

Basics of Dynamic Trunking Protocol (DTP)

By Rick Graziani

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This information is being made available for CCNA instructors and students to learn more about DTP. Please email me if you have any questions, graziani@cabrillo.edu.

Figure 1

```
3550-Switch(config-if)#switchport mode ?
  access      Set trunking mode to ACCESS unconditionally
  dot1q-tunnel Set trunking mode to DOT1Q TUNNEL unconditionally
  dynamic     Set trunking mode to dynamically negotiate access or trunk mode
  trunk       Set trunking mode to TRUNK unconditionally

2950-Switch(config-if)#switchport mode ?
  access      Set trunking mode to ACCESS unconditionally
  dynamic     Set trunking mode to dynamically negotiate access or trunk mode
  trunk       Set trunking mode to TRUNK unconditionally
```

Figure 2

switchport mode access - This command puts the interface (access port) into permanent nontrunking mode. The interface will generate DTP frames, negotiating with the neighboring interface to convert the link into a nontrunk link. The interface becomes a nontrunk interface even if the neighboring interface does not agree to the change.

switchport mode dynamic desirable - This command makes the interface actively attempt to convert the link to a trunk link. The interface becomes a trunk interface if the neighboring interface is set to **trunk**, **desirable**, or **auto** mode. This is the default mode for all Ethernet interfaces. If the neighboring interface is set to the **access** or **non-negotiate** mode, the link will become a non-trunking link.

switchport mode dynamic auto – This command makes the interface willing to convert the link to a trunk link if the neighboring interface is set to **trunk** or **desirable** mode. Otherwise, the link will become a non-trunking link.

switchport mode trunk – This command puts the interface into permanent trunking mode and negotiates to convert the link into a trunk link. The interface becomes a trunk interface even if the neighboring interface does not agree to the change.

switchport nonegotiate – Prevents the interface from generating DTP frames. You can use this command only when the interface switchport mode is **access** or **trunk**. You must manually configure the neighboring interface as a trunk interface to establish a **trunk** link, otherwise the link will be a non-trunking link.

Ethernet trunk interfaces support several different trunking modes.

- Access (default on Catalyst 2900XL switches)
- Dynamic desirable (default mode on Catalyst 2950 and 3550)
- Dynamic auto
- Trunk
- Non-negotiate
- dotq-tunnel (Not an option on the Catalyst 2950.)

Using these different trunking modes, an interface can be set to trunking or nontrunking or even able to negotiate trunking with the neighboring interface. To automatically negotiate trunking, the interfaces must be in the same VTP domain. Trunk negotiation is managed by the Dynamic Trunking Protocol (DTP), which is a Cisco proprietary Point-to-Point Protocol.

These various modes are configured using the **switchport mode** interface command as shown in Figure [1] Figure [2] shows the various DTP modes.

DTP Trunk and Access Modes

Figure 1

Switch(config-if)#**switchport mode access** – Sets trunking **OFF**

Switch(config-if)#**switchport mode trunk** – Sets trunking **ON**

Figure 2

```
3550-Switch(config)#inter fa 0/1  
3550-Switch(config-if)#switchport trunk encapsulation dot1q  
3550-Switch(config-if)#switchport mode trunk
```

Using the **switchport mode** interface command, two of the DTP modes set trunking to “off” or “on”. [1]

Access mode

For example, SwitchA and SwitchB are connected on their FastEthernet 0/1 interfaces. If both switches are set to **access** mode, then the link is a non-trunking link. Both interfaces must be on the same VLAN and only that single VLAN is transmitted across the link.

```
SwitchA(config)#inter fa 0/1  
SwitchA(config-if)#switchport mode access
```

```
SwitchB(config)#inter fa 0/1  
SwitchB(config-if)#switchport mode access
```

Trunk mode

If both switches are set to **trunk** mode, then the link is a trunking link. By default, all VLANs will be transmitted across this trunk.

```
SwitchA(config)#inter fa 0/1  
SwitchA(config-if)#switchport mode trunk
```

```
SwitchB(config)#inter fa 0/1  
SwitchB(config-if)#switchport mode trunk
```

Note: Switches such as the Catalyst 3550 that are capable of either 802.1Q or ISL trunking encapsulation, the **switchport trunk encapsulation [dot1q | isl | negotiate]** interface command must be used prior to the **switchport mode trunk** command. [2]

DTP Combinations

Figure 1 Administrative Mode Combinations and their Operational Modes

Administrative Mode	Auto	Desirable	Trunk (on)	Access (off)	Non-Negotiate (access)	Non-Negotiate (trunk)
Auto	Static access (NT)	Trunk	Trunk	Static access	Static access	Unexpected Results
Desirable	Trunk	Trunk	Trunk	Static access	Static access	Unexpected Results
Trunk (on)	Trunk	Trunk	Trunk	Unexpected Results	Unexpected Results	Trunk
Access (off)	Static access	Static access	Unexpected Results	Static access	Static access	Unexpected Results
Non-Negotiate (access)	Static access	Static access	Unexpected Results	Static access	Static access	Unexpected Results
Non-Negotiate (trunk)	Unexpected Results	Unexpected Results	Trunk	Unexpected Results	Unexpected Results	Trunk

Figure 2

```

2950-1(config)#inter fa 0/1
2950-1(config-if)#switchport mode dynamic auto
2950-1(config-if)#end
2950-1#show interface switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001

```

Figure 3

```
2950-1(config)#inter fa 0/1
2950-1(config-if)#switchport mode access
2950-1(config-if)#switchport nonegotiate
2950-1(config-if)#end

2950-1#show interface switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
```

All of these DTP modes and their various combinations can be somewhat confusing. Looking at some of the basic combinations can help clarify this.

