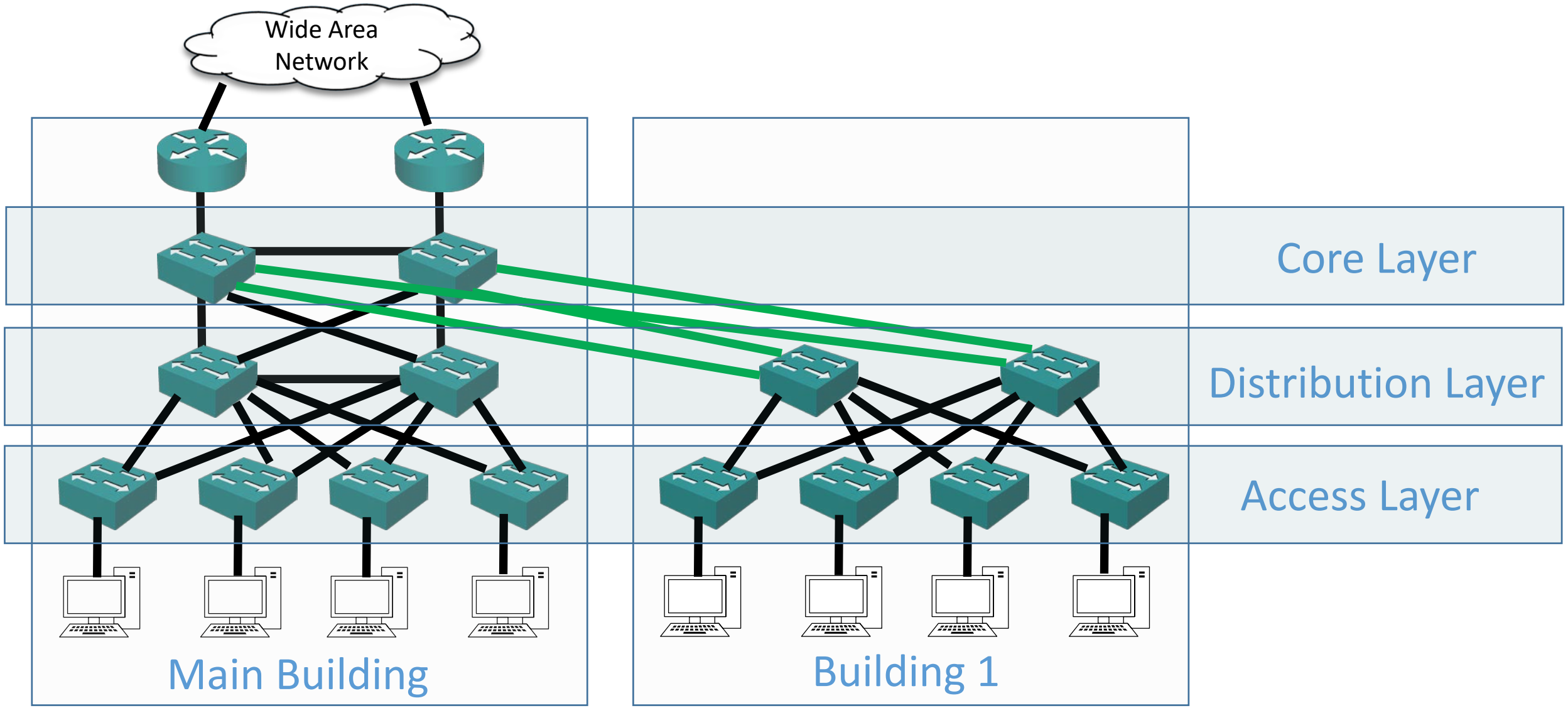
Campus Design - Oversubscription



Campus Design - Oversubscription

- End hosts do not constantly send traffic onto the network, most of the time their network connection is sitting idle
- Because of this you can connect less uplinks to each higher layer than the number of hosts you have and still maintain acceptable network performance

