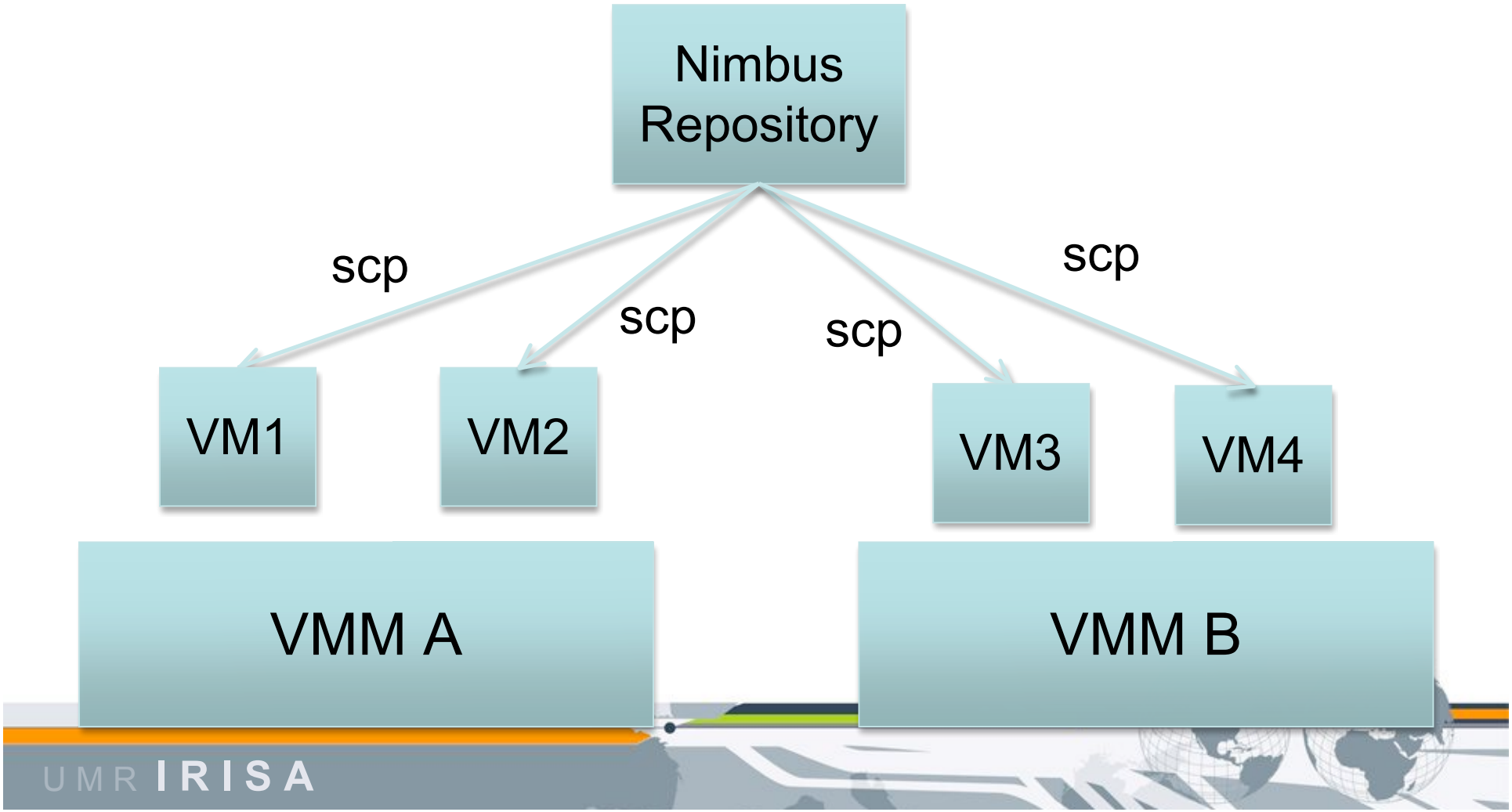
