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 statically 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_KERNELRESOURCE_COUNTERS=y
- CONFIG_KERNEL_MEMCG=y
- CONFIG_KERNEL_MEMCG_SWAP=y

Notes:
- **Conflicting with XFS kernel module**
- **CONFIG_MATH_EMULATION** required to run Debian PowerPC
- **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 :)
Thank you :)
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