Supercharged Analytics:

Ethernet Fabrics and the DB2 Analytics Accelerator for z/OS

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Abstract

- IBM® DB2® Analytics Accelerator for z/OS is a high-performance appliance that integrates multiple IBM technologies. The solution delivers extremely fast results for complex and data-intensive DB2 queries on data warehousing, business intelligence and analytic workloads. Using Ethernet Fabrics technology for the DB2 AA connectivity is an ideal, legal performance enhancement.

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Agenda

- Introduction-why should I care about analytics?
- Business analytics, distance, and networks
- DB2 Analytics Accelerator for z/OS
- Ethernet Fabrics networks
- Example use case

Business Analytics (BA) basics summary

- The process of developing optimal or realistic business decision recommendations and insights derived through the application of statistical modeling and analysis of an existing or simulated database.
- The ultimate goal of BA is to gain competitive advantage and to optimize business outcomes.
- BA plays a major role in fraud detection and prevention in 2015
- BA on z Systems is a major focus for IBM
- Source: *The Clipper Group Navigator* "Addressing New Business Analytics Challenges-When the IBM zEnterprise Really Makes Sense". 21 December 2012

OLTP vs. Analytics – Examples

OLTP - "Transactional"	Transactional Analytics: (Operational BA)	Deep Analytics
Withdrawal from a bank account using an ATM	Approve request to increase credit line based on credit history and customer profile	Regular reporting to central bank – sum of transactions by account
Buying a book at Amazon.com	Propose additional books based on similar purchases by other customers	Which books were best-sellers in Europe over the last 2 months?
Check-In for a flight at the airport	Offer an upgrade based on frequent flyer history of all passengers and available seats	Marketing campaign to sell more tickets in off-peak times
Hand-over manufactured printers to an oversea-carrier	Optimize shipping by selecting cheapest and most reliable carrier on demand	Trend of printers sold in emerging countries versus established markets.

Why Should I Care About Analytics?

Fraud

- “Businesses lose an estimated $3.5 billion annually to fraud and financial crime.”- Association of Certified Fraud Examiners
- “Fraud losses are estimated to total $80 billion per year in the health care sector alone.” -Coalition Against Insurance Fraud
- According to the FBI, non-health related insurance fraud is believed to top $40 billion annually.
- According to the U.S. Department of Justice, financial fraud impact of identity theft of credit cards in the U.S. added up to nearly $25 billion in 2012.

Forbes 22 Sept 2014

Sarah Diamond, General Manager IBM Global Business Services

- Fraud is a crippling problem for large corporations in data intensive industries such as financial services, government, and healthcare.
  - Roughly 5 % of an average organization's revenue is estimated to be lost to fraud.
- The short term financial loss is negligible compared to the long term loss of valued customers who are no longer comfortable buying from merchants whose networks have been hacked.

The Nature of Fraud

- "As fraud schemes become more sophisticated and migratory, **access to real time data** and the use of advanced data analysis to monitor claims and provider characteristics are critically important."

