



Education

WAN Optimization and Cloud Computing

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Agenda Topics

- How the WAN is integral to Cloud Computing
- WAN-related challenges to Cloud Computing
- How WAN optimization addresses latency and bandwidth bottlenecks
- Issues with deploying WAN optimization into The Cloud

What is a Cloud?



Gartner

Cloud computing is a style of computing where scalable and elastic IT-enabled capabilities are delivered as a service to external (Public) or to internal (Private) customers using Internet technologies.



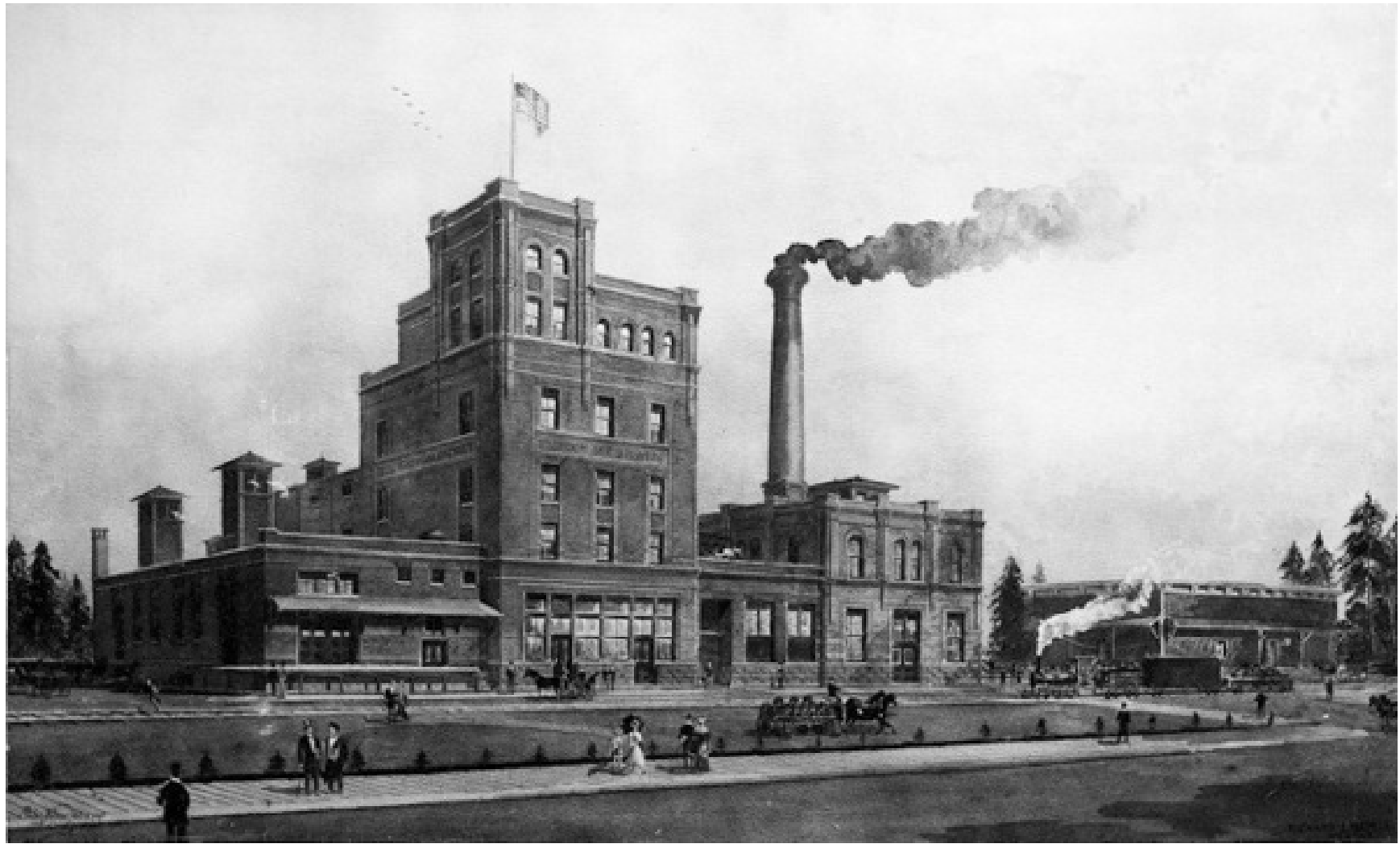
Bank of America
Merrill Lynch
RESEARCH

The Cloud is shared servers (resources) located within a data center delivering applications over internet technologies.



Cloud computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet.

