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Gestione del networking in ambiente Hyper-V cluster e supporto per Live Migration

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Virtual Networking in Hyper-V

Introduzione



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Argomenti trattati

- 1. Progettazione del networking in ambiente cluster
 - a. Schede di rete necessarie
 - b. Rete Live Migration
 - c. Rete Cluster Private
- 2. Configurazione delle schede di rete
- 3. Schede di rete usate dai servizi di Failover Cluster
 - a. Priorità di gestione
- 4. Novità nel networking di Hyper-V 3.0
 - a. Nuove funzionalità dei Virtual Switch
 - i. Gestione della banda minima/massima garantita
 - b. Supporto per il NIC teaming integrato

Elemente di una rete

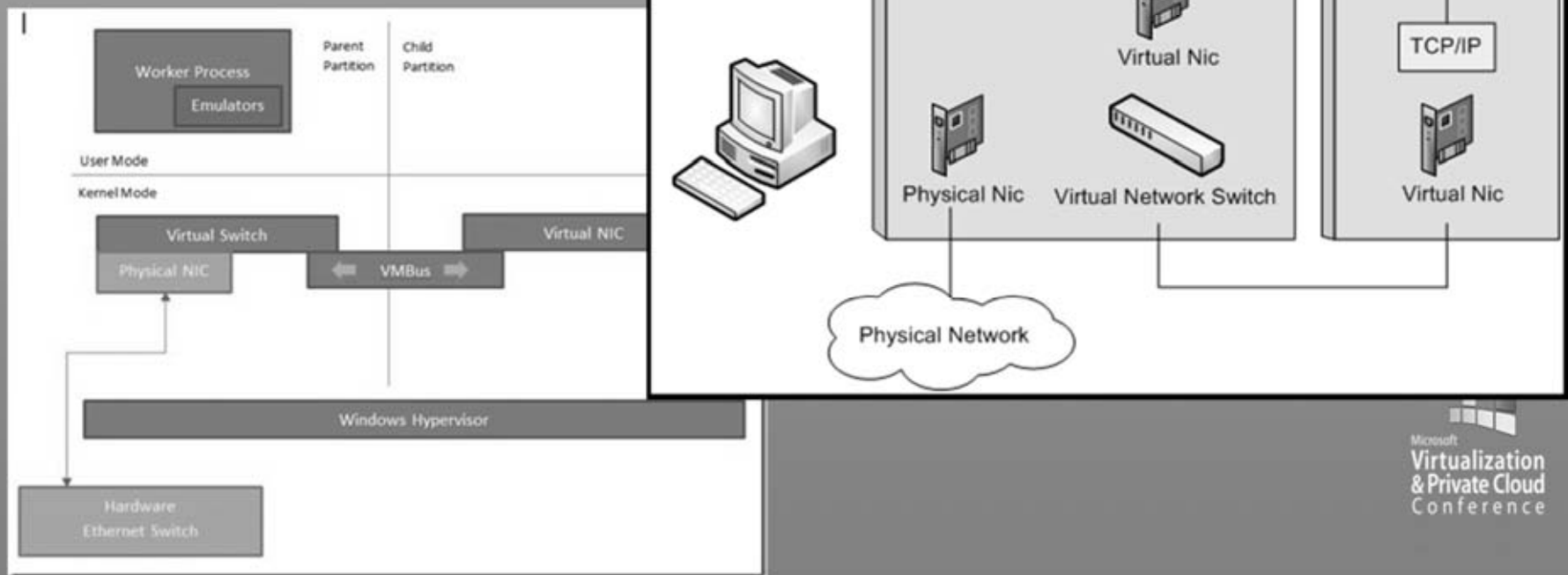
- NIC (Network Interface Card)
 - pNIC (physical NIC)
 - vNIC (virtual NIC)
- Switch
 - Physical switch(es)
 - Virtual switch(es)

Virtual NIC

- Legacy interface
 - Utilizza un driver emulato
 - Supporta pre-boot execution (PXE)
 - È compatibile con molti sistemi operativi
 - Non supporta sistemi operativi a 64 bit
- Synthetic Interface
 - Richiede Hyper-V integration components
 - Utilizza il synthetic driver stack (VMBus che comunica usando shared memory)
 - Prestazioni migliori
 - Supporta VLAN tagging e altro

