Deploying Virtual Desktop Infrastructure (VDI) in the Cisco Data Centre
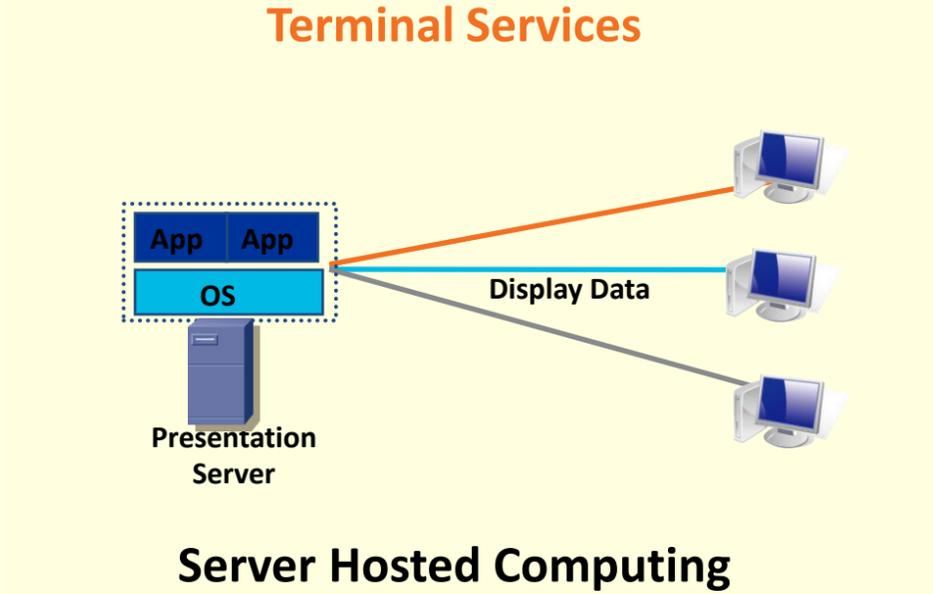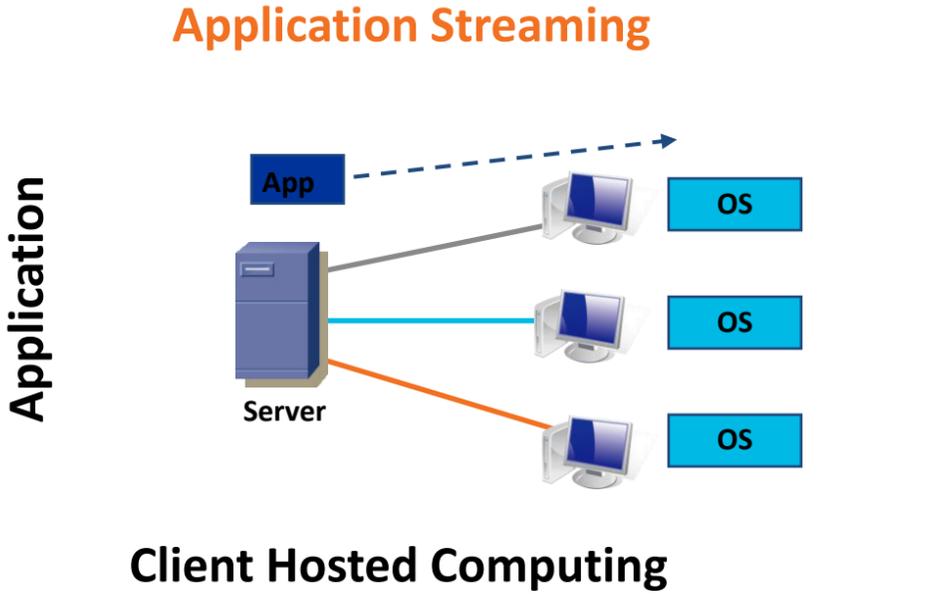
BRKVIR-2002

TOMORROW
starts here.

Overview

Virtual Desktop Models

Virtual Desktop Streaming

Hosted Virtual Desktop

O/S Desktop

App | Guest App
App | Guest OS
Main OS

Synchronized Desktop

Apps
OS
Server

Apps | Apps | Apps
OS | OS | OS
Hypervisor
Display Data

Application Streaming

Terminal Services

Application

App

Server

OS
OS
OS

App | App
OS
Presentation Server
Display Data

Client Hosted Computing

Server Hosted Computing
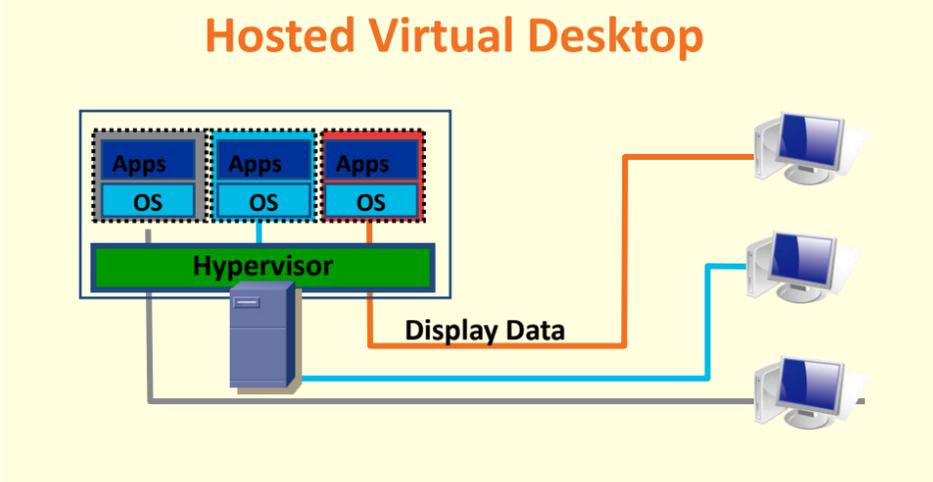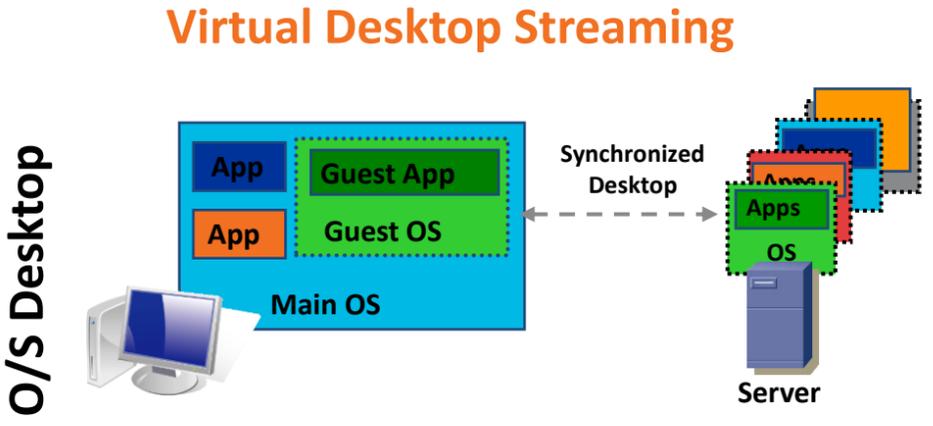
The Network is the Desktop

Keyboard, Video, Mouse

Thin Client
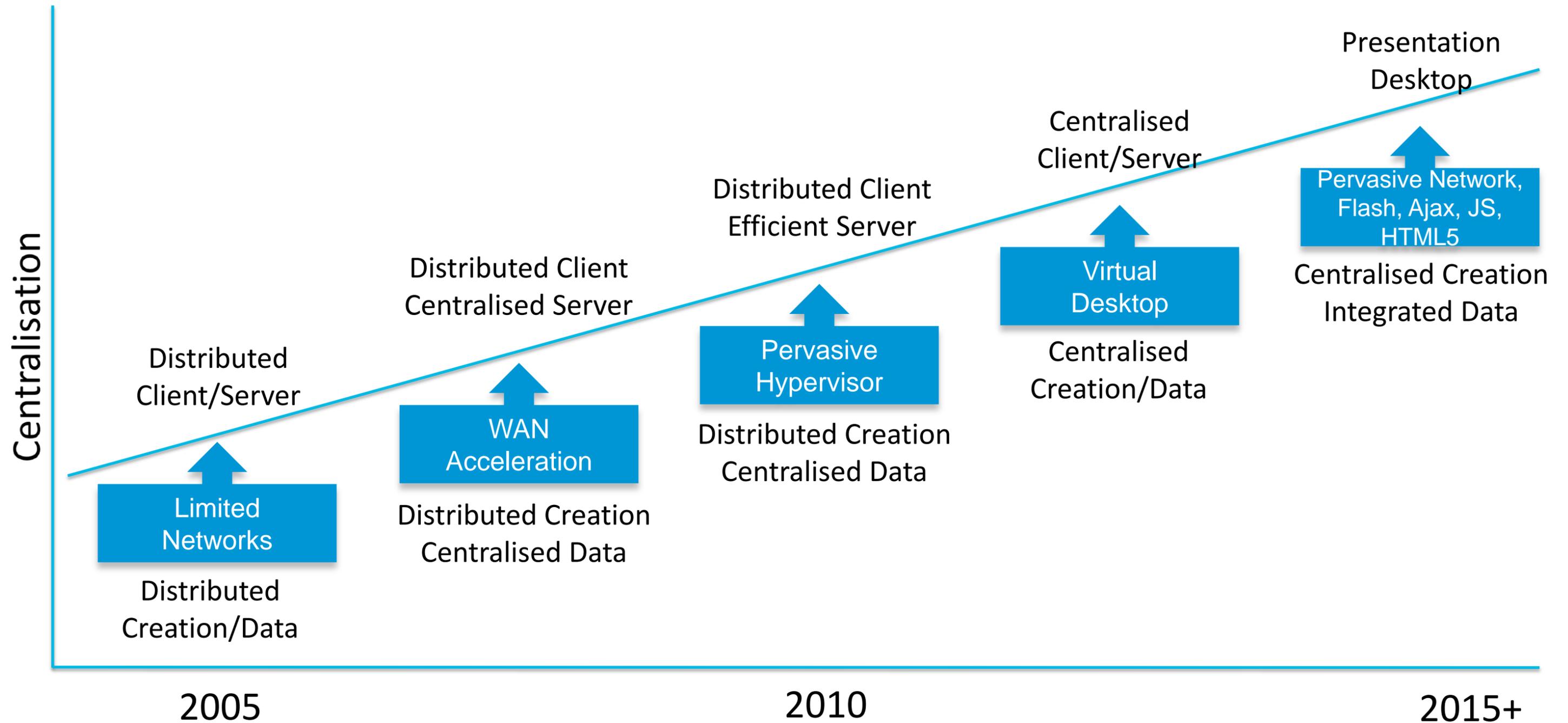
Broker

Network

Compute Storage
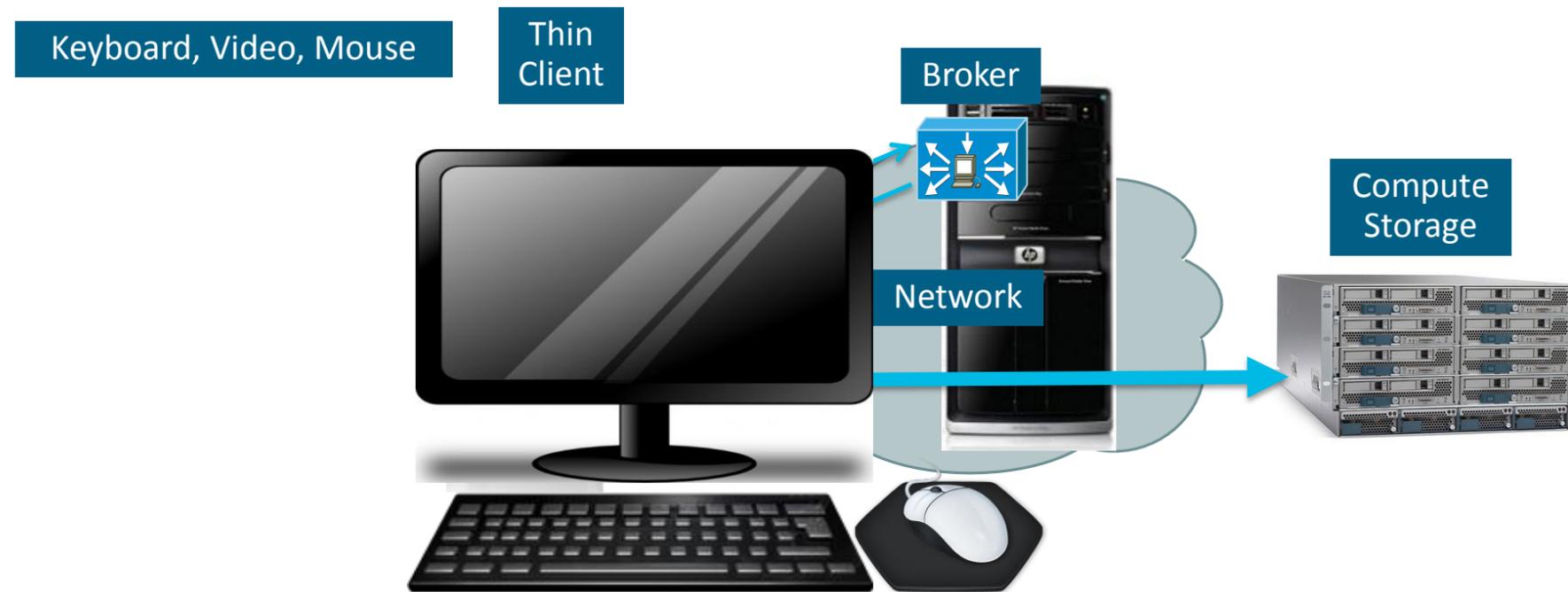
- Large OS
- Many local applications
- Vulnerable
- Constant patching
- Data backup
- Complex management
- Software distribution delivery challenges
- Skilled local support staff required

- Personal Computer is disaggregated

- Keyboard, Video, and Mouse stay with user

- Compute and storage move to the data centre

- Network availability is required for all application access

- Network performance is critical to user experience

Hosted Applications

Regulated Industries			Task Workers	
Government	Healthcare	Finance Banking	Retail	Education
• Data Protection • Disaster Recovery			• Cost of Ownership	

Capabilities
- Flexibility/Mobility/Ubiquity
- Faster time to market
- Moves, Adds, Changes
- Real estate
- Fewer desktop devices

Use Cases
- Call centres
- Consultants
- Off shore development
- Partners/Extranet
- Windows 7 migrations

Cisco*live!*

Moving Through VDI Rather Than To VDI

Centralisation

Presentation
Desktop

Centralised
Client/Server

Pervasive Network,
Flash, Ajax, JS,
HTML5

Centralised Creation
Integrated Data

Distributed Client
Efficient Server

Virtual
Desktop

Centralised
Creation/Data

Distributed Client
Centralised Server

Pervasive
Hypervisor

Distributed Creation
Centralised Data

Distributed
Client/Server

WAN
Acceleration

Distributed Creation
Centralised Data

Limited
Networks

Distributed
Creation/Data

2005

2010

2015+

Cisco live!
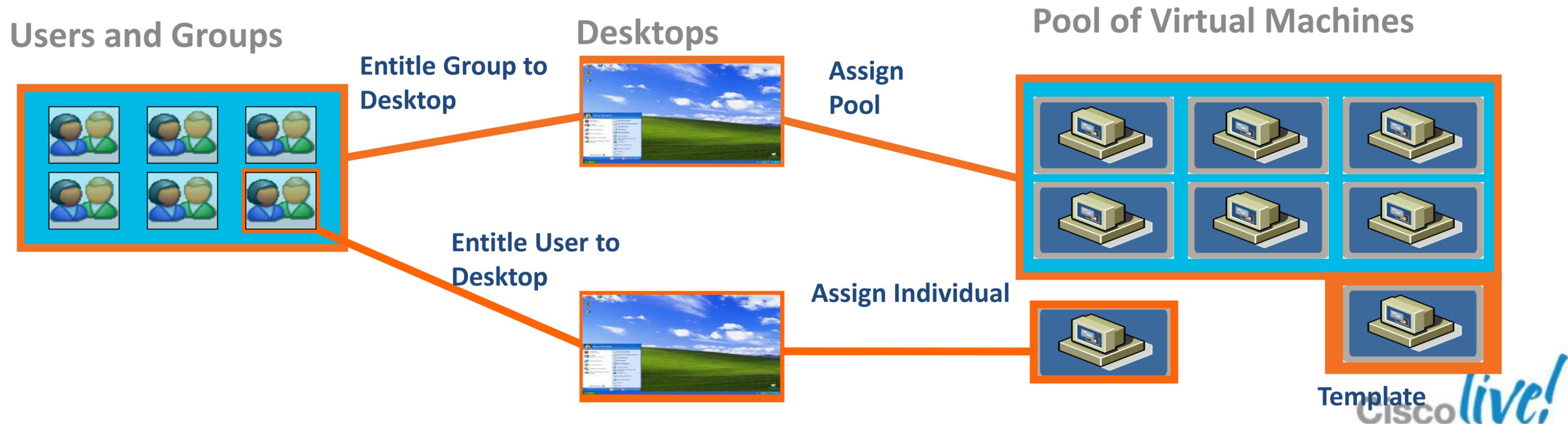
Software

Generic Broker Components

- Display Protocol
  - Client (with user)
  - Server/Agent (in HVD)

    Broker control

    Multimedia redirect drivers

    Virtual Printer drivers

    Security components

- Provision
  - Integrates with virtualisation infrastructure and Active Directory (AD)

- Administration Portal
  - Provision, assign, and monitor

- Connect
  - Authenticate AD users and groups to desktop pools
  - Direct user requests to virtual desktop or application

- Access Gateway/Proxy
  - Display protocol client/server
  - SSL tunnel from client to gateway

- User Portal
  - Publish virtual desktops and applications in a web portal

 Cisco Public

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VMware and Citrix Components

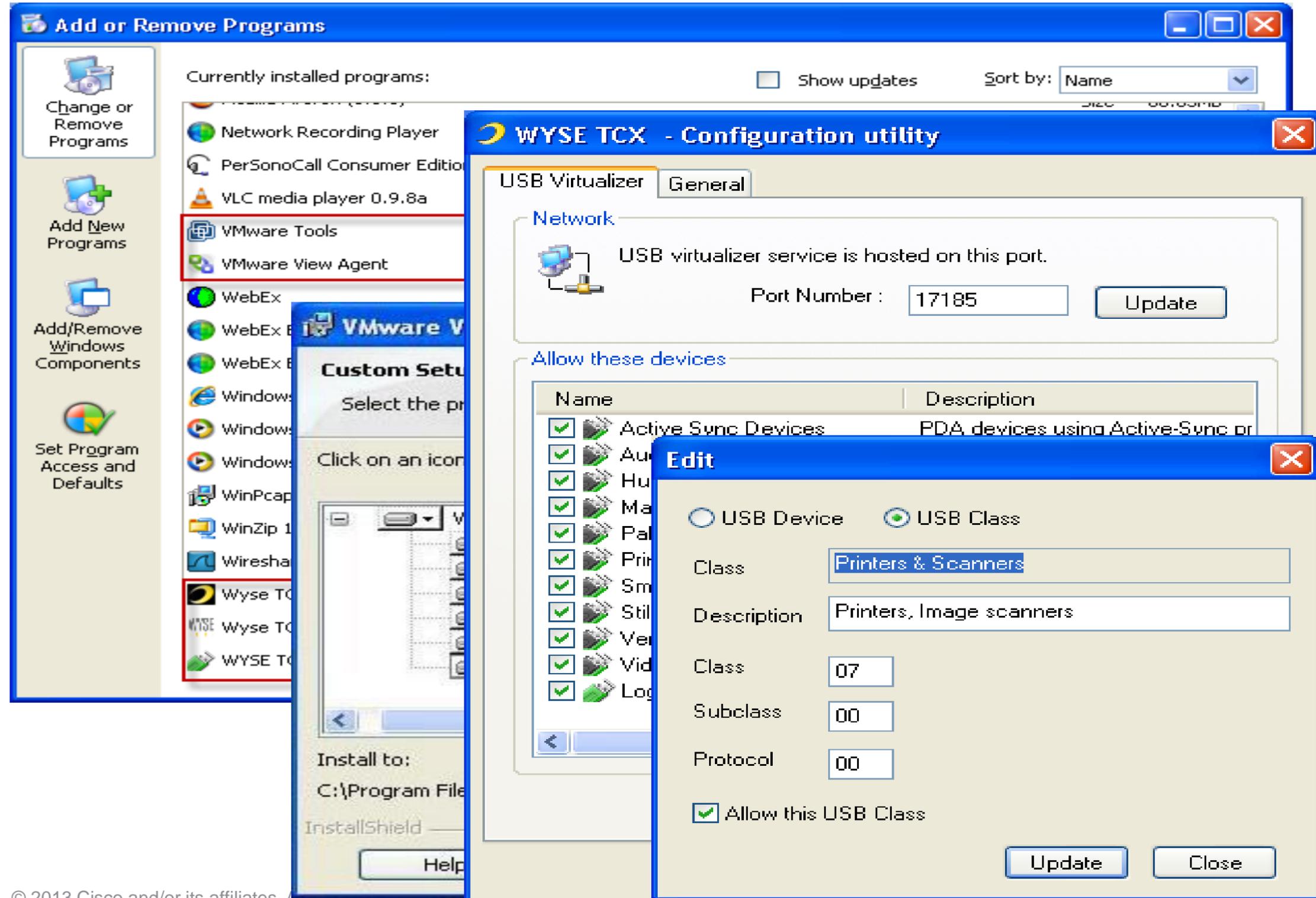| Function	VMware View 4	Citrix XenDesktop 4
Display Protocol Client	View Client	Citrix Receiver
Desktop Agent	View Agent contains PCoIP and RDP with Wyse TCX	Virtual Desktop Agent contains ICA and HDX Servers
Broker Provisioning	Composer / Thinapp	Provisioning Server
Broker Routing	Connection Server	Desktop Delivery Controller
Broker Proxy	Security Server	Access Gateway
Portal	View Portal	Web Interface
Administration	View Administrator	Management Console
Hypervisor	VSphere ESX	XenServer
Orchestration	Virtual Center	XenCenter

 Cisco Public

Broker Desktop Entitlement

- ## Non-Persistent or Pooled
  - Generic virtual desktop assigned to users on a per session first come first server basis and then returned to the pool (possibly with profile removed) or destroyed

- ## Persistent or Assigned
  - Permanently assigned to a user statically or by first to connect

Users and Groups

Desktops

Pool of Virtual Machines

Entitle Group to Desktop

Assign Pool

Entitle User to Desktop

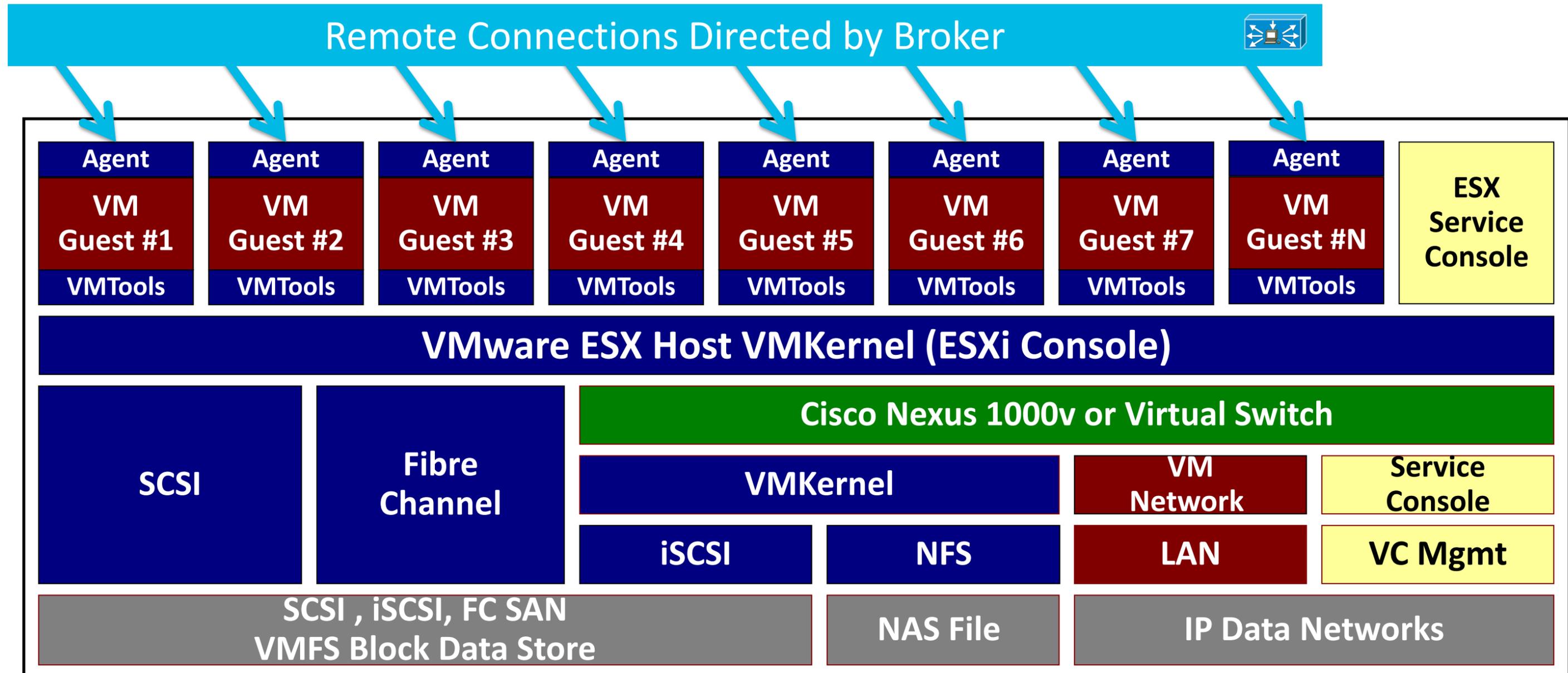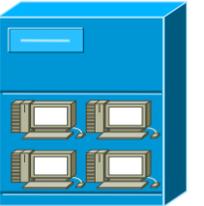**Assign Individual**

Template

Display Protocol Server Components

- VMware Tools

- Broker Agent

- Multimedia Redirector (Windows Media and Flash)

- Rich Sound Server (Analog Mic/Skr)
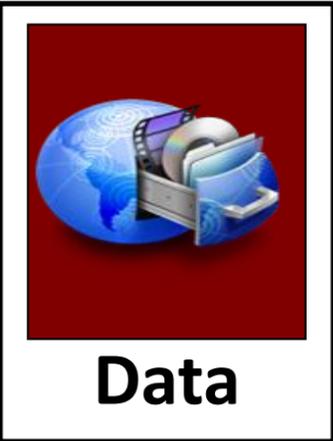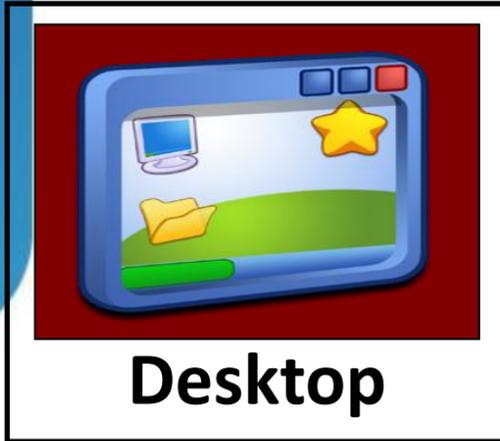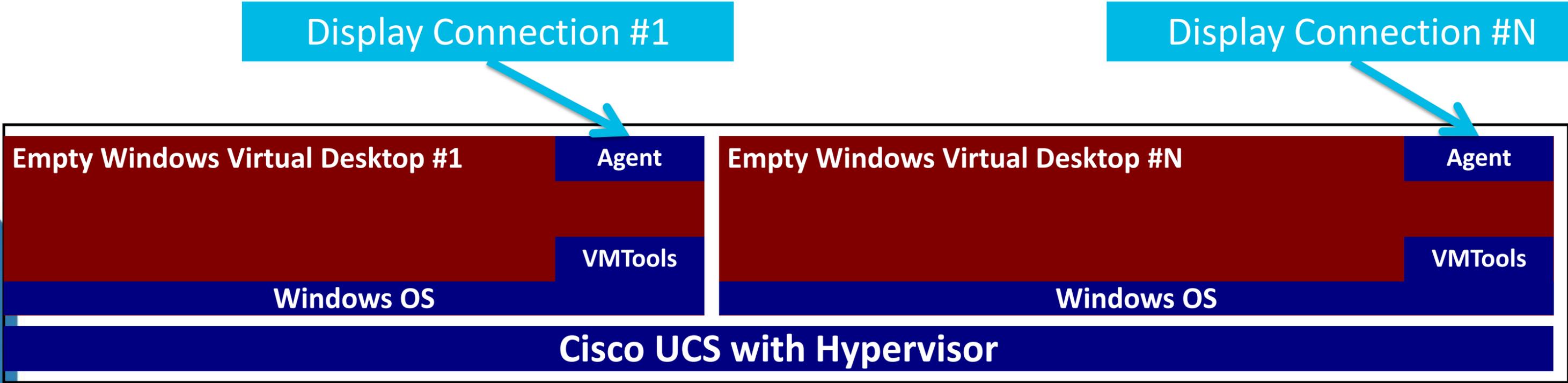
- USB Virtualisation Server

