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R485
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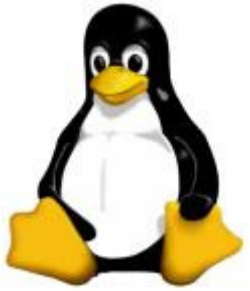
R529
Q10

The Tru Linux Story

Building a SAP Enterprise Environment based on Linux / x86_64 with ATIX



ATIX

Michael Hagmann / Head of Enterprise Server Technology
Schaan, 24. June 2009

Agenda

- Hilti Introduction
- Introduction – from Tru64 to Linux
- Implementation – from the Evaluation to the Execution
- Problems / Pitfalls

Hilti in Brief – a worldwide presence

Hilti is the competent partner for construction professionals worldwide.

Products and services of technical superiority increase the productivity of Hilti's customers.

They benefit from innovation, comprehensive advice and professional services; together this generates significant added value.

Hilti in Brief – a worldwide presence

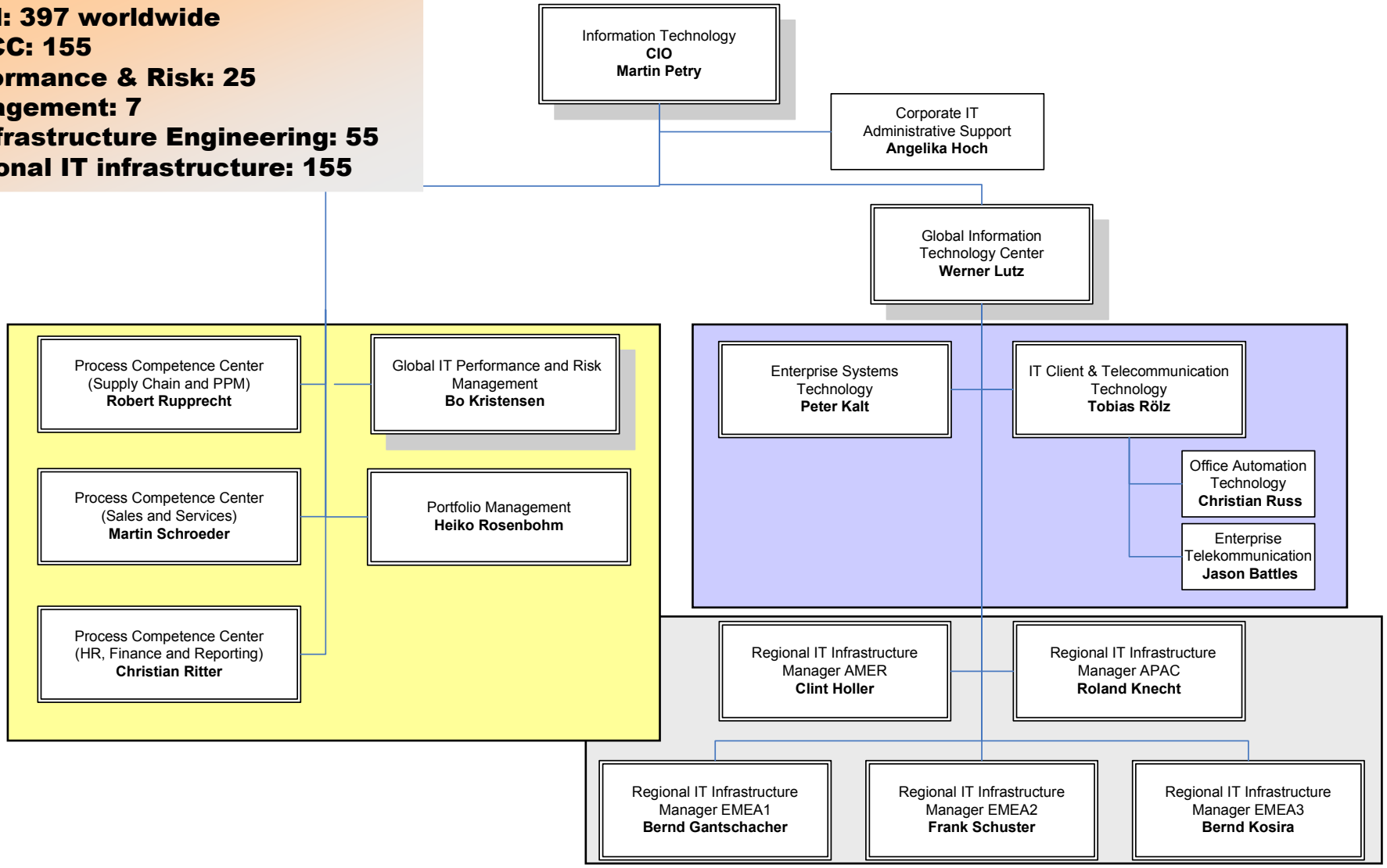
- Founded in 1941 in Schaan, Principality of Liechtenstein
- One of the global leading companies in providing products, systems and services to construction professionals
- Located in more than 120 countries on six continents
- More than 20,000 employees
- More than 50 nationalities at Group Headquarters in Schaan
- Direct sales model
- 2003 winner of the Carl Bertelsmann Prize for outstanding corporate culture

