CS 725/825 & IT 725

Lecture 19

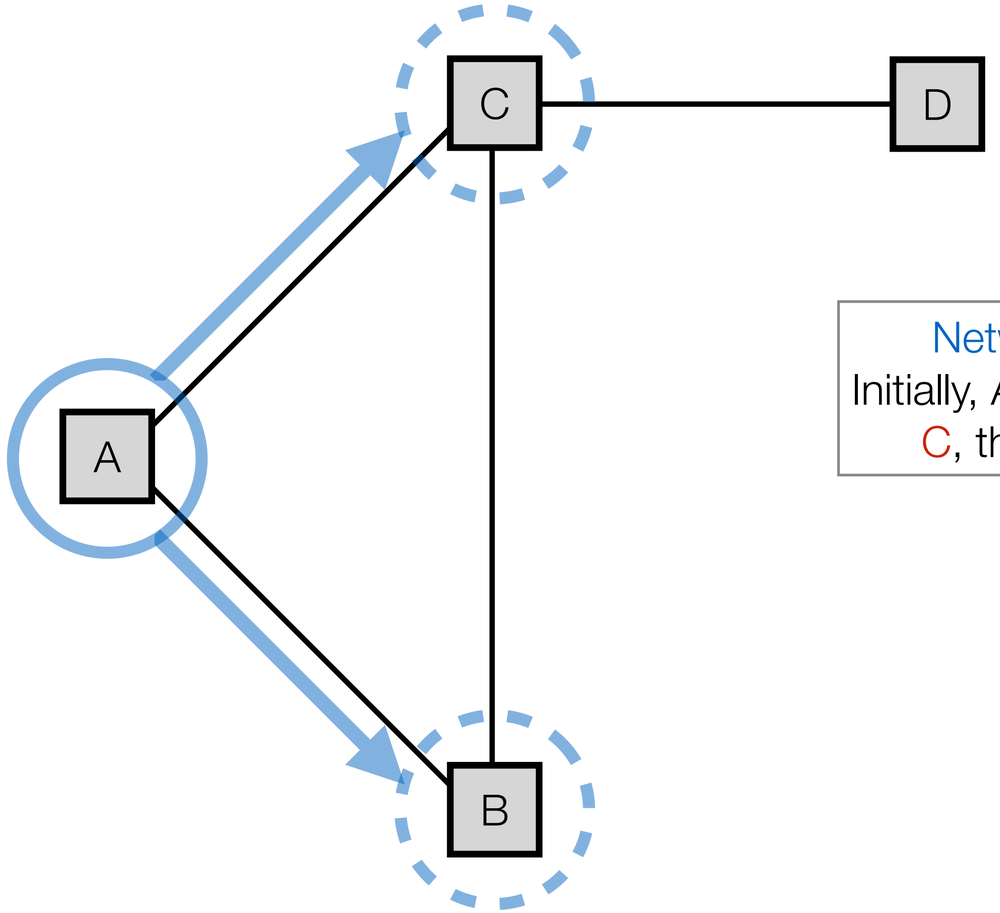
Network Layer

November 4, 2024

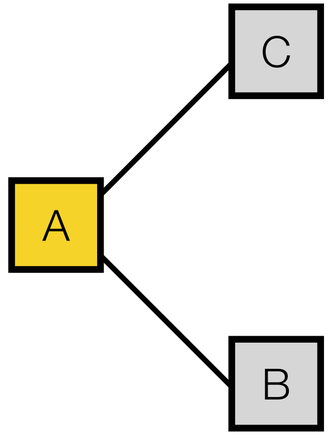
Link State (recap)

- Exact neighbor information flooded to every node on the network
- Topology of the entire networks is discovered in each node
- Shortest paths calculated and used to populate the routing tables

