Tooling Linux for the Future of Embedded Systems

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With SUSE You Can

Control Infrastructure

Optimize Operations

Innovate Faster
What is SUSE Embedded?

SUSE Embedded solutions deliver an optimized operating system for single-purpose workloads.

Reduced Operating System

SUSE Linux Enterprise Server as the Foundation

Embedded-based Subscription

JeOS provides a lean, yet powerful footprint for a task-specific, fixed-function hardware or software stack.

Enterprise-grade systems made simple for fixed-function product solution development.

Flexible and customized licensing and subscription model allows access to a select set of SUSE components.
Current Market Penetration

- Telecom
- Logistics
- Security
- System Integrators
- Distribution OEM
- Healthcare
- Manufacturing
- Retail
- SUSE Embedded
Advantages of a SUSE Embedded Solution

- Simple build processes utilizing JeOS, along with custom subscription and licensing plans.
- Enterprise security and reliability for single purposes systems across a range of industries and mission-critical environments.
- Enhance productivity and innovation by offloading OS support and maintenance to seasoned Linux experts.
- Flexibility to grow, scale and adapt with ease to changing technical and business demands.

Secure, Flexible, Supported
SUSE Embedded
Building an Embedded System is Challenging
Embedded Systems Simplified

• Enterprise Quality OS
  - Maintenance Updates
  - Security patches
  - Just enough OS

• Package Builds
  - X86, ARM64, Power, System z, more…

• Package Repositories
  - Public
  - Private

• Repeatable Clean Builds
  - Multiple hypervisors or image formats

• Version control
SUSE Linux Enterprise Server

Power your physical, virtual, and cloud-based, mission-critical workloads with a world-class, secure open source server operating system

• Create an agile IT infrastructure using the latest container applications
• Maximize service uptime with live patching and built-in virtualization
• Improve IT infrastructure with proven security and optimized performance

99.999%
Mission-critical availability

80%
Savings in server management

80%
Cost reduction

www.suse.com/products/server
SUSE Linux Enterprise Server 12

Life Cycle Model

• 13-Year Life Cycle
  • 10 years general support
  • 3 years extended support
  • Different life cycles for modules

• Long Term Service Pack Support (LTSS)
  • Available for all versions
  • Up to 3 years extended support
Rapid Innovation

- Leverage latest Linux kernel
- Avoid backporting patches; benefits of peer review with upstream Kernel
- Improved hardware support

<table>
<thead>
<tr>
<th>SUSE Release</th>
<th>Kernel Version</th>
<th>Competitive Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLES 11</td>
<td>2.6.27</td>
<td>2.6.32</td>
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<tr>
<td>SLES 11 SP1</td>
<td>2.6.32</td>
<td>2.6.32</td>
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<tr>
<td>SLES 11 SP2 - SP4</td>
<td>3.01.101</td>
<td>2.6.31</td>
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<tr>
<td>SLES 12</td>
<td>3.12</td>
<td>3.10</td>
</tr>
<tr>
<td>SLES 12 SP1</td>
<td>3.12</td>
<td>3.10</td>
</tr>
<tr>
<td>SLES 12 SP2</td>
<td>4.4</td>
<td>3.10</td>
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</table>
Focus on the Solution, Not the Operating System

Just Enough Operating System (JeOS)

What is JeOS?
• A lean, function-specific operating system built on SUSE Linux Enterprise Server
• Ideal platform for products and appliances in today’s agile environments
• Perfect minimized host operating system

Take Advantage of JeOS
• KVM/Xen Fully Virtualized
• Xen Para-virtualized
• Microsoft Hyper-V
• VMware
• OpenStack Cloud
Packages, Platforms, and Repositories

**SUSE Open Build Service (OBS)**

OBS is a generic system to build and distribute binary packages from sources in an automatic, consistent and reproducible way.

- **Build (Packaging) Formats**
  - rpm (spec)
  - deb (dsc)
- **Build Architectures**: Qemu can be used to emulate not existing hardware
  - ia32, ia64, x86-64, ppc*, hppa, mips, m68k, s390*, various ARM architectures.
- **Image System (KIWI)**
  - ISO, Live CD/DVD, PXEBoot, HDD, etc.
  - Build in chroot, lxc, XEN or KVM, etc.
- **Repositories**: rpm-md, yast, apt, maintenance channels
- **Build Process Features**
Open Build Service

- Builds from sources, outputs installable packages or ISOs
- Builds on all architectures
  - arm64, x86_64, ppc64, s390x
- Stores sources, binaries, signing keys
- Calculates the need for package rebuilds
- Free and Open Source
SUSE Package Hub

Community Packages for SLES

- Built and maintained by the community of users
- Approved and supported by SUSE
- High-quality, up-to-date packages delivered by openSUSE Factory
- No additional charge to use packages
- Packages available for the life of the product, including multiple releases

Over 600 packages available for all architectures
Virtual, Physical and Cloud

**SUSE KIWI**

KIWI is a command line tool, written in Perl, for building Linux images & supporting a variety of image formats.

