

TNE10006/TNE6006: Networks and Switching



Layer 2 Redundancy

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Outline

- What is Redundancy
- Problems caused by Layer 2 redundancy
 - Broadcast Storms
 - MAC Address Instability
 - Unicast Duplication



Redundancy

Why have Redundancy?

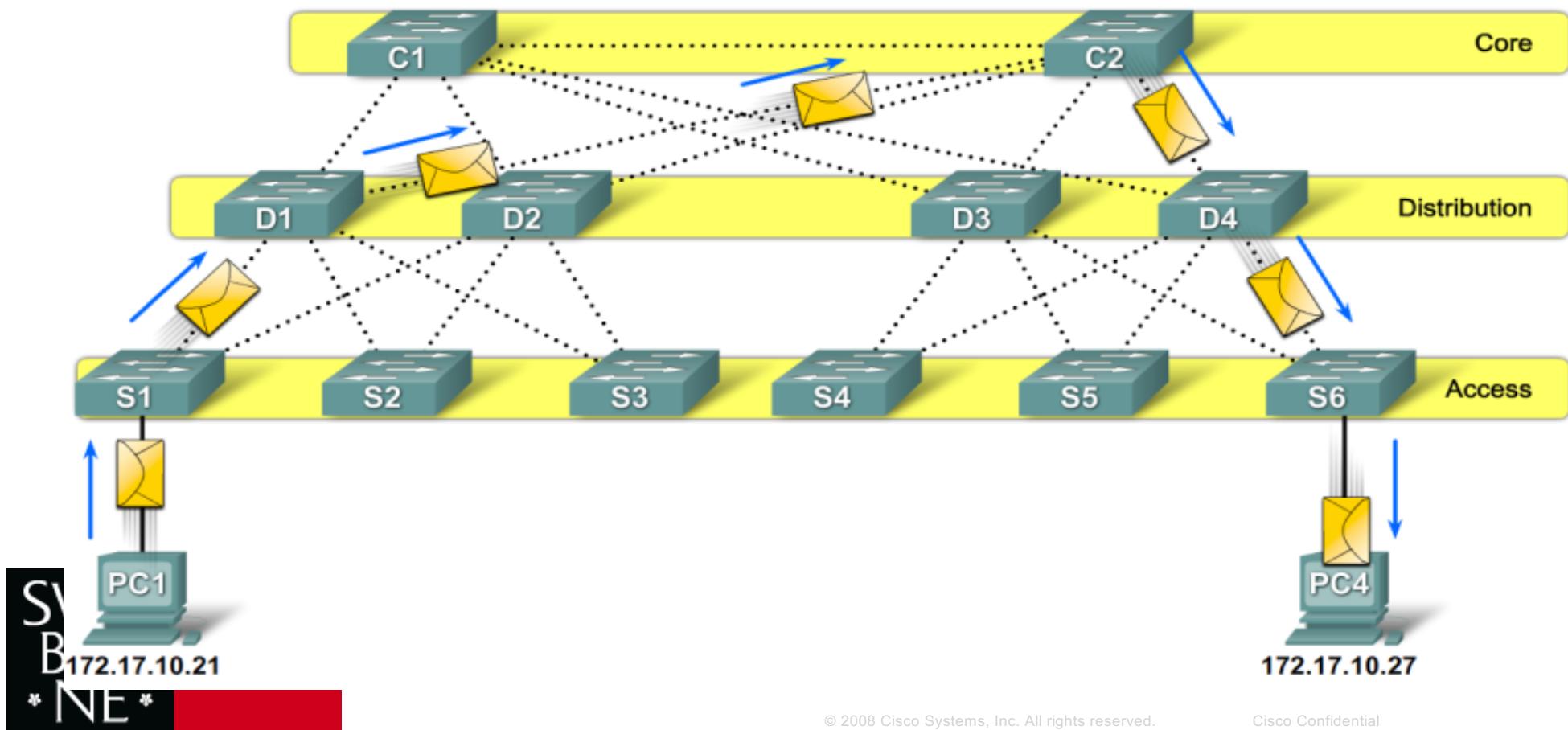
- **Redundancy** in networks is critical, it allows networks to be **fault tolerant**
- The **failure** of a single link, interface, or device can cause **downtime**
- **Redundant topologies** protect against network downtime, by eliminating outages caused by a **single point** of failure
- Balance between the cost of redundancy with the need for network availability (cost of failure)
- Five Nines uptime – 99.999 % - 5.25 mins down time per year



Redundant Design Example

- Each **Access Layer Switch** is connected to **2 Distribution Layer Switches**
- Each **Distribution Layer Switch** is connected to **2 Core Layer Switches**

