WAN Optimization and Thin Client: Complementary or Competitive Application Delivery Methods?

Josh Tseng, Riverbed
WAN Optimization and Thin Client: Complementary or Competitive Application Delivery Methods?

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Agenda Topics

- What is Thin Client computing?
- What is WAN Optimization?
- How WAN optimization complements thin client computing
- Competitive or complementary?
Larry Ellison, March 8, 1996

“The era of the PC is almost over, and the era of the [thin client] is about to begin. The time has come to build a modern pencil.”

Gartner in 2008:

~4 million thin clients in 2008 (out of 108 million PC’s)
~20 million by 2012, 45% CAGR
What is Thin Client?

- Consolidated computing architecture that relies on the central server for all processing activities
  - Focus on conveying input and output between thin client and server
  - Remote user only views screen images
  - Central server performs all processing
  - Also known as “virtual desktop” computing

- Main Thin Client Objectives
  - Cost reduction through server consolidation
  - Reduce consumption of network bandwidth
  - Improved Security
Thin Client over WAN

Only screen pixels and user input sent over the WAN, leading to reduced bandwidth utilization
Successes of Thin Client

- **Server consolidation**
  - All administration takes place at the server

- **Security**
  - All data resides centrally; reduces exposure at remote sites

- **Reduces network bandwidth utilization**
  - Cost savings from using lower-speed WAN links
  - General guideline: 20kbps per end-user
  - Additional 150kbps per user if printing is needed
Thin Client Weaknesses/Disappointments

▷ Poor performance in high-latency WAN environments
  ◦ Mouse-movements and keyboard clicks sensitive to latency
  ◦ Application/end-user keyboard interactions are difficult to predict

▷ Not effective for video applications
  ◦ Real-time compression by thin client system is less effective than original streaming compression
  ◦ No ability to share split/share video streams

▷ Complexity
  ◦ Many applications difficult to integrate

▷ Slow document printing
  ◦ Reduced bandwidth affects ability to obtain hard document copies

▷ Expensive licensing costs
  ◦ Original cost savings objective not realized
What is WAN Optimization?

Solution that facilitates distributed computing by addressing WAN performance problems

- Uses appliance or software agent at each communicating site
- Employs data deduplication and protocol optimization techniques
- Based on client-server computing--processing is distributed to client machines

Addresses both bandwidth and latency issues that affect WAN performance

- Deliver LAN-like performance over the WAN
Addressing 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

Check out SNIA Tutorial:
Understanding Data Deduplication
Disk-based Data Reduction

60 to 90 percent data reduction

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Addressing Latency Issues

- Application-specific chattiness mitigation modules
  - CIFS, MAPI, MAPI2003, NFS, SQL, etc…
- Aggressive read-ahead to pre-fetch data
  - Pipeline delivery of all application data
  - Eliminate chattiness over the WAN
Address Application-Level Chattiness

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WAN Optimization objectives

- **LAN-like performance over the WAN**
  - WAN can be used just like a LAN
  - Store and access files directly over the WAN

- **Reduce bandwidth utilization**
  - Eliminate 65% to 95% of network traffic over the WAN

- **Consolidate and centralize all servers into DC**
  - Reduce hardware in branch offices
  - Virtualize servers in the data center
  - Local backup and recovery for all servers in DC
WAN Optimization LAN-like performance

Atlanta to India E1 (2 Mbps) WAN connection (~150ms RT latency)

Bandwidth Utilization Report
for Class /Outbound/FTP

Class Utilization with Peaks

Partition: /Outbound uncommitted-none

<table>
<thead>
<tr>
<th>IP Address</th>
<th>Name</th>
<th>Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.120.20.51</td>
<td>10.120.20.51</td>
<td>(none)</td>
</tr>
</tbody>
</table>
### Traffic Summary

<table>
<thead>
<tr>
<th>Port</th>
<th>Reduction</th>
<th>LAN</th>
<th>WAN</th>
<th>Traffic %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Traffic</td>
<td>--</td>
<td>78.9 GB</td>
<td>12.7 GB</td>
<td>--</td>
</tr>
<tr>
<td>HTTP (80)</td>
<td>(95.07%)</td>
<td>34.3 GB</td>
<td>1.6 GB</td>
<td>43.50%</td>
</tr>
<tr>
<td>JDE (8011)</td>
<td>(89.33%)</td>
<td>13.7 GB</td>
<td>1.4 GB</td>
<td>17.99%</td>
</tr>
<tr>
<td>email (1352)</td>
<td>(57.57%)</td>
<td>9.6 GB</td>
<td>4 GB</td>
<td>12.16%</td>
</tr>
<tr>
<td>DB (1521)</td>
<td>(60.84%)</td>
<td>7.3 GB</td>
<td>2.8 GB</td>
<td>9.34%</td>
</tr>
<tr>
<td>JDE (8003)</td>
<td>(89.47%)</td>
<td>4.7 GB</td>
<td>511.6 MB</td>
<td>6.01%</td>
</tr>
<tr>
<td>JDE (85)</td>
<td>(89.38%)</td>
<td>2.5 GB</td>
<td>279.8 MB</td>
<td>3.26%</td>
</tr>
</tbody>
</table>

