Intelligent Protection Switching (IPS)

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IPS Overview

A method for automatically recovering from various ring failure and line degradation scenarios by wrapping the traffic away from the failed span.

Characteristics

- Plug & Play operation
- Topology knowledge independence
- L2 protocol
- Transparent to layer 3 routing protocols

More characteristics

- No need to allocate protection bandwidth
- Protection switching event hierarchy
- Ring restoration in less than 50 msec

Analogous to self healing properties of SONET/SDH rings

IPS Triggers

Automatic	**Operator**
Signal Fail	Lockout of Protection
Signal Degrade	Forced Switch
WTR	Manual Switch
IPS Messages	

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Automatic Triggers

- Signal Failure

  Caused by Media Signal Failure, or SRP Keep alive failure.

  Action: performs a wrap (if hierarchy permits)

- Signal Degradation

  Caused by excessive L2 CRC error Rate

  Action: performs a wrap (if hierarchy permits)

- Wait To Restore

  Entered when fault condition clears.

  Action: wait for a configures period of time before unwrapping to prevent protection switch oscillation

Maintenance Triggers

- Lockout of Protection
  - Prevents ring wraps anywhere in the ring
    - Operator override
- Forced Switch
  - Performs a protection switch (wrap) on the requested span
    - Adding a node in a controlled fashion
- Manual Switch
  - Similar to Force Switch but at a lower priority
    - Maintenance while preserving automatic protection

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Protocol Messages

- Short path
  - Sent over the adjacent failed span
  - Never forwarded - stripped by the receiving node
- Long path
  - Sent around the ring
  - Always forwarded (except by originator)

IPS States

- Idle

  Node is ready to perform a protection switch.
  Behavior: Sends IPS Idle messages to both adjacent nodes

