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OpenVMS Integrity Migrations - Customer Experiences

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Agenda

- Introduction and Session Objective
- Overview
- What We Did
- Summary/Conclusions

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About Software Concepts

- Located in Nashua, NH (USA)
- More than 20 years in business
- An International reputation
 - A leading provider of remote managed DBA services for the Rdb and DBMS databases
 - A leading provider of remote managed services for OpenVMS systems
- Proven track record
 - Actively managing 100s of databases and dozens of sites and configurations
 - Remote DBA service since 1995 (still supporting many of the same sites)

Session Objectives

- To relate experiences of actual migrations from VAXen and Alphas to Integrity
- Primarily based on a specific customer engagements:
 - Large multi-national manufacturing company, multiple sites
 - Large financial services company

Session Objectives (cont)

- Share experiences and lessons learned from working with numerous customers making these transitions
- Concentrate on the systems and database aspects of the migrations.
- This session is a work in progress – please feel free to discuss and interact

Non – Objectives

- This is not another “Migrating to Integrity” session where:
 - You get the high level overview of migrating
 - You get a list of things “to do”
- This is not an “Application Porting” session
- I can do either of those, if you want
 - Please speak to me offline

About Application Porting...

- The application is important – obviously
 - But it is not necessarily the most difficult or expensive part of the migration
 - Alpha code ports to Integrity very easily
 - VAX code may require a bit more work
- Countless stories of porting success
 - Deutsche Börse – 5 million lines with minimal changes
 - HP/Intel Porting workshops – millions of lines ported, numerous applications successfully ported in a matter of days

*It's the infrastructure and data
that you should worry about!*

Platform Infrastructure

- Our experience: Most time spent migrating platform infrastructure
 - File systems, users/groups, logicals, queues, startup/shutdown, environment setup
 - What is legacy, what is currently used?
 - What do you migrate?
 - What do you leave behind?
 - When do you migrate platform resources?
 - How do you synchronize at production cutover?
 - Other?

Database Migration

- Our Experience: Database migration is the most critical step
 - Conversion for upgraded DB software?
 - Minimal to no downtime for cutover – how and when to migrate large DBs
 - Rollback planning – what to do if decision is made to rollback
 - Archives – how to access archived databases from prior versions

Session Focus

- Applications – Lots of other information available
- Platform and Database – We believe these are the difficult areas
 - *So this session will focus on these two topics.*

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Overview

- Large multi-national Manufacturing Company
- Two sites,
 - BKV – VAX to Integrity
 - MTV – Alpha to Integrity
- MTV will migrate to two Integrity clusters
 - Today, two business units share the same Alpha cluster
- Both sites utilize similar applications
 - FORTRAN/Rdb/FMS

Customer's Problem Statement

- The current hardware platforms represent a significant risk to the stability of our manufacturing operations.
 - An outage of this system creates a cost to the business of **\$138M** *per hour* while manufacturing is offline.
 - Hardware related incidents in Q1 resulted in a loss of **\$329M**.
- Some efforts have already been undertaken to reduce application related issues over past two years.
 - The customer realized a ~30% YOY reduction in issues due to these efforts.

Customer's Problem Statement (continued)

- In order to maximize the impact of these gains in application stability and given the impact of the hardware related failures in Q1, it is now appropriate to pursue actions to eliminate the infrastructure risks associated with the hardware platform.

Current Hardware – BKV

- AlphaServer 2100 4/275
- AlphaServer 2100 4/233
- HSZ40 Controllers
- Disks:
 - 8 – 2GB
 - 6 – 4GB

