

Oracle
VMS Software
Stromasys

Software
INTERNATIONAL
Concepts

FINE OLD WINE IN NEW BOTTLES

**CHARON-AXP in Oracle HPC Cloud
with Oracle Rdb and VSI OpenVMS**



About Software Concepts International

Managing OpenVMS systems and
databases requiring maximum
performance and availability –
worldwide



Disclaimers

- ◆ Each system/application unique
- ◆ Isolated performance tests result in imperfect world views
- ◆ Evolving software & hardware are moving targets
- ◆ Tuning trumps hardware



Background

Implementation

Measurements

Adjustments



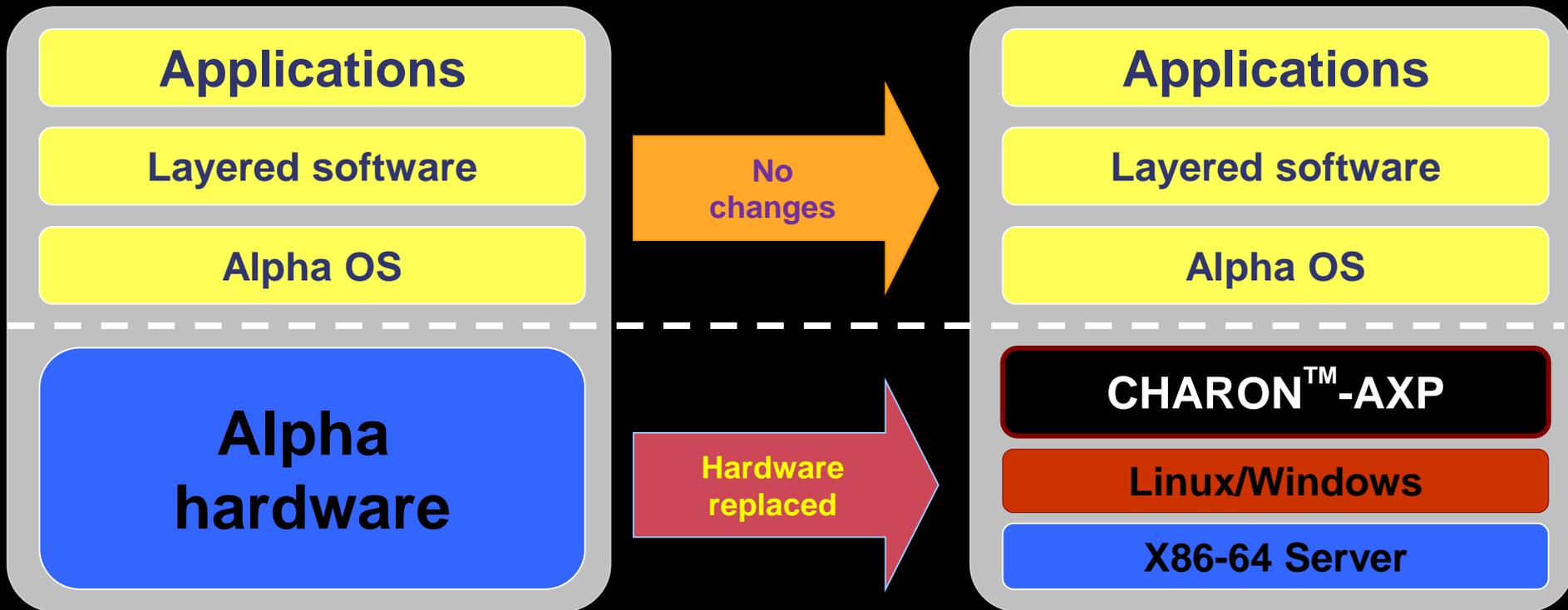
Background

- ◆ Customer wishes to migrate from on-premises AlphaServer hardware to emulation
 - ◆ Reduce to zero : downtime, power, cooling, space, maintenance, management, risk
 - ◆ No application or system changes : Lift-and-shift
- ◆ GS1280 to Charon-AXP on Oracle Cloud
- ◆ Fastest AlphaServer : tough to beat
- ◆ SCI engaged by Oracle and Stromasys to facilitate proof-of-concept



