ubuntu

Creating the World's Fastest OpenStack

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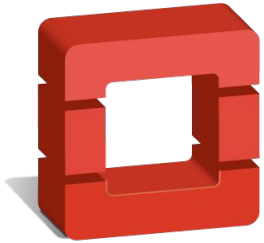
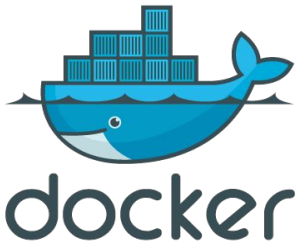
What do all of these have in common?





ubunt.eu/win-orange-box

LXD is an ultra-fast Linux-only hypervisor

type 1
paravirt

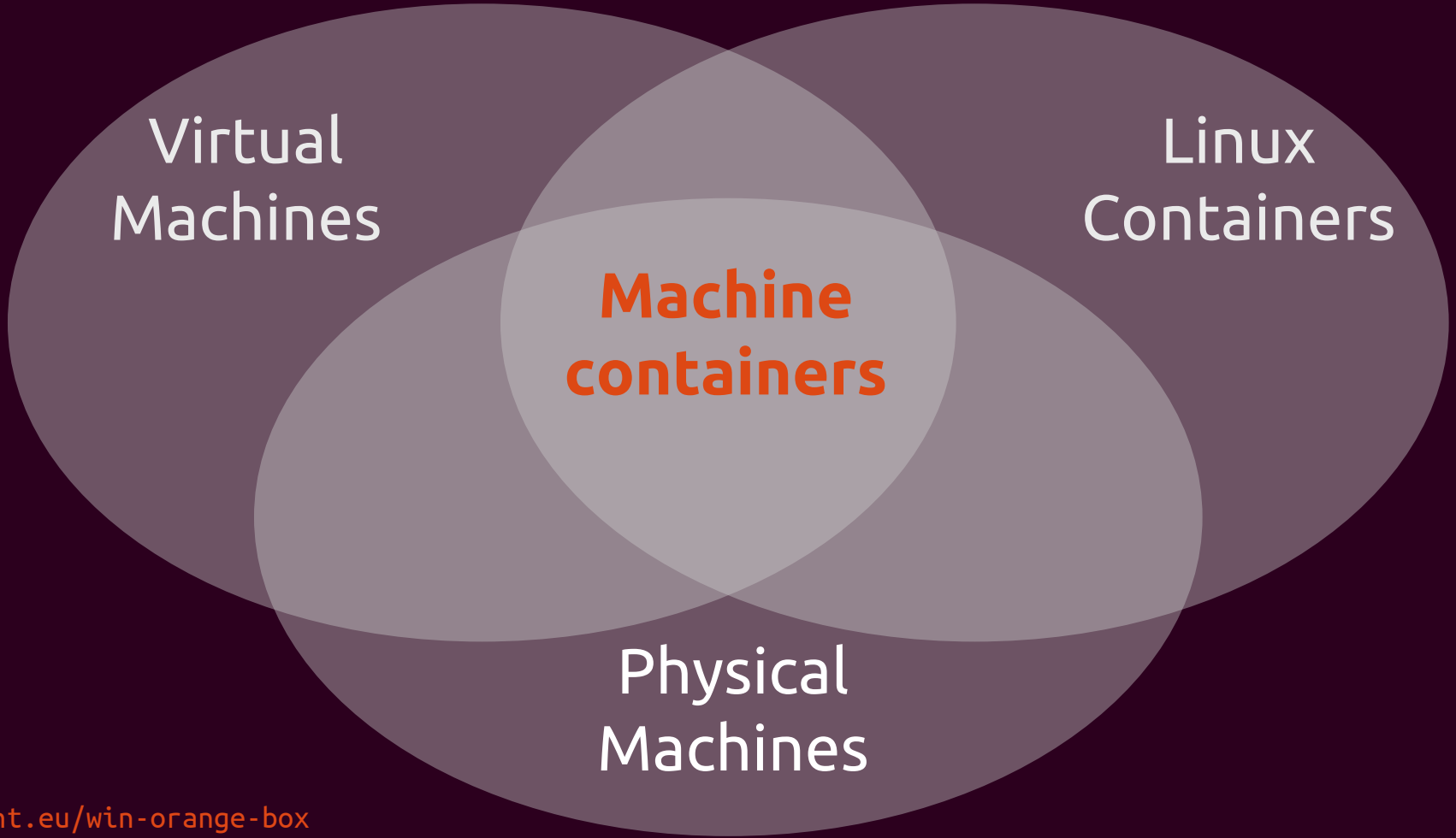
type 2
hw-accel

type 3
container

LXD provides machine containers

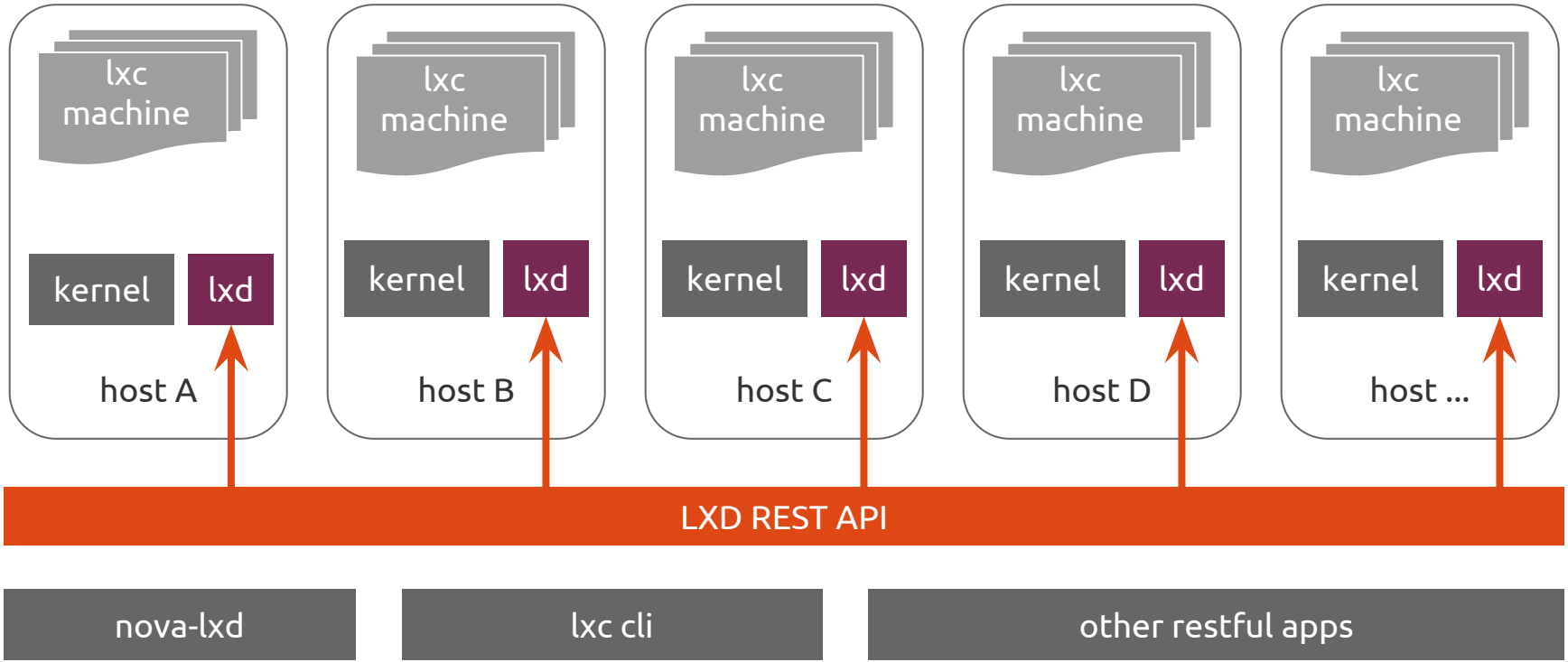
Application containers like Docker
host a single process on a filesystem

