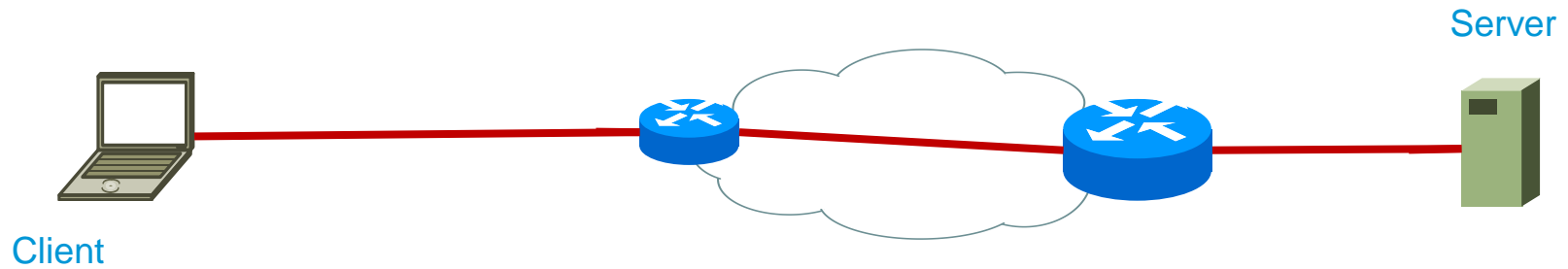


Vlastnosti sítě v době rozmachu mobilních zařízení

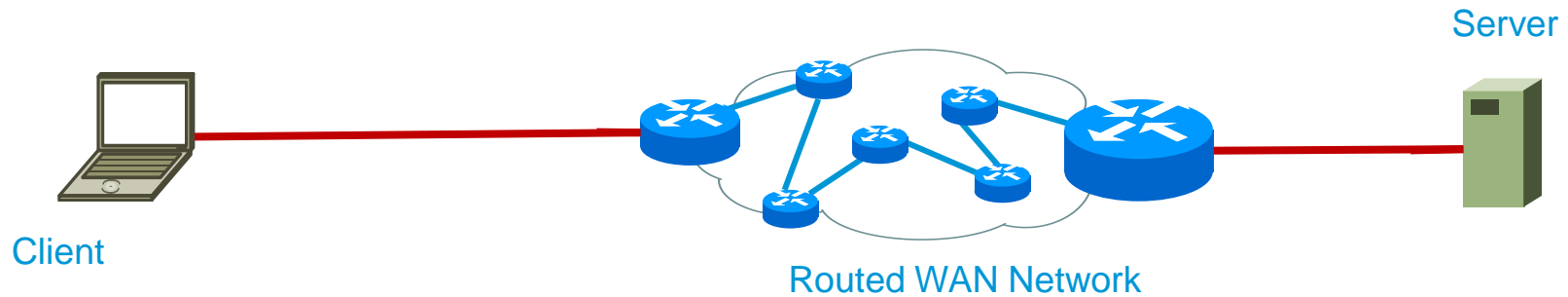
Radek Boch
Systems Engineer, Cisco
CCIE #7095

