Virtual Bridging considerations from Server perspective

Ilango Ganga
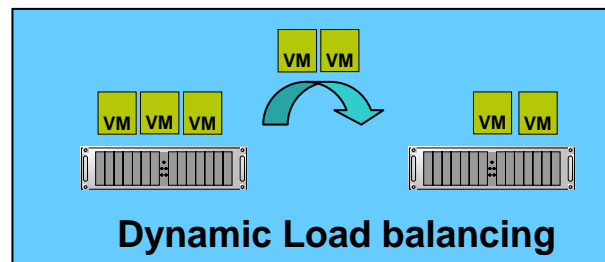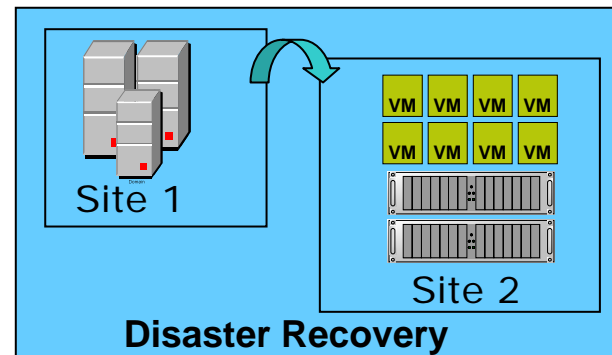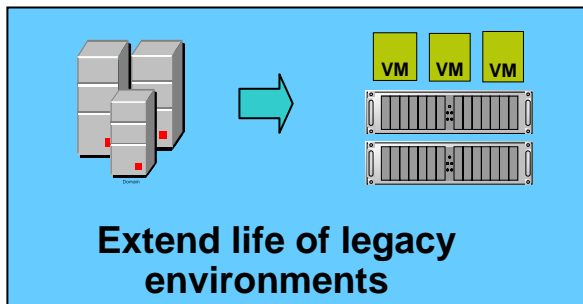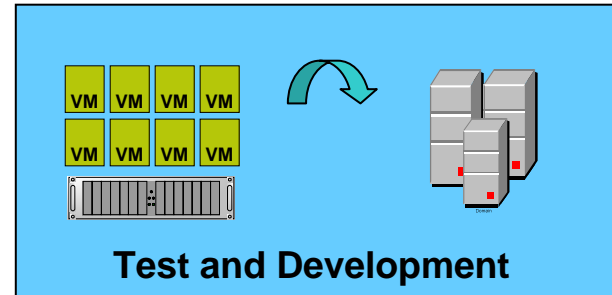
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Outline

- Server Virtualization concepts
- Virtual Ethernet Bridging evolution
  - Server based
    - Emulated Virtual Bridging in VMM/IOVM
    - Embedded Virtual Bridging in NIC
  - Network based
    - Virtual Bridging in Network Access Bridge
- Virtual bridge management
- Problem statement
- Considerations for IEEE Standardization
- Summary

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Server virtualization Usage Models

Server consolidation

Test and Development

Extend life of legacy environments

Disaster Recovery (Site 1, Site 2)