Machine containers from LXD
boot a full OS on their filesystem



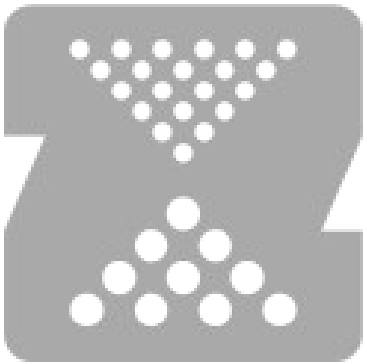
ubunt.eu/win-orange-box

LXD is API driven



ubunt.eu/win-orange-box

ZFS-on-Linux accelerates containers



- snapshot backups
- copy-on-write clones
- integrity checking
- automatic repairs
- efficient compression

LXD is

fast
efficient
secure

Why is this the world's fastest OpenStack?

1. Hyperconverged architecture deploys in minutes
2. Dozens of LXD instances launch in seconds
3. Snapshot everything in under a second
4. Instances perform as bare metal
5. Services migrate in real-time

ubunt.eu/win-orange-box

demo

ubuntu admin admin

Project
Admin
System
Overview
Hypervisors
Host Aggregates
Instances
Flavors
Images
Networks
Routers
Defaults
Metadata Definitions
System Information
Identity

All Hypervisors

Hypervisor Summary

VCPU Usage
Used 0 of 12

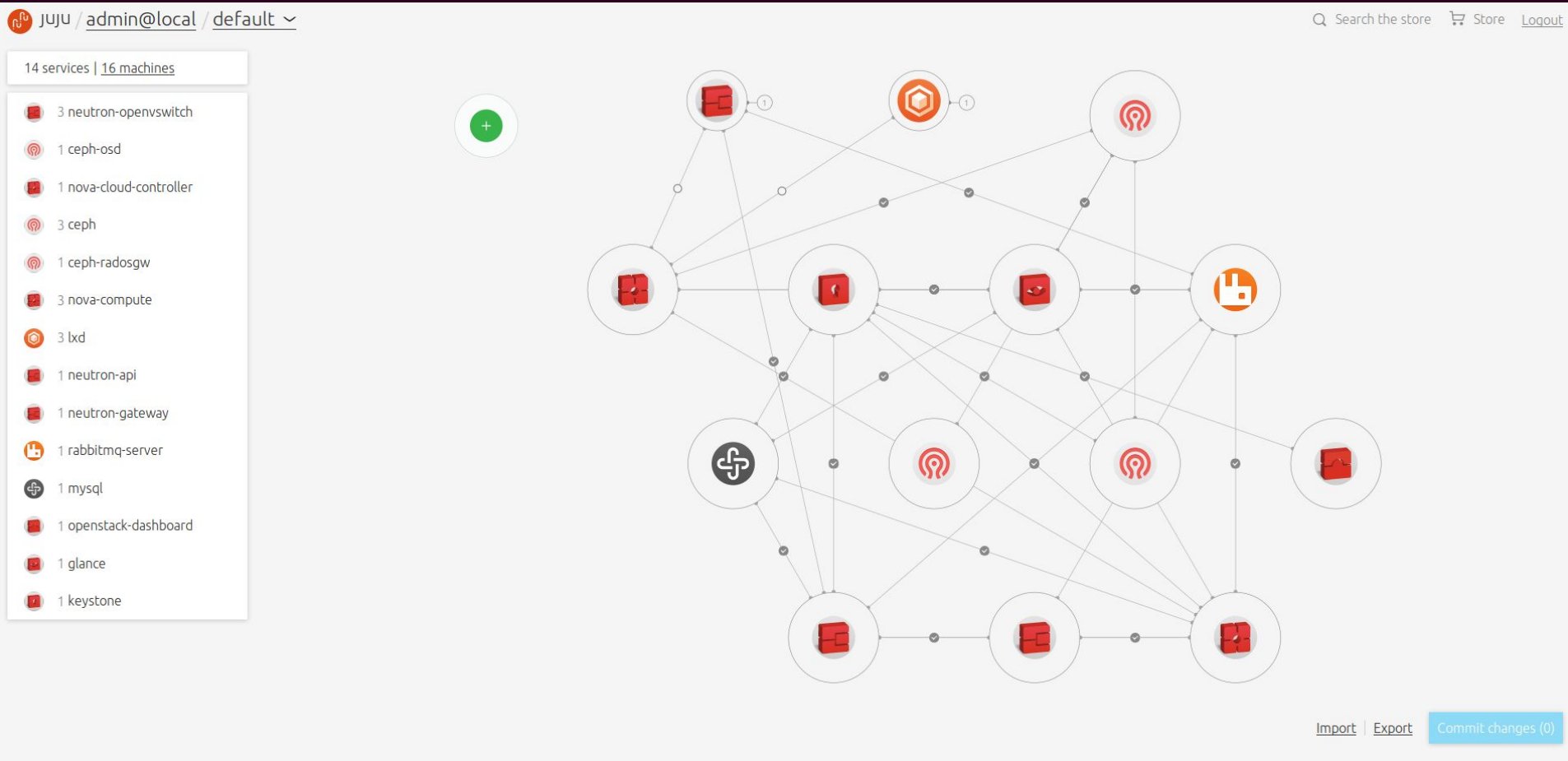
Memory Usage
Used 1.5GB of 46.1GB

Local Disk Usage
Used 0Bytes of 492GB

Hypervisor | Compute Host

Hostname	Type	VCPUs (used)	VCPUs (total)	RAM (used)	RAM (total)	Local Storage (used)	Local Storage (total)	Instances
juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-11	lxd	0	4	512MB	15.4GB	0Bytes	164GB	0
juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-12	lxd	0	4	512MB	15.4GB	0Bytes	164GB	0
juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-13	lxd	0	4	512MB	15.4GB	0Bytes	164GB	0

Displaying 3 items


juju / admin@local / default
Search the store
Store
Logout
14 services | 16 machines
