

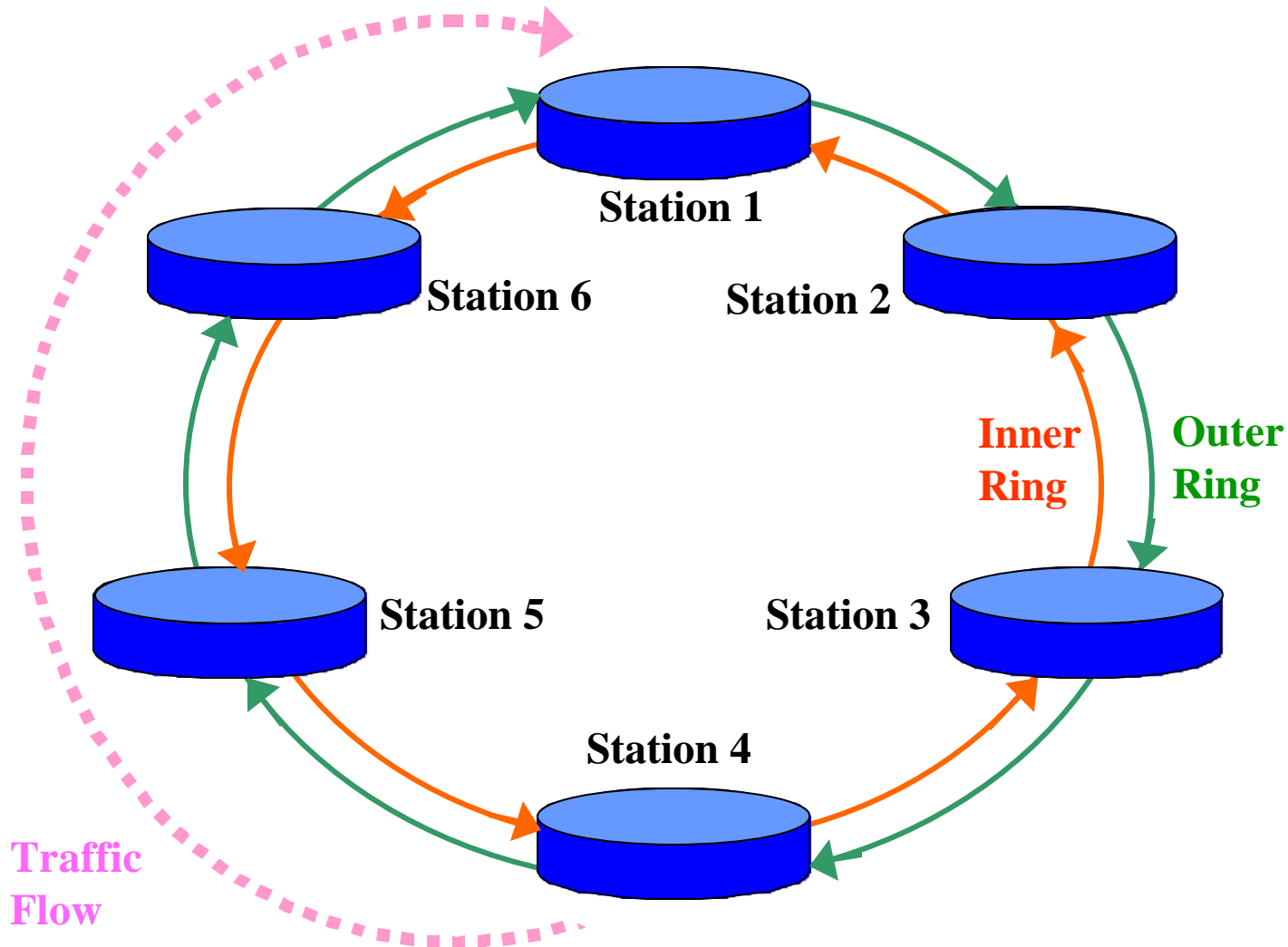
RPR Protection

Gal Mor, Corrigent Systems
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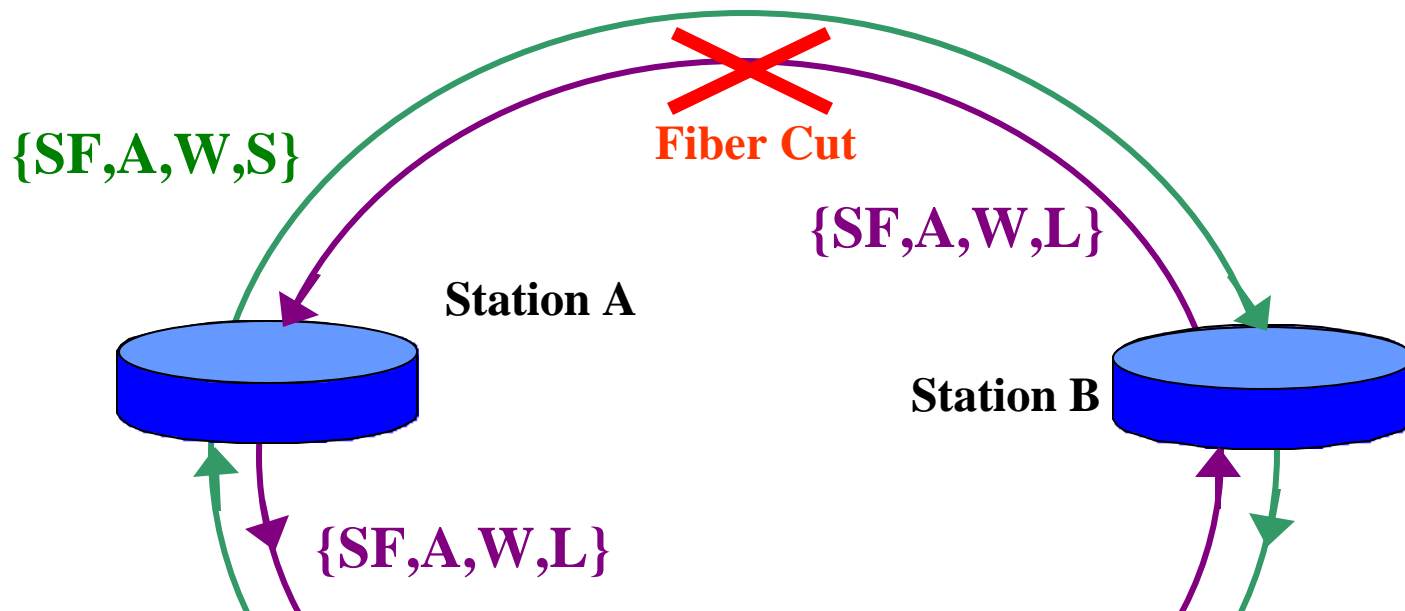
Requirements

- Protection within 50 msec
- Wrap protection is required
 - Packets may indicate “Steering Only Data” (SWIS)
- Steer protection is optional
- Use Topology Discovery protocol to determine Stations protection method support
- If all Stations can do both
 - Operator’s selection

