Integrating HP Integrity servers into the OpenVMS AlphaServer environment – a guide for planning and porting

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Introduction

HP has standardized its enterprise-class platforms on the HP Integrity server line. Based on industry-standard Intel® Itanium® 2 microprocessors, Integrity servers are architected by HP as the next generation of higher performing, more flexible, more adaptable servers.

The good news for OpenVMS customers is that they can integrate the latest HP Integrity servers into their current AlphaServer OpenVMS environments. Along with enjoying a lower total cost of ownership (TCO), OpenVMS customers are able to protect their investments in proprietary and ISV applications with a well-documented porting process.

But before porting there must be planning. And it is not just a question of IT planning because the technical aspects of porting are straightforward. Instead, the planning process can start with a focus on the business decision of when to add Integrity servers rather than the technical question of how to do it. This means that OpenVMS customers can fine-tune the integration of HP Integrity servers into their current OpenVMS environments based on business needs instead of technical prerequisites.

This white paper explores planning the integration of HP Integrity servers into the OpenVMS environment and presents an overview of the porting process. The first section — Planning for porting, outlines the key steps and considerations in planning the integration. The second section, The Porting project: what's involved, provides a high-level description of important aspects of the porting project. Appendix A presents a porting checklist that can be of significant value in determining the amount of work the port will require.

Planning for porting

Customers who prefer to remain on and grow their AlphaServer system environments can continue to take advantage of new versions of OpenVMS. Those who choose to deploy OpenVMS on HP Integrity servers can immediately exploit its capabilities. And those whose plans call for integration of both server platforms into a single, clustered environment can do so as well, thus protecting their investments and meeting future needs.

Concurrent development and porting

HP will continue delivering AlphaServer systems until October 2006 with ongoing support for at least five years after that. This means that OpenVMS business partners and end users can continue OpenVMS application development efforts for current and future AlphaServer production-system environments while concurrently porting applications to the Integrity server architecture.

For hands-on experience, HP OpenVMS customers and business partners can take advantage of a secure environment for testing applications on OpenVMS in HP labs in Nashua, New Hampshire, and other sites around the world. HP has invested heavily in creating lab environments to help customers evaluate software and hardware technology on the latest versions of OpenVMS.

In addition, HP software partners have resources available to them through the Developer and Solution Partner Program (DSPP) at www.hp.com/go/dspp

OpenVMS is running on Integrity servers

The OpenVMS operating system has been in a state of continuous high-quality evolution since its 1977 introduction on the VAX line of 32-bit servers. OpenVMS was ported to the Alpha 64-bit architecture in the early 1990s. And now HP OpenVMS runs on the full line of HP Integrity servers from the entry-class rx1620 to the Superdome.

Single-source code approach
Beginning with v8.2, OpenVMS is now developed from a single-source-code stream for both HP Integrity servers and AlphaServer systems. This approach allows for simultaneous release of new non-hardware-dependent features and functions on both platforms. Current investments in AlphaServer systems are protected and customers can take advantage of the lower predicted total cost of ownership and greater flexibility afforded by the Integrity server line.

Application source code and data file compatibility
With binary data file compatibility, HP AlphaServer systems run seamlessly with Integrity servers. Most existing OpenVMS applications – whether developed in-house or purchased from a third party – will run on HP Integrity servers by simply recompiling and relinking the source code. If the source code is not available, HP has tools available to ensure that customers are able to take the fullest possible advantage of this advanced enterprise server platform. One powerful tool is the HP OpenVMS Migration Software for HP Alpha to Integrity Servers (OMSAIS). The HP OMSAIS product includes two components:

- Alpha Environment Software Translator (AEST) — an HP OMSAIS utility that translates executable and shareable OpenVMS AlphaServer system images into functionally equivalent images that run on OpenVMS on Integrity servers. A translated image is an OpenVMS Integrity server image containing both AlphaServer system code translated into Integrity server code, as well as the original OpenVMS AlphaServer system image
- Translated Image Environment (TIE) — a software component within the operating system that provides the run-time environment for translated image execution.

