HEALTHCARE DEPLOYMENTS

- *Marty Lafferty, DCIA*
- *David Cerf, Crossroads Systems*
- *Peter Spellman, TraceLink*
- *Jason Warman, Aspera*

Hybrid Cloud Case Study

David Cerf

EVP Crossroads Systems

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Case Study: Fujifilm

Background: FUJIFILM Medical Systems U.S.A., Inc. is a leading provider of medical imaging technologies for acquiring, processing, managing and storing diagnostic images and related data

The Problem

- Provide secure, online data at the most competitive cost

- HIPAA compliance

- Keep the data up to 100 years

- Support 60+ hospitals (including gov't and military)

- Meet on-premise / off-premise requirements

Current Solution - Disk

Fujifilm Medical Managed Services had an existing cloud infrastructure using disk

- Very expensive
- Wanted on-site storage with data protection
- Need simpler data portability

A Big Idea

- FujiFilm is the world's leader for tape media

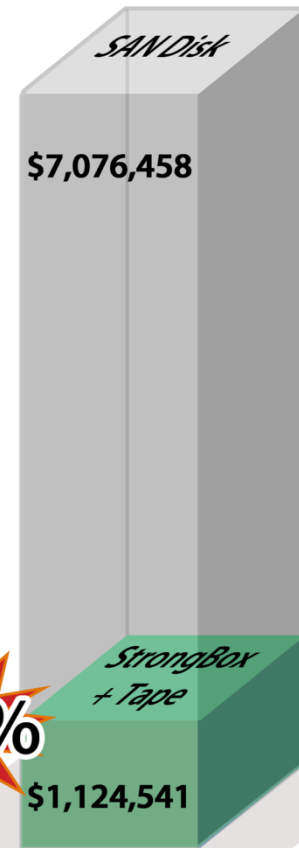- How could they leverage their own data tape media

- NAS appliance combining LTFS tape technology and disk

- Small amount of disk cache for fast file storage and retrieval

- Physical tape for cost effective, long-term, reliable and highly scalable capacity storage

Simplified Workflow
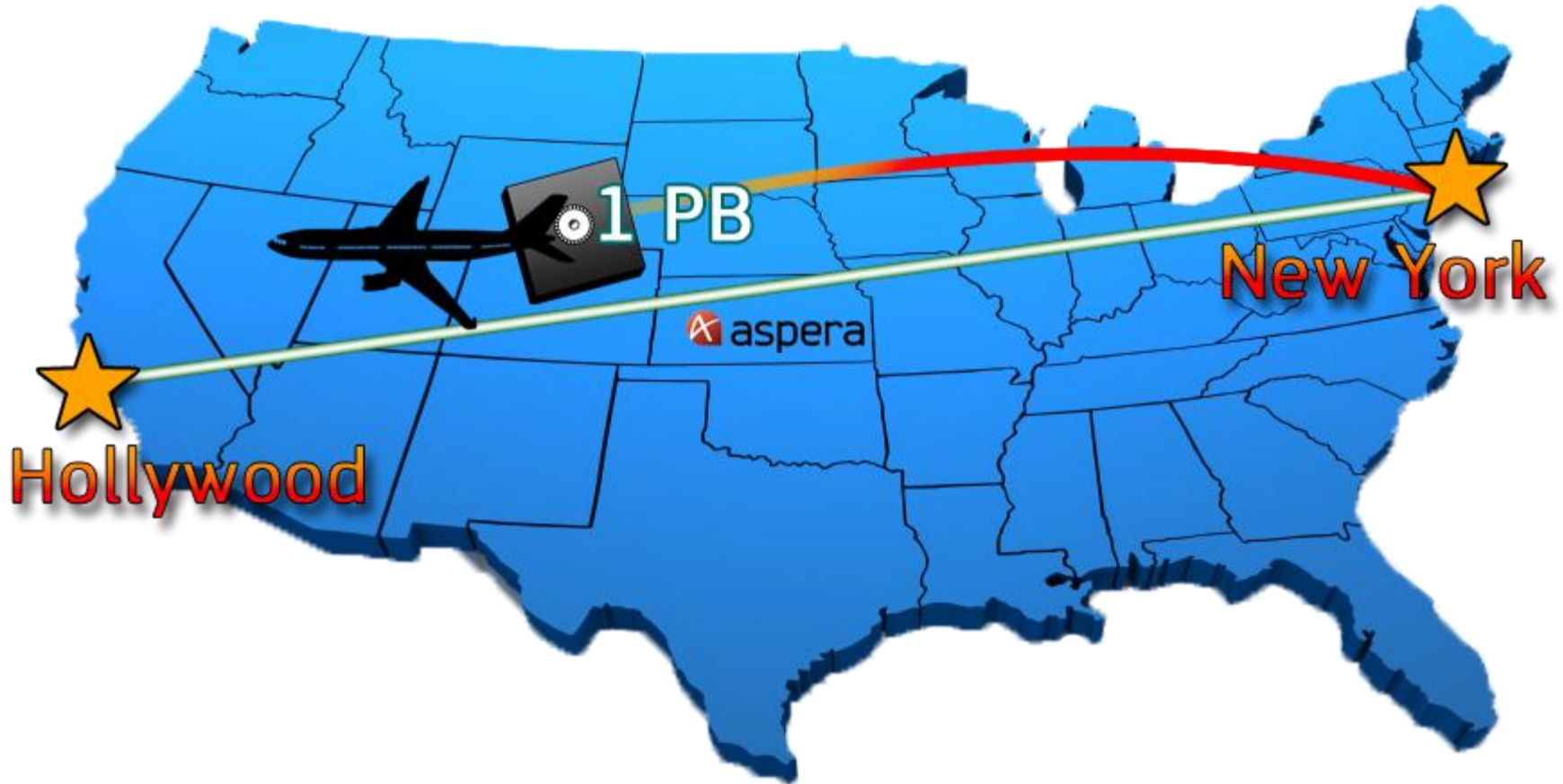
Efficiently move large amounts of data without high network costs
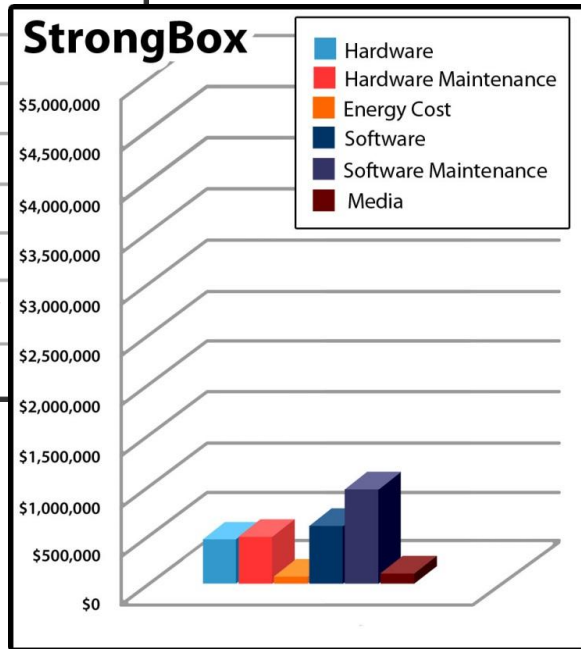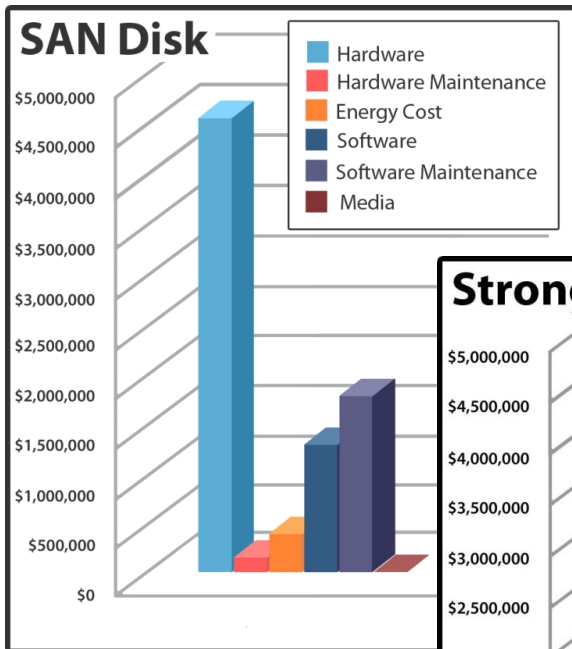
COST OF 1 PETABYTE | 2 COPIES | 10 YEARS
*A New Approach to Lowering the Cost of Storing File Archive Information, Brad Johns Consulting, 2012

