Towards Convergence of GMPLS and ASON standards

Dr. Lyndon Y. Ong
Ciena Corporation
June 2006

Overview

- Current Status
- Efforts towards Convergence
  - Routing Protocol
  - Signaling Protocol
- Interworking Efforts
- Challenges
- Conclusion

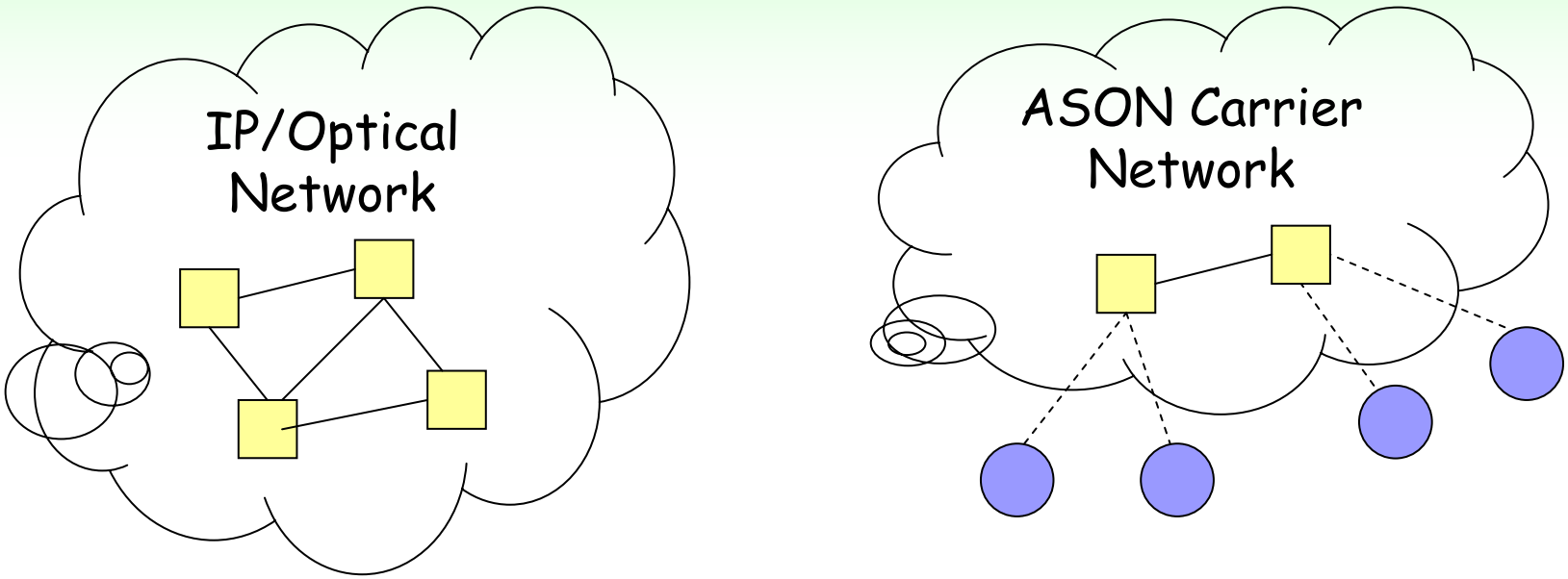
ASON and GMPLS

	GMPLS	ASON	Status
Signaling: -RSVP -CR-LDP -PNNI	 RFC 3473 RFC 3472	 G.7713.2 G.7713..3 G.7713.1	 Interworking reqd Deprecated No equivalent
Routing: -Reqts -OSPF-TE -IS-IS	 RFC 3630, 4202 RFC 4203 RFC 4205	 G.7715, G.7715.1 tbd (OIF DDRP) tbd	 Converging Good chances Good chances
Discovery	RFC 4204	G.7714, G.7714.1	Not aligned in function or protocol

