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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?

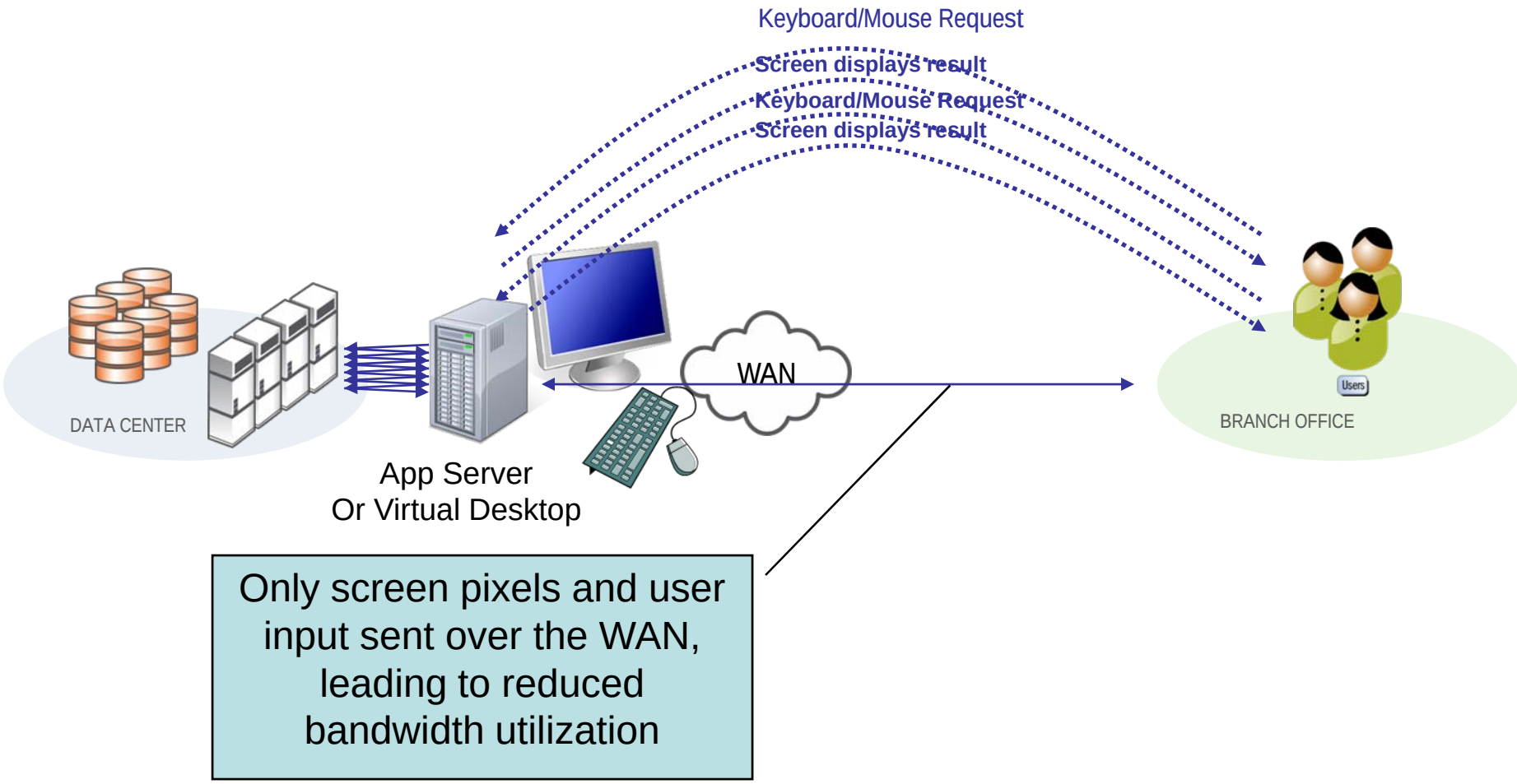
Bold Predictions about Thin Client

- 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

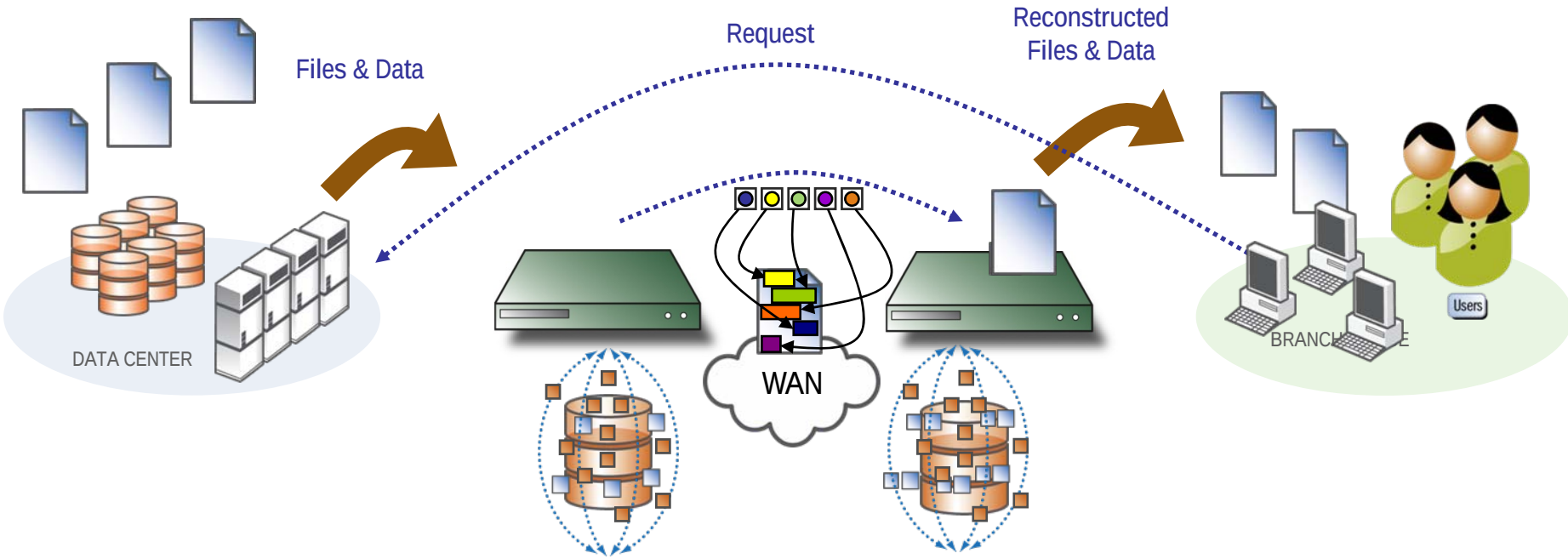
- Disk-based deduplication technology
  - Identify redundant data at the byte level, not application (e.g., file) level
  - Use disks to store vast dictionaries of byte sequences for long periods of time
  - Use symbols to transfer repetitive sequences of byte-level raw data
  - ***Only*** deduplicated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

Check out SNIA Tutorial:

Understanding Data Deduplication

Disk-based Data Reduction

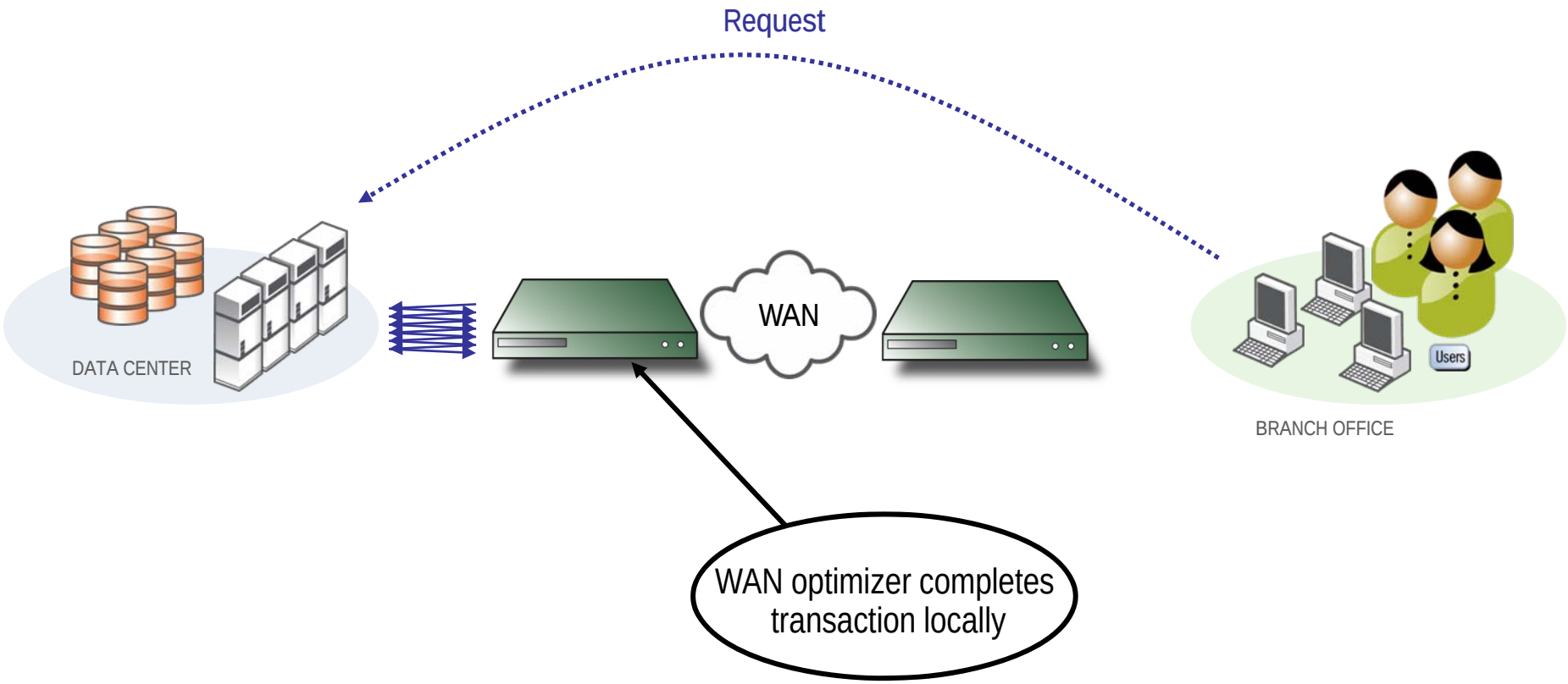
60 to 90 percent data reduction



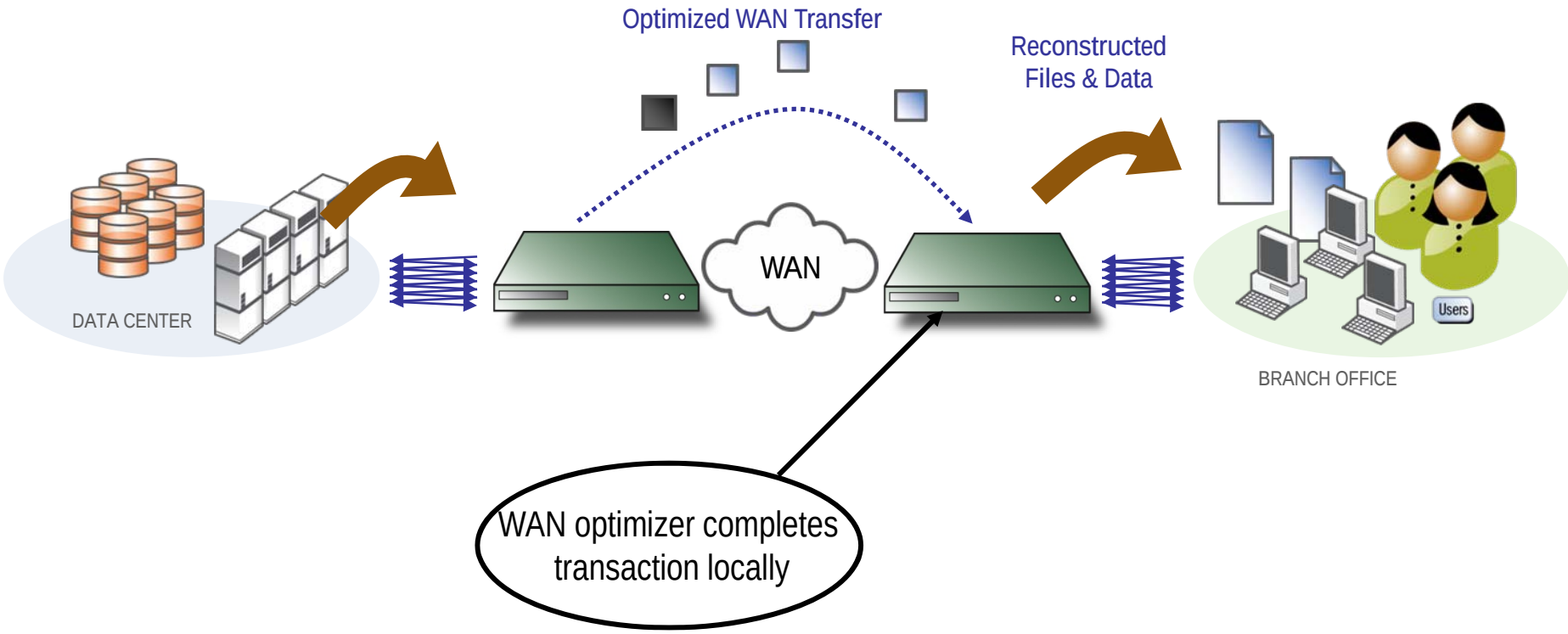
Addressing Latency Issues

- 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