Permivault

- Fujifilm established a non-proprietary, file-based and fully portable storage solution for long-term data retention

- Online all the time and easily accessible through multiple points of access

- Easy migration and scalability, offering seamless interaction with existing systems

- Up to 84% cost reduction over disk with StrongBox/LTFS

*A New Approach to Lowering the Cost of Storing File Archive Information, Brad Johns Consulting, 2012

Architecture

Flexible Options for Data Transfer

Network Share — VPN

Permivault FileStor-HSM — HTTPS/SSL

Strongbox® — WAN Opt/SSL

Account Portal

Import / Export Media

Fujifilm Data Center
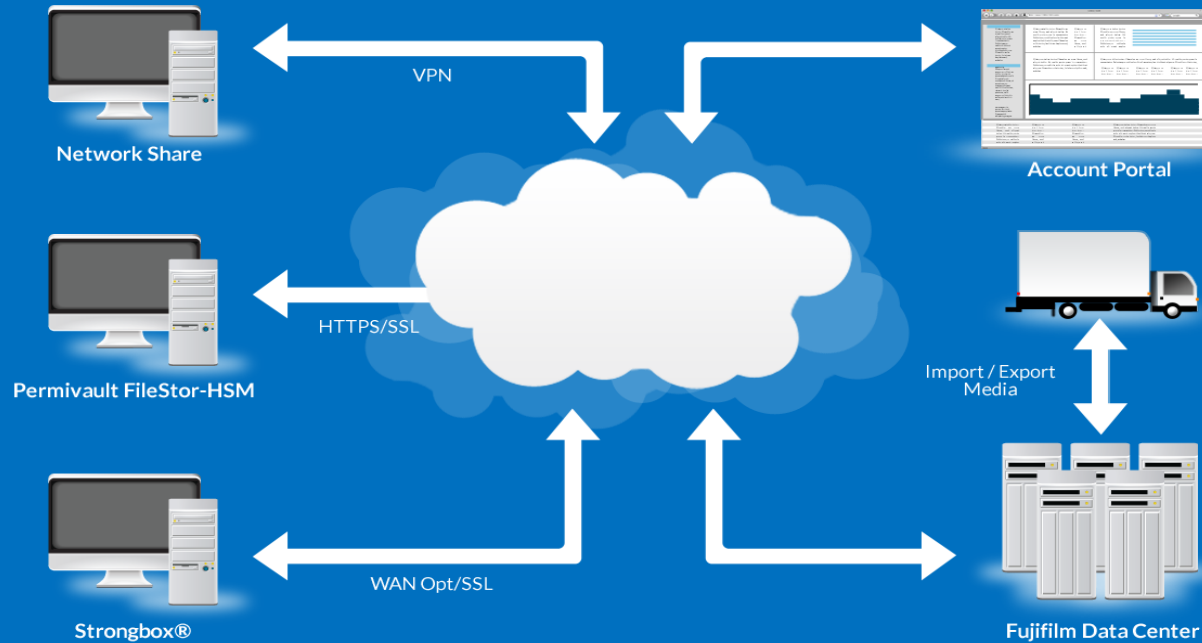
FileStor-HSM
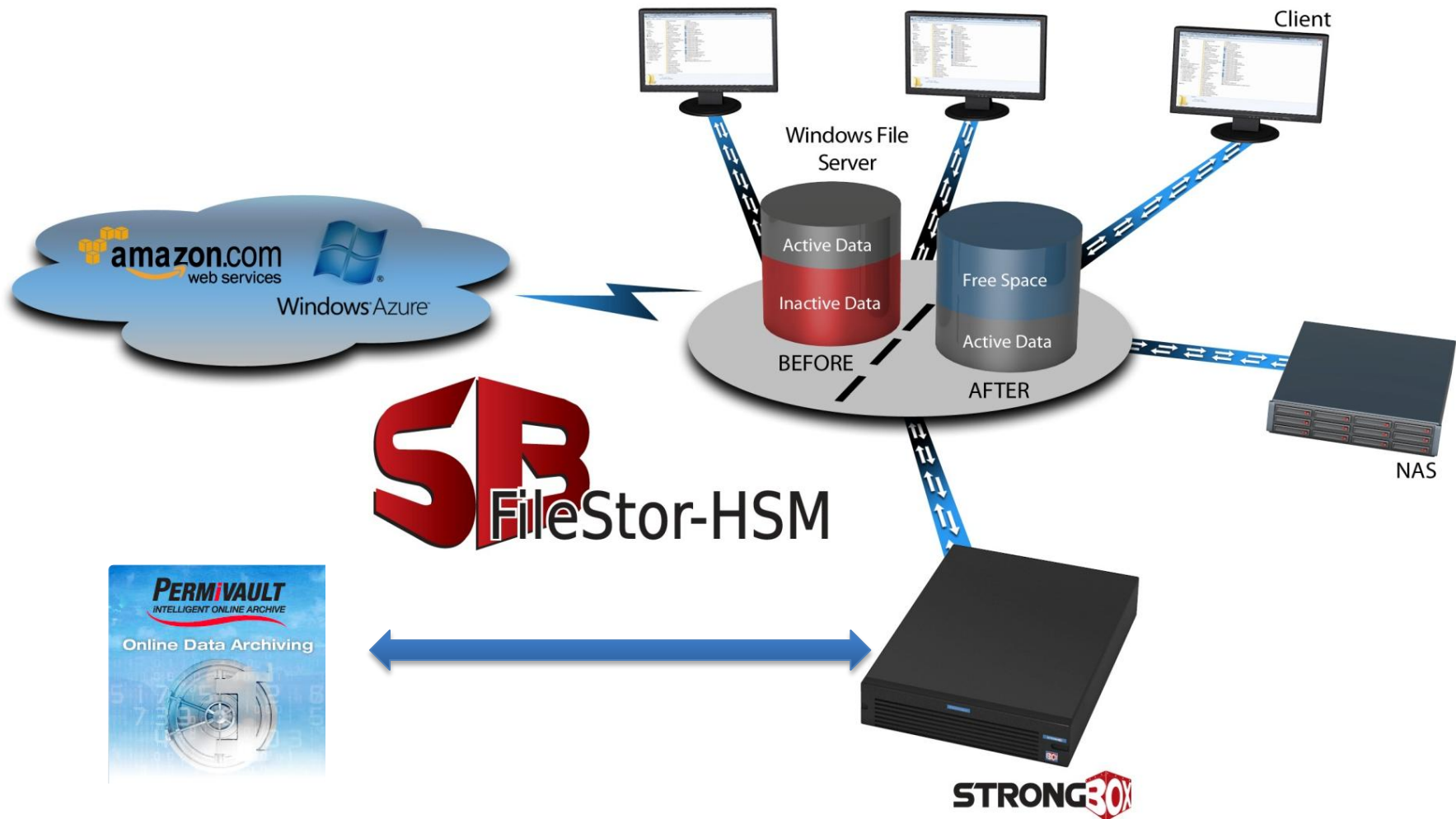
Results

