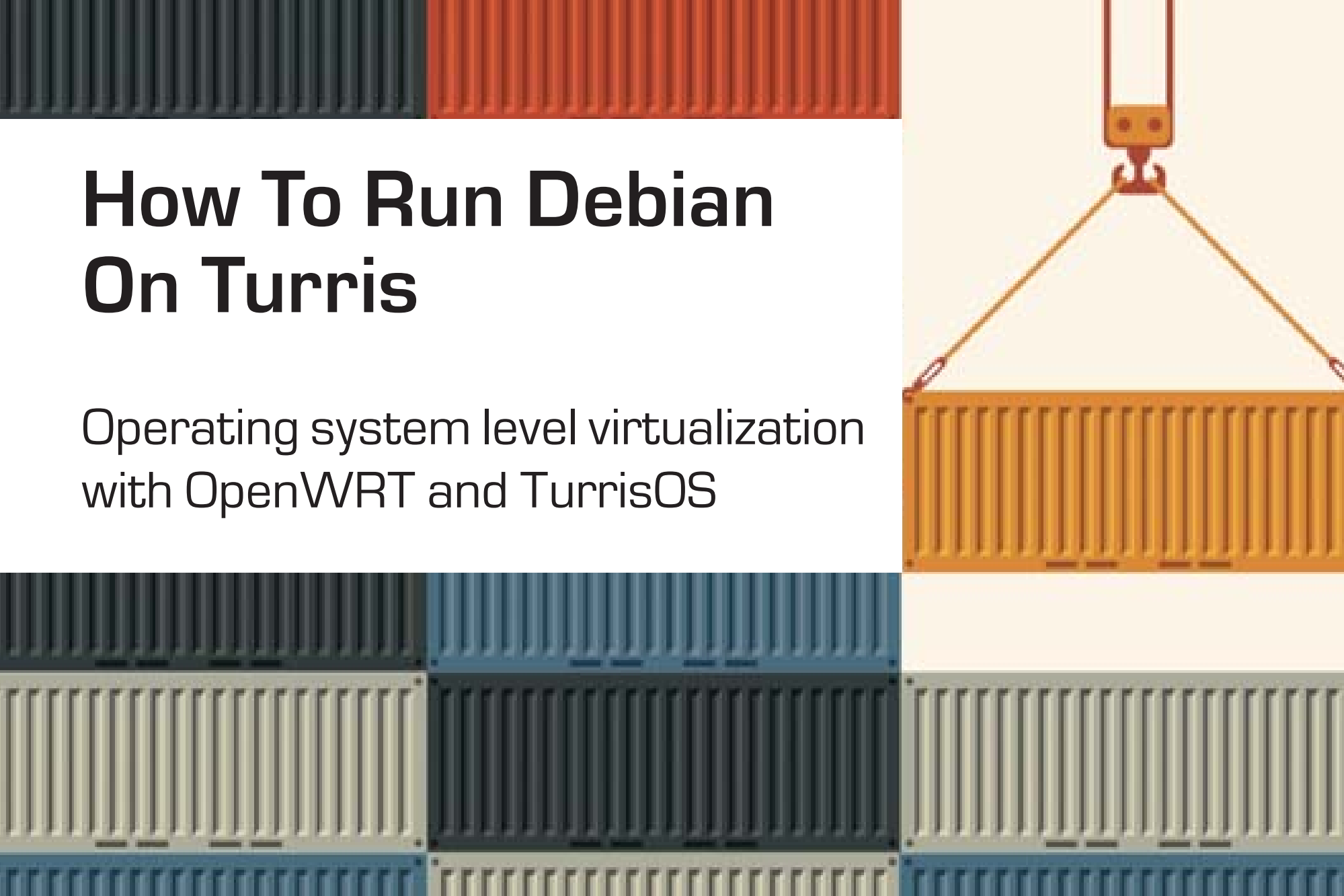
How To Run Debian On Turris

Operating system level virtualization with OpenWRT and TurrisOS



Why It Is Cool To Have Virtualization?

- Security and isolation
- Resource control and network virtualization
- Ability to run different OS, including Debian and OpenWRT
- Automated testing without main router configuration impact

Virtualization Types For The Turris

- Hardware virtualization
  - Requires hardware support
  - Significant overhead on the embedded hardware
- Operating system–level virtualization
  - Little to no overhead
  - Isolation mechanisms
  - Network virtualization
  - Resource control

Containers On Linux

- All recent technologies are using kernel cgroups, available in kernel since 2.6.24

- Namespace isolation (PIDs, UTS, Network, Mount, IPC, UIDs)

- Software that uses cgroups/namespaces: LXC, Docker, libvirt, systemd, lxd, etc.

- Still work in progress

LXC On Turris

- Source code is easy to understand and debug, tool itself is very simple

- Port for the OpenWRT was already done
  - OpenWRT Luci and ubus integration
  - Latest version available via feeds

- Very flexible: supports a lot of storage engines, networking configurations, etc.

- Could be used as starting point for the more complicated solutions, like Docker and Vagrant

Running LXC On Turris?

- Kernel modifications required
- Package/lxc needs to be installed
- Custom templates created:
  - BusyBox templated – perfect for the stati cally compiled services
  - TurrisOS
  - OpenWRT
  - Debian PowerPCSPE

Kernel Modifications

CONFIG_KERNEL_NAMESPACES=y
CONFIG_KERNEL_UTS_NS=y
CONFIG_KERNEL_IPC_NS=y
CONFIG_KERNEL_PID_NS=y
CONFIG_KERNEL_USER_NS=y
CONFIG_KERNEL_NET_NS=y
CONFIG_KERNEL_LXC_MISC=y
CONFIG_KERNEL_CGROUPS=y
CONFIG_KERNEL_CGROUP_DEVICE=y
CONFIG_KERNEL_CGROUP_SCHED=y
CONFIG_KERNEL_CGROUP_CPUACCT=y
CONFIG_KERNEL_CGROUP_FREEZER=y
CONFIG_KERNEL_CPUSETS=y
CONFIG_KERNEL_RESOURCE_COUNTERS=y
CONFIG_KERNEL_MEMCG=y
CONFIG_KERNEL_MEMCG_SWAP=y

Notes:

- **Conflicting with XFS kernel module**
- CONFIG_MATH_EMULATION **required to run Debian PowerPCSPE**
- CONFIG_EXT4_FS_SECURITY **and** CONFIG_EXT4_FS_POSIX_ACL **required to run docker**
- **OverlayFS is already backported to the OpenWRT**

Recent Changes:

- Kernel changes included to the TurrisOS (not yet released)

- Turris will run on updated kernel which will address some issues with namespaces and OpenWRT

- Stay tuned)

Other Notes

- 8Gb SD card was added to provide more disk space and avoid NAND wear out
- Docker port is done and could be found on my github (samm-git/turris-containers)
- I was not able to find any performance or stability regressions
- Hopefully kernel changes will be integrated by the Turris project

Live Demo :)

- Creating new lxc containers from scratch
  - Busybox container
  - OpenWRT container
  - TurrisOS container
- Running TurrisOS, including web interface
- Debian PowerPCSPE demo
- Other operation

Thank you :)

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