OpenVMS Strategy
Technical Update
Future Directions
Porting Considerations

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Wichtigste Facts und Adressen (10 Folien Summary up-front)

- Zentrale Web-Adressen von HP
- Wichtige Files zur Portierungshilfe
- System-Analyse
- OpenVMS Emulation
- Listen der SW-Verfügbarkeit
- HP Kontakte OVMS Spezialisten
- Liste wichtigster OpenVMS Adressen

Die wesentliche Web-Adresse von HP

The HP Alpha RetainTrust (ART) program underscores HP's commitment to providing long-term business continuity for AlphaServer customers. The program eases the evolution of moving from the Alpha platform to HP's Integrity systems by ensuring we carry forward the trust you have placed in us. ART is focused on showing you the business value of moving forward with HP as a company, and mitigating the risk associated with transitions to Integrity.

- Alpha RetainTrust Program
- Overview
- Initiatives
- Products
- Partners
- Services
- Business Practices

http://www.hp.com/products1/evolution/alpha_retaintrust/index.html

Informationen als pdf/Word/PP-Files für Sie

- Finanzielle Vorteile von OpenVMS
  - Studie (Techwise Research) zu TCO
- Portierungshilfe (12 Seiten mit vielen Web-Adressen)
  - Porting OpenVMS applications White Paper
- Unterschiede der Floating Point Darstellung
  - I64 flp White Paper
- Best Practises für Programmier (Word-File)
  - Porting OpenVMS applications by Gaitan D'Antoni
  - Porting „real" applications by Guy Peleg
- Zur Fehlerbehebung
  - Fatal Bugchecks
- Integrating Integrity Servers into OpenVMS Alpha environment

Generelle Hintergrundinformation zum Betriebssystem

- Porting OpenVMS operating system to Integrity Servers

Grundlagen zur sinnvollen Migration: **Exakte** Ist-Analyse

- Systemtyp, Prozessortyp
- Anzahl und Frequenz des/der Prozessoren
- Betriebssystem inkl. Versions-Nummer
- Spezielle Compiler: Bliss, Macro32, Mumps, Lisp, Ada, ...
- Layered Products: Datatrieve, FMS, ...
- Datenbanken inkl. Versions-Nummer
- Applikationen.
  - Eigene (Code vorhanden?)
  - ISV SW inkl. Versions-Nummmer
- Spezielle HW oder Busse: Q-Bus, M-Bus, VME, IEEE488, ...

Lösungsmöglichkeit: Software-Emulation

- The CHARON-VAX family of products are VAX replacement systems, running as a software application on industry standard systems. They present to the VAX software the exact copy of a VAX hardware system, and will run unmodified VAX operating systems, layered software and applications. The compatibility is so exact that we run the original VAX hardware diagnostics during the design, and the CHARON products were certified using the original AXE hardware verification test suite of Digital Equipment Corporation's VAX engineering group.

- **http://www.softresint.com/charon-vax/index.htm**

OpenVMS Produkte für Integrity

HP OpenVMS Systems

OpenVMS Version 8.2 is now generally available for entry-level HP Integrity servers as well as the full line of HP AlphaServer systems. By the first half of 2006, OpenVMS will also be available on mid-range and high-end Integrity servers, including the HP Integrity Superdome.

This new release of OpenVMS is based on a single-source code stream. Therefore, non-hardware-dependent enhancements will become available on both Integrity servers and AlphaServer systems with each release.

Now you can have the rock-solid availability, disaster tolerance, security, and scalability for which OpenVMS is known on your choice of Integrity or AlphaServer hardware. You can also add a new HP Integrity server running OpenVMS right into your existing cluster of AlphaServer systems. In addition, bringing applications running on OVMS for AlphaServer systems on to the Integrity platform can be as straightforward as recompile, relink, test, and go.

OpenVMS for HP Integrity servers and AlphaServer systems

» HP OpenVMS for Integrity servers and HP OpenVMS for AlphaServer systems Version 8.2 Operating Systems Software Product Description (SPD)
» New features and benefits for OpenVMS Version 8.2
» OpenVMS Hardware Support chart
» OpenVMS v8.2 post-FRS systems and options rollout
» OpenVMS Migration Software tools
» HP OpenVMS for Integrity servers and HP OpenVMS Alpha Version 8.2 QuickSpecs HTML | PDF
» HP OpenVMS Cluster software

Documentation for OpenVMS v8.2

» HP OpenVMS Version 8.2 Release Notes (PDF, 462KB)
» HP OpenVMS Version 8.2 Features and Documentation Overview (PDF, 429KB)
» HP OpenVMS Version 8.2 Upgrade and Installation Manual (PDF, 2030KB)
» Porting Applications from HP OpenVMS Alpha to HP OpenVMS Industry Standard 64 for Integrity Servers (PDF, 450KB)

General information

» HP OpenVMS Industry Standard 64 (OpenVMS I64) Business Practices for HP Integrity Servers (PDF)
» Software Public Rollout Reports for OpenVMS
» OpenVMS on Alpha to OpenVMS on Integrity layered product plans
» HP AlphaServer systems home page
» HP Integrity servers home page

http://h71000.www7.hp.com/openvms/integrity/products.html

Relevante Informationen: Layered Products

OpenVMS Alpha to OpenVMS I64 Layered Product Porting Schedule

OpenVMS Alpha Products Moving to OpenVMS I64

NOTE: Calendar Year, Calendar Quarter are used in this report. The approximate start date of each product release on the OpenVMS I64 platform is shown.

TCP/IP	H1'04		Subsequent versions planned for H2'04, H2'05
DFS (Distributed File System)	Q4'03		
Middleware			
ACMS		Q1'06	Oracle RDB, CDD, DBMS, Trace dependencies.
DECforms		Q1'06	Oracle CDD dependent
DECforms Web Connector		Q1'06	
TP Web Connector		Q1'06	ACMS dependent
TP Desktop Connector		Q1'06	ACMS dependent
RTR		Q1'05	
COM for *OpenVMS*		Q4'04	
DCE Family		Q4'04	
General e-Business			
XML	Q1'04		
Secure Web Server (based on Apache)	Q4'03		
Secure Web Brower (based on Mozilla)	Q1'04		
Simple Object Access Protocol (SOAP)	Q1'04		

http://www.hp.com/products1/evolution/alpha_retaintrust/download/ openvms_move.pdf

Relevante Informationen: Application Status Report

Sorted by PARTNER or SOLUTION

Partner name	Application name	Industry segment	HP Integrity OpenVMS v8.1	HP Integrity OpenVMS v8.2
2AB, Inc.	iLock Security Services	Professional Services	(Ready)	(Planned)
2AB, Inc.	orb2	E-infrastructure — Application integration and development		(3Q04)
Accelation Software Inc. (formerly EasyEntry Software)	OPSSUITE	E-infrastructure — Application integration and development	(May 2004)	(Planned)
ACCESS d.o.o.	CTI (Computer-Telephony Integration)	Communications — Enhanced network services (ENS)		(Planned)
ACCESS d.o.o.	Fakt-o-r	E-infrastructure — Application integration and development		(Planned)
ACCESS d.o.o.	KiD	Finance — Customer relationship management		(Planned)
ACCESS d.o.o.	SOVA	Finance — Customer relationship management		6.0 (3Q05)
ACCESS d.o.o.	Tourist Access	E-infrastructure — Application integration and development		(Planned)
achil.net SA (formerly Hirschmann Consulting AG)	HISO LOCO	E-infrastructure — Application integration and development		(Planned)

http://h71000.www7.hp.com/solutions/matrix/i64partner_A.html

Relevante Informationen:

NICHT auf Itanium OVMS portierte Produkte

Other HP OpenVMS Products Not Moving to OpenVMS I64

Product	Platform	Comment/Alternative
Allen-Bradley Data Highway (DAS)	VAX, Alpha	The replacement product is BASEstar Open DAS.
Allen-Bradley INTERCHANGE DAS	VAX, Alpha	The replacement product is BASEstar Open DAS.
Modicon DAS	VAX, Alpha	The replacement product is BASEstar Open DAS.
NT Disk Services	Alpha	Product support will continue on OpenVMS Alpha.
ALL-IN-1 Office Server	VAX, Alpha	The replacement product is Office Server. ALL-IN-1 will continue to be certified on new versions of OpenVMS through 2004, and at a minimum, will be supported through 2005. Office Server will continue to be available and supported on OpenVMS VAX and Alpha for the foreseeable future.
Siemens H1 DAS	VAX, Alpha	The replacement product is BASEstar Open DAS.
Enterprise Toolkit	VAX, Alpha	The replacement product is NetBeans, plus some plugins to enable distributed 3GL development.
MAILbus 400		The replacement product is PMDF-MTA.
ECP Data Collector	VAX, Alpha	The replacement product is a data collector that will be made generally available.

http://www.hp.com/products1/evolution/alpha_retaintrust/openvms/openvms_plans.html

HP OpenVMS Spezialisten

- **Name**
-
- Thomas Sonnentag
- Hartmut Schreiber
- Tobias Nicol
- Leo Plewa
- Hans Werner
- Florian Axmann
- Wolfgang Söhnchen
- Christian Kroner
- Manfred Kaselow
- Peter Eisenmann
- Helmut Ammer
- Michael Grünwald
- Thilo Lauer
- Christian Büchler
- Gabriele Hennig
- Franz J. Nienhaus
- Herbert Siek
- Friedhelm Meyer
- Martin Thalhammer

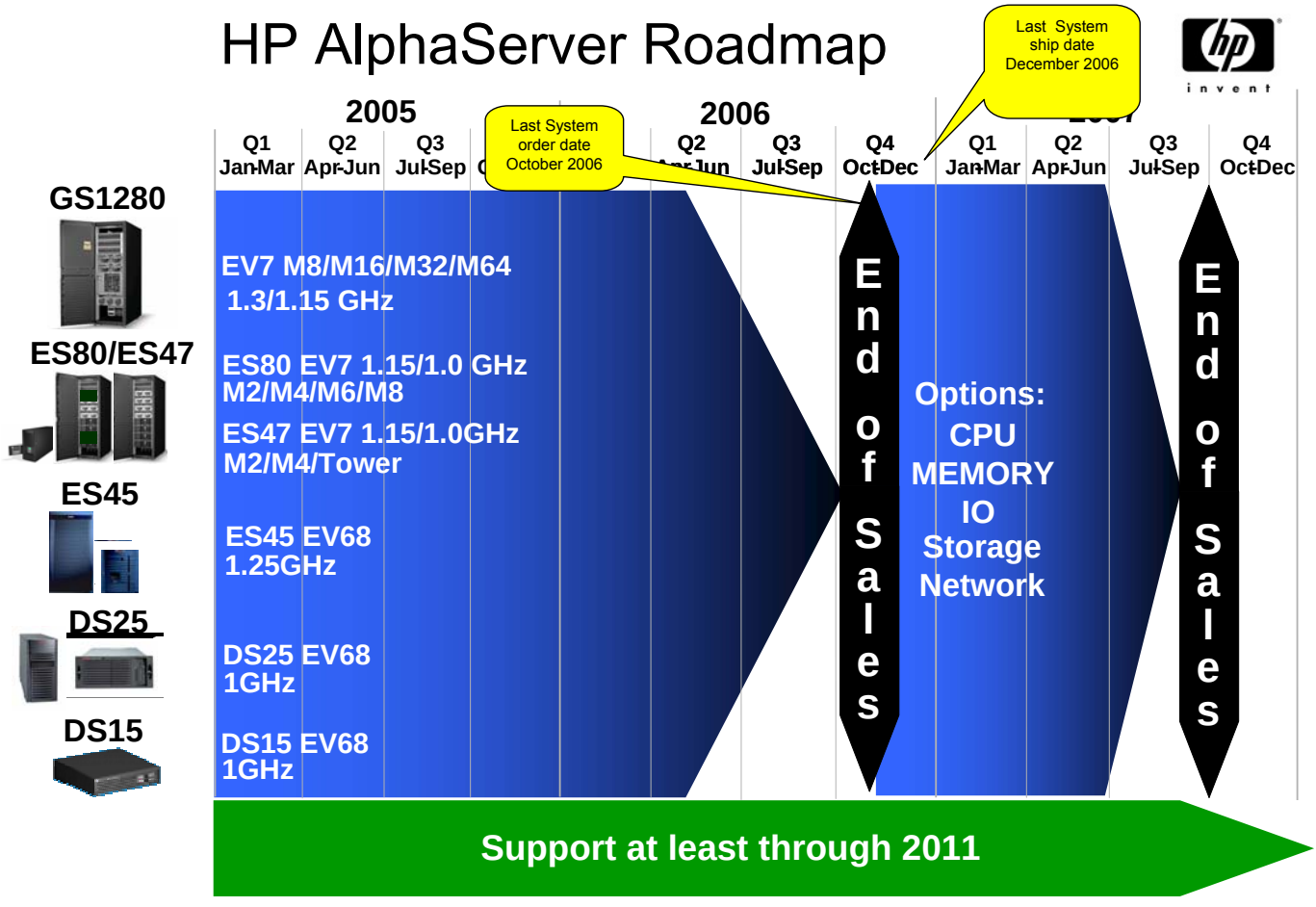
For further Information about OpenVMS on Integrity Servers

- General OpenVMS on Integrity Servers
  http://h71000.www7.hp.com/openvms/integrity/index.html
- Layered product rollout schedules
  http://h71000.www7.hp.com/openvms/os/swroll/index.html
- Layered products plans (products that either will not be ported or are under review)
  http://h71000.www7.hp.com/openvms/integrity/openvms_plans.html
- OpenVMS Partner plans
  http://h71000.www7.hp.com/openvms/integrity/partners.html
- Website for Whitepapers and technical documents:
  http://h71000.www7.hp.com/openvms/integrity/resources.html

Agenda

- OpenVMS Strategy
- OpenVMS Roadmaps
- Support, Pricing, Licensing
- Samba / Pathworks / Secure Server
- New Features in OpenVMS V8.2-1
- New Features in OpenVMS V8.3
- Moving Applications from Alpha to Integrity Servers

HP AlphaServer Roadmap

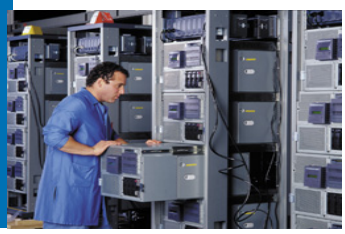
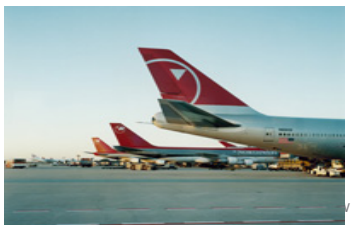
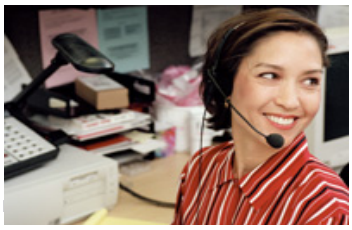


OpenVMS Business Profile

- OpenVMS Users: Millions of users around the globe
- OpenVMS Systems in use (VAX, Alpha, Integrity):300,000 in production
- New Customers: via Vertical Value Added Retailers (VARS)

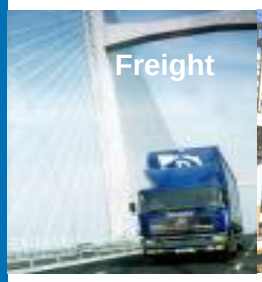
Market Profile:

- #1 rated in Healthcare
- 30% of mobile phones billed in the world
- 50% of the world's SMS transactions
- Significant world presence in top Exchanges: 6 new in 18 months
- Significant world presence in Lottery systems
- Leading supplier to Semiconductor manufacturers worldwide


Transportation

Increased Focus



Key Customers – Austrian Rail, EZPass (New York), Fast Ferries (Greece), Stena Ferries (Sweden), Florida State Tolls, South Eastern Freight, Telintrans (France), MOR (China), Indian Railways, Auto Route (France), Start Track (Australia), ECT Rotterdam, Dubai Port Authority

Some Major projects

- Start Track/Australian Post - distribution integration
- Pan Europe Animal Tracking
- ECT/Dutch Rail - Port integration
- SNCF Rail - eTicketing RFP
- Indian Rail – RFID, DR/DT and eTicketing projects

