VSI Technical Update
January 2019

VMS Software

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Notice

This information contains forward looking statements and is provided solely for your convenience.

While the information herein is based on our current best estimates, such **information is subject to change without notice.**

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Agenda

General comments on engineering an operating system

Release Roadmap

x86 Update

Other projects

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General comments on VSI OpenVMS Engineering

What is the work to continuously maintain and improve OpenVMS (or any operating system):

- Quality and defect repair
- New software features
- Hardware technology concurrency
- Software standards concurrency
- Support

All VSI engineering investment aligns to the above areas

General comments on VSI OpenVMS Engineering

August 2014 through 2016

- Recover the operating system and application code and deliver VSI OpenVMS releases

- x86 architectural work

- Hardware modernization – i4, StoreOnce, 64 core, 1.5TB memory, new 3PAR models

- Software modernization – OpenSSL update, Apache updates, more Open Source applications

- Support more Integrity servers

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General comments on VSI OpenVMS Engineering

2017 – 2018

- More hardware – i6, 16 Gb Fibre, LTO-8 tape, 12 Gb SAS

- More software – Java 8, VSI TCPIP, OpenSSL releases, more Open Source

- AlphaServer support

- More x86 – on the way to booting

2019 – x86 releases in phases

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General comments on VSI OpenVMS Engineering

A few comments on Quality and Support –

- VSI has a Quality, Verification, and Test team that is separate from R&D
- The QTV team maintains and enhances a robust set of test tools – OS regression tests, cluster tests, and system exercisers
- QTV tools are being updated and enhanced for OpenVMS on x86
- QTV is testing continuously on 5 clusters – QTV-L, QTV-Network, QTV-Storage, QTV-Regression, QTV-Patch
- Support Team is geographically dispersed between North America, Europe, Australia
- Support resolves 80% of support calls in 30 days or less

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Executive Summary – x86-64 Release Plan

- V9.0: x86-64 Early Adopter Kit (EAK) – kick the tires
  - The EAK is for a selected set of partners, ISVs, and customers
  - The system will be less than complete
  - Content will depend, to a large degree, on the needs of the participants
  - Cross tools - compile/link on Itanium, run/debug on x86
  - Q2 2019

- V9.1: x86-64 General EAK Release – complete system but Field Test
  - Available for all partners, ISVs and customers
  - Not for production
  - Native tools
  - Today's OpenVMS on x86
  - Q4 2019

- V9.2: x86-64 Production Release
  - Same features will be on Alpha and Itanium, where possible
  - Plan to release OpenVMS V9.2 on x86 and I64 at the same time. Alpha V9.2 will follow in 6 months
  - Q4 2020

VSI OpenVMS Roadmap

VSI OpenVMS Rolling Roadmap

2019	2020	2021

2019

Q1
SAMBA
New HPE StoreOnce Models
P441 SAS RAID Controller (12Gb SAS)
Enhanced Password Management

Q2
OpenVMS V9.0 x86-64 Early Adopters Kit
- Selected ISVs, Partners & Customers
- New Licensing
- Selected HPE Servers
- Graphical Boot Manager
- Virtual Machine guest option – Oracle VM VirtualBox
- VSI TCP/IP
- Compilers – C, FORTRAN, Pascal, COBOL, BASIC, BLISS, XMACRO
- Compile/link on IA64, run/debug on x86
- Select Layered Products

CRTL/C99 updates for IA64, Alpha
OpenVMS V8.4-2L1 Integrity Update Kit

Q4
OpenVMS V9.1 (x86-64 General Early Adopters Kit)
- Available to All ISVs, Partners & Customers
- Additional Layered Products
- Additional Compilers - C++
- Additional Open Source Applications
- Additional Virtual Machine guest options - kvm
- Native build tools - compile/link on x86

