Integration of OpenVMS Data and Applications

John Apps
Business Critical Servers
HP
Agenda

- **Service-Oriented Architecture: Enabling an Adaptive Infrastructure for an Adaptive Enterprise**

- Integration Technology packaging on OpenVMS

- Software Development
  - ...no integration without it...
  - On OpenVMS
  - On other platforms for OpenVMS

- Integration Technologies, Partners and Products
  - Data
  - Components
  - Applications
  - Web Services
  - Message Queuing and Caching

- What we are doing to help

- Questions and answers
Service-Oriented Architecture

The evolution of [Web] applications into service-oriented components with Web Services

The concept of Web Services is the beginning of a new Service-Oriented Architecture in building better software applications

The change from an object-oriented system to a service-oriented one is an evolutionary idea stemming from the Internet and Web system

Services must be based on shared organizing principles that constitute a Service-Oriented Architecture, the architectural concept behind Web Services
Service-oriented Architecture
Enabling an Adaptive Infrastructure for an Adaptive Enterprise

Technology, services, and partnerships applied together by HP to create infrastructure solutions tailored to unique needs.
SOA Integration Component Layers

Service Provider

Applications

3GL Components

Existing Data

Exposed As Services

Exposed As Services

Screen Based Integration
Java Connector Architecture

Java Component
.NET Component
SQL Stored Procedure

Relational, Hierarchical, Network, Flat, Object, ...

Exposed As Services
SOA Integration Component Layers

Service Provider

Applications

3GL Components
- Java Component
- .NET Component
- SQL Stored Procedure

Existing Data
- Relational, Hierarchical, Network, Flat, Object, ...

Service Provider

Industry-standard message formats, i.e., SOAP, XML

Industry-standard protocols, i.e., HTTP, SMTP
SOA Integration Component Layers

Service Provider

Applications

Screen Based Integration
Java Connector Architecture

3GL Components

Java Component
.NET Component
SQL Stored Procedure

Existing Data

Relational, Hierarchical, Network, Flat, Object, ...

Implementation details hidden from caller. Data conversion done according to standard schemas.

Messages can be synchronous or asynchronous, with or without notification or attachments.
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e-Business Infrastructure Packaging for OpenVMS I64 on Integrity Systems

- The key e-Business, integration, and Internet technologies are packaged with OpenVMS I64
  - Foundation Operating Environment (FOE)
    - Secure Web Server (based on Apache) including PHP, Perl, and JSP (Tomcat) support
    - Secure Web Browser (based on Mozilla)
    - Software Development Kit (SDK) for the Java™ platform
      - Note: this is the Java JVM and tools from HP-UX
    - Enterprise Directory
    - NetBeans Integrated Development Environment (IDE)
    - Simple Object Access Protocol (SOAP) Toolkit based on Apache Axis
    - XML Technology (parser and stylesheet processor for C++ and Java)
    - UDDI Client Toolkit
  - Mission Critical Operating Environment (MCOE)
    - Reliable Transaction Router
e-Business Infrastructure Packaging for OpenVMS Alpha

- The key e-Business, integration, and Internet technologies are packaged with OpenVMS Alpha on the e-Business Infrastructure CD

- Secure Web Server (based on Apache) including PHP, Perl, and JSP (Tomcat) support
- Secure Web Browser (based on Mozilla)
- Software Development Kit (SDK) for the Java™ platform
- Reliable Transaction Router
- Enterprise Directory (LDAP)
- COM
- BridgeWorks
- NetBeans
- Simple Object Access Protocol (SOAP) Toolkit (based on Apache Axis)
- UDDI Client Toolkit
Agenda

- Service-Oriented Architecture: Enabling an Adaptive Infrastructure for an Adaptive Enterprise

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Software Development

On OpenVMS:
- Used to have Enterprise Toolkit for Visual Studio (V6), now replaced by
- NetBeans
- DECset is still available for pure 3GL environments without full-blown graphical IDE

On other platforms:
- develop on 'platform of choice', test and deploy on OpenVMS using:
  - “Distributed NetBeans” with remote code management and debugging (run on Windows, debug on OpenVMS)
  - BEA WebLogic Workshop (strong support for Web Services)
  - jDeveloper
  - jBuilder
  - Eclipse
  - ...
Software Development