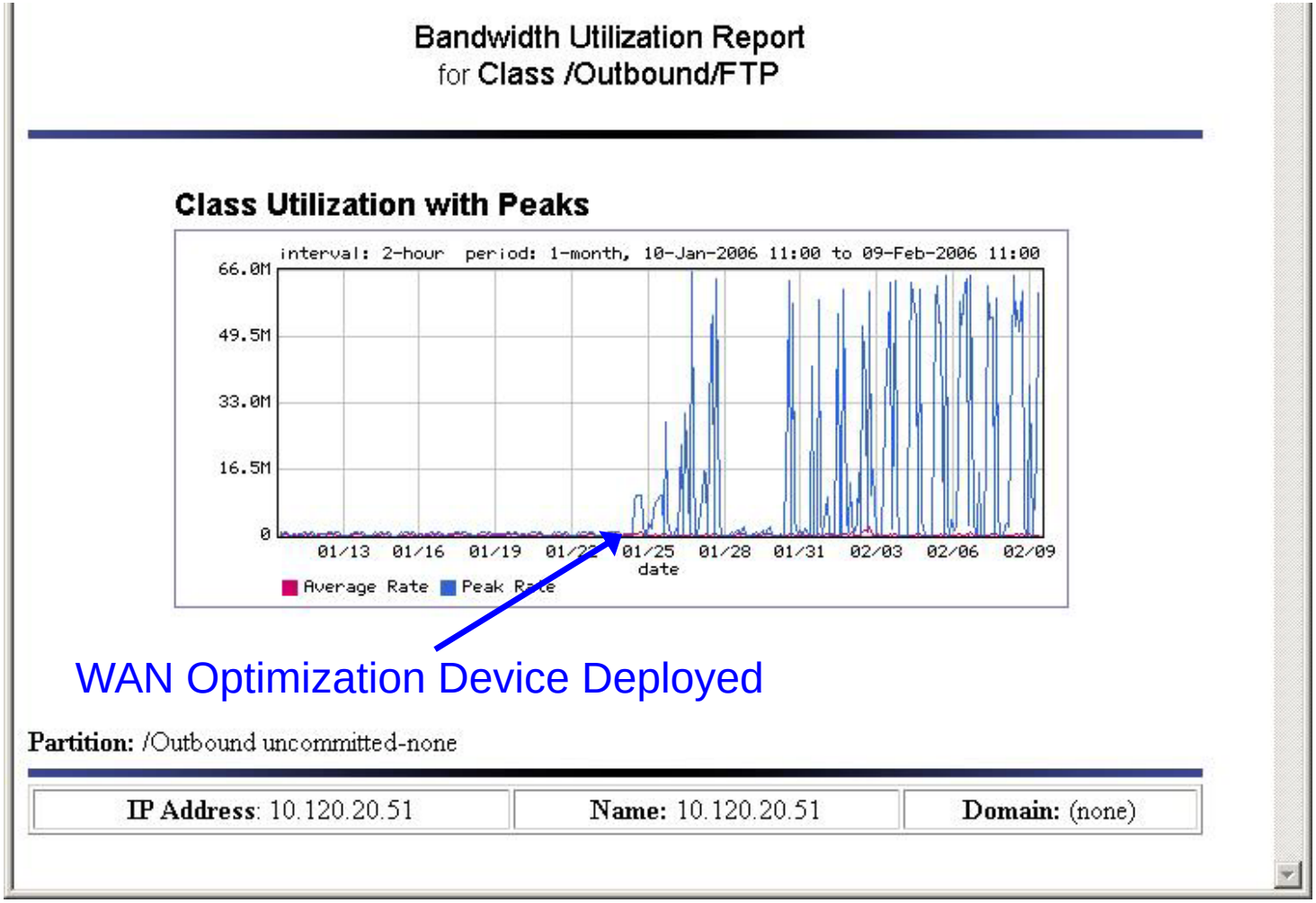


WAN Optimization objectives

- 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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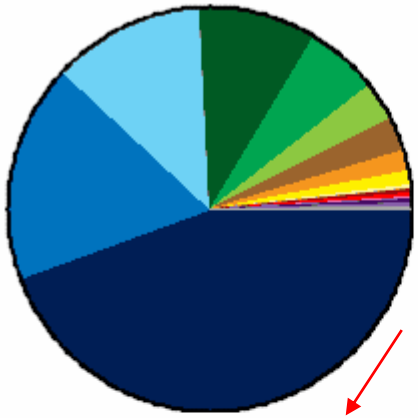
Traffic Summary