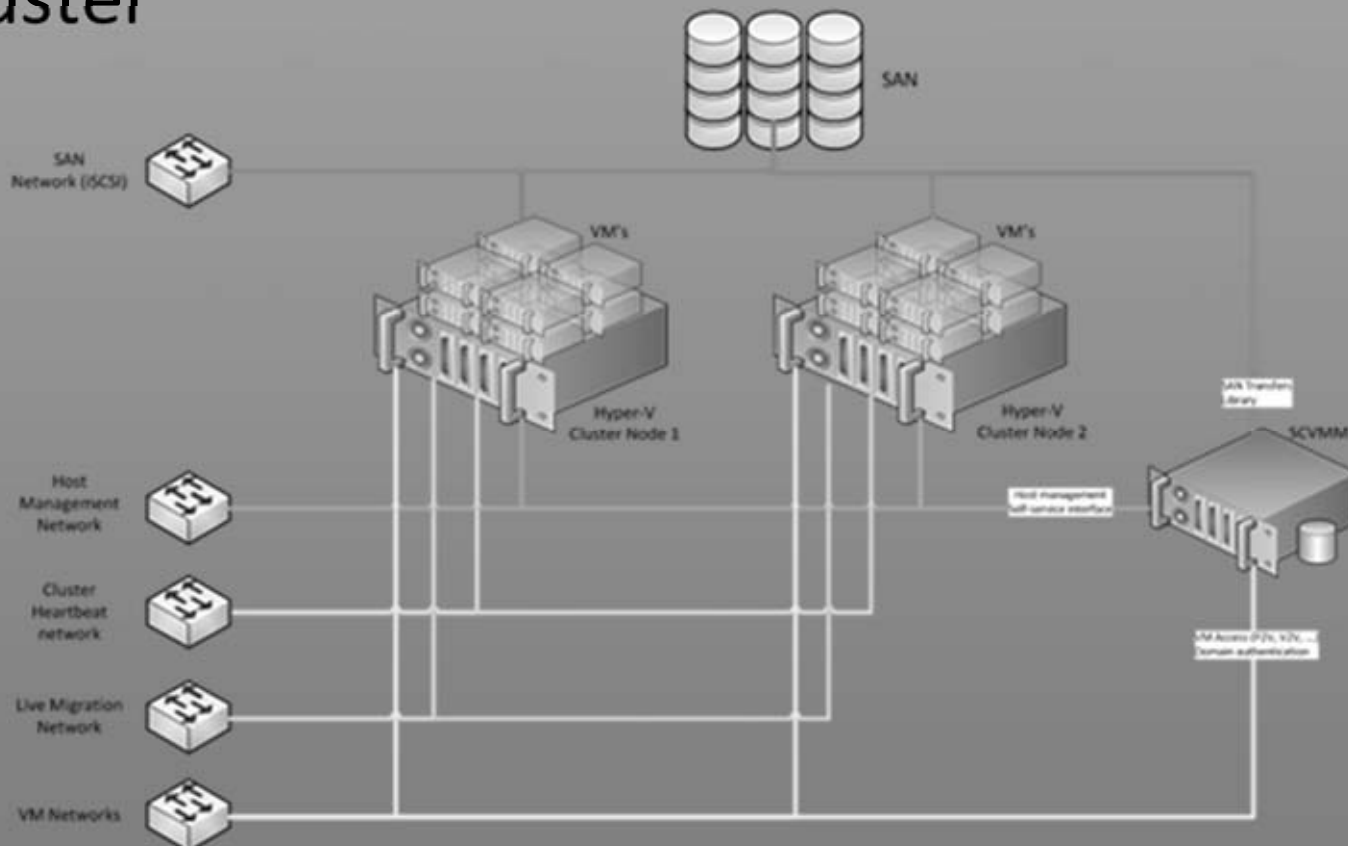
Virtual Switch

- Configurare a livello di Hyper-V
 - External
 - Private
 - Internal



Rete in ambito cluster

- Per le VM solo reti “public”
- Varie nuove reti necessarie alle funzioni del cluster



Virtual Networking in Hyper-V

Pianificazione



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Tipi di reti

- Rete di gestione (Management)
 - Tutto quello che riguarda la parent partition (inclusi i backup)
- Almeno una rete pubblica per le VM
- Rete privata per il Failover Cluster
 - Heartbeat
- Opzionale
 - Rete privata per Live Migration (LM)
 - Rete privata per il CSV
- Se richiesto: rete per IP storage
 - iSCSI
 - NAS (in Hyper-V3)

Schede di rete necessarie

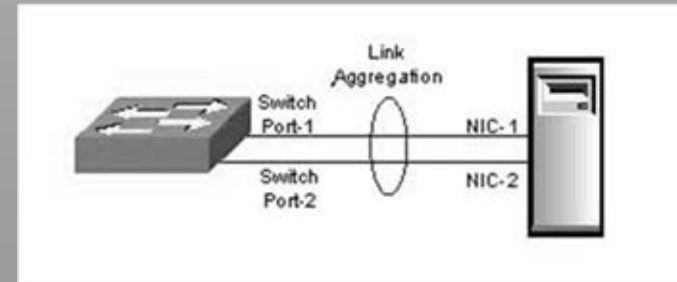
<i>Rete</i>	<i>NIC min</i>	<i>NIC best</i>	<i>Note</i>
Gestione	1	1?	Necessaria
VM	1	2 o più	Può essere condivisa con la gestione
Privata	1	1	Necessaria per un cluster
LM	(1)	1	Può essere condivisa con la privata
CSV	(1)	1	Può essere condivisa con la privata
iSCSI	(1)	2 o più	Dipende dallo storage

Ridondanza delle NIC

- Alcune reti richiedono ridondanza
 - Altre no (come quella di heartbeat)
- Ridondanza -> almeno 2 NIC
- Prestazioni -> molte NIC
- Software di teaming di terze parti
 - Complessi? Sicuramente diversi
 - Integrato in Windows Server 2012... ma...
 - Spesso includono funzioni per creare virtual NIC multiple

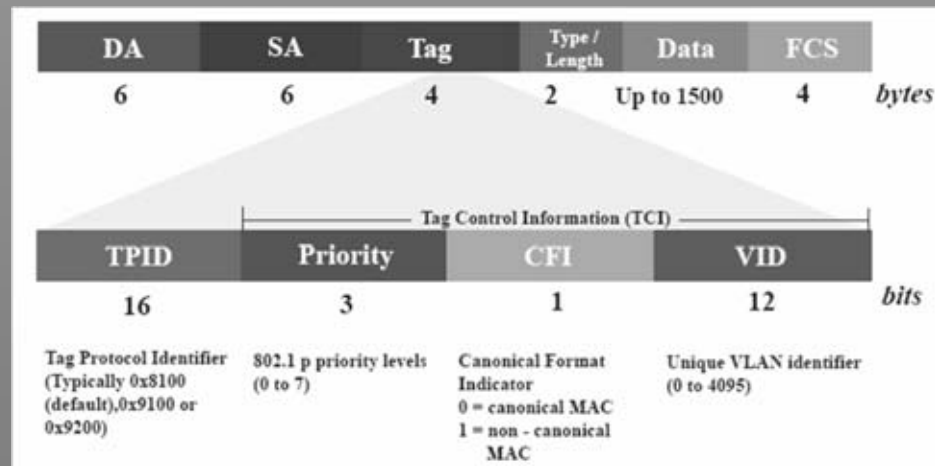
NIC Teaming

- Tipi di teaming
 - Switch independent
 - puro failover
 - “smart”
 - Switch port aggregation
 - 802.3ad, Etherchannel, LAG, ...
 - Vero aggregation?
- Quando non vanno usati?
 - Storage iSCSI



