

**Using Virtualization Technology**

- **Virtualization Technology in Recent Years**
  - 64bit-OS supports virtual machine monitor as default
    - Virtual PC on Windows (test compatibility with a 32-bit Windows XP)
    - KVM on Linux (e.g. RHEL 6, Scientific Linux 6, …)

- **Virtualization at Server-side**
  - Virtualization has changed server structures
  - Typical scheme before 2010
  - Host machine (high-spec computer)
  - Virtual machine (each corresponds to a Blade-type computer)

  - without Virtualization
  - Rule1: 1 computer = 1 service
    - Keep it simple for easy maintenance
  - Rule2: Many pieces of computers
    - Low/Middle-spec computer = many
    - Matches Blade-type server system

  - with Virtualization
  - Rule1: 1 virtual machine = 1 service
    - Keep it simple, as is before
  - Rule2: 1 host = many virtual machines
    - High-spec host machine > 1 virtual machine
    - One host has several virtual machines

**Virtualization Setup and Experience at J-PARC MR**

- **Virtual Servers for Control Services**
  - Basic control services are moved to virtual machines (2012)
    - dhcp, tftp, ldap, RDB (postgresql, mySQL)
    - cron, zlog (E-log), cacti, channel archive engines
    - Simulator machine for an old linux version

- **Virtual Environment Setups in 2013**
  - 2 groups – service servers and vioc servers
    - Each group consists of 3 host machines
    - Each group can be in operation with 2 hosts (in case one host dead)
    - In each group, distribute virtual machines to have a balance between 3 hosts

**Past Studies at J-PARC MR**

- **Virtual IOC (2011)**
  - EPICS IOC (I/O controller) running on a virtual machine
    - Compatible to an IOC running on a “real” VME-bus computer
    - For soft-records and simple network devices (no real I/O)
    - 2010: Feasibility studies using XEN around 2010
    - 2011: Operational version using KVM started

**System load of a typical host machine (ex. jkjblade3b)**

- UP Network traffic (1day)
- LFT CPU and Memory (10min)

**Experienced Troubles**

- **a) Sudden stop of a host machine**
  - 2013/2/09 20:19 a host, jkjblade3f, stopped
  - => vioc’s were moved to another host (3e) manually
  - 23:40 recovery procedure was completed
  - => soft_lockup (kernel parameter) - setup changed

  “known bug: virt. OS dies when cpu not assigned from a host

- **b) NFS of a virtual machine is unstable**
  - NFS mount of a virtual machine turns to read-only unexpectedly,
    after network maintenance and/or faults
  - => It happens only when a virtual machine is SL6.
  - Virtual machines for service servers were down-ported to SL5.4, to avoid this problem.

**References:**

- J-PARC control in general
  - J-PARC CONTROL TOWARD FUTURE RELIABLE OPERATION, ICALEPCS2011, N.Kamikubota et al.
  - EPICS IOC and Virtual IOC at J-PARC MR

- J-PARC control in general
  - EPICS IO CONTROLLERS AT J-PARC MR USING XEN, ICALEPCS2011, N.Kamikubota et al.

**Abstract**

At the J-PARC Main Ring (MR), we have used virtual-machine environment extensively in our accelerator control.
In the summer of 2012, we updated our operating system from Scientific Linux 4 (SL4) to Scientific Linux 6 (SL6).
In the SL6, KVM virtual-machine environment is supported as a default service.
This fact encouraged us to port basic control services (dhcp, tftp, ldap, rdb, achiver, etc.) to virtual machines.
Virtual machines are running on a few (not many) physical machines.
This scheme enables easier maintenance of control services than before.