OpenVMS's Strategic Investment Areas

- Continuation of the Itanium processor family:
  - New systems, Performance and Scalability enhancements
- Support for current and next generation storage architectures
- System and Server Management S/W: OpenView, Global WorkLoad Manager, System Insight Manager,…
- Virtualization: Clustering, Disaster Tolerance, Virtual Machine, Utility Pricing,…
- Industry Standards: Integrity, PCI, PCI-X, Kerberos, IPsec, IPv6, LDAP,…
- Open Source: Apache, Samba, Netbeans, SNORT,WBEM
- Application Integration: Web Services,.NET, J2EE, …
- ISV support: UNIX portability, early access, porting assistance, WhitePapers, workshops, etc
- Our employees: training, training, training

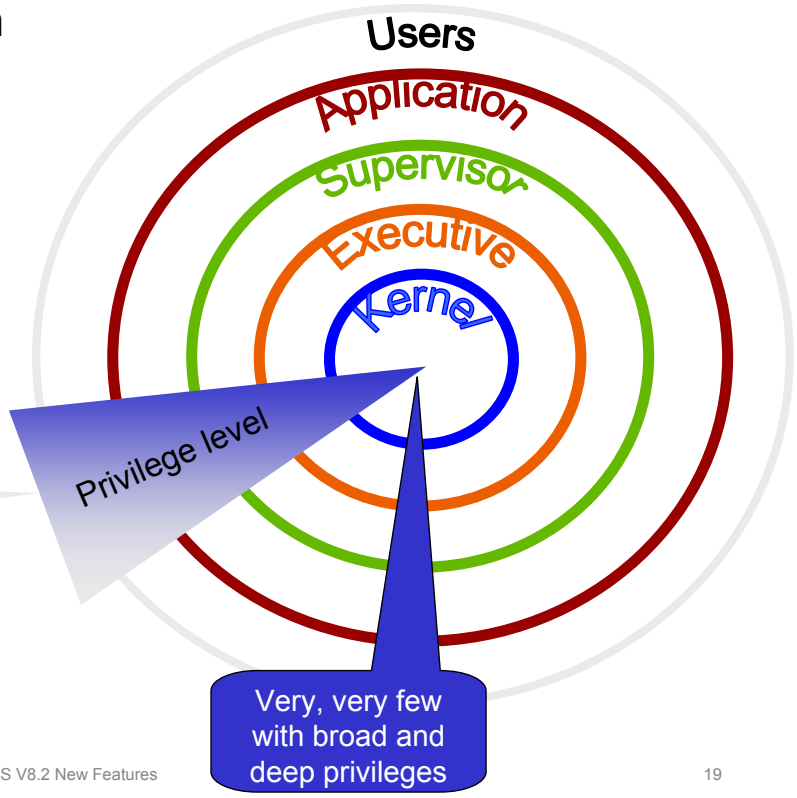
OpenVMS = Secure by Design

Embracing industry standard security technologies for secure and seamless enterprise on a C2 compliant, Virus resistant highly available platform.

Network security	Data Integrity and confidentiality	Intrusion detection and analysis	Host Access
Support of Industry Standard Network Security tools • Kerberos • OpenSSL • SSH • IPSEC • Secure Delivery	Support Industry Standard encryption • CDSA • GnuPG • Fully integrated AES encryption for OpenVMS (Securing Backups)	• Host Based Cluster wide intrusion detection • Comprehensive Audit analysis and reporting • SNORT	• Single Security Domain across host or cluster • methods • Fine grain privileges • OpenView integration • Support for multiple authentication (LDAP, Kerberos)

OpenVMS security
Many layers – single domain

- Each layer requires its own privileges
- A breach in any one layer does not compromise any other layer
- Result:
  - Maximum protection
  - Minimum worry



Agenda

- OpenVMS Strategy
- **OpenVMS Roadmaps**
- Support, Pricing, Licensing
- Samba / Pathworks / Secure Server
- New Features in OpenVMS V8.2-1
- New Features in OpenVMS V8.3
- Moving Applications from Alpha to Integrity Servers

OpenVMS for Integrity Servers Rollout Plan

February 2005

Version 8.2

- rx1620
- rx2620
- rx4640 up to 8 CPU's
  All speed variants supported on these platforms

CPU: Deerfield, Madison6&9

Note: *No McKinley support*

Note: OpenVMS will not be supported on the rx5670

Sept. 2005

Version 8.2-1

- rx8620
- Superdome

CPU: Madison 9

16 CPU's per nPar

mx2 not supported

Pre-enabled support for Montecito updates of rx1620, rx2620, rx4640 (available Q1 2006)

H1 2006

Version V8.3

System upgrades:
- rx1620
- rx2620
- rx4640

Montecito support:
- rx7620
- rx8620
- Superdome

New 4P, 8P server & chipset

CPU: Montecito *Dual Core*

12-18 months After V8.3

Version V8.4

New Integrity Platforms

All products, dates, and figures are preliminary and are subject to change without notice.

OpenVMS Integrity Option Rollout Plan

February 2005

Version 8.2

❖ **Storage**
- U160 & U320 SCSI (non-shared)
- Fibre Channel
- SmartArray Backplane RAID (mid-2005)

❖ **Storage Solutions**
- HSG, EVA, MSA1000, XP

❖ **LAN**
- 5701(10/100/1000)
- 8255x (10/100/1000)

❖ **Graphics**
- ATI Radeon 7000 equiv.
- ATI Radeon 7500/2D & 3D

H1 2006

Version 8.3

❖ **Storage**
- U160 & U320 SCSI (non-shared)
- Fibre Channel
- SmartArray Backplane RAID

❖ **Storage Solutions**
- HSG, EVA, MSA1000, XP

❖ **LAN**
- 5701(10/100/1000)
- 8255x (10/100/1000)

❖ **Graphics**
- TBD

All products, dates, and figures are preliminary and are subject to change without notice.

OpenVMS V8.2

- Version 8.2 Highlights
  - System and Hardware Support
  - General User Features
  - Performance & Scalability Infrastructure Changes
  - RAS features
  - Security Enhancements
  - More UNIX Portability features
  - Networking Enhancements
  - System Management

"OpenVMS continues to be a strategic platform for HP. This is demonstrated by the new release of OpenVMS Version 8.2..."

Ann Livermore
Executive Vice President
Technology Solutions Group

Upgrading OpenVMS Alpha & Integrity Environments

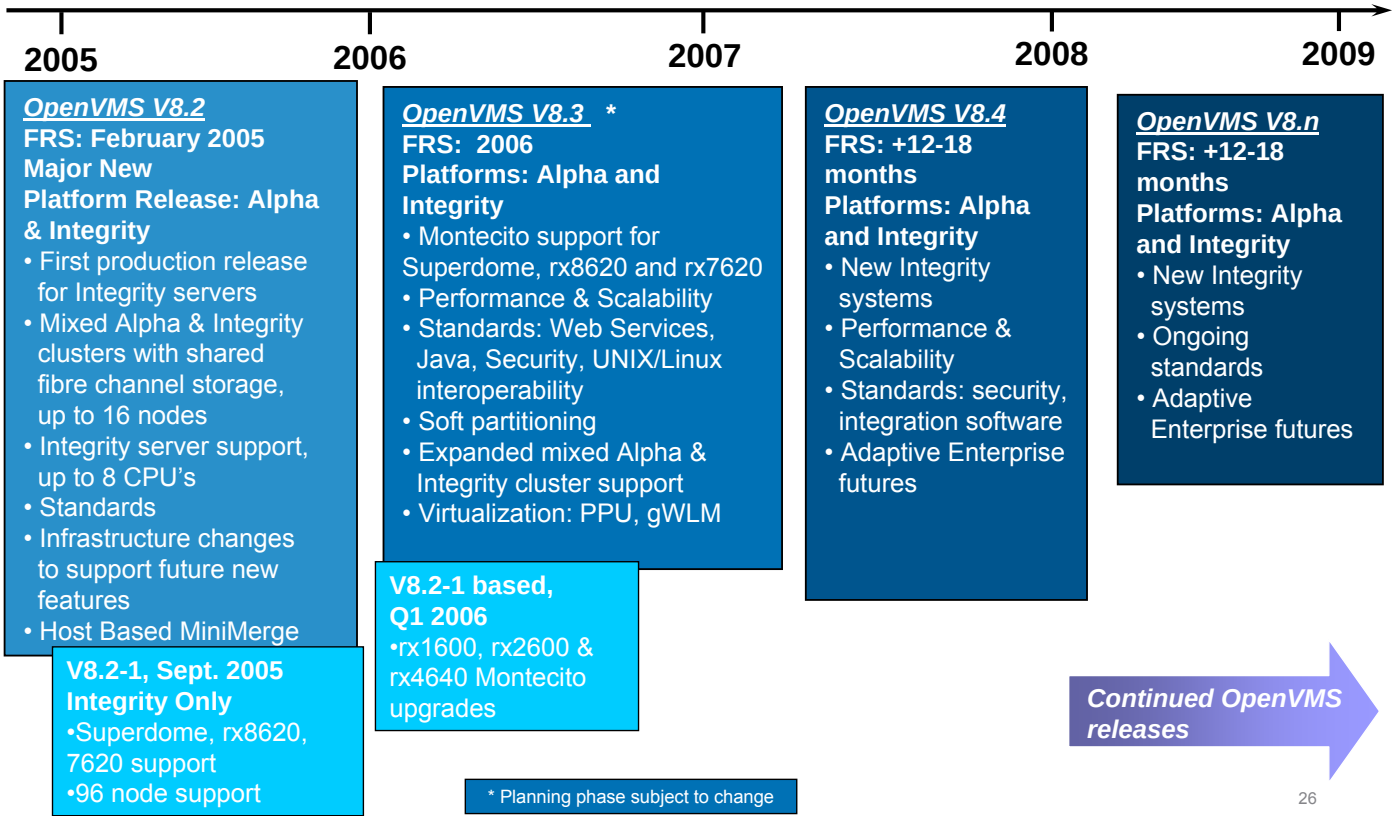
- System Software Upgrade Paths to V8.2
- Alpha Direct Upgrade Paths:
  - V7.3-1 to V8.2
  - V7.3-2 to V8.2
- Integrity Direct Upgrade Paths:
  - Fresh install required
- Cluster Upgrade Paths – Alpha & Integrity
  - Cluster rolling upgrades are supported from V7.3-2
  - Warranted pairs are V8.2/V8.2 and V8.2/V7.3-2

OpenVMS V8.2-1 for Integrity Servers

Shipping Sept 2005

- OpenVMS support for Mad9 cell-based systems including:
  - rx8620: 4 cells, up to 16 CPUs
  - rx7620: 2 cells, up to 8 CPUs
  - Superdome: Hard partitions of up to 16p/4 cells
  - Primary differences between SX1000 and the low end systems supported in 8.2: More I/O slots, More CPUs, and different architecture
- 96-node cluster support

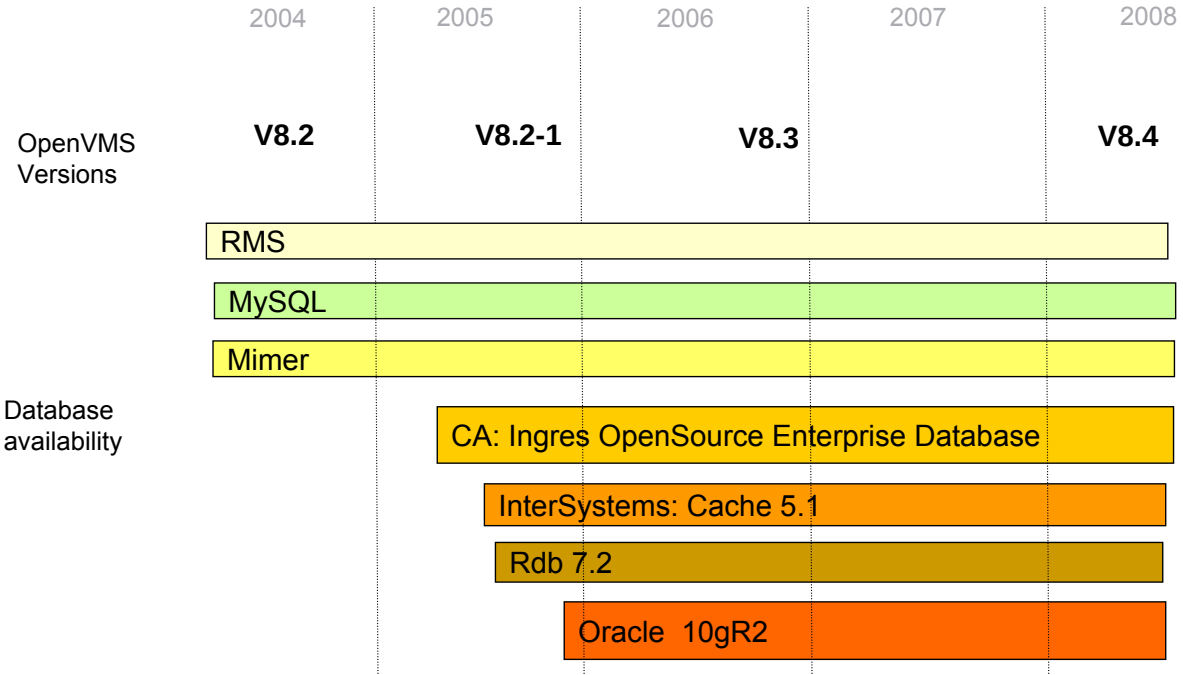
HP OpenVMS Operating System Rolling Roadmap



OpenVMS ISV solutions update

- **871** applications from **401** partners
  - **325** solutions already ported
- Recent H1 2005 application releases:
  - Mimer RDBMS
  - Compuware Uniface
  - Process Software *Precisemail* Anti-SPAM
  - BEA BMQ 5.0 for OpenVMS I64
  - IBM WebSphereMQ 5.3 for OpenVMS I64
  - BEA WebLogic Server 8.1 Sp3 for OpenVMS I64
- Additional H2 2005 application releases expected:
  - Sophos Anti-Virus
  - Savant PULSE Blood Donor solution
  - Oracle 10gR2
  - Oracle Rdb V7.2
  - InterSystems Cache'
  - Computer Associates Ingres r3

OpenVMS Integrity Database Porting Timeline



Oracle Rdb Roadmap

Development Stream	Q1 CY05	Q2 CY05	Q3 CY05	Q4 CY05	Q1 CY06	Q2 CY06	Q3 CY06	Q4 CY06
Rdb 7.0 VAX & Alpha	7.0.8 Maintenance Release + VMS 8.2		7.0.8.1 Maintenance Release		Maintenance Release		Maintenance Release	
Rdb 7.1 Alpha	7.1.4 Maintenance Release + VMS 8.2		7.1.4.1 Maintenance Release		Maintenance Release		Maintenance Release	
Rdb 7.2 IPF & Alpha	Beta 1	Beta 2	Beta 3	V7.2 Production Release	V7.2.0.1 Maintenance Release	V7.2.0.2 Maintenance Release	V7.2.1.0 Feature Release	V7.2.1.1 Maintenance Release

Oracle on OpenVMS

Now

- **8*i*R3(8.1.7.4) w/OPS**
- **9*i*R2(9.2.0.5) w/RAC**
  - **20% perf boost**
- **10*g*R1(10.1.0.2) w RAC**

Q3CY05

- **9.2.0.6**

Q1CY06

Future

**9*i*/10*g* patchsets

- **10*g* (9.0.4)Split Configuration**
- **11.0.3 w/8.1.7 (Split Configuration)**
- **11.5.8 w/8.1.7 (Split Configuration)**
- **10*g* (10.1.x) Split Configuration**

- **VMS 7.3, 7.3-1, 7.3-2, 8.2 w/8*i*R3**
- **VMS 7.3, 7.3-1, 7.3-2, 8.2 w/9*i*R2**
- **VMS 8.2 10*g***

- **Split Configurations allow backend database to reside on OpenVMS. Apps must be on supported middle-tier: HP-UX PA-RISC, Tru64 UNIX, Linux, Windows**

hp OpenVMS I64 Operating Environments

Operating Environment Packaging

- **Introduce OpenVMS packaging consistent with HP-UX OEs**
- **Provides a 3 tier pricing paradigm (good, better, best)**