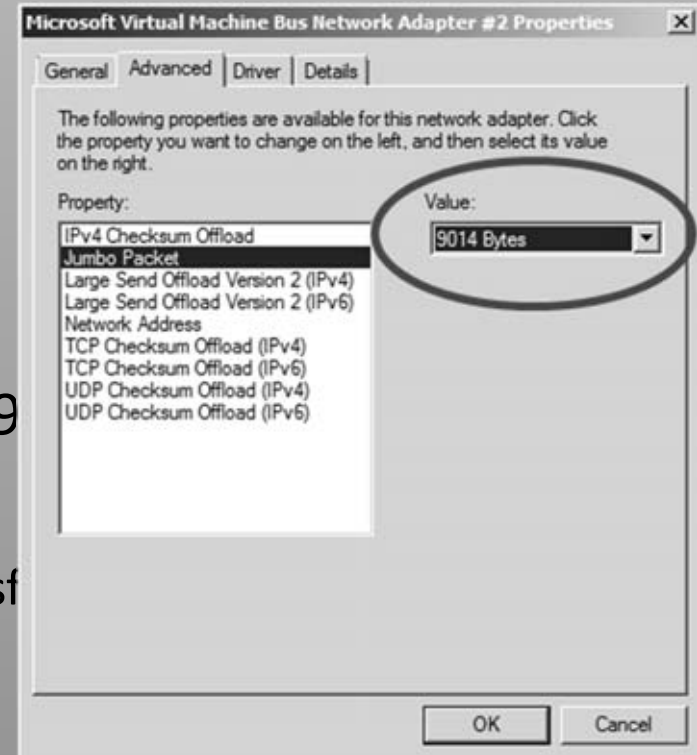
Utilizzo delle VLAN

- Virtual LAN (802.1Q)
 - Più reti logiche (isolate) su una stessa fisica
 - VLAN ID 1-4094
 - Concetto di pNIC virtuale
 - Richiedono configurazione lato switch
- Private VLAN
 - Introdotte con Hyper-V3



NIC Optimization

- Jumbo Frames
 - Ethernet frames da 1,500 bytes a ~9000
 - Aumenta throughput
 - Reduce CPU utilization of large file transfers
- Dove usarlo?
 - iSCSI, LM
- Considerazioni
- TCP Offload support
 - TCP/IP traffic in a VM can be offloaded to a physical NIC on the host computer
 - Reduce CPU burden
 - Networking offload to improve performance
 - Live Migration is supported with Full TCP Offload

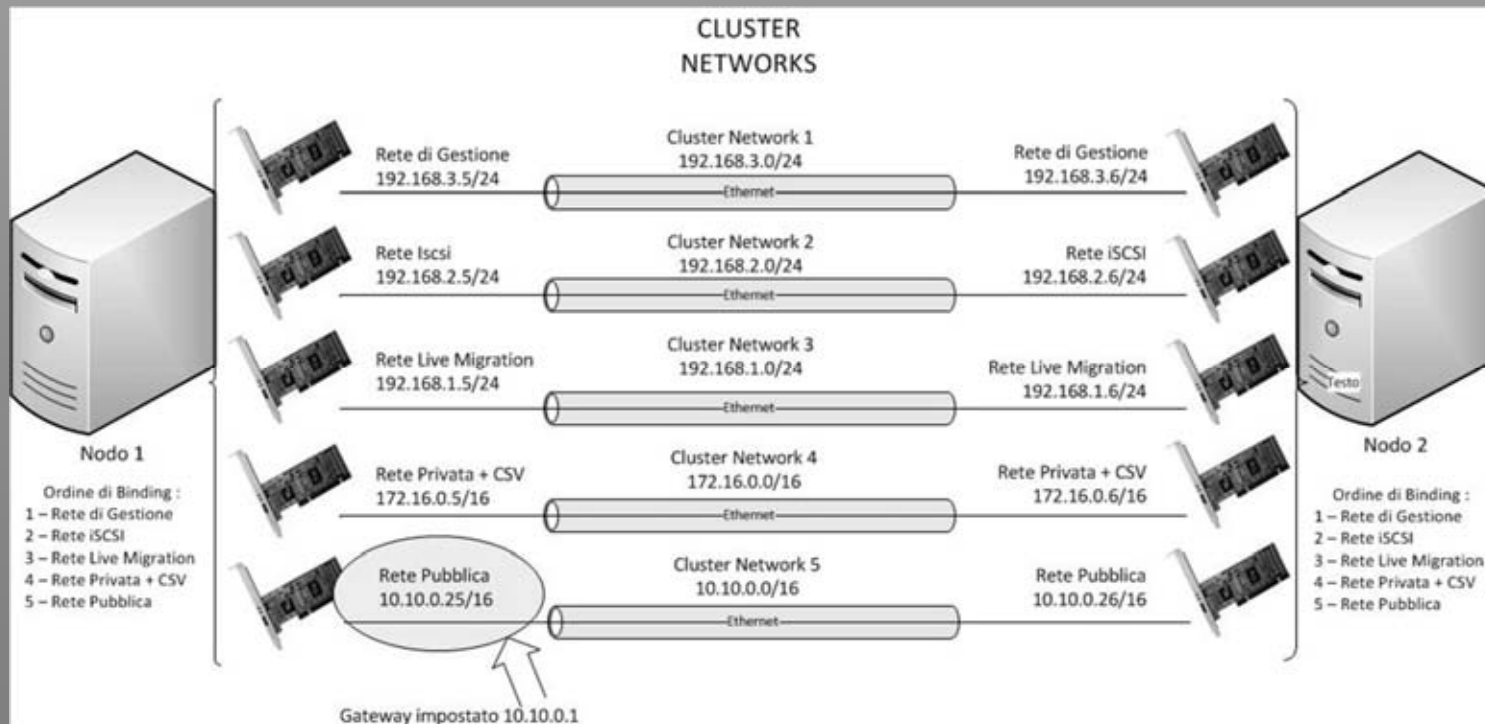


NIC Optimization

- Virtual Machine Queue (VMQ) Support
- Overview
 - NIC can DMA packets directly into VM memory
 - VM Device buffer gets assigned to one of the queues
 - Avoids packet copies in the VSP
 - Avoids route lookup in the virtual switch (VMQ Queue ID)
 - Allows the NIC to essentially appear as multiple NICs on the physical host (queues)
- Benefits
 - Host no longer has device DMA data in its own buffer resulting in a shorter path length for I/O (performance gain)

