Network Interface Specifications in the OIF from a Carrier Perspective

Hans-Martin Foisel

T-Systems Nova GmbH
Technology Centre

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

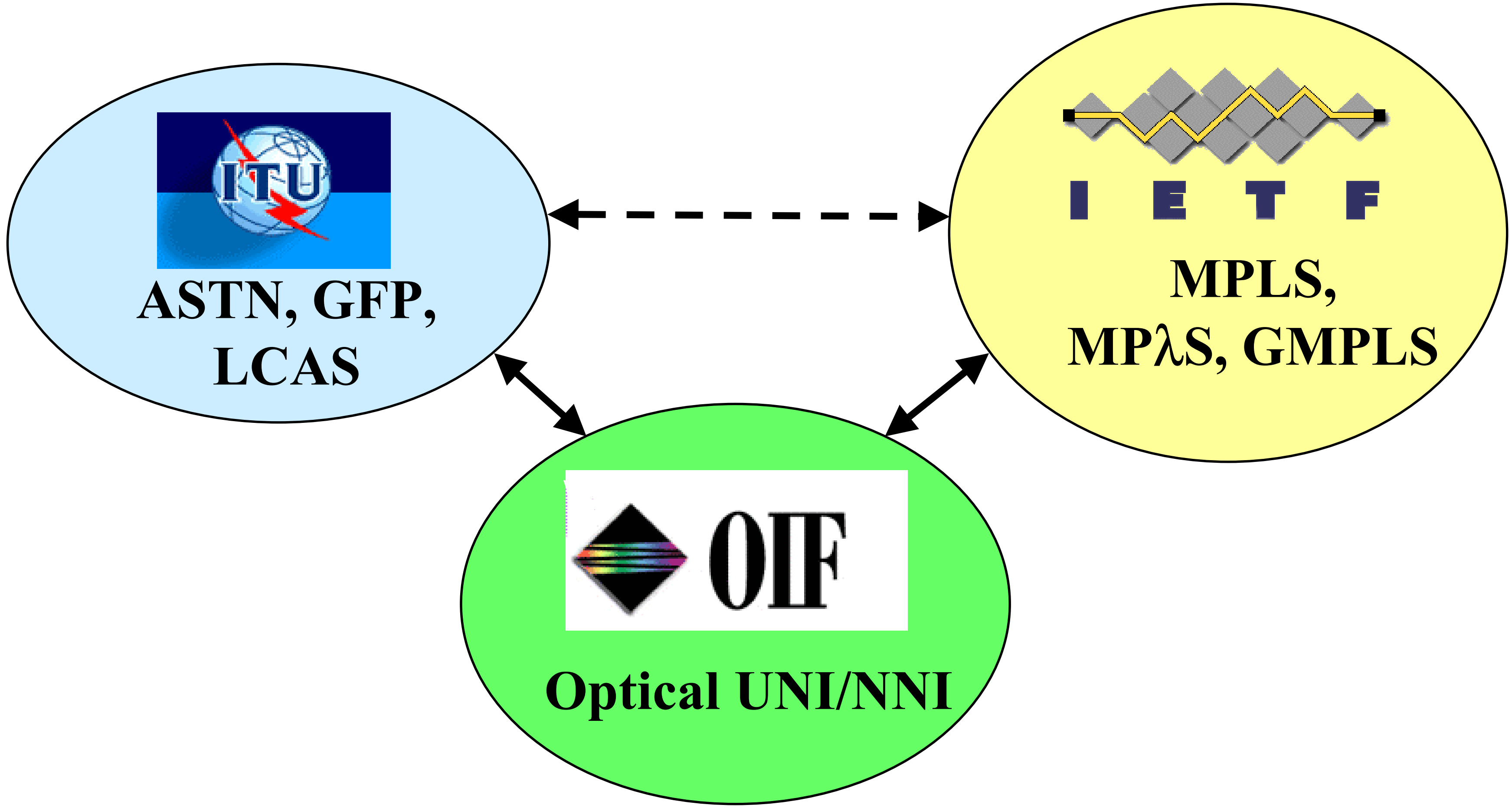
UNI 2.0

- 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



OIF	**Optical Internetworking Forum**
IETF	**Internet Engineering Task Force**
ITU-T	**International Telecommunication Union**

