SRP - MAC OVERVIEW

SRP Protocol and Features

- **Packet Formats**
- **Packet Flow**
- **Rx Process**
- **Tx Process**
- **Priority**

- **Fairness**
- **SRP Synchronizer**
- **Pass-through**
- **Wrap**

SRP Header Format

0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
TTL								RI	MODE			PRI			P

TTL   Time to Live

RI   Ring ID

MODE   {IPS, Topology, Usage, Data}

PRI   Priority of Packet

P   Parity Bit

SRP Data Packet Format

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
TTL · RI · 111 · PRI · P
48 bit Destination MAC Address
48 bit Source MAC Address
16 Bit Protocol Type
Variable Length Payload
CRC-32 excludes SRP HDR

SRP Usage Packet Format

CONEXANT

0 1 2 3 4 5 6 7	8 9	0 1	2 3 4	5
0x01	RI	110	111	P

**48 bit Source
MAC Address**

16 bit Reserved Field

16 Bit Usage Value

**CRC-32
excludes SRP HDR**
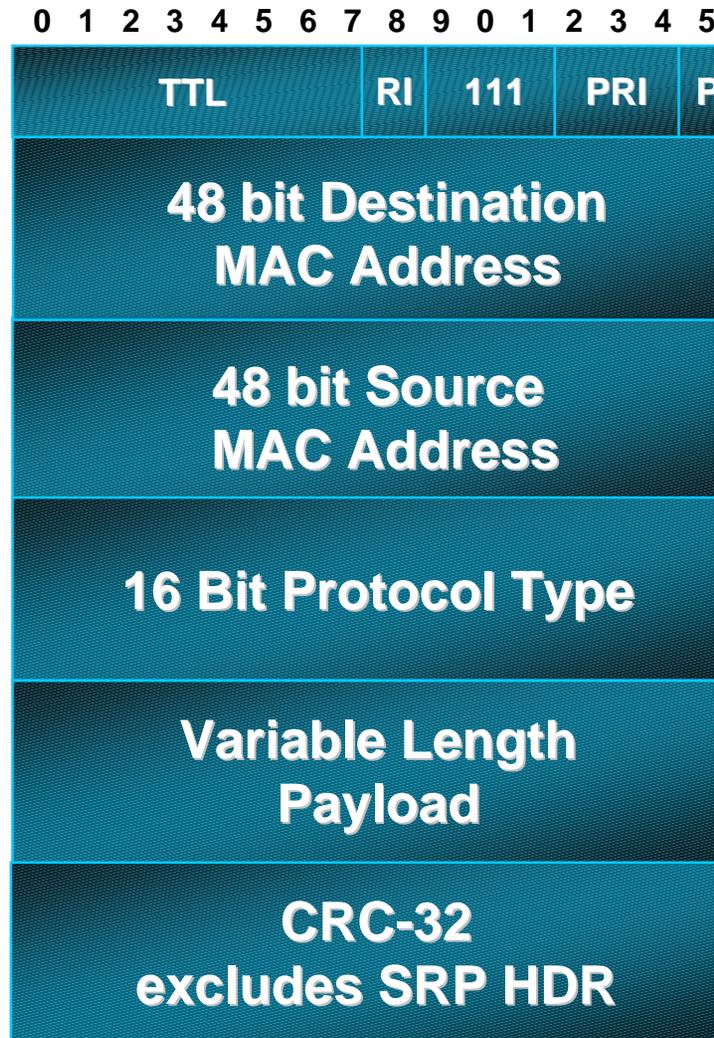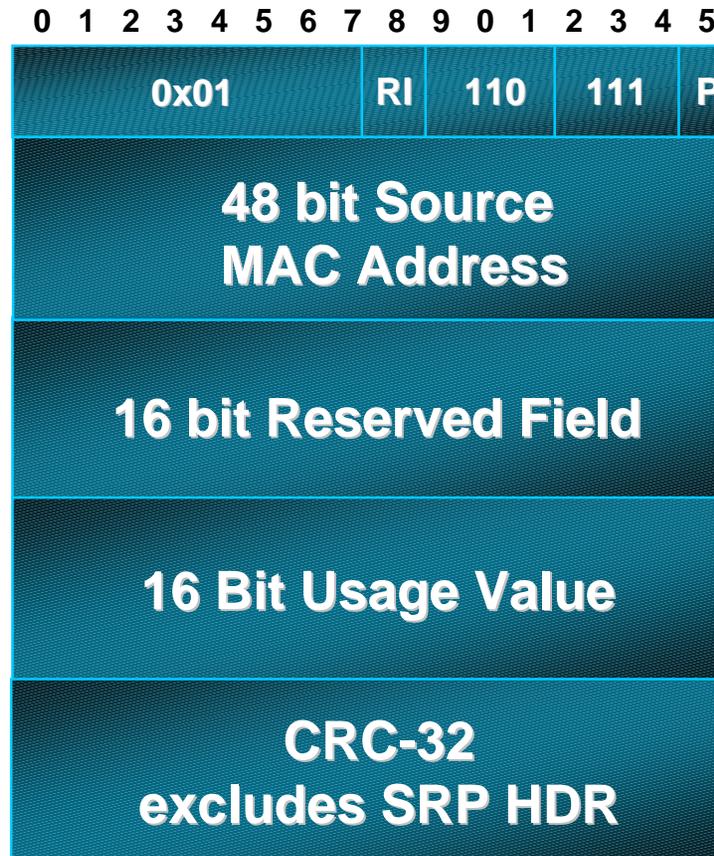
SRP Control Packet Format