Pianificazione

- Popolare le NIC in modo speculare
- Configurazione di rete speculare
- Configurazione degli IP omogenea
- Rinominare le schede di rete
- Decidere se usare o meno le VLAN



Demo



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Implementazione



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Software di teaming

- Intel Advantage Network Services
- Broadcom Advanced Server Program

The screenshot displays the Broadcom Advanced Control Suite 4 interface. The main window is titled "Broadcom Advanced Control Suite 4" and has a menu bar with "File", "View", "Action", "Filter", "Context", "Tools", "Teams", "iSCSI", and "Help". Below the menu bar, there is a "Filter" dropdown set to "TEAM VIEW", an "Information" dropdown, and a checked "Vital Signs" checkbox. The interface is divided into several sections:

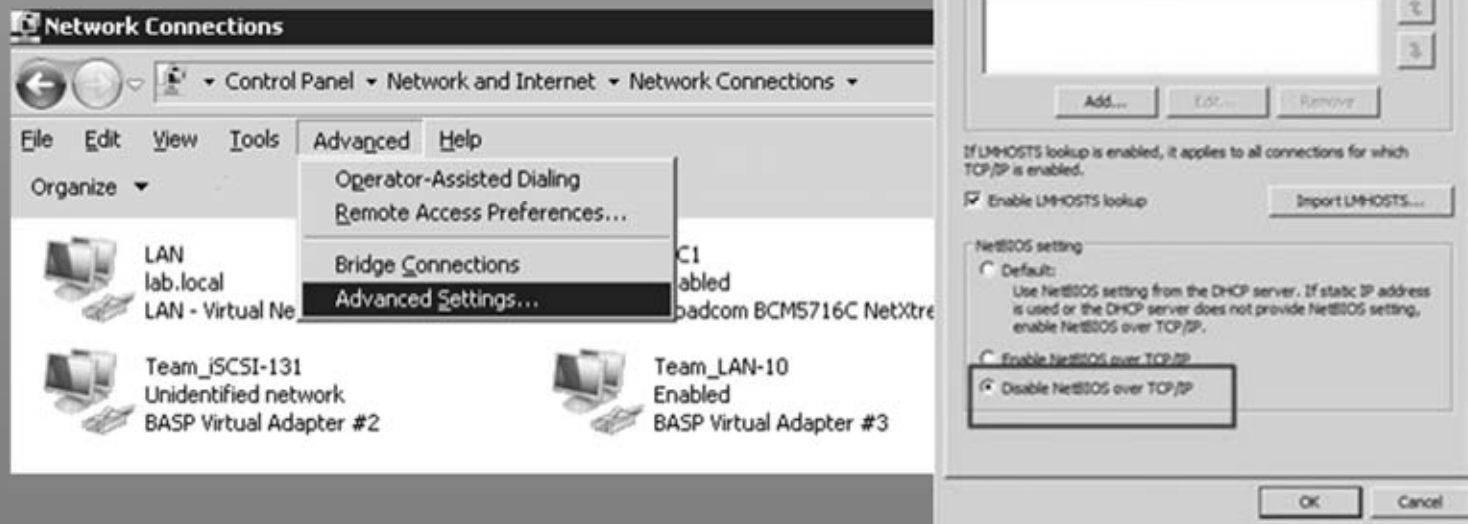
- Explorer View:** A tree view on the left showing the hierarchy: Hosts > hyperv2-1 > Teams > Team > BASP Virtual Adapters. Under "BASP Virtual Adapters", several adapters are listed, including "iSCSI-130 ((0018) BASP Virt...", "iSCSI-131 ((0019) BASP Virt...", "LAN-10 ((0020) BASP Virtual...", and "Private-121 ((0024) BASP Vi...". Below this, "Primary Adapters" are listed, including "[0007] Broadcom BCM5716C" and "[0008] Broadcom BCM5716C".
- Information Tab:** A table showing properties for the selected adapter. The table has two columns: "Property" and "Value".

Property	Value
Vital Signs	
MAC Address	60EB69BA5853
Team Name	Team
Team Type	Smart Load Balancing(TM) and Failover
Offload Capabilities	LSO,CO,RSS
IPv4 Address	192.168.130.81
VLAN ID	130
Driver Status	Loaded
Link Status	Up
MTU	9000
- Vital Signs Description:** A text box below the table stating: "The Vital Signs section of the Information tab has useful information about the network adapters that are installed in your system, such as the link status of the adapter and general network connectivity."
- Search Network Connections:** A separate window on the right with a search bar and a list of network connections:
 - NIC1
Enabled
Broadcom BCM5716C NetXtreme II G...
 - Team_iSCSI-130
Unidentified network
BASP Virtual Adapter
 - Team_LAN-10
Enabled
BASP Virtual Adapter #3

At the bottom of the screenshot, there are logos for "BROADCOM" on the left and "BACS4" in the center. On the bottom right, there is a logo for "Microsoft Virtualization & Private Cloud Conference".

