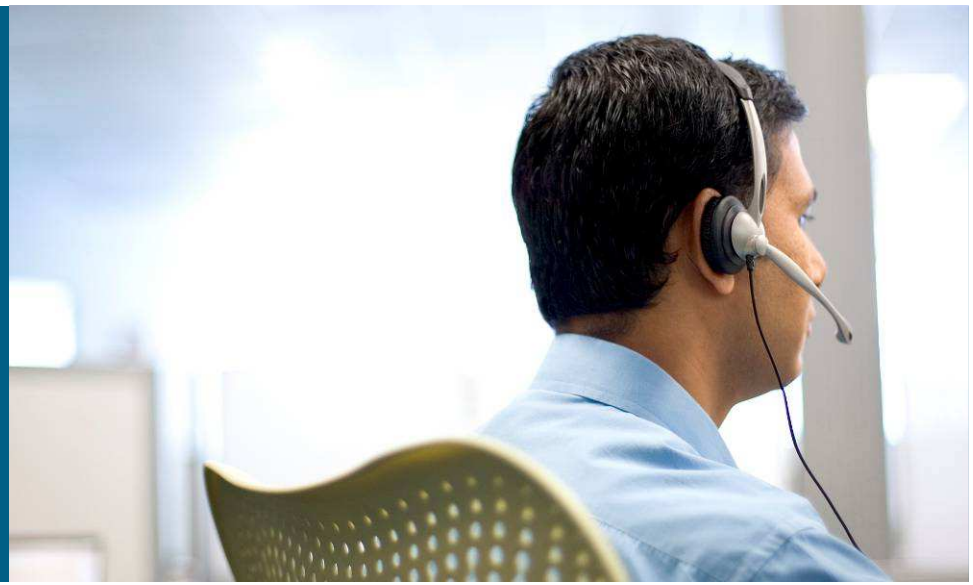
Introduction to Cisco Mobile IP Technology View



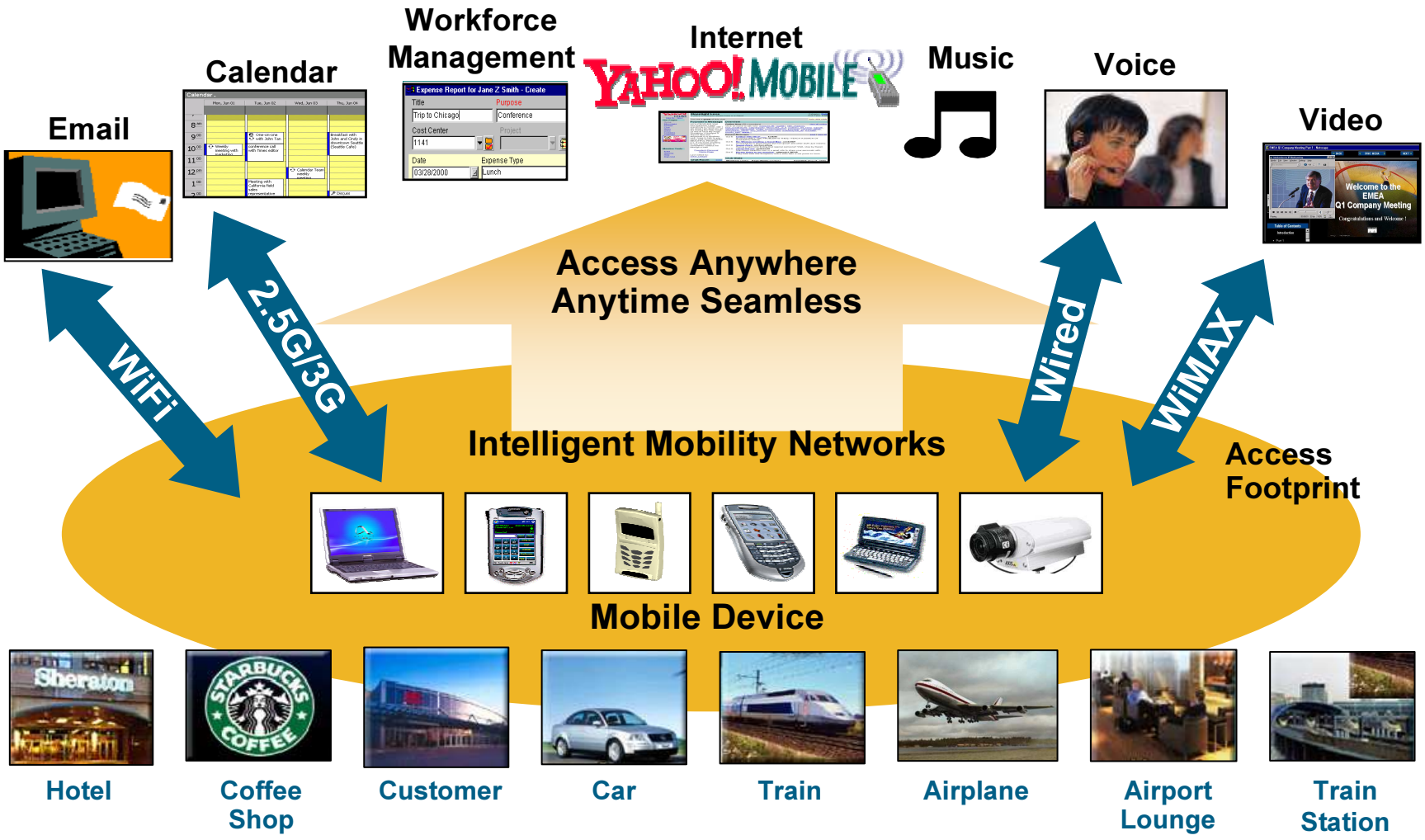
Cisco Systems

Agenda

- IP Mobility Challenges
- Mobile IP Technology Overview
- Cisco Mobile IP Product Overview
- Q and A

