Mixed system containers & VMs

Introducing LXD virtual machine support

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What are system containers?

01. **They are the oldest type of containers**
   *BSD jails, Linux vServer, Solaris Zones, OpenVZ, LXC and LXD.*

02. **They behave like standalone systems**
   *No need for specialized software or custom images.*

03. **Low overhead, easy management**
   *Thousands can be run on one system, as easy to manage as a bunch of processes.*
What are virtual machines?

01 Virtualized hardware & firmware
   Behaves in many ways like a physical system.

02 Hardware accelerated
   Useful virtualization requires hardware support, additional performance gain comes from using virtualization-aware devices (e.g. virtio).

03 Can run just about any OS
   Not constrained to Linux only.
LXD

System container & VM manager

LXD REST API

<table>
<thead>
<tr>
<th>CLI</th>
<th>Ansible</th>
<th>Juju</th>
<th>OpenNebula</th>
<th>your own client?</th>
</tr>
</thead>
</table>

- **Host A**: LXD, LXC, QEMU, Linux kernel
- **Host B**: LXD, LXC, QEMU, Linux kernel
- **Host C**: LXD, LXC, QEMU, Linux kernel
- **Host ...**: LXD, LXC, QEMU, Linux kernel

Your own client?
Installing Linux...

This process may take a few minutes. Starting the Linux container.
<table>
<thead>
<tr>
<th>Build jobs</th>
<th>View config</th>
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<tr>
<td>#29663.1</td>
<td><strong>Compiler</strong>: gcc <strong>Xcode</strong>: xcode9.3.3</td>
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<td>#29663.2</td>
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**Pull Request #10276**: Use large enough buffer for signature in dgst.c

Chapter 25: Do not use ! to check if a pointer is NULL

- Commit 5299865
- #10276: Use large enough buffer for signature in dgst.c
- Branch master

nbika

#29663 failed
- Ran for 25 min
- Total time 2 hrs 7 min 42 sec
- about 3 hours ago
What LXD is

01 Simple
Clean command line interface, simple REST API and clear terminology.

02 Fast
Image based, optimized storage & migration, direct hardware access.

03 Secure
Safe by default. Combines all available kernel security features.

04 Scalable
From a single instance on a laptop to tens of thousands of instances in a cluster.
LXD clustering

01 **Built-in clustering support**
No external dependencies, all LXD 3.0 or higher installations can be instantly turned into a cluster.

02 **Same API as a single node**
Clients that aren’t clustering aware just see it as a very large LXD instance.

03 **Scales to thousands of containers on dozens of nodes**
Uses a built-in distributed database and cross-connections between the nodes to offer a consistent view to clients and load-balance containers.
LXD virtual machines

01 Modern machines
*UEFI with Secure Boot (where available), virtio devices only, based on QEMU 4.2.*

02 Same API and semantics as our containers
*No particular VM knowledge needed by existing clients.*

03 Integrates seamlessly with LXD networks, storage, projects, profiles, ...
*All existing configuration can be shared between containers and virtual machines, profiles with resource limits or devices can apply to both types.*
LXD

Main components

- Certificates
- Cluster
- Events
- Images
- Instances
- Networks
- Operations
- Projects
- Storage pools
- Storage volumes
- Aliases
- Snapshots
- Backups
Demo time!
What’s next

01 Images for more distributions
Get feature parity with our set of container images, done by adding VM image building capability to Distrobuilder and having those images built as part of our normal pipeline.

02 Live update of VM configuration
Device hotplug, live adjustments of resource restrictions, ...

03 Security
Integrate with our existing AppArmor and Seccomp generators.

04 Close feature gap with containers
Publishing, backups, migration, filesystem passthrough, usb devices, GPUs, ...

05 Agent on other operating systems
Port the VM agent to using newly implemented virtio-vsock driver for Windows.
LXD everywhere

**Linux**

- **snap install lxd**
  - requires snapd on a supported Linux distribution

**Native packages**

available for some releases on Alpine, ArchLinux, Fedora, Gentoo, OpenSUSE and Ubuntu

**On your Chromebook**

Search for “Terminal” in your app launcher

**MacOS**

- **brew install lxc**
  - requires Homebrew on current MacOS

**Windows**

- **choco install lxc**
  - requires Chocoalatey on current Windows 10
Contributing to LXD

01 Written in Go
With low level logic in C through a variety of libraries.

02 Fully translatable client
An easy way to contribute to LXD, translate our CLI in your language!

03 API client libraries
Official ones for Go and Python
Additional ones in Ruby, Node, Java, Haskell, ...

04 Apache2 licensed
Re-use and improve any of our Go packages in your own projects.

05 No copyright assignment
Easy contributions, no legal paperwork, just send a pull request.

06 Online user community
Very active discussion forum with active experts in container networking, security and more.

git clone https://github.com/lxc/lxd
Questions?

Website: https://linuxcontainers.org/lxd
Code: https://github.com/lxc/lxd
Online demo: https://linuxcontainers.org/lxd/try-it

We have stickers, come get them in front!

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