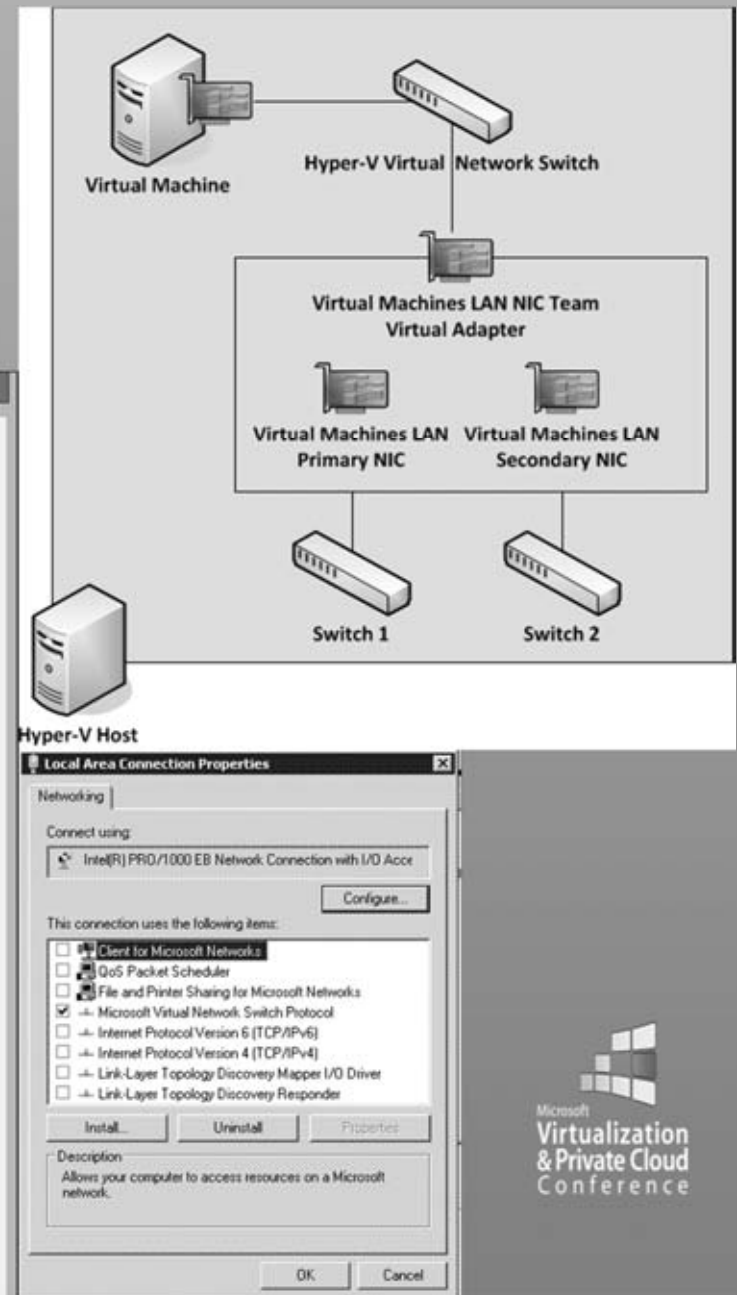
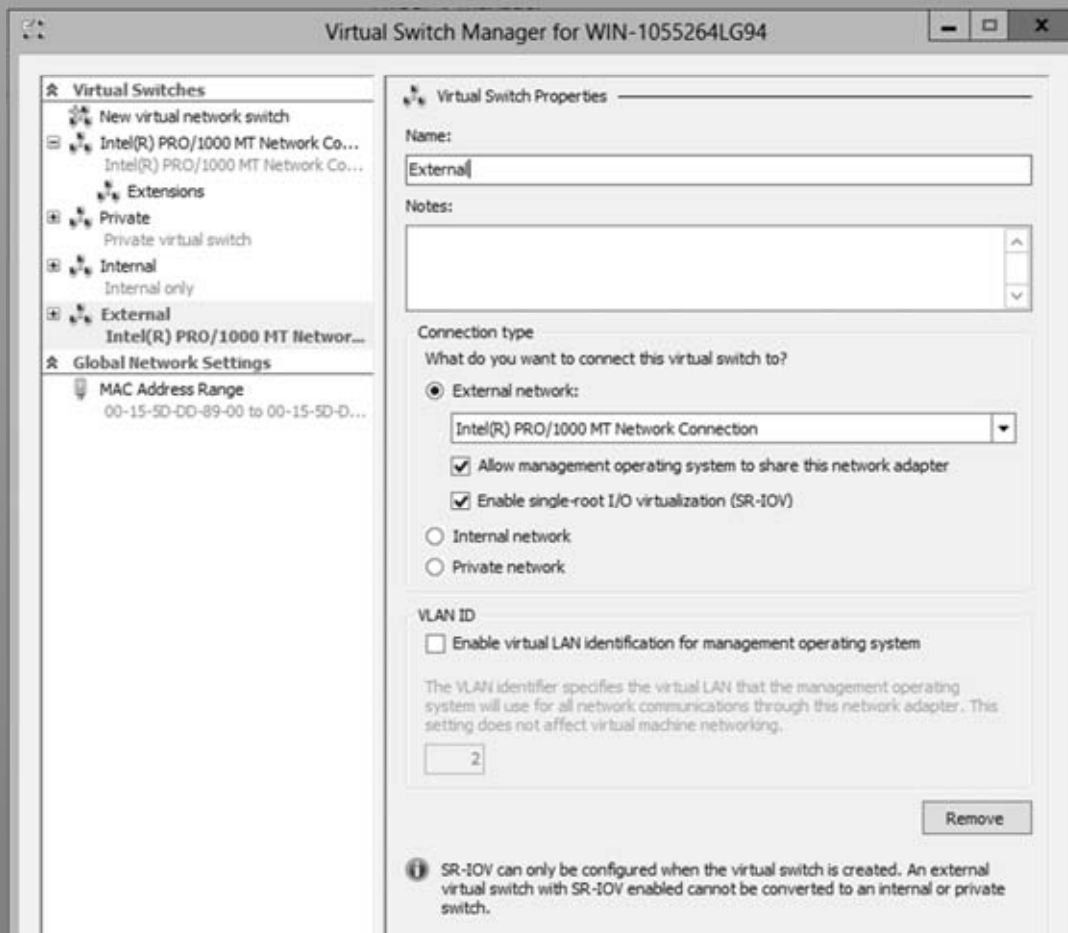
Binding varie sulle NIC