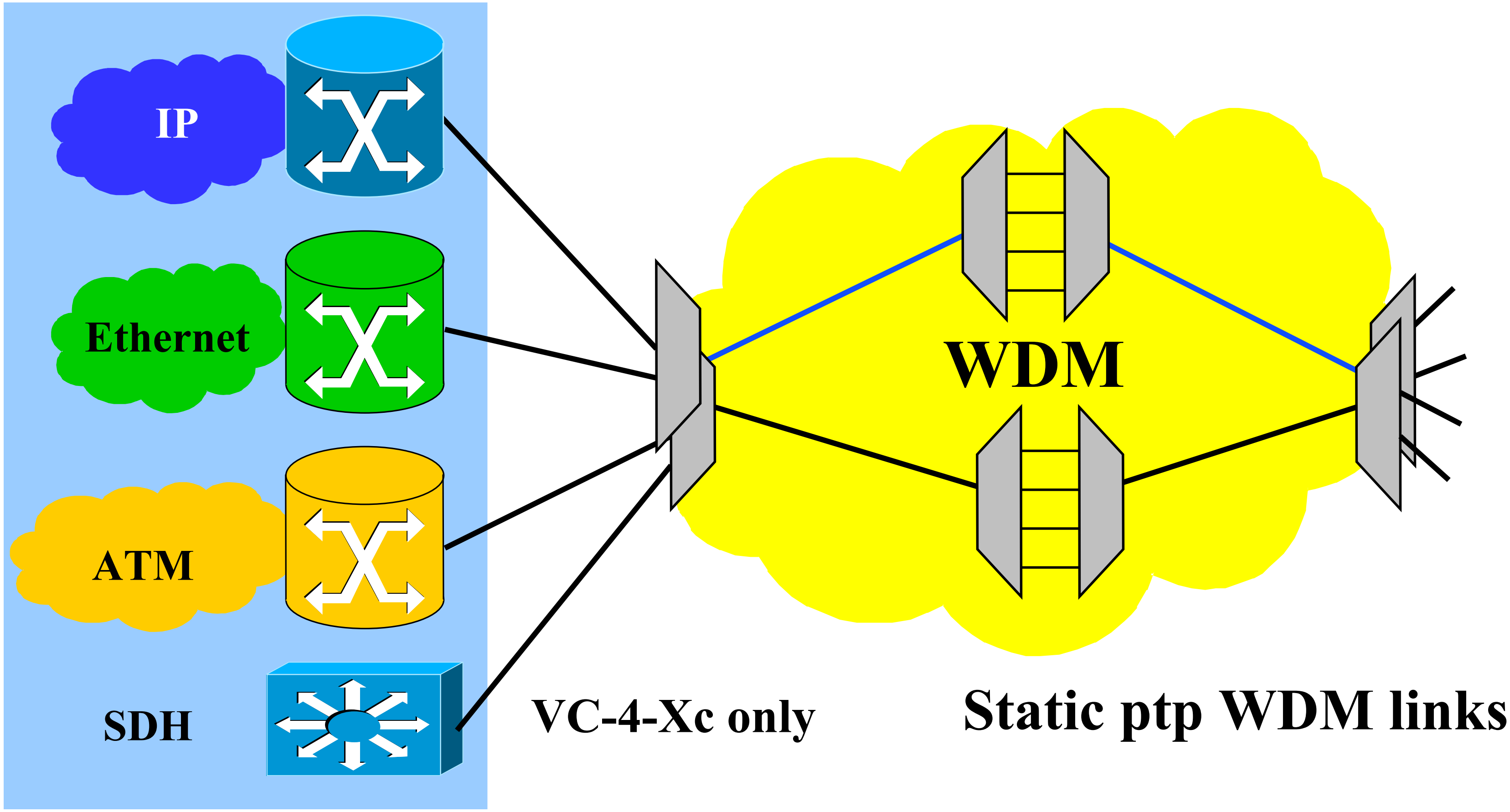
TN Enhancements Provided by the Standardisation Bodies and Forums