Key figures for 2008

Sales	CHF 4,700 million
Operating result	CHF 450 million
Net income	CHF 243 million
Expenditures for research and development	CHF 189 million
Employees worldwide (average)	20,450

Hilti – Global IT Organization

Total: 397 worldwide
IT PCC: 155
Performance & Risk: 25
Management: 7
IT infrastructure Engineering: 55
Regional IT infrastructure: 155



Business Driven IT Strategy: Ensure Hilti Customer Success through Integrated Information Systems Services Globally

High Availability of Computing and Network Utility

One Global IT Team

High Performance Network Computing

Standard IT Practices and Tools

Optimized Global Applications for Common Processes and Core Data

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Hilti - History

1992

In 1992 the decision was taken to build future ERP environments on the Alpha/TRU64 platform based on the following reasons

- **only 64Bit platform at this time**
- **outstanding benchmark results**
- **best of breed high availability features (DIGITAL clustering functionality)**
- **potential for the technology consolidation of the VMS and UNIX systems**

2001

During the HP/IBM evaluation in 2001 the decision was taken to continue with Alpha/TRU64 based on the following reasons

- **the missing/partial support of SAP of the IBM P4 chip in full 64bit mode**
- **the superior cluster functionality of TRU64**
- **the more or less equal benchmark results at this time**
- **the missing financial advantage doing a change**
- **the expected heavy impact on the GPD/H2 project**
- **the expected additional cost's for additional components if switching to IBM**
- **a review was expected to take place from 2006 onwards**

Hilti - Situation 2005

- Single vendor strategy for SAP (GPD / H2) servers and storage (HP)
- In-house system engineering and operating
- Good in-house know-how through multi-year experience with the technology
- Digital/Compaq/HP alpha technology used so far is nearing its end of life, HP decided to discontinue Tru64 in 2004
- New SAP components and release versions require new technology
- APO Phase III rollout requires significant hardware upgrade 2006
- Servers bought at the begin of SAP (GPD/H2) need replacement

➔ The missing support for new SW releases on TRU64 and the need to invest into new HW triggered Hilti to decide to which technology platform we are migrating

Hilti - Our Hardware Vision:

For the new server technology we want a platform which

- Enables standardization in the datacenters
- Continues to support high availability, high performance and pure 64Bit computing
- Supports all new SAP components and releases
- Reduces availability constraints on the SW market for other components
- Works with our existing storage environment
- Is offered by multiple vendors, and that way allows us to switch between these vendors
- Gives us maximum flexibility
- Helps us to reduce costs (lower cost HW because of bigger market share and volume bundling)

Hilti - Three Options:

a) Itanium processors with HP UX operating system for our large servers and standard industry servers with Linux for our mid size and small servers.

b) Power processors with IBM AIX operating system for our large servers and standard industry servers with Linux for our mid size and small servers.

c) Standard industry servers with Linux operating system for all servers.

Hilti - The Decision (21. February 2006)

From: Petry, Martin

Sent: Dienstag, 21. Februar 2006 13:03

Subject: EB decision on Hardware Sourcing Strategy

Importance: High

The EB approved today our Hardware Sourcing Strategy, i.e. we go for Linux on Standard Industry Servers.

Thank you to the infrastructure team for the quality preparation of the decision.

