

HP OpenVMS Migration Software for Alpha to Integrity Servers

Release Notes

February 2005

Revision/Update Information:	This is a new manual.
Software Version:	OpenVMS Migration Software for Alpha to Integrity Servers Version 1.0
Operating System and Version:	OpenVMS Alpha Version 7.3 or higher (for binary translator) OpenVMS I64 Version 8.2 or higher (for translated images)

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Preface

HP OpenVMS Migration Software for Alpha to Integrity Servers (OMSAI) supports the migration of OpenVMS Alpha applications to OpenVMS Itanium systems. An OMSAI utility, the Alpha Environment Software Translator (AEST), translates executable and shareable OpenVMS Alpha images into functionally equivalent images that run on OpenVMS Itanium systems. A translated image is an OpenVMS Itanium image containing both Alpha code translated into Itanium code as well as the original OpenVMS Alpha image. The OMSIA utility also translates Alpha executables created by OpenVMS Migration Software for VAX to Alpha Systems (MSVA) into functionally equivalent OpenVMS I64 images.

Associated Documents

- *HP OpenVMS Migration for Alpha to Integrity Servers Guide to Translating Images*
- *HP OpenVMS Migration for Alpha to Integrity Servers Installation Guide*
- *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Release Notes, June, 2002*
- *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Installation Guide, June, 2002*
- *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Translating Images, June, 2002*

1.1 Overview

HP OpenVMS Migration Software for Alpha to Integrity Servers for OpenVMS I64 Systems (OMSAI) is a product that translates existing OpenVMS Alpha applications for use on OpenVMS I64 systems. OMSAI can do the following:

- Translate native OpenVMS Alpha or previously produced by DECmigrate user-mode executable files and shareable images to their OpenVMS I64 equivalents (subject to limitations).
- Identify dependencies on user-supplied shareable images that might also need to be translated or recompiled.
- Identify nonportable code that might need to be rewritten in order to run successfully on OpenVMS Alpha systems.
- Make it possible to combine translated Alpha executable and shareable images with OpenVMS I64 executable and shareable images that have been compiled with native Intel® Itanium® compilers.

OpenVMS Migration Software for Alpha to Integrity Servers software produces a working OpenVMS I64 executable from any OpenVMS Alpha executable, whether native or VESTed (produced by DECmigrate,) that meets the criteria described in Section 1.2.

1.2 Criteria

OMSAI software produces a working OpenVMS I64 executable from any OpenVMS Alpha executable that meets the following criteria. This section defines requirements and restrictions to translatable images.

1.2.1 Translatable Images

The OpenVMS Migration Software for Alpha to Integrity Servers translates any user-mode OpenVMS Alpha binary images, with the limitations listed below, including native Alpha images and VESTed images that were previously translated from VAX binary images by any existing version of DECmigrate. These include:

- Native Alpha binary images, linked and working on OpenVMS Alpha versions from 6.1 to 7.3-*x*.
- VESTed binary images produced by DECmigrate Versions 1.0 through 1.2. In this case original VAX images should be linked on OpenVMS VAX Versions 5.5 through 7.3. VESTed images are intended to run on OpenVMS Alpha Versions 6.1 through 7.3.

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1.2 Criteria

1.2.2 Run-Time Performance Restrictions

OpenVMS Migration Software for Alpha to Integrity Servers operates much like a compiler, except that the input file is a Alpha binary executable file rather than source code of any level. A translated image does not benefit from an optimizing compiler that takes advantage of the Itanium architecture. Also, because the Alpha and Itanium architectures do not map exactly, some of the code sequences will be modified or emulated. This implies that the Alpha binary image translated to Itanium will typically run slower than a native generated Itanium image. The expected slow down factor is hard to predict and strongly case dependent, but is not expected to be more than a factor of 10 worst case.

