Rocks based Virtual Cluster Management System: GriVon

Project Overview & VMware Roll

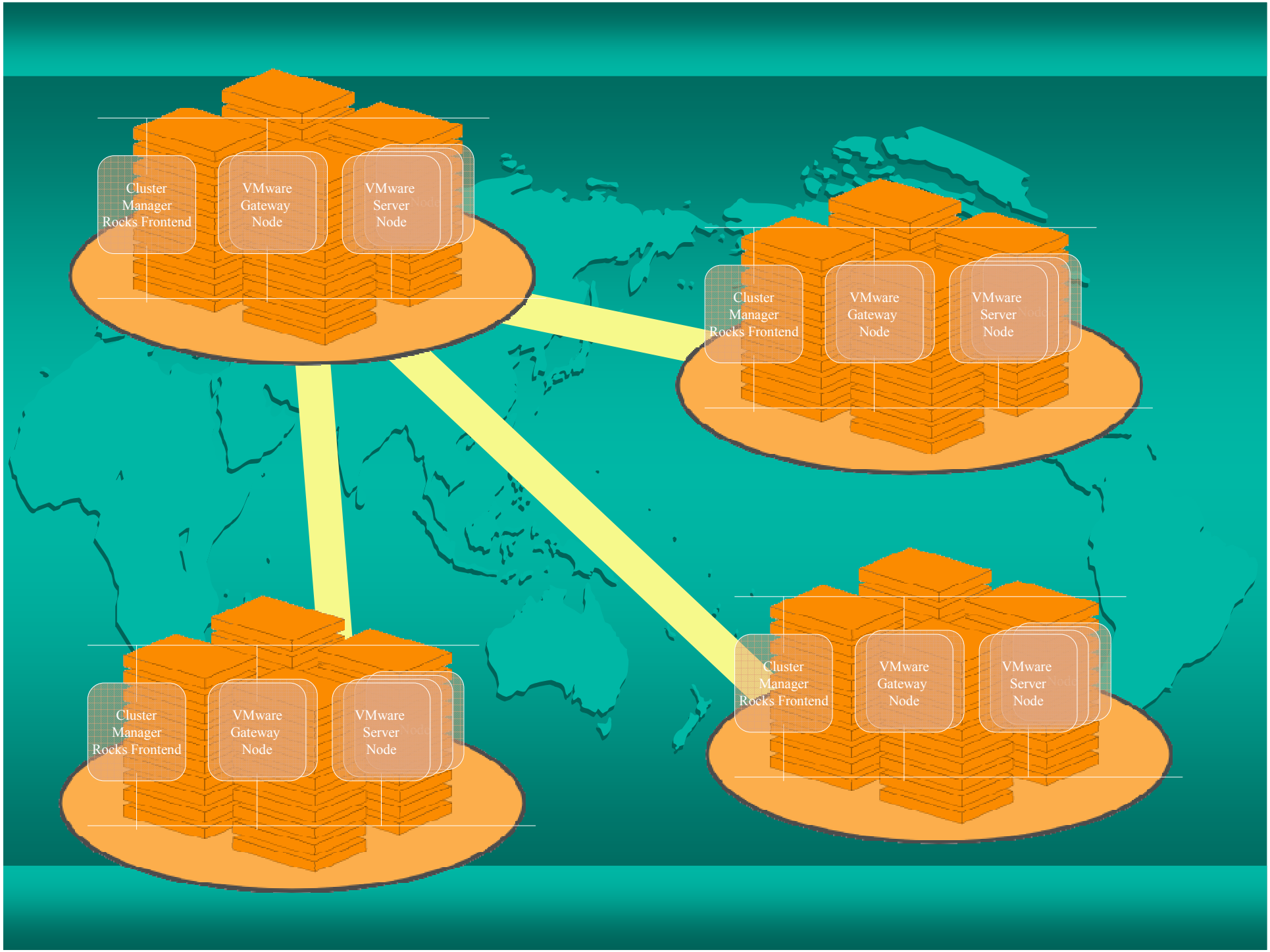
http://code.google.com/p/grivon/

Takahiro Hirofuchi
t.hirofuchi at aist.go.jp
National Institute of Advanced Industrial Science and Technology

OSGC2008

AIST Virtual Cluster Project
GriVon (Code name)

- Multi-site Virtual Cluster System
  - Easy-to-use distributed computing environment via single-system-image clusters
  - Maximum flexibility and scalability for cluster management