- Up to 94% cost reduction over disk with StrongBox/LTFS

- Scalability

- FutureProof

- Portability

- Customer data stays their data

*A New Approach to Lowering the Cost of Storing File Archive Information, Brad Johns Consulting, 2012

Hybrid Cloud Case Study

David Cerf

EVP Crossroads Systems

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The Global Life Sciences Challenge

Counterfeit | Genuine

Protect Patients

7% Share of global drug supply that is counterfeit ($75B)[1]

>100,000 People who die each year from counterfeits[2]

Enable Health

500% Increase in out-of-stock incidents in past 5 years[3]

25% Share of global pop. lacking regular access to medicine[4]

Profitable Access

80% Share of medicine consumed by 15% of the global pop.[5]

$165B Sales growth expected from Pharmerging markets[6]

[1] Center for Medicine in the Public Interest
[2] American Enterprise Institute
[3] FDA
[4] World Health Organization
[5] World Health Organization
[6] IMS Market Prognosis 2012

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Lives are Threatened Due to Poor Supply Chain Visibility and Information, Even in the US

Epogen   **Timothy Fagan**

Heparin   **Julian Oryschak**

Doxil   **Renee Mosier**

Drug Counterfeiting

$2B

Annual sales of anemia drug Epogen

110,000

Units of counterfeit Epogen distributed in US

Contaminated Ingredients

$4B

Annual sales of blood thinning drug Heparin

81

Known deaths in U.S. due to contaminated Heparin

Drug Shortages

$500M

Annual sales of cancer drug Doxil

99%

Share of U.S. hospitals experiencing drug shortage in 2012

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Today's Life Sciences Supply Network Requires Rethinking Traditional IT Strategy

Global Supply Network Integration	Challenge:	End-to-end integration of 10s to 1000s of supply chain partners for global production and track & trace compliance
Big Data	Challenge:	Massive amounts of data and transactions generated by pharmaceutical track & trace requirements
Changing Regulations and Standards	Challenge:	Continuous evolution of regulations and standards which impact global IT information architecture
Global Production and Market Access	Challenge:	Improving visibility and performance as outsourcing grows while protecting revenue streams in emerging markets

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Global Supply Network Integration

- US track and trace regulations (California ePedigree) require extensive information sharing across internal sites, external supply networks and supply chain distribution networks

- Global track and trace regulations require information sharing across internal sites and external supply networks plus reporting to government agencies

- Global production require information sharing across internal sites and external supply networks

Upstream Partners
- CMO / CPOs
- Material suppliers
- Internal Distribution Centers
- Third-Party Logistic Providers

Downstream Partners
- Licensing Partners
- Direct/Indirect Wholesalers
- Pharmacies, Hospitals, Clinics
- Returns Processors

Governments & Agencies
- China
- Turkey
- Brazil
- Argentina
- European Union

Example Mid-Tier Pharmaceutical Company Network

Upstream Partners

10-100

Downstream Partners

75-2000

Governments

10-20

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Big Data

- Global track and trace requirements generate vast amounts of data unlike any other supply chain application
- Traditional IT architectures and strategies cannot scale to meet the data and performance requirements

Storage (Petabytes)	Objects (Billions)	Transactions (Millions)	Participants (Thousands)
• New data generated • Record retention	• Serial numbers • Product master data	• Orders, shipments • Identity verifications	• Mfg and distribution channels • Hospitals, clinics, gov'ts
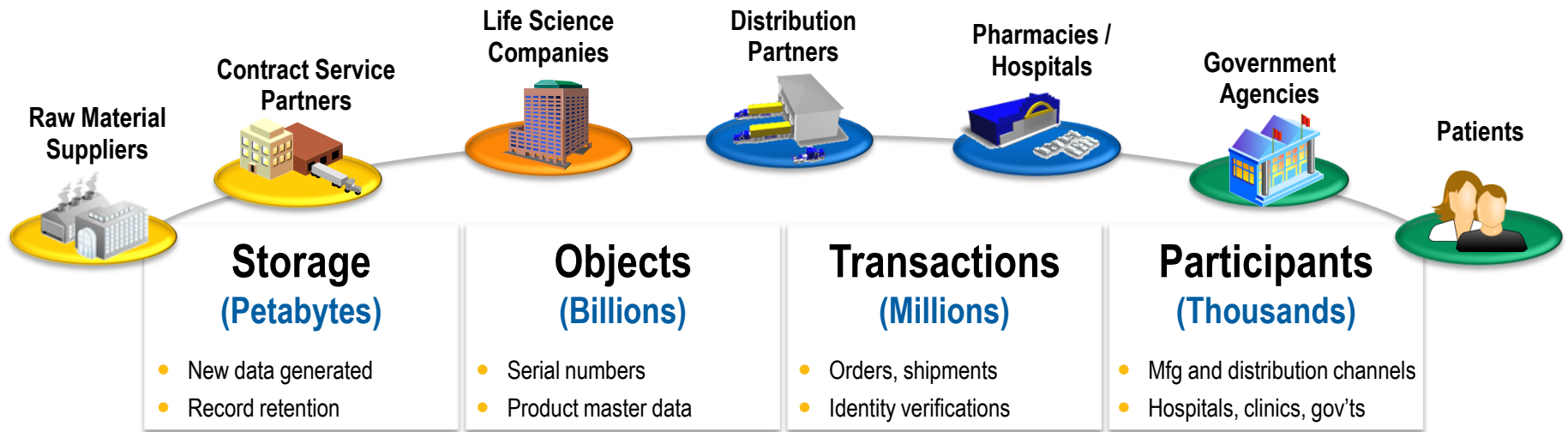
Example Mid-Tier Pharmaceutical Company Data Management

