Qualcomm

# Ramdump for Trusted VMs

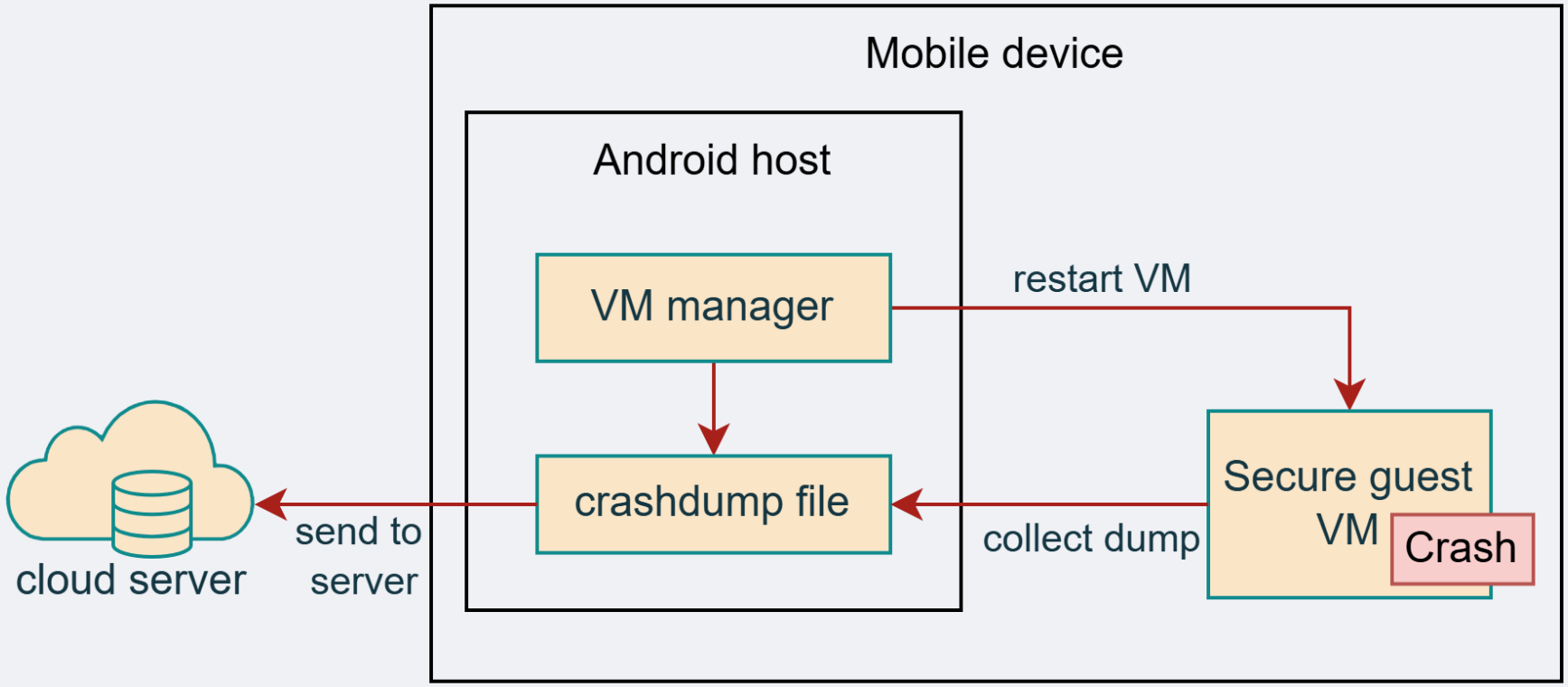
## Efficient Crash Debugging Without Rebooting The Device