Cluster
Manager
Rocks Frontend
VMware
Gateway
Node
VMware
Server
Node
Cluster
Manager
Rocks Frontend
VMware
Gateway
Node
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Server
Node
Cluster
Manager
Rocks Frontend
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Cluster
Manager
Rocks Frontend
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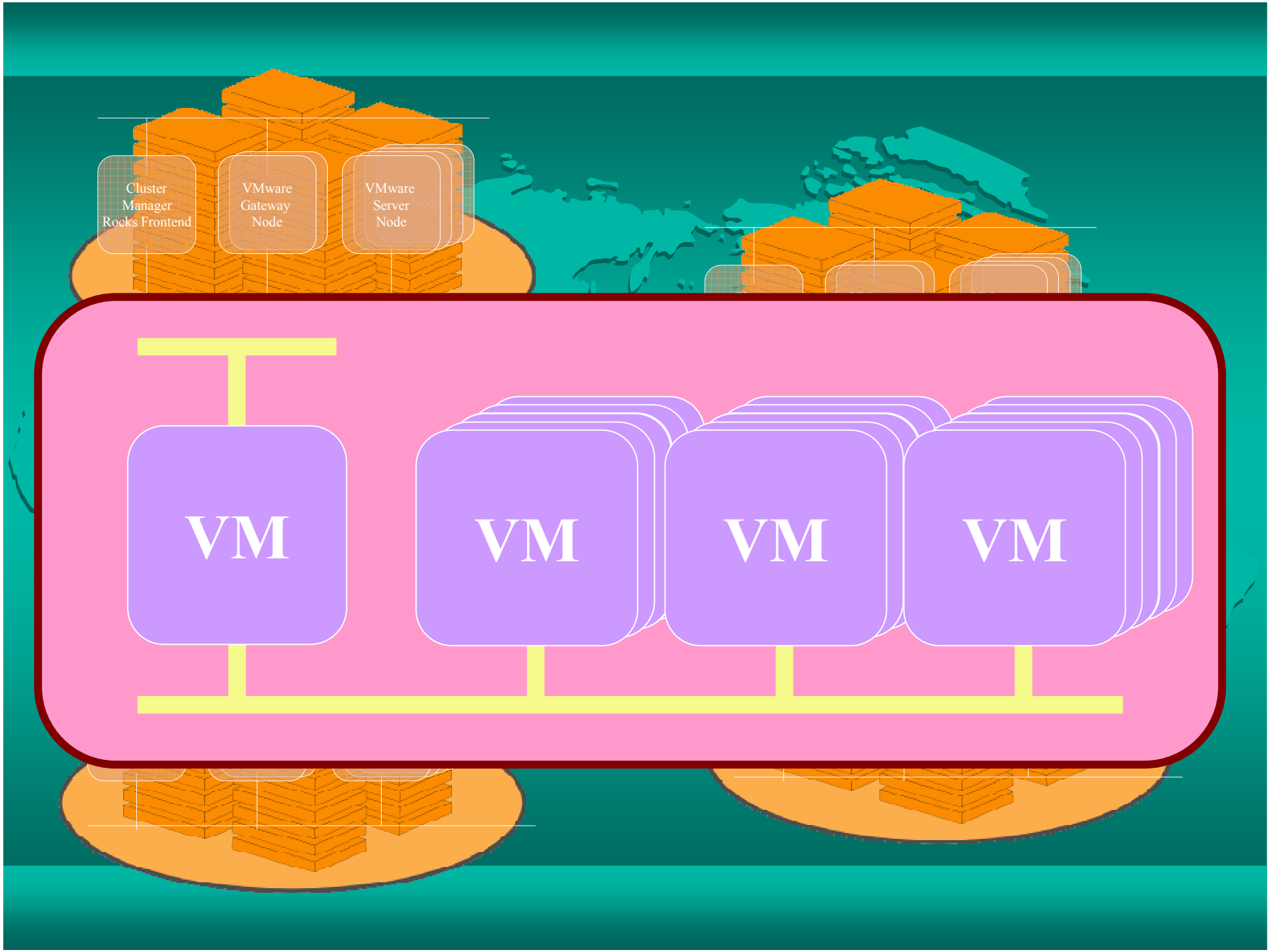
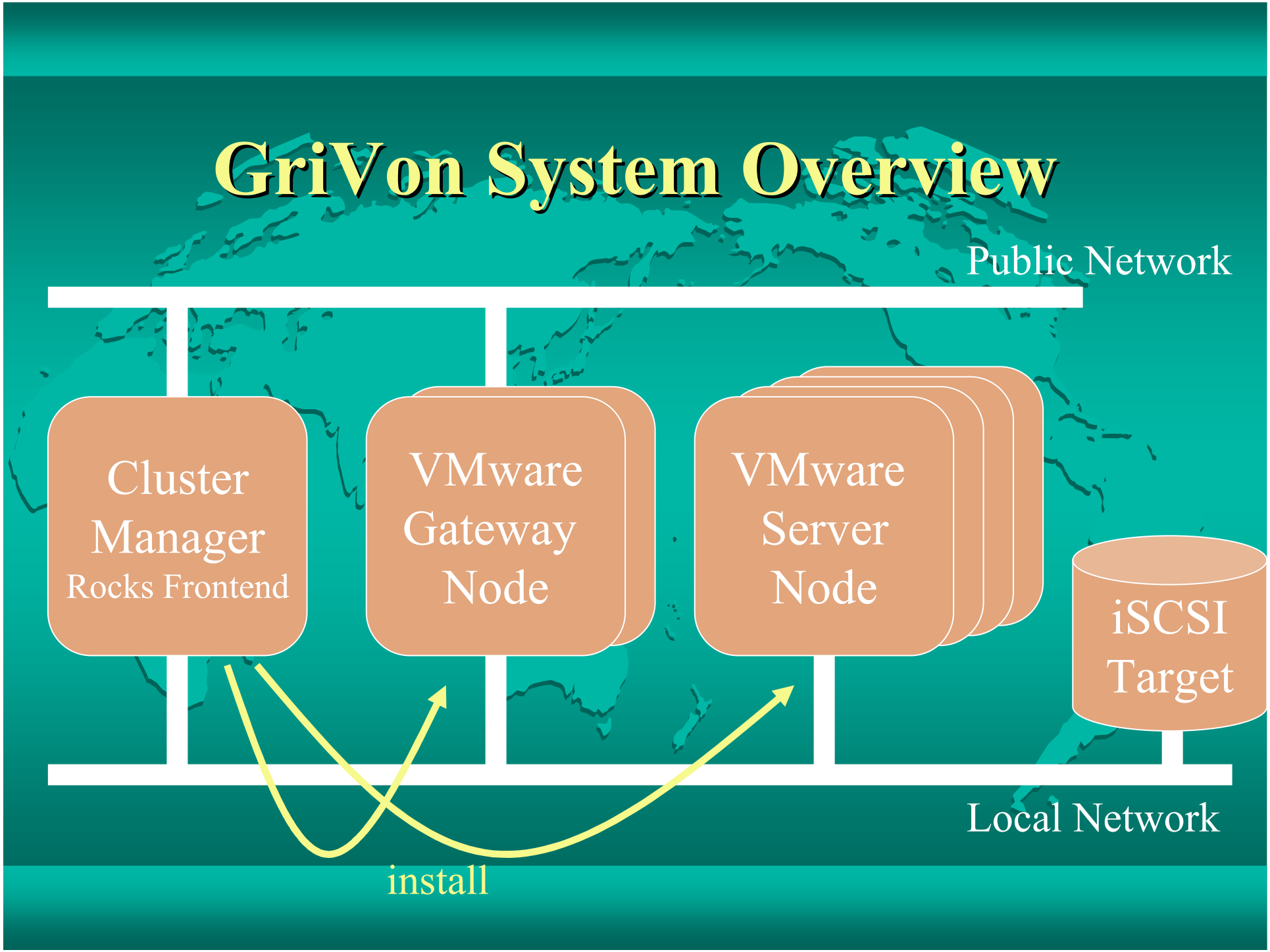
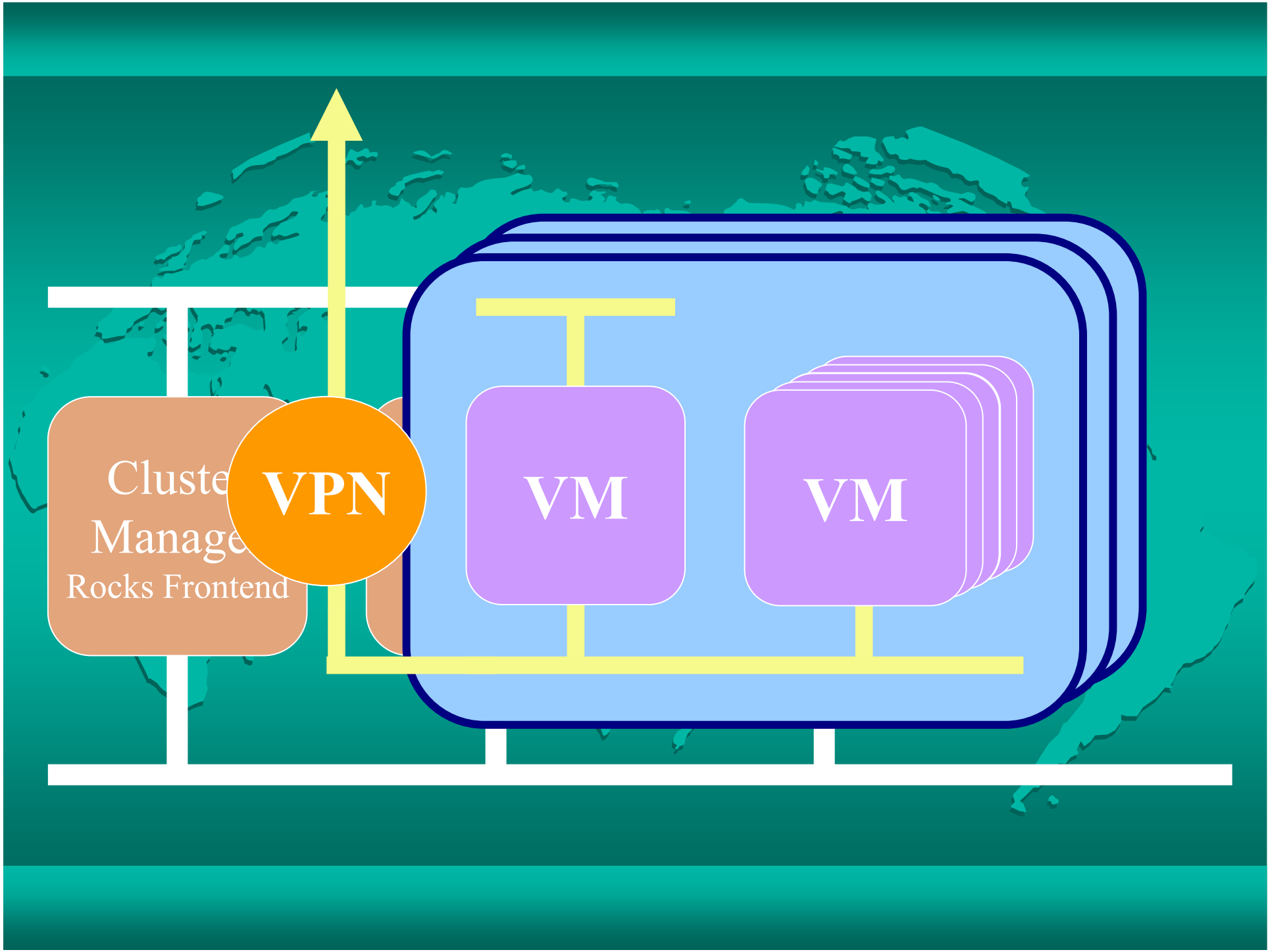
Gateway
Node
VMware
Server
Node


