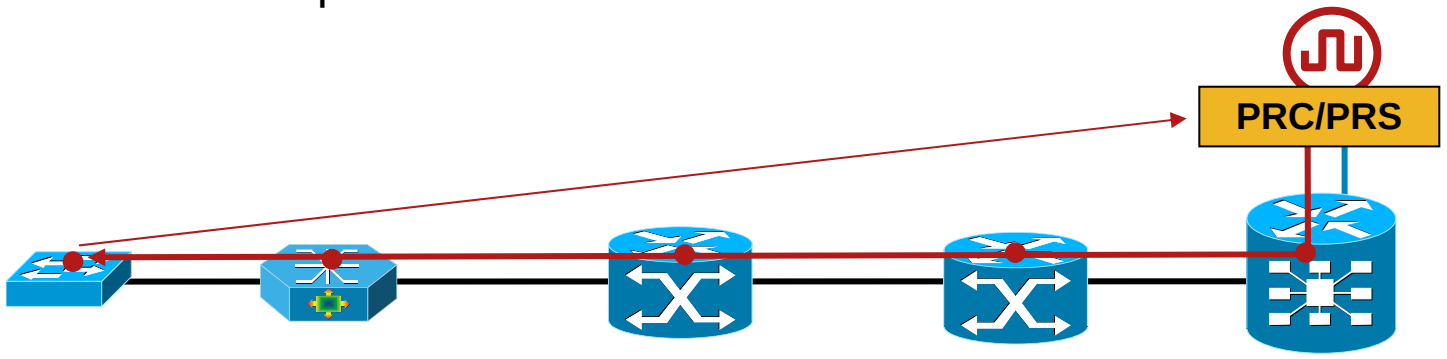
- Timestamps TLV
  - For transfer of phase or ToD
  - Follows timing chain via the Synchronous Ethernet nodes and links
  - Would overlay usual time protocols as NTP or PTP
- Source Priority TLV
  - Can participate to clock selection process
    - Ex: two sources with same SSM QL, same locally allocated priority
  - Information can be part of Source ID TLV
- Connectivity Check TLV
  - Use configured common key to check link connectivity
- Vendor Specific TLV
  - Vendor specific extensions

More To Think About

- Simplicity vs. complexity
- ID format
  - IPv4 and IPv6
  - NSAP
  - CLLI (Common Language Location ID)
- Frame size
- Clock selection algorithm would have to be improved to make use of new criteria.
- Network Interconnect
- Over Ethernet link only – i.e. no interworking with other synchronous L1 (e.g. SDH, GPON, SHDSL)
  - Without new distinct specifications

Possible External Extensions

- Communications with SSU/TSG
  - Two-way communication between EEC and SSU/TSG
  - SSU/TSG can perform network management functions, collecting pertinent information from the network elements they serve.
  - ESMC or other protocol?



- Enhanced synchronization network management by coupling with higher level protocols
  - IGP and BGP extensions
  - Constrained Routing (Synchronization Traffic Engineering)

Combining ESMC With Other Network Protocols

- ESMC is a simple link messaging channel.
- Extensions are limited.
- Further extensions could combine ESMC with network protocols such as routing protocols.
  - Ex: IGP within one domain, BGP when crossing domain
  - Autodiscovery of synchronization resources (e.g. BITS/SSU)
- Other protocols could become an alternative to ESMC extensions.
  - E.g. best path setup (TE-like function)
- Such combination or alternative may be more suitable for inter-office time distribution.

Key Take-Aways

- ESMC has been designed to transmit SSM QL over Ethernet but has also been designed flexible.
- ESMC can transmit other information, enriching the synchronization management within a Synchronous Ethernet network domain.
- ESMC may be used independently of the active synchronization path and from SSM QL transmission (i.e. when in QL-disabled mode).
- Use of new information will require new capabilities in the EECs clock selection algorithm.
- ESMC has structural and scope limits.
- ESMC could be combined with other protocols to extend network synchronization management.

Operator’s feedback is important.

- Please tell us (ITU-T SG15 Q13) what you’d need.
- Recall: This is about improving not changing.

Q & A