IBM Power Systems for SAP HANA Implementations

Alfred Freudenberger
North America SAP on Power Systems Executive
afreude@us.ibm.com
512-659-8059

Blog: SAPonPower.wordpress.com
SAP HANA Deployment Options for Different Use Cases

- **Technology Platform**: Customer specific development.
- **Content**: Reports that are re-built on HANA using a BI frontend.
- **Accelerated Apps**: Speed up existing business suite functionality/applications through a side-by-side scenario with HANA.
- **Products on In-Memory**: Existing applications and strategic investment areas that may be disruptive.

Examples:
- e.g. Demographics & Google Maps
- e.g. SAP ERP: Operational reporting
- e.g. SAP ERP: CO-PA
- e.g. SAP BW -7.3 SP5-on HANA, Business Suite, S/4HANA
SAP HANA on Power Architecture

Not a separate fork of the HANA code

2010 2011 2012 2013 2014 2015
SAP HANA on IBM POWER

Enterprise ready
Flexible form
Virtualized
Any/all IBM Power Systems
HANA license from SAP

Let's run in-memory databases smarter.
SAP HANA on IBM Power – Expected Customer Value

- Delivering the reliability required by mission critical systems
  - HANA needs 30 to 40x memory of conventional DBs – Power delivers comprehensive memory protection by default, not as an option
  - Historic fault resilience, dynamic component deallocation, on the fly repair and fault isolation are unmatched in open systems

- Performance
  - Packing more HANA throughput into few cores leaves room for other requirements, reduces datacenter footprint and environmentals
  - Over 3x memory bandwidth, 8 threads per core deliver consistent HANA response time, even during Delta Merge processing

- Flexibility
  - Industry leading, low overhead virtualization included by default, not an option with high overhead and artificial constraints unsuitable for production workloads
  - Capacity on Demand
  - Partition isolation allowing prod, non-prod and HA to be intermixed

- Competitive TCA, Lower Total Cost of HANA Landscape
POWER8 Memory

- 10 chips per rank for extra redundancy beyond chipkill
- "On-the-fly" lane isolation/repair

Diagram showing:
- DRAM Chips
- Memory Buffer
- DDR Interfaces
- Scheduler & Management
- 16MB Memory Cache
- POWER8 Link
New World record set by IBM Power E870 on SAP BW Enhanced Mixed Load Standard Application Benchmark with 2 Billion records

(1) IBM Power Enterprise System E870 on the SAP BW Extended mixed load standard application benchmark running SAP NetWeaver 7.31 application; 4 processors / 40 cores / 320 threads, POWER8; 4.19GHz, 1024 GB memory, 192,750 adhoc navigation steps per hour on SuSE Linux Enterprise Server 11 and SAP Hana 1.0, Certification #: 2015024 Result valid as of June 1, 2015. Source: http://www.sap.com/benchmark

(2) Dell PowerEdge R930, on the SAP BW Extended mixed load standard application benchmark running SAP Netweaver 7.31 application; 4 processors / 72 cores / 144 threads, Intel Xeon Processor E-7 8890 v3; 2.5 GHz; 1536 GB memory, 172,450 adhoc navigation steps per hour on SuSE Linux Enterprise Server 11 and SAP Hana 1.0, Certification #: 2015014

(3) Dell PowerEdge R920, on the SAP BW Extended mixed load standard application benchmark running SAP Netweaver 7.31 application; 4 processors / 60 cores / 120 threads, Intel Xeon Processor E-7 4890 v2; 2.8 GHz; 1024 GB memory, 137,010 adhoc navigation steps per hour on SuSE Linux Enterprise Server 11 and SAP Hana 1.0, Certification #: 2014044

(4) HP DL580 Gen8, on the SAP BW Extended mixed load standard application benchmark running SAP Netweaver 7.30 application; 4 processors / 60 cores / 120 threads, Intel Xeon Processor E-7 4880 v2; 2.5 GHz; 1024 GB memory, 126,980 adhoc navigation steps per hour on SuSE Linux Enterprise Server 11 and SAP Hana 1.0, Certification #: 201409

SAP and all SAP logos are trademarks or registered trademarks of SAP AG in Germany and in several other countries. All other product and service names mentioned are the trademarks of their respective companies.
HANA Appliance

Appliance delivery approach

- Solution validation done by SAP and partner
- Preconfigured hardware set-up
- Preinstalled software

Fast Implementation Support fully provided by SAP

SAP HANA tailored data center integration

- Installation needs to be done by customer
- Customer aligns with the hardware partner on individual support mode

More Flexibility
Save IT budget and existing investment

TDI – Tailored Datacenter Integration
Delivering freedom of choice to the HANA Landscape

Applications

SAP HANA®

High Availability
SAP HANA Auto Host-standby & System Replication, SUSE HA Ext, RH HA Plugin¹, Symantec HAL, Tivoli SA

