

# S/R Actions and State Diagram



- Documents and Objectives
- Partitioning of Work between Node and Port
- Definition of Port States
- Definition of Node States

New States

Changes to Existing C Code

- Suspend Transaction/Propagation
- Resume
- Port Transitions

# Documents and Objectives



- Documents
  - 97-031r8 - Suspend/Resume Proposal
  - 97-053r0 - Port S/R Actions (C code)
  - 97-054r0 - Node S/R Actions (C code)
  - 97-055r0 - Port S/R State Diagram
- Objectives of Actions and State Diagram
  - Detailed Review of S/R Proposal
  - Normative part of S/R

# Partitioning of Work



- Node
  - PHY register access packets
  - Arbitration signals (Suspend, Disable)
  - Coordinator for multi-port actions
- Port
  - Drives TpBias (HIGH, LOW and HiZ)
  - Receives TpBias
  - Handshakes with peer port

# Definition of Port States



- $\text{Disconnected}^* = \text{!connected} \ \& \ \text{!port\_status}$
- $\text{Suspended}^* = \text{connected} \ \& \ \text{!port\_status}$
- $\text{Connected (active)} = \text{connected} \ \& \ \text{port\_status}$
- Register Bits
  - $\text{Status\_A.con} = \text{connected}$
  - $\text{Status\_A.bias} = \text{port\_status}$
  - $\text{Control\_Set.suspend} = \text{!port\_status}$

\* Port is suspended and consumes less than 1.65 milliwatts

# Definition of Port States (cont'd)



- Disabled\*  
Control\_Set.disable
- Resume  
Transition from power-down to active
- Suspend Initiator/Target  
Transition from active to power-down
- Failed Resume\*/Suspend\*  
Peer port failed to handshake  
Control\_Set.fault

# Definition of Node States



- **Port Register Transmit**  
Response to PHY register access packet.  
Similar to Self-ID Transmit.
- **Node Suspend Target**  
Entered by receiving RX\_SUSPEND.  
Suspends all active ports.
- **Port Change (free running)**  
Notifies node controller of any change in port registers.  
Triggers resume\_event.

# Definition of Node States (cont'd)



- **Node Resume (free-running)**  
Detects sleep changing from TRUE to FALSE.  
Resumes all suspended ports.
- **Node Suspend (not in rev 0.41)**  
Sets sleep if LPS is FALSE and all ports powered-down.
- **Resume Event (entered when resume\_event = TRUE)**  
Resumes the node based on its resume status:  
BOUNDARY INITIATOR, BOUNDARY TARGET,  
RESUME INITIATOR, RESUME TARGET.

# Changes to Existing C Code

- **connection\_status**

Only updates “connected” while power\_down is TRUE.  
Monitors con\_status instead of port\_status.

- **reset\_start\_actions**

Transmits TX\_SUSPEND, TX\_DISABLE.

- **receive\_actions/transmit\_actions**

Detects PHY register access packets.



# Suspend Transaction



## Suspend Initiator

## Suspend Target

node actions

- Receives PHY access packet (receive)
- Transmits PHY response packet (port register transmit)
- Transmits BUS\_RESET and TX\_SUSPEND (reset start)

- Receives PHY access packet
- Receives PHY response packet
- Receives and repeats TX\_SUSPEND (receive)

port actions

- Waits for port\_status to go LOW (suspend initiator)
- Drives TpBias LOW (suspended)

- Drives TpBias LOW (suspend target)
- Waits for port\_status to go LOW (suspend target)
- (suspended)

# Suspend Propagation



## Suspend Target/Initiator

## Suspend Target

node actions

port actions

- Receives PHY access packet
- Receives PHY response packet
- Receives and repeats TX\_SUSPEND (receive)

- Waits for port\_status to go LOW(suspend initiator)
- Drives TpBias LOW (suspended)

- Receives PHY access packet
- Receives PHY response packet
- Receives and repeats TX\_SUSPEND (receive)

- Drives TpBias LOW (suspend target)
- Waits for port\_status to go LOW (suspend target)
- (suspended)

# Resume



## Resume Initiator

node actions

- LPS goes active
- Resume all suspended ports (node resume)

port actions

- Drives TpBias HIGH and waits for port\_status equals TRUE (resume)
- Waits for port\_status going TRUE (resume-active)

node actions

- Wait 5\*RESET\_DETECT  
If BUS\_RESET detected, then attempt short reset.  
(resume event)

## Boundary Target

- At least one port active and one port suspended

- Suspended port detects port\_status going TRUE (suspended - resume)

- Drives TpBias HIGH (resume-active)

- Detects change in port\_status (port change)

- Wait 2\*RESET\_DETECT and issue short reset.