OpenVMS I64 Operating Environments:

•Foundation OE (FOE) Base

– An **internet ready**, feature rich feature set for **price sensitive** customer

•Enterprise OE (EOE)

– A **higher cost** feature set that enhances the customer experience in areas of **manageability, single system availability and performance**

•Mission Critical OE (MCOE)

– Has the **highest cost**, but delivers the ultimate customer experience in terms of **multi-system availability and workload management**

HP OpenVMS Operating Environments for Integrity Servers

OpenVMS I64 Mission Critical Operating Environment (MCOE)

OpenVMS I64 Enterprise Operating Environment (EOE)

OpenVMS I64 Foundation Operating Environment (FOE)

- OpenVMS Operating System
- **OpenVMS Unlimited User Licensing**
- TCP/IP Services for OpenVMS
- DECnet-Plus for OpenVMS End System
- DECwindows Motif for OpenVMS
- DECnet IV
- Performance Data Collector
- OpenVMS Web Agents
- OpenVMS
- WEBM/CIM

Integration Technologies

- Secure Web Server
- Secure Web Browser
- SDK for Java Platform
- XML Technology
- NetBeans
- Simple Object Access Protocol (SOAP) Toolkit
- Kerberos
- Enterprise Directory
- CDSA
- SSL
- OpenSource Tools

Add to Foundation:

- RMSjournaling
- VolumeShadowing
- DECram
- OpenVMS Mgmt Station
- Availability Mgr
- OpenView Performance Agent

Add to Enterprise:

- OpenVMS Clusters
- OpenVMS RTR Backend

Easier to order

Easier license management

Straight forward installation of OE's from a single DVD

Simpler support contracts

➔ higher customer satisfaction

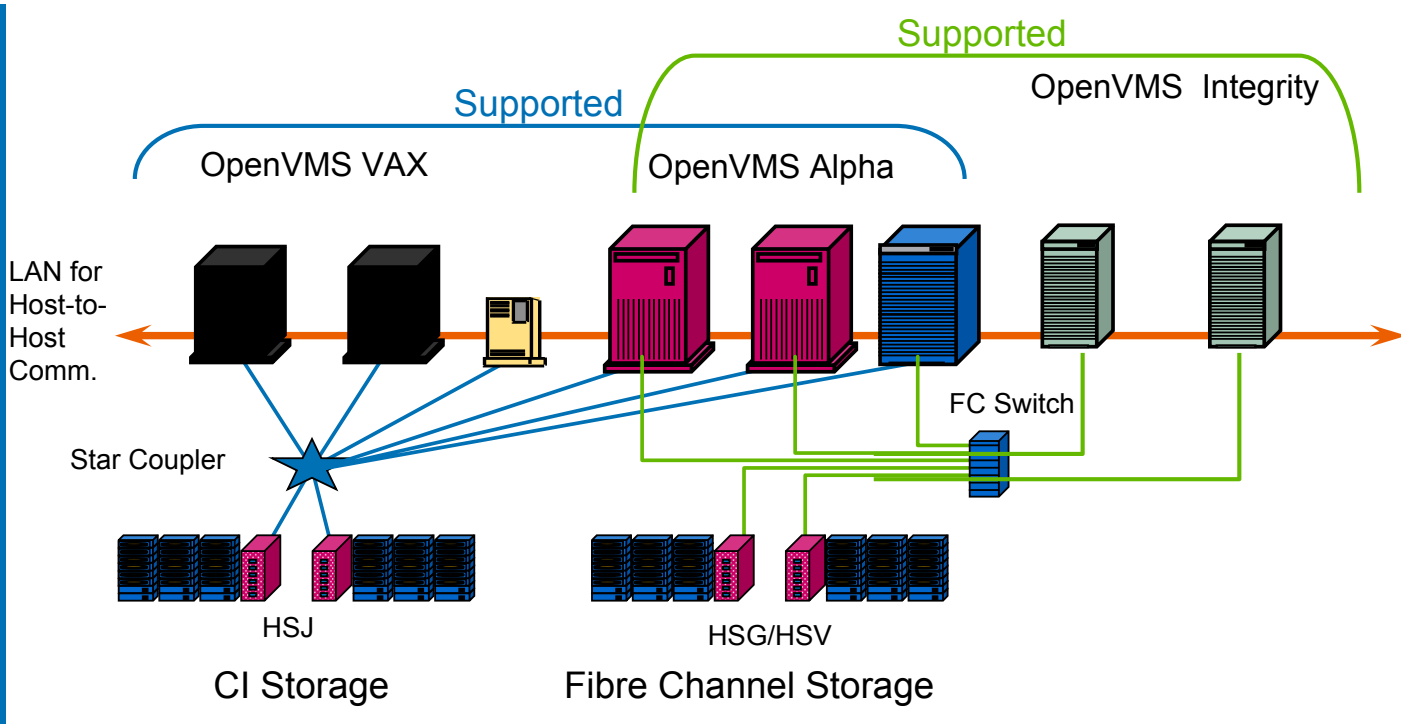
One DVD media for all 3 OE's

OpenVMS Integrity Layered Products Phase Rollout Plan

Available Today	Q4/2005	H1 2006

• Compilers:
  • BASIC
  • C
  • C++
  • COBOL
  • Fortran
  • Pascal
• DECset tools
• DCE
• DQS
• FMS
• OpenView OVO Agent
• RAID Software
• Archive Backup System
• Data Cartridge Server
• Disk File Optimizer
• Hierarchical Storage Manager
• Media Robot Utility
• **Reliable Transaction Router**
• Save Set Manager
• **X.25**
• **HP OpenVMS Migration Software**
	•Datatrieve
	•DEC/EDI
	•Global Workload Manager (gWLM)
	•**BaseStar Family**
	  •**BASEstar Open Server**
	  •**Omni API**
	  •**Omni MMS**
	  •**DECoasp/H1**
	  •**DECosap/ AP**
	  •**Siemens S7**
		•ACMS (including TP Web & TP Desktop Connectors)
		•DECforms
		•GKS
		•**IBM Interconnect Family**
		•**Samba evaluation kit**
		•**TDMS**
		
		Not Porting
		•**Advanced Server**
		•**Storage Library System (SLS)**

OpenVMS Clusters Facilitate Integrity Adoption



NOTE: Support for VAX and Integrity mixed environment is supported for migration purposes only.

OpenVMS Integrity Clusters Rollout Plan

Feb. 2005

Version 8.2

- ❖Up to 16 Nodes
  - ▪ Expanded Functionality
  - ▪ Larger node count qualification during 2005
- ❖Cluster Interconnect
  - ▪Gigabit Ethernet
  - ▪10/100 Ethernet

V8.2 (Warranted)
V8.2 & V7.3-2 Alpha (Warranted)

H1 2006

Version 8.3

- ❖Full Functionality
  - ▪ Cluster Satellite Boot
- ❖Cluster Interconnect
  - ▪ Gigabit Ethernet
  - ▪ 10/100 Ethernet
  - ▪ 10 Gigabit Ethernet*
  - ▪ Next-Generation Interconnect – post V8.3

V8.x (Warranted)
V8.x & V8.2 & V7.3-2 Alpha (Migration)

* - If HP Program is Ready

All products, dates, and figures are preliminary and are subject to change without notice.

OpenVMS Virtual Server Environment Roadmap

2005

- •Galaxy Alpha w/OpenVMS 8.2

2006

- • Global Workload Manager V1.0, Integrity and Alpha Q4 2005
- • Galaxy Integrity (no shared memory)
- • iCAP - Instant Capacity V1.0
- • TiCAP - Temporary Instant Capacity V1.0
- • HPVM – HP Virtual Machine

2007

- • Global Workload Manager V2.0, Integrity and Alpha
- • PPU – Pay Per Use V1.0 Active CPU & Percent CPU

2008

- • Firm Partitions

All implementations Integrity only unless otherwise specified

HP VSE for HP OpenVMS Roadmap

HP Virtual Server Environment (VSE) - certified and integrated with key partners

Control	Availability	Partitioning	Utility Pricing
✓ Systems Insight Manager	✓ OpenVMS Mixed Architecture Clusters (all nodes active) ✓ Disaster Tolerant Clusters, extends to 800 Km ✓ Volume Shadowing ✓ Availability Manager	✓ nPars (Hard Partitioning) ✓ vPars (Soft Partitioning) ✓ Partition Management SW ✓ Class Scheduler	✓ AlphaServer Instant Capacity

✓ global WLM

Shipping 12/05

✓ HP Integrity Virtual Machines (VM) and Firm Partitioning

✓ PPU – all CPUs active and Percent CPU

✓ iCAP and TiCAP for Integrity

OpenVMS Storage HW Roadmap

2005 | 2006 | 2007 | 2008 | 2009

MSA Storage Family
- Support of MSA1500 (H1 2005), next MSA1000 (H1 2005)

EVA Storage Family
- New EVA Array Support (H1 2005) (Includes new Continuous Access active/active support)

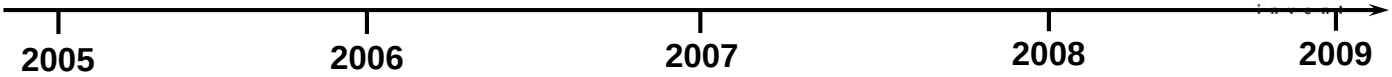
XP Storage Family
- Ongoing support of larger cluster configs
- Support of XP12000 (H1 2005)

HSG80 Support
- Support for ACS 8.8x final firmware updates

Storage Adapter Support
- U320 Backplane RAID (SmartArray) (Alpha Q1 2005, Integrity Server mid-2005)
- LP10000 Dual Channel FC – Q4 2004 (Alpha)

OpenVMS Integrity Storage Support (2005 and beyond)
- FC support to connect into existing SANs at V8.2
  - EVA, MSA, EMA and XP Solutions
- SmartArray support identical to Alpha in mid-CY2005
- Direct-Attached SCSI support ONLY for internal and non-shared external storage
- Utilize adapters that will be supported by multiple OS environments

OpenVMS Storage SW Roadmap



Media Robot Utility
V1.8: (Q1 2005)
•OpenVMS V8.2 Support
•Integrity & Alpha Support

Disk File Optimizer V2.9:(Q1 2005)
•OpenVMS V8.2 Support
•Integrity & Alpha Support

Save Set Manager
V1.8: (Q1 2005)
•OpenVMS V8.2 Support
•Integrity & Alpha Support

Hierarchical Storage Manager V4.3:(Q1 2005)
• OpenVMS V8.2 Support
• Integrity & Alpha Support

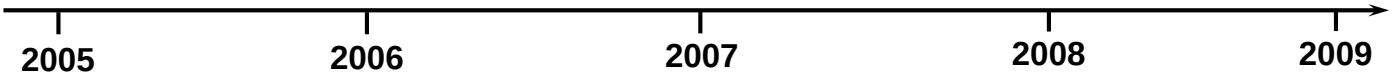
DCSC V3.3 (Q1 2005)
• OpenVMS V8.2
• ACSLS PL4 Transfers

RAID SoftwareV3.0: (Q1 2005)
• OpenVMS V8.2 Support
• Integrity & Alpha Support
• Support PCSI installation Alpha & Integrity

MRU, DFO, HSM, SSM, DCSC & RAID Continued Releases.

Integrity, Alpha, & VAX Versions

OpenVMS Enterprise Backup Solutions Roadmap



HP OpenView Data Protector Enhancements
• Post V5.5 Enhancements –
  • Oracle, Oracle Rdb Support, port to Integrity (mid-2005)
  • Standalone restore, server support (TBD)

Legato NetWorker Enhancements
• ODS5, Oracle, Oracle Rdb (Shipped mid-2004)
• Integrity port (Q1 2005)
• Standalone Support OpenVMS Server Support (TBD)

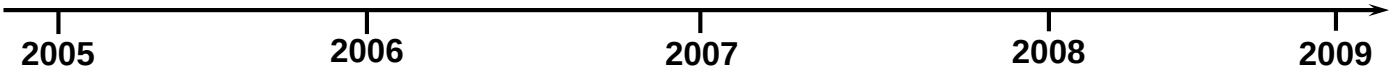
Archive/Backup System V4.3 (Q1 2005)
•Support for OpenVMS V8.2 (Alpha and Integrity)
• New device support
• Bug fixes

Minor Features, New Tape Support, New O/S Support

Storage Library System V2.9J (Q1 2005)
• Support for OpenVMS Alpha V8.2
• No Integrity port

Maintenance only - New O/S Support, No New Tape support, No New Features, No Integrity port

OpenVMS LAN HW Roadmap

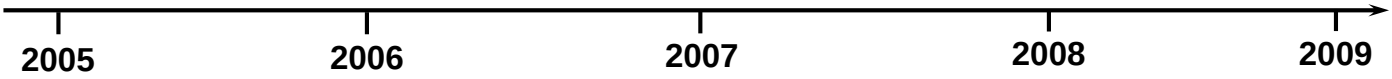


OpenVMS V8.2
- Gigabit Ethernet support (Alpha and Itanium)
- LAN Fail-Over improvements
- Duplex Mode Mismatch notification

OpenVMS V8.3
- Itanium Network Boot support
- VLAN support
- 10 Gigabit NIC support (Integrity Servers only)

OpenVMS V8.x
- RNIC Support

OpenVMS Security Roadmap



OpenVMS V8.2
- ACME Login EAK wt LDAP
- Kerberos 1.2
- OpenSSL 1.2
- CDSA (Secure Delivery SDK)
- Buffer Overflow Protection (Integrity Servers only)

OpenVMS V8.3 *
- Production Quality ACME Login wt LDAP & Kerberos Agents
- CDSA/Secure Delivery
- VMS Encrypt Integration
- IPSEC ships as part of TCP/IP
- Kerberos version update

OpenVMS V8.4
- ACME Login is the default login with LDAP & and Kerberos Agents
- Full function Secure Delivery

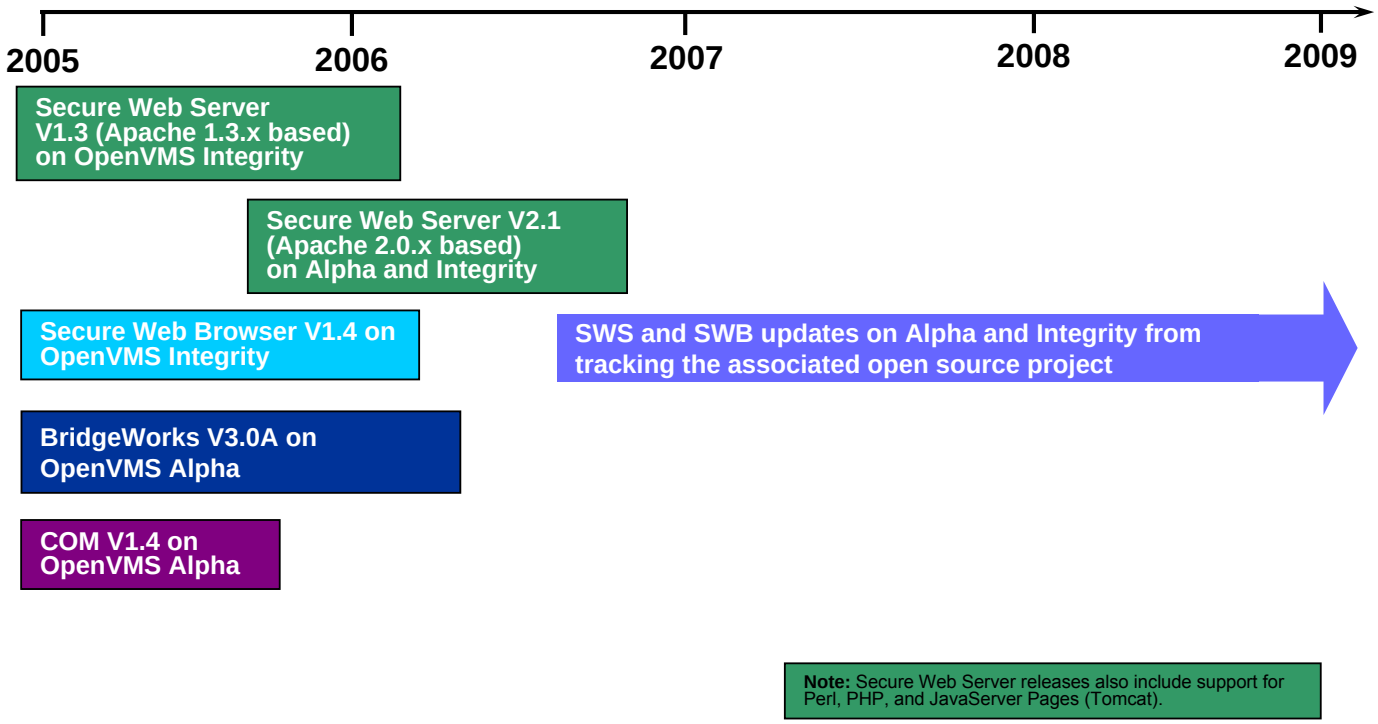
OpenVMS V8.n (Futures)
- Smart Card
- Kerberized SSH
- IPfilter

