



Nubes Privadas con Mikrotik



mum
MikroTik User Meeting

BUENOS AIRES, ARGENTINA, NOVEMBER 15 – 16, 2018

Buenos días!

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Mikrotik Certified Trainer



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Sistemas de Información

Networking-Cloud Computing-Servicios
Empresariales

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Ing. Silvana C. Marsiglia



Ing. Luis Maria Carriles

Nubes Privadas con Mikrotik

A network diagram consisting of various sized circles (nodes) connected by thin lines, some solid and some dashed, forming a complex web structure. The nodes are in shades of grey and blue.

1.

Nube

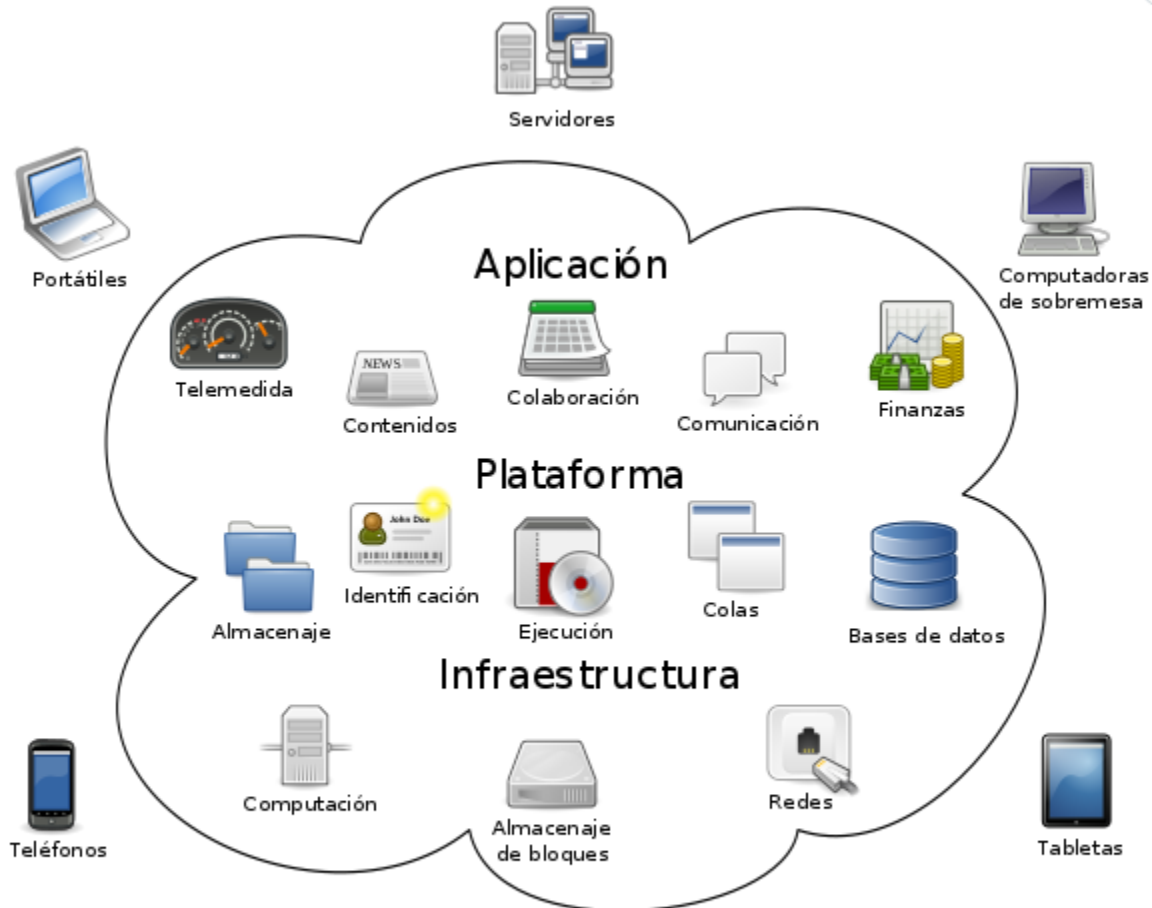
Marco Conceptual

“

*Computación en la nube (Cloud Computing) es un paradigma que permite ofrecer **servicios de computación** a través de una red.*