Campus Design - Oversubscription

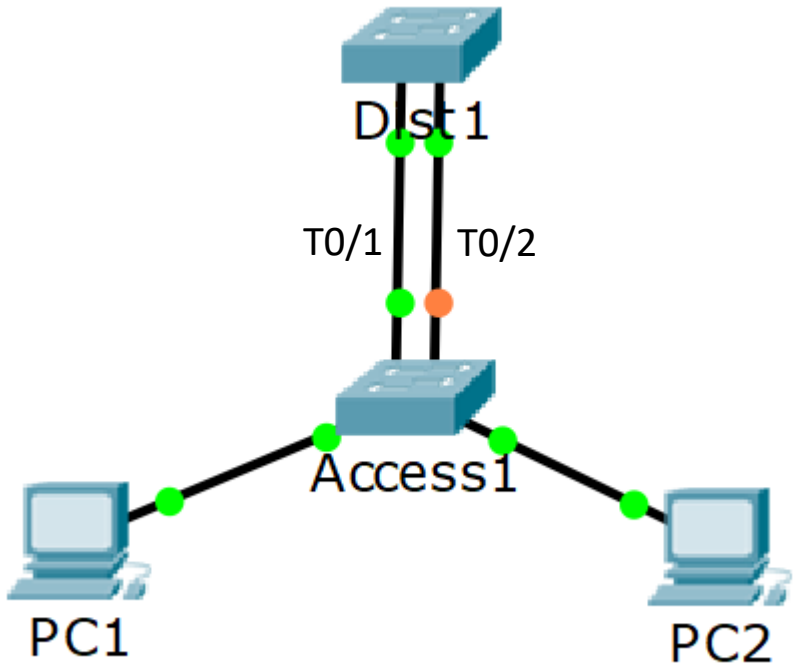
- A starting rule-of-thumb recommendation for oversubscription is 20:1 from the access layer to the distribution layer
- Meaning if you had 20 PCs connected with 1Gbps NICs at the access layer, you would require a single 1Gbps uplink to the distribution layer
- The recommendation is 4:1 for the distribution to core layer links
- These are general values, you should analyse the traffic on your network to verify links are not congested

Campus Design - Oversubscription

- Switches often have dedicated uplink ports with higher bandwidth than their access ports
- For example a 48 port 1Gbps switch with a pair of 10Gbps uplinks
- This can help with the subscription ratio
- 48 x 1Gbps clients = 48 Gbps
- 2 x 10Gbps uplinks = 20 Gbps
- Subscription ratio = 2.4:1
- But we have a problem when we connect 2 uplinks…

Spanning Tree Load Balancing

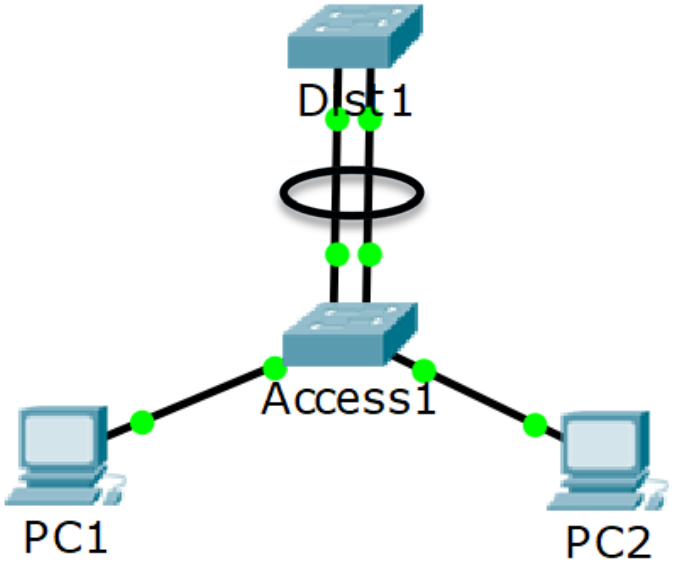
- **A Spanning Tree instance provides redundancy, but not load balancing**
- If a switch has multiple equal cost paths via the same neighbour switch towards the Root Bridge, it will select the port with the lowest Port ID



- Access1 selects the single best path towards the Root Bridge
- T0/1 is selected as the Root Port as it has the lowest Port ID
- T0/2 is blocking
- We only have 10Gbps (not 20Gbps) uplink bandwidth in our example