Routing Efforts - Process

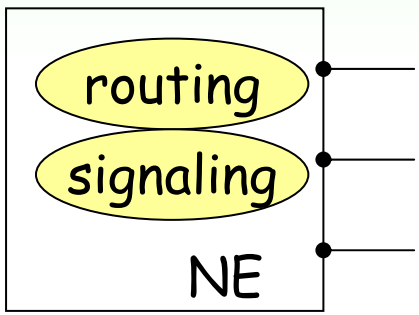
- Discussion between IETF, ITU-T and OIF
  - GMPLS routing specifications
  - ITU-T G.7715 and G.7715.1 requirements
  - OIF prototyping efforts
- Formation of joint design teams
  - Requirements
  - Evaluation of GMPLS protocols for ASON routing
- Creation of RFCs
  - RFC 4258
  - draft-ietf-ccamp-gmpls-ason-routing-eval-02.txt (approved)

Routing Topics: Client Reachability

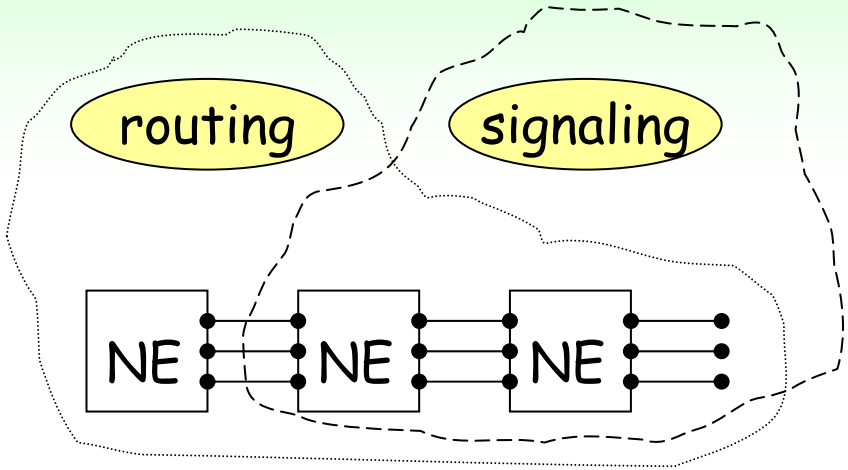


- ASON Model assumes that client devices have a separate naming/addressing space
- Client connectivity is not advertised within the network using the internal routing protocol
- Instead reachability to client addresses may be advertised