Wikipedia

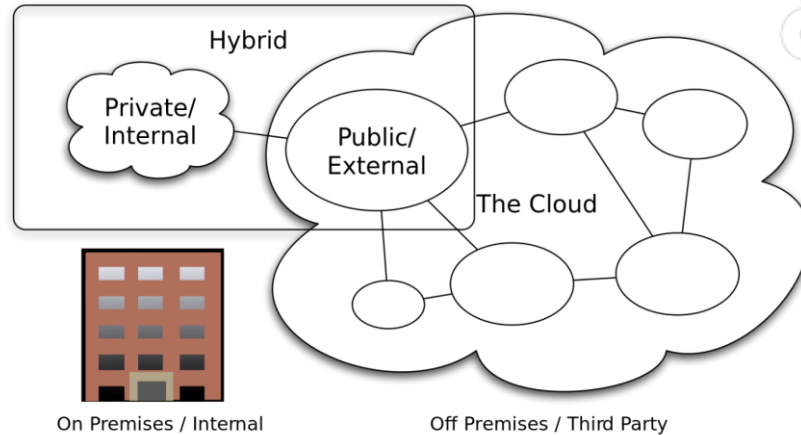
Computación en la Nube



Computación en la nube

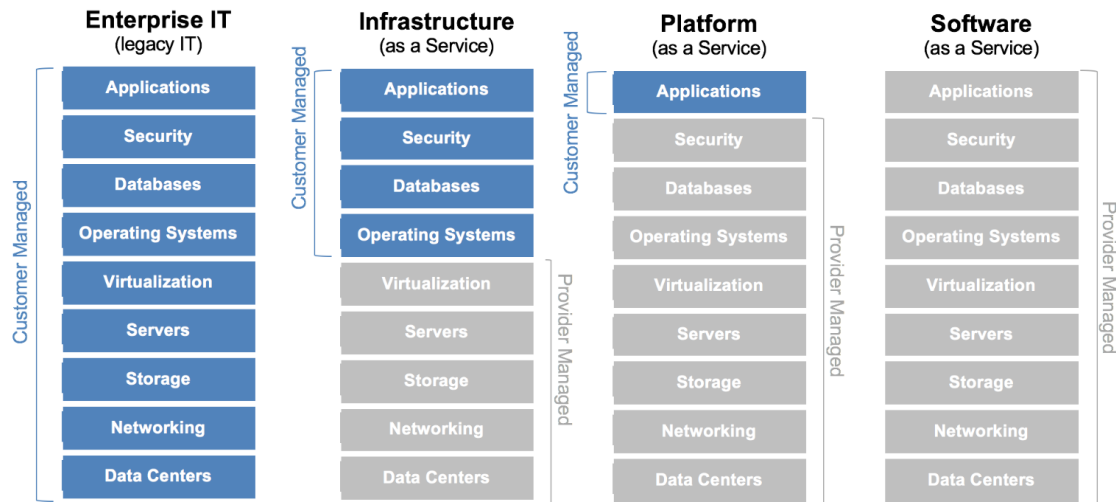
Tipos de Nubes

- ◎ Publicas
- ◎ Privadas
- ◎ Mixtas



Cloud Computing Types

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2.

Bonding

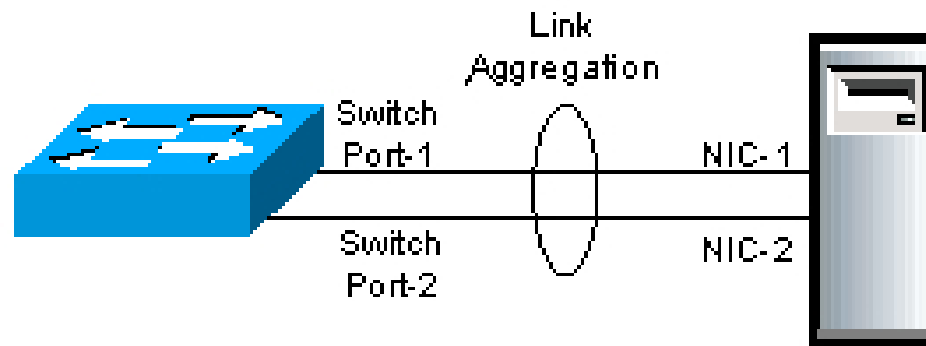
Marco Conceptual

“

Es una tecnología que permite el agregado de múltiples interfaces similares en un solo enlace virtual, obteniendo mayores tasas de transferencia de datos y proporcionando conmutación por error

