

**COMMITTEE T1 – TELECOMMUNICATIONS**

**T1X1.5**

**Boulder, CO., March 26 - 28, 2001**

**T1X1.5/2001-112**

**CONTRIBUTION TO T1 STANDARDS PROJECT**

**TITLE** Slide Presentation for T1X1.5/2001-098  
**SOURCE** Sudheer Dharanikota, Raj Jain Nayna Networks Inc.  
Riad Hartani Caspian Networks Inc.  
Dimitri Papadimitriou Alcatel  
Yong Xue, Curtis Brownmiller WorldCom  
2400 N. Glenville Dr.  
Richardson, TX. 75082  
**CONTACT** Raj Jain

**Raj Jain is now at  
Washington University in Saint Louis  
Jain@cse.wustl.edu  
<http://www.cse.wustl.edu/~jain/>**

**PROJECT** Optical Hierarchical Interfaces

---

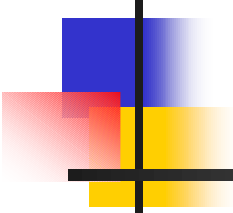
**ABSTRACT**

This document contains the slide presentation for T1X1.5/2001-098.

---

**Notice**

This Document has been prepared to assist Standards Committee T1X1. It is offered to the committee as a basis for discussion and is not a binding proposal on Nayna Networks Inc., Caspian Networks Inc., Alcatel, or WorldCom. Information presented in this document may be subject to change after more study. Nayna Networks Inc., Caspian Networks Inc., Alcatel, and WorldCom specifically reserve the right to add to, amend, or to withdraw the statements contained herein.



# On SRLG for Diversity and Risk Assessment (ANSI T1X1.5/2001-098)

---

**Sudheer Dharanikota, Raj Jain - Nayna Networks**

**Curtis Brownmiller, Yong Xue - WorldCom**

**Dimitri Papadimitriou – Alcatel**

**Riad Hartani – Caspian Networks Inc.**



A decorative graphic on the left side of the slide, consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Outline

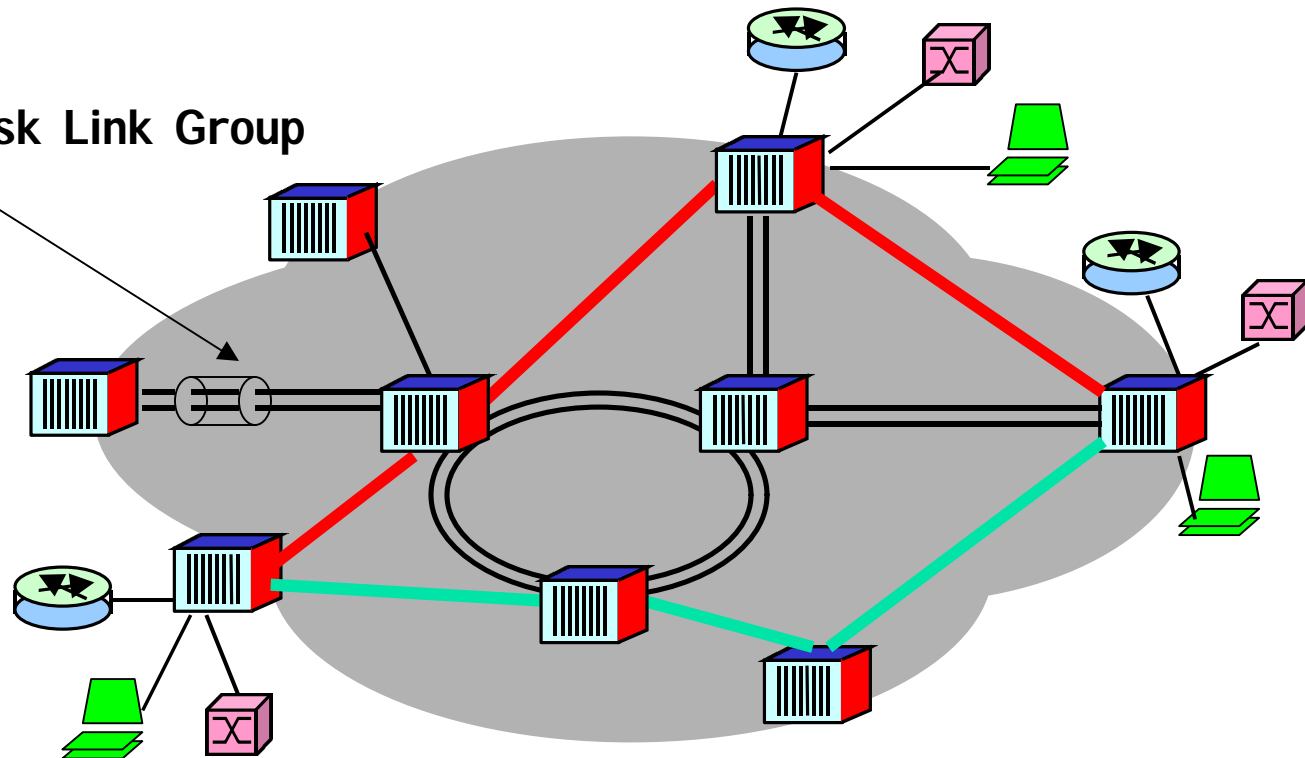
---

- Shared Risk Link Group (SRLG)
- Path Diversity
- Goals
- Risk assessment
- Risk Assessment Steps
- Steps in Achieving Diversity
- Requirements
- Extensions
- Conclusions

