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# 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?

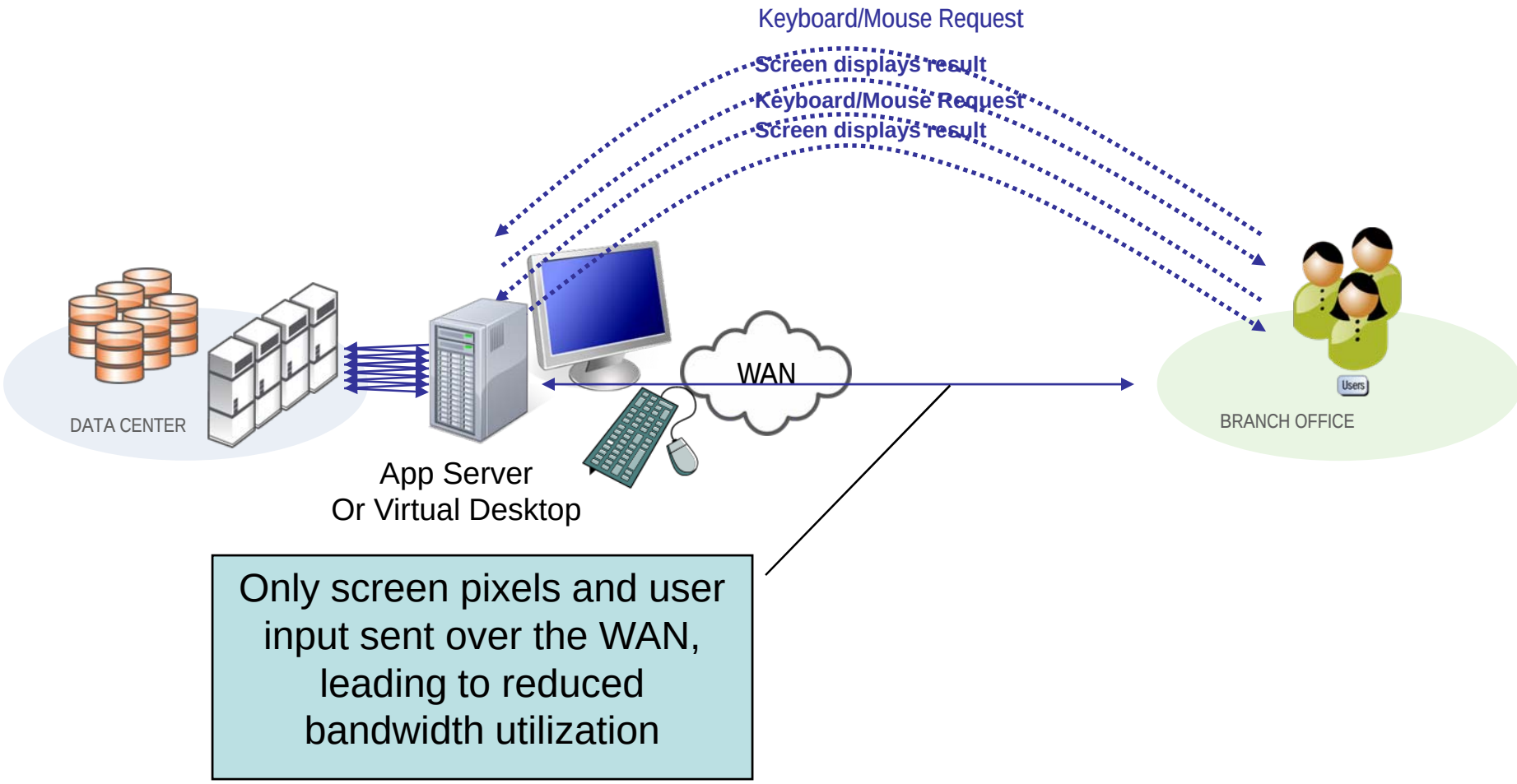
# Bold Predictions about Thin Client

- 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



# 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

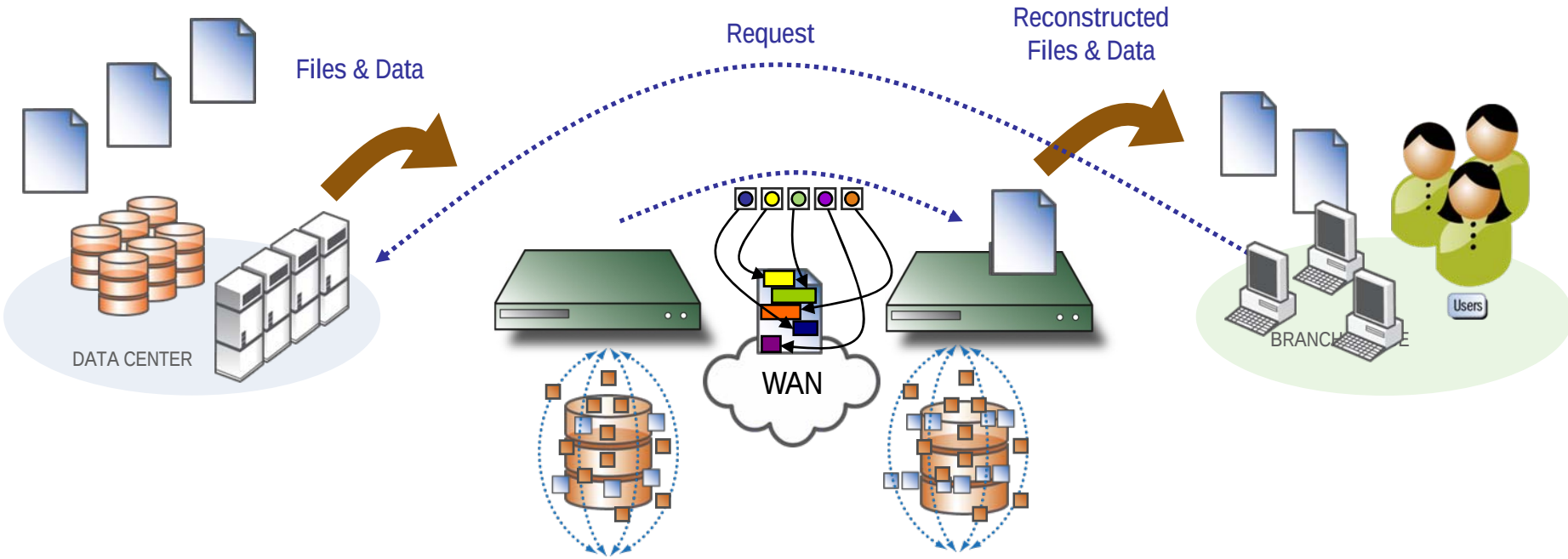
- Disk-based deduplication technology
  - Identify redundant data at the byte level, not application (e.g., file) level
  - Use disks to store vast dictionaries of byte sequences for long periods of time
  - Use symbols to transfer repetitive sequences of byte-level raw data
  - ***Only*** deduplicated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