IP Mobility Vision

Enable Service and Business to Move with You



Mobility Network Environment Today

- Roaming across network boundaries and across various access media types

  DSL, Wi-Fi, Ethernet, 1xRTT/GPRS, GPS, satellite communications

- Different network media addressing different needs

  Wide coverage/low bandwidth

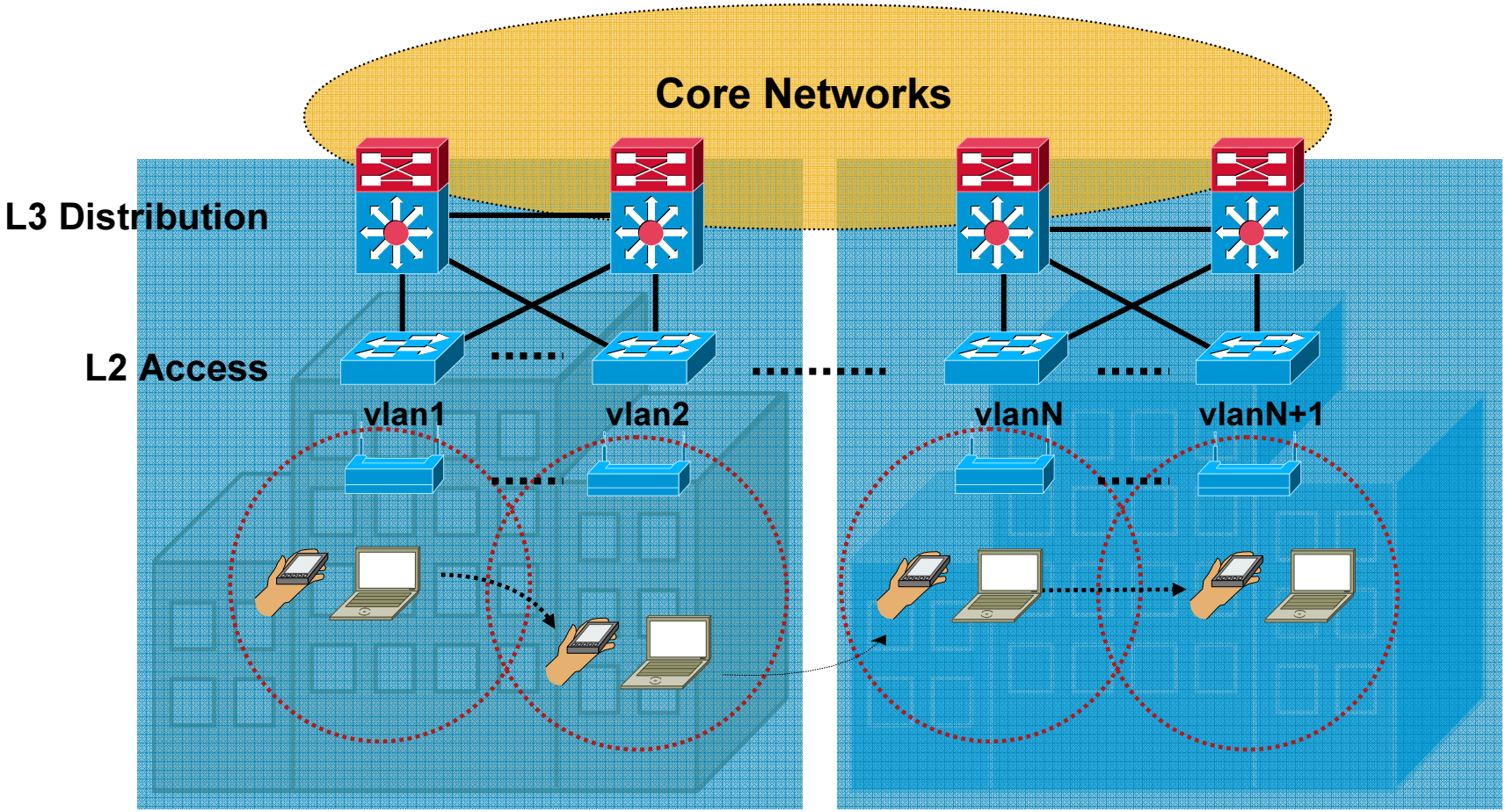
  Limited coverage/high bandwidth

- Access networks may belong to or go through publicly accessible networks

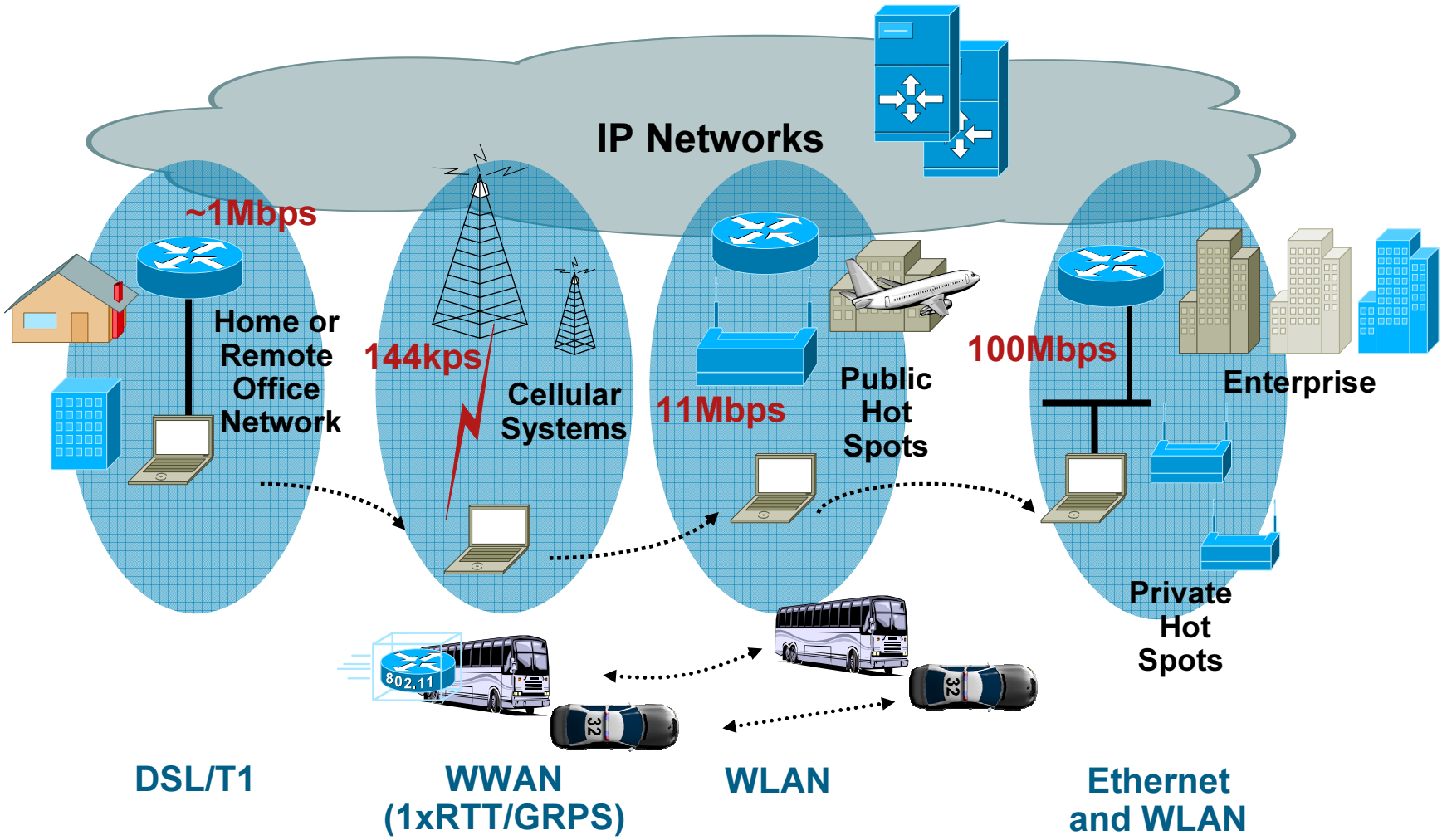
  Security is a consideration

Roaming in Enterprise Campus

Roaming Across Layer 3 Network Boundary

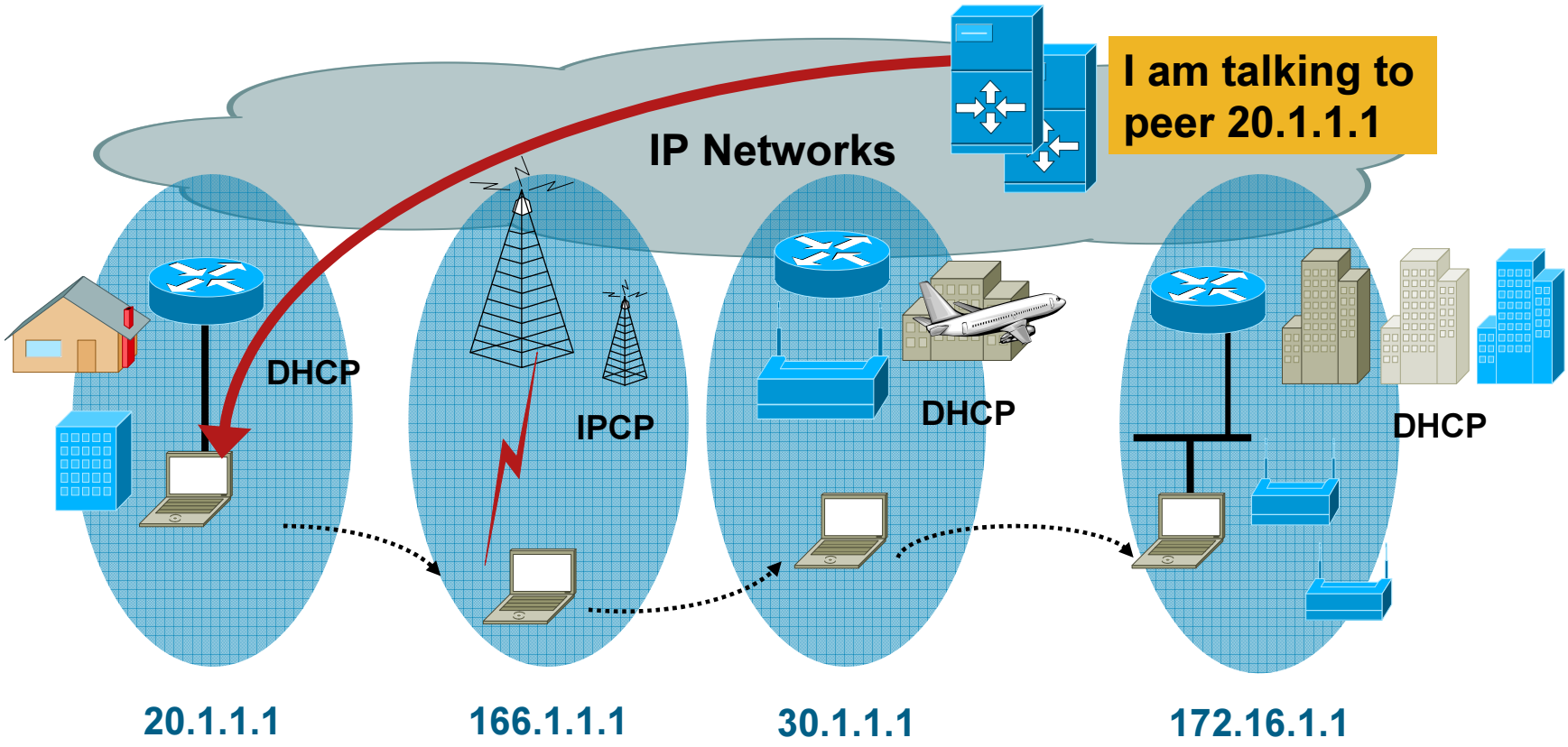


Anywhere Roaming Scenario



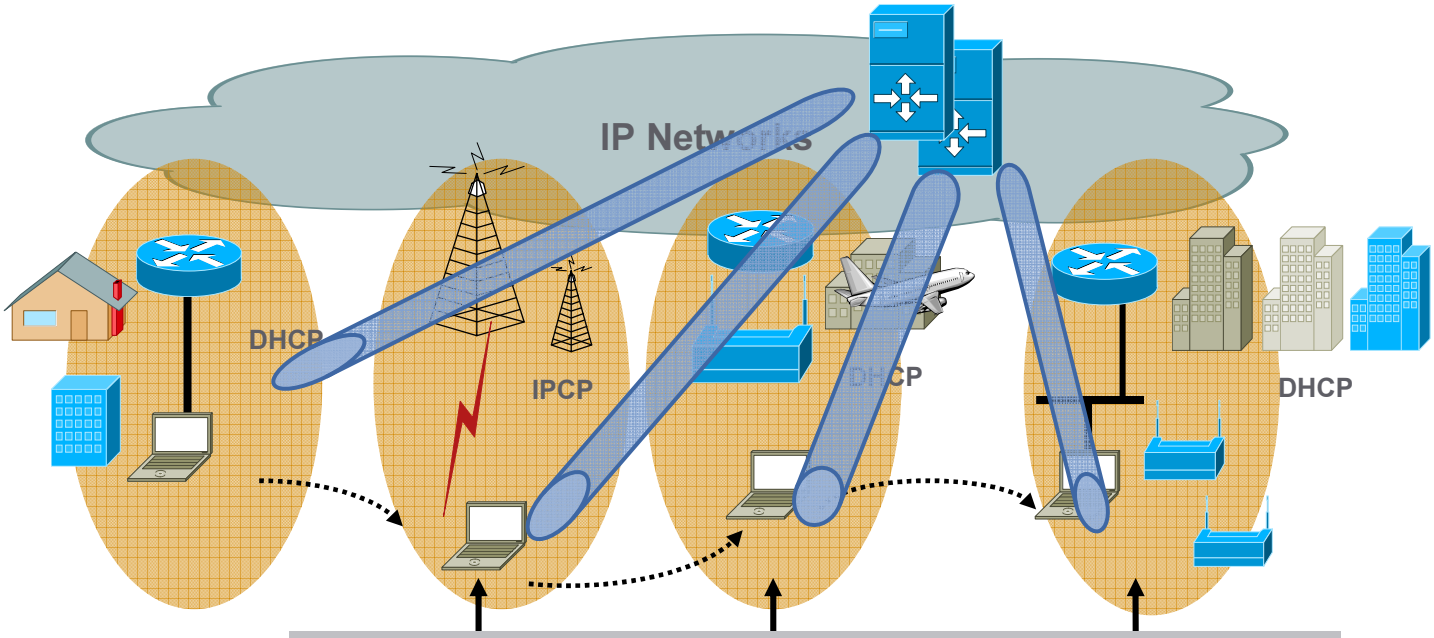
The Fundamental Technical Challenge

- The IP address of a mobile node changes when the node roams; this causes IP connectivity to be interrupted