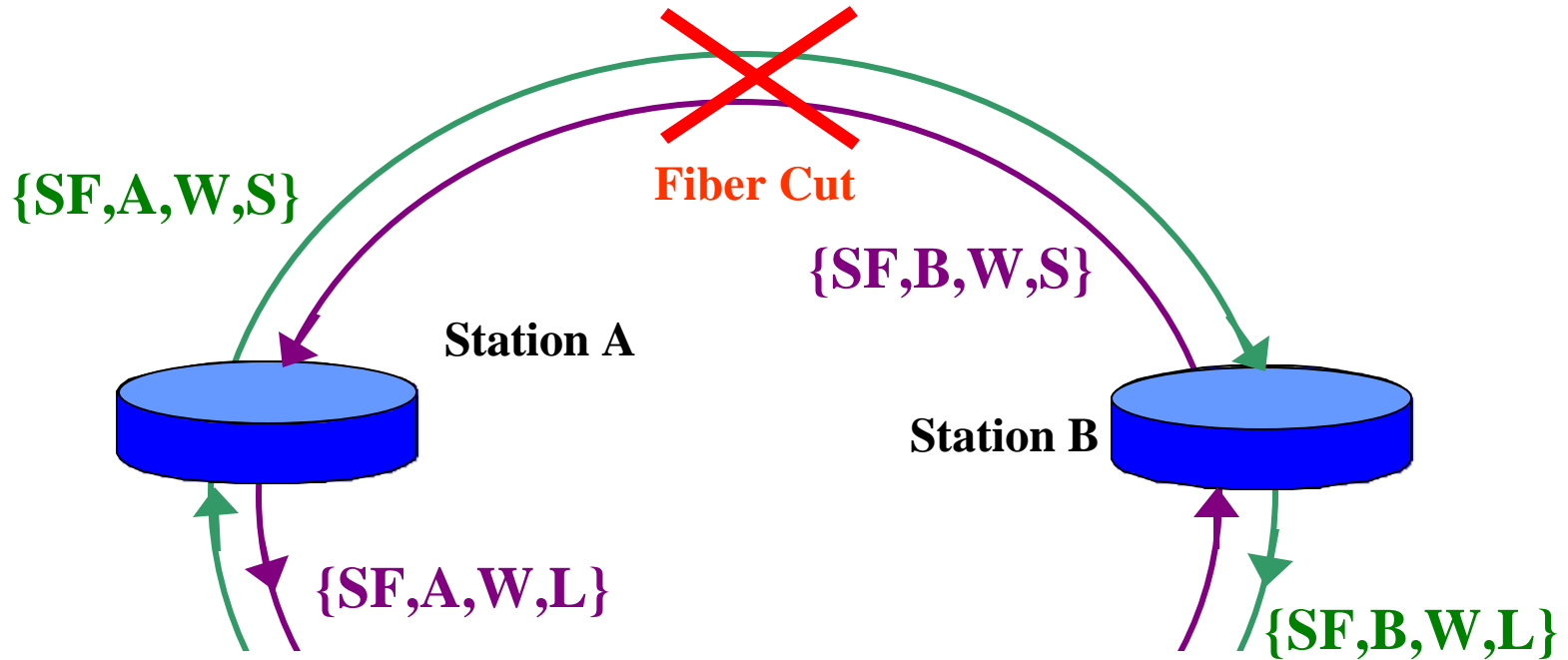
RPR Ring



Unidirectional Fiber Failure Detection



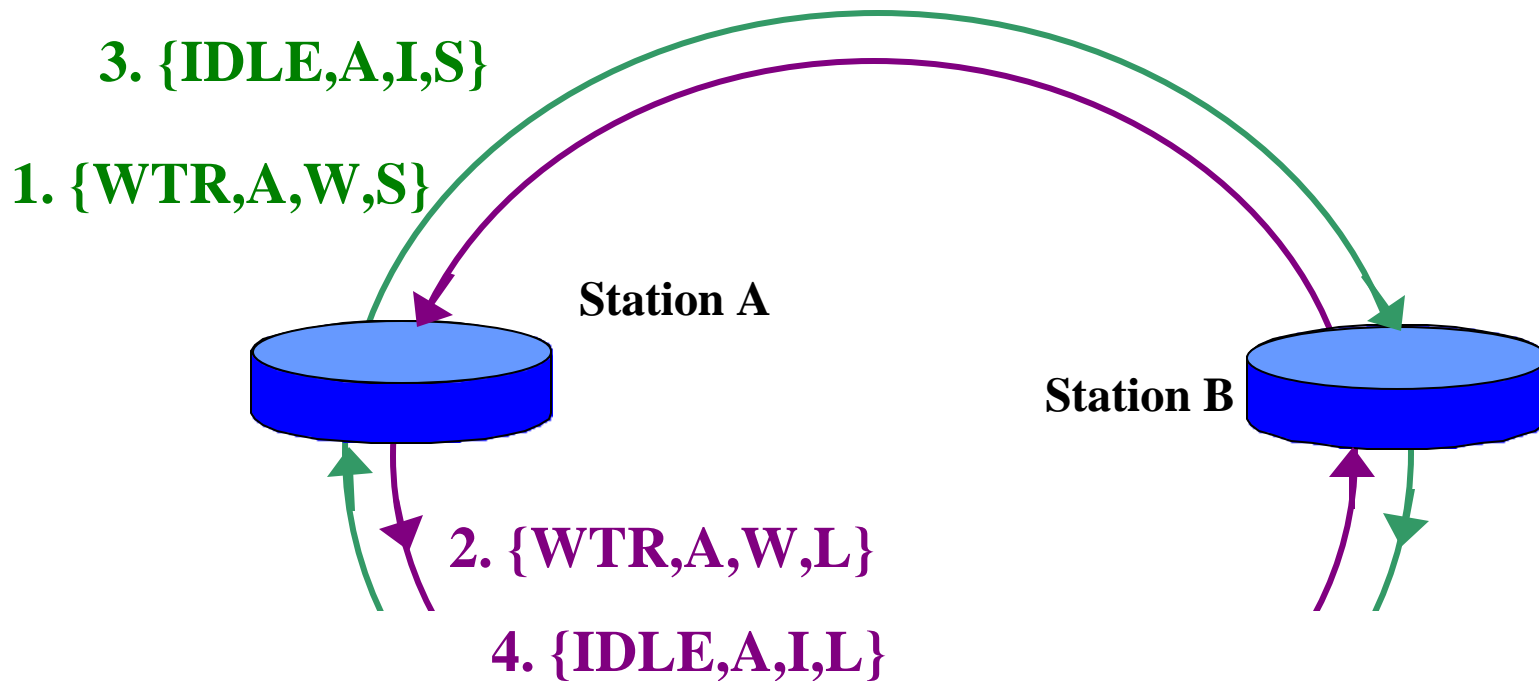
Bidirectional Fiber Failure Detection



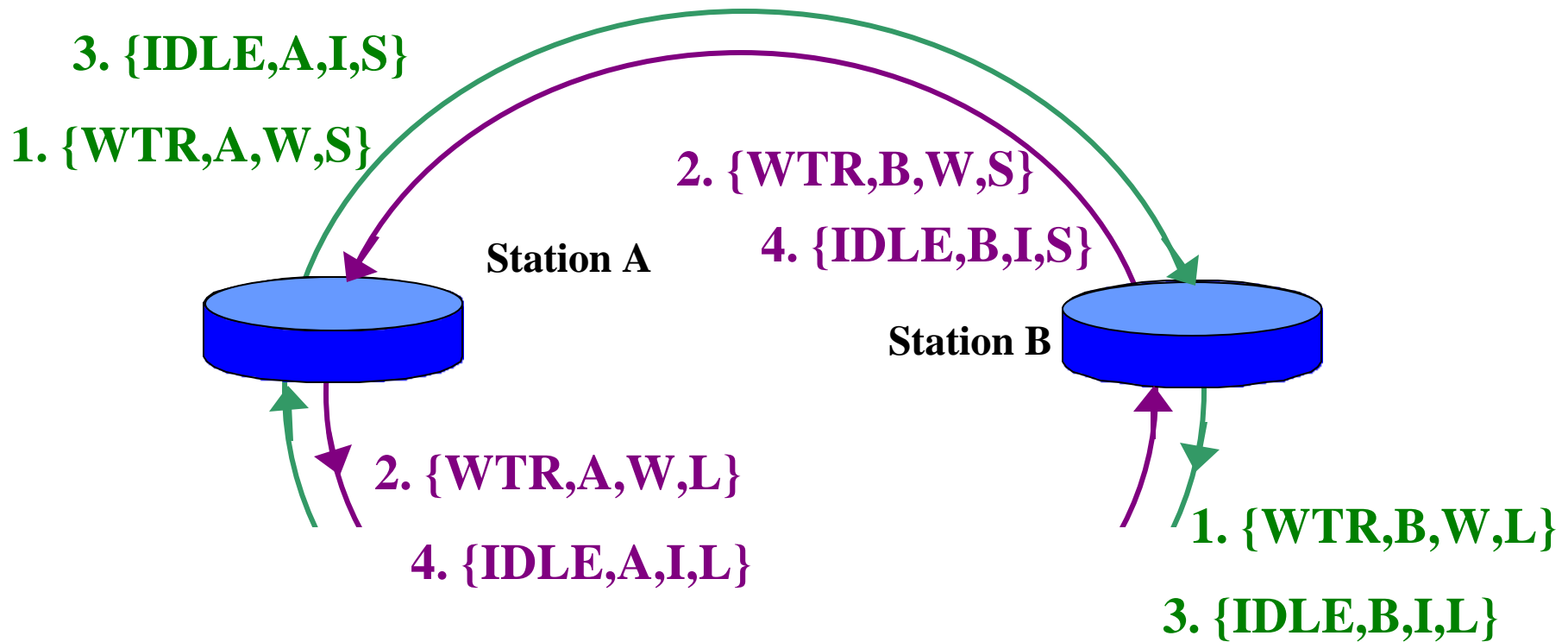
Fiber Failure Detection (cont)

- Station that detects a failure on its receiver port generates:
 - Broadcast “Short” message on the opposite ring
 - Broadcast “Long” message around the ring, away from the failure
- The Station repeats protection message generation every T1 sec until it receives its protection message back, or until the failure disappears
 - Recommendation: $T1=1$