Routing Topics : Separation of Control Entities



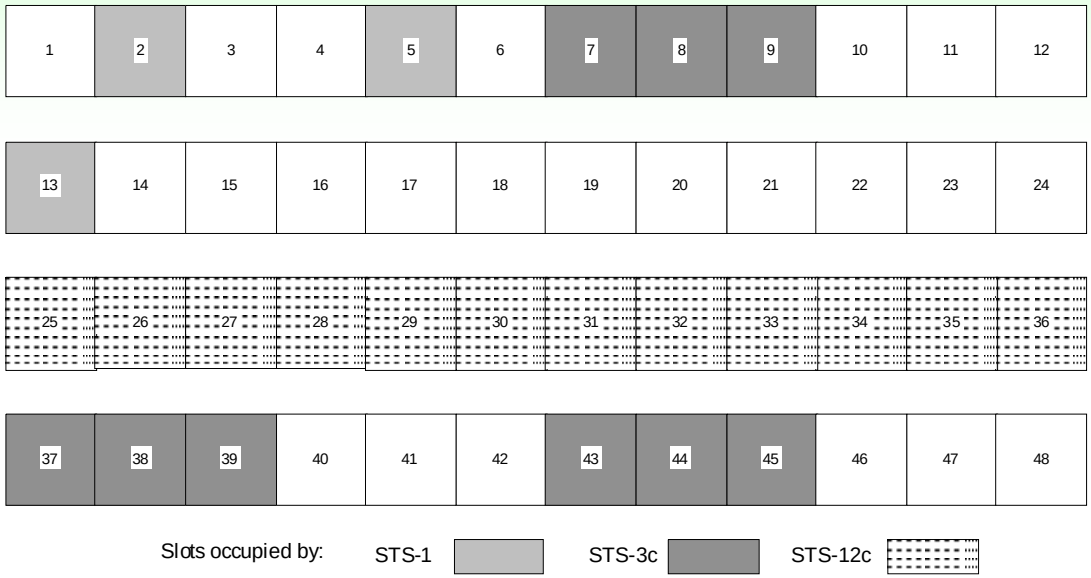
LSR Model



ASON Model

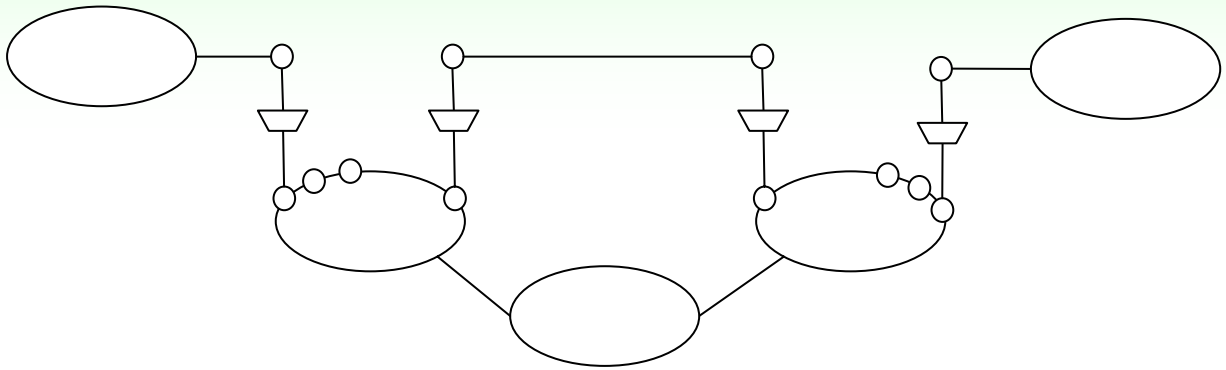
- ASON Model assumes control/transport separation
  - single Routing Controller could support many Network Elements
  - single Signaling Controller could support different set of NEs
  - example case: Proxy server for legacy domain

Routing Topics : Bandwidth Availability



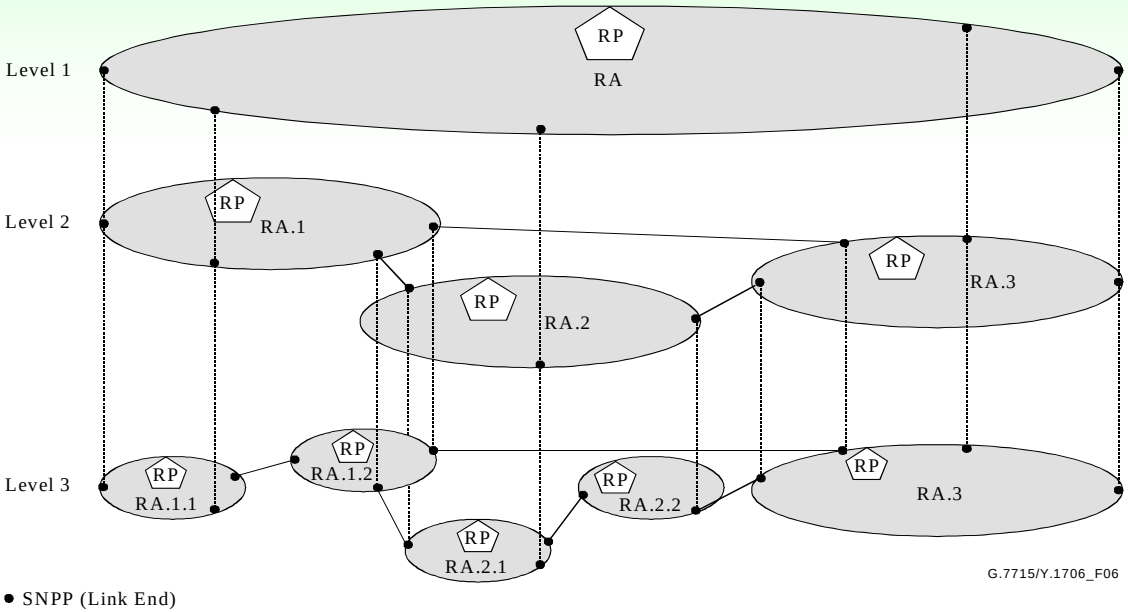
- Partially occupied OC48 example:
- simple bit/sec measure does not accurately indicate availability for each signal type
- position of occupied timeslots affects availability for contiguous concatenation
- availability per signal type would be more accurate