Roadmaps continue to chart future
Beginning with v8.2, OpenVMS supports both HP AlphaServer systems and HP Integrity servers. OpenVMS v8.2 supports entry-class Integrity servers and all AlphaServer systems. As of September 2005, OpenVMS v8.2-1 will support the entire line of Integrity servers from the largest Integrity Superdome through the entry-class rx1620.

OpenVMS roadmaps are updated quarterly and extend five years out. They are available at www.hp.com/go/openvms/roadmap

As customers step through the planning and implementation process it is important to keep in mind that, all things being equal, they can opt for either AlphaServer systems or Integrity servers into the fourth quarter of 2006 with HP support for the AlphaServer family extending at least until 2011. From a business perspective, though, it is prudent to explore incrementally implementing Integrity servers because of their greater flexibility and more favorable total cost of ownership.

The next section presents the key steps and considerations when planning the integration of Integrity servers into the OpenVMS environment.

Key steps and considerations

Whether deployed on Integrity servers, AlphaServer systems or a mixture of both in the same cluster, OpenVMS is functionally the same operating system. Deploying the newest version of OpenVMS on an Integrity server requires the same effort as upgrading an AlphaServer system or upgrading to a new AlphaServer system.

The planning, sizing, testing, and implementation cycles are the same with the exception of software porting to the Integrity server environment. This typically straightforward activity is covered in the next section — The porting project: what's involved.

The tables on pages 4 and 5 display the planning and implementation process at a high level. Each step includes:

- The event or condition that would trigger it
- The recommended action to take
- Comments to provide more detail

Capacity planning

HP Services stands ready to assist you in the capacity-planning step. Information is available at www.hp.com/go/services.

Trigger	Action	Comments
New projects	Consider requirements	Estimate specific requirements for • Hardware • Software • Storage • Database • Applications
Performance	Consider timing	• First, assess Integrity servers because they carry a lower TCO than AlphaServer systems • For substantial near-term application performance improvements, larger AlphaServer systems may be more appropriate
System expansion	Prepare to integrate new cluster nodes Consider application-porting status	• Integrity servers should be your first choice unless all elements of the solution stack will not be fully ported to Integrity • If elements are not anticipated to be ready, contact the owner of that element (e.g., application developer or ISV) to make the need and timing clear • For the status of most ISV and HP OpenVMS applications, see www.hp.com/go/openvms/. Click on "OpenVMS solutions" for HP OpenVMS software and click on "Partner solutions" for the status of ISV software
Modified, updated, or new business process	Consider timing; part of operation being affected; complexity of process	A good time to add Integrity servers to the environment is when business processes are being modified. This provides for fewer steps, allows for TCO advantages sooner, and ensures the infrastructure is ready for all future enhancements

Ensure all software is ported to and qualified on OpenVMS for Integrity servers

Trigger	Action	Comments
Evaluation of software	• Port in-house developed software using the process described in the next section. • For third-party applications ensure that the provider has ported or is porting the application.	• Porting applications from OpenVMS on VAX or AlphaServer systems is generally a straightforward operation provided the practices described in this white paper and those covered in the technical porting guides are followed • HP stands ready to assist in any way possible including the use of OpenVMS labs • The technical porting guide for AlphaServer to Integrity is available at www.hp.com/go/openvms/doc • The technical porting guide for VAX to Integrity is under development and will also be found at the above URL

Choose a pilot project and proceed with it on Integrity servers

Trigger	Action	Comments
New application New business process Expansion of a localized operation	Develop a pilot implementation to test capacity and performance assumptions	• Extrapolate actual needs based on tested assumptions • Adjust configuration, tune software

Move the pilot project into production

Trigger	Action	Comments
Pilot meets your qualification criteria	• Prepare and test production-level configurations • Adjust configuration as needed • Tune software • Test fully integrated environment • Deploy	• Because releases of OpenVMS beginning with v8.2 will have a common code stream, OpenVMS environments will continue to evolve in the consistent, seamless way that has been the case for many years • OpenVMS on Integrity will integrate into OpenVMS AlphaServer clusters provided qualified-pair policies are met

Continue assessment, evaluation, planning and evolution best practices

Trigger	Action	Comments
On going	Follow the process established for the organization	HP Services stands ready to assist you as needed

The porting project: what's involved?