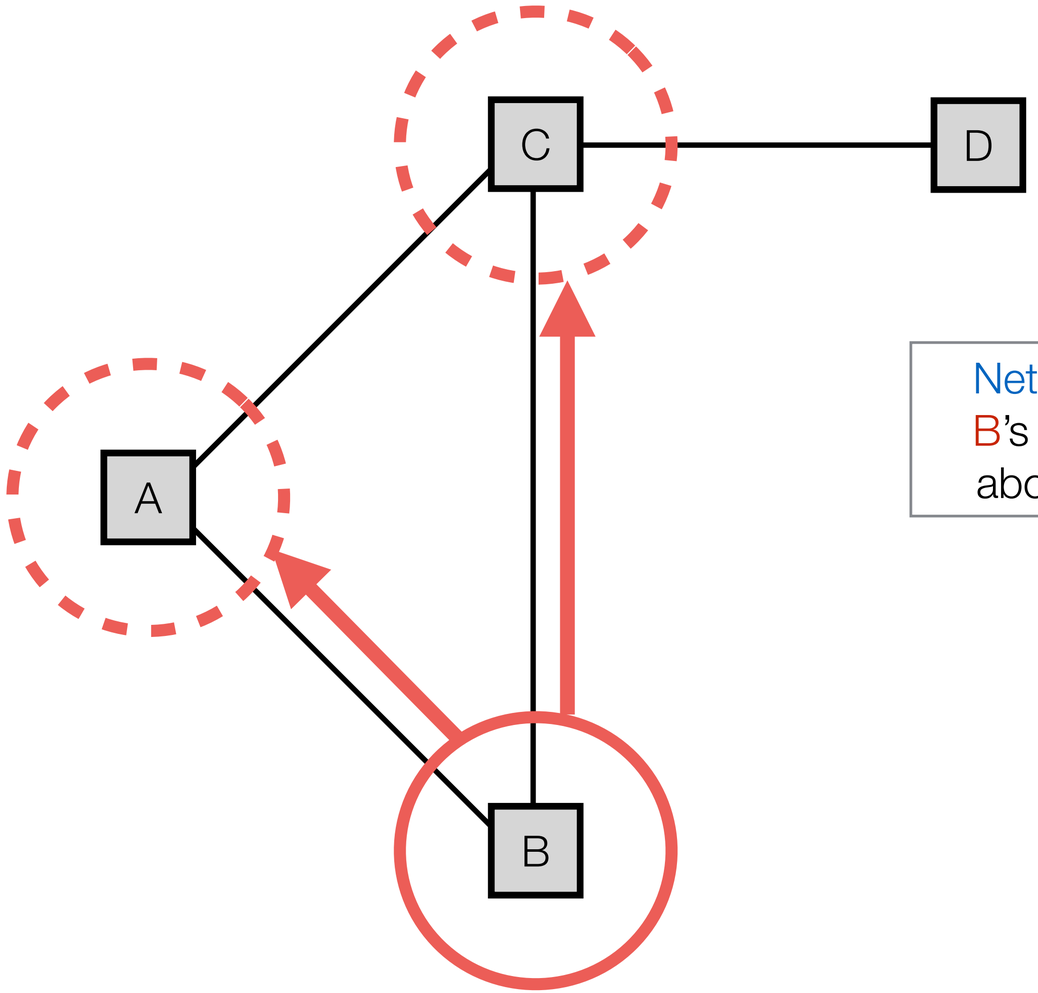
Link State routing



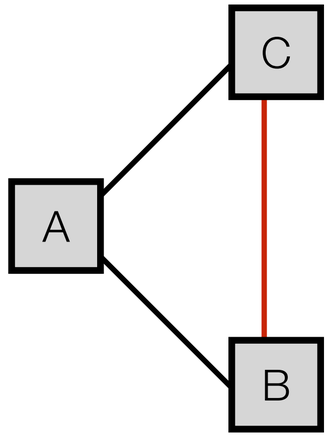
Network topology as seen by A:
Initially, A knows it is connected to B and C, this info is flooded to all nodes