- **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

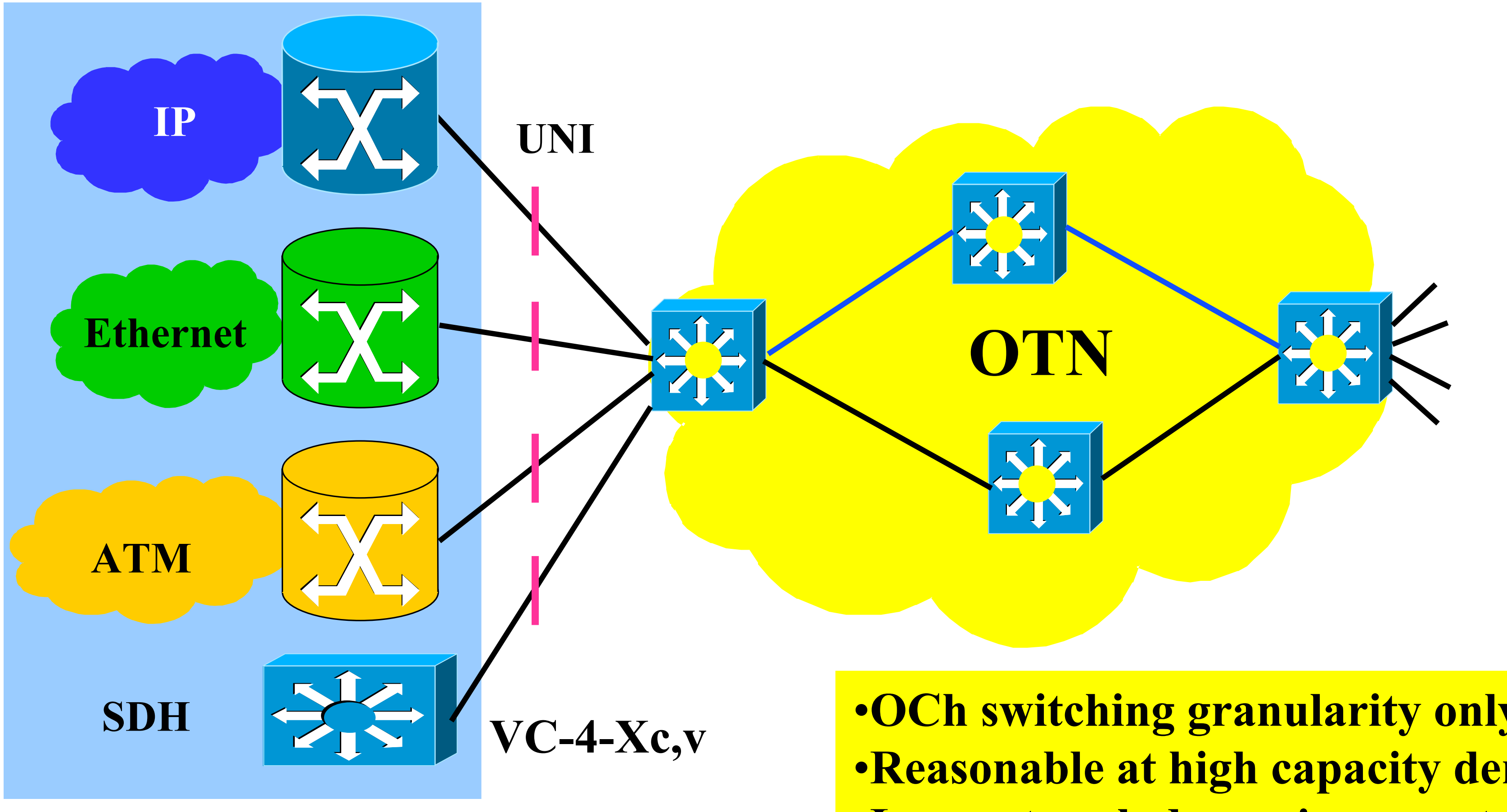
One traffic aggregation stage



Aggregation/
multiplexing
in client layers

OCh Agile Optical TN

One traffic aggregation stage