Unidirectional Fiber Recovery



Bidirectional Fiber Recovery



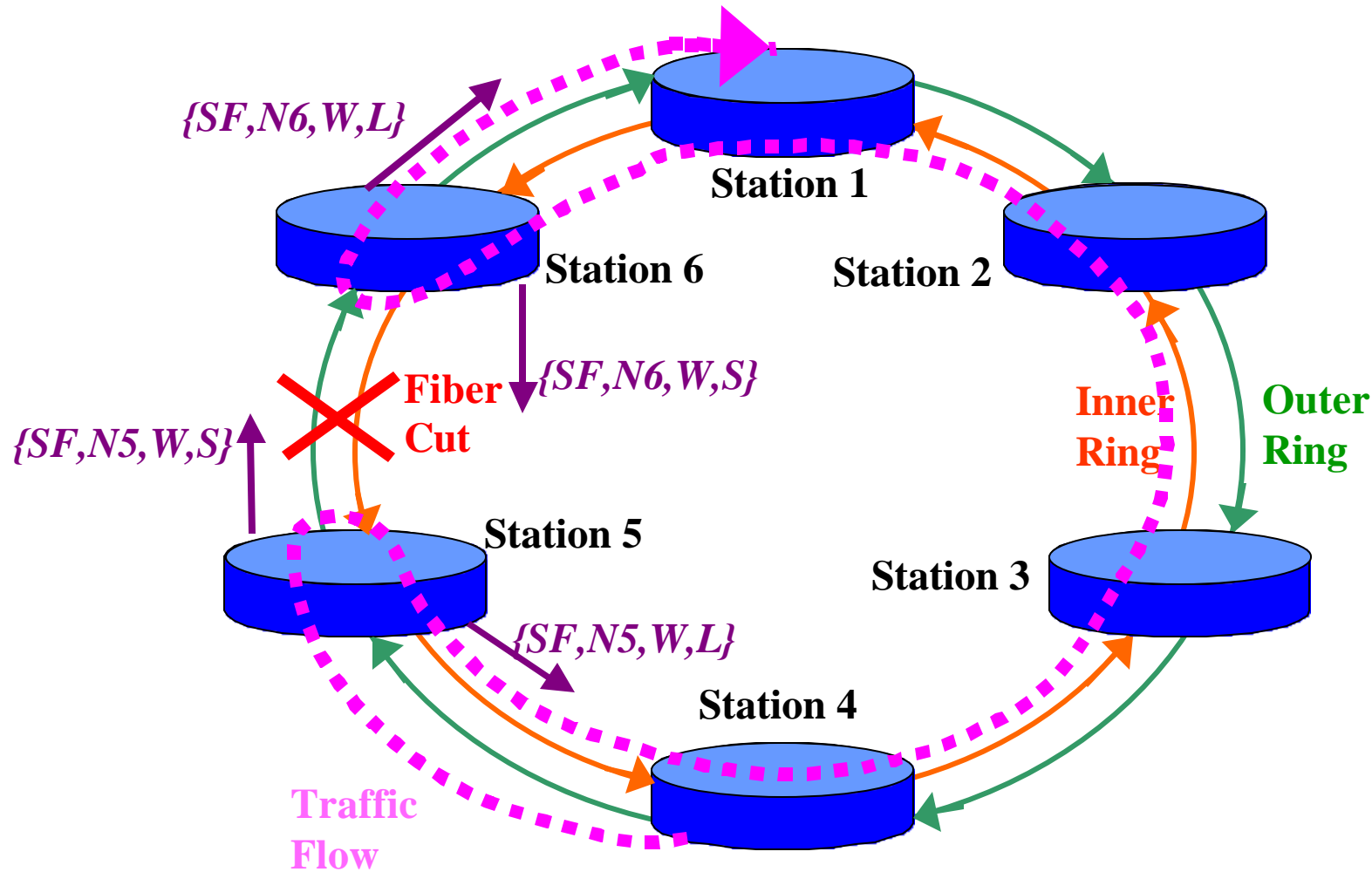
Fiber Recovery (cont)

- Station that detects disappearance of failure on its interface generates:
 - Broadcast “Short” message with WTR indication on the opposite ring
 - Broadcast “Long” message with WTR indication around the ring, away from the recovered failure
- The Station repeats protection message generation every T1 sec until it receives its protection message back, or until WTR expires

