ASON/GMPLS Interoperability from an ITU perspective

Jonathan Sadler

September 25, 2005

Agenda

> **Review ITU-T**

>> **Composition**

>> **Method of operation**

> **Discussion of ITU-T ASON**

>> **Motivation for standardization**

>> **Progression of work**

> **Differences in Approach**

> **Ongoing ASON work**

>> **Multi-layer**

>> **Application to non-optical Transport**

ITU-T

> **International Telecommunications Union**

>> **UN Economic/Social Council Specialized Agency**

> **Members are:**

>> **Members States (Governments) – voting rights**

>> **Sector Members (Companies/Research Org.) - no voting right**

> **Work is subdivided by:**

>> **Sectors (ITU-T, ITU-R, ITU-D)**

>> **Study Groups – defines major subject areas for study**

>>> **SG 4 – Telecommunications Management**

>>> **SG 13 – Data Systems**

>>> **SG 15 – Transport Systems**

>> **Questions**

>>> **Q12/15 – Transport System Architecture (incl. ASON Arch.)**

>>> **Q14/15 – Transport System Management (incl. ASON Proto.)**

ITU-T

> **Primary product: ITU-T Recommendations**

>> **Developed by Questions**

>>> **Primary participants: Technical Experts from Sector Members**

>> **Ratified by Member States**

>>> **Can be blocked by objection from one Member State**

> **Development methodology: Top Down**

>> **Understand Requirements (Business, Policy, Technical)**

>> **Develop Architecture to support Requirements**

>> **Refine details of Architecture**

>> **Specify Protocols**

> **All driven by requirement for 100% consensus**

Agenda

> **Review ITU-T**

> > Composition

> > Method of operation

> **Discussion of ITU-T ASON**

> > **Motivation for standardization**

> > **Progression of work**

> Differences in Approach

> Ongoing ASON work

> > Multi-layer

> > Application to non-optical Transport

Standardization Motivation: ASON

> **Need for "Provisioning Velocity"**

> > **"Stalemate" on Management-based approaches to velocity**

> **Advancements in Control Plane Technology**

> > **ATM Forum, IETF**

> **Need to meet Business Requirements**

> > **Customer/Service Provider Relationship**

> > **Efficient use of Assets**

> **Requirements/Architecture needed to guide development**

> > **Maintain consistency with existing architecture recs.**

> > > **G.805 – Functional Architecture of Transport Networks**

ITU-T Rec. G.807: Requirements for ASTN
ITU-T Rec. G.8080: Architecture for ASON

Progression of Work: ASON

|		
2001 Jan	**G.807**	**Requirements for ASTN**
2001 Oct	**G.8080**	**Architecture for ASON**
	G.7712	**Arch and Specification of DCN**
	G.7713	**Distributed Connection Management**
	G.7714	**Generalized automatic discovery techniques**
2002 Apr	**G.7715**	**Architecture and Requirements for Routing**
2003 Jan	**G.7713.1**	**DCM based on PNNI**
	G.7713.2	**DCM based on RSVP-TE**
	G.7713.3	**DCM based on CR-LDP**
	G.7714.1	**Automatic discovery for SDH and OTN**
	G.8080	**Amendment 1**
2003 Oct	**G.7715.1**	**Routing Arch. & Req. for Link State Protocols**
2004 Apr	**G.7713**	**Amendment 1**
2004 Nov	**G.7718**	**Framework for ASON Management**
	G.8080	**Amendment 2**
2005 Apr	**G.7714**	**2nd Edition**

Agenda

> **Review ITU-T**

>> Composition

>> Method of operation

> **Discussion of ITU-T ASON**

>> Motivation for standardization

>> Progression of work

> **Differences in Approach**

> **Ongoing ASON work**

>> Multi-layer

>> Application to non-optical Transport

Differences in Approach

> **ITU expects heterogeneity**

> > **G.805 "Sub-Networks" abstract the collection of equipment supporting a Sub-Network Connection**