7.4.2011

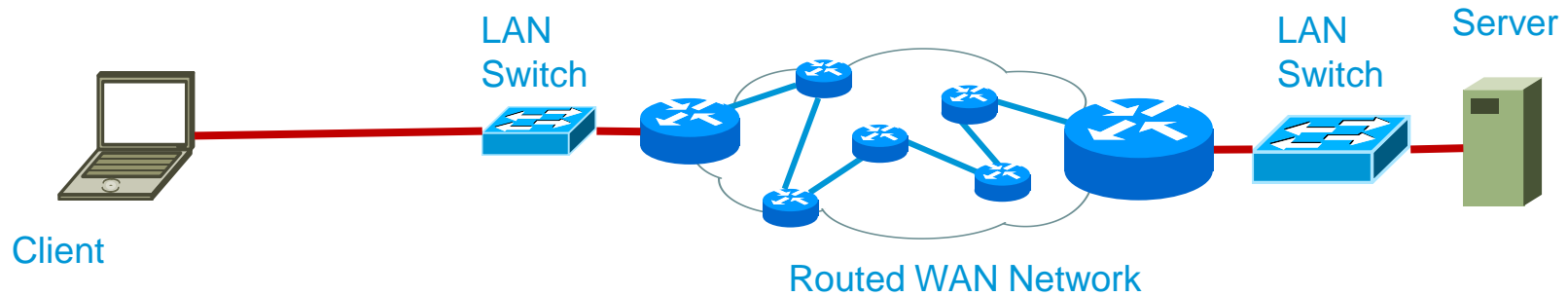
IP everywhere



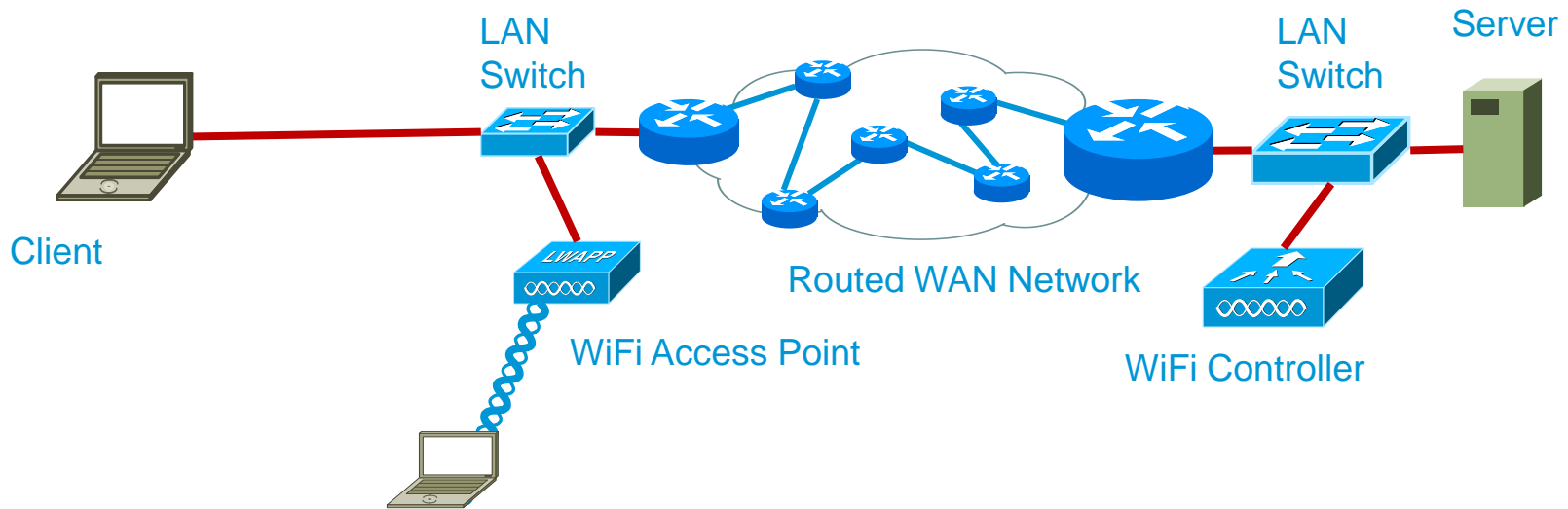
IP everywhere



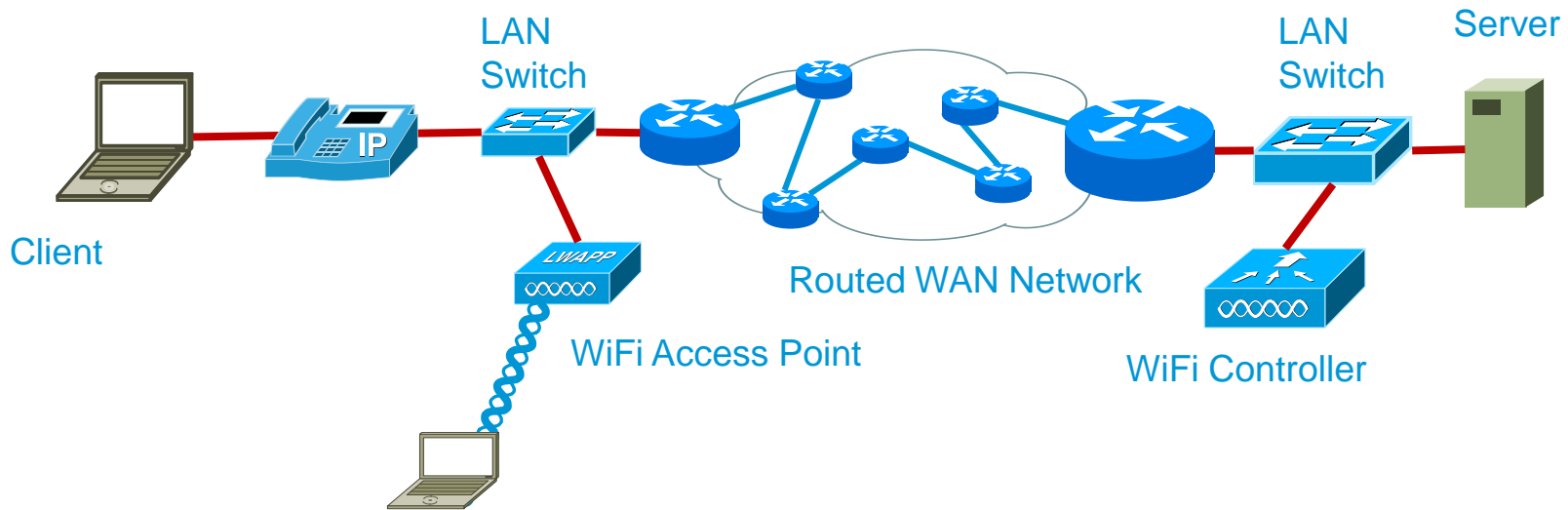
IP everywhere



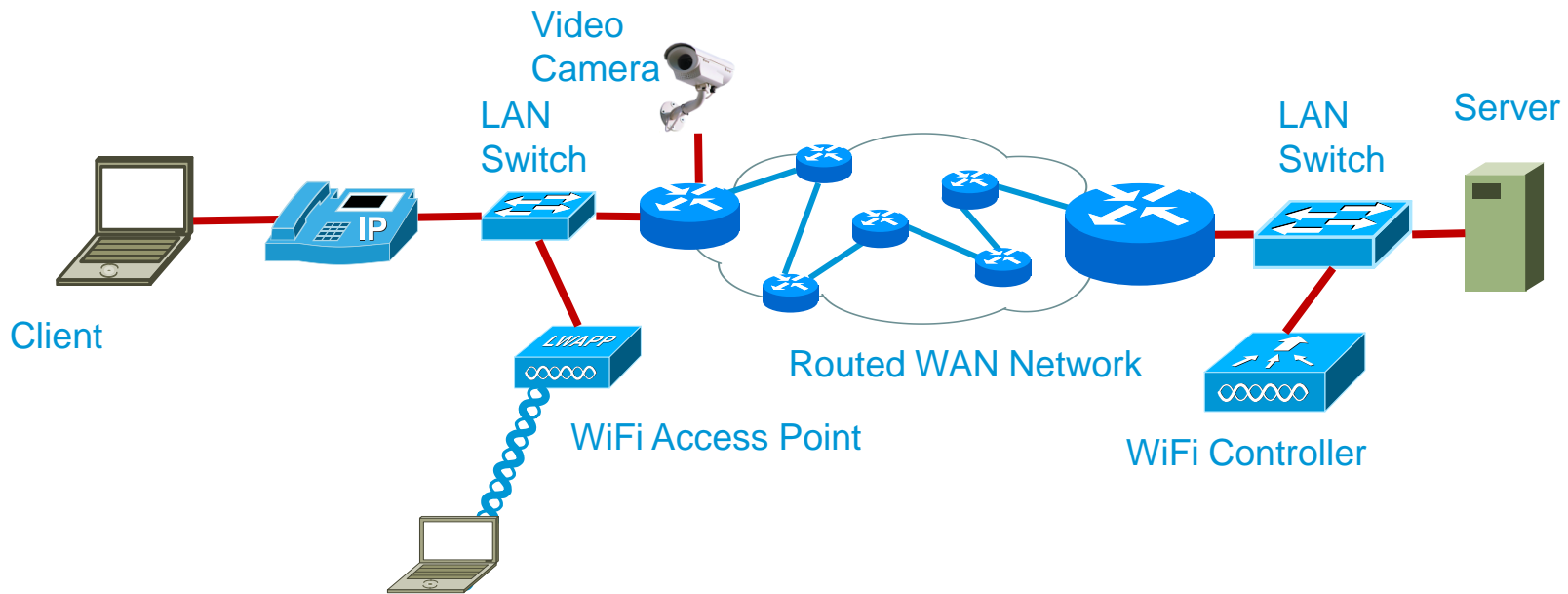
IP everywhere



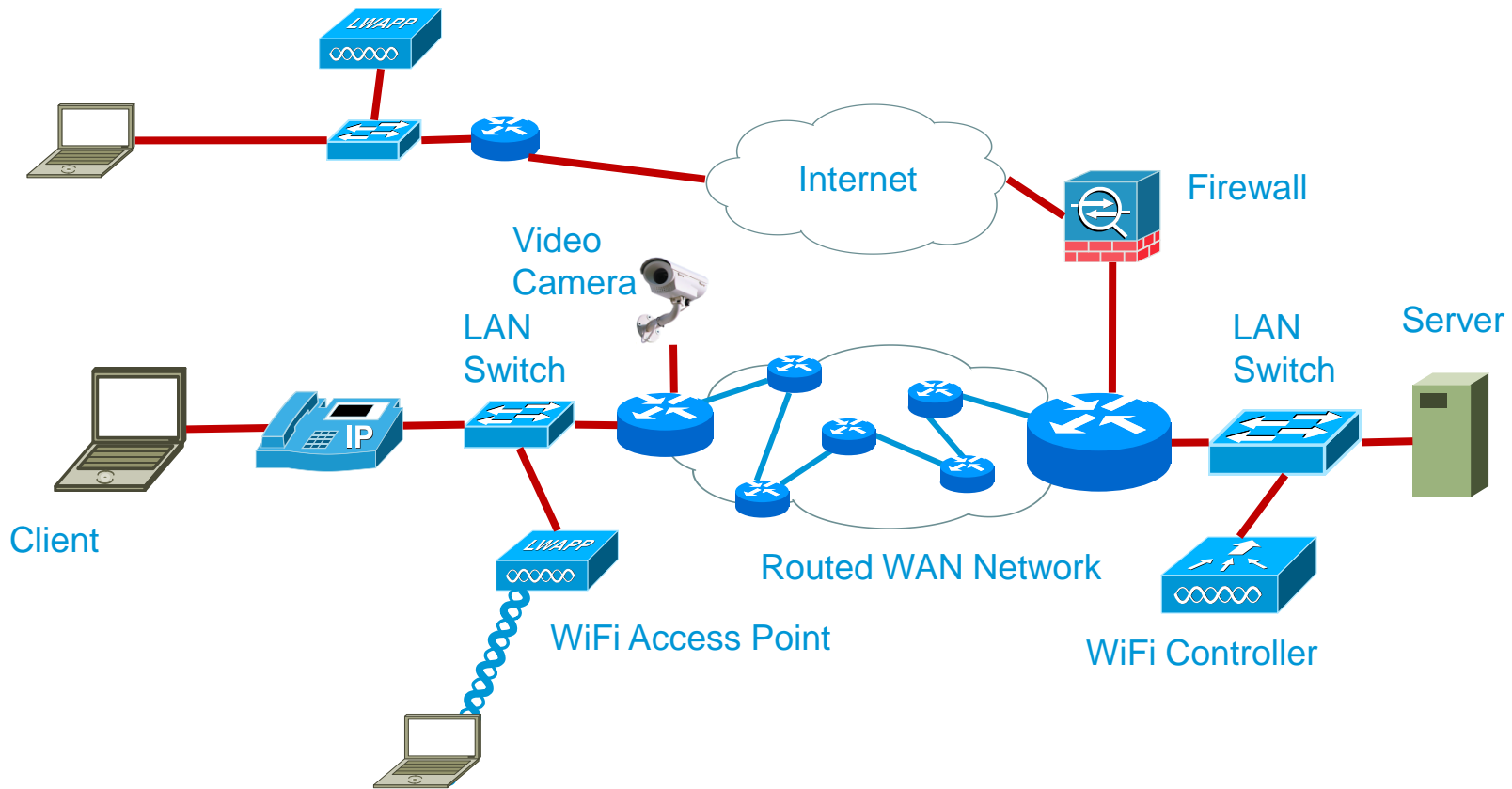
IP everywhere



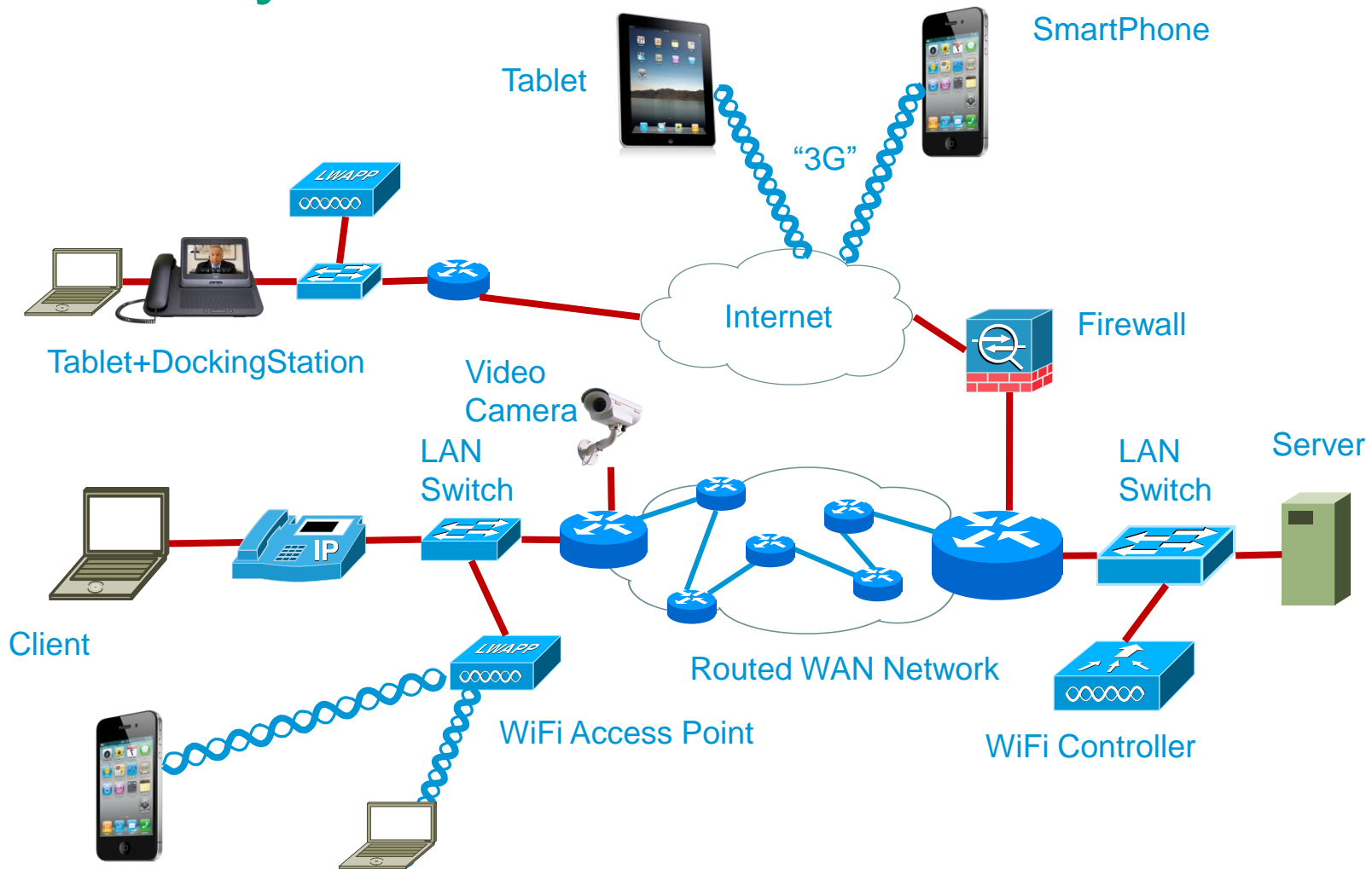
IP everywhere



IP everywhere



IP everywhere

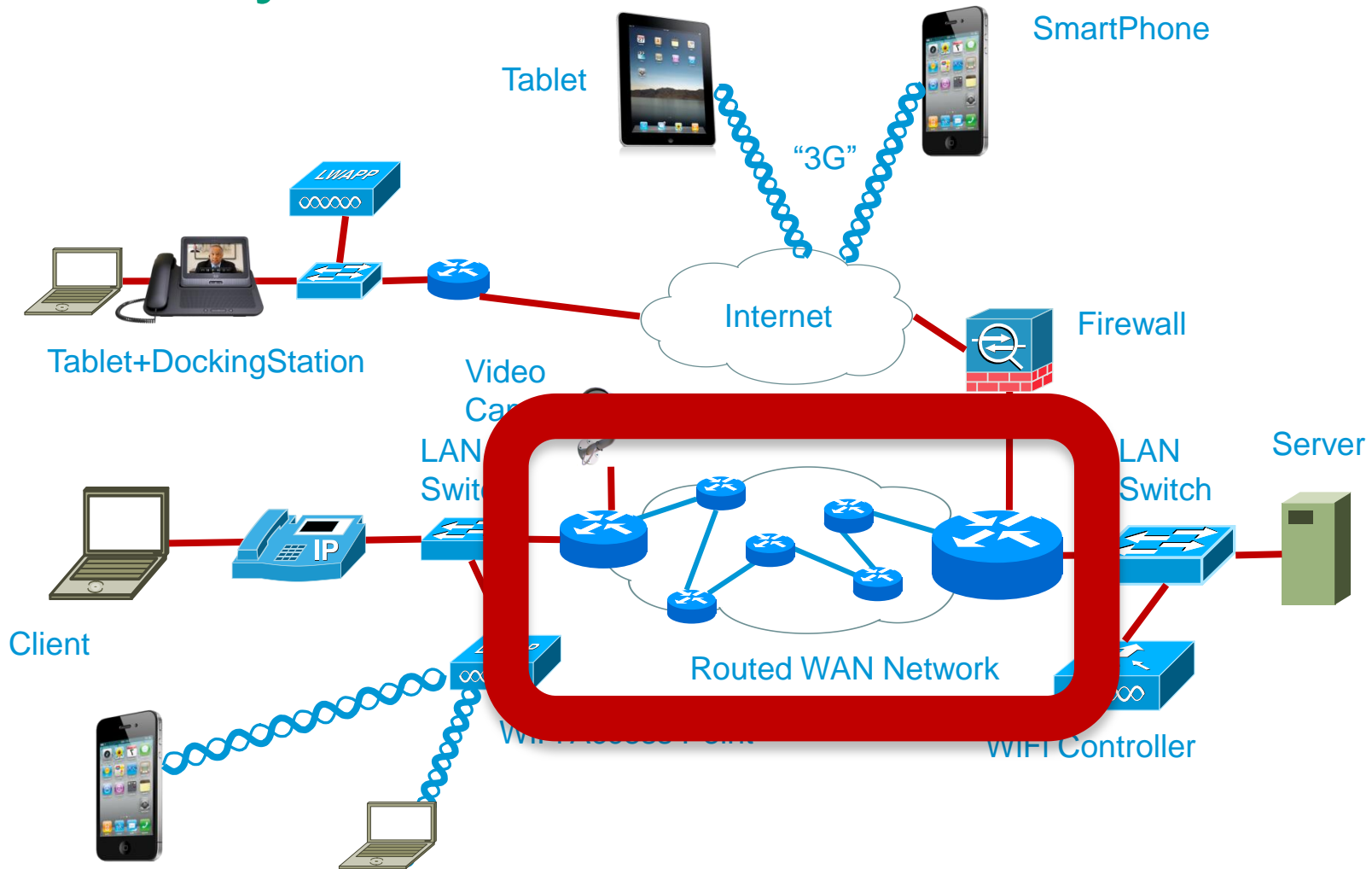


Meet the Ike Theodore (IT) Willis



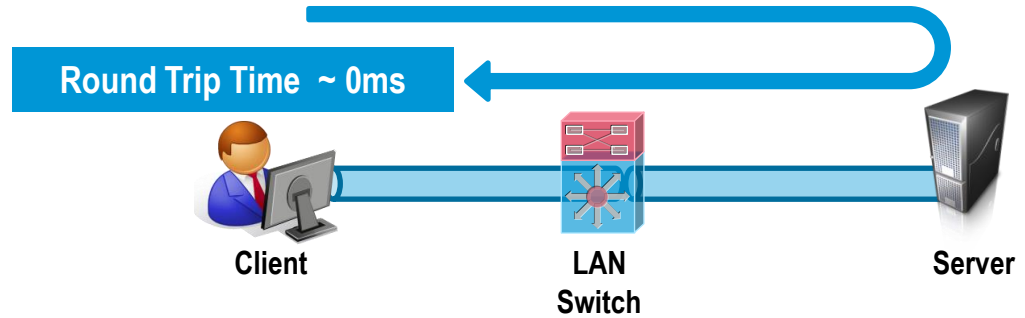
<http://www.youtube.com/watch?v=VTWDTdyhTv0>

IP everywhere

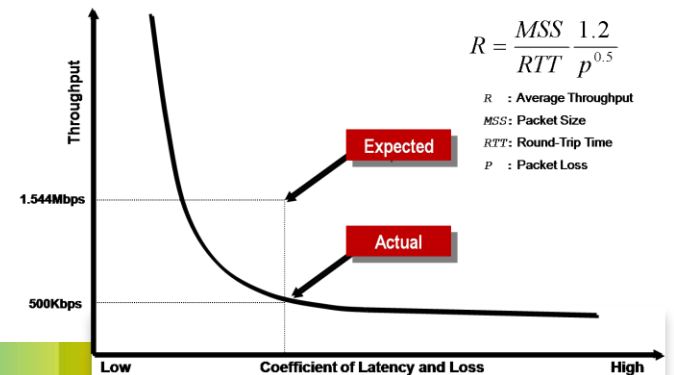
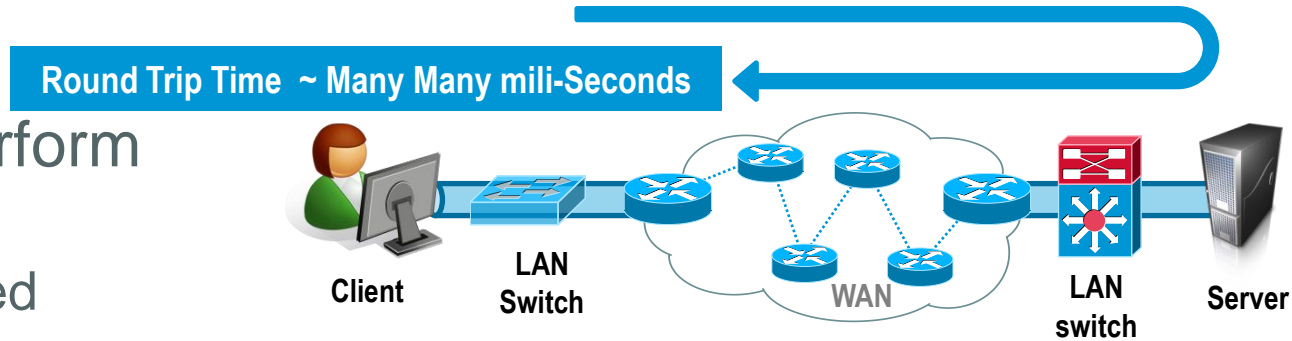


Application Delivery Challenges

- Applications perform well in LAN
 - High bandwidth
 - Low latency
 - Reliability

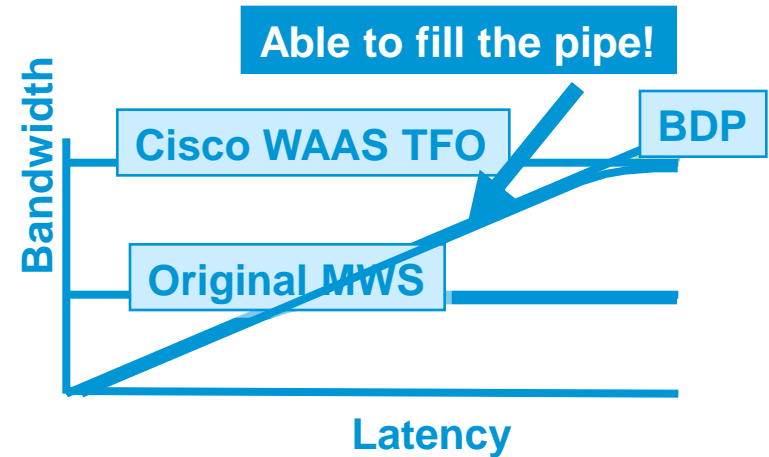