0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5

0x01	RI	MODE	111	P

0x000000000000

48 bit Source MAC Address

16 Bit Protocol Type

16 Bit Control Type

16 Bit Length

Variable Length Payload

CRC-32 excludes SRP HDR
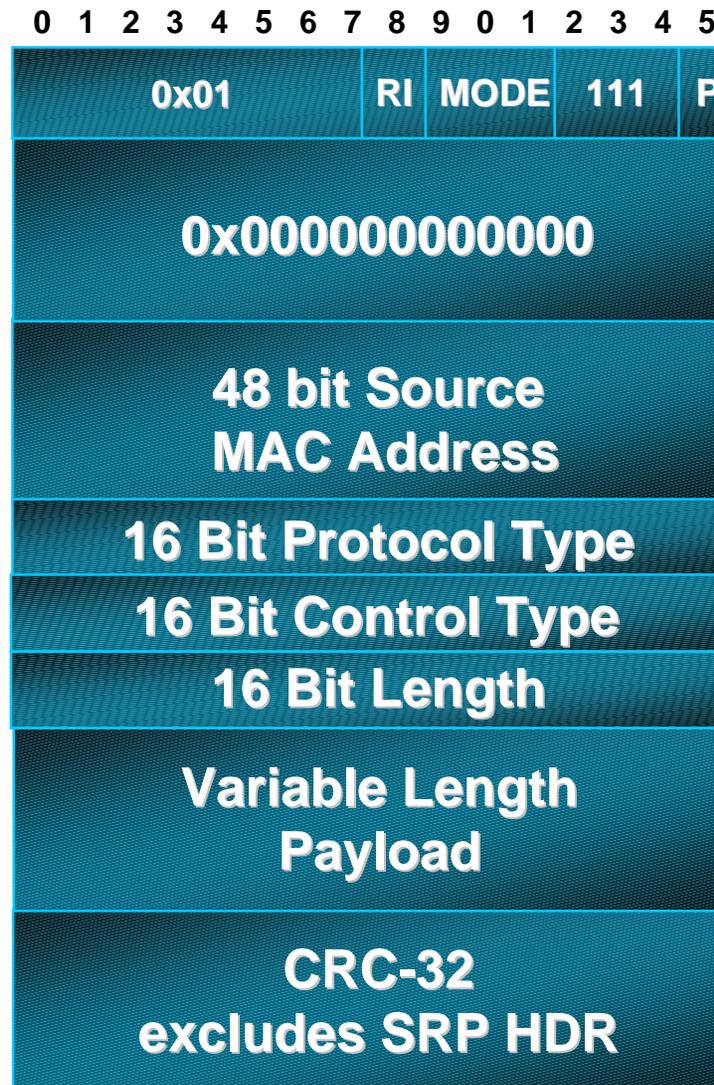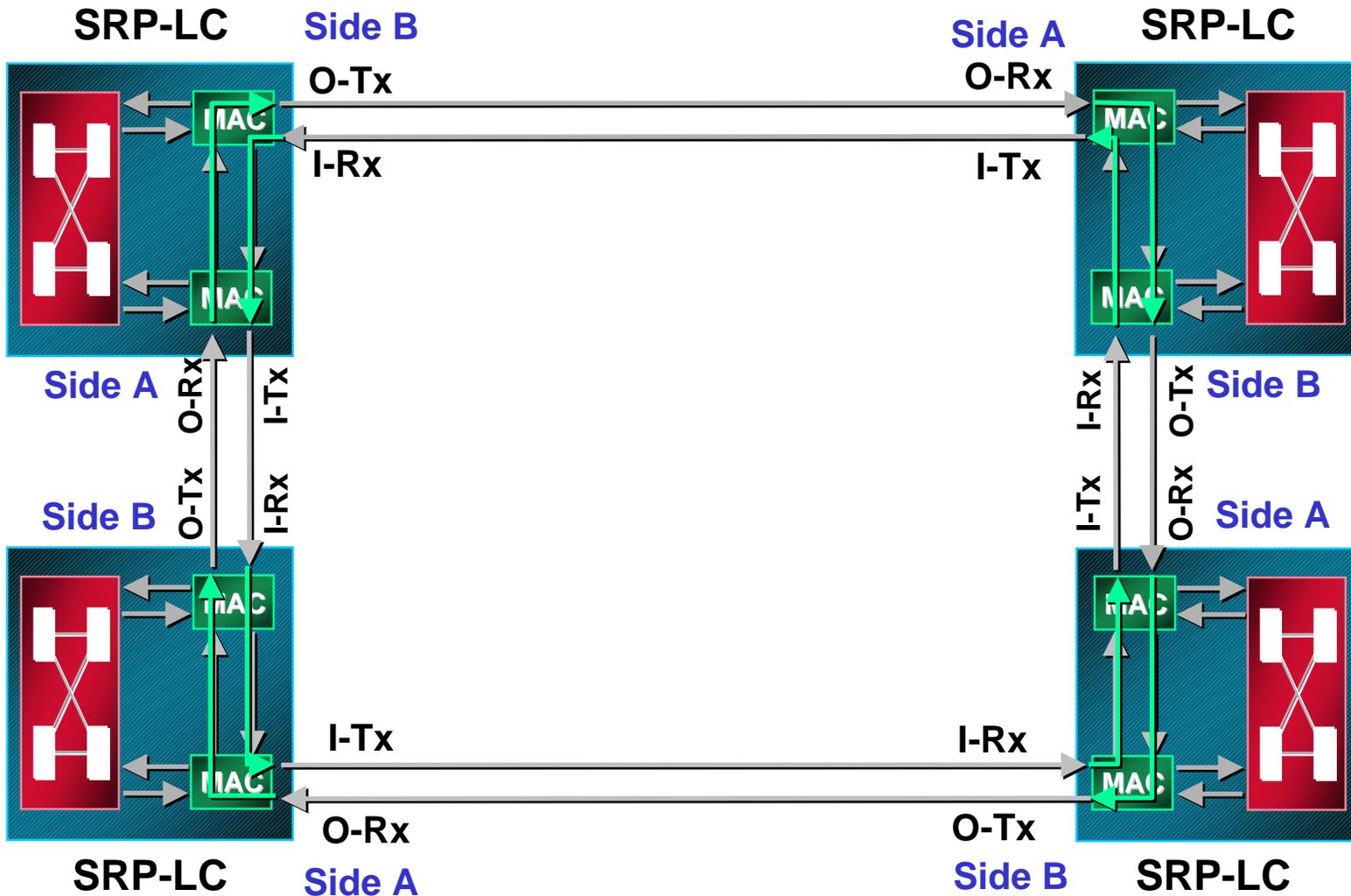
Ring Packet Flow

