Computer Network Protocols
Network Layer (Part 1)
Lesson 2

جامعة المستقبل
كلية الهندسة والتقنيات الهندسية
قسم هندسة تقنيات الحاسوب
المرحلة الرابعة

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Dynamic Routing Algorithm

We will study two type of dynamic routing algorithm, these are:

1. Distance Vector Routing.

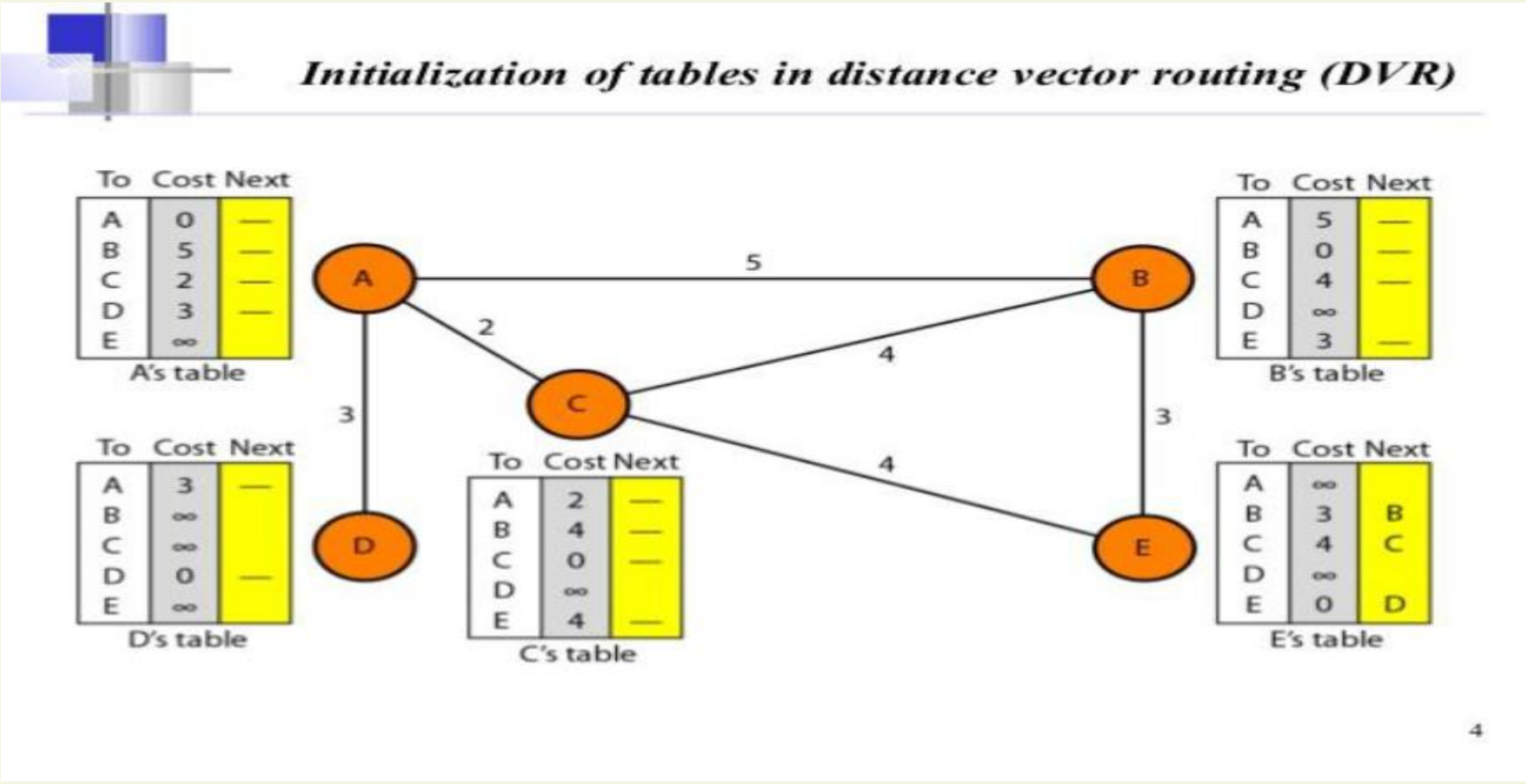
2. Link state routing.