2020

OpenVMS V9.2
Production Release – x86-64, Itanium
- Full Production Release
- Security
  - Signed OS execlets
  - Stronger Password Encryption
  - OpenSSL V1.1.1x
- Additional HPE & Dell Servers
- Improved Network Performance
- OpenJDK
- Compilers - C, FORTRAN, Pascal, COBOL, BASIC, BLISS, XMACRO, C++
- Standards updates on OpenVMS V9.2/x86:
  - C
  - C++
  - FORTRAN

2021

OpenVMS V9.2
Production Release –Alpha

Similar software features on Alpha V9.2 as on x86 and IA64 with exceptions:

- No OpenJDK on Alpha
- Existing IO options on Alpha
- Alpha compiler front ends will not be updated

Based on current, best estimates. Subject to change without notice.

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x86 Server/IO support notes

The universe of x86 servers and IO is very different from the constrained world of proprietary servers

Basic technical requirement for OpenVMS support of an x86 server is it must be UEFI based (HPE GEN9 or later)

Most of the operating system does not care about the specific CPU/chipset in the server

IO is a different story! Need specific device driver support for IO cards from different vendors

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x86 Server/IO support notes

When OpenVMS was part of DEC/CPQ/HPE, we worked with the server groups to test new server models as they were developed, running the OS on prototype hardware and firmware with one goal – the software must be ready when the hardware is ready to ship

Now VSI is a software company with the ultimate goal to run OpenVMS on any server vendor's hardware

But we will not be able to acquire every server model from every manufacturer

VSI will create device drivers for mainline/traditional IO and will investigate driver support for future IO technologies based on customer demand

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x86 Server/IO support notes

How will we handle the server/IO variety?

- x86 server generations are based on major CPU/chipset releases from Intel

- VSI will test representative server models within a vendor product line and will support architecturally equivalent server models

- VSI will list the IO cards for which we have support

- If a customer is interested in a specific x86 server model, we will work with the customer to figure out a qualification plan for OpenVMS on that server

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x86 Server/IO Roadmap

	OpenVMS V9.0 EAK	OpenVMS V9.1 EAK	OpenVMS V9.2	
Server Models	HPE servers DL20, DL380, DL580 ML30	HPE servers DL20, DL380, DL580 ML30	HPE servers DL20, DL380, DL580 ML30 Blades – investigating	Dell servers Cloud, Modular, Rack, Tower – models TBD Blades – investigating
VM Hypervisor	Oracle VM VirtualBox	Oracle VM VirtualBox, KVM	Oracle VM VirtualBox, KVM	
SmartArray/RAID/HBA	P408	P408, P816, P824	P408, P816, P824 Dell Perc - investigating	
Fibre Channel	Qlogic 26601/2 - 16Gb single, dual port	Qlogic 26601/2 - 16Gb single, dual port	Qlogic 26601/2 - 16Gb single, dual port Emulex LPe16001/2 – 16Gb single, dual port (investigating)	
NIC	1 Gb – Intel I350, BCOM 5719 FlexLOM and add-in cards	1 Gb – Intel I350, BCOM 5719 FlexLOM and add-in cards 10 Gb – Intel X710, X550	1 Gb – Intel I350, BCOM 5719 FlexLOM and add-in cards 10 Gb – Intel X710, X550	
USB	USB 2.0	USB 3.1	USB 3.1	

Notes

- VSI will test specific models in a server product line and will support architecturally equivalent server models (same CPU/chipset family)
- VSI will work with customers for specific server model support if not listed above
- IO card support will be a subset of what is available on x86 Windows/Linux servers
- USB device support will be for server oriented memory devices such as memory sticks and mass storage drives

Based on current, best estimates. Subject to change without notice.

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Back to the x86 release plan…

You might ask – what is VSI doing in the year between the 9.1 EAK and the 9.2 production release?