- CVS richiede NTLM (o kerberos dalla prossima versione)
- iSCSI è consigliabile che sia semplice IP
- Definire l'ordine di binding in questo modo
 - Rete dedicata alla gestione
 - Rete iSCSI (?)
 - Rete dedicata alla Live Migration
 - Rete dedicata agli Heartbeat del cluster e alle comunicazioni CSV
 - Rete pubblica



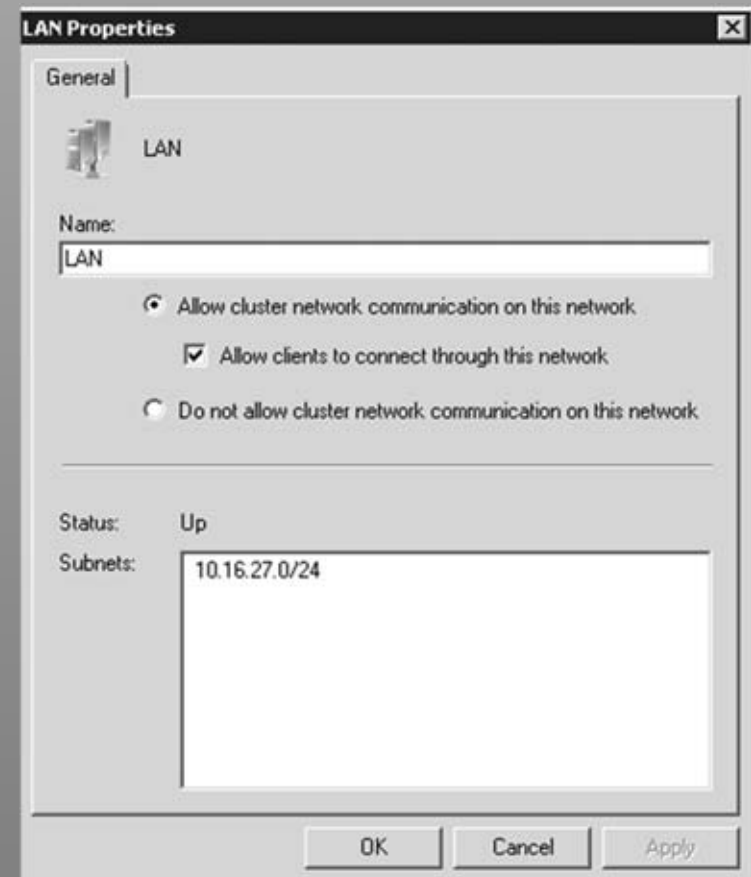
Rete virtuale

- Modalità bridge



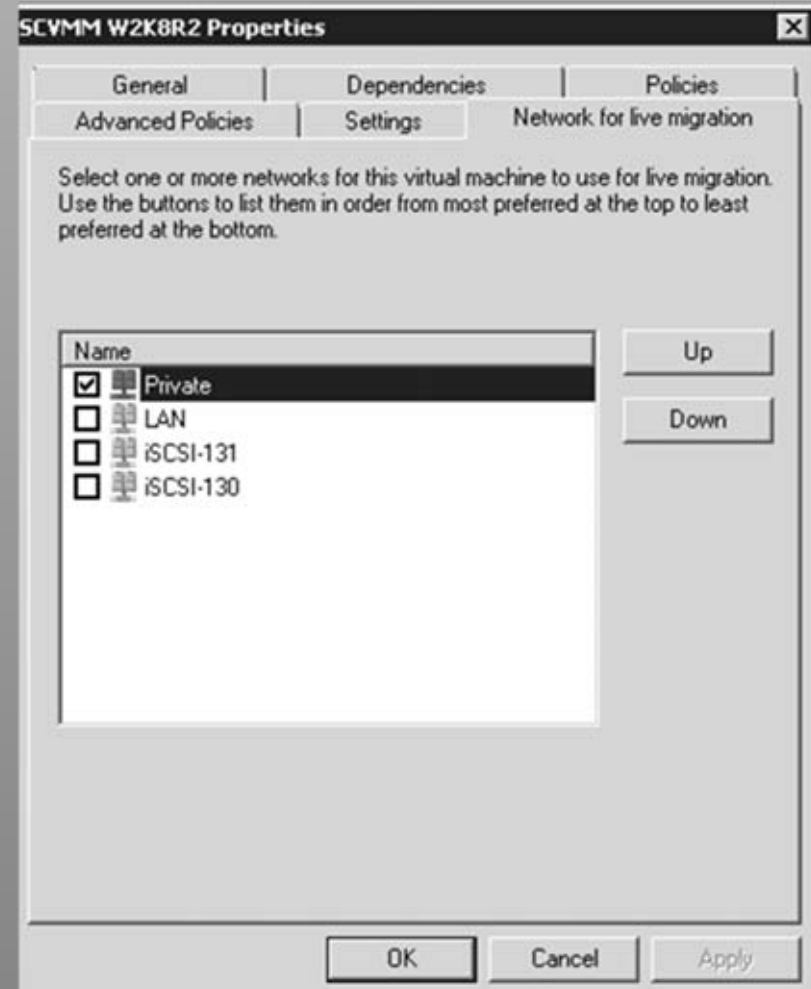
Rete per cluster heartbeat

- Configurabile nelle proprietà delle reti del Failover Cluster
- Impostare
 - Private
 - Management come backup