OpenVMS customers can make the decision to integrate Integrity servers into their OpenVMS environments with full confidence that the transition will not unduly tax their technical and operational resources. Operating system, middleware, development tool, and compiler compatibility protects long-term OpenVMS investments while extensive porting support for customers and ISVs further minimizes the effort involved.

Common application development techniques allow ISVs and end-user developers to continue using their current and future AlphaServer systems while transitioning to or adding Integrity servers. An organization can, therefore, conduct business as usual while incrementally enhancing operations and gaining a lower TCO.

To ensure a smooth transition, HP and Intel created a suite of development tools that maximizes the functionality of the Integrity server and maintains the functionality and user interface that characterizes the AlphaServer OpenVMS development tool suite.

Porting scenarios – what is the degree of difficulty?

HP's goal is to maintain forward source code compatibility. This means that "well-behaved" applications – those using standard documented interfaces – that currently run on recommended versions of OpenVMS Alpha should run successfully on OpenVMS on Integrity servers. ISVs and customers who take advantage of published system services and library interfaces can have a high level of confidence that their applications will move with little or no modifications to the latest version of the OpenVMS operating system.

The whether-or-not-to-port discussion takes place in the business offices of both customers and ISVs. The customer environment will typically include both in-house and third-party applications. Hundreds of ISV applications meeting all requirements have already been ported or are in the process of being ported to Integrity servers. Furthermore, new applications that have not been on OpenVMS in the past are now being brought over to OpenVMS for Integrity servers. In some cases ISVs have not yet decided to port their applications to OpenVMS for Integrity servers. Customers may feel little control over an ISV's decision whether or not to port to the OpenVMS on Integrity server environment. However, it has been HP's experience that ISVs do listen to their customers. Therefore, we recommend that customers strongly encourage their third-party providers who have not yet done so to port their products to OpenVMS for Integrity servers as soon as possible.

ISV support
HP recognizes that not all layered software and middleware supplier products will be immediately available for Integrity servers. HP is committed to supporting software vendors with information, hardware, support, and tools that will make this process as straightforward as possible. Each vendor will have to monitor the progress of their suppliers of prerequisite software to ensure that the required components are in place for their own development and expansion schedules.

The HP tool set on the existing Alpha platform and the new Integrity platform makes porting to the Integrity server platform transparent for most applications in terms of code base, commands, and process. It will reduce the time required for product porting. Nothing, though, will replace the unit test, system test, and regression test that accompany any quality product release.

Most OpenVMS application providers have ported their products to the Integrity server platform or plan to do so. The following web site provides a list of partners who have committed to porting their products to OpenVMS on Integrity server systems: http://h71000.www7.hp.com/partners/index.html

In-house applications
The relative ease or difficulty of porting depends in large part on the;

- Availability of source code
- Level of maintenance the code receives
- Application complexity

A few of the questions to ask in the run-up to porting include:

- Are all source code files available to build the application?
- When was the last time the application environment was completely recompiled and rebuilt?
- How many languages were used to construct the application?
- On what HP layered and third-party products does the application depend for proper operation?

If the source code files are intact and well maintained, then the porting process will be straightforward. If code is missing or non-existent then more work will be required. In any case, HP has the tools and the knowledge to help customers port their applications regardless of the shape they are in.

