The Role of WAN Optimization in Cloud Infrastructures

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Agenda Topics

- Importance of the WAN and the Cloud
- What is WAN Optimization and how does it work?
- Key considerations when deploying WAN optimization into the Cloud
  - Placement
  - Scalability
  - Non-interoperability
Cloud/Utility Computing

Your Business

Shared Power Utility
The WAN is a core component of The Cloud
Elasticity and Economic Benefits

- Cloud provider realizes quantities of scale
  - Cloud provider gets large serving multiple customers
  - Per-unit provisioning costs decrease with size

- Expand IT resources on demand
  - Cloud provider provisions resources
  - Procurement of IT resources hidden from consumer

- Cloud provider provides focus and expertise
  - Focus creates superior expertise delivering IT resources
  - Superior expertise leads to improved IT performance and efficiency
Issues with migrating to the Cloud

- Largely same existing physical WAN infrastructure used to access Cloud
  - Same WAN links with bandwidth and latency
- Cloud data centers are potentially “far away”
  - Cloud infrastructure supports many enterprises
  - Large scale drives lower per-unit cost for data center services
- All employees will be “remote” from their data
  - Even single-location companies will be remote from their data
  - HQ employees previously local to servers, but not with Cloud model
### WAN Performance Bottlenecks

#### The “distance” problem
- Latency and application chattiness
- Slower application access

#### “Skinny Straw” problem
- Thousands of companies
- Millions of users
- Varied bandwidth

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#### Typical WAN Performance Results—UP TO 20x SLOWER

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<th>Action/ Latency</th>
<th>~ LAN (&lt;10ms)</th>
<th>WAN (~100ms)</th>
<th>WAN (~200ms)</th>
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Bottleneck #1: Bandwidth Limitations

- Lots of data needs to be sent over limited WAN bandwidth
- Congestion problems lead to miserable performance

- Files
- Email
- Web Apps
- Database
- Data Backup
- VOIP

Typically 1.5 Mbps to 10Mbps
Fixing Bottleneck #1: Bandwidth Limitations

- **Disk-based deduplication technology**
  - Identify redundant data at the byte level, not application (e.g., file) level
  - Use disks to store vast dictionaries of byte sequences for long periods of time
  - Use symbols to transfer repetitive sequences of byte-level raw data
  - **Only** deduplicated data stored on disk
Disk-based Data Reduction

60 to 90 percent data reduction
Bottleneck #2: Application “Chattiness”

Interactive apps, underlying protocols require 100s or 1000s of round trips for one operation!

- **Web-based applications**
  - CRM
  - Document Management
  - Call Center Apps
  - Project Mgmt Apps
  - Accounting Apps
  - Other Custom Apps

- **Legacy apps:**
  - Common Internet File System (CIFS)
  - Messaging Application Programming Interface (MAPI)
  - UNIX File Sharing (NFS)
Fixing Bottleneck #2: Application-Level Chattiness

- Application-specific chattiness mitigation modules
  - HTTP, CIFS, MAPI, MAPI2003, NFS, etc…

- Protocol-compliant read-aheads to pre-fetch data
  - Pipeline delivery of all application data
  - Eliminate chattiness over the WAN
Addressing Application-Level Chattiness

WAN optimizer completes transaction locally
Addressing Application-Level Chattiness

WAN optimizer completes transaction locally
Throughput achieved through WAN optimization

Actual Results:
Atlanta to Malaysia E1 (2 Mbps) WAN connection (~150ms RT latency)

WAN Optimization Device Deployed
Bandwidth reduction achieved through WAN optimization

79GB of data was reduced to 13GB (83% reduced)

66GB of data was removed from the International links at Malaysia
WAN optimization solution components

- **Physical Appliances**
  - Must physically deploy into infrastructure
  - Maximize performance/cost

- **Software/Virtual appliances**
  - Flexible; spin up as needed
  - Does not need

- **Software clients**
  - WAN optimization from anywhere

- **Traffic interception options**
  - Required for scaling through load balancing
  - Physical and virtual devices available
Key Considerations for Cloud Deployment

- **Placement:** Where to put WAN optimization devices
  - WAN optimization is a symmetric technology (devices on both sides of WAN)
  - Where does device go in Cloud?

