CCNA 200-301, Volume I

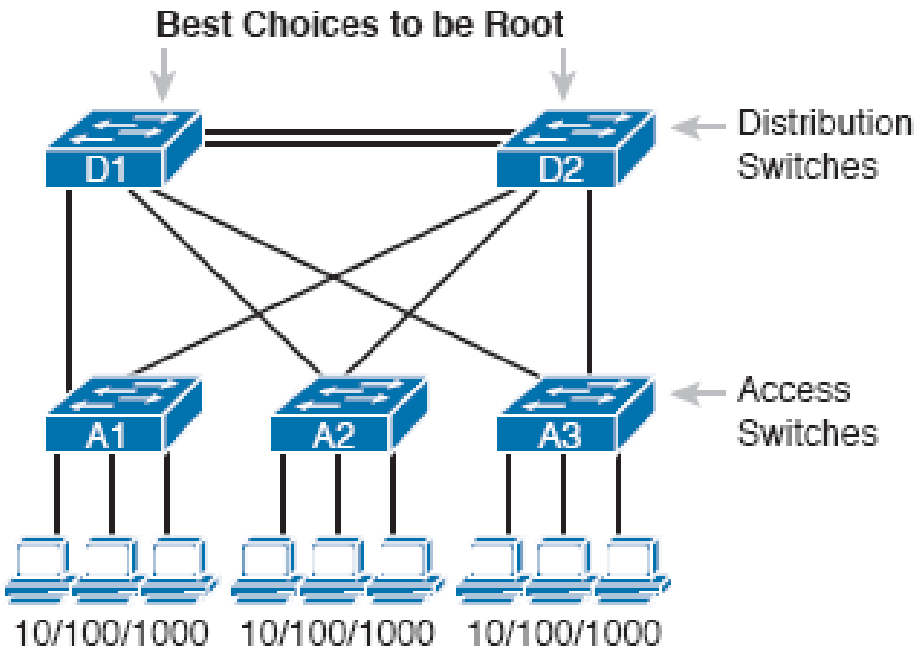
Chapter 10

RSTP and EtherChannel Configuration

Objectives

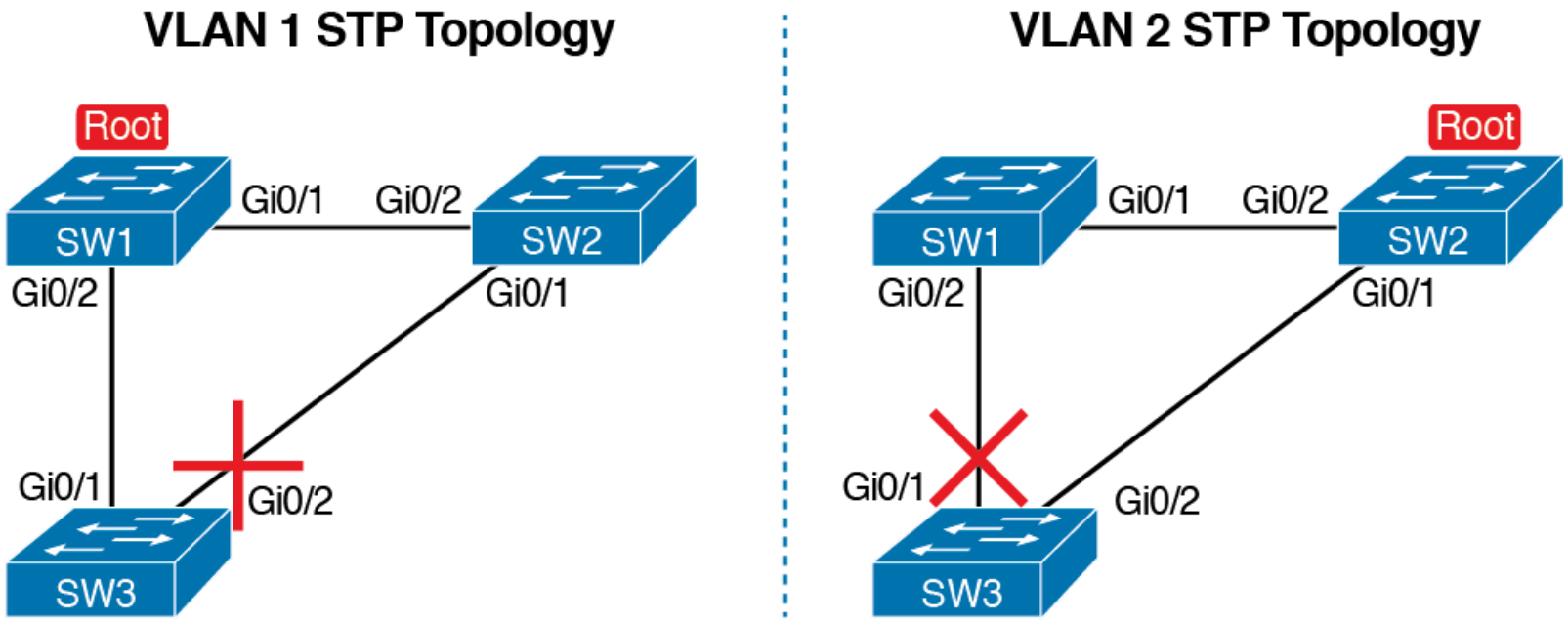
- Understanding RSTP Through Configuration
- Implementing EtherChannel

