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- **Working Group:** Architecture
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- **SOURCE:**

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- **DATE:** July 20-21, 1999
- **ABSTRACT:** This paper is an attempt to compile the prevailing views previously presented in OIF papers from many sources into one document. It is the intention of this paper to set an architecture foundation to guide the OIF in the justification and completion of its projects.
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Paper OIF99.095 July 20, 1999 Slide # 1

This paper is an attempt to compile the prevailing views previously presented in OIF papers from many sources into one document. It is the intention of this paper to set an architecture foundation to guide the OIF in the justification and completion of its projects.

There is little new information in this paper; but it contains our view of the OIFs current direction.

Our objective is to use this paper to clarify the OIF projects. After making any necessary changes, we hope that this paper or something derived from it may make the basis for a living list document for reference architectures.

## Architecture Assumptions

- Two architecture models needed:
  - Metro model
    - one (few ?) administrative domains
    - less standardization
    - lease dark fiber or optical channel
    - more options for rates and encapsulation e.g. GbE, ATM, etc.
  - Backbone model
    - Standardized - few choices - few speeds
    - Packet over SONET (POS) for Data traffic
    - Optical Transport Network (OTN)

Paper OIF99.095 July 20, 1999 Slide # 2

There are many architectures that may be implemented but for the purposes of guiding the OIF, we believe that two reference models are needed.

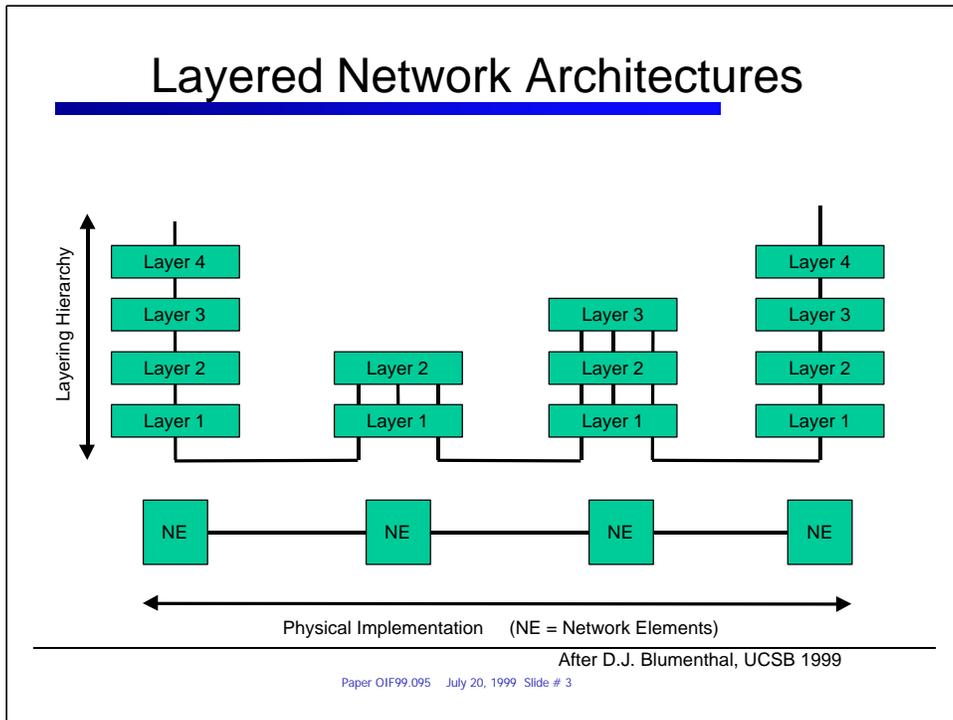
For the sake of today's discussion we have labeled them the Metro model and the Backbone model.

The backbone model may be considered the traditional long distance, wide area transport segment.

The metro model is viewed as a more recent segment with a wider variation in implementations.

This slide tries to summarize some of the key differences.

The rest of this presentation focuses on the backbone reference model.



The architecture working group has adopted the policy that the architecture will be based on a layered network.