**Check out SNIA Tutorial:**

**Understanding Data Deduplication**

# Disk-based Data Reduction

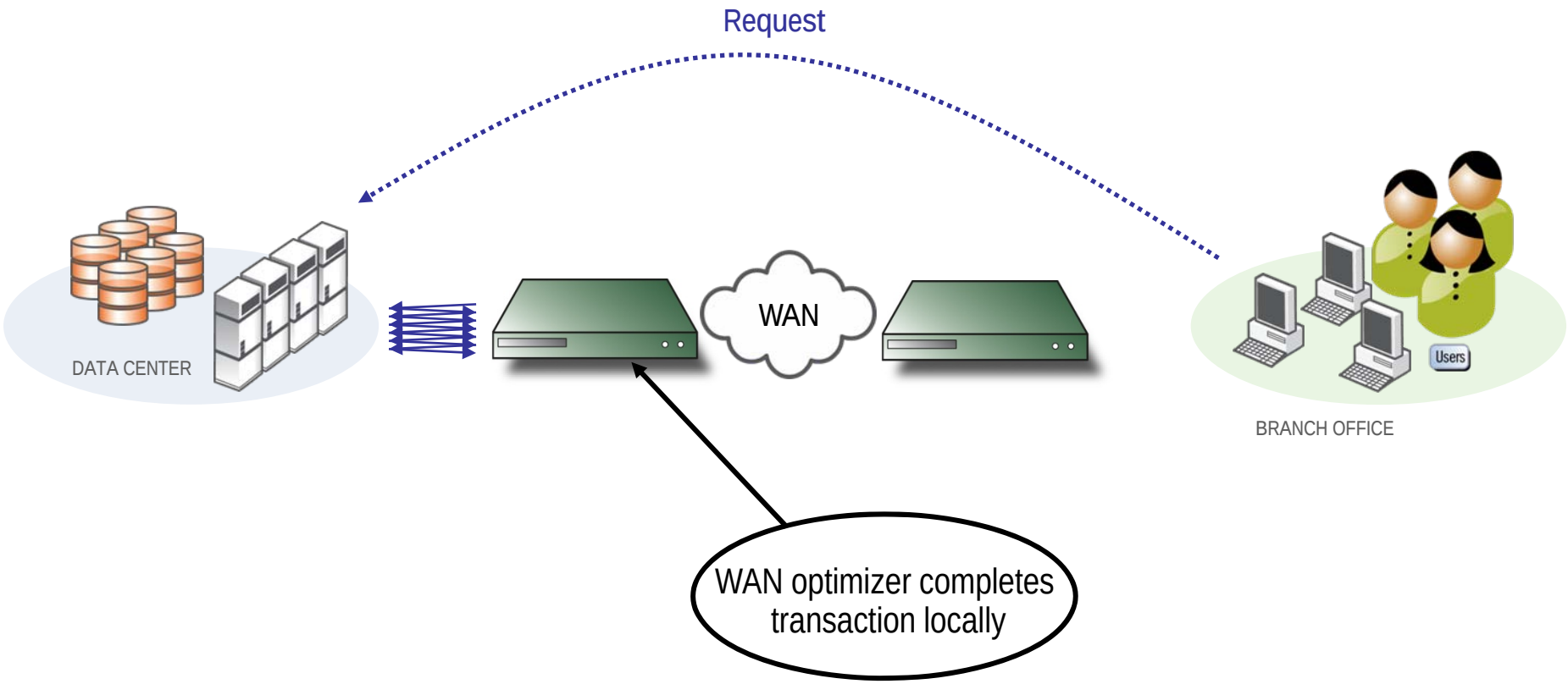
***60 to 90 percent data reduction***



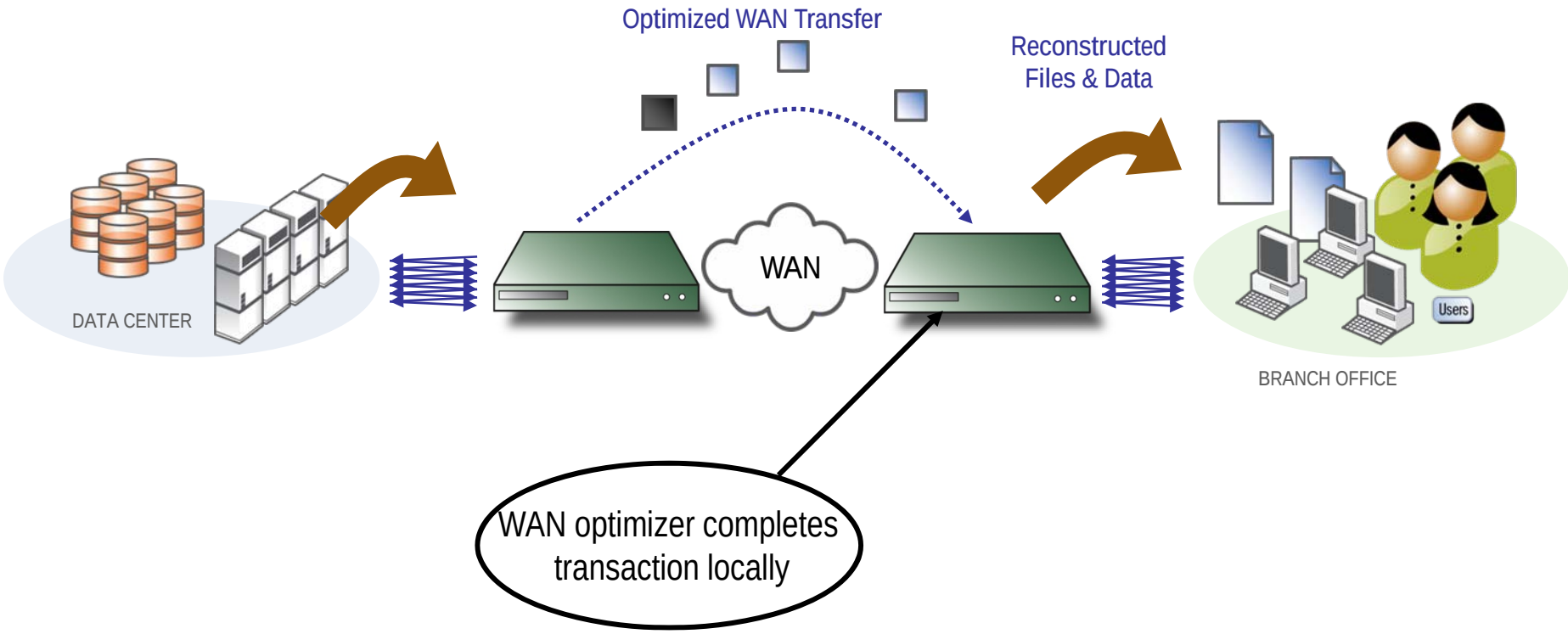
# Addressing Latency Issues

- 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



# Address Application-Level Chattiness

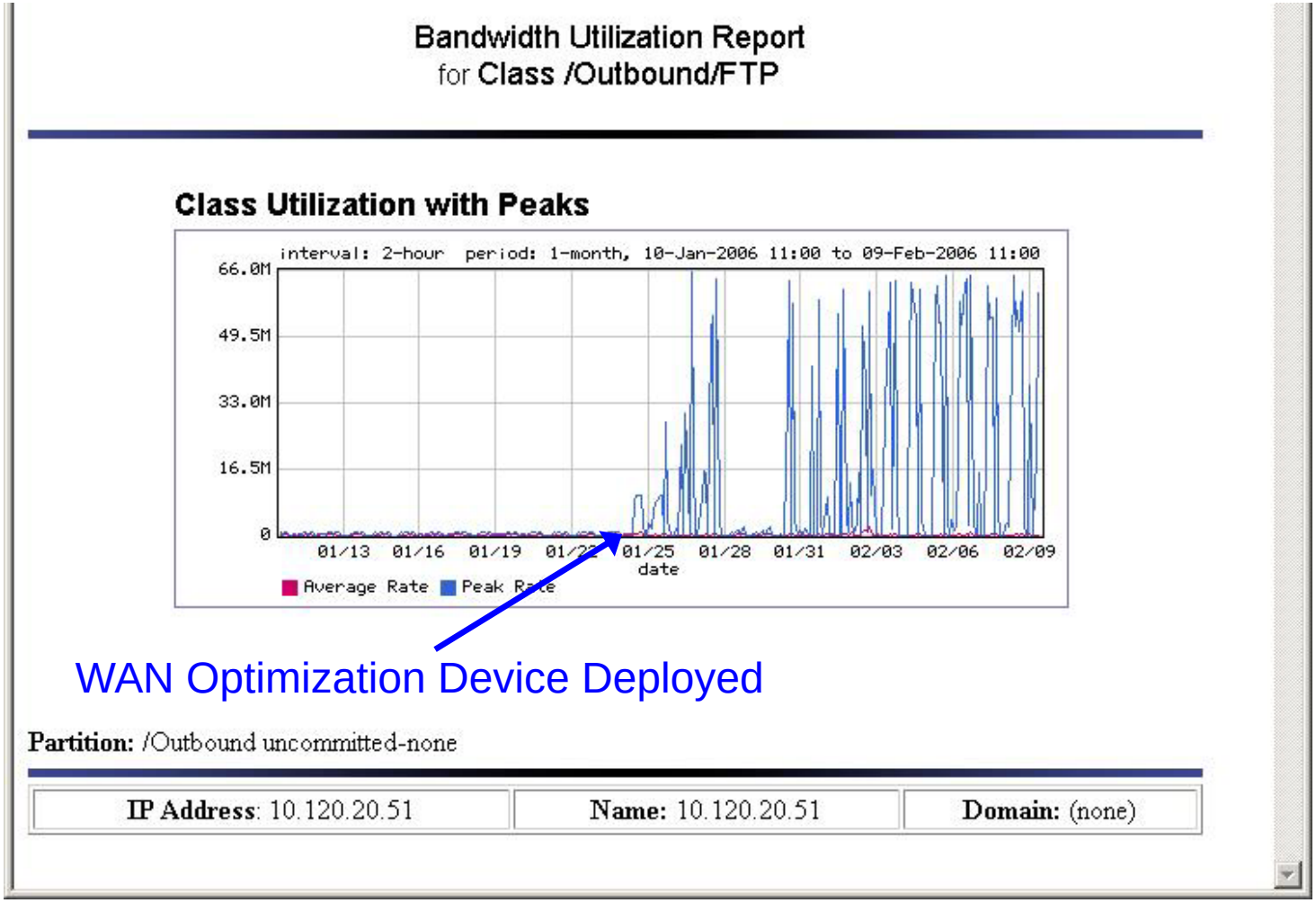


# WAN Optimization objectives

- 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)



# WAN Optimization Bandwidth Reduction

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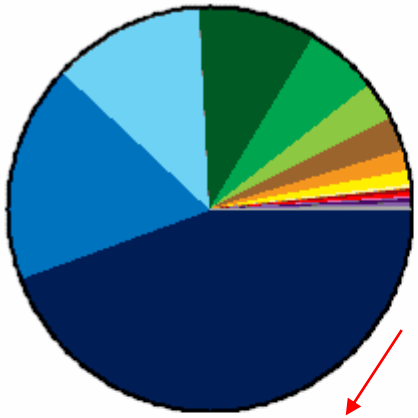
## Traffic Summary



After-optimization data volume

Before-optimization data volume

% Data reduction on WAN