Node Packet Flow
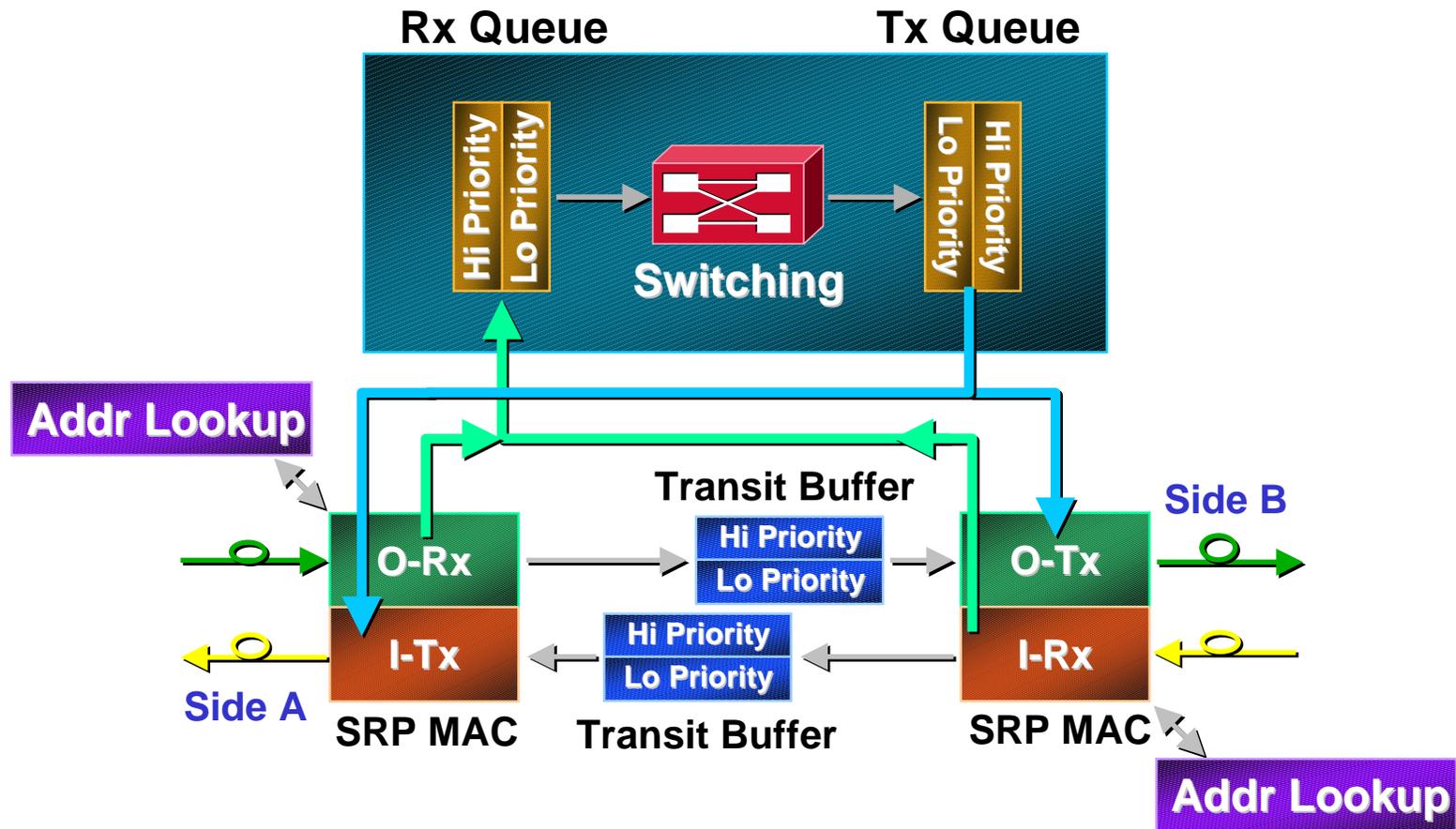
Receive Packet Handling

