

# Providing a Cloud Network Infrastructure on a Supercomputer

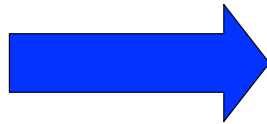
Jonathan Appavoo, Volkmar Uhlig, Jan Stoess, Amos  
Waterland, Bryan Rosenberg, Robert Wisniewski, Dilma  
Da Silva, Eric Van Hensbergen and Udo Steinberg

# A Utility Computing Vision

Generate Capacity



Metered and  
Billed In Units.



Re-Packaged & Refined  
(Selling SW Execution)

As "computers"  
As Building Blocks  
DB OLTP  
CRM Optimizers  
As Services  
Generic IT  
Niche providers

Re-branded



Traded



Producing, Distributing, Packaging : Generic Units of  
Computational Commodities which are Consumed and  
Utilized in the Provisioning of Value

- 1) Proprietary Production
- 2) Generically Used
- 3) Independently Metered and Traded on an going Consumption Basis.
- 4) Global Scale

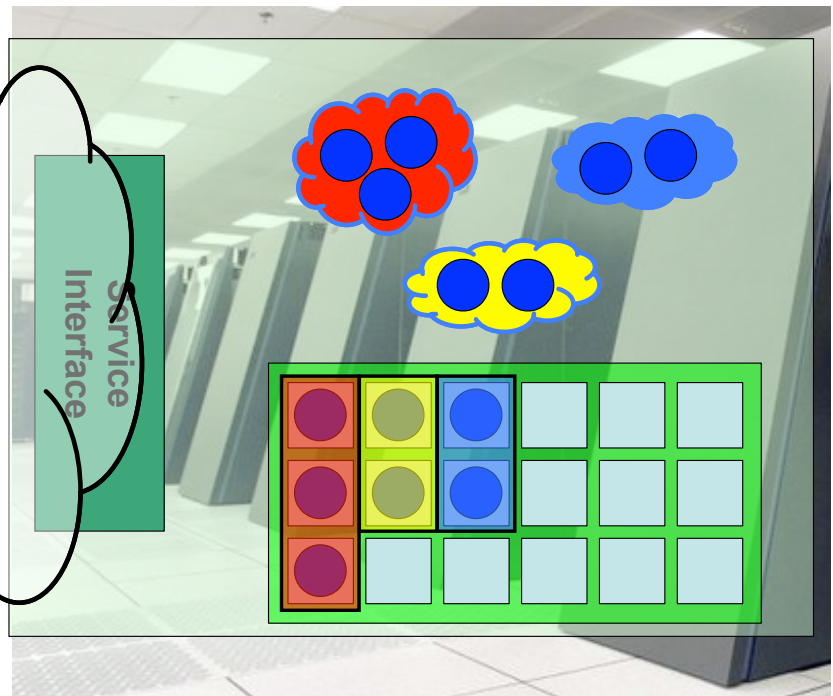
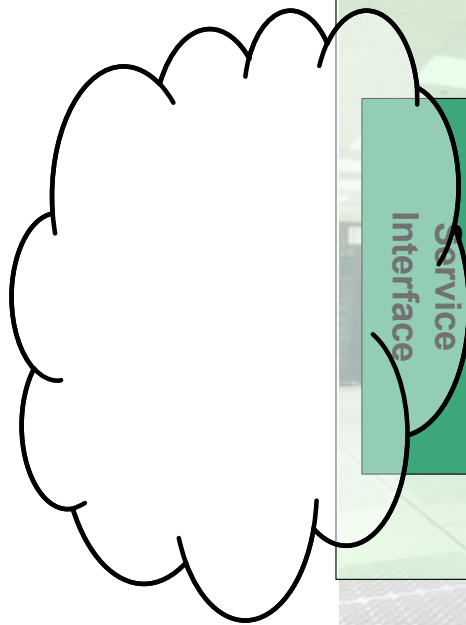