Wiki Mikrotik

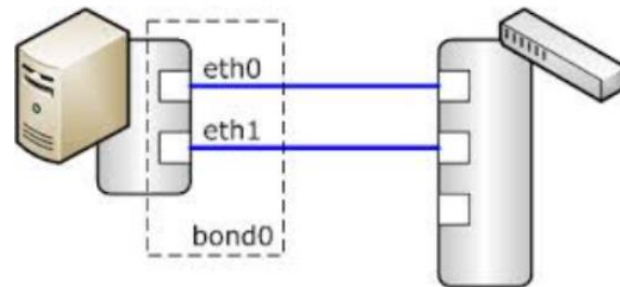
Bonding



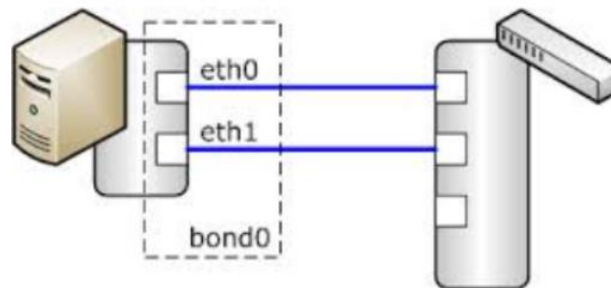
Ethernet Bonding

El controlador bonding, está incluido en prácticamente todas las distribuciones de GNU/Linux, el cual permite sumar las capacidades de varias interfaces físicas de red con objeto de crear una interfaz lógica.

`bond0 = eth0, eth1`



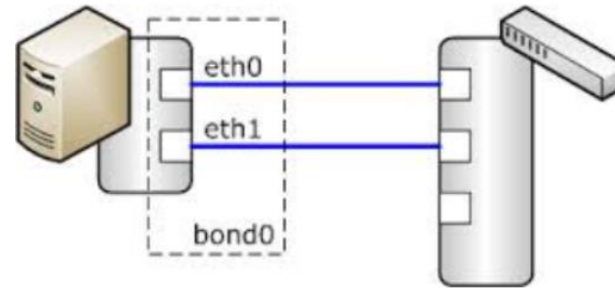
Bonding: Modos



© Modo 0 - balance-rr

Utiliza el método Round-Robin entre las tarjetas de red que forman el enlace. Es decir, transmite los paquetes en orden secuencial desde la primera tarjeta esclava hasta la última, y entonces vuelve a empezar por la primera de nuevo. Esta opción ofrece balanceo de carga y tolerancia a fallos. Todas las transmisiones de datos son enviadas y recibidas de forma secuencial en cada interfaz esclava del arreglo empezando con la primera que esté disponible. Es la política predeterminada del controlador y la que funciona para la mayoría de los casos.

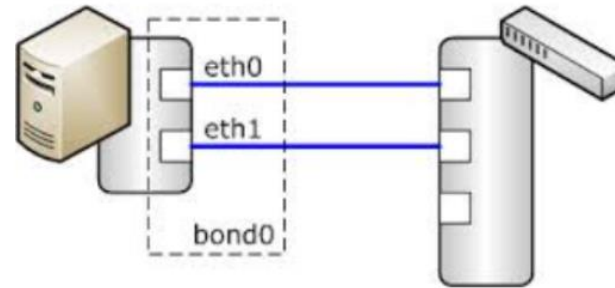
Bonding: Modos



© Modo I - active-backup

Sólo una de las tarjetas esclavas está activa la otra está pasiva. Si la tarjeta activa falla, otra tarjeta se vuelve activa y recibe el tráfico. Esta opción ofrece tolerancia a fallos.