(100,000,000 Serial Numbers Annually)

Active Serial Numbers	Active Messages	Data Storage
1.2B	**17M /mo**	**48 TB**

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Changing Regulations and Standards

- By 2017, dozens of countries will have track and trace regulations
- Global track and trace regulations have highly diverse data and business process requirements
  - Serialization   ePedigree   Government reporting   Authentication
- Standards for track and trace data and data exchange are still being developed and will continue to evolve

Selected Track and Trace Regulations

>7B Serialized Products / Year (2017)

Example Mid-Tier Pharmaceutical Company Compliance Environment

Integrated Packaging Lines	Unique Country Reports	Trading Partner Data Formats
40	**30**	**75**

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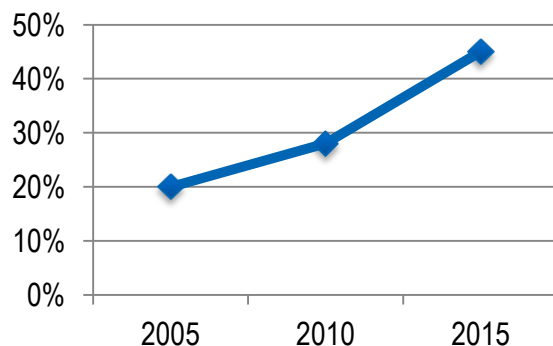
Global Production and Market Access

- By 2015, almost 50% of total production will be outsourced

- Emerging markets are growing at 3x the rate of developed markets
  - 10-30% of emerging market revenue leaks through drug counterfeits

Increasing Outsourced Production

Global Pharma Market Share - 2015

Legend:
- US / Canada
- Europe
- Japan / S. Korea
- Pharmerging (BRIC)
- Rest of World
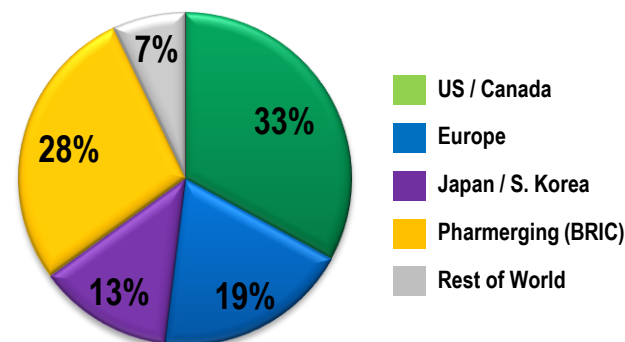
Example Mid-Tier Pharmaceutical Company Business Risk

Excess Inventory Safety Stock	Out-of-Stock Losses	Emerging Mkt. Counterfeit Loss
$166M	**$42M** /yr	**$525M** /yr

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Cloud-based Network Information Architecture
Application Platform Connecting People, Processes and Information
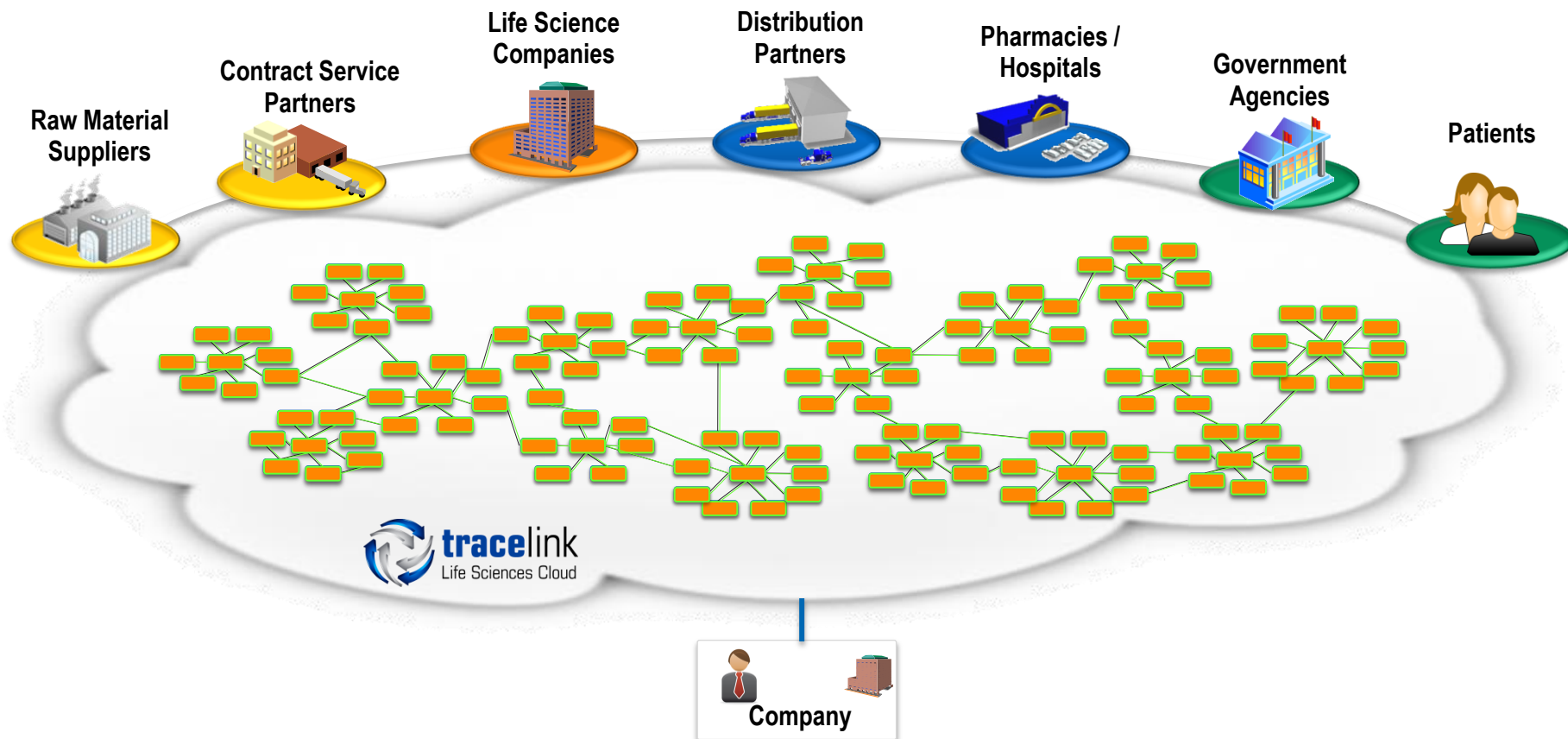
A Cloud-based Network Information Architecture and Application Platform is required to:

- **Global Supply Network Integration**: Eliminate the cost and time to connect all supply chain partners

- **Big Data**: Provide global scaling and information access at a fraction of traditional architectures

- **Changing Regulations and Standards**: Isolate core ERP systems from continuous update and modification

- **Global Production and Emerging Market Access**: Enable real-time visibility, collaboration and control from ingredient to patient

Mission-Critical Life Sciences Public Cloud Infrastructure
Key Requirements and Learnings

"Designing for the cloud" is crucial

- Distributed and loosely-coupled architecture is required

- Designing for unlimited computing and storage changes architectural paradigms

- Programmatic deployment is a must

- Network latency is a concern but can be managed

- Customer self-service and system visibility is important

- Cloud capabilities change the economic and commercial equation, but require customer education
    - Unlimited users and data, network-wide integrated connectivity, etc.