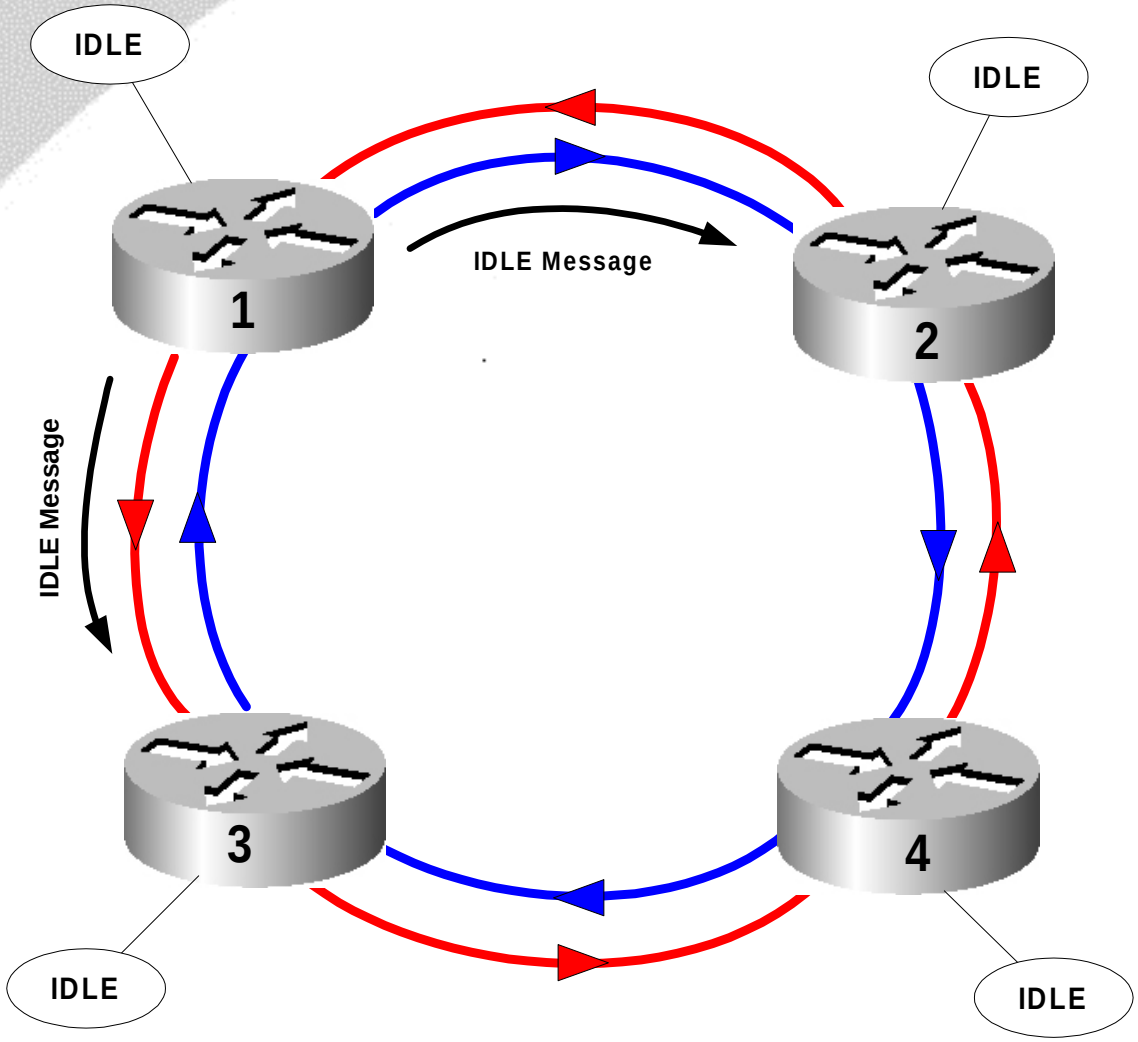
- IPS Forwarding

  Node enters state when it receives a long IPS message
  Behavior : Forwards long IPS messages

- Wrapped

  Node enters state when it receives a local request, detects a fault or receives a short path IPS message from an adjacent node
  Behavior : Performs a wrap

IPS – IDLE state



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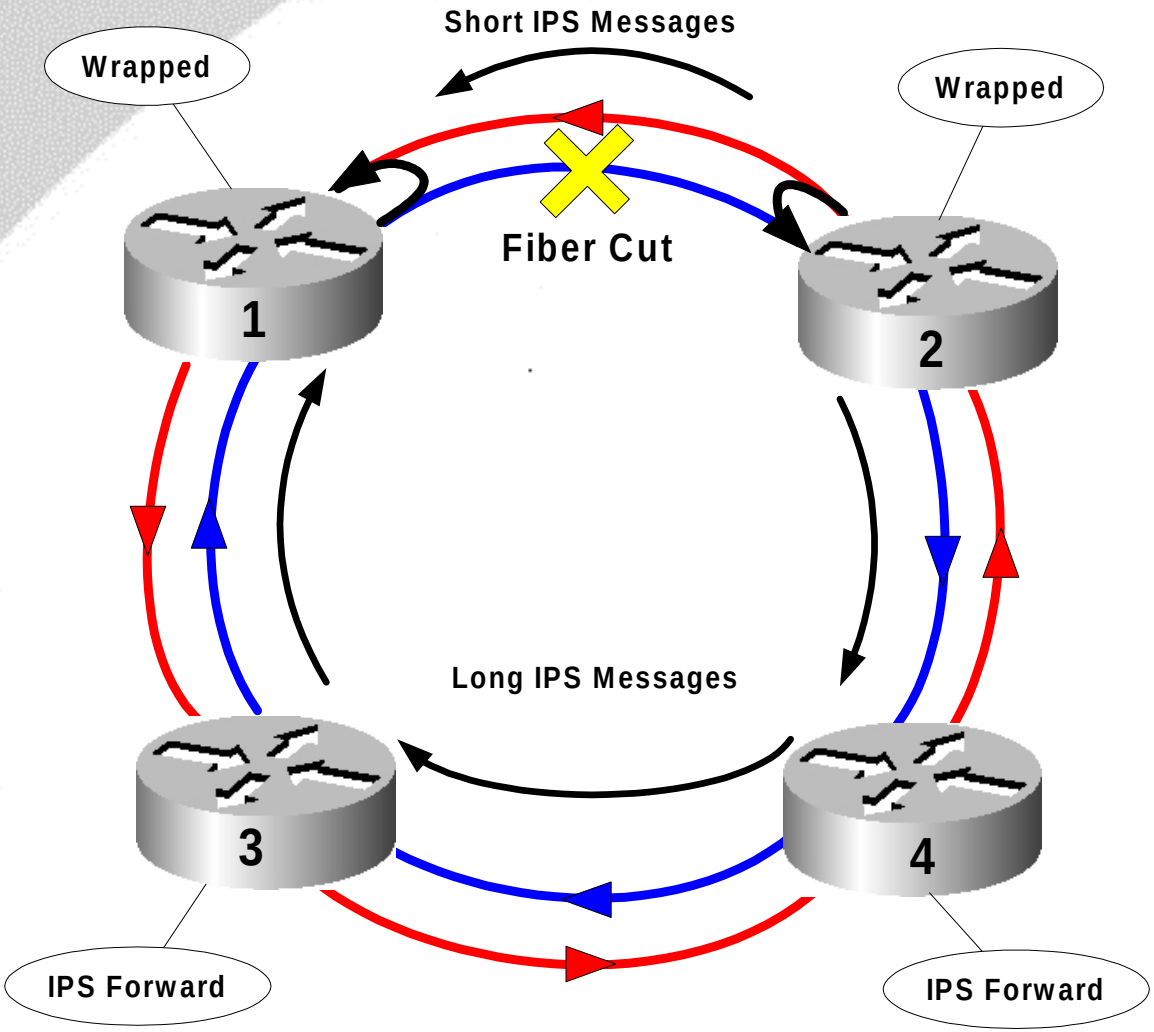
Single Fiber Cut