Cluster
Manager
Rocks Frontend
VMware
Gateway
Node
VMware
Server
Node
VM
VM
VM
VM

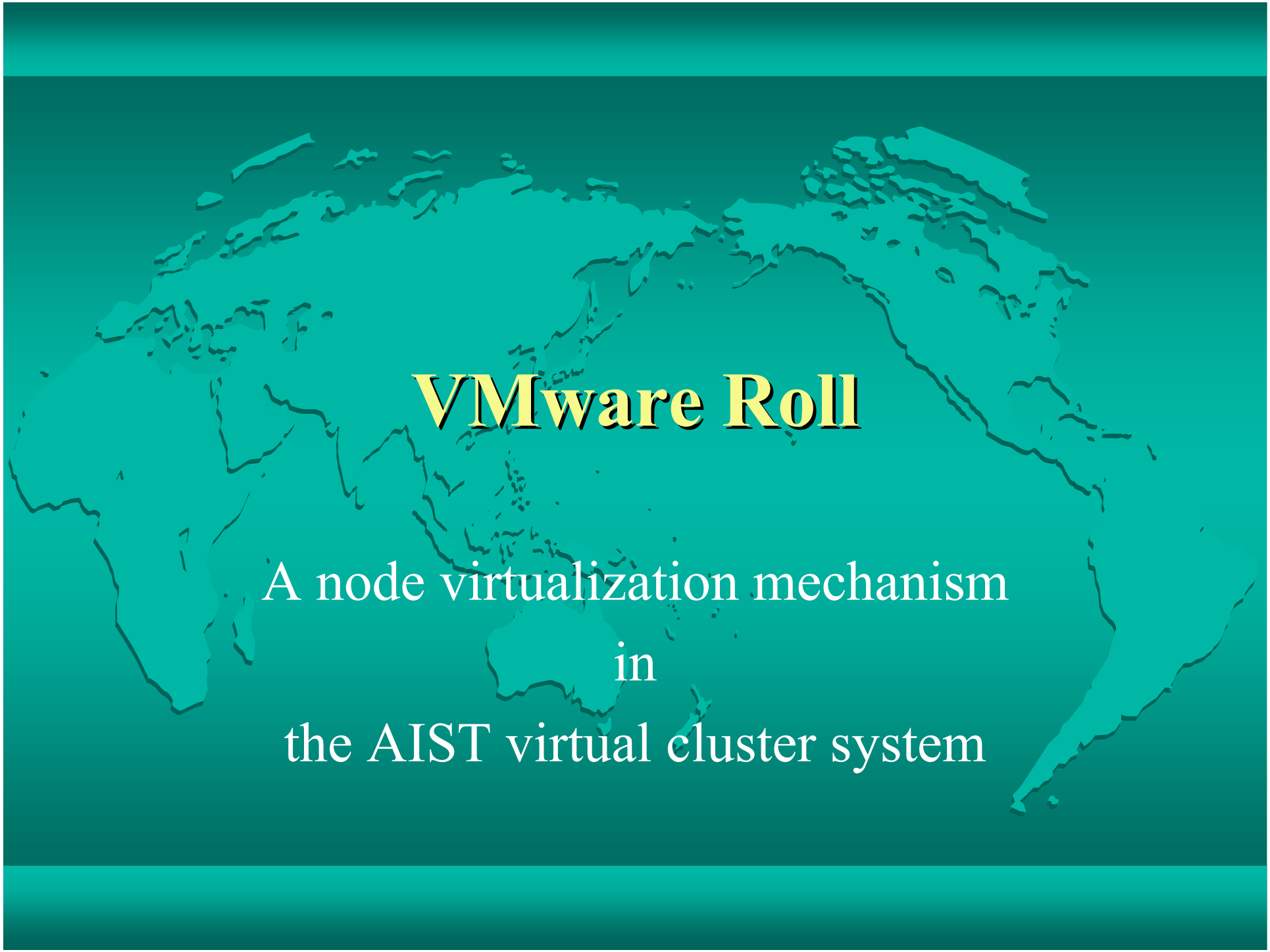
GriVon System Overview




Cluste
Manage
Rocks Frontend
VPN
VM
VM

Project Status

- A prototype system works for demos.
  - SC2007
  - waku-waku Akihabara Conference Demo 2008
- Todo (a lot, but now)
  - improve implementation quality
  - release code
  - get users


