openQA
Helping SUSE® Linux Enterprise with Automated Testing

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Why SUSE automate testing
SYSTEM
CHANGE
AHEAD
Upstreams

Upstream projects are moving fast

- Kernel – New version every 3 months
- GNOME – New version every 6 months
- KDE Plasma – New version every 3 months
- Docker – New version every 3 months
- SaltStack – New version every 3-6 months
Change is **good**

Security, Bug, Performance Fixes

Hardware Support

New Features
Change is **bad**

Security, Performance Regressions

Bugs!

Functionality Changes
Users

Users expectations are trending towards receiving software faster and faster

- SLE Modules
- SUSE PackageHub
- Rolling Releases (openSUSE Tumbleweed, Arch)
- OBS, Copr, EPEL, PPAs, AUR
Diversification

Distribution Projects are offering more stuff in different ways

- Modularization, Containers, Docker, JeOS
- Editions (Fedora Workstation, Server, Cloud)
- Multiple Distributions (SLES, SLED, SLE4SAP, openSUSE Leap, Tumbleweed)
DevOps for Distributions
The problem(s) with every other test tool
But.. Selenium

DevOps Containers

CI Jenkins

Gerrit Travis
But..

DevOps

Selenium

Containers

Docker

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Travis
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Selenium

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Jenkins

Gerrit

Travis
But.. Docker Selenium Docker Containers Docker
DevOps Docker Docker Docker
CI Docker Jenkins Docker
Docker Gerrit Docker Travis
NEWS FLASH: We do not build code

We build **Distributions**

Our users do not care if our code works, only if it works correctly as part of the Distribution

There are lots of testing tools for Code
None for actual Operating Systems and Apps as a cohesive product
Until now...
openQA to the rescue
openQA

Open Source distribution testing framework

Started in 2009

Tests Operating Systems and their applications

GUI & Console Testing

Used by the openSUSE Leap, Tumbleweed, SUSE Linux Enterprise & Fedora
openQA – Testing like a user

Does NOT touch the software directly

Controls keyboard & mouse and uses them like a user

Uses OpenCV to ‘read’ the actual screen output and compare to predefined needles

Also reads plain text from serial
Desktop Selection

The desktop environment on your computer provides the graphical user interface for your computer, as well as a suite of applications for email, Web browsing, office productivity, games, and utilities to manage your computer.

openSUSE offers a choice of desktop environments. The most widely used desktop environments are GNOME and KDE, and they are equally supported under openSUSE. Both desktop environments are easy to use, highly integrated, and have an attractive look and feel. Each desktop environment has a distinct style, so personal taste determines which is the most appropriate desktop for you.

- GNOME Desktop
- KDE Desktop
- Other
Needles only match areas of interest
Not just graphical testing

openQA supports executing console test scripts on a system under test

- Write scripts in the openQA Domain Specific Language.
- Add scripts (bash, perl, python, ...) to the openQA test suite. openQA test API can deploy & execute.
- Download existing script/packages then execute in the openQA DSL.
Supported Console Outputs

Multiple methods of comparing text results for openQA systems under test

- Simple string comparison.
- JUnit Parsing.
- Custom results analysis in the openQA DSL.
Console Example

```ada
select_console 'root-console';
assert_script_run("zypper -n in a2ps");
assert_script_run("curl https://www.suse.com > /tmp/suse.html");
validate_script_output "a2ps -o /tmp/suse.ps /tmp/suse.html 2>&1",
    sub { m/saved into the file/ }, 3;
```
openQA does **NOT** only test graphically
Reports like a Pro

