Crostini: a Linux Desktop on Chrome OS
Introduction and agenda

Introduction:
- Chrome OS, readily available, fast, secure, open source
- Linux on Chrome OS (Crostini)
  - Easy to get Debian container, fully integrated with Chrome OS

Agenda:
- Getting started with Linux on Chrome OS (crostini), integration with Chrome OS
- Architecture
- Advanced usage
Getting started: installation
Installation

Preferences: ctrl+shift+p
Graphical apps integration
Drive and file system sharing
Container reachable on penguin.linux.test, many ports also forwarded from localhost
Settings

- Linux
  - Manage shared files & folders
  - USB Device preferences
  - Remove Linux Apps for Chromebook
Roadmap

Upcoming features:
- USB pass-through
- Audio support
- GPU integration
- FUSE

Enterprise (manageability) features:
- Device policy OFF: crostini not allowed for anybody using the device
- Device policy ON: is the user a member of the enterprise?
  - YES: User policy (on/off)
  - NO: Device policy (on/off for non-affiliated users)
The architecture
Overall architecture

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Simplified architecture

- Guest VM
  - Unprivileged container
    - LXD
      - Linux
        - Chrome
          - Crosvm
            - Linux
CrosVM

- Hypervisor using KVM with a focus on security
- Written in Rust for memory safety
- By default, devices run in jailed child processes using namespaces, and seccomp.
- Only boots Linux guests on Linux hosts.
- Optimized for Chrome OS hosts, but works on common Linux desktops.
Host-side daemons

- Chrome - Wayland compositor
- Concierge - VM lifecycle manager
- Cicerone - Container lifecycle manager/guest integration
- Seneschal - 9P server factory
Termina

- Slimmed-down Chrome OS for running LXD containers
  - Linux 4.19
  - maitred - init system that can be controlled over gRPC
  - LXD 3.0.2
  - tremplin - exposes gRPC API to control LXD
- Read-only, dm-verity - allows state to be held only in containers
Guest-side daemons

- Sommelier - Nested Wayland compositor, supports X11 forwarding
  - 3 instances - Wayland, X11 (lowdpi), X11 (highdpi)
- Garçon - container guest agent
  - Uses PackageKit to run periodic apt upgrades (for CrOS guest tools)
  - App launcher integration via parsing .desktop files
  - Allows opening URLs in host Chrome, new Terminal app windows
Advanced usage
Welcome to crosh, the Chrome OS developer shell.
If you got here by mistake, don't panic! Just close this tab and carry on.
Type ‘help’ for a list of commands.
If you want to customize the look/behavior, you can use the options page.
Load it by using the Ctrl+Shift+P keyboard shortcut.

```
crash> vnc
USAGE: vnc
    [ start [--enable-gpu] <name> ]
    stop <name> ]
    destroy <name> ]
    export <vm name> <file name> [removable storage name] ]
    list]
    share <vm name> <path> ]
    container <vm name> <container name> [ <image server> <image alias> ] ]

crash> vsh
ERROR: Missing vm_name
```

vsh <vm_name> [ <container_name> ]
Connect to a shell inside the VM <vm_name>, or to a shell inside the container <container_name> within the VM <vm_name>.

```
crash> vnc list
Termina
Total Size (bytes): 1661878272
```

Preferences: ctrl+shift+p
vsh termina

crash> vsh termina
(termina) chronos@localhost ~ $ lxc list
To start your first container, try: lxc launch ubuntu:18.04

+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+
|   NAME    |   STATE    |   IPV4      |   IPV6    |   TYPE   | SNAPSHOTS|
+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+
|  penguin  |  RUNNING    | 100.115.92.195 |  |  |  |  |
+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+

(termina) chronos@localhost ~ $ lxc network list

+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+
|   NAME    |   TYPE    |   MANAGED      |   DESCRIPTION    |   USED BY   |
+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+
|  eth0     |  physical   |  NO             |  |  |  |  |
+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+
|  lxdbr0   |  bridge    |  YES            |  |  |  |  |
+-------------------------------+-----------------+-------------------+---------+---------+----------+----------+

