

IEEE 802.3z

Enschede, Netherlands

1. Redundancy and Fault Reporting
2. Test Modes
3. Transparent Signalling Channel

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Redundancy Requirement

Application Scenario

- **Gigabit Links will be used in two primary applications**
 - As a backbone between two hubs
 - High bandwidth, high value end station attachment
- **Both are high value applications**
 - Critical traffic
 - Downtime affects 000's of users and applications
 - Require high availability
 - Require high manageability
 - Cost is tertiary issue



High Availability Requirements

- Propose use of dual homing and link redundancy
- Two connectors on the adapter, hub module

Each one is a full scale link

One is in use, the other is in standby

Makes no sense to switch to a non-working link

Having a non-working secondary link is an alarm condition

Redundancy controller starts running with one Link, and switches over to other Link upon a definite state transition

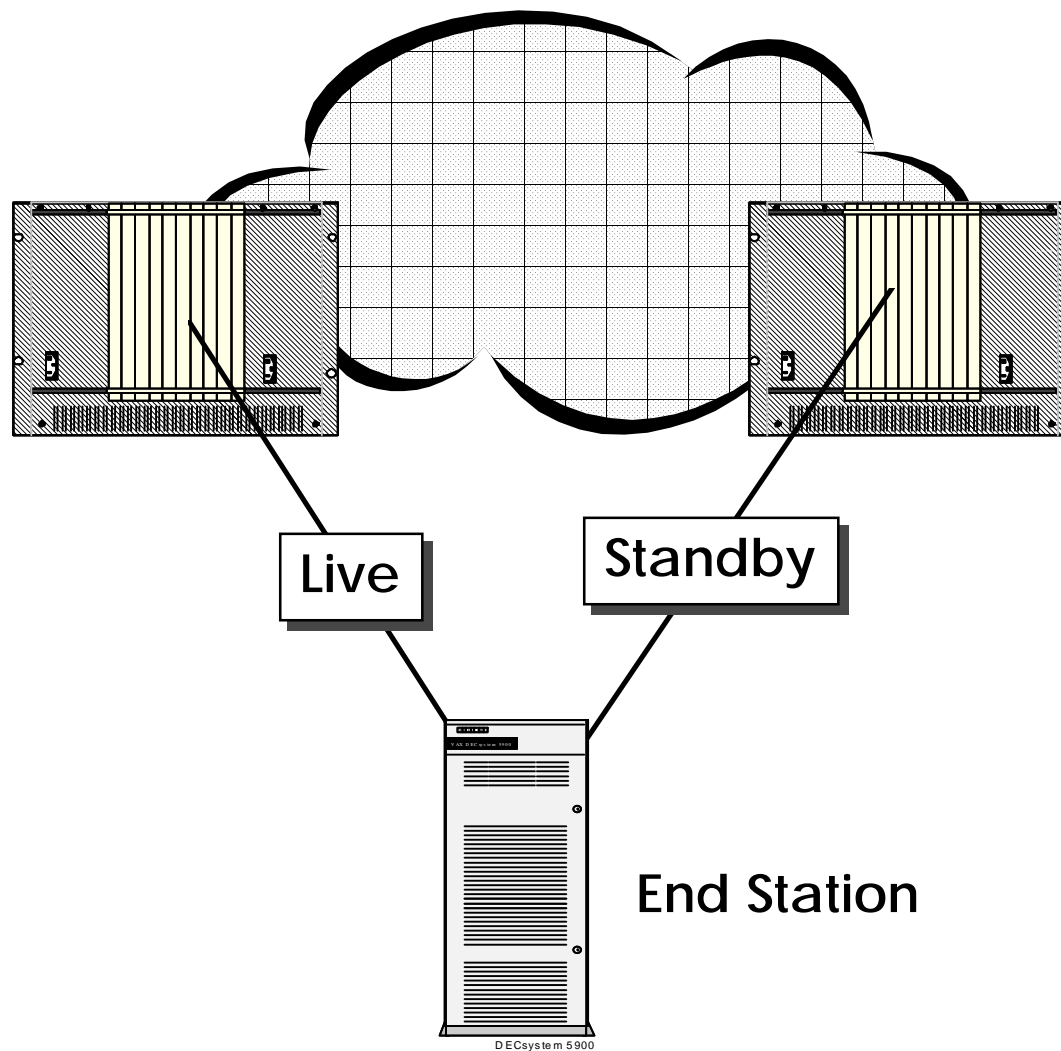
No obligation to return to former link when it comes up again