Rete per Live Migration

- Sicurezza
 - IPsec ha un impatto negativo sulle prestazioni
 - Usare le VLAN
- Requisito
 - Stessa rete logica
 - in Hyper-V2 solo 1 LM alla volta
- Priorità regolabile (a livello di VM)
 - Proprietà del Failover Cluster
 - When you configure a network for live migration for a specific virtual machine, the setting is global and therefore applies to all virtual machines
- Meglio mettere almeno due scelte



Rete per CVS

- Cluster Shared Volumes communication
- Necessaria per redirected I/O mode
- Best practice
 - **Drive letter of system disk**
 - On all nodes, the drive letter for the system disk must be the same
 - **Authentication protocol**
 - The NTLM protocol must be enabled on all nodes
 - In Hyper-V3 è possibile usare Kerberos
 - **Client for Microsoft Networks and File and Printer Sharing for Microsoft Networks must be enabled**



Rete per CVS

- Scelta in automatico
 - Per verificare la rete preferenziale
 - import-module failoverclusters
 - Get-ClusterNetwork | ft Name, Metric, AutoMetric, Role
 - **Designating a Preferred Network for Cluster Shared Volumes Communication**
 - <http://technet.microsoft.com/it-it/library/ff182335%28v=ws.10%29.aspx>

```
PS C:\Users\Administrator.LAB> import-module failoverclusters
PS C:\Users\Administrator.LAB> Get-ClusterNetwork | ft Name, Metric, AutoMetric, Role
```

<u>Name</u>	<u>Metric</u>	<u>AutoMetric</u>	<u>Role</u>
iSCSI-130	10200	True	0
iSCSI-131	10100	True	0
LAN	10000	True	3
Private	1000	True	1

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Hyper-V3



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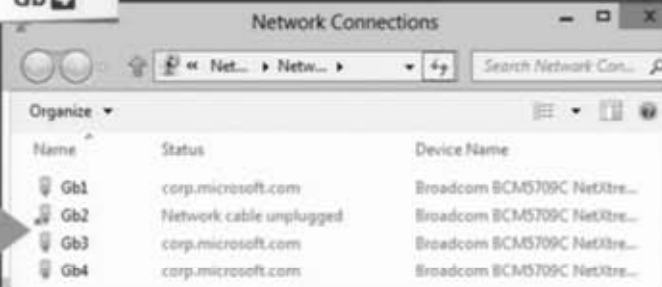
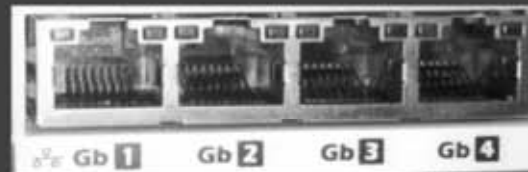
Novità in Hyper-V3

- Nomenclatura coerente delle pNIC (W2K12)
- Supporto per il NIC teaming integrato (W2K12)
- Gestione della banda minima/massima garantita
- Support for SR-IOV (Direct Access to the physical Network adapter)
- PVLAN support
- Dynamic Virtual Machine Queue (D-VMQ)
- Receive Side Coalescing (RSC)
- DHCP Guard
- Extensible virtual switch
- IPsec Task offload

CDN (Consistent Device Naming)

- <http://www.thomasmaurer.ch/2012/04/windows-server-2012-cdn-consistent-device-naming/>

Meaningful names for Ethernet ports



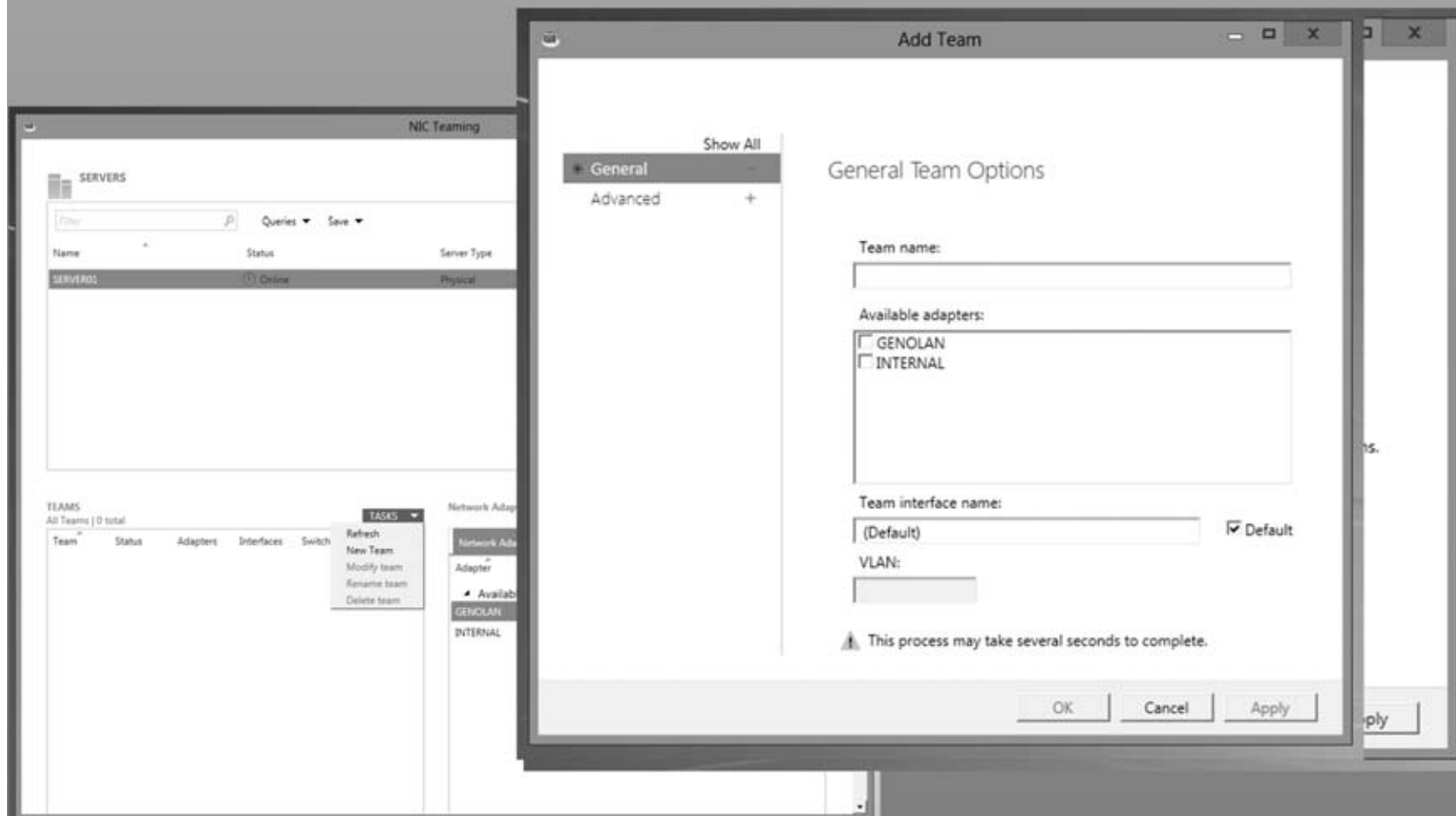
Name	Status	Device Name
Gb1	corp.microsoft.com	Broadcom BCM5709C NetXtre...
Gb2	Network cable unplugged	Broadcom BCM5709C NetXtre...
Gb3	corp.microsoft.com	Broadcom BCM5709C NetXtre...
Gb4	corp.microsoft.com	Broadcom BCM5709C NetXtre...