1.2.3 Global Restrictions

OpenVMS Migration Software for Alpha to Integrity Servers cannot generate a working program whenever when the original program:

- Does not work.
- Contains non-user-mode code.
- Uses undocumented interfaces into operating system.
- Uses user-written system services.
- Has been linked so that code and data are tied to fixed addresses.
- References system memory space.
- Uses privileged or undocumented Alpha instructions.
- Uses self-modifying or other dynamically generated code, which will be handled in simulator mode on the fallback interpreter for Alpha code.
- Depends on shareable images that have not been translated or recompiled for OpenVMS I64 systems.
- Was linked on a version of OpenVMS Alpha earlier than Version 6.1, for native Alpha images.
- Was linked on a version of OpenVMS VAX earlier than Version 5.5, for VESTed images.

Note

VESTed VAX images will retain the same limitations in translation to the I64 platform as were applicable in DECmigrate for the VAX binary images translation to the Alpha platform. For details about limitations related to VESTed VAX images, see the *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Release Notes*.

1.3 Multithreaded Applications Restrictions

Translation of multithreaded applications has additional limitations:

- Only native OpenVMS Alpha images can be translated and supported. Multithreaded images linked on OpenVMS VA, cannot be translated and are not supported.

1.3 Multithreaded Applications Restrictions

- Support of multithreaded applications that use user-mode thread managers other than DECThreads/PThreads implement their own thread management, or use system services to directly access kernel threads mechanisms are not guaranteed.
- The correct translation of multithreaded applications, that are written on low-level programming languages and that use nonstandard locking/synchronization techniques is not guaranteed. This is because Alpha instructions used for locking/synchronization have no direct equivalents in the Itanium processors architecture and cannot be translated instruction-by-instruction.

1.3.1 Interoperability Restrictions

On an OpenVMS I64 system, native and translated images can interoperate with one another: a native image can call a translated image and a translated image can call a native image. A native routine that either calls or is called by a translated image must be compiled with the `/TIE` qualifier and linked with the `/NONATIVE_ONLY` qualifier. Checking for interoperability between native and translated images occurs at run time. If the `/TIE` and `/NONATIVE_ONLY` qualifiers were not used to compile and link the native routine, an error occurs at run time when the native routine and a translated image attempt to interoperate. If such an error occurs, recompile and relink the native routine appropriately.

Note

IAS Assembler for OpenVMS I64 systems does not support the `/TIE` switch. When coding function descriptors in IAS Assembler, the developer must specify a procedure signature block if the routine can be called by translated code. For more information, refer to the *HP OpenVMS Calling Standard*.

1.3.2 Supported Languages

OpenVMS Migration Software for Alpha to Integrity Servers supports the translation of OpenVMS Alpha images that are written in the following programming languages:

- C
- C++
- Fortran
- COBOL
- BLISS
- Macro-32
- Macro-64

Note

The same languages that were supported in DECmigrate for VAX binary image translation to the Alpha platform are supported in the translation to the I64 platform, excluding PL/I. VAX programs written in PL/I are not supported because of lack of RTL support. For more information, see Section 1.3.3. For details about limitations related to VESTed VAX

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1.3 Multithreaded Applications Restrictions

images, see the *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Release Notes*.

1.3.3 Supported RTLs

OpenVMS Migration Software for Alpha to Integrity Servers supports the following run-time libraries:

- HP C/C++ runtime libraries for OpenVMS Alpha
- VAX C run-time libraries for OpenVMS VAX
- Fortran run-time libraries
- COBOL run-time libraries
- Mathematical libraries
- Relevant system run-time libraries

Note

The same run-time libraries that were supported in DECmigrate for VAX binary image translation to the Alpha platform are supported in the translation to the I64 platform, excluding PL/I RTL which is not available on I64. For details about limitations related to VESTed VAX images, see the *OpenVMS Migration Software for VAX to Alpha Systems V1.2 Release Notes*.

1.3.4 System Quotas

To translate large images, you may need to increase system quotas so that AEST has enough memory to complete the translation. The relevant quotas that might need to adjustment are:

- BYTLM
- WSDEF
- WSQUO
- WSEXTENT
- PGFLQUO

1.4 Software Requirements

OpenVMS Migration Software for Alpha to Integrity Servers binary translator (AEST) should be running on OpenVMS Alpha Version 7.3 and higher. Translated applications must be running on OpenVMS I64 8.2 and higher.