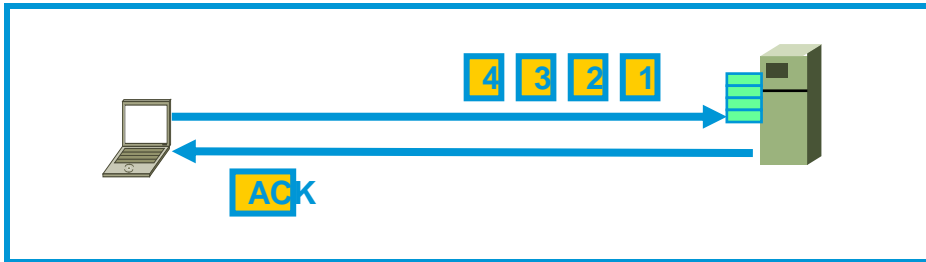


- Applications perform poorly in WAN
 - Already congested
 - Low bandwidth
 - Latency
 - Packet Loss



TCP Window Size Scaling

RFC 1323

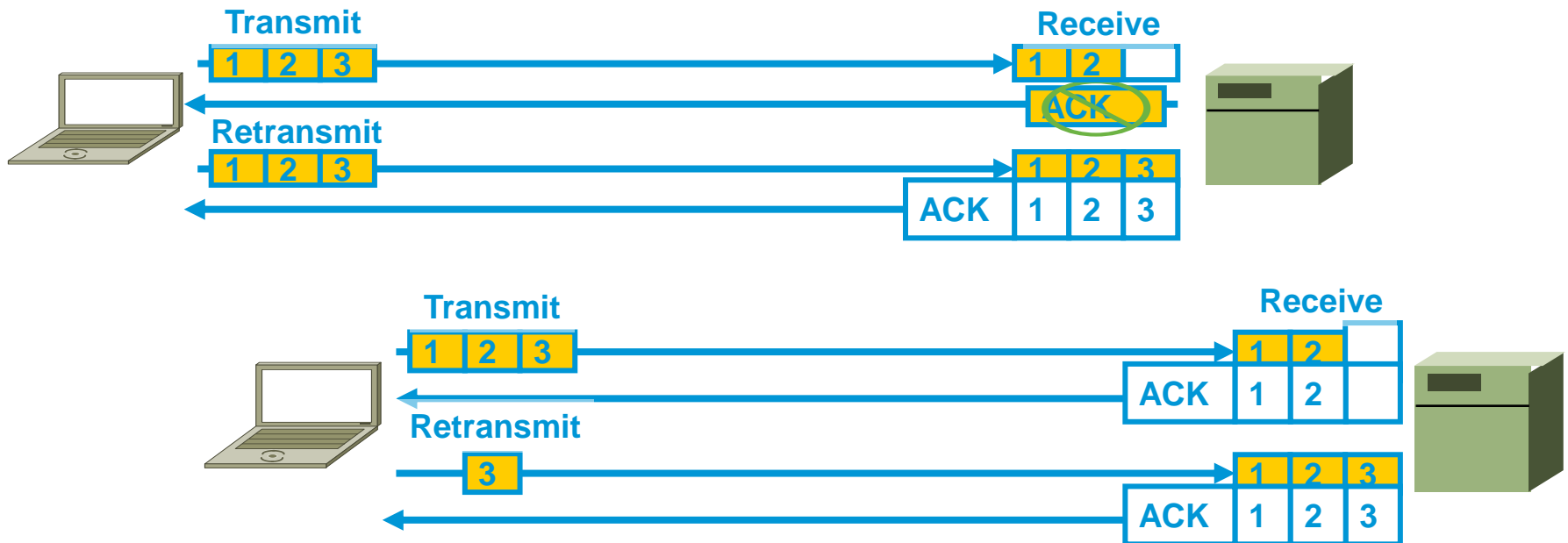


- Generally, ACKnowledgements are sent when an entire TCP window has been received
- Cisco WAAS TFO window scaling (based on RFC 1323) scales the TCP window to 2MB to overcome problems with filling LFNs (Long Fat Networks)
- MWS - maximum window size, BDP - bw delay product

TCP Selective Acknowledgment Options

RFC 2018

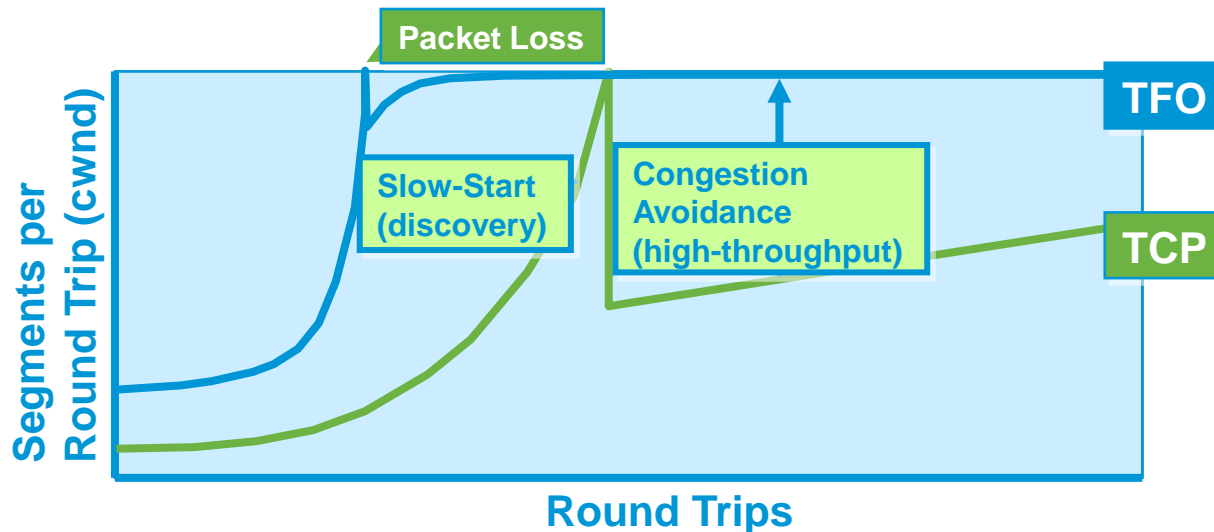
- Cisco WAAS employs TCP extensions to improve acknowledgement of transmitted data, improve delivery of missing segments, and unnecessary minimize retransmission, based on RFC 2018 and extensions