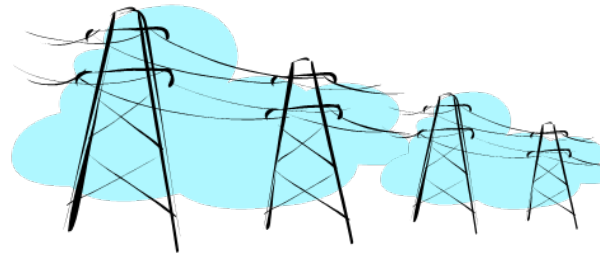
The Beer Factory (Werner Vogels, CTO Amazon) **SNIA**



Cloud/Utility Computing

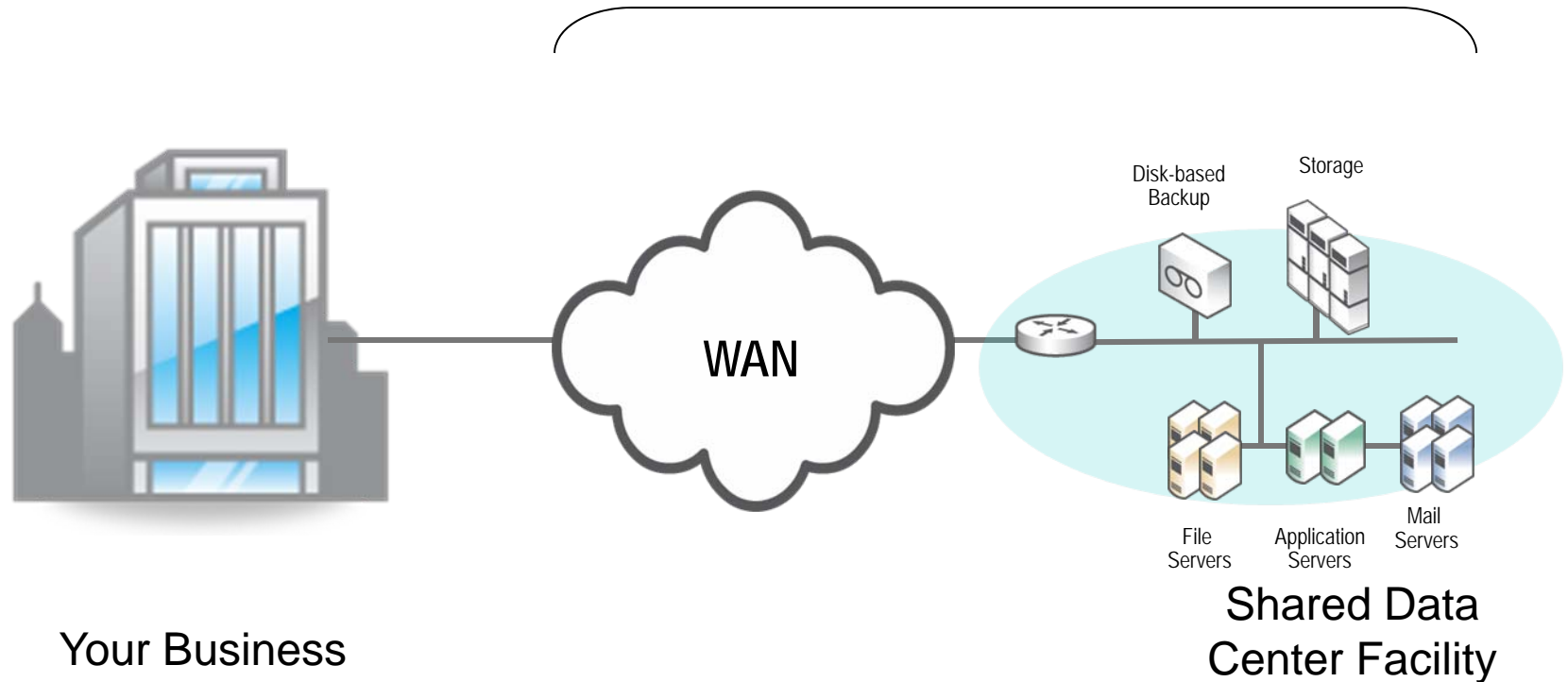


Your Business



Shared Power
Utility

The “Cloud”



➤ The WAN is a core component of The Cloud

Electrons and Photons

- The transmission “Network” allows you to place shared resources anywhere you want
 - ◆ Away from cities to avoid pollution/fallout
 - ◆ Near cheap resources
 - ◆ Where Gov’t regulations permit
- Shared data centers may be far away from end-users
 - ◆ WAN allows distant users to access central resources
 - ◆ Larger data centers can serve many users across distant geographies

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

Private vs. Public Clouds

- **Private Cloud – You own the Data Center**
 - ◆ You own and manage the infrastructure and the data
 - ◆ You are responsible for security
 - ◆ You handle cost accounting
- **Public Cloud – 3rd party owns the Data Center**
 - ◆ Cloud Provider owns the infrastructure; you own the data
 - ◆ Cloud Provider provides for your security in their DC
 - ◆ Cloud Provider handles cost accounting