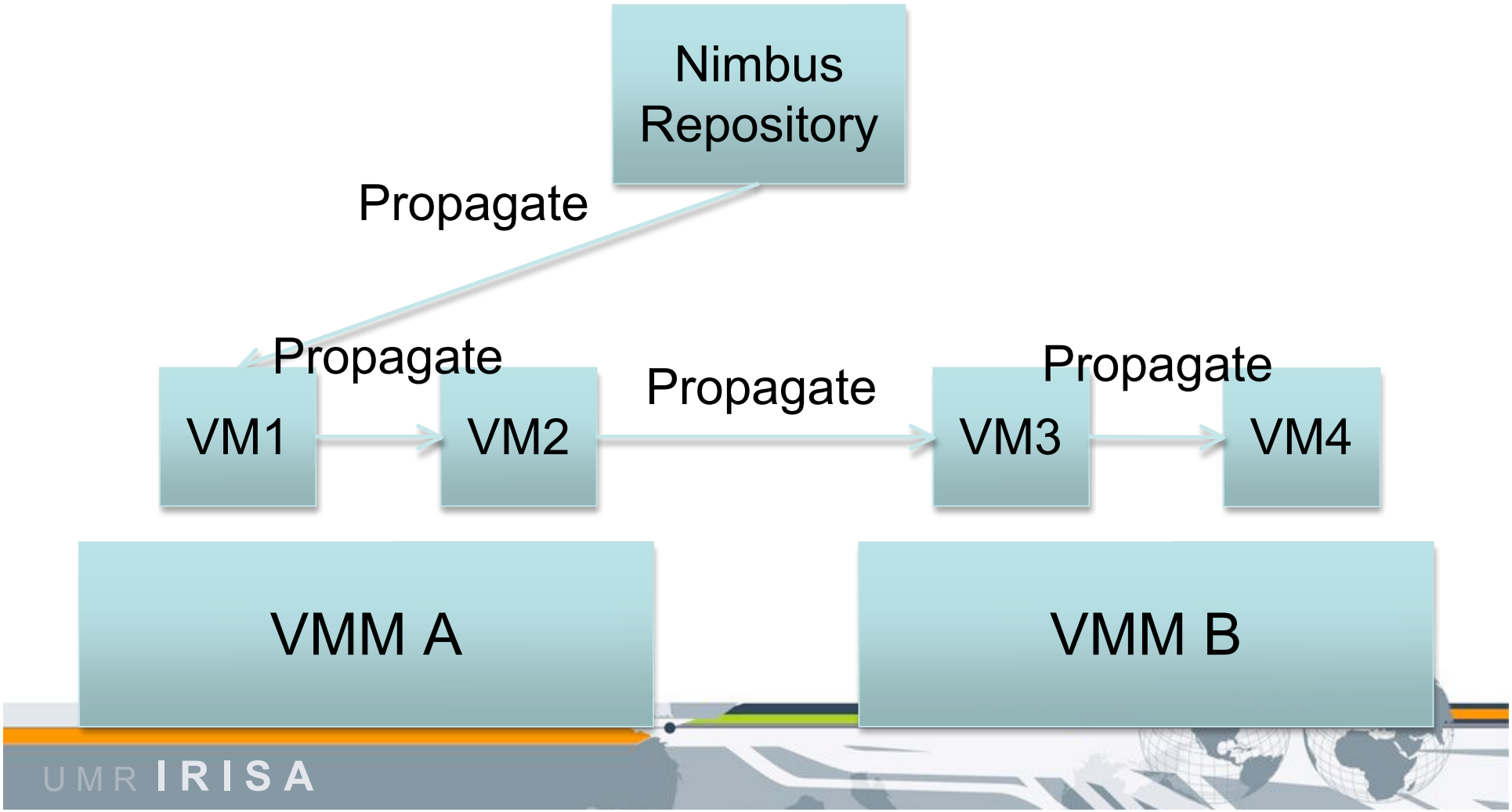
Fast Virtual Cluster Creation (1/3)