Desktop (OS) Virtualisation

Remote Connections Directed by Broker

Agent	Agent	Agent	Agent	Agent	Agent	Agent	Agent	
VM Guest #1	**VM Guest #2**	**VM Guest #3**	**VM Guest #4**	**VM Guest #5**	**VM Guest #6**	**VM Guest #7**	**VM Guest #N**	**ESX Service Console**
VMTools	VMTools	VMTools	VMTools	VMTools	VMTools	VMTools	VMTools	

VMware ESX Host VMKernel (ESXi Console)

SCSI	Fibre Channel	Cisco Nexus 1000v or Virtual Switch		
		VMKernel	**VM Network**	**Service Console**
		iSCSI / **NFS**	**LAN**	**VC Mgmt**

SCSI , iSCSI, FC SAN VMFS Block Data Store | **NAS File** | **IP Data Networks**

- Virtual Machine (VM)
- Small Computer System Interface (SCSI)
- Storage Area Network (SAN)
- Virtual Machine File System (VMFS)

- Fibre Channel (FC)
- Network File System (NFS)
- Network Attached Storage (NAS)
- Virtual Center (VC)

Hosted Desktop with Streamed Virtual Application

Display Connection #1

Display Connection #N

Empty Windows Virtual Desktop #1	Agent	Empty Windows Virtual Desktop #N	Agent
	VMTools		VMTools
Windows OS		Windows OS	

Cisco UCS with Hypervisor

Desktop

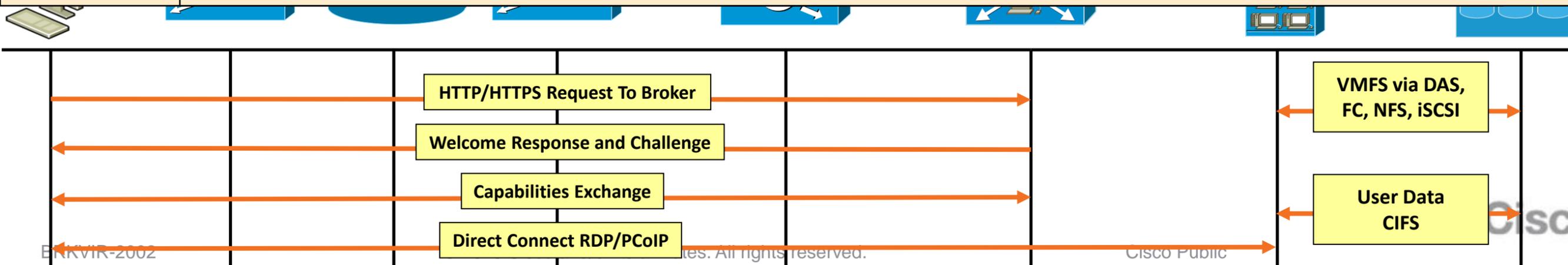**Application Streaming Server**

Profile

Data

- Profile decoupled from desktop OS using tools like AppSense
- Desktop provisioned with minimal or fixed set of applications installed

- Applications reside on File (VMware) or Streaming Server (Citrix)
- Administrator manages one master copy of an application that is streamed at run time
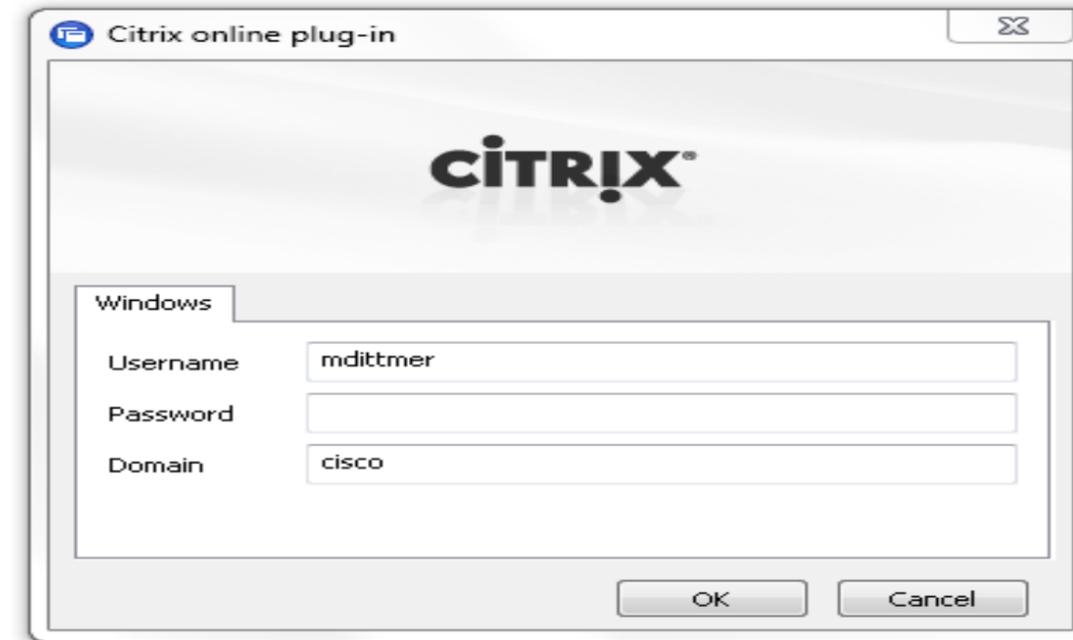
Example Direct Mode Broker Exchange

```
<broker    <broker ve   <?xml version="1.0"?>
<config    <id>CN=d    <broker version="3.0">
 <result    <name>dc     <desktop-connection>
 <offlir    <type>st      <result>ok</result>
 <broke    <state>d      <id>CN=dc1-p,OU=Applications,DC=vdi,DC=vmware,DC=int</id>
 <auther   <session     <address>10.87.121.28</address>
 <screer   id>COMPAN   <port>3389</port>
  <name    n=XXXX,ou    <additional-listeners>
  <param   <reset-a     <additional-listener name="MMR">10.87.121.28:9427</additional-listener>
   <para   <reset-a     </additional-listeners>
    <nar   <user-pr     <protocol>RDP</protocol>
    <va    <prefere     <user-name>jifrench</user-name>
    </pa   <prefere     <password>YzZmNGFlMTMt</password>
   </para  <prefere     <domain-name>COMPANY</domain-name>
  </scree  <prefere     <enable-usb>true</enable-usb>
</auther   <prefere     <enable-mmr>true</enable-mmr>
           </user-p     </desktop-connection>
           </broker>    </broker>
```

HTTP/HTTPS Request To Broker

Welcome Response and Challenge

Capabilities Exchange

Direct Connect RDP/PCoIP

VMFS via DAS, FC, NFS, iSCSI
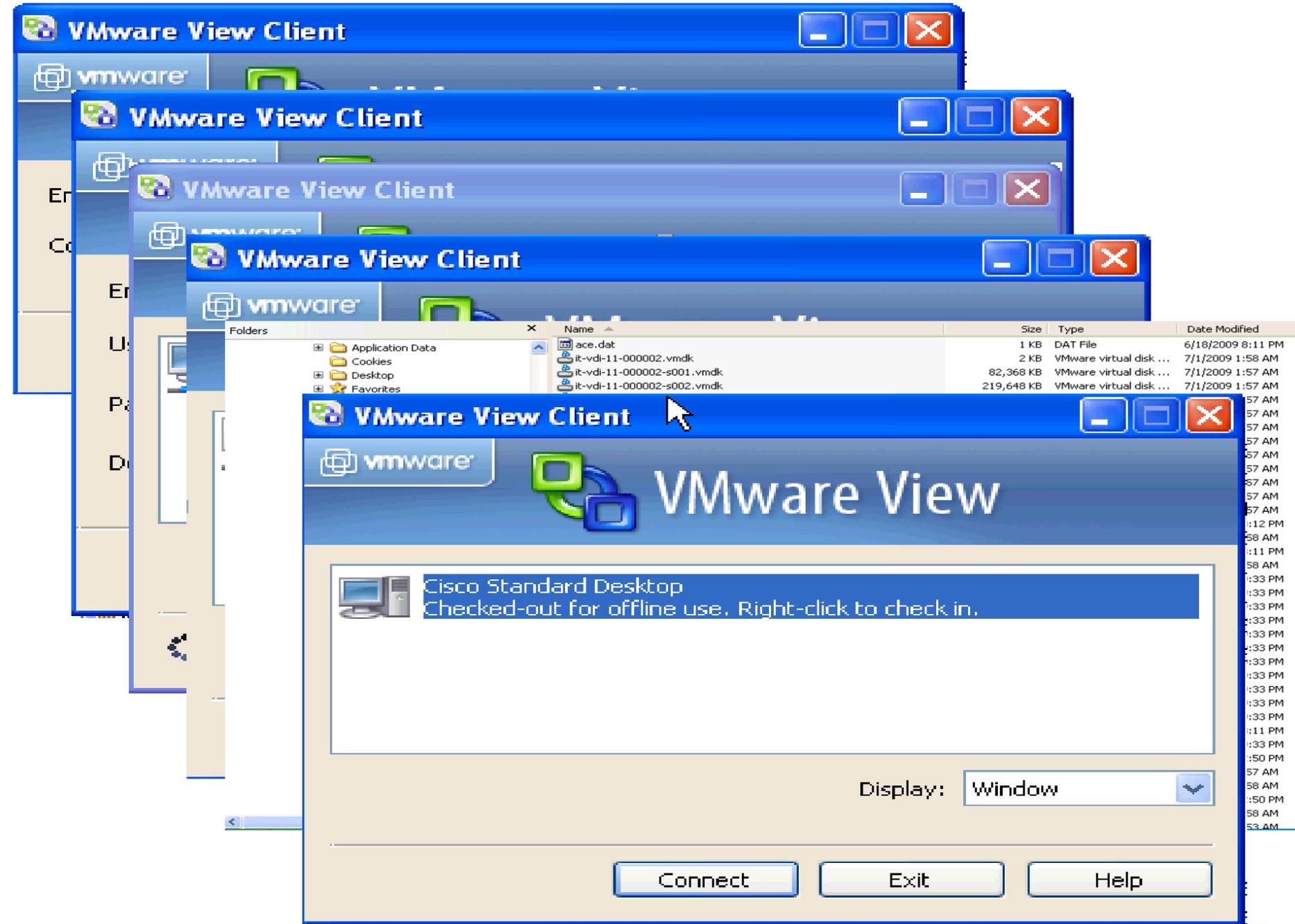
User Data CIFS
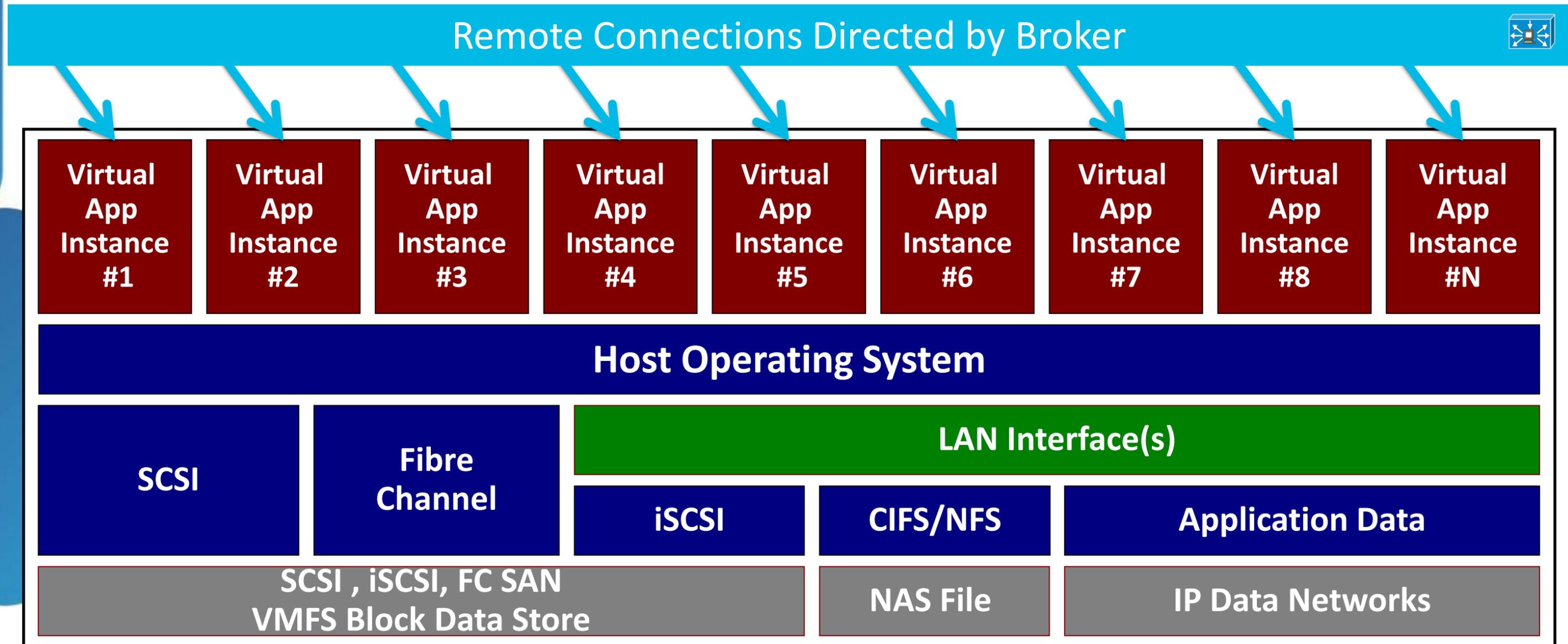
Thick Desktop Display Protocol Clients

- Thick client devices refer to standard PC or Laptops running a standard OS but have similar software as the thin client installed as an application

- Thick client devices allow users to work offline and are often the choice of the "Road Warrior" user

VMware View Offline Desktop

- Check out and check in desktop

- Local VMware Player installed

- Provides offline desktop

- Desktop must be shutdown to be checked in

- Not supported with linked clones

Application Virtualisation (Terminal Services)

Remote Connections Directed by Broker

Virtual App Instance #1	Virtual App Instance #2	Virtual App Instance #3	Virtual App Instance #4	Virtual App Instance #5	Virtual App Instance #6	Virtual App Instance #7	Virtual App Instance #8	Virtual App Instance #N

Host Operating System

SCSI	Fibre Channel	LAN Interface(s)		
		iSCSI	CIFS/NFS	Application Data

SCSI , iSCSI, FC SAN VMFS Block Data Store	NAS File	IP Data Networks

- No device or kernel drivers
- No Windows services
- No Windows class names or window name
- Installers cannot require a restart during install

- Support shared IP addresses
- No Inter-Process Communications
- No Distributed Component Object Model (DCOM)
- Registry/App Objects must link to USER32.DLL

Shared Desktop

Desktop
- Challenge
- Windowing

Presentation Desktop

Broker
- Security (AAA)
- Monitoring
- Publishing
- Routing

Display
Display
Display
Display
Display
Display

Data Centre	Storage

Hosted Applications

Co-Located Storage
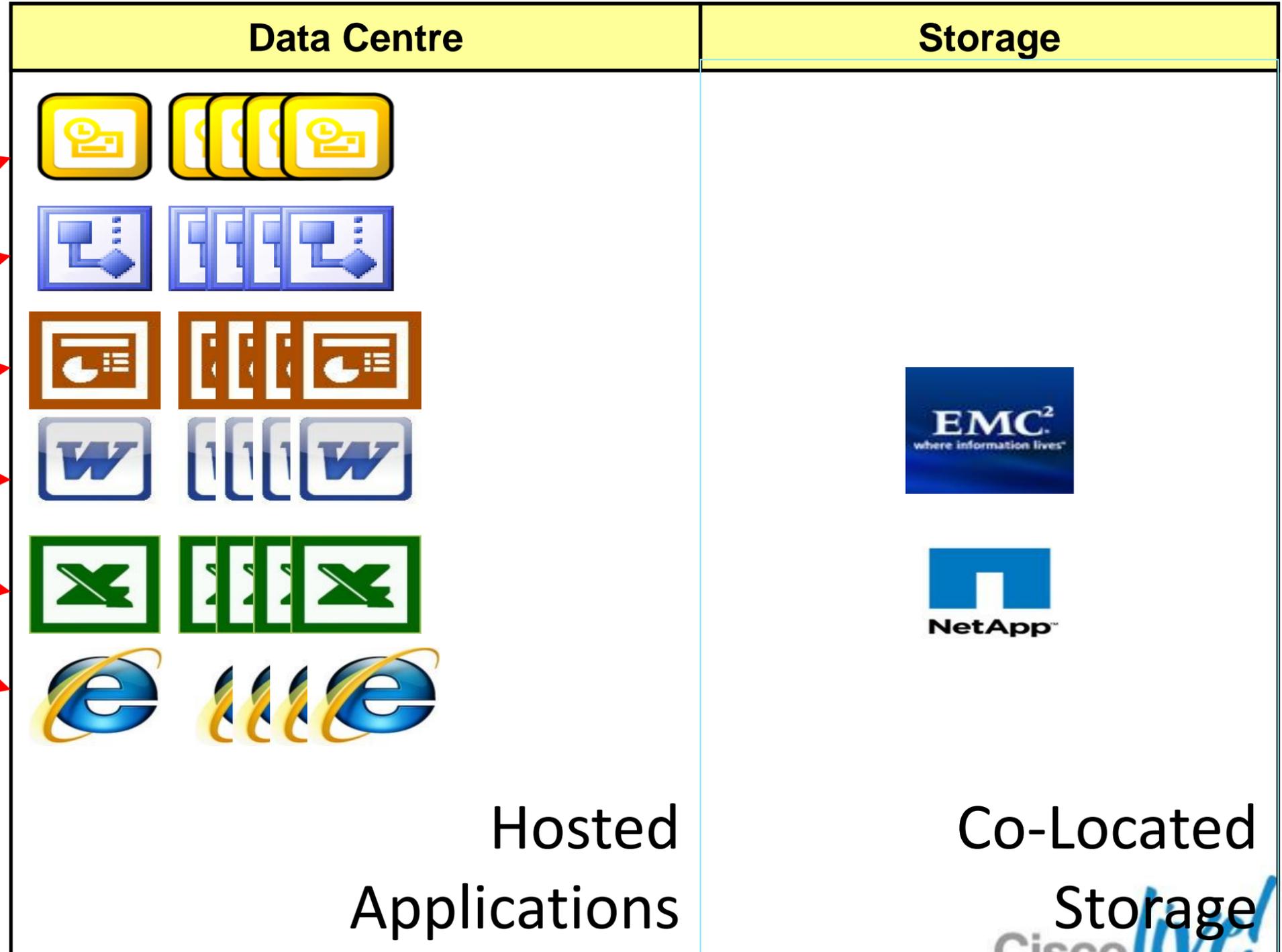
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Shared Web, Display, and Communication Workspace
Applications Everywhere to Me Anywhere

Presentation	Publishing	Access	Hosting	Data

Presentation
Desktop
- Challenge
- Windowing

Publishing
Broker
- Security (AAA)
- Monitoring
- Publishing
- Routing

Access
- SIP/Web
- Display
- Display
- Display
- Display
- Web
- Web
- HTML5

Hosting
Interactive Voice/Video

Hosted Client/Server Applications And Desktops

Web SAAS
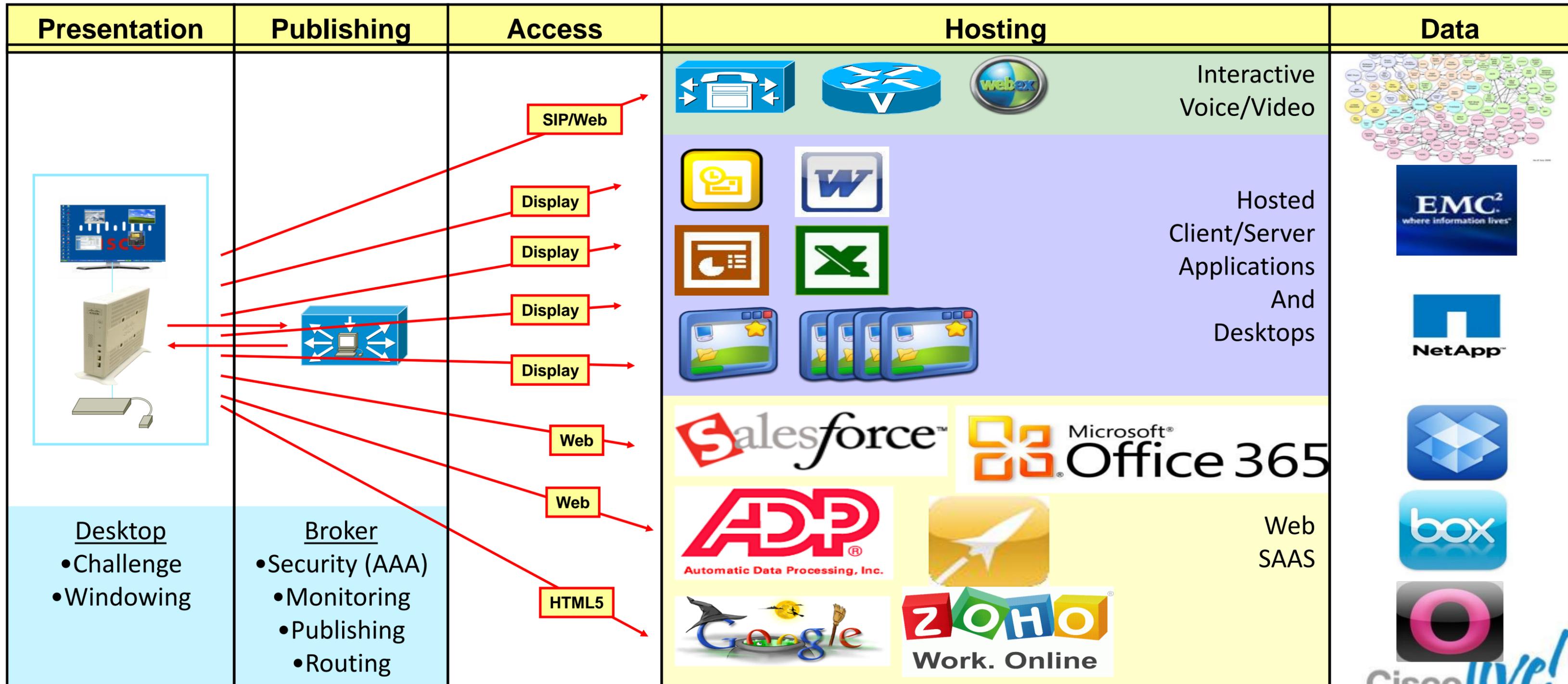
Data

Display Protocol Clients With Application Publishing
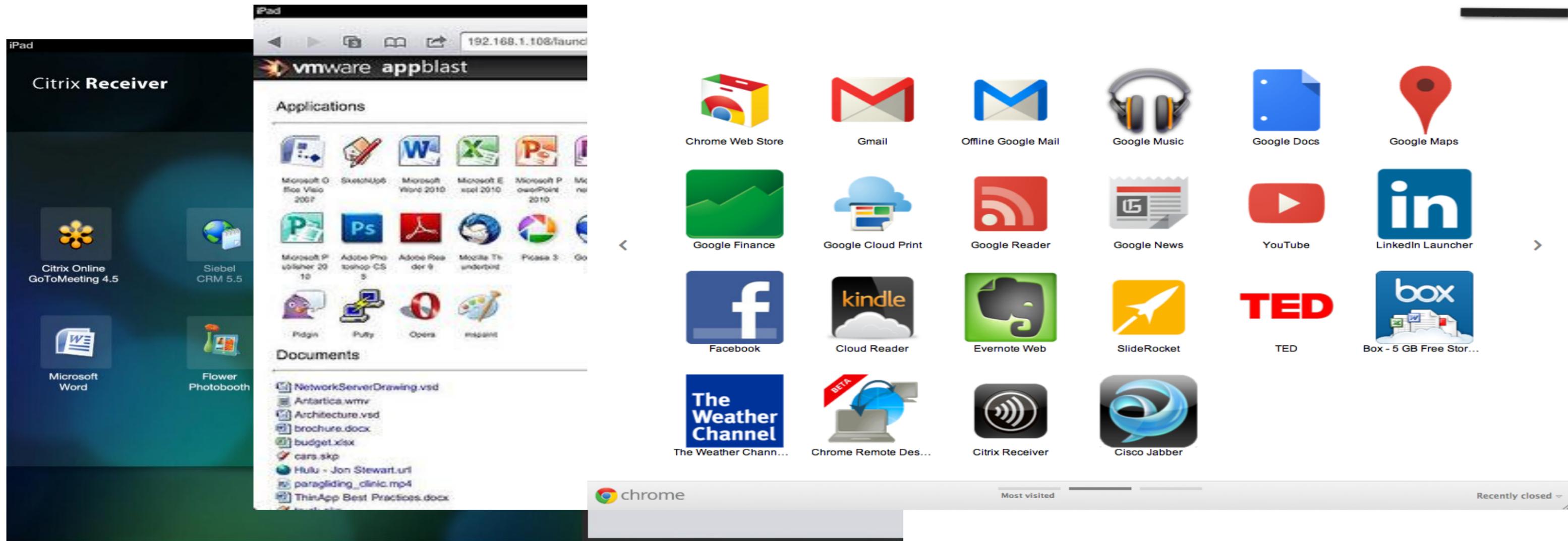
- Citrix Receiver

- Vmware AppBlaster

- ChromeOS

Cisco VXI
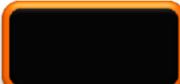
= Cisco Products

Virtualised Data Centre

Applications/Desktop OS

Cisco Collaboration Applications

MS Office

Desktop Virtualisation Software

CITRIX vmware

Hypervisor

CITRIX vmware Microsoft

WAAS

Quad

AnyConnect

UCS

ASA

Nexus 1000v

Virtual Security Gateway

Unified CM

Hypervisor

Compute

ACE
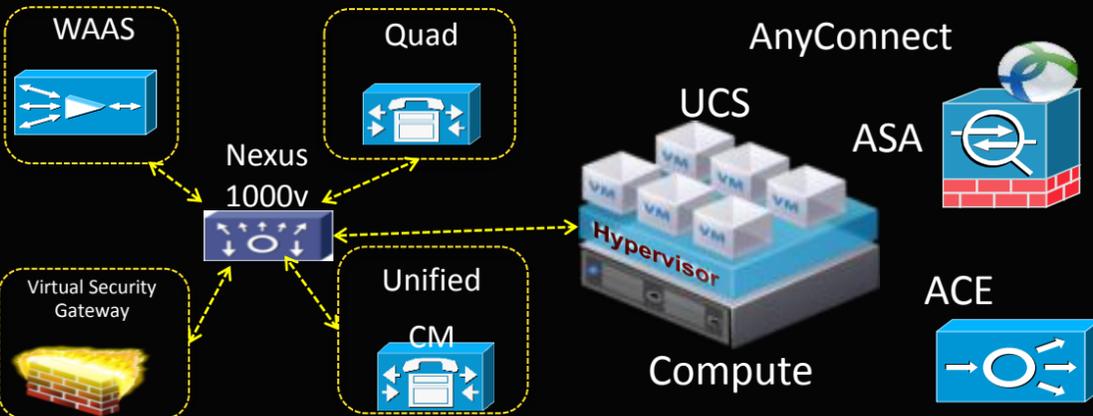
Storage

EMC² NetApp

Virtualisation-Aware Borderless Network

Cisco® Identity Services Engine

CDN

WAAS

PoE

Routing

Switching

Virtualised Collaborative Workspace

Cisco Virtualisation Experience Clients

AnyConnect

Cisco VXC 6215 Thin Client

Cisco VXC 4000 PC Client

Cisco VXC 22xx & 21xx Zero Client

Cius Business Tablet

WYSE

End-to-End Management and Optimization

AppSense atlantis COMPUTING Liquidware Labs Dedicated to the ART & Science of Virtualization™ unidesk VDI, Uncompromised.
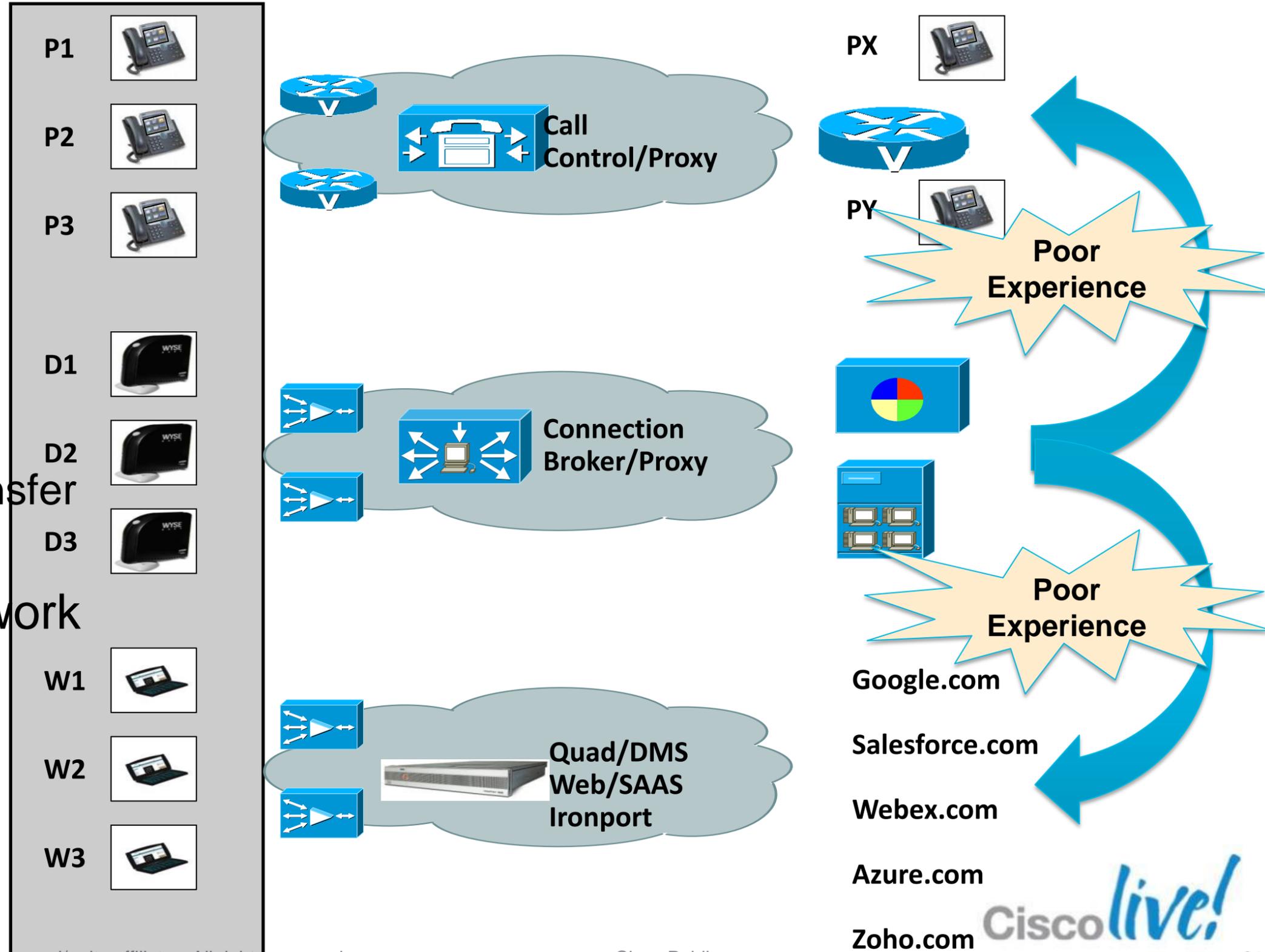
Cisco live!