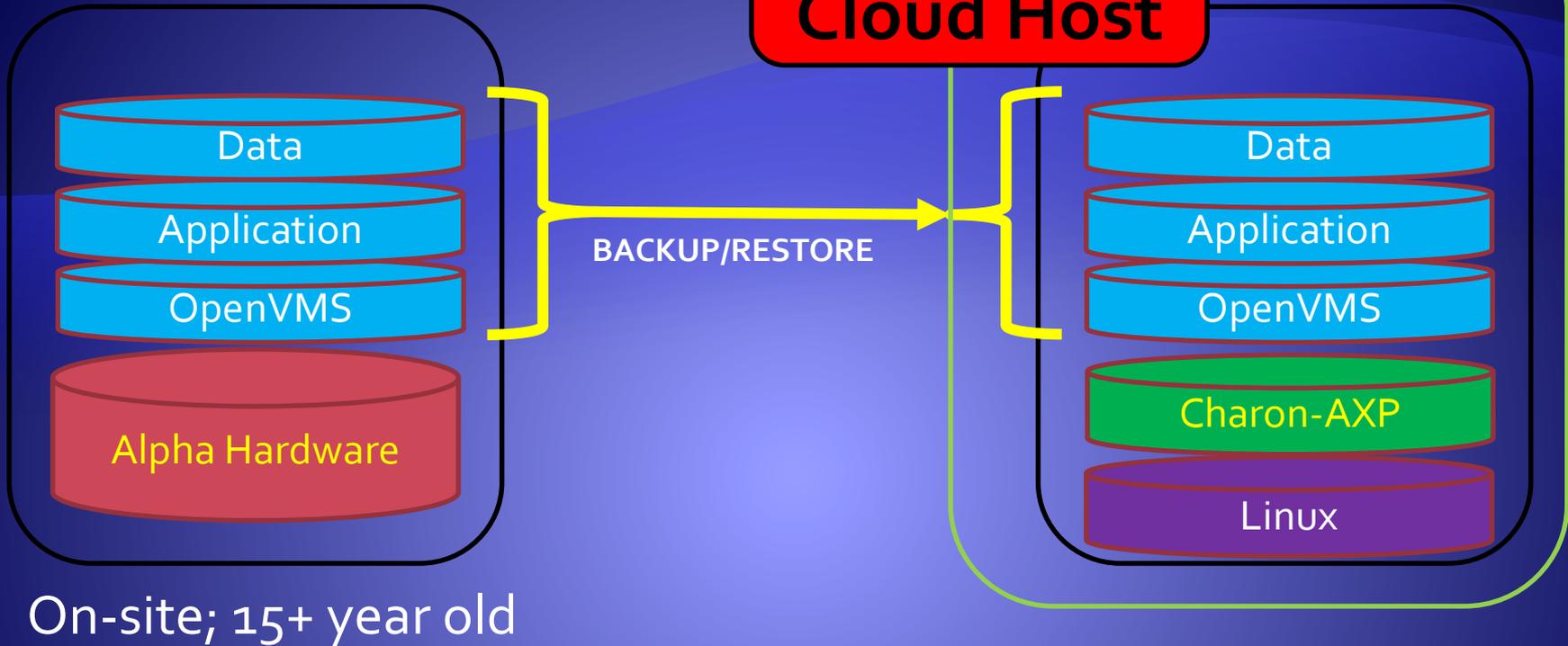
CHARON Emulation

- ◆ Thousands installations globally
- ◆ Worldwide development & support organization
- ◆ Recognized as the drop-in replacement for hardware
- ◆ Rock solid
- ◆ Very low-risk deployment
 - ◆ Transparent & direct hardware replacement
 - ◆ No software impact



Intent

Oracle HPC Cloud Host



On-site; 15+ year old

- ◆ 36C @3.7T, 384GB, NVMe
- ◆ Bare metal
- ◆ Oracle Linux 7.6 UEK
- ◆ Charon-AXP V4.9
 - ◆ 16P GS1280, 128GB
 - ◆ 2 NIC, 4 disk volumes

Anticipations

- ◆ Emulated quicker than hardware
 - ◆ Most workloads faster; some slower
- ◆ Disk
 - ◆ Lower latency
 - ◆ Greater bandwidth
- ◆ Maximal memory relieves IO requirements
- ◆ Impressively performant for commercial workload



VSI OpenVMS

- ◆ VSI OpenVMS Alpha V8.4-2L2
 - ◆ Optimized for EV6 & later processors
 - ◆ Shorter/faster instruction sequences
 - ◆ Benefits emulation equally
- ◆ SCI experience ~5% to ~25% faster
 - ◆ Workload dependent
- ◆ Binary compatible with prior DEC/CPO/HP/VSI OpenVMS Alpha releases & software



Project Outline

- 1) OCI provides Oracle Linux pre-installed
- 2) Configure virtual NICs for OpenVMS guest
- 3) Configure block storage for OpenVMS guest
- 4) Install Charon software packages/dependencies
- 5) Configure Charon-AXP emulator
- 6) Backup existing OpenVMS system to container files; transfer to host
- 7) Boot OpenVMS Alpha from container files
- 8) Configure TCPIP address, Gateway, DNS, NTP



