OpenVMS on Integrity Servers:
Migrating from Alpha

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This session is NOT about –

- Marketing
- Non-disclosure material
- Product sales strategies

In the interest of transparency –

- I have never been an employee of Digital/Compaq/HP/Intel

- I do have a small holding in HP stock

- I am not presently a consultant to HP/Intel

- None of the material is derived from a Non-Disclosure

- The opinions expressed are purely my own.

Agenda –

- Is IA-64 different?

- Do these differences matter to developers?

- What is it like to run OpenVMS on Integrity?

Is IA-64 different? –

- Technical review – Data Formats

- Issues in porting

- History and context of EPIC
  (CISC, RISC, EPIC)

- Technical emphasis

- Sizing and migration

Don't know means DON'T KNOW –

- But we can make reasonable analyses based upon published data

    - Published Alpha specifications

    - Published Itanium(tm) specifications

    - OpenVMS documentation set

    - Digital Technical Journal

    - Validated against field test experience

Don't know means DON'T KNOW (cont'd) –

- and upon applicable experience

  - PDP-11 to VAX (1978 – present)
  - VAX to Alpha (1992 – present)
  - General experience

My personal background –

- 25 years of experience on multiple platforms

- Platforms (integer size/address size/ integer format)

  - IBM System/360/370 (32/24/2)

  - Digital PDP-11 (16/16/2)

  - Digital VAX (32/32/2)

  - CDC 6600 (60/18?/1)

  - Digital PDP-10 (36/?/2)

  - Compaq Alpha (64/64/2)

My personal background (cont'd) –

- Compiler code generator developer
- incomplete PhD research
- FPS-164 array processor experience
- Portable software developer

OpenVMS and IA-64 –

- Direction Announced June 2001

- First Public Details – Fall 2001
  see http://www.rlgsc.com/cets/2001/1224.html

- First Boot - February 2004

- Release - February 2005

Architectural Attributes

	PDP-11	VAX	Alpha	Itanium
Architecture Type	1/2 Address	CISC	RISC	EPIC
Address Size	16	32	64	64
Integer Size	16	32	64	64
Byte Order	little	little	little	little
Alignment	word	none	quad	quad

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Porting –

- Cross Platform/OS
  (Solaris C/C++ to OpenVMS Alpha)

- Cross O/S
  (OpenVMS C/C++ to Tru64 C/C++)

- Cross Platform/Same OS
  OpenVMS VAX to/from Alpha

Porting Difficulty –

	Operating System	
	Same	Different
Same Platform	0	10*
Different Platform	1	15*

* Highly Application Sensitive

Itanium Issues–

- Atomicity

- Precision

- Address Size

- Granularity

- Alignment

- Byte Ordering

Atomicity –

- on VAX, INCx was accidentally thread atomic
- on Alpha, translated as load/add/store
- Alpha translation was not safe
- accidental atomicity was not part of the spec
- solution – use ADAWI

Precision –

- VAX floating point/integer sizes/formats different from Alpha

- Alpha and Itanium – same precision/formats

Address Size

- VAX – 32 bits

- Alpha/Itanium – 64 bits

- VAX to Alpha required data structure changes

Granularity –

- VAX was byte aligned for all operands

- Alpha/Itanium require natural alignment

- VAX was prone to fractured loads/stores

Data Alignment –

- VAX was byte aligned – all operands

- Alpha/Itanium require natural alignment

- No difference between Alpha/Itanium

Byte Ordering –

- VAX is little endian (low byte addressed)

- Alpha is little endian

- Itanium operates little/big endian

History and Context of EPIC –

- Alpha antecedents include IBM System 360/91
- Itanium descended from VLIW, and microcode
- Itanium is more dependent on compilers
- compiler dependency is not new
- EPIC presumes (correctly) that virtually all code is generated by compilers

Technical Emphasis –

- from a programming level, Itanium and Alpha have similar restrictions

- there are few technical/programming impediments to porting applications between Alpha/Itanium

Sizing and Migration–

- sizing (speed and/or size) is quite application sensitive

- strategy – get smallest/cheapest system

- do science – DO NOT guess

- optimization may have substantial impact

Instructions, Bundles, etc. –

- IA-64 is designed to be compiled
- CISC/RISC were intended for human coding
  - scoreboard for safety
  - easily decodeable
  - simple syntax
  - IA-64 bundles are designed to be generated

Do these differences matter to Developers?

- Do you work in:

  - MACRO-64

  - MACRO-32

  - Write Exception and Trap Handling Code

  - Write Device Drivers and Similar Hardware sensitive code

What is it like to run OpenVMS on Integrity?

- As always, OpenVMS is OpenVMS

  – same API

  – DCL is the same

  – Alpha and Itanium are mostly common source

  – Potential hazard – Updated language standards

Questions?

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Session Notes & Materials:
    http://www.rlgsc.com/encompass-canada/2005-05/index.html