Although this white paper primarily addresses the planning and porting of OpenVMS AlphaServer and Integrity server applications, customers who need to port their VAX applications to the Integrity server platform can find guidance in a white paper entitled "Making the transition from HP OpenVMS VAX to HP OpenVMS on Integrity Servers" available at: http://h71000.www7.hp.com/openvms/whitepapers/index.html.

OpenVMS application porting strategy

The OpenVMS application porting strategy can be summed up in one phrase: **Compile and Go!** The goal is to provide customers total compatibility between the AlphaServer system and Integrity server platforms to simplify application porting as much as possible and to protect their investments.

Development environments
HP OpenVMS provides complete and comprehensive 3GL and TP development environments that can be used by customers who develop and deploy applications completely on OpenVMS.

HP has ported the existing OpenVMS development tools and utilities that currently ship with the OpenVMS operating system to the Integrity server platform. This means that developers should be able to use their existing procedures for developing, debugging, testing, and deploying their applications on the Integrity server platform.

HP has ported and updated the full suite of DECset software development tools to the Integrity server platform:

- HP Code Management System (CMS)
- HP Digital Test Manager (DTM)
- HP Language Sensitive Editor/Source Code Analyzer (LSE/SCA)
- HP Module Management System (MMS)
- HP Performance and Coverage Analyzer (PCA)

Additional information is available at http://h71000.www.7.hp.com/commercial/decset/decset_index.html

HP also provides a development environment allowing users to develop on the desktop of their choice and deploy on OpenVMS. Distributed NetBeans — a programming environment that extends the capabilities of NetBeans — lets users develop, edit, compile, debug, and build applications for OpenVMS on Windows® or LINUX systems.

More information on NetBeans and Distributed NetBeans is available at http://h71000.www7.hp.com/openvms/products/ips/netbeans/

HP also works with business partners to provide 4GL tools and development environments.

HP supports the following compilers on OpenVMS on Integrity servers:

- HP BASIC
- HP C
- HP C++
- HP COBOL
- HP Fortran
- HP Pascal
- HP AMACRO
- Gnat Ada for OpenVMS I64
- Java™ Technology

For compiler details see http://h71000.www7.hp.com/commercial/cace.html

Binary translator
If application source code is not available, HP provides a binary translator that translates user mode OpenVMS Alpha images to OpenVMS on Integrity server images. The translator translates:

- Native Alpha images written in C, C++, COBOL, or FORTRAN
- VAX images written in C, C++, COBOL or FORTRAN that have been translated into Alpha images using DECmigrate

The translator will not translate all images. Among these are:

- Self-modifying code
- User-written system services
- Privileged instructions

For binary translator details see www.hp.com/go/openvms/products/omsais

Understanding the differences

Although the commonality in OpenVMS features between Alpha and the Integrity server platform is clear, there will be some significant implementation differences between the two platforms that may affect user-written applications.

Calling standard
HP has determined that the most efficient way to use the compiler technologies developed by Intel is to adopt industry standards used by the Intel® compiler. One clear advantage of this decision is that development tools will be ported more easily to OpenVMS in the future.

All of the compilers, development tools, and utilities provided with the OpenVMS operating system on the Integrity server platform will use and understand these new formats. Application developers will not need to concern themselves with these formats unless their applications have specific knowledge of them.

HP has adopted the Intel® calling standard with a few modifications needed for OpenVMS. Documentation of this standard is available at www.hp.com/go/openvms. Click on "OpenVMS on Integrity" and then on "Resources."

Floating point formats
The Integrity server architecture supports the IEEE floating point format. AlphaServer systems support the IEEE floating point format as well as the VAX floating point formats. All compilers ported from AlphaServer systems to the Integrity server platform will retain support for the VAX floating-point formats. For example, if a compiler supports G float on Alpha, that same compiler will support G float on Integrity servers. HP provides support in the compiler to do the necessary data conversions. Specific details of this feature are covered in the "OpenVMS Floating Point" white paper found at http://h71000.www7.hp.com/openvms/integrity/resources.html

Customers with any concerns about the different floating-point formats should contact HP.