The Impacts of the Challenge

- User workflow is interrupted
- Harder to manage remote mobile devices for IT

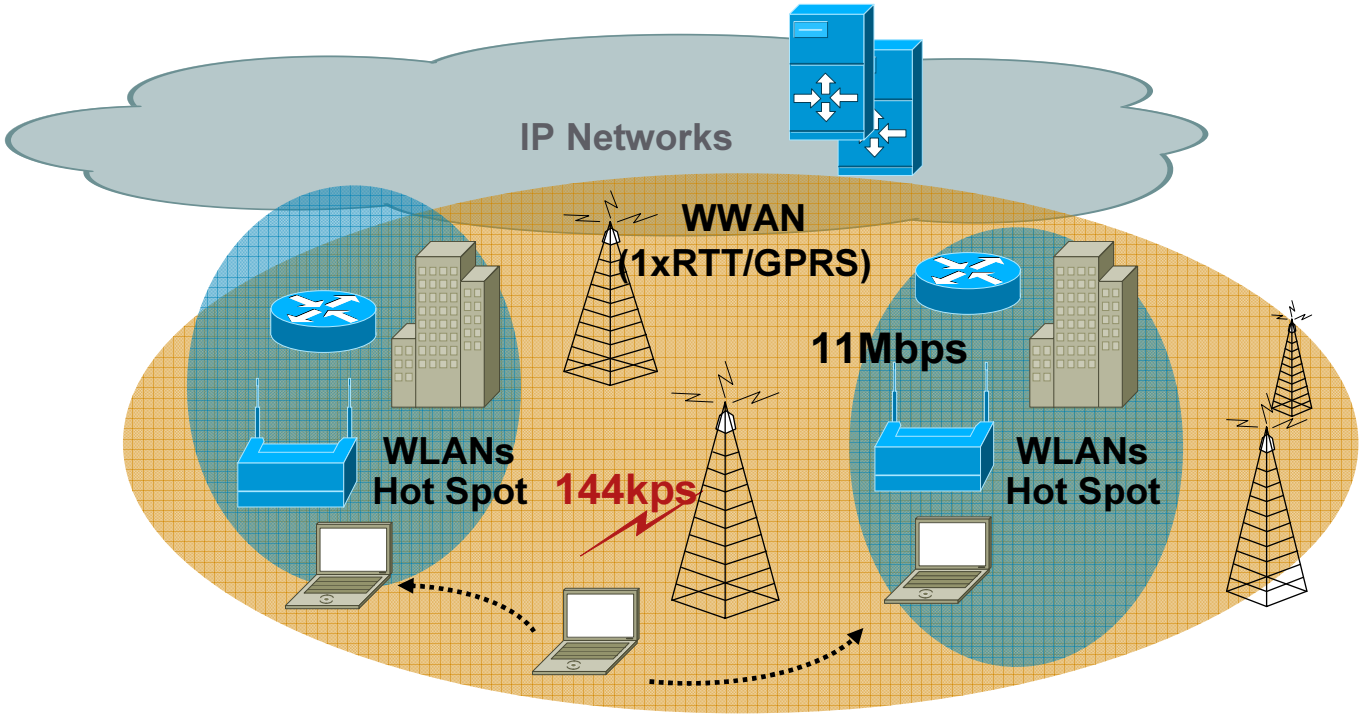


- IP, VPN, and application connections drop
- Restart VPN connection
- Restart application
- Re-login to the application

IPsec Tunnel

The Impacts of the Challenge (Cont.)

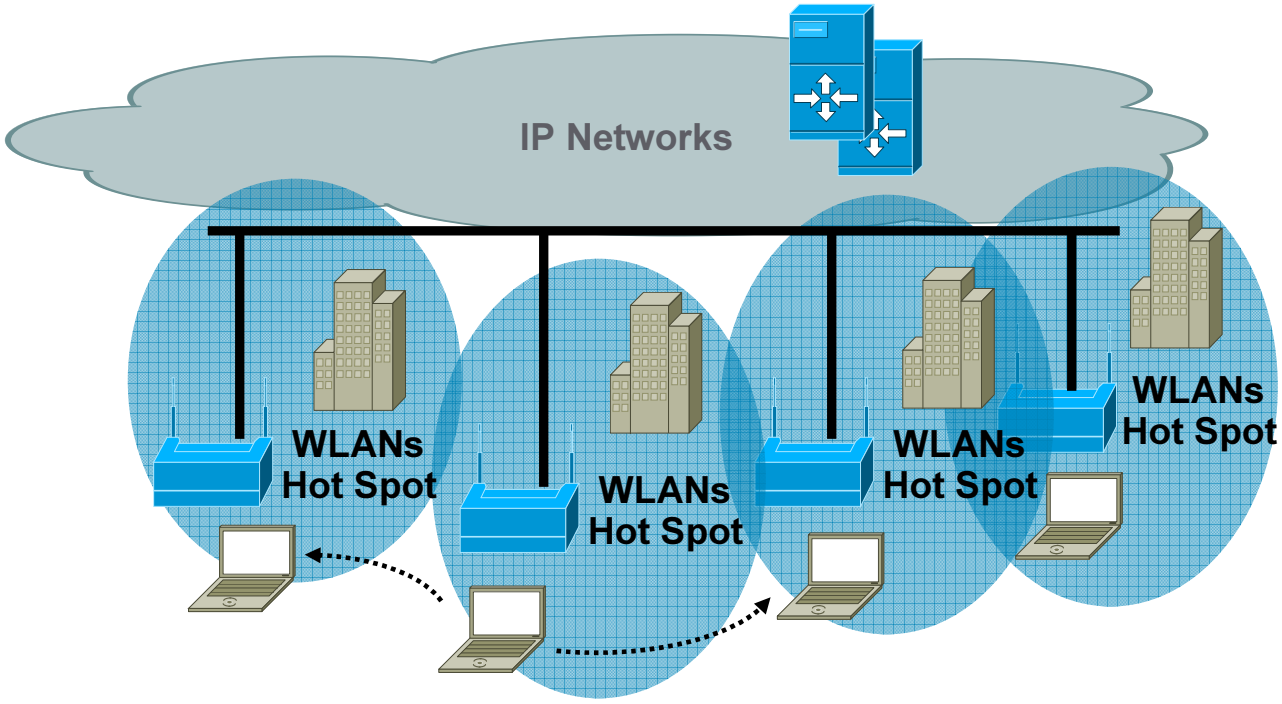
- IT or business investment is not maximized



When MN Roams from WWAN (Lower Bandwidth) to WLAN (Higher Bandwidth), Should It Stay in WWAN for IP Connectivity or Switch to WLAN for Higher Bandwidth?

The Impacts of the Challenge (Cont.)

- Not a scalable network design



One Flat Network Design Can Lead to Network Congestion

"Mobile IP: An IP Mobility protocol that provides an IP node the ability to retain the same IP address and maintain application connectivity while traveling across networks."

Mobile IP Addresses the Impacts

- Enable seamless user workflow

  Undisrupted IP connectivity after crossing subnets and/or changing network media types