(termina) chronos@localhost ~ $ lxc version
Client version: 3.0.2
Server version: 3.0.2

(termina) chronos@localhost ~ $ lxc profile list

+-------------------------------+-----------------+---------+----------+
|   NAME    |   USED BY   |
+-------------------------------+-----------------+---------+----------+
|  default  |  1          |
+-------------------------------+-----------------+---------+----------+

(termina) chronos@localhost ~ $ }
Running a custom container

```
(termina) chronos@localhost ~ $ lxc remote list
+----------+---------+---------+---------+---------+---------+---------+
| NAME     | URL     | PROTOCOL| AUTH TYPE| PUBLIC | STATIC |
+----------+---------+---------+---------+---------+---------+---------+
| images   | https://images.linuxcontainers.org | simplestreams | YES | NO |
| local (default) | unix:// | lxd | tls | NO | YES |
| ubuntu   | https://cloud-images.ubuntu.com/releases | simplestreams | YES | YES |
| ubuntu-daily | https://cloud-images.ubuntu.com/daily | simplestreams | YES | YES |
+----------+---------+---------+---------+---------+---------+---------+

(termina) chronos@localhost ~ $ lxc image list
+----------+----------+---------+---------+---------+----------+----------+----------+----------+----------+
| NAME      | FINGERPRINT | PUBLIC | DESCRIPCION | ARCH | SIZE | UPLOAD DATE |
+----------+----------+---------+---------+---------+----------+----------+----------+----------+----------+
| 1d1b49864586 | no | Fedora 29 amd64 (20190122_07:32) | x86_64 | 89.34MB | Jan 22, 2019 at 5:59pm (UTC) |
| 2b6d6f842c46 | no | Archlinux current amd64 (20190122_07:32) | x86_64 | 270.37MB | Jan 22, 2019 at 6:01pm (UTC) |
| 3a4a73775c7f | no | Alpine 3.8 amd64 (20190122_13:01) | x86_64 | 2.34MB | Jan 22, 2019 at 5:59pm (UTC) |
| e913a553412 | no | Debian stretch amd64 (20190105_12:48) | x86_64 | 299.99MB | Jan 22, 2019 at 3:14pm (UTC) |
+----------+----------+---------+---------+---------+----------+----------+----------+----------+----------+

(termina) chronos@localhost ~ $ lxc image copy images:fedora/29 local:
Image copied successfully!

(termina) chronos@localhost ~ $ lxc image copy images:archlinux local:
Copying the image: rootfs: 38% (5.62MB/s)

(termina) chronos@localhost ~ $ lxc launch 3a4a73775c7f alpine
Creating alpine
Starting alpine

(termina) chronos@localhost ~ $ lxc list
+----------+----------+---------+---------+---------+----------+----------+
| NAME     | STATE     | IPV4    | IPV6    | TYPE     | SNAPPHOTS |
+----------+----------+---------+---------+---------+----------+
| alpine   | RUNNING | 100.115.92.197 (eth0) | PERSISTENT | 0
| penguin  | RUNNING | 100.115.92.285 (eth0) | PERSISTENT | 0
+----------+----------+---------+---------+---------+----------+
```
Running a custom container

(termina) chronos@localhost ~ $ #lx-exec alpine0\n(termina) chronos@localhost ~ $ lx-console alpine0\nTo detach from the console, press: <ctrl>-a q

Welcome to Alpine Linux 3.8
Kernel 4.19.16-02893-g2cf2c17c8a43 on an x86_64 (/dev/console)
alpine0 login: root
Welcome to Alpine!

The Alpine Wiki contains a large amount of how-to guides and general
information about administrating Alpine systems.

You can setup the system with the command: setup-alpine
You may change this message by editing /etc/motd.
alpine000:~ # apk ...
Conclusion, Q & A

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