A Lot of Things Have Happened in the Last Year

- SLES for SAP Applications
- SLES for SAP Application support changes
- Upgrade Paths
- SAP Configuration & Tuning
- NVDIMM / Intel Optane DC
- Workload Memory Protection
- High Availability
- DataHub / Container
- Roadmap / Future Directions
Infrastructure for SAP Solutions

SLES for SAP Applications

- Is SAP Software Development Reference Platform
- SAP on SLES Certification in 1999
- 12000+ joint Customers, 100+ References
- 80+% Market Share Worldwide
- Integrated 24x7 Support through SAP Solution Manager
- Appliance and OS Platform
  - SAP NetWeaver BW Accelerator*
  - SAP High Performance Analytic Appliance
  - SAP StreamWork Enterprise Agent*
  - SAP NetWeaver Enterprise Search*
  - SAP Business ByDesign*
  - SAP HANA Enterprise Cloud*
  - SAP's own ERP on HANA runs SUSE

SAP success story:
http://scn.sap.com/community/linux/blog/2015/10/09/sap-se-relies-on-suse-also-for-the-sap-hana-enterprise-cloud
SLES for SAP Applications

- PRIORITY SUPPORT for SAP
  - ESPOS
  - HANA Hardening
  - YaST for SAP
  - Virtualization consistency
  - Container Runtime
  - SAP HANA Performance Pack
  - SUSE Connect
  - HANA HA+DR
  - HA Cluster Connector
  - High Availability
  - SAP Specific Update Channel
  - SUSE Linux Enterprise Server

- PRIORITY SUPPORT for SAP
Deployment Options for SAP Workloads

Such as SAP HANA, NetWeaver & S/4 HANA

**On-Premise**
- Datacenter Installations & Appliances
  - Virtualized
  - Bare Metal
  - x86_64
  - System-Z
  - Power

**Public Cloud**
- Cloud Images
  - Cloud Images
  - AWS
  - Google Cloud Platform
  - Alibaba Cloud

**Private Cloud**
- Cloud Images & Management
  - Cloud Images
  - SUSE OpenStack Cloud
  - SUSE Enterprise Storage

SLES 15 as multi-modal OS serves all platforms and deployment types from one single code stream.
SLES for SAP Application Support Changes
Announced in November – Long-Term Support Included in Standard Subscription

Any given SLES for SAP Applications 12 and SLES for SAP Applications 15 release / service pack now provides 4.5 years of support with the regular subscription during the GA live time of the general code-stream

- Effective since December 2018
- Premium support for 4.5 years included in SLES for SAP Applications subscriptions
- No need to purchase additional LTSS service for the last 2 years of a service pack’s lifecycle
- Ability to skip a service pack
- Better alignment with Hardware replacement cycle
## Lifecycles for SLES for SAP Applications 11/12/15

<table>
<thead>
<tr>
<th>Service Pack Release</th>
<th>FCS Date</th>
<th>ESPOS* Ends</th>
<th>LTSS Ends</th>
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<tr>
<td>SUSE Linux Enterprise Server for SAP Applications 11</td>
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<td>31 Jan 2019</td>
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*ESPOS - Extended Service Pack Overlap Support

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<tr>
<th>Service Pack Release</th>
<th>FCS Date</th>
<th>General Support Ends</th>
<th>ESPOS* Ends</th>
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<td>SUSE Linux Enterprise Server for SAP Applications 12 SP2</td>
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<td>07 Mar 2018</td>
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<td>SUSE Linux Enterprise Server for SAP Applications 12 SP3</td>
<td>07 Sep 2017</td>
<td>12 Jun 2019</td>
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<td>SUSE Linux Enterprise Server for SAP Applications 12 SP4</td>
<td>12 Dec 2018</td>
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*ESPOS - Extended Service Pack Overlap Support

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<th>Service Pack Release</th>
<th>FCS Date</th>
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<tr>
<td>SUSE Linux Enterprise Server for SAP Applications 15</td>
<td>16 Jul 2018</td>
<td>01 Jan 2023</td>
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</table>

*ESPOS - Extended Service Pack Overlap Support

- SLES for SAP Applications 12 and 15 are supported until end of ESPOS date with a general subscription
- Customers can purchase LTSS at the end of support for the last service pack of SLES for SAP 12 and 15 if they choose to stay on the release for a longer time
Example of SLES for SAP Applications 12 Timeline