Default: Desirable mode

By default, Ethernet interfaces on most Cisco switches are set to **desirable** mode. This is true for both the Catalyst 2950 and 3550 switches. **Desirable** mode will create a trunk link if the neighboring interface is set to **desirable**, **trunk**, or **auto** mode. Because both interfaces by default are in **desirable** mode, this means a link between two Cisco switches will automatically become a trunk link unless configured otherwise.

Combinations

Figure [1] shows the various DTP trunking modes and the results of the different combinations. One combination that could result in traffic being blocked from transmitting the link is if one interface is in **access** mode and the neighboring interface is in **trunk** mode. In this case, the **access** mode interface will only want to do non-trunking, while the **trunk** mode interface will only want to do trunking. This is not a recommended combination and may create unexpected results. Traffic may or may not be able to transit the link depending upon several factors, such as the spanning tree root bridge location. In some situations the link will work as a non-trunking link even though one interface is in **access** mode and the other interface is in **trunk** mode. In other situations spanning tree will put the **access** mode port into blocking mode and traffic will not transit the link to the neighboring **trunk** mode interface. In order to get consistent results, regardless of the topology, it is recommended never to have a combination of **access** mode and **trunk** mode on the interfaces of two neighboring switches.

The only modes that actually negotiate trunking between adjacent switches are **trunk**, **dynamic desirable** and **dynamic auto**. Even though the **switchport mode trunk** will not modify its own interface to be anything other than trunking, it will send out DTP frames to attempt to negotiate the other end of the link to be a trunking interface.

In Figure [2] the `show interface switchport` command shows the Negotiation of Trunking set to On. The interface will always attempt to negotiate trunking on the link unless the `switchport nonegotiate` command is configured on the interface.

Nonegotiate

The `switchport nonegotiate` command prevents the interface from generating DTP frames, turning the Negotiation of Trunking off. This can be viewed with the `show interface switchport` command [3] The `switchport nonnegotiate` interface command can only be used on an interface that is in **access** mode or **trunk** mode, previously configured with either the `switchport mode access` command or the `switchport mode trunk` command.

If an interface is configured with both the `switchport mode trunk` command and the `switchport nonegotiate` command, the interface on the neighboring switch must be configured as with `switchport mode trunk` command to establish a **trunk** link, otherwise the link will be a nontrunking link.

To enable trunking to a device that does not support DTP, the `switchport mode trunk` and `switchport nonegotiate` interface configuration commands should be used to cause the interface to become a trunk but to not generate DTP frames. The `switchport mode access` and `switchport nonegotiate` interface configuration commands should be used when configuring a non-trunking interface to another switch that does not support DTP.

Verifying DTP

Figure 1

```
2950-1(config)#inter fa 0/1
2950-1(config-if)#switchport mode dynamic auto
2950-1(config-if)#end
2950-1#show interface switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
```

Figure 2

```
2950-1#show interface switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: dynamic desirable
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001

2950-1#show inter trunk

Port      Mode           Encapsulation  Status      Native vlan
Fa0/1     desirable     802.1q         trunking    1

Port      Vlans allowed on trunk
Fa0/1     1-4094

Port      Vlans allowed and active in management domain
Fa0/1     1

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     1
```

The `show interface switchport` command can be used to verify DTP information and status: [1]

- Administrative Mode
- Operational Mode
- Administrative Trunking Encapsulation
- Negotiation of Trunking

The Administrative Mode displays the DTP state of the interface. The default on most Cisco switches is dynamic desirable. The DTP mode can be set using the `switchport mode` interface command.

The Operational Mode shows whether the interface is in a trunking or non-trunking state. If the Operational Mode is `static access`, then this interface considers the link as non-trunking. If the Operational Mode is `trunk`, then this interface is considered a trunking link. The `show interface trunk` command can be used to display all of the interfaces on the switch that have an Operational Mode set as `trunk`. [2]

The Administrative Trunking Encapsulation displays the trunking protocol, 802.1Q or ISL, that is used on this interface if the Operational Mode is in a trunking state. If the Operational Mode of the switch is in `static access`, non-trunking, then the trunking protocol that is Administrative Trunking Encapsulation displays is not currently being used on the link.

The Negotiation of Trunking shows whether the interface is willing to negotiate trunking by sending DTP frames. By default, the interface will negotiate trunking and the Negotiation of Trunking will show as On. The `switchport nonegotiate` interface command is used to turn off this negotiation.