Distance Vector Routing

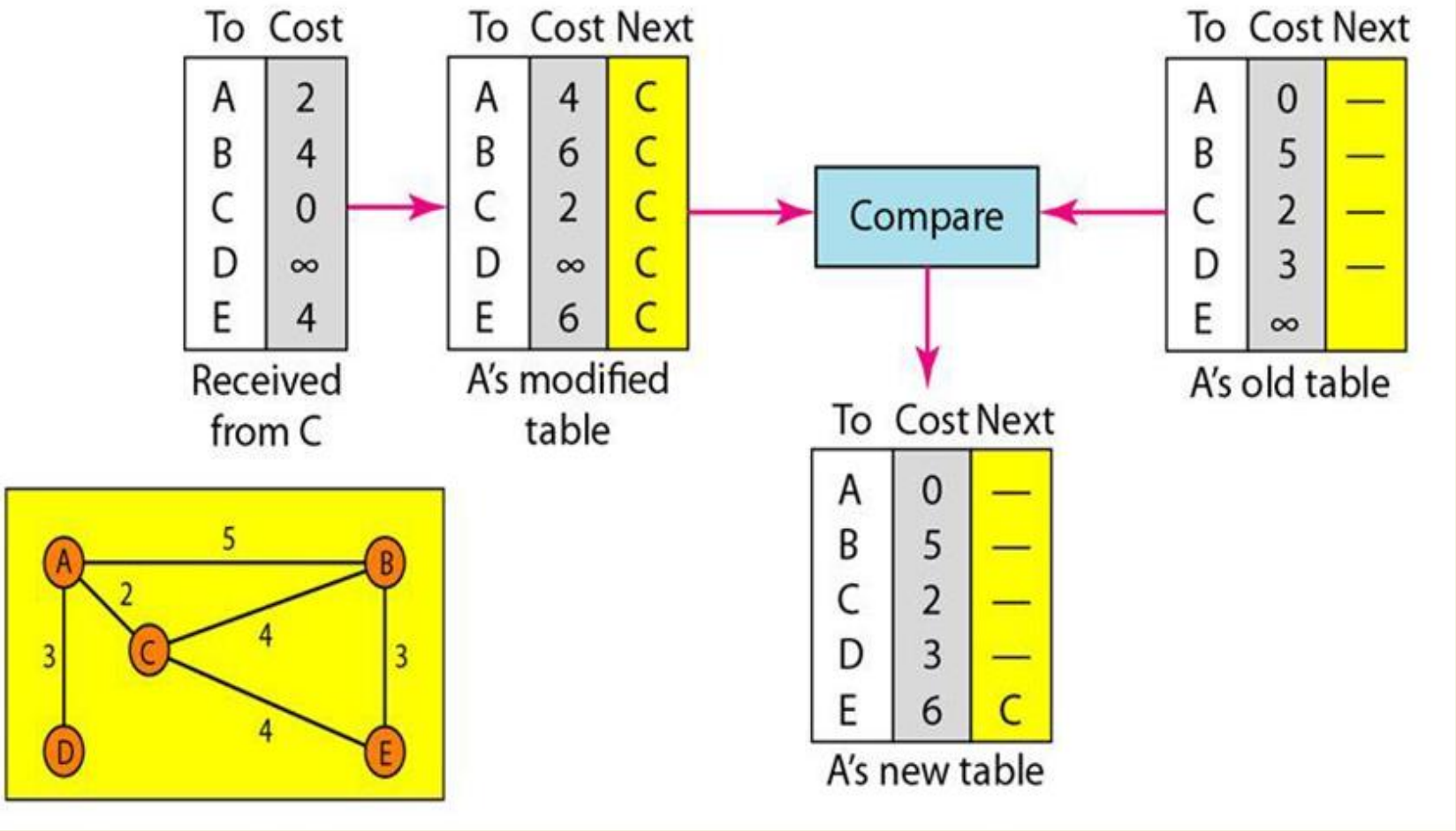
- Distance Vector routing is **intra-domain** protocols, **inside** Autonomous system, but not between Autonomous system.
- Distance-vector routing is based on the **least-cost** goal.
- Distance Vector developed by **Bellman-Ford** algorithm.
- Bellman **equation** is used to find the **least** cost (**shortest distance**) between a source and destination.
- A **distance vector routing algorithm** operates by having each router **maintain a table** (i.e., a **vector**) giving the best known distance to each destination.
- These tables are **updated by exchanging** information with the neighbor's router. Every router knows the **best link** to reach each destination.
- Distance Vector router **tells ONLY neighbors** about ALL routes
- **RIP** based on distance vector routing, each router **shares**, **at regular intervals**, its knowledge about entire AS with its neighbor.
- It is so **slow** and does not take **Bandwidth** into consideration when choose the root.