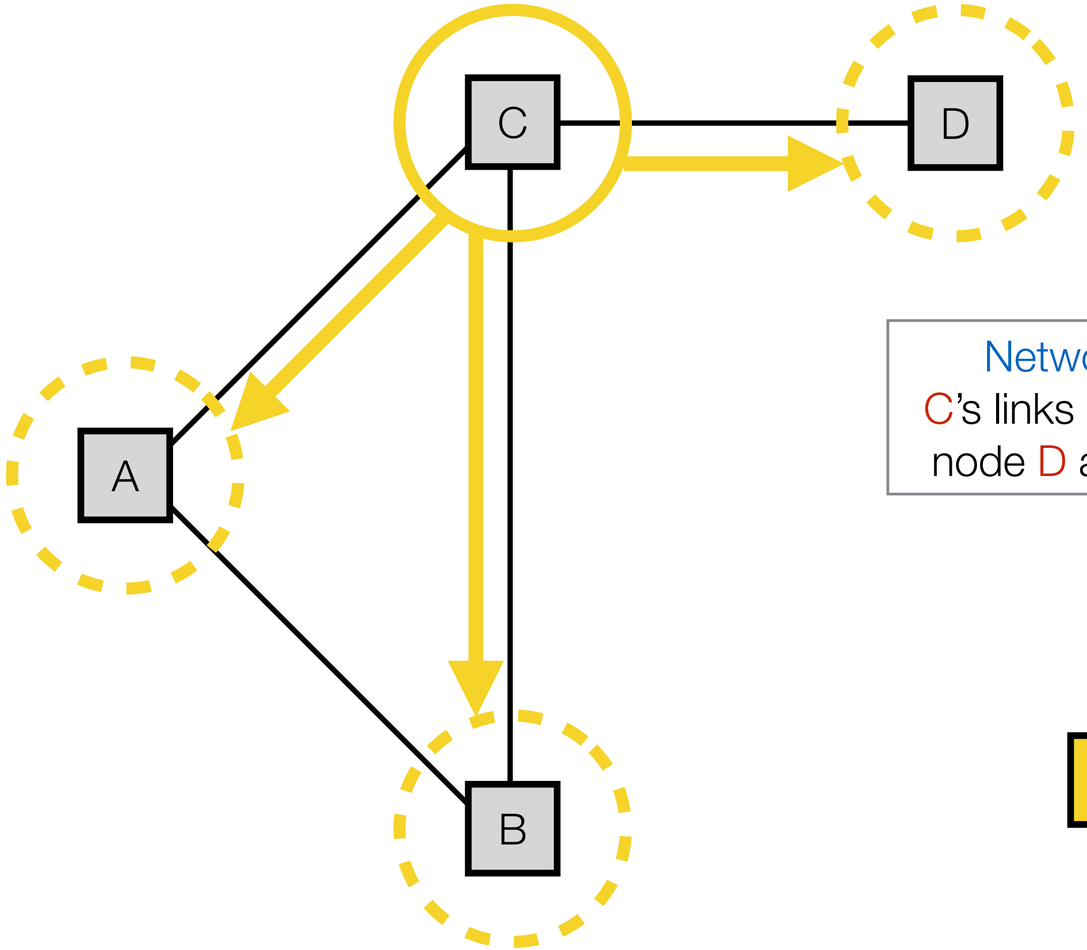
Link State routing



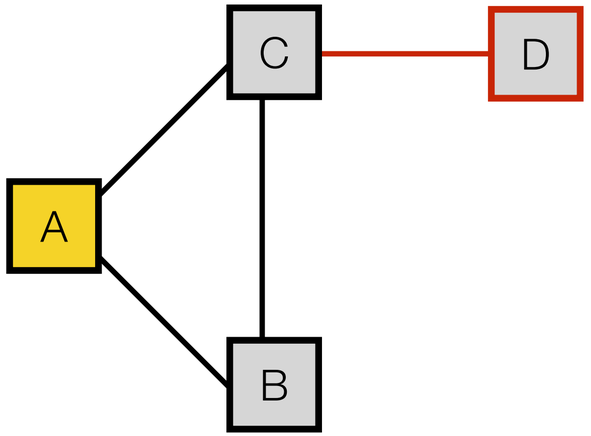
Network topology as seen by A:
B's links state received, A learns about the link between B and C