Cong Zhang

cong.zhang@oss.qualcomm.com
Qualcomm CSE Linux kernel team

# Background

Crash handling workflow for Secure Guest VM in Android Host VM

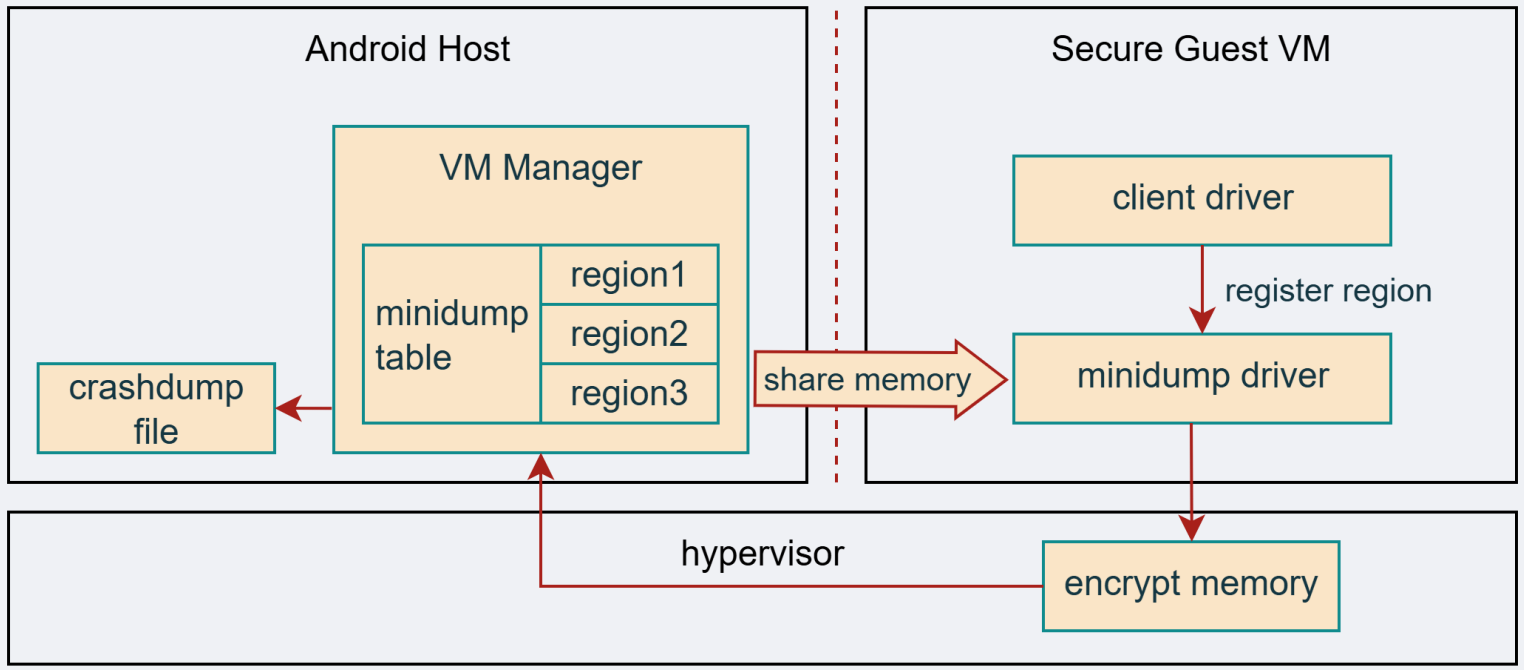


# Problem

- Guest VM memory is isolated from the host and contains sensitive data, so leakage must be prevented.
- A full crash dump can be very large, especially when there are many devices and crash instances. This requires significant storage and makes cloud upload difficult.
- Secure guest VM reboot should be fast, and crash dump collection cannot cause long delays.