Case Studies
Ensuring Product Integrity – Improving Supply Network Performance

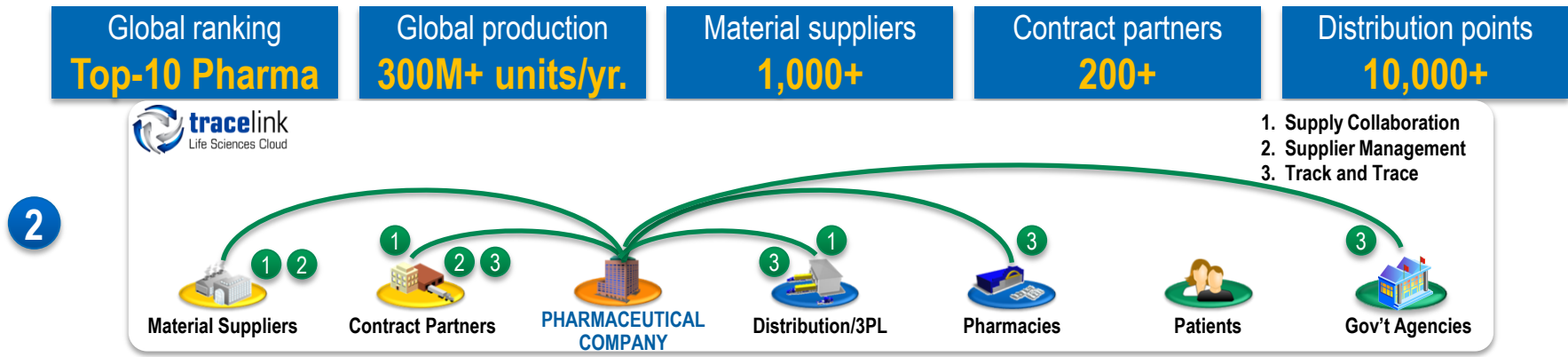| Global ranking	Global production	Material suppliers	Contract partners	Distribution points
Top-10 Pharma	**700M+ units/yr.**	**3,000+**	**500+**	**10,000+**

1

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1. Track and Trace
2. Supply Collaboration
3. Financial Reconciliation

Material Suppliers — Contract Partners — **PHARMACEUTICAL COMPANY** — Distribution/3PL — Pharmacies — Patients — Gov't Agencies
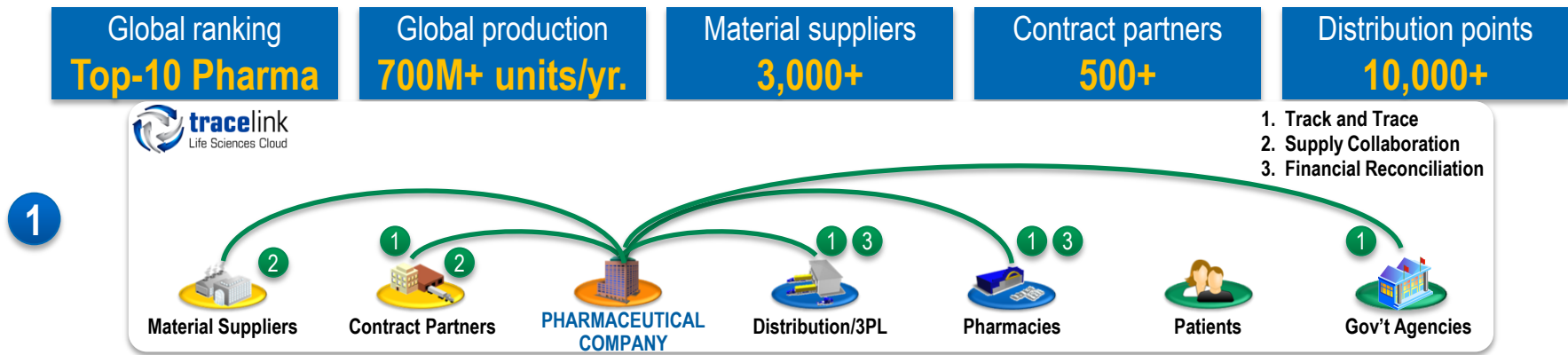
Goals:
1) **Ensure global product integrity and secure track and trace compliance**
2) **Lay the foundation for improved external supply performance and financial reconciliation**

Global ranking	Global production	Material suppliers	Contract partners	Distribution points
Top-10 Pharma	**300M+ units/yr.**	**1,000+**	**200+**	**10,000+**

2

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1. Supply Collaboration
2. Supplier Management
3. Track and Trace

Material Suppliers — Contract Partners — **PHARMACEUTICAL COMPANY** — Distribution/3PL — Pharmacies — Patients — Gov't Agencies

Goals:
1) **Improve external supply quality oversight and supply network performance**
2) **Lay the foundation for global track and trace compliance**

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Life Sciences Cloud

Questions?

PRESENTER

Jason Warman

Director of Sales Engineering

jason@asperasoft.com

AGENDA

- Cloud Promise

- Aspera technology and solutions

- Use Cases

- Q&A

Creating next-generation transport technologies

that move the world's digital assets at maximum speed,

regardless of file size, transfer distance and network conditions.

THE POTENTIAL OF INFINITE COMPUTING RESOURCES, ON DEMAND

- Eliminates the need to plan ahead
- Allows companies to quickly meet changes in demand
- Without the lead-time bottleneck

THE ELIMINATION OF AN UP-FRONT COMMITMENT

- Reduce capital outlay and investment risk
- Start small & increase hardware resources to match need
- Auto-scale to meet demand