Typical Configuration Choice: Making Distribution Switch Be Root

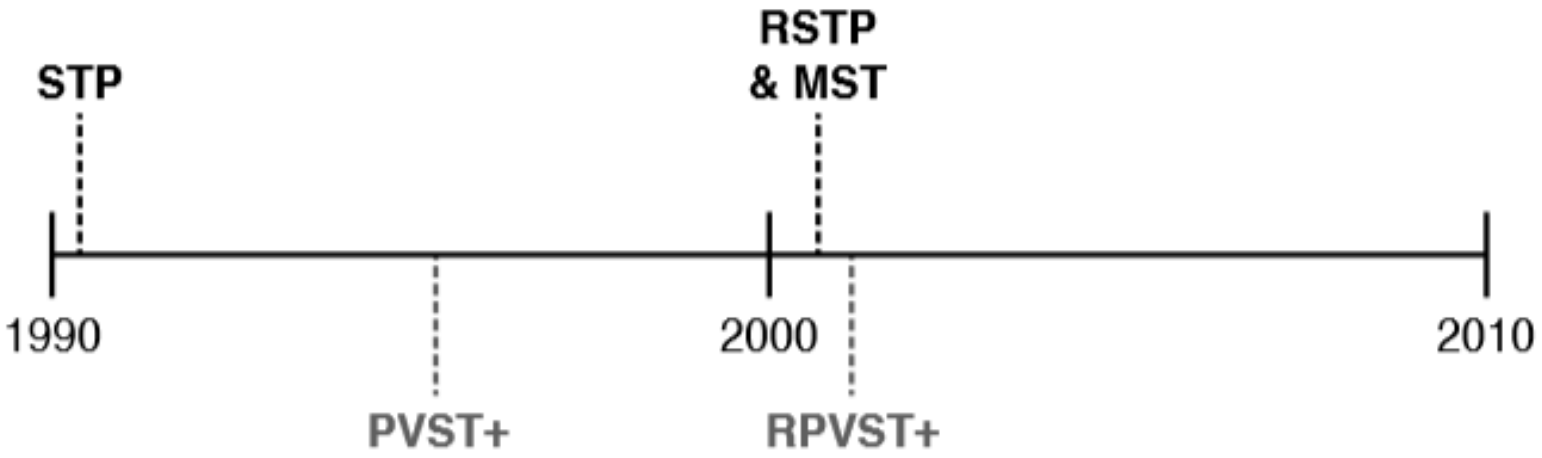


- For instance: In a typical LAN design model, with two distribution layer switches connecting to multiple access layer switches; most network engineers would make the one of the distribution switches the STP root switch.