Answer –

Supporting the 9.1 customers

Testing and Debugging

Optimizing

Building/testing LPs and Open Source apps

Improving the network stack

Perhaps a new device driver or two

Perhaps some software features

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x86 Porting Update

Executive Summary – x86-64 Development Plan

Strategic work areas for porting OpenVMS to x86-64 architecture systems

As in any port to a new architecture, implementation includes a number of **architecture-defined interfaces** that are critical to the inner workings of the system.

System components are being modified to implement the x86-64 **calling conventions**.

OpenVMS is currently built for Alpha and Itanium from **common source code** modules. x86-64 support is being added to that code base. There are some new modules and modules with x86 code paths. But the vast majority of the OS code is unchanged.

Compilers
- Creating a converter to connect DEC-created compiler front-ends to the **LLVM back-end code generator**
- LLVM targets x86-64 as well as many other architectures, providing a direct path for porting to other architectures in the future

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Future VMS Compilers and Image Building
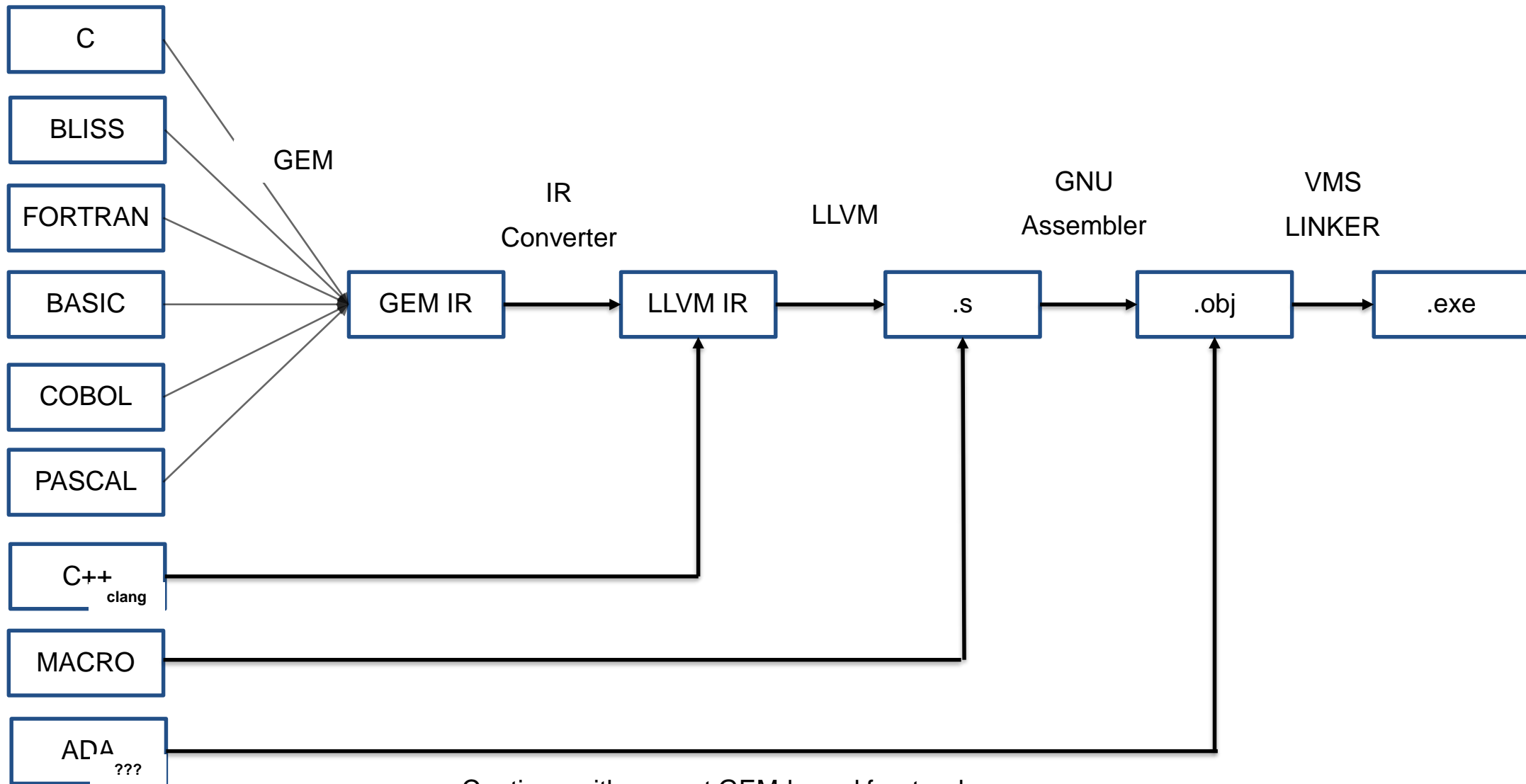
- Continue with current GEM-based frontends
- Use open source LLVM for backend code generation
- Create internal representation (IR) converter
- LLVM targets X86, PowerPC, ARM, MIPS, SPARC, and more