**NetBeans?**

- Sun-Sponsored Open-Source Integrated Development Environment
- 100% Java – runs anywhere there’s a JVM
- Feature-rich, drag-n-drop GUI creation, JSPs, Web services
- Extensible
- Supports other languages (C/C++, XML, HTML, Fortran*, Cobol*, Pascal*)
  - Support for CMS
  - CVS client
  - Ant (multiple platform builds from one build definition file)
Software Development

“Distributed NetBeans”?  
- Allows any desktop (Windows, Linux, HP-UX, etc.) to be used to do remote OpenVMS development  
- NetBeans runs on the desktop  
- Provides remote compilation (Java, C/C++), error navigation, remote execution, and eventually debugging  
- Also provides remote Ant ("Make without the wrinkles") operations  
- Remote CMS operations
Software Development
Distributed NetBeans

HP Desktop Computer

DCL Commands

DCL Command Output

Advanced Server
Share, SAMBA, FTP

OpenVMS Alpha
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# Data Integration

## Data
- Viewed as data
  - Supports multiple platforms:
    - OpenVMS, NSK, UNIX, Linux, Windows, IBM, ...
  - Supports multiple data sources:
    - Rdb, Oracle 9 and 10, Sybase, Informix, IMS/DB, DB2, NonStopSQL, SQL Server, ...
  - Supports multiple interfaces:
    - JDBC, ODBC, ADO.NET, OLE/DB, XML

## Attunity Connect

- Viewed as [value] objects
  - Data in files and DBs exposed as:
    - JavaBeans
    - Enterprise JavaBeans
    - .NET Methods
    - Web Services

## WRQ Verstream Integration Broker (VIB)
Attunity Data Integration Products

EAI

EII

ETL / DW / BI

Data Access & Adapters

Data Federation

Change Data Capture

Attunity Server and Metadata

Legacy

Relational

Apps

Enterprise Data Sources
Attunity Connect – Functional Architecture

- ODBC
- JDBC
- ADO.NET
- Web Services
- JCA
- COM, .NET
- MS BizTalk
- BEA WebLogic
- Oracle AS

**SQL Query Processor**

**XML Service Processor**

**SQL Query Governor**

**XML Event Services**

**Native Adapter**

**Metadata**

**Legacy**

**Relational**

**Apps**

**ATTUNITY CONNECT**

**ATTUNITY STUDIO**
Attunity Federate – Functional Architecture

- Portals
- Business Intelligence
- Composite Applications

- Distributed Federation Engine
- SQL and XML Interfaces
- Distributed Transaction Mngr
- Metadata
  - Virtual DB
  - Federated DB
  - Segmented DB

- Adapters
- Legacy
- Relational / DW
- Apps
Attunity Stream – Functional Architecture

ETL | BAM | EAI / ESB

-->

SQL Change Publisher | XML Change Publisher

Event Warehouse

Change Capture | Metadata

-->

Legacy | Relational | Apps

10/31/2004 OpenVMS Application Integration Strategy
## Comprehensive Enterprise Data Support

### Data Integration

<table>
<thead>
<tr>
<th>Relational</th>
<th>Non-Relational</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle</td>
<td>VSAM</td>
<td>CICS</td>
</tr>
<tr>
<td>DB2</td>
<td>IMS/DB</td>
<td>IMS/TM</td>
</tr>
<tr>
<td>Sybase</td>
<td>Adabas</td>
<td>Pathway</td>
</tr>
<tr>
<td>Informix</td>
<td>QSAM</td>
<td>Tuxedo</td>
</tr>
<tr>
<td>Ingres</td>
<td>Enscribe</td>
<td>Natural</td>
</tr>
<tr>
<td>SQL Server</td>
<td>RMS</td>
<td>COBOL</td>
</tr>
<tr>
<td>Rdb</td>
<td>C/D ISAM</td>
<td>RPG</td>
</tr>
<tr>
<td>SQL/MP</td>
<td>Flat Files</td>
<td>C</td>
</tr>
<tr>
<td>DBMS</td>
<td>Delimited Text</td>
<td>Any other 3GL</td>
</tr>
</tbody>
</table>
Universal Connectivity

Data Integration

SQL
- ODBC
- JDBC
- OLE/DB
- ADO
- ADO.NET

XML
- JCA
- .NET
- COM
- XML/HTTP
- Web Services (SOAP/WSDL)

3rd Party
- MS BizTalk
- BEA WebLogic
- Oracle AS
- BO Data Integrator
Enterprise Platform Support

