#### **Distance Vector Routing Algorithm** Chapter 4 (Bellman Ford) Network Layer iterative: Distance Table data structure continues until no each node has its own nodes exchange info. row for each possible destination self-terminating no column for each directly-"signal" to stop attached neighbor to node asynchronous: example: in node X, for dest. Y A note on the use of these ppt slides: nodes need not We're making these slides freely available to all (faculty, students, readers). They're in powerpoint form so you can add, modify, and delete slides (including this one) and slide content to suit your needs. They obviously represent a *lot* of work on our part. In return for use, we only ask the followien: via neighbor Z: Computer Networking: exchange info/iterate A Top Down Approach in lock step! Featuring the Internet, following following: If you use these slides (e.g., in a class) in substantially unaltered form, that you mention their source (after all, we'd like people to use our book!) If you post any slides in substantially unaltered form on a www site, that distributed: distance from X to 2<sup>nd</sup> edition. = Y, via Z as next hop Jim Kurose, Keith Ross each node D(Y.Z)you note that they are adapted from (or perhaps identical to) our slides, and note our copyright of this material. Addison-Wesley, July communicates only with $= c(X,Z) + min_{_{M}} \{D^{Z}(Y,w)\}$ 2002 directly-attached Thanks and enjoy! JFK/KWR neighbors All material copyright 1996-2002 J.F Kurose and K.W. Ross, All Rights Reserved Network Layer 4-1 Network Laver 4-2



















### Comparison of LS and DV algorithms

#### Message complexity

LS: with n nodes, E links, O(nE) msgs sent each DV: exchange between neighbors only convergence time varies

### Speed of Convergence

LS: O(n<sup>2</sup>) algorithm requires O(nE) msgs may have oscillations <u>DV</u>: convergence time varies may be routing loops count-to-infinity problem Robustness: what happens if router malfunctions? LS: node can advertise

incorrect *link* cost each node computes only its own table

> DV node can advertise incorrect *path* cost each node's table used by others • error propagate thru

network

Network Layer 4-13

# Chapter 4 roadmap

- 4.1 Introduction and Network Service Models
- 4.2 Routing Principles
- 4.3 Hierarchical Routing
- 4.4 The Internet (IP) Protocol
- 4.5 Routing in the Internet
- 4.6 What's Inside a Router
- 4.7 IPv6
- 4.8 Multicast Routing
- 4.9 Mobility

Network Layer 4-14

# Hierarchical Routing

Our routing study thus far - idealization all routers identical network "flat" ..., not true in practice

scale: with 200 million destinations: can't store all dest's in routing tables! routing table exchange would swamp links!

### administrative autonomy

internet = network of networks each network admin may want to control routing in its own network

Network Layer 4-15

# <u>Hierarchical Routing</u>

aggregate routers into regions, "autonomous systems" (AS)

routers in same AS run same routing protocol

### "intra-AS" routing

protocol routers in different AS can run different intra-AS routing protocol

#### gateway routers-

special routers in AS run intra-AS routing protocol with all other routers in AS *also* responsible for routing to destinations outside AS

run *inter-AS routing* protocol with other gateway routers

Network Layer 4-16



