Synchronizing timestamps of trace events between host and guest VM

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The problem

- Calculate the timestamps offset in nanosecond precision
- Frequencies of the host and guest clocks are different
- The synchronisation solution should work with all hypervisor
ftrace clock sources

➔ local
➔ global
➔ counter
➔ uptime
➔ x86-tsc
➔ ppc-tb
➔ mono
➔ mono_raw
➔ boot
Using NTP

- Host
  - NTP client
  - system time

- Guest 1
  - NTP client
  - system time

- Guest 2
  - NTP client
  - system time

- Internet

- NTP Server
NTP approach

- **Pros**
  - Works with all hypervisors

- **Cons**
  - Tens of milliseconds accuracy
  - Clocks must be synchronized in advanced, before running the trace
Using PTP

Clock offset

\[
\frac{(T1' - T1 - T2' + T2)}{2}
\]
Using PTP

- tens of microseconds accuracy
- clocks must be synchronized in advanced, before running the trace
PTP-like algorithm

Host

Guest

Clock offset

\[(T1' - T1 - T2' + T2) / 2\]

- round trip time is not symmetric
- no hardware timestamping
- Up to few hundred packets are exchanged in one clock offset measurement
- ftrace is used to get the packet times
PTP-like algorithm
PTP-like algorithm

- **Pros**
  - Works with all hypervisors
  - No need to synchronize system clocks in advanced

- **Cons**
  - Tens of microseconds accuracy
Other ideas

Any other approaches for synchronizing trace timestamps?

Other time synchronization protocols?

VM clock internals

- How the VM clock is implemented?
- What is the relation between host and guest clock?