Architecture-specific code
Customers with Alpha architecture-specific code – code that "knows" the number of registers in a context switch or knows details about the machine architecture – will probably have to make modifications to this code. This is code that is usually written in Alpha assembler language. Alpha assembler code will need to be rewritten in a high-level language such as C or in Intel's assembly language.

Object and image file formats
HP has switched from using proprietary formats for object and image files to the industry-standard ELF format for Integrity server object and image files. In addition, HP is using the industry-standard DWARF for debugging and traceback information in Integrity server files. Any applications dealing with the object or executable image file formats will have to be modified to handle these new formats. This type of code is typically found in compilers, debuggers, and analysis tools that directly process or manipulate object files or executable images.

Conditional code
Customers with command files or application source code conditionalized for VAX and AlphaServer systems may have to make changes to the code when moving to Integrity servers in order to deal with the three different platforms.

Porting process

A porting project comprises the following tasks:

1. Assessment of porting needs
2. Compiling/linking/running
3. Unit testing
4. System testing
5. Regression testing
6. Shipment of revised application
7. Operation or installation of processes or procedures
8. Remote support or maintenance

Although each task is completed sequentially, repetition of some steps may be required if problems arise.

A detailed technical description of the porting process is covered in a porting guide available at http://h71000.www7.hp.com/openvms/integrity/resources.html

Assessment of porting needs
The first step in any porting project is the assessment task. All components of the existing application need to be inventoried to determine all prerequisites and dependencies for differences in development, and operational tasks.

Source code, infrastructure products, scripts, and procedures are examples of the areas that need detailed checking for development tasks.

Installation requirements, on-disk structure, backup/restore functionality, operator look-and-feel, and system administration are examples of operational tasks.

This inventory is then compared to the list of supported products, procedures, and functionalities of the target platform. All deviations need to be researched for schedule mismatches, missing functionality, procedural conflicts, and supportability. All costs and time impacts are included in an engineering plan to provide a total picture of all porting issues.

Compiling/linking/running
This task involves converting source code modules to a single module or to a set of interdependent executable modules through a series of target-dependent operations.

Unit testing
Unit testing is the first level of testing and is usually performed by the source-code development or change engineer.

System testing
When one or more interdependent modules have completed unit testing, the interaction between the modules is tested for correct operation. Specific testing is performed to check that the individual modules pass the correct information between them, and that the combination of modules performs the correct sequence of operations within the allotted time, as determined by the design, specification, and architecture of the application solution.

Regression testing
Regression testing is a solution-oriented test that exercises the individual modules using a predetermined sequence of operational and performance events. Given a known set of inputs, the solution is run and the output and all operator-visible intermediary results are checked for compliance with a specification and with a previous version of the application. Both correct operations and error paths are checked as part of this testing level.

Shipping or implementing the revised application
The next release of the application is ready for archival and release to the customer base or, in the case of an in-house application, to be implemented when:

- The executable part of the application has completion criteria
- All shippable and engineering documentation is complete
- All operational-dependent software is available on the target platform

Operation and installation of processes and procedures
On implementing (whether an ISV or in-house application), a different set of parameters becomes important. The new revision of the application replaces the current version, but only after performing various tasks specific to the environment. Installation is only a small part when the environment is using the application to run the business.

Testing should be performed to ensure that the new version is compatible with the environment's unique use of the application. All administrative and operator actions must be addressed by documentation and training. System and data backups are created to ensure that the environment can return to a known reference point if any ambiguities occur in the normal course of business.

Parallel operation of using both versions of the application environment to run the business may be warranted based on the degree of change in the environment (hardware or software), the criticality of the application to conduct business as usual, or just the large number of people and information that the application affects.

Extra procedures must be instituted when the change invalidates any local archives that are required for legal or business considerations, such as accessibility to backup media.