Martin

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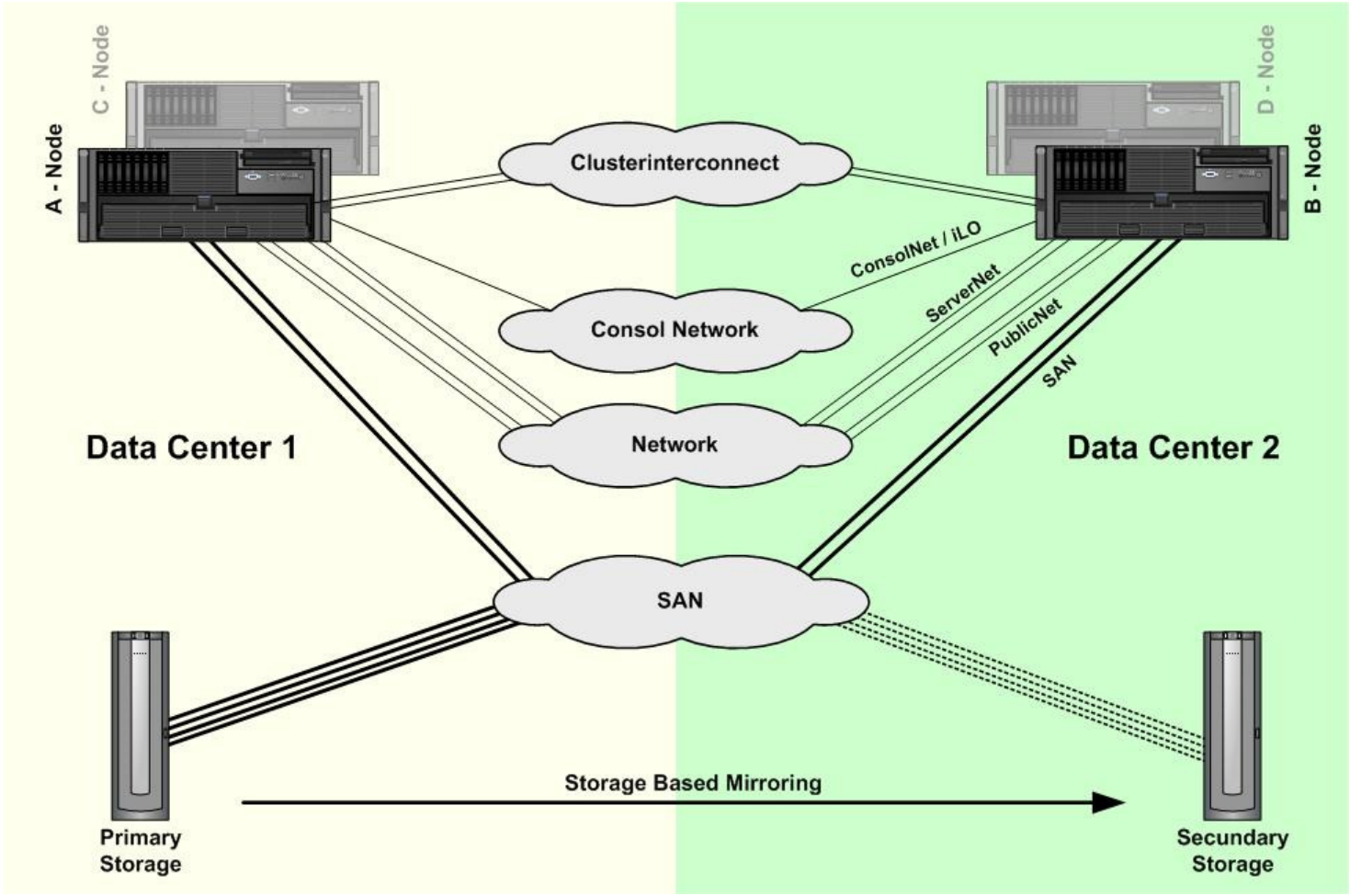
Hilti IT - LINUX implementation approach

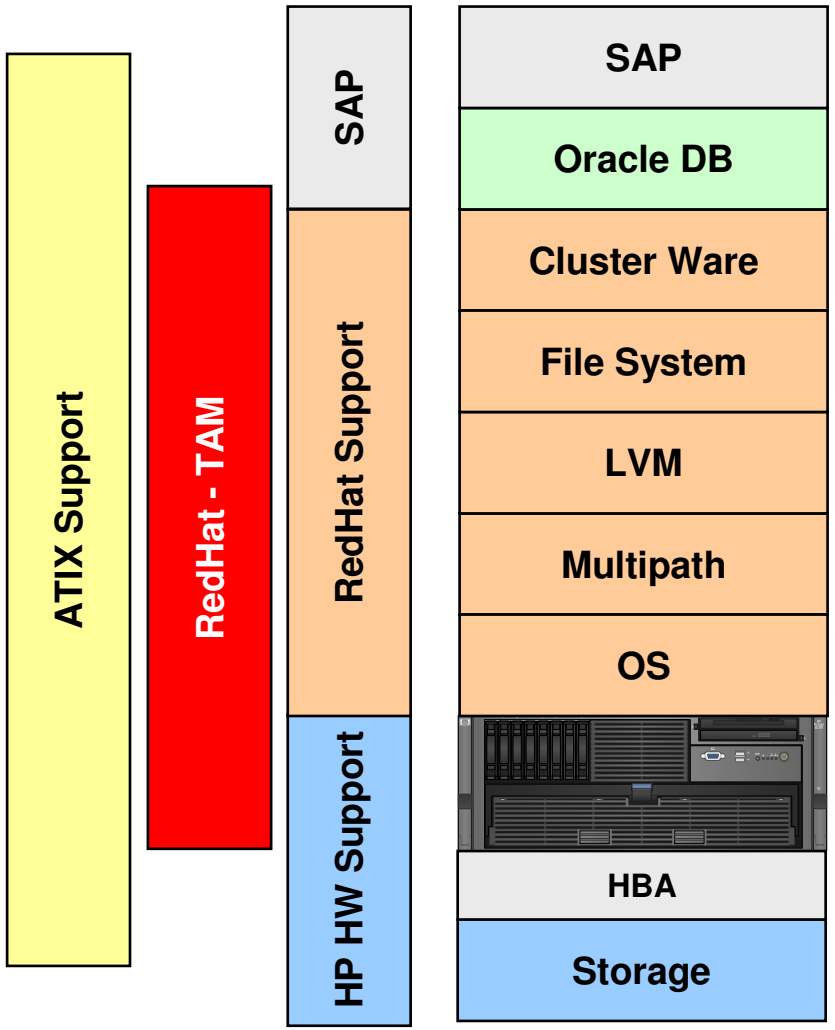
- Our LINUX environment will be built up based on an internal bundling approach with the Help from our Engineering Partner ATIX AG
- These bundles will be reviewed every 12-18 month
- The first bundle Linux-B1.0 is being built based on the Red Hat Enterprise Linux 4 (64Bit) with the SharedRoot Extension from ATIX AG

