

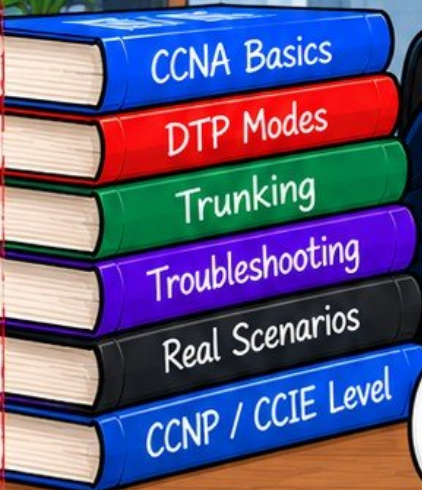
Dynamic Trunking Protocol DTP

Complete Guide from CCNA to CCIE

Concepts | Working | Modes | Commands | Real Scenarios | Troubleshooting



How does DTP work?
Which mode to use?
What are the commands?



What You Will Learn?

- 1 What is DTP?
- 2 How DTP Works?
- 3 DTP Modes Explained
- 4 Commands with Examples
- 5 Real-World Scenarios
- 6 Troubleshooting DTP Issues
- 7 Best Practices
- 8 Interview Questions
- 9 CCNA to CCIE Level Topics
- 10 Summary & Key Takeaways



Master DTP with
Real Examples and Scenarios

Dynamic Trunking Protocol (DTP)

DTP is a Cisco proprietary Layer 2 protocol that automatically negotiates whether a switch port should be in Access or Trunk mode.



Definition

Dynamic Trunking Protocol (DTP) is a **Cisco proprietary protocol** used between Cisco switches to **dynamically negotiate the trunking status** of a link.



Key Points

- ✓ DTP works at **Layer 2** (Data Link Layer)
- ✓ Runs **only** between Cisco devices
- ✓ Automatically negotiates trunk or access mode
- ✓ Uses DTP frames (multicast **MAC 01-00-0C-CC-CC-CC**)
- ✓ Default state on Cisco switches is **dynamic auto**
- ✓ Negotiation happens only if both sides support DTP
- ✓ Can be disabled using the command "**switchport nonegotiate**"



Why DTP is Used ?

- ✓ Automatically create trunk links between switches
- ✓ Reduces manual configuration
- ✓ Helps in dynamic network environments
- ✓ Useful when deploying new switches