Load Balancing with One Tree for VLAN 1 and Another for VLAN 2



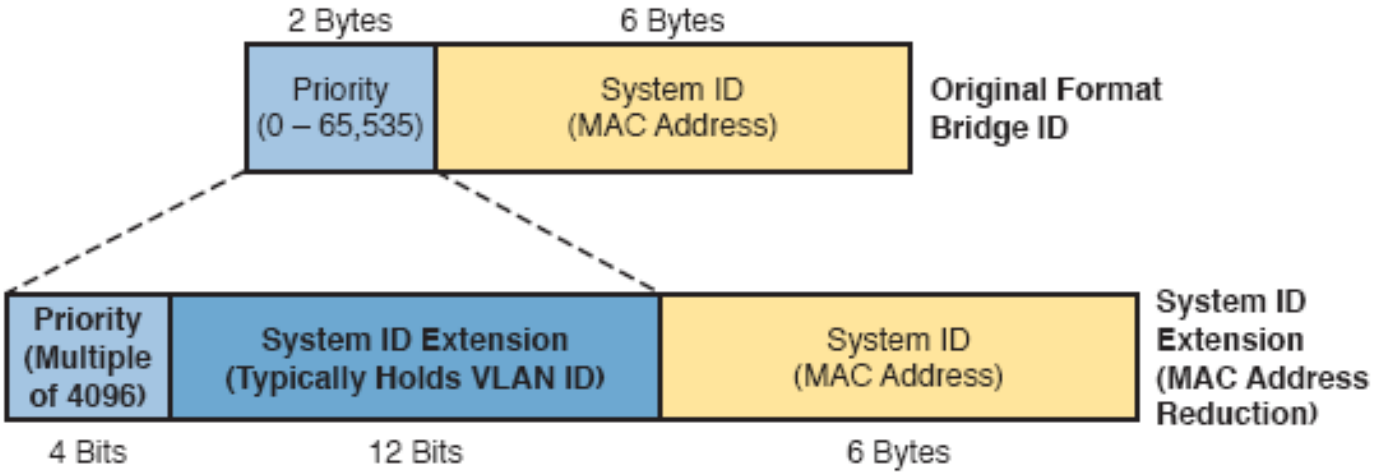
Timeline of Per-VLAN and Multiple STP Features



STP Standards and Configuration Options

Name	Based on STP or RSTP?	# Trees	Original IEEE Standard	Config Parameter
STP	STP	1 (CST)	802.1D	N/A
PVST+	STP	1/VLAN	802.1D	pvst
RSTP	RSTP	1 (CST)	802.1w	N/A
Rapid PVST+	RSTP	1/VLAN	802.1w	rapid-pvst
MSTP	RSTP	1 or more*	802.1s	mst