TCP Large Initial Windows

RFC 3390

- 20% of network traffic is long-lived connections, 80% of network connections are short-lived
- Short-lived connections transmit smaller numbers of packets and are torn down before ever leaving the slow-start phase of TCP
- Based on RFC3390, increases initial window size to expedite entry into congestion avoidance mode for high throughput



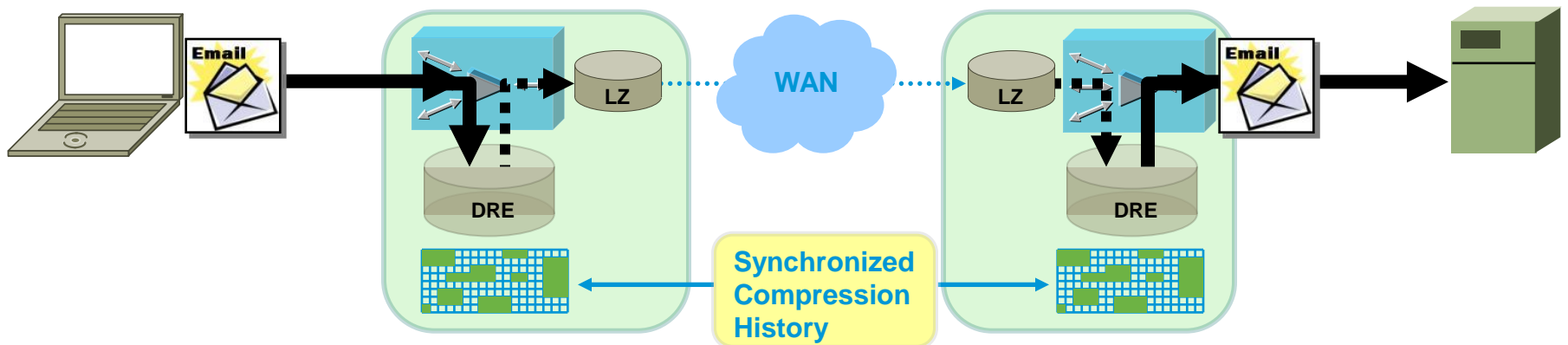
Advanced Compression

LZ & DRE

- Cisco WAAS advanced compression nearly eliminates the transmission of redundant data patterns and compresses data that must traverse the WAN to improve application performance and save bandwidth

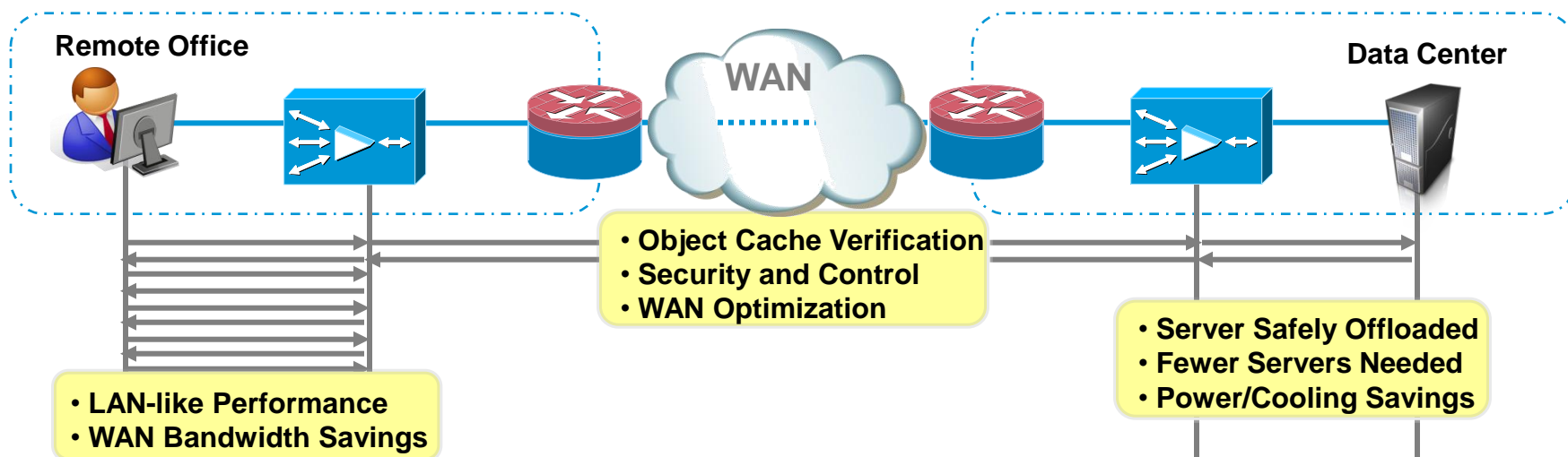
Data Redundancy Elimination (DRE): application-agnostic compression eliminates redundant data from TCP streams providing up to 100:1 compression

Persistent LZ Compression: session-based compression provides up to an additional 10:1 compression even for messages that have been optimized by DRE

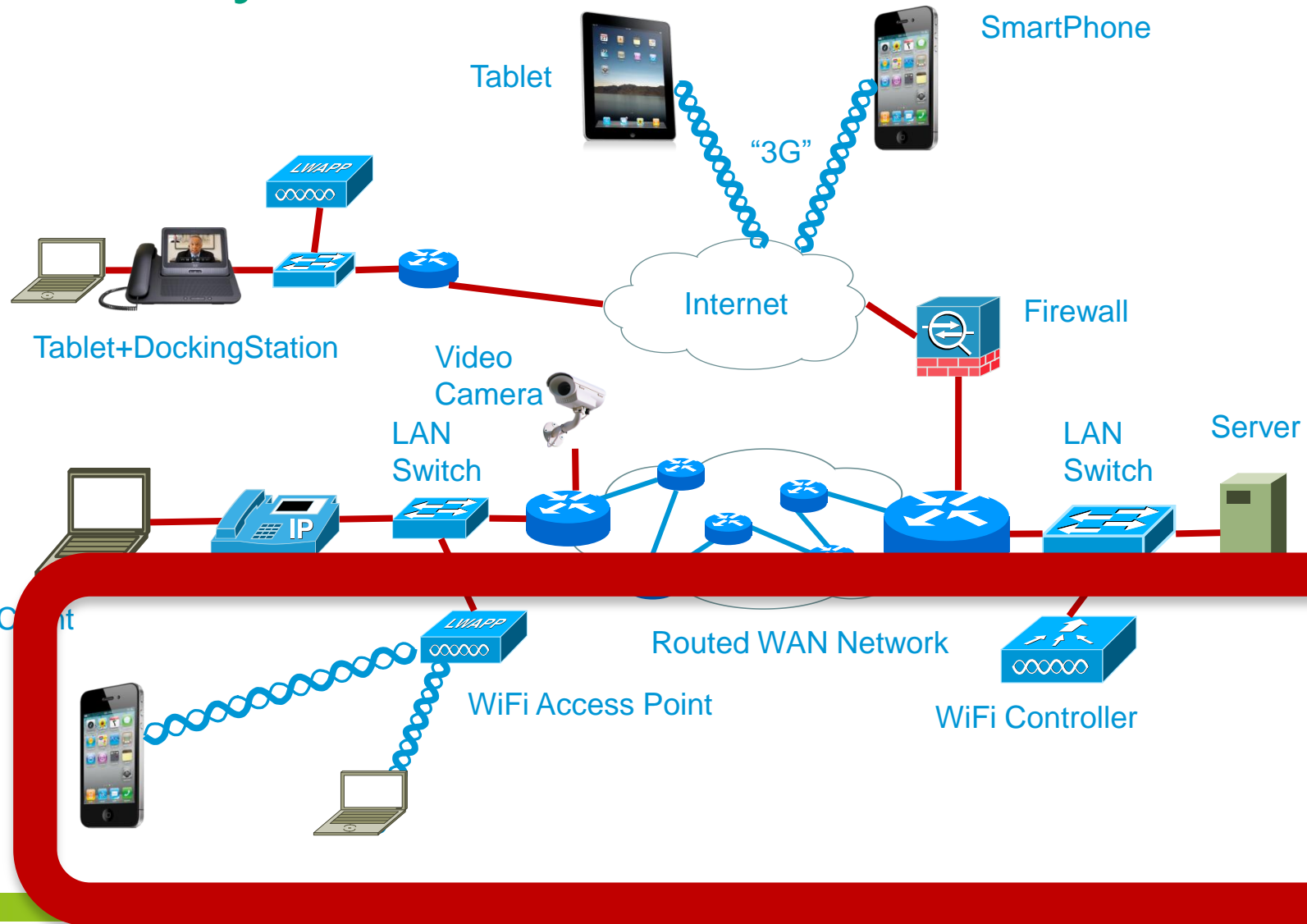


Application-Specific Acceleration

- Application and Protocol Awareness
 - Minimize chatter
 - Safe caching
 - Scheduled File preposition
- Intelligent Server Offload
 - Caching and optimizations
- WAAS Application Accelerators
 - CIFS, NFS, MAPI, Video, HTTP, SSL, Windows printing
- Licensed developed and validated with application vendors



IP everywhere



Cisco WCS - My WCS Home - wcs4.cisco.com - Microsoft Internet Explorer provided by Cisco Systems, Inc.

Alarm Summary 783 1 5261 Wireless Control System

Monitor Reports Configure Services Administration Tools Help

WCS Home

General Client Security Mesh CleanAir

Inventory Detail Status

Controllers: 2 Radios: 113 MSEs: 0

Coverage Areas

Name	Total APs	ahn Radios	bighn Radios	Out of Service Radios	Clients
Cisco San Jose - Site 5	55	55	55	0	15

Total APs not yet assigned to Maps: 2

Client Count

Recent Coverage Holes (0)

Access Point	Interface	Failed Clients	Total
None detected			

Wireless Control System Dashboard Monitor Reports Configuration Mobility Administration Tools Help

Client Details : fefelix - Cisco:a9:ad:b2

Monitor Clients Client Details -- Select a command -- Go

Properties

User Name	fefelix	Protocol	802.11g	Security Policy	--	RSSI
IP Address	176.12.1.4	SSID	alpha	802.11 Authentication	OPENSYSM	SNR
MAC Address	00:40:96:a9:ad:b2	Profile	alpha	Cipher	--	Retries
Vendor	Cisco	AP Name	MREAP-ECT-fefelix	EAP Type	--	Throughput
Power Save	Yes	AP MAC Address	00:18:74:fa:a8:f0			Data rate
		Interface	management			Packets Tx/Rx
		VLAN ID	0			Bytes Tx/Rx

RF Quality v.s Association

SNR v.s RSSI

Events

Event Type	Date/Time
Disassociated	2/12/08 12:31 PM
WEP Decrypt Error	2/12/08 12:31 PM
Authentication Failure	2/12/08 12:31 PM
Disassociated	2/12/08 12:31 PM
Authentication Failure	2/12/08 12:31 PM

Map

Last Located on 5/3/2008 12:00AM

Floor: Cisco San Jose - Site 5>BLD 14>4th floor

On Location Server: loc-1

Monitor Maps Area View - Microsoft Internet Explorer provided by Cisco Systems, Inc.

