Network Interface Specifications in the OIF from a Carrier Perspective

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Outline

- Introduction to the Optical Internetworking Forum
- Transport network enhancements provided by the standardization bodies and forums
- Concept of a VC-4 agile transport network
- Migration path
- Conclusion
Optical Internetworking Forum

Overview

Mission
The OIF Technical Committee's mission is to accomplish the technical objectives of the OIF with the principal goal to cooperatively produce technical Implementation Agreements and other technical documents to accelerate the deployment of optical networking technology and facilitate industry convergence on interoperability.

Members
The OIF continues to grow with >350 member companies worldwide representing system vendors, service providers, component suppliers, consultants and end users.
OIF Working Groups

There are currently six Working Groups:

- Architecture
- Carrier
- Signaling
- OAM&P (Operations, Administration, Maintenance, & Provisioning)
- Interoperability
- Physical & Link Layer
Carrier Working Group

- Develops requirements and guidelines for future optical networking products
- Provides a common direction to the component & equipment vendors community
- Provide input and guidance to other OIF working groups
- Specify interworking requirements
- Delineate issues with the installed base or Greenfield applications
- Develop service concepts
- Provide inputs to other standards bodies and forums
Interoperability Working Group

- Definition of testing methodologies
- Perform conformance tests to implementation agreements
- OIF technical leadership for interoperability trials

Interoperability tests are one of the most important OIF activities, which show the practical, real interoperability performance of TN elements and public demonstrate the support of Implementation Agreements in the OIF community.

Interoperability tests of full size UNI, NNI and the interworking with NMS is seen of paramount importance!
OIF activities

- Focused first on (Optical) User Network Interface, UNI
  - Subset demonstrated in June 2001 at SuperComm
  - UNI 1.0 specification ratification Oct.2001
- Close collaboration with IETF, OIF-UNI signaling is a subset of GMPLS
- UNI 1.0 specification serves as input to ITU-T/ASTN work
- Currently work is done concerning (Optical) NNI and (Optical) UNI 2.0 specification
OIF NNI and UNI 2.0 activities

UNI 2.0
- Supports for non-destructive bandwidth modification
- Makes auto discovery mechanisms mandatory
- More than SONET/SDH signals (Ethernet, → IEEE)
- Enhanced security
- Billing and accounting

NNI
- Initial focus domain-to-domain interface within a single carrier network
- Each domain will typically consist of single vendor’s equipment
- First carrier requirements are specified
Standardisation Bodies and Forums

ASTN, GFP, LCAS

Optical UNI/NNI

MPLS, MPLS, GMPLS

OIF Optical Internetworking Forum
IETF Internet Engineering Task Force
ITU-T International Telecommunication Union
TN Enhancements Provided by the Standardisation Bodies and Forums

- Generic Framing Procedure (GFP), ITU-T Rec. 7041
- Virtual concatenation, ITU-T Rec. G.707 (Network Node Interface for SDH)
- Link Capacity Adjustment Scheme for Virtual Concatenated Signals (LCAS), ITU-T Rec. 7042
- GMPLS (Control Plane), IETF (draft-ietf-ccamp-gmpls-architecture)
- Requirements for automatic switched transport networks (ASTN), ITU-T Rec. 807
- User Network Interface (UNI 1.0), OIF

⇒ With this tool set the efficiency of optical transport networks can be enhanced considerably
Today's Transportnetwork
One traffic aggregation stage

Aggregation/multiplexing in client layers

Static ptp WDM links
VC-4-Xc only

WDM

IP
Ethernet
ATM
SDH

Static ptp WDM links
VC-4-Xc only

Aggregation/multiplexing in client layers
OCh Agile Optical TN
One traffic aggregation stage

- OCh switching granularity only
- Reasonable at high capacity demands
- Low network dynamics expected
- OCh utilization low

Aggregation/multiplexing in client layers
Concept of a VC-4 Agile TN
Two aggregation stages

- Fast (re)configurable transport network with VC-4 switching granularity
- Reasonable at today's and near future traffic demand
- Highest network dynamics expected
- OCh utilization high

Aggregation/multiplexing in client layers
Multiplexing/grooming in SDH (OCh) layer

SDH/WDM

UNI

IP
Ethernet
ATM

SDH

GE, 10GE, VC-4-Xv
VC-4 Agile Transport Network
Potential Implementation #1

Aggregation/multiplexing in client layers

Multiplexing/grooming in SDH/OTN layer

Payload only is transported

Ethernet

time

SDH/OTN

LCAS node, GFP

UNI 2.0

IP

Ethernet

ATM

SDH

GE, 10GE-LAN

LCAS node, GFP

Ethernet

Payload only is transported

VC-4

Ethernet

time
VC-4 Agile Transport Network
Potential Implementation #2

- IP
- Ethernet
- ATM
- SDH
- UNI 1.0
- SDH/OTN
- VC-4-Xv
- LCAS nodes
- Multiplexing/grooming in SDH/OTN layer
- Payload only is transported

Aggregation/multiplexing in client layers

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How could one get there?

- Ask intensively for early implementations
- Detailed and profound lab tests
- Gain own experiences in real telecommunication environment field tests
- Base the decision for real network implementation on serious (worst case) business scenarios

⇒ DT is planning to perform field experiments for evaluation of the optical network interfaces:
  - NNI (control & data plane)
  - UNI (signaling & data plane)

Additionally Ethernet based MAN, the interworking client-transport network, seamless network management and new WDM/TDM technologies are evaluated
Global Seamless Networks Demonstrator

Darmstadt

Service Line Systems Integration
von T-Systems

Technologiezentrum

Darmstadt

Berlin

Service Line Systems Integration
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Technologiezentrum

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Global Seamless Networks Demonstrator

Demonstration & visualisation of functionalities of an ASTN/GMPLS transport network. Client gain:

- **Fast connection provisioning (NNI)**
- **Additional transport service level: beside 1+1 protected & unprotected, ⇒ restoration (NNI)**
- **Direct connection invocation by the customer via signalling (UNI)**
- **Flexible access network under customer control (in a certain range) in the Ethernet based MAN**

Carrier gain:

- **Standardised interfaces (NNI, UNI, NMI) enable interoperability of different vendor equipment and network domains!**
- **Control plane (NNI) increase network capacity utilisation**
- **Reduction of operational costs due to automatic neighbour and service discovery**
- **Ethernet based MAN enables flexible services, e.g. (CNMS)**
Global Seamless Networks
Optical Transport Network Show Cases

Show Case (1) : ASTN/GMPLS (NNI)
- Demonstration & visualisation of Network-Network-Interface functionality (control plane functionality)

Show Case (2) : ASTN/GMPLS (NNI & UNI)
- Demonstration & visualisation of User-Network-Interface functionality and client - transport network interworking

Show Case (3) : BB-client network access up to 10GE
- Demonstration & visualisation of an Ethernet based customer managed access network

Show Case (4) : ASTN/GMPLS - Ethernet MAN interworking
- Demonstration & visualisation of metro - transport network interworking

Show Case (5) : Enabling Technologies
- Investigation & demonstration of new transport network approaches: transparent sub-networks and high capacity TDM networks
Conclusion

Tools for an efficient data transport over optical networks are in place:
- GFP makes it flexible,
- LCAS & virtual concatenation, control plane & UNI makes it elastic

OIF interoperability demonstration of the optical network interface functions are of paramount importance!

Let's go for a new generation of data transport networks!
Thank you for your attention

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