Data Integration

Windows
- NT
- XP
- Server 2000
- Server 2003

Mid-Range
- HP/UX
- Solaris
- AIX
- HP Tru64 Unix
- DG-UX
- Linux
- OpenVMS
- OS/400

High End
- OS/390
- z/OS
- HP NonStop NSK
Agenda

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• What we are doing to help

• Questions and answers
## Component Integration

### Components

- **Viewed as “data”**
  - Wrapped component is exposed as a SQL Stored Procedure
  - Invocation in same SQL query as one to pure data:
    - Join data returned from 3GL with SQL query

  - Attunity Connect

- **Viewed as “objects”**
  - 3GL modules wrapped and exposed as:
    - JavaBeans
    - Enterprise JavaBeans
    - .NET Methods
    - Web Services

  - WRQ Verstream Integration Broker
  - HP BridgeWorks
Component Integration – HP BridgeWorks

Wraps callable 3GL applications

Handles all languages adhering to the OpenVMS Call Standard (including Pascal, BASIC, Fortran, C, COBOL, DIBOL, ADA, C++, …)

Automates process using compiler generated ANA files

Wraps callable ACMS Tasks*

Generates multi-threaded agent

(provides access to SignIn, SignOut, Extended Status, and ACMS Application Name)

Automates process using ACMS compiler generated** STDL files

* Java™ based connections only

** Requires ACMS V4.2+
Component Integration – HP BridgeWorks

Wraps DCL Procedures as routines

Allows passing in parameters and passing back a return value

For example:

wrap a DCL procedure and invoke it from a VB program – the DCL procedure writes the results of execution to a log file

Provides generic wrapping of OpenVMS based Files

Returns contents as a String

For example:

wrap the log file produced by the above DCL procedure and 'read' it to check the results of the invoked command procedure
Component Integration – HP BridgeWorks

Components in **green** you supply, BridgeWorks provides/generates the rest

- DCE RPC for Windows client;
  ICCS for OpenVMS client

Internet

Internet

Apache

JSP

Tomcat

JVM

Platform = …

BWX MC

J2EE

IPC

Alpha/OpenVMS V7.2-2+
W2000 / Windows XP

BWX SC

Your Application

IPC

BWX Manager

OpenVMS

Alpha/OpenVMS V7.2-2+
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## Application Integration

**Applications**

- **Integrate at the screen level**
  - Support for multiple platforms
    - 3270
    - VTs
    - AS400
    - HP3000
    - ...
  - Screens exposed as
    - JavaBeans
    - .NET methods
    - Web Services
  - Runtime available on
    - OpenVMS
    - HP-UX
    - Linux, U*IX
    - Windows
    - ...
  - Development GUI on Windows

- **Integrate using JCA**
  - J2EE standard
  - Interfaces available or being developed by SAP, PeopleSoft, Siebel, ...
  - Interfaces for CICS and IMS and other TP software

- **Integrate using EDI**

---

**Verastream Host Integrator**

- Includes flow manager for controlling interaction between connected systems
- Seamless integration with MS BizTalk
- Build composite applications with data, components and applications regardless of technology, e.g.,
  - .NET methods for screens
  - Java methods for components
  - Java objects for data sources

**Verastream Integration Broker**

Attunity Connect

**Verastream Integration Broker**
Application Integration

**Target Applications & Tools**
Reuse legacy functions in new ways

**Interfaces**
.NET, COM, Java, EJB, Web-services, HTTP/XML, JMS

**Composite Services**
Combine components into high value services

**Components**
Represent business functions or data elements

**Adapters**
Abstracts host logic & data into components

**OpenVMS specific adapters**

**Screen:** Any VT-based application (VAX, Alpha, Itanium) including: All-in-1, FMS, DECforms, TDMS, Cognos Powerhouse, 3GLs, SMG

**Data:** RMS Files, RMS, Oracle Rdb, Oracle CDD, Oracle DB

---

OpenVMS Mainframe
HP e3000
AS/400
Databases
Custom/ Packaged Apps
Application Integration

Existing applications, components & databases

Reusable business components

“Composite application” components

New “Composite application”

Composite Application encapsulating existing business functions (screens), components and data. Allows reuse and helps accelerate new application development

getOrder(Cus)

cusData(Cus)

cusData(Cus){
  // some code…
  }

cusData(Cus)

getCus(Cus)

getCus(Cus)

getOrder(Cus)
Application Integration

OpenVMS Server

- BWX Addserver Component
- Verastream Services Daemon
- DECForms Checking Application
- RMS Data
- DECForms Checking Model Deployed on VHI Server
- Claims Data Module
- Authentication/Shipping Component
- Verastream Java Classes
- Model Servlet Business Logic
- Viewing (JSP)
- Controller Servlet
- Apache/Tomcat Server
- Web Clients HTML/Javascript
- Components built with WRQ Verastream
- Components used by WRQ Verastream

Windows/UNIX/Linux Server
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Integration using Web Services

Web Service?