# Abstract System View

**Users**  
(developers, service  
providers, resellers)

**Public Access**  
**Network**

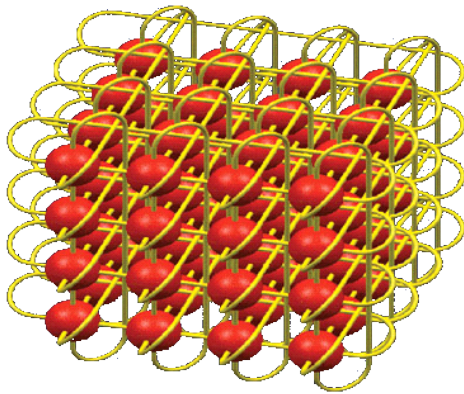
**The Computer**





# A Global-scale Computer

Large-scale  
Communication-centric  
System

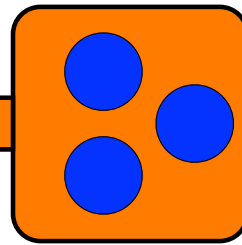


Aggressive Integration

+



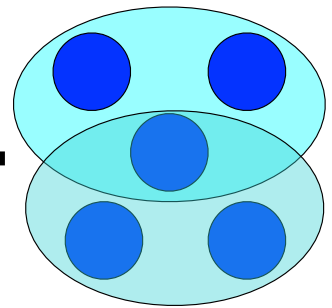
Control  
Channels



Raw Hardware  
Access

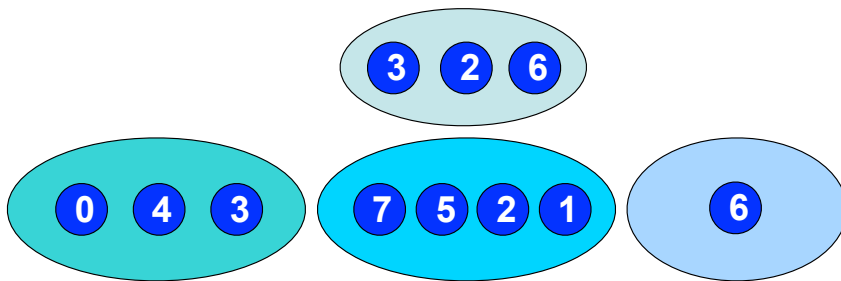
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Communication  
Domains