Based on current, best estimates. Subject to change without notice.

Porting playbook

Chapter 1 – Executable Images

- **Definition**: Register Mapping, Calling Standard extensions
- **Creation:** Compilers, Assembler
- **Action:** LIBRARIAN, LINKER, INSTALL, Image Activator
- **Analysis:** SDA, DEBUG/XDELTA, ANALYZE IMAGE, ANALYZE OBJECT

Chapter 2 – Architecture-Specific Needs (a.k.a. "The 5%")

- Booting
- Interrupts, Exceptions
- Memory Management: protection types, access modes, address space, etc.
- Atomic Instructions
- Floating Point
- Special needs for code in assembler (e.g. VAX QUEUE instruction emulation)

Chapter 3 – Compiling and Linking Everything Else (a.k.a. "The 95%")

- Large task but mostly mechanical
- Flush out any remaining 'inter-routine linkage' problems

x86 Projects

System

- Boot Manager
- MemoryDisk
- Dump Kernel
- Device Management
- Memory Management
- Software Interrupt Services
- Scheduler and process management
- Debugger

Objects & Images

- Calling Standard
- Compilers
- Linker / Librarian
- Image Activator
- Stack Unwinding
- Conditionalized Code

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Other Projects

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More Projects

VSI TCPIP – up to date network stack with up to date ciphers, key exchanges. Get it ready for x86 and release on Alpha, and investigate new features (CKO, PTP)

Samba – update from 2008 code base to 2017 V4.6.5 with SMB v2/v3 support

Password Management – DoD requirements for min pw length, special characters, percent change

OpenSSL 1.1.1x – investigating. Also investigate FIPS 140-2 compliance

CRTL/C99 – standards update to C compiler and CRTL

OpenJDK – for x86 (probably Java 11 or 12) and I64 (Java 8 replacement)

12 Gb SAS – faster Smart Array card, faster drives

VAFS – new file system, support large disks, improved performance

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Reference material

OpenVMS Integrity Operating Environment

Released		Planned
BOE Components:	**HAOE Components**	**BOE Components**

Released BOE Components	Released BOE Components (cont.)	HAOE Components	Planned BOE Components
• V8.4-2L1 operating system	• NOTARY V1.0	• Availability Manager Base V8.4-2L1	• CSWS additional modules
• ANT V1.7-1B	• OpenSSL V1.02k	• RMS Journaling V8.4-2L1	• GNV Updates
• AXIS2 VB1.0-1	• PERL V5.20-2A	• Volume Shadowing V8.4-2L1	• SAMBA (CIFS) 4.6.5
• CDSA V2.4-322A	• TCP/IP V5.7-13ECO5F	• OpenVMS Cluster Client V8.4-2L1	• OpenSSL V1.1.x
• CIFS V1.2ECO1A	• The Data Collector V2.3-1220A	• OpenVMS Cluster Software V8.4-2L1	
• CSWS V2.4-3G	• UDDI V1.0B	• RTR V5.3	
• CSWS_JAVA V8.5-4	• VSI Binary Checker V1.2		
• CSWS_PHP V5.2-17A	• WBEM/CIM V3.0-B151019		
• DCPS V2.8	• WBEM providers V2.2-5D		
• DECnet Phase IV V8.4-2L1	• WSIT 3.4-1		
• DECnet Phase V V8.4I	• XML C++ 3.0-1-1		
• DECram V8.4-2L1	• XML_JAVA V4.0-1		
• DECwindows Motif V1.7E			
• DCE (runtime) V3.2A			
• ENCRYPT V8.4-2L1			
• Enterprise Directory V5.8			
• Kerberos V3.2-260			
• GNV V3.0-2			

