

# Virtualization-based Testbed For Variability-Aware Software



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## Motivation

- Quick prototyping, testing and evaluation of variability aware software.
- Use of variability models from expedition experiments and literature to generate variations in a virtual execution environment.
- Lesser cost for development, compared to hardware testbed.
- Faster Prototyping.
- Allows development of many test cases and tests that are more robust and with better coverage .

## Variability Model

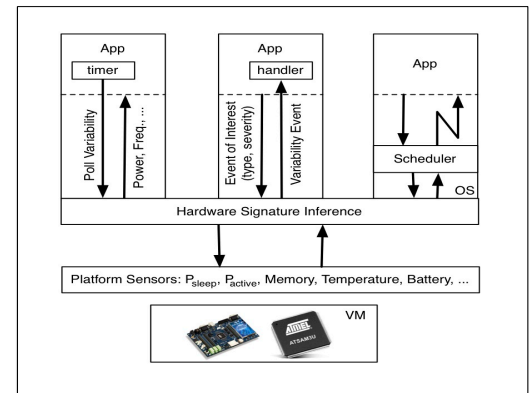
- **General Architecture:** The state of the virtual machine is used as input to variability models, which return variations that should be pushed into the virtual execution environment.
- **Power Model:** Determines expected power of the various components in the VM based on instance, temperature, state, and other parameters.
- **Frequency Model:** Adjusts the real time clock in the VM to account for variations in clock frequencies.
- **Error Model:** Encapsulates errors like bit flipping in registers and memory errors.

## VMM Development Plan

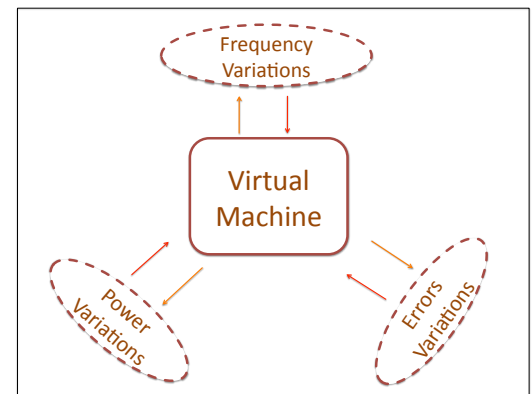
- QEMU as the virtual machine monitor: Open Source, Several architectures supported.
- VM state is used as input to the variability model.
- Virtual variability sensors provide variability information to guest OS and change state.

## Guest OS Development Plan

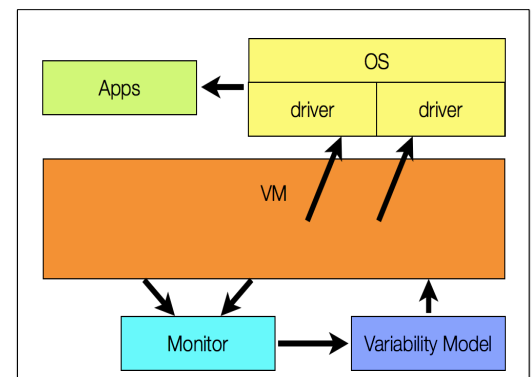
- Drivers probe variability information from virtual variability sensors
- Guest OS provides variability information to applications, or uses information to drive adaptation strategies.



Variability aware applications



Virtual Machine interacting with variability model



Overview of the Testbed

NSF Expedition in Computing, Variability-Aware Software for Efficient Computing with Nanoscale Devices <http://variability.org>