3 neutron-openvswitch
1 ceph-osd
1 nova-cloud-controller
3 ceph
1 ceph-radosgw
3 nova-compute
3 lxd
1 neutron-api
1 neutron-gateway
1 rabbitmq-server
1 mysql
1 openstack-dashboard
1 glance
1 keystone
Import
Export
Commit changes (0)

```
[Services]
NAME                STATUS EXPOSED CHARM
ceph                active false   cs:~openstack-charmers-next/xenial/ceph-217
ceph-osd            active false   cs:~openstack-charmers-next/xenial/ceph-osd-216
ceph-radosgw        active false   cs:~openstack-charmers-next/xenial/ceph-radosgw-209
glance              active false   cs:~openstack-charmers-next/xenial/glance-207
keystone            active false   cs:~openstack-charmers-next/xenial/keystone-209
lxd                        false   cs:~openstack-charmers-next/xenial/lxd-203
mysql               active false   cs:~james-page/xenial/percona-cluster-0
neutron-api         active false   cs:~openstack-charmers-next/xenial/neutron-api-214
neutron-gateway     active false   cs:~openstack-charmers-next/xenial/neutron-gateway-209
neutron-openvswitch        false   cs:~openstack-charmers-next/xenial/neutron-openvswitch-208
nova-cloud-controller active false cs:~openstack-charmers-next/xenial/nova-cloud-controller-210
nova-compute        active false   cs:~openstack-charmers-next/xenial/nova-compute-215
openstack-dashboard active false   cs:~openstack-charmers-next/xenial/openstack-dashboard-203
rabbitmq-server     active false   cs:~openstack-charmers-next/xenial/rabbitmq-server-204
```

[Relations]