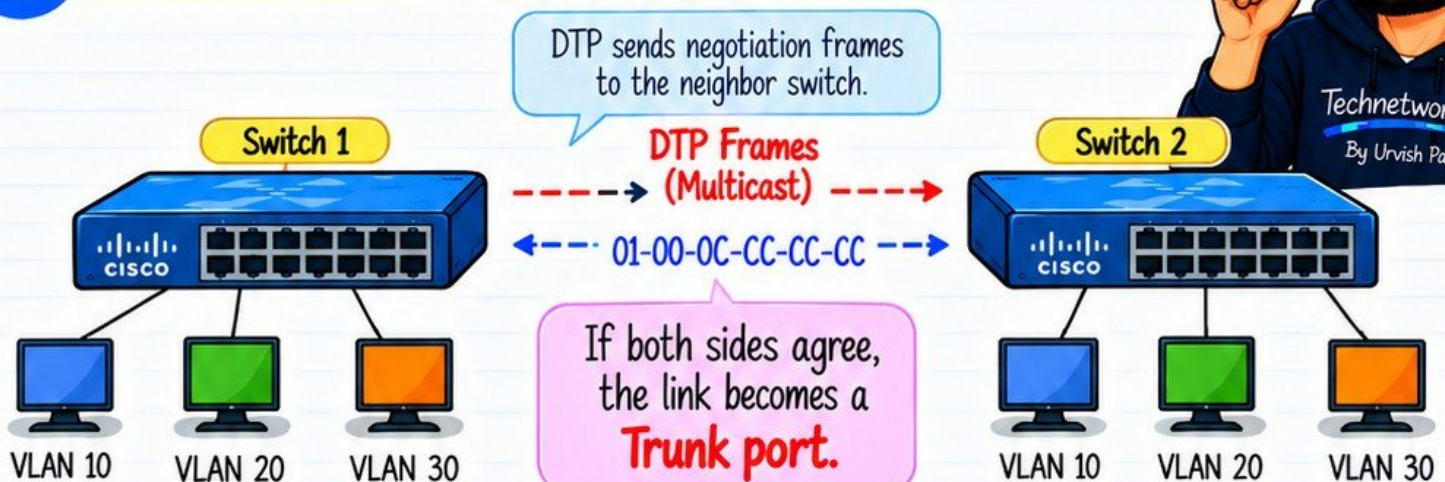
Important Notes

- ✓ DTP is a **Cisco proprietary** protocol (non-standard)
- ✓ It does **not work** with **non-Cisco devices** (e.g. HP, Aruba, Juniper, etc.)
- ✓ For security and stability, it is often recommended to **disable DTP and manually configure trunks**.

DTP makes trunking easy and automatic between **Cisco switches** !



How DTP Works ? (High Level View)



DTP has 4 different modes. Each mode behaves differently

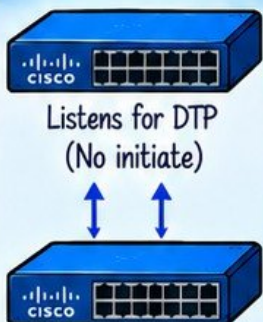
Understanding these modes is important to control trunking behavior and to avoid unexpected trunk formation.

DTP Mode	Description	Sends DTP Frames ?	Forms Trunk Automatically ?	Typical Use Case
Dynamic Auto	Actively listens for DTP frames but does not initiate trunking.	No	Yes (if the other side is desirable)	- Safer mode - Commonly used on access switch
Dynamic Desirable	Actively sends DTP frames and negotiates trunking.	Yes	Yes (if the other side supports DTP: desirable or auto)	- Used when you want to form a trunk - Commonly used between switches
Trunk	Always forms a trunk. Does not use DTP.	No	Always	- Manually configured trunk - Recommended for production environments
Access	Forces the port to be an access port. Does not use DTP.	No	Never	- Used for end devices (PC, Server, IP Phone) - Prevents unwanted trunk formation



Visual Representation

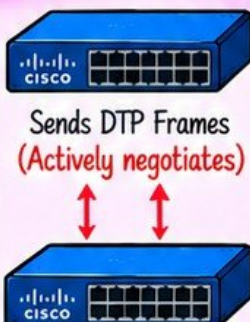
Dynamic Auto



Listens for DTP
(No initiate)

Forms trunk only
if other side is
Desirable

Dynamic Desirable



Sends DTP Frames
(Actively negotiates)

Forms trunk if
other side is Auto
or Desirable

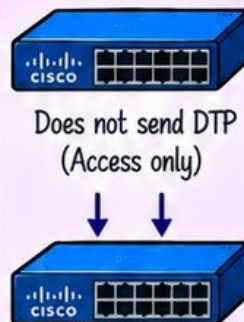
Trunk



Always forms
Trunk
(No DTP)

Permanent trunk
(DTP disabled)

Access



Does not send DTP
(Access only)

Never forms trunk
(DTP disabled)



Pro Tip:

- Use Dynamic Auto on access switches
- Use Dynamic Desirable when you want to initiate trunk
- Use Trunk mode for stable and secure trunk links
- Use Access mode to prevent unwanted trunks

Choose the right DTP mode based on your network design and security requirements!

Technetworkk
By Urvish Patel



Configure and Verify DTP using CLI Commands

These commands are used to configure DTP modes, verify DTP status and troubleshoot trunking issues on Cisco switches.