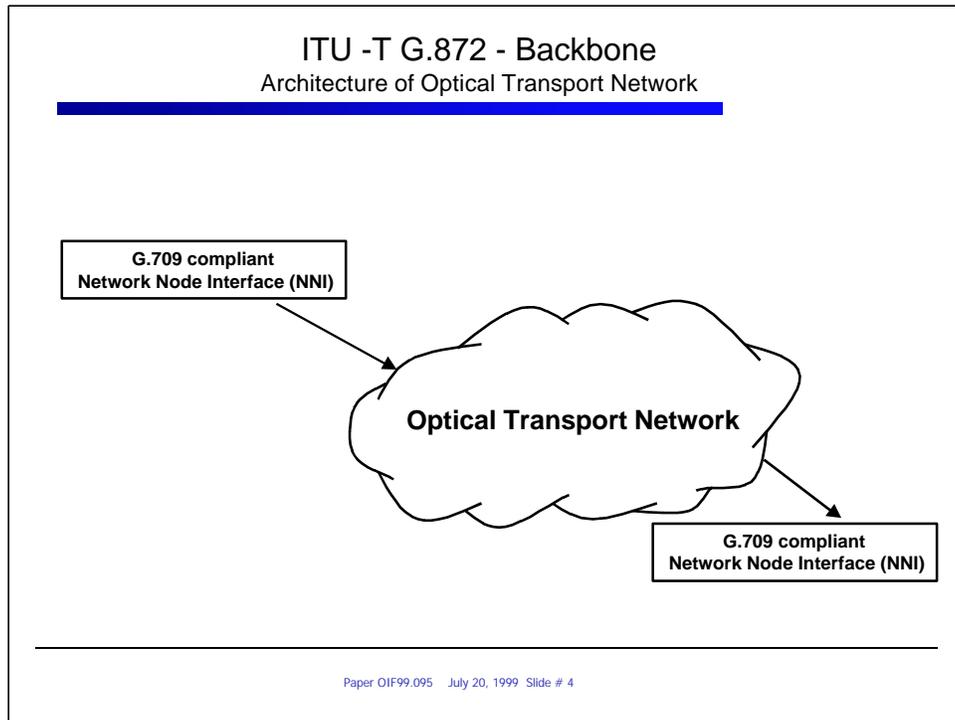
Paper OIF98.034 and OIF98.035 by Andy Reid, BT, made an excellent case for the layered architecture and set several principles:

A layer does not require its own set of boxes.

The desire to reduce cost by reducing boxes must not be confused with eliminating layers.

OIF should adopt a two stage approach to development of interface specifications:

- a functional description with logical interfacing
- a physical interface specification which identifies the logical interfaces present in a given implementation.



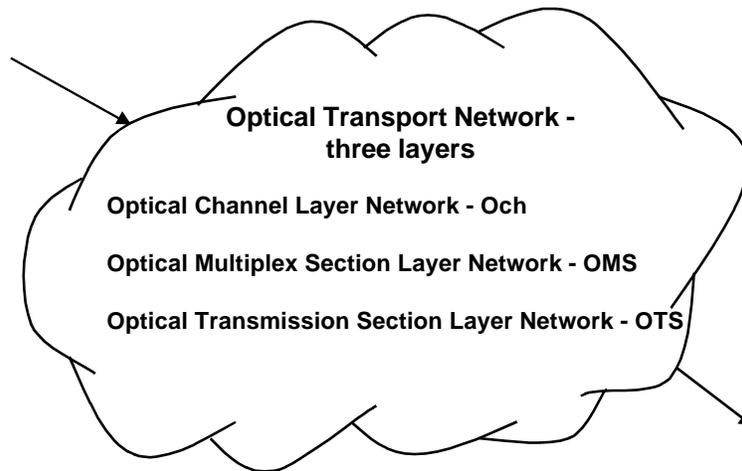
The OIF believes that the ITU will complete a series of standards in a timely manner which will document the optical transport network.

This series of standards uses ITU G.872 to outline the architecture of the optical transport network. G.871 contains the overall plan for the series of standards.

OIF98.025.1 by Kingsley and Garner of Lucent gives an excellent summary of this series of standards.