Primitive for  
Competition &  
Cooperation

# Communication Domains as Permission



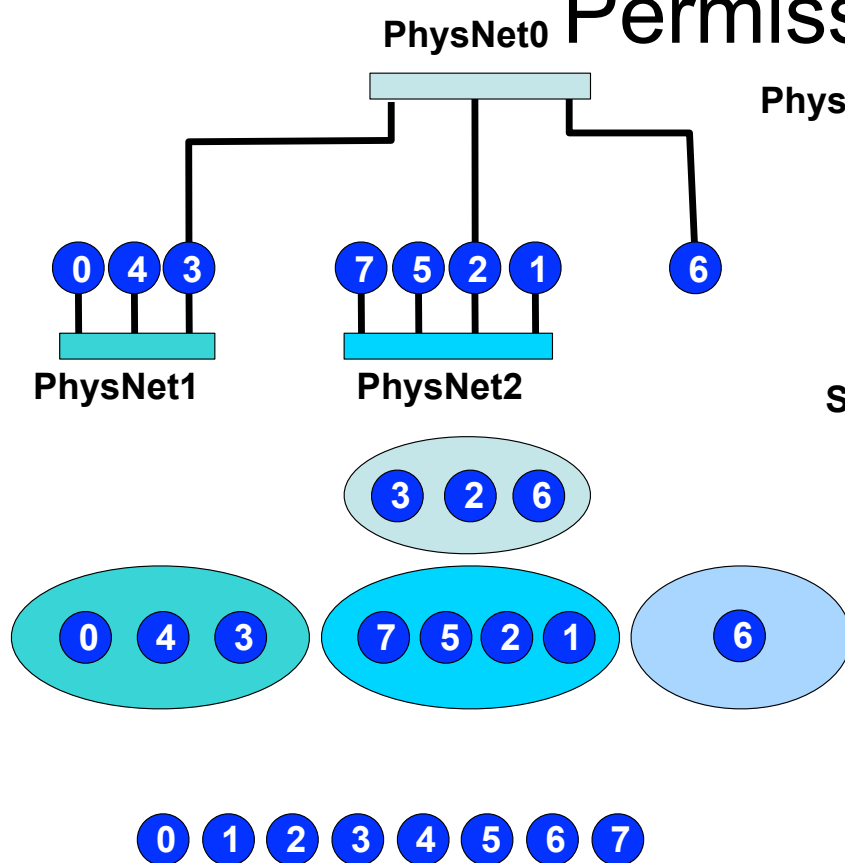
0 1 2 3 4 5 6 7

Phys IDs	Dst							
	0	1	2	3	4	5	6	7
Src	0	1			1	1		
	1		1	1			1	
	2		1	1		1	1	1
	3	1		1	1		1	
	4	1			1	1		
	5		1	1			1	
	6			1	1			1
	7		1	1			1	

isAllowed(X,Y)?

The Physical Owner wants this relationship enforced independent of software.

# Communication Domains as Permission



Phys IDs	Dst							
	0	1	2	3	4	5	6	7
Src	0	1		1	1			
	1		1			1		1
	2		1	1		1	1	1
	3		1	1	1		1	
	4			1	1			
	5		1			1		1
	6		1	1			1	
	7		1			1		1