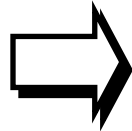


VMS 6.2-1H1
Common System
Disk

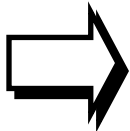
New Hardware

- One full configuration at BTV
- Two full configurations at MTV

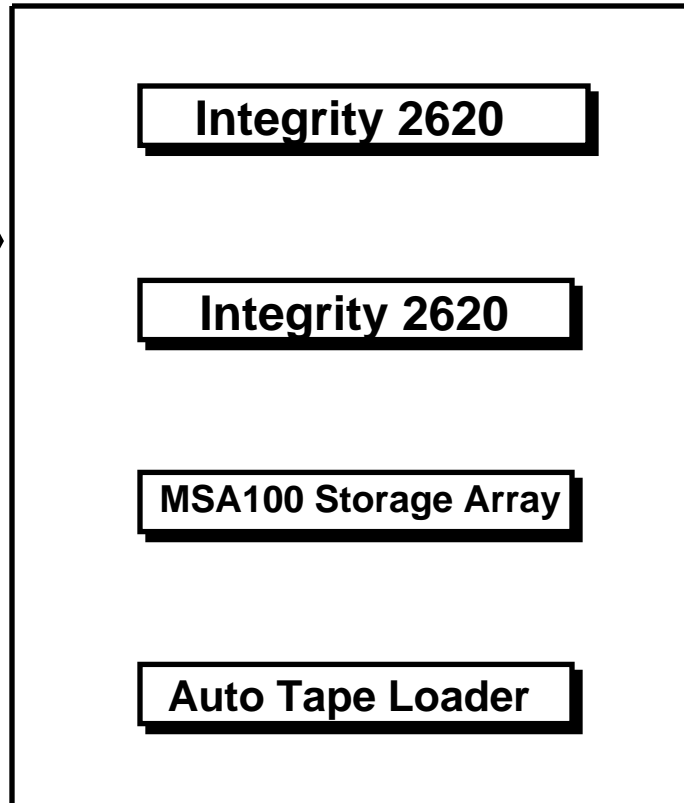
- 100mb Network
- Fiber Channel



- 24x 36GB drives



- 8 Tapes
- Automated Backups



Current Software – BKV

- BASIC
- CDD-PLUS
- DBI-INT
- DCPS-OPEN
- DTR
- FMS
- FORTRAN
- MESSAGE-ROUTER
- MR-VMSMAIL-GATEWAY
- PWKS-DT-BK-CL
- PWLMDOSCCC05.00
- PWLMDOSCCC05.01
- RDB
- RSM-SERVER
- SLS
- SNA-3270-TE
- TEAMDATA
- TSM
- UCX
- VAXSET
- VOLSHAD

Current Software – MTV

- BASIC-USER
- BOOKBROWSER
- CAPACITY-PLANNER
- CDD-PLUS
- DATA-DISTRIBUTOR
- DECPS-DC
- DECPS-PA
- DTR
- DVNETEXT
- DW-SNA-3270-TE-VMS
- FMS
- FORTRAN
- NET-APP-SUP-200
- OPENVMS-ALPHA
- OPENVMS-ALPHA-ADL
- RDB
- RSM-SERVER
- SNA-3270-TE
- SNA-API
- SNA-DTF-UTL
- SNA-PRE
- SNA-RJE
- VMSCLUSTER
- VOLSHAD

Other applications

- **Raxco** (PerfectDisk, PerfectCache)
- Brooks Automation - RS/1
- Numerous custom code applications

3rd Party Applications: What is Available for HP I64?

Itanium® 2-based partners and applications search - Windows Internet Explorer

https://h20299.www2.hp.com/customertool/Default.aspx

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HP Integrity server solutions Itanium® 2-based partners and applications

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- » Adaptive Enterprise
- » Media & Library

HP Integrity servers, based on Intel® Itanium® 2 processors, provide industry-leading performance, scalability, flexibility, and mission-critical reliability. HP's strong partnerships with independent software vendors (ISVs) allow us to offer a broad range of Integrity-based solutions to meet the needs of customers across many vertical industries and horizontal applications.

To find out if the application you require is available for HP Integrity servers, you can search by the company, application, or solution category areas.

Customers must perform their own independent third party availability verification before making any purchase decision. Application availability information provided herein is provided "as is" without warranties of merchantability, fitness for a particular purpose, or non-infringement of intellectual property. HP does not warrant the accuracy or completeness of this information.

