CISC 7332X T6

C12b: LAN Switching: Spanning Tree Algorithm

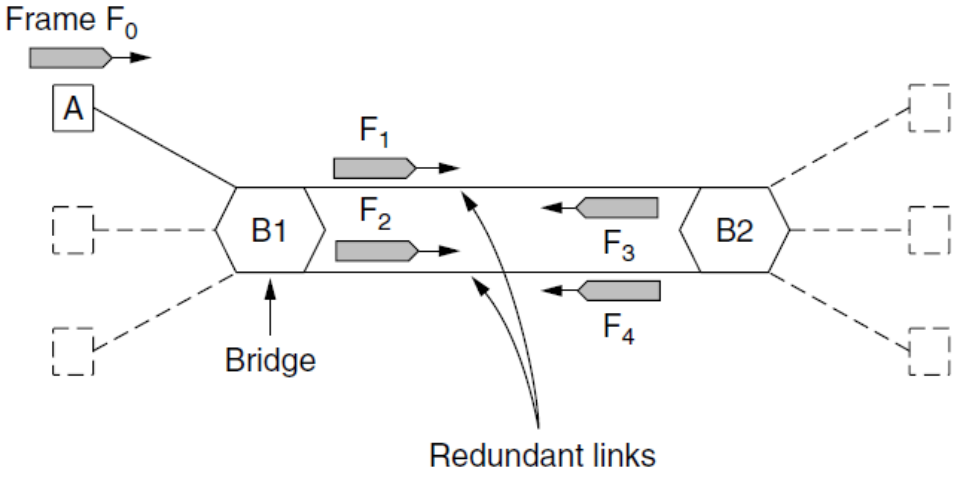
Hui Chen

Department of Computer & Information Science

CUNY Brooklyn College

Problem in Extended LAN

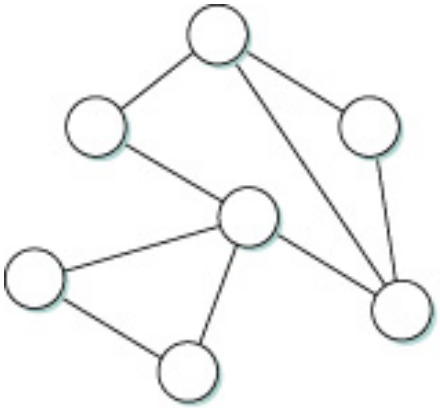
- Bridge topologies with loops and only backward learning (the learning algorithm discussed) will cause frames to circulate for ever



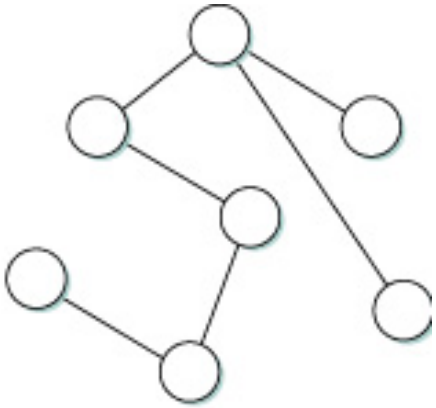
Spanning Tree

- Need spanning tree algorithm to solve problem
- Spanning tree: A spanning tree of an undirected graph of *n* nodes is a subgraph of a set of *n – 1* edges that connects all nodes.
  - A tree is a simple, undirected, connected, acyclic graph
  - A connected graph with n nodes and n-1 edges is a tree.
  - A graph is connected if there is a path from any point to any other point in the graph.
  - A graph G is a pair (V,E), where V is a set of vertices, and E is a set of edges between the vertices $E \subseteq \{\{u,v\} \mid u, v \in V\}$