Performance Tests

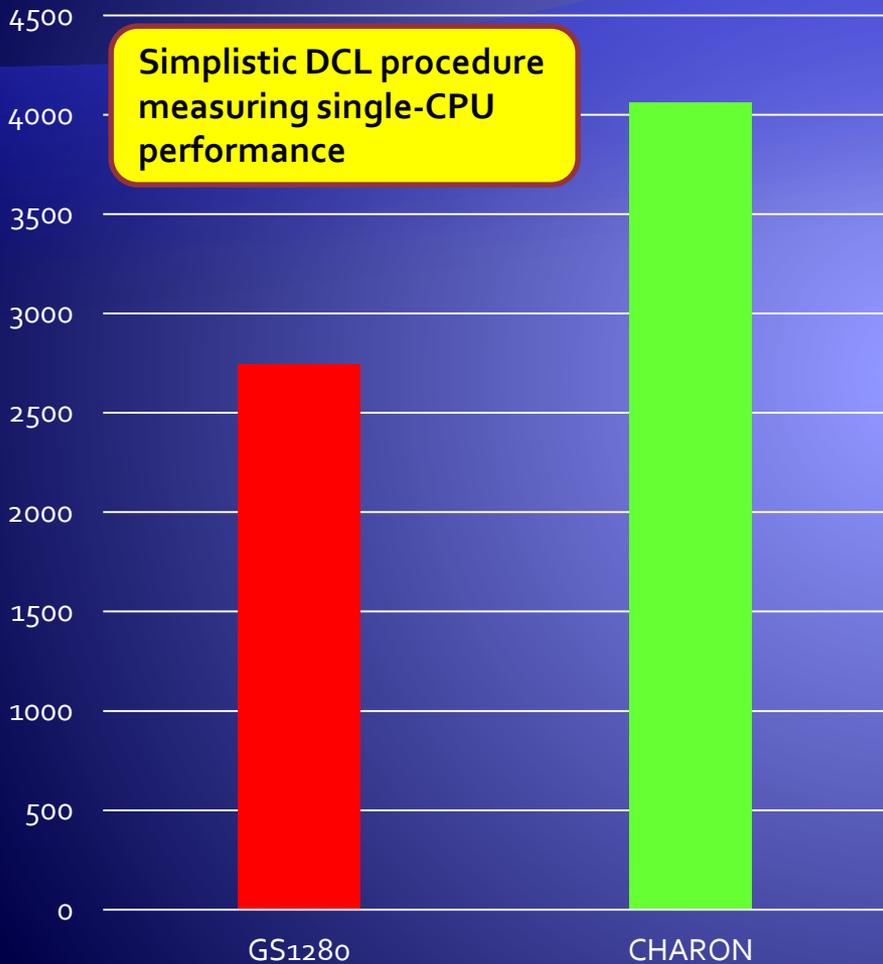
- ◆ SCI executed numerous micro performance tests to evaluate various aspects of CPU & IO
- ◆ In isolation to help identify component behavior
- ◆ Provides insight : application experience



CPU Up To 50% Faster –

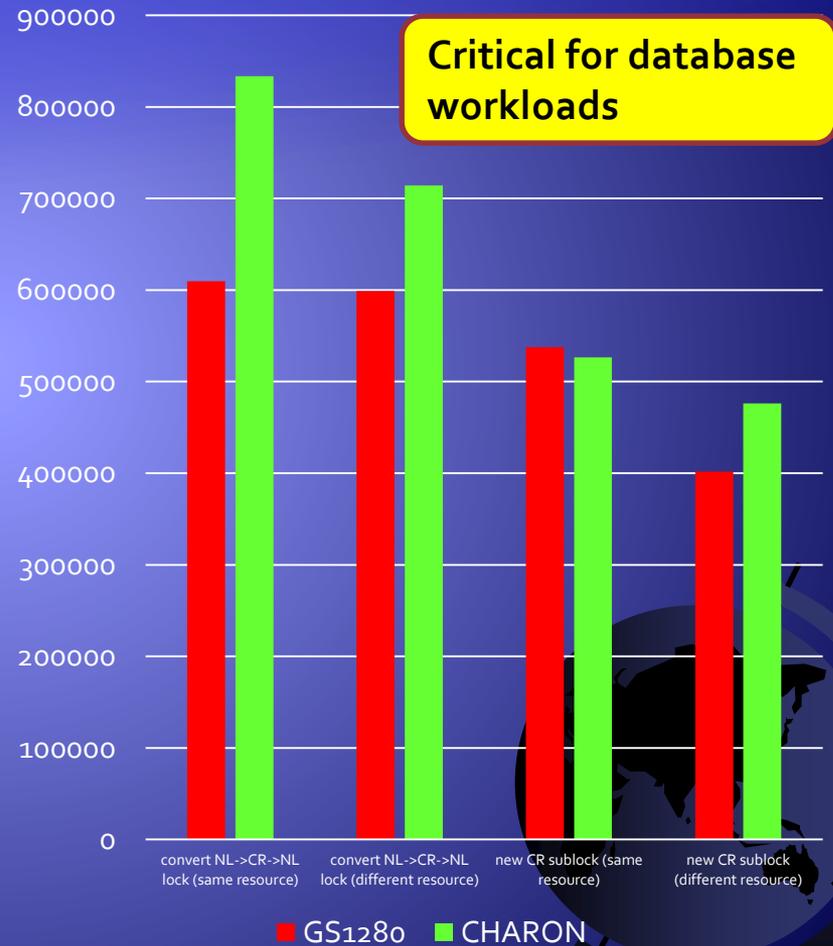
“Fastest Alpha We Have Seen”