SERVICE1	SERVICE2	RELATION	TYPE
ceph	ceph	mon	peer
ceph	ceph-osd	mon	regular
ceph	ceph-radosgw	mon	regular
ceph	glance	ceph	regular
ceph	nova-compute	ceph	regular
ceph-radosgw	ceph-radosgw	cluster	peer
ceph-radosgw	keystone	identity-service	regular
glance	glance	cluster	peer
glance	keystone	identity-service	regular
glance	mysql	shared-db	regular
glance	nova-cloud-controller	image-service	regular
glance	nova-compute	image-service	regular
glance	rabbitmq-server	amqp	regular
keystone	keystone	cluster	peer
keystone	mysql	shared-db	regular
keystone	neutron-api	identity-service	regular
keystone	nova-cloud-controller	identity-service	regular
keystone	openstack-dashboard	identity-service	regular
lxd	lxd	lxd-migration	peer
lxd	nova-compute	lxd	regular
mysql	mysql	cluster	peer
mysql	neutron-api	shared-db	regular
mysql	nova-cloud-controller	shared-db	regular
neutron-api	neutron-api	cluster	peer
neutron-api	neutron-gateway	neutron-plugin-api	regular
neutron-api	neutron-openvswitch	neutron-plugin-api	regular
neutron-api	nova-cloud-controller	neutron-api	regular
neutron-api	rabbitmq-server	amqp	regular
neutron-gateway	neutron-gateway	cluster	peer
neutron-gateway	nova-cloud-controller	quantum-network-service	regular
neutron-gateway	rabbitmq-server	amqp	regular
neutron-openvswitch	nova-compute	neutron-plugin	regular
neutron-openvswitch	rabbitmq-server	amqp	regular
nova-cloud-controller	nova-cloud-controller	cluster	peer
nova-cloud-controller	nova-compute	cloud-compute	regular
nova-cloud-controller	rabbitmq-server	amqp	regular
nova-compute	lxd	lxd	subordinate
nova-compute	neutron-openvswitch	neutron-plugin	subordinate
nova-compute	nova-compute	compute-peer	peer
nova-compute	rabbitmq-server	amqp	regular
openstack-dashboard	openstack-dashboard	cluster	peer
rabbitmq-server	rabbitmq-server	cluster	peer

```
[Units]
ID                          WORKLOAD-STATUS JUJU-STATUS VERSION     MACHINE PORTS           PUBLIC-ADDRESS
ceph-osd/0                  active          idle        2.0-beta4.1 3                       10.108.58.211
ceph-radosgw/0              active          idle        2.0-beta4.1 4       80/tcp          10.108.58.249
ceph/0                      active          idle        2.0-beta4.1 0                       10.108.58.163
ceph/1                      active          idle        2.0-beta4.1 1                       10.108.58.17
ceph/2                      active          idle        2.0-beta4.1 2                       10.108.58.55
glance/0                    active          idle        2.0-beta4.1 5       9292/tcp        10.108.58.101
keystone/0                  active          idle        2.0-beta4.1 6                       10.108.58.199
mysql/0                     active          idle        2.0-beta4.1 7                       10.108.58.150
neutron-api/0               active          idle        2.0-beta4.1 8       9696/tcp        10.108.58.208
neutron-gateway/0           active          idle        2.0-beta4.1 9                       10.108.58.195
nova-cloud-controller/0     unknown         lost        2.0-beta4.1 10      8774/tcp        10.108.58.137
nova-compute/0              active          idle        2.0-beta4.1 11                      10.108.58.221
  lxd/0                     active          idle        2.0-beta4.1                         10.108.58.221
  neutron-openvswitch/0     active          idle        2.0-beta4.1                         10.108.58.221
nova-compute/1              active          idle        2.0-beta4.1 12                      10.108.58.252
  lxd/2                     unknown         lost        2.0-beta4.1                         10.108.58.252
  neutron-openvswitch/2     active          idle        2.0-beta4.1                         10.108.58.252
nova-compute/2              unknown         lost        2.0-beta4.1 13                      10.108.58.57
  lxd/1                     active          idle        2.0-beta4.1                         10.108.58.57
  neutron-openvswitch/1     active          idle        2.0-beta4.1                         10.108.58.57
openstack-dashboard/0       active          idle        2.0-beta4.1 14      80/tcp,443/tcp  10.108.58.143
rabbitmq-server/0           active          idle        2.0-beta4.1 15      5672/tcp        10.108.58.107
```

```
[Machines]
ID          STATE   DNS            INS-ID                                              SERIES
0           started 10.108.58.163 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-0  xenial
1           started 10.108.58.17  juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-1  xenial
2           started 10.108.58.55  juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-2  xenial
3           started 10.108.58.211 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-3  xenial
4           started 10.108.58.249 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4  xenial
5           started 10.108.58.101 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-5  xenial
6           started 10.108.58.199 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-6  xenial
7           started 10.108.58.150 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-7  xenial
8           started 10.108.58.208 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-8  xenial
9           started 10.108.58.195 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9  xenial