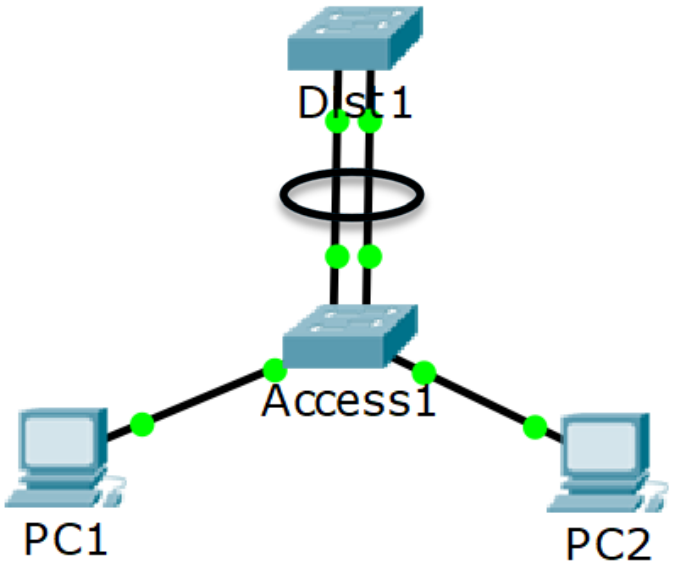
EtherChannel

- Etherchannel groups multiple physical interfaces into a single logical interface
- Spanning Tree sees the EtherChannel as a single interface, so it does not block any ports
- We now get the full 20Gbps bandwidth



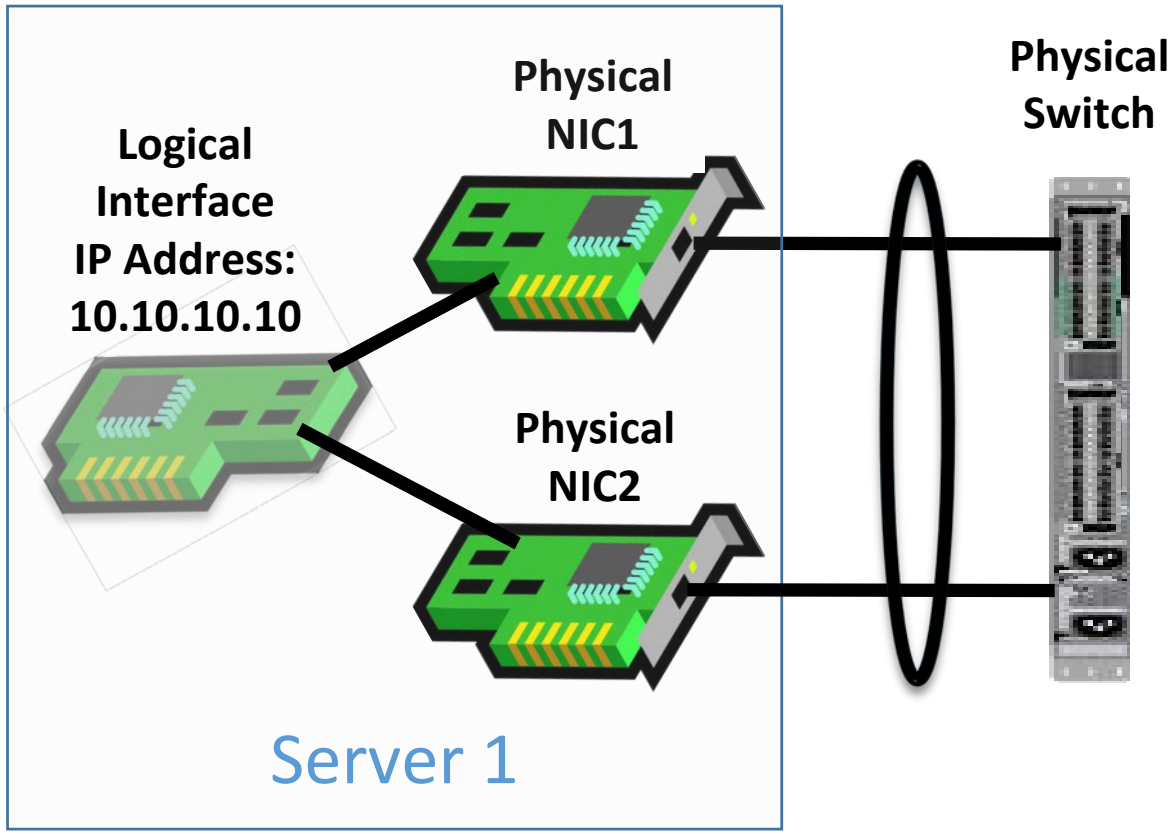
EtherChannel Load Balancing and Redundancy

- Traffic is load balanced across all the links in the EtherChannel
- If an interface goes down its traffic will fail over to the remaining links



NIC Teaming

- NIC Teaming combines multiple physical network cards into a single logical interface



Terminology

- EtherChannel is also known as:
  - A Port Channel
  - LAG Link Aggregation
  - A link bundle
- NIC Teaming is also known as:
  - Bonding
  - NIC balancing
  - Link aggregation