> > > **Allows sub-networks to use different methods for the same function (e.g. Protection)**
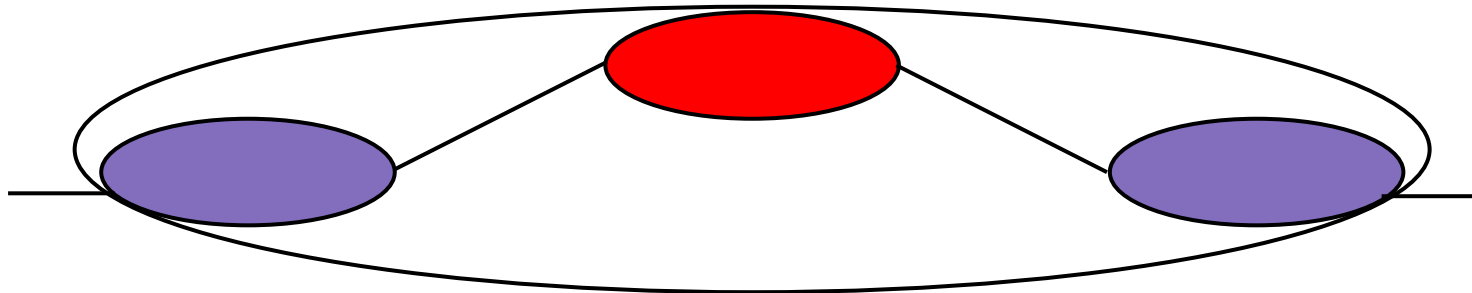
> > **No external view of Sub-Network internals**

> > > **Different addressing formats may be used**

> > > **Different protocols may be used**

> > **Hierarchical in nature**

Different Carriers and Vendors may use different approaches

Differences in Approach

> **ITU expects hierarchical multi-area routing**

>   **ASON Routing Areas are essentially G.805 Sub-Networks**

>   **Collection of Routing Areas form a larger Routing Area**

>   **Routing area details are opaque to higher level areas**
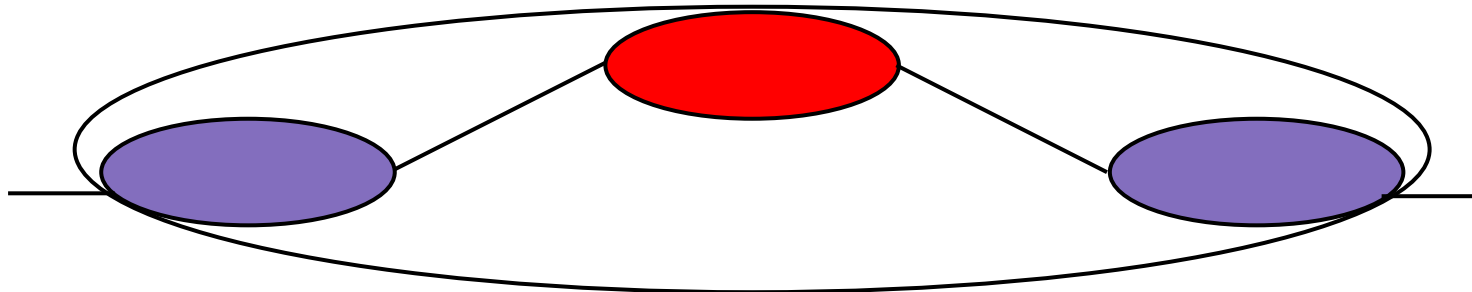
>   **As with Sub-Networks, this allows for different carrier and vendor approaches to coexist**
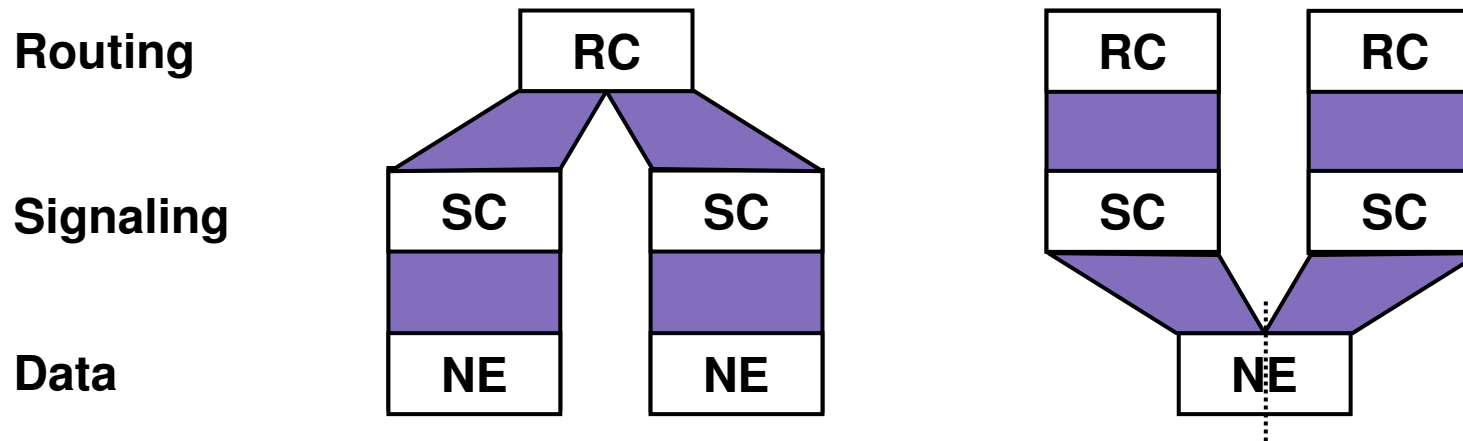
Differences in Approach