  Maintain application operations, such as dispatch, field report

- Simplify the network experiences of the user

  Do not need to reestablish VPN, restart application, or login again

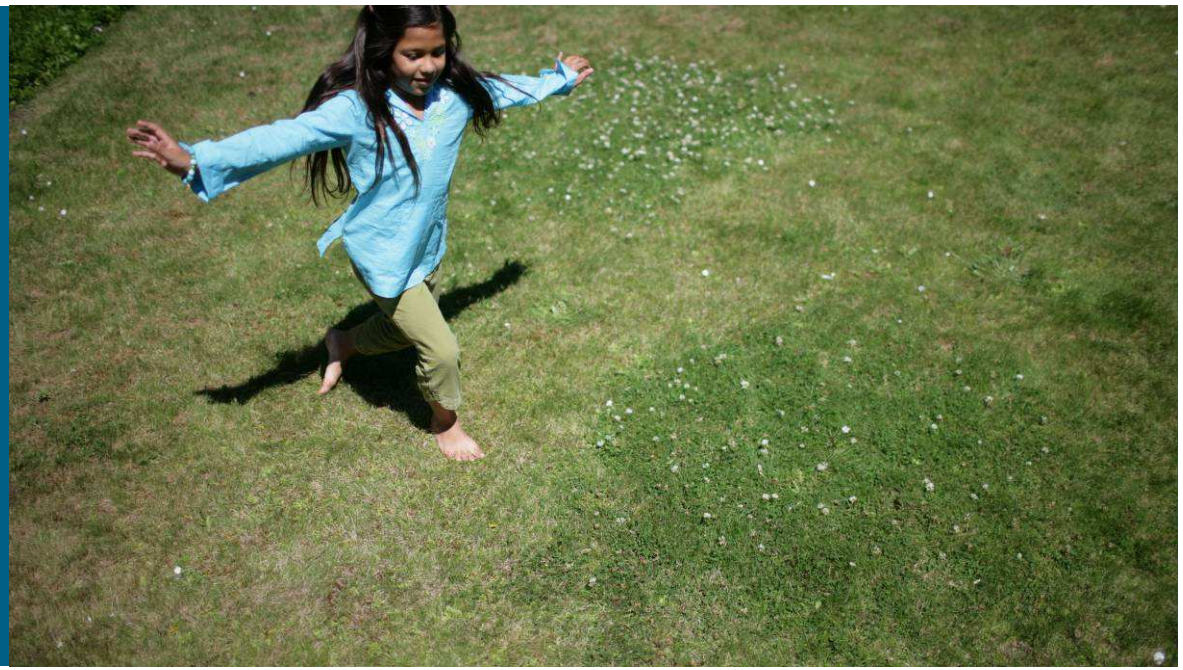
- Protect IT investment

  Enable use of the highest bandwidth link or the preferred one

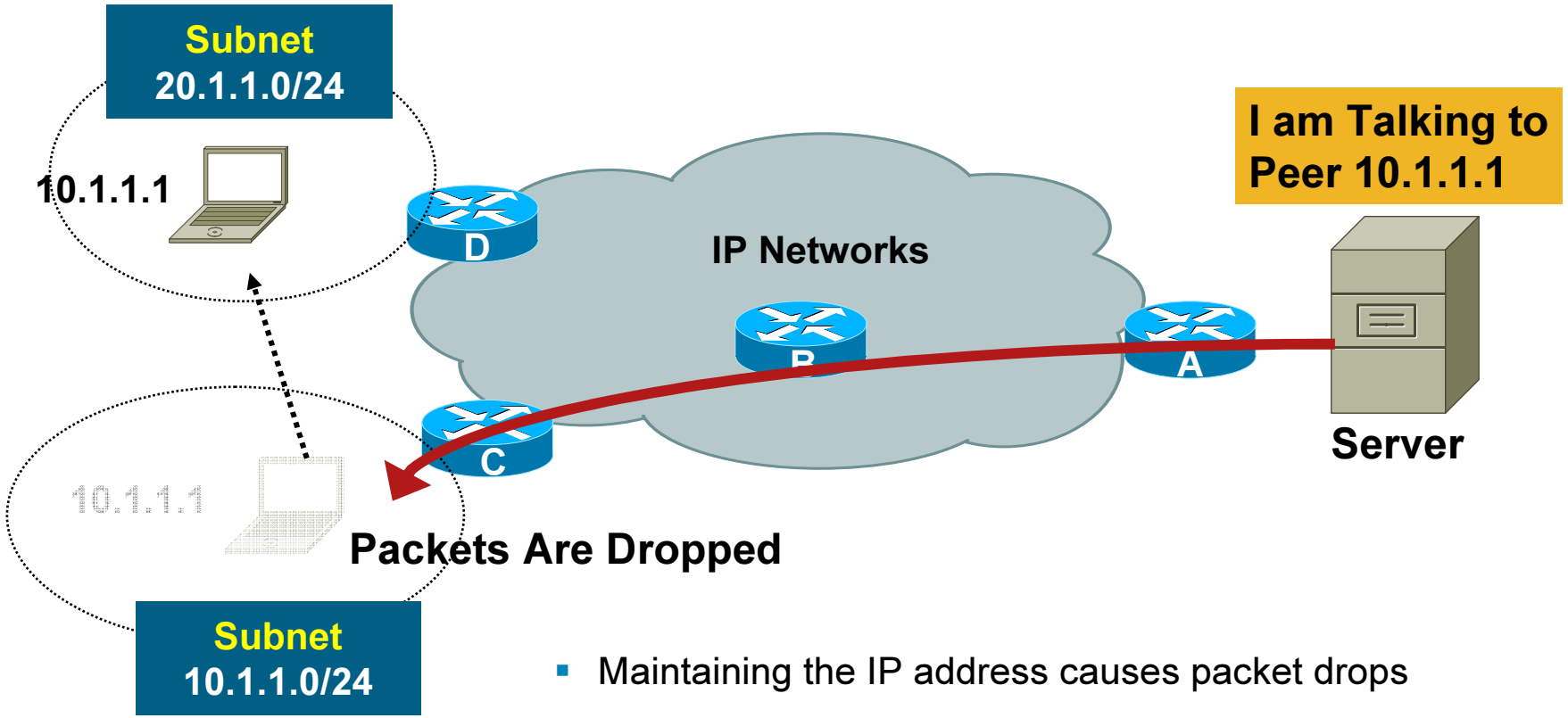
- Eases WLAN network design for better scalability

  No restriction to design one flat network

Mobile IP Technology Overview

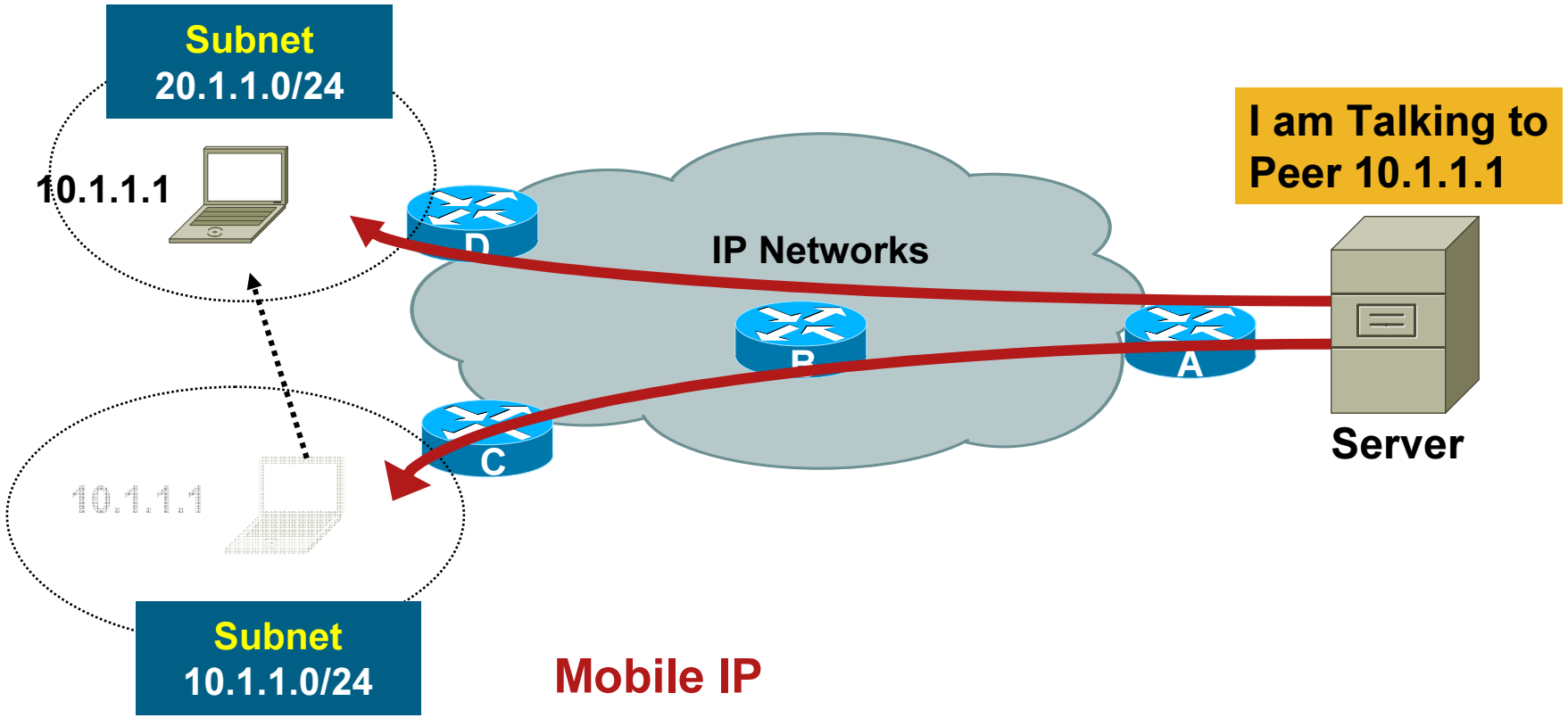


Technical Problem Without Mobile IP



- Maintaining the IP address causes packet drops
- Renewing the IP address loses application continuity
- Injecting host route has routing convergence, scalability, and stability concerns

Technical Problem Without Mobile IP



Mobile IP

- Maintains the same IP address to maintain application continuity and avoid the impacts
- Minimizes routing convergence, scalability, and stability

Mobile IP Components

- Home Agent (HA)

  Serves as the anchor point (home network) for a mobile device, regardless its given location

  Router maintains current location of the mobile node and forwards traffic there

- Foreign Agent (FA)

  Represents the current location (visiting network) of a mobile device

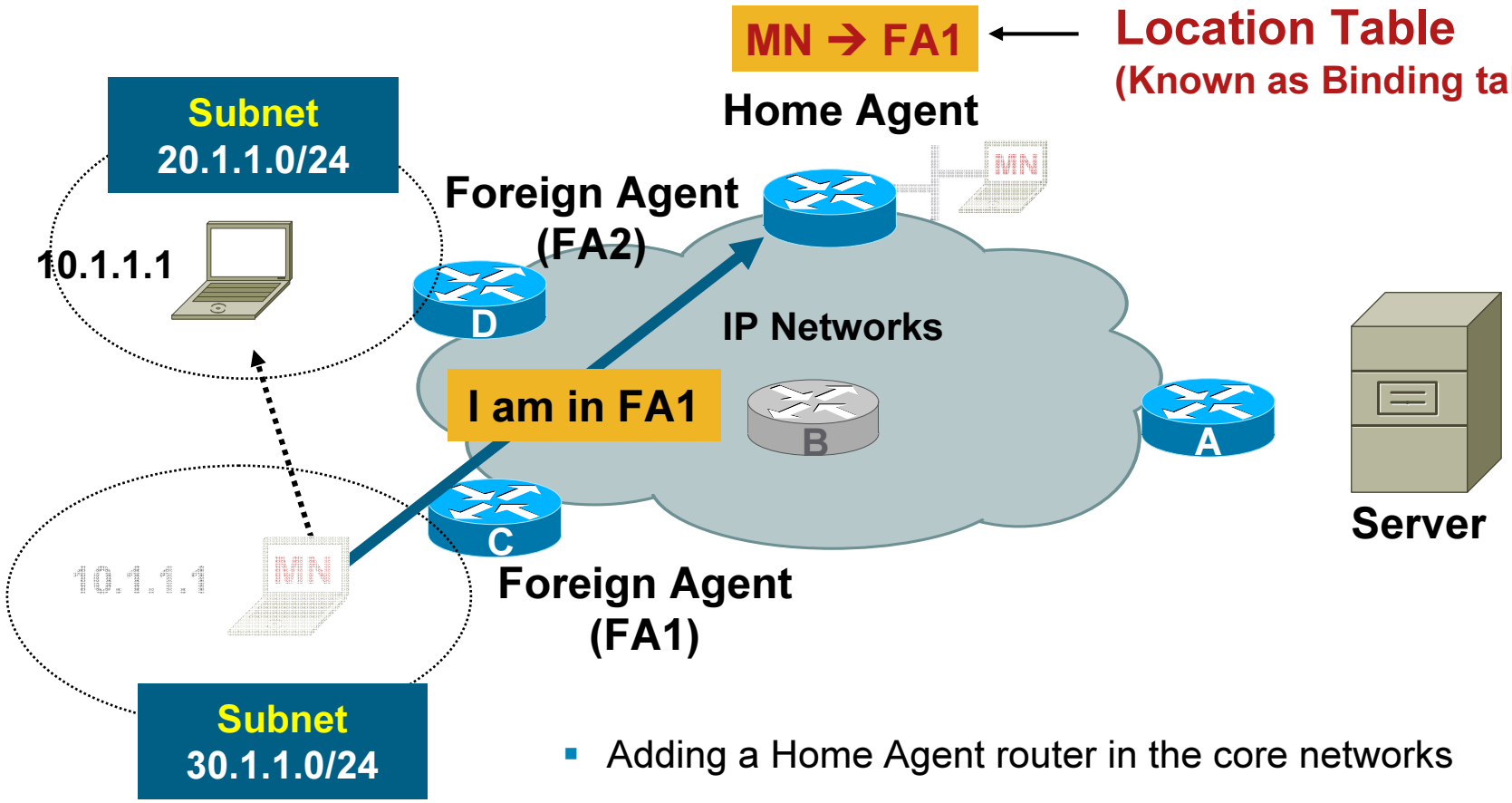
  Routers provides routing services (ie: encapsulation and administrative control), to the mobile device