- Standard Nimbus propagation: scp



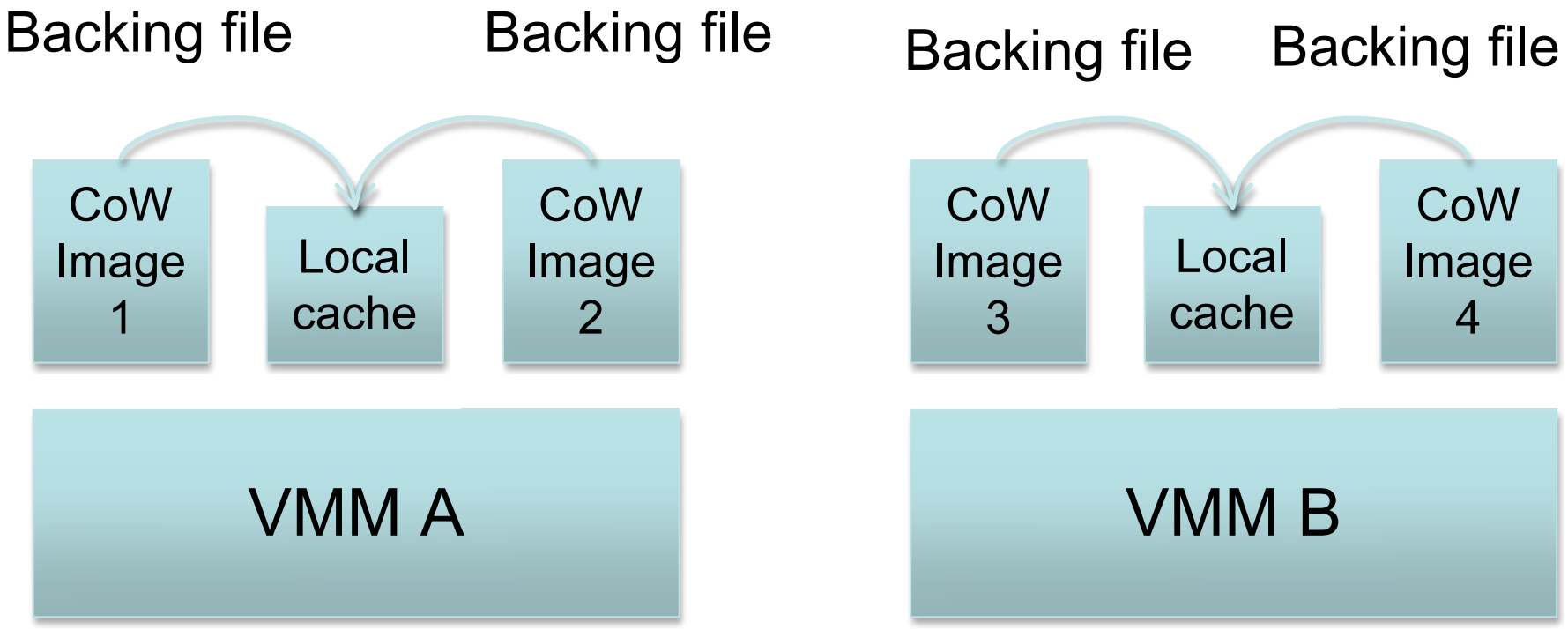
Fast Virtual Cluster Creation (2/3)