Dynamic Load balancing
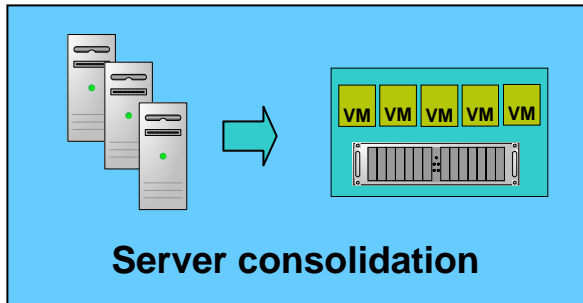
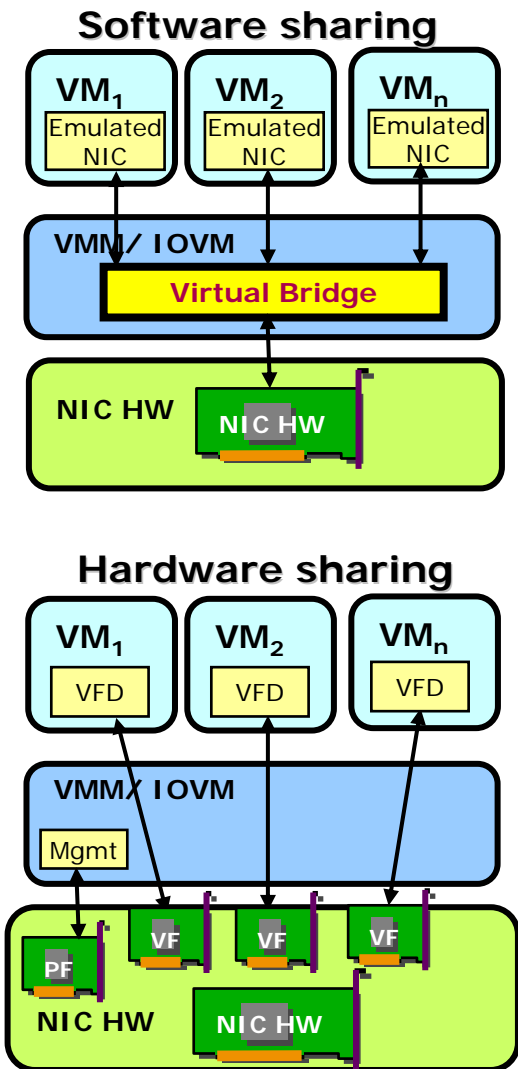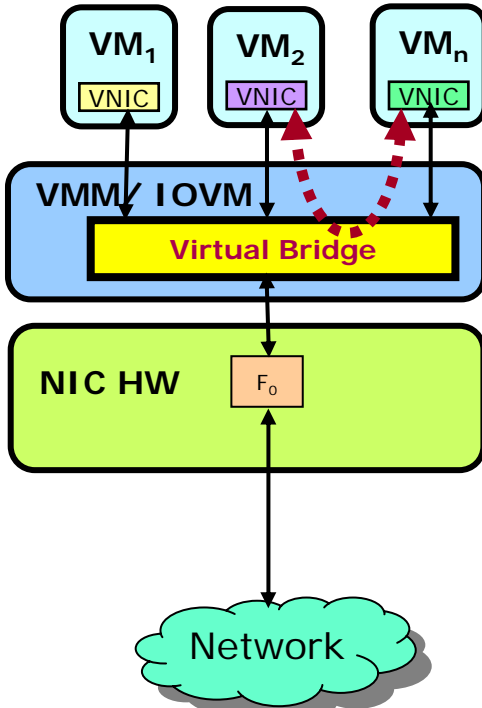# Server I/O Virtualization concepts

- Virtualization is the creation of a number of different execution environments on a single computer
  - The execution environments are called Virtual Machines (VM)
  - A VM has it's own operating system and resources
- A software layer that creates and maintains the Virtual Machine environment is called a Virtual Machine Monitor (VMM)
  - VMM provides capabilities such as NIC emulation, VM migration, and Virtual bridging functionality

- Virtual bridging allows software sharing of a hardware NIC between multiple VMs

- PCI-SIG SR-IOV provides a standard mechanism for hardware sharing of I/O devices