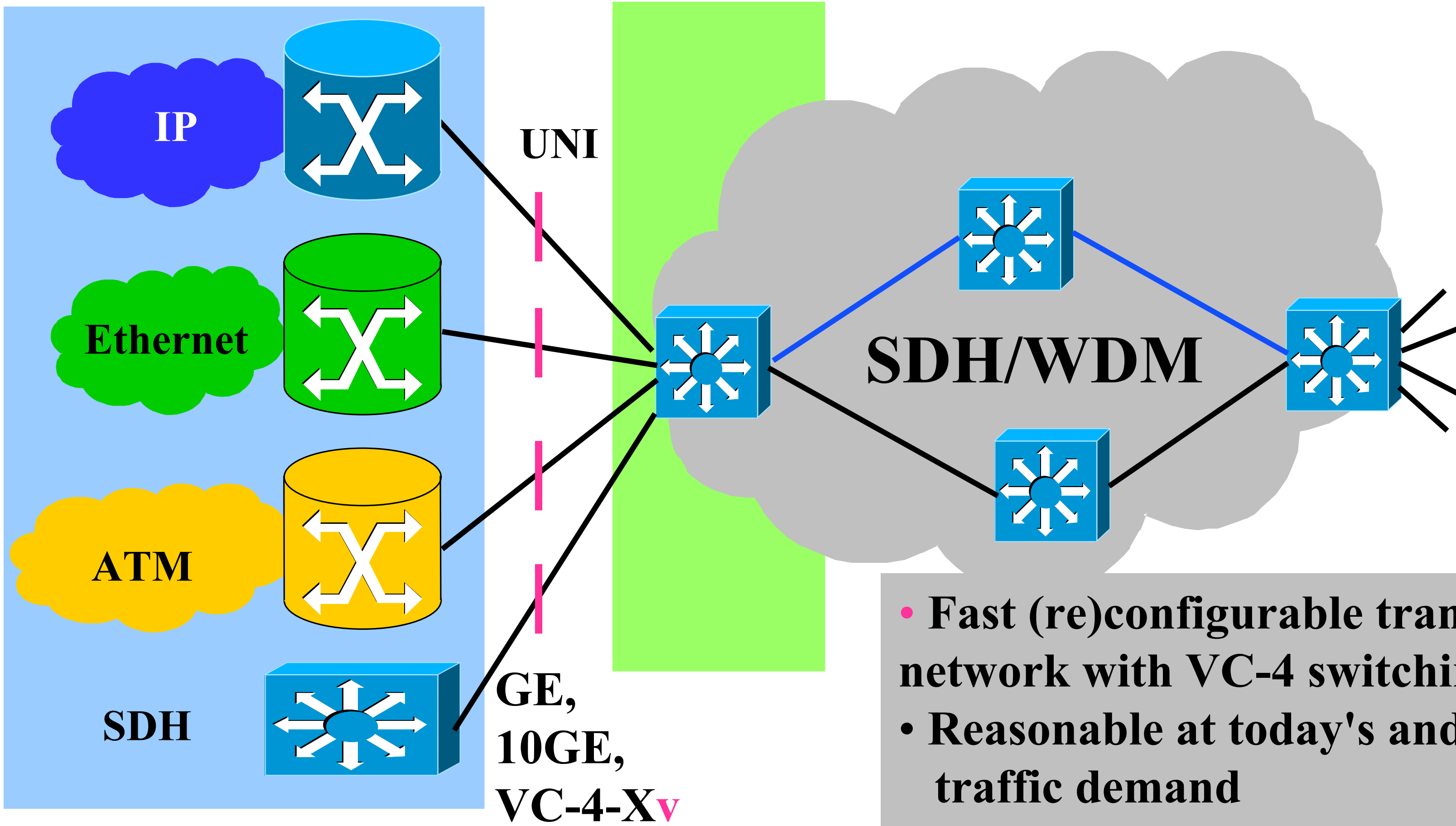


Aggregation/
multiplexing
in client layers

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

Concept of a VC-4 Agile TN

Two aggregation stages