G.709 - Network Node Interface for the Optical Transport Network

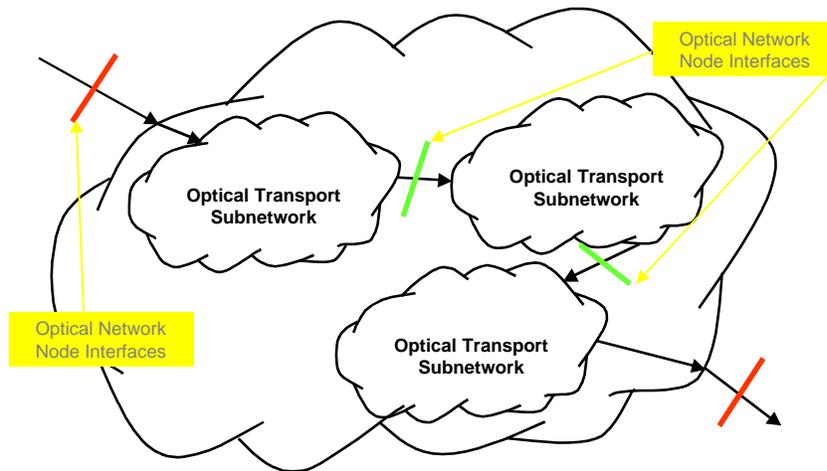
ITU -T G.872  
Architecture of Optical Transport Networks



Paper OIF99.095 July 20, 1999 Slide # 5

The optical transport network uses three layers. Each of these layers has a trail trace to help manage that particular layer in the network.

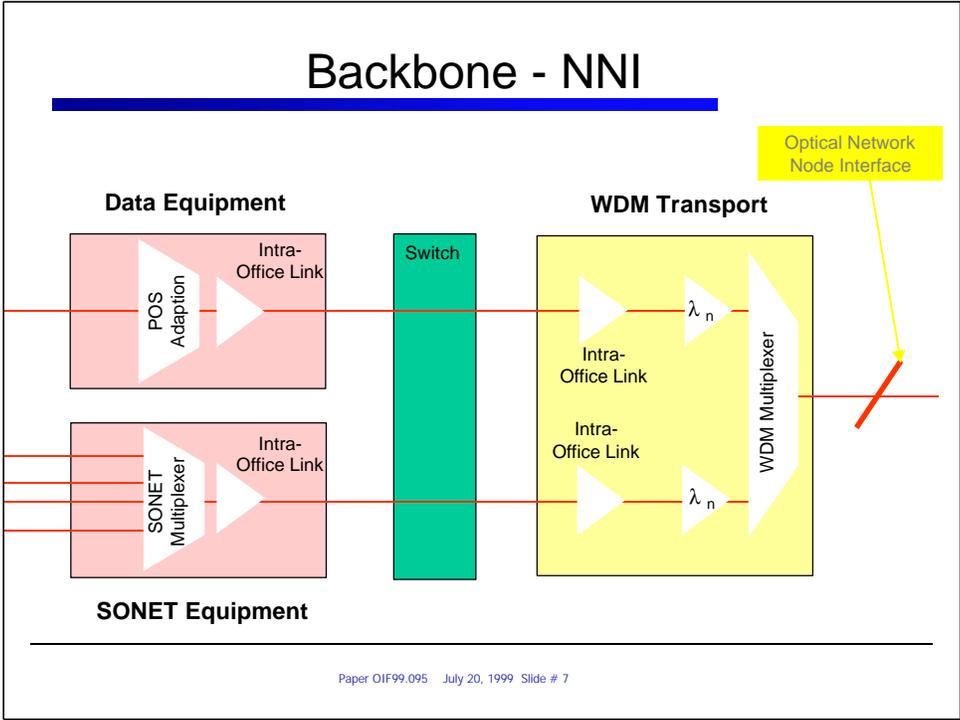
ITU -T G.872  
Architecture of Optical Transport Networks



Paper OIF99.095 July 20, 1999 Slide # 6

The optical transport network may be comprised of subnetworks. The most general case of this would include subnetworks managed by different domains.

From an optical internetworking perspective, the optical network node interfaces should be identical.



This slide considers the architecture of a functional block diagram of a network node interface for a G.872 compliant network node interface.

This functional block diagram considers both SONYET multiplexor and data equipment as sources for data streams that are then assigned wavelengths and multiplexed into a common transport fiber by the WDM transport equipment.

The network layer functions of the G.872 optical transport network will be implemented within these functional blocks.