  Reasons: We can buildup a cluster environment with
  - Cluster Services
  - Cluster file system
  - ATIX Sharedroot to keep administrative overhead under control
  - Easily add and remove cluster members
  - Support is available for all components
- First bundle must support operational LINUX environments from July 1, 2006 forward

Hilti IT - Overview Standard Cluster

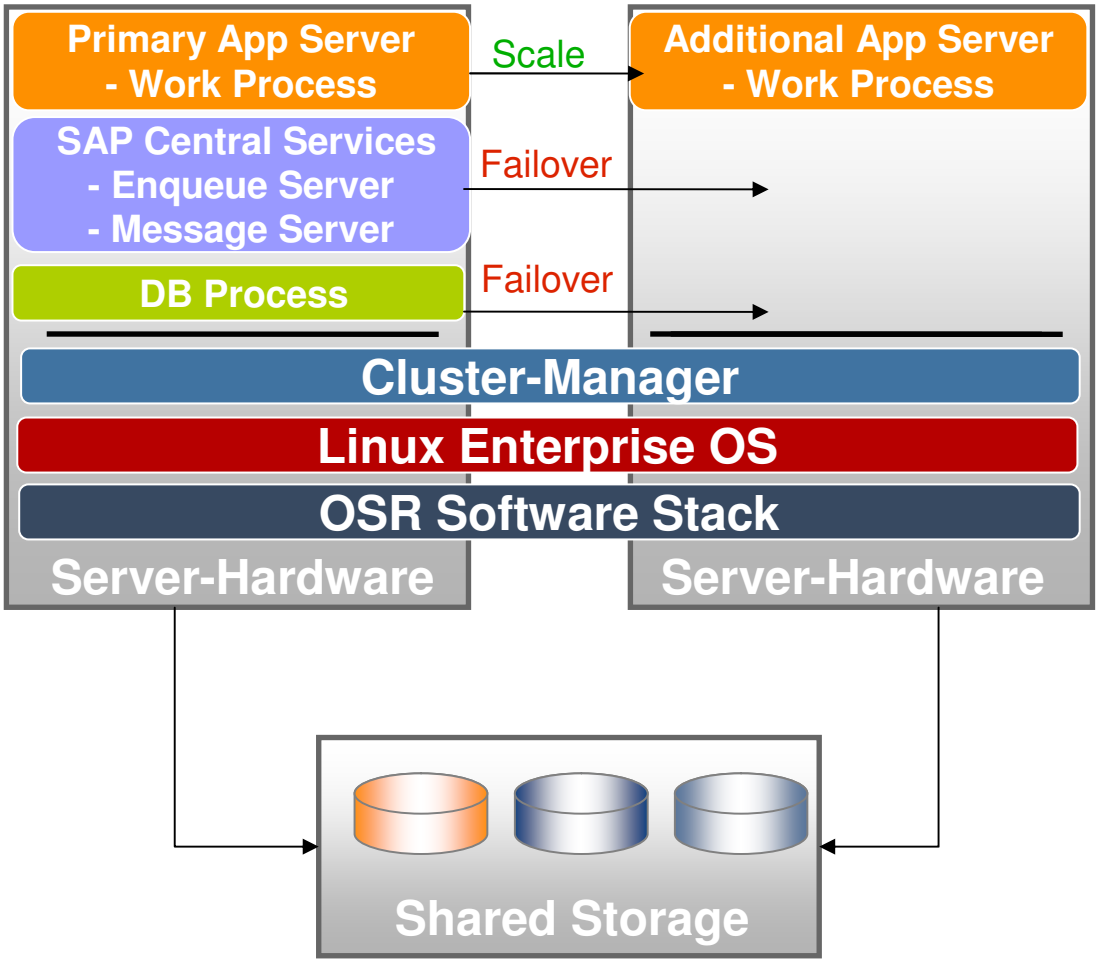


Hilti IT - Current Linux HW / SW stack



	Oracle	SAP	HP	RedHat	EMC
NetWeaver / Appl.Server / CI		OK			
[Oracle] 10.2.0.4	OK	OK			
[RedHat] RHCS	OK	OK		OK	OK
[RedHat] GFS / DLM + [ATIX] shared root DLM = Distributed Lock Manager	OK	OK	OK	OK	OK
[RedHat] LVM	OK	OK	OK	OK	OK
[RedHat] Device Mapper for EMC / HP XP storage [HP] Qlogic for HP-EVA storage			OK	OK	OK
RedHat 4.7 + / 64bit	OK	OK	OK	OK	OK
[HP] DL385 G2 / G5 [HP] DL585 G1 / G2 / G5 [HP] DL785 G5		OK	OK	OK	OK
[Qlogic] FCA2214 [Qlogic] FC1142SR, FC1242SR			OK	OK	OK
[HP] – EVA-8000 [HP] – XP12000 / XP24000 [EMC] – CX3-nn			OK		OK

Standard Cluster Hilti with ATIX Open Sharedroot



Hilti - From Unix to Linux

- 2009/05: Go Live of SAP ERP (2 x HP DL785 G5 32 Core / 128 GB)