Open Source Security Tools
- Stunnel (secure tunnel)
- GnuPG V1.2.4

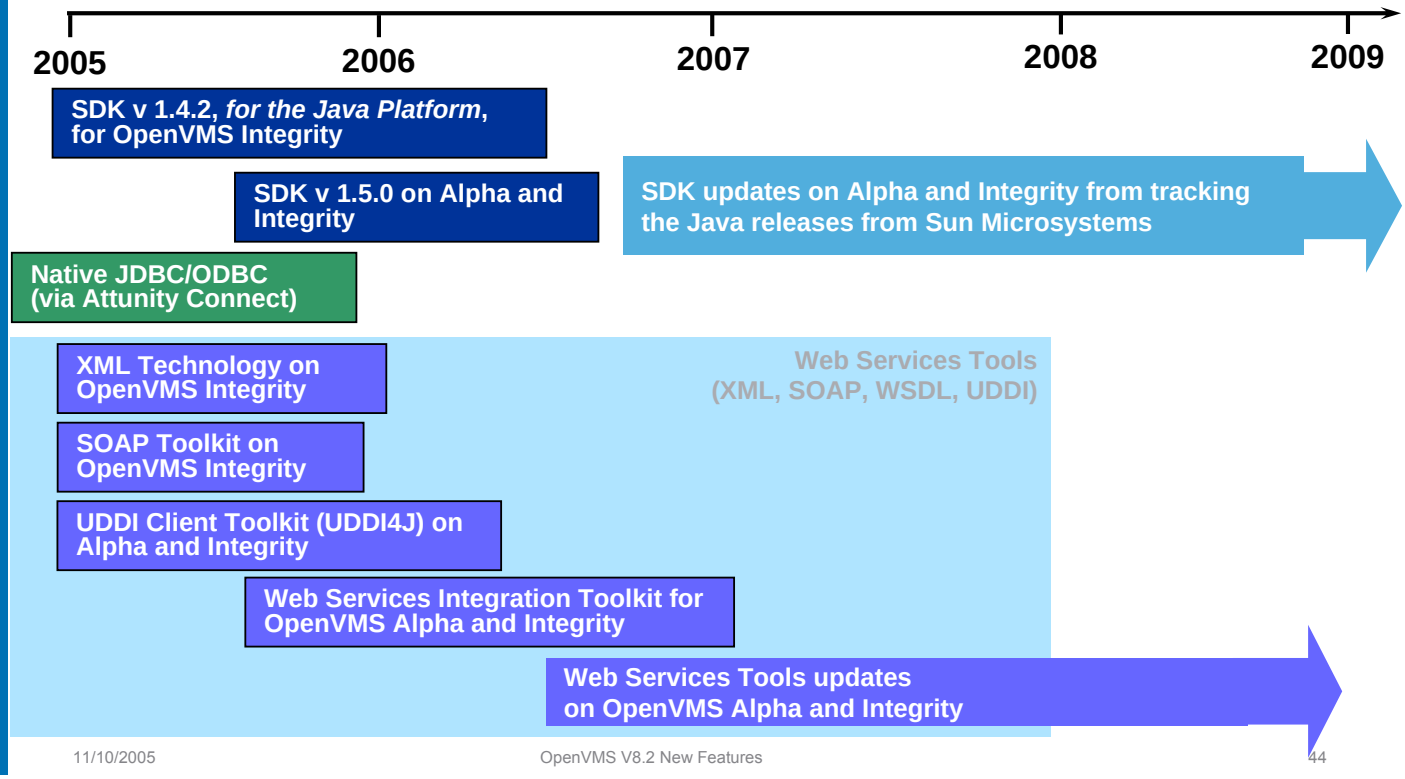
Open Source Security Tools
- SSLDump
- SNORT for Network Intrusion Detection

IPSEC EAK

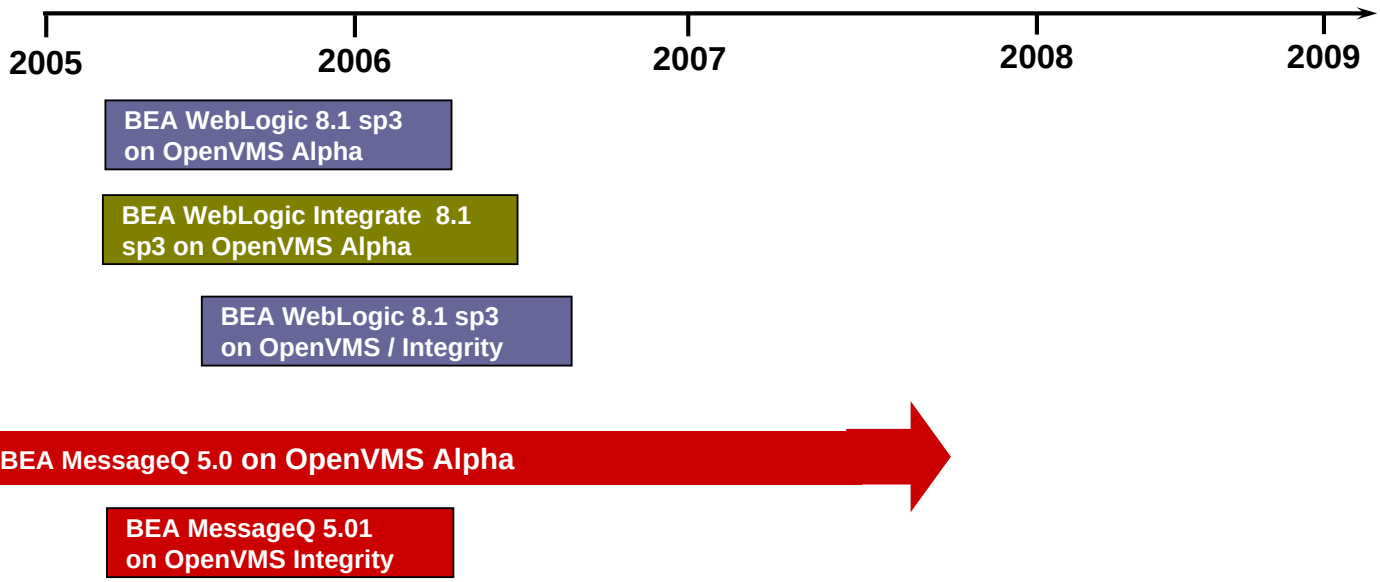
OpenVMS eBusiness and Integration Technologies



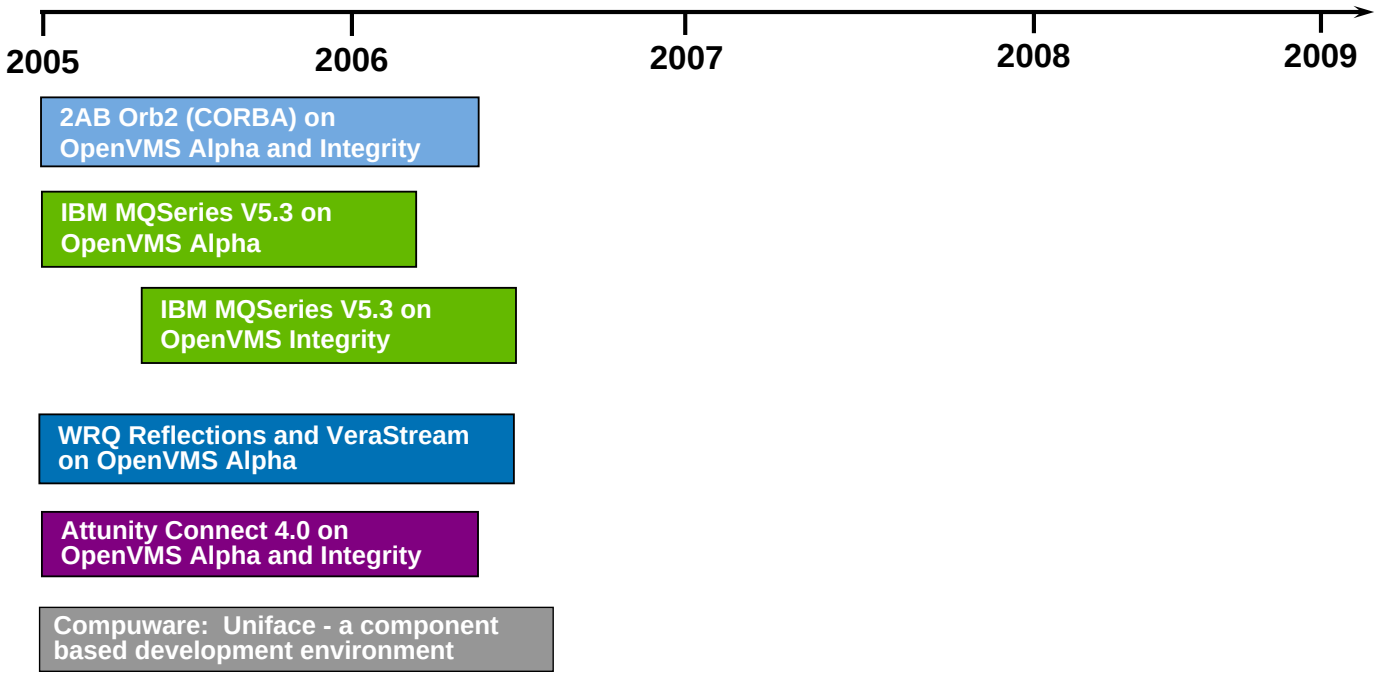
OpenVMS eBusiness and Integration Technologies



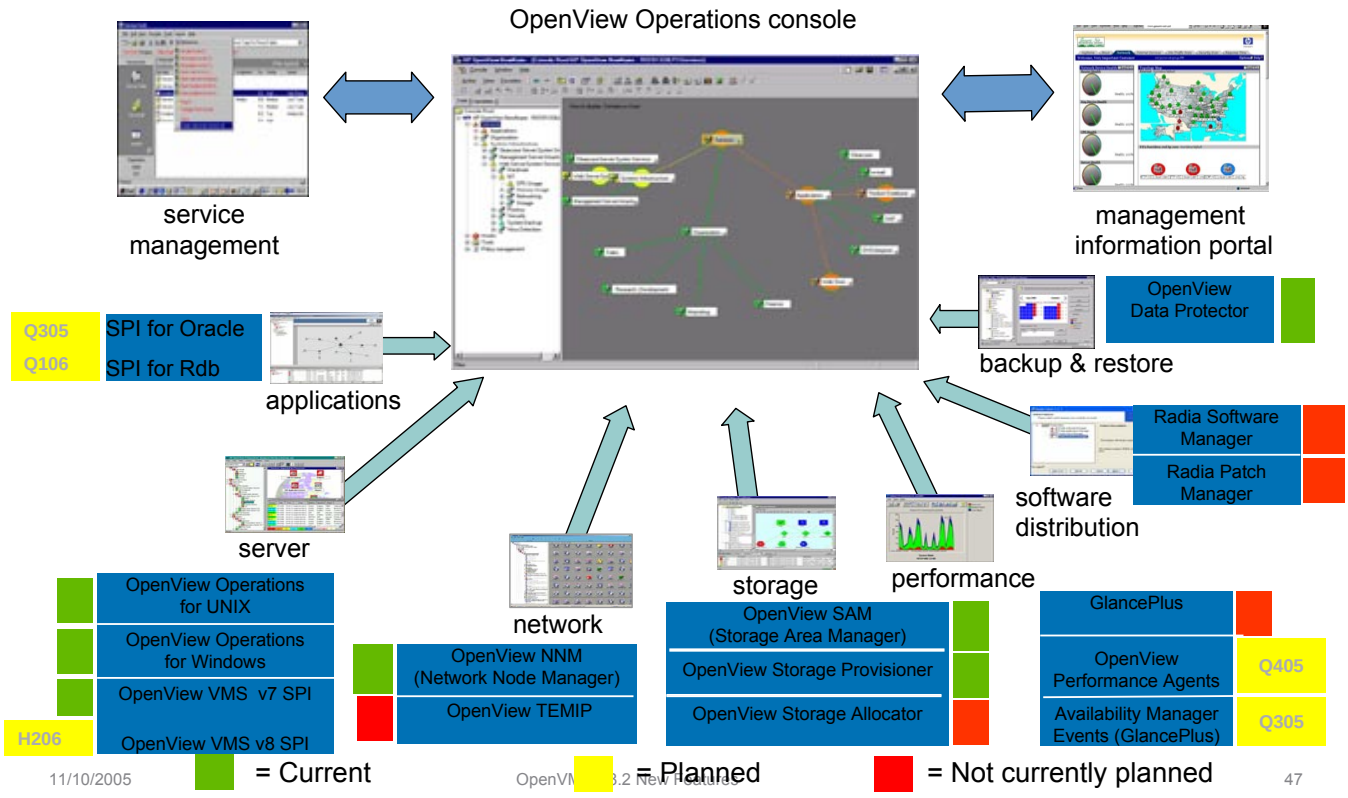
OpenVMS eBusiness and Integration Technologies



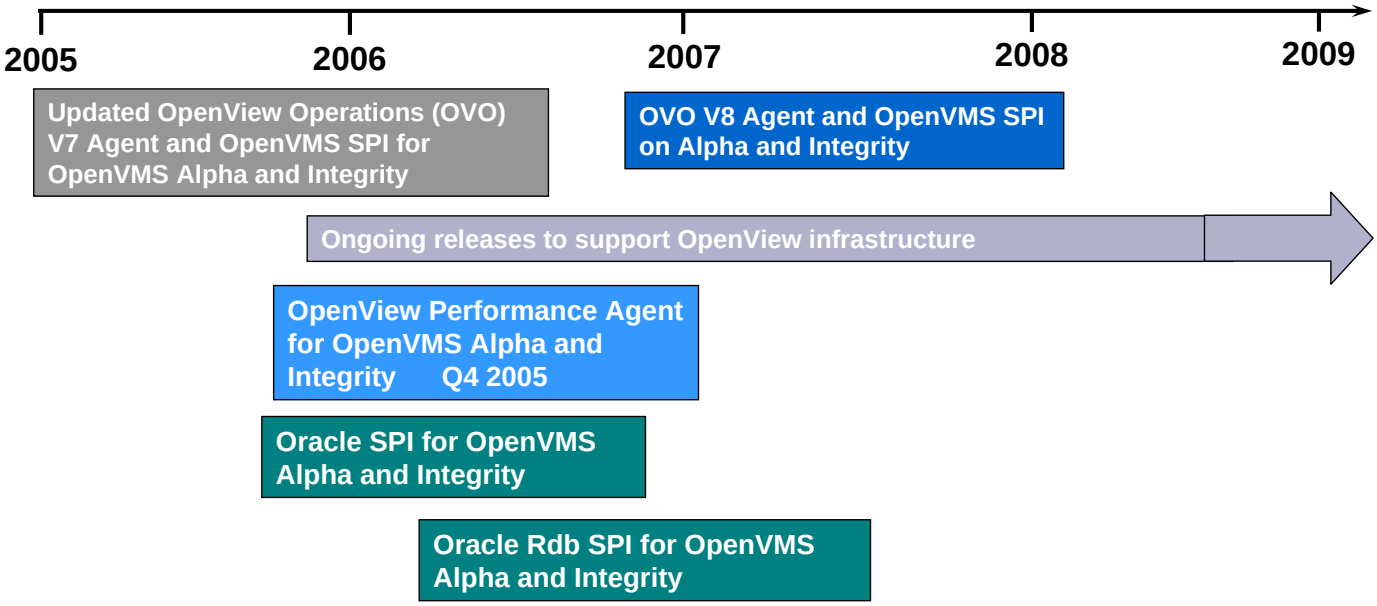
OpenVMS eBusiness and Integration Technologies