Software sharing

VM$_1$ VM$_2$ VM$_n$
Emulated NIC Emulated NIC Emulated NIC

VMM/ IOVM

Virtual Bridge

NIC HW

NIC HW

Hardware sharing

VM$_1$ VM$_2$ VM$_n$
VFD VFD VFD

VMM/ IOVM

Mgmt

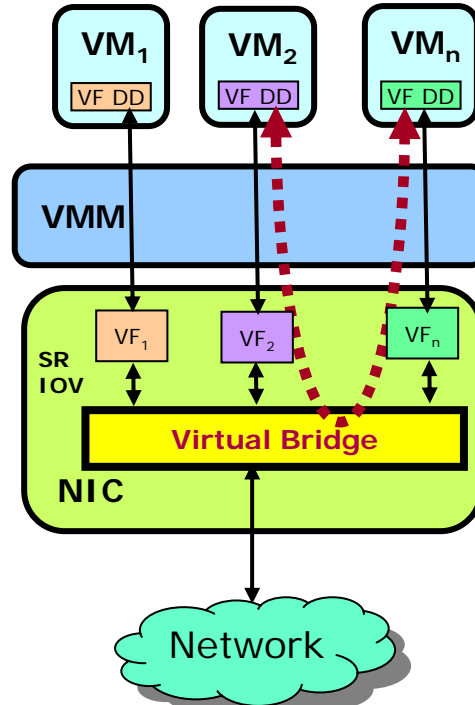VF VF VF

PF

NIC HW   NIC HW

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Virtual Bridge evolution
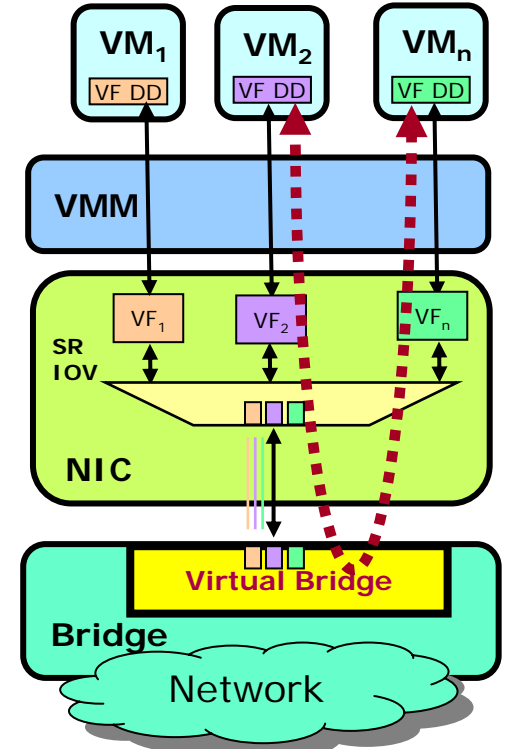

2008 **2009**

Virtual Bridging in VMM or IOVM

Virtual Bridging in NIC
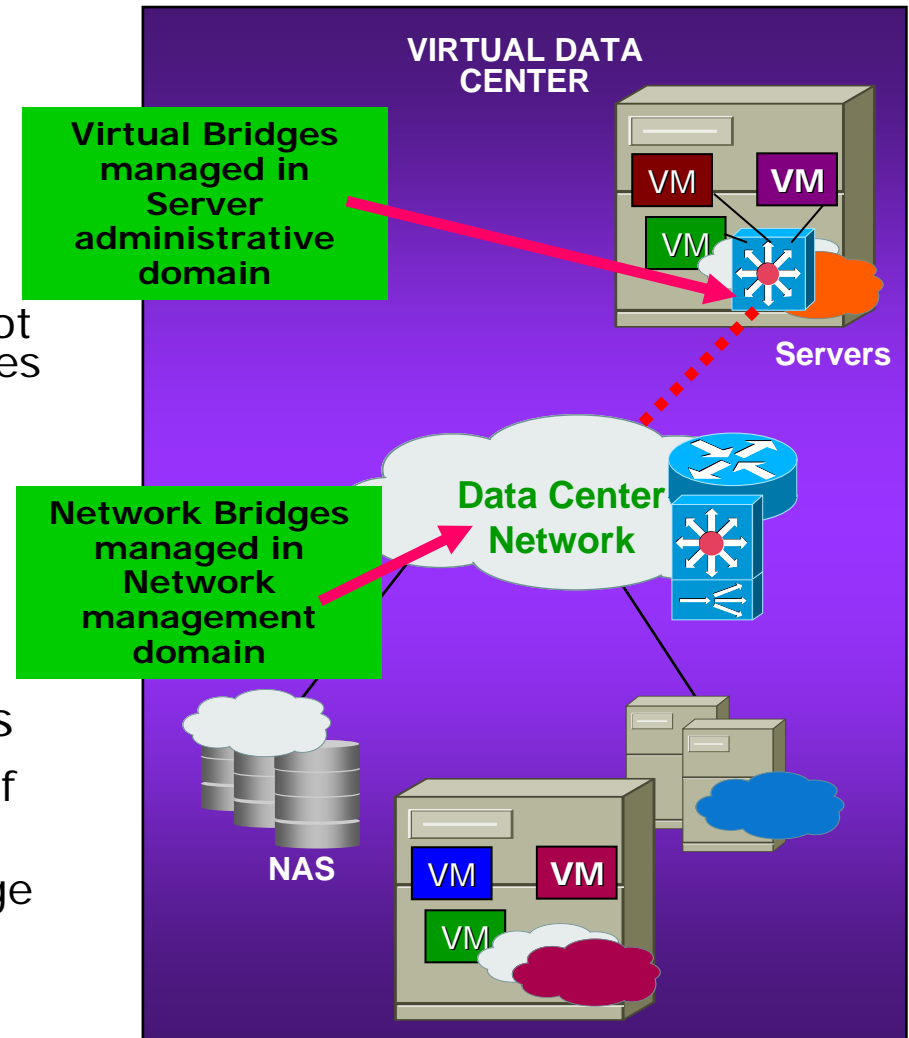
Virtual Bridging in Network Access Bridge