1 Verify DTP Status

```
Switch# show interfaces trunk
```

```
Switch# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Gi0/1	on	802.1q	trunk	1
Gi0/2	auto	802.1q	trunk	1

Shows all trunk ports and their current trunking status and mode.

2 Check Interface DTP Details

```
Switch# show interfaces gi0/1 switchport
```

Name: GigabitEthernet0/1
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On

Shows detailed DTP information for a specific interface.

3 Configure DTP Mode - Dynamic Auto

```
Switch(config)# interface gi0/1
```

```
Switch(config-if)# switchport mode dynamic auto
```



Listens for DTP frames but does not initiate trunking. Forms trunk if the other side is desirable.

4 Configure DTP Mode - Dynamic Desirable

```
Switch(config)# interface gi0/1
```

```
Switch(config-if)# switchport mode dynamic desirable
```



Actively sends DTP frames and tries to form a trunk. Forms trunk if the other side is auto or desirable.

5 Configure Trunk Mode (No DTP)

```
Switch(config)# interface gi0/1
```

```
Switch(config-if)# switchport mode trunk
```



Manually configured trunk port. DTP is disabled in this mode.

6 Configure Access Mode (No DTP)

```
Switch(config)# interface gi0/1
```

```
Switch(config-if)# switchport mode access
```

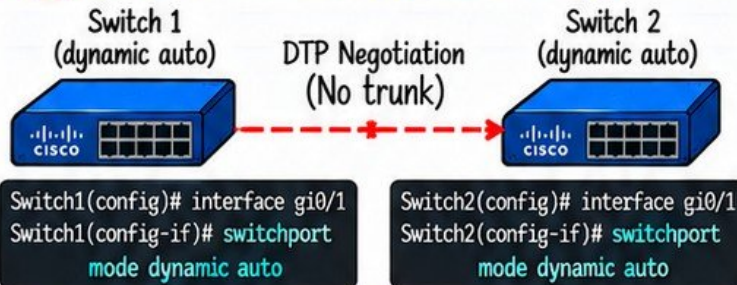


Forces the port to be an access port. DTP is disabled and it will never form a trunk.

Real-World Scenarios with Behavior & Validation

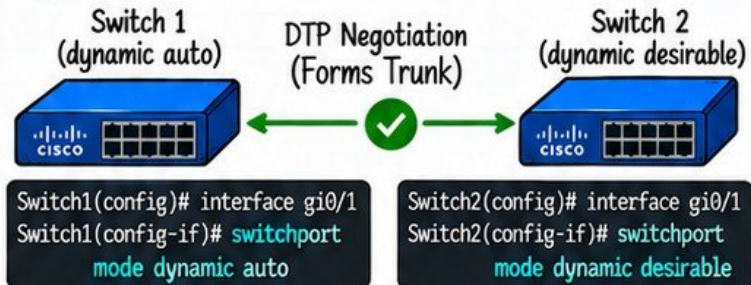
Understanding how DTP works in different combinations helps in designing proper trunking and avoiding unexpected behavior.

1 Dynamic Auto - Dynamic Auto



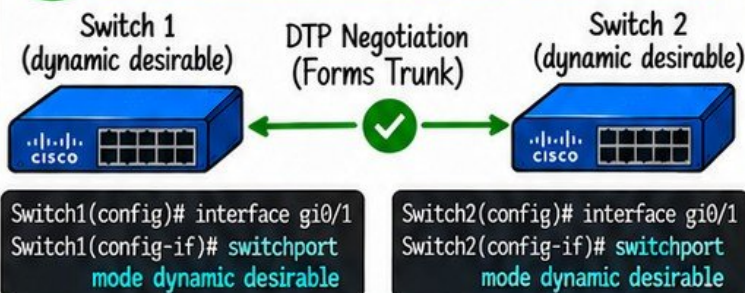
- No trunk is formed
- Both sides are passive (only listen)
- Stays in access mode

2 Dynamic Auto - Dynamic Desirable



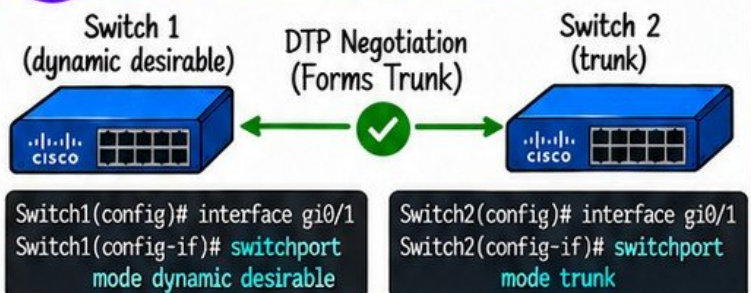
- Trunk is formed
- Desirable actively sends DTP frames
- Auto listens and responds

3 Dynamic Desirable - Dynamic Desirable



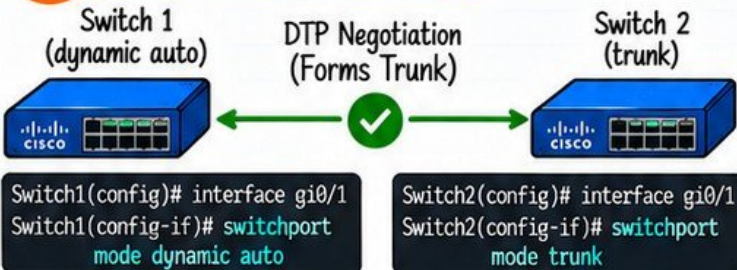
- Trunk is formed
- Both sides actively send DTP frames
- Commonly used in environments where trunks are expected

4 Dynamic Desirable - Trunk



- Trunk is formed
- Trunk mode does not use DTP but will trunk with desirable
- Common in enterprise networks

5 Dynamic Auto - Trunk



- Trunk is formed
- Trunk mode does not send DTP frames but accepts desirable/auto
- Useful when you want a guarantee of trunk on one side

6 Dynamic Modes - Access



- No trunk is formed
- Access mode does not respond to DTP
- Stays in access mode (DTP disabled)

More Real-World Scenarios with Examples

These scenarios help you understand how DTP behaves in different network environments and how to troubleshoot common issues.

1 Switch Connected to a Non-Cisco Device

DTP works only between Cisco devices. If a non-Cisco device (e.g. Server, Firewall, PC) is connected, keep the port in Access mode.