10          started 10.108.58.137 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-10 xenial
11          started 10.108.58.221 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-11 xenial
12          started 10.108.58.252 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-12 xenial
13          started 10.108.58.57  juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-13 xenial
14          started 10.108.58.143 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-14 xenial
15          started 10.108.58.107 juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-15 xenial
```

```
kirkland@x230:~⟫ lxc list
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
|                     NAME                      |  STATE  |        IPV4         | IPV6 |   TYPE    | SNAPSHOTS |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-b9eb2d85-76aa-465f-8337-d6bc9d748947-machine-0  | RUNNING | 10.108.58.162 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-0  | RUNNING | 10.108.58.163 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-1  | RUNNING | 10.108.58.17 (eth0)  |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-10 | RUNNING | 10.108.58.137 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-11 | RUNNING | 10.108.58.221 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-12 | RUNNING | 10.108.58.252 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-13 | RUNNING | 10.108.58.57 (eth0)  |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-14 | RUNNING | 10.108.58.143 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-15 | RUNNING | 10.108.58.107 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-2  | RUNNING | 10.108.58.55 (eth0)  |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-3  | RUNNING | 10.108.58.211 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4  | RUNNING | 10.108.58.249 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-5  | RUNNING | 10.108.58.101 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-6  | RUNNING | 10.108.58.199 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-7  | RUNNING | 10.108.58.150 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-8  | RUNNING | 10.108.58.208 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9  | RUNNING | 10.108.58.195 (eth0) |      | PERSISTENT | 0         |
+-----------------------------------------------+---------+---------------------+------+-----------+-----------+
```

```
kirkland@x230:~⟫ lxc exec juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-15 -- ps -ef
UID        PID  PPID  C STIME TTY          TIME CMD
root         1     0  0 Apr22 ?        00:00:09 /sbin/init
root        47     1  0 Apr22 ?        00:00:04 /lib/systemd/systemd-journald
syslog      82     1  0 Apr22 ?        00:00:01 /usr/sbin/rsyslogd -n
root        83     1  0 Apr22 ?        00:00:00 /usr/sbin/cron -f
root        84     1  0 Apr22 ?        00:00:04 /lib/systemd/systemd-logind
root        85     1  0 Apr22 ?        00:03:18 /usr/lib/accountsservice/accounts-daemon
message+    86     1  0 Apr22 ?        00:00:05 /usr/bin/dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation
daemon     100     1  0 Apr22 ?        00:00:00 /usr/sbin/atd -f
root       126     1  0 Apr22 ?        00:00:01 /usr/lib/policykit-1/polkitd --no-debug
root       288     1  0 Apr22 ?        00:00:00 /sbin/dhclient -1 -v -pf /run/dhclient.eth0.pid -lf /var/lib/dhcp/dhclient.eth0.leases -I -df /var
/lib/dhcp/dhclient6.eth0.leases eth0
root       360     1  0 Apr22 ?        00:00:00 /usr/sbin/sshd -D
root      1790     1  0 Apr22 ?        00:00:00 bash /var/lib/juju/init/jujud-machine-15/exec-start.sh
root      1801     1  0 Apr22 console  00:00:00 /sbin/agetty --noclear --keep-baud console 115200 38400 9600 vt220
root      1804  1790  0 Apr22 ?        00:00:10 /var/lib/juju/tools/machine-15/jujud machine --data-dir /var/lib/juju --machine-id 15 --debug
root      1888     1  0 Apr22 ?        00:00:00 bash /var/lib/juju/init/jujud-unit-rabbitmq-server-0/exec-start.sh
root      1892  1888  0 Apr22 ?        00:00:29 /var/lib/juju/tools/unit-rabbitmq-server-0/jujud unit --data-dir /var/lib/juju --unit-name rabbitm
q-server/0 --debug
rabbitmq 11689     1  0 Apr22 ?        00:00:00 /lib/systemd/systemd --user
rabbitmq 11690 11689  0 Apr22 ?        00:00:00 (sd-pam)
rabbitmq 12988     1  0 Apr22 ?        00:00:00 /bin/sh /usr/sbin/rabbitmq-server
rabbitmq 12993 12988  0 Apr22 ?        00:00:00 /bin/sh -e /usr/lib/rabbitmq/bin/rabbitmq-server
rabbitmq 13075     1  0 Apr22 ?        00:00:01 /usr/lib/erlang/erts-7.3/bin/epmd -daemon
rabbitmq 13159 12993  0 Apr22 ?        00:19:01 /usr/lib/erlang/erts-7.3/bin/beam.smp -W w -A 64 -P 1048576 -K true -B i -- -root /usr/lib/erlang
-progname erl -- -home /var/lib/rabbitmq -- -pa /usr/lib/rabbitmq/
rabbitmq 13279 13159  0 Apr22 ?        00:00:00 inet_gethost 4
rabbitmq 13280 13279  0 Apr22 ?        00:00:00 inet_gethost 4
root     25531    _ 0  0 14:29 ?        00:00:00 ps -ef
```

```
kirkland@x230:~⟫ sudo zpool list
NAME   SIZE  ALLOC   FREE  EXPANDSZ   FRAG    CAP  DEDUP  HEALTH  ALTROOT
lxd    199G  24.7G   174G         -     8%    12%  1.00x  ONLINE  -
kirkland@x230:~⟫ sudo zpool status
  pool: lxd
 state: ONLINE
  scan: none requested
config:

        NAME        STATE     READ WRITE CKSUM
        lxd         ONLINE       0     0     0
          sda2      ONLINE       0     0     0

errors: No known data errors
kirkland@x230:~⟫ sudo zpool iostat -v
              capacity     operations    bandwidth
pool        alloc   free   read  write   read  write
----------  -----  -----  -----  -----  -----  -----
lxd         24.7G   174G    108     74  6.33M  3.35M
  sda2      24.7G   174G    108     74  6.33M  3.35M
----------  -----  -----  -----  -----  -----  -----
```

```
kirkland@x230:~⟫ time lxc launch ubuntu-xenial
Creating memorable-myesha
Starting memorable-myesha

real    0m3.382s
user    0m0.008s
sys     0m0.004s
kirkland@x230:~⟫ time lxc launch ubuntu-xenial
Creating electropositive-therese
Starting electropositive-therese

real    0m3.807s
user    0m0.000s
sys     0m0.004s
```

```
root@juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9:~# sysbench --test=cpu run
sysbench 0.4.12:  multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000


Test execution summary:
    total time:                          10.2060s
    total number of events:              10000
    total time taken by event execution: 10.2035
    per-request statistics:
         min:                                  0.93ms
         avg:                                  1.02ms
         max:                                  4.74ms
         approx.  95 percentile:               1.13ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   10.2035/0.00
```

```
kirkland@x230:~⟫ sysbench --test=cpu run
sysbench 0.4.12:  multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000


Test execution summary:
    total time:                          10.2092s
    total number of events:              10000
    total time taken by event execution: 10.2074
    per-request statistics:
         min:                                  0.93ms
         avg:                                  1.02ms
         max:                                  4.32ms
         approx.  95 percentile:               1.12ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   10.2074/0.00
```

```
kirkland@x230:~⟫ lxc exec juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9 -- grep processor /proc/cpuinfo

processor       : 0
processor       : 1
processor       : 2
processor       : 3
kirkland@x230:~⟫ lxc config set juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9 limits.cpu 1

kirkland@x230:~⟫ lxc exec juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9 -- grep processor /proc/cpuinfo
processor       : 0
kirkland@x230:~⟫
```

```
kirkland@x230:~⟫ lxc exec juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4 -- free
              total        used        free      shared  buff/cache   available
Mem:       16121148       43296    16016464      449240       61388    16016464
Swap:     181015572     5536776   175478796
kirkland@x230:~⟫ lxc config set juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4 limits.memory 256MB
kirkland@x230:~⟫ lxc exec juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4 -- free
              total        used        free      shared  buff/cache   available
Mem:         262144       43420      157332      447944       61392      157332
Swap:     181015572     5545916   175469656
kirkland@x230:~⟫
```

```
kirkland@x230:~⟫ lxc list
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
|                        NAME                         |  STATE  |         IPV4        | IPV6 |    TYPE    | SNAPSHOTS |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-b9eb2d85-76aa-465f-8337-d6bc9d748947-machine-0 | RUNNING | 10.108.58.162 (eth0) |      | PERSISTENT | 5         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-0 | RUNNING | 10.108.58.163 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-1 | RUNNING | 10.108.58.17 (eth0)  |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-10 | RUNNING | 10.108.58.137 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-11 | RUNNING | 10.108.58.221 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-12 | RUNNING | 10.108.58.252 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-13 | RUNNING | 10.108.58.57 (eth0)  |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-14 | RUNNING | 10.108.58.143 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-15 | RUNNING | 10.108.58.107 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-2 | RUNNING | 10.108.58.55 (eth0)  |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-3 | RUNNING | 10.108.58.211 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-4 | RUNNING | 10.108.58.249 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-5 | RUNNING | 10.108.58.101 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-6 | RUNNING | 10.108.58.199 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-7 | RUNNING | 10.108.58.150 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-8 | RUNNING | 10.108.58.208 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
| juju-db581363-1330-4689-89cd-a4f9e79c141e-machine-9 | RUNNING | 10.108.58.195 (eth0) |      | PERSISTENT | 4         |
+-----------------------------------------------------+---------+---------------------+------+------------+-----------+
kirkland@x230:~⟫ lxc list | grep RUNNING | col2 | xargs -i lxc snapshot {}
kirkland@x230:~⟫
```