Cisco Public

Collaboration

Hosted Presentation Applications
What's a Communications Company To Do?

- **Communications Network**
  - Peer to peer
  - Real time experience
  - Call Admission Control
- **Client/Server Network**
  - Client to server
  - Mix of real time and bulk transfer
  - Allow all
- **Web/Streaming/SAAS Network**
  - Client to server
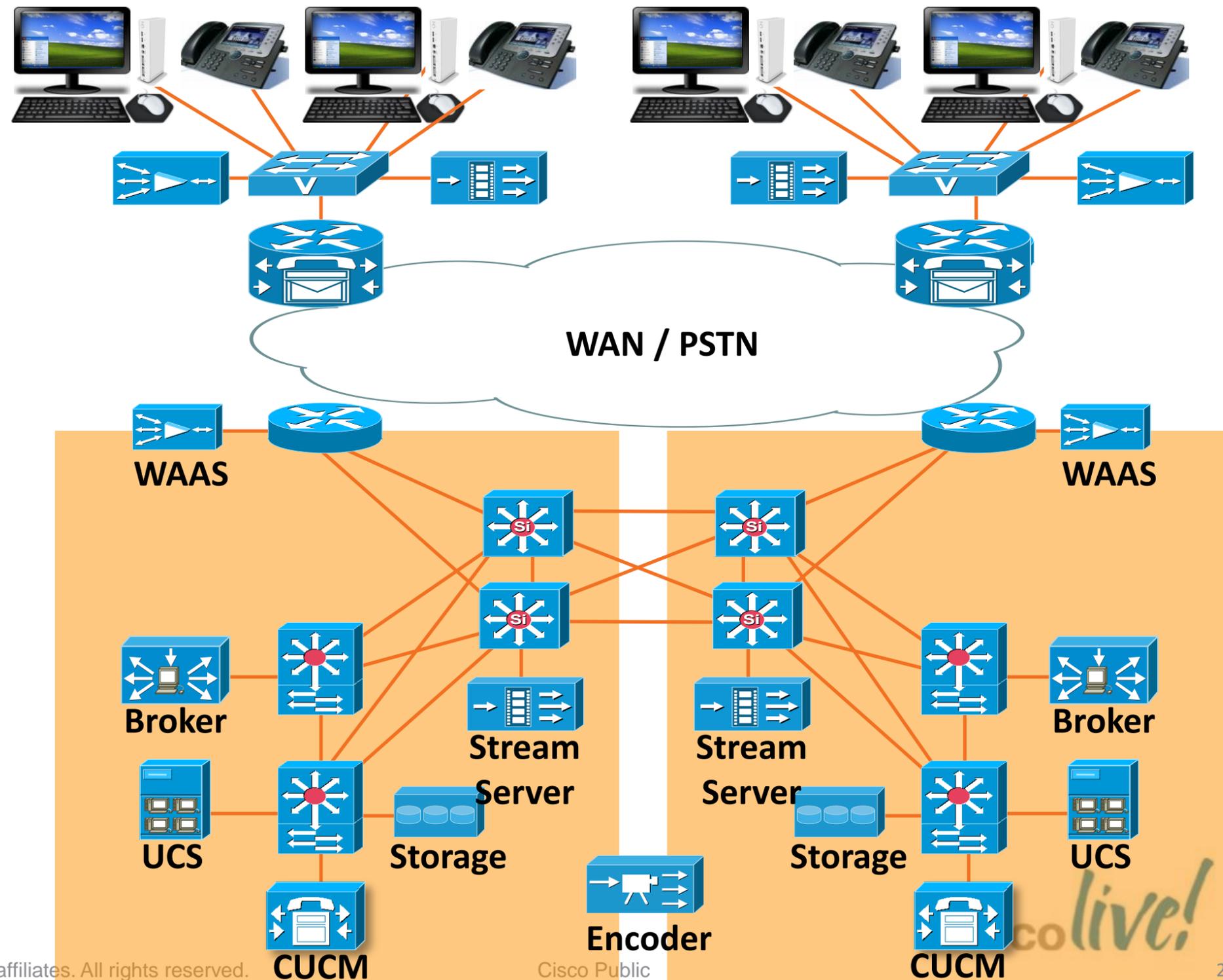 - Network tolerant
  - Mostly bulk transfer

P1

P2

P3

D1

D2

D3

W1

W2

W3

Call Control/Proxy

Connection Broker/Proxy

Quad/DMS Web/SAAS Ironport

PX

PY

Poor Experience

Poor Experience

Google.com

Salesforce.com

Webex.com

Azure.com

Zoho.com

Cisco Public

Cisco live!

Cisco Quad Web, Collaboration, & Application Publishing

Calendar

| 05 | **Tuesday, October 5** |
| | ◄ Previous | Next ► |

5:00 to 5:30 AM - Weekly Status Report

5:00 to 7:00 AM - GET DC Weekly Community Call

6:00 to 2:00 PM - Morgan Stanley - FY11 Account...

1:1

Hosted By: Siva Mandalam

Siva Mandalam 🔊 sinatara
◯ Offline
DIRECTOR.PRODUCT & SOLUTIONS MARKET
(Find more)

Wed Oct 06 1:58AM,UTC+0000
560 McCarthy Blvd., MILPITAS, California,
United States, 95035

> Go to Profile |Open Profile in new window

Web Desktop

Virtual Desktops
- VMware View 4 Desktop
- VMware View 3.5 Desktop
- Citrix XenDesktop
- Quest Desktop

Software As A Service (SAAS)
- Webex
- Salesforce
- ADP Payroll

Communications
- Cisco Show and Share
- Vsearch

✏ Edit Content   Select Content   ➕ Create

iPad   1:44 PM   72%

Settings Sign Out Feedback

Profile   People   Communities

Journal   Library   Contacts

Subfolders   Images

My Communities
Virtualization for UC on Server and Desktop
Virtual Desktop Infrastructure
Iselin NJ Lab
Getting Started
GET Data Center Application Services
GET CDO Interlock
Enterprise Architecture and Systems
ECP Policy Engine

>> All Communities

Community Analyst/Developer: Su... 11:08 AM

Stacey Goldsmith wants to add you as a **Confirm** contact. Jul 29

Search Contacts

chrome

Cisco Virtual Experience Infrastructure

- Unified Communications
  - Virtual Experience Client (VXC) – Zero Client
  - Cisco IP Hard Phone
  - Branch Call Control, Voice Gateway, and Voice Mail
- Borderless Network
  - Wireless
  - Wide Area Application Services (WAAS) for better performance and user density
  - Content Delivery System (CDS) for streaming video caching, splitting, and branch multicast
- Data Centre
  - Unified Compute System (UCS)
  - Centralised Call Control with Cisco Unified Communication Manager (CUCM) on UCS
  - Digital Media System (DMS)
- Partners
  - Broker
  - Storage

WAN / PSTN

WAAS

WAAS

Broker

Stream Server

Stream Server

Broker

UCS

Storage

Storage

UCS

CUCM

Encoder

CUCM

Desktop Video Call

- Unified Communications
  - Cisco Unified Personal Communicator (CUPC) or any softphone
  - Branch call control, voice gateway, and voice mail
  - Media is peer to peer within sites or across MPLS sites
- Borderless Network
  - QoS provides low latency queueing
  - Call Admission Control (CAC)
  - Business applications protected
- Data Centre
 - Centralised Call Control with Cisco Unified Communication Manager (CUCM) on UCS

WAN / PSTN

CUCM

CUCM
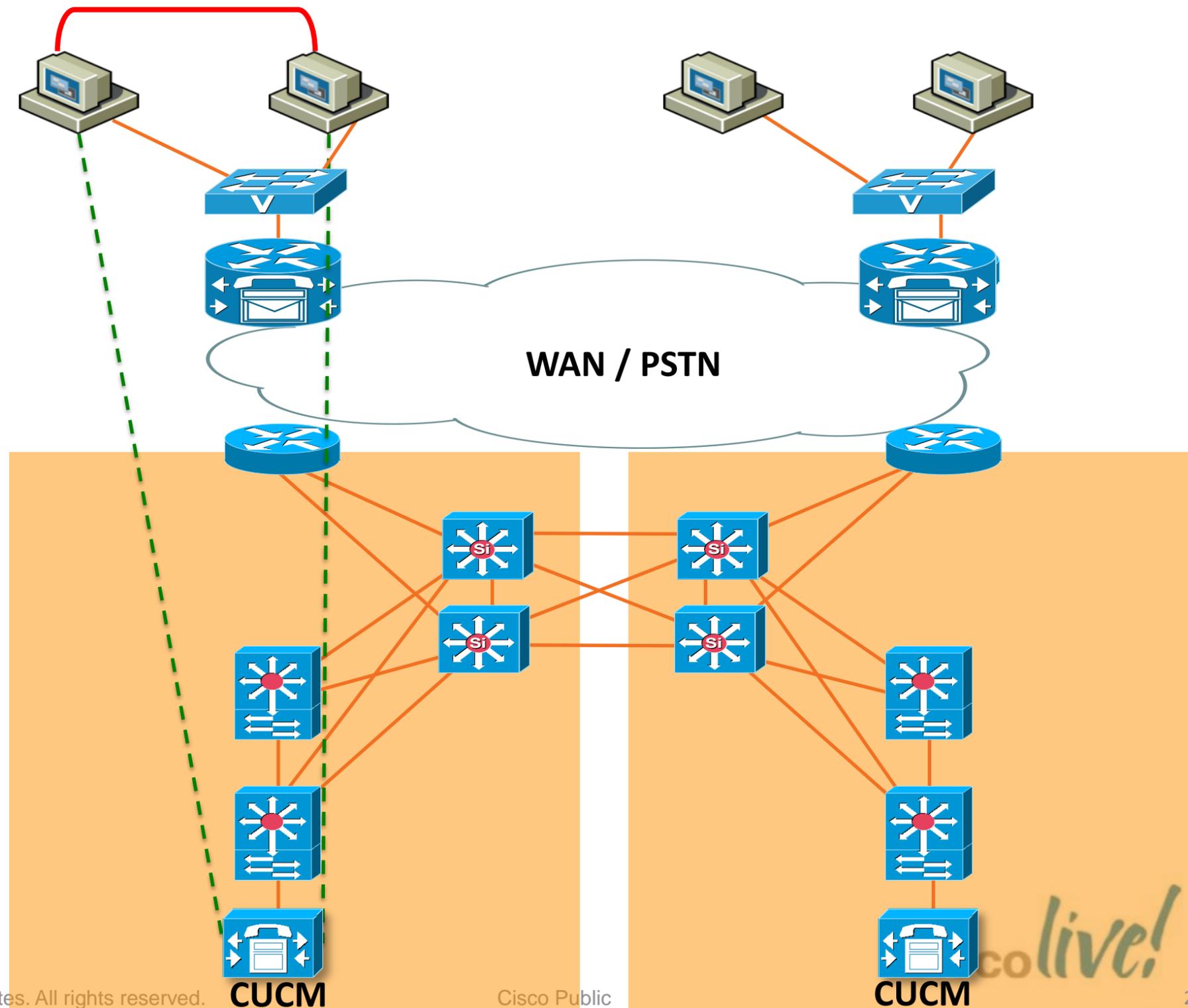
Virtual Desktop Video Call with VDI

- Unified Communications
  - Centralised call control
  - Broken call admission control
  - High client CPU
  - Poor video
  - Out of Sync Audio
- Borderless Network
  - Best effort queue
  - Bandwidth up to 150 Mbps
  - Media hair-pinned through data centre
- Data Centre
  - Server farm network loaded
  - High server CPU

WAN / PSTN

Broker

UCS

Storage

CUCM

Broker

Storage

UCS

CUCM

Cisco Public
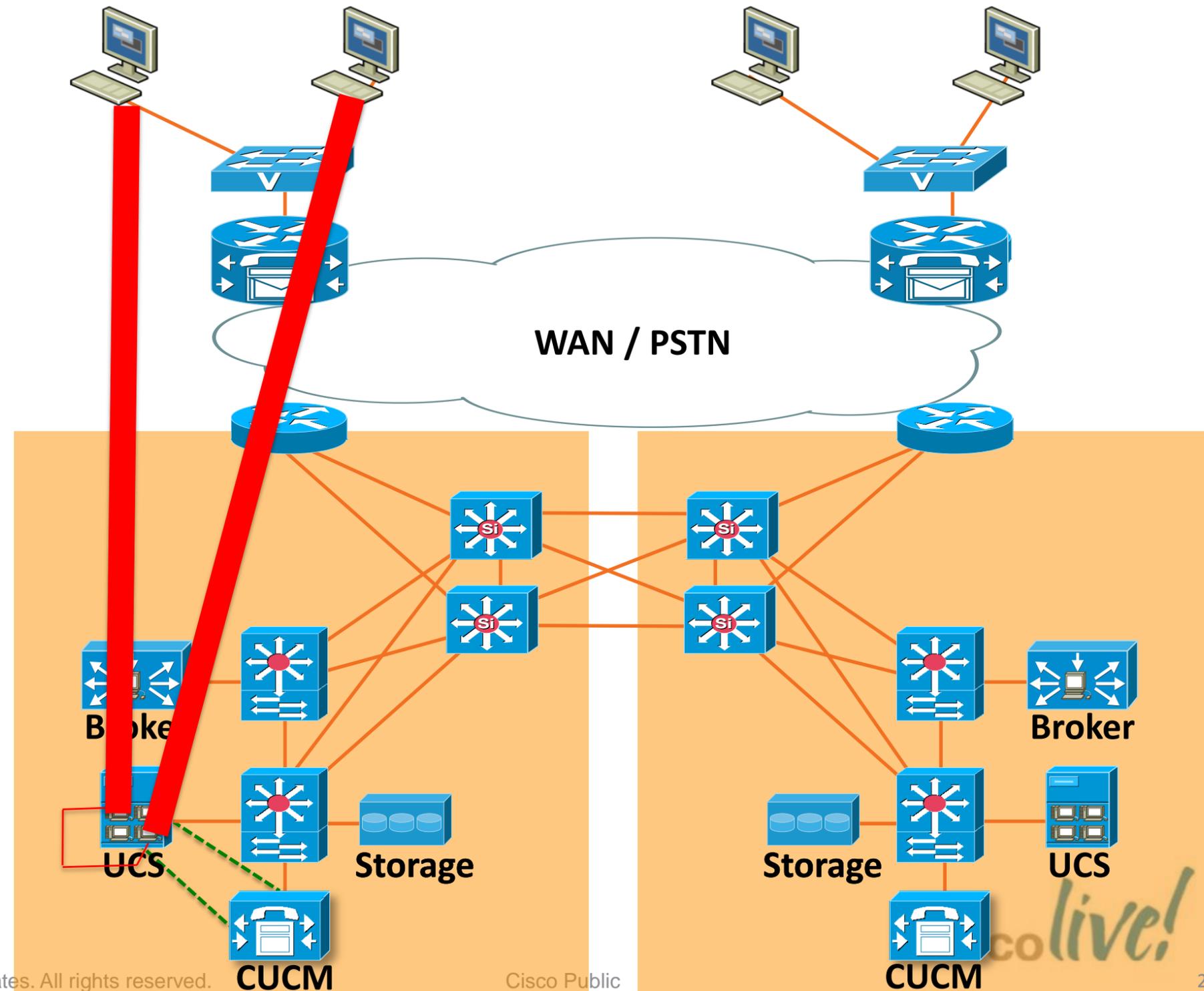
Live Streaming Video

- **Unified Communications**
  - PC has local browser with media player
- **Borderless Network**
  - CDS and/or multicast split video in a display protocol resulting in one stream per user on the WAN
  - Bandwidth/experience is native 100/300/700 kbps
  - QoS protects business applications and other traffic
- **Data Centre**
  - Encoder sources a single stream to CDS which unicasts or multicasts to scale

CDE   CDE

WAN / PSTN

Stream Server   Stream Server

Encoder
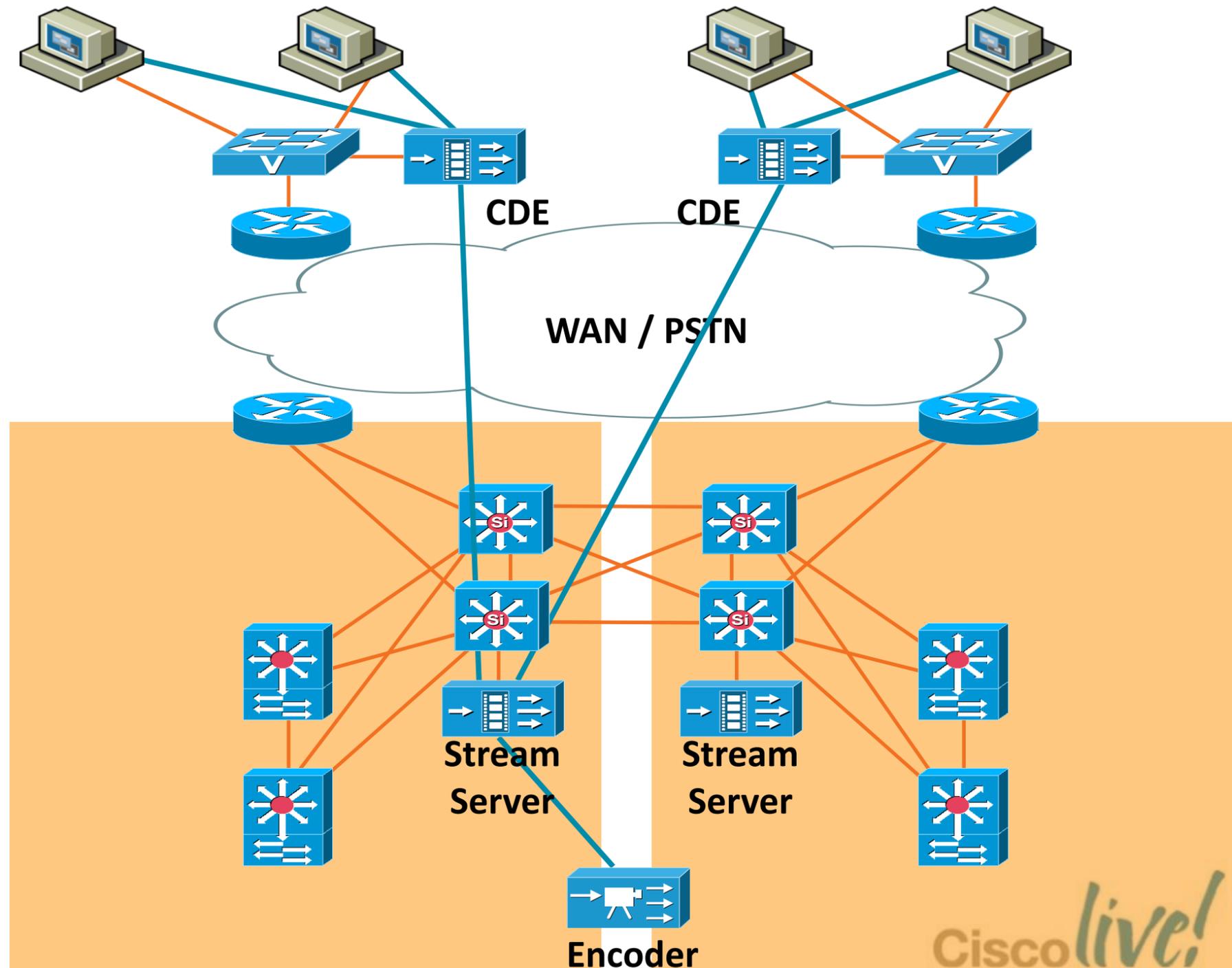
Live Streaming Video with VDI

- Unified Communications
  - Zero/thin client with display protocol client only needs capacity to decode
- Borderless Network
  - CDS and multicast cannot split video in a display protocol resulting in one stream per user on the WAN
  - Bandwidth/experience varies depending on display protocol & streaming format
  - No QoS so entire experience suffers if congestion
- Data Centre
  - Stream sourced from encoder
  - Servers are loaded by transcoding and/or transrating
  - Server farm is loaded by all streams

CDE   CDE

WAN / PSTN

Broker

UCS

Stream Server

Storage

Stream Server

Storage

Broker

UCS

Encoder

Cisco live!
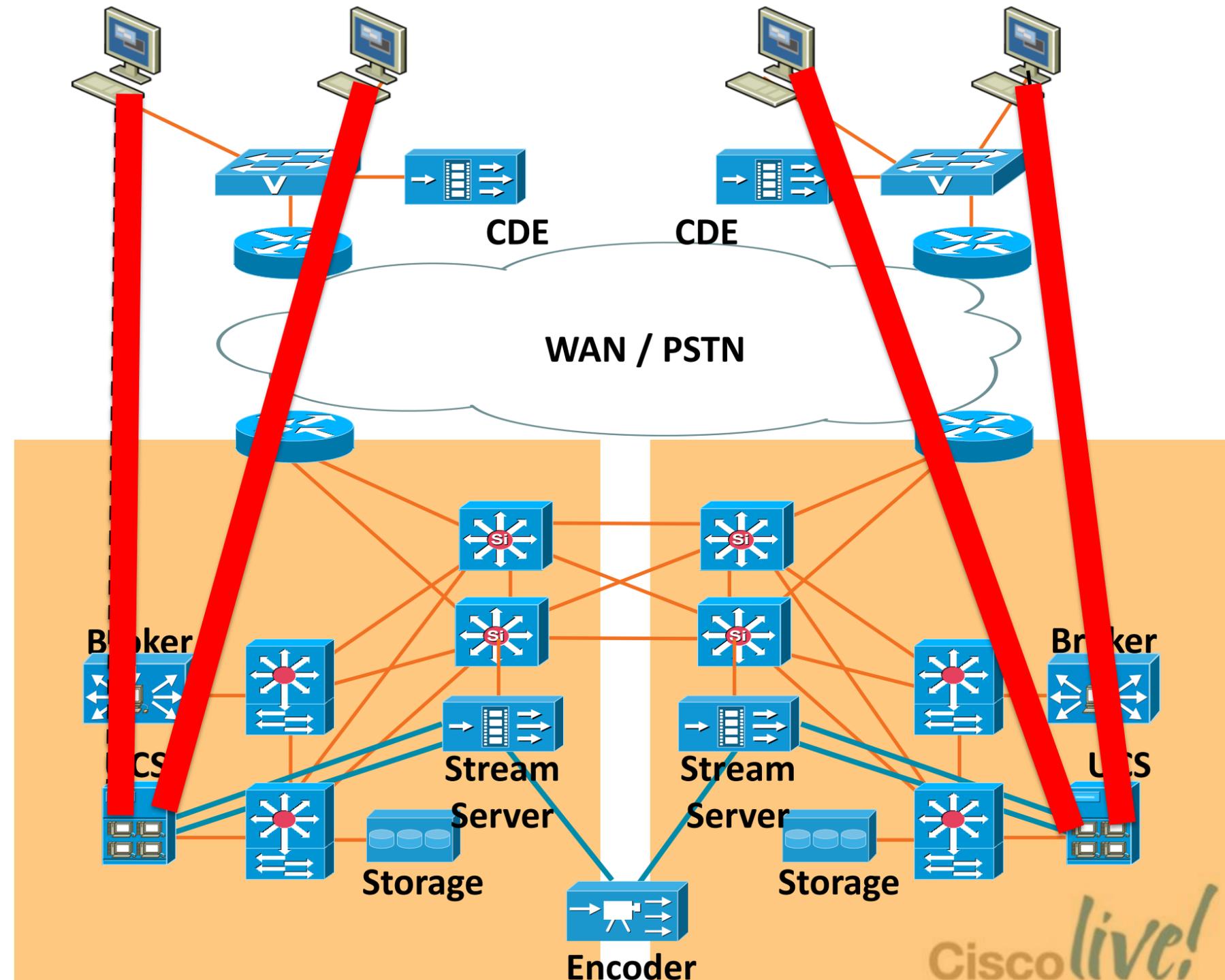
What Do End Users Need?