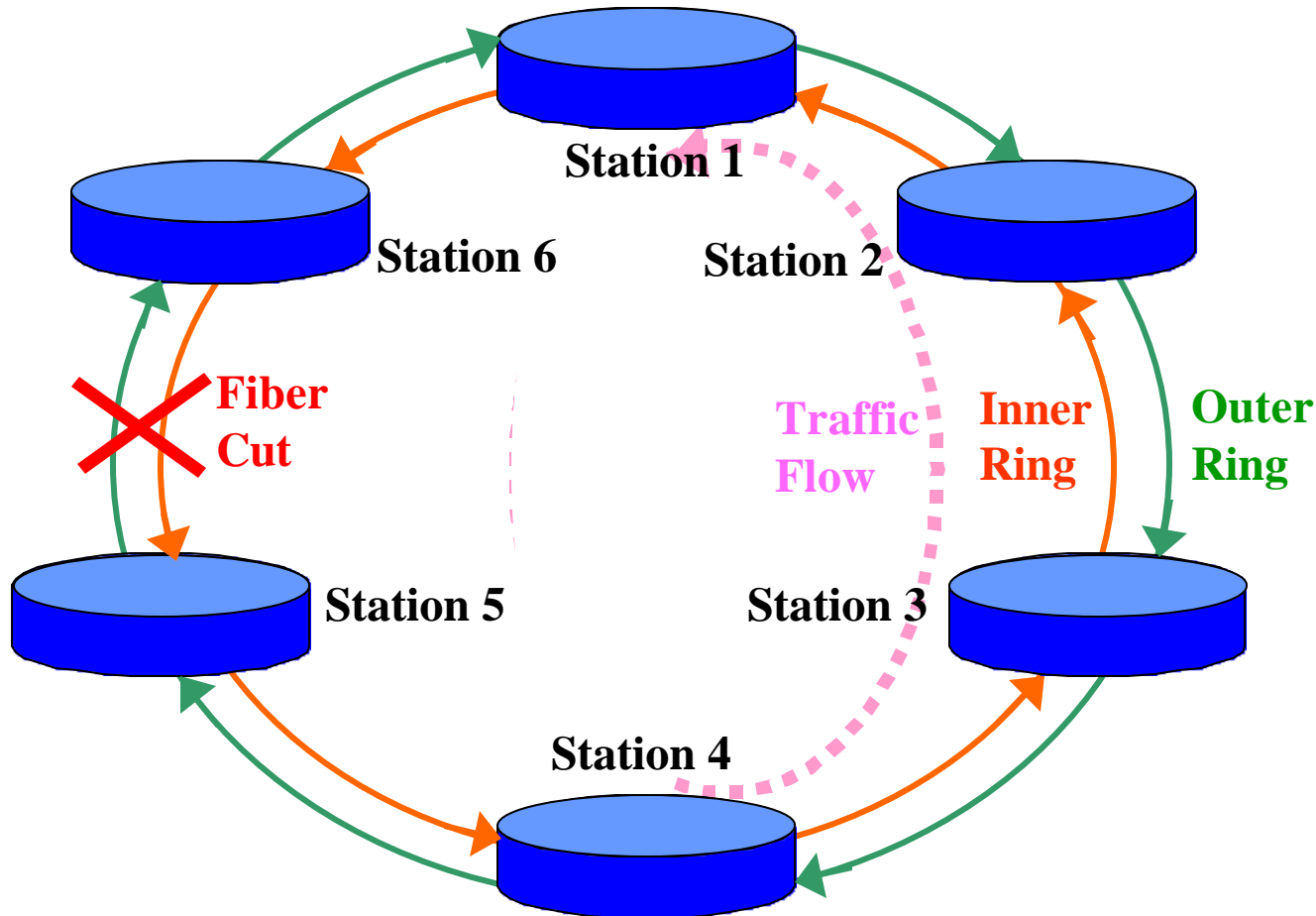
Fiber Recovery (cont)

- After WTR period, the Station generates:
 - Broadcast “Short” message with IDLE indication on the opposite ring
 - Broadcast “Long” message with IDLE indication around the ring, away from the recovered failure
- The Station repeats IDLE protection message generation every T_1 sec until it receives its message back