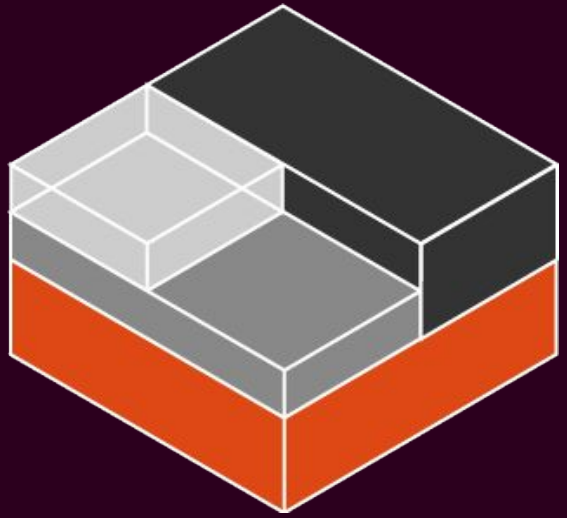
Why is this the world's fastest OpenStack?

1. Hyperconverged architecture deploys in minutes
2. Dozens of LXD instances launch in seconds
3. Snapshot everything in under a second
4. Instances perform as bare metal
5. Services migrate in real-time

ubunt.eu/win-orange-box

lxc --help

```
config      - Manage configuration.
copy        - Copy containers within or in between lxd instances.
delete      - Delete containers or container snapshots.
exec        - Execute the specified command in a container.
file        - Manage files on a container.
help        - Presents details on how to use LXD.
image       - Manipulate container images
info        - List information on containers.
launch      - Launch a container from a particular image.
list        - Lists the available resources.
move        - Move containers within or in between lxd instances.
profile     - Manage configuration profiles.
publish     - Publish containers as images.
remote      - Manage remote LXD servers.
restart     - Restarts one or more containers.
restore     - Reset the state of a resource back to a snapshot.
snapshot    - Create a read-only snapshot of a container.
start       - Starts one or more containers.
stop        - Stops one or more containers.
version     - Prints the version number of LXD.
```



ubuntu.com/lxd

github.com/lxc

linuxcontainers.org

ubunt.eu/win-orange-box


ubuntu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