2 February 2017

Routing on the Internet

A rough outline

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Outline

Internet Architecture in a nutshell

Addresses and Routing

The Routing Protocol

Acknowledgement: RIPE NCC Training Services
Some material herein is based on their
BGP Operations and Security Training course.

Different Players at Different Layers

Internet Architecture in a nutshell

Applications

Network

The Internet is

A Network of Independent Netorks

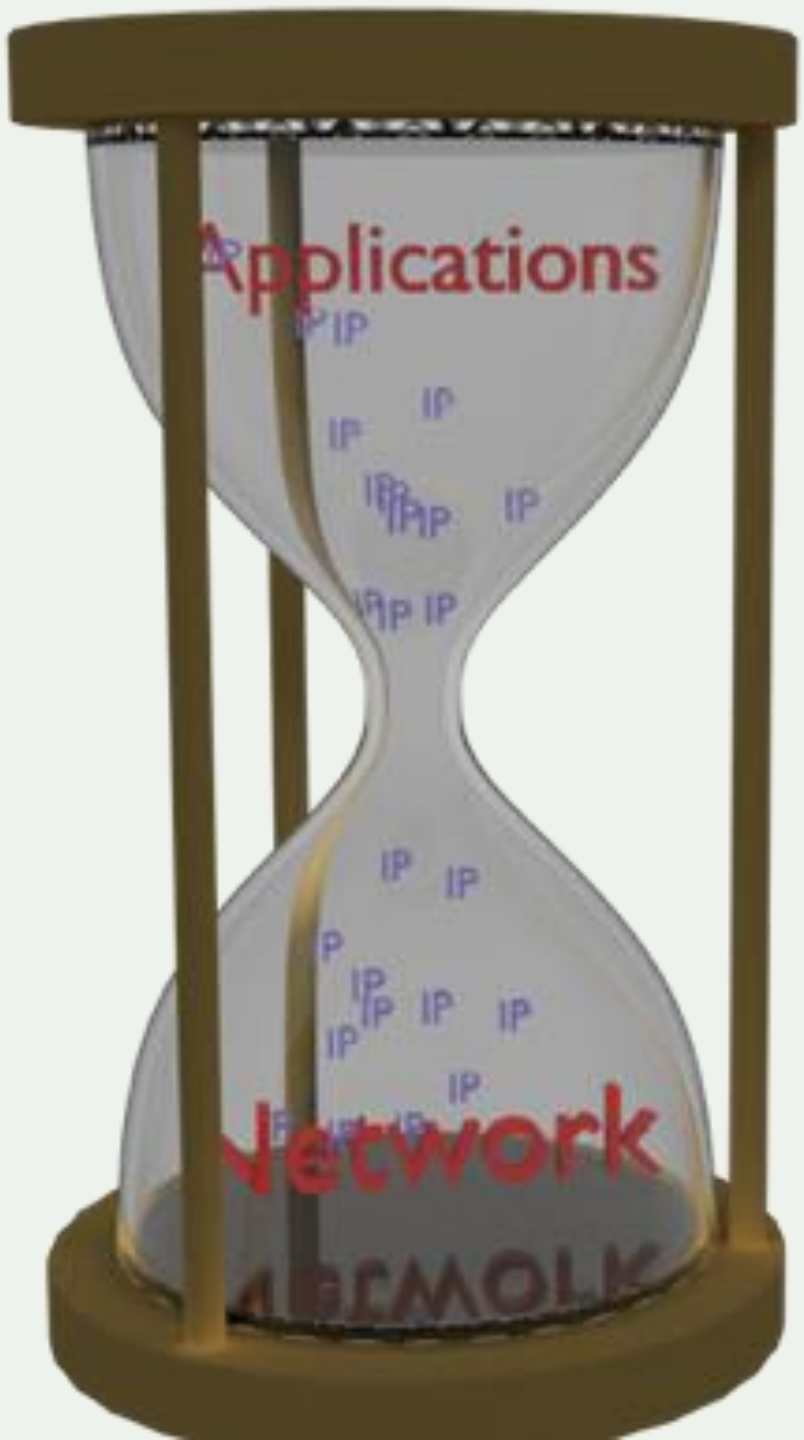
That exchange IP traffic

Application Layer: Applications use IP for connectivity

The Network Access Layer: Components in the Network Access Layer deliver IP connectivity

The IP Layer: provides a coherent mapping between the layers

(IP=Internet Protocol)