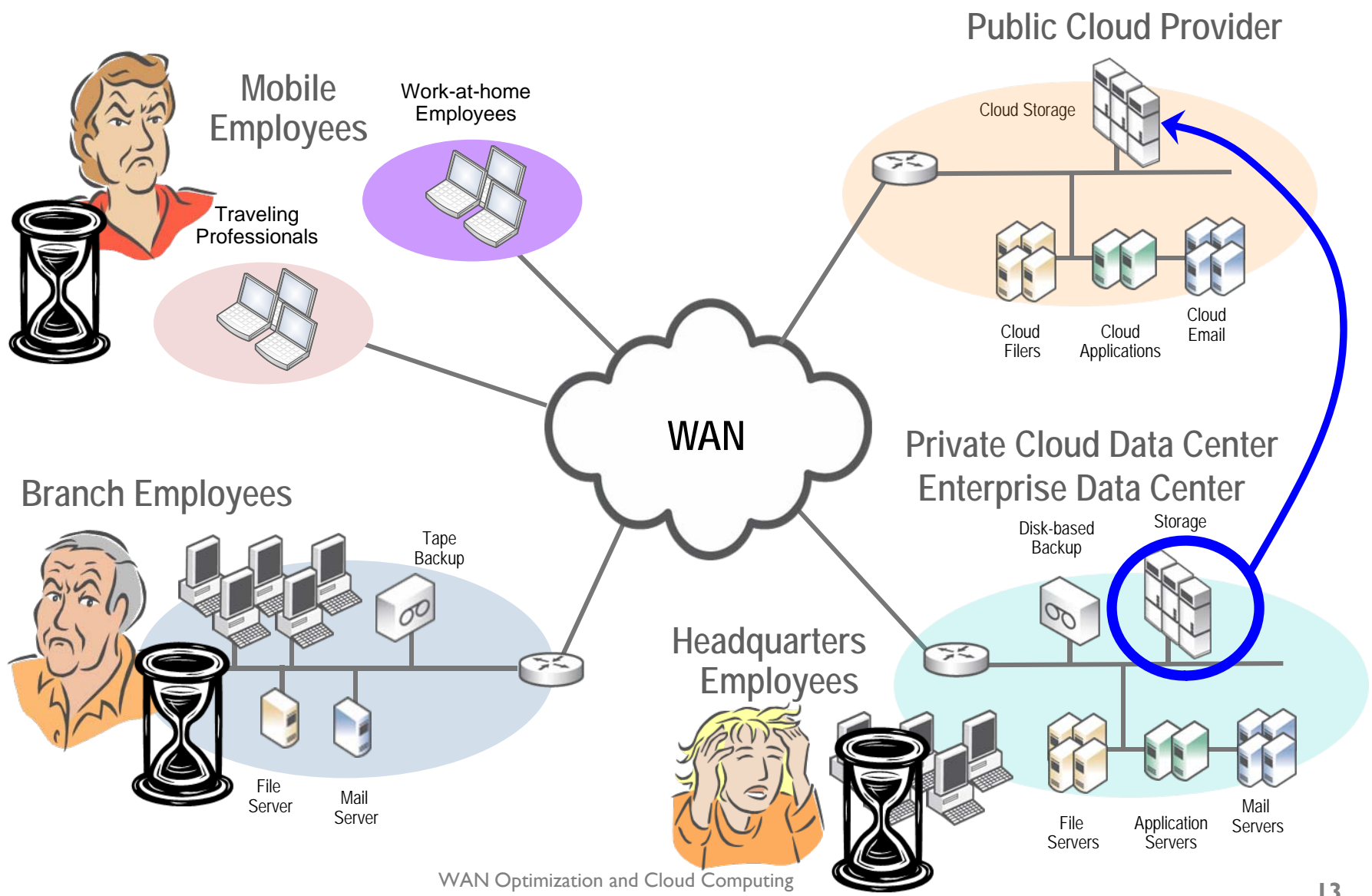
Enabling Technologies for Cloud

- Consolidation & Virtualization
 - ◆ Sharing of hardware resources
- Billing and Provisioning
 - ◆ Appropriate cost accounting
- Security and Availability
 - ◆ Ensure your data remains accessible and safe
- WAN connectivity
 - ◆ Delivery of cloud applications to the end-user

WAN-related challenges to Cloud

- Largely same physical WAN infrastructure used to access Cloud
 - ◆ Same WAN links with bandwidth and latency
- Cloud data centers are “far away”
 - ◆ Lower per-unit cost of large data centers driven by scale
- All employees will be “remote” from their data
 - ◆ Even single-location companies will be remote from their data
- Many legacy applications will continue use chatty protocols, even if moved to the Cloud
 - ◆ WAN latency will impact performance for many Cloud applications

Building a Cloud Infrastructure



WAN performance key to The Cloud

- Slow performance jeopardizes Cloud adoption
 - ◆ Reduced productivity
 - ◆ Employee frustration
- Cloud benefits negated by slow performance
 - ◆ Employees may associate Cloud Computing with slow performance
 - ◆ May reject Cloud deployment along with its benefits
- WAN performance must be addressed for Cloud adoption

WAN Performance Bottlenecks

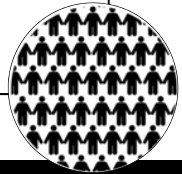
The "distance" problem

- Latency and application chattiness
- Slower application access



"Skinny Straw" problem

- Thousands of companies
- Millions of users
- Varied bandwidth



THE EXTREMELY UNFUNNY PART – UP TO 20x SLOWER

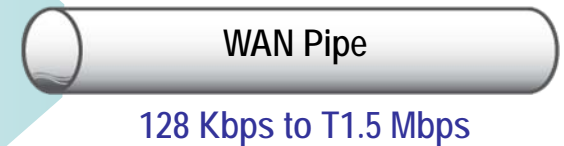
Action/ Latency	~ LAN (<10ms)	WAN (~100ms)	WAN (~200ms)
Login	2.08	23.08	34.54
"Reports" Tab	1.19	9.80	22.62
Upload 3MB doc	26.74	88.54	109.03
Download	10	38	40