-Daniel R. Levinson

Inspector General

Office of the Inspector General

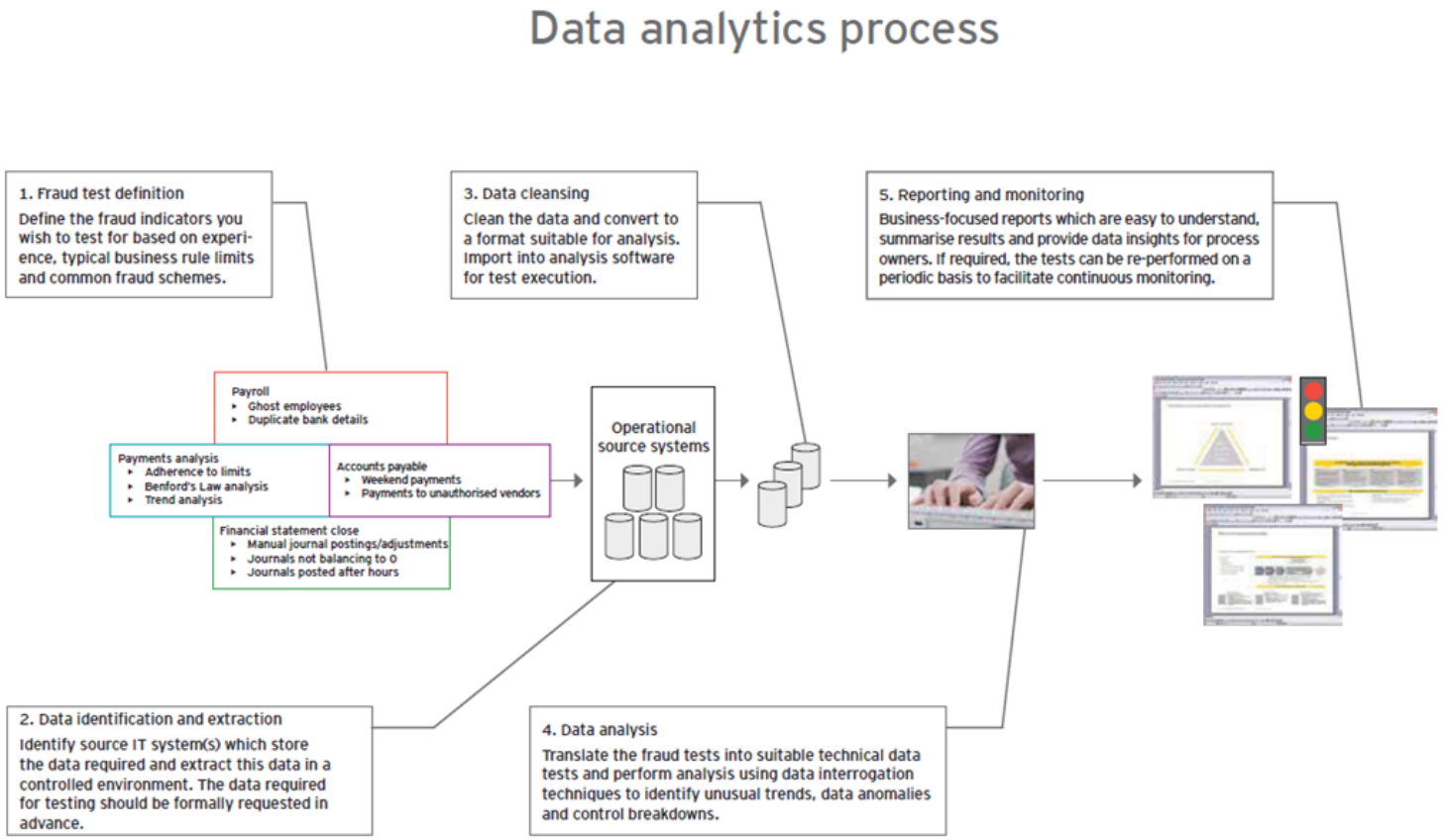
U.S. Department of Health and Human Services

The Role of Analytics In Fraud Detection

- Data analytics and its techniques can have a significant role to play in the early warning, detection, and monitoring of fraud.
- Organizations using analytics techniques can extract, analyze, interpret and transform their business data to help detect and prevent potential instances of fraud.

- **Z13 and IBM DB2AA: Real Time Fraud Detection and Prevention**

The Role of Analytics In Fraud Detection



Business Analytics, distance, and networks

The Analytics Network Problem

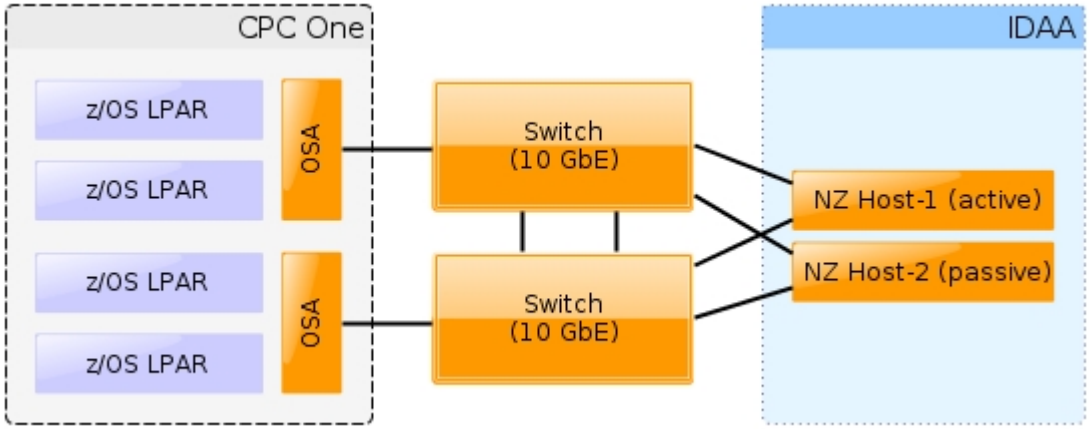
- Distance matters (time it takes to travel a distance)
- What do you do when the data you need is a long distance away?
  - Cost of providing fast data access over distance
- We want to run analytics on the most current “real time” data
  - But getting a snapshot of a moving target is a single use happening
- If the data is “big” moving it to a distant location can be a significant burden on the network.
- The delay and cost of “moving a brick through a garden hose” may lead to using a recent, but stale copy of the data.