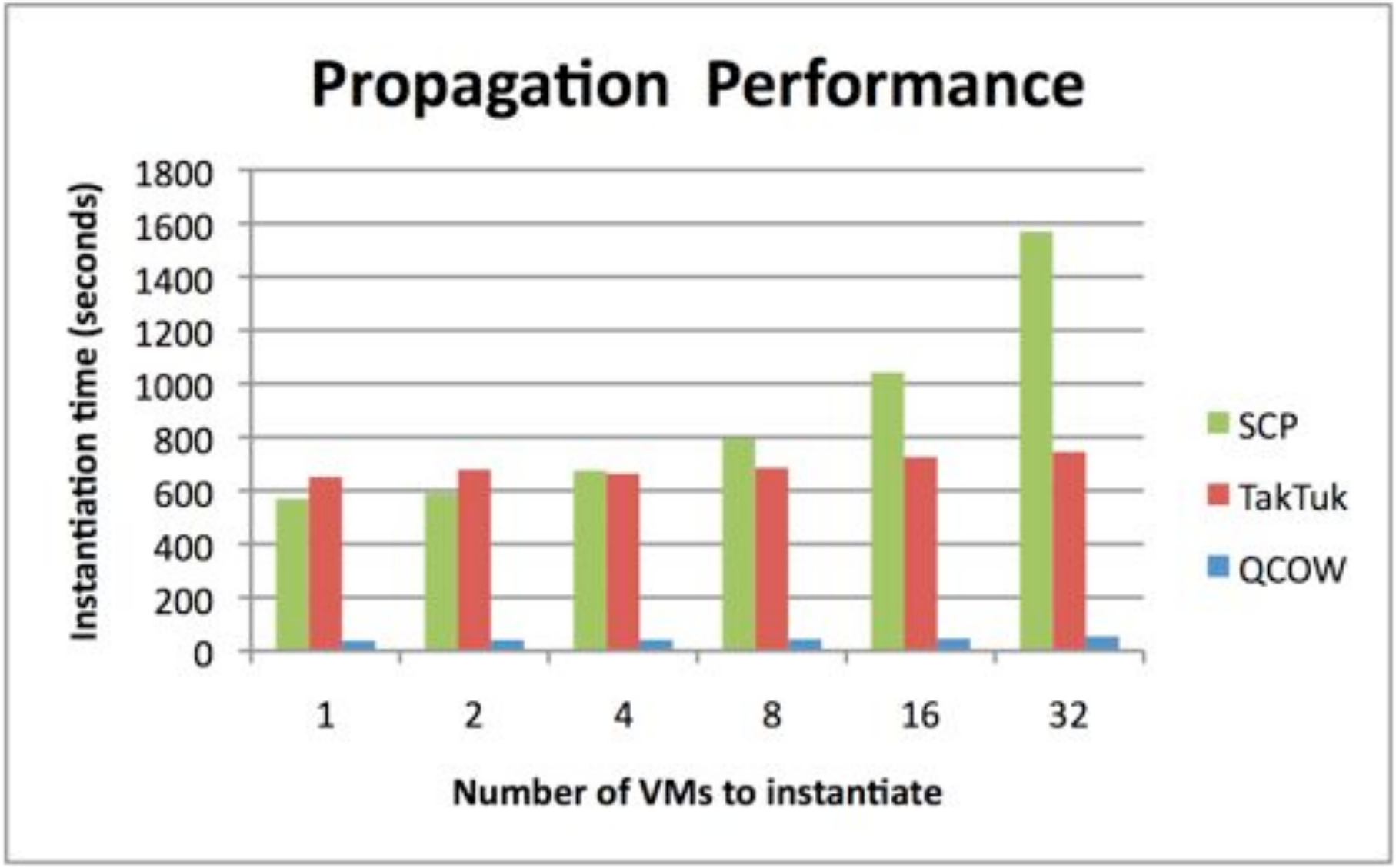
- Pipelined Nimbus propagation: Kastafior/TakTuk



Fast Virtual Cluster Creation (3/3)

- Leverage Xen Copy-on-Write (CoW) capabilities




Propagation Performance
Instantiation time (seconds)
1800
1600
1400
1200
1000
800
600
400
200
0
1
2
4
8
16
32
Number of VMs to instantiate
SCP
TakTuk
QCOW

NETWORK-TRANSPARENT LIVE MIGRATION

Live Migration

- Relocate a guest virtual machine from one host to another
- Without interruption of service
- Supported by most hypervisors
  - Xen
  - VMware
  - KVM/QEMU
  - VirtualBox

Live Migration Limitations

- Current implementations: LAN-only
- Relies on
  - Shared storage
  - Intra-subnet migration
- Existing research work
  - Storage live migration algorithms (similar to RAM)
  - Network-transparency (IPv6, tunnels, etc.)