- Links are entirely independent
- May terminate on different equipment
- Compatible with repeater proposal



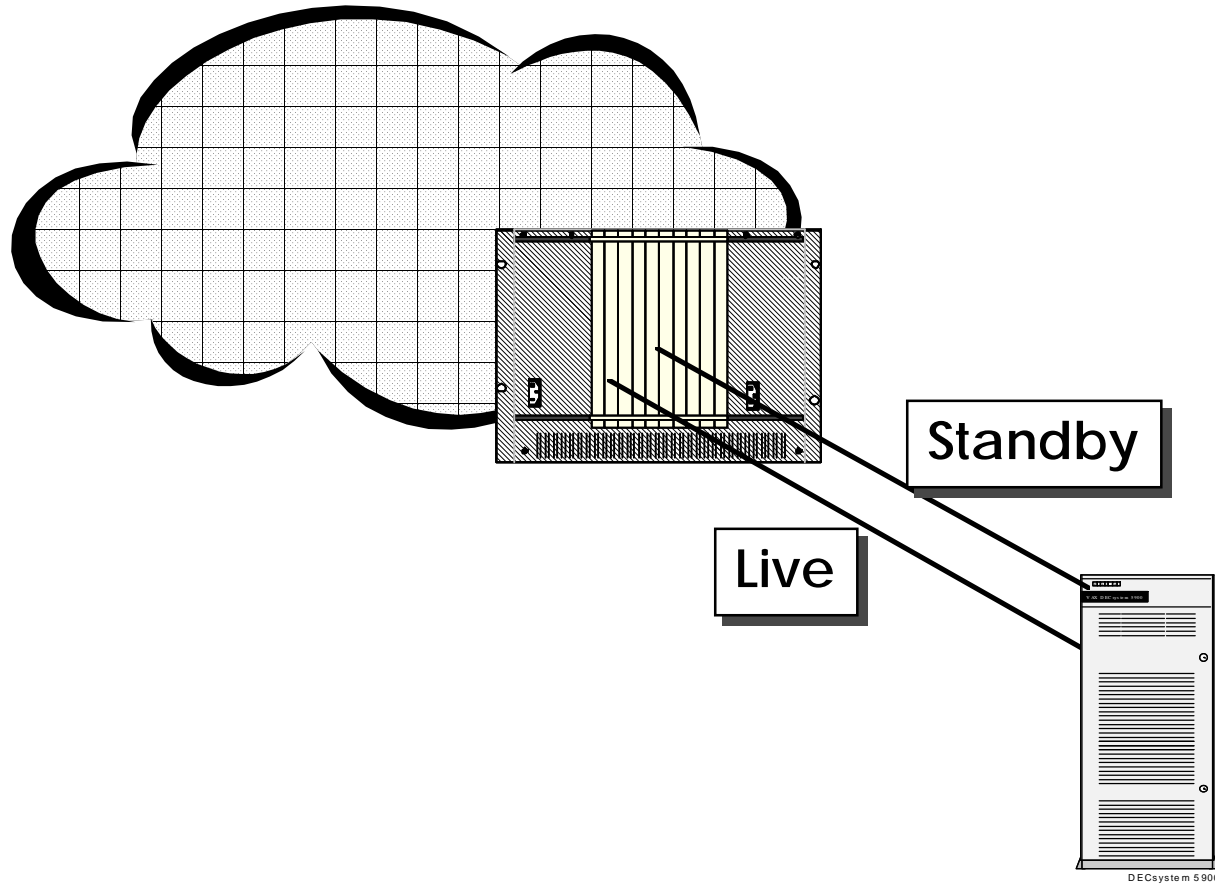
Sample Configuration

Dual Homing to redundant hubs



Sample Configuration

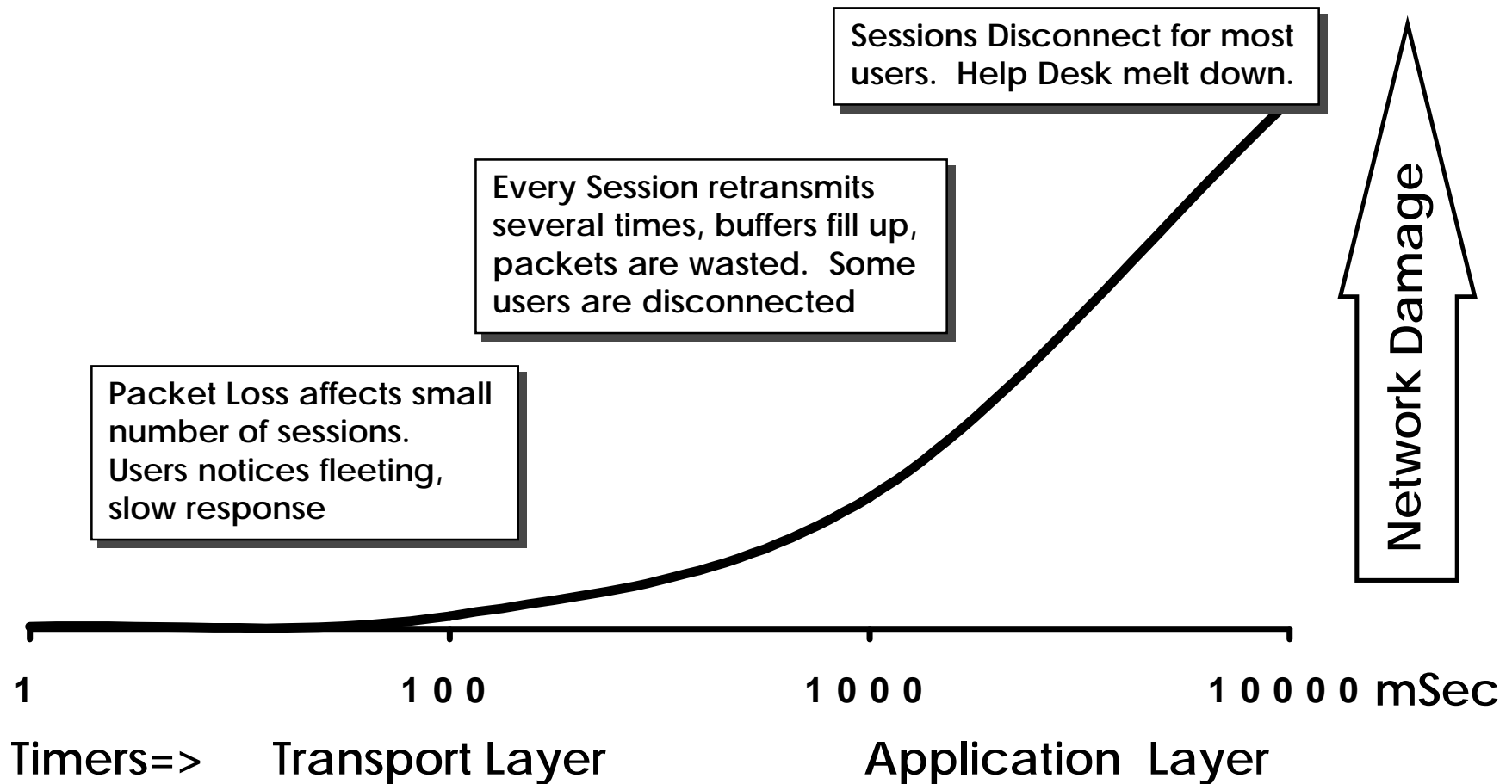
Dual Homing to multiple ports in one hub



Link Failures and Recovery

Timing Aspects

- Packet Loss is inevitable, but can be minimized



State Transitions and their impact

- Port establishes two links at startup
 - Standby link transmits IDLE all the time
 - Active link passes data
- Must react within 100 Milliseconds, prefer 10
 - Rules out CRC based approaches
 - Require a derived state based on statistical sampling of the errors
 - Unbounded reaction time, and ambiguous state transitions
- Port switches links when local phy indicates:
 - `rcv_not_available == TRUE`
 - `rcv_config_ack == FALSE`
 - `signal_status == NOT_OK`
 - `link_control == DISABLE` (from management layer)