Network Considerations for Analytics

- The weight of what is being transported becomes a burden and bottleneck
  - Typical communications/storage networks and DASD arrays are being shared and have many simultaneous demands placed on them.
- The server therefore has to wait for the data to arrive. ☹
  - The real bottleneck is downstream, near where the data is stored.
- **If we can make the server wait less by speeding access to the data (by putting the processing power closer to the data) with a dedicated network the answers to queries will come quicker which is the name of the game and the goal for most enterprises with analytics!**

The Network: Ethernet Fabrics Technology

IBM recommended HA network configuration

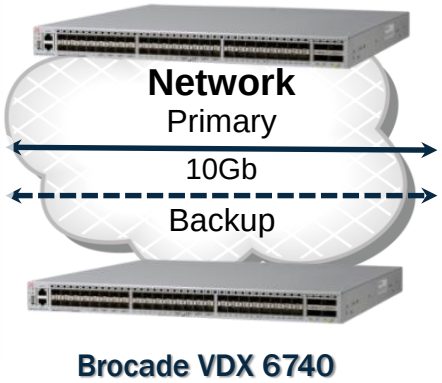


[Website for reference on network configurations]

Analytics Use Case: real time fraud detection/prevention

- IBM DB2 Analytics Accelerator for z/OS

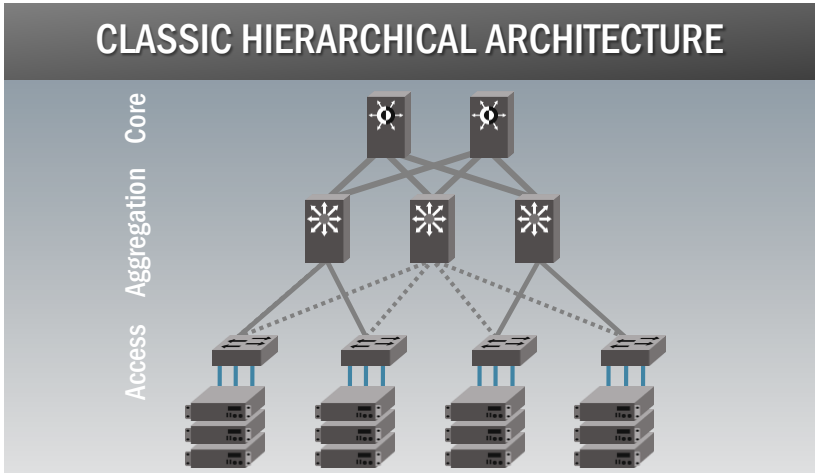
- Accelerate analytic performance by delivering higher throughput with flatter, flexible Ethernet Fabrics
- Improve information availability and resiliency with all links active, Layer 1/2/3 equal cost multipathing
- Network Advisor Dashboards provide real-time deep visibility and insight into the network for meaningful knowledge



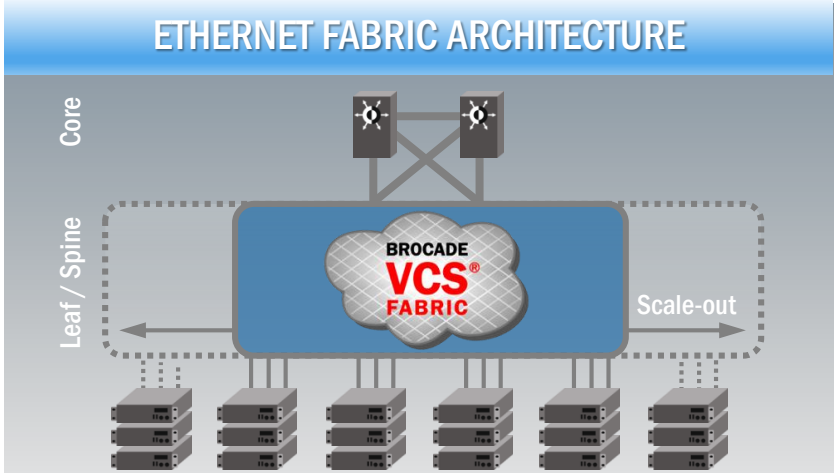
Data Warehouse Application
DB2 for z/OS enabled for
IBM DB2 Analytics Accelerator