> **ITU expects network boundaries**

>> **E-NNI and UNI Reference Points**

I-NNI

E-NNI   **E-NNI**

UNI   **UNI**
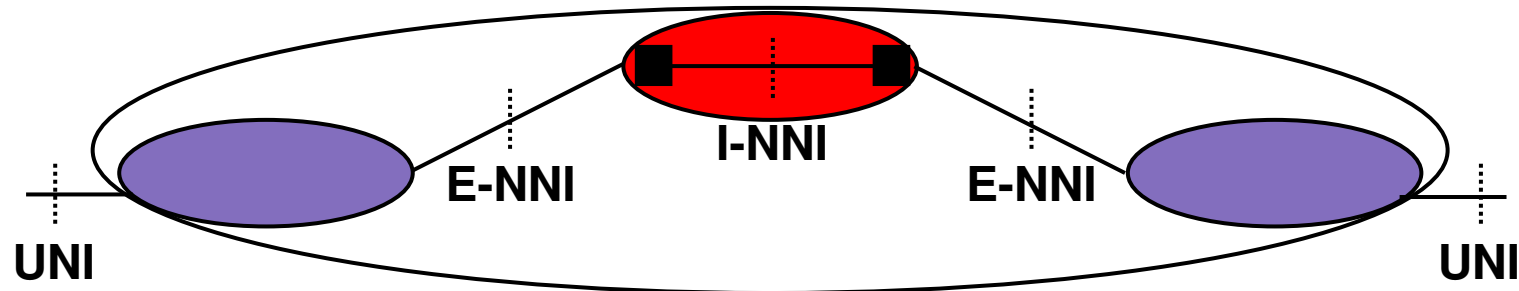
> **UNI: Customer Service Request interface**

>> **Low Trust, High Functionality**

> **E-NNI: Peer Signaling interface**

>> **Medium -> High Trust**

> **I-NNI: Internal Signaling Interface**

>> **Vendor Extensions possible**

Differences in Approach

> **ITU expects distribution of Control Plane Components and NEs other than 1:1**

Routing

Signaling

Data

> **Allows for simplification of routing implementations that support hierarchical routing**

> **Allows for better support of large (thousand of ports) NEs**

Differences in Approach

> **ITU expects maintenance of Transport Behavior**

> > **Transport plane connection can only be taken down when explicitly signaled**

> > **Network managed through management of service instances**

Differences in Approach

> **IETF expects maintenance of Packet Network Behavior**

  > **Homogeneity**

    > **Use of IP addressing everywhere**

    > **No Trust Boundaries within the network**

    > **Low Functionality in the Network**

  > **Packet Network Control Behavior**

    > **Control, Management, and Switching within one NE**

    > **All routers participate in all Control Plane protocols**

      > **Includes customer equipment**

    > **Maintain IP Control Protocol processing approaches**

    > **Network managed through management of Control Plane Protocols**

Differences in Approach

> **How is this manifested in the protocols?**

> > **Even with different requirements, protocols are almost identical**

> > > **ASON Signaling** (G.7713.2)

> > > > **One New Object: "Call Object" (a.k.a. G-UNI)**

> > > > **Clarification on Z-end initiated disconnect**

> > > > **Different Soft Permanent Connection handling**

> > > **ASON Routing** (OIF E-NNI *Draft* Extensions based on G.7715/.1)

> > > > **3 New SubTLVs for:**

> > > > > **NodeID to handle RouterID / NodeID separation**

> > > > > **Link capacity (separate layer network info)**

> > > > > **Endpoint reachability (i.e. UNI endpoints)**

> > > > **G.805 Sub-Networks use containment hierarchy**

> > > > > **Inter-Area TE route calculation procedure**

Differences in Approach

> **How is this manifested in the protocols?**

>> **Even with different requirements, protocols are almost identical**

>>> **ASON Neighbor Discovery** (G.7714)