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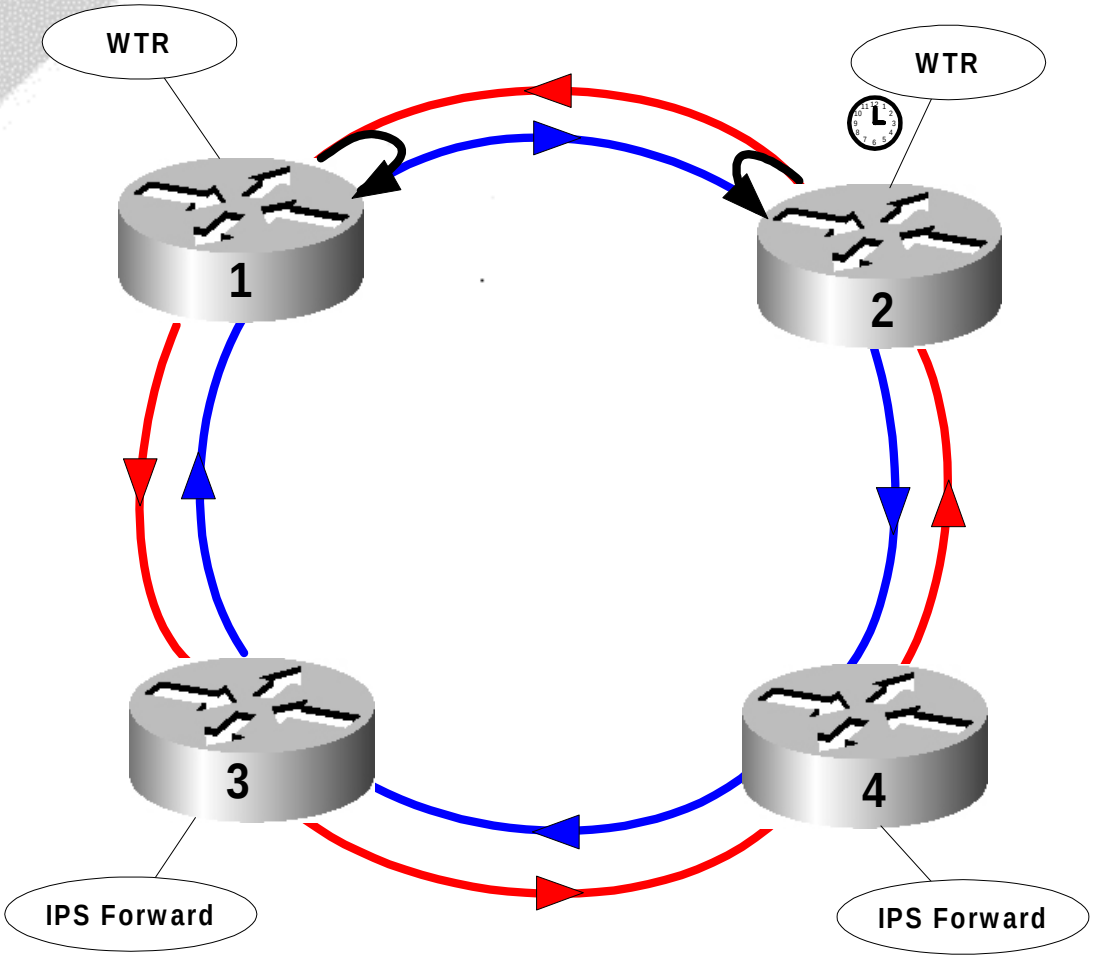
Fault Clears