Examine a Redundant Design



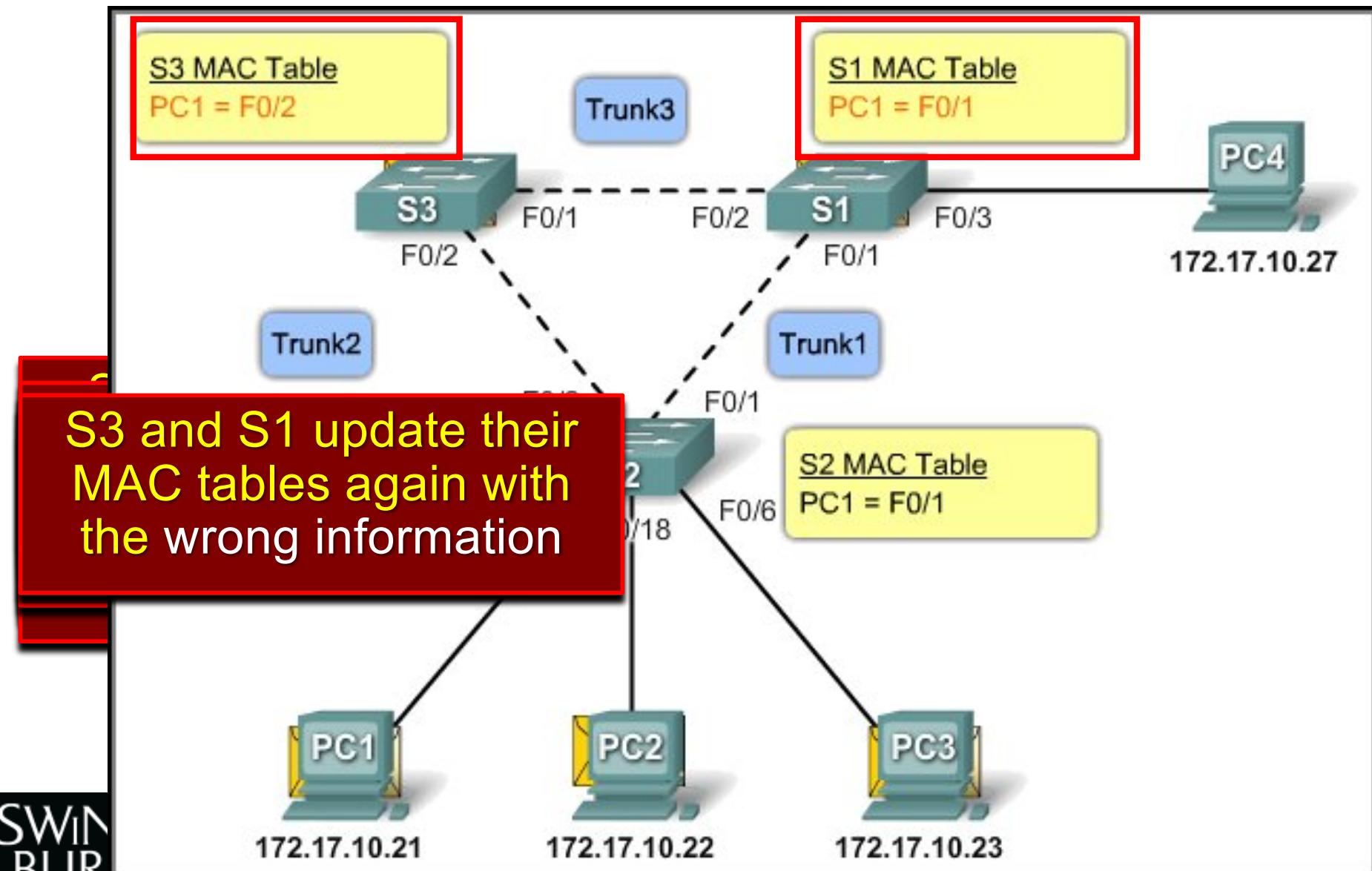


Redundancy Problems Broadcast Storm

- When multiple paths exist between two, a Layer 2 loop can occur
- Ethernet frames do not have a time to live
 - If there is a loop, they will continue to be forwarded from switch to switch endlessly or until a link is disrupted and breaks the loop
- Broadcast frames are forwarded out all switch ports, except the originating port
- If there is more than one path for the frame to be forwarded out, it can result in an endless loop, a Broadcast Storm