>>>> **Built up on G.805 Trails/Link Connections**

>>> **ASON Signaling Communications Network**

>>>> **Strict separation of:**

>>>>> **Packet network carrying signaling packets (SCN)**

>>>>> **Optical Control Plane "Application"**

>>> **SCN IP addresses are separate from RouterID**
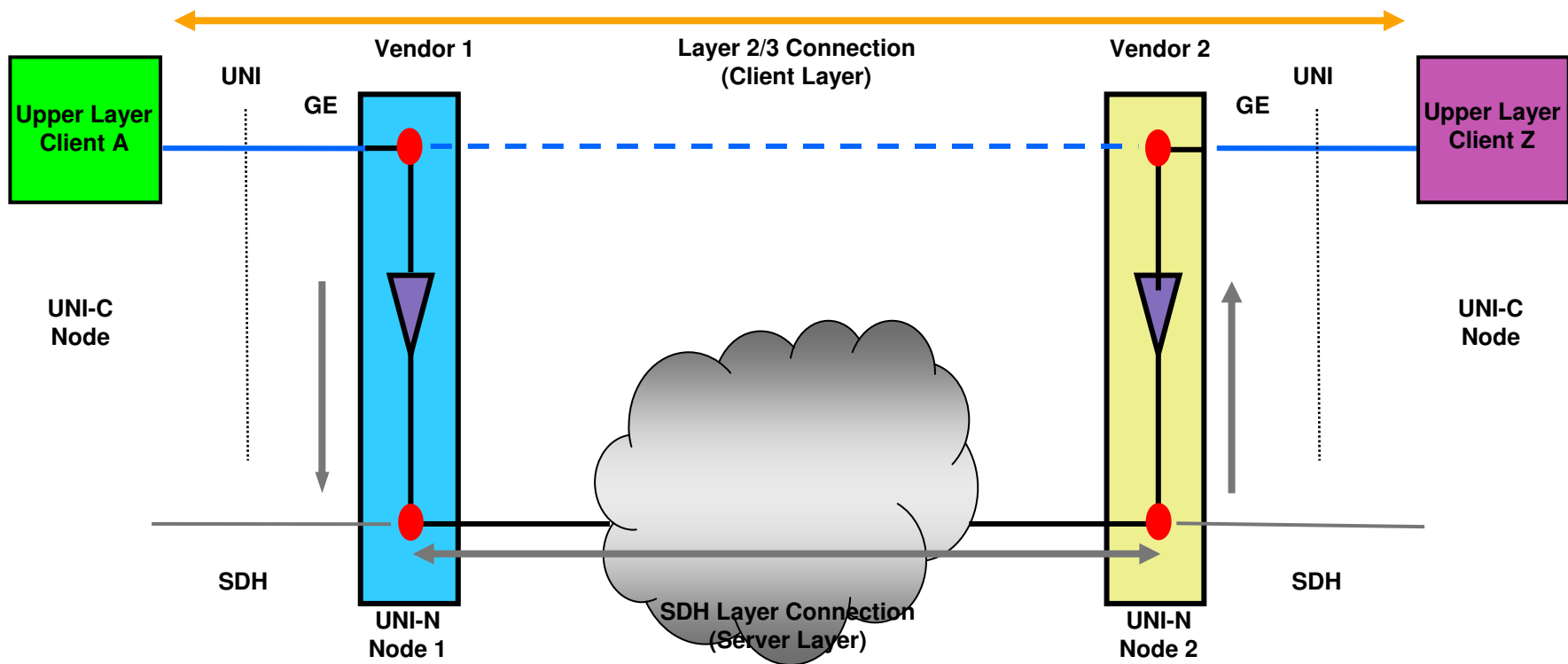
>>>> **Allows for easy SCN redesign/renumbering**

Agenda

> **Review ITU-T**

> > Composition

> > Method of operation

> **Discussion of ITU-T ASON**

> > Motivation for standardization

> > Progression of work

> **Differences in Approach**

> **Ongoing ASON work**

> > **Multi-layer**

> > **Application to non-optical Transport**

Ongoing ASON work

> Multi-layer support

Ongoing ASON work

> **Application to non-optical Transport**

>> **Packet Transport**

>>> **Ethernet (G.8010)**

>>> **MPLS-TE (G.8110)**

>> **Natural outgrowth from multi-layer work**

>> **Discussions started with IETF in attempt to align this work**

Our Vision

Deliver to customers technology that transforms the way the world communicates™.