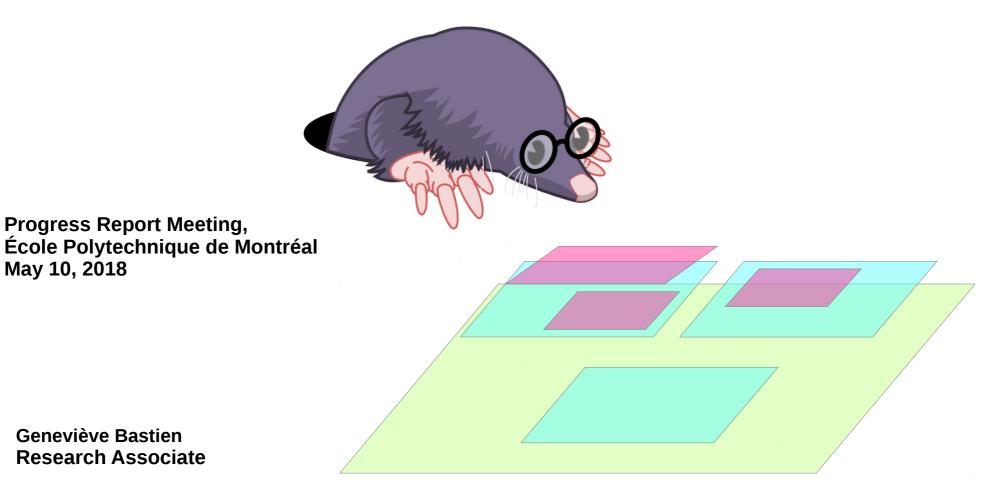
Virtual Machine Tracing for Everyone



2014: **Analyze execution and preemption of virtual machines** - Mohamad Gebai

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VCPU 2							
VCPU 1							
► Threads							
▼ Guest: "e06f0c7c-a52c-409c-a8e5-65da72c244							_
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► Threads							

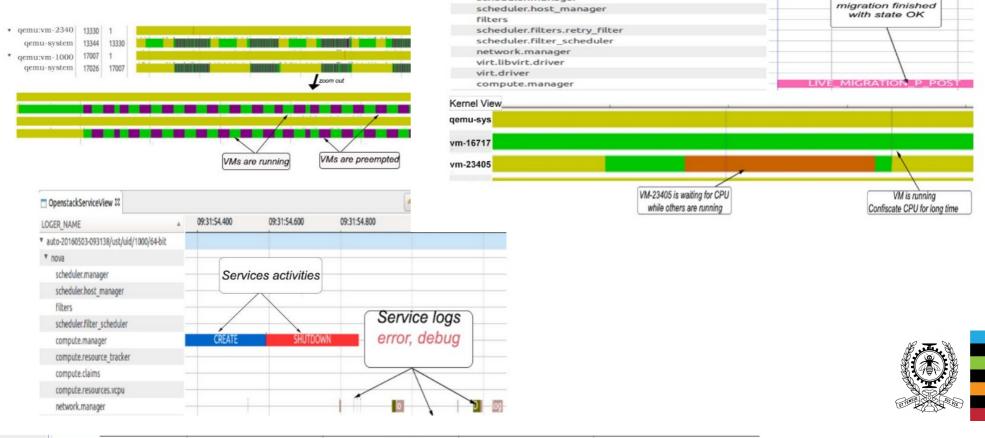


2016: **Multilevel execution of VM, utilization of physical resources** - Cédric Biancheri

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History of VM Tracing @Dorsal

2017: Tracing Open Stack, from Very High to Very Low Level - Yves Junior Bationo



scheduler.manager

vm-1000			ACTIVE		
vm-1111	PAUSED	ACTIVE		DELETED	
vm-2222	BUILDIN	G ACTIVE		DELETED	
vm-3333			BUILDING		ACTIVE

Work in progress:

Host-assisted guest tracing - Abderrahmane BenBachir

Tracing and Analyzing Virtual Machines from Host – Hani Nemati

Tracing and Analyzing Virtual Resources other than CPU – Adel Belkhiri

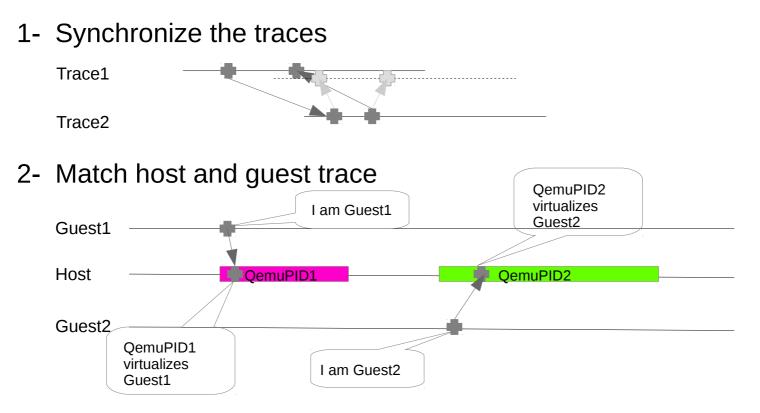
Tracing and Analyzing Containers – Loïc Gelle



Method

- Addons module in LTTng (by Mohamad and Francis) adds and traces a ping-pong hypercall between guest and host.
 - → Hackish, but worked!

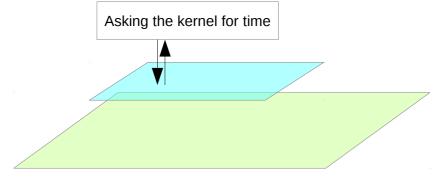
Why?