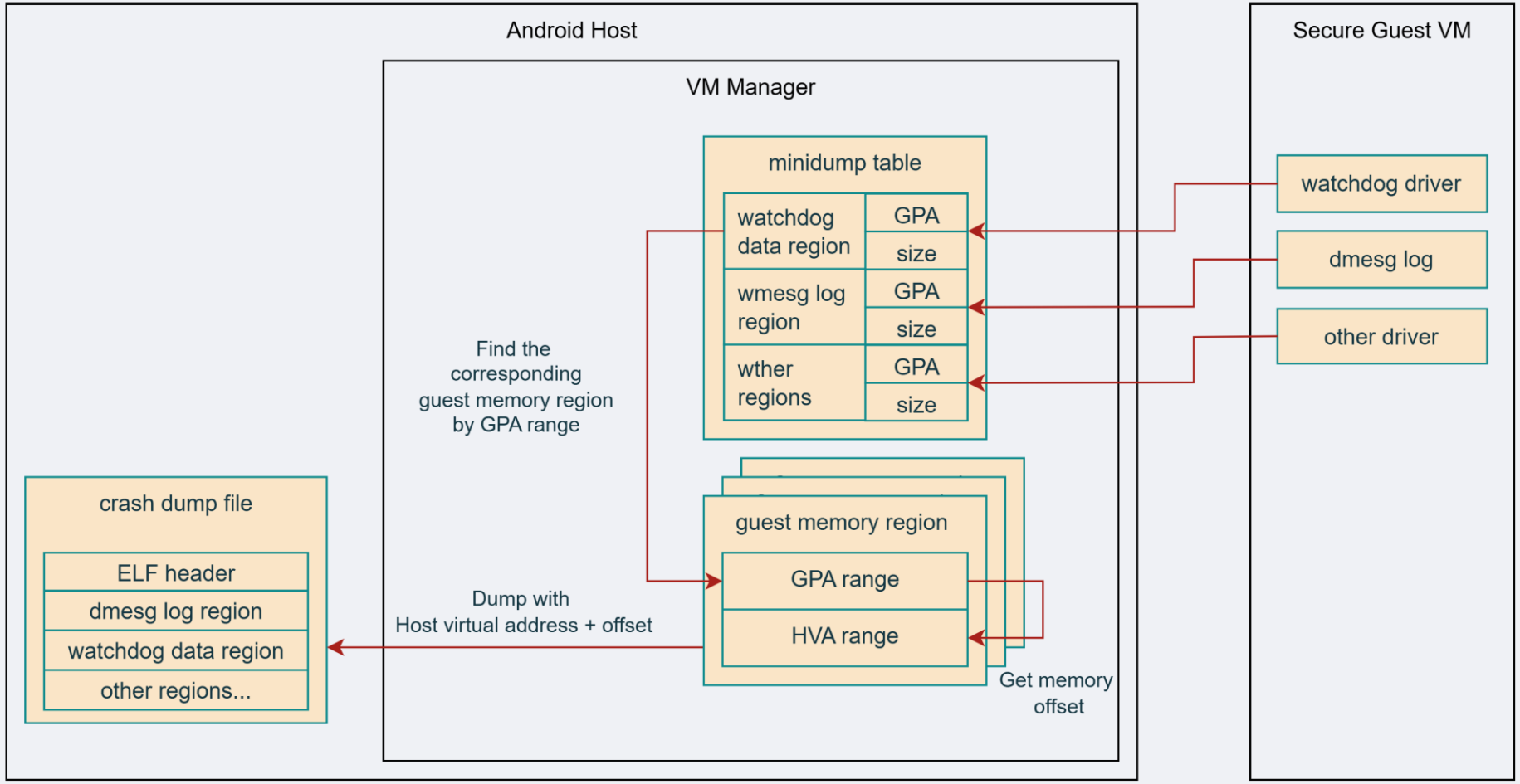
# Design

- Collect only critical areas.
- Gather data from the host side.
- Encrypt memory in the hypervisor.
- We call it “minidump.”
- Meminspect upstream is in progress and may follow this design after acceptance.