OpenVMS Integrity Layered Products

Released		Planned

• ABS / MDMS V4.6
• ACMS dev, remote, runtime V5.2
• BASIC V1.8-4
• C V7.4-1
• C++ V7.4-6
• COBOL V3.1-7
• Datatrieve V7.4-1
• DECforms dev, runtime V4.2
• DECset V12.9-1
  (CMS, DTM, MMS, SCA, LSE, PCA)
• DFO V3.3
• DEC DFS V2.5
• FMS dev, runtime V2.6
• FORTRAN V8.3-3
	• Japanese VMS
	  - DECforms V4.2
	  - DCPS V2.8
	  - FMS V2.6
	  - DECwindows Motif V1.7E
	• MRU V1.9
	• PASCAL V6.2
	• SSM V1.9-1
	• TDMS dev, runtime V2.1-1
	• T4 V4.4D
	• OMNI / OSAP
	• DQS V1.4
	• GKS V7.3
	• OMNI V4.1
	• OSAP V4.1
	• X.25
		• C updates for C99

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OpenVMS Alpha – OS & Layered Products

Released		Planned
• V8.4-2L1/V8.4-2L2 OS • CDSA V2.4-320A • DCPS V2.8-1 • DECnet Phase IV V8.4-2L1 • DECnet Phase V V8.4D • DECram V8.4-2L1 • DECwindows Motif V1.7F • DCE (runtime) V3.2B • ENCRYPT V8.4-2L1 • Enterprise Directory V5.8-2 • Kerberos V3.2-152B • DQS V1.4 • NOTARY V1.0 • OpenSSL V1.02KA • TCP/IP V5.7-13ECO5F • The Data Collector V2.3-1220 • VSI Binary Checker V1.1A • AM Base V8.4-2L1	• RMS Journaling V8.4-2L2 • Volume Shadowing V8.4-2L2 • OpenVMS Cluster Client V8.4-2L2 • OpenVMS Cluster Software V8.4-2L2 • RTR V5.4-1 • T4 V4.4D • ABS / MDMS V4.6-1 • ACMS dev, remote, runtime V5.3 • BASIC V1.8-5 • C V7.4-1 • C++ V7.4-8 • COBOL V3.1-7 • Datatrieve V7.4-1 • DECforms dev, runtime V4.2-1 • DECset V12.9-3 (CMS, DTM, MMS, SCA, LSE, PCA) • DFO V3.3-1 • DEC DFS V2.5-1	• FMS dev, runtime V2.6-1 • FORTRAN V8.3-3 • MRU V1.9-1 • PASCAL V6.2-125 • SSM V1.9-1-2 • TDMS dev, runtime V2.1-2 • AM Base V8.4-2L1 • AM Data Analyzer V3.2 • GKS V7.3 • OMNI V4.1 • OSAP V4.1 • X.25
		• OpenSSL V1.1.x

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OpenVMS Integrity Open Source Products