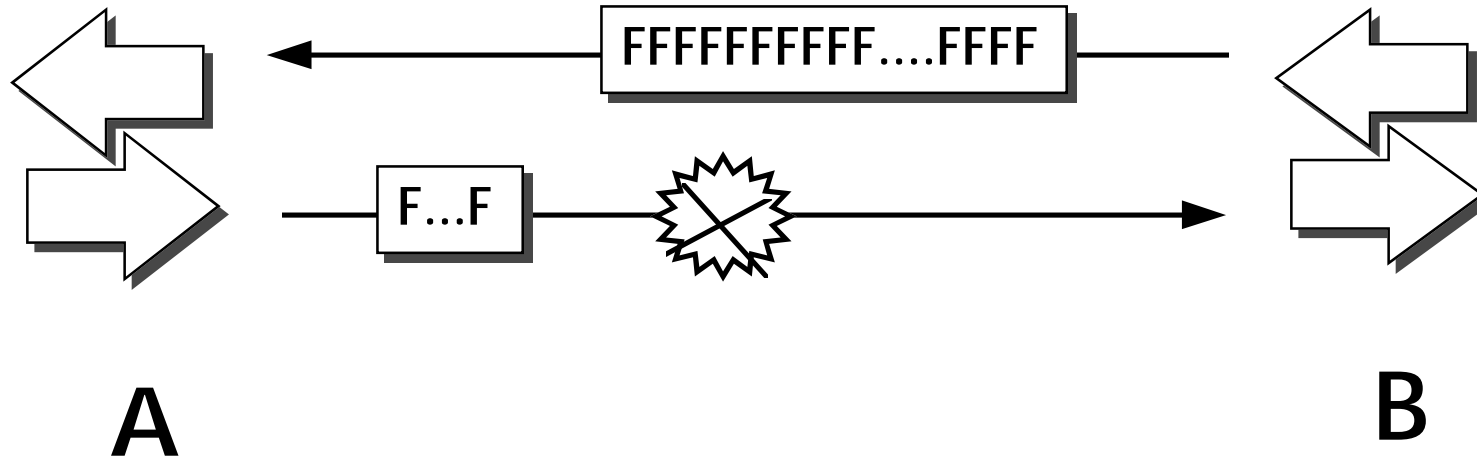
Need for Remote Fault Indications

- **Current proposal validates the link during link startup**
 - Phy sends F code during link startup
 - Appearance of F code in the receiver at any other time indicates remote link take down
- **Remote fault indication is needed to provide real time indication of remote failure**
- **Want to distinguish between**
 - Remote equipment off line - disable, power fail, eqpt fail
 - Fiber Strand broken
 - Fiber operational but system is not passing valid data