- **Control packet processing**
- **Data packet processing**
- **Multicast handling**

Control Packet Processing

Data Packet Processing

Lo Priority

Hi Priority

Address Lookup

Transit Buffer

Rx Packet Processing

Rx Fiber

Hi Priority

Lo Priority

Receive Packet Handling
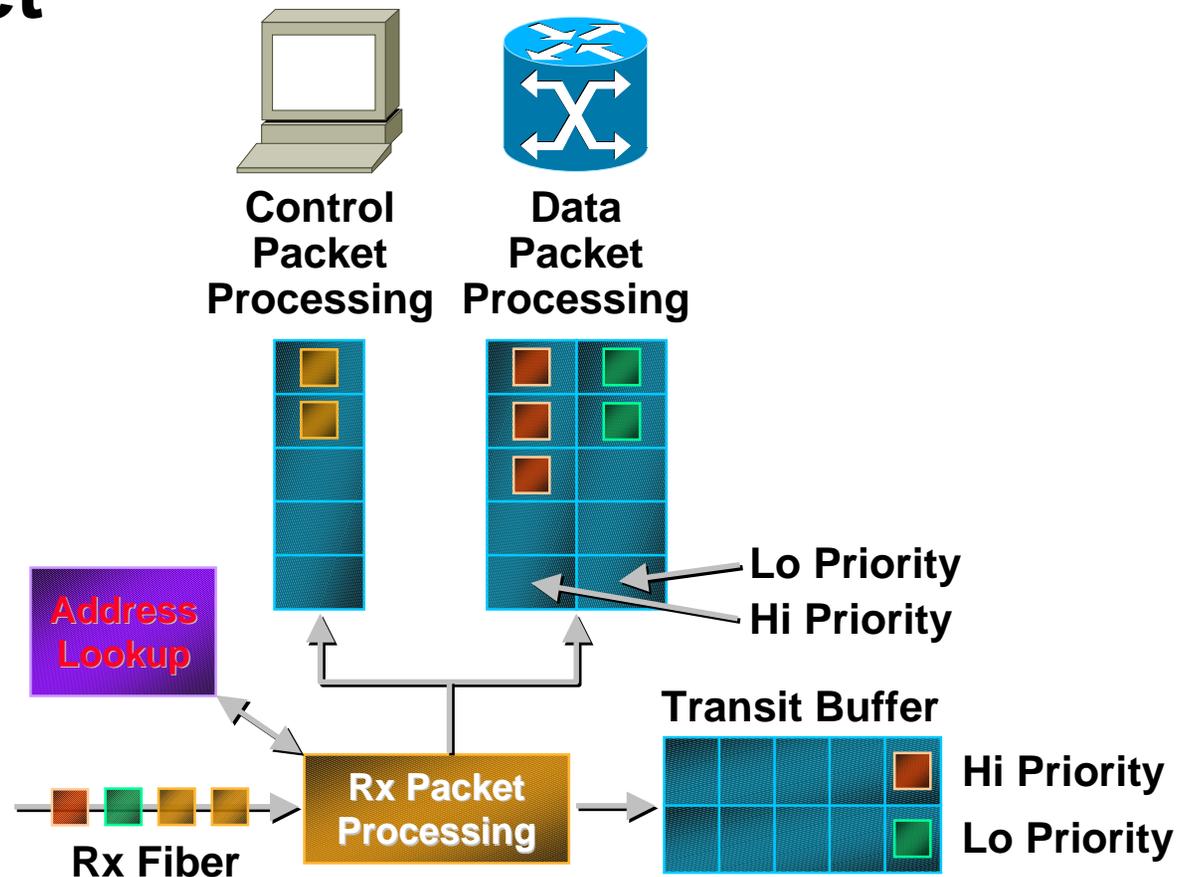
Six Things Can Happen
to an Incoming Packet

- **Stripped**
- **Forwarded**
- **Received and stripped**

- **Received and forwarded**
- **Wrapped**
- **Pass-through**

Receive Packet Stripping

- ## **Normal Operation**
  - – Unicast Destination Strip Qualified by RI
  - – Multicast Source Strip Qualified by RI