Number of Applications

Call Centre or Clerical	Professional	Design Professional

Administrative	Rich Media	Graphics or Custom
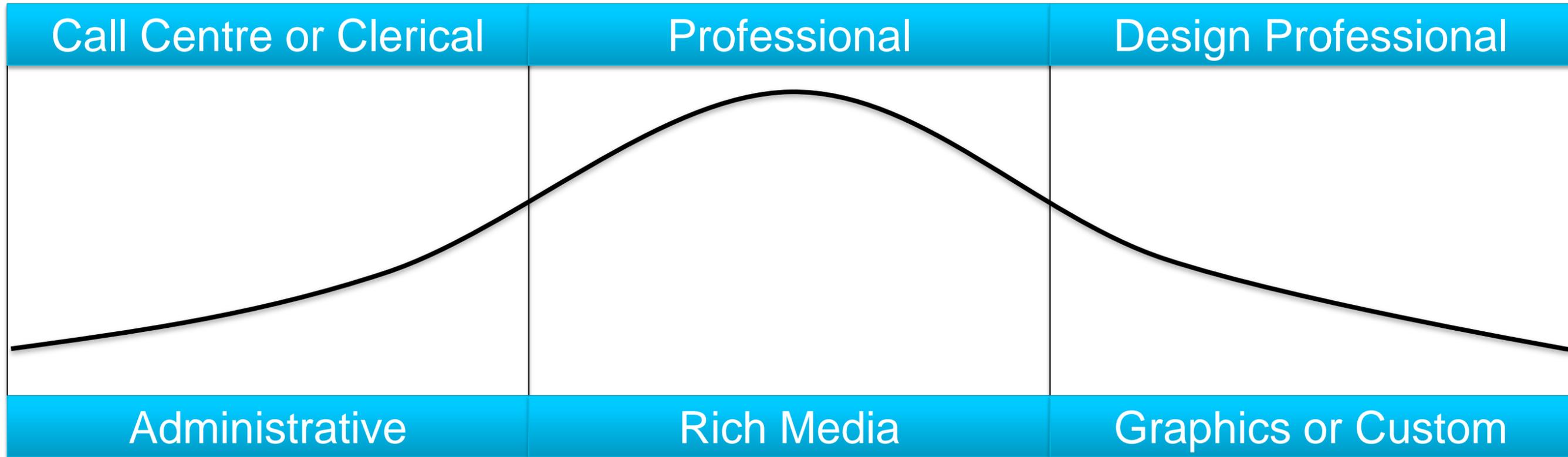
Remote/Task Worker	Knowledge Worker	Power User

Thin Clients | **Capable Clients**

It's all About the Application!

	User	Hardware	OS	Software	Execution	Storage	Security	Life (Yrs)
Zero	Task	Chip	Firmware	None	All remote	None	Low risk	7-10
Thin	Task/Knowledge	Limited	Hardened	Display	All remote	None	Low risk	5-7
Hybrid	Knowledge	Capable (possible media offload)	Hardened General (Linux or Windows Embedded)	Display Rich Media Web	Client/Server remote Rich media local	Transient Encrypted	Medium risk	5-7
Thick	Knowledge or Power	High End	Open General (Windows, Linux, Mac)	Unlimited	Mostly local Some remote	Persistent	High risk	3-5

1. Status-quo - Use whatever desktop/notebook/etc you already have

2. PC refresh - buy new desktop/notebook hardware with HVD and application virtualisation rollout

3. Recycle PC - Convert old PC hardware to a "homebrew" thin-client

4. New thin/zero clients - New purchases

Cisco Public

VXC Feature Comparison

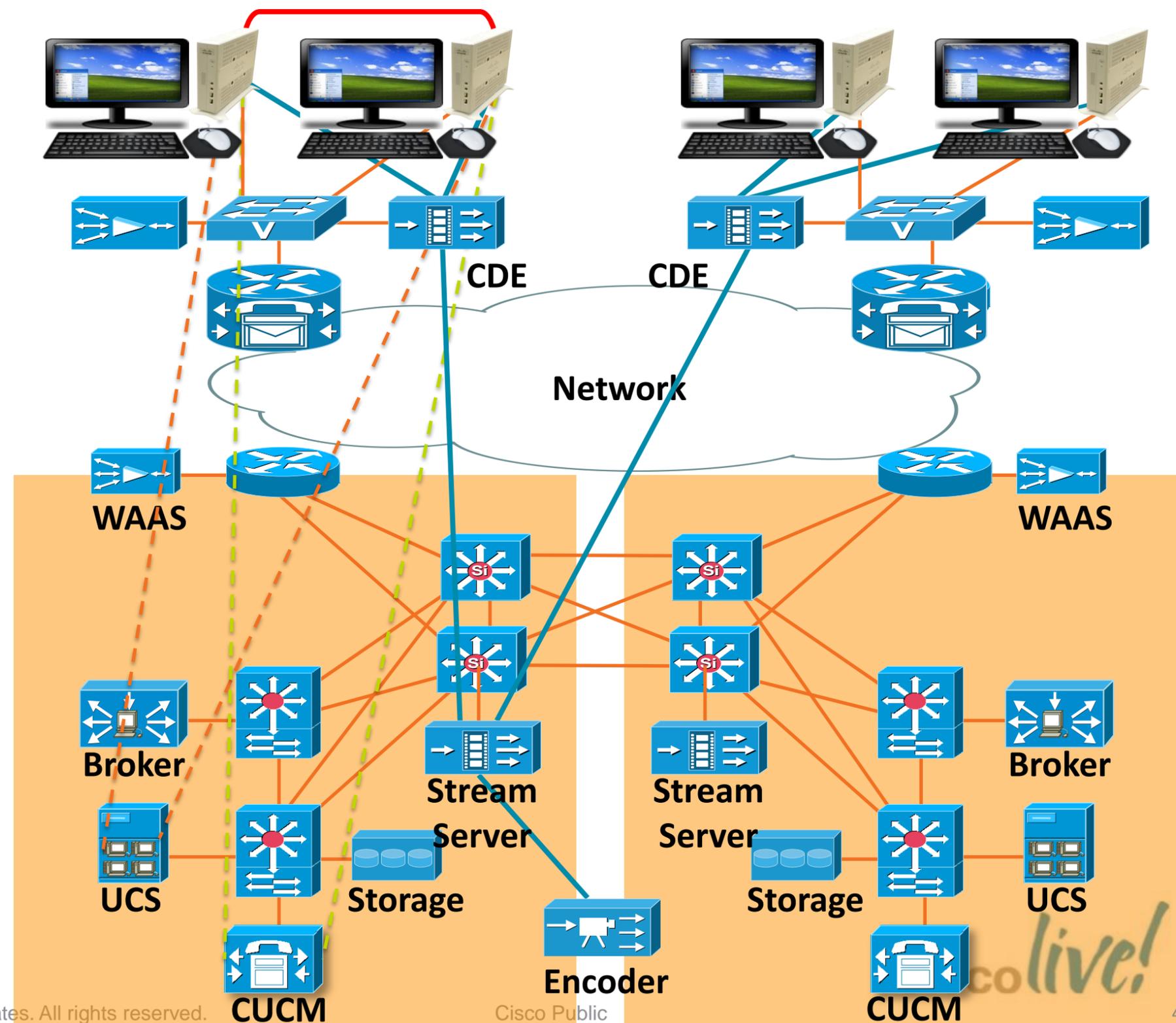|	VXC 2100 Series	VXC 2200 Series	VXC 4000*	VXC 6215*	Cisco Cius
Form Factor	"Backpack" Integrated	"Tower" Standalone	PC Software	"Tower" Standalone	Enterprise Tablet
Availability	Shipping	Shipping	Q4 CY 2011	Q4 CY 2011	Shipping
Platform	Zero Client	Zero Client	Win7, XP	Linux	Android (x86)
HVD Protocol Support	2111 – PCoIP 2112 – HDX,RDP	2211 – PCoIP 2212 – HDX,RDP	Citrix XenDekstop VMware View	HDX, RDP, PCoIP	Citrix XenDektion VMware View
UC Protocol Support (add on)	N/A	N/A	Software Appliance	HDX, RDP (Q4CY11) PCoIP (Q1CY12)	N/A
UC Client Support*	CUPC, Connect	CUPC, Connect	CUPC, CUCiLync	CUPC, CUCiLync	Native
Voice	IP Phone 8961, 9951, 9971	N/A, can be used with IP Phone	Yes	Yes	Yes
Video	IP Phone 9971, 9951	N/A, can be used with IP Video Phone	No	Yes	Yes
Monitor Support	Single or Dual, 1920x1200	Single or Dual, 1920x1200	Varies based on underlying HW	Single:2560x1600 Dual:1920x1200	Single Mirror, 1024x600 (on the roadmap for dual monitor support)
PoE	PoE	PoE	N/A	No	PoE
Encoding & Decoding	Via IP Phone	Via IP Phone	Audio only. Video on the roadmap.	Standard Video HD Capable*	HD Capable (720p)

Cisco Public

VXC 6215 Software Stack

Applications

VXC 4000 for Linux

HVD Broker

UI (Video Render/SRST/EM)

OAM&P/ Serviceability

CSF2G
Enhanced Call Control
SIPPC, CC API, Media Engine
Accessories Manager

Citrix
Receiver

RDP
Client

VmWare
View

Firefox
Rediscover the web

HVD Agent (Virtual channel Interface)

Platform

A/V
Device Manager

AnyConnect
VPN

EnergyWise
Client

MediaNet
Client Framework

Operating System

Blue
Tooth

USB

DECT

CDP
LLDP

IPv4

IPv6

Hardware OEM

Hardware GT56N Dual Core 1.6GHz
Dual Display, PoE

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VXC Manager

- Centralised device and software management

- VXCM is automatically discovered through DNS and DHCP options

- Distributions may leverage WAAS or CDS in lieu of a repository

Traditional Services Work For All Clients

- ## Unified Communications
  - Softphone in VXI runs native locally
  - Supports Survivable Remote Site Telephony (SRST) supported
  - Use local services (gateways, call control, vmail, etc.)
  - No voice hairpinning

- ## Borderless Network
  - Use local internet access
  - Use CDS/ACNS/WAAS to cache, split, and/or multicast streaming media
  - Provide QoS for rich media

- ## Data Centre
  - Offload server CPU
  - Offload server bandwidth

CDE **CDE**

Network

WAAS **WAAS**

Broker **Broker**

Stream Server **Stream Server**

UCS **Storage** **Storage** **UCS**

CUCM **Encoder** **CUCM**

Cisco Public

Cisco VXI Workspace Convergence

- VXC 6215 is capable of replacing a thin client, phone, video conference device, and Netbook/Chromebook

- Jabber and AnyConnect to be available on Windows, Mac, Applie iOS, Android, and Blackberry with Citrix/VMware clients and a web browser

- VXC Single Sign On (SSO) for telephony and virtual desktop/application

- Stateless client with centralised user profile for telephony and virtual desktop

- Quad publishes virtual desktop/application, telephony, and web/SAAS applications

VXC

VXC

VXC

Call Control

Connection Broker

Web Security Appliance

Media Services

Presentation Server

Virtual Desktop

Salesforce.com

Webex.com

adp.com

Cisco live!
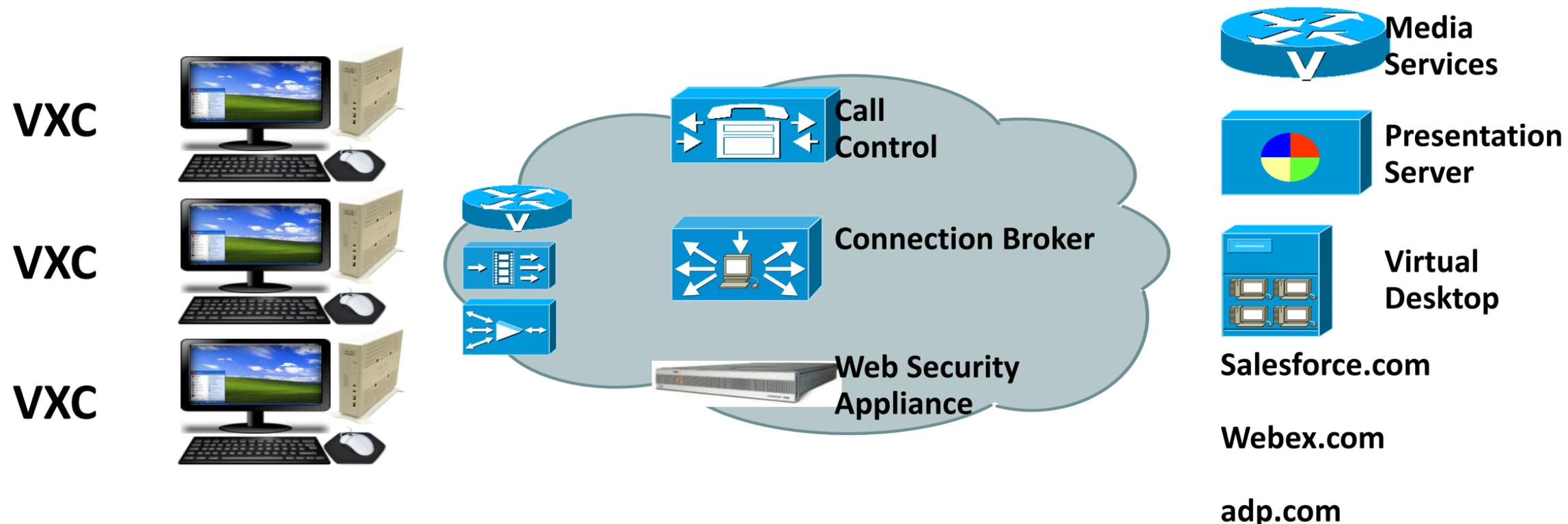
Borderless Network

Decoding the VDI Protocol Stack

	VMware View	Microsoft RDS	Citrix Xen
Application	VMware View	Microsoft RDS	Citrix Xen
Underlying Protocols	PCoIP 4172	RDP 3389	ICA 2598/1494
	UDP	TCP	
Deployment Considerations	• Client-slide hardware "strongly recommended" for optimal experience- Can increase acquisition costs and TCO • MMR with Win7 desktops not supported	• No Client-side hardware dependency • Remote FX requires H/W assist (server GPU) • Standards-based encryption model	• No client-side or server-side hardware dependency • Standards-based as well as proprietary encryption models

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Display Protocol Considerations

- Network
  - Transport – TCP, UDP, RTP
  - Behaviour - bandwidth, congestion, latency, drop
- Channels
  - Inband
  - Out of band
- Acceleration
  - Encryption
  - Compression
- USB
  - Headset
  - Print
  - Drive
  - Security

- Voice
  - USB headset
  - Analog microphone/speaker
- Video
  - Streaming - Windows Media, Adobe Flash, QuickTime, or SilverLight
  - Telephony
  - Graphics - 2D or 3D graphics, animated gifs
- Print
  - Print server
  - Printer location
  - User mobility

Display Protocol Summary

Protocol	Vendor	Transport	Bandwidth without WAAS (Approx)	Bandwidth with WAAS (Approx)
Remote Desktop Protocol (RDP)	Microsoft	TCP 3389	384 Kbps	96 Kbps
Independent Computing Architecture (ICA)	Citrix	TCP 2598 CGP TCP 1494 ICA	120 Kbps	60 Kbps
PC over IP (PCoIP)	Teradici / VMware	Media – UDP 50002/4172 Control – TCP 50002/4172	192 Kbps	192 Kbps
Remote Graphics System (RGS)	HP	TCP 42966	1 Mbps	TBD
Appliance Link Protocol (ALP)	Oracle	Media - UDP >32768 Control – TCP 7007	400+ Kbps	400+ Kbps

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WAAS Performance Results for ICA and RDP

Measuring response time improvements for internet browsing with IE

Latency Reduction

■ Native ■ With WAAS

Seconds (s)

60% faster

60% faster

ICA

Bandwidth Reduction

■ Native ■ With WAAS

Kbps

50% Improvement

70% Improvement

ICA

RDP

RDP

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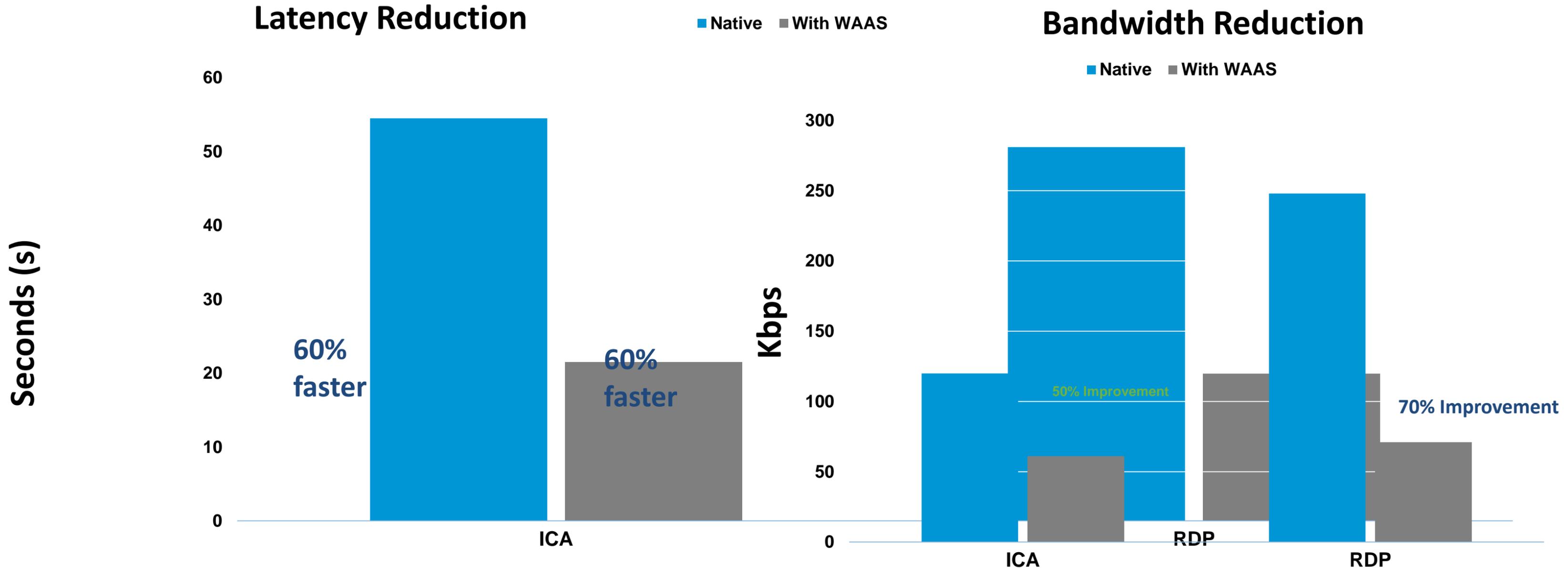
Display Protocol Channels

- Display protocols operate at the session layer

- Display protocols were intended to remote applications and not desktops

- Desktop interactions require that some local client services be extended to the remote virtual desktop

- Channels provide a means to extend remote virtual desktop services

- Channels cannot leverage network services like QoS, security, media bridging, stream splitting or multicast

Display Protocol TCP

USB

Video

Sound

Print
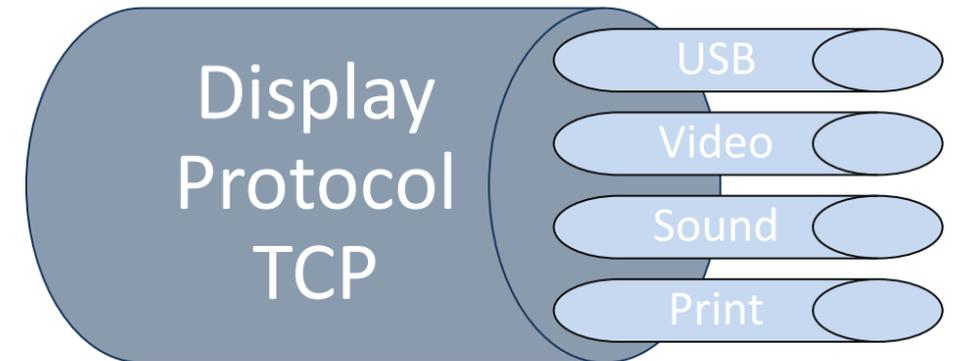
Fundamental Problems with In-Band Channels

- Mixing interactive and bulk transfer traffic types in a single TCP connection
  - Client copies file from local USB with packets #1 and #2
  - Client clicks with packet #3

- If network could provide better service to packet #3, it would reach host before #1 and #2

- Destination host TCP stack will wait for the rest of the TCP window to send to the application

Display Client

Display Server

Local Desktop

Display Client

Remote Virtual Desktop

Display Agents

Tools

3

2

1

3

2

1

3
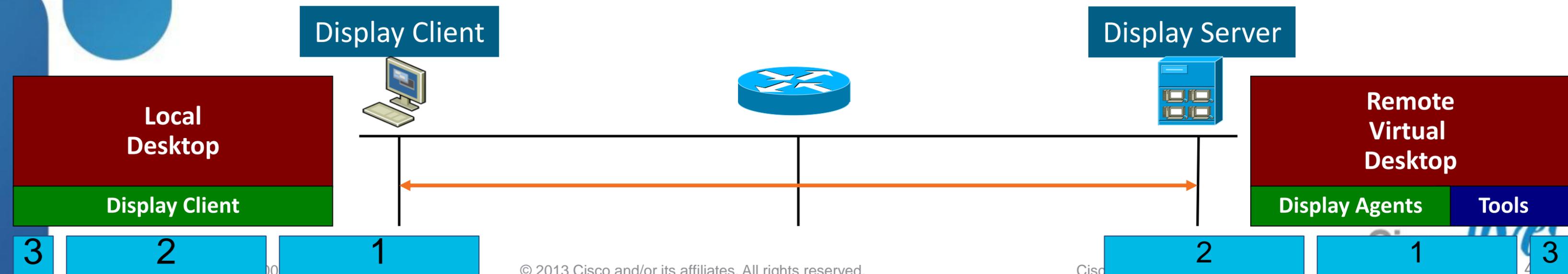
Wyse TCX Redirection Types
(Similar to Multistream ICA)

- ## Out of band media
  - Rich Sound on UDP 6901
  - USB Redirection on TCP 17185
  - Multimedia Redirection on TCP 9427

- ## URL Redirection
  - Content Source accessed by Thin Client
  - Complete network and CPU Offload on the Server
  - Great for Multicast and URLs
  - Very limited use cases are currently supported

- ## MultiMedia Redirection
  - Rendering Redirection (Transcoding)
    - Content opened and decoded by the Server
    - Client renders multimedia
    - Universal codec support (codec not required on the Thin Client)
    - Least efficient for the Server (e.g. ~5x Bandwidth needed)
  - Decoding Redirection (Bypass)
    - Content opened by Server
    - Client Decodes and Renders Multimedia
    - Significant network and CPU Offload on the Server
    - Requires Codec Support on the Client

A

B

Local Desktop
Decoder
Display Client

Remote Virtual Desktop	
Display Agent	Tools

Display Protocol TCP 3389

Rich Sound UDP 6901

USB Redirection TCP 17185

Multimedia TCP 9427

Public
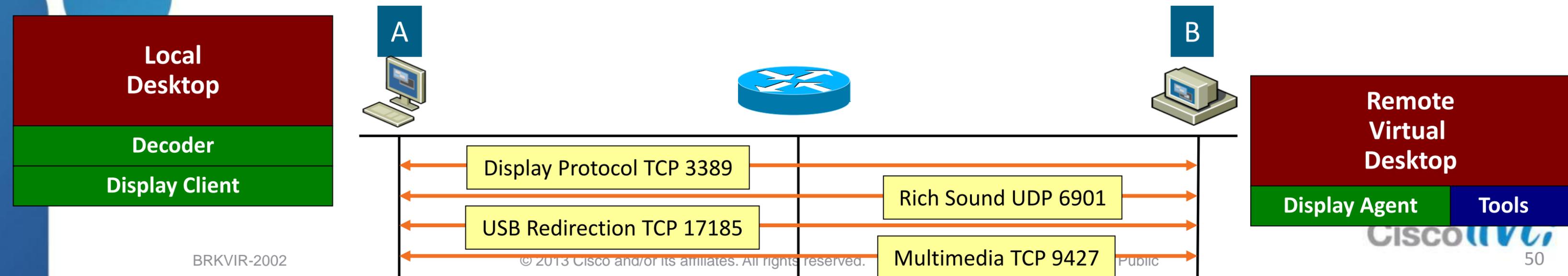
WAN Acceleration Increases User Density 2–7x

- Data Redundancy Elimination (DRE) eliminates redundancy within or between flows

- LZ compression eliminates redundancy within flows

- TCP Flow Optimisation (TFO) fills the pipe over high latency links

- Transport Data De-duplication – No byte pattern crosses the network twice

Origin Connection

Origin Connection

WAN

Optimised Connection

DRE CACHE

LZ

LZ

DRE CACHE
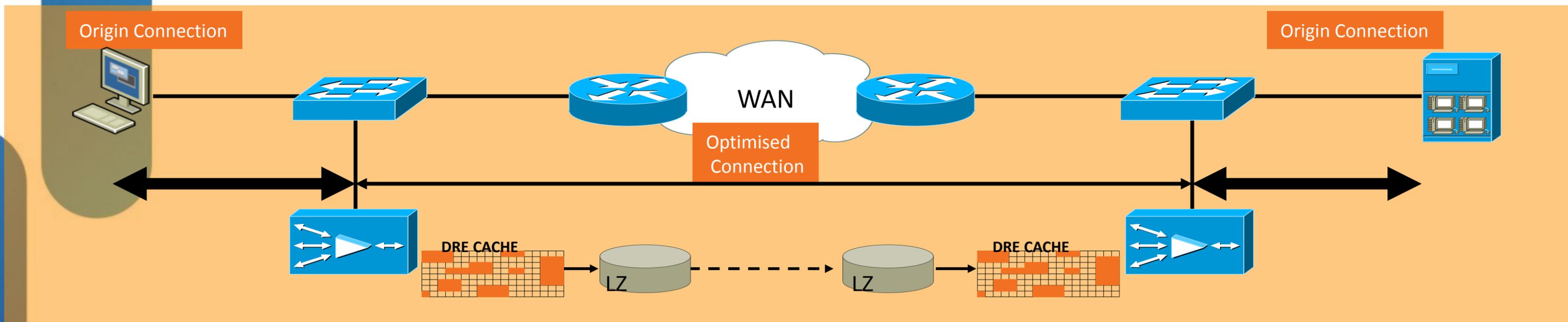
Decode

Window Scaling
Large Initial Windows
Congestion Mgmt
Improved Retransmit

Encode

WAAS Reduces MMR Bandwidth Usage

Rich Media Streaming w/ MMR (Direct Connect)

BW Optimisation for VIEW MMR Traffic
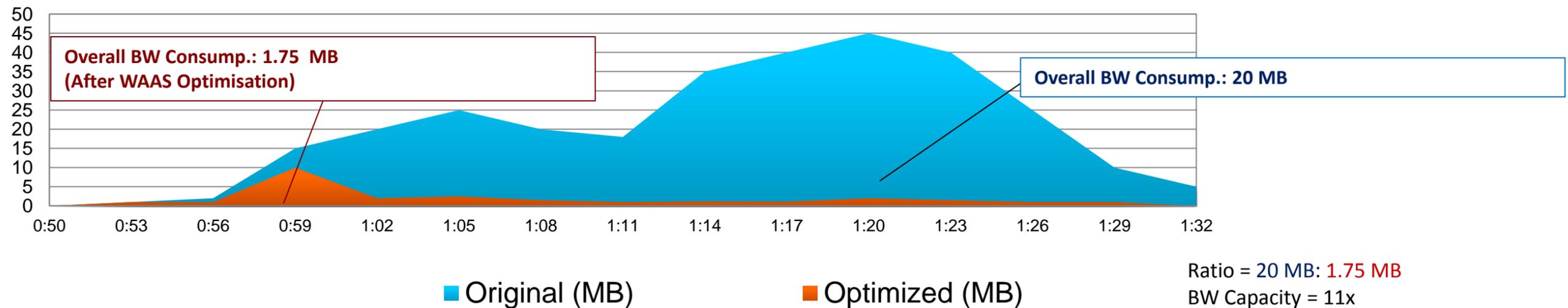
Overall BW Consump.: 1.75 MB
(After WAAS Optimisation)

Overall BW Consump.: 20 MB

■ Original (MB)   ■ Optimized (MB)

Ratio = 20 MB : 1.75 MB
BW Capacity = 11x

	Source IP:Port	Dest IP:Port	Peer Id	Applied Policy	Open Duration	Org Bytes	Opt Bytes	% Comp	Classifier Name
🔍	10.10.3.111:1719	10.10.1.53:32111	Core-WAE		0:4:9	6.376 KB	3.167 KB	50%	USBRedirect
🔍	10.10.3.111:1721	10.10.1.53:9427	Core-WAE		0:2:27	4.7251 MB	52.3486 KB	99%	MMR
🔍	10.10.3.110:1296	10.10.1.54:32111	Core-WAE		0:0:59	6.2959 KB	2.8584 KB	55%	USBRedirect
🔍	10.10.3.110:1299	10.10.1.54:9427	Core-WAE		0:0:3	1.3522 MB	18.376 KB	99%	MMR