- Standards-based, defined by organizations such as JCP, OASIS, ebXML
- Loosely coupled connectivity, often using HTTP as transport mechanism
- Synchronous or asynchronous
- Supports Remote Procedure Call (RPC) or Document Exchange (one way)
- Platform agnostic: Java, .NET, LAMP, home-grown
- Connectivity testing defined by WS-I.org

A small step for technology; a giant leap for business.

This leap is not about technology; it is about enabling organizations to conduct business, with technology assisting business, not restricting it.

This leap is the beginning of the era when information technology matures to become invisible in business interaction.
Major Web Service Technologies

• SOAP – Simple Object Access Protocol
  − Standard packaging structure for XML doc transport
  − Transport over SMTP, HTTP, FTP
  − Also defines encoding and binding standards for non-XML RPC invocations
  − EJBs can be exposed through SOAP and so can .NET components

• WSDL – Web Services Description Language
  − XML technology that describes the interface to a web service in a standardized way
  − Describes I/O parameters of an invocation externally
  − Describes service protocol binding

• UDDI – Universal Description, Discovery, and Integration
  − Registry of available web services (worldwide)
  − Used for advertising, discovering and integrating web services
Web Service Interaction

Application

Soap Client

HTTP Request

HTTP Response

Service

SOAP Processor

WSDL

Discrete Business Logic

UDDI Registry

10/31/2004 OpenVMS Application Integration Strategy
## Web Services Integration

<table>
<thead>
<tr>
<th>Web Services</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>− Invoke 3GL routines and ACMS Tasks which have been wrapped as JavaBeans or EJBs</td>
<td>HP BridgeWorks</td>
</tr>
<tr>
<td>− Serve 3GL routines which have been wrapped as .NET methods, JavaBeans or EJBs</td>
<td>WRQ Verstream Integration Broker (VIB)</td>
</tr>
<tr>
<td>− Serve data as Web Services</td>
<td>Attunity Connect, VIB</td>
</tr>
<tr>
<td>− Expose VT screens and other terminal devices as Web Services; allow their invocation from Web Service-enabled software such as .NET, Apache SOAP Toolkit (Axis)</td>
<td>WRQ Verstream Host Integration</td>
</tr>
<tr>
<td>− Transactional Web Services</td>
<td>Arjuna ArjunaXTS</td>
</tr>
</tbody>
</table>
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  - Web Services
  - Message Queuing and Caching

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Message Queuing and Caching

Messaging Queuing

- Asynchronous delivery of messages:
  - Peer to peer: guaranteed once, delivery coordinated by distributed transactions, notification of receipt
  - Pub/Sub: optimal transmission of messages to multiple, subscribed, parties with guaranteed delivery and notification of receipt
- Standards-based JMS
- Integration with MQ Series, Tibco, MSMQ
- Fault tolerance through clustering
- Load balancing across cluster nodes

Arjuna ArjunaMS
IBM WebSphere MQ
SpiritSoft SpiritWave
Oracle Advanced Queuing
Message Queuing and Caching

Caching

- Uses queuing for guaranteed delivery and fault tolerance
- Used primarily in read-only environments (up to 90% increase in throughput possible)
- Caches built in a hierarchical fashion as a fan-out:
  - large, medium and small caches, depending on environment
- Standards-based - JCACHE
- Non-intrusive optimization of IBM WebSphere MQ queues

SpitCache from SpiritSoft
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What are we doing to help HP’s SOA Services – What we deliver

**Plan**
- SOA Strategy and Vision
- SOA Concept
- SOA Blueprint
- SOA Pilot

**Design**
- SOA Design Service
- Integration Comp. Center
  - Applications Development
  - Applications Consolidation
  - Applications Integration

**Build**
- SOA Implementation Service
  - HP C&I App & Infra., Services sales
  - Web Services
  - Design services & ICC specify roadmap