Routing Topics : Adaptation Capabilities



- Link advertising should reflect
  - whether link end is TCP or CP
  - what kinds of adaptation are supported at the link end
  - useful in routing to the right adaptation function

Routing Topics : Hierarchy



- G.7715 Routing Model
  - allows routing areas to exist within routing areas
  - each area is opaque to the outside
  - multiple levels of areas may exist as administered by the carrier

Hierarchy Requirements from G.7715/7715.1

- Distinguishing between different types of information
  - especially when sourced from a different level
- Loop avoidance
  - avoid feeding of information up or down leading to looping of advertisements
- Upward mapping or translation
  - configured or abstracted topology is advertised externally
- Downward distribution
  - received external topology is distributed internally

Results

- Proposed solutions in draft-dimitri-ccamp-ason-routing-sol-01.txt
  - Many thanks to Dimitri Papadimitriou!
- Passed initial comments by CCAMP WG
- Currently under review by OSPF and IS-IS experts
- Will need review by ITU-T and OIF
  - OIF has already indicated support in principle
- Headed towards WG draft, hopefully approval in Nov 06

Proposals in draft-dimitri

- Add client reachability advertisement
  - extension of the Node Address TLV
  - includes associated TE Router ID
- Add Local/Remote TE Router ID to TE Link LSA
  - modeled after
- Add per-signal-type bandwidth extension
  - extension of the Interface Switching Capabilities TLV
- Add Adaptation TLV
- Start to include “hooks” for hierarchy support