```
Switch(config)# interface gi0/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport nonegotiate
```

✓ Always use access mode and disable DTP when connecting to non-Cisco devices.

3 DTP Disabled Using Nonegotiate

The command `switchport nonegotiate` disables DTP on the interface. The port will not send or respond to DTP frames.



```
Switch(config)# interface gi0/1
Switch(config-if)# switchport mode trunk (or access)
Switch(config-if)# switchport nonegotiate
```

✓

- Use nonegotiate on access ports for security.
- Use on trunk ports when you don't want DTP.
- Common in enterprise and data center environments.

2 User Accidentally Configures Trunk on Access Side

If a port is manually set to trunk, it will always form a trunk even if the other side is dynamic or access.



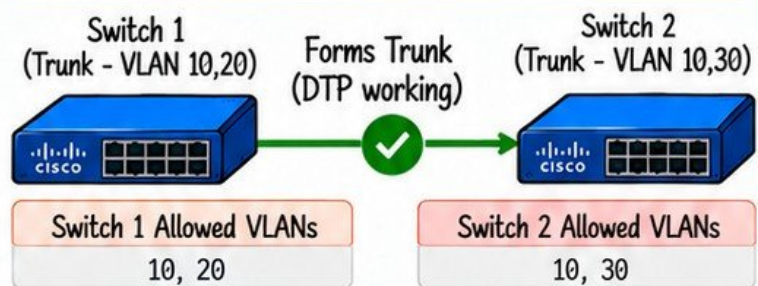
```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode trunk
```



- Manual trunk will always form a trunk.
- Can lead to unexpected VLAN propagation.
- Only use trunk where required.

4 VLAN Mismatch on Trunk (DTP Working)

Even if DTP forms a trunk successfully, VLAN mismatch can cause connectivity issues.



- DTP forms trunk but VLANs are not the same.
- VLAN 30 (on Switch 2) will not pass to Switch 1.
- Users in VLAN 30 will not get connectivity.



- Verify allowed VLAN list:
Switch# `show interfaces trunk`
Switch(config-if)# `switchport trunk allowed vlan 10,20,30`

More Real-World Scenarios with Examples

These scenarios are important for CCNP / CCIE level as they cover troubleshooting, security and mixed mode environments.

7 Both Sides Dynamic Auto (No Trunk)

If both sides are in dynamic auto mode, they only listen and do not initiate DTP negotiation. So trunk will not form.