PCoIP Session (points to 10.10.3.111:1721 row)

RDP Session (points to 10.10.3.110:1299 row)

Solutions Setup

2 Concurrent View Clients
Display Protocol: RDP and PCoIP
View Deployment Mode: Direct Connection
BW/Latency: T1/80 ms
Play Time: 5-6 Minutes of Repeat Tracks

Audio: Format: MP3
    Bitrate/Size: 192 Kbps/8.3 MB
Video: Format: WMV v.9
    Bitrate: 1527 Kbps and 1772 Kbps
    Size: 18.8 MB and 62.4 MB

WAAS Applied Policies: TFO, DRE, LZ
WAAS Classification Map:
    - MMR – TCP Port 9427
    - USB – TCP Port 32111
Overall Compression: 79.8%

Print

1. USB attached printer via display protocol USB extension
2. Centralised print server
3. Branch print server (physical machine or Windows on WAAS)
4. Direct print

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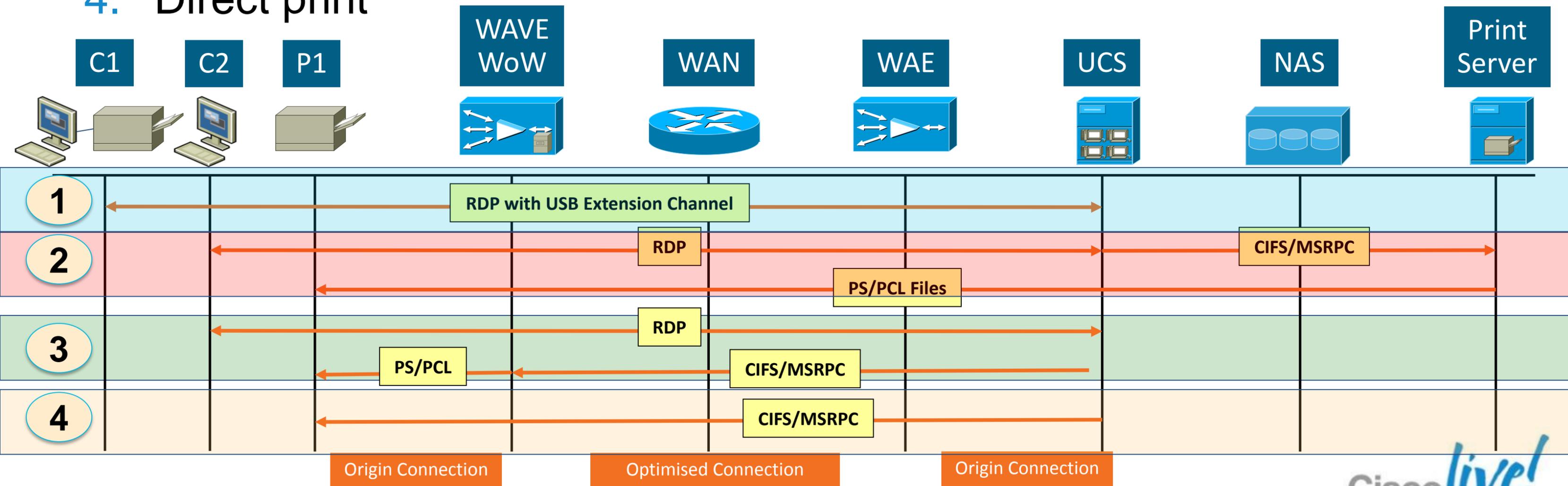
Setting Connections for WAAS

- Vmware View 4, 4.5, and 4.6

  – Microsoft RDP

  Configuring VmWare View to use Uncompressed RDP sessions

  Apply client profile in Microsoft Group Policy Object (GPO) to the View client (local policy if not in Active Directory)

  Apply registry changes to the VM (security layer 0)

  – Teradici PCoIP

  Control connection is TCP 4172

  WAAS is unable to accelerate data on UDP 4172

  WAAS optimises Windows View client MMR on TCP 9427 and USB on TCP 32111 (Not Zero Clients)

- Citrix Settings Before WAAS 4.5

  – Citrix XenDesktop 4 ICA/HDX

  Must turn OFF the Citrix ICA protocol's nativeRC5 encryption and compression

  Can enable ICA over SSL for WAAS and ACE compatibility

  – Citrix XenDesktop 5 ICA/HDX

  Security warning if RC5 hash disabled (XenApp is not effected)

Quality of Service in a Cisco VXI Network

- Display protocols obscure multiple traffic types in a single TCP connection

Protocol	TCP/UDP Port	DSCP /CoS Value
Desktop Virtualisation Protocols		
RDP7	TCP 3389	DSCP af21/CoS 2
PCoIP*	TCP & UDP 50002 TCP & UDP 4172	DSCP af21/CoS 2 DSCP af21/CoS 2
ICA/HDX		
Session	TCP 1494	DSCP af21/CoS 2
Session Reliability	TCP 2598	DSCP af21/CoS 2
Web Services	TCP 80	DSCP af21/CoS 2
USB Redirection (PCoIP)	TCP 32111	DSCP af11/CoS 1
MMR	TCP 9427	DSCP af31/CoS 4
Other Protocols found within Cisco VXI		
Network-based Printing (CIFS)	TCP 445	DSCP af11/CoS 1
UC Signalling (SCCP)	TCP 2000	DSCP cs3/CoS 3
UC Signalling (SIP)	TCP 5060	DSCP cs3 /CoS 3
UC Signalling (CTI)	TCP 2748	DSCP cs3/CoS 3
UC Media (RTP, sRTP)	UDP 16384 - 32767	DSCP ef/CoS 5

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Quality of Service in a Cisco VXI Network

Ports Used During Classification for QoS

ip access-list **RDP**
 permit tcp any eq 3389 any
ip access-list **PCoIP-UDP**
 permit udp any eq 50002 any
ip access-list **PCoIP-TCP**
 permit tcp any eq 50002 any
ip access-list **PCoIP-UDP-new**
 permit udp any eq 4172 any
ip access-list **PCoIP-TCP-new**
 permit tcp any eq 4172 any
ip access-list **ICA**
 permit tcp any eq 1494 any
!
ip access-list **View-USB**
 permit tcp any eq 32111 any

ip access-list **MMR**
 permit tcp any eq 9427 any
!
ip access-list **NetworkPrinter**
 permit ip any host 10.1.128.10
 permit ip any host 10.1.2.201
!
ip access-list **CUPCDesktopControl**
 permit tcp any host 10.0.128.125 eq 2748
 permit tcp any host 10.0.128.123 eq 2748

Cisco's Nexus 1000v deployed with its ability to safeguard against DHCP snooping, dynamic ARP inspection and IP source guard

In testing done, the markings were done on the Nexus 1000v whenever possible

Quality of Service in a Cisco VXI Network

- These example provides a guideline for deploying QoS in a Cisco VXI Network

Class-maps

```
class-map type qos match-any CALL-SIGNALING
 match access-group name  CUPCDesktopControl

class-map type qos match-any MMR-STREAMING
 match access-group name MMR

class-map type qos match-any TRANS-DATA
 match access-group name RDP
 match access-group name PCoIP-UDP
 match access-group name PCoIP-TCP
 match access-group name PCoIP-UDP-new
 match access-group name PCoIP-TCP-new

class-map type qos  match-any BULK-DATA
 match access-group name View-USB
 match access-group name NetworkPrinter
```

Policy-map

```
policy-map type qos pmap-HVDPort
 class CALL-SIGNALING
   set cos 3
   set dscp cs3
   ! dscp = 24
 class MMR-STREAMING
   set cos 4
   set dscp af31
   ! dscp = 26
 class TRANS-DATA
   set cos 2
   set dscp af21
   ! dscp = 18
 class BULK-DATA
   set cos 1
   set dscp af11
   ! dscp = 10
```

Quality of Service Validation with MMR

- Viewing QoS Policy Statistics

DC-WAN#**show policy-map interface**

GigabitEthernet0/0
Service-policy input: HQ-LAN-EDGE-IN

Class-map: **MMR-STREAMING** (match-any)
3532 packets, 5249960 bytes
30 second offered rate 9000 bps, drop rate 0
Match: dscp af31 (26) af32 (28) af33 (30)
0 packets, 0 bytes
30 second rate 0 bps
Match: **access-group name MMR**
3532 packets, 5249960 bytes
30 second rate 9000 bps
QoS Set
dscp af31
Packets marked 3532

Serial0/0/0:0
Service-policy output: WAN-EDGE

Class-map: **MMR-STREAMING** (match-any)
5456 packets, 8052828 bytes
30 second offered rate 393000 bps, drop
Match: dscp af31 (26) af32 (28) af33 (30)
5456 packets, 8052828 bytes
30 second rate 393000 bps
Match: **access-group name MMR**
0 packets, 0 bytes
30 second rate 0 bps
Queueing
queue limit 64 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 5456/8052828
bandwidth 5% (76 kbps)
Exp-weight-constant: 9 (1/512)
Mean queue depth: 25 packets

DMZ Deployments

- AnyConnect with optional WAAS Mobile

- DMZ secured with a firewall (ASA)

- ACE balances and offloads display protocol proxy/gateway

- ACE provides backend broker availability and scale
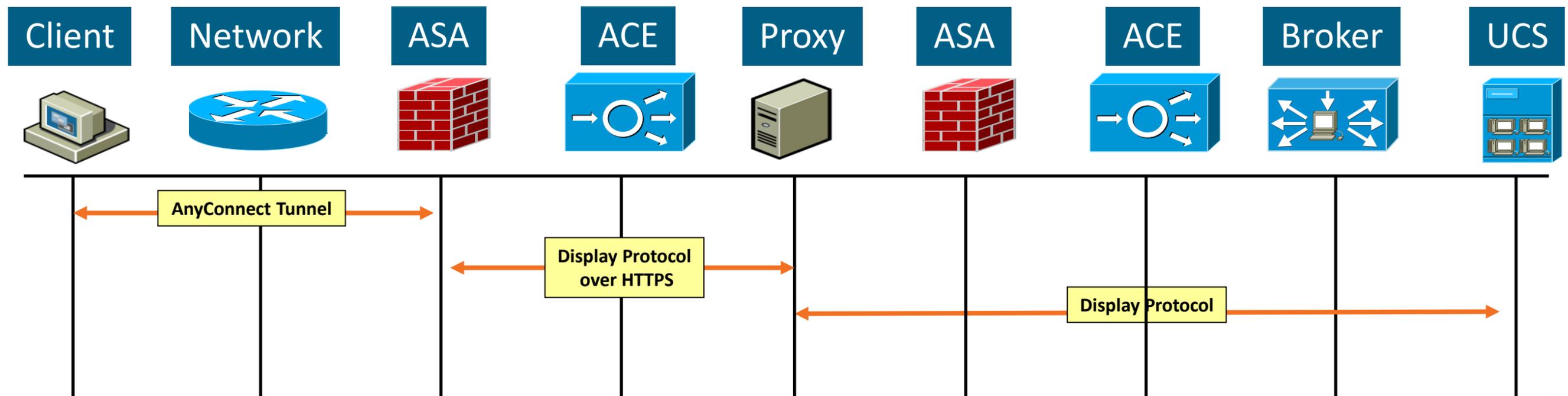
Borderless Network ACE SSL Offload Benefits

Connection Server

CPU Utilisation on Connection Server

View Users

Baseline
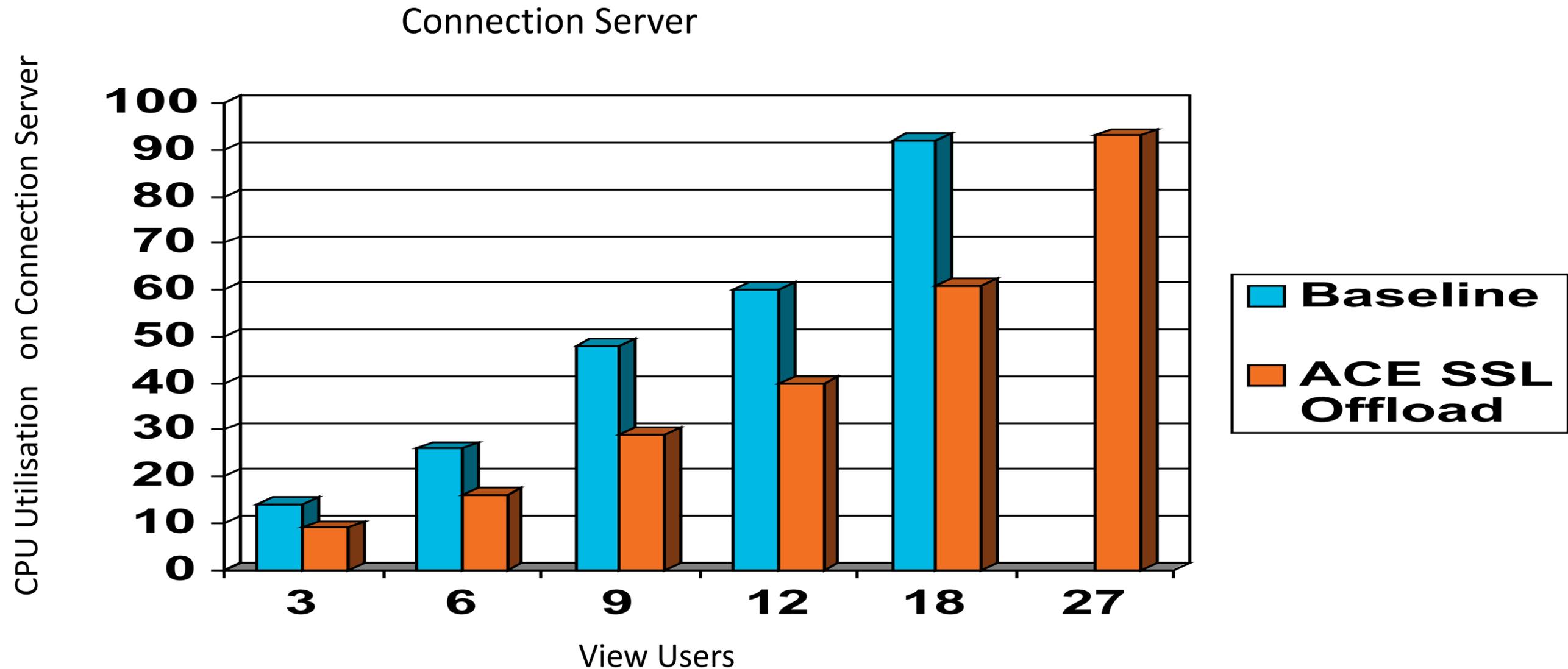
ACE SSL Offload

- Connection Server config: 1 x 2.33 Ghz, 1 Gb Memory
- 30% reduction in CPU utilisation
- 50% more virtual desktops supported due to SSL Offload

Data Centre - Compute

Considerations

- Compute
  - Scale
  - Cost
  - Performance
  - Power/Cooling
  - Space
  - Cabling

- Storage Scale
  - Scale capacity (Linked and Flex Clones)
  - Scale IOPS

- Client Network Services
  - Security
  - Monitoring
  - IP address management

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Cisco UCS – Do More with Less!

How do you achieve a 30% savings

x86 Servers	Infrastructure Elements	Power Consumption	VDI Instances per Server	Rack Space	Distribution Layer Ports	In Rack Cabling
50%	50%	24+%	100%	30%	30%	75%

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Infrastructure Statelessness For Automation & Efficiency

- Application virtualisation decouples application from OS (i.e. ThinApp, AppV, Provisioning Server, etc.)

- Hypervisor decouples OS from compute hardware

- UCS Service Profile decouple server from BIOS

- Nexus Port Profile decouples cabling from server

APP	APP	APP	APP
AppVirt	AppVirt	AppVirt	AppVirt

OS	OS

Hypervisor

Server

BIOS (UCS Service Profile)

Port Profile

Network (LAN/SAN)
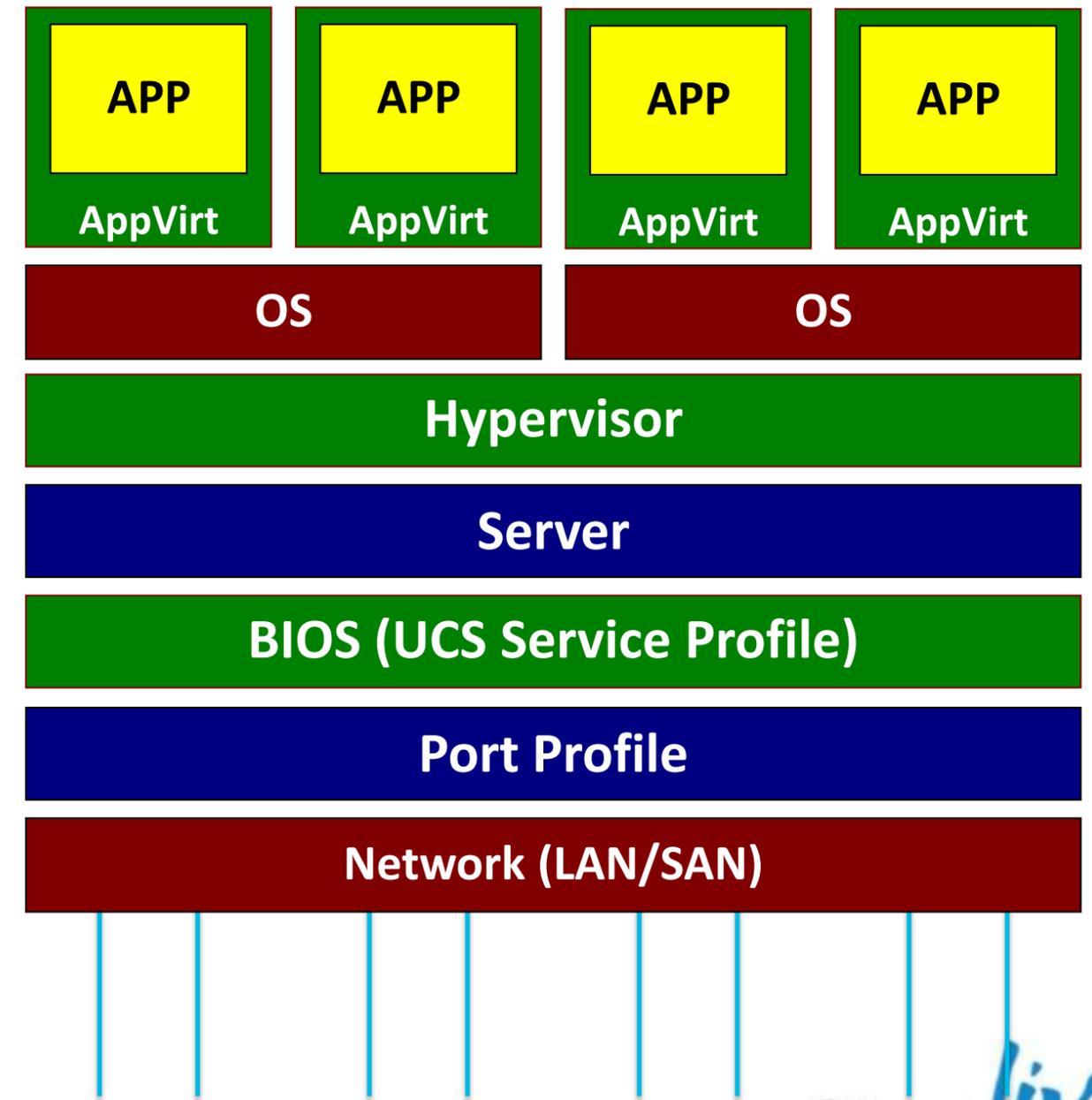
UCS Virtual Desktop Densities
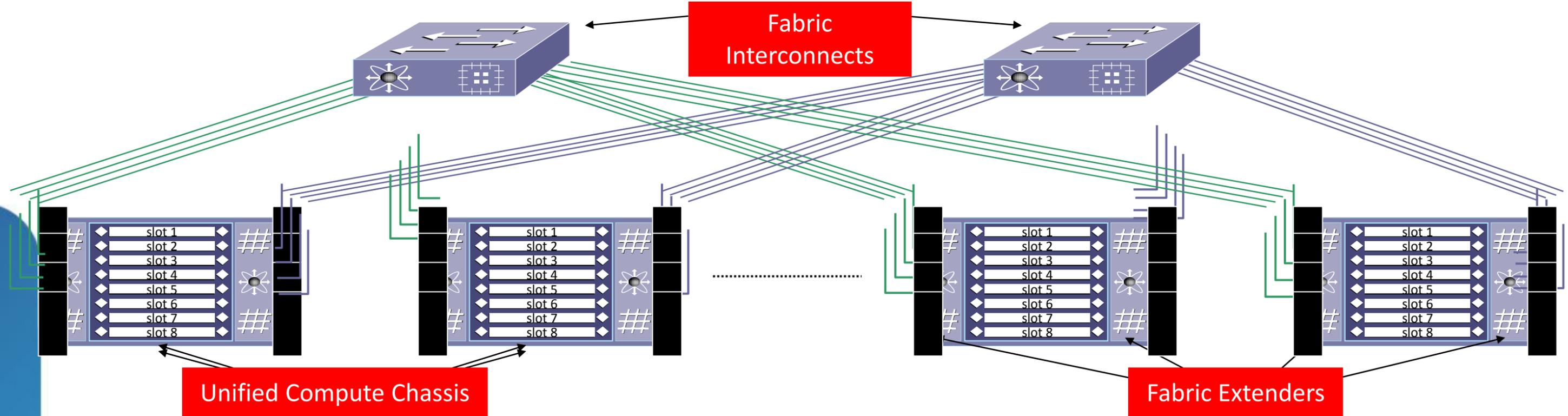
Blade	Server CPU	Server Memory	Desktop Configuration	Per Blade	Per Chassis	Per Domain
B200-M1	Xeon5570 2.93 GHz	48 GB	WinXP 512 MB	128	1,024	40,960
B200-M1	Xeon5570 2.93 GHz	96 GB	WinXP 512 MB	160	1,280	51,200
B200-M1	Xeon5570 2.93 GHz	96 GB	WinXP 1024 MB	150	1,200	48,000
B250-M1	Xeon5570 2.93 GHz	192 GB	WinXP 1024 MB	332	1,328	53,120
B250-M2	Xeon5600 3.33 GHz	192 GB	Win7-32 1.5 GB	110	440	17,600
B230-M1	Xeon6500/7500	128 GB	Win7-32 1.0 GB	100	800	32,000

B-Series Product Details

UCS B200 General Purpose Blade Server

High-density server with balanced compute performance and I/O flexibility

UCS B250 Extended Memory Blade Server

Memory-intensive server for virtualised and large-data-set workloads

UCS B440 High-Performance Blade Server

Compute & memory-intensive server for enterprise-critical workloads

UCS B230 Compact - Performance Blade

Compute & memory-intensive server for enterprise-critical workloads

	B200 M2	B250 M2	B200 M3	B230 M2	B440 M2
Slots	1	1	1	1	2
CPU	X-5600	X-5600	E5-2600	E7-2800	E7-4800
Cores	8	8	16	20	40
DIMMs	48	48	24	32	32
Max GB	96GB	384GB	768GB (with 32GB, coming soon)	512GB	1TB
Disk	2 x 2.5"	2 x 2.5"	2 x 2.5"	2 SSD	4 x 2.5"
Raid	0/1	0/1	0/1	0/1	0/1/5/6
Integrated I/O	No	No	Dual 20Gb	No	No
Mezz	1	1	1	1	2

CPU Considerations for Virtual Machine

Number of Cores	CPU Clock Speed	Amount of Cache Memory	CPU Virtualization Technology

- ## CPU class

  - CPU class is affected by number of cores, CPU clock speed, amount of cache memory and CPU virtualisation technology

- ## CPU core count

  - CPU core count affects virtual machine scalability and performance

- ## CPU over commitment

  - CPU over commitment occurs when the number of virtual CPUs assigned to the virtual machines exceeds the number of physical CPUs available to the host

- ## Virtual machine role priority

  - Virtual machine role priority determines how CPU resources are distributed across virtual machines

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Example CPU Capacity Planning
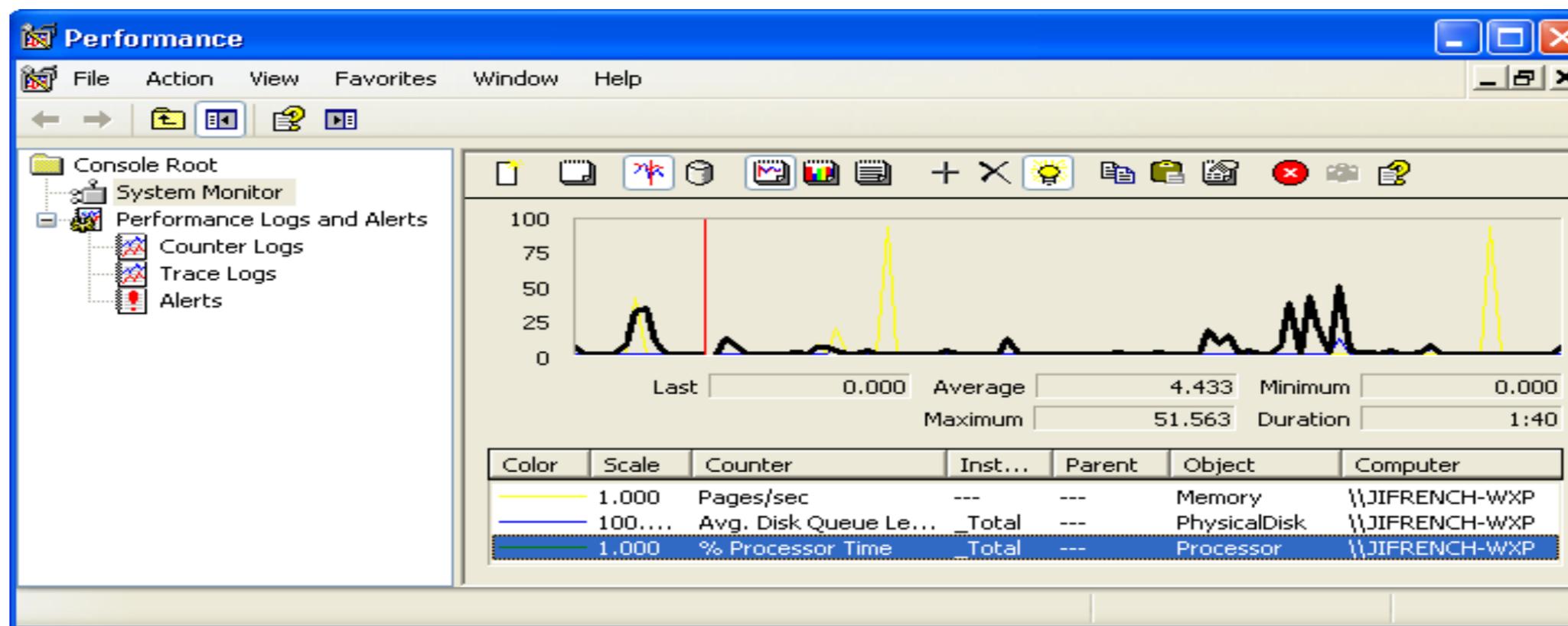
- Win XP % Processor Time average 5% on 2 GHz core

- Requires 100 MHz per desktop (0.05 * 2 GHz)

- 100 desktops require 10 GHz processing (100 * 100 MHz)

- Add 10% to 25% overhead for virtualisation, display protocol, and buffer for spike

- 100 desktops achieved on ~4 cores to achieve 12 GHz

- Planning

  – Windows XP 150-250 MHz

  – Windows 400-600 MHz

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Example Memory Capacity Planning