## Using the Architecture Model

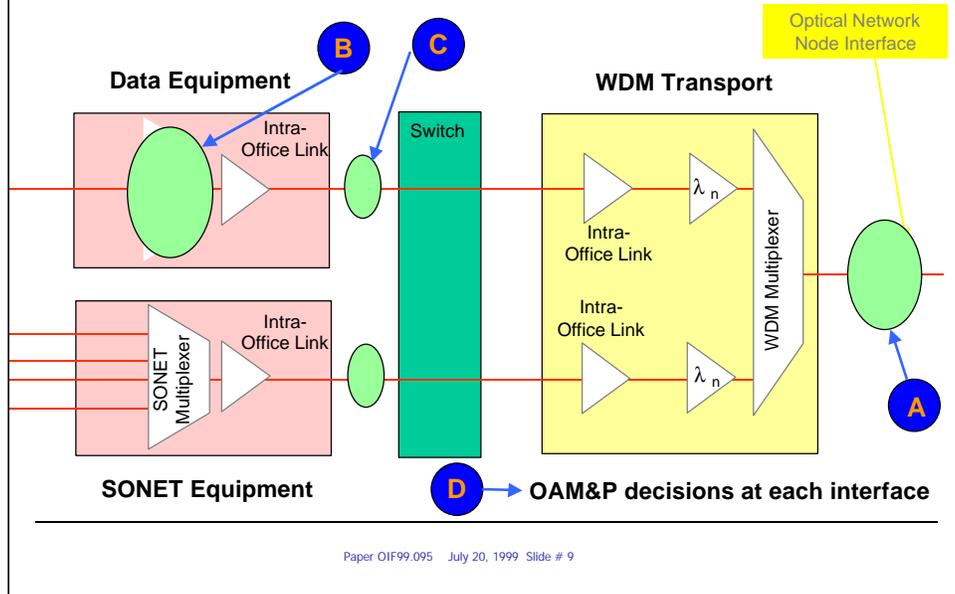
- What are the Critical OIF Decisions ?
- Backbone - Adopt the ITU-T G.872 compliant
  - Identify and recommend data specific modifications as needed
  - Monitor this series of specs and provide comments
- Define intra-office physical interface(s?)
- OAM&P function and implementation for each interface
- Is there a simplified architecture for the Metro ?
  - Choose a few solutions ?

Paper OIF99.095 July 20, 1999 Slide # 8

Is this architectural model helpful to guide the OIF in making critical decisions?

The following slides map these questions into current projects within the OIF.

## Backbone - NNI - Four Key Decisions



See the next slide for an explanation of A, B, C, and D.

## Four Key Decisions

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- A** Adopt the G.872 architecture and monitor and contribute to the development of the optical transport network specifications outlined in G.871.
- B** Choose the adaption process for data into the SONET frames.
- C** Specify low cost short distance physical layer options between the functional blocks of the NNI. This also includes the links between NNIs of the optical subnetworks.
- D** Determine how OAM&P will be developed and communicated between the functional blocks of the NNI.  
  
Any additional signaling needed for OAM&P within optical transport network than being planned by ITU?

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Paper OIF99.095 July 20, 1999 Slide # 10

Text is self-explanatory.

The following four slides further clarify these decision opportunities by elaborating on how the existing OIF projects map to these four critical questions.

## Four Key Decisions - A

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Adopt the G.872 architecture and monitor and contribute to the development of the optical transport network specifications outlined in G.871.

PLL - Study point 1 - SONET/ SDH based Interfaces  
what speeds?

PLL - Study Point 2 - Synchronization and Jitter  
Does this only apply to NNI or within NNI also?

PLL Study point 3 - reduced SONET/SDH overhead functionality  
At NNI ?  
Within NNI, see Item D.

PLL Study Point 5 - Non-SONET/SDH Interfaces  
For backbone?  
For Metro applications?

Arch: P2 - Optical Internetworking Architecture

Arch: P4 - Architecture for Protection and Restoration

Text is self-explanatory.

## Four Key Decisions - B

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Choose the adaption process for data into the SONET frames.

PLL - Study point 4: Data Link Layer Protocol

Arch P3 - IP transport via SONET framed and rate signals

Text is self-explanatory.

## Four Key Decisions - C

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Specify low cost short distance physical layer options between the functional blocks of the NNI. This also includes the links between NNIs of the optical subnetworks.

PLL - Study point 4 - Link Layer Protocol SPI - System Physical Interface

Text is self-explanatory.

## Four Key Decisions - D

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Determine how OAM&P will be developed and communicated between the functional blocks of the NNI.

Any additional signaling needed for OAM&P within optical transport network than being planned by ITU?

OAM&P requirements for optical internetworking

OAM&P - communication of optical fault indicators among other technologies, domains, and network layers.

Text is self-explanatory.

## Requested Action

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- Motion:  
The reference architectural model for the backbone described in this presentation is the backbone architecture used by the OIF.
- If Motion passes:  
Use this presentation as the basis for the Architecture WG Project P2 - Optical Internetworking Architecture : function and reference models
- If Motion fails:  
How should the architectural model be changed to meet the objective?