```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode
dynamic auto
```

```
Switch2(config)# interface gi0/1
Switch2(config-if)# switchport mode
dynamic auto
```

- Both sides are passive (only listen)
- Trunk will NOT form

8 Both Sides Dynamic Desirable (Trunk Forms)

If both sides are in dynamic desirable mode, DTP negotiation happens and trunk is formed automatically.



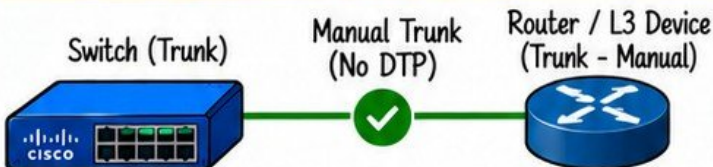
```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode
dynamic desirable
```

```
Switch2(config)# interface gi0/1
Switch2(config-if)# switchport mode
dynamic desirable
```

- Both sides actively send DTP frames
- Trunk will form successfully

9 Trunk to a Router or L3 Device (No DTP)

Routers and most L3 devices do not support DTP. You must manually configure the interface as trunk.



```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode trunk
```

```
Router(config)# interface gi0/0
Router(config-if)# encapsulation dot1q
Router(config-if)# no shutdown
```

- DTP is not used.
- Manually configure the trunk on both sides.
- Common in Router-on-a-Stick and Layer 3 switches.

10 Disabling DTP on Trunk for Security

In enterprise environments, it is a best practice to disable DTP on trunk ports to prevent unwanted trunk formation.



```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode trunk
Switch1(config-if)# switchport nonegotiate
```

```
Switch2(config)# interface gi0/1
Switch2(config-if)# switchport mode trunk
Switch2(config-if)# switchport nonegotiate
```

- Manually configured trunk
- DTP is disabled using switchport nonegotiate
- Recommended for production and security

Quick Summary of Key Scenarios

Scenario	Switch 1 Mode	Switch 2 Mode	DTP Works ?	Trunk Formed ?
1. Dynamic Auto ⇌ Dynamic Auto	Auto	Auto	✗	✗
2. Dynamic Auto ⇌ Dynamic Desirable	Auto	Desirable	✓	✓
3. Dynamic Desirable ⇌ Dynamic Desirable	Desirable	Desirable	✓	✓
4. Trunk ⇌ Any	Trunk	Any	✗	✓
5. Access ⇌ Any	Access	Any	✗	✗
6. Trunk ⇌ Router/L3 Device	Trunk	Manual Trunk	✗	✓

Pro Tip:

- Disable DTP on all trunk ports using: `switchport nonegotiate`
- Always verify trunk status after configuration.
- Regularly check VLAN allowed list on trunks.
- Use access mode on end-user ports.



Common Issues, Commands and Solutions

These troubleshooting scenarios help you quickly identify and fix DTP related issues in real-world networks.

1 Check DTP Status on a Port

Use this command to check current DTP mode and trunking information on an interface.

```
Switch# show interfaces gi0/1 switchport
Name: GigabitEthernet0/1
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
```



Check for:

- Administrative Mode (auto/desirable/trunk/access)
- Operational Mode (trunk or access)
- Negotiation of Trunking (On/Off)

2 Verify Trunking on the Switch

Shows all trunk ports and allowed VLANs.