1.5 Known Problems and Limitations

- Programs using atomic instructions RS and RC and CALL_PAL AMOVRM and AMOVRR are not supported by the OpenVMS Migration Software for Alpha to Integrity Servers. Applications that previously were VESTed with the /PRESERVE=INSTRUCTION_ATOMICALITY qualifier can be translated but will generate a run-time error. This will be addressed in future versions of OpenVMS and OMSAI.

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1.5 Known Problems and Limitations

- If a translatable program is compiled with G_FLOAT format, the expected performance slowdown factor may be more than a factor of 100 (worst case). This problem will be addressed in a future release.
- The binary translator does not provide support for __FAST_SETJMP, _FAST_LONGJMP. This will be corrected in a future release.
- Any Alpha or VESTed VAX images translated with a previous version of OMSAI need to be retranslated using the V1.0 kit.
- For V1.0 (first production release), TIE\$SHARE run-time support for translated images is not bundled with the base operating system. This support will be bundled with a future version of the operating system thereby enabling software developers to distribute translated versions of their products to customers who have OpenVMS I64 systems, regardless of whether those customers have purchased OpenVMS Migration Software for Alpha to Integrity Servers. The TIE V1.0 PCSI kit must be installed on the OpenVMS I64 operating system for run-time support of translated images.
- For native code translated code to interoperate, it must meet the following requirements:
 - All function descriptors must contain signature data. The signature data is used by the jacket routines to transform arguments and return values between their native and VAX or Alpha formats. Native I64 images contain function descriptors for both outbound calls and all entry points.
 - All calls to function variables (that is, where the identity of the called function is contained in a variable) must be made through the library routine OT\$CALL_PROC. OT\$CALL_PROC determines at run time whether the function being called is native or translated, and it calls native code directly and translated code via TIE.

These requirements are met by compiling code using the /TIE qualifier and linking it using the /NONATIVE_ONLY qualifier. /TIE is supported by most OpenVMS I64 compilers including the Macro-32 compiler. It is not supported by the C++ compiler.

- Translation of VAX programs written in VAX DECC

No run-time library support is available for VAX programs compiled with the DECC compiler. For VAX programs written in C, run-time library support is available only for VAX programs compiled with the VAXC compiler. You can determine which compiler was used to create a VAX image by performing an ANALYZE/IMAGE command on the VAX system and inspecting the output. Search the output for an area titled "Shareable Image List." If VAXCRTL appears in the list, the image is compiled with VAXC; if DECC\$SHR appears in the list, the image is compiled with DECC.
- C++ Limitations

Because of internal differences in object architecture, translated C++ images cannot interoperate with native C++ images. C++ components of an application (main program and shareable images) must be either all translated (from Alpha C++ images) or all compiled with the I64 native C++ compiler.

Additionally, the I64 C++ compiler does not support the /TIE qualifier. This means that I64 native images written in C++ can neither call nor be called by other translated images written in other languages.
- Floating point exceptions with D-float math

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1.5 Known Problems and Limitations

There is a known problem in the TIE run-time library that can cause spurious floating point exceptions if the following conditions are true:

- The translated code is written in C and compiled on Alpha.
- It makes calls to floating point math functions.
- It is compiled with /FLOAT=D_FLOAT.
- The math routines encounter invalid floating point values.

Under these circumstances the program may encounter "floating invalid operation" exceptions that should not be reported for code written in C. Without knowing how the program was written and compiled, it is difficult to detect this problem other than by testing. If a program is known to do floating point math, do an ANALYZE/IMAGE of the program. The lack of a reference to DMPLSSHR in the ANALYZE/IMAGE output is an indicator that the program may be vulnerable to this problem.

This problem will be corrected in a future update.

- The translation of Alpha or VESTED VAX PL/I applications is not supported.
- DECwindows applications are not supported by HP OpenVMS Migration Software for Alpha to Integrity Servers (OSMAI).