Estimated VUPS



more is better

OpenVMS Locking Performance



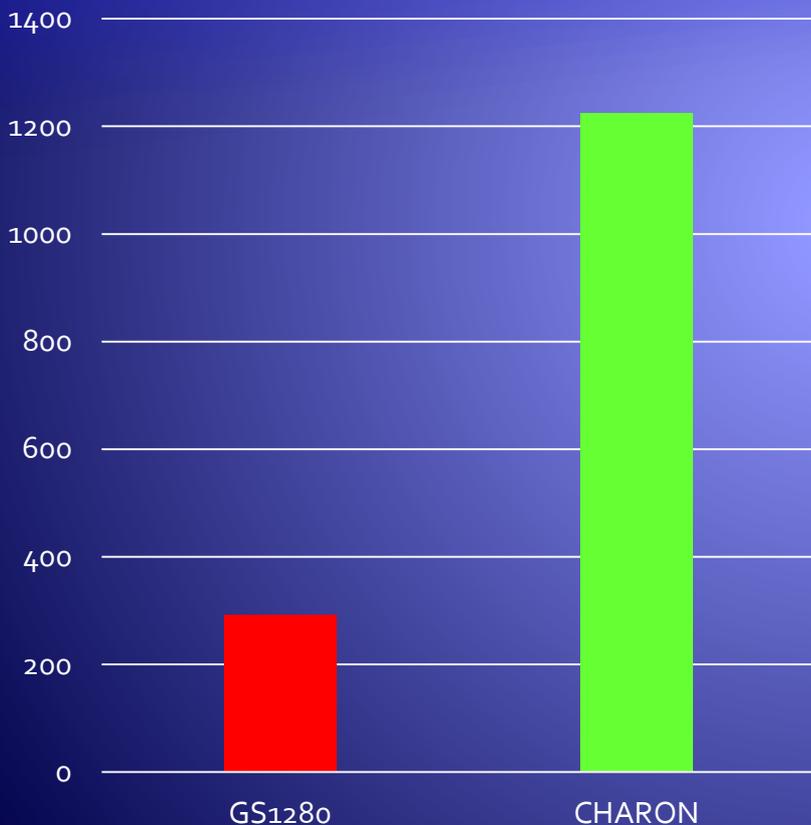
more is better

Single Disk > 10X faster

Bandwidth = throughput

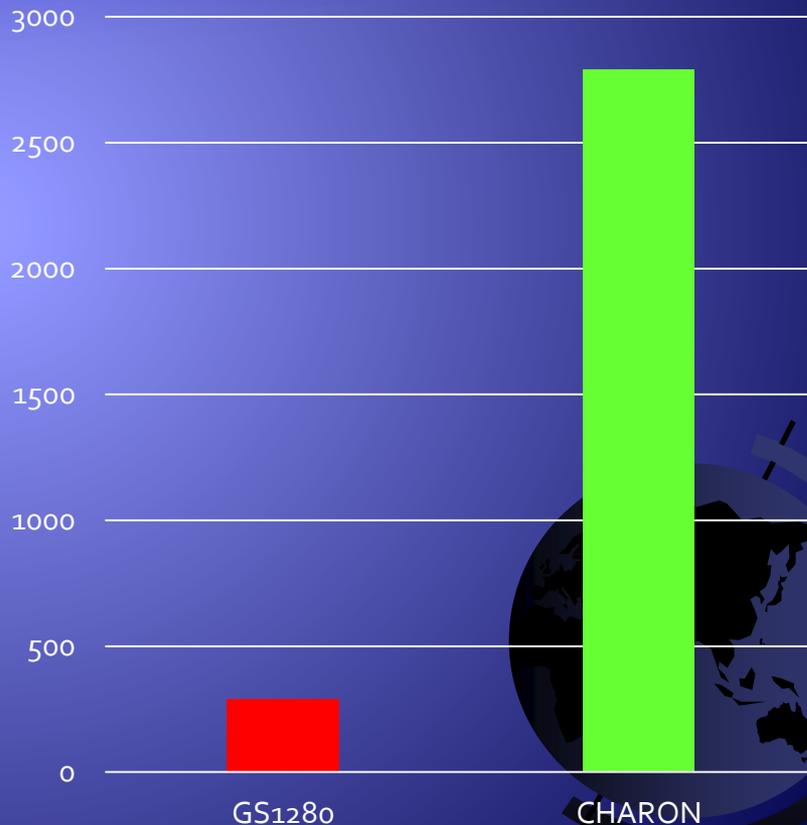
Random IO largely dominated by controller response time

Single Disk Sequential Read
Bandwidth MB/sec



more is better

Single Disk Random 32k IOPS



more is better

Synthetic Rdb OLTP Workload

- ◆ SCI constructed test framework
- ◆ 250 million indexed rows of random data
 - ◆ 20 tables of 25 columns
- ◆ Application Loop
 - ◆ Start read-write transaction
 - ◆ Select random table
 - ◆ Generate random key
 - ◆ Update random column
 - ◆ Commit



731,136 Transactions / Minute

- ◆ 12,000+ OLTP update TPS

```
Node: RUMP (1/1/1) Oracle Rdb V7.3-300 Perf. Monitor 23-JAN-2019 20:43:00.29
Rate: 3.00 Seconds          Summary IO Statistics          Elapsed: 00:01:02.28
Page: 1 of 1          DISK$DATA1: [BIGDB.ALPHA]BIGDB.RDB;1          Mode: Online
```

```
-----
statistic..... rate.per.second..... total..... average.....
name..... max..... cur..... avg..... count..... per.trans....
transactions          12422      12168      12185.6      758925      1.0
verb successes        86880      85101      85219.4      5307470      6.9
verb failures          0           0           0.0           0           0.0

synch data reads      0           0           0.0           0           0.0
synch data writes     0           0           0.0           0           0.0
asynch data reads     0           0           0.0           0           0.0
asynch data writes   0           0           0.0           0           0.0
RUJ file reads        0           0           0.0           0           0.0
RUJ file writes       0           0           0.0           0           0.0
AIJ file reads        0           0           0.0           0           0.0
AIJ file writes       2322      2203      2244.5      139789      0.1
root file reads       0           0           0.0           0           0.0
root file writes      21          13          13.9           870          0.0
```