Remote support and maintenance considerations
The effort to maintain and support the users of the application will be increased at the time of its revisions. New or modified local procedures may create special needs for the support staff. Existing remote diagnostic techniques and tools may require changes to support the new revision and may necessitate training of both the local and support staff resources

Porting resources

Because not all organizations will have expertise in all phases of the porting process, HP has gathered a set of resources that can assist our ISVs and customers as they go through the process. These resources can provide everything from porting guides to teams of personnel with equipment that will handle the entire porting task. A subset of these resources includes:

- Developer & Solution Partner Program (DSPP) — as DSPP members, developers have access to a team of dedicated consultants who deliver technical assistance to meet development needs. They can be a focal point for migration- and porting-related activities, including issues around system performance and application optimization. HP consultants work directly with a technical representative from customer companies to ensure requests are resolved in an accurate and timely fashion. For more information on the DSPP visit www.hp.com/go/dspp/
- HP TestDrive — customers can research and experience the OpenVMS on Integrity server environment over the Internet with the HP TestDrive program. Details are available at http://www.testdrive.hp.com/
- HP Services — as the HP strategy related to Integrity server systems continues to develop, Sales Resources and Global Services will be assessing the impact to the long-term plans of HP customers and ISVs. A number of template and custom service offerings will be created and documented to address generic and unique situations of each customer. Each service offering will be built to support the future directions of the customers by making sure there are tools and resources available to assist with a change whenever a decision point is reached. For more information on software consulting and development support visit: http://h71028.www7.hp.com/enterprise/cache/10300-0-0-225-121.html

HP education and training
HP offers a number of education and training programs for the OpenVMS environment. These courses can be accessed at HP Education Centers, at customer facilities, or online. Detailed information is available at: http://www.hp.com/education/sections/openvms.html

Conclusion

OpenVMS customers can fine-tune the integration of industry-standard HP Integrity servers into their current OpenVMS environments based on business needs instead of technical prerequisites.

HP has ensured that, in the best case, integrating Integrity servers into the OpenVMS environment can be as straightforward as adding a new node to an existing OpenVMS AlphaServer cluster.

For porting issues that are more complex, HP offers tools and services to ease the transition.

In the end, OpenVMS customers will benefit from a lower total cost of ownership (TCO) while protecting their investment in proprietary and ISV applications.

Appendix A: Porting Checklist

In porting projects, many issues and tasks are often overlooked that can cause schedules and costs to escalate beyond original estimates. To help eliminate this problem, HP has created a porting checklist. Completing this checklist and consulting with HP will help customers and ISVs assess the effort necessary for porting applications from AlphaServer systems to the Integrity server platform.

1. In one sentence, what does the application do?

2. On what operating system and version does the current application environment run? (Example: OpenVMS VAX v7.1, OpenVMS Alpha v7.3)

3. To what operating system will the application be ported?

4. List all languages and versions that were used to construct the application
   (Examples: COBOL v2.7, Compaq C v6.4 , Compaq Fortran v6.6).

Language	Version	Comments

4b. If more languages were used, list them on a separate page.

5. List all HP layered and third-party products the application is dependent on for proper operation
   (Examples: Rdb, Oracle, COBOL PreCompiler, Compaq MessageQ, SMG, DECforms).

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Language	Version	Comments

5b. If more products were used, list them on a separate page.

6. Are all source code files available to build the application? Yes ❑ No ❑

7. How many disk blocks or MBs of source code files are there?

8. When was the last time the application environment was completely recompiled and rebuilt?

9. If the application is rebuilt more than once a quarter, how often is the application rebuilt?

10. How is the application tested or verified for proper operation after it is rebuilt?

11. Which source-code management tool is used, if any?

12. Do you have a separate development and test environment from which the application updates and tests?
Yes ❑ No ❑

13. What is the primary reason for porting the application?

For more information

To learn more about the OpenVMS operating system
visit www.hp.com/go/openvms

To learn more, visit **www.hp.com**.

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