Address https://wcs3.cisco.com/webacs/monitorAreaMap.do?serviceDomainId=116#refresh

Wireless Control System Dashboard Monitor Reports Configuration Mobility Administration Tools Help

Dashboard

General Client Security Mesh Reports

RF Quality

Client Count	Poor	Good	Excellent
558	28	251	251

EAP Type Distribution

Client Traffic

Client Count

Wireless Control System Monitor Reports Configure Mobility Administration Tools Help

Contributing APs

- sjc14-31b-ap6
- sjc14-31b-ap5
- sjc14-31b-ap4

Refresh Heatmap

Layers

RSSI Color Lookup

Zoom 100% Refresh 30 sec Full Screen

Alarm Summary

Loaded

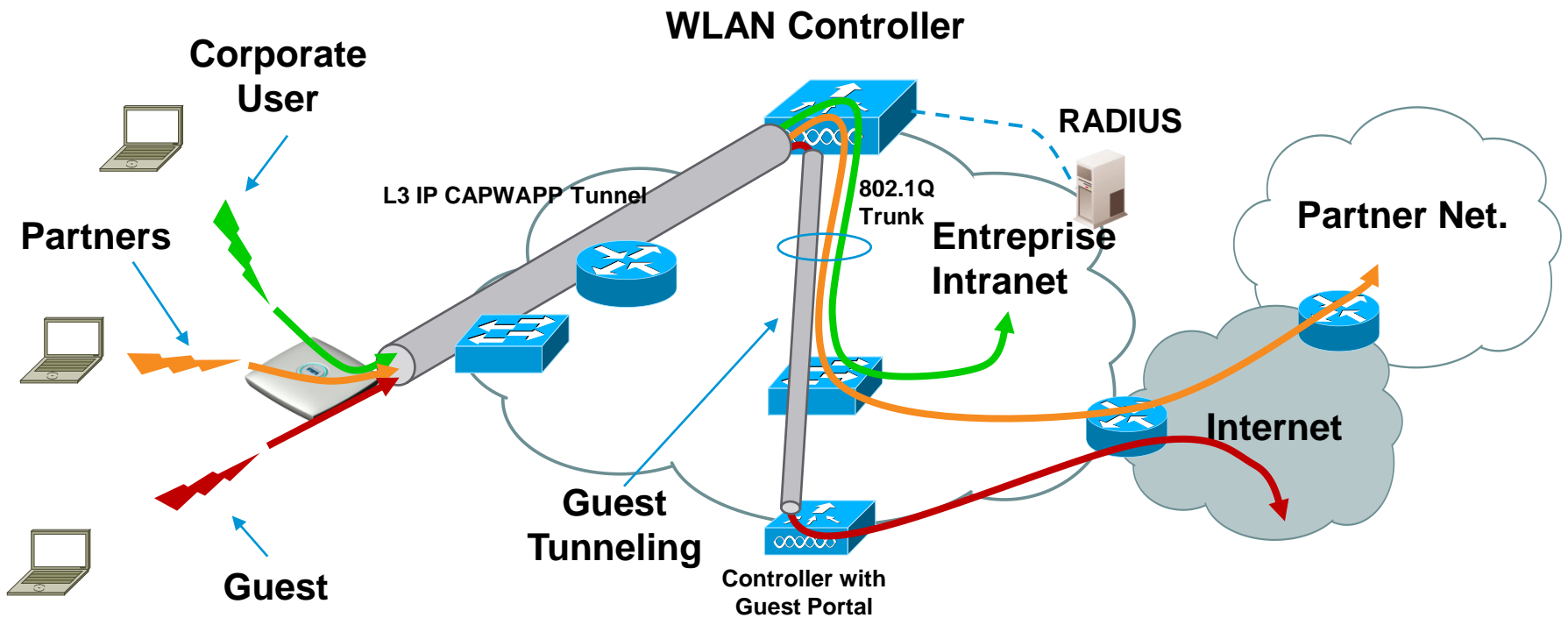
Gaining Perspective



A Unified WLAN System

Overview

- WLAN Controller - For wireless end-user devices, the controller is a 802.1Q bridge that takes traffic of the air and puts it on a VLAN
- CAPWAPP Tunnel - Light Weight Access Point Protocol is used between APs and WLAN Controller (Data Plane / Control Plane)
- The AP connects to an access port—no concept of VLANs at the AP



802.11n Highlights

- Better overall end-user experience for high bandwidth data, voice and video applications
 - 5x higher throughput (up to 300 Mbps per radio)
 - More reliable and predictable coverage
- Backwards compatibility with 802.11a/b/g clients
 - Clients will co-exist for a long time

Primary 802.11n Components

■ Multiple Input Multiple Output (MIMO)

Maximal Ratio Combining (MRC)

Beam forming

Spatial multiplexing

■ 40 MHz Channels

Two adjacent 20 MHz channels are combined to create a single 40 MHz channel

■ Improved MAC Efficiency

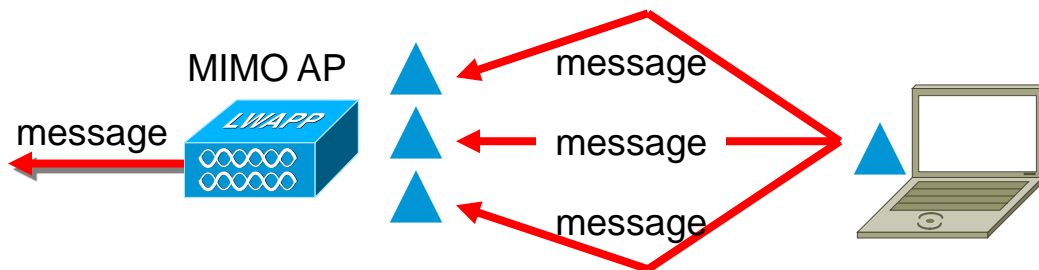
Packet aggregation – multiple packets aggregated in a single transmission

Block Acknowledgements

MIMO Overview

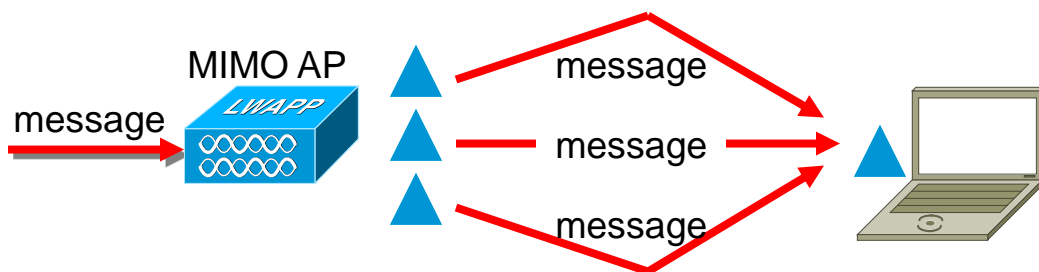
Maximal Ratio Combining

- Performed by receiver
- Combines multiple received signals
- Increases receive sensitivity
- Works with non-MIMO and MIMO clients



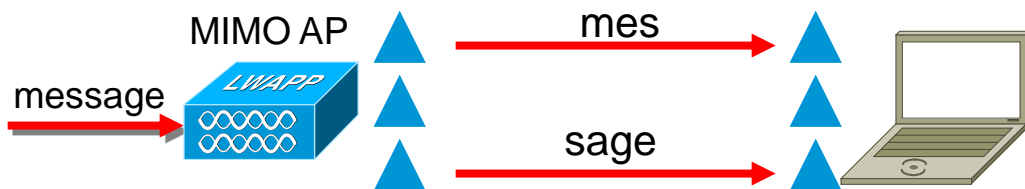
Transmit beam forming

- Performed by transmitter
- Ensures signal received in phase
- Increases receive sensitivity
- Works with non-MIMO and MIMO clients



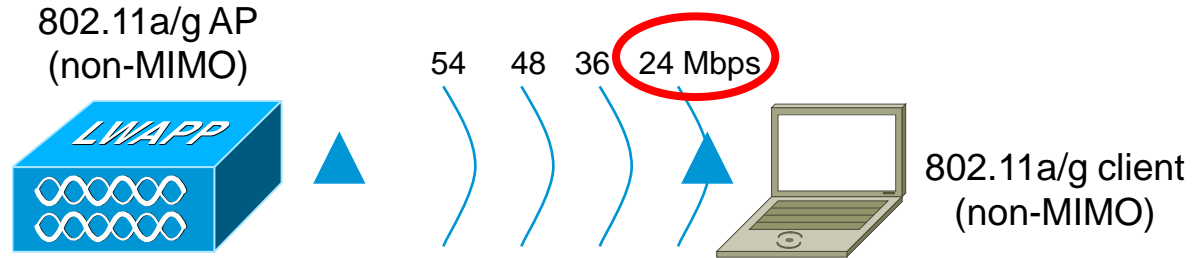
Spatial Multiplexing

- Transmitter and receiver participate
- Multiple antennas txmt concurrently on same channel
- Increases bandwidth
- Requires MIMO client

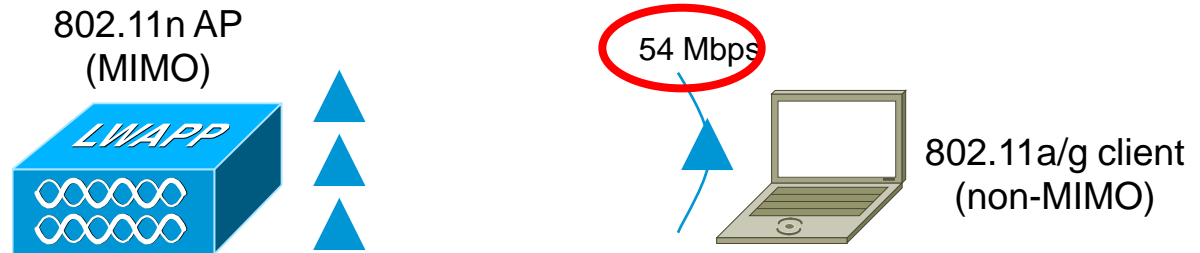


MIMO Increases PHY Data Rates for all clients

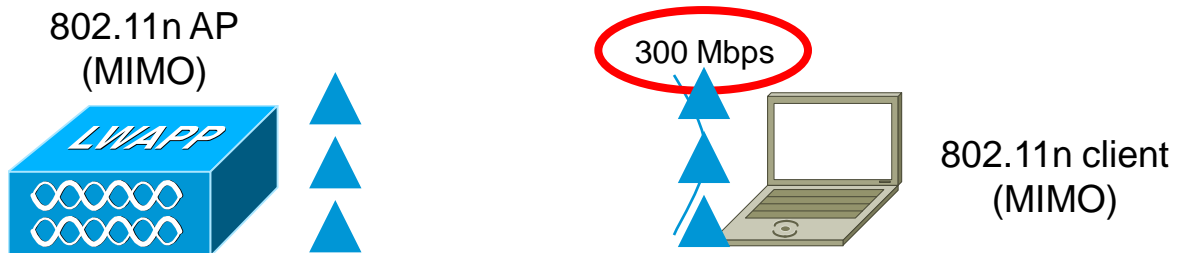
- Maximal Ratio Combining (MRC)
- Beam forming
- Spatial Multiplexing