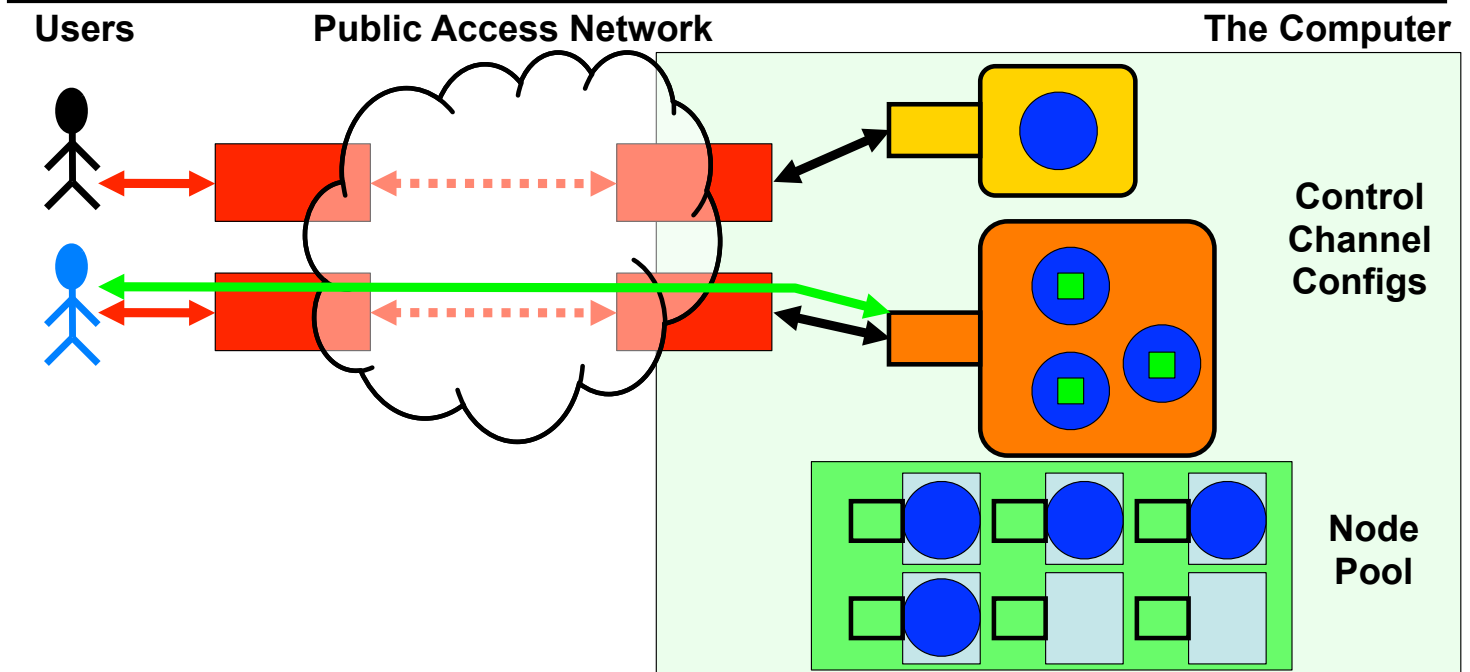
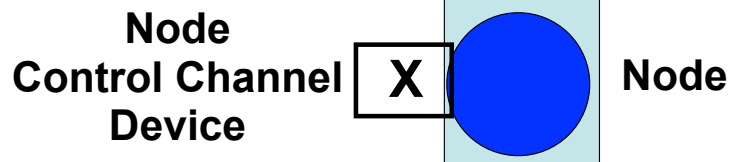
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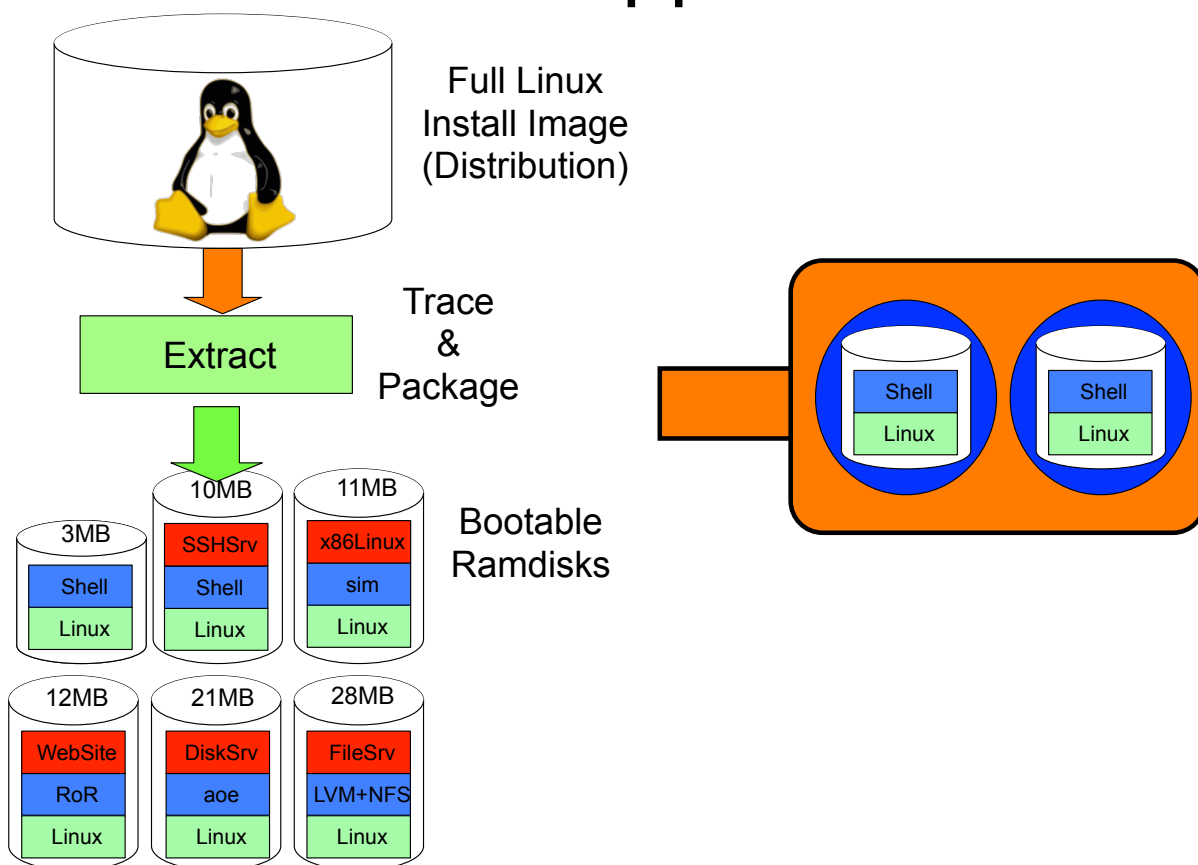
# Public Access Control Channel as a Multicast Console Device