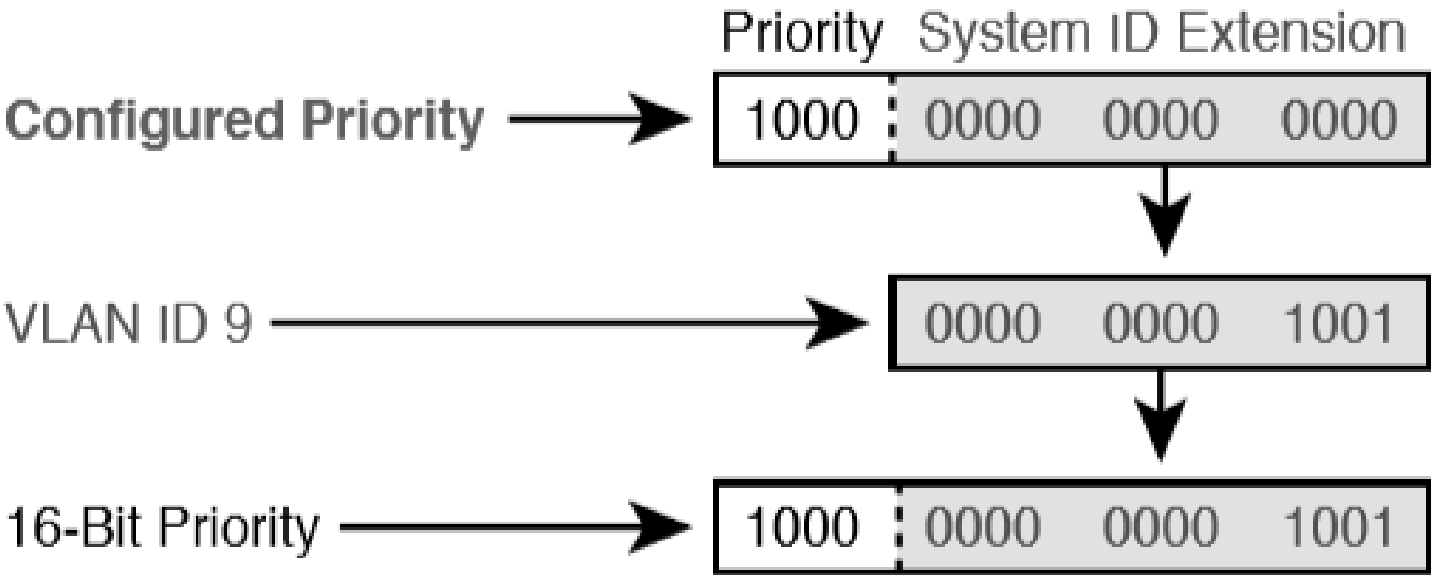
STP System ID Extension



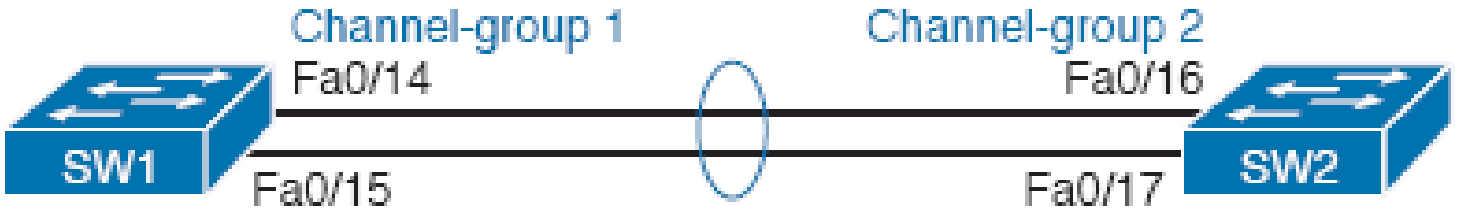
STP/RSTP Configurable Priority Values

Decimal Value	16-bit Binary Equivalent	Decimal Value	16-bit Binary Equivalent
0	**0000** 0000 0000 0000	32768	**1000** 0000 0000 0000
4096	**0001** 0000 0000 0000	36864	**1001** 0000 0000 0000
8192	**0010** 0000 0000 0000	40960	**1010** 0000 0000 0000
12288	**0011** 0000 0000 0000	45056	**1011** 0000 0000 0000
16384	**0100** 0000 0000 0000	49152	**1100** 0000 0000 0000
20480	**0101** 0000 0000 0000	53248	**1101** 0000 0000 0000
24576	**0110** 0000 0000 0000	57344	**1110** 0000 0000 0000
28672	**0111** 0000 0000 0000	61440	**1111** 0000 0000 0000

Configured Priority (16-Bit) and System ID Extension (12-Bit) Added



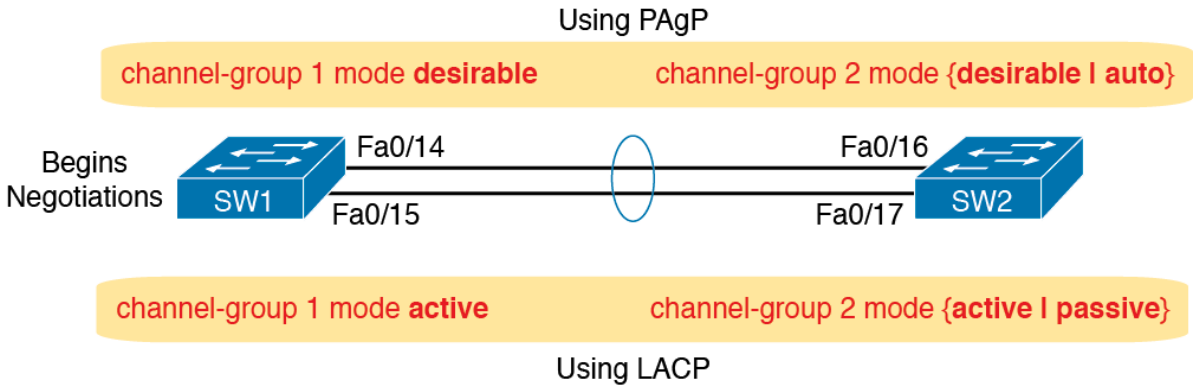
Configuring a Manual EtherChannel



Step 1. Add the channel-group number mode on command in interface configuration mode under each physical interface that should be in the channel to add it to the channel.

