



Spanning Tree Protocol

EE 122: Intro to Communication Networks

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<http://inst.eecs.berkeley.edu/~ee122/>

Slides by Lisa Fowler

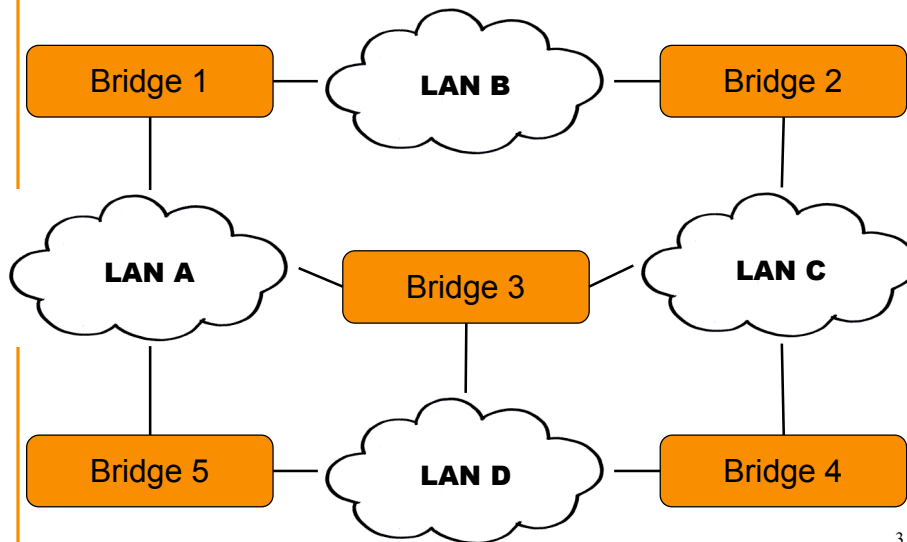
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Overview

- Networks need redundancy
 - Provide redundant paths between end stations to enable the Bridged LAN to continue to provide the Service in the event of component failure (of bridge or segment)
- Loops can cause major problems
 - Ethernet does not provide any notion like TTL in order to eventually remove looping frames
- Reduce bridge topology to a single *spanning tree*
 - Trees have no cycles \Rightarrow loop-free
 - Automatically reconfigure the spanning tree in a reproducible and predictable manner

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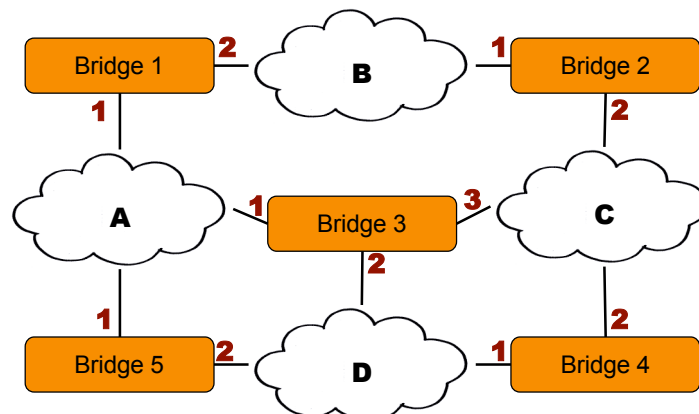
Network Diagram



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Spanning Tree Protocol Required Elements

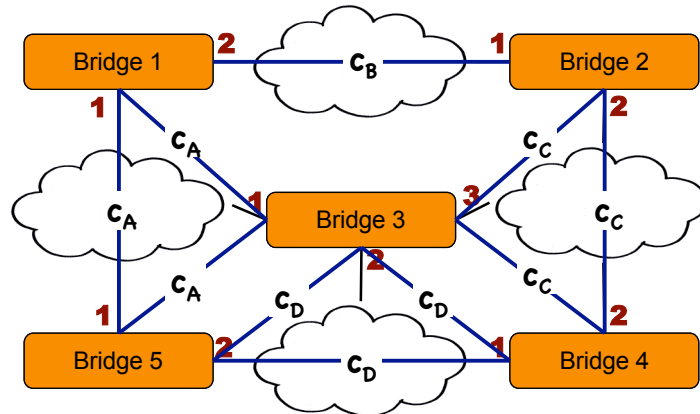
- Each bridge has a unique Bridge ID = unique device ID + priority number
- Within each bridge, each port has a unique ID



