

# OPTIMIZING THE ENSEMBLE

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# Motivation

- \* power is a limiting factor in data centers
- \* for a variety of reasons, data centers are over-provisioned (utilization < 100%)
- \* CPU power control advances mean other system components (including cooling) now dominate
- \* ideally we would like energy proportional systems:
  - o Watts at 0% utilization, Max Watts at 100% util.

# Experimental Setup

- \* blade enclosure with 16 blades and 10 fans
- \* each blade has 2 dual-core AMD CPUs and 16 GB of RAM
- \* system is not energy proportional (high idle power)
- \* Xen VMs + SAN (fibre channel to a consolidated storage server)
- \* workload: 'gamut' generates target load levels