Available	Investigating
• ActiveMQ V5.15.0A • cURL & libcURL V7.49.0A (OpenSSL 1.0.2h support) • Lua V5.2.3 • Mosquitto V1.4.14 (MQTT broker) • Paho-C V1.2.0 (MQTT client) • PHP V5.6.10B • Ruby V2.2.2I • SCALA V2.11.8 • Subversion V1.8-13 • SWIG V3.0.5 • Vgit2 V0.8.5 • ZeroMQ V4.1.2 • gSOAP V2.8.32 • GNUplot V5.0-2 • Maven V3.3-9 • Syslog • Redis 4.0.0 • PDF Viewer • Gearman 1.1.17 • HAProxy 1.7.9 • LibMariaDB 2.1.0 (MariaDB and MySQL client API)	• Precision Time Protocol (PTP) • Erlang • Several Others Being Reviewed • SAMBA (CIFS) 4.6.5 (in progress) • PostgreSQL client • New IDE based on Visual Studio Code

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OpenVMS Alpha Open Source Products

Available	Coming Soon	Investigating
• CIFS V1.2ECO1C • CSWS V2.4-3O • CSWS_JAVA V6.0-47A • Mosquito 1.4.14 (MQTT broker) • Paho-C 1.2.0 (MQTT client) • Redis 4.0.0	• SAMBA 4.6.5	• ZeroMQ 4.1-2 • Redis 4.0.0 (beta available) • New IDE based on Visual Studio Code

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Prior VSI OpenVMS Releases

May 2015

OpenVMS V8.4-1H1

Itanium® Processor 9500 series
- New CPU architecture
- Vastly improved performance

HP Integrity System Support
- rx2800
- HP Integrity Server Blades
  - BL860c
  - BL870c
  - BL890c
- Blades FlexFabric LAN support
- 9300 series blades and rx2800

Software
- Quality Enhancements
  - Operating System
  - Layered Products
- Product Rebranding

March 2016

OpenVMS V8.4-2

HPE Integrity System Support
- Full BL890c Support
  - 64 Cores (hyperthreads off)
  - 1.5 TB Memory
- AUTOGEN (large memory)
- UEFI 2.3
- Network Boot for i4 Blades
- WBEM for i4
- rx7640 / rx8640

Performance
- More alignment faults eliminated
- Tunable BACKUP Compression

Software Component Updates
- Enterprise Directory 5.7
- CSWS (based on Apache 2.4.12)
- LDDRIVER 9.7
- Latest Time Zone Definitions
- I18N (for localized language support)
- Digital Signing 2.0
- Rebranding 2.0

August 2016

OpenVMS V8.4-2L1

Limited Software Release
- Updated SSL to 1.0.2h
- Updated key exchanges
- 0.9.8/1.0.2 coexistence mechanism
- VSI and HPE libraries and shareable images are compatible
- 0.9.8 no longer supported

SSL-Related Capabilities
- Updated for compatibility with 1.0.2: TCP/IP, ENCRYPT, NOTARY, LDAP, ACMELDAP, Enterprise Directory, WBEM services, WBEM providers, CSWS

Patch Kits
- Includes contents of patch kits issued through June 15, 2016

Based on current, best estimates. Subject to change without notice.

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Prior VSI OpenVMS Releases

2017

Q1

- Alpha V8.4-2L1 Operating System
- Itanium
  - JAVA 1.8
  - Digital Signing for ISVs
  - OpenSSL 1.0.2j