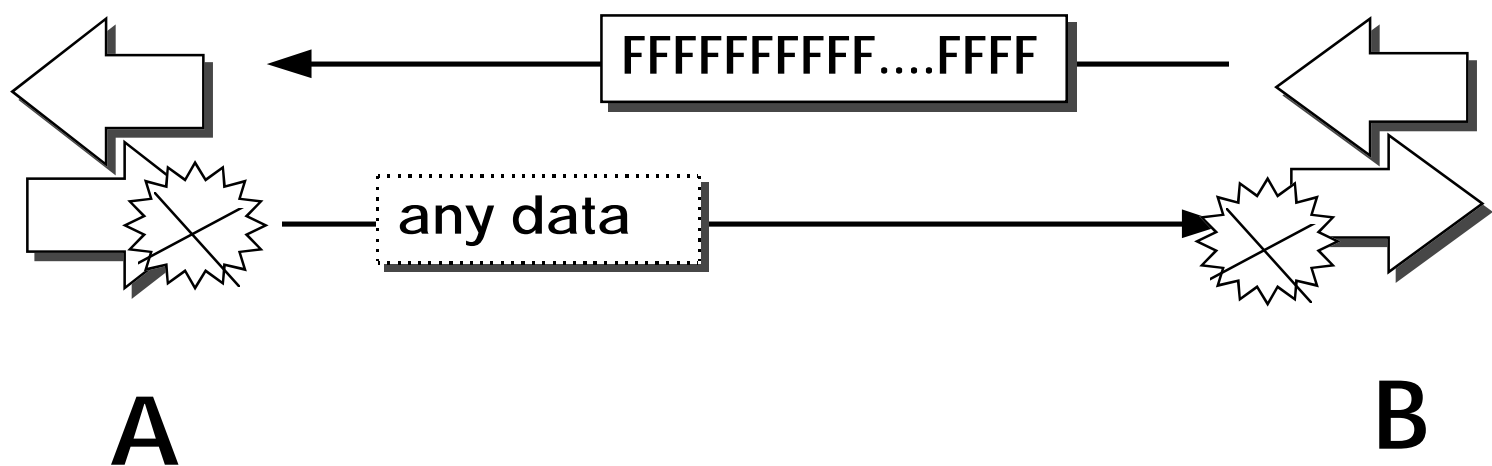
Broken Strand Problem

- Link startup fails altogether, cannot recover
- Fiber break can also happen during life of the link
- How does B indicate to A that no signal is coming through (signal_status == NOT_OK)



Malfunctioning Xmt or Rcv Problem

- `signal_status == OK` and `excessive_receive_errors == TRUE`
- F is ambiguous in this case
- Let's use F2 for this case, and F1 for no signal



Accomodation of Remote Fault

- Upon detection of a fault, the following happens
 - Link is taken down - <F> signal sent
 - Followed by configuration message - <C>
 - RF bit is set in the configuration page
 - Additional bits may be assigned in the primary page or in next page
- Remote Fault processing can be slow, relative to link
- Will work with Rich Taborek to define in more detail for interim



Test Modes for Gigabit Links

(no relation to redundancy)

- There is likely to arise a need for a bench test mode

Style of 100BaseT2

Why? - using certified, in spec components is not sufficient to ensure system level compliance and interoperability

- Production/Certification Test Mode

Prove in-spec operation for certain parameters

level, eye opening, clocking, jitter, signal envelopes

Local user interface and internal signal interface

Will require the system under test to generate certain symbols, symbol sets and possibly bad codes that exhibit known clock, signal behavior

Receiving end will be Test Equipment

Optical and Copper groups will further spec this out



Link Test Mode - Graceful Take Down

- Need a means to definitively take the link out for service in order to allow local testing and repair to take place without impacting link management counters
- Propose the following sequence:
 - User wishes to break the link between A and B
 - User instructs A to take the link out of service
 - A issues <F> code for TBD period
 - Then issues a <D> code - NEW! - 2 character ordered set
 - B sends a <C> code to A, ready to restart the link
 - B ignores all subsequent errors until it receives <C> codes, indicating A's intention to bring up the link.
 - User may now safely command the A to issue test signals



Transparent Signalling Channel

Requirement

- Need to leave code space in the PHY layer available for
 - protocol extension
 - Signalling channel
 - Unspecified growth
- Current Code Space consists of a small number of ordered sets - any other characters generate <Bad_Code> indication
 - Too inflexible to accomodate future needs
 - Extension will not affect state machine design



Transparent Signaling Channel

Proposal

- Define new compound ordered set <SIGNAL>



- Behaves like <IDLE> ordered set

May be interspersed in any combination with <IDLE> in the IPG

If transmitted after an <T, R or H> it return disparity to negative

If transmitted after <SIGNAL>, then maintains disparity negative

- Consists of 4 character set, followed by the appropriate <IDLE> to flip/mainain RD.

The RD function is already a part of the phy

Contents and function of the DATA octets is not being standardized at this time



Transparent Signalling Channel

Negotiation and Support

- **Negotiation**

A bit in the configuration register is used to indicate support for Transparent Signalling

It is negotiated via <C> ordered sets, during link startup

If supported, then secondary negotiation is entered via TBD process (work with Rich and Igor to clarify)

- **Support by Non Implementors**

Non implementors indicate No Support for the feature

NEVER send the <SIGNAL> ordered set

Treat the 6 characters the same as an <IDLE>



Impact on 802.3Z standard

Summary

- **Redundancy Aspects**

- Add Remote Fault Indication

- Define/Add bits to configuration page

- Allow alternate state machine (Howie's summary)

- That transitions from State 4 (Link_OK) to using standby link

- Instead of going back to State 1(Link_Not_Available)

- **Test Modes**

- Add <D> 2 Character ordered set

- Recommend that this issue become a work item for an Optical PMD group

- **Transparent Signalling Channel**

- Add <Signal> ordered set

- **Total 2 Character ordered sets remains at 6 (w/o Defer)**