Application/OS	Optimised Memory Use
Windows XP	125 MB
Microsoft Word	15 MB
Microsoft Excel	15 MB
MSFT Powerpoint	10 MB
Microsoft Outlook	10 MB
Total	175 MB
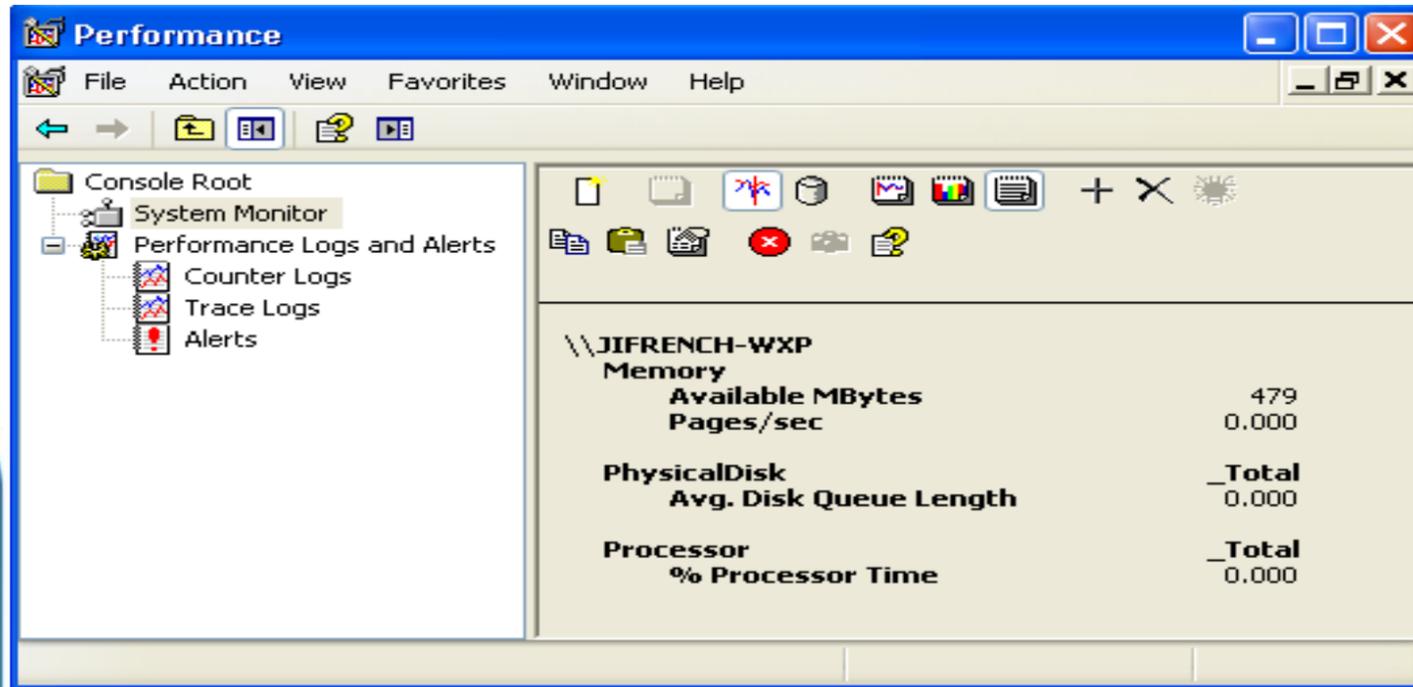
- Vmware ESX Transparent Page Sharing to share master copy of memory pages among virtual machines

  - Windows XP - 4 KB page sharing

  - Windows 7 - 1 MB page sharing

- Planning

  - Windows XP - 512-1024 MB

  - Windows 7-32 bit - 1-1.5 GB

  - Windows 7-64 bit - 2-3 GB

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Data Centre - Network

Deployment Considerations

WAN Edge		WAN Edge	

DC-1 Core

VDI	Apps	Data
VM 1 VM 2 VM 3	VM 4 VM 5 VM 6	VM 7 VM 8 VM 9

DC-2 Core

VDI	Apps	Data
VM 10 VM 11 VM 12	VM 13 VM 14 VM 15	VM 16 VM 17 VM 18
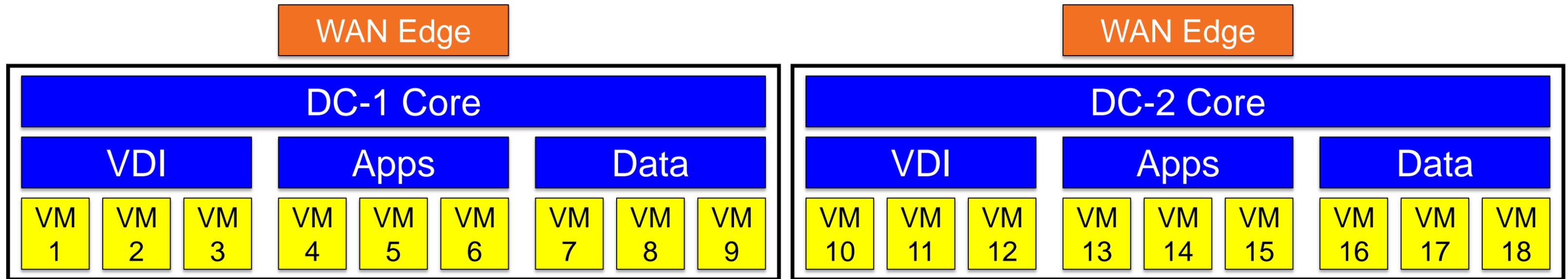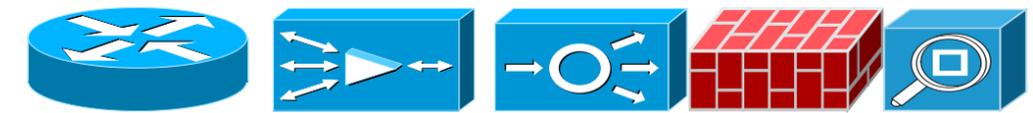
- Separate from application environments

- Modular physical, network and compute infrastructure

- Predictable and repeatable scalability

- Campus security best practice

- IP address management

- Hosted virtual desktops in the server farm access considered east/west

- Hosted virtual desktops considered as a campus are north/south

- WAN edge in the access block is east/west?

- Data centre core is becoming an any to any transport

- It's all relative…

Client Campus Security

IP Source Guard

Dynamic ARP Inspection

DHCP Snooping

Port Security

Email Server

"Your Email Passwd Is 'joecisco' !"

Man in the Middle
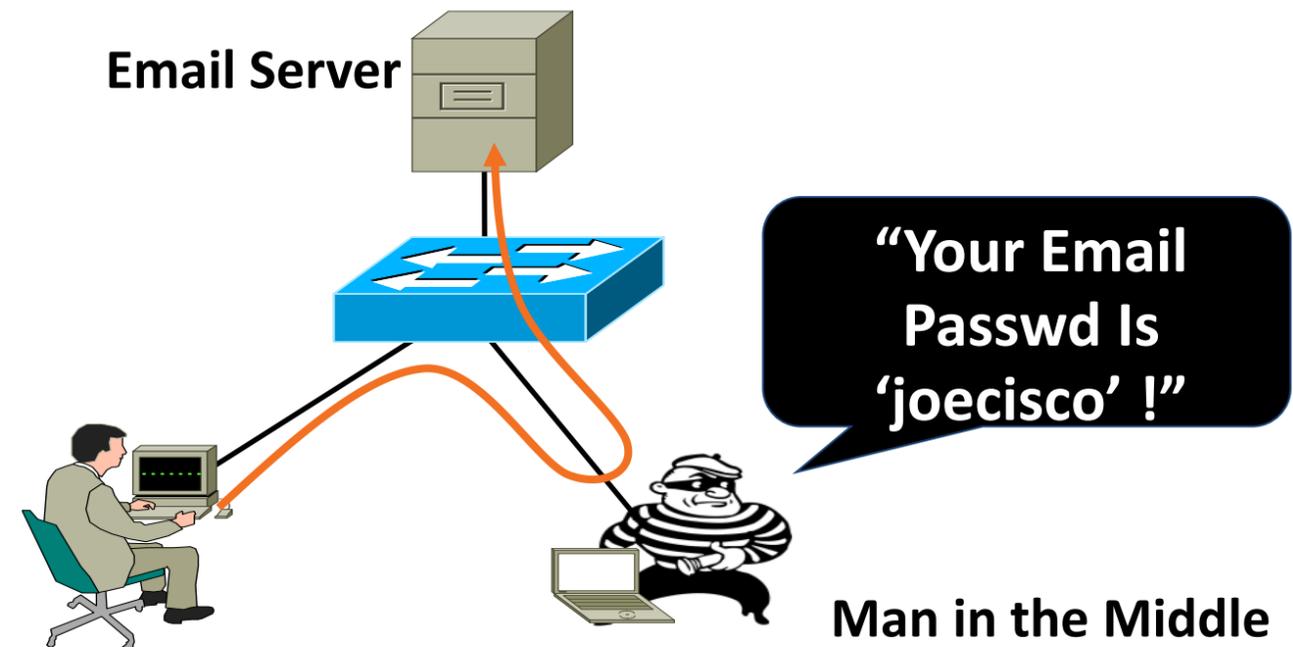
- Port Security prevents CAM attacks, DHCP Starvation attacks and spanning tree loop mitigation

- DHCP Snooping prevents Rogue DHCP Server attacks

- Dynamic ARP Inspection prevents current ARP attacks

- IP Source Guard prevents IP/MAC Spoofing and a wide variety of TCP/UDP splicing and DoS attacks

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Nexus 1000v per VM Network Services

- Virtual Ethernet Module (VEM)
  - Networking capabilities at the hypervisor level
  - L2 switching, CDP, Netflow, ACLs, QoS, SNMP, SPAN, etc
  - Local Switching
  - Port Profile to simplify Network Policy

- Virtual Supervisor Module (VSM)
  - Mgmt, monitoring and config of VEM instances
  - Sees each VEM as a virtual chassis module
  - Configuration done through port-profiles
  - Tight integration with Virtual Center
  - Runs on dedicated appliance or virtual machine

- Virtual Chassis Concept
  - Redundant Supervisors (VSMs)
  - Currently up to 128 VEM instances (128 ESX hosts)
  - Presents a network view of the virtual access layer
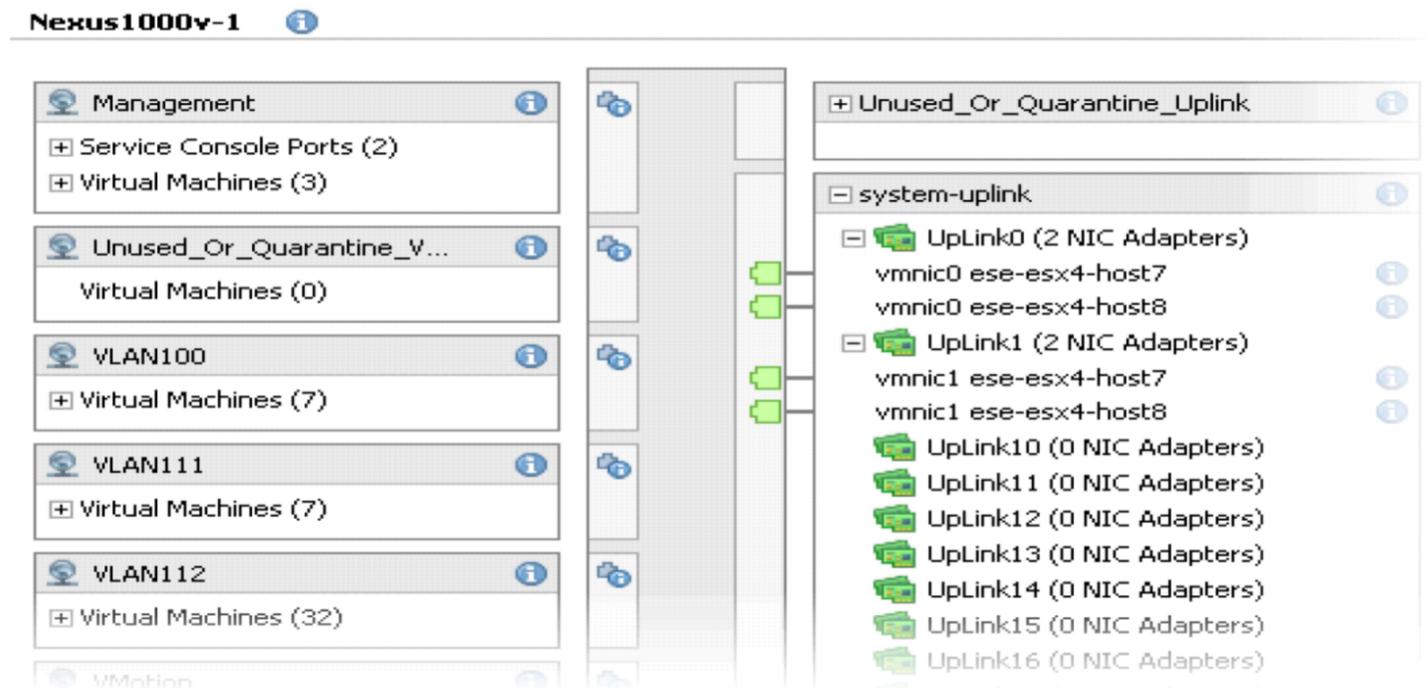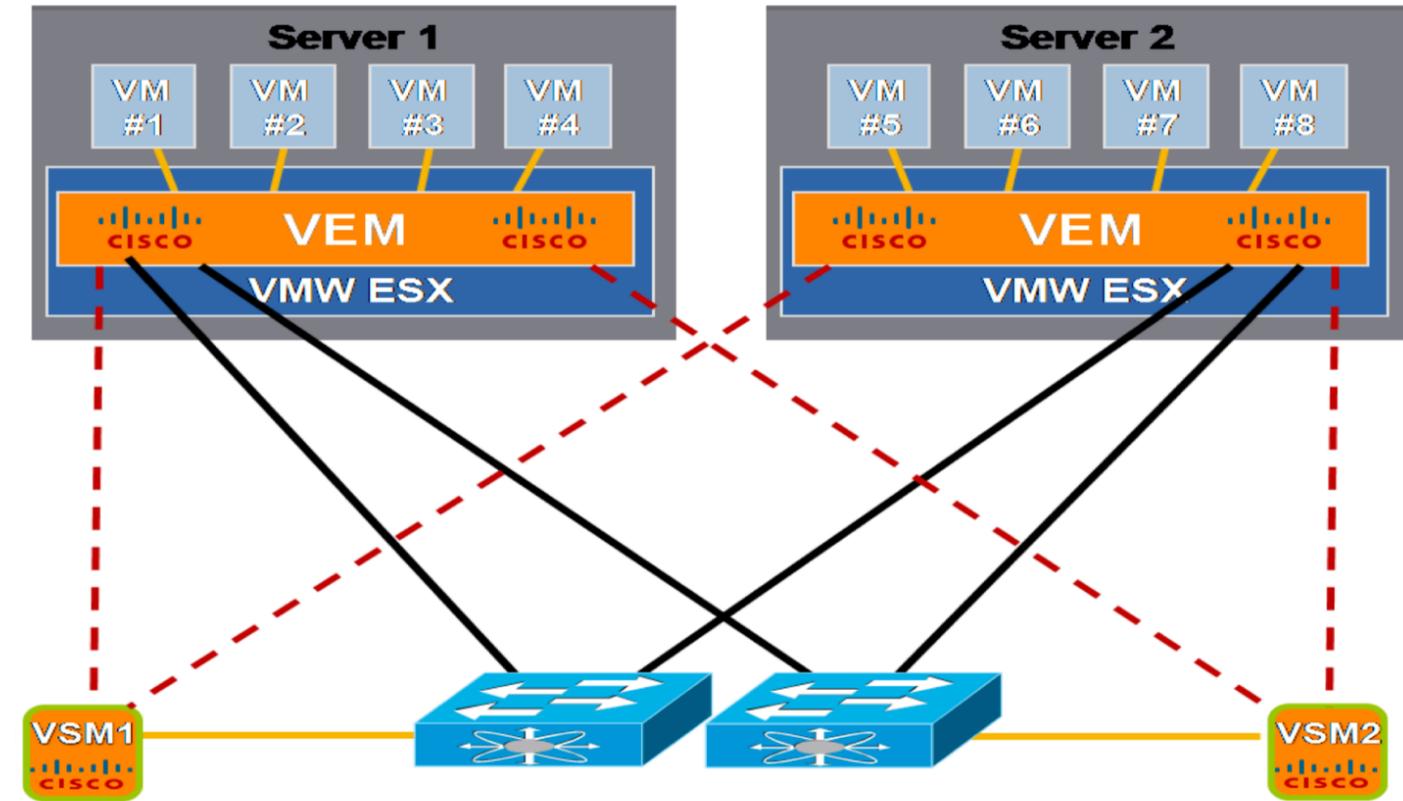
Nexus 1000v with Virtual Security Gateway

Virtual Network Management Center (VNMC)

Tenant: Coke

VM VM
VM VM
VM VM

Tenant: Pepsi

Zone: Research

VM VM
VM VM
VM VM

Zone: Marketing

Zone A: vApp
VM VM

Zone B: vApp
VM VM

vPath

Nexus 1000V

vSphere
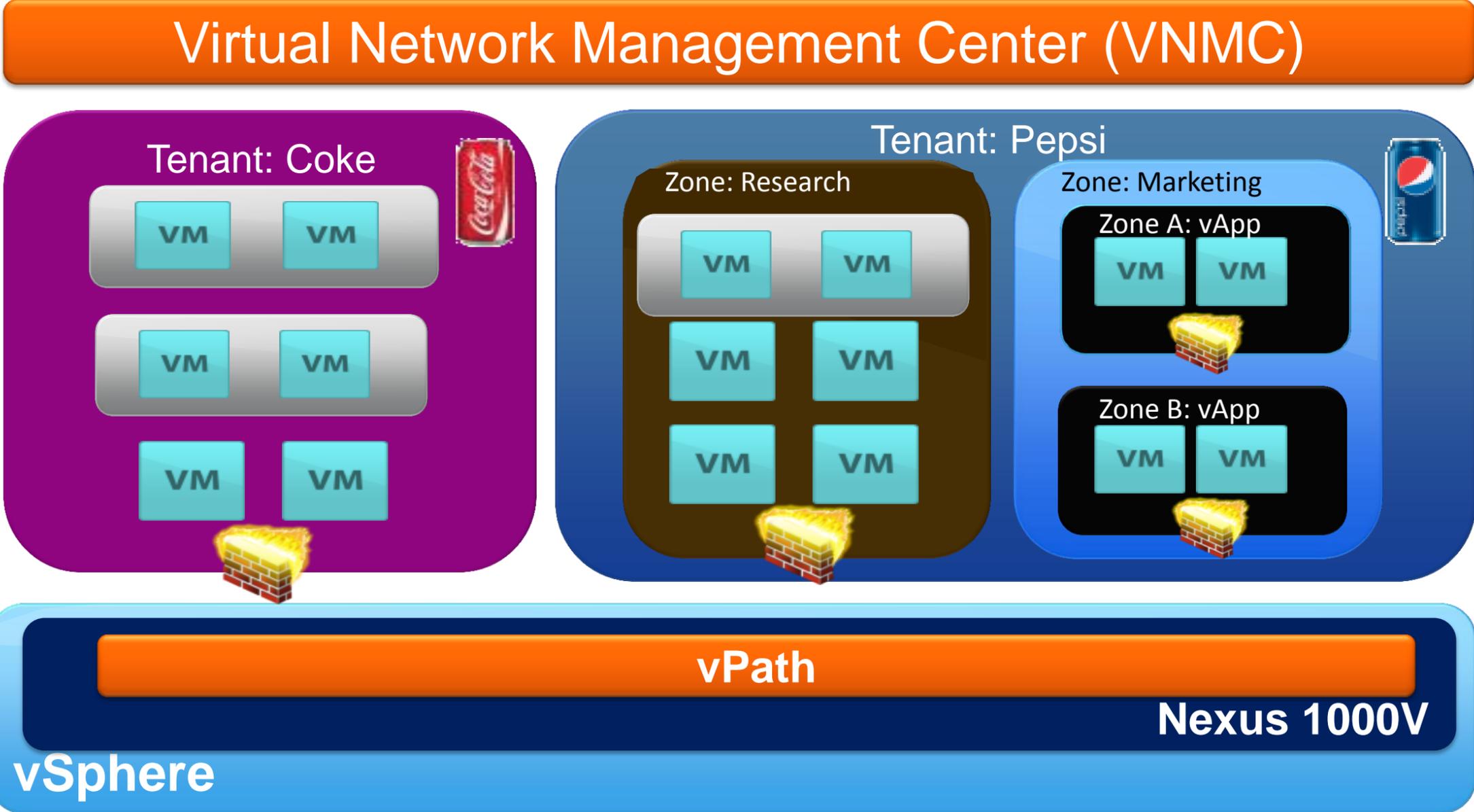
Specify zoning policy with appropriate granularity
- Tenant, VDC, vApp

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Host-Based Security

- Patching
  - Persistent desktop versus non-persistent desktop

- Behavioural based (Cisco Security Agent)

- Virus Scanning
  - Virtual machine virus scanning
  - VMSafe service in vSphere 5
  - NAS (file server) based virus scanning
  - Network or proxy based virus scanning (Scansafe Ironport)

- Virtual desktop access
  - Directed or proxied

- Zoning
  - Mergers and Acquisitions (M&A) separated from Traders
  - Payroll

Data Centre - Storage

Overview

- Type
  - Virtual machine
  - User data
  - Profile
  - Virtual applications
- Storage
  - Storage Area Network (SAN)
  - Network Attached Storage (NAS)
  - Direct Attached Storage (DAS)
- File System
  - NT File System (NTFS)
  - File Allocation Table (FAT)
  - Extended File System (ext3)
  - Virtual Machine File System (VMFS)
  - Raw Device Mapping (RDM)

- File Access
  - Common Internet File System (CIFS) / Server Message Block (SMB)
  - Network File System (NFS)
- Block Transport
  - Small Computer System Interface (SCSI)
  - Internet SCSI (iSCSI)
  - Fibre Channel (FC)
  - FC over Ethernet (FCoE)
  - SCSI over FC over IP (FCIP)
- Data Deduplication
  - NetApp File Level Flex Clone
  - VMware Linked Clone
  - Atlantis Computing iLio
  - Citrix Intellicache
  - Cisco WAAS Transport

VMware Clones Lower Capacity

- **Full Clones**

  – Copy of a VM (at a given point) with a separate identity

  – Can be powered on, suspended, snapshot, reconfigured, etc. independent of the VM it was cloned from

- **Link Clones**

  – Storage reduced 90% to 50% over full clones

  – Redirect folders to a separate optional user disk (i.e. D:)

  – Rapid provisioning desktops vs. full cloning

  – Copy of the original virtual machine that shares the virtual disks with the original virtual machine in an ongoing mann

  – VMware View Operations

    Refresh – Clean desktop, Pristine image

    Recompose – Migrate existing desktops from one version to the other

    Re-Balance – Re-locate desktops to enable efficient usage of the storage available (add more storag or retire existing array)

Master, Replica, and Clone
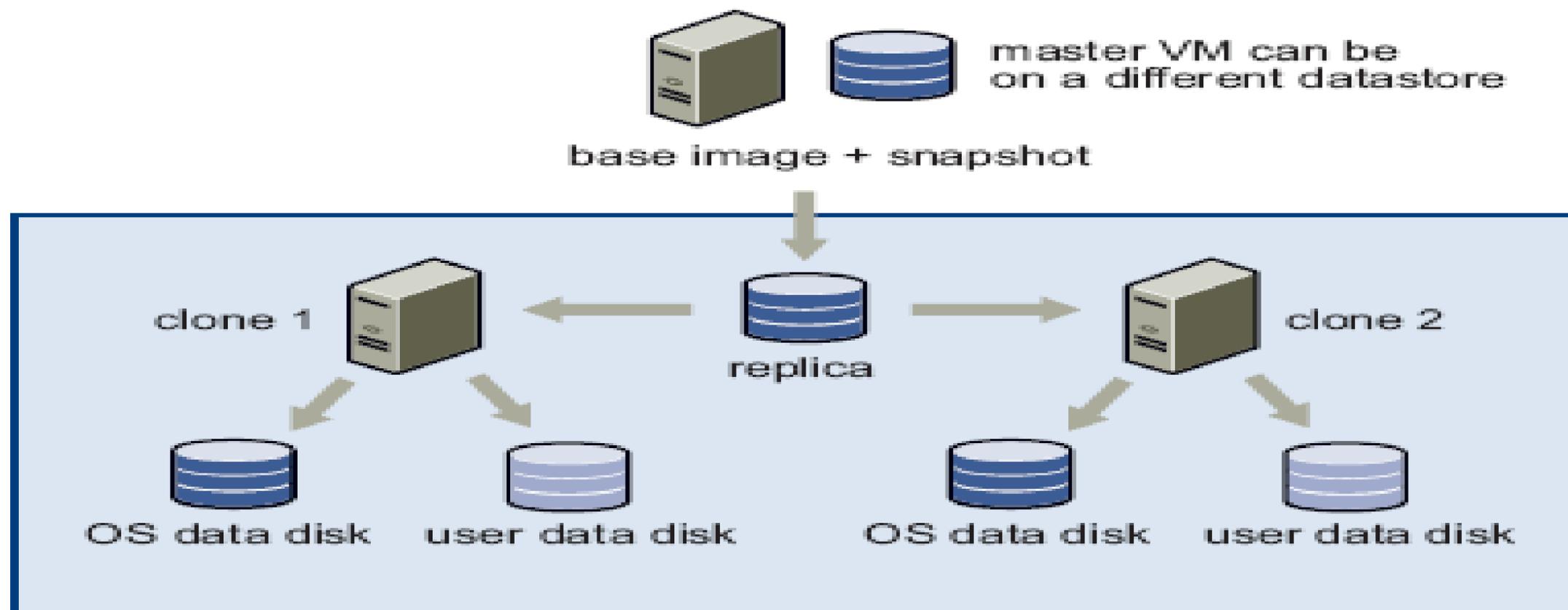
- Full clone wastes storage and is slow to clone

- Replica is a full clone created from the gold master

- Master VM can be updated or replaced without affecting the replica

- The replica is a protected entity within Virtual Center

- Linked clones bloats over time

  – Expect about a 50% savings depending on desktop type/use

- Operations

  – Refresh – Clean desktop, Pristine image

  – Recompose – Migrate existing desktops from one version to the other

  – Re-Balance – Re-locate desktops to enable efficient usage of the storage available (add more storage or retire existing array)