VMware Roll
A node virtualization mechanism
in
the AIST virtual cluster system

Design Criteria

- License Management
  - A VMware Server instance needs a unique serial key
  - Serial Key Pool
  - Distributed as a Roll source
- Multi-Frontend
  - A virtual frontend for each virtual cluster
  - A (virtual) frontend may exist in a remote cluster.
- Maximum Flexibility for Virtual Networking
  - Multiple virtual network interfaces for a virtual node
  - A VLAN is dynamically assigned for a new virtual cluster
  - No reinstallation for new settings

Rocks Commands

add host vmware
remove host vmware

create host vmware
destroy host vmware

add host vlan
remove host vlan
list host vlan
config host vlan

add host vmware interface
remove host vmware interface
list host vmware interface

add host vmwarenet
remove host vmwarenet
list host vmwarenet
config host vmwarenet

add vmwarekey
set host vmwarekey
remove host vmwarekey
list vmwarekey
config host vmwarekey

start host vmware
stop host vmware
reboot host vmware
list host vmware

suspend host vmware
resume host vmware

plugins for removing host

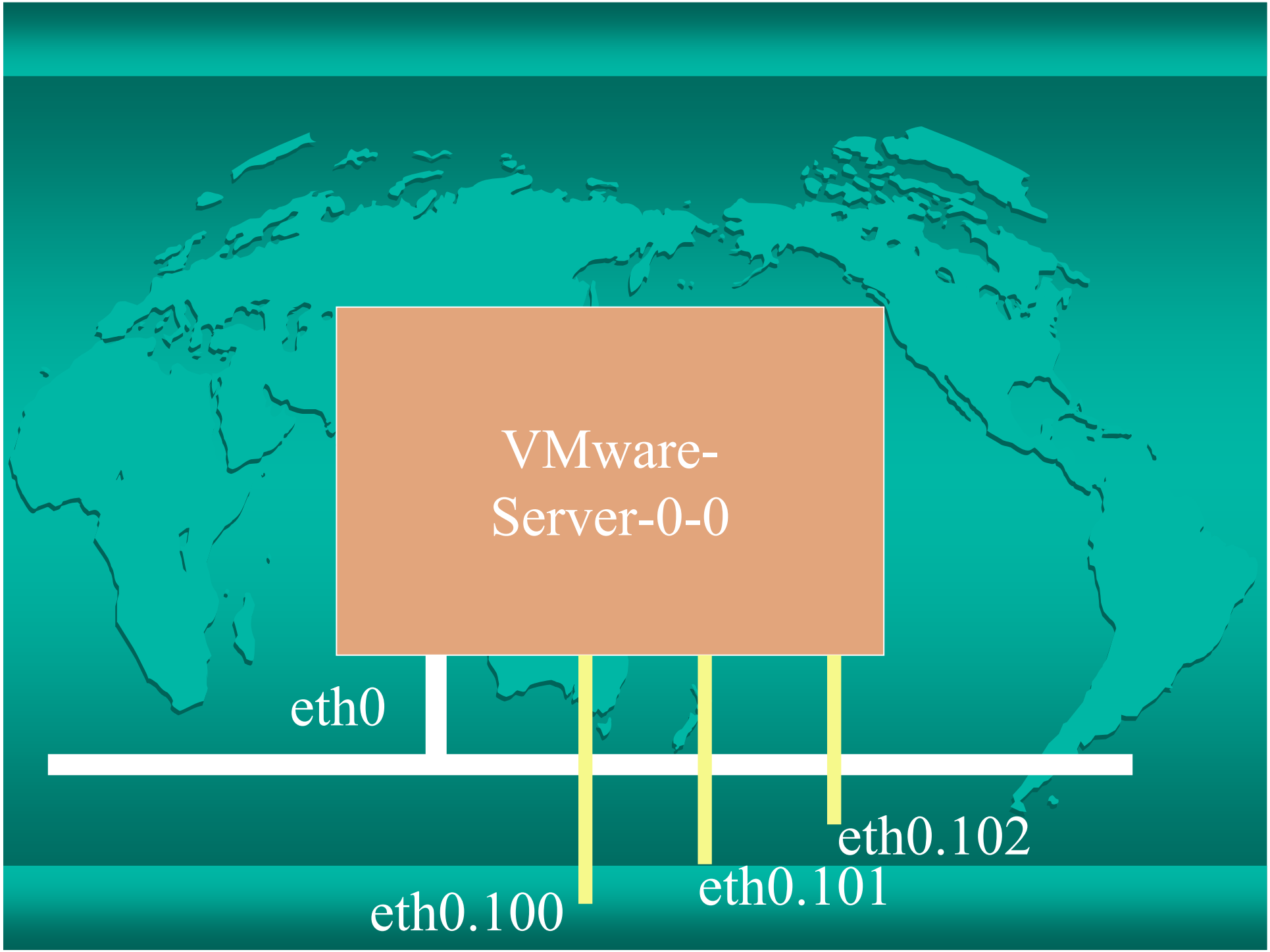
Database Tables

- vmware_nodes
  - Remove Node Colum
    - The node inside a VM may be registered to another frontend.
- vmware_macs
  - add IfIndex Colum
    - its interface number inside a VM (e.g., eth0, eth1 …)
- vmware_disks
- vmware_vmnets
- vmware_vmnet_members
- vmware_serials

Add VLAN interfaces

```
vizzy:# rocks add host vlan vmware-server-0-0 viface=eth0.100
Added VLAN with VID == 100 to IF -:eth0:-

vizzy:# rocks add host vlan vmware-server-0-0 viface=eth0.101
Added VLAN with VID == 101 to IF -:eth0:-

vizzy:# rocks add host vlan vmware-server-0-0 viface=eth0.102
Added VLAN with VID == 102 to IF -:eth0:-

* The added VLAN interfaces are now active.
The next reinstallation also sets the interfaces automatically.
```

```
vizzy:# rocks list host interface vmware-server-0-0
SUBNET  IFACE    MAC               IP             NETMASK   GATEWAY MODULE NAME
private eth0     00:30:1b:b3:24:72 10.255.255.254 255.0.0.0 ------- tg3    vmware-server-0-0
------- eth0.100 ----------------- -------------- --------- ------- ------ -----------------
------- eth0.101 ----------------- -------------- --------- ------- ------ -----------------
------- eth0.102 ----------------- -------------- --------- ------- ------ -----------------
```