% Data reduction on WAN:
- HTTP (80): (95.07%)
- JDE (8011): (89.33%)
- email (1352): (57.57%)
- DB (1521): (60.84%)
- JDE (8003): (89.47%)
- JDE (85): (89.38%)

Before-optimization data volume:
- HTTP (80): 34.3 GB
- JDE (8011): 13.7 GB
- email (1352): 9.6 GB
- DB (1521): 7.3 GB
- JDE (8003): 4.7 GB
- JDE (85): 2.5 GB

After-optimization data volume:
- HTTP (80): 1.6 GB
- JDE (8011): 1.4 GB
- email (1352): 4 GB
- DB (1521): 2.8 GB
- JDE (8003): 511.6 MB
- JDE (85): 279.8 MB

% of overall traffic before optimization:
- HTTP (80): 43.50%
- JDE (8011): 17.99%
- email (1352): 12.16%
- DB (1521): 9.34%
- JDE (8003): 6.01%
- JDE (85): 3.26%

### Bandwidth Reduction

- 79GB of data was reduced to 13GB (83% reduced)
- 66GB of data was removed from the International links at Malaysia

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WAN Optimization Weaknesses

- **Security**
  - Application data is resident on desktop PC’s
  - Disk drives can be stolen

- **Maintenance of remote PC’s**
  - Desktop operating system patches and updates handled remotely

- **Lack of optimizations for older or rare applications/protocols**
  - NCP, Appletalk, etc…
## Benefit Comparison: Thin Client vs. WAN Optimization

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Thin Client</th>
<th>WAN Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidate servers</td>
<td>✔ ✔ ✔ ✔</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Reduce bandwidth usage</td>
<td>✔ ✔ ✔ ✔</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Address WAN Latency</td>
<td>✔ ❌</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Video Applications</td>
<td>✔ ❌</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>Security</td>
<td>✔ ✔ ✔ ✔</td>
<td>✔ ❌</td>
</tr>
<tr>
<td>Improved end-user experience</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
<tr>
<td>Positive ROI</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔ ✔</td>
</tr>
</tbody>
</table>
Where to use WAN Opt vs. Thin Client

- Thin client addresses special security/data handling requirements
  - No data retained in remote locations
  - All data centrally-stored

- WAN Optimization addresses WAN latency
  - Superior LAN-like performance for applications
  - Better “touch” responsiveness for many apps (e.g., CAD)
  - Thin client is unusable for some environments

- Other intangibles
  - Application integration issues
  - Legacy end-user preferences
  - Licensing costs can be expensive for thin client
  - Video applications
WAN Optimization for Thin Client Traffic

- Disable embedded encryption & compression
  - Allows WAN Opt device to apply deduplication to original raw thin client data
  - Data deduplication across multiple thin-client sessions can be effective
- Use memory-only-based data deduplication algorithms
  - Memory-only processing of thin-client data
  - Minimizes processing latency
- Use Enhanced Transports (optional)
  - Minimizes TCP impact of packet loss for thin-client traffic
- Use QoS enforcement
  - Both bandwidth reservation and priority queuing of thin-client traffic
Compression/deduplication of thin-client traffic

Thin Client Data Sent over WAN

- **Baseline**: No Compression of ICA Data
- **Default Compression**
- **WAN Opt**: 1st Transfer (Cold Xfer)
- **WAN Opt**: 2nd Transfer (Warm Xfer)

**WAN Opt**: 1st Xfer: 21% Better Data Reduction

**WAN Opt**: 2nd Xfer: 45% Better Data Reduction
**Time Response Improvement for RDP Traffic**

*Assumes congested network environment with bandwidth constraints*
Both thin client and WAN optimization are important and provide value

- Some environments need thin client for security/data handling requirements
- WAN optimization provides superior alternative in others

Today, WAN optimization provides an alternative that did not exist 5+ years ago

- Many enterprises removing thin client and using WAN optimization instead
- Others continue to use thin clients for many applications
Complementary:  
- Most enterprises have needs for both thin client and WAN optimization  
- WAN optimization can improve thin client performance

Competitive:  
- WAN optimization is displacing some application environments that formerly used thin client  
- WAN optimization should also be considered for any new application environments

Bottom Line: They are both competitive and complementary
Please send any questions or comments on this presentation to SNIA:

trackvirtualizationapplication@snia.org

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- SNIA Education Committee

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