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CSE421 - Computer Networks - SEQ

Lecture 18 - Routing Algorithms (Link State)

* Global Algorithm - knows all the network information of the topology before making routing table; also keeps a record of the costs of the links; least cost path is used to reach dest^n. → Main difference w/ Distance Vector.
  ↙ centralized
  ↓ can compare costs.
* shortest path algorithm

(*) Link State Routing Process -

Step 01 - Each router learns about its own DC networks.
  ↳ part of the routing table

" 02 - Hello Packets
* Each router contacts its neighbors on DC networks
* router will not be aware of its neighbors on the link until it receives a hello packet. → after it, an adjacency is established w/ the neighbor (active router)
* no response → inactive
* small hello packets continue to be exchanged betⁿ two adj. neighbors - keep alive function to monitor the state of the neighbor.

Step 03 - Each router builds a LSP (link state packet) containing the state of each DC link
* LSP contains link-state info about the sender's links (sending R)
* routers only send out LSPs to interfaces where it has established adj. w/ other routers.
  ↳ basically those who replied to Hello packet

LAN side
- No hello response
- No LSP

Step 04 - Flooding LSP
* Each router floods the LSP to all neighbors who then store all LSPs received in a DB
* neighbor immediately sends out the LSPs to all other interfaces except the one that received it.

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* Link-State routing Protocol then calculates the SPF algorithm after flooding is complete → reaches convergence must faster than DV.
* LSP can be sent only when —
  (I) router is initially started / startup time.
  (II) Δ in topology → link broken / new router / adj. made or broken.
    ↳ DV keeps sending packets but here only when there is an update.

due to flooding, R learns all the link-state info for each router in its routing area

Step 05 — Building the Link State DB
* each router uses the LSPs to build a DB that is a complete map of the topology + finds best path to each dest^n network using SPF algorithm.
* using this DB, the routing table is made.
* each router in the topology determines the shortest path from its own perspective
  ↓
  SPF Tree
  ↓
  Routing Table.

Advantages — (I) Faster Network Convergence → LSP flooding
(II) Topological Map → using SPF tree, each R can find shortest path
(III) Hierarchical Design → use of multiple areas + better route summarization
(IV) Event Driven Updates → LSPs only sent when there is a Δ in the topology + specific info about the Δ + no periodic updates.

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Differences between DV and Link State Routing-

	DV	Link State
(I) Network view	Neighbor	Complete topology knowledge
(II) Best Path calⁿ	Based on fewest no. of hops	Based on link cost
(III) Updates	Routing Table periodically	Link state updates when there is a Δ.
(IV) Algorithm	Bellman Ford	Dijsktra
(V) CPU+Memory	Low utilization	Intensive
(VI) Hierarchy	No	Yes
(VII) Convergence Time	Moderate	Fast

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