- 2009/03: Go Live of new Spooling (Unispool) on Linux
- 2008/12: Go Live of ECM Documentum
- 2008/09: Go Live of SAP CRM (2 x HP DL785 G5 32 Core / 128 GB)
- 2008/04: Performance Test of HP DL785 G5 / IBM x3950 M2 → HP DL785 G5
- 2007/12: Evaluation of ScaleUP Solution → test HP DL785 G5 / IBM x3950 M2
- 2007/05: Go Live of SAP BI and HCM
- 2007/04: Go Live of SAP PI
- 2006/11: Go Live of SAP EP (6 x HP DL585 G1 8 Core / 64 GB)
- 2006/10: Go Live of SAP APO (4 x HP DL585 G1 8 Core / 32 - 128 GB)
- 2006/07: Ready for Rollout first Linux operational Systems with HP / Red Hat / ATIX
- 2006/02: Ramp-Up the initial Linux Infrastructure and Hardware Vendor eval. HP / IBM
- 2006/02: Hilti Board decided for Linux with x86_64 Standard Server
- 2005/12: successful POC with Red Hat and ATIX Sharedroot ext.
- 2005: Hilti found ATIX AG at the Linuxtag as Engineering partner (Sharedroot ext.)
- 2005: Hilti start a Evaluation project to identify potential options
- 2004: HP decided to discontinue Tru64
- 1992 - 2004: highly standardized Tru64 / Alpha System landscape

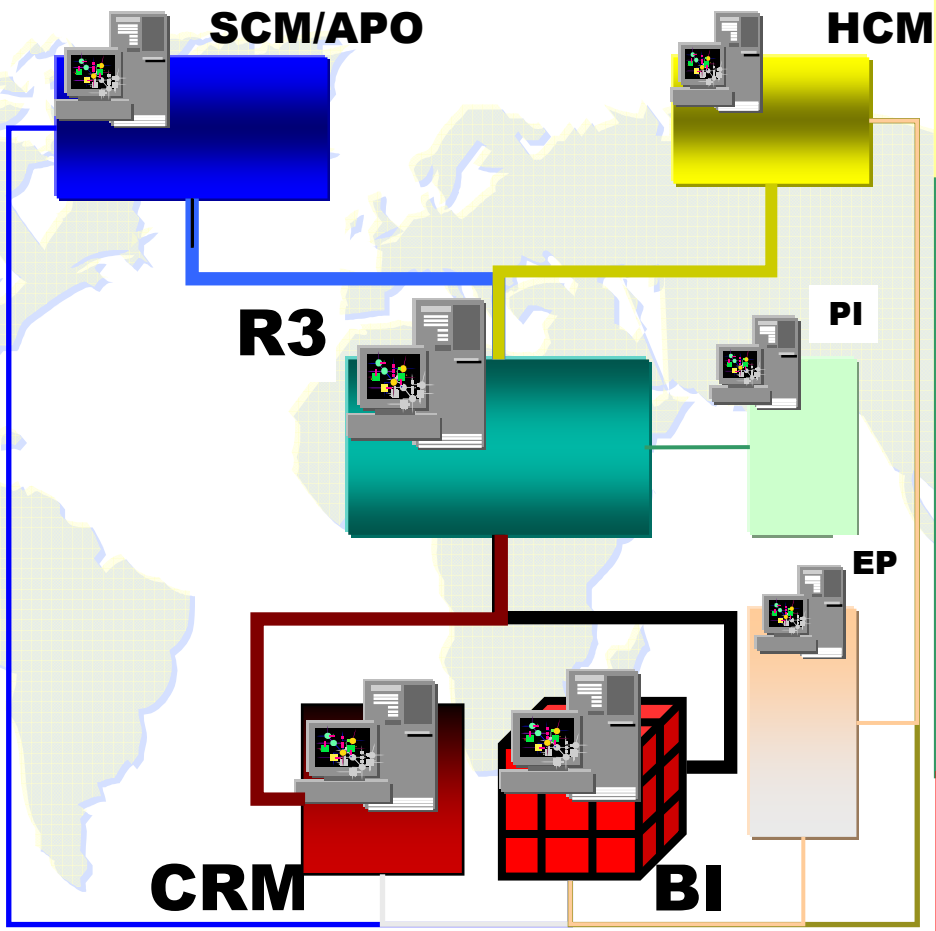
Hilti IT – Server - Current Status Enterprise Server