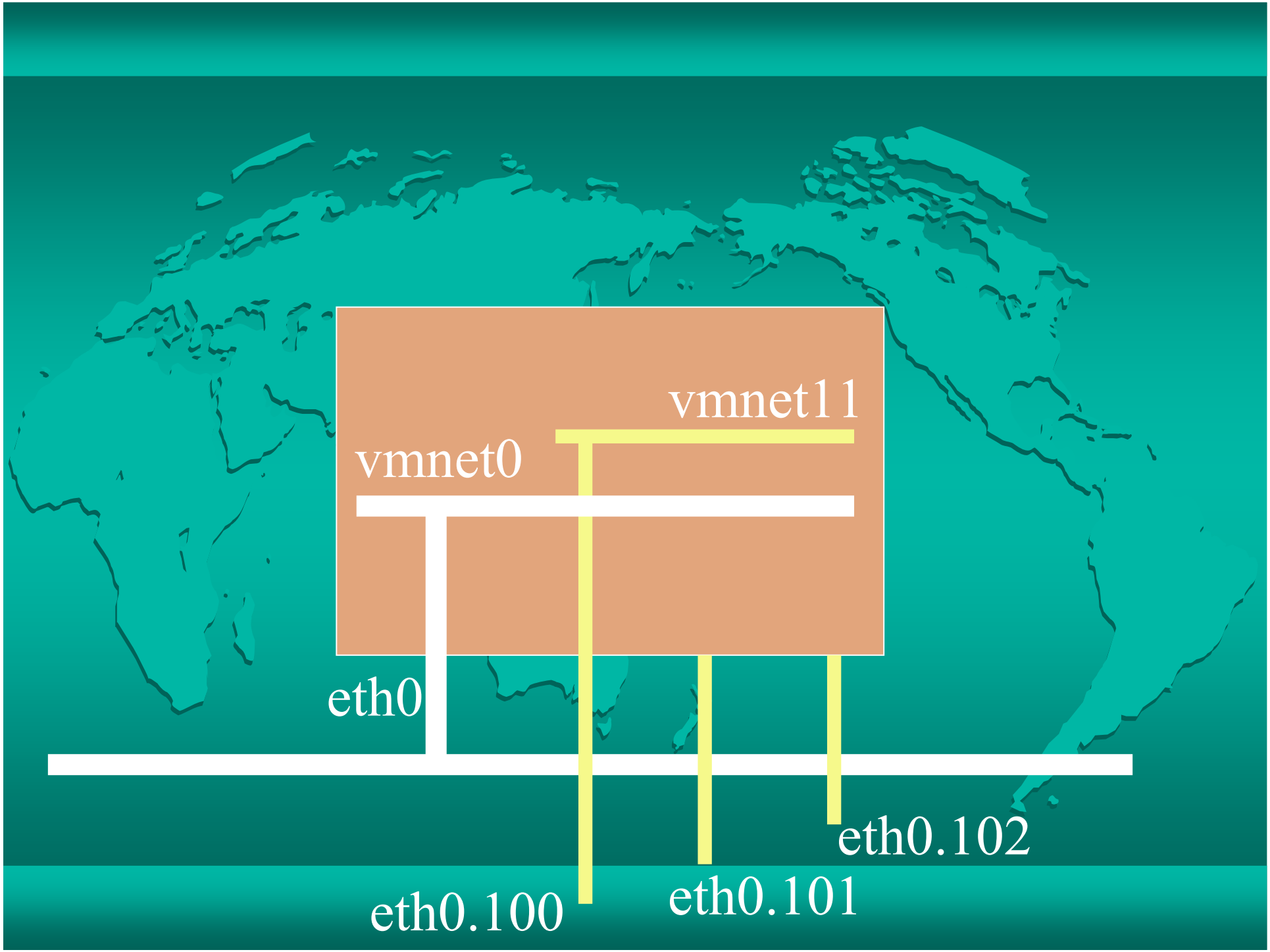

VMware-
Server-0-0
eth0
eth0.100
eth0.101
eth0.102

Add VMware Network Settings

```
vizzy:# rocks add host vmwarenet vmware-server-0-0
iface=eth0 type=bridge

vizzy:# rocks add host vmwarenet vmware-server-0-0
iface=eth0.100 type=bridge

vizzy:# rocks list host vmwarenet
VMNET   TYPE   DEVICE   HOSTADDR NETMASK
vmnet0  bridge eth0       -------- -------
vmnet11 bridge eth0.100 -------- -------
```

* The added VMware network settings are now active.
The next reinstallation also sets the VMware network settings automatically.

* It supports "bridge", "NAT", and "host-only" network settings for each physical network interface. "bridge" is already implemented.