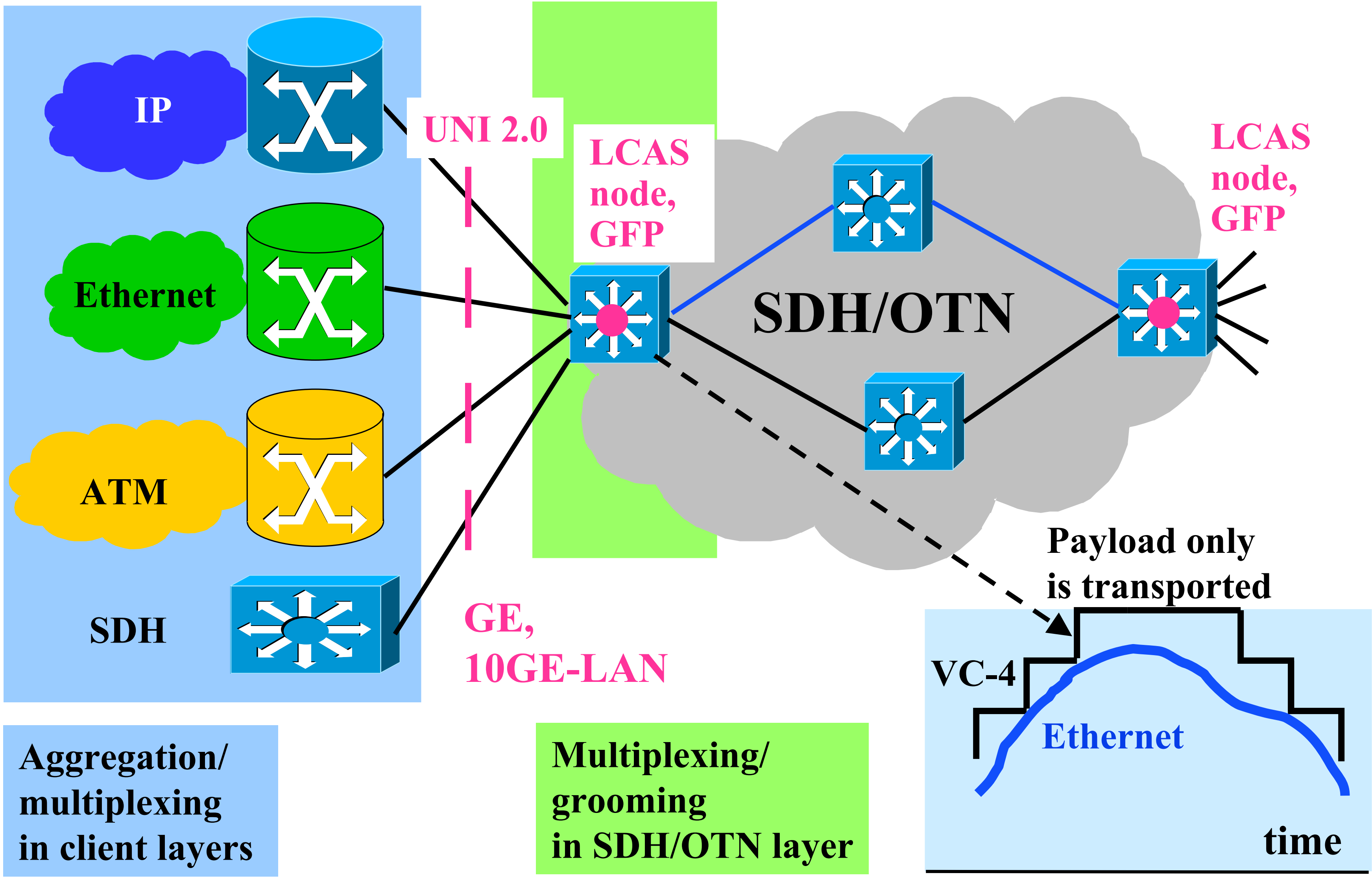
- Fast (re)configurable transport network with VC-4 switching granularity
- Reasonable at today's and near future traffic demand
- Highest network dynamics expected
- OCh utilization high