File System
GPFS², XFS

OS
Linux Enterprise Server
Priority Support for SAP applications

Server Hardware
POWER7+(non-prod) or POWER8
Standalone or shared/PVM virtualized

Storage Hardware
Customer choice

Hypothetical Power Landscape

ECC
BW HA
ECC App
CRM
BW QA
CRM QA
BW App

PowerVM
HANA
HANA
App
DB/App
DB/App
App

Data

1) Not currently supported with Linux on Power. Contact RedHat for product plans.
2) GPFS is currently supported for Linux on Power by IBM. Contact SAP for plans for certification with HANA on Power.
HANA on POWER Portfolio

Power Systems

HANA on Power Solution Editions
- IBM fast-start option
- Industry best-practice
- Quick configurations
- Aggressively priced
- Rapid deployment of SAP HANA on IBM Power Systems
SAP HANA HA: System Replication

Performance Optimized

- Very fast recovery
- High cost for 100% standby resources
- Ideal for high RTO and expectation of frequent outages

Cost Optimized

- Recovery from disk
- Much lower cost – 10% reserved
- Ideally suited for virtualized infrastructure with infrequent outages
Memory and I/O Intensive Operations

- **Active** and **Standby** servers
- **Master Name Server** and **Index Server**
- **Data Disks** and **Log Disks**

Load time dependent on throughput of IOPS

- All columns at initialization/HA
- Selected columns at initialization/HA
  - Others on demand

**Delta Merge Process**

- Before Merge
  - Write Operations
  - Master1
  - Delta1
  - Read Operations

- During Merge
  - Merge Operation
  - Master1
  - Master2
  - Delta1
  - Delta2
  - Read Operations

- After Merge
  - Write Operations
  - Master2
  - Read Operations

**I/O latency & throughput dependency**

Extremely high memory demand

Response time of on-demand columns dependent on latency, throughput of IOPS

---

SAP HANA database

- Memory
- Data Area (disk)
- Log Area (disk)
- Savepoint
- COMMIT
- Data Backups
- Log Backups

I/O latency dependency

---

IBM Internal Use Only © 2015 IBM Corporation
HWCCT – Hardware configuration check tool

Determine if system meets KPI requirements

- Landscape test
  - OS config validity
  - Consistency of landscape based on reference architecture

- File system throughput/latency

- Network throughput for multinode configurations
  - 9.5 GBits for single stream
  - 9.0 GBits for duplex stream

<table>
<thead>
<tr>
<th>Volume</th>
<th>Block Sizes</th>
<th>Test File Size *</th>
<th>Initial Write (MB/s)</th>
<th>Overwrite (MB/s)</th>
<th>Read (MB/s)</th>
<th>Latency (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log</td>
<td>4K</td>
<td>5G</td>
<td>n.a.</td>
<td>30</td>
<td>n.a.</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>16K</td>
<td>16G</td>
<td>n.a.</td>
<td>120</td>
<td>n.a.</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>1M</td>
<td>16G</td>
<td>n.a.</td>
<td>250</td>
<td>500</td>
<td>n.a.</td>
</tr>
<tr>
<td>Data</td>
<td>4K</td>
<td>5G</td>
<td>10</td>
<td>20</td>
<td>80</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>16K</td>
<td>16G</td>
<td>40</td>
<td>100</td>
<td>200</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>64K</td>
<td>16G</td>
<td>100</td>
<td>150</td>
<td>250</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>1M</td>
<td>16G</td>
<td>150</td>
<td>200</td>
<td>300</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>16M</td>
<td>16G</td>
<td>200</td>
<td>250</td>
<td>400</td>
<td>n.a.</td>
</tr>
<tr>
<td></td>
<td>64M</td>
<td>16G</td>
<td>200</td>
<td>250</td>
<td>400</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
IBM Services for SAP HANA on Power

- Technical design and infrastructure deployment
  - Planning and configuration
  - Installation and verification
  - Coordinate with SAP
  - Validation and testing
  - Recovery/availability plan
  - Coaching and skills transfer

- Operation and optimization
  - Proactive services
  - Solution support
  - Optimization
  - Service management
  - Operating model

- Assess, Upgrade and Migrate
  - Project services
  - Health check assessment
  - Platform upgrade
  - Deploy scale-out hardware¹

¹ Scale our solution with General Parallel File System (GFPS)
SAP HANA on IBM Power Summary

- Analytics enable decision making, Suite on HANA runs the business
  - Power Systems delivers the non-stop operations required of these mission critical systems

- Performance - HANA demands extreme memory and thread throughput
  - Power Systems delivers 4x threads, over 3x memory throughput compared to x86

- Flexibility
  - Power Virtualization built in, not a poorly supported afterthought

- Competitive TCA, Lower Total Cost of HANA Landscape