Tuning

- ◆ Fastest platform is perfect starting point
- ◆ Careful & experienced Linux, Charon, OpenVMS, and Rdb configuration & tuning extract every cycle
- ◆ Continually ask “why isn’t it faster”



Why Aren't Rdb Workloads Faster

- ◆ Creates Alpha executable subroutines at run time
 - ◆ Per-query performance oriented
 - ◆ Alpha architecture generation aware
- ◆ Regrettably, code & changing data end up on same memory pages
 - ◆ Challenging for emulator translation machinery
- ◆ SCI collaborated with Rdb engineering to prototype isolating generated code from data
 - ◆ SCI expertise in software optimizations
 - ◆ Significant potential for Rdb applications

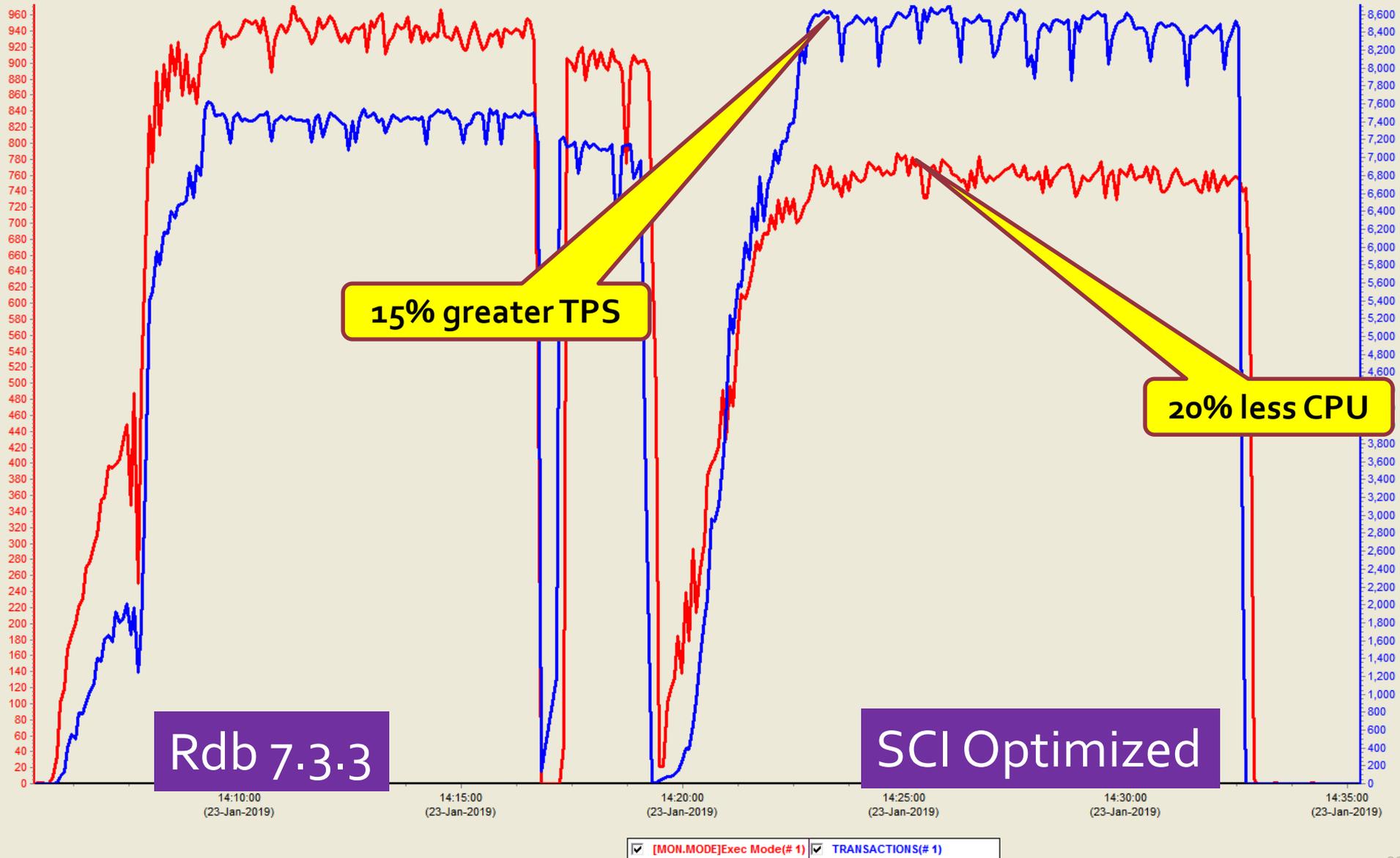


Optimized in Rdb V7.3-310

- ◆ Altered Rdb internal memory management
 - ◆ Isolate runtime generated code from data
- ◆ Upgrade to Rdb Release 7.3.3.1 or later
- ◆ **DEFINE/SYSTEM
RDMS\$BIND_CODE_OPTIMIZATION 3**
- ◆ May consume a bit more process virtual memory