- 185 Server with Red Hat Linux on x86_64
- 46 SharedRoot Cluster with RHEL4.7+
- 63 Single Server with RHEL4 (RHEL5 for XEN Hosts)
- 30 Virtual Server with XEN
- 1530 AMD Cores ~ 1’530’000 SAPS
- 7588 Gigabyte Memory
- 205 Terabyte Storage (netto)
- Last Alpha/Tru64 systems planned to be moved out End 2010
- Server portfolio based on
  - HP Proliant 385 / 585 / 785
  - DELL in the Windows environment for remote sites

Hilti IT - GPD/H2 System Environment

Supply Chain Planning
- All markets
- All plants
- 100GB LiveCache DB
- Daily Planning Runs
- SAP ECM 6.0 NonUnîcode
- Running on X86_64 RedHat Linux

Customer Relationship Mgt
- Outbound Telemarketing
- 5500 mobile devices Laptop and PDA
- SAP ECM 6.0 Unîcode
- Running on X86_64 RedHat Linux
- 2.5 TB Database / +1TB/yr
- biggest SAP mobile Sales implementation worldwide
- 2nd biggest SAP CRM system based on transactions



Centralized Global Operation

Global HR System
- All employees globally
- HR and Payroll
- SAP ECM 6.0 Unicode
- Running on X86_64 RedHat Linux

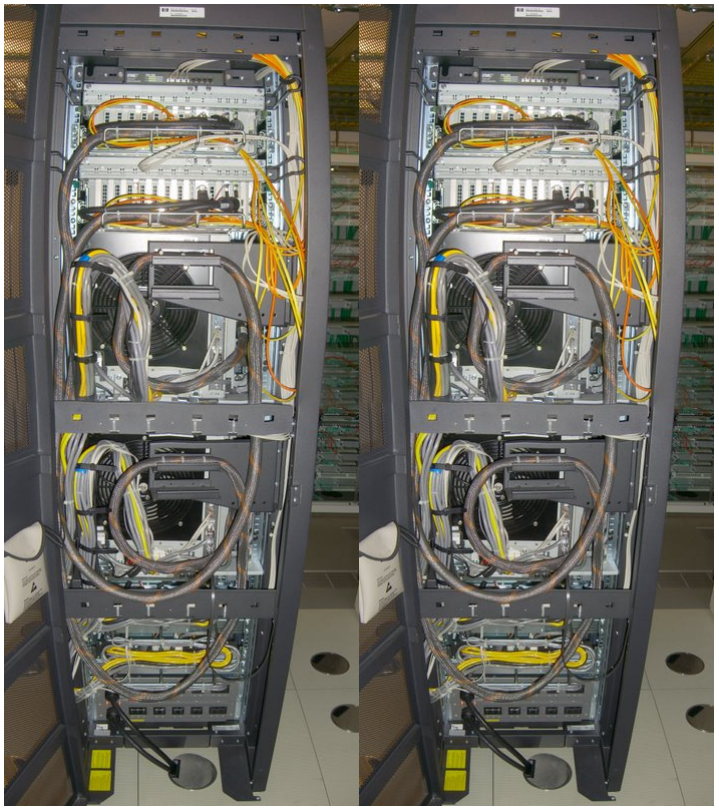
ERP System
- 35 Sales Organizations
- All plants and HQ
- covering 98% of Sales
- SAP R3 4.6c NonUnîcode
- Running on X86_64 RedHat Linux
- 5.5 TB Database / +1.2TB/yr
- 9500 active users per week
- 384'000 / 2 SAPS
- Concurrent 8000 users
- up to 8Mio Dialog Steps/day
- within top 10 SAP ERP systems worldwide based on SAP transactions