PAY-FOR-USE RESOURCE MODEL

- Virtual machines by the hour
- Storage by the month
- Bandwidth by the GB

COMPUTER MODELING

SEISMIC EXPLORATION

MUSIC & AUDIO

PORTABLE DOCUMENTS

PDF

MEDICAL IMAGING

GENETIC SEQUENCING

VIDEO & GRAPHICS

SATELLITE IMAGING

5

TCP Performs well in LAN

- Ideal network conditions
- Low latency, low packet loss
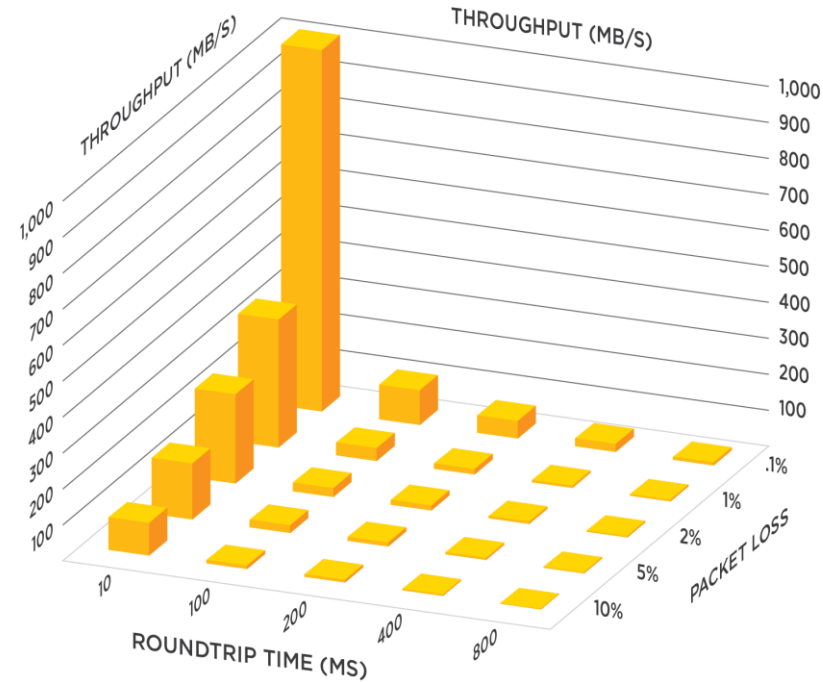
Distance degrades conditions on all networks

- Latency (or Round Trip Times) increase
- Packet losses increase

TCP performance degrades with distance

- Throughput bottleneck becomes more severe with increased latency and packet loss

TCP does not scale with bandwidth
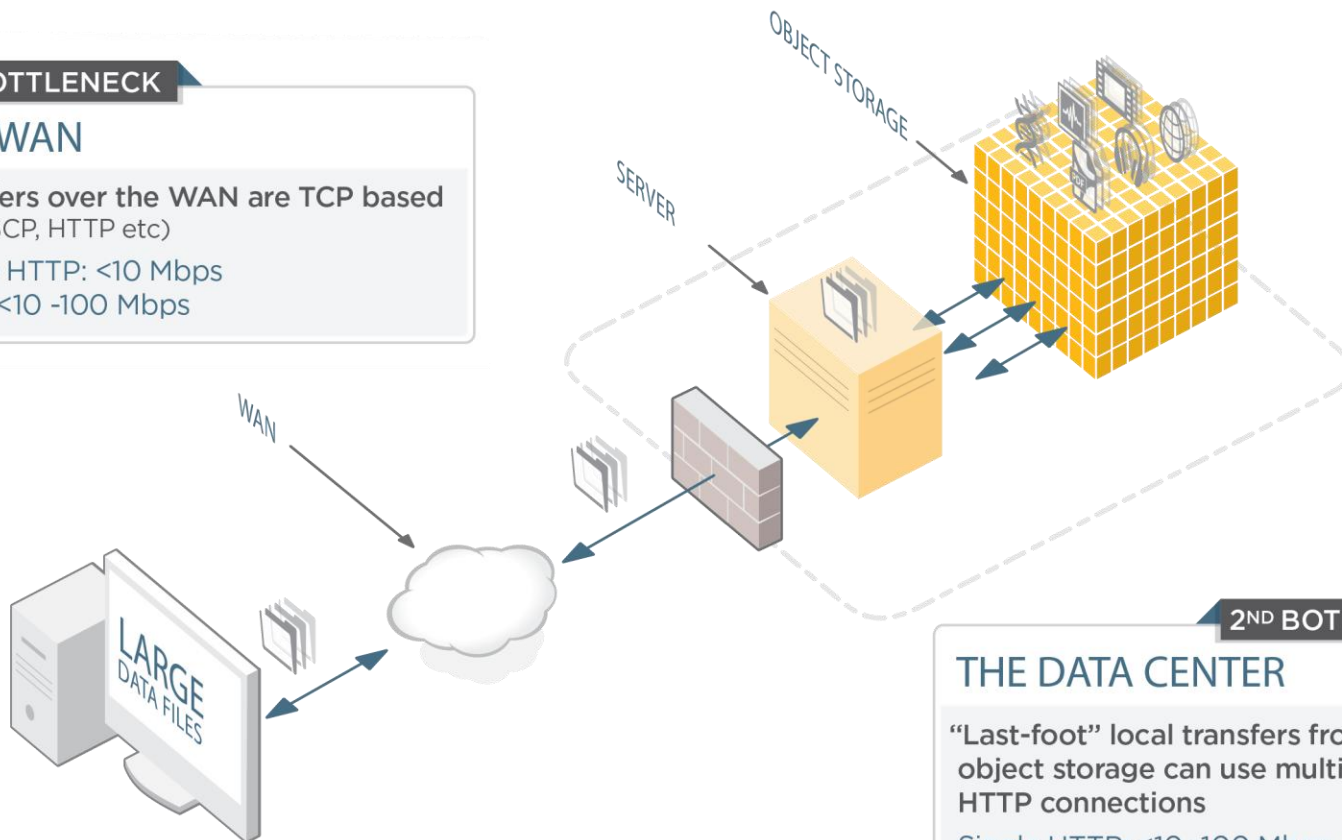
- Adding more bandwidth does not improve throughput

1ST BOTTLENECK

THE WAN

Transfers over the WAN are TCP based
(FTP, SCP, HTTP etc)

Single HTTP: <10 Mbps
Multi: <10 -100 Mbps

2ND BOTTLENECK

THE DATA CENTER

"Last-foot" local transfers from server to object storage can use multiple HTTP connections

Single HTTP: <10 -100 Mbps

OBJECT STORAGE

SERVER

WAN

LARGE DATA FILES

Maximum line-rate WAN transfer speed

- Transfer performance scales with bandwidth independent of transfer distance and resilient to packet loss