- Mobile Node (MN)

  Mobile device that allows the device to report to its Home Agent its current visiting network

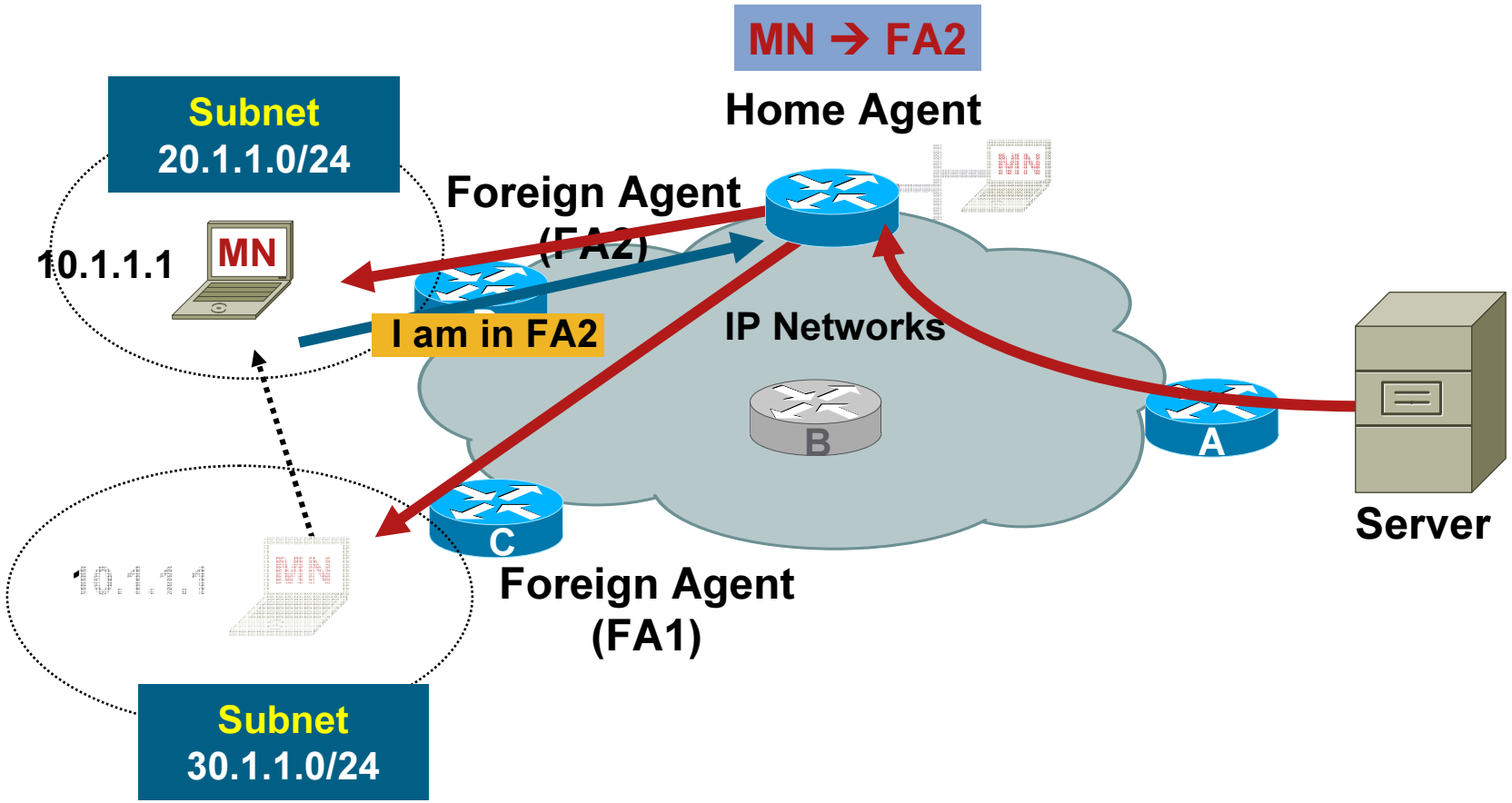
  Hosts with Mobile IP client software

Adding Mobile IP for Seamless Roaming

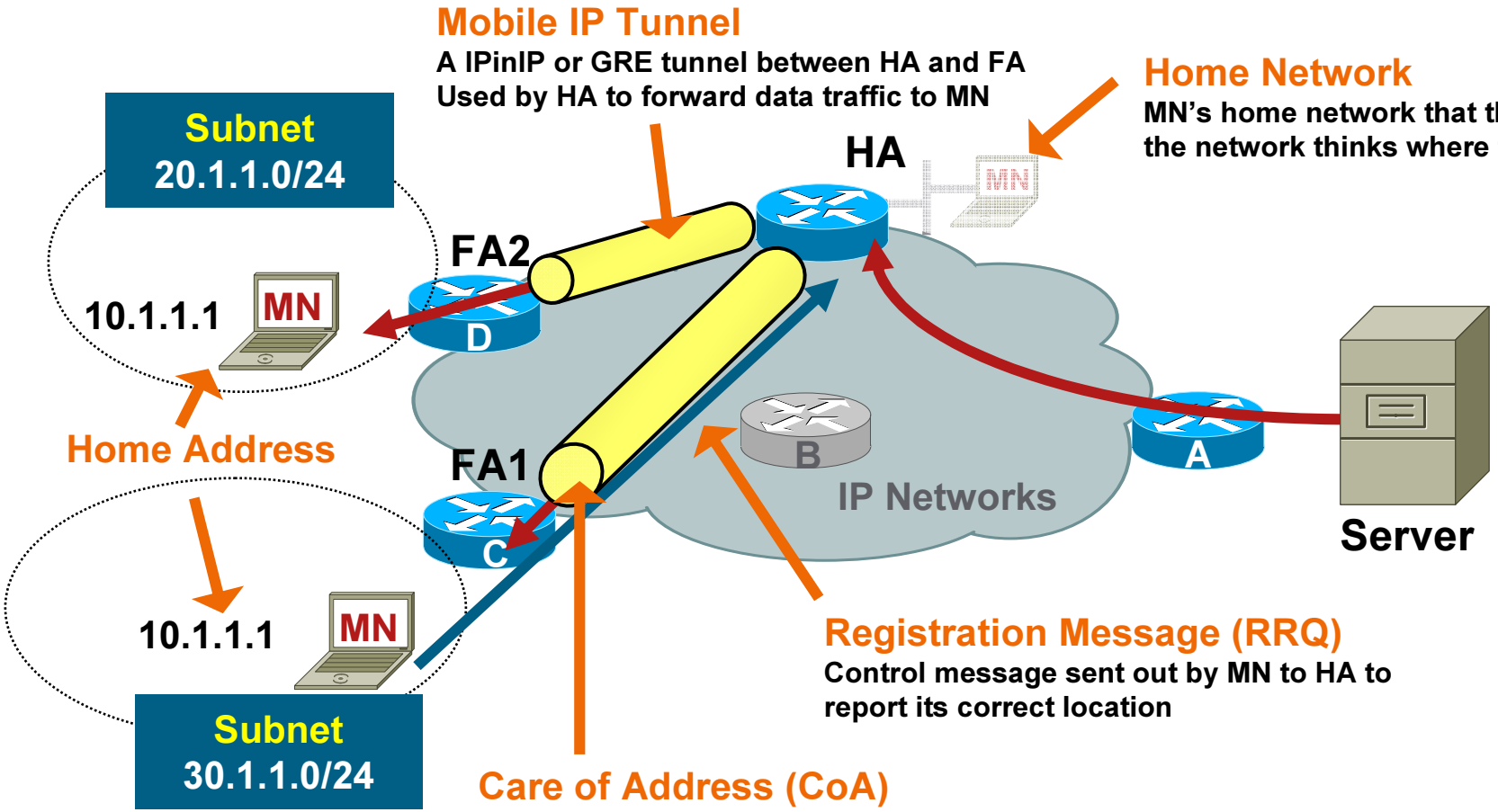


- Adding a Home Agent router in the core networks
- Enabling Foreign Agent function in the access routers
- Adding Mobile IP client software on the mobile device

Mobile IP Data Traffic Flow Overview



Mobile IP Terminology



Cisco Mobile IP Product Overview

Cisco IOS IP Mobility Portfolios

Mobile IP-Based

Local Area Mobility

- Server migration in an enterprise

IS-835-Based Mobile IP

- Subscriber data session continuity within a cellular data system

IETF Standard Mobile IP

- Seamless session and application continuity across various networks (wireless and wired)

Cisco Mobile Networks

- Cisco innovation—based on IETF standard Mobile IP
- Group mobility—mobilizing an entire subnet
- Remote mobile office

Cisco Mobile VPN

- Integrating security and mobility
- Seamless secure mobility for host mobility

Cisco Mobile IPv6 and NEMO*

- IPv6 support for host and network mobility

1990s

*NEMO planned

Cisco Mobile IP—Standard-Based Solution

- Approved by the Internet Engineering Steering Group (IESG) in June 1996; published proposed standard in November 1996
- Mobile IP is an IETF proposed standard solution for mobility at Layer 3 IP
  - RFC 3344: Mobile IP
  - RFC 2003: Tunnel Encapsulation
  - RFC 2005: Mobile IP Applicability
  - RFC 2006: Mobile IP MIB
  - RFC 2794: Mobile IP Network Access Identifier Extension
  - RFC 3012: Mobile IP Challenge/Response Extension
  - RFC 3024: Reverse Tunneling for Mobile IP
  - RFC 3115: Mobile IP Vendor/Organization Specific Extension