Redundancy Problems

Broadcast Storm





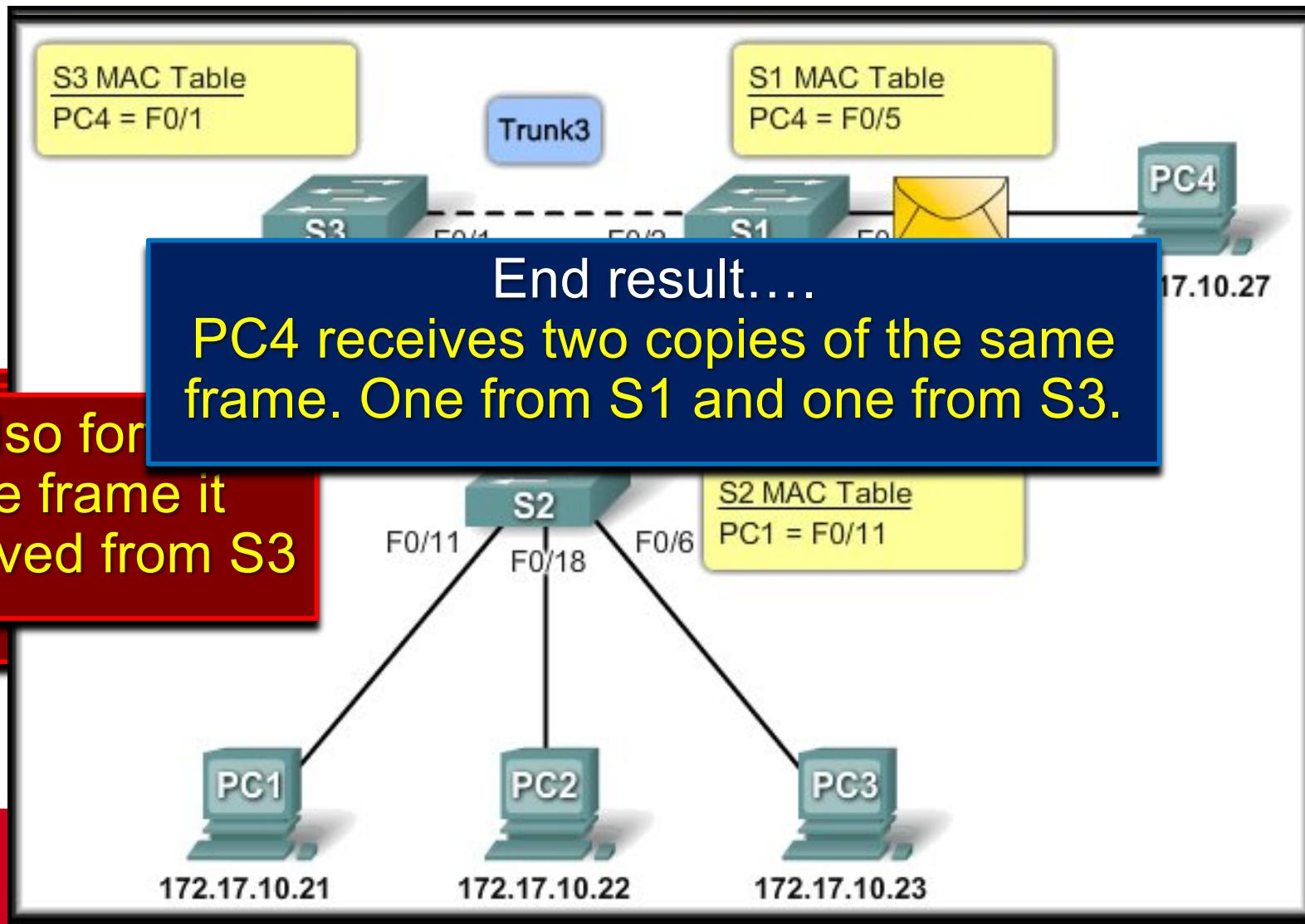
Redundancy Problems Broadcast Storm

- Use of bandwidth disrupts normal traffic flow
- All devices must process (Use CPU cycles) the broadcasts
- User PCs and servers can lock up trying to process all the broadcast frames
- MAC address Table Instability – Which port to forward unicast frame ?



Redundancy Problems

Unicast Duplication





Redundancy Problems

Unicast Duplication

- Unicast frames sent onto a looped network can result in **duplicate frames** arriving at the destination device
- Most upper layer protocols are not designed to recognize or cope with duplicate transmissions
- Even TCP where duplicate frames may result in a slowdown of transmission rates



Layer 2 Redundancy Summary

In this lecture, we covered:

- What is Redundancy
- Problems caused by Layer 2 redundancy
 - Broadcast Storms
 - MAC Address Instability
 - Unicast Duplication