**Manage**
- SOA Lifecycle Management Service
  - SOA Operations Mgmt
  - SOA Software Factory Mgmt

**Evolve**
- SOA Agility Impact
  - SOA Agility Impact Service

- ✓ ITSM V3 applied to SOA & WebServices
- ✓ Manage & Meter reuse to manage software as assets
- ✓ ROI of SOA/WebServices
- ✓ Business dashboard
What are we doing to help

OpenVMS eBusiness Lab

provides a secure hardware and software environment for internal groups and external partners to stage and evaluate eBusiness products on OpenVMS

• located in HP’s Nashua, New Hampshire, USA, facility
• systems can be accessed locally or remotely
• systems are configured with the latest eBusiness technology on OpenVMS including web server (Apache), middleware, application servers, Java and database systems
What we are doing to help

Complementary Resources and Services

hp will deliver transition tools, services and support portfolios at no charge to help with customer and partner transitions

• two day workshops to evaluate the current environment and plan for transition and integration
• consulting expertise centers jointly staffed with HP and Intel experts
• worldwide porting centers for validating ISV and custom applications on Itanium™ processor family systems
• on-Line support including “test drive” systems for application testing over the net
• comprehensive portfolio of white papers with “how to” transitioning information
Architectural Workshop
January 15th – Day 1

10:00 Welcome and Introductions

10:15 Customer Presents

- Business & Technical requirements regarding eCommerce Application / Environment and Goals
- Current Architecture
- Future Design
- Implementation Prerequisites
- Availability and Disaster Recovery Requirements today and future

12:00 LUNCH

1:00 Implementing Java based tiered solutions. Examples and best practices.

2:30 Discussion on Proposed Architecture

3:30 BREAK

3:45 Discussion on Architecture (continued)

4:30 Recap

5:00 Adjourn
### Architectural Workshop (2)

**January 16th – Day 2**

<table>
<thead>
<tr>
<th>Time</th>
<th>Agenda Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>Review Today’s Agenda and make any necessary modification</td>
</tr>
<tr>
<td>9:15</td>
<td>Tru64 and HP-UX Roadmaps</td>
</tr>
<tr>
<td></td>
<td>- TruCluster and MC/ServiceGuard Architecture and Implementation Overview</td>
</tr>
<tr>
<td></td>
<td>- Application Integration into a HA environment</td>
</tr>
<tr>
<td></td>
<td>- Disaster Tolerance Solutions</td>
</tr>
<tr>
<td>11:15</td>
<td>BREAK</td>
</tr>
<tr>
<td>11:30</td>
<td>Review of overall HA architecture based on Customer design Implementation</td>
</tr>
<tr>
<td></td>
<td>issues and product features required for Customer’s HA requirements</td>
</tr>
<tr>
<td>12:00</td>
<td>LUNCH (working)</td>
</tr>
<tr>
<td>2:00</td>
<td>Recommendation of Platform</td>
</tr>
<tr>
<td>2:30</td>
<td>Recap and Summary</td>
</tr>
<tr>
<td>3:00</td>
<td>End</td>
</tr>
</tbody>
</table>
Technology Seminars

hp also has an extensive portfolio of seminars which can be adopted to customers’ needs