- ## **Error Traps**
  - – Unicast Source Strip Qualified by RI
 - – TTL Timeout Strip

Multicast Handling

- **Unlike unicast packets, multicast packets are source stripped**

- **Arriving multicast packets are forwarded to the host processing module**

- **The multicast packets are placed onto the transit buffer for continued circulation**

Transmit Packet Handling

- # **Priority handling**
- # **Transmit decision algorithm**
- # **Fairness**

Transmit Queues

Lo Priority   Hi Priority

Transit Buffer

Hi Priority
Lo Priority

High Threshold   Low Threshold

Tx Fiber

Fairness
Signaling
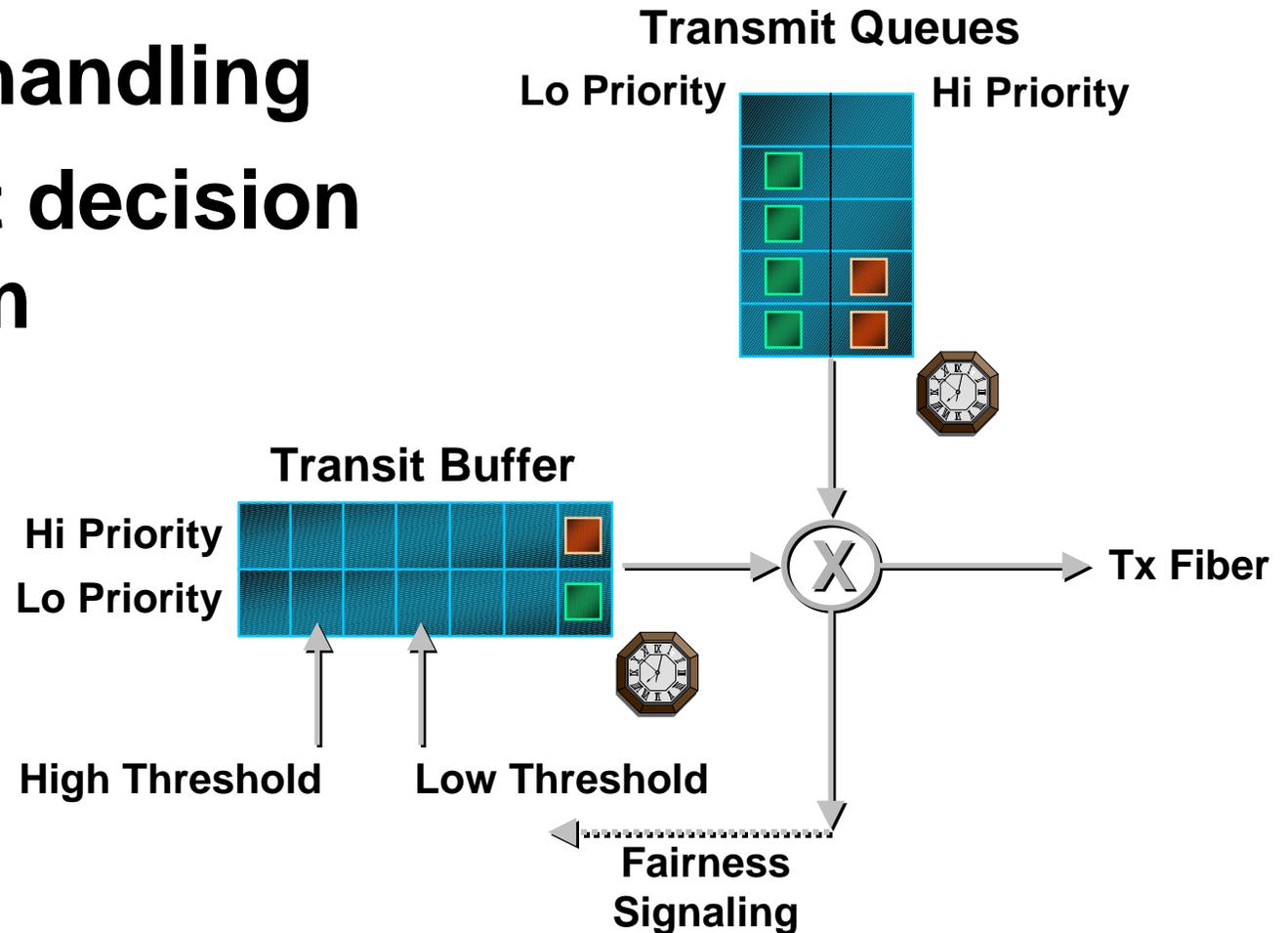
Priority Handling

- **The priority field is set by the node sourcing a packet onto the ring**

- **The priority field is received by the node sinking the packet from the ring**

- **SRP maps 8 levels to 2 levels while on the ring.**

  – A configured priority threshold is used to determine if the packet should be placed in the high or low priority queues

Transmit Decision Algorithm

- **No TB Congestion**
  - High Transit, High Transmit, Low Transmit, Low Transit
- **TB Depth > Low Threshold -OR-**

  my_usage > allow_usage
  - High Transit, High Transmit, Low Transit
- **TB Depth > High Threshold**
  - High Transit, Low Transit

SRP-fa (Transmit)

$$\text{MY\_USAGE} \leq \text{ALLOW\_USAGE} \leq \text{MAX\_ALLOW}$$

- **Incremented when transmitting low priority transmit packets**