Congestion Avoidance and Policy Control

- Automatic, full utilization of available bandwidth
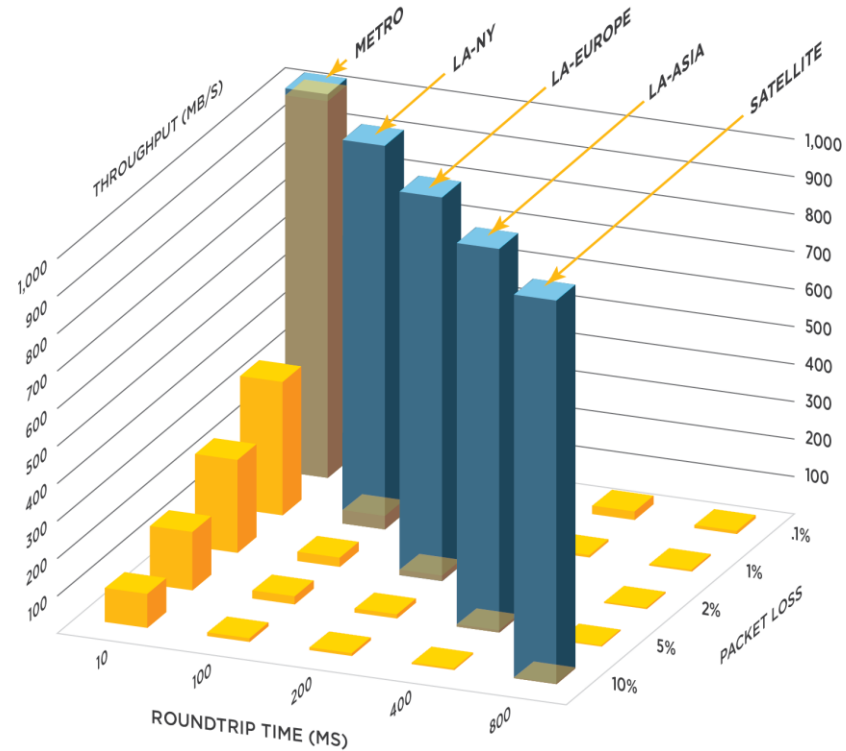
Uncompromising security and reliability

- Secure, user/endpoint authentication
- AES-128 cryptography in transit & at-rest

Scalable management, monitoring and control

- Real-time progress, performance and bandwidth utilization

Enterprise-Class File Delivery

- Precise and predictable transfer times
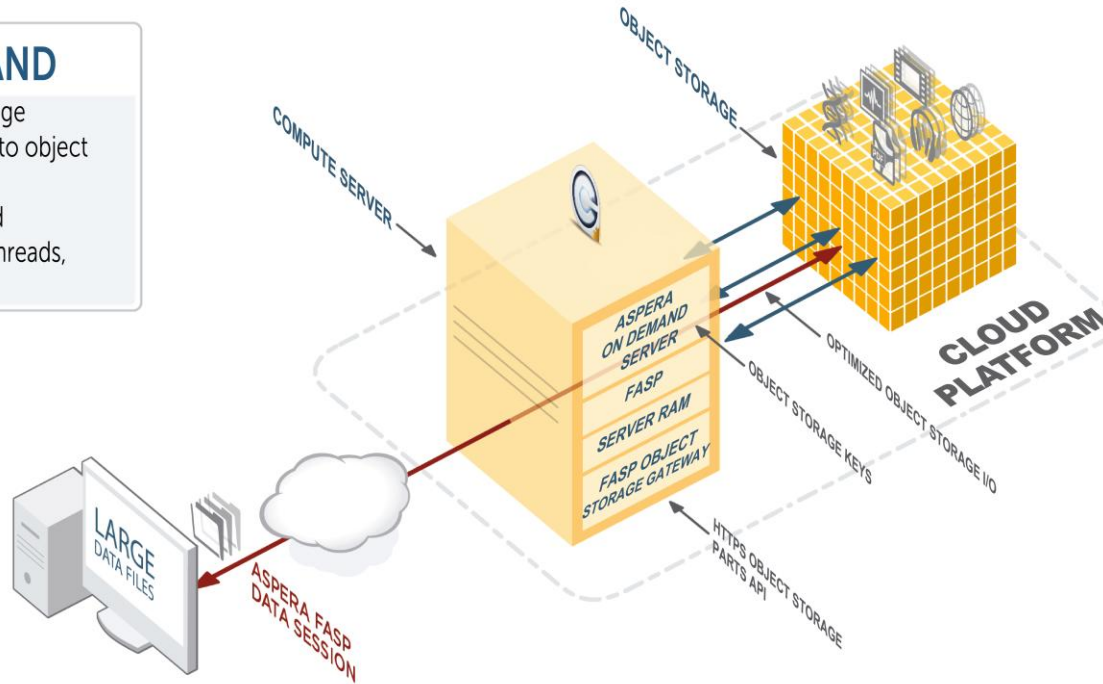- Extreme scalability (concurrency and throughput)

THE SOLUTION

ASPERA ON DEMAND

- Full client-side r/w of object storage
- Synchronous transfer from client to object storage (via Aspera On Demand)
- *fasp*™ transfer speeds end-to-end
- Real-time optimization of HTTP threads, chunk size, interfaced to *fasp*

Client Software

- client
- connect plug-in
- point-to-point
- cargo downloader
- mobile apps

OBJECT STORAGE

COMPUTE SERVER

ASPERA ON DEMAND SERVER
FASP
SERVER RAM
FASP OBJECT STORAGE GATEWAY

LARGE DATA FILES

ASPERA FASP DATA SESSION

OPTIMIZED OBJECT STORAGE I/O

OBJECT STORAGE KEYS

HTTPS OBJECT STORAGE PARTS API

CLOUD PLATFORM

amazon web services™

Windows Azure™

openstack CLOUD SOFTWARE

Google™

Akamai

Road Map

BT | CloudSigma | hp Cloud | rackspace the open cloud company | terremark

Performance

EFFECTIVE THROUGHPUT
up to 1Gbps
(per server Extra Large Instance)
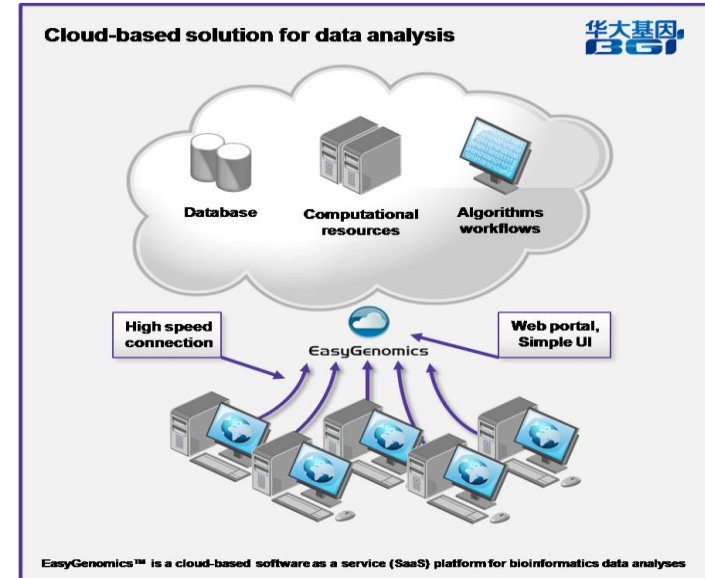10TB per 24 hours

9

Challenge

- Sharing large volumes of data between internationally dispersed collectors, data analysers and researchers

- BGI developed cloud-based bioinformatics platform "EasyGenomics™ to provide scientists with high-speed data exchange, point-to-click data analysis workflows including whole genome resequencing, targeted resequencing, RNA-Seq, small RNA and Denovo assembly