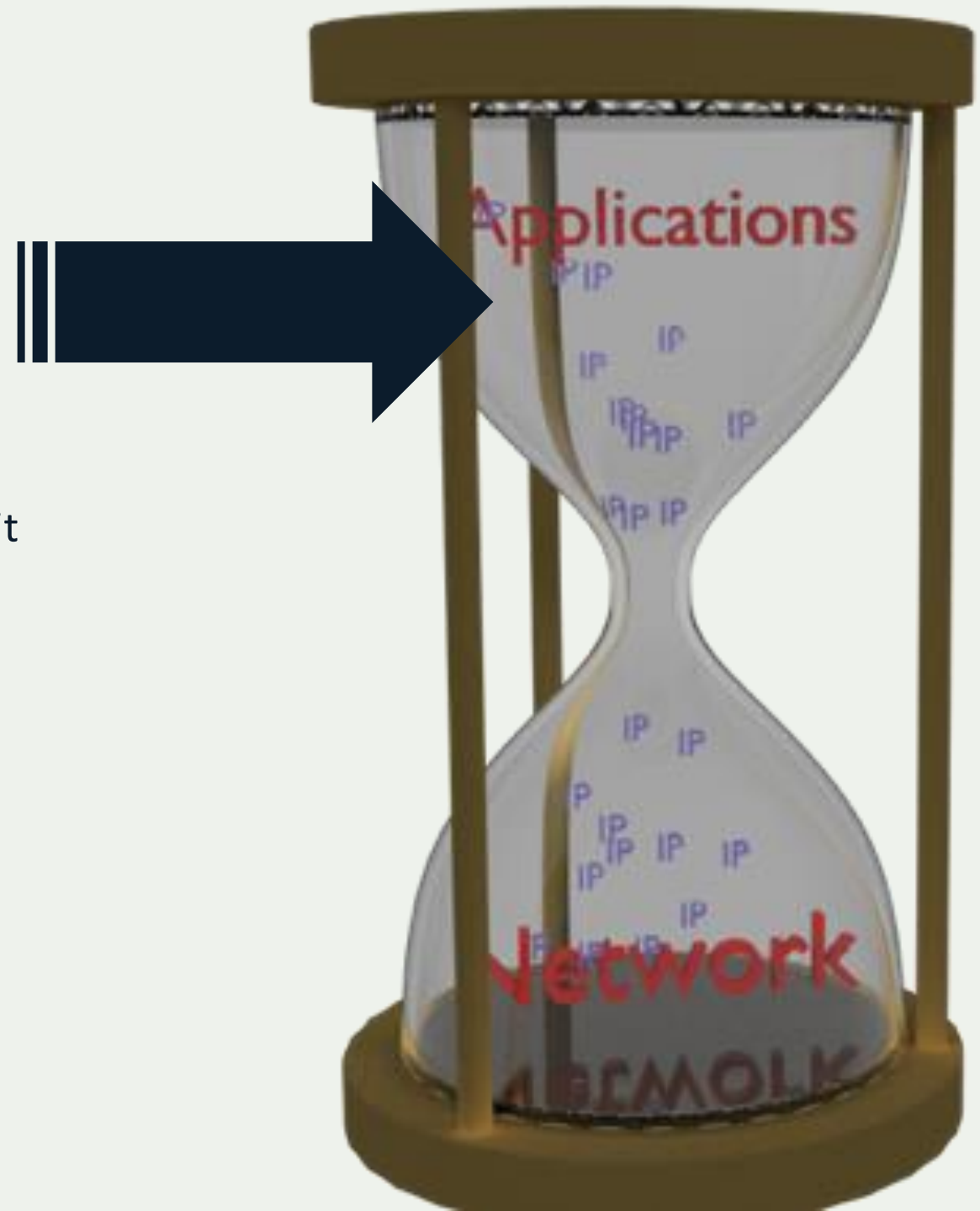
Applications

Applications are what the users care about

Most people conceive the utility of the various applications as the Internet

E-mail and WWW are just two applications, albeit successful ones

Business, voice and face communication, entertainment such as videos and games

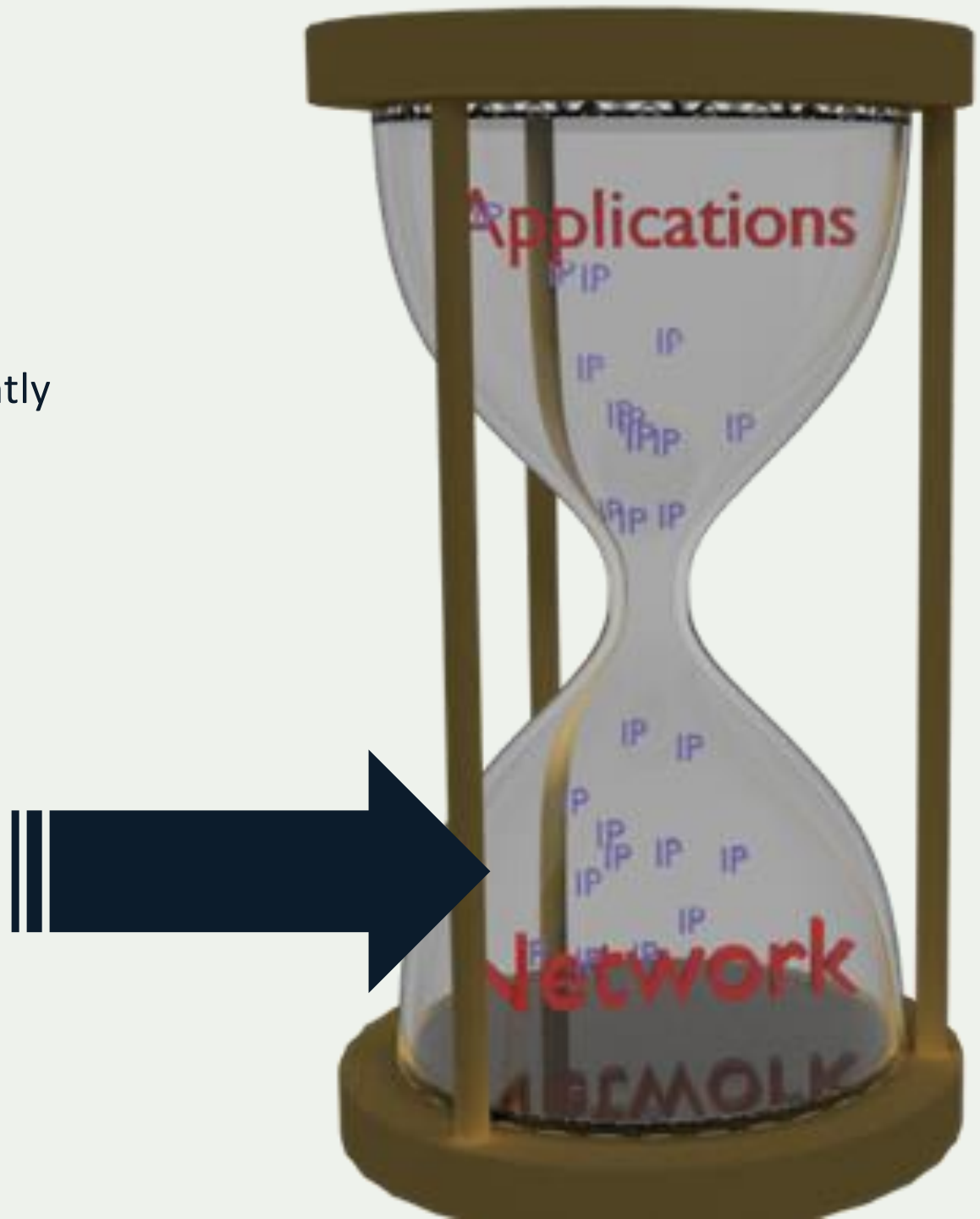


Network

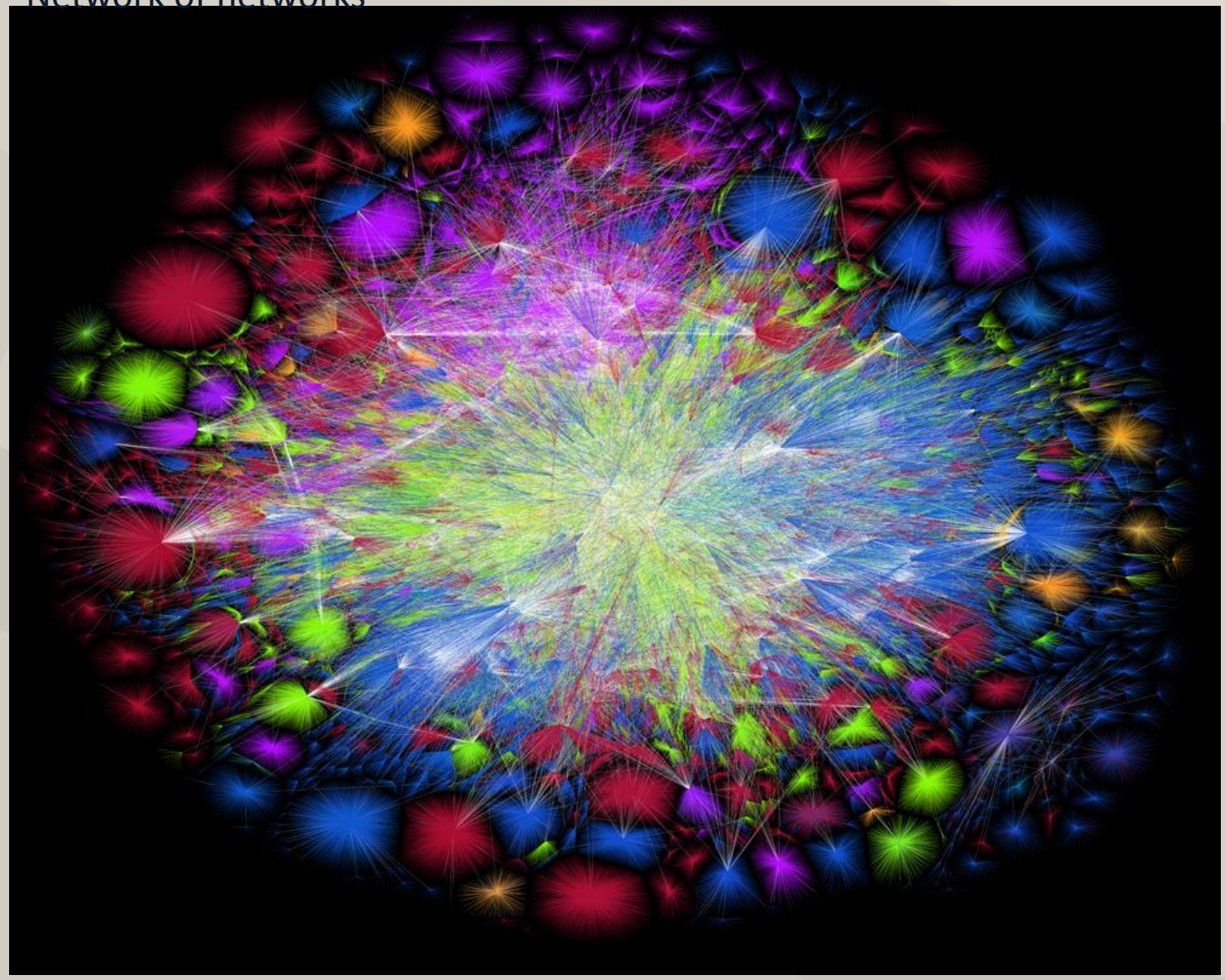
The layer that provides the IP to the customers

The Internet is made up out of many independently operated networks that all provide some level of network access

The network exchange IP packets between each other



Network of networks



Serving different markets

The Price of Bandwidth, in bulk, per Mbps

Highly competitive

Commodity

A EUR80 fiber cross connect:	$0.01
Internet Exchange traffic:	$0.25*
Backbone traffic Western Europe:	$0.50
Transatlantic traffic, wholesale:	$1
Internet Transit, wholesale:	$2
Internet Transit, retail:	$15
Broadband Internet, consumer:	$50
National Ethernet service:	$180
3G mobile data, national:	$11,400
GSM voice call, national:	$483,840
3G mobile data, roaming low:	$834,000
3G mobile data, roaming high:	$3,127,500
GSM voice call, roaming:	$3,338,496
SMS Text Messages:	$210,000,000
SMS Text Messages, roaming:	$1,166,400,000