Search for the solution you need the way you want

Choose one of the search options below to find the Itanium-supported application that best suits your requirements.

1 Company Name

Click on the first letter in the company name or type the name in the box and hit search.

123 · A · B · C · D · E · F · G · H · I · J · K · L · M · N · O · P · Q · R · S · T · U · V · W · X · Y · Z

Search»

2 Application Name

New systems – Software

- BKV and MTV:
 - VMS – FOE
 - VMSCLUSTER
 - DTR
 - FORTRAN
 - RDB
 - FMS (development node only)
 - CMS (development node only)
 - MMS (development node only)
 - PCA (development node only)
 - BASIC (BKV development node only)

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New System Installation

- Site preparation was performed by the customer
- Hardware installation was performed by HP
- VMS installation and initial configuration by HP
- Network Connectivity by the customer and HP
- Once network connectivity was established, SCI was able to start work
 - Everything discussed in this session was done remotely – no onsite presence was necessary

First Steps

- An early, first step was to create a sandbox environment in which to begin the work
 - The sandbox was located in the SCI development lab
 - This allowed easy access to develop and test tools prior to use at customer site
- 2 systems – 1 VAX, 1 Integrity

The Integrity Test Environment

- Utilized 1 of SCI's RX2620 systems
 - Included a 72GB drive
- Created LD drives (containers) to simulate drives on the existing customer systems
- 1x1 mapping
 - 12 x 4GB = 48GB – easy on a 72 GB drive
- This allowed SCI to begin the migration effort long before the new systems were installed

Simulated Drives

Original System:

\$1\$DIA1:	(RF7201)	Mounted	0	DB_BACKUPS2	1506756	1	3
\$1\$DIA2:	(RF7202)	Mounted	0	DB_BACKUPS	1938936	1	3
\$2\$DUA0:	(HSD000)	Mounted	2	SYSTEMDISK	5614137	970	3
\$2\$DUA1:	(HSD001)	Mounted	0	LIM\$DATADSK1	6168330	174	3
\$2\$DUA2:	(HSD000)	Mounted	1	LIM\$PROGDISK	6437934	157	3
\$2\$DUA3:	(HSD000)	Mounted	0	DATADISK1	3909177	20	3
\$2\$DUA4:	(HSD000)	Mounted	0	PAGEFILES	3337488	2	3
\$2\$DUA5:	(HSD001)	Mounted	0	DCS_DISK	6652314	4	3
\$2\$DUA6:	(HSD000)	Mounted	0	RDB2\$DISK	2182194	107	3
\$2\$DUA7:	(HSD001)	Mounted	3	SCRATCH2	534240	1	3
\$2\$DUA8:	(HSD001)	Mounted	0	SLS_DISK	5583096	1	3
\$2\$DUA9:	(HSD001)	Mounted	0	NEW\$DATA	317799	240	3
\$2\$DUA10:	(HSD001)	Mounted	0	SCRATCH	1082187	1	3
\$2\$DUA11:	(HSD000)	Mounted	0	VAXVMSRL054	1792593	1	3

Test System:

\$5\$LDA1:	(STAR3)	Mounted	0	LIM\$DATADSK1	5857360	1	1
\$5\$LDA2:	(STAR3)	Mounted	0	LIM\$PROGDISK	6641488	1	1
\$5\$LDA3:	(STAR3)	Mounted	0	DATADISK1	4179808	1	1
\$5\$LDA4:	(STAR3)	Mounted	0	PAGEFILES	3510656	1	1
\$5\$LDA5:	(STAR3)	Mounted	0	DCS_DISK	6589072	1	1
\$5\$LDA6:	(STAR3)	Mounted	0	RDB2\$DISK	5985024	1	1
\$5\$LDA7:	(STAR3)	Mounted	0	SCRATCH2	3244880	1	1
\$5\$LDA8:	(STAR3)	Mounted	0	SLS_DISK	4718656	1	1
\$5\$LDA9:	(STAR3)	Mounted	0	NEW\$DATA	7914736	1	1
\$5\$LDA10:	(STAR3)	Mounted	0	SCRATCH	7034464	1	1
\$5\$LDA11:	(STAR3)	Mounted	0	VAXVMSRL054	0	1	1
\$5\$LDA20:	(STAR3)	Mounted	0	SYSTEMDISK	5446917	1	1
\$5\$LDA21:	(STAR3)	Mounted	0	DB_BACKUPS2	1528576	1	1
\$5\$LDA22:	(STAR3)	Mounted	0	DB_BACKUPS	1556304	1	1