IBM DB2 Analytics
Accelerator

Ethernet Fabrics



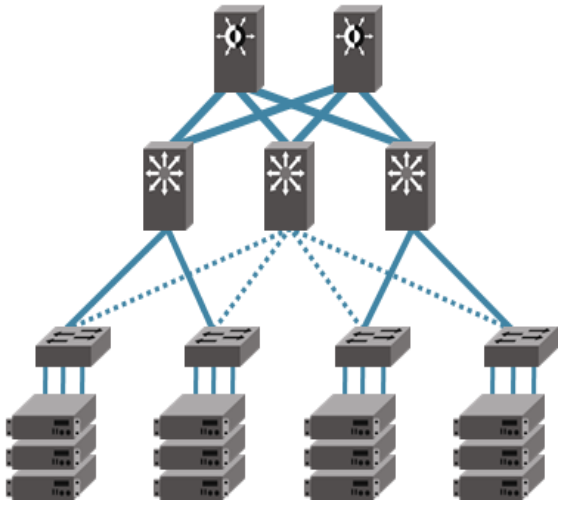
- Rigid architecture, north-south optimized
- Inefficient link utilization
- Individually managed switches, complex
- Scale-up
- VM-ignorant



- Topology freedom, east-west optimized
- All links active, Layer 1/2/3 multipathing
- Fabric managed as one logical switch
- Scale-out
- VM-aware

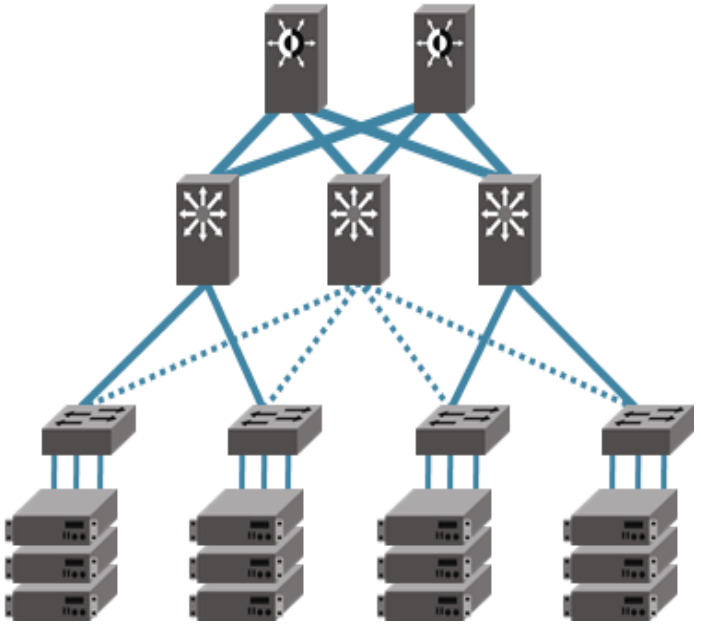
Classical Hierarchical Network Architecture

- The connections between switches, or Inter-Switch Links (ISLs, shown as solid blue lines), are not allowed to form a loop or frames aren't delivered.
- Spanning Tree Protocol (STP) prevents loops by creating a tree topology with only one active path between any two switches.
- Inactive paths are shown as dotted lines



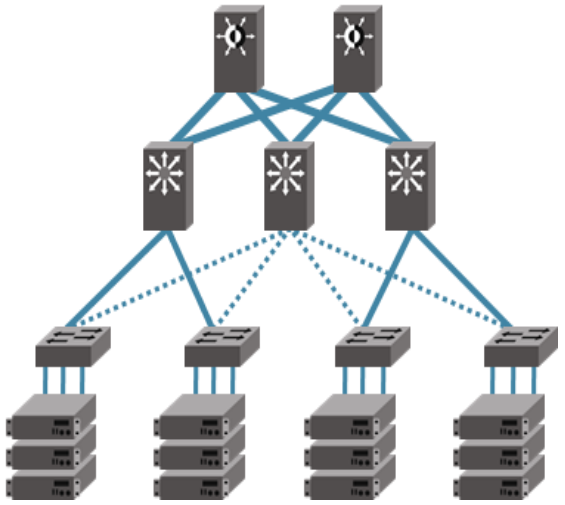
Classical Hierarchical Network Architecture

- ISL bandwidth is limited to a single logical connection, since multiple connections between switches are prohibited.
- Enhancements to Ethernet tried to overcome this limitation.
- Link Aggregation Groups (LAGs) were defined so that multiple links between switches were treated as a single connection without forming loops.
  - A LAG must be manually configured on each port in the LAG and is not very flexible.