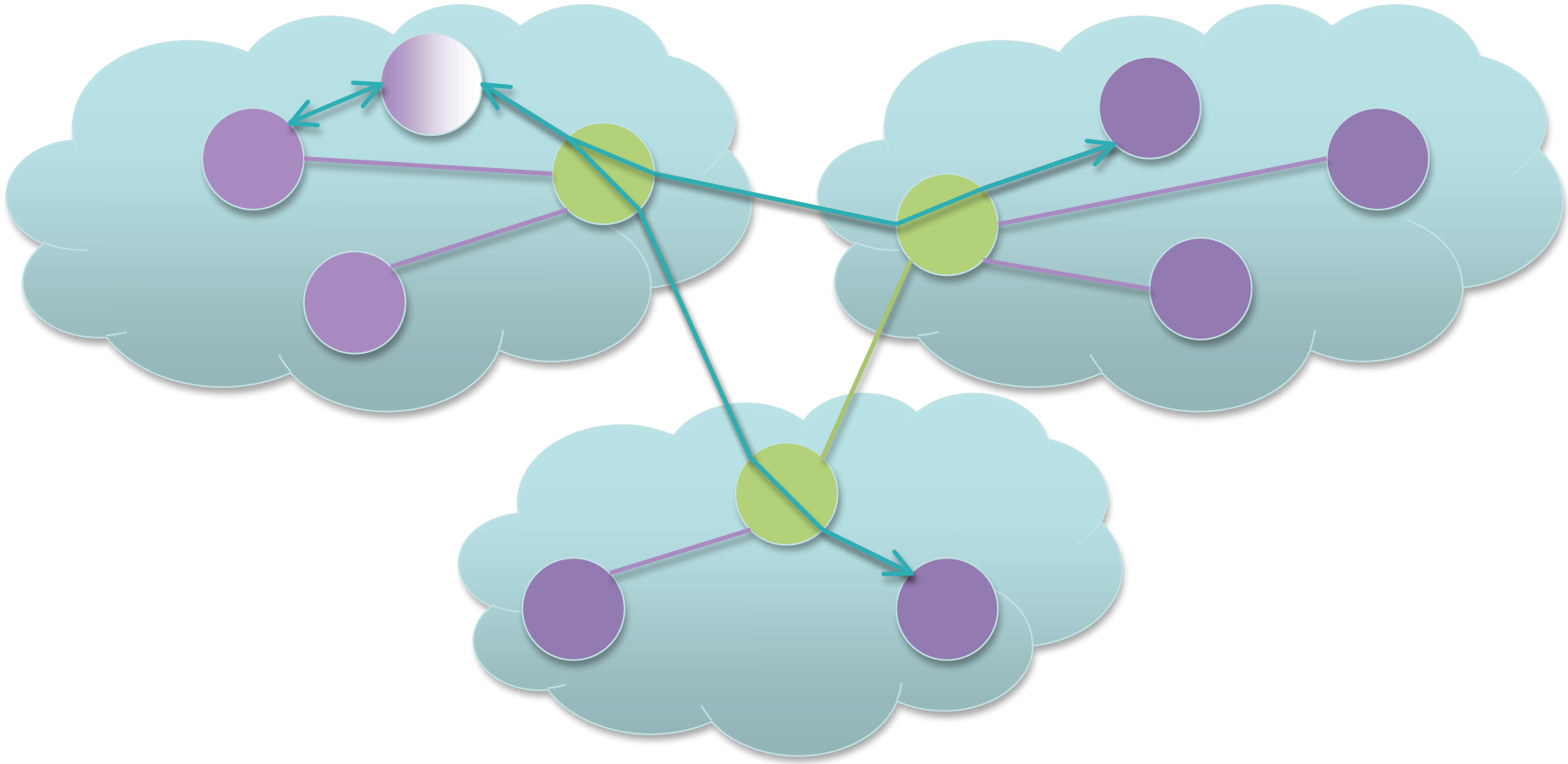
Network transparency issues

- Migration from one subnet to another
  - Conflicts
    - MAC address conflicts
    - IP address conflicts
  - Routing
    - From/to virtual machines of the same subnet
    - From/to virtual machines of other subnets