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Protection Request Hierarchy

Highest Priority

- Lockout of Protection
- Forced Switch
- Signal Fail
- Signal Degrade
- Manual Switch
- Wait To Restore
- No Request

Lowest Priority

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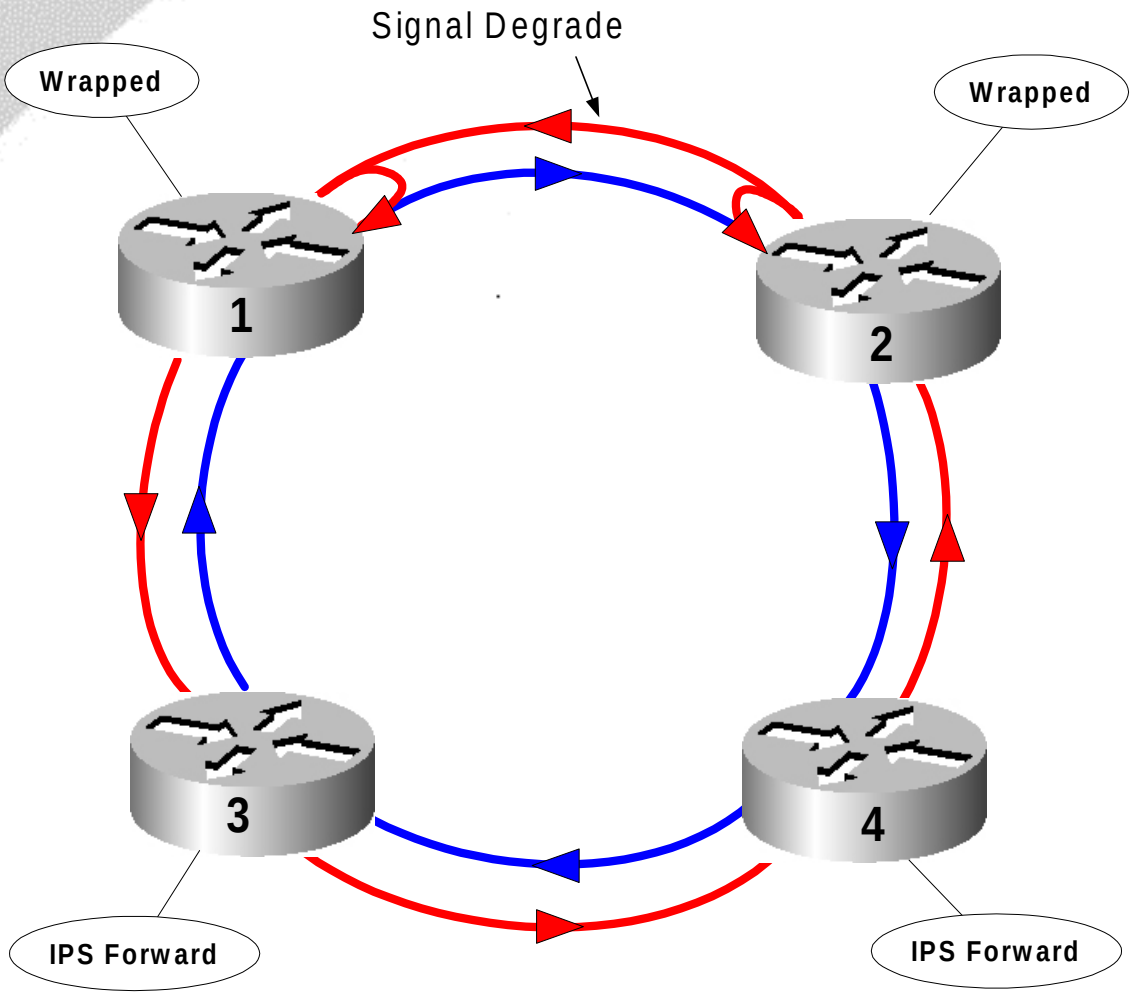
IPS Hierarchy