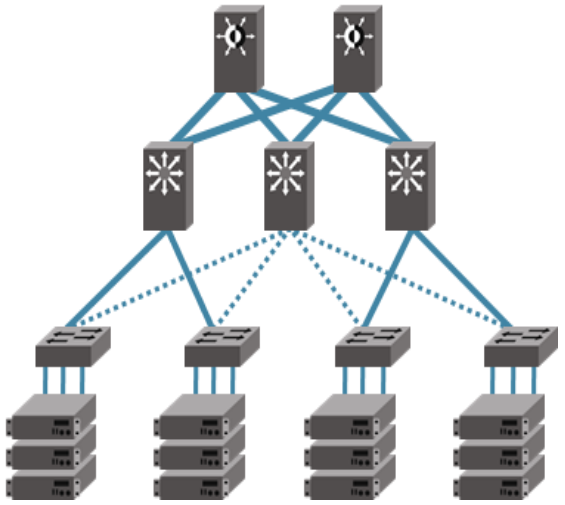
Classical Hierarchical Network Architecture

- STP automatically recovers when a link is lost. However, it halts all traffic through the network and must reconfigure the single path between all switches in the network before allowing traffic to flow again.
- Halting all traffic for tens of seconds up to minutes on all links limits scalability and constrains traffic to applications that can tolerate data path blocking to achieve link resiliency.



Classical Hierarchical Network Architecture

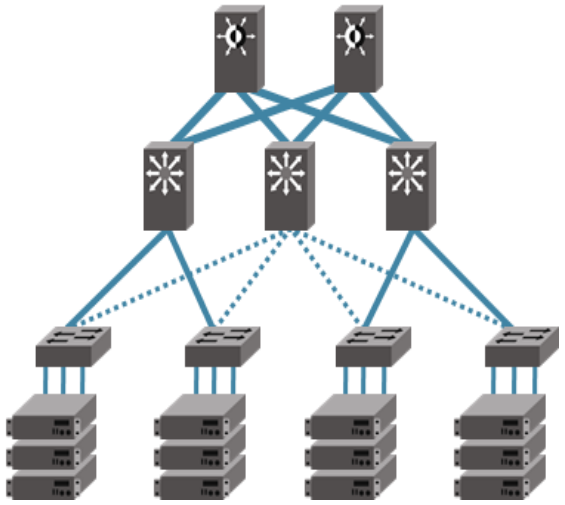
- In the past, traffic relied on TCP to handle this interruption in service.
- Today, with almost all data center applications running in a 24 x 7 high availability mode and storage traffic growing on the Ethernet network, loss of connectivity in the data path for even a few seconds is unacceptable.
- **This is even more true for analytics and real time fraud detection and prevention.**



Classical Hierarchical Network Architecture

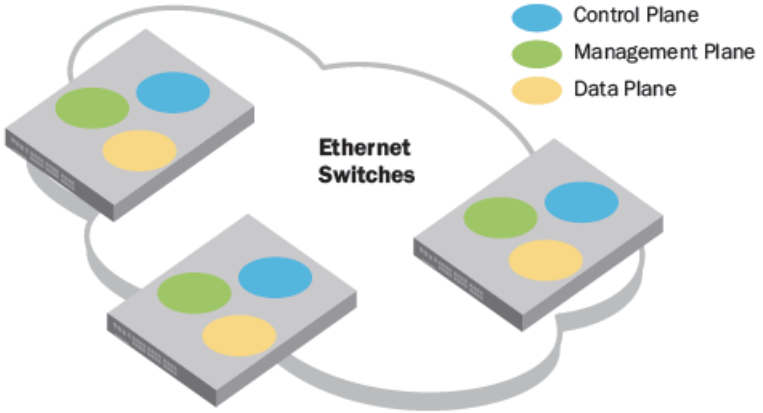
The classic Ethernet switch architecture presents other limitations.

- Each switch has its own control and management planes.
- Each switch has to discover and process the protocol of each frame as it arrives on an ingress port.
- As more switches are added, protocol processing time increases adding latency.
- Each switch and each port in the switch has to be configured individually, since there is no sharing of common configuration and policy information between switches.
- Complexity increases, configuration mistakes increase, and operations and management resources do not scale well.