NFS Linked Clone Storage Consumption

- Replica is a full clone

- Linked clone consumes <10%

- Linked clone bloats over time

- Expect about a 50% savings depending on desktop type/use
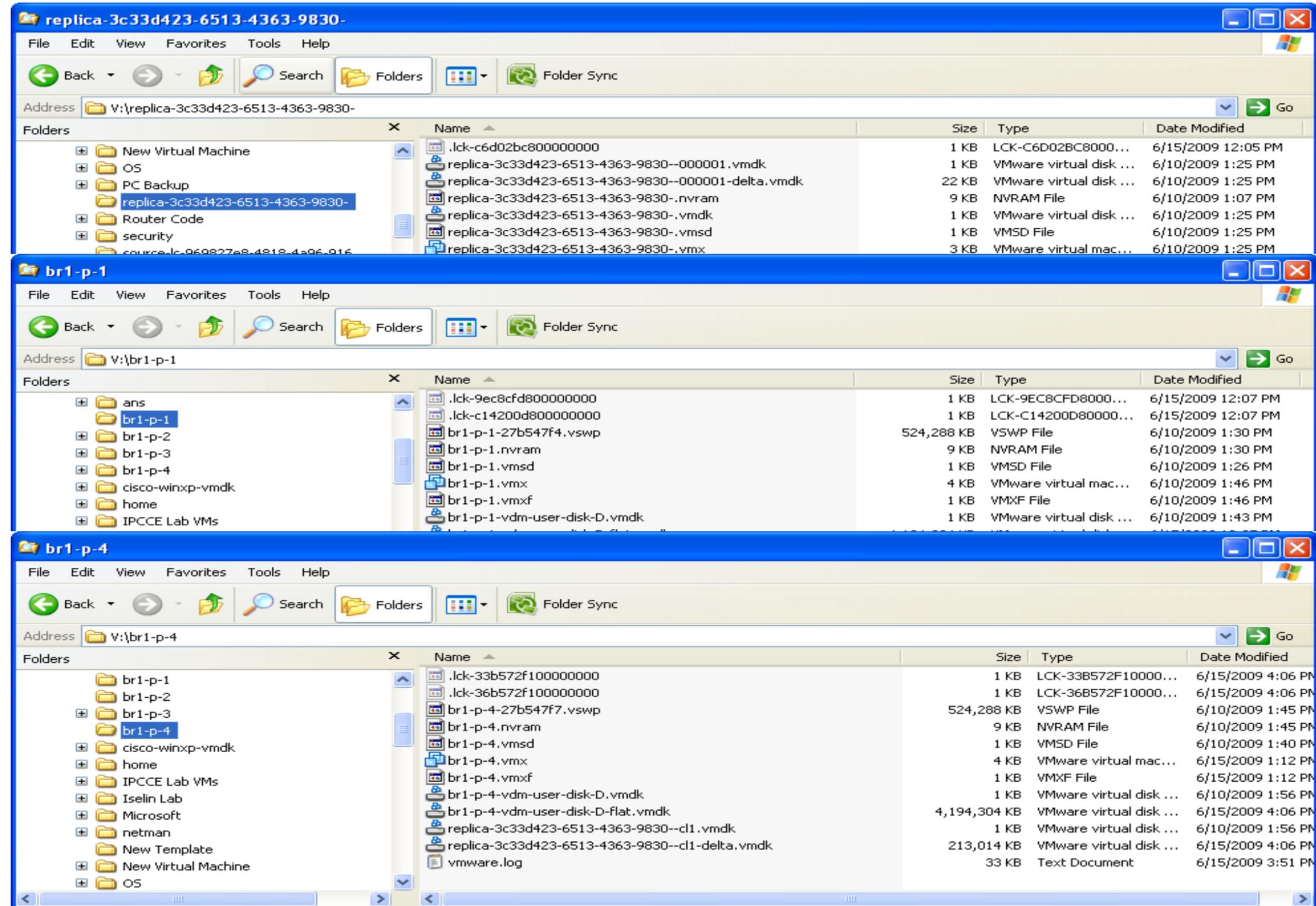
Example Desktop Storage Planning
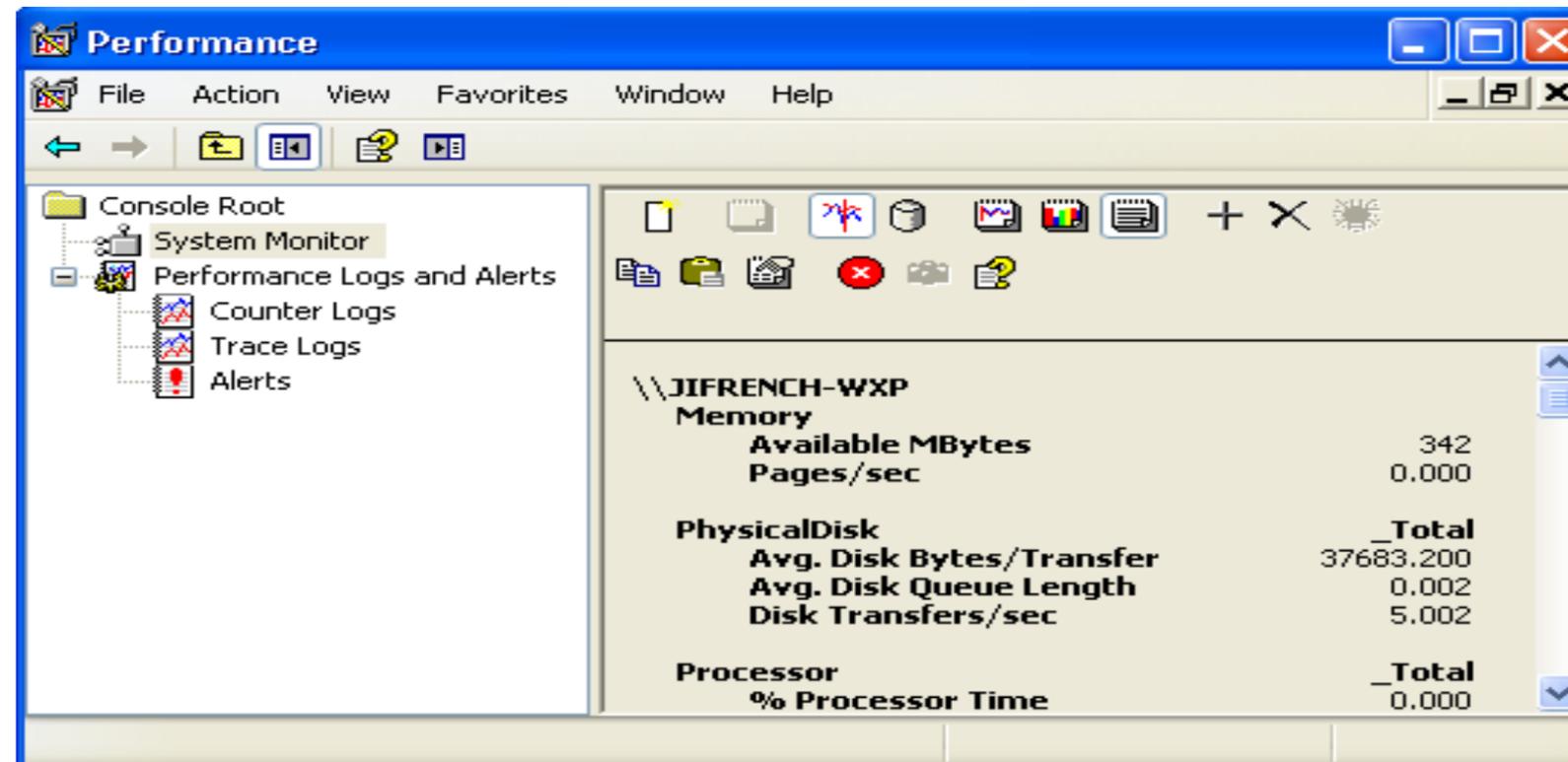
- IOPS are ~ 5 per second

- Capacity equals base OS/App/Data size (10 GB) plus suspend/resume (512 MB RAM), page files (100 MB), etc. ~ 11.1 GB

- For 100 desktops
  - IOPS = 5 * 100 VMs = 500 IOPS
  - Throughput = 500 * 4096 Bps = 2048 KBps
  - Storage = 11.1 GB * 1.15 = 1.276 TB (no storage reduction)

- Planning
  - Windows XP 5-10 IOPS
  - Windows 7 10-20 IOPS

- Common 15K RPM drive provides
  - 300 IOPS so 2 spindles are needed
  - 4096 Bytes per IOP
  - <1 Mbps average

Atlantis ILIO Deployment Options

Top-of-Rack

VDI Broker **Atlantis ILIO**

1/10Gbe Fibre Channel

DATA
APP
OS

SAN/NAS Storage
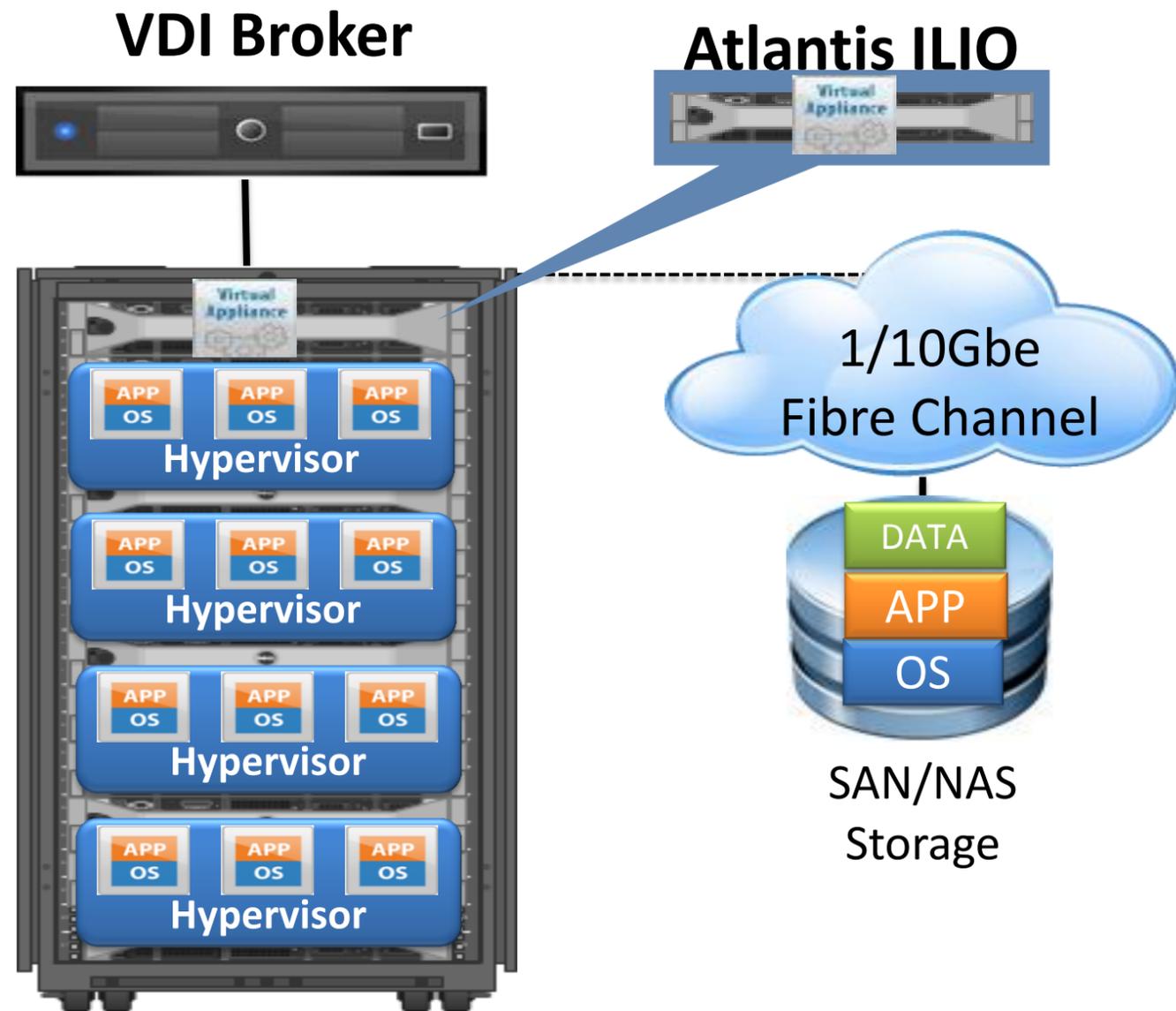
- Non disruptive to existing VDI architecture
- Ideal for brownfield implementations

On Each Server

VDI Broker **Atlantis ILIO**

1/10Gbe Fibre Channel

DATA

SAN/NAS Storage
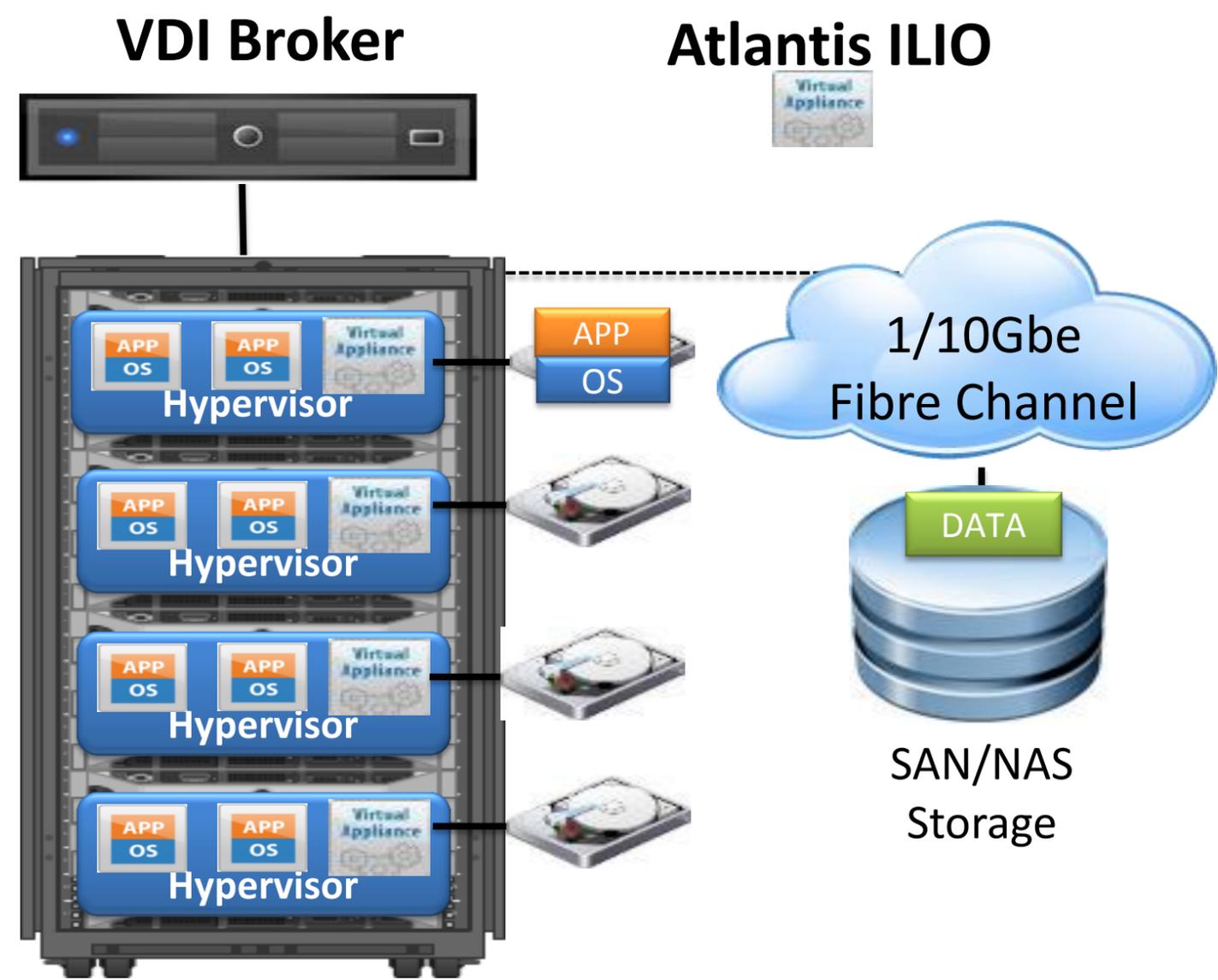
- No dedicated hardware
- Lowest cost and Best performance
- Greenfield implementation

Atlantis ILIO Virtual Appliance

Hypervisor

Desktop
DATA	4k
APP	4k
OS	4k

Desktop
DATA	4k
APP	4k
OS	4k

Desktop
DATA	4k
APP	4k
OS	4k

Random IO

Atlantis ILIO Virtual Appliance

atlantis
C O M P U T I N G

.VMDK

.VMDK

.VMDK

Inline Dedup

vScaler

IO Scheduler

RAM

64k
64k
64k

Local SATA/SSD

Sequential IO

SAN/NAS Storage

Atlantis ILIO works at the Windows Protocol Layer and terminates IO traffic locally on the hypervisor
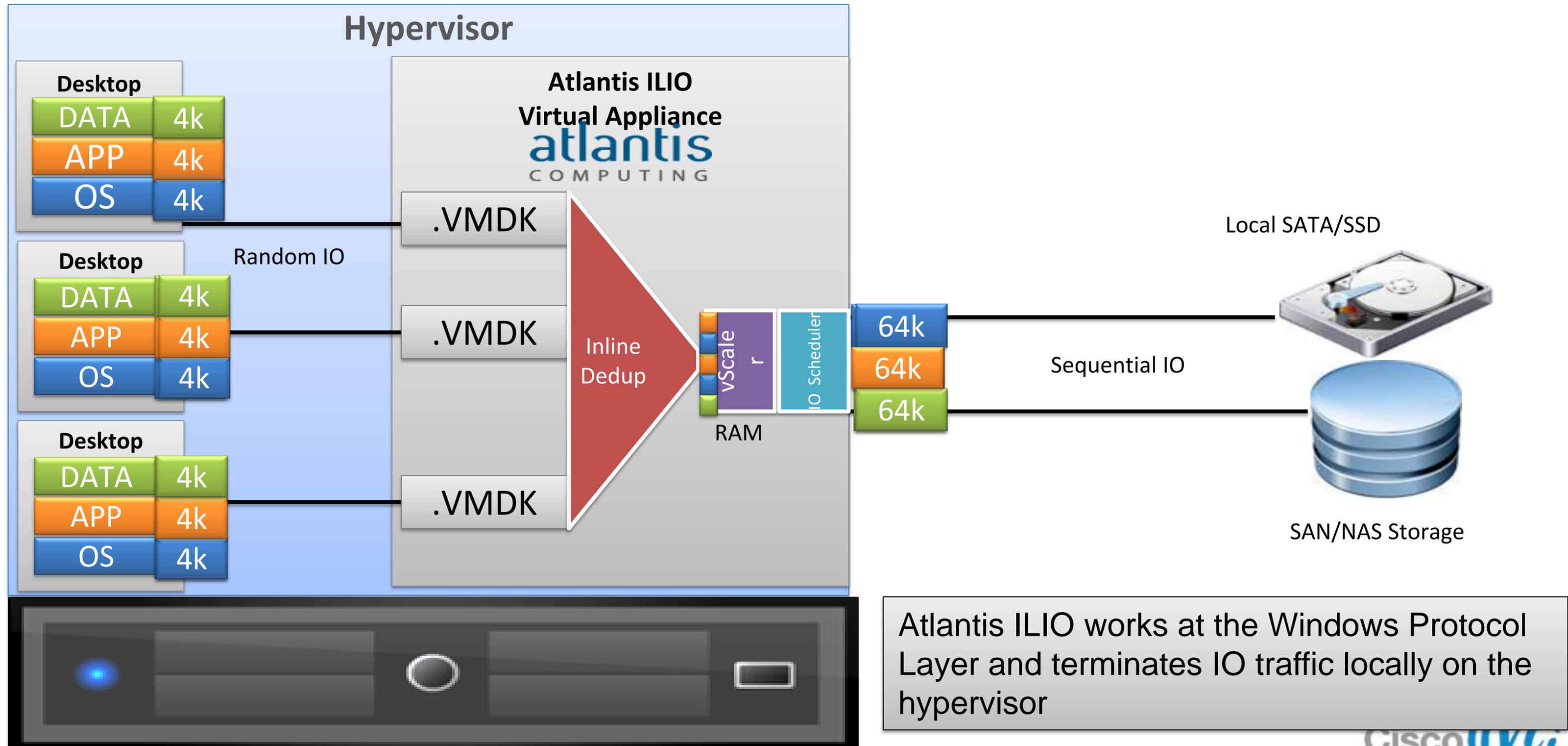
Atlantis UCS Storage IOPS Offload

Atlantis ILIO IOPS Offload (OnBlade)
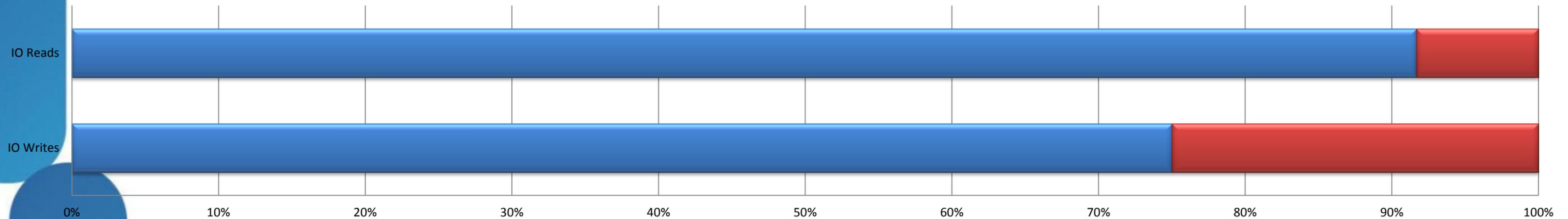
Atlantis ILIO IOPS Offload (Top-of-Rack)
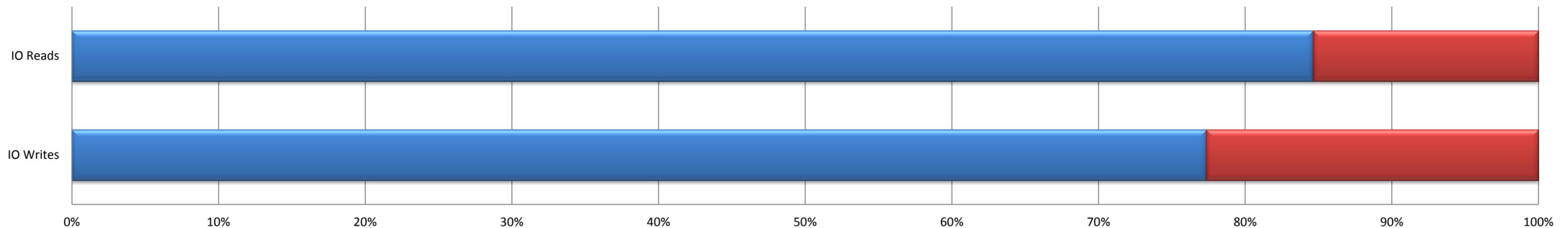
- Storage IOPS are critical to scaleable VDI

- Win7 with AV requires around 80 IOPS

- ILIO appliance with UCS Extended Memory Technology helps in reducing IOPS over network and to disk

- ILIO on UCS benefits
  - Storage Optimisation
  - Performance acceleration
  - Support for Stateless or Persistent desktop models
  - Cut storage cost
  - Improves overall user experience

Planning

- **Storage Requirements**
  - Total number of desktops
  - Type of desktops (persistent, non-persistent)
  - Size per desktop
  - OS for desktop
  - Worker workload profile
  - Storage growth horizon
  - Disaster recovery, backup, and data protection requirements
  - Size of NAS (CIFS) home directories
  - Roaming profiles
- **Transport De-duplication**
  - Transport workload mobility solutions
  - Shared storage replication acceleration (SRDF, SnapMirror, etc.)
  - Workload mobility acceleration (Clone, VMDK access, etc.)

- **Planning**
  - Consider DAS for Non-Persistent Desktops
  - Use shared storage with RAID and replication for persistent desktops and user data
  - Use Linked Clones or File Level Flex Clones for storage capacity
  - IOPS (4096 Bytes/IOP)
    - WinXP 5-10
    - Win7 10-20
    - 15K RPM drive – 300 IOPS
    - SSD drive – 10,000s IOPS
    - Reads versus writes
  - Consider hourly, daily, monthly, and quarterly workload
  - Consider impact of antivirus
  - Use storage caching to scale
    - Consider data redundancy levels

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Sample Bandwidth Planning

- Storage (in and outbound)
  - 20 IOPS per desktop at 4K Bytes EA
  - 671 Kbps EA (assume 1 Mbps)
  - 1 Gbps for 1000 HVDs in UCS blade chassis
  - Assume 1 Mbps per HVD
- Network Display (mostly outbound)
  - Assume 1 Mbps per desktop
  - 1 Gbps for 1000 HVDs in UCS blade chassis
- Desktop Protocols (mostly inbound)
  - Estimate 8 Mbps which opens 25MB in 25 seconds and handles streaming and interactive video
  - 8 Gbps for 1000 HVDs in UCS blade chassis
- Total
  - 10 Mbps per HVD for storage, display, and desktop protocols
  - 10 Gbps for 1000 HVDs in UCS blade chassis

UCS Chassis

APP AppVirt | APP AppVirt | APP AppVirt | APP AppVirt

HVD-1 | HVD-1000

Hypervisor

Server

BIOS (UCS Service Profile)

Network (LAN/SAN)

Storage | Display | Desktop Protocols

live!
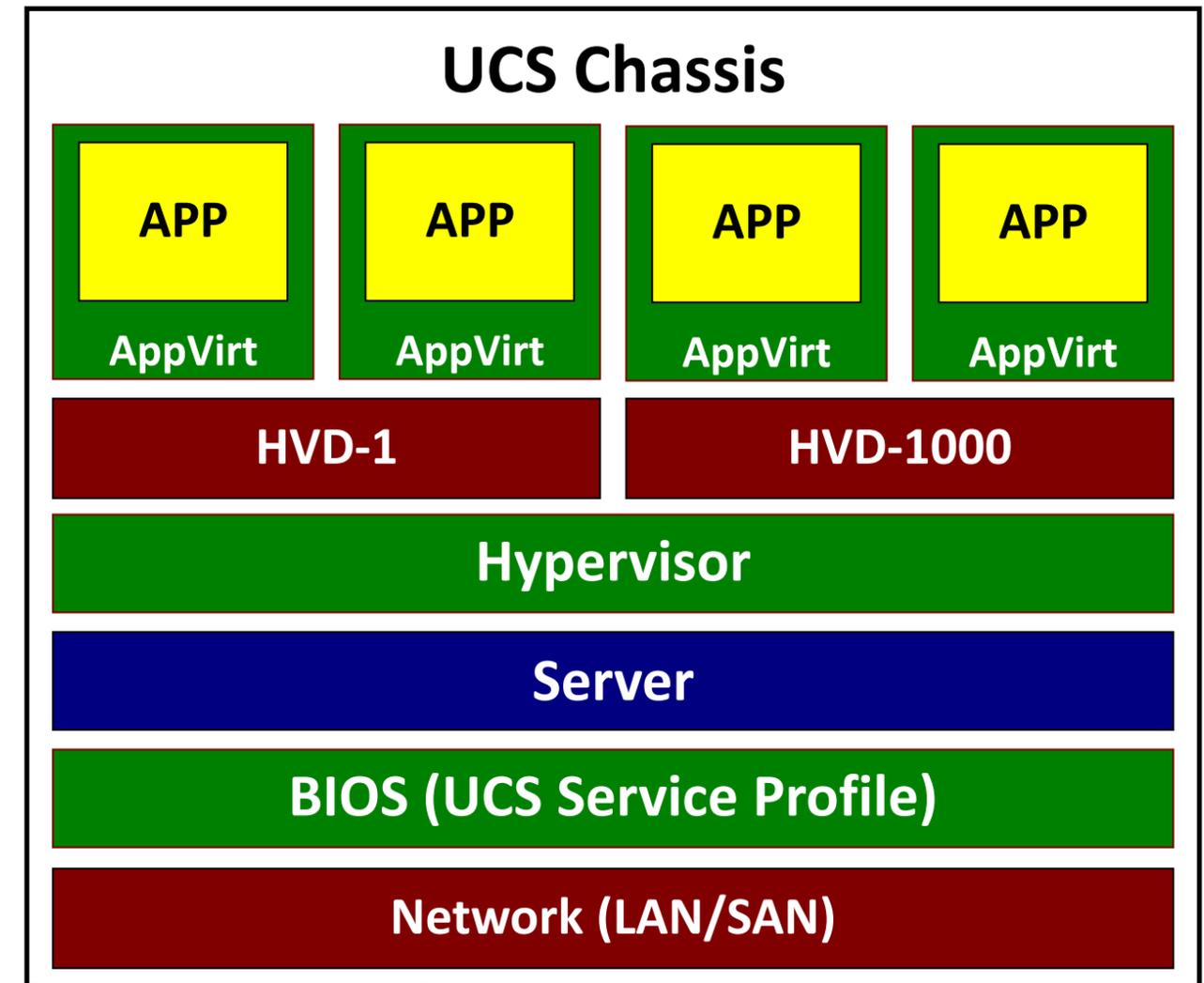
Architecture

Large Scale Virtual Desktop Architecture

- **Branch**
  - Thin Clients or display protocol clients
  - WAN Acceleration (1 connection per HVD/HVA)

- **Desktop Data Centre**
  - WAN Acceleration From Thin Client (1 connection per HVD/HVA)
  - Broker
  - Virtual Desktops
  - Limited applications
  - WAN Acceleration to Application (10 connections per HVD)

- **Application Data Centre**
  - WAN Acceleration From HVD
  - Centralised applications