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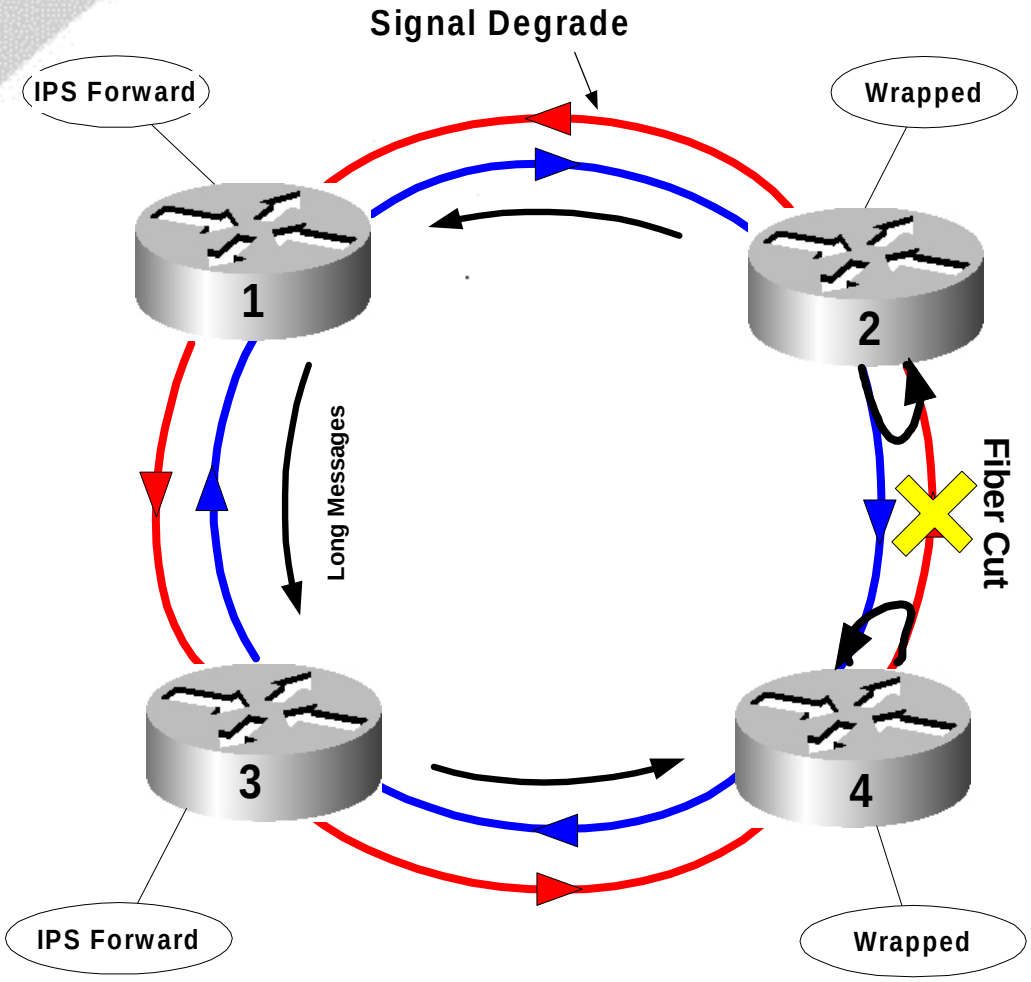
IPS Hierarchy