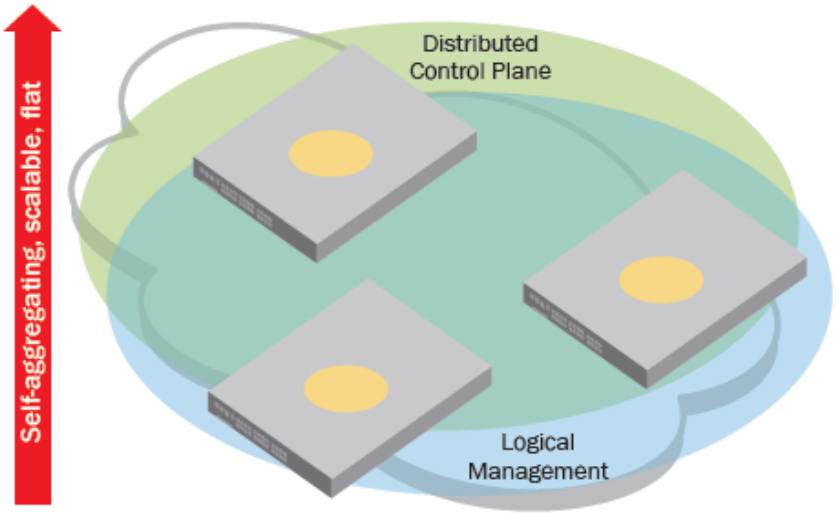
Classic Ethernet Switch Architecture

- The control, data, and management planes are logically connected to every port via a back plane.
- Control and management planes operate at the switch level not a network level.



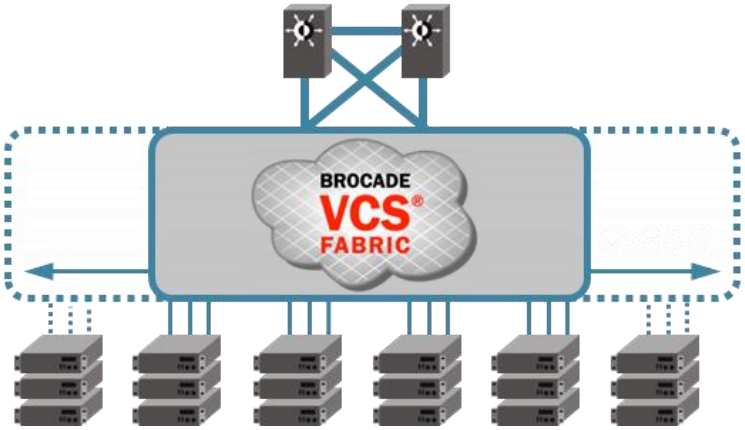
Ethernet Fabric Architecture

- Ethernet fabrics can be thought of as extending the control and management planes beyond the physical switch into the fabric.
- As shown in the Figure they now operate at a fabric level rather than at a switch level.



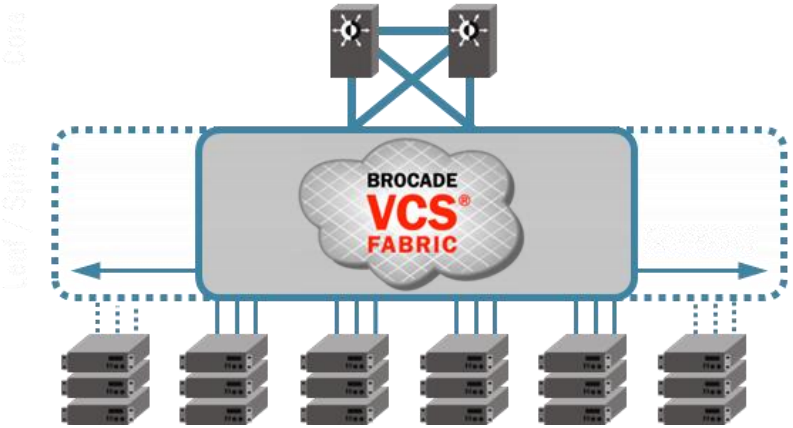
Ethernet Fabric Architecture

- The control path replaces STP with link state routing, while the data path provides equal-cost multipath forwarding at Layer 2.
- Data always takes the shortest path using multiple ISL connections without loops.
- Combined with the fabric's control plane, scaling bandwidth is made simple.
  - For example, it becomes possible to automate the formation of a new trunk when a new switch connects to any other switch in the fabric.