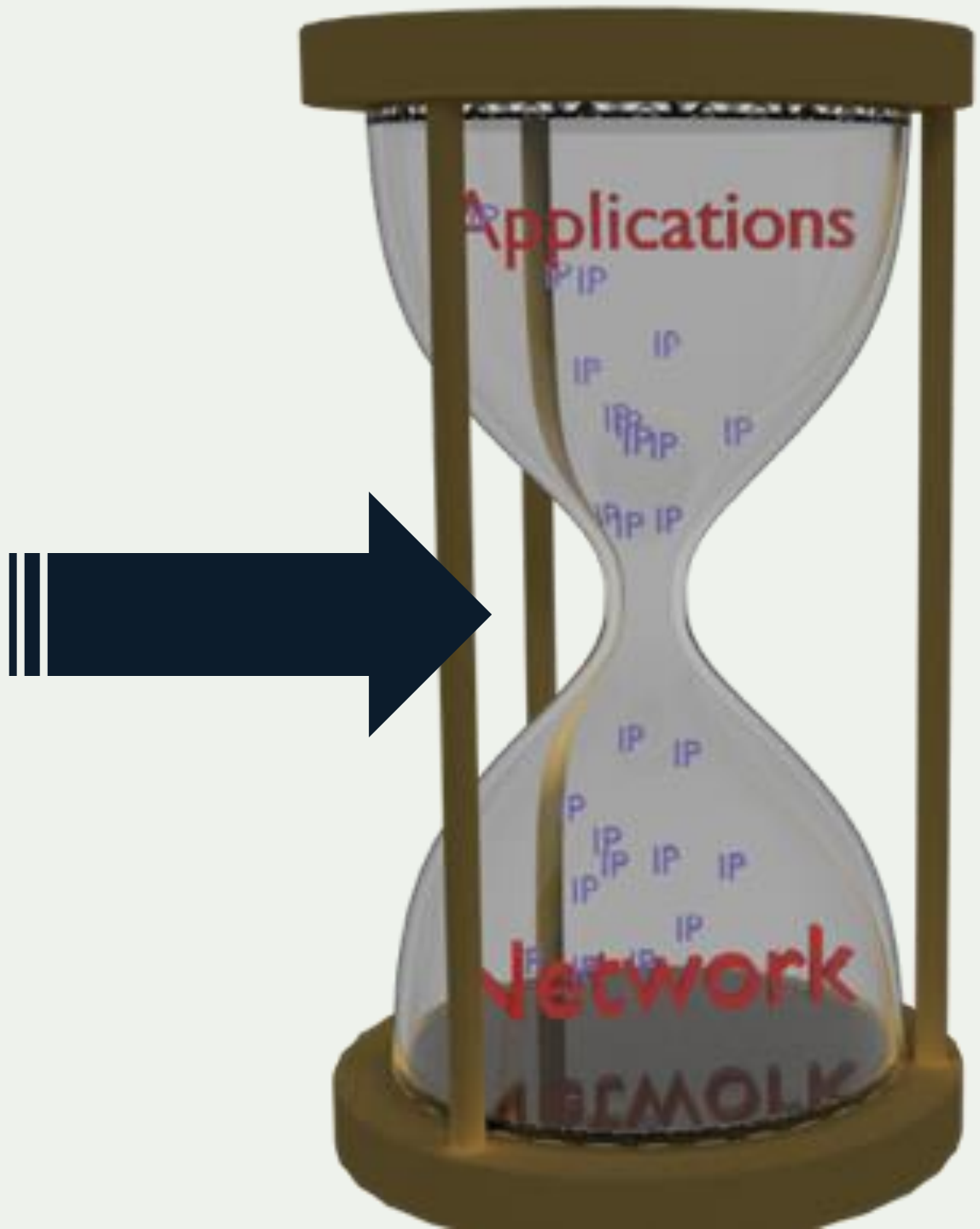
Western Europe, early-mid 2011 (based on 10Gbps or 300GB)