*A "Super" Serial Line: A simple device for Raw Access*

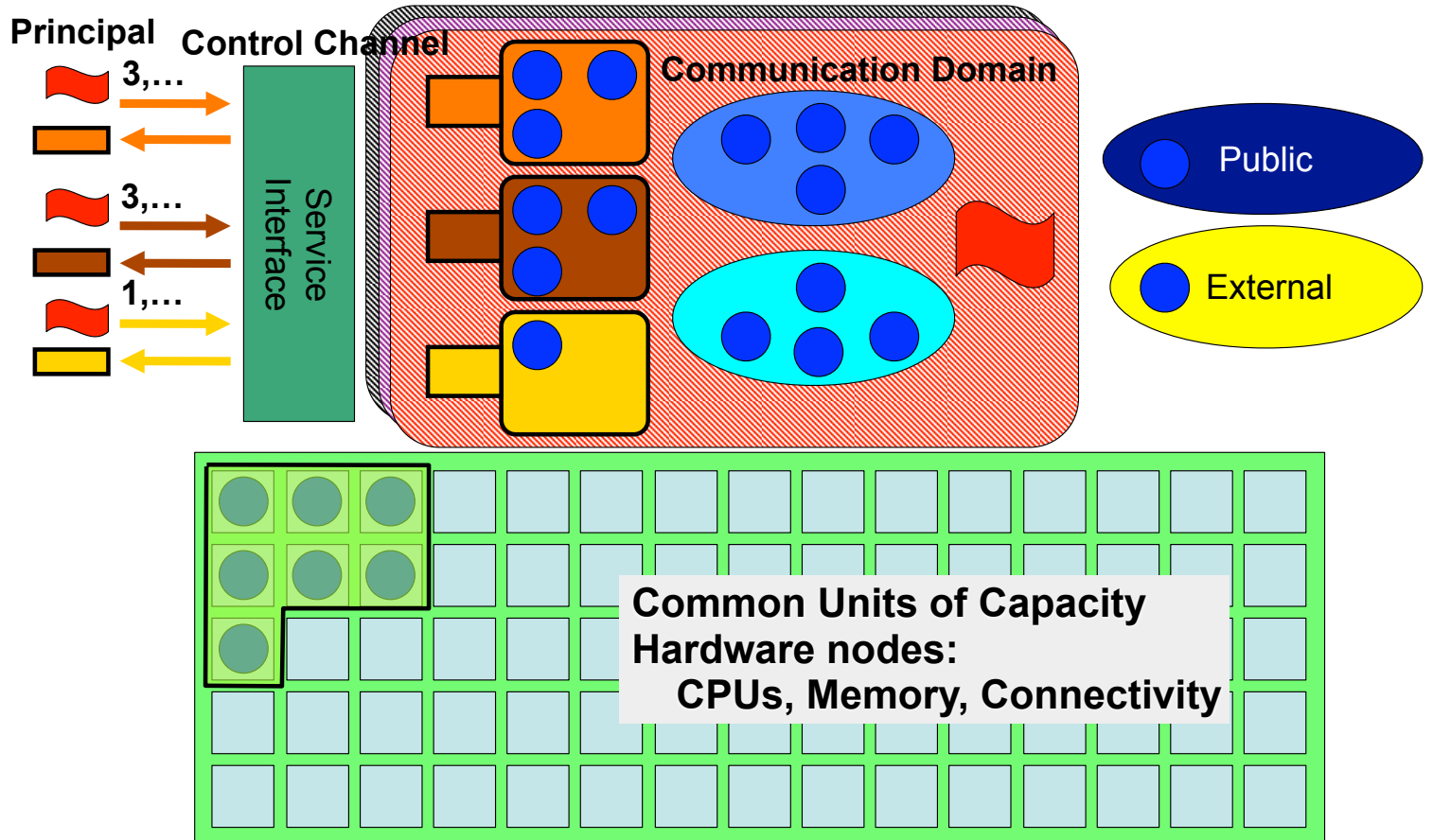


# Bootstrapping: Open-source Software Appliances

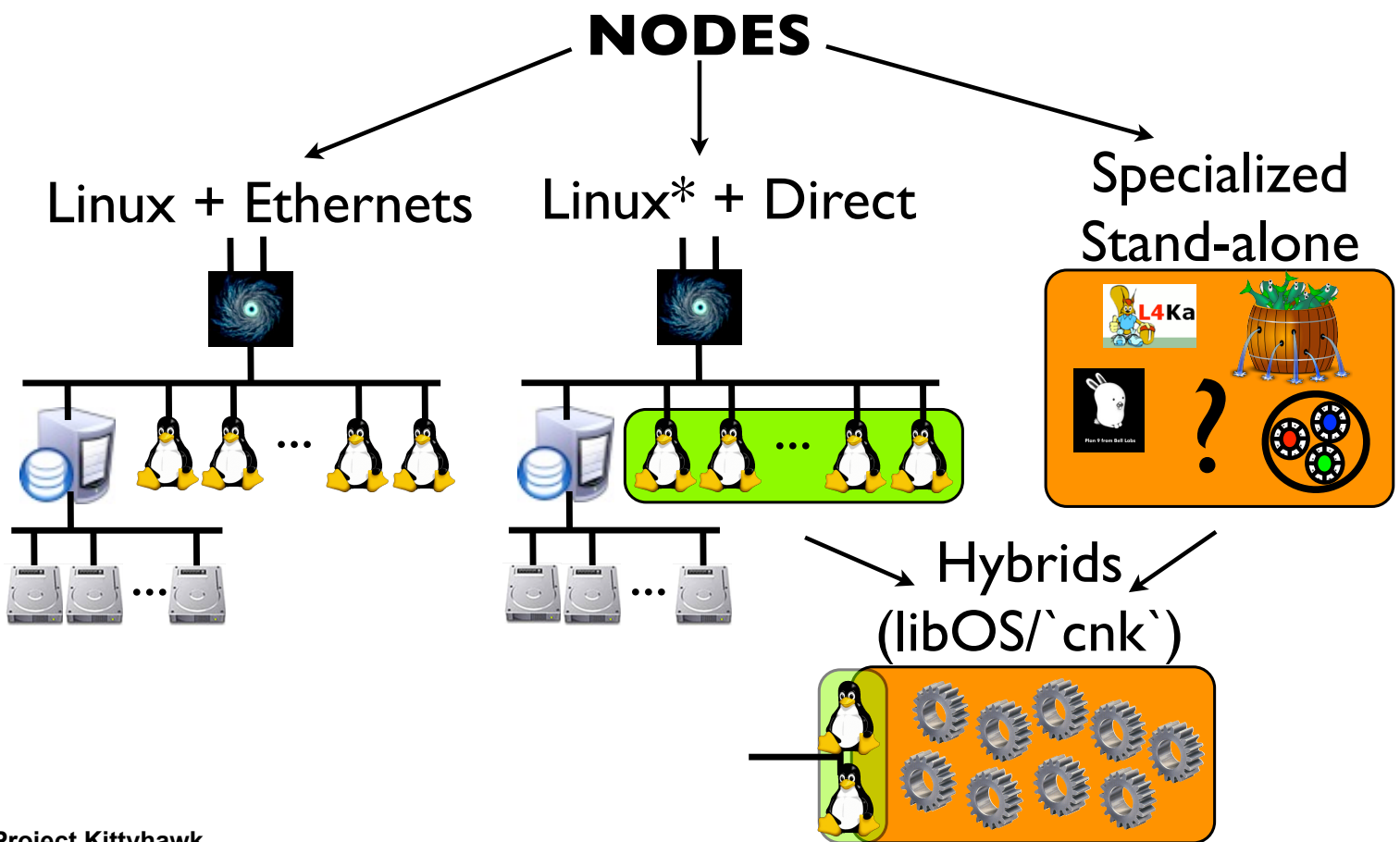




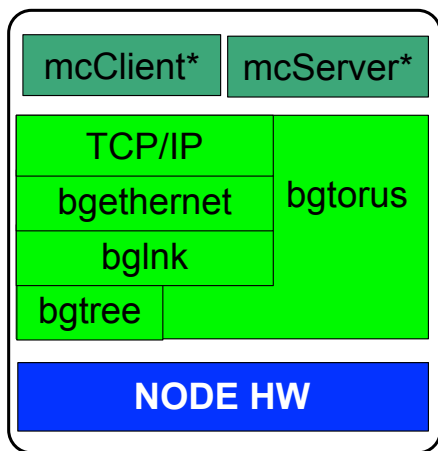
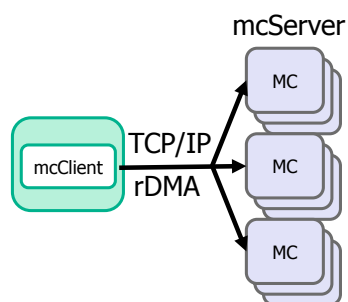
# CUC, Principals, Control Channels, Communication Domains



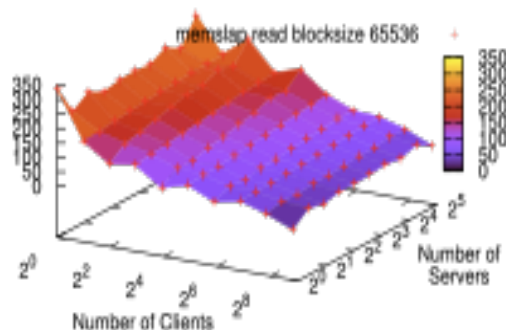