vmnet11
vmnet0
eth0
eth0.102
eth0.100
eth0.101

Add Virtual Machines

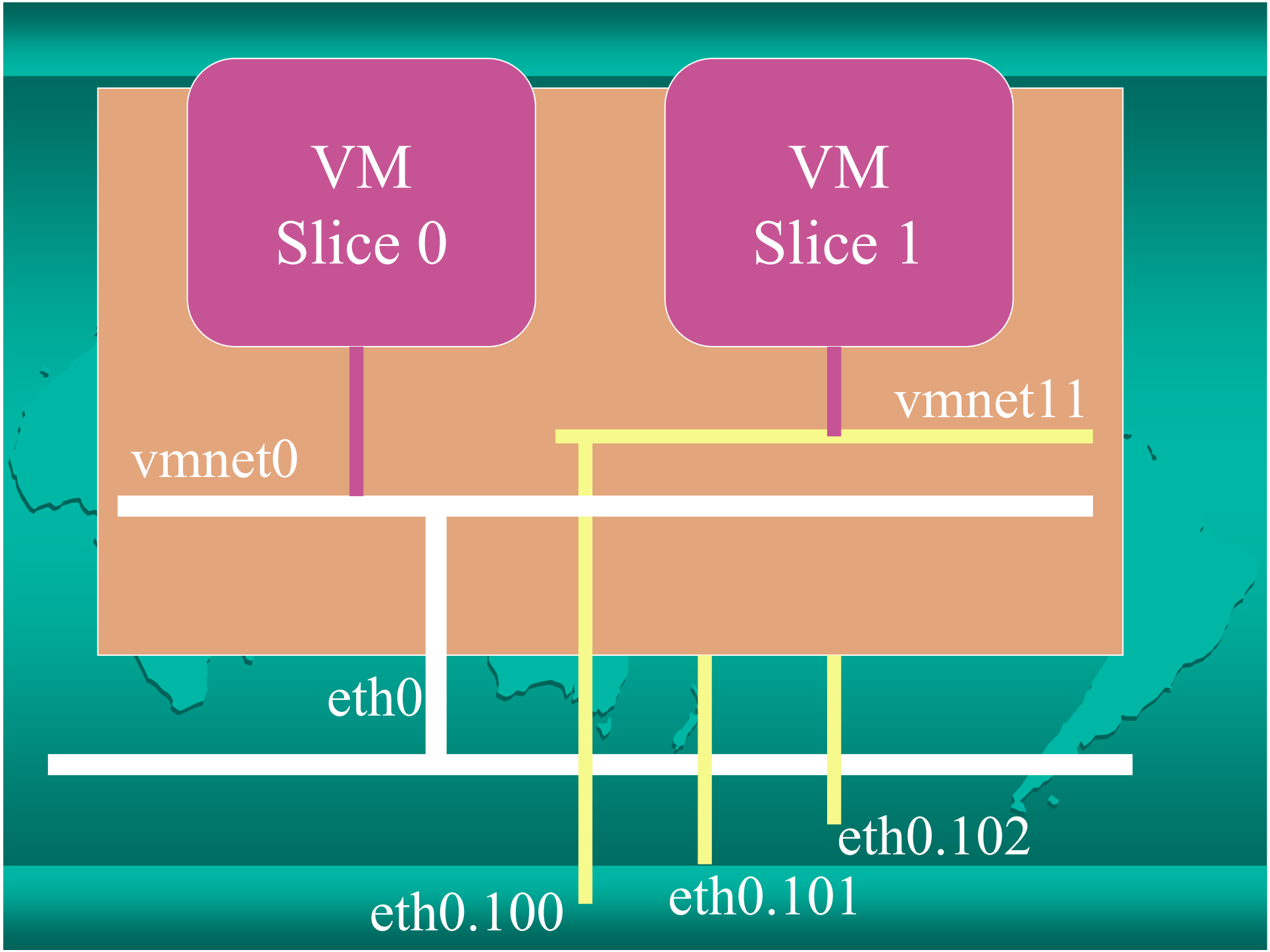
```
vizzy:# rocks add host vmware vmware-server-0-0 cpus=1
mem=768 disksize=20
added VM on node "vmware-server-0-0" slice "0“

vizzy:# rocks add host vmware vmware-server-0-0 cpus=1
mem=768 disksize=20
added VM on node "vmware-server-0-0" slice "1“
```

* These commands only add VM entries into the DB.

Add VMs' Network Interfaces

```
vizzy:# rocks add host vmware interface vmware-server-0-0
slice=0 vmnet=vmnet0
adding vmware interface to 1 slices
add 00:50:56:00:00:01 to slice0@vmware-server-0-0
(vmnodeid 22) as ifindex 0; bound to vmnet0

vizzy:# rocks add host vmware interface vmware-server-0-0
slice=1 vmnet=vmnet11
adding vmware interface to 1 slices
add 00:50:56:00:00:02 to slice1@vmware-server-0-0
(vmnodeid 23) as ifindex 0; bound to vmnet11
```

* These commands only add VM entries into the DB.

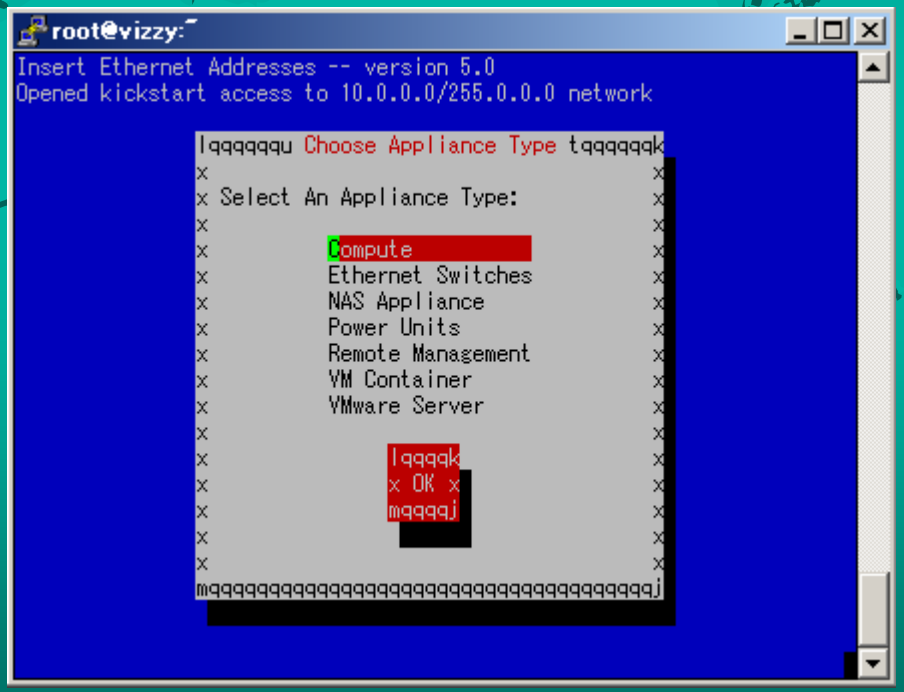

VM
Slice 0
VM
Slice 1
vmnet11
vmnet0
eth0
eth0.102
eth0.101
eth0.100

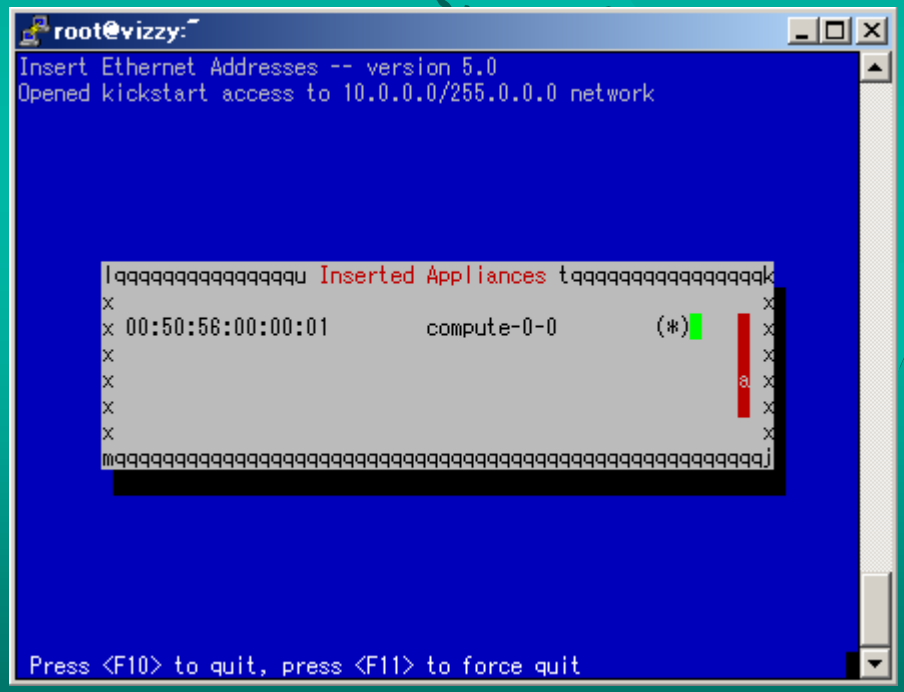
Create & Start VM

```
vizzy:# rocks create host vmware vmware-server-0-0 slice=0

vizzy:# rocks start host vmware vmware-server-0-0 slice=0

vizzy:# rocks list host vmware
VMNODE                        #CPU MEM  #NIC #DISKS STATE
slice0@vmware-server-0-0: 1    768  1    1      on
slice1@vmware-server-0-0: 1    768  1    1      none

vizzy:# vmware-server-console -h vmware-server-0-0 &
vizzy:# vncviewer vmware-server-0-0:5900 &

* VNC port number is "5900 + slice".
```