Table courtesy of Remco van Mook, Equinix

IP addressing, Routing, and DNS

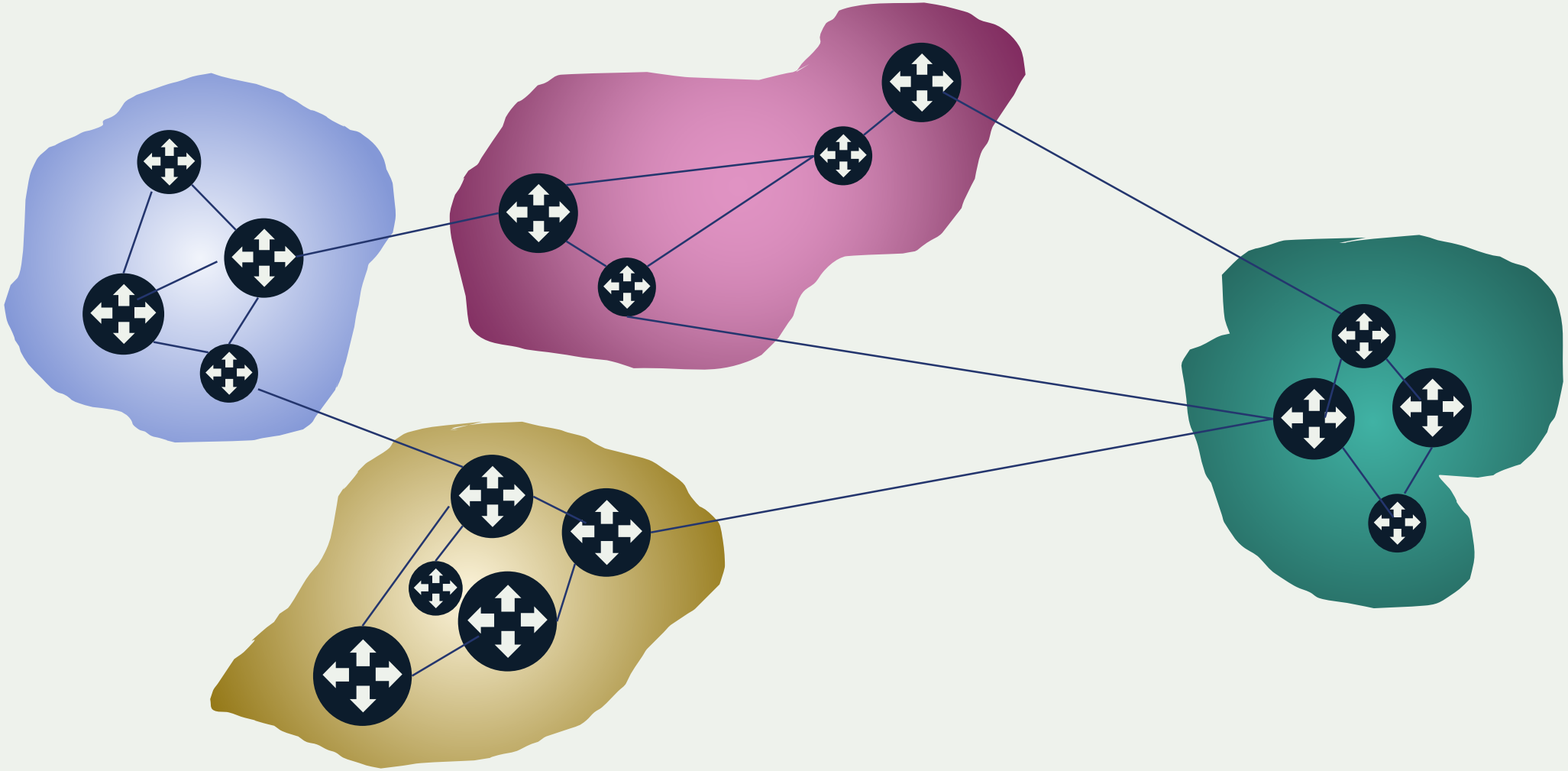
Makes for the global connectivity.