- Maximal Ratio Combining (MRC)
- Beam forming
- Spatial Multiplexing

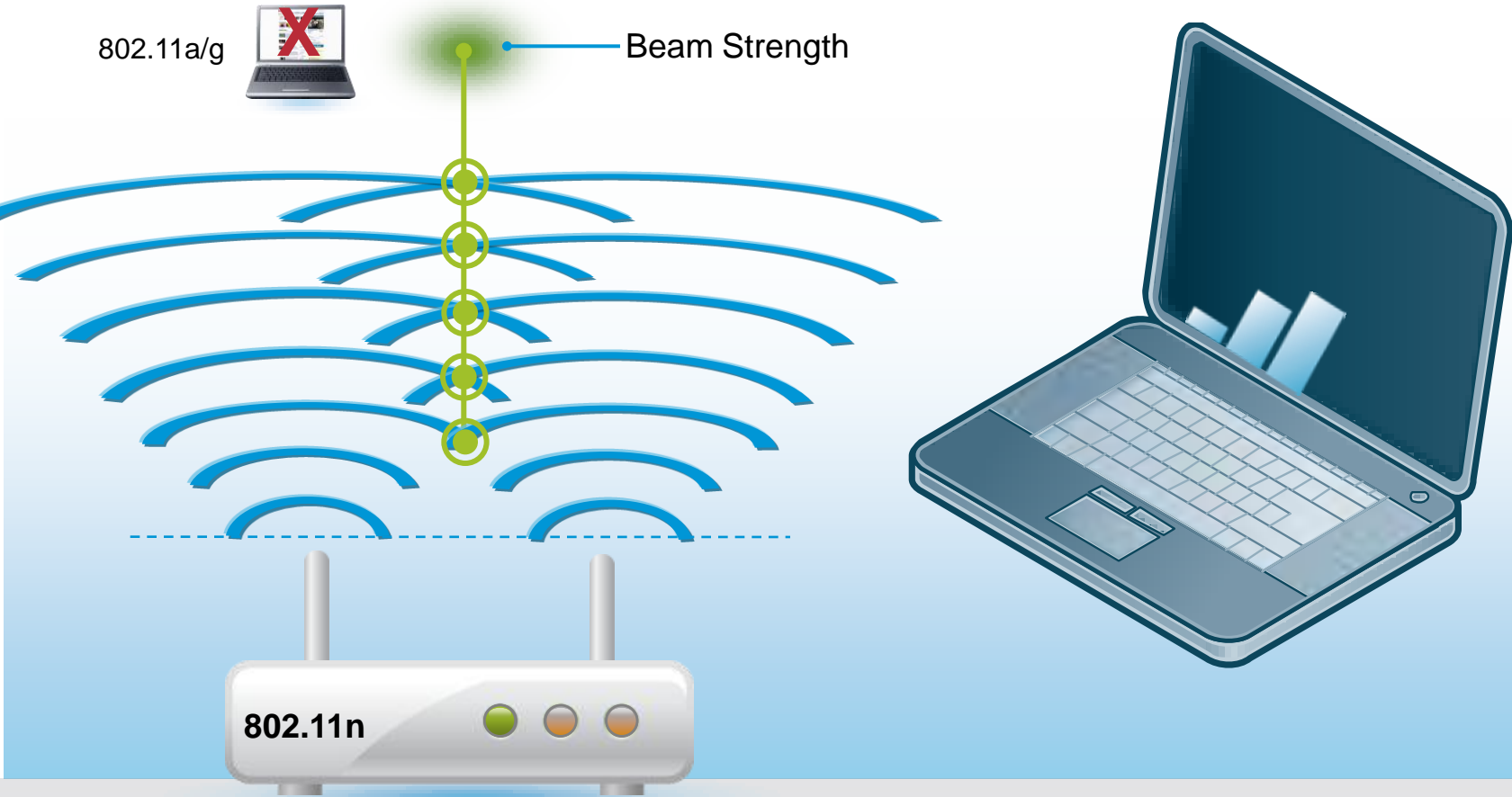


- Maximal Ratio Combining (MRC)
- Beam forming
- Spatial Multiplexing



Existing 802.11n Solutions

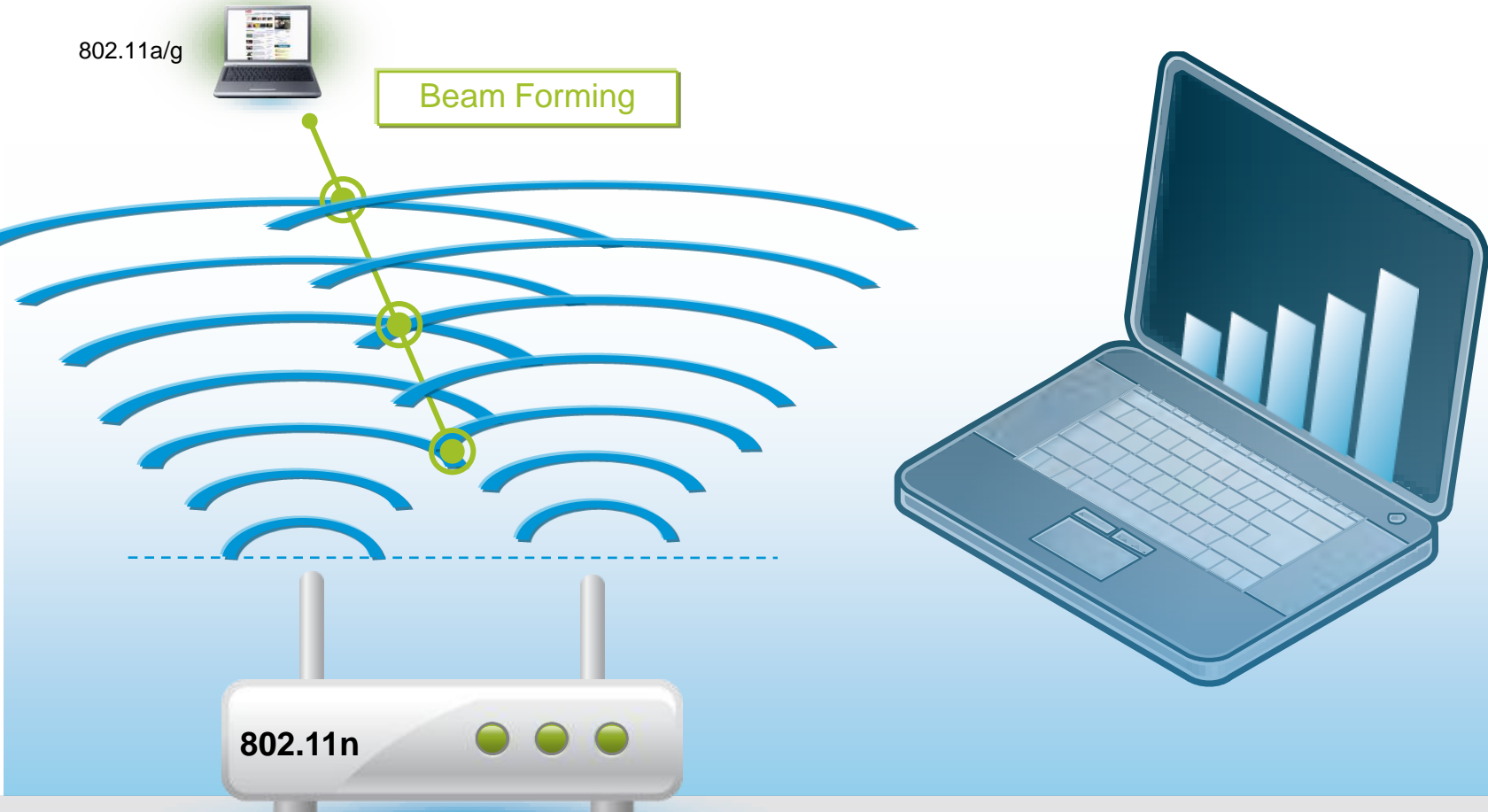
Beam Strength Not Directed to Client



802.11a/g Client Connection Not Optimized,
Creates Coverage Hole

Beam Forming

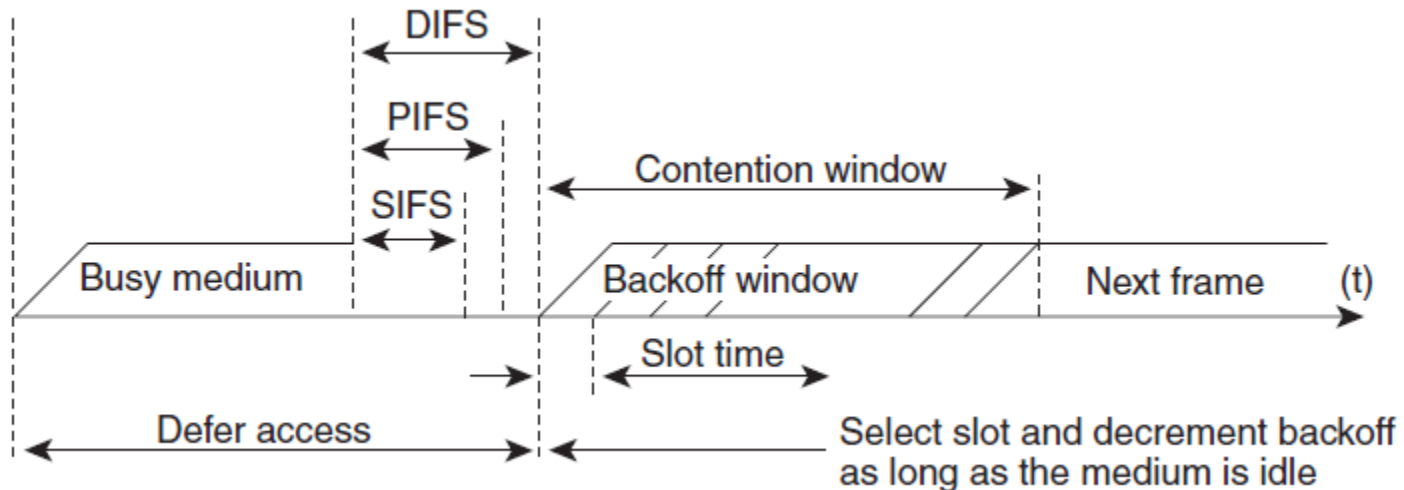
Beam Strength Directed to Client



ClientLink uses Beam Forming to Direct Signal to Improve Performance and Coverage for 802.11a/g Devices

WiFi and QoS ?!?! WMM

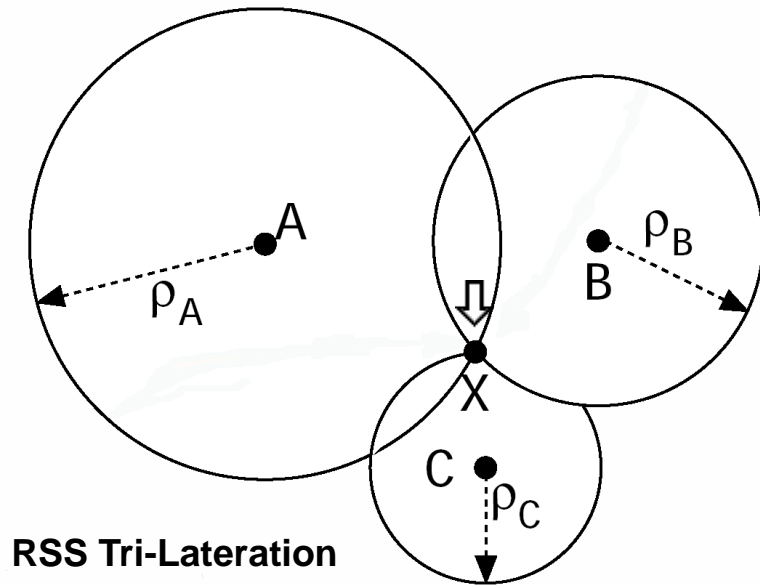
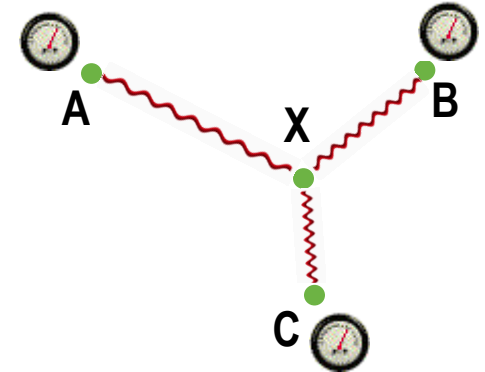
- Traffic prioritization (voice, video) on shared medium
- Different QoS classes
different ContentionWindowMin, ContentionWindowMax



Received Signal Strength (RSS) Lateration

- Based upon the measurement of the signal strength transmitted from a mobile device X to several receivers.
- The distance ρ between each transmitter and receiver can be calculated based on the amount of signal loss.