insert-ethers for VM nodes

In another console, do “insert-ethers”.
And, “rocks reboot host vmwre vmware-server-0-0.





Feature Summary

- License management
- Minimum (but sufficient?) VLAN support
- Flexible virtual networking mechanism
  - Multiple interfaces
  - No reinstallation
- Everything is done in the Rocks framework!

Future Work

- Xen
  - "rocks commands" and database tables are similar, but not completely same.
- Auto frontend installation
- Multi-site support
- iSCSI support
- Virtual cluster reservation GUI
  - The prototypes of the above 4 features are already implemented in AIST

Conclusion

- GriVon
  - Advanced virtual cluster system for large-scale computer centers and datacenters
  - Multi-site virtual cluster support
- VMware Roll
  - Very stable full virtualization
  - Flexible virtual network settings for GriVon
  - Available at http://code.google.com/p/grivon/

Appendix

VMware Server EULA

9.1(b)

use the Software solely for your own internal information processing services and computing needs in connection with permitted uses of the Software, including the hosting of computer application-based services from a Virtual Machine and provision of such services via an internal or external network, provided such services may not consist of services to a third party that provide primarily computing or processing power (such as *utility computing or grid computing*) or any computer application-based service that is traded, rented, leased or sold on a Virtual Machine basis;

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Drivers & Tools
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Version: 1.0.4 | 9/18/07 | Build: 56528
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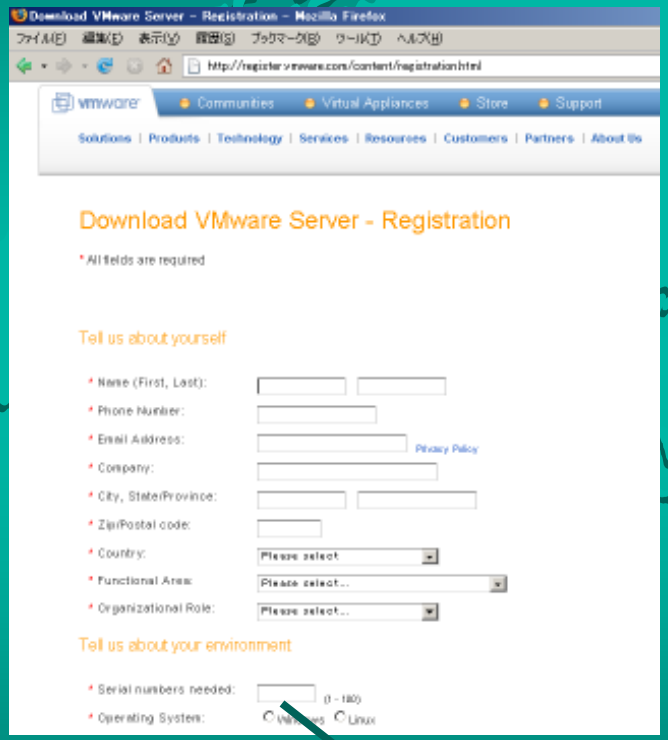

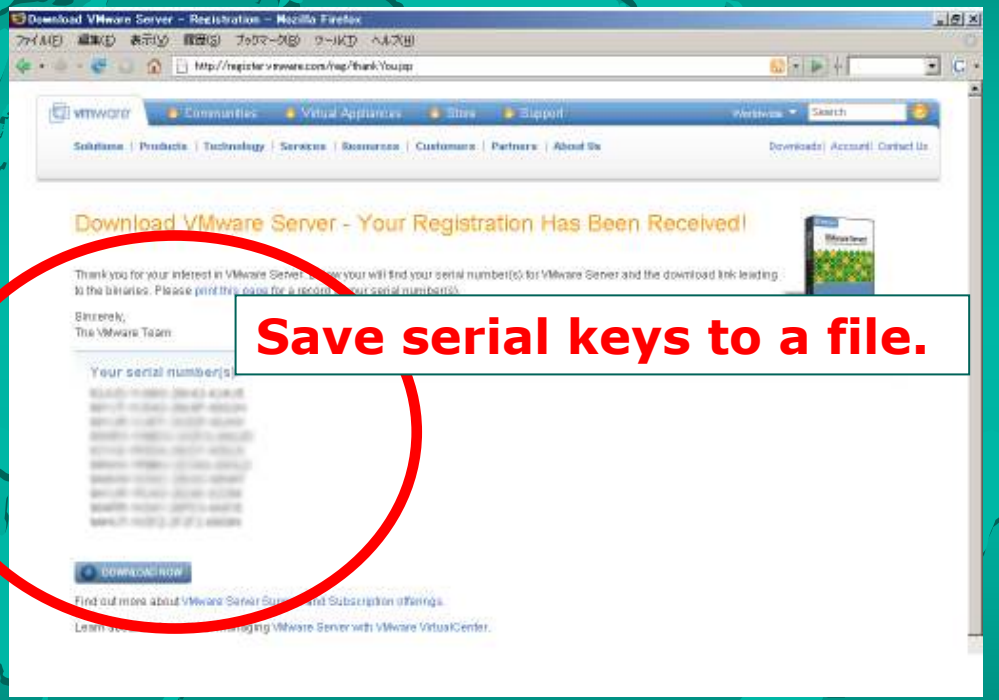

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Thank you for your interest in VMware Server. Below your will find your serial number(s) for VMware Server and the download link leading to the binaries. Please print this page for a record of your serial number(s).

Sincerely,
The VMware Team

Your serial number(s):

[redacted]

Save serial keys to a file.