Step 2. Use the same number for all commands on the same switch, but the channel-group number on the neighboring switch can differ.

Configuring Dynamic EtherChannels

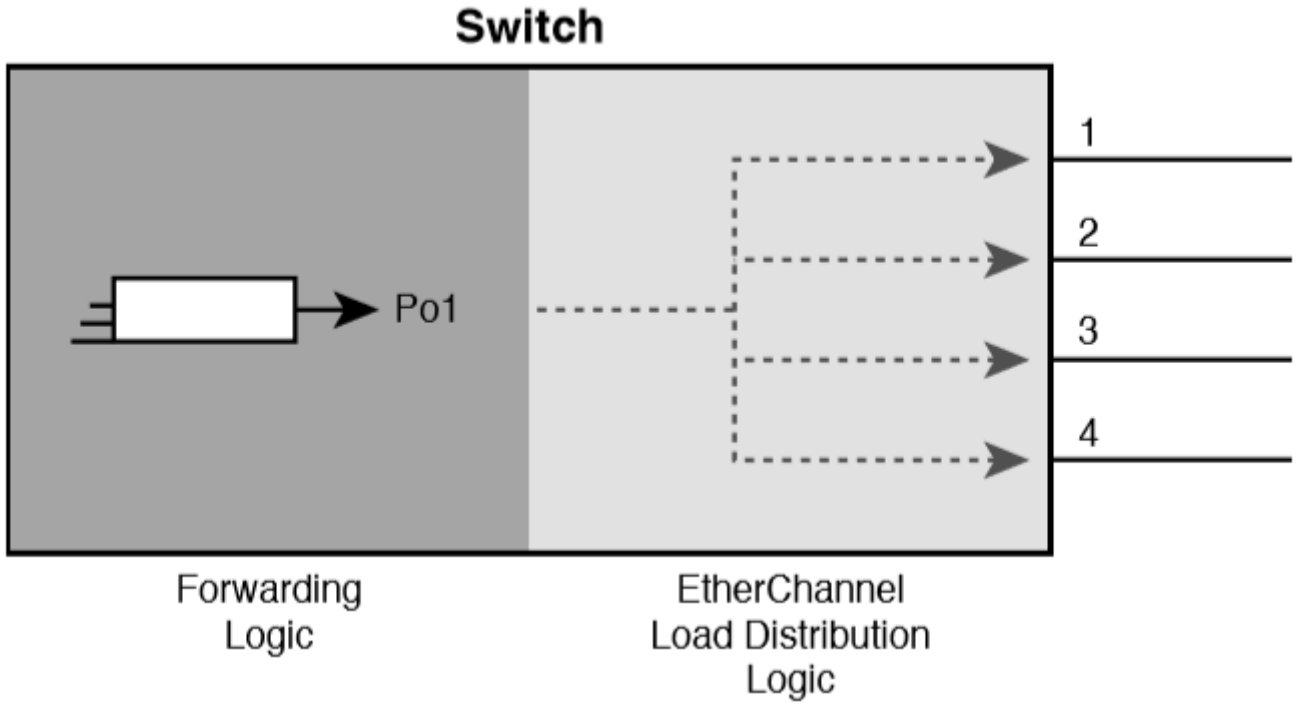


- Two different protocols support switch negotiation of EtherChannel links: PagP and LACP
- The switch can use the protocol to send messages to/from the neighboring switch and discover if their configuration settings pass all checks
- If a given physical link passes, the link is added to the EtherChannel and used