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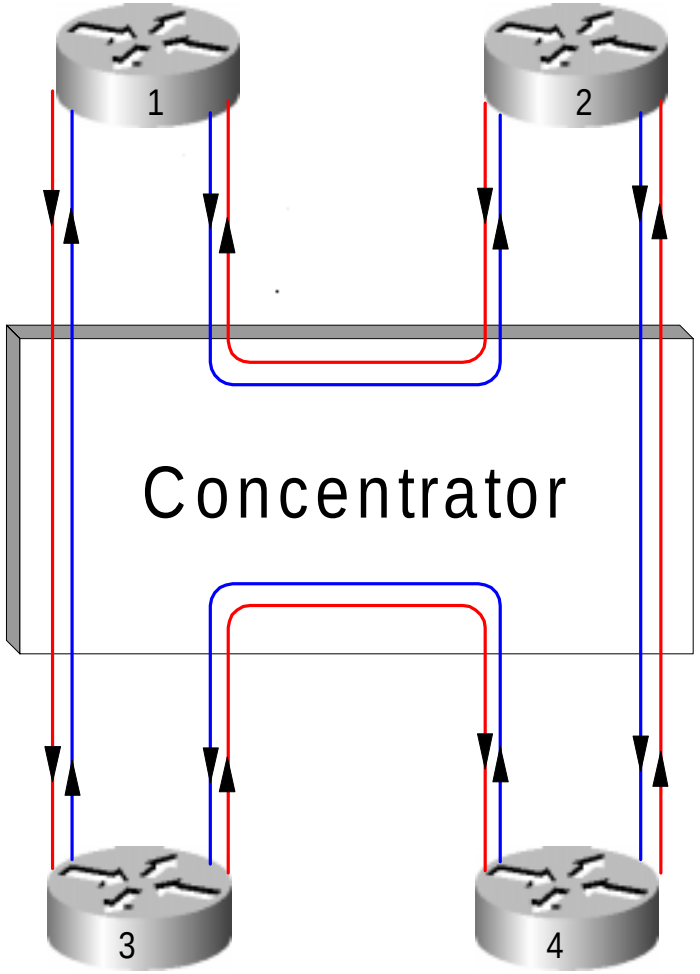
Protocol Message Rules

- IPS messages are triggered by IPS requests.
- Nodes wrap only based on short path messages (never on long path messages)
- Long path IPS messages are used to maintain protection hierarchy
- IPS messages are never wrapped

Concentrator and IPS – IDLE state



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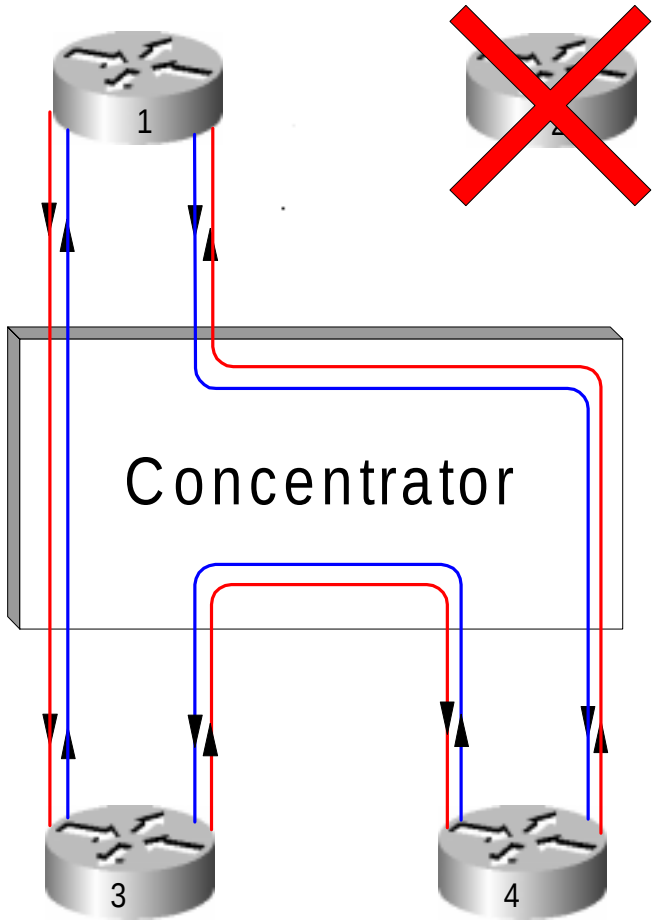
Concentrator and IPS – Node Failure



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