Cisco Mobile IP Value-Add

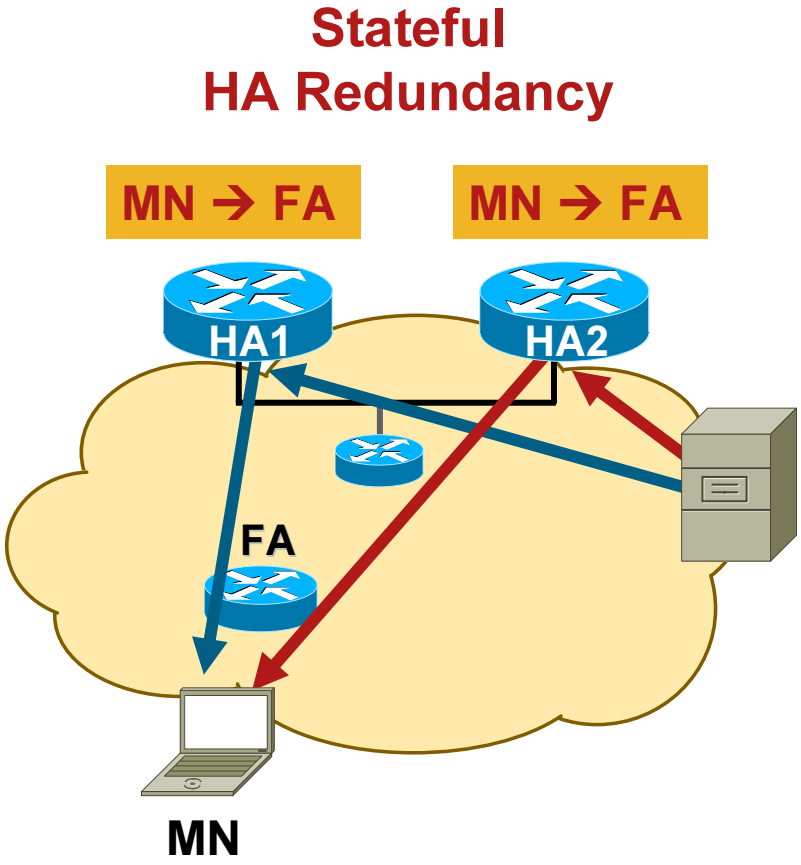
- Security
- High Availability
- Deployment Flexibility
- Mobile Networks and Mobile Routers

Cisco Mobile IP Security

- Addresses both control and data plane
  - Control plane security
    - Enables only authorized users to gain mobile IP service
    - Standard-based with AAA server integration
  - Data plane security
    - Integrates IPsec VPN (Mobile IPsec VPN) for data encryption
    - Inherits all the security benefits of IPsec
- Separation of control and data security for flexible deployment requirements

Cisco Mobile IP High Availability

- Home Agent Redundancy
  - HA is the “command center” for mobile nodes
  - Stateful approach
  - Session continuity undisrupted
- FA Redundancy
  - Protocol build-in—periodical Agent Advertisement



Cisco Mobile IP Deployment Flexibility Roaming Networks Analysis

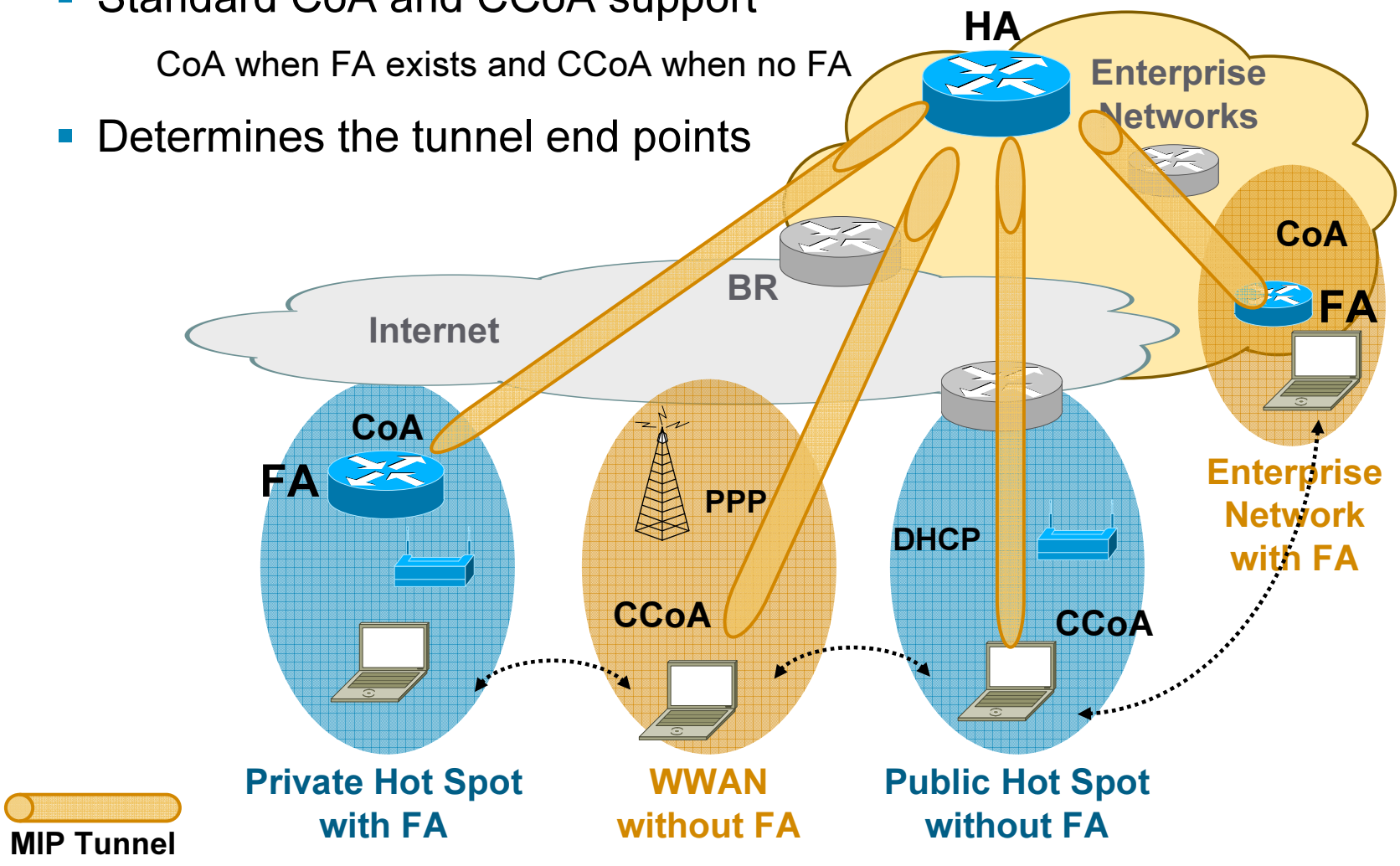
- Foreign Agent may or may not be available
  - Private hot spot versus public hot spot
- Private or Public IP addressing
  - Private or public CoA (or Collocated CoA)
- Security protection
  - Topological incorrect filtering
  - Private IP address filtering

Mobile IP Solution for FA Availability

- Standard CoA and CCoA support

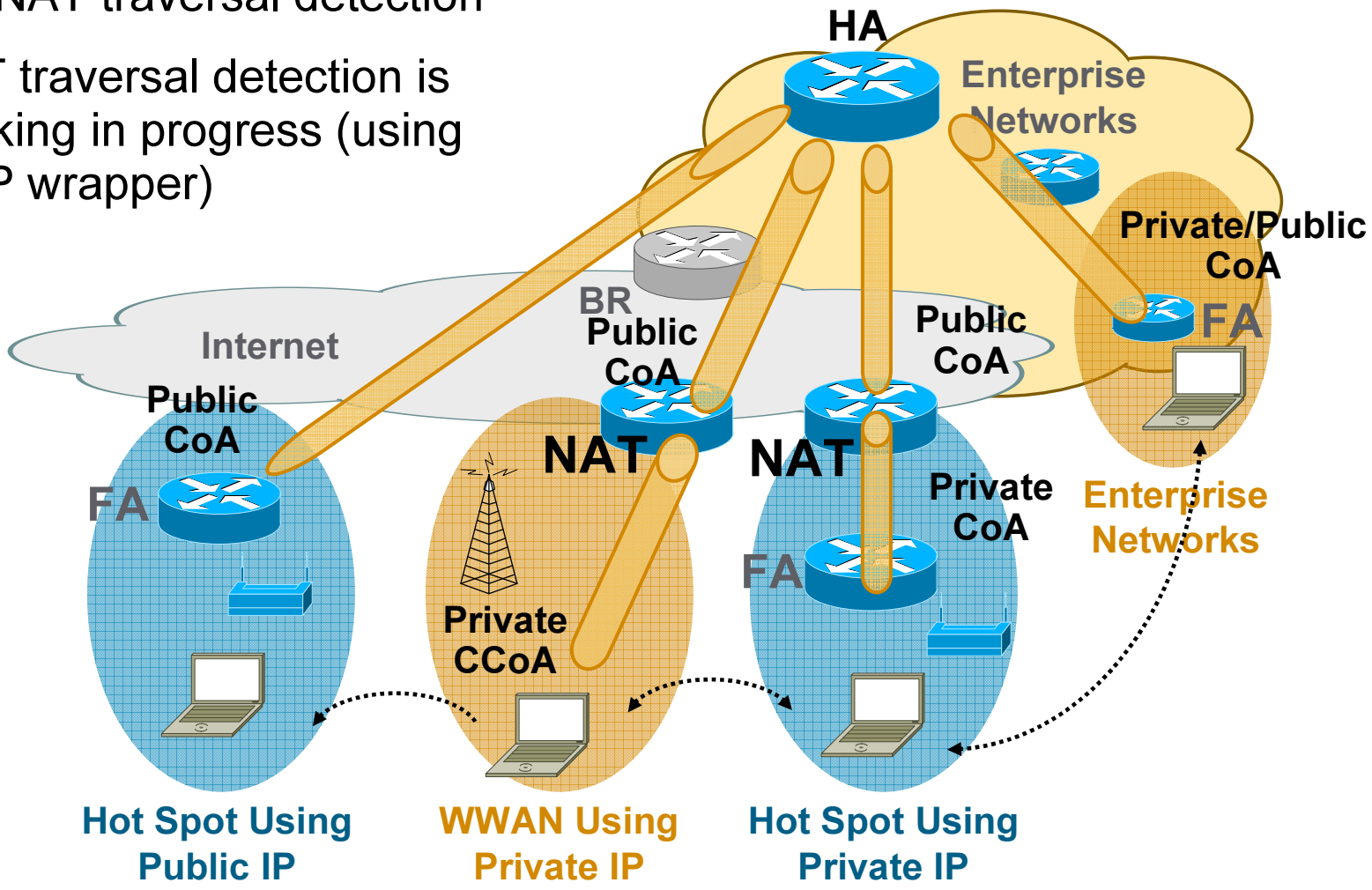
  CoA when FA exists and CCoA when no FA