```
Switch# show interfaces trunk
Port      Mode      Encapsulation  Status  Native vlan
Gi0/1     on        802.1q         trunk   1
Gi0/2     on        802.1q         trunk   1
```



Use this command to verify if the port is actually forming a trunk and which VLANs are allowed.

3 DTP Not Forming Trunk

If both sides are set to dynamic auto, trunk will not form because both are passive.



Solution:

- Change one side to dynamic desirable or trunk.
- Example: switchport mode dynamic desirable

4 Port Stuck in Access Mode

DTP is disabled or the port is configured as access.

```
Switch# show interfaces gi0/1 switchport
Administrative Mode: access
Operational Mode: access
Negotiation of Trunking: Off
```

Solution:

- Enable DTP using dynamic auto/desirable
- OR manually configure as trunk if required.
- Example: switchport mode dynamic desirable

5 Native VLAN Mismatch

If the native VLAN is different on both sides, you may see VLAN mismatch warnings and potential connectivity issues.



Solution:

- Configure the same native VLAN on both sides.
- Example: switchport trunk native vlan 1

6 DTP Disabled Using Non negotiate

If negotiate is enabled, the port will not send or respond to DTP frames.

```
Switch(config)# interface gi0/1
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport nonegotiate
```



- Use this in production for security.
- Configure the other side manually as trunk.
- Verify with: show interfaces gi0/1 switchport



Enterprise & Real-World Scenarios (CCNP / CCIE Level)

These advanced scenarios help you understand how DTP behaves in enterprise networks and how to design, troubleshoot and secure trunking.

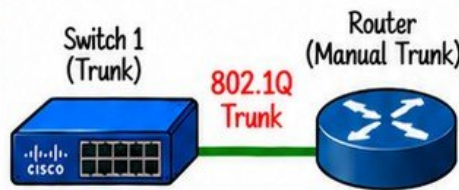
1 DTP Between Different Modes

Understand how DTP behaves with different mode combinations.

Switch 1 Mode	Switch 2 Mode	Trunk Forms ?
Dynamic Auto	Dynamic Auto	❌ No
Dynamic Auto	Dynamic Desirable	✅ Yes
Dynamic Auto	Trunk	✅ Yes
Dynamic Auto	Access	❌ No
Dynamic Desirable	Dynamic Desirable	✅ Yes
Dynamic Desirable	Trunk	✅ Yes
Dynamic Desirable	Access	❌ No
Trunk	Trunk	✅ Yes
Trunk	Access	❌ No
Access	Access	❌ No

2 Switch Connected to a Router (No DTP)

Routers do not support DTP. Configure trunk manually.



```
Switch(config)# interface gi0/1
Switch(config-if)# switchport mode trunk
```

Key Point:

- DTP is not used with routers.
- Manually configure trunk.
- Common in Router-on-a-Stick.

3 DTP in a Switch Stack / VSS

In switch stack or VSS, DTP can be used between member switches or to external devices.



```
Switch1(config)# interface gi0/1
Switch1(config-if)# switchport mode dynamic desirable
```

Key Point:

- DTP works the same way in stack/VSS.
- Ensure correct VLANs are allowed.
- Recommended to use trunk mode in production for consistency.

4 DTP in Access Layer to Distribution

Common enterprise scenario where access switches use DTP to form trunk with distribution switch.



