Thoughts on Network Interface Virtualization

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Current state of evolution

Standalone Servers and Individual Adapters

Servers connect to bridges with an OS interface per port

Network policies applied to bridge ports which are equivalent to OS interfaces

Virtualized Servers and Consolidated IO

Virtual machines connect to bridges in hypervisors

SR-IOV adapters with integrated bridges

Multiple interfaces from multiple OSes per bridge port
Use Cases for Virtualized Adapters

Functionally consolidated IO devices
- Ethernet & Fibre Channel

Multiple interfaces for single OS servers
- Multiple LANs...
  - e0 – system management VLAN
  - e1 – DMZ VLAN
  - e2 – oracle traffic
  - e3 – all other traffic
- ... and SANs
  - SAN A and SAN B

Interfaces to virtualized servers
- Reduces overhead of data movement
Virtualization Results in Complex Bridge Hierarchy

The Hypervisor LAN Switches (soft bridges) are taking on increasingly complex functionality without the performance benefit of dedicated hardware:

- Scalability reduced
- Performance reduced
- Management complexity increased
Evolving Issues

- **Softbridge performance is not scalable**
  
  Especially when policy enforcement is involved
  
  Use of more than 10% of CPU by softbridge becomes a significant barrier to acceptance

- **When VM migration is common, uniform policy enforcement is important:**
  
  Across VMs to be same as across physical servers
  
  Embedded softbridges complicate policy enforcement and reduce scalability
A Possible Solution...

Delegate complex and performance critical data path functions into upstream networking devices

- Ensures feature consistency to all traffic
- Fewer bridges – simpler and more consistent management
- Better performance and scalability

NICs provide value add data movement and ULP features

- TCP offload, RDMA, FC/SCSI DDP, IPC queue pairs, etc

Hypervisors provide features based on visibility of host state
For Consideration…

- Introduce a new on-the-wire indication to identify a virtual adapter endpoint within a data frame
  
  For example, a new tag similar to QTag

  **Specify a the use of such an indication between NICs supporting virtualized interfaces and an upstream bridge**

  Enable upstream bridge to perform data plane functions such as:

  Filtering

  Access Control

  Security Functions

  **Define appropriate supporting control plane and management protocols**
Thank You!