Public and Private Clouds Share a Fundamental Pain

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



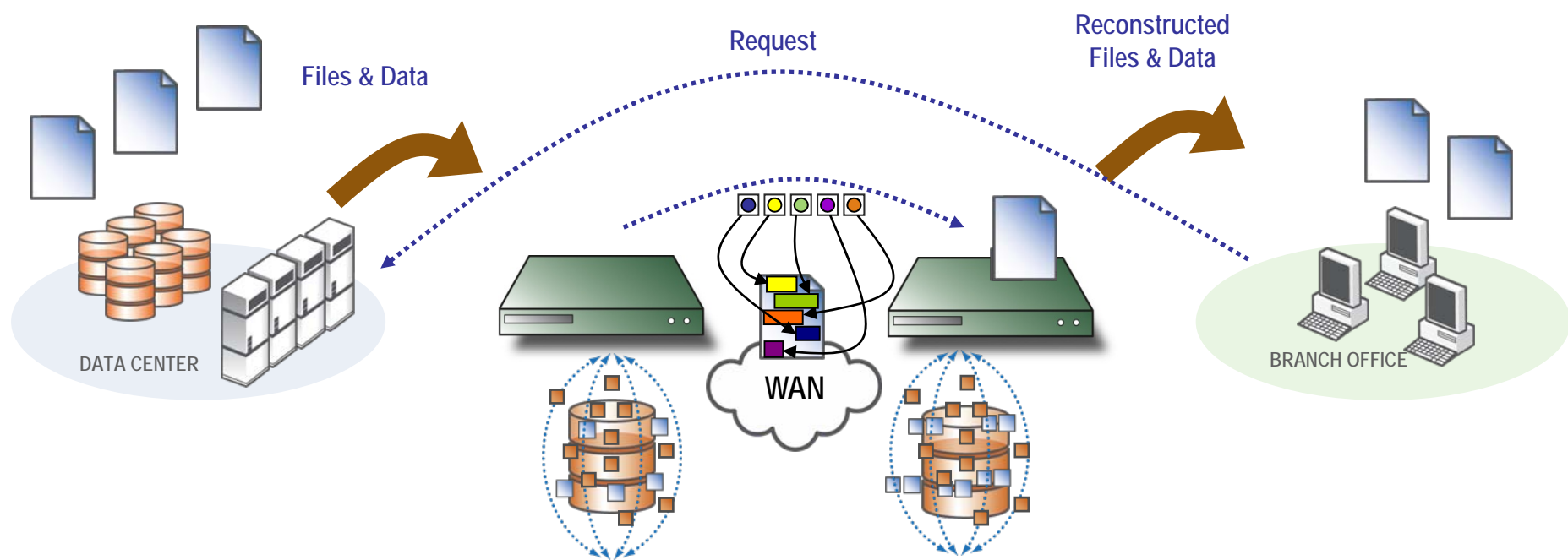
Fixing Bottleneck #1: Bandwidth Limitations

➤ 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”

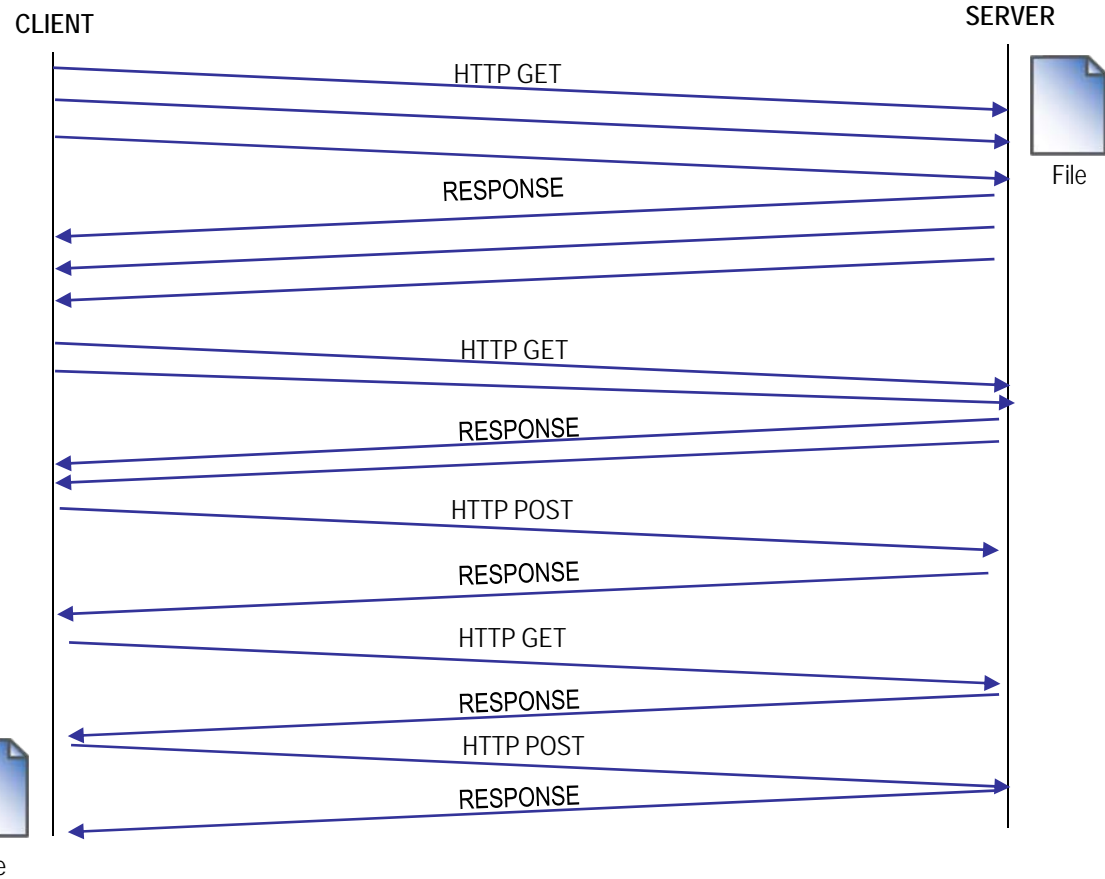
➤ Interactive apps, underlying protocols require 100s or 1000s of round trips for one operation!