SLES for SAP 12 – updates to Extended Service Pack Overlap Support ESPOS

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Chart is approximate. Actual SLES 12 lifecycle may vary.
* SP5 and schedule not yet confirmed

Each release of SLES for SAP Applications provides during GA of base code-stream
- 12 month of general support (Full product support)
- 6 month Service pack overlap support (Full product support)
- 36 month of ESPOS support (Support under LTSS limitations)
Upgrade Paths
Upgrade Paths

- Also applicable for SLES for SAP Applications
- Upgrade from plain SLES to SLES for SAP Applications possible

SAP Configuration & Tuning
Options

SAP Note “1275776 - Linux: Preparing SLES for SAP environments”

- using sapconf
- using saptune
- manual configuration

“sapconf versus saptune” [https://www.suse.com/c/sapconf-versus-saptune/]

Only use ONE way to configure a system setting!
**sapconf**

- **Minimum set** of operating system changes
- **No differentiation** between SAP Applications
- Available in SLES (therefore, SLES for SAP Application as well)
- Rework in 2018 (ab SLES 12 SP1)
- Uses tuned (one profile to rule them all)
- **Now every parameter is configurable**
  (/etc/configure/sapconf and /usr/lib/tuned/tuned.conf)
- “A new sapconf is available”
- [https://www.suse.com/c/a-new-sapconf-is-available/](https://www.suse.com/c/a-new-sapconf-is-available/)
- TLTR: Summary of important things:
saptune

- Implements **specific SAP notes** or groups (solution)
- **Solutions** for SAP HANA, SAP NetWeaver, etc.
- Only SLES for SAP Applications (12 SP1 and later)

- Rework in progress
- Still uses tuned (one profile: saptune)
- **Every** parameter will be configurable
  - `/etc/saptune/override` for own changes
  - `/etc/saptune/extra directory` for partners
- Verification / comparison
- Blog posts will come soon
NVDIMM / Intel Optane DC
SAP HANA as an In-Memory Database

SAP HANA as an in-Memory database has the problem that all data needs to read to memory on a restart of the system

- DB tends to be huge, so it simply takes time to do so
- From an operating perspective, even if the HANA database is clustered, there is a higher risk to the DC (since system is active, the other one is restarting)
- There have been some projects in the past to enable persistent memory
  - If the HANA DB can be kept in memory, only a consistency check is required on reboot, but loading multiple terabytes of data from disk in memory isn’t needed in most cases
NVDIMM Support Enables Faster Recovery after System Restarts

Reboot in-memory systems faster with databases remaining in memory

- Replace RAM with NVDIMM persistent storage for in-memory applications
- Avoid the wait time to reload data from storage into memory after system restarts
- SAP HANA – when recognizing Optane memory – puts its column store into NVDimms, whereas Rowstore and the Query engine use standard DRAM
  - Servers still require disks and HANA continues to write data dumbs and transaction logs to disk

SAP HANA Rev 35 supports NVDIMMs with SLES 12 SP4 and SLES 15 GA
NVDIMM Support Enables Faster Recovery after System Restarts

Reboot and restart SAP HANA systems faster

- SAP has done the first set of performance analysis
  - The larger the DB is, the bigger the advantage
- From a performance perspective, during operation there is no significant difference for HANA because:
  - Read times are similar to DRAM
  - HANA writes changes in batch operations in the background, so slower write speed isn’t significant
- Initial HANA configurations were 15 TB (3 TB DRAM, 12TB NVDIMM)
  - We have seen POC’s up to 36 TB (8 sockets)

**Faster start times for less downtime**

<table>
<thead>
<tr>
<th>Dataset Size</th>
<th>Traditional System (with SSD storage)</th>
<th>Persistent Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>6TB</td>
<td>50 min</td>
<td>4 min</td>
</tr>
</tbody>
</table>

**12.5x improvement**

**Increased memory capacity while reducing TCO**

Memory capacity per CPU: **> 3 TB**

Source: [Blog by Andreas Schuster, Product Manager – SAP HANA Platform](https://www.blogs.sap.com/andreas-schuster/)
Workload Memory Protection
Workload Memory Protection

Page Cache Limit is gone with SLES 15

The kernel swaps out rarely accessed memory pages to use freed memory pages as cache to speed up file system operations, for example during backup operations. Certain applications use large amounts of memory for accelerated access to business data. Rarely accessed parts of this memory are subject of this swap out. Later access to swapped out memory regions results in poor application response times.