Requires the use of an appropriate path loss model and knowledge of path loss variables, TX/RX power, cable losses and antenna gain.



RSS Tri-Lateration

The Impact of a Crowded Spectrum

Performance At Risk in Unprotected Networks









End User Impact

- Reduced network capacity and coverage
- Poor quality voice and video
- Potential complete link failure

IT Manager Impact

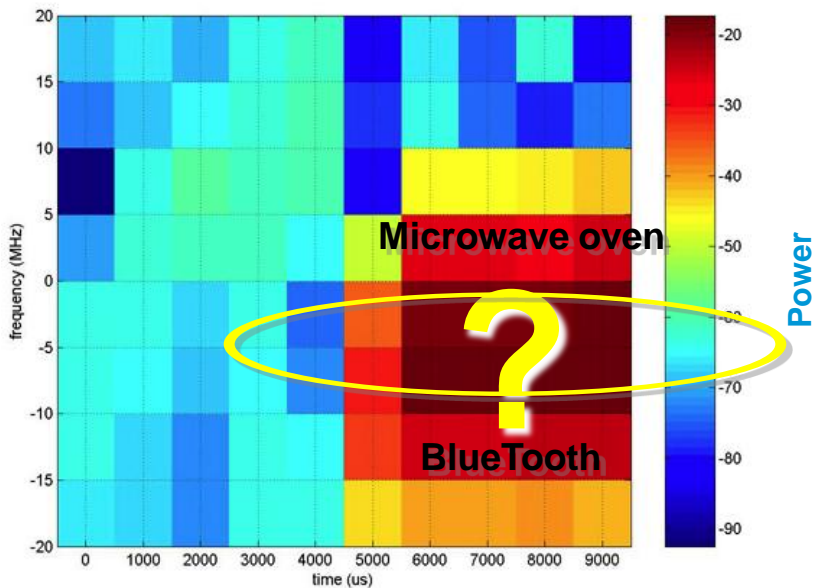
- Potential security breaches
- Support calls
- Increased cost of operation

Interference Type	Image	Throughput Reduction	
		Near (25 ft)	Far (75 ft)
2.4 or 5 GHz Cordless Phones		100%	100%
Video Camera		100%	57%
Wi-Fi (busy neighbor)		90%	75%
Microwave Oven		63%	53%
Bluetooth Headset		20%	17%
DECT Phone		18%	10%

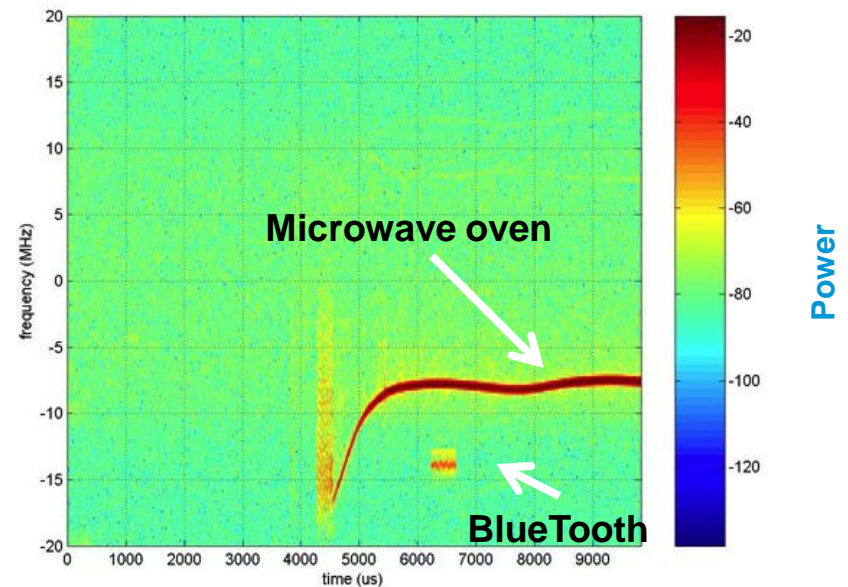
High Resolution Spectral Advantage

The Industry's ONLY in-line high-resolution spectrum analyzer

Typical Wi-Fi chipset
Spectral Resolution at 5 MHz

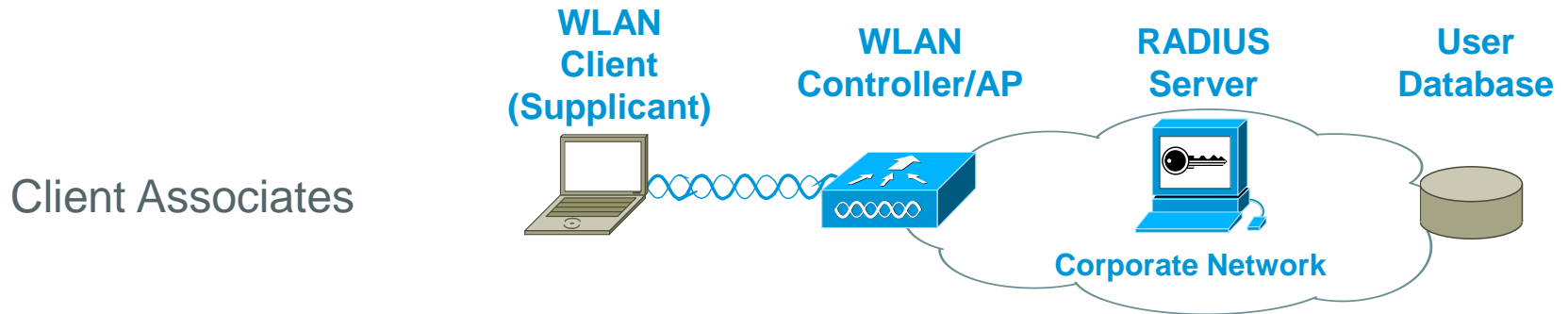


Cisco CleanAir Wi-Fi chipset
Spectral Resolution at 78 to 156 KHz



'Chip View Visualization' of Microwave oven and BlueTooth Interference

How Does WiFi client connects?



Cannot Send Data Until...



...EAP Authentication Complete



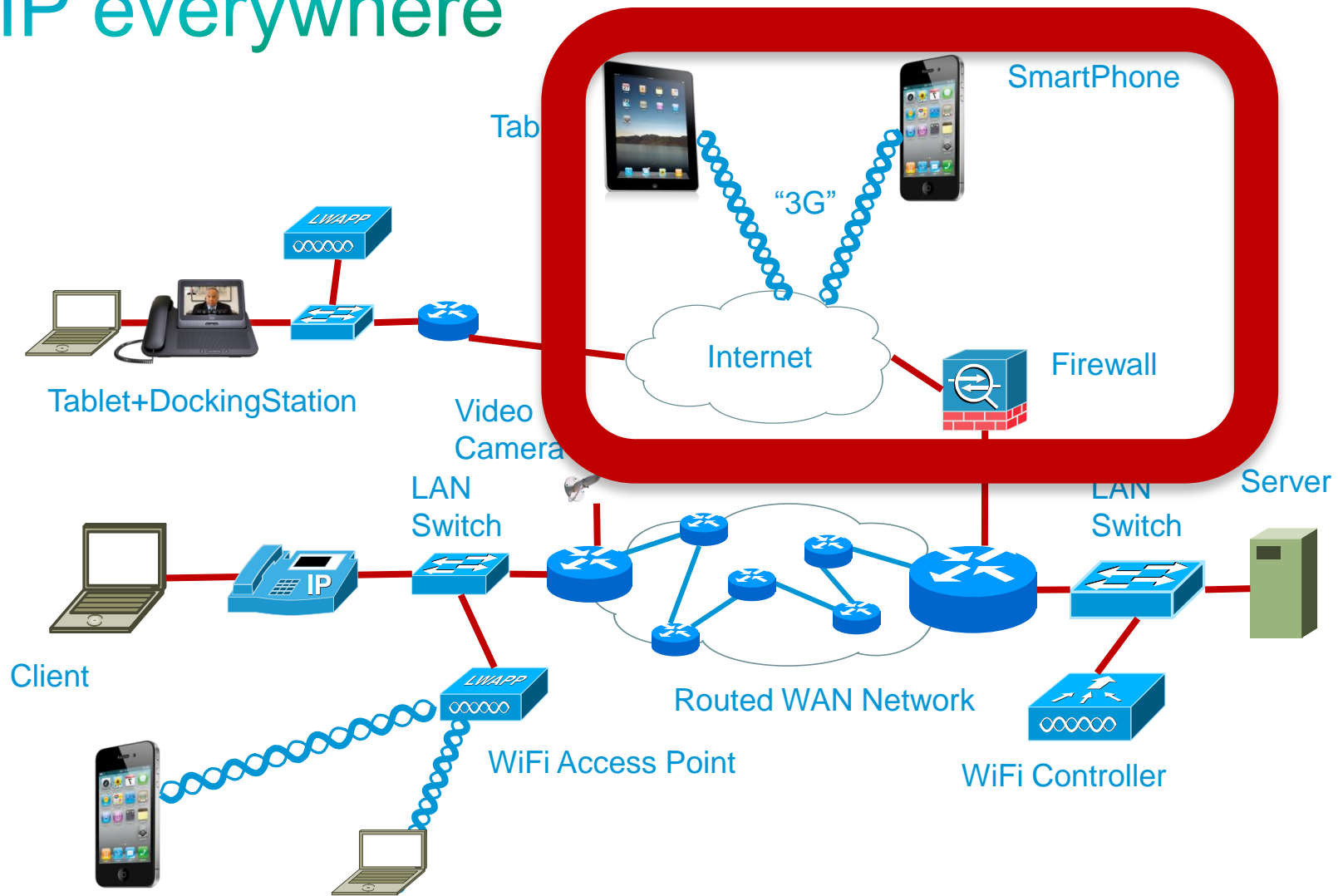
Client Sends Data



WLAN client - Supplicant

- Endpoint SW client
 - + WLAN/WiFi client
 - for Authentication (PSK, EAP-MD5, PEAP, EAP-TLS, ...)
 - for Encryption (WPA, WPA2, ...)
 - + Wired (ethernet) client
 - for Authentication
 - for Encryption on Layer2 (IEEE 802.1ae, AES)
- On “Every” Endpoint?

IP everywhere



Traditional Remote-Access VPN



Limited
Predominantly PC-Based

Manual
Nonpersistent
Connection; No Gateway
Autodetection

Unprotected
No Security for Web
and Web Applications



No Security

Security



Skype

You Tube

Salesforce.com



Intranet

Corporate File
Sharing



(Mobile) Devices - Cisco AnyConnect Secure Mobility

Web Security with Next-Generation Remote Access



Choice
Diverse Endpoint Support for Greater Flexibility

Who?
What?
Where?
When?
How?