Q2

- Alpha Layered Products
- Alpha V8.4-2L2 Operating System
- OpenSSL 1.0.2k

Q4

- 16Gb Fibre Channel for rx2800
- Itanium i6 Support Announced

2018

Q1
LTO-8 Tape
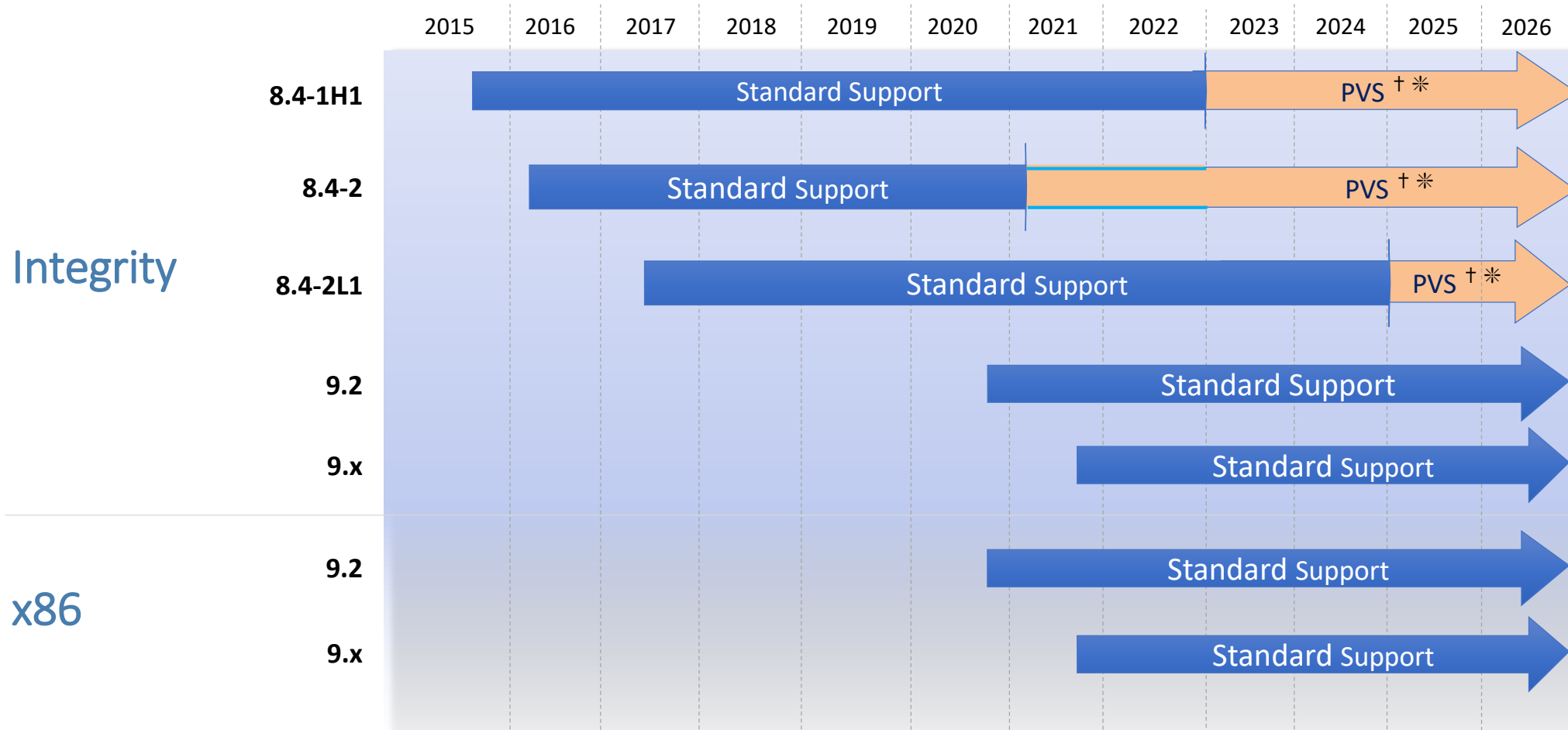
Q2
OMNI
OSAP
GKS
DQS

Q3
VSI TCP/IP V10.5

Q4
JAVA 8 Update
HPE MSA2050 support
3PAR FW V3.3.1

VSI OpenVMS Integrity & x86 Support Roadmap