- **Types & Formats:**
  - Images: ISO, Live CD/DVD, PXEBoot, HDD, USB
  - Appliances: .ovf, .ova
  - Virtual Machines: .vmdk, .vhd, .vdi, .qcow2
  - Containers

- Hosted on github https://github.com/openSUSE/kiwi
- All SUSE® & openSUSE images are built with KIWI
  - Physical, Virtual and Cloud!
- KIWI can produce most formats known to humankind
Leveraging the Benefits of KIWI

Prepare
- Read config.xml
- Initialize the repositories
- Install Packages
- Apply overlay files
- Execute config.sh
- Output is an unpacked image tree (directory)

Create
- Read information from unpacked image tree
- Read the config file
- Execute images.sh
- Read bootimage description
- Create bootimage
- Bundle boot image and target image to create final image
Compile, Build, Run

Open Build Service

- Package Source
- Packages
- Project
  - add targets
  - Package

KIWI

- SUSE Repository
- Private Repository
- Image Description
- Unpacked Image
- Image Description
- #kiwi -prepare
- #kiwi -create
- Image

Physical

Container

Virtual
- Xen
- KVM

Cloud

- Amazon Web Services
- Windows
- OpenStack
Automated Testing

openQA

• Used by openSUSE® Leap, Tumbleweed, SUSE® Linux Enterprise & Fedora®
• Tests Operating Systems and Applications
• GUI & Console Testing
  - Uses OpenCV to ‘read’ the actual screen output and compare to predefined needles
  - Controls keyboard & mouse and uses them like a user
  - Also reads plain text from serial
• Execute console test scripts (openQA DSL, (bash perl, python)) Deployed via openQA test API
• Comparison
  - String comparison, Junit Parsing, custom results in openQA DSL
• Pluggable backend for os-autoinst support QEMU/VM, LibVirt/RemoteVM, IPMI/HW
Automated Test Infrastructure

SUSE openQA

WebUI

REST API

Worker → Pool → os-autoinst → QEMU | VM
Worker → Pool → os-autoinst → QEMU | VM
Worker → Pool → os-autoinst → QEMU | VM

openQA package

os-autoinst package
Patch and update

Subscription Management Tool

The Subscription Management Tool establishes a proxy system for SUSE Customer Center which allows enterprise customers to optimize the management of SUSE Linux Enterprise software updates and subscription entitlements.

• The proxy provides repository and registration targets while optimizing bandwidth consumption
• The Subscription Management Tool informs the SUSE Linux Enterprise devices throughout the network of available software updates.
• Firewall policy and regulatory compliance during the software update process
• Automated server entitlement tracking across large server deployments and effective measurement of subscription use

• Staging
  - Mirror
  - Test
  - Validated
Subscription Management Tool

Mirror Patches and Updates for Active Subscriptions

Customer A
Embedded Solution

Customer B
Embedded Solution

Customer C
Embedded Solution

Embedded Partner

SMT Server

SUSE Customer Center
Why SUSE?
What Do We Mean by Always Open?

It’s not just WHAT we do. It’s HOW we do it.

- True to open source vision
- Flexible and adaptive
- Enterprise support
## Community Involvement

<table>
<thead>
<tr>
<th>Community Involvement</th>
<th>QEMU</th>
<th>SPEC</th>
<th>GNOME</th>
<th>Open Data Center Alliance</th>
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<tbody>
<tr>
<td>openSUSE</td>
<td>openstack</td>
<td>KVM</td>
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<tr>
<td>YaST</td>
<td>Mozilla Foundation</td>
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<tr>
<td>High Availability</td>
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<td>Spacewalk</td>
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<tr>
<td>open Build Service</td>
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<tr>
<td>open MAINFRAME Project</td>
<td>VISOR Project</td>
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<tr>
<td>MariaDB</td>
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<tr>
<td>OPEN MAINFRAME ALLIANCE</td>
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<td>OPEN INVENTION NETWORK</td>
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<tr>
<td>CLOUD FOUNDRY</td>
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<tr>
<td>And more...</td>
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SUSE at a Glance

1st Enterprise Open Stack Distribution

24+ Years of Linux Engineering Experience

5000+ Global Partners

150+ Support Engineers

7000+ Certified Applications

20,000+ Certified Systems

2/3+ of the Fortune Global 100 use SUSE Linux Enterprise
Where SUSE Leads

15+ Mainframe Linux
Over 15 years of mainframe Linux market share leadership

4/5 Linux in Finance
4 out of 5 of the world’s largest banks use SUSE Linux Enterprise

70% SAP on Linux
70% of all SAP applications running on Linux run on SUSE

80% Linux in Large Enterprise
Over 80% of the Fortune Global 50 are active SUSE Customers

9/10 Linux in Aerospace
9 out of 10 of the largest aerospace companies rely on SUSE

x10 Linux in Telecom
10 of the largest telecommunications carriers rely on SUSE

7/10 Linux in Pharma
7 out of 10 of the largest pharmaceutical companies use SUSE Linux Enterprise

7/10 Linux in Retail
7 out of 10 of the largest retailers in the U.S. are active SUSE customers

x10 Linux in Automotive
10 of the largest global automobile mfgs. are active SUSE customers

50% Linux in HPC
Half of the world’s 20 largest super computers run on SUSE

7/10 Linux in Manufacturing
7 out of 10 world’s largest manufacturers use SUSE Linux Enterprise

7/10 Linux in HPC
Half of the world’s 20 largest super computers run on SUSE

7/10 Linux in Manufacturing
7 out of 10 world’s largest manufacturers use SUSE Linux Enterprise
Thank You

www.suse.com/embedded

embedded@suse.com
Appendix: Resources

SUSE Embedded
• www.suse.com/embedded
  Download the White paper on Embedded Security

Open Build Service
• Main website http://openbuildservice.org/
• Documentation http://openbuildservice.org/help/manuals/
• SUSE instance https://build.opensuse.org/

KIWI
• Main website http://opensuse.github.io/kiwi/
• Documentation https://doc.opensuse.org/projects/kiwi/doc/

openQA
• Main Website http://open qa/
• Documentation http://open.qa/documentation/