HP OpenView Portfolio Roadmap

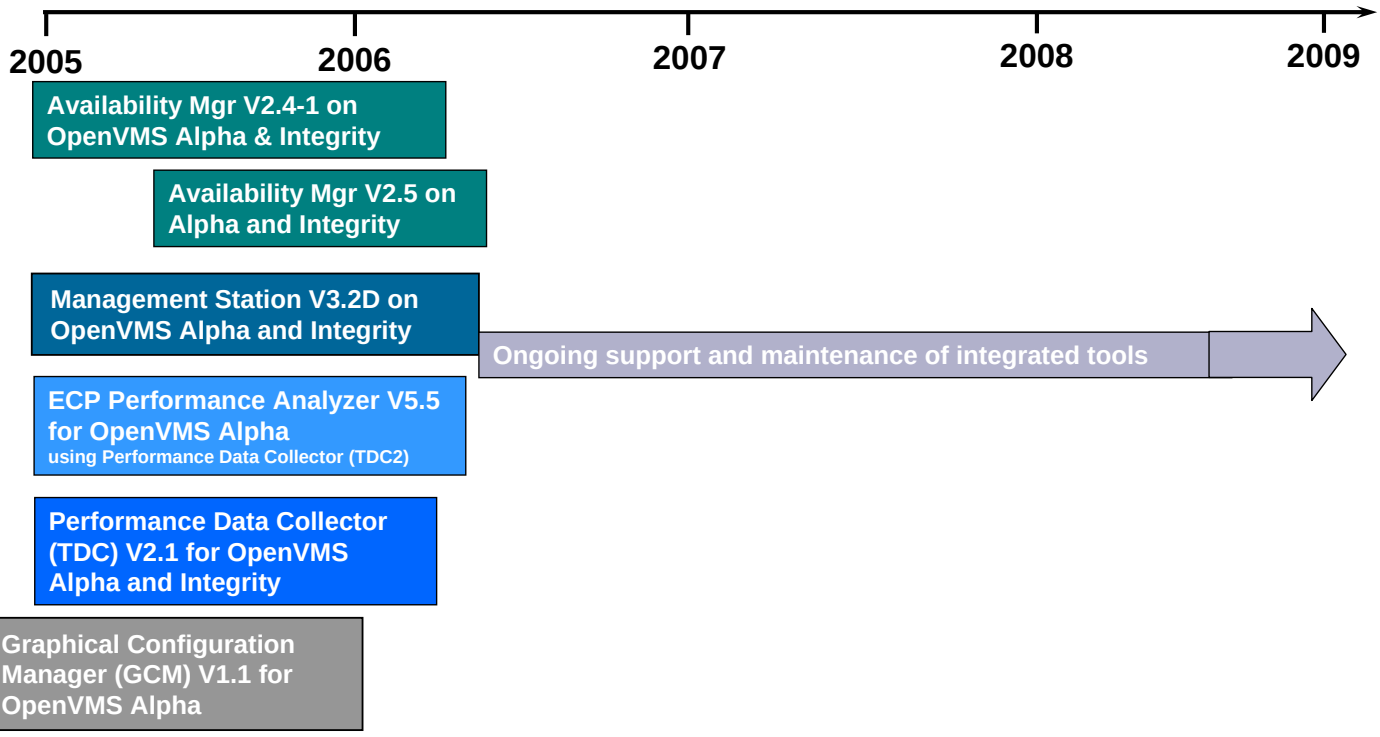


OpenVMS OpenView Roadmap

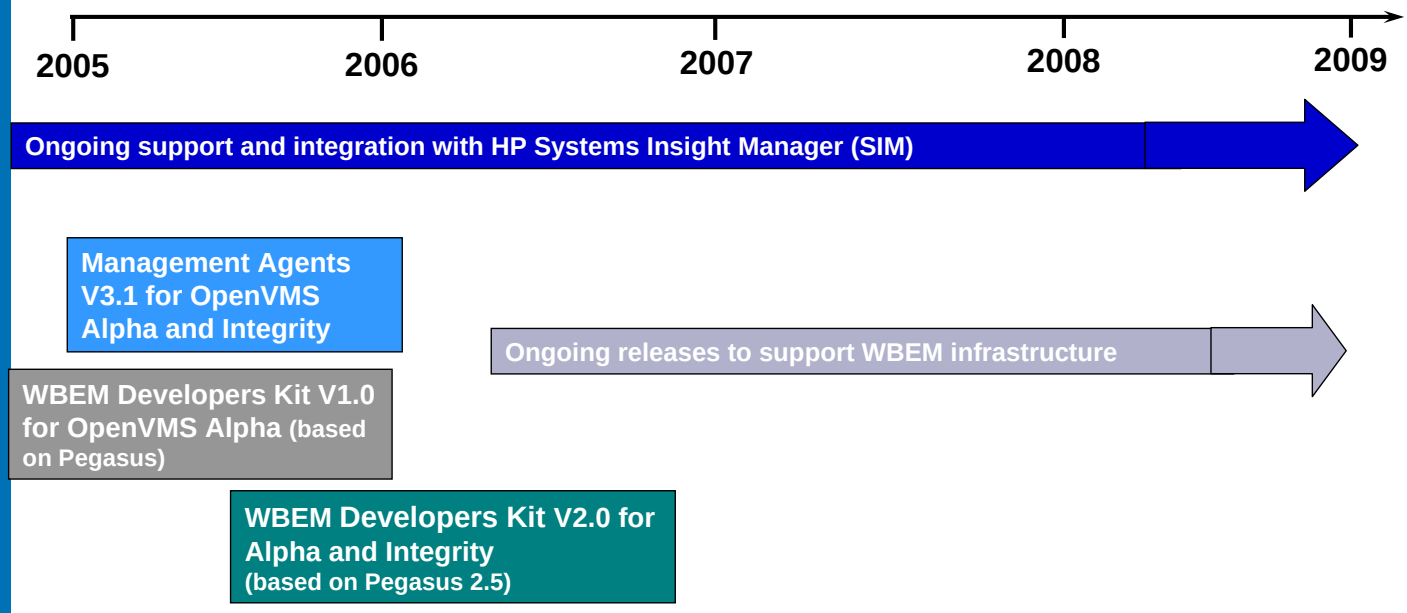


Note: OVO Agents for OpenVMS VAX and older OpenVMS Alpha versions are available from AppMind.

Tools Integrated with OpenVMS



OpenVMS Server Management



TCP/IP Services for OpenVMS

2005 | 2006 | 2007 | 2008 | 2009

TCP/IP V5.5 on Alpha & Integrity - OpenVMS V8.2/V8.2-1
- NFS symbolic links
- Further performance enhancements
- Libpcap library and TCPDUMP updates
- IPv6 configuration enhancements
- V5.5 ECO1 due Oct CY05

TCP/IP V5.6 June CY06 - Alpha & Integrity for OVMS V8.3
- DNS /BIND 9 Resolver & V9.3 Server
- NFS enhancements
- FTP performance improvements
- Security modifications
  - DNS security extensions
  - NTP sec update (SSL)
  - SSH upgrade w/Kerberos
- Mail improvements
- TELNET Server Device limit
- IPV6 support – LPD & TELNETSYM
- TCPIP$CONFIG (failSAFE) upd
- Improved Mgt Utilities (ifconfig)

TCP/IP (Next)
Continued focus on Networking enhancement to support interoperability, connectivity, discovery, and security

TCP/IP V5.4 ECO 5 Now available!

IPsec available post V5.6 in future release.

DECnet & X.25 Product Roadmap

2005 | 2006 | 2007 | 2008 | 2009

DECnet

Continued support for DECnet Phase IV and DECnet-Plus on pending OpenVMS Version V8.2

V8.2 DECnet Phase IV on Alpha & Integrity (February 2005)

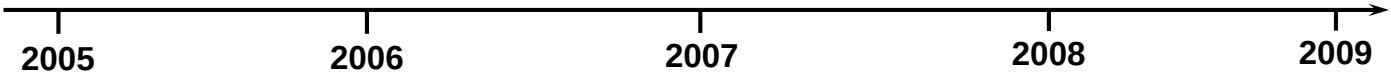
V8.2 DECnet-Plus on Alpha & Integrity (February 2005)

X.25

Continued support for X.25 on OpenVMS

V 2.0 X.25 Q2 2005 (Alpha and Integrity)

Advanced Server, PATHWORKS for OpenVMS & PATHWORKS 32



Advanced Server V7.3a ECO4 for OpenVMS V8.2 & V8.2-1 Alpha – Available Now!

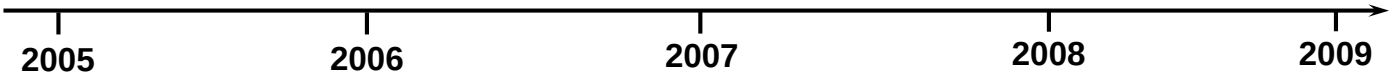
Samba V3.0 evaluation release for Integrity only Dec CY2005

Samba V4.0 Production release Alpha & Integrity H2 CY2006

PATHWORKS for OpenVMS V6.1
- **Support for OpenVMS V7.3-2 release**
- **No IPF Integrity support planned**

PATHWORKS 32 – V7.4 Continued support for MS Pack releases for Win 2000, Windows XP & Win Server 2003

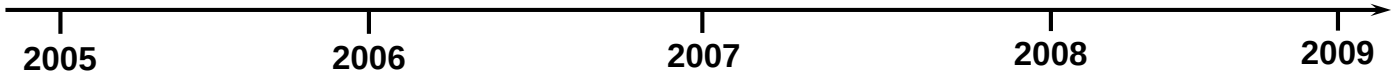
OpenVMS IBM SNA Solutions



Support for HP OpenVMS SNA product set on OpenVMS Version 8.2 Alpha in Dec CY2005

IBM SNA product port to Integrity June CY2006
- HP SNA APPC/LU6.2 Programming Interface for OpenVMS
- HP SNA Application Programming Interface for OpenVMS
- HP SNA 3270 Data Stream Programming Interface for OpenVMS
- HP SNA Remote Job Entry for OpenVMS
- HP SNA Data Transfer Facility Server for OpenVMS
- HP SNA Data Transfer Facility Client for OpenVMS
- HP SNA Printer Emulator for OpenVMS
- HP SNA 3270 Terminal Emulator for OpenVMS

DECprint Supervisor (DCPS) Roadmap



DCPS V2.4
FRS: Feb. 2005

- New HP Printer support
- Media type selection
- PCSI installation
- Bug Fixes

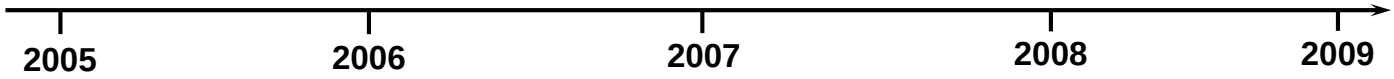
DCPS V2.5 *
FRS: H2 2005
Platforms: Alpha and Integrity

- New HP Printer Support
- Better LPD support
- IPV6
- Better Punch Option
- Bug Fixes

DCPS Future Functionality

- USB port printing
- Parallel port printing
- Print to file
- PPD file parsing
- PDF Printing

Reliable Transaction Router (RTR) Roadmap



RTR V5.0 – Q3 2005

- New OpenVMS release for Integrity
- Quality enhancements
- Fault detection web browser interface
- V5.0 Platform support: OpenVMS Integrity, OpenVMS Alpha, Linux I32 front end, Windows

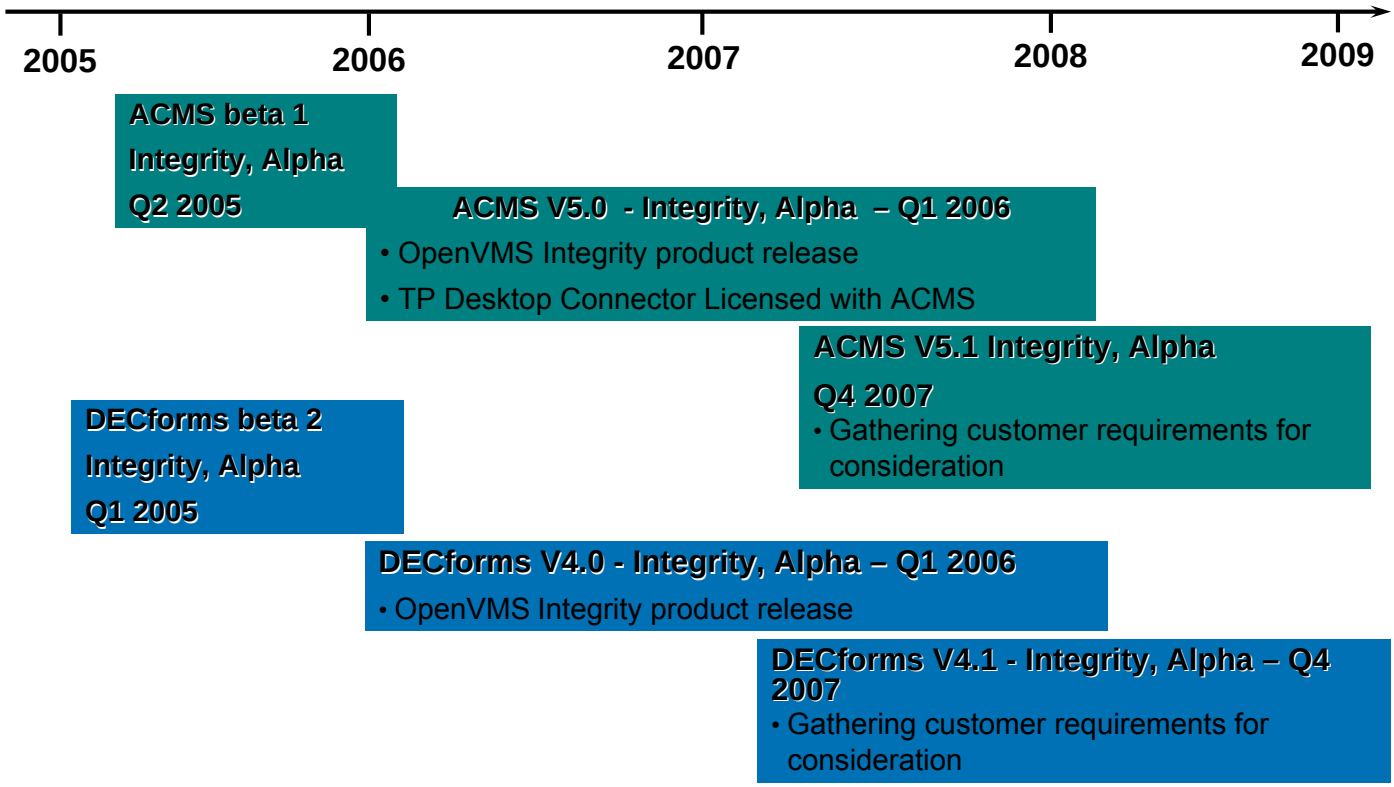
RTR V5.X

- Gathering customer requirements for consideration
- Platform support: OpenVMS Integrity, OpenVMS Alpha, Linux I32 front end, Windows

