Rapid Spanning Tree

Mick Seaman

IEEE 802.1

September 1999

Rapid Spanning Tree

- Revised State Machines
- Forwarding Spanning Tree Information
- Model Implementation Goals
- Topology Change Handling
- New PDU Formats

Revised State Machines

- 'No new states' (port roles or port states)
  - 'recent root' and 'recent backup' timers track role transitions, replacing Forwards/Forwarder
- 'Rapid' enhancements accelerate transitions
  - between existing states
- Port focused not bridge focused
  - Bridge is a collection of ports
  - Root bridge just bridge without root port

Revised State Machines

- Propose use of 802.3 state machine conventions
  - State tables sparse
  - State machines not on the basis of 'port state'
  - Very easy to transliterate to implementation
  - State tables can be done as a check

Forwarding Information

- Information propagated as soon as bridge update process changes it
- Transmit rate limited
- Independent 'hello timers' per port
  - Root and Branch Bridges do not differ

Model Implementation Goals

- Efficient for bridges with large #s of ports
- 'Immediate' change propagation
- Bounded compute load
  - Rate limited scheduling of bridge wide updates
  - Reception does not imply immediate compute
- Interrupt handling of 'disabled' ports
- 'Realistic' hardware handling

Processes, Interrupts, and Tasks

Model assumes:

- Processes run to completion
- Processes do not interrupt each other
- Interrupts interrupt processes arbitrarily
- Interrupts do not interrupt each other
- No interrupt disable/enable support
- No mutex, semaphore, or thread support

Processes, Interrupts, and Tasks

- Receive BPDUs
  - A scheduled process
- Bridge Update Task
  - A scheduled process with frequency limits
- Port Update Task
  - Executed by a process or an interrupt
- Transmit BPDUs
  - A scheduled process

BPDU Reception

- Compares received info with existing info
  - better information substituted
- Pending flags record other events
  - 'topology change notification', etc.
- Signals 'new info' if new or aged info.
- Initiates port update, schedules bridge update if 'new info'.

Bridge Update

- Selects 'root port' and 'alternate root port'
- Selects 'designated', 'alternate', and 'backup' ports
- Runs port update for root port
  - May generate signal for all other ports
- Runs port update for all other ports
  - May generate signal for root port

Topology Change Handling

- Topology change propagation per port
  - 'tc_while' timer per port
  - set for short time
  - for a long time on links to legacy bridges
- TCNs sent periodically on Root Port
- TCs sent on Designated Ports

New BPDU Formats

- State not commands
  - Add sender's port role and port state
  - Add 'sync' flag
  - Sufficient to encode 'designated indication' and 'designated confirmation'
- Add 'tcn' indication to config BPDU
  - Reduces # of PDUs sent, simplifies decisions

New BPDU Formats

- Migration
  - New version : problem from last meeting
  - New flags in existing version : illegal
  - Migration to Ethernet on pt-to-pt links ?