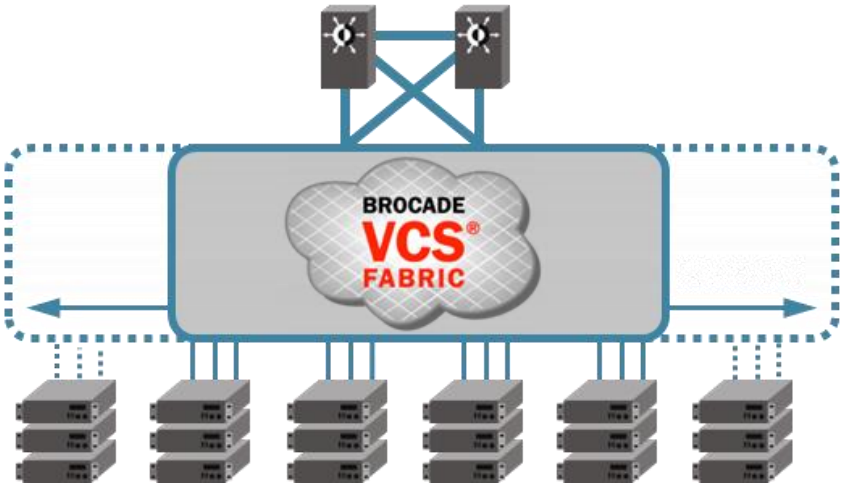
Ethernet Fabric Architecture

- If a trunk link fails or is removed, traffic is rebalanced on the existing links non-disruptively.
- Finally, if an ISL is added or removed anywhere in the fabric, traffic on other ISLs continues to flow instead of halting as with STP.



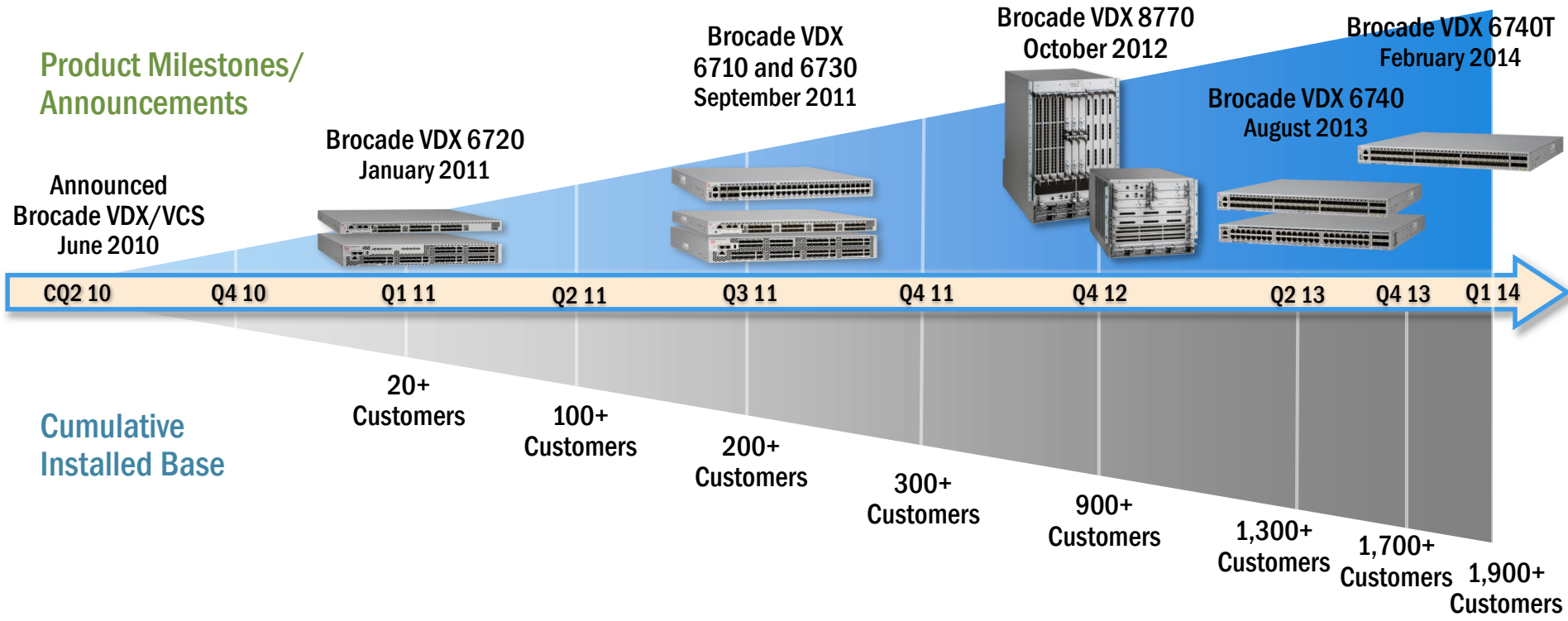
Ethernet Fabric Architecture

- With this architecture in place, a group of switches can be defined as part of a “logical chassis”, similar to port cards in a chassis switch.
- This simplifies management, monitoring, and operations since policy and security configuration parameters can be easily shared across all switches in the logical chassis.