% of overall traffic before optimization

| Port | Reduction | LAN | WAN | Traffic % |
|---|---|---|---|---|
| Total Traffic | -- | 78.9 GB | 12.7 GB | -- |
| HTTP (80) | (95.07%) | 34.3 GB | 1.6 GB | 43.50% |
| JDE (8011) | (89.33%) | 13.7 GB | 1.4 GB | 17.39% |
| email (1352) | (57.57%) | 9.6 GB | 4 GB | 12.16% |
| DB (1521) | (60.84%) | 7.3 GB | 2.8 GB | 9.34% |
| JDE (8003) | (89.47%) | 4.7 GB | 511.6 MB | 6.01% |
| JDE (85) | (89.38%) | 2.5 GB | 279.8 MB | 3.26% |
| SQL:TDS (1433) | (47.38%) | 2.3 GB | 1.2 GB | 2.95% |
| JDE (8021) | (96.69%) | 1.4 GB | 48.5 MB | 1.82% |
| Asset (8300) | (94.68%) | 1001 MB | 53.2 MB | 1.24% |
| Unknown (1565) | (88.96%) | 375.9 MB | 41.4 MB | 0.46% |
| JDE (8005) | (52.80%) | 327.3 MB | 154.5 MB | 0.40% |
| CIFS:TCP (445) | (45.92%) | 312.7 MB | 169.1 MB | 0.39% |
| SMTP (25) | (85.99%) | 234.8 MB | 32.9 MB | 0.29% |
| FTP (21) | (84.02%) | 150.1 MB | 23.9 MB | 0.19% |
| Unknown (1112) | (66.80%) | 112 MB | 37.2 MB | 0.14% |
| Other | (67.6%) | 371.0 MB | 120.4 MB | 0.43% |

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

# 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

| Requirements | Thin Client | WAN Optimization |
|---|---|---|
| Consolidate servers | ✓ ✓ ✓ | ✓ ✓ ✓ |
| Reduce bandwidth usage | ✓ ✓ ✓ | ✓ ✓ ✓ |
| Address WAN Latency | ✗ | ✓ ✓ ✓ |
| Video Applications | ✗ | ✓ ✓ |
| Security | ✓ ✓ ✓ | ✗ |
| Improved end-user experience | ✓ ✓ | ✓ ✓ ✓ |
| Positive ROI | ✓ ✓ | ✓ ✓ ✓ |