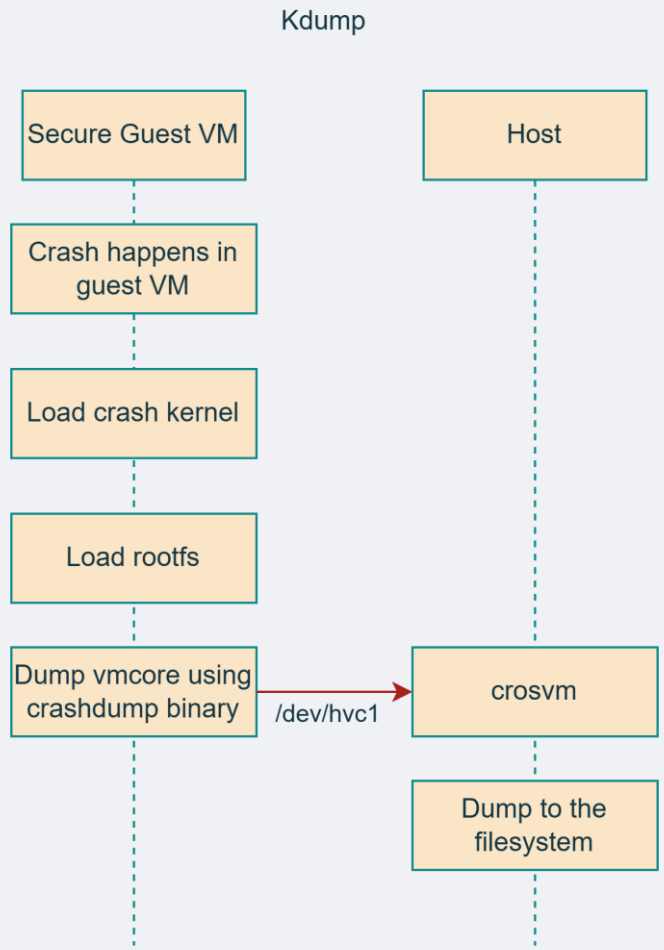
# Design

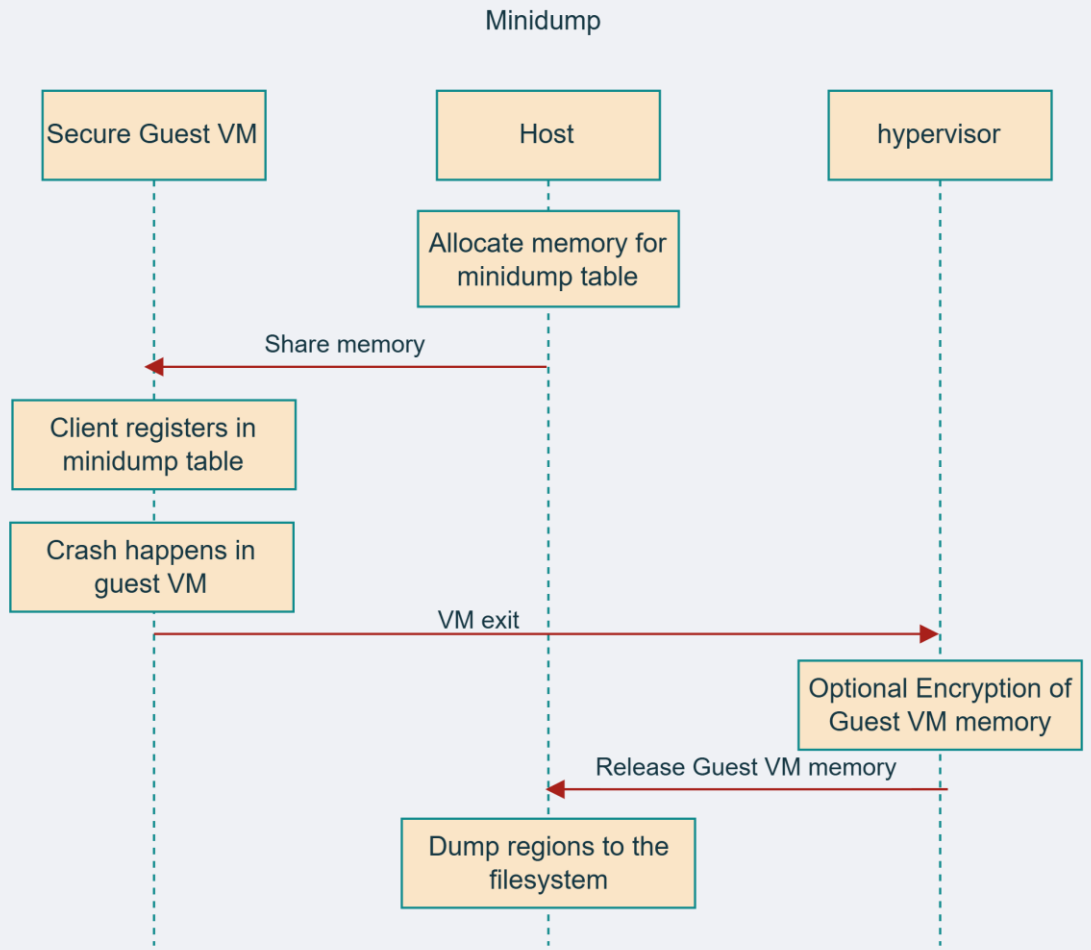
How to get a specific region in the Android host?