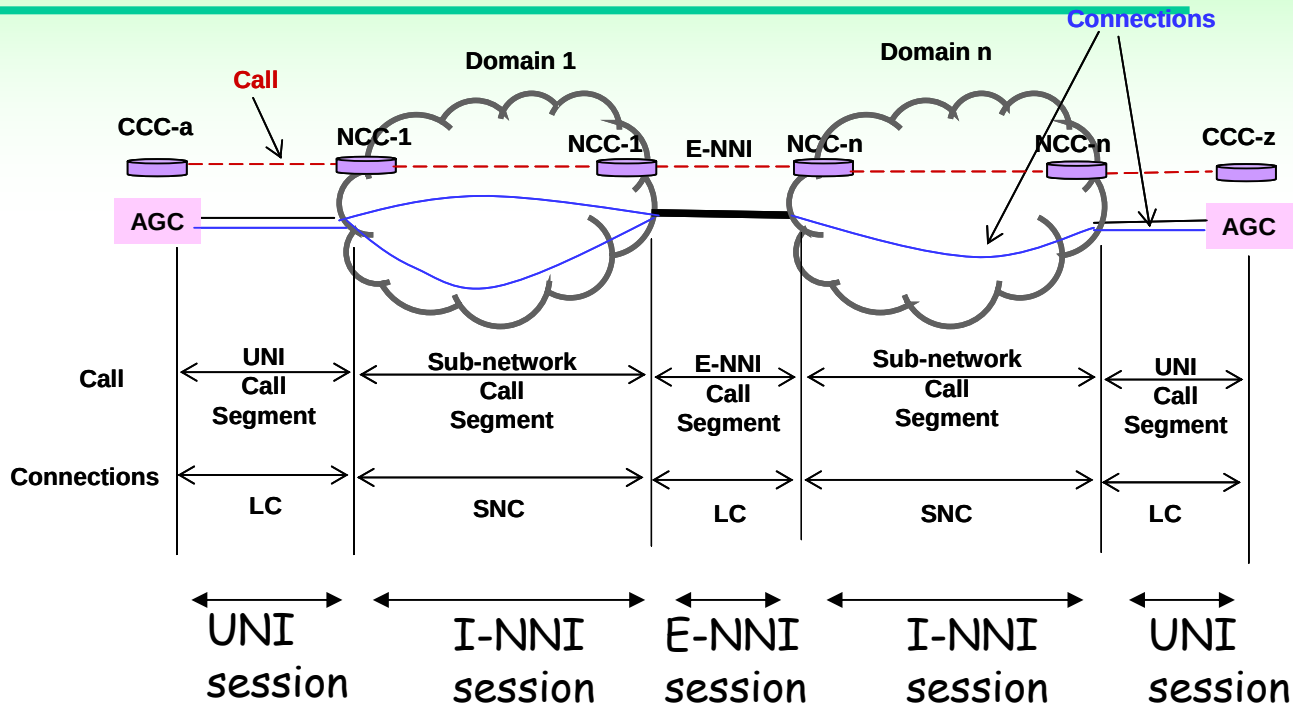
Comparison with OIF prototyping

- OIF DDRP – prototype tested in 2003, 2004 and 2005
- DDRP TNA Reachability TLV
  - includes Node ID/TNA pairing
- DDRP Local and Remote Node ID TLV in TE Link LSA
  - two TLVs rather than one
- DDRP Modified ISC TLV
  - does not include bit-per-second bandwidth measurement
- OIF has not yet prototyped selective adaptation
  - future topic for multi-layer connections
- OIF has not yet prototyped >1 level hierarchy
  - future topic for more complex carrier networks

Signaling Convergence (or lack of)

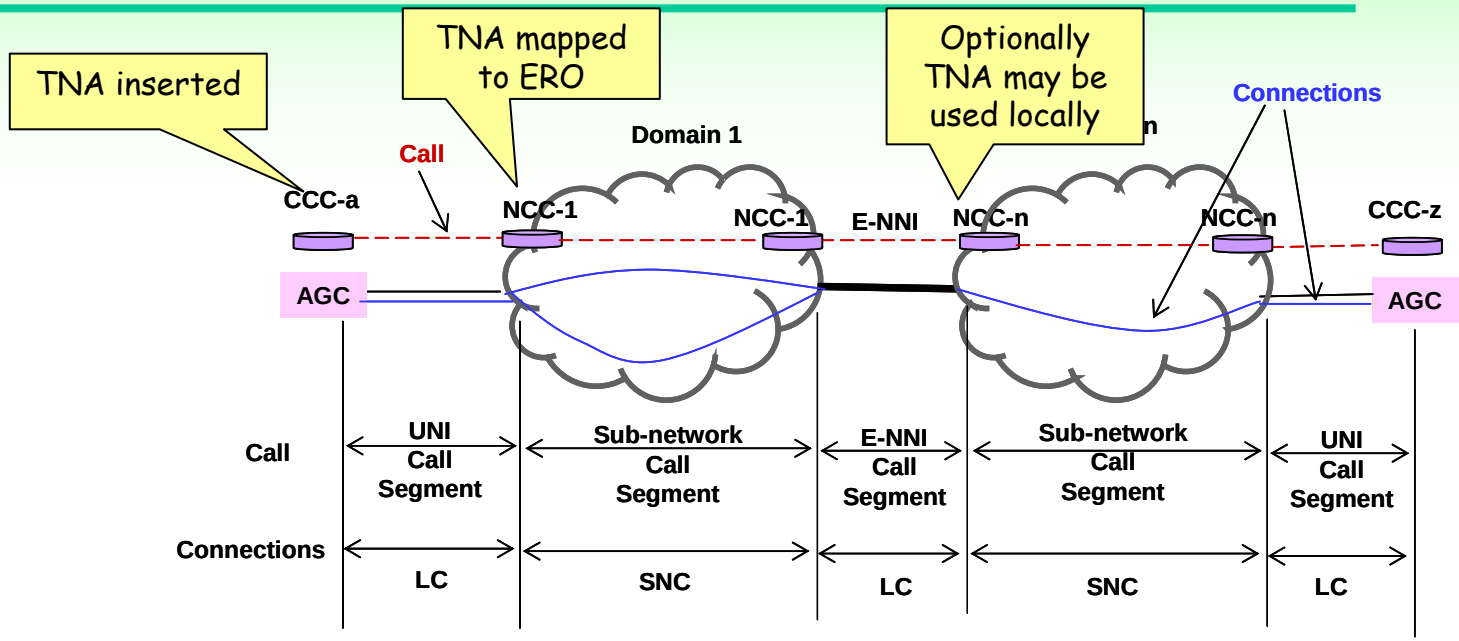
- Parallel work in IETF, ITU-T and OIF
  - OIF UNI specification
  - GMPLS RSVP-TE specification (RFC 3473)
  - ITU-T Recommendation G.7713.2
- Roughly similar timeframes, but incompatible
  - Same base message set
- OIF and ITU-T specs have:
  - Different session object classes and formats
  - Different addressing model
  - Some procedural differences
- Where to go from here?
  - Difficult: specifications already approved and published