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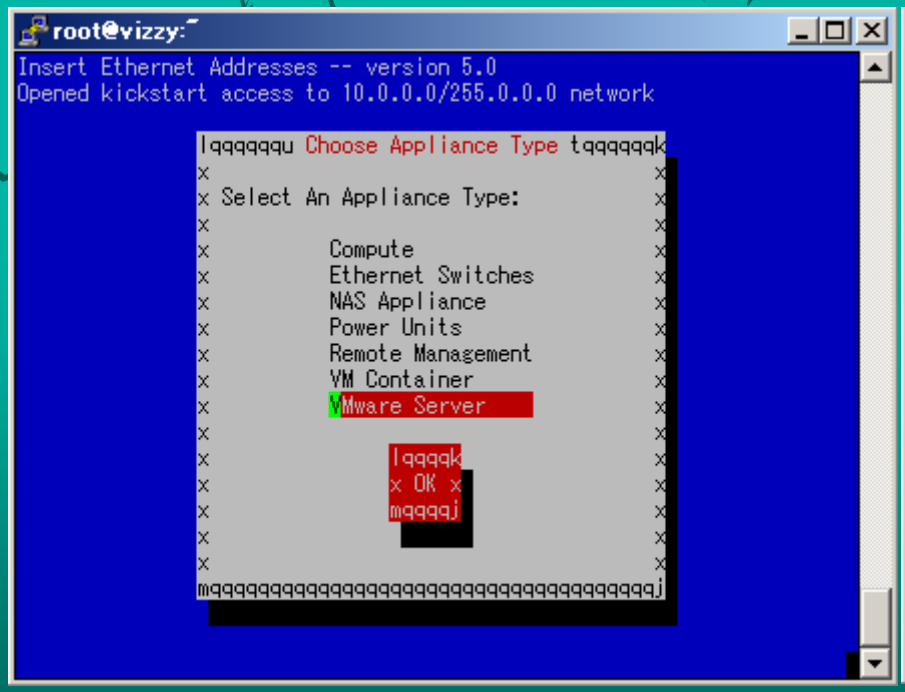
Learn about the benefits of managing VMware Server with VMware VirtualCenter.

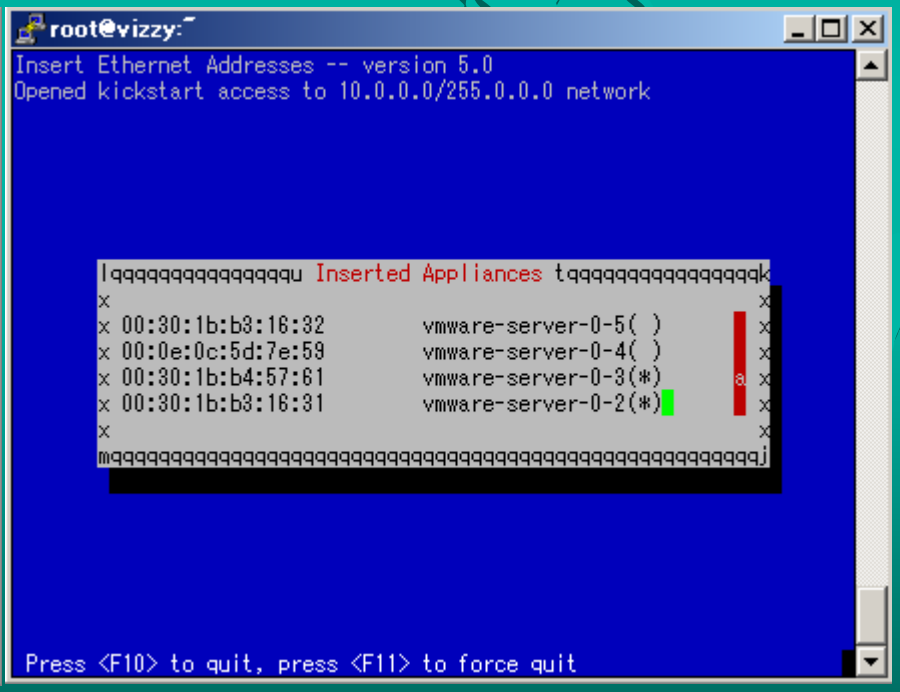
Installation

- Download a VMware Roll source.
  - Extract it into somewhere
- Download VMware binary RPMs.
  - VMware-server-${ver}.rpm
  - VMware-server-console-${ver}.rpm
  - Copy them into ${vmware-roll-root}/RPMS/i386/
- Do “make roll”
- Install the built roll
  - “rocks add roll VMware-5.0-0.i386.disk1.iso”
  - “rocks enable roll vmware”
  - “cd /home/install; rocks-dist dist”

Add VMware-Server Nodes

- Do “insert-ethers”





Add Serials to Key Pool

```
vizzy:# rocks add vmwarekey $(cat vmware-serials.txt)
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
added “XXXXX-XXXXX-XXXXX-XXXXX" to serial number pool
serial numbers: total 10, used 0
```

Assign Serial Keys to VMware Server Nodes

```
vizzy:# rocks set host vmwarekey vmware-server-0-0

vizzy:# rocks list vmwarekey
SERIAL                      HOST
XXXXX-XXXXX-XXXXX-XXXXX: vmware-server-0-0
XXXXX-XXXXX-XXXXX-XXXXX: ------------------
XXXXX-XXXXX-XXXXX-XXXXX: ------------------
XXXXX-XXXXX-XXXXX-XXXXX: ------------------
XXXXX-XXXXX-XXXXX-XXXXX: ------------------
```

* The assigned serial key is now active.
The next reinstallation also sets the serial key to the host automatically.
* If arg. is “vmware-server”, assign all nodes at once.

Create VMs in Nodes

```
vizzy:# rocks create host vmware vmware-server-0-0 slice=0
# creating slice0@vmware-server-0-0
ssh -x vmware-server-0-0 vmware-vdiskmanager -c -a
lsilogic -s 20Gb -t 0
/state/partition1/vmware/disks/0.scsi0:0.vmdk
Using log file /tmp/vmware-root/vdiskmanager.log
Creating a monolithic growable disk
'/state/partition1/vmware/disks/0.scsi0:0.vmdk'
Virtual disk creation successful.
ssh -x vmware-server-0-0 vmware-cmd -s register
/state/partition1/vmware/0/0.vmx
register(/state/partition1/vmware/0/0.vmx) = 1
```

Start VMs in Nodes

```
vizzy:# rocks start host vmware vmware-server-0-0 slice=0
ssh -x vmware-server-0-0 vmware-cmd
/state/partition1/vmware/0/0.vmx start
start() = 1


vizzy:# rocks list host vmware
VMNODE                          #CPU MEM  #NIC #DISKS STATE
slice0@vmware-server-0-0: 1    768  1    1      on
slice1@vmware-server-0-0: 1    768  1    1      none

vizzy:# vmware-server-console -h vmware-server-0-0 &
vizzy:# vncviewer vmware-server-0-0:5900 &
```

* VNC port number is "5900 + slice".