- ◆ **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)



File

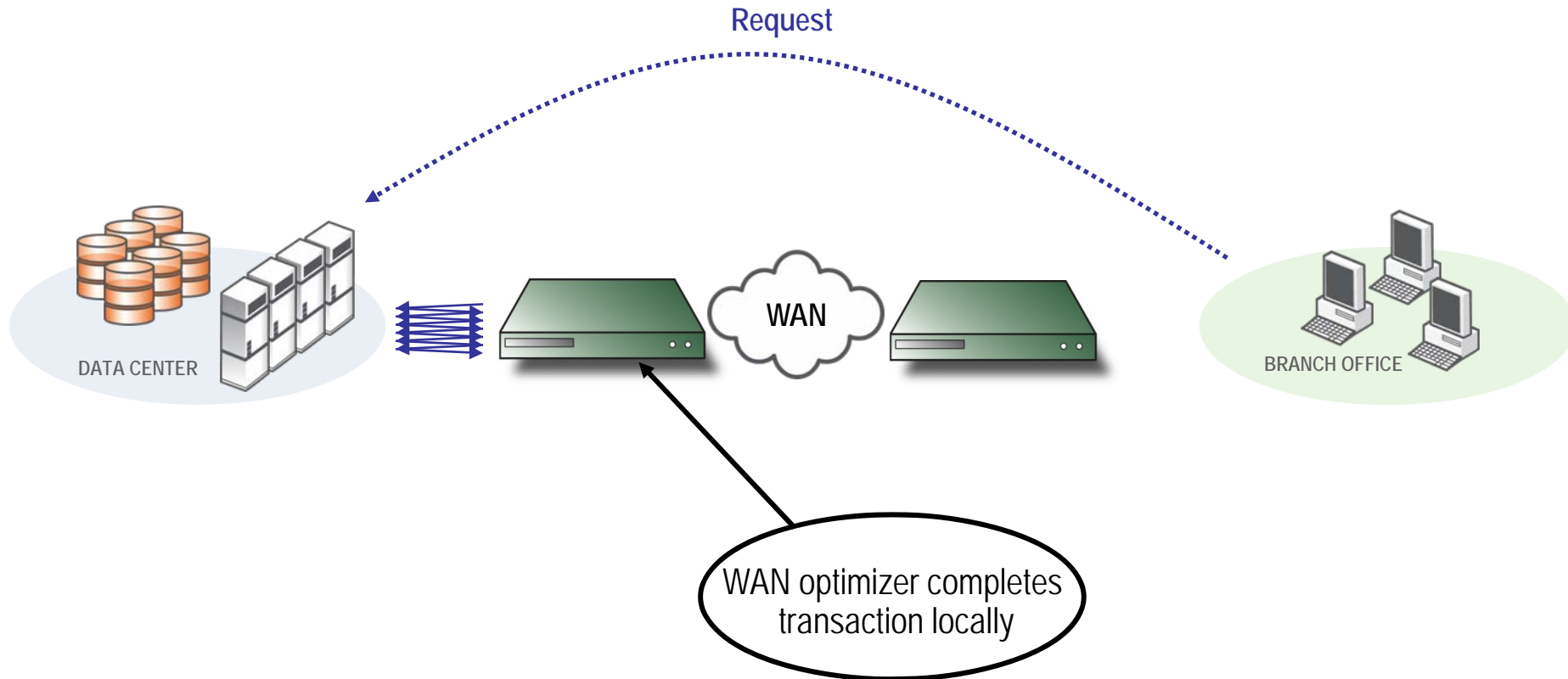
GET GIFs



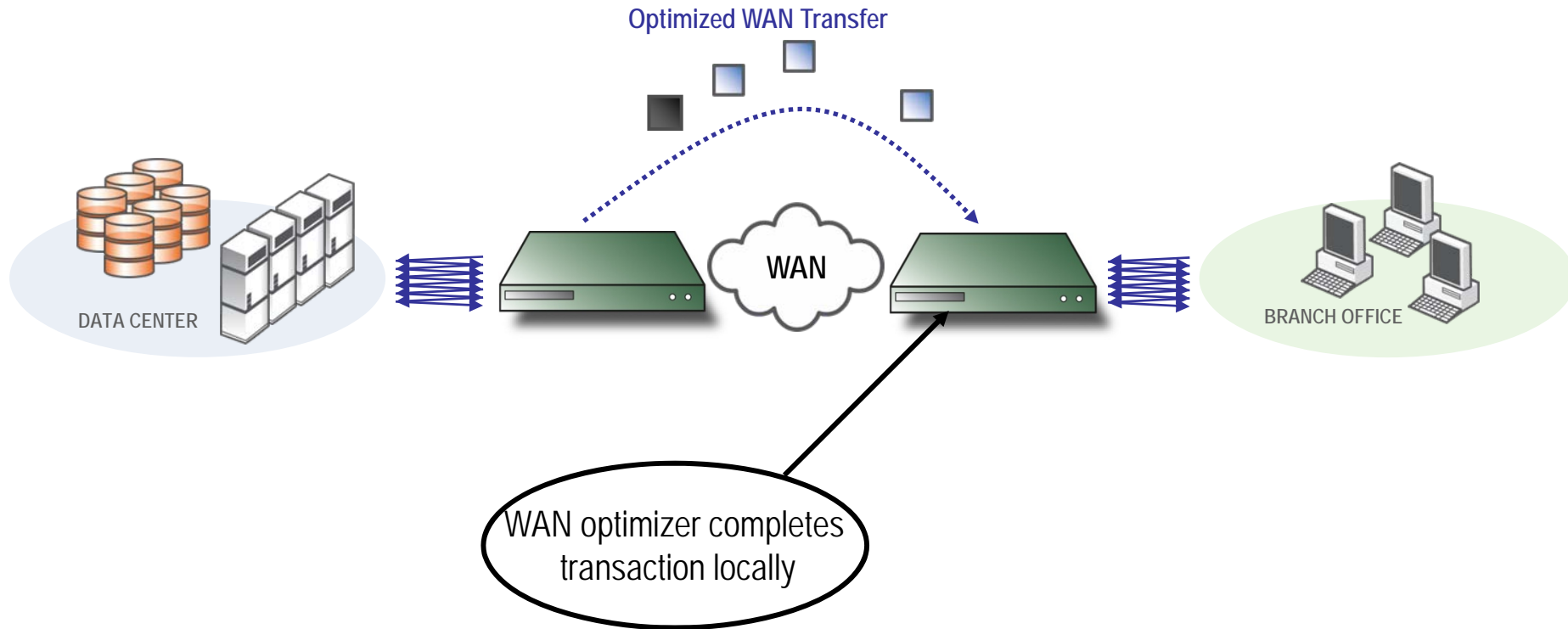
Fixing Bottleneck #2: Application-Level Chattiness

- Application-specific chattiness mitigation modules
 - ◆ HTTP, CIFS, MAPI, MAPI2003, NFS, SQL, etc...
- Protocol-compliant read-aheads to pre-fetch data
 - ◆ Pipeline delivery of all application data
 - ◆ Eliminate chattiness over the WAN