Including a whole slew of other standards

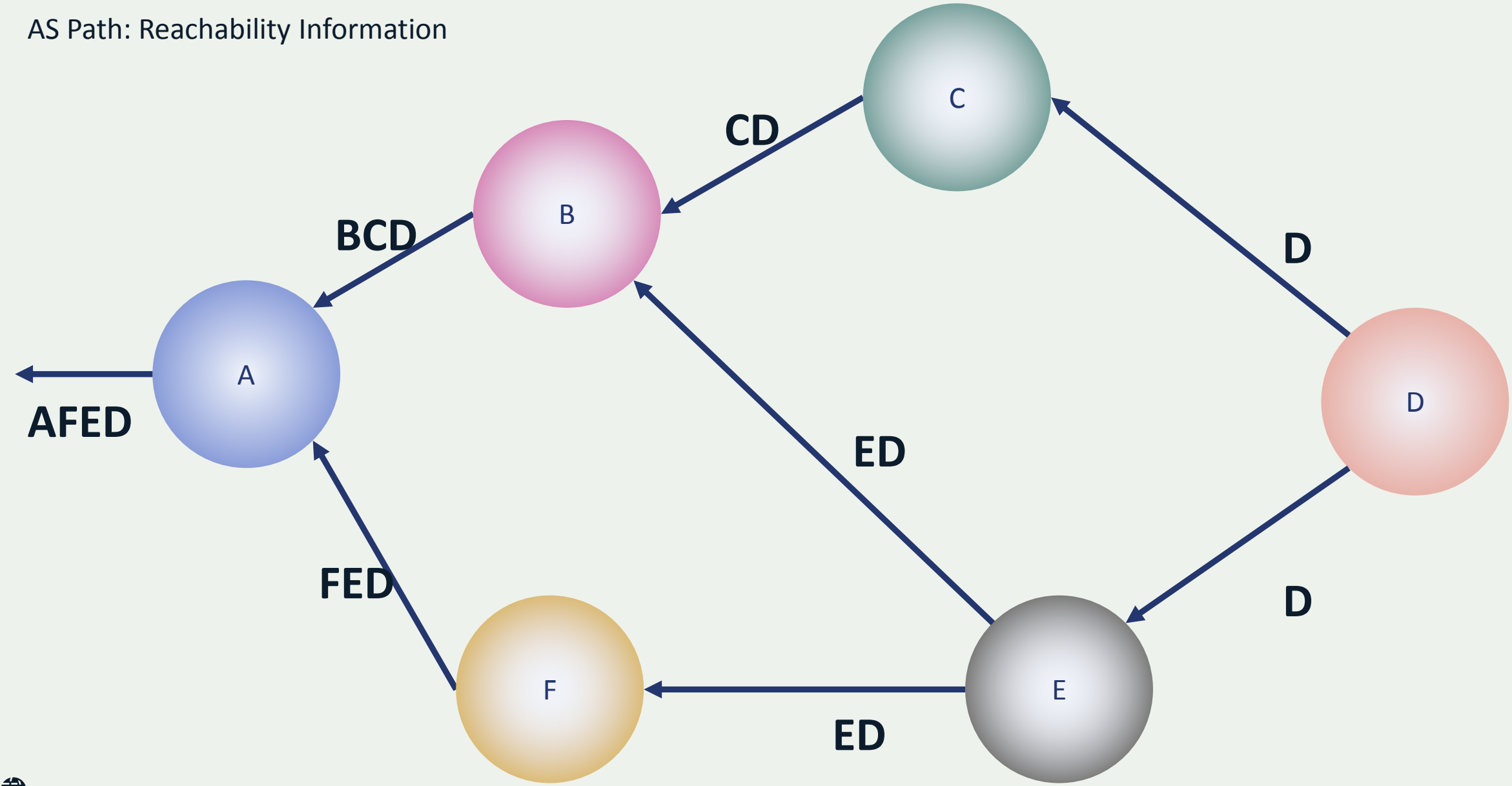


Addressing and Routing

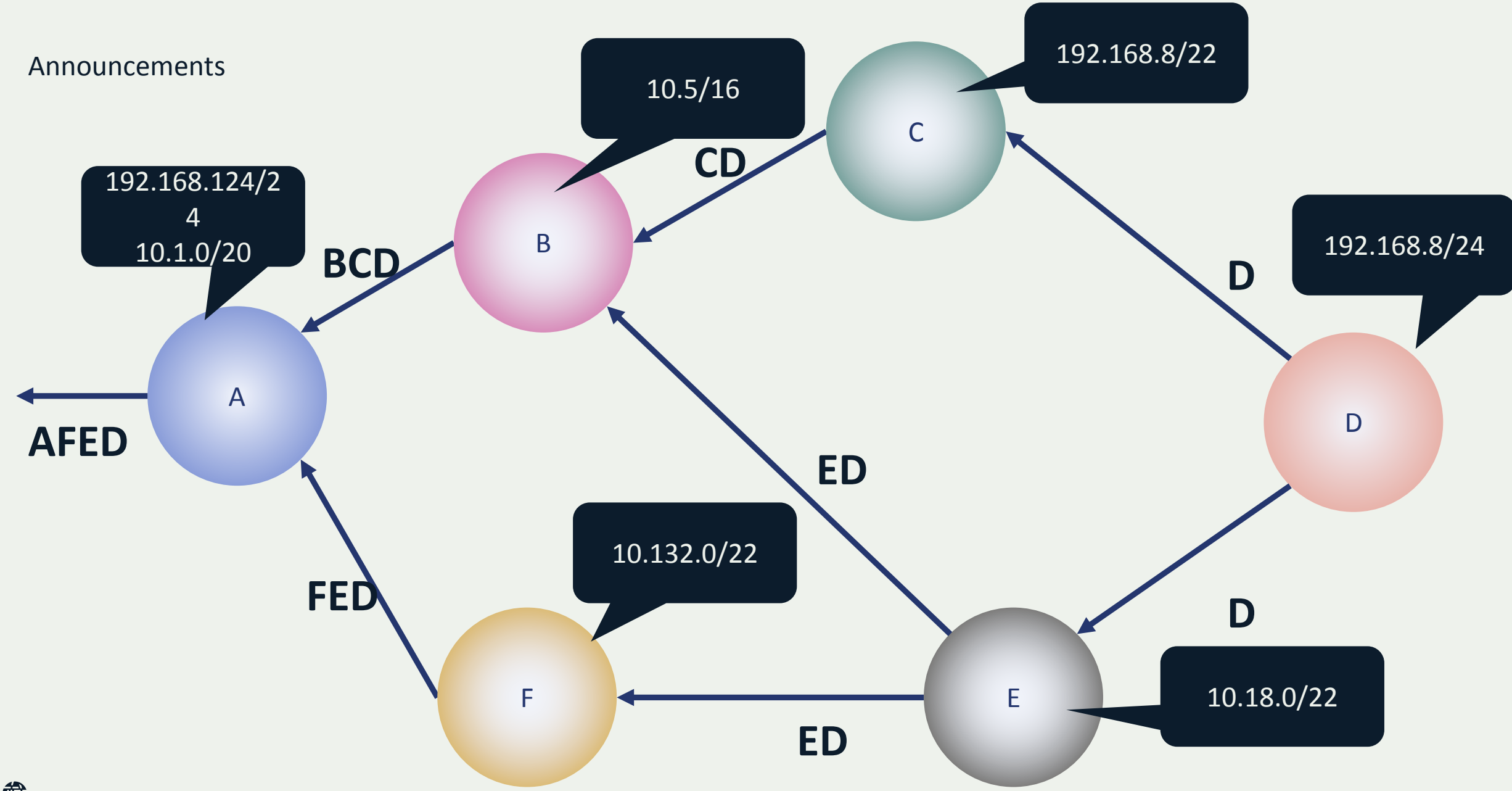
Internet Architecture in a nutshell

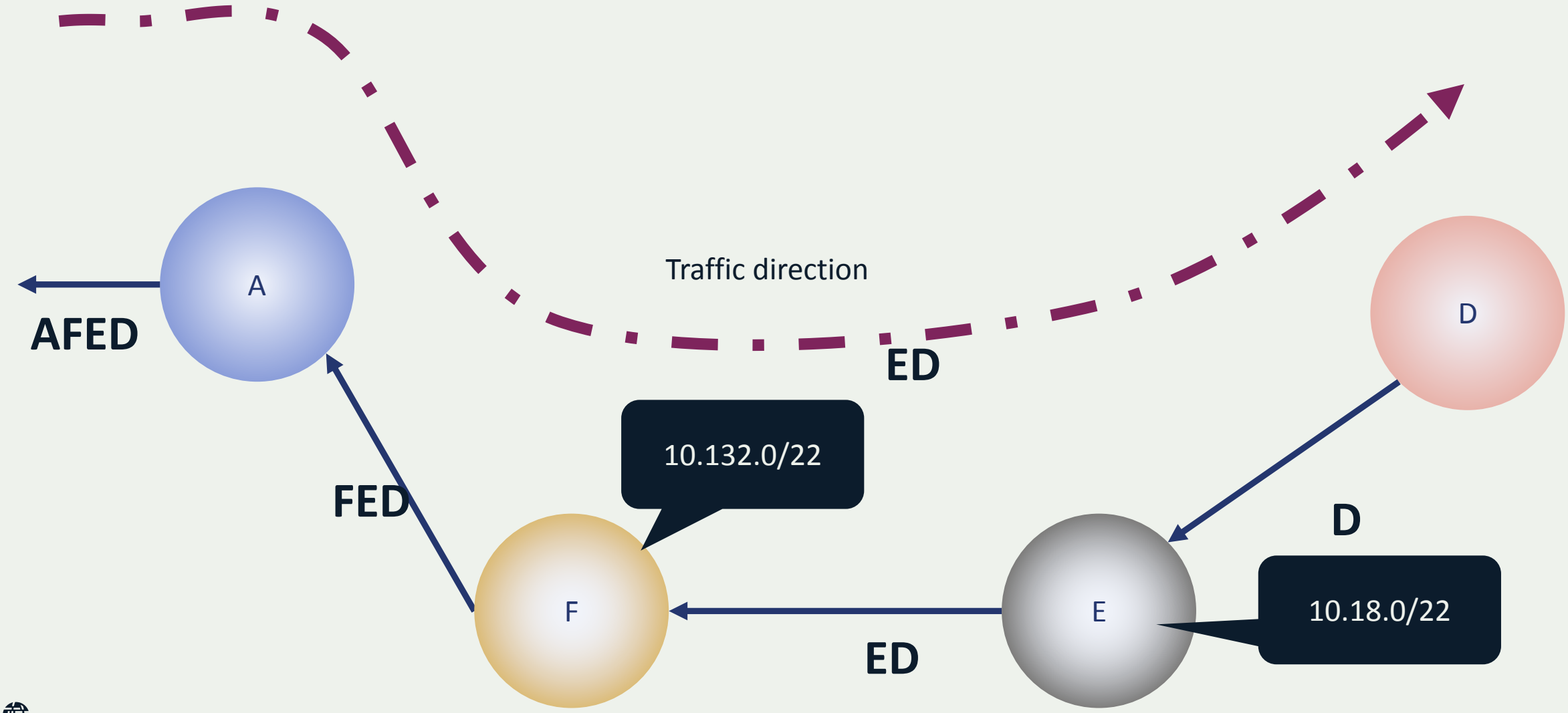


AS Path: Reachability Information

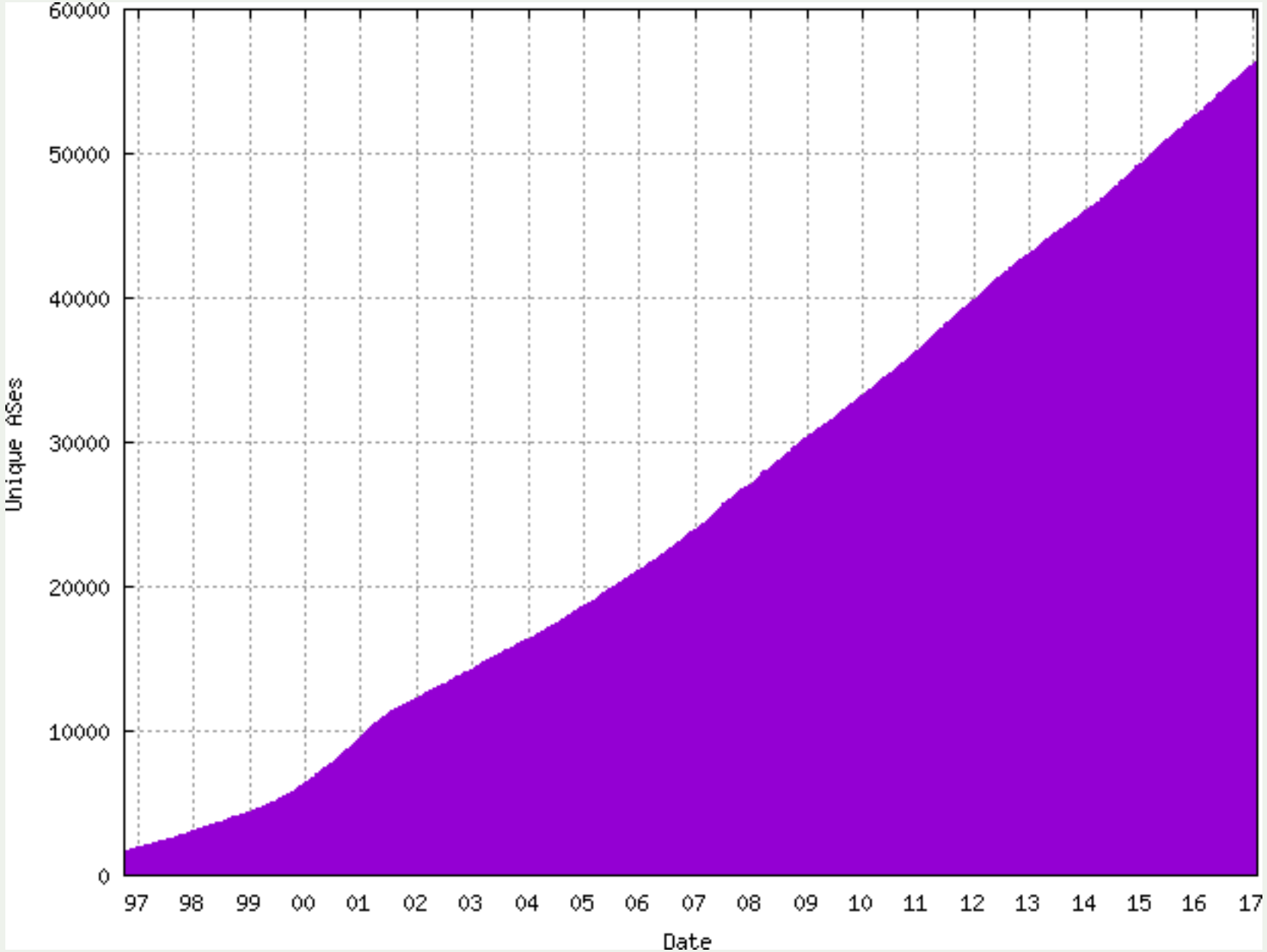


Announcements





Announcements Direction