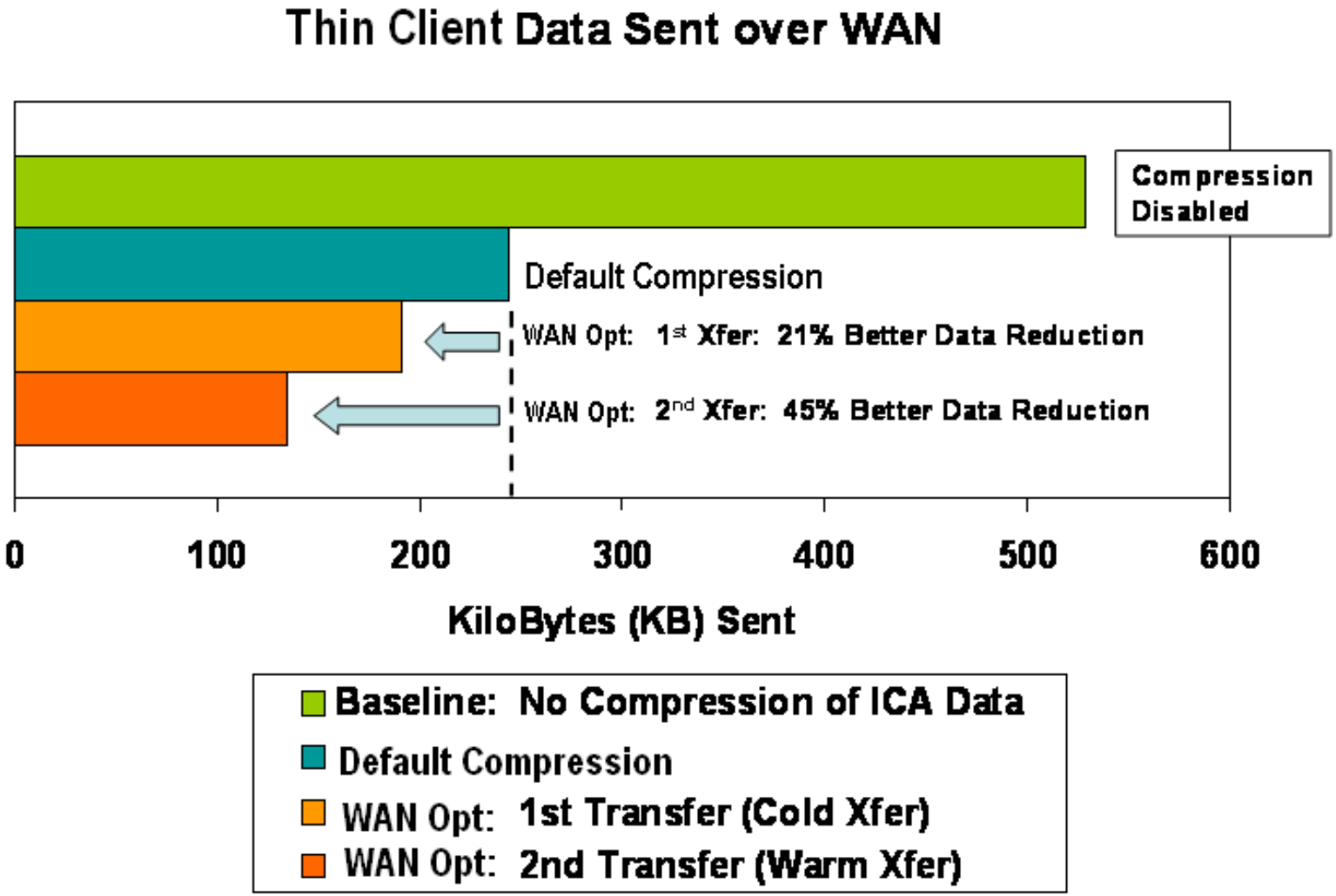
# Where to use WAN Opt vs. Thin Client

- 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

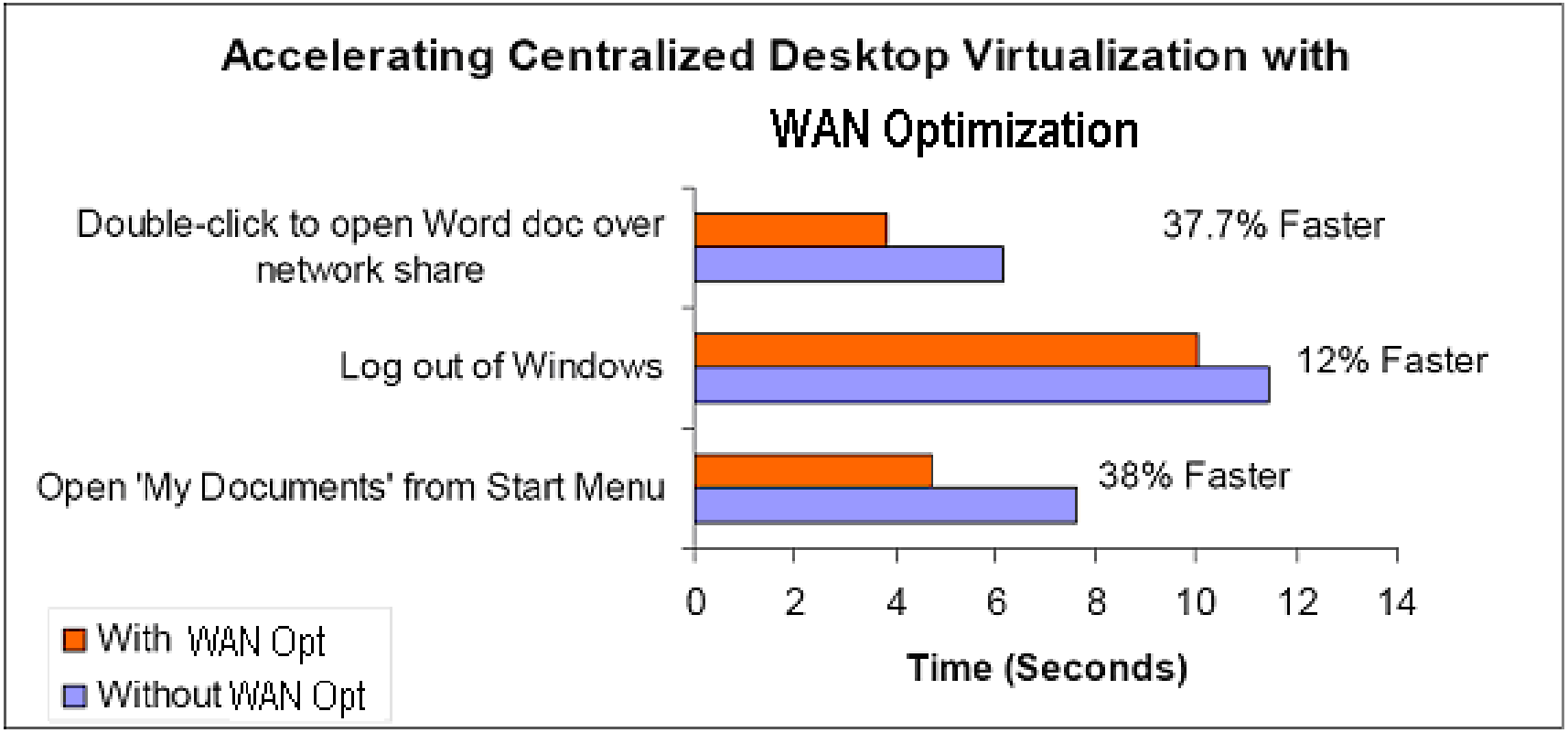
# WAN Optimization for Thin Client Traffic

- 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



# Time Response Improvement for RDP Traffic




*Assumes congested network environment with bandwidth constraints

# In the real-world…

- 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

# Competitive or Complementary?

- 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

# Q&A / Feedback

- Please send any questions or comments on this presentation to SNIA: trackvirtualizationapplication@snia.org

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