- **Scalability:** Cloud infrastructures are large
  - WAN opt must scale for Cloud infrastructures

- **Non-interoperability:** WAN optimization involves proprietary technologies
  - Devices from Vendor A don’t interoperate with Vendor B
  - Devices placed in Cloud must match devices in enterprise
  - Vendor selection is key consideration
Placement of WAN optimization devices

- **For Private Cloud (dedicated) environments**
  - Deploy physical or virtual WAN optimization appliances

- **For IaaS Cloud environments:**
  - Deploy virtual WAN optimization appliances

- **For PaaS Cloud environments**
  - Install WAN optimization software

- **For SaaS Cloud environments**
  - WAN optimization devices can’t be deployed into Cloud provider’s infrastructure
  - Most SaaS vendors don’t offer WAN optimization
  - Must find another way
Deploying WAN opt into the Cloud

IaaS

SaaS

PaaS

Mobile Worker

Branches

Enterprise WAN

Data Centers

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What about SaaS deployments?

- In 2010 SaaS was 73% of Cloud market according to market analysts
  - SaaS growth projections as high as 25% CAGR or more
- SaaS providers don’t provide access to infrastructure
  - Customers cannot install own appliances or software into SaaS Cloud
- 1000’s of SaaS providers worldwide
  - Most don’t know about WAN optimization
  - Few are willing to deploy WAN optimization devices
  - Not practical to expect all your SaaS providers to deploy your WAN optimization devices
Content Delivery Networks (CDN’s)

- **CDN**: System of local caching servers that serve copies of frequently-accessed data to users
- **WAN optimization available from CDN provider**
  - WAN optimization available on 90,000+ servers at 3000+ Points-of-Presence (POP) around the world
  - At least one POP is local to most SaaS providers
- **CDN provider can host server-side WAN optimization software**
  - Local WAN optimization devices peers with instances at CDN provider POP
CDN-hosted WAN optimization

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Scalability

- **SaaS/CDN infrastructures are HUGE**
  - Hundreds or thousands of customers
  - Thousands of POPs
  - Tens of thousands of servers
  - Hundreds of thousands of end-users

- **A WAN optimization product that cannot scale will not be deployed by your CDN or SaaS provider**
  - Not all can scale to the requirements of CDN or SaaS network infrastructures
  - A WAN optimization product that works for your enterprise may not work in the Cloud
Interoperability requires one standard vendor across all infrastructures

- WAN Optimization uses proprietary technologies
- Vendor A devices will not interoperate with Vendor B
- Same vendor everywhere—enterprise, Cloud, mobile

Vendor selection is key consideration

- Must choose vendor product supported by SaaS/CDN provider
- SaaS/CDN provider can only use products that scale
- A product that works for your enterprise may not work in the SaaS/CDN infrastructure
WAN optimization and the Cloud

Mobile Employees

Traveling Professionals

Work-at-home Employees

Enterprise WAN

Cloud Storage

Cloud Filers

Cloud Applications

Cloud Email

Enterprise Data Center

Content Delivery Network (CDN)

Cloud: IaaS, PaaS, SaaS

File Servers

Application Servers

Mail Servers

Disk-based Backup

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Summary Thoughts

- Cloud computing allows consolidation and sharing of IT resources
  - Similar to consolidation and sharing of power/other resources
- WAN optimization key to allowing Cloud computing
  - WAN optimization increases capacity and performance of the WAN infrastructure
- Key issues must be addressed to deploy WAN optimization for the Cloud
  - Placement, Scalability, and Non-interoperability
Please send any questions or comments on this presentation to SNIA: tracktutorials@snia.org

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