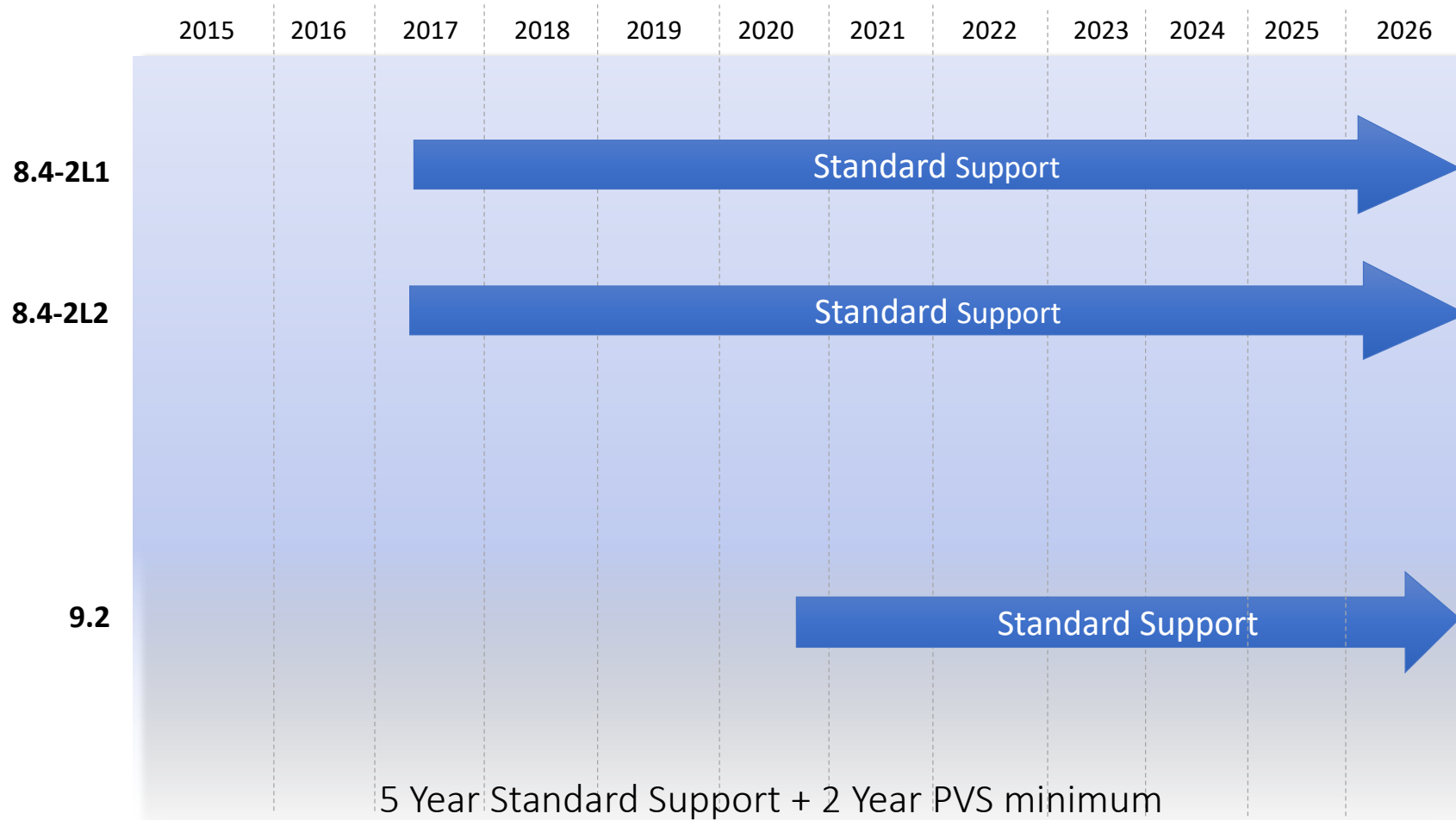5 Year Standard Support + 2 Year PVS minimum

† PVS – Prior Version Support without Sustaining Engineering
24 Month notice will be provided before support is ended
﹡ Extended Engineering Support (EES) contract is available

VSI OpenVMS Alpha Support Roadmap

Thank You

To learn more please contact us:

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