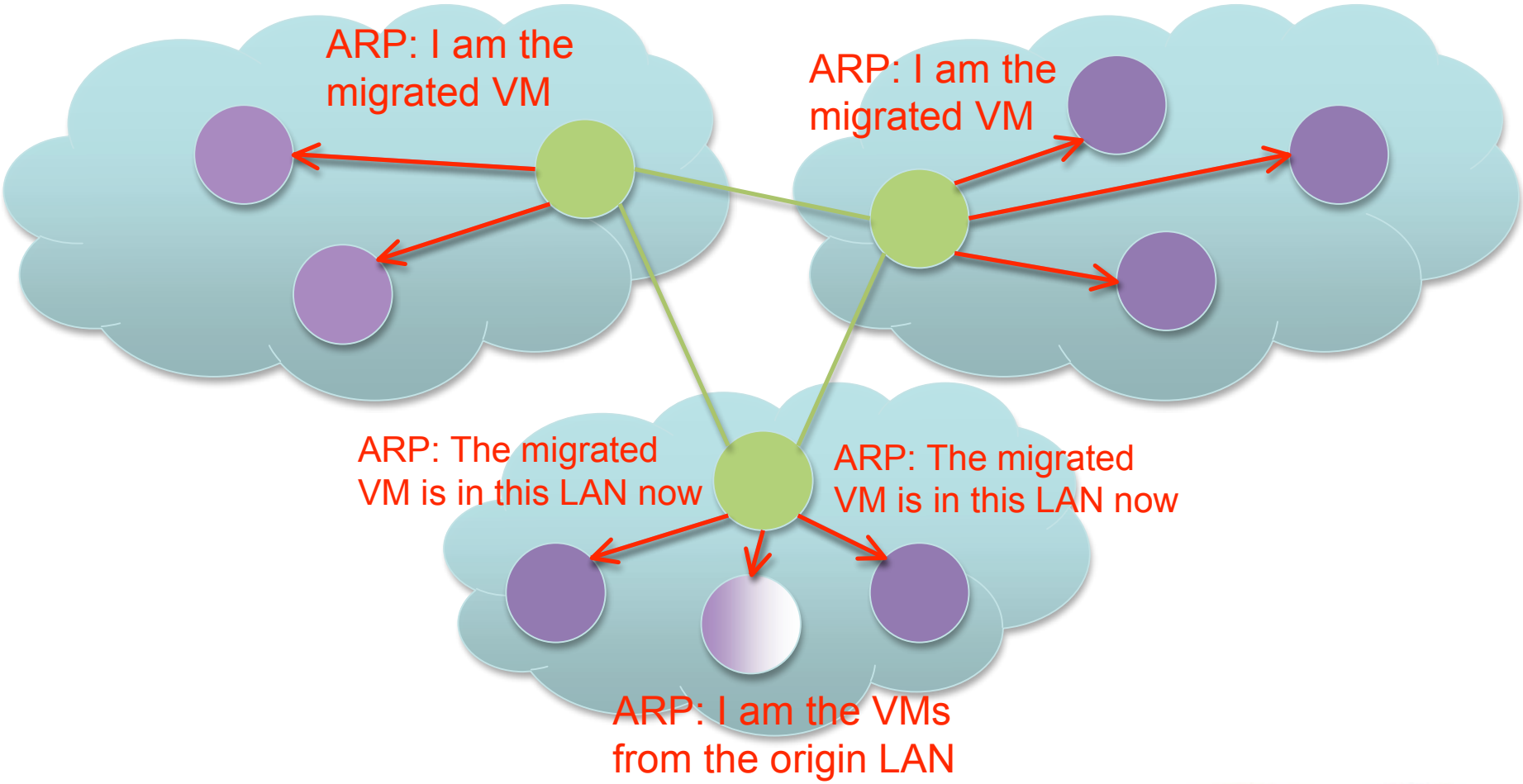
Solution selected for ViNe

- Configure ViNe as a big network
  - All machines believe they are in the same LAN
  - Use ARP proxy to allow traffic between LANs
  - Use the ViNe infrastructure to tunnel traffic
- After migration:
  - Use gratuitous ARP packets to
    - Redirect traffic to ViNe routers
    - Enable direct communication in the same LAN