Optimized in Rdb V7.3-310



That is

Just a Starting Point

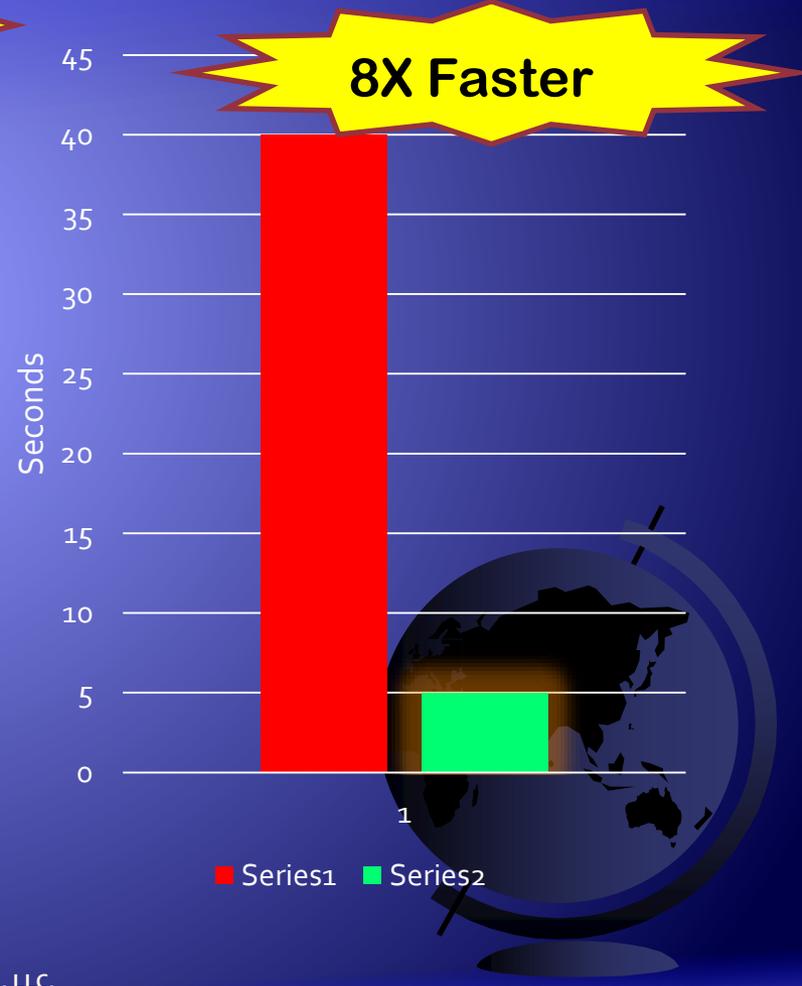
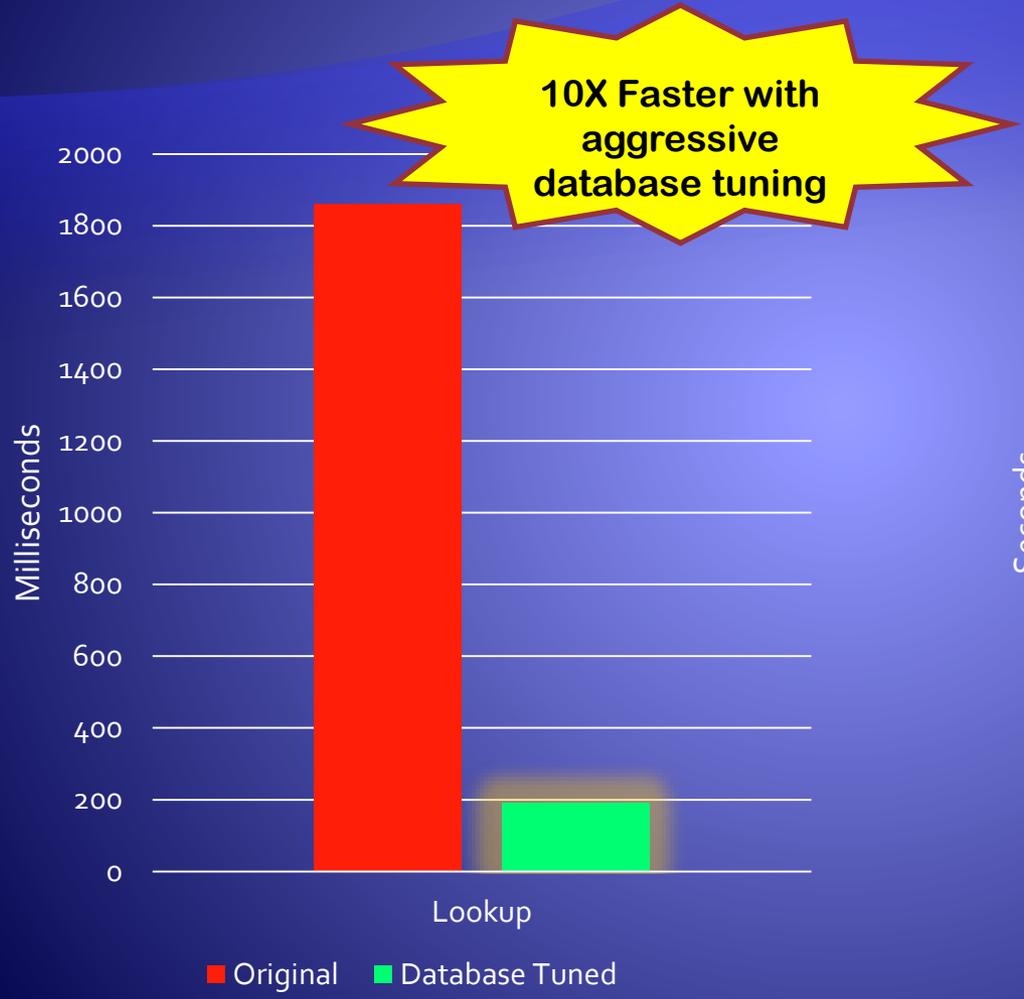