Disp Protocols

Theatre Desktop Centres

App Protocols

Corporate Application Data Centres
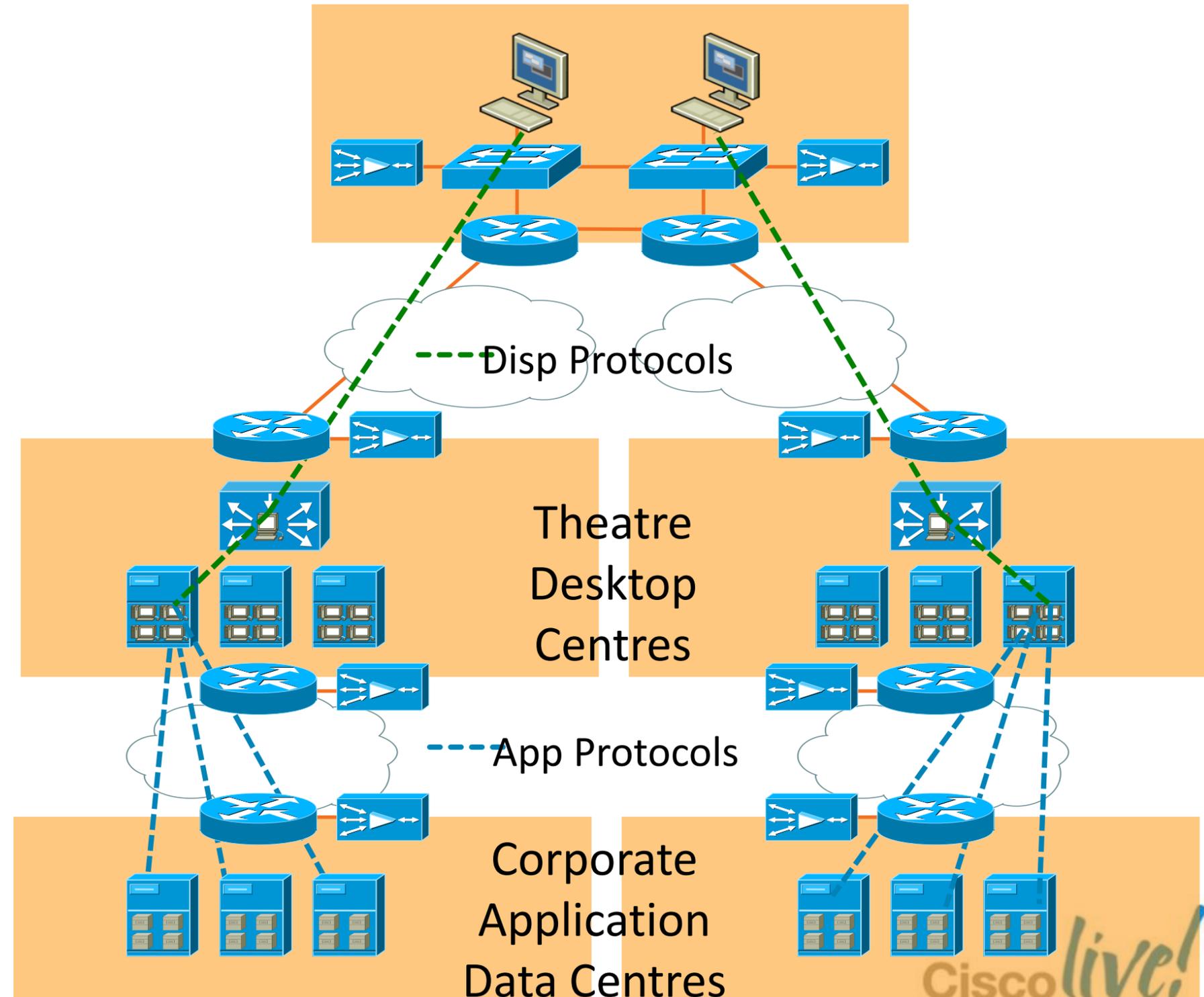
Availability

Fault Domains

- Client – 1 user
- Branch Switch – Up to 250
- Building or WAN – 2 to 1,000
- SLB – 2,000 to 20,000

- Broker – Up to 1000
- UCS Blade – Up to 332
- UCS Chassis – Up to 1,328
- Storage – 1 to 10,000

Client	LAN	WAE	WAN	WAE	ACE	Broker	UCS	Storage
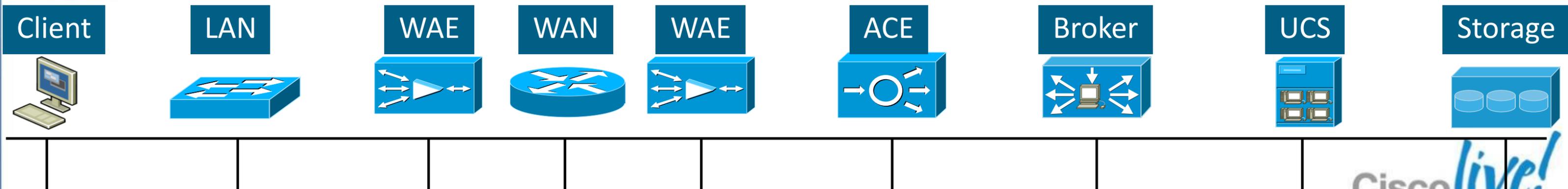
WAAS NFS Transport DeDuplication

- Client LAN attached terminal

- Native protocols over WAN

- Centralised VMDK and user data

- Storage
  - NFS from ESX to NAS
  - WAAS between ESX and NAS
  - 99.6% compression (10 GB reduced to <100 MB)

	Source IP:Port	Dest IP:Port	Peer Id	Applied Policy	Open Duration	Org Bytes	Opt Bytes	% Comp	Cla...
🔍	192.168.203.200:693	192.168.101.100:2049	dc1-wae2		0:45:48	10.0108 GB	67.5429 MB	99%	
🔍	192.168.203.200:694	192.168.101.100:2049	dc1-wae2		0:27:48	166.7422 KB	26.8691 KB	84%	
🔍	192.168.203.201:807	192.168.101.100:2049	dc1-wae2		796:9:51	19.9475 GB	1.5759 GB	92%	
🔍	192.168.203.201:808	192.168.101.100:2049	dc1-wae2		796:9:51	930.2551 MB	131.4365 MB	86%	

C1 **C2** **C3** **UCS** **WAE** **Network** **WAE** **NAS**

RDP

NFS

Origin Connection   Optimised Connection   Origin Connection
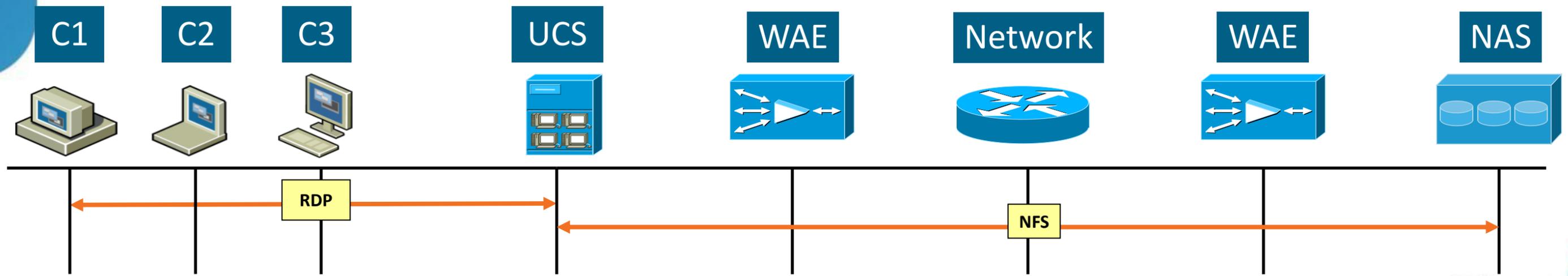
Remote NAS WAAS NFS Storage Acceleration

- Display protocols are challenged by rich media

- Mitigate display protocol challenges by placing compute close to user

- Achieve data protection by placing vmdk in data centre

- Minimise network impact with WAAS

WinXP Action	NFS Origin	NFS Optimised	Percent Optimised
Boot	204	2.922	98.61%
Login	91.781	1.938	97.89%
Office	201	3.584	98.26%
Web 5X	21.5	0.433	98%
On demand Flash	3.333	0.062	98.18%

Virtual Desktop Architecture

- ## Normal Conditions
  - Desktops provisioned to use local NFS Filer
  - SnapMirror Replicates VMDK files through WAAS
  - Netapp Flex Clones to reduce storage

- ## Event
  - NAS fails over to replicated NAS using L2 extension or Route Health Injection (RHI)
  - WAAS enables desktops to run from NAS in remote data centre
  - View Clients maintain display protocol connection with stationary compute VM

- - - RDP
- - - NFS
- - - Replication

WAN #1

WAN #2

r1

r3 r4

r2

e1

r7

r9

c1

r5 r6

e3

c2

Server Farm 1

Server Farm 2

f1

r8

e2

r10

e4

f2
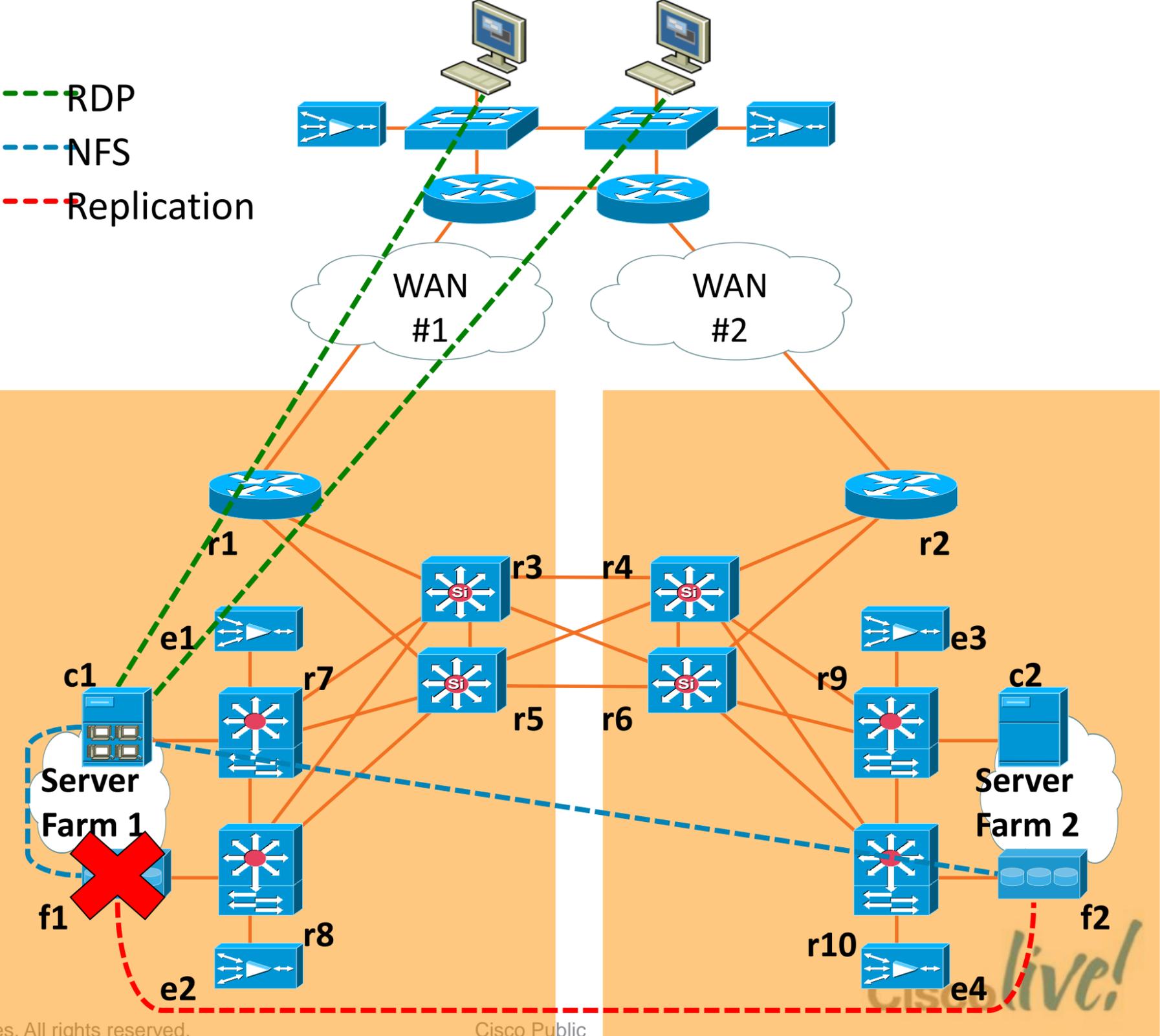
VMotion Acceleration

- VMotion uses TCP to reliably migrate the contents of memory from one compute to another

- Source host initiates a TCP 8000 connection to the destination host

- WAAS can be in the path using inline card or WCCP

- WAAS reduces 512 MB transfer to just 31 MB if warmed with similar WinXP desktop

- WAAS enables bulk VMotion between data centres in the event storage moves

- WAAS enables efficient VMotion from/to private to/from public clouds

	Source IP:Port	Dest IP:Port	Peer Id	Applied Policy	Open Duration	Org Bytes	Opt Bytes	% Comp	Classifie Name
🔍	10.87.121.4:49157	192.168.203.201:8000	dc1-wae2		0:1:24	513.254 MB	31.5101 MB	94%	HTTP
🔍	192.168.203.201:49157	10.87.121.4:8000	dc1-wae2		0:1:24	136 Bytes	300 Bytes	-	HTTP

UCS	WAE	IP Network	WAE	UCS

Vmotion TCP 8000
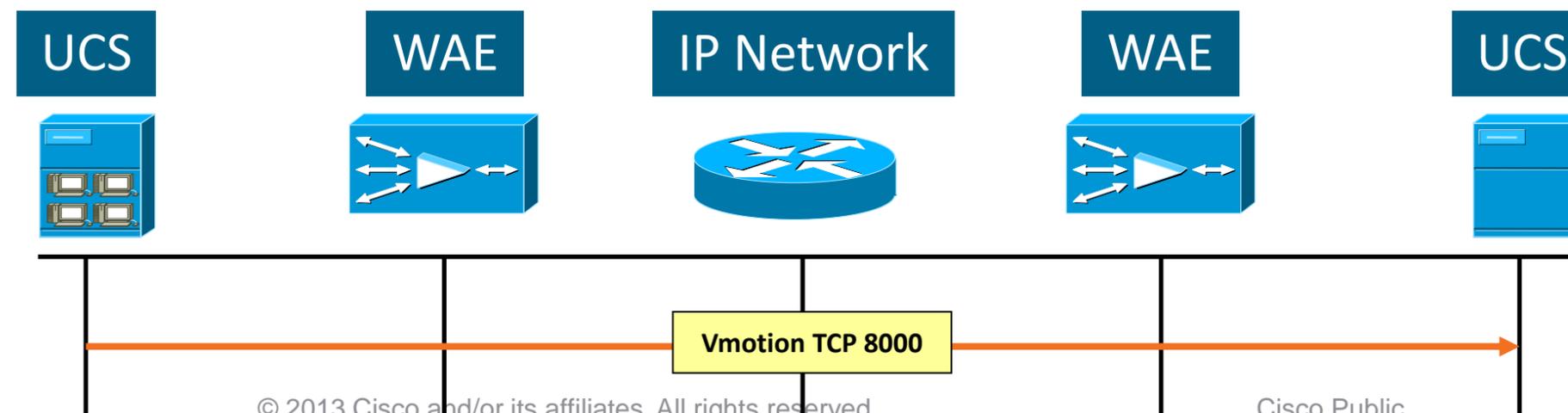
VMotion Compute Follows Storage

Normal Conditions

- Desktops provisioned to use local NFS Filer

- SnapMirror Replicates VMDK files through WAAS

- Netapp Flex Clones to reduce storage

Event

- NAS fails over to replicated NAS using L2 Extension or Route Health Injection (RHI)

- WAAS efficiently migrates desktop VMs to backup compute following storage

- Client VMs can preserve IP with RHI, L2MP, or request new IP through DDNS

RDP
NFS
Replication

WAN #1
WAN #2

r1
r3
r4
r2
e1
c1
r7
r5
r6
r9
e3
c2
Server Farm 1
r8
f1
e2
r10
f2
e4
Server Farm 2
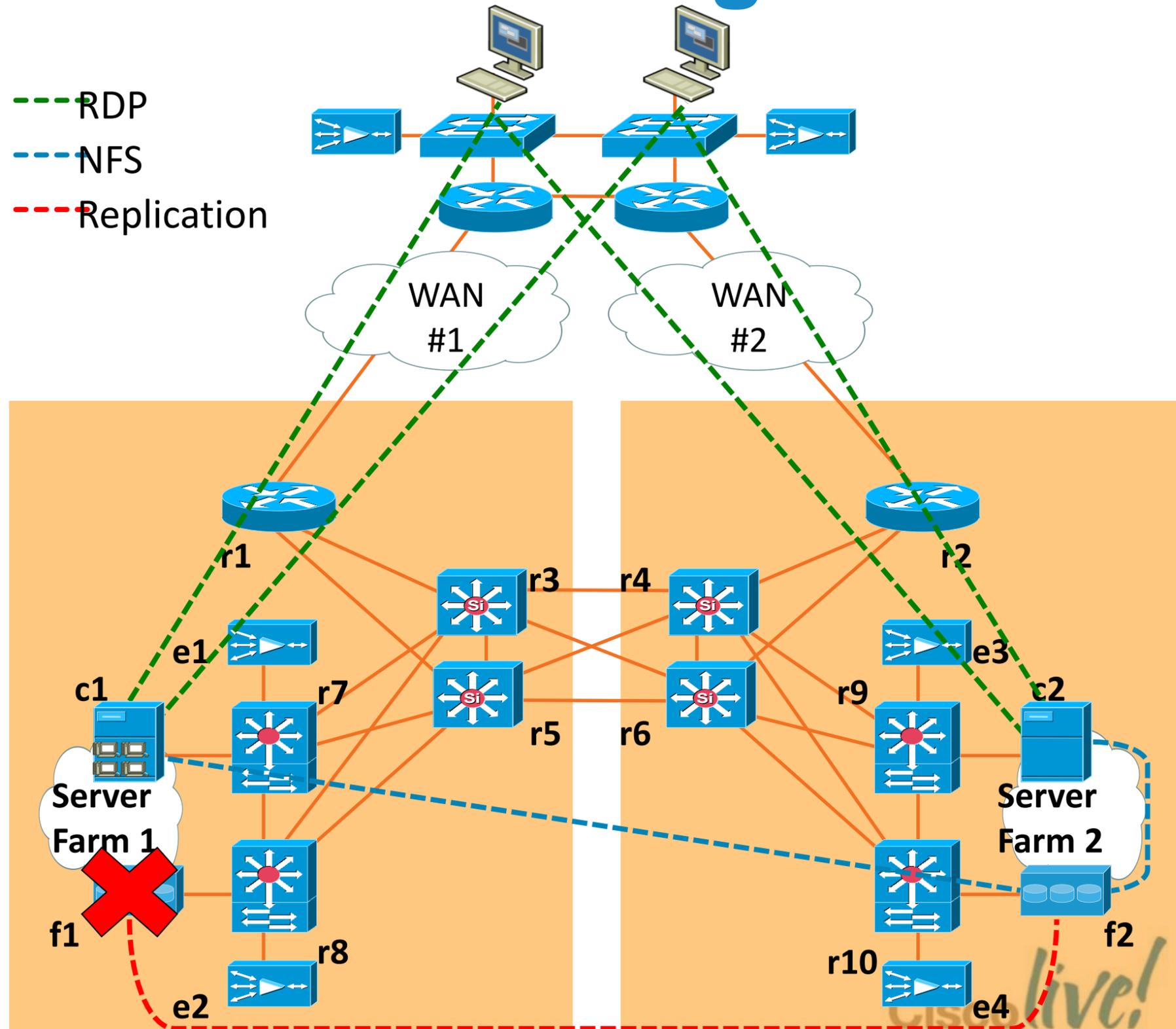
View Offline Desktop Check Out/In Acceleration

- View Client includes VMware Player

- Client checks out (downloads) virtual desktop VMDK

- WAAS accelerates chec out and check in
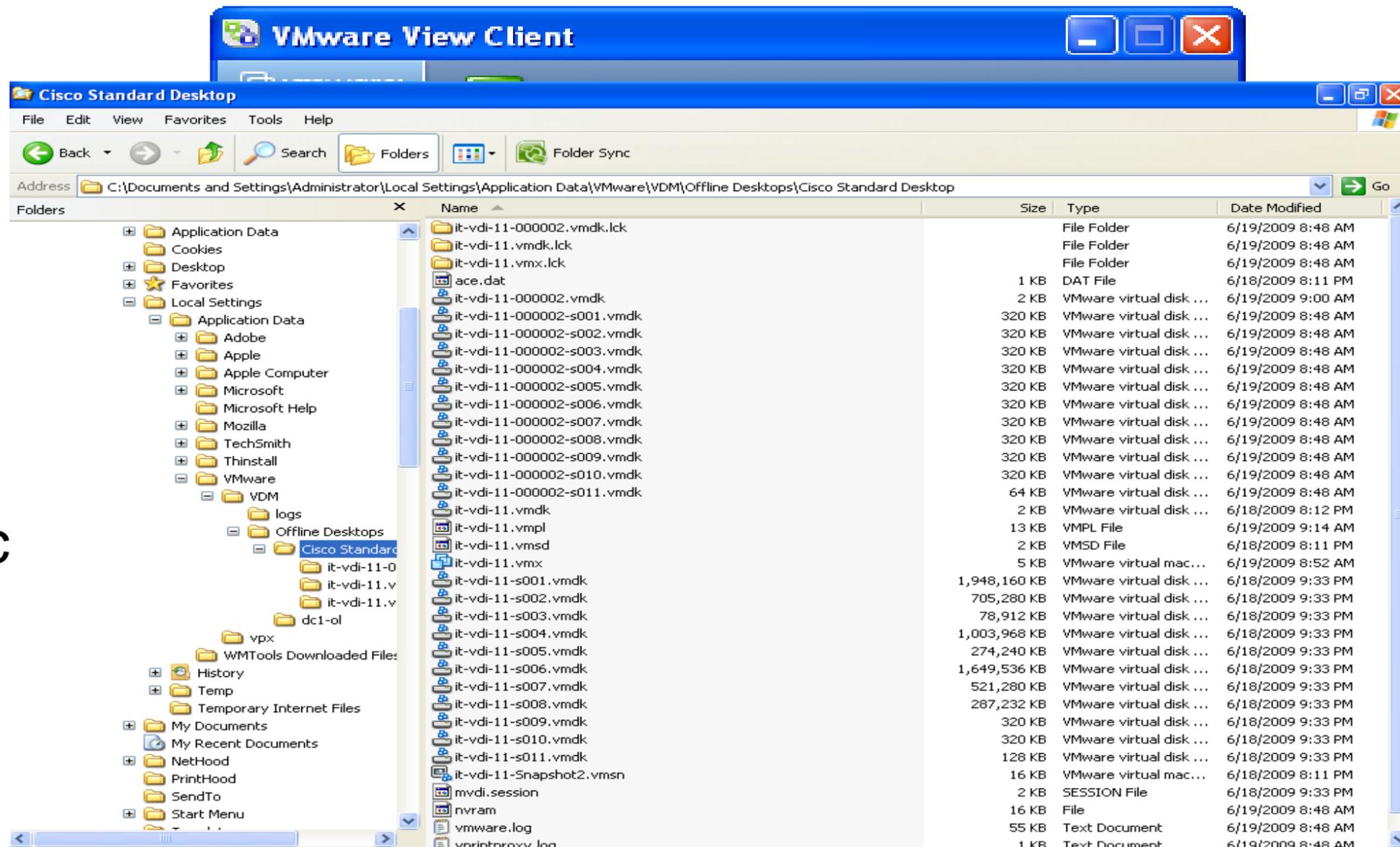
	Source IP:Port	Dest IP:Port	Peer Id	Applied Policy	Open Duration	Org Bytes	Opt Bytes	% Comp	Classifier Name
	192.168.203.3:2586	172.18.160.210:80	dc1-wae2		0:32:51	3.2043 GB	70.2188 MB	98%	HTTP

Strategy

Approach

- Centralised when you can
  - Communications – Email
  - Productivity – Office, Wiki
  - Information Management – File, Sharepoint, iDisk, etc.
  - Business applications – Client/Server
- Local when you must
  - Communications

    IP Telephony (interactive softphone)

    Video on demand (native encoding with local caching and prepositioning)

    Video streaming (broadcast)
  - Rich media web
  - Print

Considerations

- Business
  - Identify worker types (i.e. Task, Knowledge, Power, etc.)
  - Pursue when it makes business sense
  - Address security and compliance requirements
  - Consider the workspace (not just a desktop)
  - Consider the employ onboarding and off-boarding workflow
- Design
  - Fault domains
  - Disaster recovery
  - Shared storage scalability
  - Application concurrency
  - Per application requirements (One bad app ruins a bushel!)
  - Rich media or graphic intensive applications have many caveats
  - Stateless desktop is the goal

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VXI - Employee On Boarding

Cisco Cloud Portal (Service Catalog Portal)

Cisco Cloud Portal (cont'd)

Cisco Process Orchestrator

Cisco Process Orchestrator
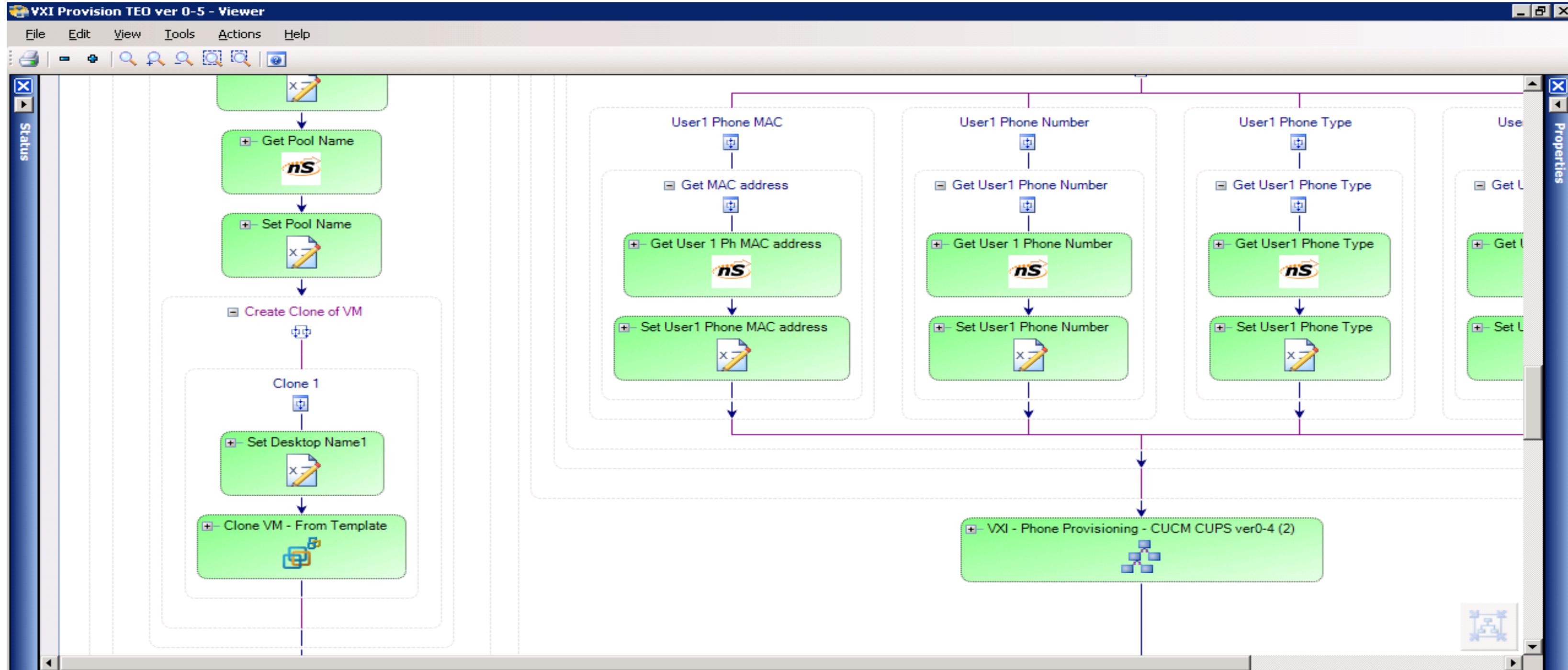
Collaboration

- Telephony

  – Cisco Telephony Customer

  89XX/99XX series phones will support integrated zero client if VDI is planned

  AT power will power both phone and zero client (within limits)

  – Not Cisco Telephony Customer

  Consider a Unified Desktop

  If not, standalone zero client with Energywise PoE

- Streaming

  – Zero client in small scale with display protocol supported video formats

  – Hybrid client with integrated browser using CDS and/or multicast today

Borderless Network Summary

- Security/QoS
  - Thicker clients need advanced security and QoS
  - Thin clients need extreme availability and interactivity
  - Variety of clients will increase due to consumerisation
  - Need to design for all types
- WAN
  - WAAS for thin RDP/ICA and PC user scale and experience
  - WAAS/CDS to scale streaming media when there's a local browser/player
- LAN
  - Thin clients have real time and availability requirements
  - Prepare the LAN for thin client PoE with Energywise

Data Centre Summary

- UCS offers unique advantages

  - Cost, power, space (Big fast memory, Unified Fabric)

  - Best availability through lower Time To Repair

  - Converged management

  - Memory is a big deal for Windows 7 – 2X over WinXP and diminished VMware memory oversubscription from paging change

  - Safe first place to deploy UCS

  - Broker displaces many server provisioning tools so less need for existing tool integration

- Network

  - Separate desktops from applications

  - Secure and monitor hosted virtual desktops

- Storage

  - Unified Fabric (SAN or NAS)

  - Atlantis Computing storage acceleration using UCS big fast memory

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Cisco VDI Benefits

- Scale

- Secure

- Deliver

- Unify

- Experience

- Operate

Customer Scenarios

Q & A

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