  MY_USAGE = MY_USAGE + PAK_LEN

- **MY_USAGE gets decremented by a fixed fraction at regular intervals**

Transmit Rate Counter

ALLOW_USAGE set according to feedback received by neighbors

Can decay upwards to MAX_ALLOW

Threshold
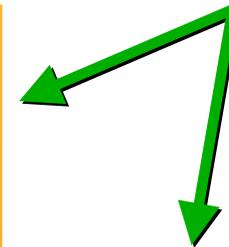
MAX_ALLOW static pre-configured parameter

SRP-fa (Forward Rate Counter)

- **Determine if upstream nodes are causing congestion to downstream nodes**

- **Incremented when transmitting low priority transit packets**
  - **FWD_RATE = FWD_RATE + PAK_LEN**

- **FWD_RATE gets decremented by a fixed fraction at regular intervals**

SRP-fa

- **High priority transmit packets are not rate controlled by the SRP-fa**
  - Committed Access Rate (CAR)

- **Excess transit packets are not rate limited by the node instead it generates a fairness message**

SRP-fa

- **Throttling is done by not sourcing packets until**

  – MY_USAGE < ALLOWED_USAGE

- **Usage field contains bandwidth information and are sent periodically even if there is no new bandwidth information to send**

  – Where there is no new bandwidth information to send a null value is sent

Congested Usage Generation

- **Transit Buffer is Congested**

If (more congested than downstream node)
generated_usage = lp_my_usage
else

generated_usage = received_usage

# *Uncongested Usage Generation*

- **Transit Buffer is not Congested**

If (DnS congested due to UpS traffic)