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Spanning Tree Protocol Required Elements

- Assign a cost to the segments between any two bridges (can be custom, unlike in lecture, where we used uniform cost)



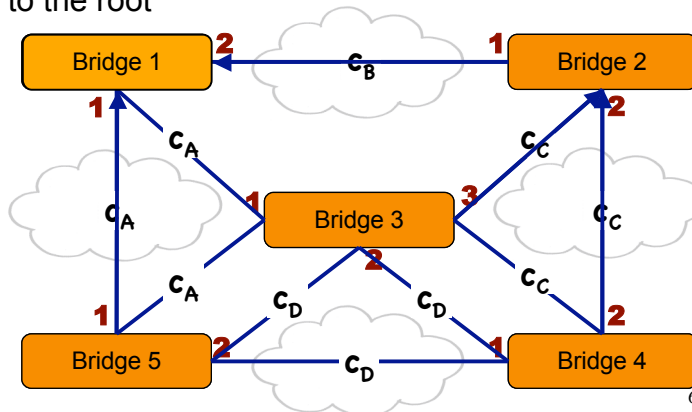
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Spanning Tree Protocol

- Elect a root bridge
 - Compare Bridge ID (compare priority number then compare unique ID)
- Each bridge selects a *root port*: the port with the least cost path to the root

Costs

$c_A - 100$
 $c_B - 19$
 $c_C - 4$
 $c_D - 100$



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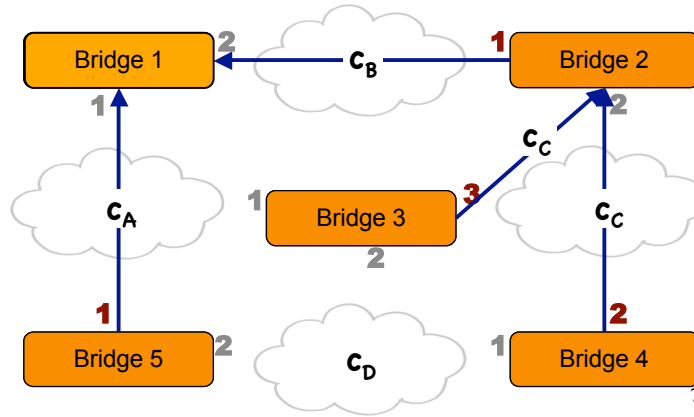
Spanning Tree Protocol

2. Each bridge selects a *root port*: the port with the least cost path to the root
 - a) Break ties by picking neighbor w/ lowest ID

Costs

$C_A - 100$
 $C_B - 19$
 $C_C - 4$
 $C_D - 100$

| Bridge | Root Port |
|--------|-----------|
| 1 | |
| 2 | 1 |
| 3 | 3 |
| 4 | 2 |
| 5 | 1 |



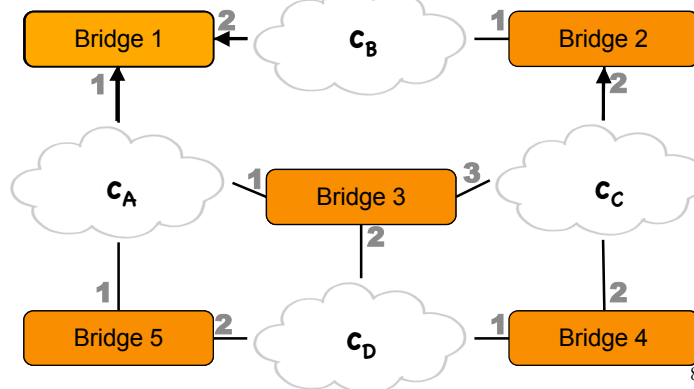
Spanning Tree Protocol

3. All bridges on the network segment collectively determine least cost path from network segment to root
 - a) The port that connects the network segment to the bridge that provides this path is called the *designated port*

