VLANs and Spanning Tree cheat sheet

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Concepts first, then the commands. Labs: Packet Tracer, CML or GNS3. Always check which VLAN a port is in before changing it on a live switch.

VLAN basics

Term	Meaning
VLAN	A separate Layer 2 network (broadcast domain) on a shared switch
Access port	Belongs to one VLAN, frames sent untagged (PCs, printers)
Trunk	Carries many VLANs; 802.1Q adds a 4-byte tag with the VLAN ID
Native VLAN	The VLAN sent untagged on a trunk (default 1): must match on both ends
Voice VLAN	Separate tagged VLAN for an IP phone on an access port
VLAN ranges	Normal 1–1005, extended 1006–4094; 1 and 1002–1005 are reserved defaults
SVI	Virtual Layer 3 interface for a VLAN (interface vlan 10)

VLAN and trunk commands

Command	What it does
`vlan 10` `name STAFF`	Create and name VLAN 10
`switchport mode access` `switchport access vlan 10`	Make the port an access port in VLAN 10
`switchport voice vlan 20`	Voice VLAN for an IP phone
`switchport mode trunk`	Force a trunk
`switchport nonegotiate`	Turn off DTP (trunk negotiation)
`switchport trunk allowed vlan 10,20,30`	Only these VLANs on the trunk
`switchport trunk allowed vlan add 40`	Add a VLAN without removing the others
`switchport trunk native vlan 99`	Unused VLAN as native (security)

> **Careful:** `allowed vlan 40` without **add** replaces the whole list and can cut off every other VLAN.

Inter-VLAN routing

Command	What it does
`ip routing`	Enable routing on a Layer 3 switch

`interface vlan 10`
`ip address 10.10.10.1 255.255.255.0`
`no shutdown`
	SVI = default gateway for VLAN 10

`interface g0/0.10`
`encapsulation dot1Q 10`
`ip address 10.10.10.1 255.255.255.0`
	Router-on-a-stick sub-interface

`ip helper-address 10.0.0.5`	Forward DHCP requests to a server in another VLAN

Spanning Tree in short

Item	What to know
Why	Stops Layer 2 loops (broadcast storms) on redundant links
Root bridge	Lowest bridge ID wins: priority (default 32768 + VLAN) then lowest MAC
Root port	Each non-root switch: best path (lowest cost) to the root
Designated port	One forwarding port per segment
Blocked / alternate	Kept ready, takes over if a link fails
Costs (short)	10 Mb/s 100 · 100 Mb/s 19 · 1 Gb/s 4 · 10 Gb/s 2
Versions	STP 802.1D (slow, ~30–50 s), Rapid PVST+ / RSTP 802.1w (seconds), MST 802.1s

STP commands

Command	What it does
`spanning-tree mode rapid-pvst`	Use Rapid PVST+ (recommended)
`spanning-tree vlan 10 root primary`	Make this switch root for VLAN 10
`spanning-tree vlan 10 priority 4096`	Set priority manually (multiples of 4096)
`spanning-tree portfast`	Edge port: forward immediately (end devices only)
`spanning-tree bpduguard enable`	Err-disable the port if a BPDU arrives
`spanning-tree guard root`	Stop a downstream switch becoming root

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Show and troubleshoot

Command	What it does
`show vlan brief`	VLANs and access ports
`show interfaces trunk`	Trunks, native VLAN, allowed VLANs
`show interfaces g0/1 switchport`	Mode, access and voice VLAN of one port
`show spanning-tree vlan 10`	Root, port roles and states
`show spanning-tree summary`	Mode and PortFast/BPDU Guard defaults
`show interfaces status err-disabled`	Ports shut by BPDU Guard or port security
`errdisable recovery cause bpduguard`	Auto-recover err-disabled ports

Common faults

Symptom	Likely cause
PC gets no DHCP address	Wrong access VLAN, or missing ip helper-address
VLAN works on one switch only	VLAN not created on the other switch or not allowed on the trunk
Native VLAN mismatch log	Different native VLAN on each end of the trunk
Port suddenly err-disabled	BPDU Guard tripped: someone plugged in a switch
Whole network slow, LEDs flashing	Loop / broadcast storm: check STP and recent cabling

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