Simulated Drives

```
STAR3_$ dir $5$DKA100:[VIRTUAL_DISKS.XX.BK]/size
```

```
Directory $5$DKA100:[VIRTUAL_DISKS.XX.BK]
```

```
$1$DIA1.DSK;1      1954050
$1$DIA2.DSK;1      1954050
$2$DUA0.DSK;1      8377528
$2$DUA1.DSK;1      8377528
$2$DUA10.DSK;1     8377528
$2$DUA11.DSK;1     8377528
$2$DUA2.DSK;1      8377528
$2$DUA3.DSK;1      8377528
$2$DUA4.DSK;1      8377528
$2$DUA5.DSK;1      8377528
$2$DUA6.DSK;1      8377528
$2$DUA7.DSK;1      8377528
$2$DUA8.DSK;1      8377528
$2$DUA9.DSK;1      8377528
```

```
Total of 15 files, 104438436 blocks.
```

- Used the 'Device' names as the container name
- All containers are the same size as the original disks

Disks

- We created a mapping of old drives and names to new
 - 1 to 1 mapping – used all the same volume names
 - Eases porting of code that used `DISK$VolName` logicals

Dev Name (new sys)	Equiv dev/logical (old system)	Volume Name
\$1\$DGA111	None	None
\$1\$DGA101	\$2\$DUA3, \$1\$DUS3, DSA3	DATADISK1
\$1\$DGA102	\$2\$DUA2, \$1\$DUS2, DSA2	LIM\$PROGDISK
\$1\$DGA103	\$2\$DUA1,\$1\$DUS1, DSA1	LIM\$DATADSK1
\$1\$DGA104	\$1\$DIA1, DSA8	DB_BACKUPS2
\$1\$DGA105	\$1\$DIA2	DB_BACKUPS
\$1\$DGA106	\$2\$DUA4	PAGEFILES
\$1\$DGA107	\$2\$DUA0,\$1\$DUS0, DSA0	SYSTEMDISK
\$1\$DGA108	\$2\$DUA11, dsa101	VAXVMSRL054
\$1\$DGA201	\$2\$DUA6, dsa21	RDB2\$DISK
\$1\$DGA202	\$2\$dua5, \$1\$DUS4, DSA10	DCS_DISK
\$1\$DGA203	\$2\$DUA9, dsa9	NEW\$DATA
\$1\$DGA204	\$2\$DUA8, dsa6	SLS_DISK
\$1\$DGA205	\$2\$DUA10	SCRATCH
\$1\$DGA206	\$2\$DUA7, dsa7	SCRATCH2

Disks

- Why One-to-one drive mapping?
 - Low risk
 - Might be wasting disks?
 - Missed opportunities to clean up?
- Use of rooted logical names
 - Used to facilitate the combination of a few of the source disks onto one disk.

The Test Environment –

- Charon VAX Emulator
 - SCI has a Charon Emulator available
 - Duplicated the customers VAX environment on the Charon emulator.
 - Copied customer system and data disks
 - Made for easier access to compare old/new systems

Moving/Updating the environment

- The first major goal was to recreate the current environments on the new systems
 - Within reason, and as appropriate
- Available Options
 - Copy the current environment and modify?
 - Create a new environment from the ground up?
- SCl chose to copy, writing new where needed

Moving/Updating Environment

- How do you determine what to modify?
- You could start at the beginning and edit each configuration file
- We utilized tools to assist us in the determination of what needs changing and where those changes need to be applied.
- Where possible, we utilized a tool to make the changes.