Records screenshots & logs for analysis

Encodes video of each test run

Provides ISO/HDD images for reproduction

Dashboard for easy review and reporting
openSUSE Leap 42.1 Maintenance
Build openSUSE:Maintenance:4933:385617 (a day ago) 10 passed
Build openSUSE:Maintenance:4925:385731 (about 27 hours ago) 10 passed
Build openSUSE:Maintenance:4916:385623 (a day ago) 10 passed

openSUSE Leap 42.1 Test Updates
Build 20160407222427 (about 1.7 hours ago) 6 passed
Build 20160406223300 (a day ago) 6 passed
Build 20160406184444 (a day ago) 6 passed

openSUSE Leap 42.1 Updates
Build 20160408130312 (about 2 hours ago) 9 passed 1 failed 2 failed
Build 20160405132837 (3 days ago) 10 passed 2 failed
Build 20160405083057 (3 days ago) 10 passed 2 failed

openSUSE Tumbleweed
Build 20160407 (about 16 hours ago) 76 passed 9 failed
Build 20160406 (a day ago) 76 passed 9 failed
Build 20160405 (3 days ago) 76 passed 9 failed
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<th>s390x</th>
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</table>
Results for opensuse-Tumbleweed-DVD-x86_64-Build20180407-kde

Result: **passed** finished about 15 hours ago (01:03 hours)

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>References</th>
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<tr>
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<tr>
<td>welcome</td>
<td>passed</td>
<td><img src="image3.png" alt="Image" /></td>
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<tr>
<td>good_buttons</td>
<td>passed</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>installation_mode</td>
<td>passed</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>partitioning</td>
<td>passed</td>
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<tr>
<td>partitioning_finish</td>
<td>passed</td>
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<tr>
<td>installer_timezone</td>
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<td><img src="image8.png" alt="Image" /></td>
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</table>
openSUSE Leap 42.2 Alpha 1

Boot from Hard Disk

Installation

Upgrade
Results for opensuse-Tumbleweed-DVD-x86_64-Build20160407-ext4

Result: **passed** finished **about 14 hours ago** (10:33 minutes)

Result Files

- Video
- vars.json
- serial0.txt
- autoinst-log.txt

Uploaded Logs

- install_and_reboot-y2logs.tar.bz2

Assets

- openSUSE-Tumbleweed-DVD-x86_64-Snapshot20160407-Media.iso
Pluggable Backends

- os-autoinst
  - QEMU
  - Libvirt
    - IPMI
    - General HW
  - Remote VM
  - Real HW

- VM
Backend Protocols

- **QEMU**
  - VNC
  - Serial
  - VM

- **Libvirt**
  - VNC
  - SSH
  - Remote VM

- **IPMI General HW**
  - VNC
  - SOL
  - IPMI
  - Real HW
Feature Highlights

- Multi Arch Support (Intel, ppc64le, s390x, aarch64)
- Multi Machine Testing (incl. Openvswitch)
- Add-On Testing (SLE Extensions, Modules, etc)
- Real Hardware Testing (IPMI & IP KVM)
- Disk Image Creation
- Testing without OS Installation (Testing from Image)
- Multi Hypervisor Support (KVM, Xen, VMware, KVM for zSystems, Hyper-V)
- FedMsg Support
Tag Everything

New Review Workflow
• Tag issues with comments or bug ID’s
• Tags appear next to scenario traffic lights on dashboard
• Repeated issues automatically inherit previous Tags

Build Tagging
• Mark a build as important to ensure result & asset retention
• Tagged builds can be immune from ‘obsolescence’
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Who’s using openQA?
Who's using openQA?

openSUSE
• Tumbleweed – Rolling Release Testing
• Leap – Validation and System Testing

SUSE
• SLES – Multi-Arch (x86_64, s390x, ppc64) Validation, System, Stress, Regression Testing
• SLED – Validation, System, Stress, Regression Testing
• HA – Multi-Arch (x86_64, s390x) Validation and Multi-Machine Testing

Red Hat
Red Hat??