RTR V4.2 Platforms supported

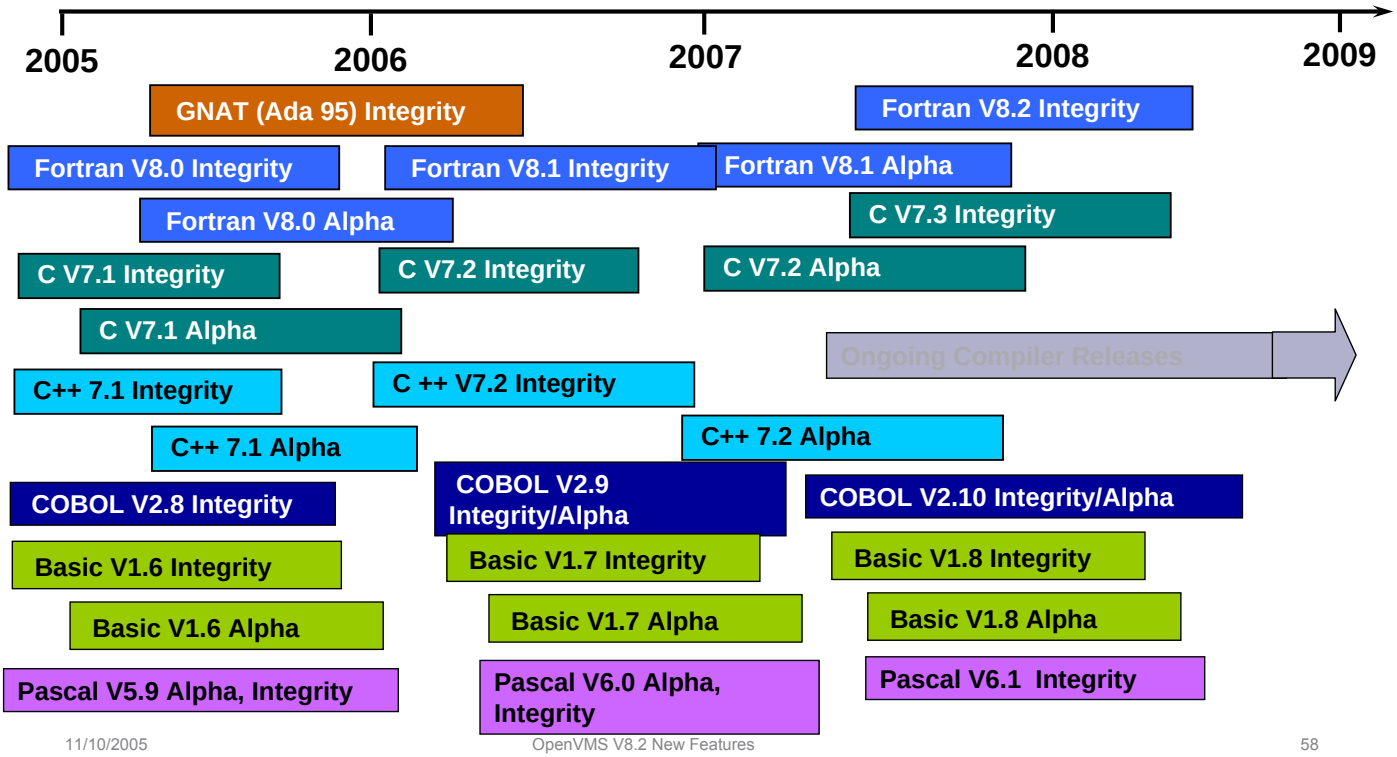
- OpenVMS VAX & Alpha
- Tru64 UNIX
- Windows
- Linux I32 front end
- Sun Solaris

ACMS and DECforms Roadmap



Roadmap subject to change

Application Development and Deployment - Compilers



UNIX Portability Roadmap

2005 | 2006 | 2007 | 2008 | 2009

OpenVMS V8.2

CRTL
- File Lock APIs
- statvfs/fstatvfs
- Stnd stat struct

GNV 1.6
- VI
- gnuTAR
- Continued configure and Make improvements

OpenVMS V8.3

- Symbolic Links
- Byte range locking
- GNV update

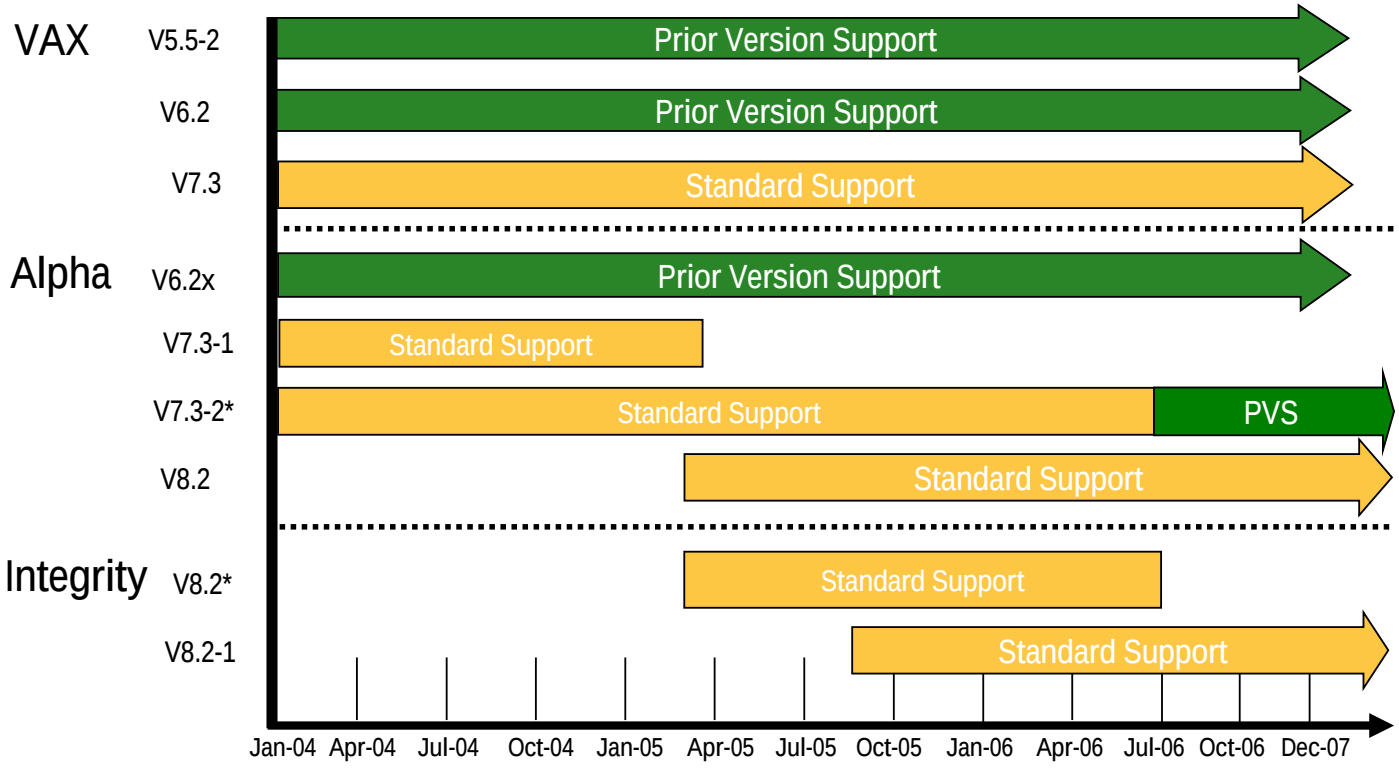
OpenVMS V8.x

- Semaphores
- Shared write for stream files
- ioctl()
- GNV update
- Shared memory APIs

OpenVMS V8.2
Symbolic Links SDK
- CRTL APIs
- DCL support
- NFS support (in future TCP/IP ECO)

OpenVMS Service Support Pricing

OpenVMS Service Support Roadmap



*Standard support for V7.3-2 on Alpha and V8.2 on Integrity will end when V8.3 ships, which is currently H106.

OpenVMS Integrity Operating Environment Per Processor License (PPL) Pricing

	US$ List Price PPL Price
Tier 1 - up to 4 socket systems	
Foundation OE	$1,195
Enterprise OE	$6,160
Mission Critical OE	$10,410
Tier 2 - unlimited socket systems	
Foundation OE	$2,970
Enterprise OE	$7,940
Mission Critical OE	$12,170

Operating Environments (OE's) are sold per processor. One OE license is required per active processor.

OpenVMS Integrity PPL Tiers

- **Tier 1 Systems** – up to 4 socket systems
  - rx16xx
  - rx26xx
  - rx4640

Example: rx4640 with 4 CPU's (2 sockets) OE pricing for FOE:

4 x $1,195 = $4780

- **Tier 2 Systems** – unlimited socket systems
  - rx74xx
  - rx86xx
  - Superdome

Example: rx86xx with 16 CPU's (8 sockets) OE pricing for EOE:

16 x $7,940 = $127,040

Licensing and support

- OpenVMS for AlphaServer Systems
  - No change
- OpenVMS for Integrity servers
  - All support programs will be consistent with those for HP-UX on Integrity servers
    - Operating environment levels
    - Per processor licensing
    - Service levels
    - Trade-in terms
    - Update notification and distribution
- Details at: www.hp.com/go/services
  - Click on Support Services

Example: per processor licensing for OpenVMS on Integrity servers

- Pay based on number of CPUs and the level of OE
- When you need more processing you buy processors and licenses for them.
- Benefits
  - Greater RoIT
  - **More granular** – pay only for what you need
  - **More flexible** – move assets as needed
  - **Accommodates partitioning*** – allows use of different types of OEs in different hardware partitions and different Operating Systems
  - **Expandable** –purchase processors and software to meet needs over time

*OpenVMS will support partitioning in 1H2006

Example: trade-in

OpenVMS for AlphaServer systems

- No Change

OpenVMS for Integrity Servers

- License transfer from AlphaServer or VAX
  - Services contract (with *license to use*)
    - Even swap at no charge for "equivalent product"
    - Parallel usage for a set period
    - Must purchase at least one year of support
  - No services contract
    - 60% discount on new license price
    - Parallel usage for a set period
    - Must purchase at least one year of support

Samba for OpenVMS

(Advanced Server and PATHWORKS and Secure Server)

What is Samba?

- Open Source/Free Software suite that provides file and print services to SMB/CIFS clients.
  - SMB/CIFS clients: i.e., Windows clients
- Freely available under the GNU GPL
- Ships with most UNIX and LINUX distributions
  - HP-UX CIFS/9000 server is Samba
  - Well known, well documented – Books are published on Samba
- See http://www.samba.org

OpenVMS File & Print Servers – Legacy

- PATHWORKS **V5.0**F-ECO2 for OpenVMS
  - Supported on OpenVMS **5.5-2** VAX only (w/ PVS)
  - Based on Windows **NT 3.51** file server
- PATHWORKS **V6.1** for OpenVMS
  - Supported on OpenVMS **6.2**, **6.2-1**, **7.3**, **7.3-2**
    - **Not** supported on OpenVMS **8.2**
  - Used in mix Alpha/VAX clusters
  - **Based** on Windows **NT 4.0** file server
  - **Supports** Windows **2000/2003**
    - Subject to Windows NT 4.0 limitations

OpenVMS File & Print Servers – Current

- Advanced Server **V7.3A** for OpenVMS
  - Supported on OpenVMS **V7.3-2**, **V8.2**
  - **Based** on Windows NT **4.0** file server
  - **Supports** Windows **2000/2003**
    - Subject to Windows NT 4.0 limitations

The Problem Is?

- Advanced Server is out of date today
  - Limits to Windows compatibility
  - Partially compatible with Active Directory
- Next generation Windows servers (Longhorn) will make Advanced Server even more out of date
  - Could break compatibility completely
  - Due to ship in 2006
- Microsoft has no incentive for compatibility
- No more updates from AT&T
- Very large investment needed to get and stay current

Samba on OpenVMS

- Samba 2.x – Old
  - There today – minimal port – many limitations
  - Not cluster aware
- Samba 3.x – Current stable version
  - Not there yet – would be our first port
  - Supports Active Directory today
- Samba 4.x – In development
  - Re-Write
  - Integrated LDAP
  - Available Threaded Architecture
  - Improved Management

Important Points

- Advanced Server support on Alpha does not change
  - Compatibility with future Windows versions may not be assured
- Samba port for VMS will focus on Integrity
- Samba would be supported by HP Services
  - Similar to HP Secure Web Server (Apache), et. al.

Samba vs Advanced Server: Installation and Configuration

- Pros
  - Samba utilizes smb.conf and INCLUDE parameters.
    - Highly customizable, down to individual clients or shares
    - Dynamic – config is read every 60 seconds
  - No licenses required
  - Virtualization via NETBIOS aliases: multiple servers appear as one
- Cons
  - Configuration is done by hand
    - Advanced Server tool guides you through each step
  - Non VMS standard installation

Samba vs Advanced Server: Transports and Protocols

- Pros
  - Superior NETBIOS support
    - Multiple names per server
    - NBNS and proxy name server support
  - Kerberos is supported
  - Some LDAP support
- Cons
  - No support for cluster wide NETBIOS name
    - Not a problem for TCP/IP, possible problem if other transports supported
  - No support for DECnet
  - No support for NetBEUI
  - Samba is not cluster aware
  - No SSO (Single Sign On)

Samba vs Advanced Server: Miscellaneous

- Pros
  - Web administration tool
    - Point and click management GUI
  - smbmnt/smbmount
    - Allow host to map drives on other CIFS servers
    - Frequently requested for OpenVMS
- Cons
  - No single utility for management (ala ADMIN)
    - Samba uses many loosely coupled tools for ADMIN
    - Work is underway to address this: Samba has new NET command

HP Secure Server – Available now!

- What is it?
  - HP Secure Server, powered by Quintara, is a web-based **e-mail server** providing reliable e-mail messaging services from any client having internet access. HPSS was jointly developed by HP and Brilliant Systems. This is a complete system with integrated virus scan and junk filter features.
- How is it packaged?
  - Available as a pre-packaged ready to operate system on either HP Integrity or AlphaServer systems. SW is completely pre installed and configured for first use and includes bundled support. SW only packages available for customers with compliant systems.

HP Secure Server
More Information Available

- Trial accounts and customer brochures available today at:

  trysecureserver.com

- Complete order information and HP Sales Guides available soon at:

  www.hp.com/go/secureserver

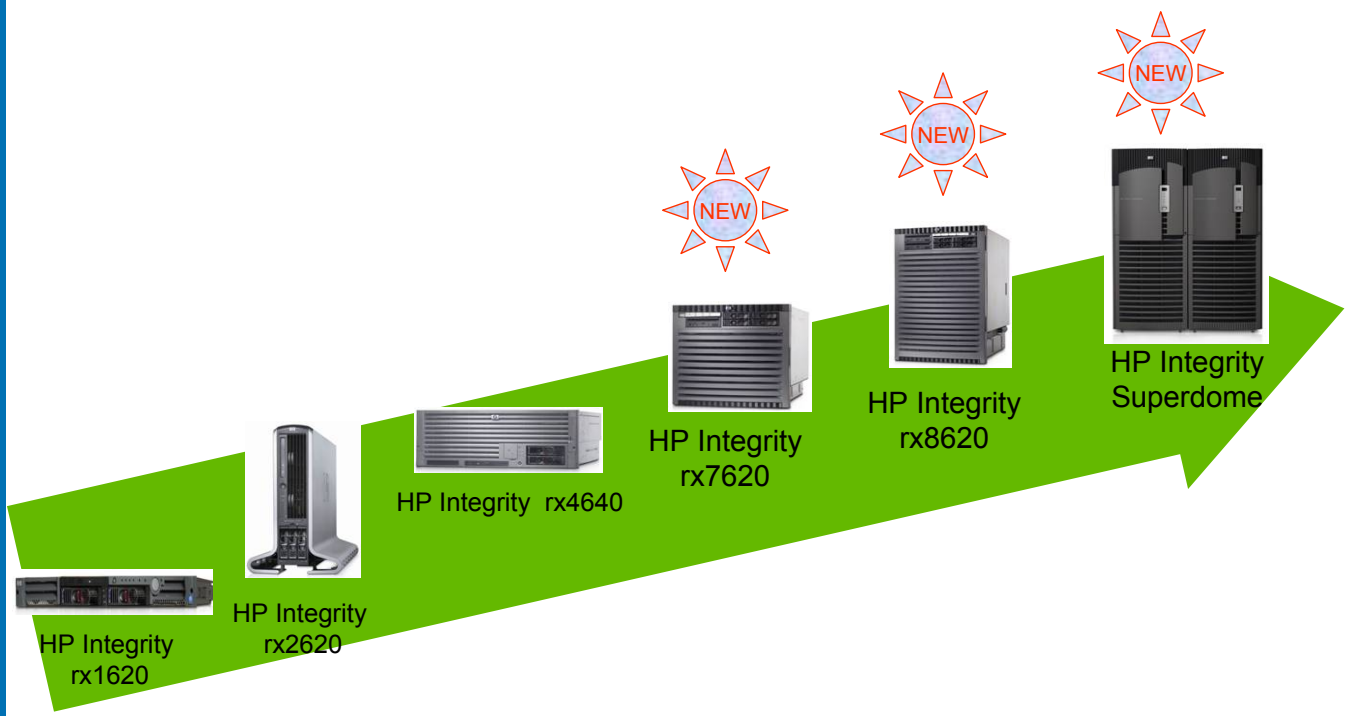
- Orders can be filled now!