Consistent Device Naming (CDN)

- BIOS supplied naming consistently identifies NICs with names, numbers - Names can be printed on the chassis!
- Most major OEMs have signed up to ship their machines with CDN-compliant BIOS
- Microsoft's implementation of PCI-SIG Engineering Change Notice (ECN)
http://www.pcisig.com/specifications/pciexpress/specifications/ECR_Slot_Naming-10.pdf
- *NIC Vendors – if your driver uses a virtual bus driver you need to talk to us!*

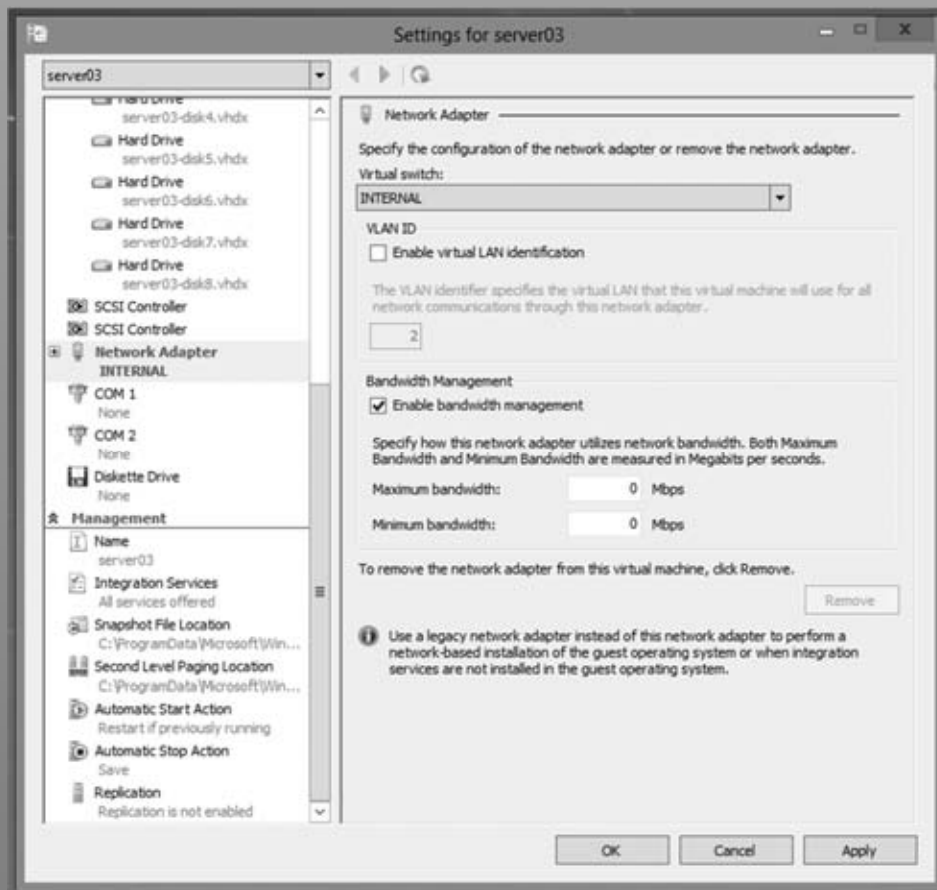
NIC Teaming

- <http://www.thomasmaurer.ch/2011/10/windows-server-8-nic-teaming/>



Bandwidth Management

- <http://www.thomasmaurer.ch/2011/09/windows-server-8-hyper-v-network-bandwidth-management/>



SR-IOV Suppor

- <http://blog.scottlowe.org/2012/03/18/sr-iov-support-in-the-next-version-of-hyper-v/>
- <http://blogs.technet.com/b/jhoward/archive/2012/03/16/everything-you-wanted-to-know-about-sr-iov-in-hyper-v-part-5.aspx>

Conclusioni

- Abbiamo visto
 - Pianificazione e configurazione del networking in ambiente cluster
 - Impostare i diversi tipi di traffici sulle diverse reti

Grazie

- Modulo di feed-back
- VC08

Questions & Answers



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Grazie

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