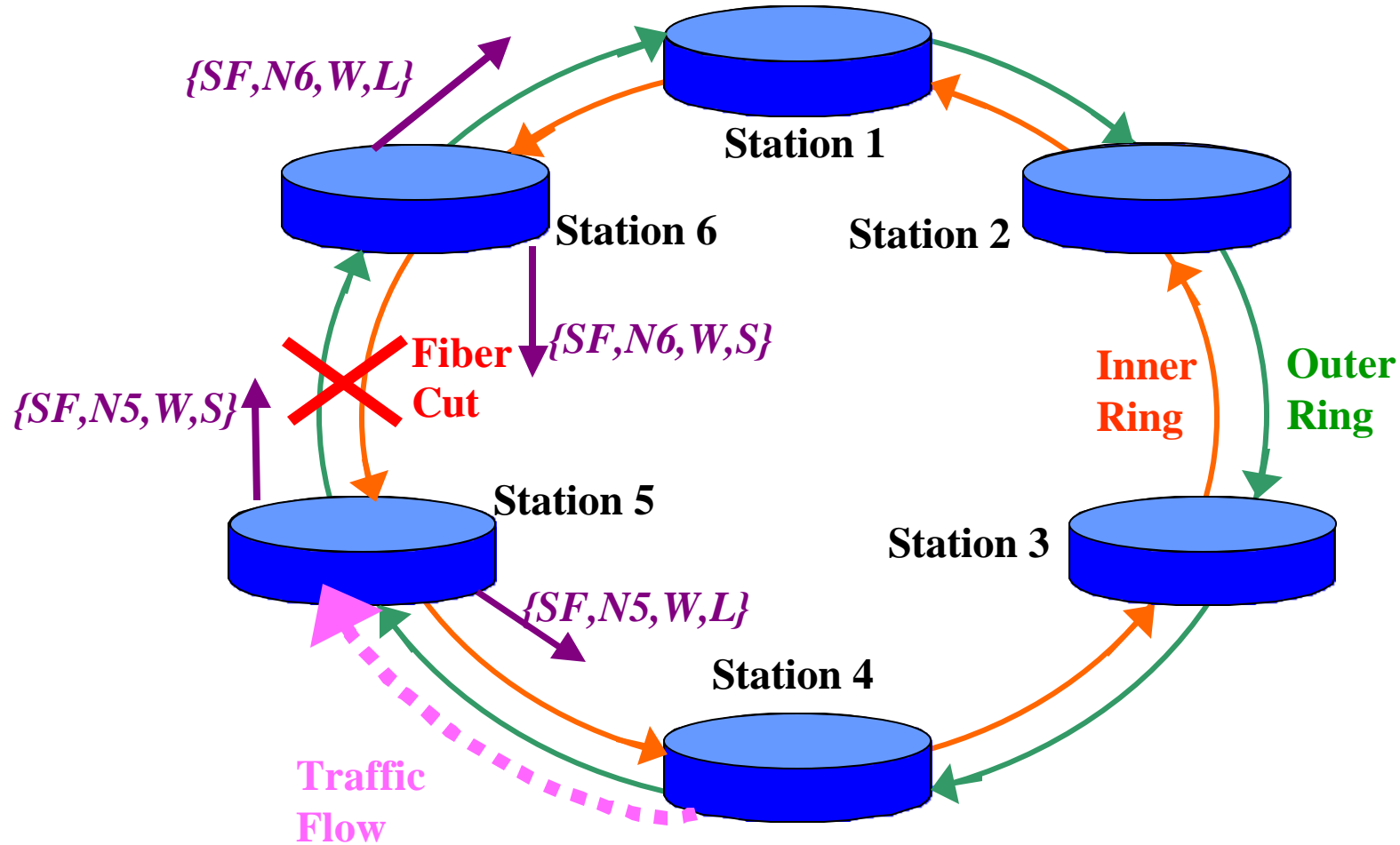
Wrap Protection



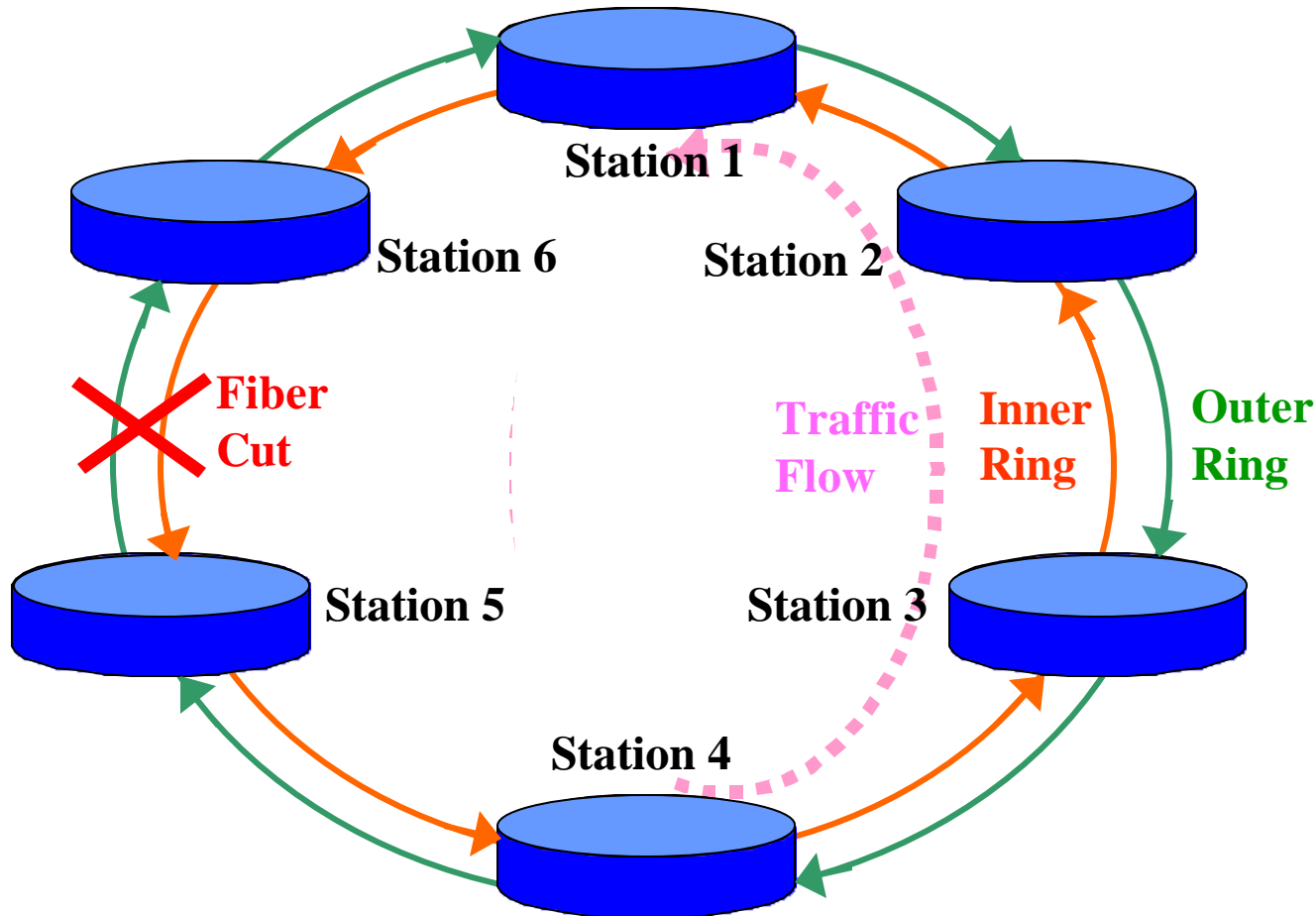
Optional Steering after Wrap Protection



Steer Protection



Steer Protection (cont)



Comparison

- Wrapping
 - Fastest response to failure, no need to communicate with all other stations for corrective action
 - Lowest packet loss
 - No special multicast/broadcast handling during failure
- Steering
 - Simpler HW, doesn't require the "Mate" link
 - Can be revertive or non-revertive

SWIS

- Packets wrap based on “type” field
- On failure the wrapping station discards packets with the “steering only” indication in the “type” field
- For “steering only” packets:
 - Packet source station set “type” field to: “steering only”
 - Source station is responsible to perform Steer within 50 msec

SWIS Applications

- Wrap protection for Multicast and Control, Steer protection for Unicast
- Wrap protection for BE traffic, Steer protection for TDM (low jitter)
- Wrap protection for packet loss sensitive flows, Steer protection for re-order sensitive flows
- Enables interoperation between fast-steering Stations and slow-steering Stations (that relies on wrapping within 50msec)

Protection Message

- Messages sent on fault detection/recovery in broadcast style
- Protection message format:
 - {Request_Type, Source_Address, Wrap_Status, Path_Indicator}
- Request_Type:
 - Force Switch
 - Signal Fail
 - Signal Degrade
 - Manual Switch
 - Wait to Restore
 - Idle

Protection Message (cont)

- Wrap_Status:
 - Idle
 - Wrap
- Path_Indicator:
 - Short Message
 - Toward upstream stations on failed ring through the opposite ring
 - Long Message
 - Toward downstream stations on the failed ring

Protection Control Message Frame Format

TTL		Type(4)	RI	PRI(7)	IOP
Destination Address					
Source Address					
Protocol Type (0x2007)					
HEC					
Control Version (0x0)		Control Type (0x2)			
Control TTL					
IPS Octet		Rsvd			
FCS					

Conclusions

- Same message format can be used for both Steering and Wrapping methods
- Standard should have Wrap as a base case and Steer as an optional case