  Have your local HP Representative contact:

  Tom Beaudet (tom.beaudet@hp.com)

HP OpenVMS Verbesserungen V 8.2-1

OpenVMS v8.2-1supports the entire line of HP Integrity servers



OpenVMS V8.2-1 for Integrity Servers

- Integrity only release – Available now!
  - Replaces OpenVMS V8.2 for Integrity servers….support for V8.2 on Integrity will end about June 2006.
  - Introduce OpenVMS support for larger Integrity servers (Madison 9 only):
    - rx8620: 4 cells, up to 16 CPUs
    - rx7620: 2 cells, up to 8 CPUs
    - Superdome: Hard partitions of up to 16p/4 cells
  - Low-cost 2-node Multi-host SCSI cluster
  - 96-node AlphaServer/Integrity clusters
  - Performance and scaling enhancements
  - Improved hardware fault handling
  - Power saver feature to reduce electricity use

Integrity only

OpenVMS V8.2-1 (**Integrity Only**)

- Low-cost 2-node SCSI cluster
- 96-node AlphaServer/Integrity clusters
- Performance and scaling enhancements
- Improved hardware fault handling
- Power saver feature to reduce electricity use
- Host-based Infoserver
- Integrated translated image support
- Fibrechannel performance display in SDA
- Debug enhancements:
  - DELTA
  - System code debugger
  - System dump debugger

OpenVMS support for cell-based Integrity Servers in 2005

Integrity only

- Support on OpenVMS V8.2-1 (continued):
  - Supported add-on I/O adapters:
    - Broadcom 5701 Gbit copper and fiber NICs (A6847A, A6825A)
    - Intel Gbit copper and fiber NICs (A7011A, A7012A)
    - Qlogic 2-port Fibre Channel adapter (A6826A) (including boot support)
    - U320 2port SCSI adapter (A7173A) (including boot support)
    - Fibre Channel/Broadcom 5703 copper and fiber combo cards (A9784A, A9782A) (including boot support of FC)
    - 4-port Intel GigE Tx (copper) (AB545A)
    - Castor combo card (2-channel U320 SCSI and 2-port Intel GigE; AB290A)
- Multiple operating system types in an nPar Configuration
- Latest shipping system firmware will be minimum required revision for all systems
- Optional factory install of OpenVMS

OpenVMS Future Directions

OpenVMS 8.3

OpenVMS V8.3 (Nemo)

- Target shipment date = H1 2006
- Candidate features...
- New Integrity platform support
  - CPU multithreading support
  - Support for 64 CPUs
- New cluster and LAN features
  - Cluster Satellite boot on Integrity systems
  - PEdriver data compression
  - PEdriver scalability improvements
  - Virtual LAN support
  - 10Gb Ethernet
  - LAN failover improvements

OpenVMS V8.3 Device Support

- Host-based volume shadowing: automatic & restartable minicopy
- 4Gb fibrechannel (latent in V8.2)
- iSCSI infrastructure
- USB 2.0
- USB terminal MUX
- USB mass storage
- SAS/SATA storage (Serial Attached SCSI/Serial ATA)
- CD/DVD record

V8.3 Kernel and Scalability

- 100K mailbox units
- Shared address data for Integrity systems
- Code granularity hint regions in S2 space
- RMS global buffers in P2 space
- System service intercept
- Ongoing performance improvements

V8.3 Unix Portability

- Byte range locking
- Symbolic links APIs
- UNIX pathname handling integrated in RMS
- GNV update

V8.3 Application Development

- DEBUG enhancements
  - NetBeans support
  - Client-server interface
- Trace, watchpoint, and SDA enhancements
- Updated Amacro/Imacro compilers
- Continued Java, web services updates

V8.3 Security & Networking

- Integrated ACME login
  - LDAP ACME
  - Kerberos ACME
- Kerberos update (MIT V1.4)
- SSH & SSL updates
- Integrated encryption services
  - AES encryption support
- NFS server on Integrity systems
- NFS client large file support
- DNS/Bind updates

V8.3 Management & Virtualization

- WBEM infrastructure, nPAR partition provider
- iCAP, TiCAP and PPU
- TDC (The Data Collector) V3.0
- Secure software delivery
- PCSI enhancements
  - ODS-5 naming support
  - Product database validation and repair
  - Product alias names

eBusiness and Integration Technology Portfolio

- Web servers and browsers
  - Secure Web Server (Apache)
  - Secure Web Browser (Mozilla)
- Web Services
  - Simple Object Access Protocol (SOAP) Toolkit (Apache Axis)
  - XML Technology (parsers and stylesheet processors) (Apache)
  - UDDI Client Toolkit (UDDI4J)
- Development tools

New
  - Java™ Standard Edition Development Kit (JDK)
  - C/C++, COBOL, Fortran, Basic, Pascal
  - NetBeans and 3GL plugins
  - Distributed NetBeans
- Application servers
  - BEA WebLogic Server
  - Tomcat

New

- Legacy integration
  - BridgeWorks
  - Web Services Integration Toolkit (WSIT)
  - TP Connector suite
  - Attunity Connect
  - WRQ VeraStream
  - Ericom Host Publisher suite
- Middleware
  - BEA MessageQ
  - orb2 by 2AB
  - IBM WebSphere MQ
  - BEA WebLogic Integration
  - SpiritSoft
  - COM
  - Reliable Transaction Router (RTR)
- Directory services
  - Enterprise Directory (LDAP, JNDI)

Systems Management for OpenVMS

Delivering Manageable Platforms

Enterprise Management

HP OpenView

- Heterogeneous coverage
- Increases IT service availability & performance
- Attaches business context to IT service

HP Server Management

Discovery, inventory, fault and remote management, role-based security, distributed tasks

Central Point of Administration

HP Systems Insight Manager

Performance Management

- Performance Data Collector (TDC)
- ECP Analyzer
- OpenView Performance Agent

Configuration Management

- OpenVMS Clusters
- Partition Manager (Galaxy and vPars)
- Management Station

Workload Management

- Class Scheduler
- Global Workload Manager
- Availability Manager

Management Futures

- OpenView Futures
  - OpenView Operations V8 support (https agents)
  - Oracle and Oracle Rdb SPIs
  - OpenView Performance Agent
    - Enables performance management and capacity planning solution for OpenVMS
- Web Management Agents
  - Updates for new supported hardware platforms
  - Server management support via HP Systems Insight Manager (SIM)
- Web Based Enterprise Management (WBEM)
  - Support virtualization and utility pricing initiatives
  - Support migration of HP SIM to WBEM infrastructure
- Continue to update tools bundled with OpenVMS
  - Management Station, Availability Manager, Performance Data Collector (TDC), ECP Performance Analyzer, and WBEM Services

Agenda

- OpenVMS Strategy
- OpenVMS Roadmaps
- Support, Pricing, Licensing
- Samba / Pathworks / Secure Server
- New Features in OpenVMS V8.2-1
- New Features in OpenVMS V8.3
- **Moving Applications from Alpha to Integrity**

Major Changes to the Base OS

- No Alpha Console
  - Booting
  - Device Discovery
  - Interrupts
  - TLB miss handler
- No Alpha PALcode
  - VAX Queue Instructions
  - VAX Registers
  - IPL and mode change
- Different primitives in CPU
  - Register Conventions
  - Exception Handling
  - Atomic Instructions
  - Process Context
- Plus, we decided to change
  - calling standard
  - object language
  - image format

Major Porting Considerations

- New Calling Standard
  - Publicly available today at http://www.hp.com/products1/evolution/alpha_retaintrust/openvms/resources.html
  - Most user application code is not affected
- Industry standard object file and debugging format
  - ELF/DWARF plus extensions
  - Most user application code is not affected
- Architecture specific code will need to be ported
  - Typically written in Alpha Assembly
- VAX/Alpha conditional code may need to be modified

Major Porting Considerations

- Floating point data types
  - Itanium architecture supports IEEE float only
  - All compilers that currently support F, D, G, S, T, and X (S and T are native IEEE formats) will continue to do so on Itanium architecture
  - IEEE is the default
  - We have updated the appropriate Runtime Libraries to add IEEE interfaces where needed
  - White Paper with technical details about the differences between VAX Float and IEEE Float is available at http://www.hp.com/products1/evolution/alpha_retaintrust/openvms/resources.html

Alpha Compilers

- HP recommends that you build your applications on OpenVMS Alpha using the latest versions of the compilers prior to starting your port to OpenVMS I64
- Latest/Next Releases on Alpha Platform
  - C V6.5, C++ V6.5
  - Fortran V7.5 (F90)
  - Basic V1.5
  - COBOL V2.8
  - Java 1.4.2-2
  - Pascal V5.9

OpenVMS on Integrity Servers Compiler Plans

- C
  - Itanium architecture implementation of OpenVMS HP C V6.5 compiler
- C++
  - Based on the same front end compiler technology as HP C++
  - This is not a port of HP C++ V6.5 but it will be able to compile most of the same source code as HP C++ V6.5
- COBOL, BASIC, PASCAL, BLISS
  - Itanium architecture implementations of the current OpenVMS compilers

OpenVMS on Integrity Servers Compiler Plans

- FORTRAN
  - Itanium architecture implementation of the current OpenVMS Fortran 90 compiler
- Java
  - Itanium architecture implementation of J2SE V1.4.2
- IMACRO
  - Compiles ported VAX Macro-32 code for Itanium architecture
  - Itanium architecture equivalent of AMACRO
- ADA
  - We will provide an Ada-95 compiler
  - We will not port the existing Ada-83 compiler

Binary Translator

- Will translate Alpha OpenVMS binary images and libraries linked under all OpenVMS versions from 6.2 to current version
- Will translate a VESTed image that was translated by DECmigrate from a VAX binary image
- Will translate images written in: C, C++, FORTRAN, or COBOL
  - Will not translate applications written BASIC, Pascal, PL/1, or Ada
- Restrictions:
  - Alpha binary code
  - Only user-mode apps
  - No privileged instruction
  - No self-modifying code
  - No sys. Memory space reference
  - No user-written system services

Real Life Experiences

- HP/Intel Developer Forum
  - 5 events, 75 participants, 51 solutions ported
- FORTRAN – Switch from F77 to F90
- Update to latest versions of compilers
- MACRO-32 – Pay attention to the porting guide
- Old development environments
  - Haven't kept up with changes to compilers, RTLs, pthreads, etc…

Floating Point

- One-at-a-time math

  x = a*b + c*d

  1. multiply a*b (& round)
  2. multiply c*d (& round)
  3. add the products

- Fused mul-add

  x = a*b + c*d

  1. multiply a*b (& round)
  2. multiply c*d & add (round only at end)

- These produce slightly different results
- Fused version runs faster

Optimization Levels

- OpenVMS compilers default to high optimization
- You may reduce opt level for debugging
- /opt=level= (for GEM compilers)
  - 0: very naïve code, no optimization at all (= /noopt)
  - 1: simple peephole optimizations
  - 2: traditional opts: CSE, hoist, strength
  - 3: adds loop unrolling
  - 4: adds inlining & software pipelining (default)
  - 5: adds loop interchange & blocking, may help or hurt

/OPTIMIZE=…TUNE= /ARCHITECTURE=

- **TUNE**
  - Code sequences *biased* towards scheduling characteristics of specified processor
  - Can produce code to make CPU run-time decision
- **ARCHITECTURE**
  - Generate code for specified architecture & later
  - Optimal instruction scheduling & use of available instructions

Examples of …TUNE & /ARCHITECURE

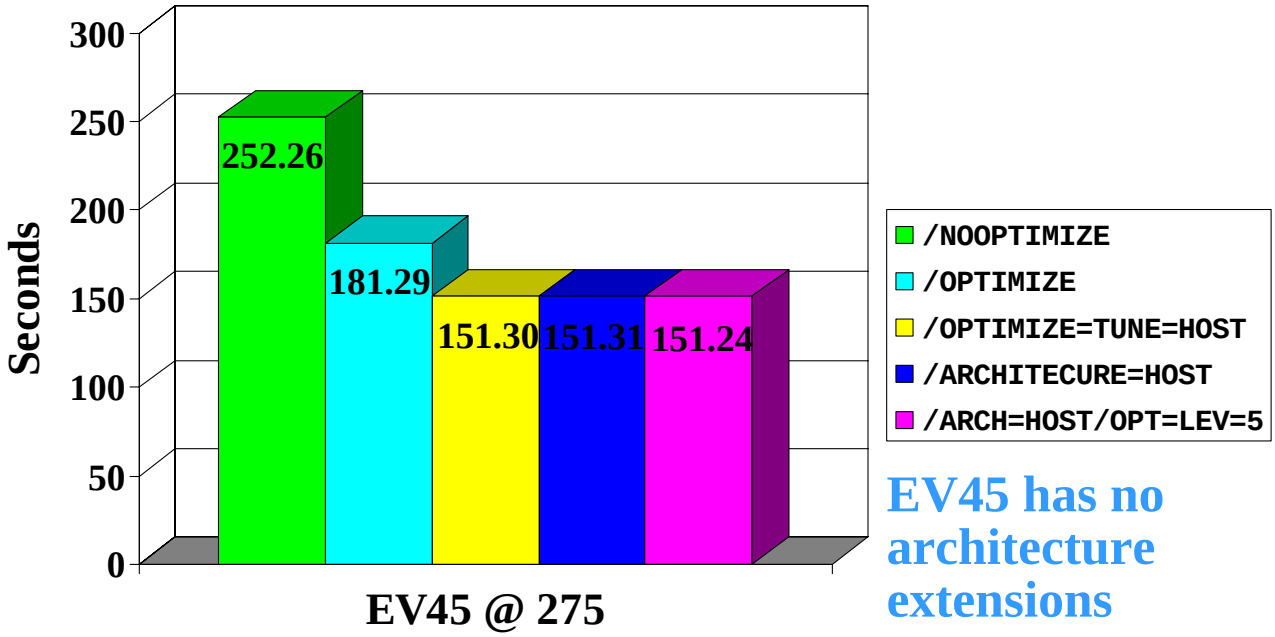
- **/OPTIMIZE=TUNE=EV56**
  - Execute on all Alpha generations
  - Biased towards EV56
- **/OPTIMIZE=TUNE=EV6 /ARCHITECTURE=EV56**
  - Execute on EV56 and later (Byte/Word instructions)
  - Biased for EV6 (quad issue)
- **/ARCHITECTURE=EV6**
  - Execute on EV6 and later (Integer-Floating conversion, Byte/Word & Quad-issue scheduling)
- **/ARCHITECTURE=HOST**
  - Code intended to run on processors the same type as host computer
  - Execute on that processor type and higher