- BGI needed a high-speed file transfer solution that would allow users to rapidly upload sequencing data to the cloud for processing and then quickly download completed projects, speeding up the data analysis process for customers
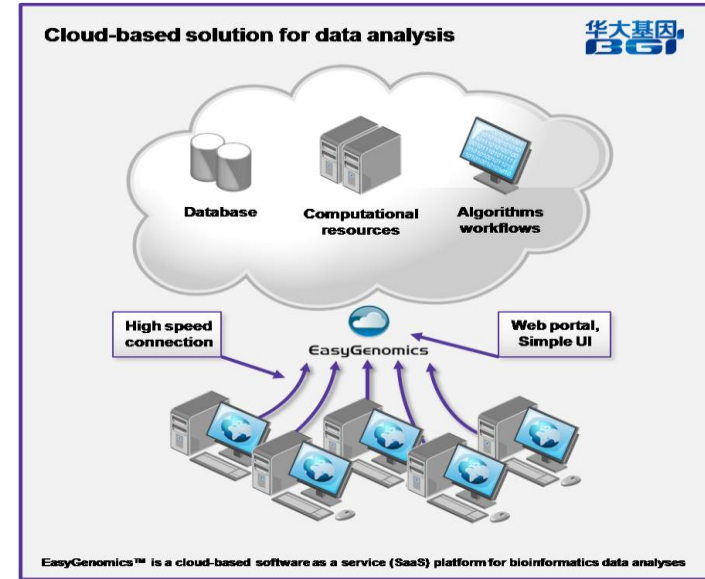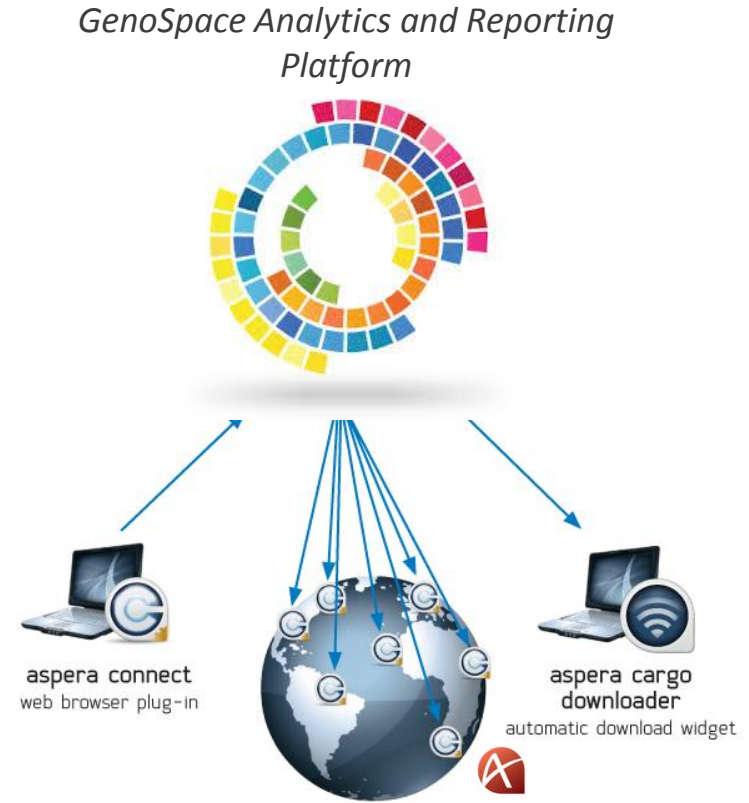
Solution

- BGI deployed the Aspera Connect Server to expand BGI's high-speed sequencing data delivery service

- Integrated Aspera *fasp*™ high-speed file transfer technology with EasyGenomics using the rich APIs available in the Software Development Kit (SDK) and the Aspera Developer Network (ADN)

- Provided a web-based file transfer framework that served as the foundation for the EasyGenomics website, delivering maximum throughput data movement over any distance with end-to-end security and exceptional bandwidth control, regardless of fluctuating network conditions

Cloud-based solution for data analysis

EasyGenomics™ is a cloud-based software as a service (SaaS) platform for bioinformatics data analyses

Challenge

- Physicians, clinical labs and researchers conducting clinical studies typically collect a large amount of clinical information from the subjects
- Analyzing and correlating patient genomic data with clinical trial results is difficult and time consuming
- Genospace created a cloud-based SaaS platform for the storage and analysis of large sets of complex genomic data
- Needed to move large multi-GB data sets from the physicians, clinical labs and researchers to their secure portal running on their cloud platform

GenoSpace Analytics and Reporting Platform

aspera connect
web browser plug-in

aspera cargo
downloader
automatic download widget

Solution

- Aspera On Demand and the Aspera Embedded Client, integrated directly into the GenoSpace platform running on Amazon Web Services (AWS).

- To deliver content to the GenoSpace database, the clinical provider simply logs into the GenoSpace portal, opens an order request, encrypts the data, and then connects to the Aspera On Demand server to complete the high-speed transfer.

- Once the data is uploaded to AWS, administrators at GenoSpace pull files from the Aspera server using the Aspera Embedded Client, decrypt the contents, and place the files into their secure database for analysis.

GenoSpace Analytics and Reporting Platform

aspera connect
web browser plug-in

aspera cargo
downloader
automatic download widget
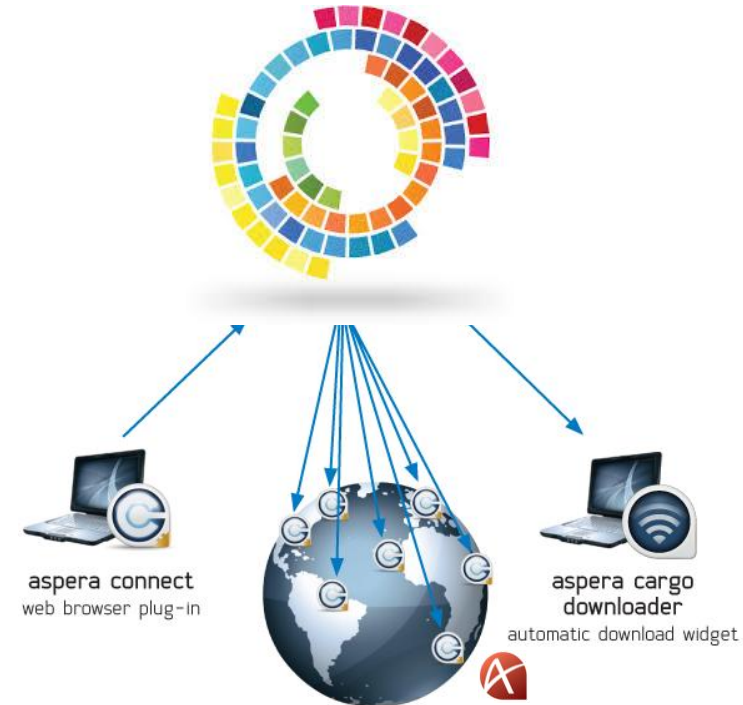
THANK YOU

For more information on any Aspera product, please contact

sales@asperasoft.com