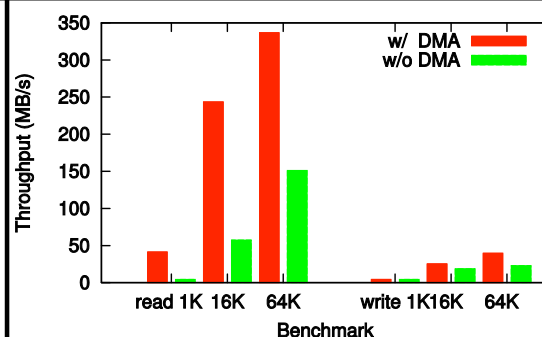
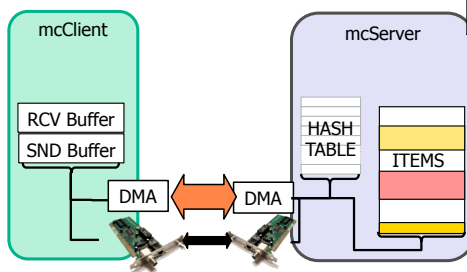
# Linux only the beginning



# MemCached (mc) Exp



```
tcp_send(to, sbuf)
tcp_rcv(from, *sbuf)
rdma_put(to, *sbuf)
rdma_get(from, *dbuf, *sbuf)
```



# Open Source Kittyhawk

That's to a lot of peoples!

<http://kittyhawk.bu.edu/kittyhawk/Kittyhawk.html>

<http://git.anl-external.org/kittyhawk/>

<http://kh-wiki.bu.edu/tiki/tiki-index.php>

<http://cs-mailman.bu.edu/mailman/listinfo/kittyhawk>

The open-sourcing of Kittyhawk was supported in part by the Department of Energy Office of Science Operating and Runtime Systems for Extreme Scale Scientific Computation project under the HARE project (contract #DE-FG02-08ER25851).

# DEMOS