```
Access SW(config)# interface gi0/1
Access SW(config-if)# switchport mode dynamic auto

Dist SW(config)# interface gi0/1
Dist SW(config-if)# switchport mode dynamic desirable
```

Solution:

- Access switch usually set to dynamic auto.
- Distribution switch set to dynamic desirable or trunk.
- Trunk will form successfully.

5 Unintended Trunk Formation

A common issue where users get unexpected trunks due to DTP, leading to security risks.



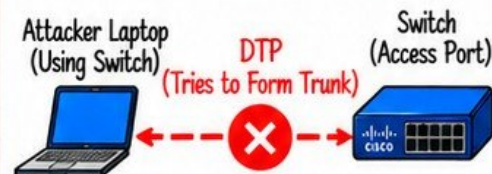
```
%DTP-5-TRUNKPORTON: Port Gi0/1
has become dot1q trunk
%LINEPROTO-5-UPDOWN: Line protocol
on Interface Gi0/1, changed state to up
```

Solution:

- Disable DTP on access ports.
- Use switchport mode access and switchport nonegotiate.

6 DTP and Security (Best Practice)

DTP can be misused by attackers to force trunking and gain access to multiple VLANs.



```
Switch(config)# interface gi0/10
Switch(config-if)# switchport mode access
Switch(config-if)# switchport nonegotiate
```

Benefits:

- Prevents unauthorized trunk formation.
- Stops VLAN hopping attacks.
- Recommended for all end-user access ports.

Best Practices for DTP



Disable DTP on access ports (switchport nonegotiate).



Use trunk mode for uplinks instead of relying on DTP.



Regularly verify trunk ports and allowed VLANs.



Monitor for unexpected trunk formations using logs and SNMP.



Follow security hardening guidelines in enterprise networks.

Key Takeaways, Best Practices & Interview Questions

A complete summary to remember DTP concepts, apply best practices and answer interview questions confidently.

1 Key Takeaways

- ✓ DTP operates **only between Cisco devices**.
- ✓ DTP negotiates trunking using **special DTP frames** (Link Layer).
- ✓ It has **4 modes**: dynamic auto, dynamic desirable, trunk and access.
- ✓ Trunk forms when **at least one side is dynamic desirable** (or both sides trunk).
- ✓ DTP does **not run on non-Cisco devices**, routers or manual trunk ports.
- ✓ Use **switchport nonegotiate** to disable DTP.
- ✓ Verify **trunk status and allowed VLANs** after configuration.
- ✓ Disable DTP on **user facing access ports** for security.
- ✓ Be careful of **native VLAN mismatch** and **unintended trunk formation**.

3 DTP Troubleshooting Checklist

- ✓ Check interface mode using **show interfaces switchport**
- ✓ Verify trunk ports using **show interfaces trunk**
- ✓ Check **DTP status (On/Off)** and negotiation mode
- ✓ Verify **allowed VLANs** on the trunk
- ✓ Look for **native VLAN mismatch**
- ✓ Use **debug dtp events** (in lab) to see DTP negotiation
- ✓ If trunk not forming, check **mode combination table**
- ✓ Check if the port is in **access mode** or **DTP is disabled**
- ✓ Verify physical connectivity and correct interface
- ✓ Check logs for unexpected DTP events

2 Best Practices

- ✓ Disable DTP on all access ports using **switchport nonegotiate**.
- 🔒 Manually configure trunk ports in enterprise networks.
- 🔍 Regularly verify trunk ports and allowed VLANs.
- ⚙️ Use descriptive interface descriptions (e.g. TRUNK_TO_SW2).
- ⚠️ Monitor for unexpected trunk formations using logs and SNMP.
- 🖨️ Check for VLAN mismatches and native VLAN issues.
- 🚫 Do not use DTP with non-Cisco devices.
- 📋 Follow security hardening guidelines and organizational standards.

4 Interview Questions (CCNA to CCIE)

- 1 What is DTP and how does it work?
- 2 What are the different DTP modes?
- 3 In which DTP mode will a trunk be formed?
- 4 What happens if both sides are set to dynamic auto?
- 5 What is the use of **switchport nonegotiate**?
- 6 Can DTP work with non-Cisco devices? Why or why not?
- 7 How will you troubleshoot if a trunk is not forming?
- 8 What are the security risks of leaving DTP enabled?
- 9 How can DTP cause VLAN hopping?
- 10 What commands will you use to verify DTP status and trunk ports?

Pro Tip:

In enterprise environments, always disable DTP on access ports and manually configure trunk ports for better security and control.