Search Tools

- HP recommends the tool “**searchall.com**” to find porting “hotspots” in code and scripts
 - Hotspots are sections of code that require attention prior to porting
- Limitations of this tool.
 - This tool works well for source code, not as well with .COM files and scripts
 - Takes a long time to run
 - Limited search list
- This tool mostly found problems in system supplied .COM files
 - e.g. **DECW\$STARTUP.COM, TCPIP\$STARTUP.COM**

Custom Search Tool

- SCl created our own tool to look for “hotspots”
 - Searched .COM, .FOR, .SFO files
 - Searched for:
 - DECNET and TCP/IP names and addresses
 - Device names
 - Known application names
 - Known logical names for devices
- Searched all disks, resulted in a comprehensive list of “hotspots”

Moving User Data

- We determined what data could be moved early in the process and what data needed to move (or be re-copied) at production cutover?
 - Developers are only users with dynamic data
 - Agreed to minimize changes
- We performed a back up of each drive and restored that backup onto the corresponding new drive
- Utilized a tool to “clean up” the migrated drive
 - Delete *.exe, *.obj, *.olb

CMS libraries

- Don't forget to update the reference directories
 - Easy step to overlook
- Don't forget to perform a CMS/VERIFY/REPAIR
 - The CMS/VERIFY should be done on the source system prior to the migration
 - Beware of known issues with CMS V4.5 and 4.5-1
 - Unstable – we had problems with ACCVIOs, HP recommended rolling back to V4.4
 - HP has since released DECset 12.8, ECO1 which appears to resolve problems (*note: CMS is a part of the DECSET software suite*)

Update

CMS Libraries – Reference Directories

```
STAR1_$ cms sho lib /full
```

```
Your CMS library list consists of:
```

Notice these are different

```
DISK$USER:[NEW_PRODUCTION.BONIS.CMS]
```

```
and contains
```

```
561 elements
```

```
2 groups
```

```
0 classes
```

```
0 reservations
```

```
0 concurrent replacements
```

```
0 reviews pending
```

```
REFERENCE_COPY directory is DSA1:[PRODUCTION.BONIS.REF]
```

```
Library attributes are: /Revision_time=Original
```

```
/Concurrent
```

```
/Nokeep
```

```
/Noextended_filenames
```

```
/NoLong_variant_names
```

```
STAR1_$
```

Database Migration

- First we needed to determine:
 - Where are all the databases?
 - Which ones get migrated?
- How do we figure this out?
- A tool, of course!
 - FIND_RDB_DATABASES.COM

Database Migration

- FIND_RDB_DATABASES.COM
 - Searches all disks for files that might be Rdb databases
 - Dump the file
 - Look for identifying data to confirm it is an Rdb database file
 - Can also look for things like version and multiple files
- Site BKV
 - Found 21 DBs at current version (7.0)
 - Found another 74 at older versions
- Site MTV
 - Found 22 DBs at current version (6.2)

Database Migration

- OpenVMS I64 systems run Rdb 7.2 *only*
- BKV – Rdb 7.0
 - For each database we needed to:
 1. Perform an Rdb backup of the database
 2. Copy the backup to the Integrity server
 3. Restore the database to Rdb v7.2. (using RMU/Restore)
- MTV – Rdb 6.0
 - The upgrade Path to Rdb 7.2 is through Rdb 7.0/7.1
 - But 7.0/7.1 not supported on OpenVMS I64
 - Options to address this issue
 - Add Alpha running Rdb 7.0 to MTV cluster?
 - Use Rdb “multi-version” support ?– run 6.0 and 7.1 at the same time

Database Migration

- SCI chose to use multi-version Rdb
 - We installed Rdb v7.1 on the MTV Alpha cluster
 - Performed the Rdb upgrade of each database on the Alpha Cluster as follows:
 1. Performed an Rdb backup of the database.
 2. Set our process to point to Rdb v7.1
 3. Restored the database to a "work environment"
 4. Performed a backup of the now upgraded database.
 5. Copied the backup to the Integrity server
 6. Restored/upgraded the database to Rdb v7.2.