- Determines the tunnel end points

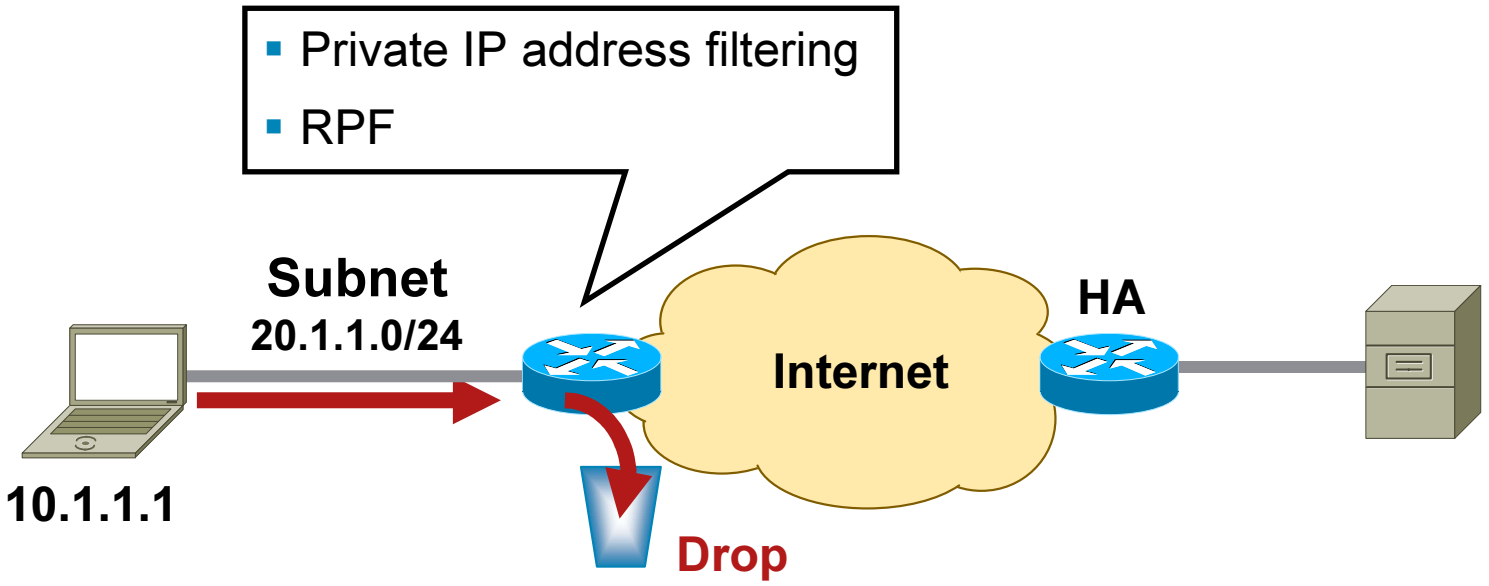


Solution for Public and Private IP Addressing

- HA NAT traversal detection
- PAT traversal detection is working in progress (using UDP wrapper)

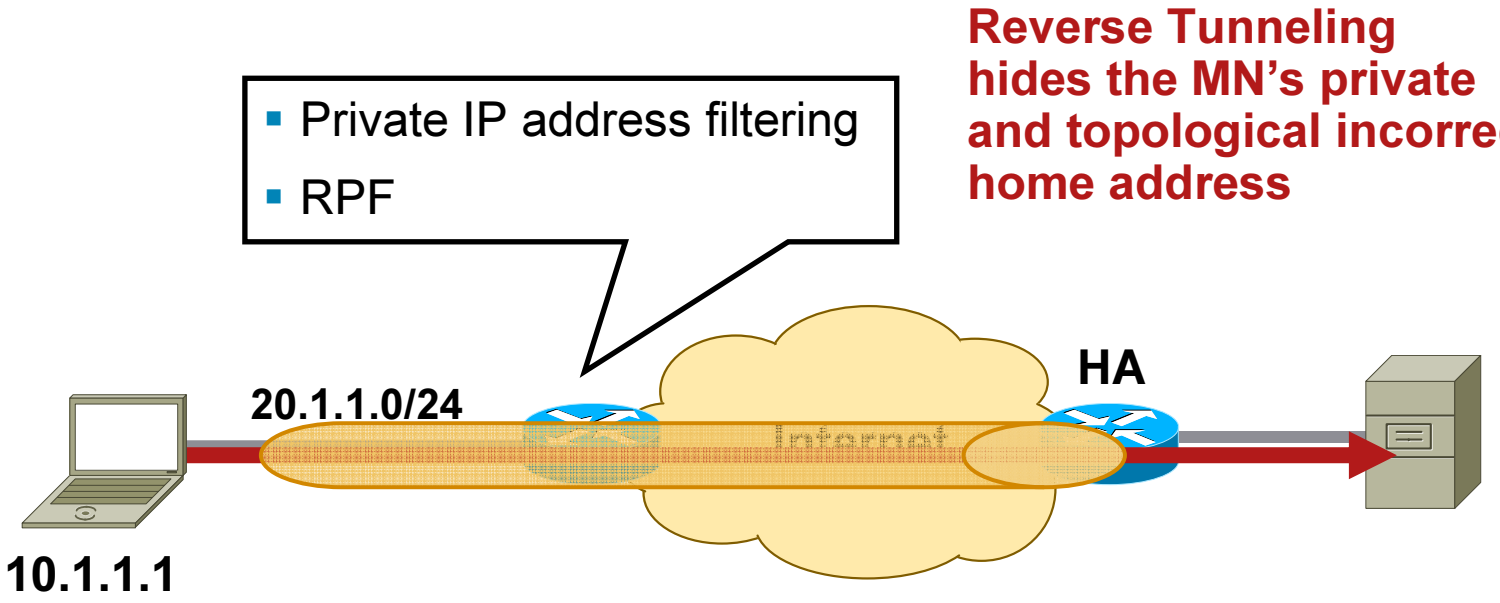


Problem of Filtering and RPF with Mobile IP



- As the source IP address (10.1.1.1) is in private IP address range, I'll drop the packet
- As the source IP address is not within 20.1.1.0/24 subnet, I'll drop the packet

Solution for Filtering and RPF Problem



- As the source IP address is in public IP address range, I'll pass the packet
- As the source IP address is within 20.1.1.0/24 subnet, I'll pass the packet

Deployment Flexibility: Software and Hardware Client Support

- Mobile IP Client

  Mobile IP client software in a host device

  Suitable for mobile users that require “full mobility”

- Mobile Router

  Cisco mobile router provides mobility function for host devices

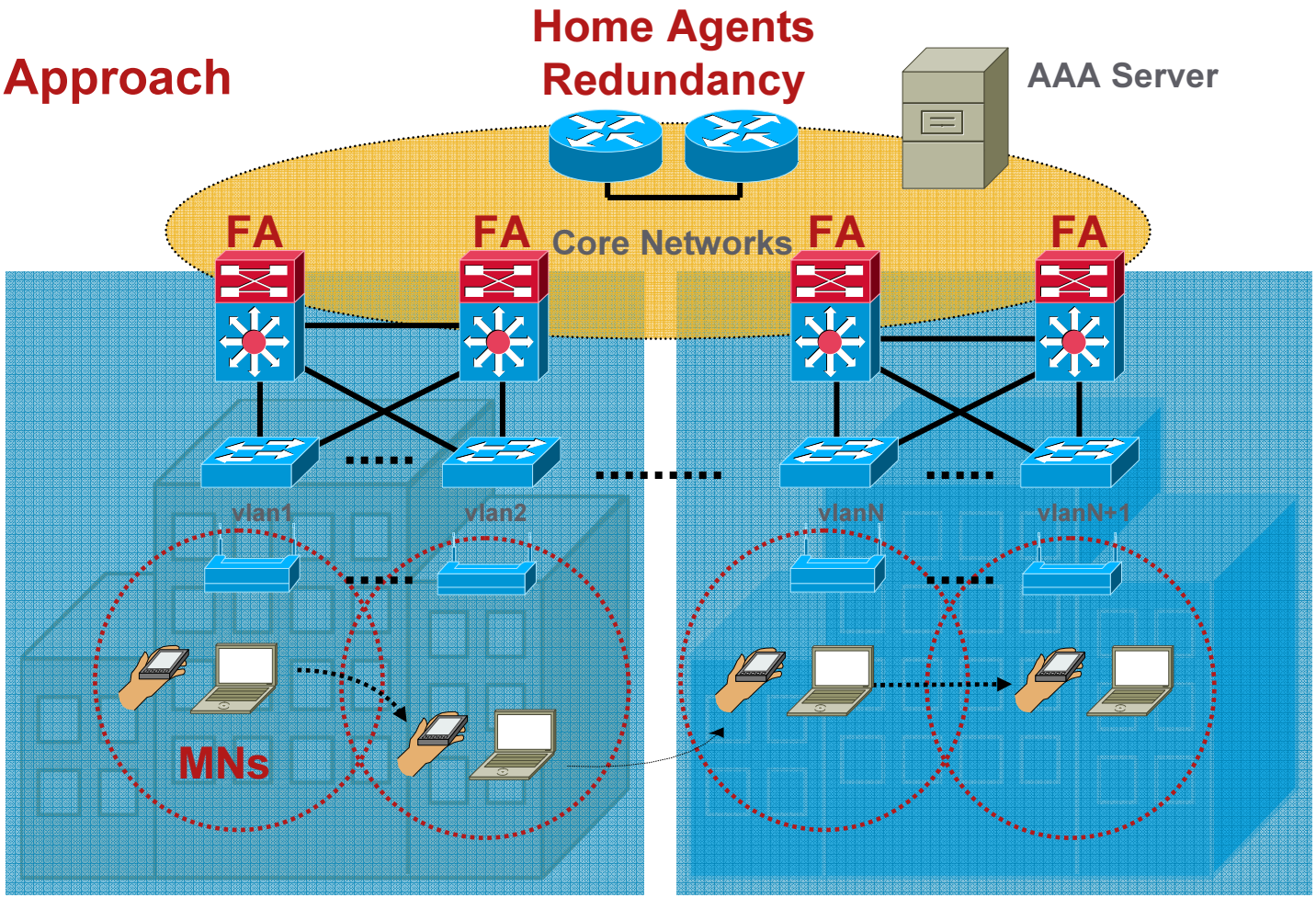
  Suitable for the environment that host devices are moved along with mobile networks

All Options Can Leverage One Standard-Based Mobile IP Infrastructure

Cisco IP Mobility on an Enterprise Campus

Client-Based Approach

- Centralized HA
- Full mobility
- MN can roam inside or outside of enterprise campus*