Prime Numbers Test

- Find first 1,000,000 prime numbers

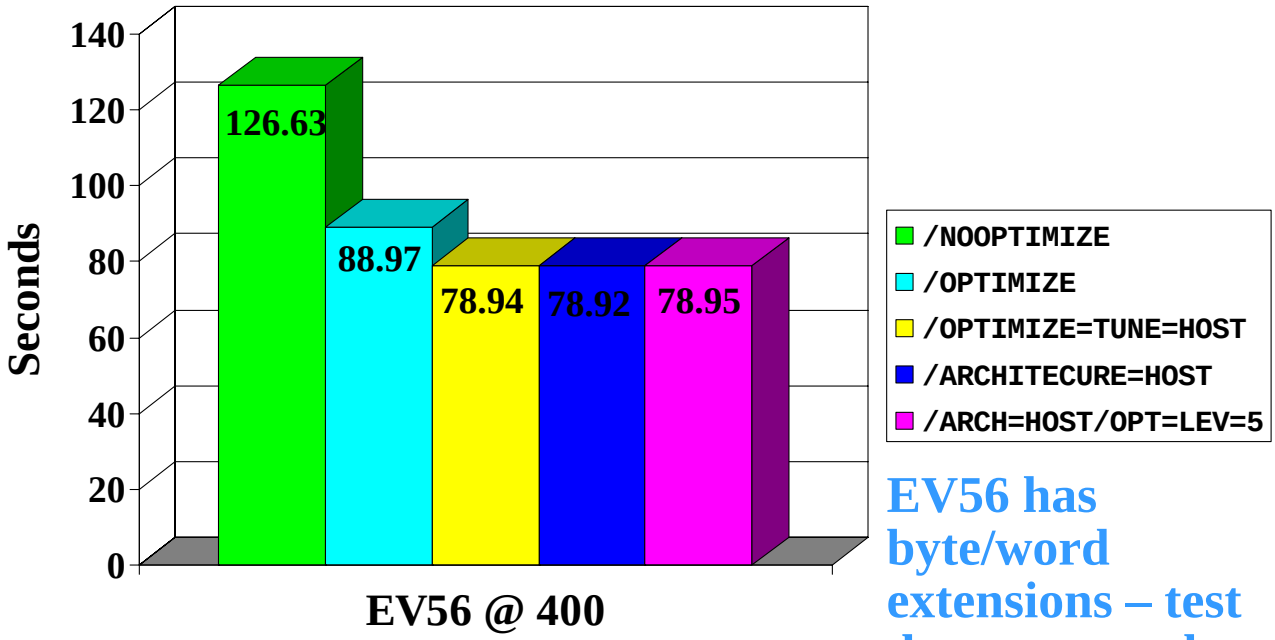
```
        primes(1) = 3
        hi_prime = 3
        hi_prime_index = 1
        hi_prime_divisor_index = 1
        do 100 i = 5,2000000000,2
        if (primes(hi_prime_divisor_index)**2 .lt. i)
            hi_prime_divisor_index = hi_prime_divisor_index + 1
        do 20 j = 1, hi_prime_divisor_index
        if (mod(i, primes(j)) .eq. 0) go to 100
20      continue
        hi_prime_index = hi_prime_index + 1
        primes(hi_prime_index) = i
        hi_prime = i
        if (hi_prime_index .eq. n_primes) go to 200
100     continue
200     …
```

Generating Primes
AlphaServer 2100 4/275



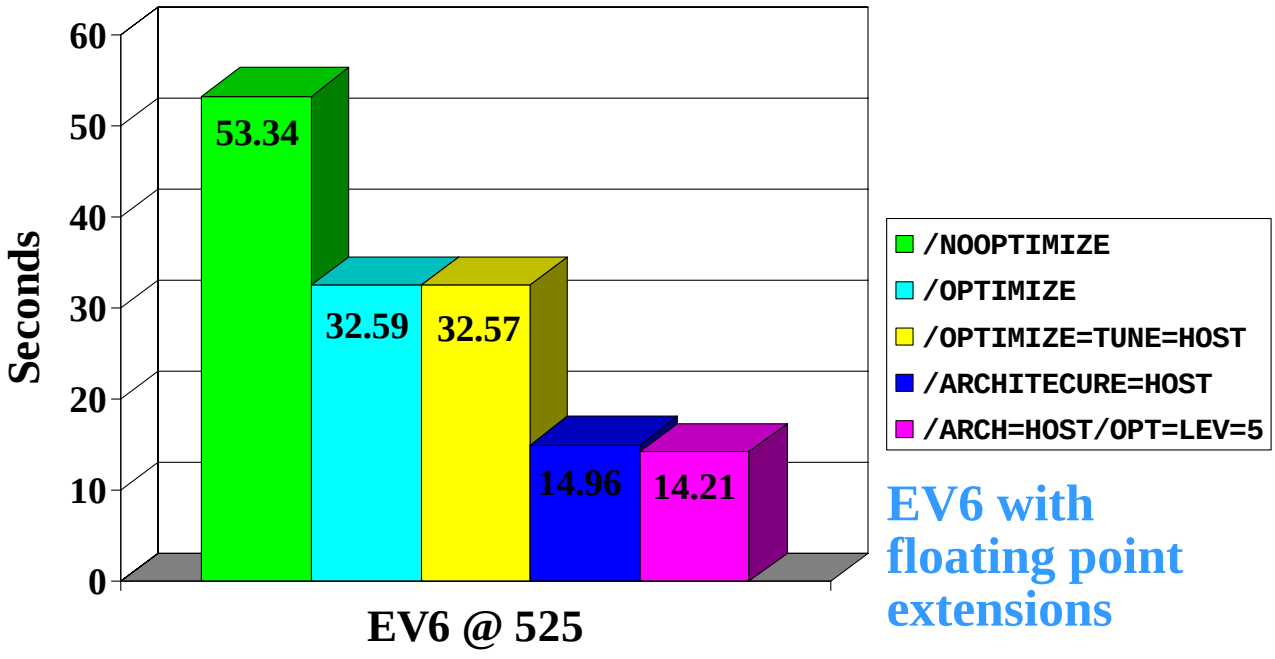
EV45 has no architecture extensions

Generating Primes
AlphaServer 4100 5/400



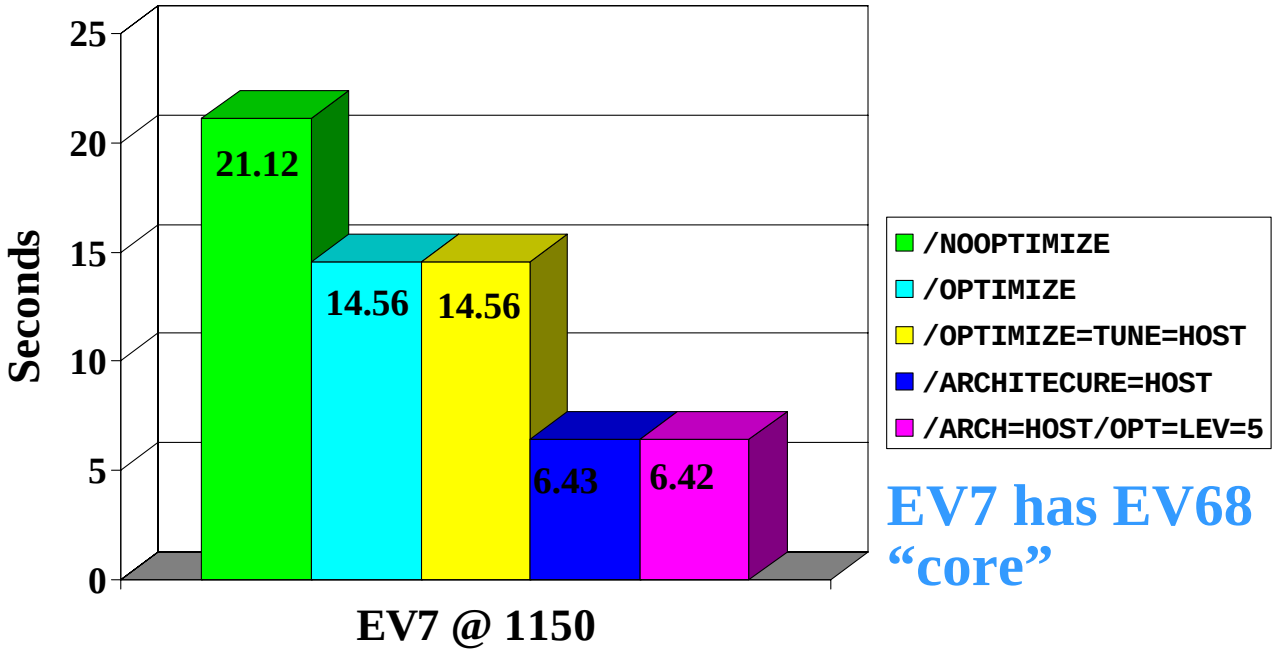
EV56 has byte/word extensions – test does not use them

Generating Primes
AlphaServer GS140 6/525



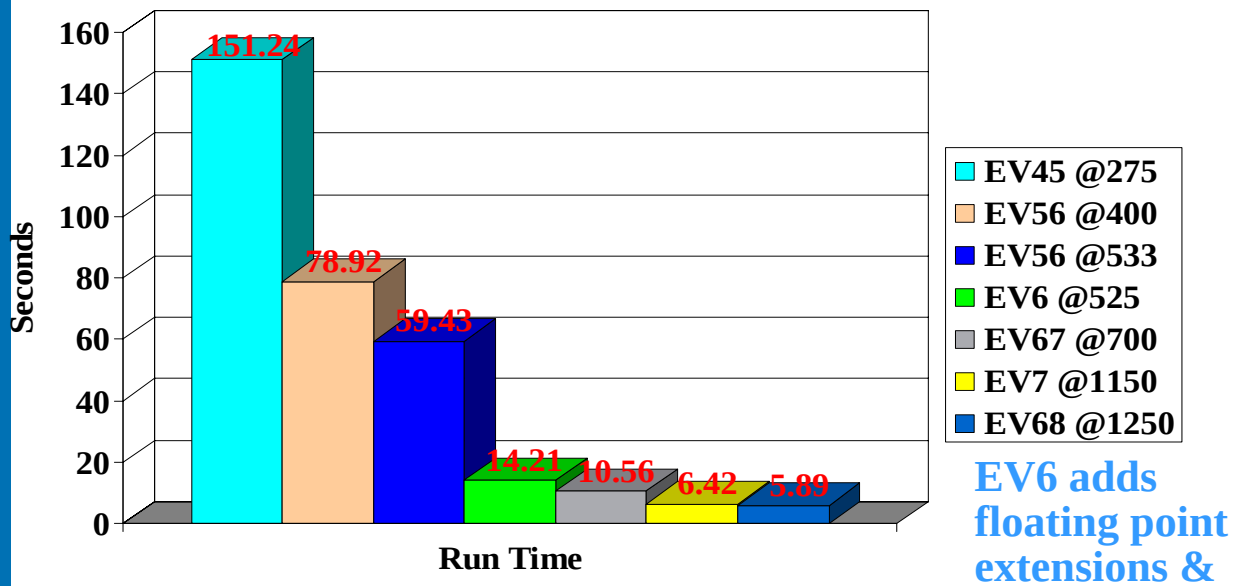
EV6 with floating point extensions

Generating Primes
GS1280 7/1150



EV7 has EV68 “core”

Generating Primes… Comparing the Machines

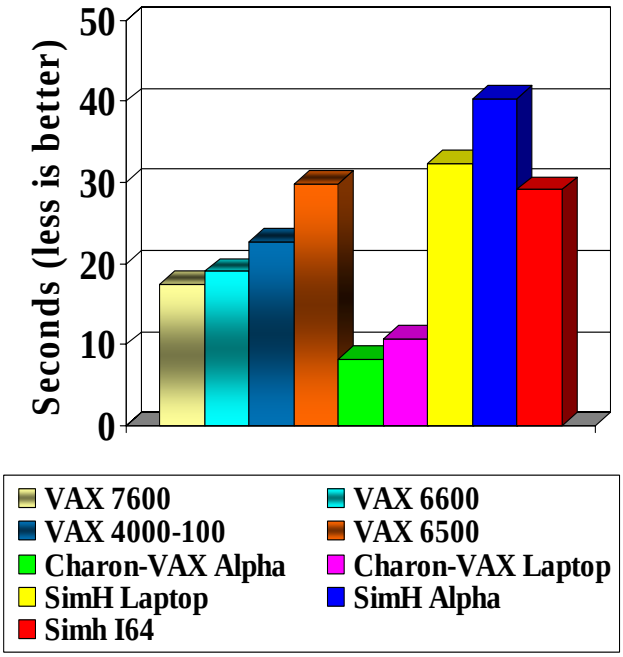


EV6 adds floating point extensions & quad-issue

Real-life Example

- Commercial Trading system
  - Insert ~2 rows per trade into Rdb database
- >99% CPU bound
  - 90+% user mode time
    - Extensive trade validations
    - <10% of elapsed time actually database transaction
- Production application compiled "/NOOPTIMIZE"
- Recompiled "/OPTIMIZE" & relinked
  - ***50% application throughput increase***

Real & Simulated VAXen Performance



- Prime number generation
  - C program from Internet
  - Single-user
  - CPU intensive
- Charon-VAX
  - Intel Laptop 2ghz
  - …at 37,000 feet
- SimH machines
  - GS1280/1.15 32p
  - rx4640/1.5/6mb
  - Intel Laptop 2ghz

Example – Moving from F77 to F90

- When using double precision float (REAL*8) for doing direct assignment (a=5.3)

F77 uses **double** precision

F90 uses **single** precision.

The result is slightly further away from the real 5.3 value.

- A computation will produce a different result with no error signaled.
- Possible solutions:
  - Fix the coding bug, as the assignment is wrong.
    - Change the assignment to a=5.3D0 or a=5.3_8
    - 5.3D0 works for both F77 and F90
  - Compile using the /ASSUME=FP_CONSTANT switch

Example – Moving from F77 to F90

```
IPL31> ty float.for
       REAL*8             TEST

       TEST = 5.3
       PRINT 100,TEST
 100   FORMAT(F,' assigned as TEST = 5.3 ')

       TEST = 5.3D0
       PRINT 200,TEST
 200   FORMAT(F,' assigned as TEST = 5.3D0')

       END
IPL31> for float
IPL31> link float
IPL31> r float
      5.3000001907348633 assigned as TEST = 5.3
      5.2999999999999998 assigned as TEST = 5.3D0
IPL31> for/assume=fp_const float
IPL31> link float
IPL31> r float
      5.2999999999999998 assigned as TEST = 5.3
      5.2999999999999998 assigned as TEST = 5.3D0
```


Up yours!

Quotas and process settings

- OpenVMS I64 images are much larger, **sometimes 3x-4x**
- Ensure your pgflquo and bytlm are (at least) 4x-10x your Alpha settings.
  - $ set default sys$system
  - $ run authorize
  - UAF> mod your_account/pgflquo=nnnnnn
  - UAF> mod your_account/bytlm=nnnnnn

Wait a second….I don't have the sources…

- OpenVMS Migration Software for HP AlphaServer Systems to HP Integrity Servers (OMSAIS)
- Utility that translates executables and shareable images from Alpha to I64
- Supports translation of images written in: C, C++, Fortran, COBOL, BLISS, MACRO-32, MACRO-64

OMSAIS

- OMSAIS includes two components:
  - AEST (Alpha Environment Software Translator)
  - TIE (Translated Image Environment)
- TIE provides run-time support for translated images
  - Integrated into V8.2-1
  - Separate download for V8.2
- Free download available from:

http://h71000.www7.hp.com/openvms/products/omsva/omsais.html

Application migration whitepapers

New application migration whitepapers:

- *Porting RPG: Moving a Compiler to Itanium* by Migration Specialties International, Inc.
- *Acucorp porting of extend technologies to OpenVMS on I64 Integrity* by Acucorp
- *ABC (Archive Backup Client)for Tivoli Storage Manager* by STORServer
- *Porting PRIMO•S to Itanium* by ABB Automation GmbH
- *Porting OpenVMS to HP Integrity Servers* by Clair Grant
- *Porting to Itanium* by Bruce Claremont

Website for Whitepapers and technical documents:

http://h71000.www7.hp.com/openvms/integrity/resources.html

OpenVMS Hobbyist Program

- In place since DECUS Cincinnati May 1997
- 644025 Paks Generated to date
- 40662 in the last 6 months
- Currently a contest for the coolest application on http://www.openvms.org
- More information http://www.openvmshobbyist.com
- Susan Skonetski – Program Manager

For further Information about OpenVMS on Integrity Servers

- General OpenVMS on Integrity Servers
  http://h71000.www7.hp.com/openvms/integrity/index.html
- Layered product rollout schedules
  http://h71000.www7.hp.com/openvms/os/swroll/index.html
- Layered products plans (products that either will not be ported or are under review)
  http://h71000.www7.hp.com/openvms/integrity/openvms_plans.html
- OpenVMS Partner plans
  http://h71000.www7.hp.com/openvms/integrity/partners.html
- OpenVMS on Integrity Servers Total Cost of Ownership white paper
  http://h71000.www7.hp.com/openvms/whitepapers/alinean_tco.pdf