Adjacency Matrices

* In this topic we’re only concerned with Local Area Networks (LANs) \*
* In a network the connection between two electronic devices (like two switches) is bi-directional meaning that data packets can travel from device A to device B, or they can travel from device B to device A.
* In a network the data rates on all of the links are kept constant
* On a network graph:
* Edges = the connections between switches or other electronic devices e.g. AB, BA, etc
* Vertices = the switch / electronic device itself e.g. A, B, C, etc.
* A Spanning Tree is similar to that of a network graph, but it only has one defined route between all of the vertices for data packets to travel on. This route is also the most optimum path for the data packets.

Edge

Vertex

A

C

D

E

F

G

B

A

C

D

E

F

G

B

Spanning Tree

Normal Network Graph

Graphical user interface, application

Description automatically generated

The cost is also known as the weighting and is the number on each of the edges.

* We can, however, make adjacency matrices based on the network graphs with their costs listed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** | **F** |
| **A** | 0 | 4 | 3 | 0 | 0 | 0 |
| **B** | 4 | 0 | 1 | 2 | 0 | 0 |
| **C** | 3 | 1 | 0 | 4 | 0 | 0 |
| **D** | 0 | 2 | 4 | 0 | 2 | 0 |
| **E** | 0 | 0 | 0 | 2 | 0 | 6 |
| **F** | 0 | 0 | 0 | 0 | 6 | 0 |

In matrix graphs like this one, the nodes don’t connect to themselves so on the diagonal, the cost is 0. Also, matrix graphs work that you start from the row vertex and end at the column vertex.

* However, if a vertex has a loop that connects to itself, that means it can connect to itself 2 times, because it can start from one end of the loop and go to the other end, or the other way around.
* A screenshot of a computer

  Description automatically generated with medium confidenceMinimal Spanning Trees (MSTs) are versions of a Spanning Tree but the single route through all of the vertices is the shortest and therefore, the most optimum. E.g.,
* The Spanning Tree Protocol (STP) is a protocol that allows the ethernet switches to learn about the existence of other ethernet switches and therefore allow them to calculate the Minimal Spanning Tree for the network.