Aggregation/
multiplexing
in client layers

Multiplexing/
grooming
in SDH (OCh) layer

VC-4 Agile Transport Network

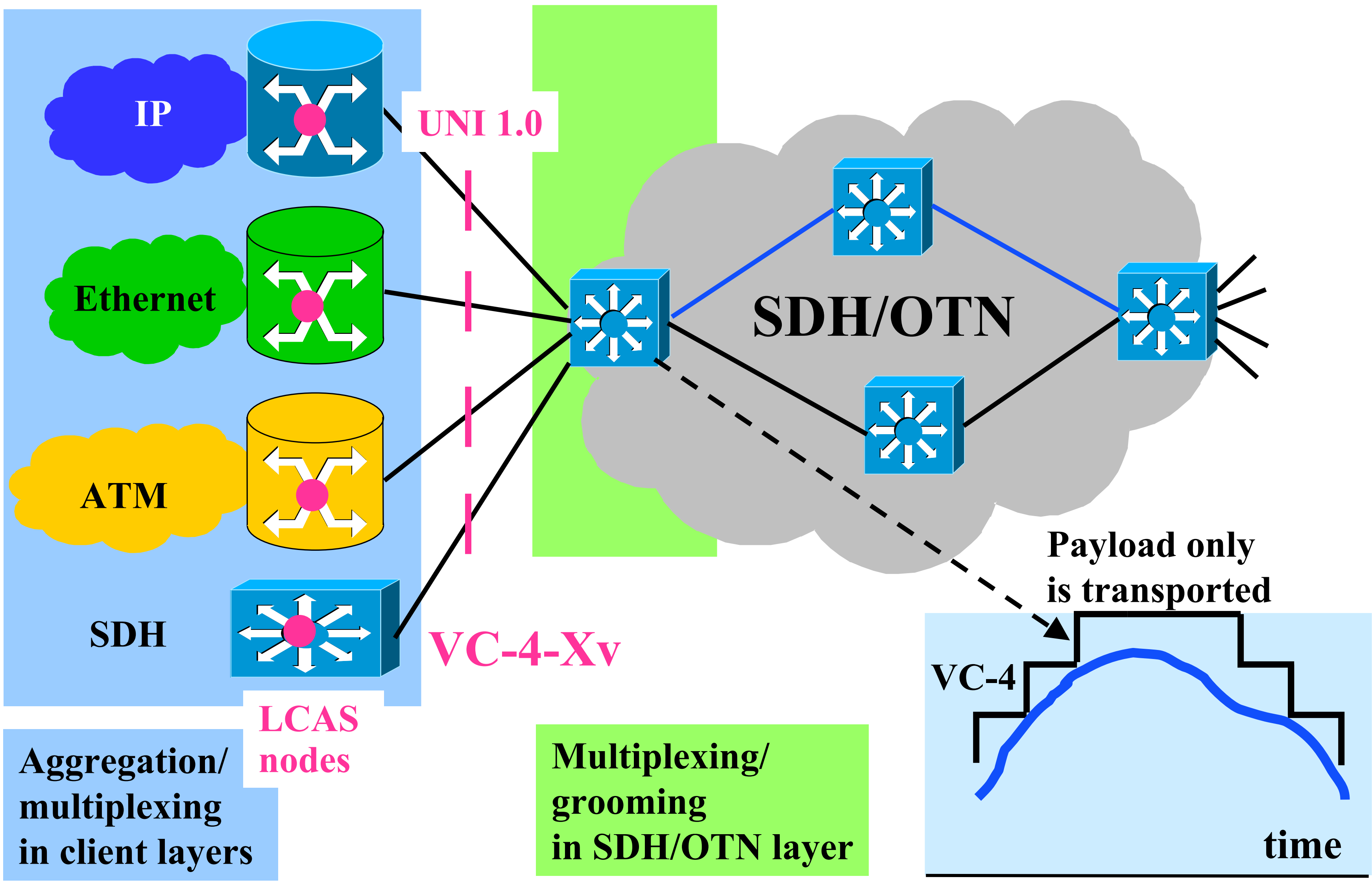
Potential Implementation #1



Aggregation/ multiplexing in client layers

Multiplexing/ grooming in SDH/OTN layer

VC-4 Agile Transport Network
Potential Implementation #2



How could one get there?