Addressing Application-Level Chattiness

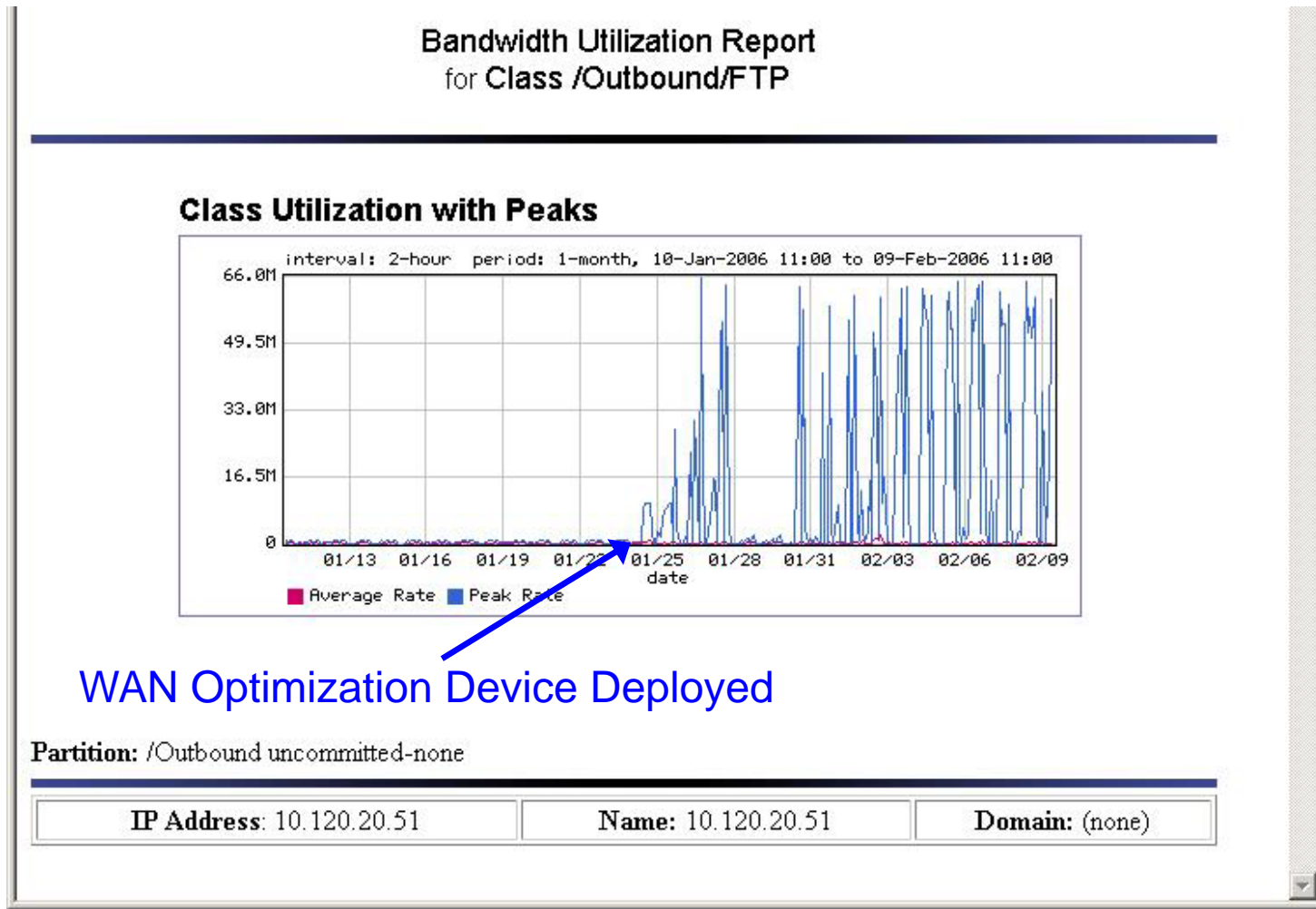


Addressing Application-Level Chattiness



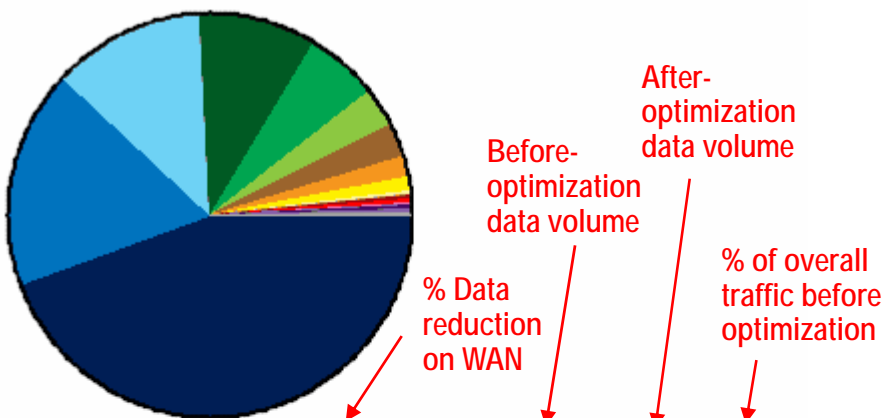
WAN Optimization LAN-like performance

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



WAN Optimization Bandwidth Reduction

Traffic Summary

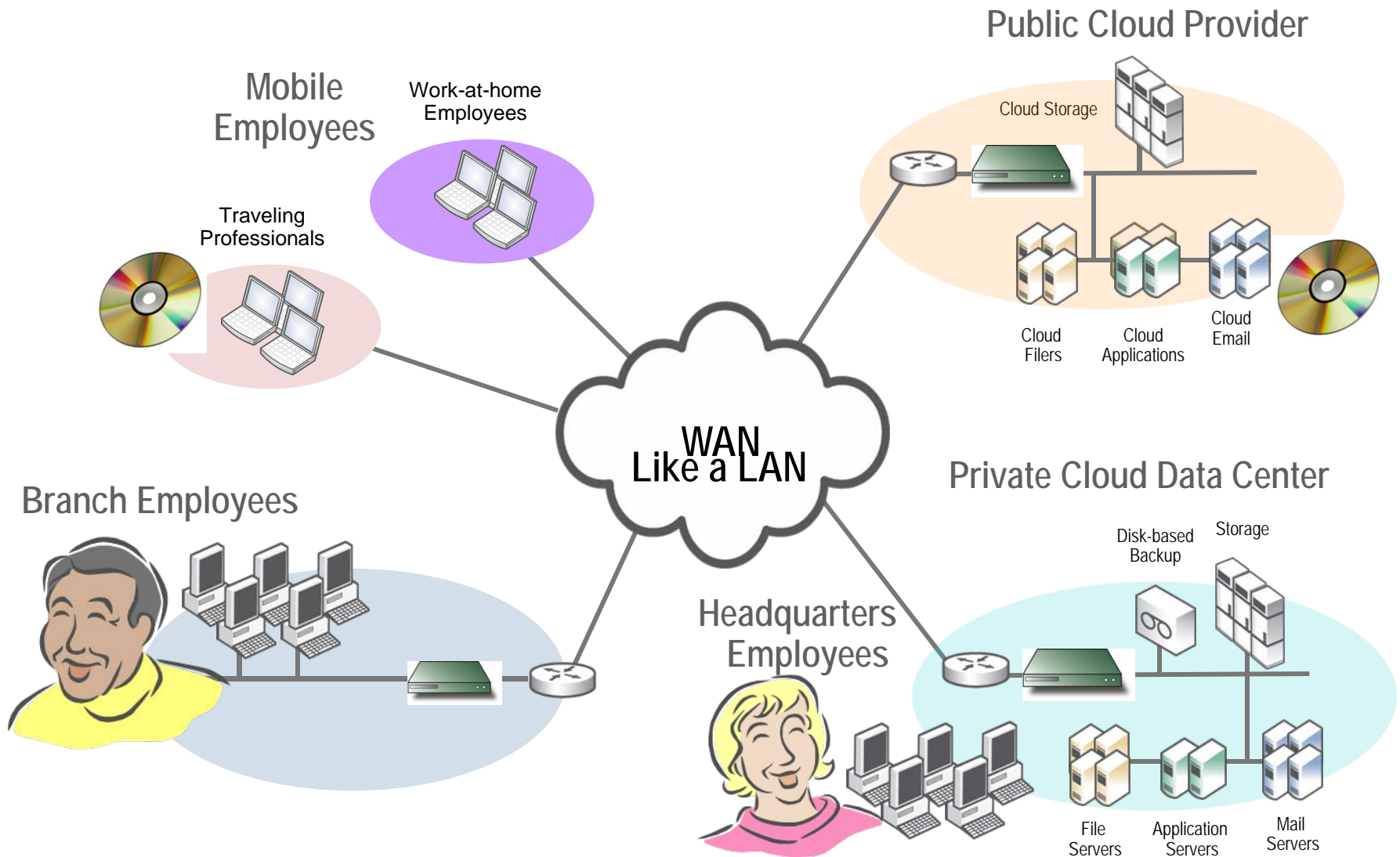


Port	Reduction	LAN	WAN	Traffic %
Total Traffic	--	78.9 GB	12.7 GB	--
HTTP (80)	(95.07%)	34.3 GB	1.6 GB	43.50%
JDE (8011)	(89.33%)	13.7 GB	1.4 GB	17.39%
email (1352)	(57.57%)	9.6 GB	4 GB	12.16%
DB (1521)	(60.84%)	7.3 GB	2.8 GB	9.34%
JDE (8003)	(89.47%)	4.7 GB	511.6 MB	6.01%
JDE (85)	(89.38%)	2.5 GB	279.8 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%

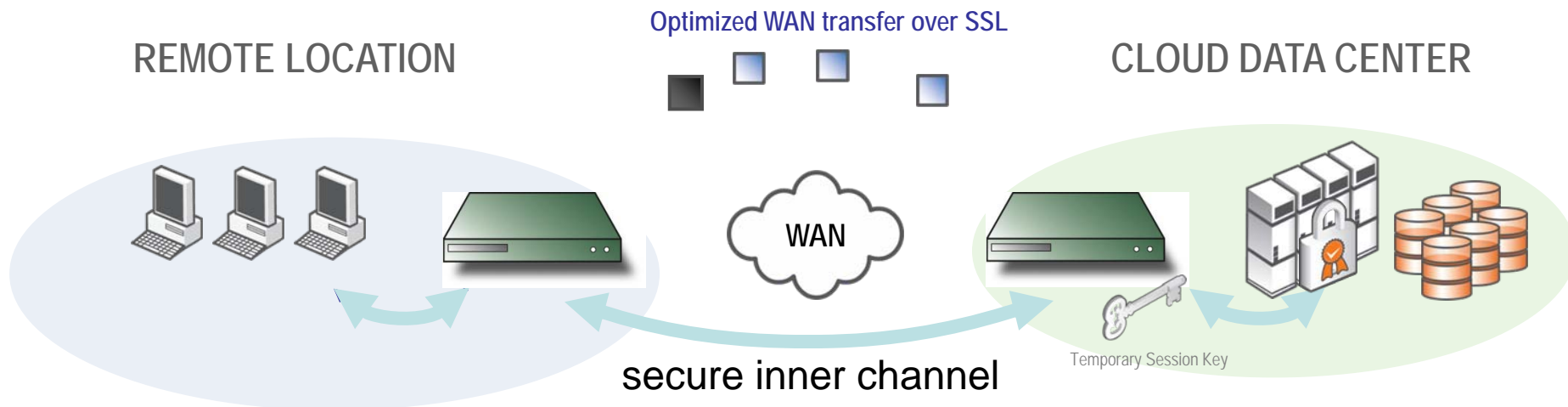