Global BI Reporting System
- 35 Sales Organizations
- SAP ECM 6.0 Unicode
- Running on X86_64 RedHat Linux
- 7TB Database / +1.6TB/yr

Hilti IT - Comparison Big Server

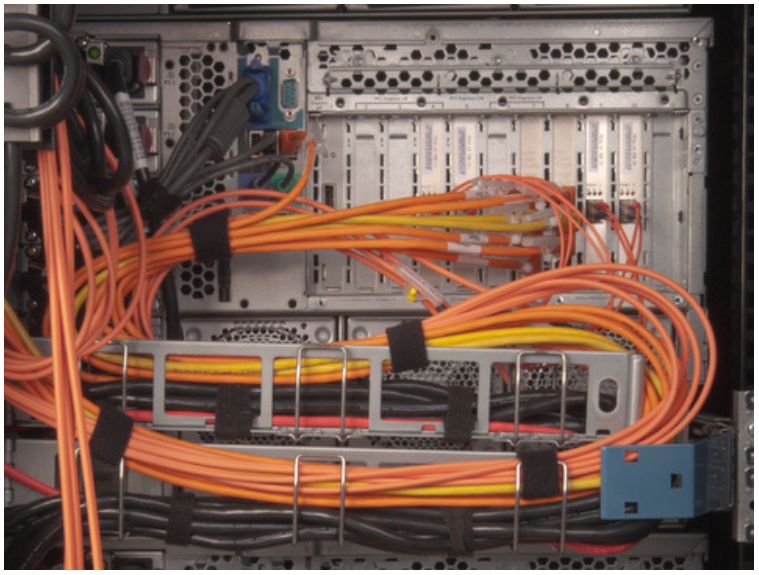
HP Alpha Server GS1280

84 u / 32 CPU / 64 GB RAM / 23000 SAPS / 8000 Watt



HP Proliant DL785 G5

7u / 32 Core / 128 GB RAM / 35000 SAPS / 1800 Watt



SAP ERP comparison Tru64 with Linux

	ERP Old (2003)	ERP New (2008)	%
Server Model	HP – GS1280	HP – DL 785 G5	
CPU Type	HP - Alpha EV7	AMD – Opteron 8356	
Cores / Memory	32 Cores / 64 GB	32 Cores / 128 GB	
Batch processing		Average > 50% faster	
Power usage (without cooling)	8 kWh	1,6 kWh	20 %
TCO (4 year‘s)	x‘xxx kCHF	xxx kCHF	< 10 %
SAP‘s	23‘200	35‘400	150 %
Relative CPU power	1	8	800 %
Database size	6,5 TB	5,3 TB (17% less)	