Database Migration

(alternative method)

- An alternative migration approach for Rdb V6.0 databases would have been to skip the V7.0/V7.1 step
 - Migrate direct from V6 to V7.2 with no intermediate step
- Utilize the Export/Import method
- Can be very time consuming
 - Multiple days for large DBs

Database Migration

(alternative method)

1. Perform RMU/ANALYZE -
 1. Preserve row counts for verification
2. Export the data (SQL EXPORT)
 1. Depending on size, this could take a long time
3. ftp to target the Integrity Server
4. Perform an SQL IMPORT on the Integrity Server
5. Perform an RMU/VERIFY
6. RMU/ANALYZE
 1. Verify that the row counts match the source counts from step

Database Verification

- On the SOURCE system:
 - Perform an RMU/VERIFY
 - skip this step if the DB is too large
 - Perform an RMU/ANALYZE
 - Dump the data to spreadsheet for comparison
 - Row counts per table will be used
 - We documented database security on source
- On the TARGET system
 - Perform an RMU/VERIFY
 - If this fails, then, you will need to consider going back to the source and doing the verify there.
 - RMU/ANALYZE
 - Dump the data to a spreadsheet for comparison

Queue Migration

- Site BKV had 19 distinct batch queues
 - Some would “appear” to be legacy
 - i.e. SNARJE\$BONIS
 - (SNA Remote Job Entry – SNA connection shutdown years ago)
- Site MTV had 34 distinct batch queues
- How do we determine which ones we need to recreate on the new systems?

Queue Migration – Batch Logging Tool

- BATCHLOGGER.COM

- Executes during SYLOGIN.COM

- Captures:

- job entry number
- command procedure filespec
- username
- log filespec
- node
- submit time
- process-id
- queue name
- job_name
- P1 – P8

- Output in CSV format – easy to manipulate

Queues – Batch Logging Tool

- Dump output to spreadsheet, and reduce data to interesting summaries:
 - Queues used
 - 11 of the 19 queues used at BKV
 - 17 of the 34 queues used at MTV
 - Frequency of use
 - Command files in use and their directories
- This would be a good tool to run as part of periodic system maintenance!

Batch Logging Tool

Things that we discovered...

- Remember the SNARJE\$BONIS queue?
 - SNA shutdown years ago?
 - There was a job executing on that queue, multiple times per hour.
 - The Job was actually trying to execute SNA commands, but there was no SNA symbiont available.
 - Allowed us to alert the application folks so they didn't port that part of the application
- We located other jobs for applications that appeared to be "forgotten" in the planning phases

Interface Identification

- For each external interface, we needed to determine:
 - The interface name
 - Purpose
 - Owner/manager (person to notify for changes)
 - DNS name or network address
 - Method of transfer (ftp, ODBC, etc)
 - Local applications or scripts
 - Local access requirements (username, pass)
- We sent this data (*as appropriate*) to:
 - The application team
 - We also utilized it in tools mentioned earlier

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Customer Impact

"Since the kickoff of the upgrade in January 2007, the sites have an overall reduction in support cases from the same time period in 2006 of 42%, with an overall decline of business critical cases by 65% during this same time period. From Q1 2007 we have seen a steady quarterly decline in cases and currently have an overall site decrease of 51% from Q1 through Q3."



Customer Impact

- Through first 4 months (121 days)
 - Issue Free Days
 - BKV – 119 days
 - MTV – 117 days
 - In the past, the customer rarely had issue free days, now they experience issue free months and quarters
 - Current Uptime
 - BKV – 290 days
 - MTV – 219 days (both clusters)
 - The support teams are now better experts
 - By going through the migration process, they are much better prepared to handle problems

Conclusions

- Understand your current environment
 - Determine what you can leave behind
 - Determine what needs to move forward
- Tools are your friends – you may need to write them yourself
 - Finding migration effort hot spots
 - Finding databases
- VMS is VMS
 - You hardly notice the platform change

Questions?