Beating Differences

- ◆ Where SCI shines
- ◆ Management, Optimization & Tuning bottom to top
 - ◆ Hardware
 - ◆ Storage
 - ◆ System
 - ◆ Databases & data files
 - ◆ Application
- ◆ Often 2X to 100X improvements

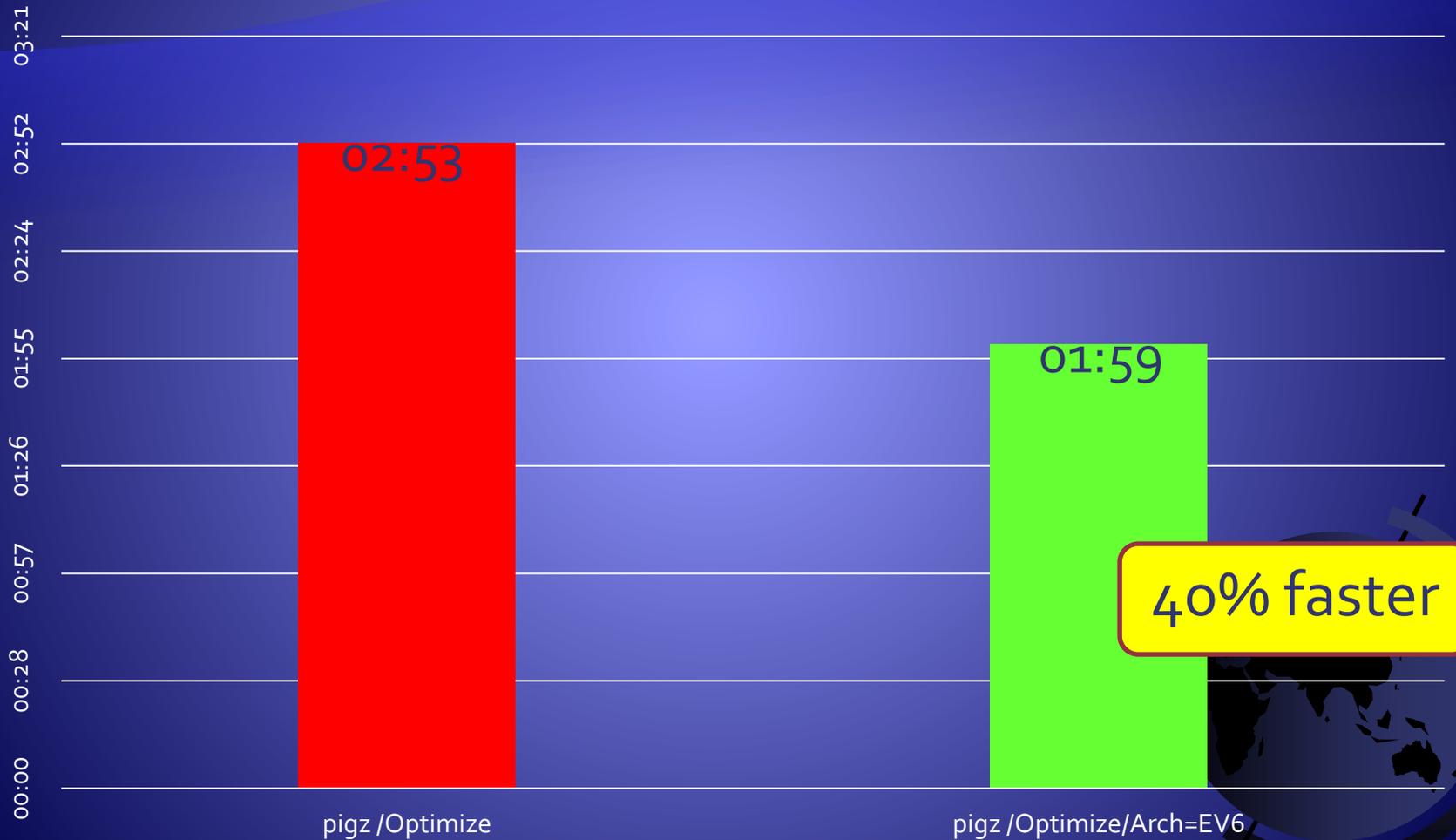


Examples : SCI Tuned



SCI Tuned on Alpha: Compiled /ARCHITECTURE=

Saveset Compress Elapsed Time : 4P System



40% faster

Next Steps

- ◆ Test drive Alpha or VAX on the cloud through SCI's "try before you buy" program
 - ◆ Every large or small Alpha or VAX ever built can be improved in emulation
- ◆ Take advantage of SCI's remote management, system, database & application analysis & tuning, migration expertise