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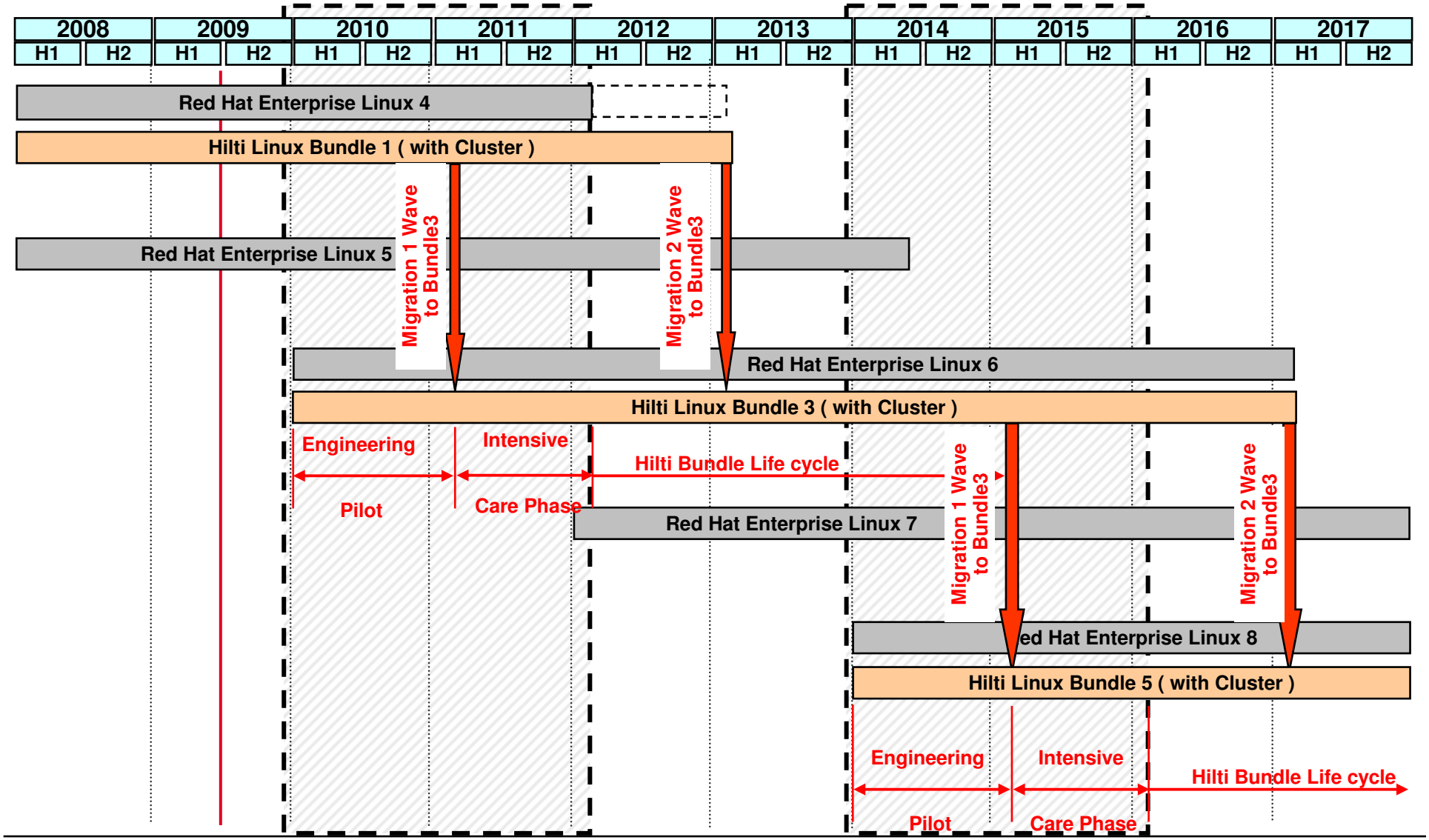
Learning's Hilti Linux Migration

- Find a competent and autonomous Engineering Partner → ATIX
- Find similar Company's and exchange experiences → ERFA Switzerland
- Early involve your Application Vendor → SAP Linuxlab
- develop a clear Support Concept
- Build your own Test process / QA Concept
- Minimize number of Updates → buy Red Hat EUS Support
- Minimize Hardware complexity → buy test hardware for every Bundle
- Build your own Releases Concept
- Have a close relationship with OS Vendor → ATIX ADSM / Red Hat TAM
- Make sure you have good internal Linux Engineering Know how
- Plan the time to get your first initial Linux Bundle including Rollouts

Hilti Linux Release Concept

- Align Hilti Linux Bundle approach to Red Hat major release cycles
- Switch our Hilti Bundle approach from a reactive mode into a proactive release schedule
- Plan major releases periodically in a 4 years cycle and skip every second major release
- Only deploy minor Release once a year, skip every second release jump to Red Hat EUS
- Do extensive testing
- 2 Year for Major Release Rollout (1 Year Engineering / Pilot, 1 Year Intensive Care Phase)

Hilti Linux Release Concept / Roadmap



Timeline 2006 - 2009

- After Start with RHEL 4.3+ in 2006 we face a lot of problems with DLM
- From Dec 2006 – Feb 2007 we upgraded all servers to RHEL4.4+
- The problem could not be finally solved and in Sep 2007 – Oct 2007 we had to do an emergency upgrade to RHEL4.5+
- Then we have been much more stable, but the AMD Barcelona CPU came out and we had to upgrade to RHEL4.6+ in Aug 2008
- This release was extremely buggy and we had to apply some hot fixes from Red Hat in Oct 2008
- With the upgrade to RHEL4.7+ we could stabilize in Jan 2009

Problems / Pitfalls Details

- Kernelbugs / Software regressions after Release Upgrades
- Diskdump / Netdump
- Netconsole
- rgmanager (Red Hat Cluster resource Group Manager)
- Leading Edge Problems
- Problems with Systemmanagement / Standardisierung
- Over 250 Tickets / Issue opened in 3 Years

Conclusion

- Yes, we had quite some Engineering work to do, but the whole migration is a big success.
- We achieved a good System stability: zero critical Business Impact yet
- Moore's law works: Standard Industry Servers covered also our biggest needs
- Complete standardization of the Hardware Platform in the Datacenter
- Significant reduction of the expenses
- Support Quality from external Providers developed to the required Enterprise Level.
- Very successful Engineering Partnership with ATIX over the last 3 Years

Q&A

We passionately enable business excellence through global IT solutions