EtherChannel Verification: PAgP Desirable Mode

```
SW1# show etherchannel 1 port-channel
                Port-channels in the group:
                ---------------------------

Port-channel: Po1
------------
Age of the Port-channel   = 0d:00h:04m:04s
Logical slot/port   = 16/1          Number of ports = 2
GC                  = 0x00020001      HotStandBy port = null
Port state          = Port-channel Ag-Inuse
Protocol            = PAgP
Port security       = Disabled
Load share deferral = Disabled

Ports in the Port-channel:

Index   Load   Port     EC state        No of bits
------+------+------+------------------+-----------
  0     00     Gi0/1    Desirable-Sl       0
  0     00     Gi0/2    Desirable-Sl       0

Time since last port bundled: 0d:00h:03m:57s Gi0/2
```

Correct EtherChannel Configuration Combinations

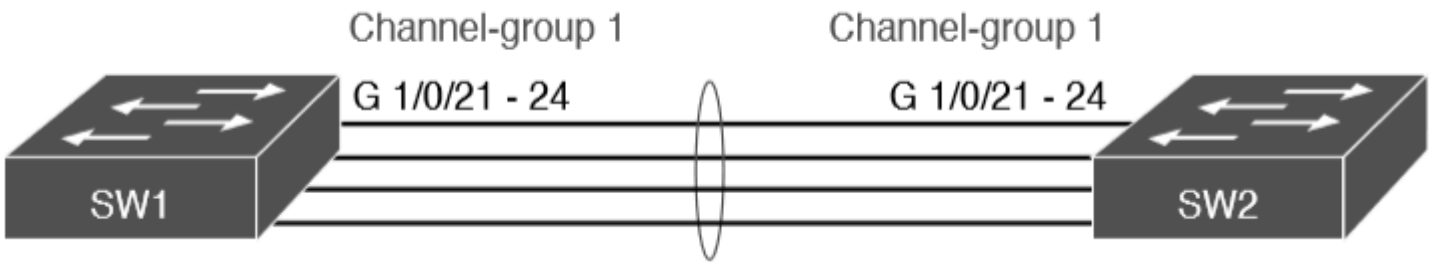


EtherChannel Load Distribution Methods

Configuration Keyword	Math Uses...	Layer
src-mac	Source MAC address	2
dst-mac	Destination MAC address	2
src-dst-mac	Both source and destination MAC	2
src-ip	Source IP address	3
dst-ip	Destination IP address	3
src-dst-ip	Both source and destination IP	3
src-port	Source TCP or UDP port	4
dst-port	Destination TCP or UDP port	4
src-dst-port	Both source and destination TCP or UDP port	4

Distributing All Frames with Same Mac Out Same Interface

Four-Link EtherChannel



Testing with Identical Source MACs When Using src-mac Balancing

```
SW1# show etherchannel load-balance
EtherChannel Load-Balancing Configuration:
        src-mac

EtherChannel Load-Balancing Addresses Used Per-Protocol:
Non-IP: Source MAC address
  IPv4: Source MAC address
  IPv6: Source MAC address

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1111
Would select Gi1/0/22 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1112
Would select Gi1/0/22 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1113
Would select Gi1/0/22 of Po1
```

Testing with Source MACs with Low-Order Bit Differences

```
SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1111
Would select Gi1/0/22 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0002 0200.1111.1111
Would select Gi1/0/24 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0003 0200.1111.1111
Would select Gi1/0/23 of Po1
```

Evidence of Source and Destination MAC Load Distribution

```
SW1# config t
Enter configuration commands, one per line.  End with CNTL/Z.
SW1(config)# port-channel load-balance src-dst-mac
SW1(config)# ^Z
SW1#
SW1# show etherchannel load-balance
EtherChannel Load-Balancing Configuration:
        src-dst-mac

EtherChannel Load-Balancing Addresses Used Per-Protocol:
Non-IP: Source XOR Destination MAC address
  IPv4: Source XOR Destination MAC address
  IPv6: Source XOR Destination MAC address

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1111
Would select Gi1/0/22 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1112
Would select Gi1/0/24 of Po1

SW1# test etherchannel load-balance interface po1 mac 0200.0000.0001 0200.1111.1113
Would select Gi1/0/23 of Po1
```