New method: putting processes into dedicated cgroup(s) and protecting them with memory.low

If the memory usages of a cgroup and all its ancestors are below their low boundaries, the cgroup's memory won't be reclaimed unless memory can be reclaimed from unprotected cgroups.

Page Cache Limit
- Was never accepted upstream
- Problems on machines with a large amount of memory

Workload Memory Protection
- Uses upstream method: cgroups
- Protects against any kind of memory pressure

Basically… putting processes into cgroups, which offers a lot of possibilities for the future.
Workload Memory Protection

...some technical details

- Requires cgroup v2 only (default is a unified hierarchy)
  - will clash with existing cgroup setups!
  - some systemd options regarding resource control (e.g. `MemoryLimit=`) won’t work any more ([man 5 systemd.resource-control](#))
- systemd unit will create a cgroup subtree with restriction (`MemoryLow=`)
- User switch moves process into the protective cgroup
  - administrative tasks on command line requires care!

We will work together with SAP to develop a clean systemd solution for sapinit!
High Availability
High Availability

Business Continuity

"hybrid" Redundancy Scenarios
e.g. SAP HANA Scale-Out System Replication
High Availability for SAP HANA
HA Scenarios, Documentation and Best Practices
SAP S/4 HANA – HA CLU 1.0 Setup
Clustered central services and distributed System

Mandatory cluster

Node A
- Pacemaker
- ASCS
- VIP_asc

Node B
- Pacemaker
- ERS
- VIP_ers

Optional clusters

AppSrv Node 1
- VIP_pas
- PAS

AppSrv Node 2
- VIP_aas
- AAS

DB Node 1
- VIP_db
- DB

DB Node N
- VIP_dbN
- DB
With the New ENSA2, Rolling Kernel Updates Are Possible

SUSE achieved SAP certification for rolling Kernel updates

- SAP Application servers (ASCS, ERS, 2 dialog Server) are updated through the process automatically, while the system remains mostly available to users
- Based on HA capabilities and new ENSA 2 mechanisms
SAP Management Integration
SAP Management Console and Command Line Interface

New sapcontrol functions
HACheckConfig
HACheckFailoverConfig
HAGetFailoverConfig
HAFailoverToNode
HACheckMaintenanceMode
HASetMaintenanceMode
DataHub / Container
SAP Is Starting to Deliver Solutions through Containers

- Containers are currently a key topic for SAP
- SAP is working on containerizing solutions right now
  - Extensions of S/4 HANA can be deployed within containers
  - HANA might become a container at some point (at least for simple and small workloads in the near future)
  - SAP DataHub is likely the first product that requires Kubernetes
- SAP is also delivering SAP Gardener to the community – a way for developers to instantiate their own Kubernetes cluster within a Kubernetes cluster
- SUSE is already working closely with SAP in this area
SAP DataHub represents a technology shift on the SAP side as it ships as containers.
SUSE and SAP Work Closely in the Area of Containers to Provide a Holistic Solution to Its Clients

SUSE already provides various solutions for clients to run container-based workloads

- **SUSE CaaS Platform** is a product that provides a platform based on Kubernetes and Docker to run containers at Enterprise Scale
- **SLES for SAP Applications** can also host containers by installing the respective extensions to the system – to get started

Containers themselves also require an OS – SUSE can help here, too!
Roadmap / Future Directions
SUSE’s Planned Focus Areas for SAP Workloads

Ongoing investment in operating enhancements for SAP NetWeaver and SAP HANA
- High Availability enhancements
- Enhanced deployment and configuration automation

Support of new technologies that are relevant for the SAP space
- New hardware, such as NVDIMM
- Container-based workloads

Consolidation of tooling
- saptune / sapconf
- Modular components
LinuxLab

Cooperation between SAP and its partners
OS vendors, Hardware, Cloud, Virtualization...

- 18+ years of joint collaboration and innovation
- SAP Alliance Team represents SUSE
- Located at the SAP Campus in St. Leon-Rot (Rot 22)

We help...
SAP and their partners collaborate with SUSE
SUSE collaborate with SAP and their partners
Best Practices

SUSE Linux Enterprise Server for SAP Applications
www.suse.com/products/sles-for-sap/

Training
elearning.suse.com/product-line/sles12/
training.suse.com/training/suse-linux-enterprise-server-2/
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