Spanning Tree: Example



A Graph

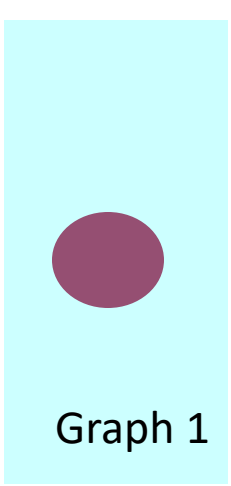


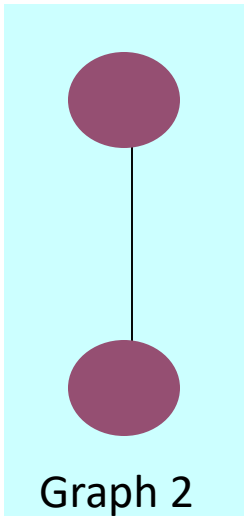
A spanning tree of the Graph

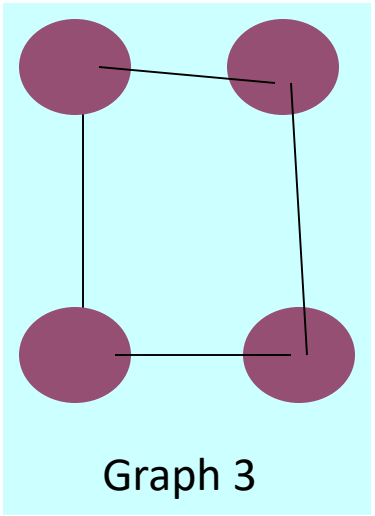
Exercise C12b-1

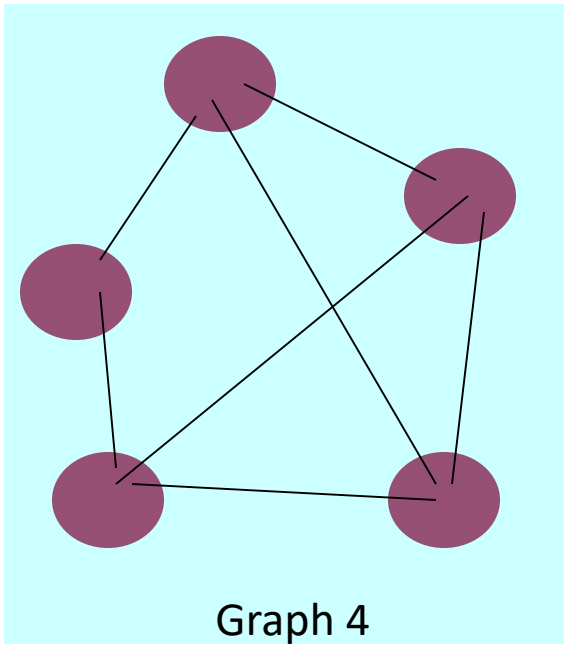
- Question
  - Indicate whether a spanning tree exists for each graph in next slide
  - Depict a spanning tree for each of the following graphs if it exists

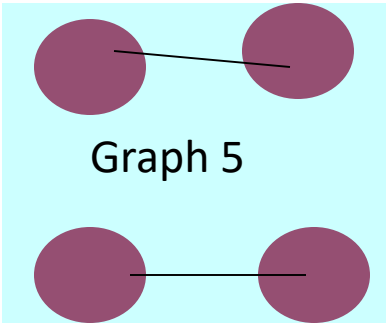
Exercise C12b-1











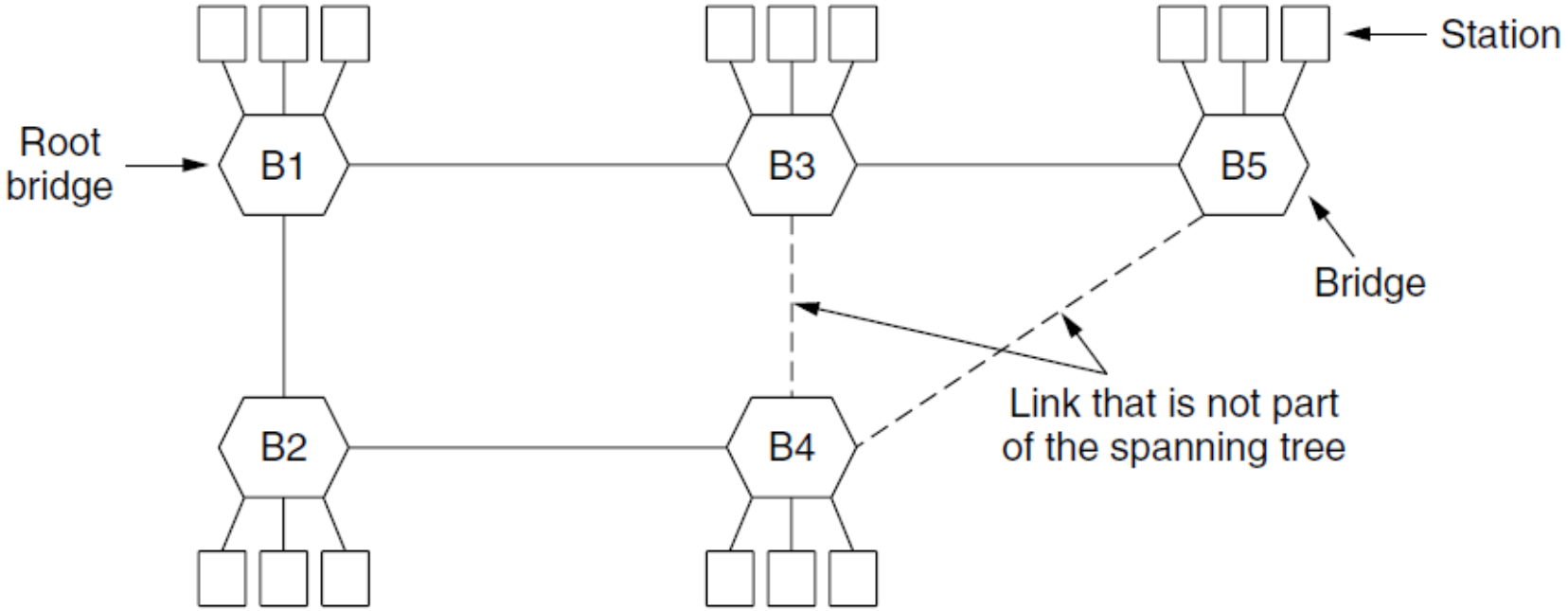
Spanning Tree Algorithm

- Subset of forwarding ports for data is use to avoid loops
- Selected with the spanning tree distributed algorithm by Perlman
- *"I think that I shall never see a graph more lovely than a tree. A tree whose crucial property is loop-free connectivity. A tree which must be sure to span. So packets can reach every LAN. First the Root must be selected By ID it is elected. Least cost paths from Root are traced In the tree these paths are placed. A mesh is made by folks like me. Then bridges find a spanning tree."*

  – Radia Perlman, 1985.

Spanning Tree Algorithm: Example

- Starting from an extended LAN as follows,



Spanning Tree Algorithm: Example Outcome

- After the algorithm runs:
  - B1 is the root, two dashed links are turned off
  - B4 uses link to B2 (lower than B3 also at distance 1)
  - B5 uses B3 (distance 1 versus B4 at distance 2)

Questions

- Why do we need the spanning tree algorithm in extended LAN?
- What is a spanning tree?