# Design

Comparison of minidump and kdump process

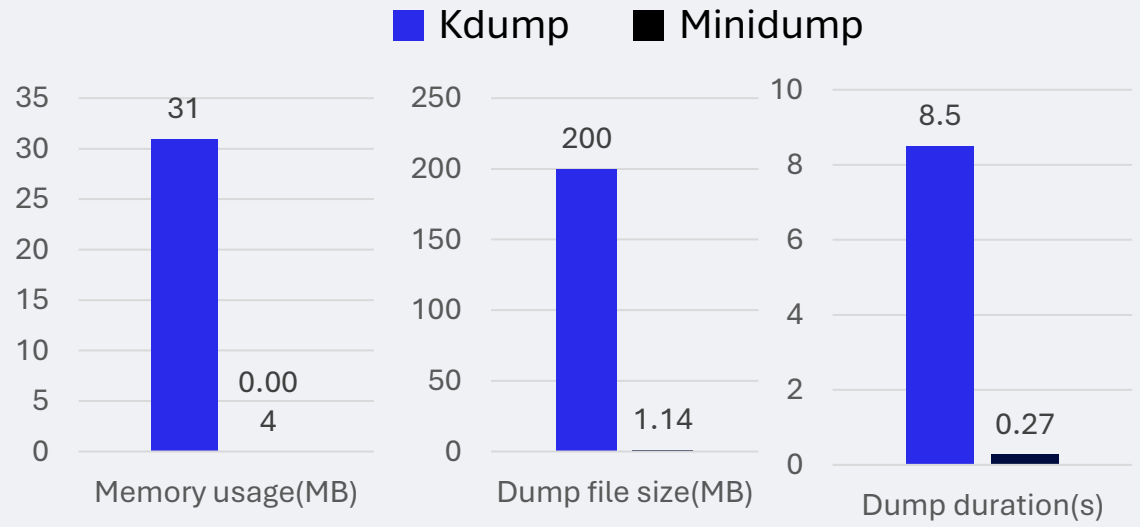


# Comparison of kdump and minidump

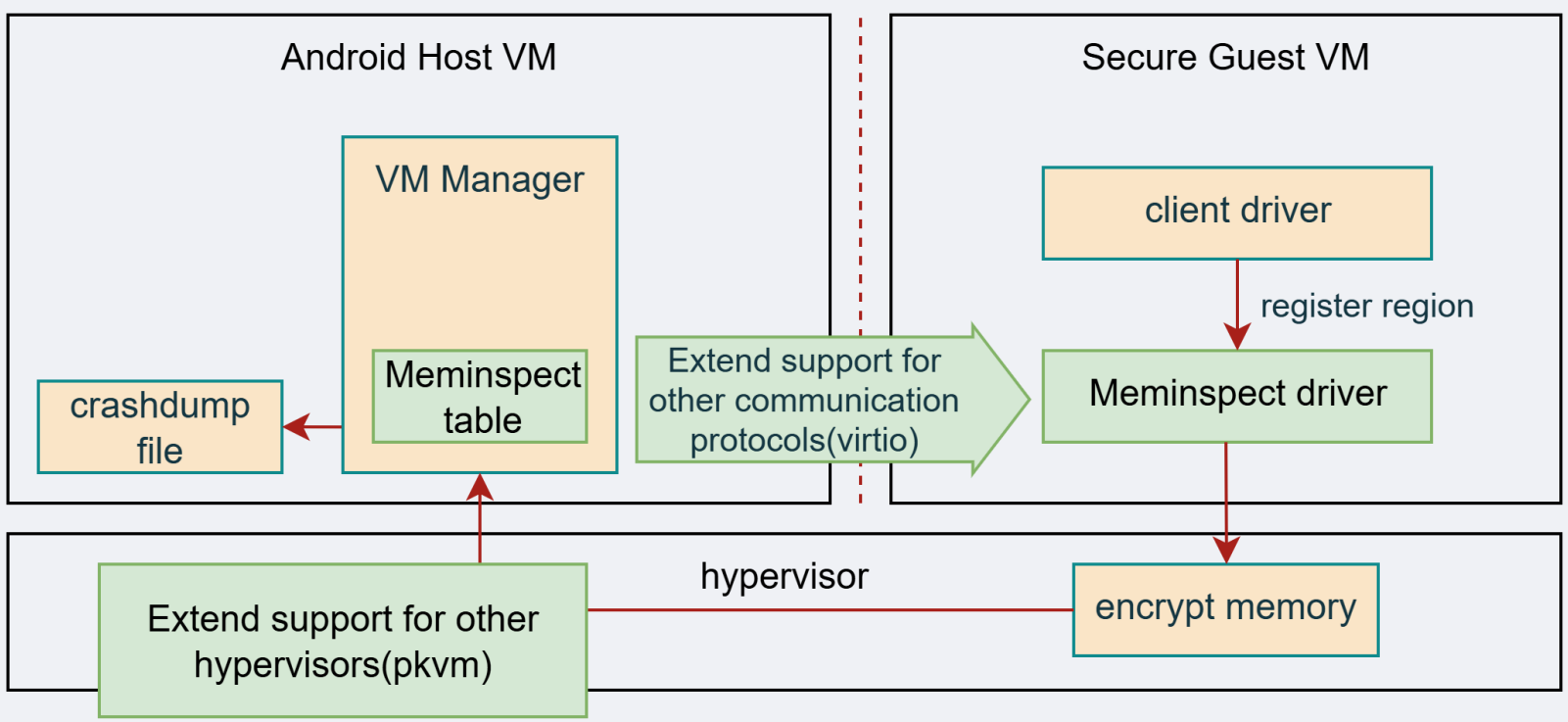
- Only critical memory regions
  - Smaller dump file size
- No crash kernel
  - Lower memory usage
  - Shorter dump duration
- Encrypt by hypervisor
  - More secure

| | Kdump | Minidump |
|---|---|---|
| Dump file size | 200 MB | 1.14 MB |
| Memory usage | 31 MB | 4 KB |
| Dump duration | 8.5 s | 0.27 s |



# What's Next?

- Follow the meminspect design
- Extend support for
  - other communication protocols such as virtio
  - other hypervisors such as pkvm



# Thank you



Follow us on:
For more information, visit us at qualcomm.com & qualcomm.com/blog

## We are Hiring Linux Kernel Engineers

San Diego

tsoni@quicinc.com

Linux maintainers(remote)

ndechesn@quicinc.com

Hyderabad

China

QIPL