Using openQA to test Fedora & Rawhide since Fedora 22

Dockerised openQA

Contributing Patches, Ideas, and New Tooling

Public Instance

https://openqa.fedoraproject.org
openSUSE Tumbleweed

Tumbleweed is openSUSE's rolling release

openQA is an integral part of Tumbleweed development

In depth testing is then carried out on the whole distribution before release

openSUSE Tumbleweed snapshots released after successful testing

New Tumbleweed release every 2-3 days, often faster.
A 'quiet' Tumbleweek

3 Snapshots

146 Package Updates

15 New Packages on the DVD

38 Packages Removed from the DVD

1 new Kernel
A 'quiet' Tumbleweek

3 Snapshots

146 Package Updates

15 New Packages on the DVD

38 Packages Removed from the DVD

1 new Kernel

QUIET?!
Tumbleweek 31/03/16 – 7/04/16

5 Snapshots

370 package updates

2 new Kernels

 GNOME 3.20 a week after it’s upstream release

All tested with over 118 different installations and upgrades
Tumbleweek 19/09/16 – 25/09/16

4 Snapshots

248 Package Updates

2 new Kernels

GNOME 3.22 less than 48 hours after its upstream release

All tested with over 118 different installations and updates
ALWAYS CHANGING.. ALWAYS WORKING
openSUSE Leap

openSUSE Leap is a new distribution combining packages from both SUSE Linux Enterprise and openSUSE

Extensive integration challenge, combining two separate code bases and ensuring key functionality is preserved

Dozens of different installation/upgrade scenarios tested for each development build
Two Codebases – One Distribution

Leap

SUSE® Linux Enterprise

drives

openSUSE
All Tested by openQA

- **Tumbleweed**
  - >8000 Packages
  - Community Developed
  - Rolling Updates
  - Rolling Base System

- **openSUSE Leap**
  - Over 6000 Packages
  - Community Developed

- **SUSE® Linux Enterprise**
  - Enterprise Packages
  - SUSE Developed

- **Shared Core**
  - >1000 Packages

- **Shared Core**
  - Stable Base System
  - Regular Updates

- **Shared Core**
  - Stable Base System
  - Regular Updates
openQA & SUSE Linux Enterprise
openQA & SUSE Linux Enterprise

openQA integrated into the SUSE Enterprise development process since SLE 11 SP4

Used by Development Teams, QA, and Release Management

Pre-Validation, Validation, Post-Validation, and Maintenance Testing
Pre-Validation/Staging

Incoming changes are 'Staged' and tested in isolation on top of the last 'known good' build

Monitored very regularly (hourly) by Release Managers

Submissions not checked in until openQA tests pass
Validation

In depth validation testing is carried out in parallel across the whole distribution for every Build

Over 100 different Validation scenarios tested

Milestones (Alpha, Beta, etc) announced only after successful testing

Improved coverage and performance compared to only manual testing
Post-Validation

openQA can schedule additional tests automatically after validation passes

openQA produces automatically verified disk images for further testing of valid builds

Suitable for Regression, Kernel, Stress, Performance and other in-depth, long running, tests.
Maintenance

openQA runs tests on each Maintenance Update before being released to customers

Incident Testing – Narrow tests of only a specific update run on an existing ‘known good’ openQA VM image

Update Testing – Broader tests including Installation & Regression updates of all pending updates on an existing ‘known good’ openQA VM image

Live Patching – Tests Live Patches atop supported Kernel Updates
Key Benefits

Smoothen Development
• Major breaking changes to SLE do not hit the codebase (easily)
• Breaking changes that do slip by openQA become new test cases
• Beta Customer feedback now of equal or greater importance than before

Faster Development
• Regular changes can be confirmed to be ready faster
• Can confidently make otherwise risky changes quicker

Better Quality Products
• Less bugs in Product releases and Maintenance Updates
• Bored Beta Customers
• Happier Customers
Would you like to know more?

Main Website
• http://open.qa

Documentation
• http://open.qa/documentation/

Bug Reports & Feature Requests
• https://progress.opensuse.org/projects/openqav3
We adapt. You succeed.