STP 802.1d / RSTP 802.1w / MSTP 802.1s

Bridge ID, Rood Bridge, Root Port
Designated Bridge & Port
BPDU (config & TCN) - 2 sec

RSTP uses holdtime - 6 sec
RSTP: BPDU sent 2sec, not relayed

Disabled	Discarding
Blocking (20s **MaxAge**)	(alt, backup and
Listening (15s **FwDelay**)	non-desg ports)
Learning (15s **FwDelay**)	Learning
Forwarding	Forwarding

RSTP ports
<u>Alternate</u> (altern. path to RootBridge)
<u>Backup</u> (redundant path to segment)
<u>P2P</u> ports (to other STP switches)
<u>Edge ports</u> (hosts, no BPDUs or ->PTP)
<u>Shared</u> (to a hub segment, normal STP)

Portfast - jump to forwarding / don't TCN

UplinkFast
- on access switches with multiple uplinks to distribution
- keep alternate root port and switch fast on it in case root lost
- make priority (49152) & cost worse, so the switch doesn't become transit
- when switching, send dummy packets with sources in CAM on new uplink
- global setting (NOT on ROOT!, only on access switches)

BackboneFast
- if Indirect Failure, inferior BPDUs heard from design. switch belown
- If RootPort Hellos not heard, don't wait MaxAge & query switch on RootP
- **RLQ** is sent on Root Ports flooded until either:
    - root switch encountered, this will flood **Positive** answers
    - switch that lost conne. to the root encountered -> Flood **Negative**
If **Negative**, trust inferior BPDUs and enable port.
If >=one **Positive** unblock port to Inferior BPDUs to announce it of new root
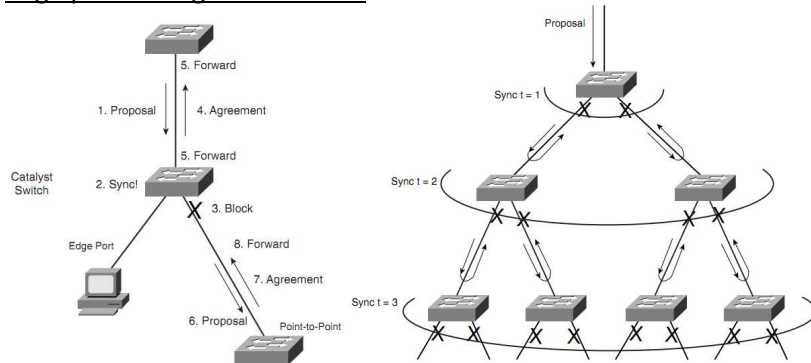- global setting on ALL switches

MST
Region: max 64 MST Instances per region. One Root Bridge per instance. **Config-name**, **Rev. no.**, **Instance-to-vlan map**
Backward compatible through **CST** (where each MST region = virtual bridge).
CST (**common and internal ...**) links MST, STP, RSTP in a big Tree
In each region, **MST** instance **0** is **IST** (Internal Spanning Tree) that makes MST region look like a Bridge in CST.
Only 1 BPDU sent for MST 0 (IST) that contains info for the other regions (MST instances). Outside MST only IST BPDUs
Default: all vlans assigned to **MST 0 (IST)**

Normal STP Reconvergence (30sec):
- SW fails
- Upstream port leaves Forwarding
- Upstream sw sends TCN on RootPort until ACK
- all switches propagate to root + ACKs
- Root get TCN and sends ACK.
- Root sets TC flag and sends update config (for MaxAge + FwDelay secs)
- All switches relay message and set MAC Table aging 15 sec.

RSTP Reconvergence:
Synchronization process, no more flood to root. Proposal-agreement (fast).
<u>Edge ports are ignored below!</u>

In addition:
- port -> discarding does not send TCN
- TC broadcast on all Desg+root ports (no Root needed for this) for 2*hello secs
- MAC-Table flushed (NOT edge ports or port with incoming TC)
- root & edge ports-> FW immediately
- ripple effect sometimes (direction of proposal/agreement changes)

STP Algorithm:
1. Lowest Root ID
2. Lowest Path Cost to Root
3. Lowest Sender Bridge ID
4. Lowest Sender Port ID.

STP Root Selection:
1. Lowest Priority
2. Lowest Bridge ID

Bridge ID (4b + 12b + 48b)
<u>Priority</u> (multiple of 4096)
<u>SystemID</u> (generally the VLAN)
+ <u>MAC</u> (lower better)

RootBridge ports: **FW** + **DP**
R & DP ports -> **FW**
Other: **BLK**

RSTP Compatibility
STP discards RSTP
RSTP reverts to STP if detect

Link costs (10,100,1000,10G)
Old: 100/10/1/1
New: 100/19/4/2