ASON Session Concept from G.7713.2



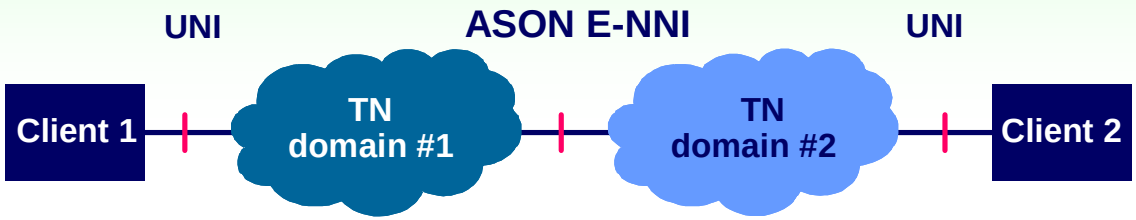
- Each segment is its own RSVP session
- end-to-end information is carried separately in G_UNI
- Combination causes an incompatibility with GMPLS assumptions of a single (or at least uniquely mapped) end-to-end session

Addressing Topics



- Client address is not mapped uniquely to network address but is mapped to ERO (may be partially mapped) and carried along for further use
- Similar to a telephony numbering model
- Distinct from a VPN addressing model where there is always a one-to-one mapping to a distinct network address

Interworking Situations



- Potential interworking includes:
  - ASON UNI – GMPLS I-NNI and reverse
  - GMPLS Overlay – ASON I-NNI/E-NNI and reverse
  - GMPLS – ASON I-NNI/E-NNI and reverse
- Currently being documented as draft OIF Guidelines based on implementation experiences

Ways to move forward

- G.7713.2 is approved and has implementations
- RFC 3473 is approved and has implementations
- How to reconcile the two? Possible activities
  - Document the interworking of G.7713.2 and RFC 3473
  - Define extensions to RFC 3473 as necessary to meet the functional requirements of G.7713
  - Document the mapping of RFC 3473 and extensions to G.7713 abstract messages and parameters

Conclusions

- Convergence is proceeding well in ASON and GMPLS routing protocol
  - supported actively by participants with overlapping memberships
  - learned from the history of the signaling protocols
  - better commitment from standards bodies to interwork
- Convergence is slow for now on signaling
  - protocol specifications are already approved with misalignments
  - future movement may be tricky
- Other areas remain to be worked but may be more local scope, e.g., discovery