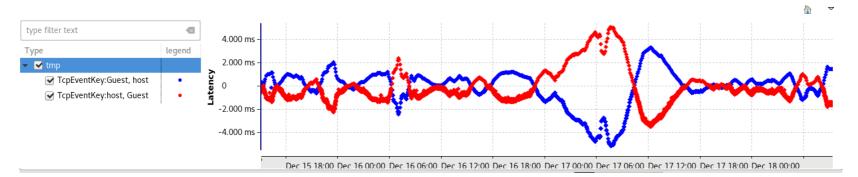


Problem 1: Trace synchronization

• Traces use clock monotonic: guest and host have their own!



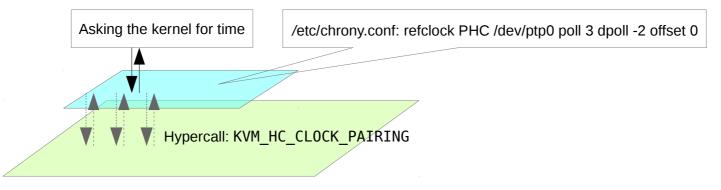
• TCP packets latency: NTP over 4 days. NOT synchronized!!!



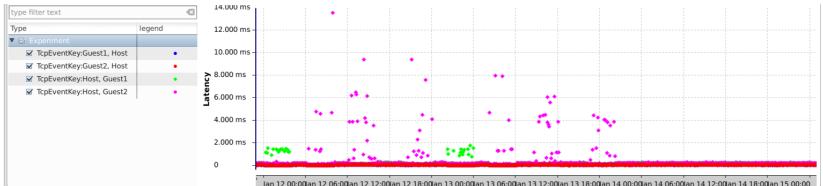


Problem 1: Trace synchronization

• As of kernel 4.11: ptp_kvm kernel module for guests + chronyd



• Over 4 days, the average TCP packet latencies: 200 μ s. Some outliers probably due to VM preemption.



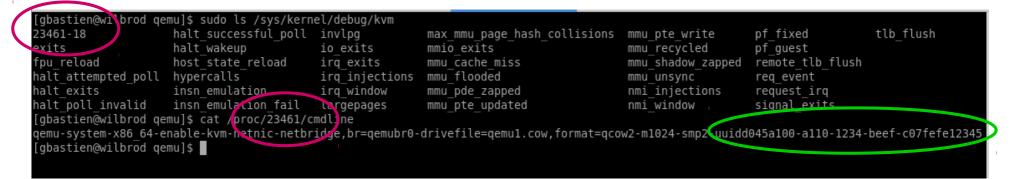
By comparison convex hull gets an average latency of 100 μ s, but only for a few seconds at a time after which it drifts away.



Problem 2: Match guest/host trace

All it takes is 1 small piece of uniquely shared data!!

• Kvm stores data in the debugfs



• What is this uuid?

QEMU	×
Machine View	
tvirtual@qemulttng0~I\$ sudo dmidecoac s system-uuid D045A100-A110-1234-BEEF-C07FEFE12345 Fuirtual@gemulttng0~I\$	

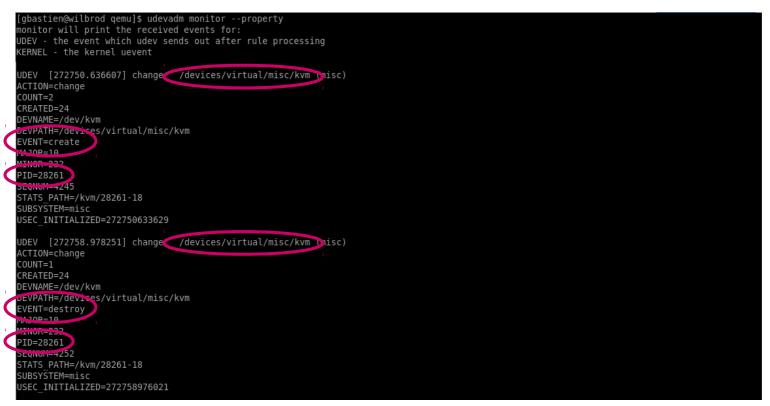


 Solution: Statedump the KVM process + UUID and add system UUID to trace's metadata!

Problem 2: Match guest/host trace

What about guests started after trace start

• KVM events in UDEV





 Solution: Monitor UDEV for KVM creation/destruction and get the UUID from the process's command line

Summary of the new approach

- Use the ptp_kvm module + chronyd for trace synchronization
- Changes in LTTng:

1- Add the system-uuid to the environment properties of the trace (kernel and ust)

2- Statedump the active guests from the debugfs information

3- Monitor udev for kvm guests creation/destruction (adds ${\sim}12-150\mu s$ per poll)



Results...

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Objective As this research topic approaches maturity, get the word out, have people use it

- Document! Promote!!! Blog posts, conferences
- Build a realistic cloud!
- Integrate with Hani's host-only approach, use snapshots
- Explore use cases for production environments: help analyze actual problems



Questions ?

Resources

- Sources:
 - https://github.com/tahini/lttng-tools branch kvm
 - https://github.com/tahini/lttng-ust-1 branch statedump_notifier (feature by Mathieu Desnoyers)
 - https://github.com/tahini/lttng-modules branch product_uuid
- Blog post on VM synchronization: http://versatic.net/tracecompass/synchronization/2018/01/15/synchronization-and-ntp.html
- Twitter: @genbastien