Distance Vector Routing (Initialization)

Ex/Update Router A using Distance vector algorithm.



Distance Vector Routing (Updating)



Distance Vector Routing

Distance vector algorithm

Bellman-Ford equation (dynamic programming)

let

$d_x(y)$:= cost of least-cost path from x to y

Then

$$d_x(y) = \min_v \{c(x,v) + d_v(y)\}$$

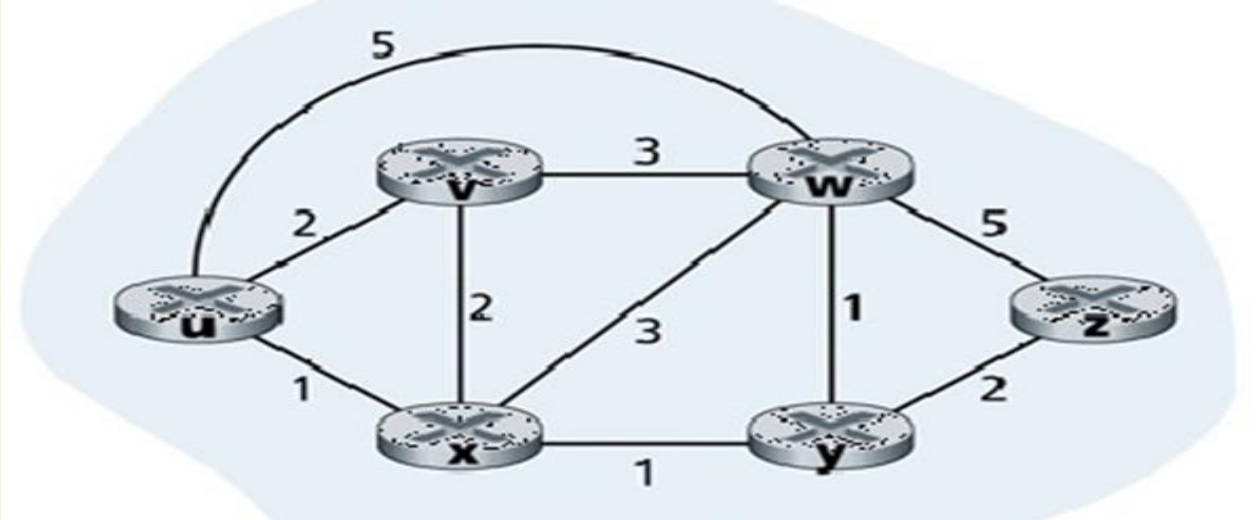
$\min_v$: *min* taken over all neighbors v of x

$c(x,v)$: cost to neighbor v

$d_v(y)$: cost from neighbor v to destination y

Distance Vector Routing Example

Consider the following network, using Bellman-Ford equation. Calculate routing graph abstraction cost (shortest path) from U to Z



$$Distance_u^z = min\{cost(U,V) + d_v^z,\ cost(U,X) + d_x^z,\ cost(U,W) + d_w^z\}$$

$$= \min\{2+5,\ 1+3,\ 5+3\}$$

$$= \min\{7,\ 4,\ 8\} = 4$$

Distance Vector Routing

The primary problem in distance vector that the algorithm often took too ***long to converge*** *after the network topology changed (due to the count-to-infinity problem). Consequently, it was replaced by a new algorithm, now called* ***link state routing****.*

End Of Lesson 2

Thanks For Listening