http://www.cidr-report.org

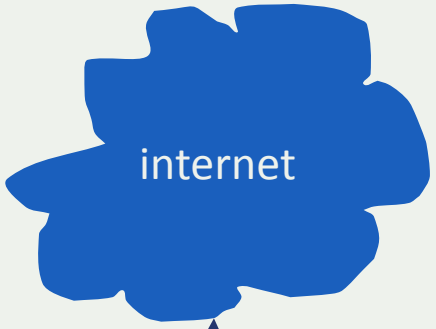
AS Types

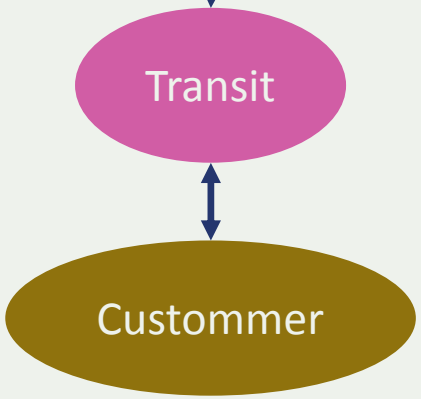
Multihomed:
Multiple neighbors

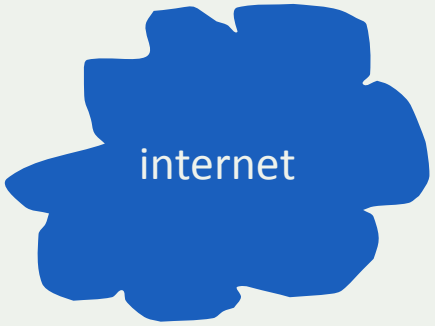
Stub:
Single neighbor

Transit:
Offers connectivity between ASes

Internet Exchange Point
Offers direct connectivity between ASes


internet