Experience
Always-On Intelligent Connection for Transparent Experience and Performance

Security
Tighter, Granular Control Through Rich Security Integrated Into the Network

Skype

You Tube

Salesforce.com



Cisco AnyConnect Secure Mobility

A Next-Generation Solution

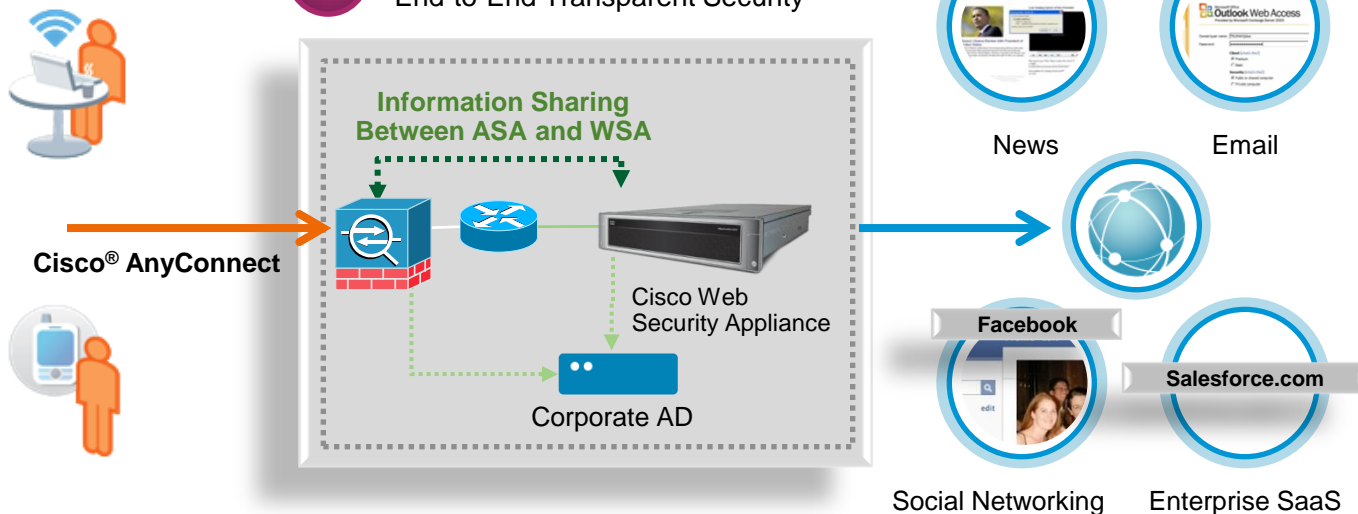
1 Cisco® AnyConnect Secure Mobility Client

- Simplified remote access
- Connection and application persistence
- Always-on VPN enforcement

2 Web Security Appliance Richer Web Controls

- Location-aware policy
- Application controls
- SaaS access control

3 Combined Solution End-to-End Transparent Security



Combining with A Cloud SaaS - ScanSafe

Security-as-a-Service

- Web Malware Scanning
- Web Filtering
- Anywhere+

Outbreak Intelligence Scanning

Oi
OutBreak Intelligence

- Antivirus Signatures
- Code Behavior
- Traffic Behavior
- URL Reputation
- Code Reputation
- Machine Learning

ScanCenter Reporting

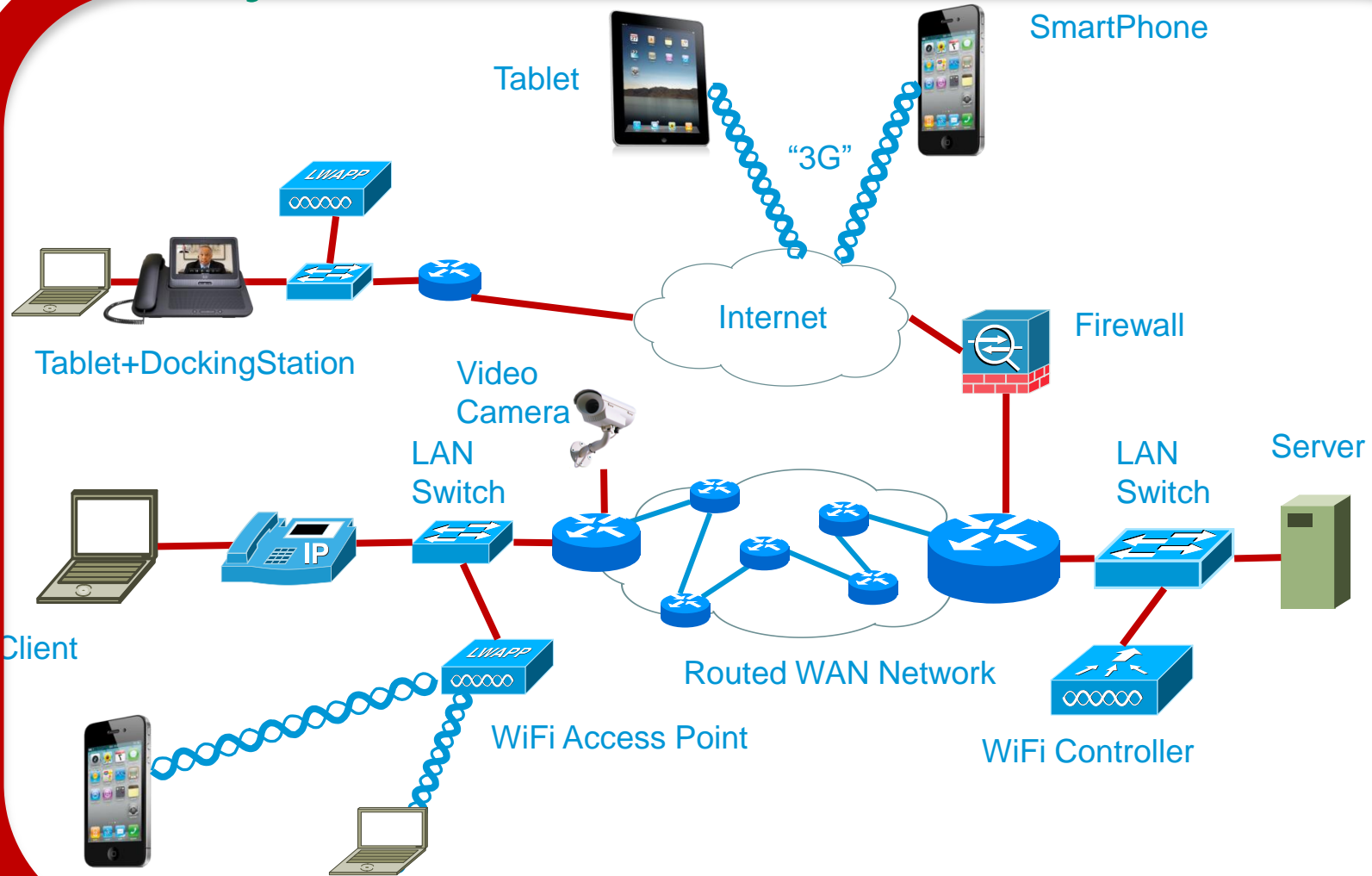
ScanCenter
web reporting



SW client – not just Supplicant!

- Endpoint SW client
 - + WLAN/WiFi client
 - for Authentication (PSK, EAP-MD5, PEAP, EAP-TLS, ...)
 - for Encryption (WPA, WPA2, ...)
 - + Wired (ethernet) client
 - for Authentication
 - for Encryption on Layer2 (IEEE 802.1ae, AES)
 - +VPN client
 - + Web Security client
 - + Telemetry client
 - + Connections Manager
- On “Every” Endpoint, including Mobile devices!

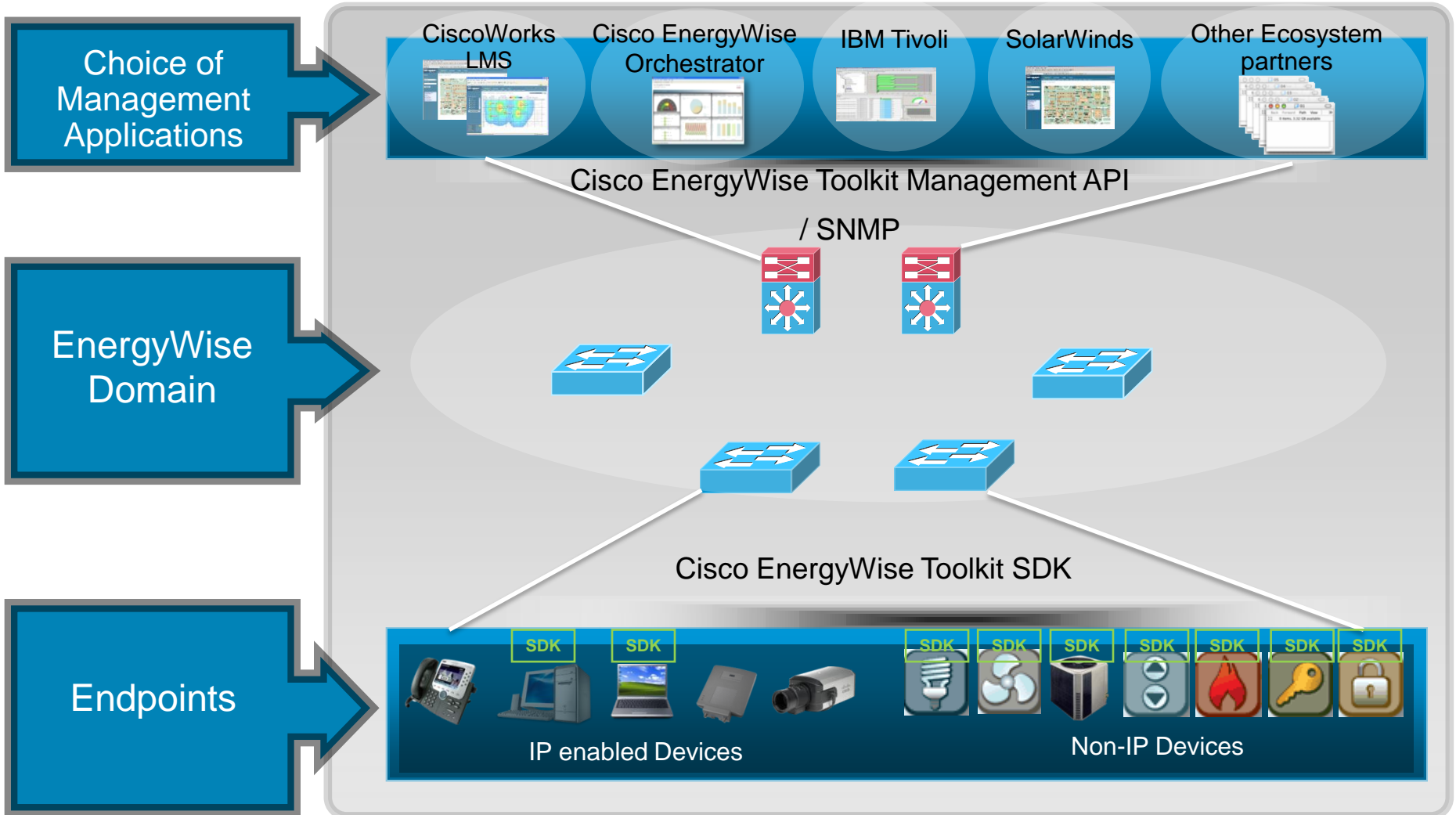
IP



“Everything” over IP

- Data over IP
 - Including Mobile Access
- Unified Communications over IP
 - Data, IM over IP
 - Voice over IP
 - Video over IP
- Video Surveillance over IP
- Physical Access over IP
- PC/desktop over IP
- Energy & Building Control over IP

Cisco EnergyWise Architecture



Which technologies is Ike using?



<http://www.youtube.com/watch?v=VTWDTdyhTv0>

Thank you.