Brocade VDX Switch and VCS Fabric Evolution

- Rapid pace of innovation



Brocade VDX 8770 Switch

Product details

Simplicity and Automation

- Brocade VCS Fabric technology
- Automatic Migration of Port Profiles (AMPP)
- Brocade Fabric Watch provides proactive monitoring and notification of critical switch component failure

Leading Scalability and Performance

- Supports 1 GbE/10 GbE/40 GbE/100 GbE
- Scales from 12 ports to over 8,000 ports per fabric
- Backplane scales to 4 Tbps per slot
- Best-in-class, 3.5 microsecond any-to-any latency
- Efficient multipathing for reliability and elasticity
- Best-in-class power efficiency

Built to Last

- 100 GbE connectivity
- Hardware-enhanced network virtualization*
- Cloud management via RESTful Application Programming Interfaces (APIs)*

* *Hardware-ready; some features to be enabled post-GA.*

Ethernet Fabrics
Data Center Access/Aggregation

Brocade VDX 6740 Switches

Product details

Simplicity and Automation

- Brocade VCS Fabric technology
- Automatic Migration of Port Profiles (AMPP)
- VCS Logical Chassis
- Auto Fabric Provisioning

Advanced Capabilities

- Full IP storage support with DCB capabilities
- Auto QoS prioritizes storage traffic
- VCS Virtual Fabric feature supports multi-tenancy
- VCS Gateway for NSX unifies virtual and physical networks
- SDN-capable (Openflow support)
- IPv6 hardware-ready

Leading Scalability and Performance

- Fixed 48 1/10 GbE SFP+ (6740) /48 1/10G BASE-T ports (6740-T) and 4 40GbE QSFP+ GbE; option up to 64 ports 10 GbE
- Fixed 48 1 GbE with 10 GbE software upgrade option
- 4×40 GbE QSFP+ ports; each 40 GbE can optionally be configured as 4×10 GbE in breakout mode
- High-performance L2/L3 switching
- Industry high deep buffers with dynamic buffering
- Increases MAC, VLANS, port profiles; delivers increased scalability
- Single ASIC, non-blocking with cut-through architecture
- Up to 160 GbE Brocade Trunk improves switch capacity
- Efficient multilayer, multipathing for reliability and elasticity

Brocade VDX 6740 Brocade VDX 6740T Brocade VDX 6740T-1G

Proactive VCS Fabric Management

- Brocade Network Advisor

Gain Visibility	Maintain Network Health	Automate Tasks
▪ Visibility from data center edge to hosts and VMs, including vCenter integration ▪ Customizable, browser-accessible dashboards ▪ Topology maps with fabric or logical chassis view	▪ Pinpoint bottlenecks, port and Rx discards, and other congestion indicators ▪ Configure and monitor sFlow traffic and generate reports ▪ Monitor Fabric Watch violations, schedule reports, and automate actions	▪ VLAN and VCS fabric management for Brocade VDX switches ▪ Non-disruptive firmware updates for entire fabric or subset ▪ Simple AMPP management

One simple tool for end-to-end network management

Monitor for and respond quickly to changes in network demand

Dramatically reduce TCO with automation of manual tasks

Customer Success with Brocade VCS Fabrics

"Brocade is an essential component in what we've designed, built, and deployed for our Infrastructure-as-a-Service model."

John Palley, Chief Operating Officer

"I love the automation, simplicity, and efficiency VDX gives us."

Kevin Grond, Network Infrastructure Manager

"Thank you, Brocade. You have made my life simple with VCS."

Ian Rousom, Network Operations

"The VDX switches are running for about a year. I forgot the password. It just works!"

Mark Eisen, Network Architect

Notable Implementations to Date

- 5th largest retailer in the world
- 4th largest bank in the world

Summary comparison

Ethernet Fabrics vs traditional Ethernet

- Flatter. Ethernet fabrics eliminate the need for Spanning Tree Protocol, while still being completely interoperable with existing Ethernet networks.
- Flexible. Can be architected in any topology to best meet the needs of any variety of workloads.
- Resilient. Multiple “least cost” paths are used for high performance and high reliability.
- Elastic. Easily scales up and down at need.

Ethernet fabrics provide higher levels of performance, utilization, availability, and simplicity.

Good Reading-Articles

December 2014 Enterprise Executive magazine

- Enterprise Networks Column: DB2 Analytics Accelerator and Ethernet Fabrics
- Article "Ethernet Fabrics 101"

Questions????

Complete your session evaluations online at www.SHARE.org/Seattle-Eval