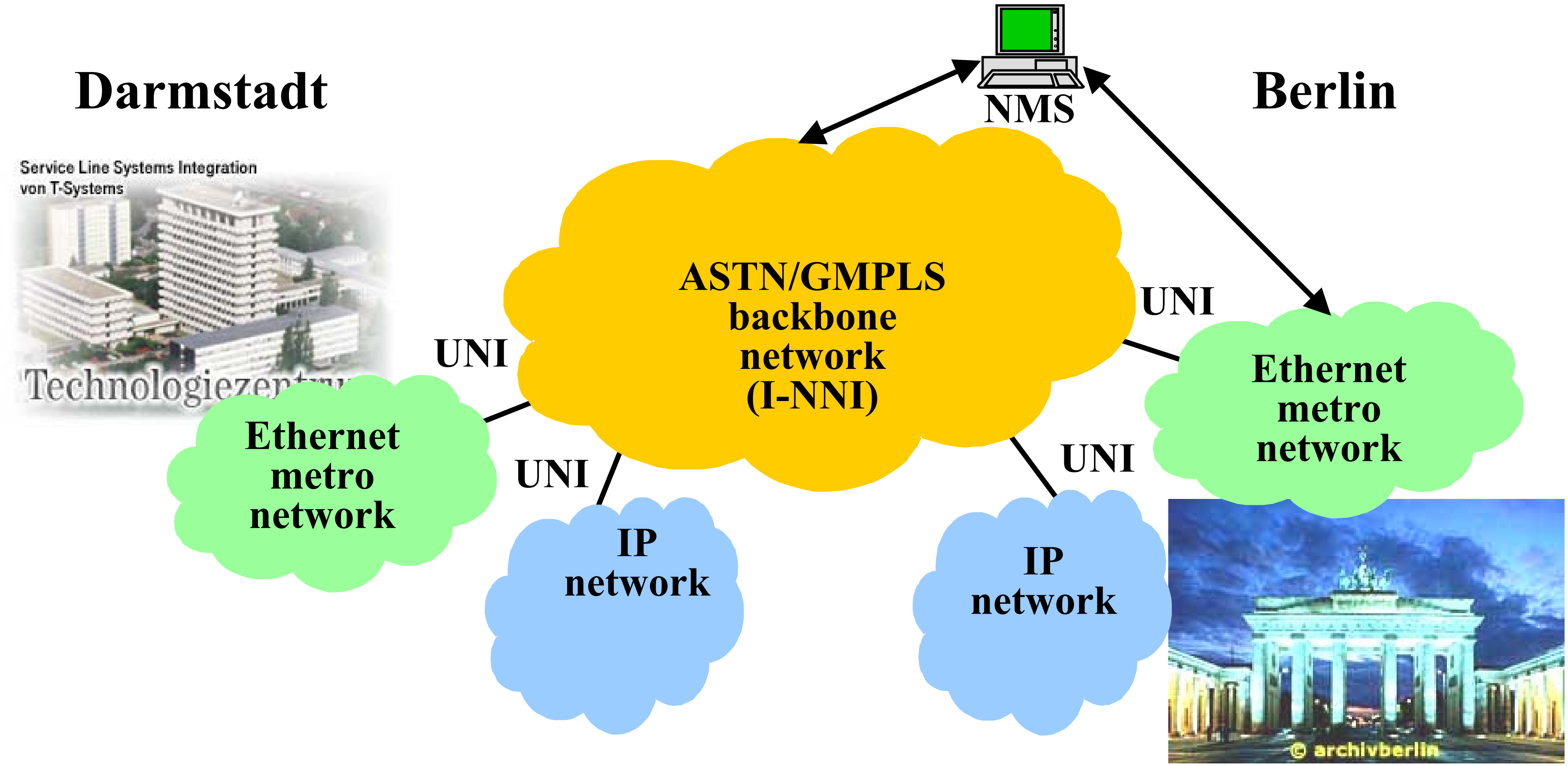
- Ask intensively for early implementations
- Detailed and profound lab tests
- Gain own experiences in real telecommunication environment field tests
- Base the decision for real network implementation on serious (worst case) business scenarios

⇒ 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



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

Hans-Martin.Foisel@t-systems.com