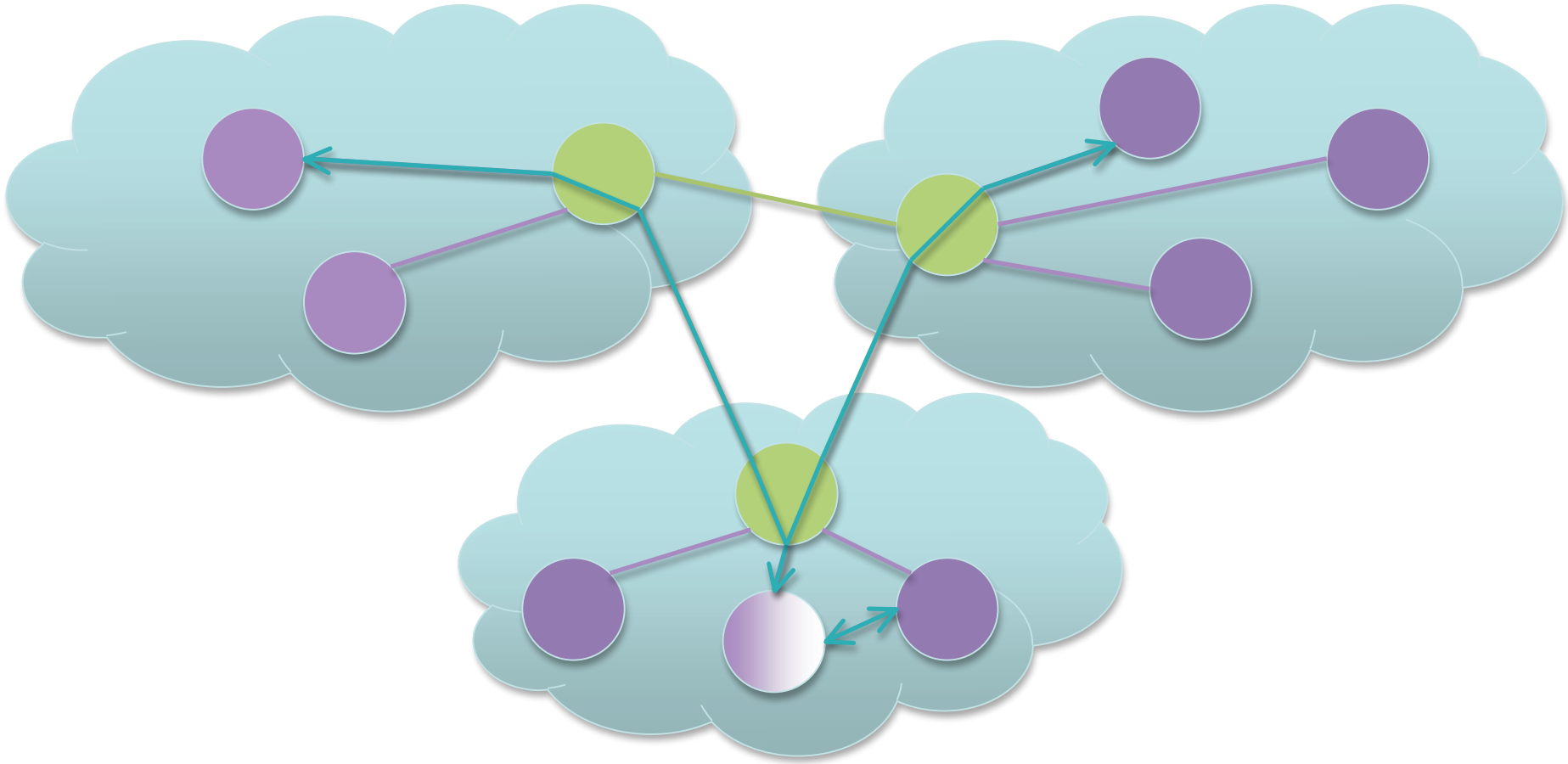
Single Machine Live Migration (1/3)



Single Machine Live Migration (3/3)



Single Machine Live Migration (3/3)



CONCLUSION

Conclusion

- Sky Computing to create large scale distributed infrastructures
- Our approach relies on
  - Nimbus for resource management, contextualization and fast cluster instantiation
  - ViNe for all-to-all connectivity
  - Hadoop for dynamic cluster extension
- Provides both infrastructure and application elasticity

Ongoing/Future Works

- Ongoing research work
  - Network-transparent live migration
  - Efficient live VM migration
  - Dynamic adaptation of distributed applications
- Future Works
  - Migration support in Nimbus
    - Leverage spot instances?
  - Combine everything to make Sky Computing leverage live migration technologies

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