Transit
Custommer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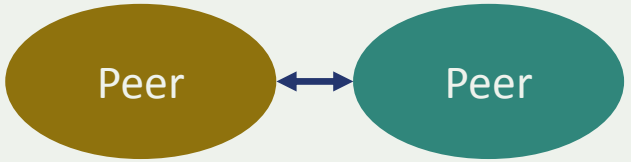
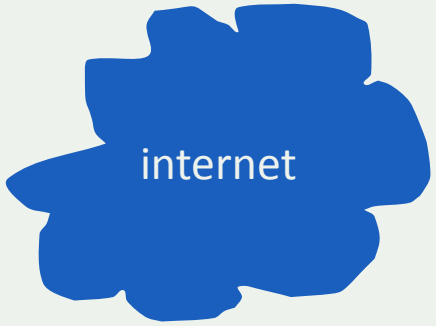

Peer
Peer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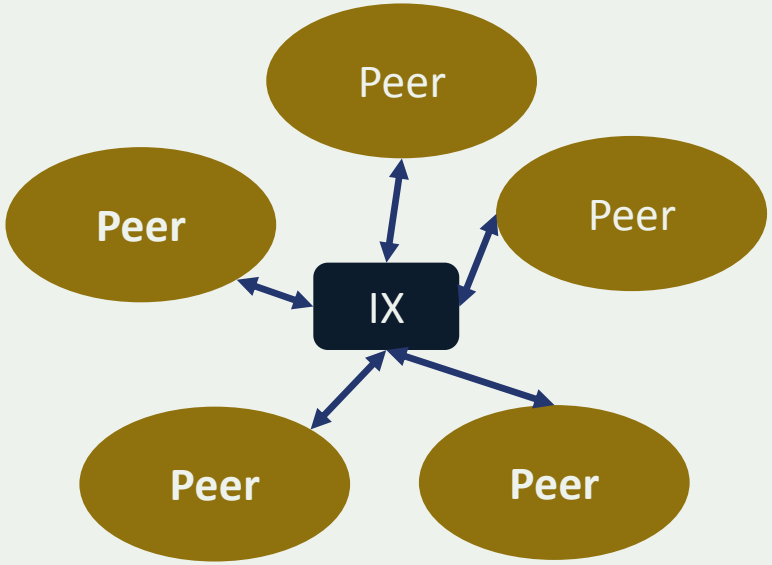
Peer
Peer
Peer
IX
Peer
Peer

Thank you.

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