    generated_usage = received_usage

else

    generated_usage = null

SRP-fa Operation Example
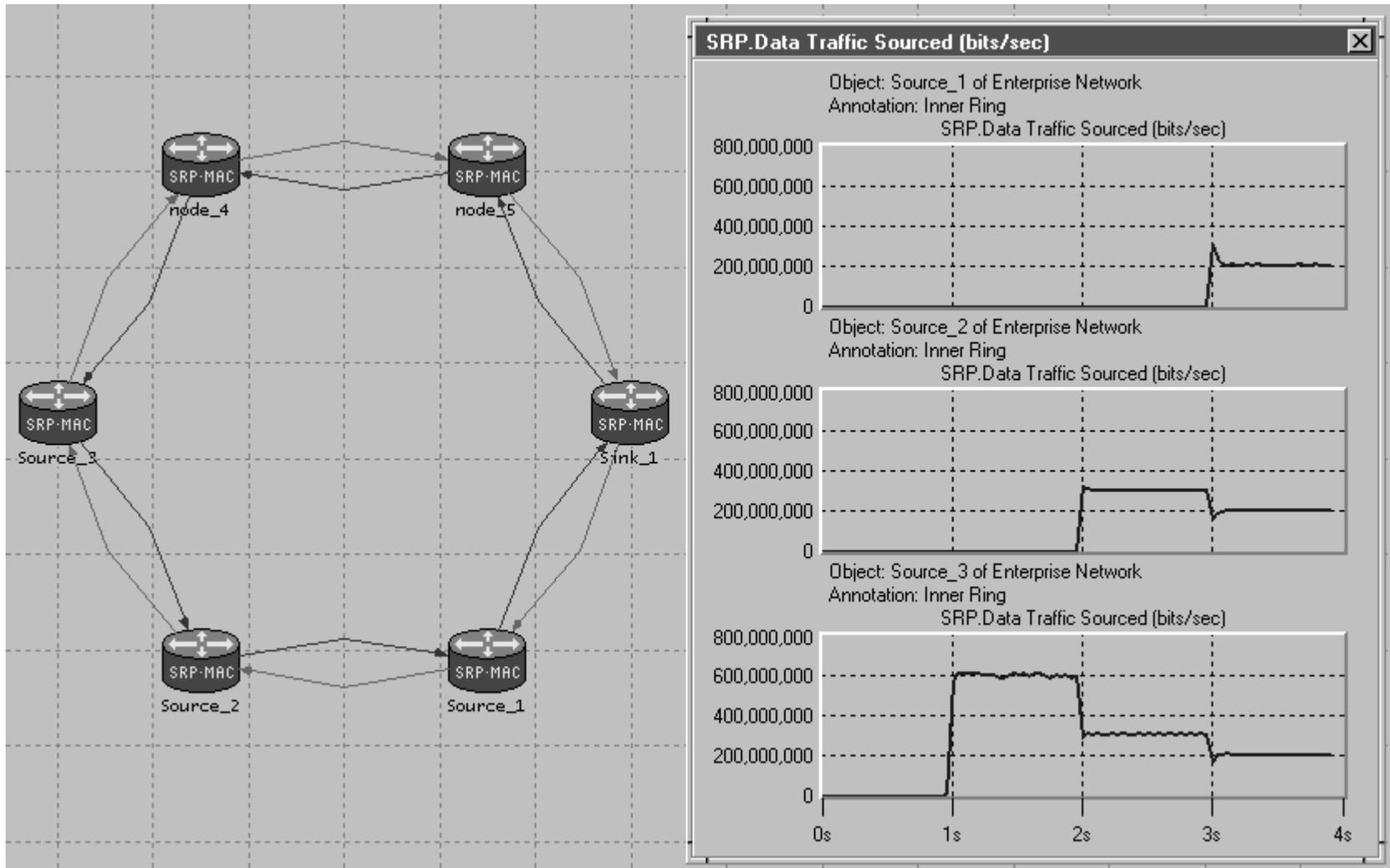
SRP Synchronizer

- **Each SRP node uses its own internal clock source**

- **Must guarantee that fast nodes do not overflow transit buffer on slower nodes**

- **Leaky Bucket algorithm monitors transmit & transit traffic and guarantees a maximum rate slightly below line rate**

Pass-Through Mode

- **Handles higher layer hardware or software problem**

- **Automatic or manual triggers**

- **Avoid ring wraps or partitioning**

- **Node appears invisible to ring**

O-Rx

I-Tx

MAC

I-Rx

O-Tx

MAC

Wrapped Mode

SRP-LC

SRP-LC

O-Tx

O-Rx

MAC

MAC

I-Rx

I-Tx

Wrapped

Wrapped

MAC

MAC

O-Tx O-Rx

I-Tx

I-Rx

O-Rx O-Tx

- **Provides protection path for fiber cuts**
- **RI used to distinguish wrapped and unwrapped packets**

I-Rx

I-Tx

MAC

MAC

I-Tx

I-Rx

MAC

MAC

O-Rx

O-Tx

SRP-LC

SRP-LC