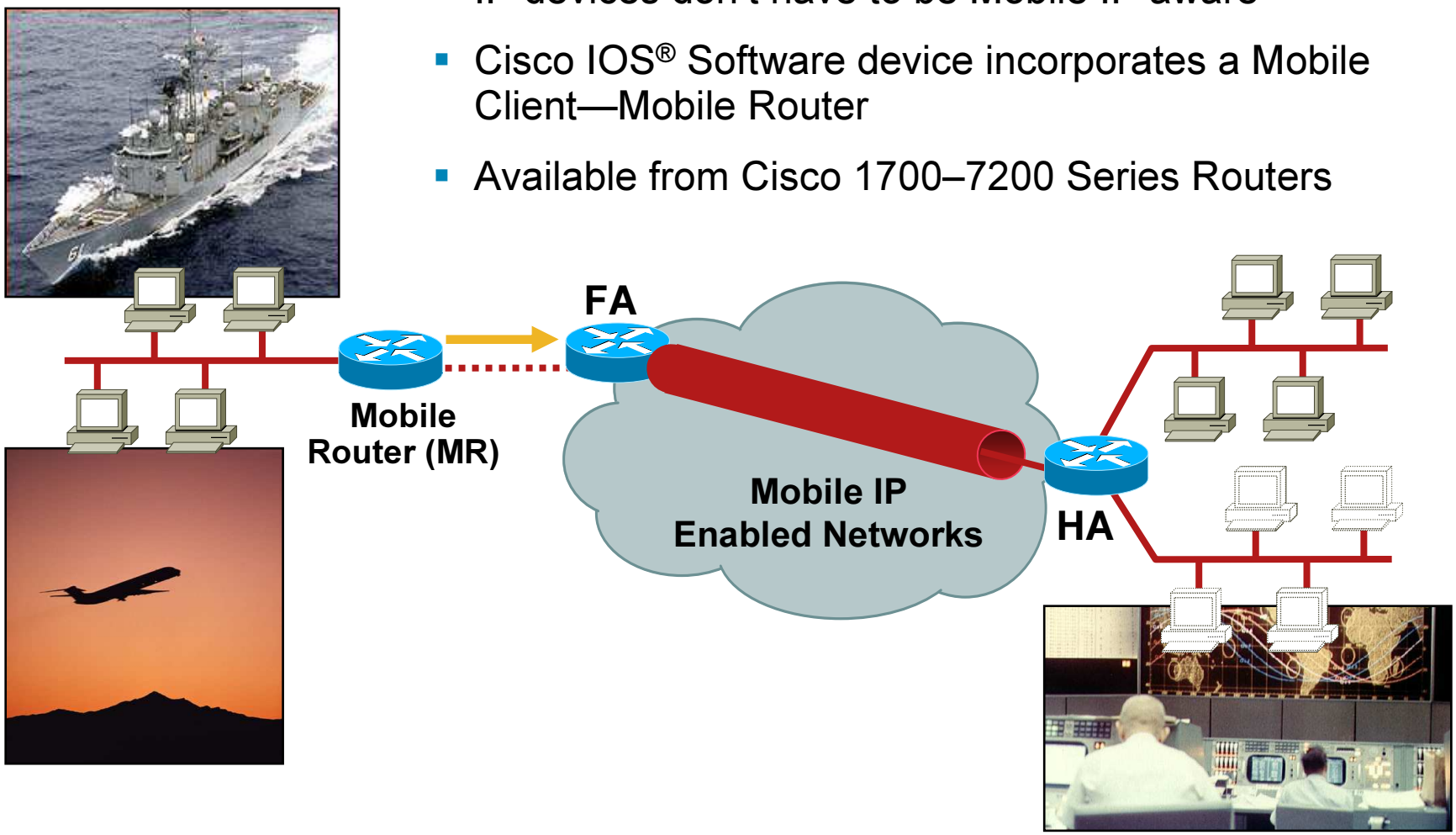


*Using Firewall traversal (or known as dual HA) design

Cisco IOS Mobile Networks

"Networks in Motion"

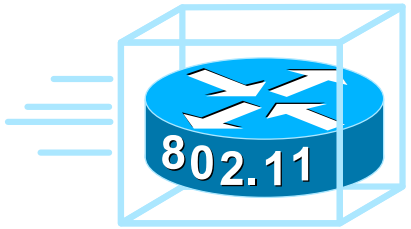
- IP devices don't have to be Mobile IP aware
- Cisco IOS® Software device incorporates a Mobile Client—Mobile Router
- Available from Cisco 1700–7200 Series Routers

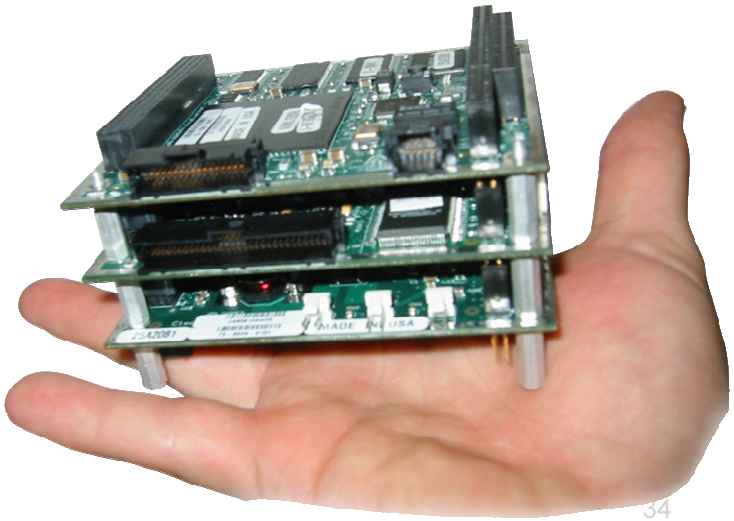


Cisco 3200 Mobile Access Router

New Cisco IOS Software Router that Extends the IP Frontier to a Mobile Vehicular Environment

- Small footprint and low power consumption
- Rugged design
- Optimized for embedded applications
- Uses Cisco IOS Software, Mobile IP, and Cisco Mobile Networks

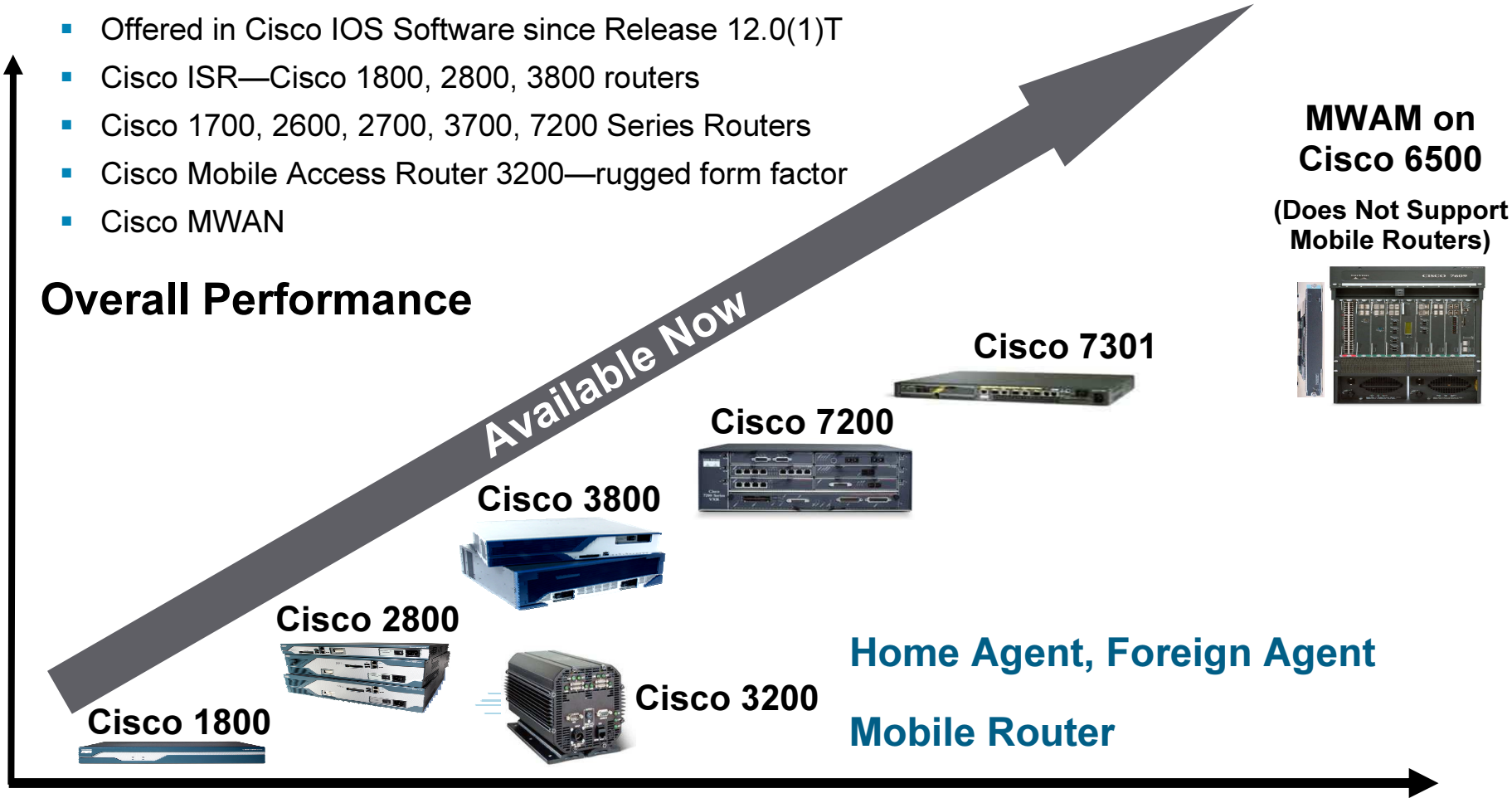




Product Availability

Wide Range of Platform Selection and Future Migration Support

- Offered in Cisco IOS Software since Release 12.0(1)T
- Cisco ISR—Cisco 1800, 2800, 3800 routers
- Cisco 1700, 2600, 2700, 3700, 7200 Series Routers
- Cisco Mobile Access Router 3200—rugged form factor
- Cisco MWAN



Mobile IP Client Options

- Birdstep Mobile IP Client

  www.birdstep.com

- ipUnPlugged Roaming Client

  www.ipunplugged.com

Cisco Mobile IP Highlights

- Available since 1999—experiences gained
- Standard Based (IETF and IS-835)—interoperability proof
- Layer 3 technology—Layer 2 media independence
- High Network Availability—stateful Home Agent Redundancy for seamless failover
- Tighten Security—secure both control and data traffic
- Flexibility in deployment—addressing different mobility requirements and network environment
- Integrated in Cisco IOS Software—leverage feature rich Cisco IOS Software