- available for delivery anywhere, anytime
- customizable for specific technologies
- can be tailored for specific customers
- can be delivered with partners
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>All</td>
<td>Introductions and Overview of the seminar</td>
</tr>
<tr>
<td>08:45</td>
<td>hp</td>
<td>OpenVMS eBusiness update and case studies</td>
</tr>
<tr>
<td>09:15</td>
<td>hp</td>
<td>Introduction to JNDI and LDAP with hp Enterprise Directory accompanied by online demos: what is a Name Service, how do I use it, what management tools are available and what do client programs look like?</td>
</tr>
<tr>
<td>10:30</td>
<td></td>
<td>Break</td>
</tr>
<tr>
<td>10:45</td>
<td>Attuinity</td>
<td>Introduction to JDBC and JCA with Attuinity Connect accompanied with online demos: how do I integrate multiple data sources from multiple platforms with one SQL statement in a Java™ programme?</td>
</tr>
<tr>
<td>11:45</td>
<td>hp/SE</td>
<td>Wrapping 3GL code as Java™Beans or EJBs with hp BridgeWorks and invoking them from WebLogic: what options are open to reusing my existing investment in 3GL code whilst writing new applications in Java™?</td>
</tr>
<tr>
<td>13:00</td>
<td></td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00</td>
<td>hp</td>
<td>Introduction to Java™Servlets and Java™Server Pages with Apache/Tomcat on OpenVMS: how can I invoke 3GL code and read OpenVMS RMS files from Java™ programs and display the results in a browser?</td>
</tr>
<tr>
<td>15:00</td>
<td></td>
<td>Break</td>
</tr>
<tr>
<td>15:15</td>
<td>Ericom</td>
<td>Introduction to SOAP and application integration with Ericom Host Publisher plus online demos: how can I integrate multiple, incompatible applications, and embed logic flow between them; and then make the results available to any client capable of processing SOAP requests, that is, Web Services?</td>
</tr>
<tr>
<td>16:30</td>
<td>BEA</td>
<td>Introduction to JMS (Java™ Message Service) with BEA WebLogic Server: what is a J2EE™ Application Server and how can I use it for synchronous and asynchronous queuing?</td>
</tr>
<tr>
<td>17:45</td>
<td>All</td>
<td>General Q&amp;A and Wrap-up</td>
</tr>
</tbody>
</table>
What we are doing to help

• JAXTX provides an API for packaging and transporting ACID transactions
  http://www.jcp.org/en/jsr/detail?id=156
• OASIS¹ – Non-profit making organization promoting eBusiness standards
  http://www.oasis-open.org/
• A Framework for implementing business transactions on the Web
• OASIS Business Transaction Protocol Primer
  http://www.oasis-open.org/committees/business-transactions/documents/primer/Primerhtml/BTP%20Primer%20D1%2020020602.html
• Business Transactions in Workflow and Business Process Management

Some references for further reading
What we are doing to help

Some more references for further reading

- The Tao of e-business services
- A Young Person's Guide to SOAP: Increases Interoperability Across Platforms and Languages
- Web Services Primer
- XMethods Utility Services
  - http://www.xmethods.com/
- WSDL / SOAP Web Services Search Engine
- Understanding Web Services (ISBN: 0-201-75081-3)
What are we doing to help

• Business agility is a core requirement for today’s organisations
• An adaptive IT infrastructure enables business agility
• The application of Web Services & an SOA are a route forward
• HP has done this before
• **HP has done it for itself**
Architecture Strategies Drive IT Transformation

- Real simplification of IT environment
- Radical reduction of IT infrastructure operating cost
- Innovation instead of maintenance

<table>
<thead>
<tr>
<th>Pre-merger</th>
<th>Today</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,000+ applications</td>
<td>4,000 applications</td>
<td>2,200 applications</td>
</tr>
<tr>
<td>25,000 servers</td>
<td>19,000 servers</td>
<td>10,000 servers</td>
</tr>
<tr>
<td>300 Data Centers</td>
<td>85 Data Centers</td>
<td>11 Data Centers</td>
</tr>
<tr>
<td>IT cost = 4.6% of revenue</td>
<td>IT cost = 3.5% of revenue</td>
<td>IT cost = &lt;3.0% of revenue</td>
</tr>
<tr>
<td>Innovation = 28% of IT spend</td>
<td>Innovation = 34% of IT spend</td>
<td>Innovation = 55% of IT spend</td>
</tr>
</tbody>
</table>
What we are doing to help
Biggest IT merger of all time

The size of the IT task

- **1,200** networked sites
- **215,000** desktops
- **49,000** network devices
- **7,000+** applications
- **900+** web servers and infrastructure
- **21,671** servers
- **228,000** mailboxes
- **26** million emails a week
- **30** million B2B messages monthly

The desired result:

- Customers and partners interact with HP as one company
- Products and solutions go-to-market through integrated, global supply chains
- HP workforce operates as a single company
- IT cost and complexity are reduced
- Business performance improves
What we are doing to help

Driving business value

- Achieved $3 billion in cost savings in 9 months
- Delivered $1.3 billion in supply chain integration savings in first nine months, $1 billion more next year
- e-business operations on a path to triple transaction volume by 2004
- Reduced build-to-order PC manufacturing costs by 26%
- Rolled out world’s largest, most complex PeopleSoft 8.0 e-HR installation
- Reduced financial transaction processing costs by almost $20 million annually
- Reduced and simplified applications portfolio from 7,000 to 5,000
- Reduced overall IT costs by 24%
Questions?

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Thank you!