## Shared Risk Link Group (SRLG)

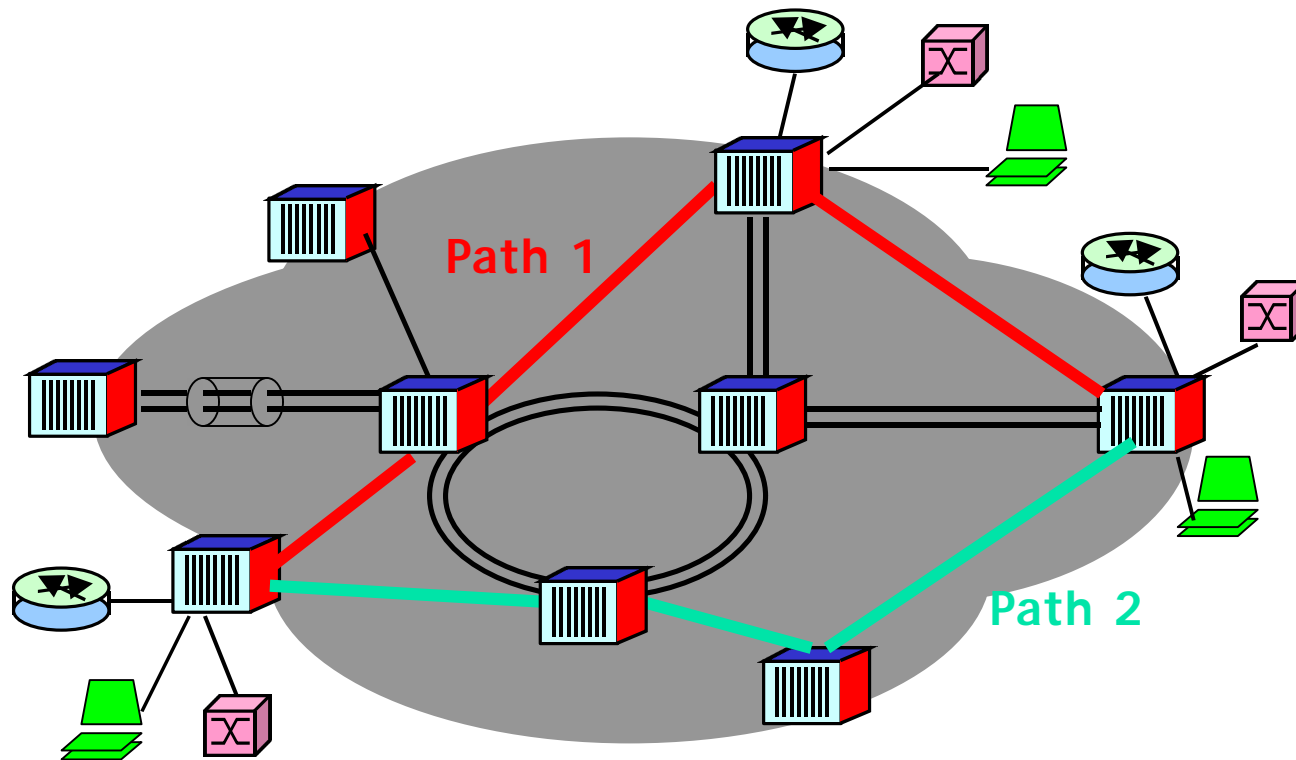
- Group of links sharing the same risk
- A link may be member of many SRLGs