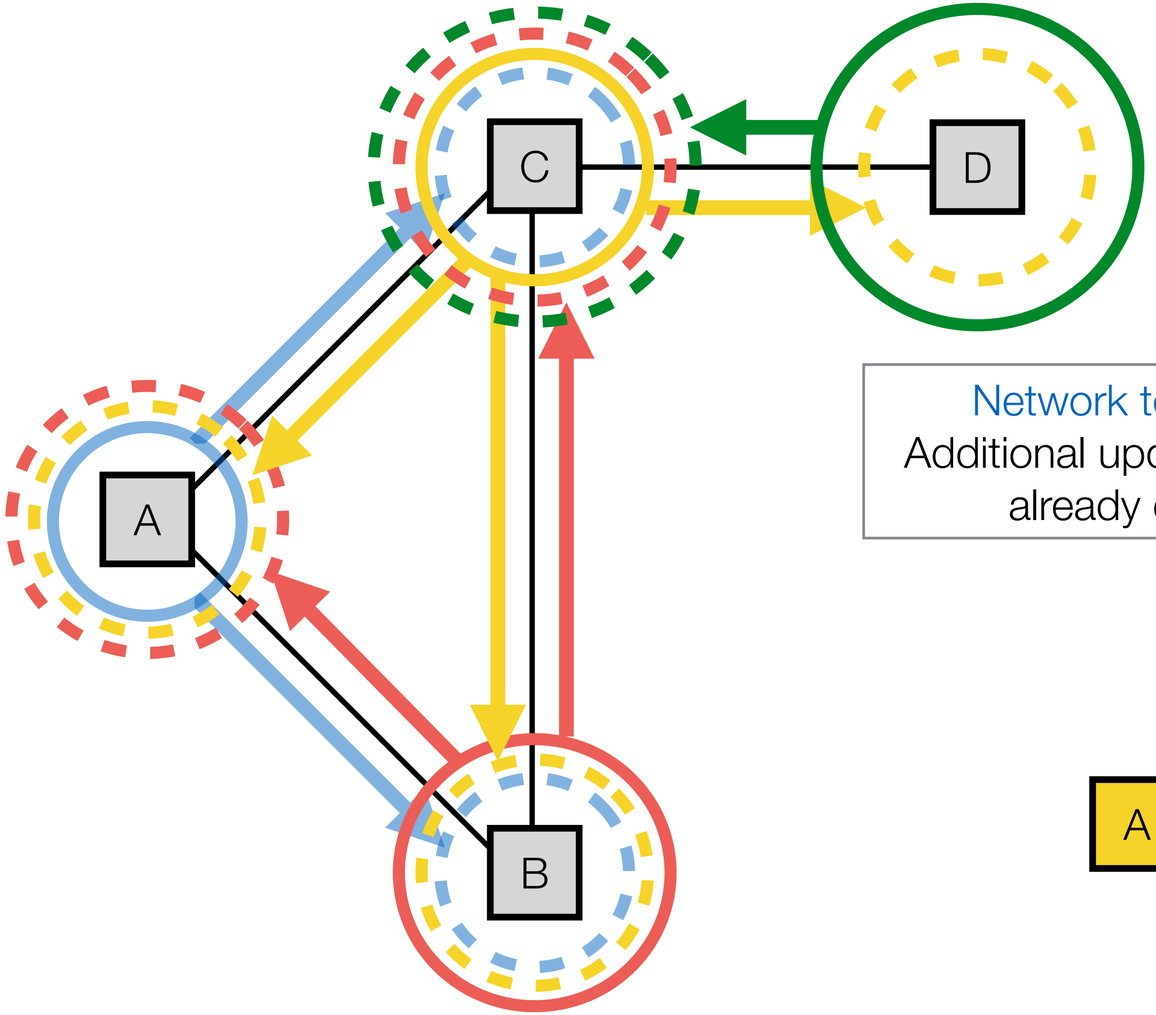
Link State routing



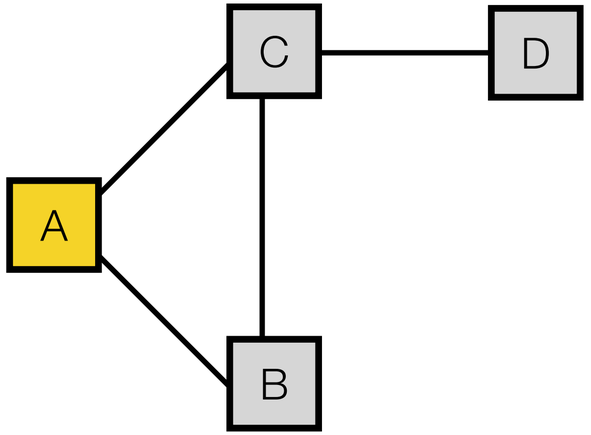
Network topology as seen by A:
C's links state received, A learns about node D and the link between C and D



Link State routing



Network topology as seen by A:
Additional updates received, confirming already discovered topology



Scalability of Routing Protocols

- Internet is large...
- Need to introduce hierarchy
  - ... into something that naturally does not have one
  - divide and conquer, abandoning hope for optimality
  - based on ownership - Autonomous System (AS)
- Different routing problems:
  - Intra AS routing - interior gateway routing (IGP)
  - Inter AS routing - exterior gateway routing (EGP)

Examples of Routing Protocols

	Distance Vector	**Link State**
IGP	RIP	OSPF
EGP	BGP-4*	

* BGP-4 extends the concept of *Distance Vector* routing to include the path information and is typically referred to as a ***Path Vector*** routing protocol

RIP

- Routing Information Protocol
  - a distance vector routing protocol
  - hops used as a measure of distance
  - 30 second update interval
- Version history
  - RIPv1 - 1988
  - RIPv2 - 1993 (includes CIDR, authentication)
  - RIPng - 1997 (IPv6 support)

OSPF

- Open Shortest Path First
  - link state routing protocol
  - two-level hierarchy
  - user-defined link weights
- Version history:
  - OSPF (1989)
  - OSPFv2 (1998)
  - OSPFv3 (2008, IPv6)