Note: See new-dcb-ganga-virtual-bridging-in-server-end-stations-0908.pdf for further details of each model

Three Virtual Bridging models expected to coexist

Virtual Bridge Management

- Virtual Bridges managed by Server Administrators

- Network bridges managed by Network Administrators
  - Data Center Network policies may not be uniformly applied to Virtual bridges

- Need for uniform application of Network and Security policies
  - For example access control

- Management information sharing between Network & Server domains
  - For example consistent application of policies incase of VM migration
  - Coexistence of different Virtual Bridge models

VIRTUAL DATA CENTER

Virtual Bridges managed in Server administrative domain

Servers

Network Bridges managed in Network management domain

Data Center Network

NAS

VM

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Problem statement

- Need for uniform application of network and security policies across virtual bridges in servers and network bridges
  - Option to manage virtual bridges as part of network infrastructure

- Two possible ways to solve it
  - Add features and management to server based virtual bridges
  - Move virtual bridging functions to external network access bridges (virtualization aware network bridges)

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Proposals for consideration to IEEE 802.1

- Several presentations made from Jul'08 to establish the need for virtual bridge standardization

- Multiple solutions proposed to IEEE 802.1 for network based virtual bridging

- Need to agree on the problem statement and high level goals (discussions in progress)
  - We need to move ahead

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Considerations for Virtualization aware network bridge Standardization ..(1)

- Multiple Virtual Bridging models expected to coexist in future
  - Solutions to comprehend interoperability with existing models
  - For example a server based virtual bridge might coexist with a network based virtual bridge
  - Multi-tiered deployments
- Compatibility with existing and future IEEE 802.1 bridging standards
  - Interoperability with emerging Data Center Bridging standards
  - Security functions such as port based access control (802.1X), and MACsec (802.1AE)
  - Consistent MIBs
- Backward compatibility with deployed network bridges and server based virtual bridges
- Server and network management domains to coexist
  - Some management functions to remain in server administrative domain
  - Comprehend sharing of management information between two administrative domains (Server management and Network Management)

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Considerations for Virtualization aware network bridge Standardization ..(2)

- Solutions to preserve existing functions such as VM migration
  - Provide bridge transparency for functions such as VM migration
  - Consistent virtual port properties associated with virtual NICs (or VFs)
  - Migration could happen across bridging models
- Virtualization of Server & Bridge ports
  - Need for consistent representation of "virtual ports" between Servers and network bridges
  - To work with HW based sharing (SR-IOV) & software sharing (Virtual NIC)
- Discovery and protocol for configuration and management
  - Protocol for configuration and management between servers and network access switches
- Preserve existing Virtualized Server functionality, for example:
  - "teaming" of multiple links
  - Allocation of bandwidth limits to virtual machines
  - A virtual machine could be a server or an appliance

Summary

Problem statement

- Need for uniform application of Network and Security policies across virtual bridges and network bridges

Standardization considerations

- Server based, and Network based Virtual bridging models expected to coexist and hence new models to interoperate with existing and deployed models

- Compatibility to existing Server virtualization functions such as VM migration across Virtual Bridge models

- Protocol for discovery and management

- Need for consistent exchange of management variables between server and network management

- Compatibility with existing and emerging IEEE 802.1 standards as applicable

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