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	✓ ✓	✓ ✓ ✓

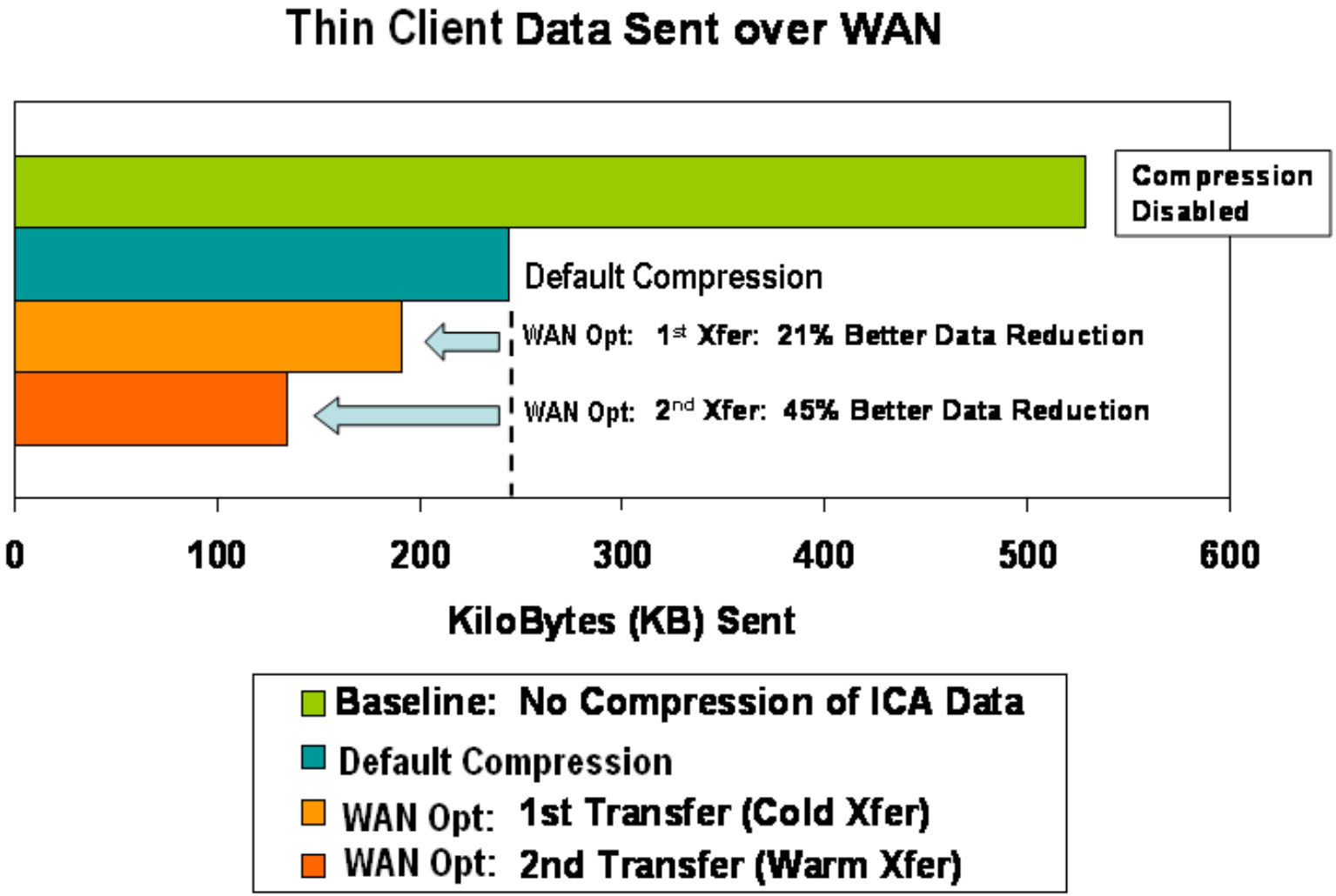
Where to use WAN Opt vs. Thin Client

- 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

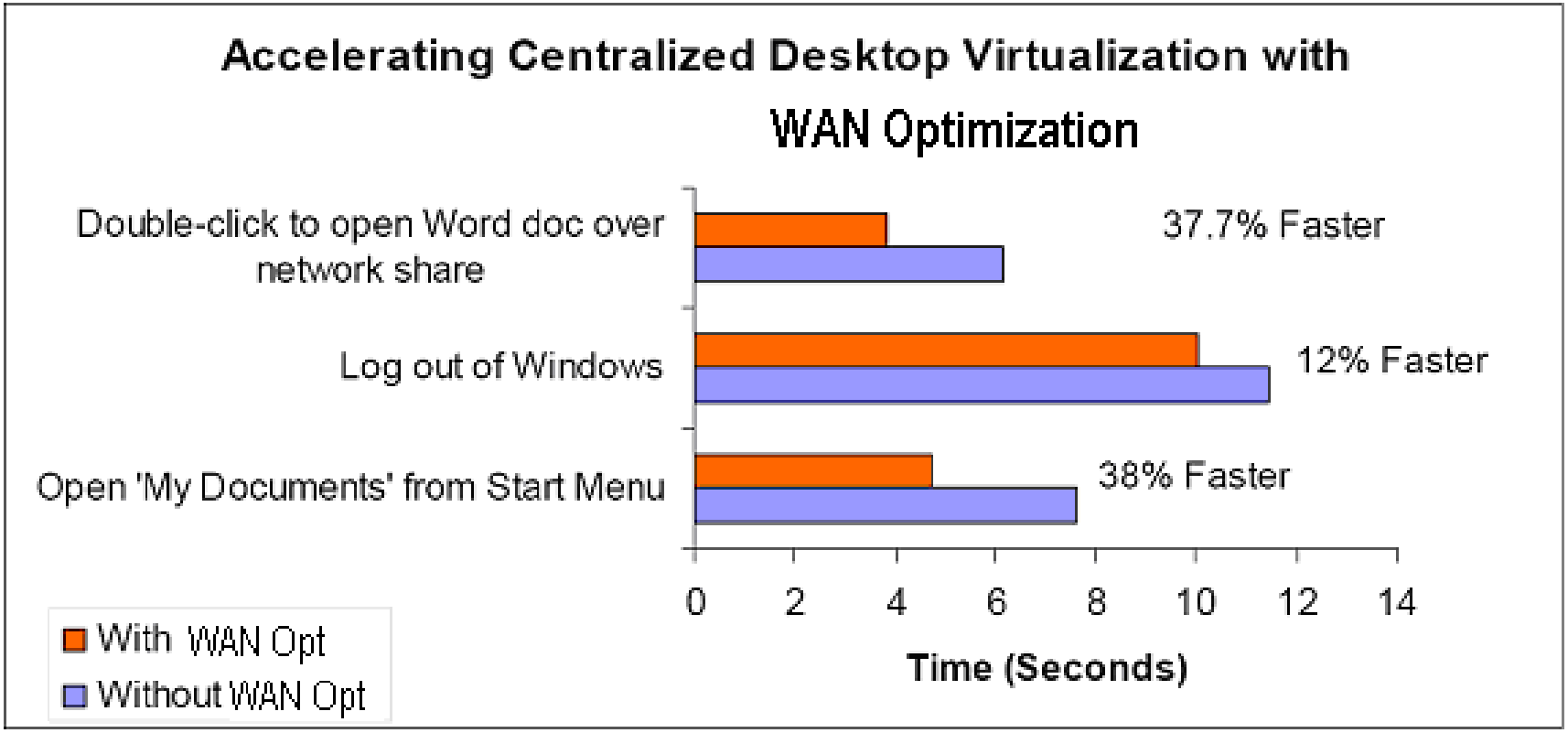
WAN Optimization for Thin Client Traffic

- 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

Many thanks to the following individuals for their contributions to this tutorial.

- SNIA Education Committee

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