Cyber-Physical and Real-Time

NSFCloud Workshop

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Participants

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The Cloud is a CPS!!

- Cooling, power, networking, buildings,
- Instrumentation and control points for power usage (subsystem level).
- Temperature profiles

Group Membership

- Using cloud to do CPS in real-time
- Very interested in how to build cloud to do that but not necessarily working on it
- Application researchers

Data Set Repository

- Application (road traffic, FMRI, weather, etc.)
- System level datasets (power, temperature, network)
- Using several different data sets together

Quick provisioning (seconds) to respond to events.

- Research problems:
  - Get virtual machines running very quickly
  - Push lower priority work out of the way
- Needed to investigate how to provide this:
  - Centralized storage
  - SSDs
  - Bare metal
  - Ability to change hypervisor priorities (e.g. start an image that is pre-loaded into memory)
- Modify cloud schedulers

Latency & jitter investigations (e.g. robotics)

- 300ms is ok for one
- 40ms is detectible by humans
- Needed to investigate this problem:
  - OpenFlow
  - Different switches
  - Tools to measure & diagnose where the latency/jitter is added (which machines, networks, software, etc.)
  - Tools to inject latency and jitter (network, compute, disk i/o)

Needed for Research

- Ability to move large data in (e.g. fMRI data) 30 MB/S, higher?

- Ad-hoc cloud (e.g. cars nearby each other) and interaction with "public" cloud.
  - Fault tolerance
  - Use local if you have to, but more capabilities available if can access a larger cloud

Needed for Research

- GPUs (FPGAs?)
  - Encryption, FMRI
- Ability to spin down disks
- Failure simulation
  - Ad-hoc cloud (e.g. cars nearby each other) and interaction with "public" cloud.
- Mobile cloud (cellular, wireless)

… and some more

- Access to newer hardware.

- Many instances to model many physical objects (e.g. millions of cars).

- Managing data centers, particularly using external information (e.g. cost of power).