79GB of data was reduced to 13GB (83% reduced)
66GB of data was removed from the International links at Malaysia

Solving the WAN Performance Problem



SSL Encryption

- Many Cloud Applications use SSL
 - ◆ Encrypted data cannot be deduplicated effectively
- Some WAN optimization products can securely optimize SSL-encrypted traffic



Public Cloud DC Deployment

- No physical access to public cloud facilities, so how to deploy WAN optimization device?
- Several deployment possibilities
 - ◆ Cloud provider deploys WAN optimization (SP owns the WAN optimization devices)
 - ◆ Virtual WAN optimization software deployed over network (you own the WAN optimization devices)
 - ◆ Other approaches (TBD)
- Public Cloud deployment for WAN optimization is not a hurdle

Metering, Cost Accounting, and Licensing SNIA

- Private Cloud: Cost accounting measures business unit performance
 - ◆ Existing cost accounting processes
 - Count bytes and sessions
 - ◆ Alternatively, no cost accounting at all
- Public Cloud: Cost accounting key to extracting profit from WAN optimization service
 - ◆ Per-user/Time-based costing and licenses
 - ◆ Similar licensing processes as Cloud Applications



Check out SNIA Tutorial:

**Sunshine user Base
Accountability with your
Cloud Storage**

Key Points

- The WAN is core component of The Cloud
- WAN optimization is essential to Cloud adoption
- WAN optimization is proven technology
- WAN optimization can be easily deployed to support The Cloud

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

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