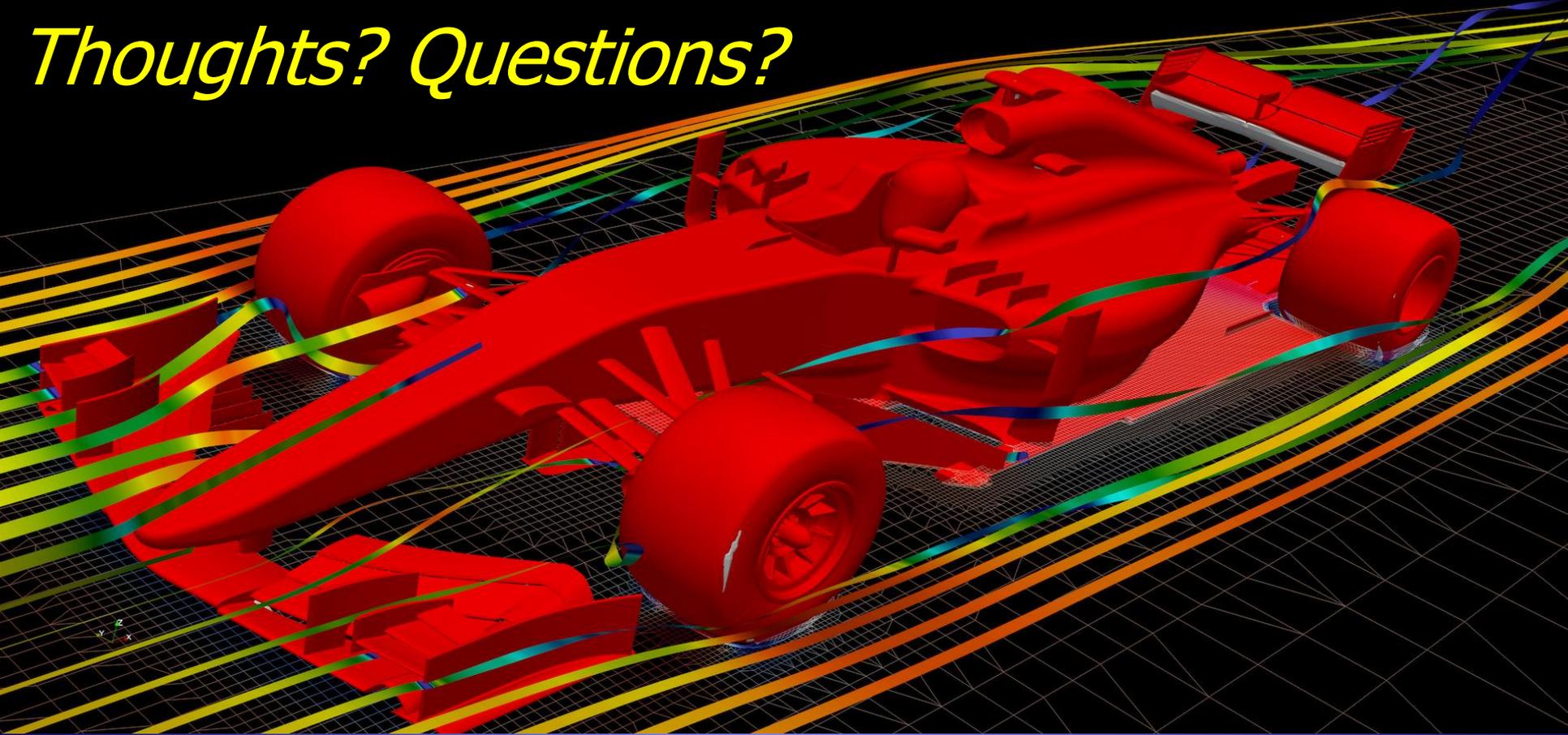


Summary

- ◆ Oracle Cloud HPC bare metal platform with Charon-AXP demonstrates fastest Alpha we've witnessed
- ◆ CHARON-AXP greater than hardware
 - ◆ CPU performance exceeds for most operations
 - ◆ Superior IO bandwidth
 - ◆ > memory facilitates effective caching & reduced IO
- ◆ VSI VMS V8.4-2L2 improved performance



Thoughts? Questions?



For SCI, OpenVMS, VSI,
Rdb, Charon, Cloud :

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Credits & Extra Special Thanks

It takes a village

- ◆ Boris Ovsyankin
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- ◆ Greg Reut

- ◆ Ian Smith
- ◆ John Prot
- ◆ John Reagan
- ◆ Kevin Duffy
- ◆ Marcin Zablocki
- ◆ Taylor Newill
- ◆ Tim Sneddon
- ◆ Tom Musson
- ◆ Tony DiFruscia
- ◆ Vadim Model



Software Concepts International

- ◆ Located in Nashua, NH, USA
 - ◆ Since 1987 business supporting OpenVMS
- ◆ International reputation as leading provider
 - ◆ Managed services, performance and consulting for OpenVMS & databases
- ◆ Proven global track record
 - ◆ Actively managing 100s of systems & databases 24x365
- ◆ VAX/Alpha emulation – CHARON expert reseller
- ◆ Migration consulting
 - ◆ Specializing in minimal downtime migrations
- ◆ Stromasys, VSI and Oracle expert business partner
- ◆ Oracle's worldwide provider of CODASYL DBMS training