Shared Risk Link Group



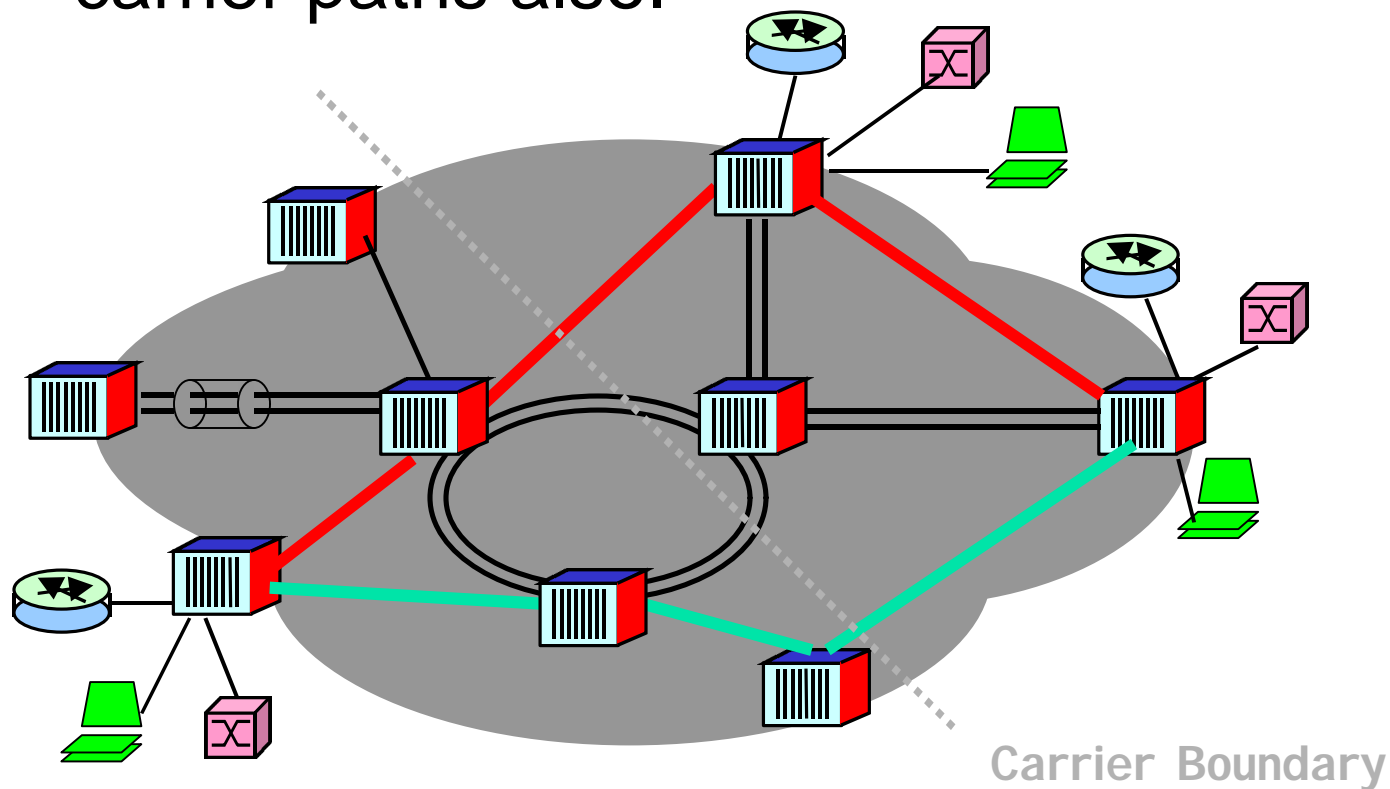
# Path Diversity

- Two paths not sharing the same risk
  - Setup(Path2, diverse from path1)



## Path Diversity (Cont)

- Diversity requirement may apply across multi-carrier paths also.



A decorative graphic consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Goals

---

- Automate path computation for diversity and risk assessment
- Reduce the amount of information exchanged:  
Summarization of SRLGs

A decorative graphic consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Risk assessment

---

- Risk assessment: Evaluation of the potential risk associated to the inclusion of a given resource in a given path.  
E.g., Risk Factor =  $P(\text{Fault})$   
Weight Factor = Preference for a resource



A decorative graphic on the left side of the slide, consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Risk Assessment Steps

---

- User specifies availability requirements  
(Not in the scope of this document)
- **Assign the risk factor and weight factors to physical and logical resources**
- Propagate the above-configured information using routing protocols
- Use the above information in path computation  
E.g., Risk of path  $\langle 1, 3, 5 \rangle = \text{Risk } 1 \times \text{Risk } 3 \times \text{Risk } 5$

A decorative graphic on the left side of the slide, consisting of a vertical black line intersected by a horizontal black line. To the left of the intersection are overlapping colored squares in yellow, red, and blue.

# Steps in achieving diversity

---

1. Topology: Rings, mesh, domains, ...
2. Constraints:
  - Inclusive: E.g., Domain topology
  - Exclusive: E.g., Link or node types
  - Limiting: E.g., Bandwidth
3. Output:
  - Path Availability
  - Maximum diverse path
  - Loose or strict route

A decorative graphic on the left side of the slide, consisting of overlapping yellow, red, and blue squares with a black crosshair.

# Requirements

---

## ■ Encoding

- Logical and physical structure in SRLG
- Summarizable encoding mechanism

## ■ Capability

- Domain, node, link capability associated to SRLG
- Risk assessment parameters
- Preferential route selection parameters

A decorative graphic consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Extensions

---

- Routing protocol
  - Domain topology and inter-domain link information propagation
  - Scoping this information to reduce flooding
- Path Computation Algorithms, e.g., CSPF
  - Extend to optimize risk and use new constraints

A decorative graphic consisting of overlapping yellow, red, and blue squares with a black crosshair.

## Conclusions

---

- **SRLG:**
  - For diversity
  - For risk assessment
  - Applies to links, nodes, domains
- **Extensions Required for routing protocols:**
  - Propagation of SRLG information
  - Use in path computation