Costs

$C_A - 100$
 $C_B - 19$
 $C_C - 4$
 $C_D - 100$

| Bridge | Root Port | Design. Port |
|--------|-----------|--------------|
| 1 | | 1,2 |
| 2 | 1 | 2 |
| 3 | 3 | |
| 4 | 2 | |
| 5 | 1 | |

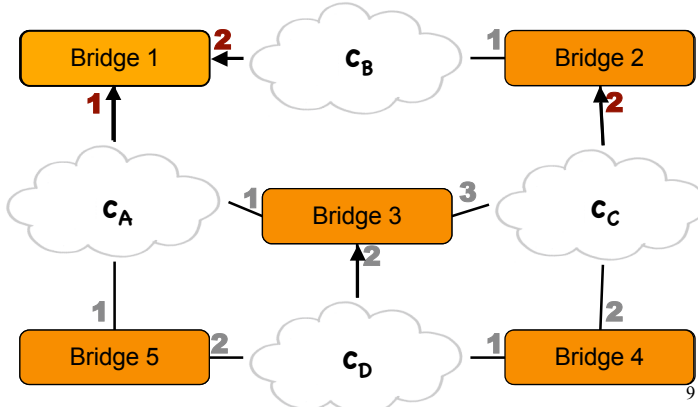


Spanning Tree Protocol

- a) The port that connects the network segment to the bridge that provides this path is called the *designated port*
 - i. Break ties by picking bridge w/ lowest ID

Costs
 $C_A - 100$
 $C_B - 19$
 $C_C - 4$
 $C_D - 100$

| Bridge | Root Port | Design. Port |
|--------|-----------|--------------|
| 1 | | 1,2 |
| 2 | 1 | 2 |
| 3 | 3 | 2 |
| 4 | 2 | |
| 5 | 1 | |

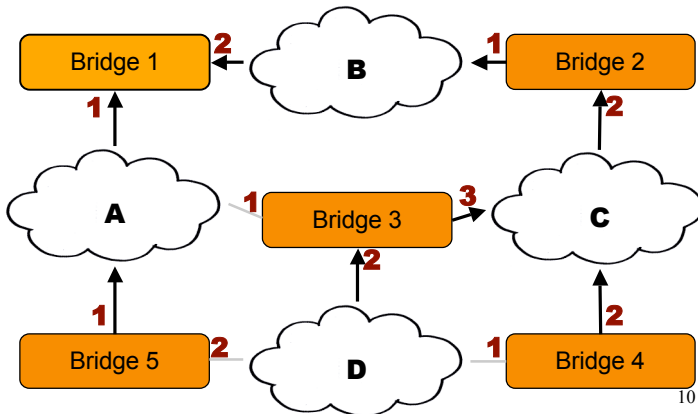


Spanning Tree Protocol

- 4. If there's still a tie for any of the above, pick the lowest port #

Costs
 $C_A - 100$
 $C_B - 19$
 $C_C - 4$
 $C_D - 100$

| Bridge | Root Port | Design. Port |
|--------|-----------|--------------|
| 1 | | 1,2 |
| 2 | 1 | 2 |
| 3 | 3 | 2 |
| 4 | 2 | |
| 5 | 1 | |



Spanning Tree Protocol

5. Now any time frames require broadcasting, a bridge *only accepts them from a designated or a root port ...*
6. ... and only floods to other root or designated ports

Costs

$C_A - 100$
 $C_B - 19$
 $C_C - 4$
 $C_D - 100$

| Bridge | Root Port | Design. Port |
|--------|-----------|--------------|
| 1 | | 1,2 |
| 2 | 1 | 2 |
| 3 | 3 | 2 |
| 4 | 2 | |
| 5 | 1 | |