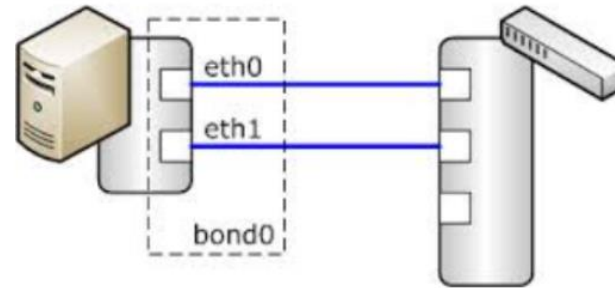
Bonding: Modos



© Modo 2 - balance-xor

Se aplica una política XOR basada en dirección MAC origen XOR dirección MAC destino. De esta forma se selecciona la misma tarjeta esclava para cada MAC destino. Esta opción ofrece balanceo de carga y tolerancia a fallos. Es decir un conjunto de clientes a una MAC y otro conjunto a otra MAC.

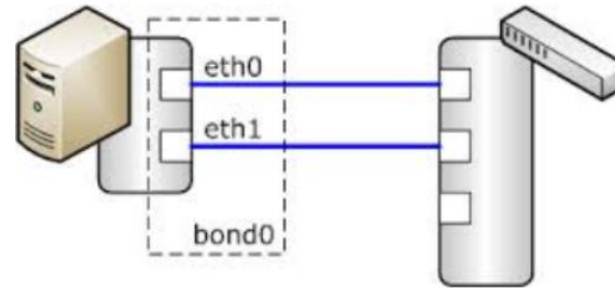
Bonding: Modos



© Modo 3 - broadcast

Se retransmiten todos los paquetes a todas las tarjetas esclavas. Esta opción ofrece tolerancia a fallos. Y se puede utilizar cuando nodos se tiene conexión redundante a dos switch que utilizan ISL (Inter Switch Link)

Bonding: Modos

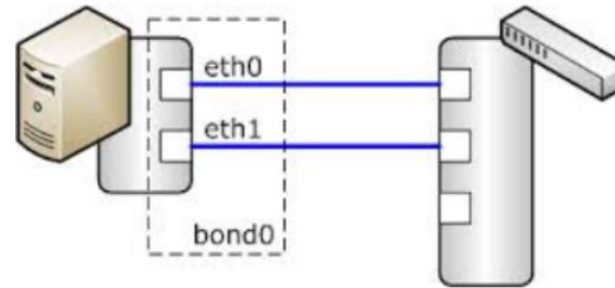


© Modo 4 - 802.ad

802.3ad (Dynamic link aggregation), permite agregar varios enlaces para conseguir un mayor ancho de banda. En el tráfico entrante y saliente.

Todos los enlaces deben tener la misma velocidad y ancho de banda. Es necesario equipamiento de red que soporte 802.3ad. En redes esto se conoce como Port Trunking y en Cisco como EtherChannel. Se debe configurar manualmente los puertos de switch de red utilizadas por cada interfaz para funcionar correctamente.

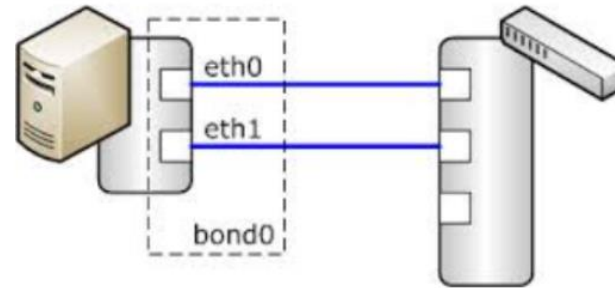
Bonding: Modos



© Modo 5 - balance-tlb

balance-tlb: El tráfico saliente se distribuye según la carga de trabajo en cada tarjeta esclava. Balancea la carga de transmisión entre los esclavos dependiendo de la velocidad de estos y de la carga total. El tráfico es recibido por un esclavo, en caso de fallar otro esclavo toma su MAC y continúa recibiendo tráfico.

Bonding: Modos



© Modo 6 - balance-alb

Incluye el balanceo del tráfico saliente (modo 5) más el balanceo del tráfico entrante. realiza el balanceo anterior además de un balanceo también en la recepción. Para el balanceo del tráfico recibido se utiliza negociación ARP. Este método debe modificar las MAC de los esclavos estando las tarjetas activas, esto debe estar soportado por el driver para poder usar este método

A decorative background consisting of a network diagram with various nodes (circles) and connecting lines, rendered in light gray and blue tones, primarily located on the left and bottom-right sides of the slide.

3.

Caso de Estudio

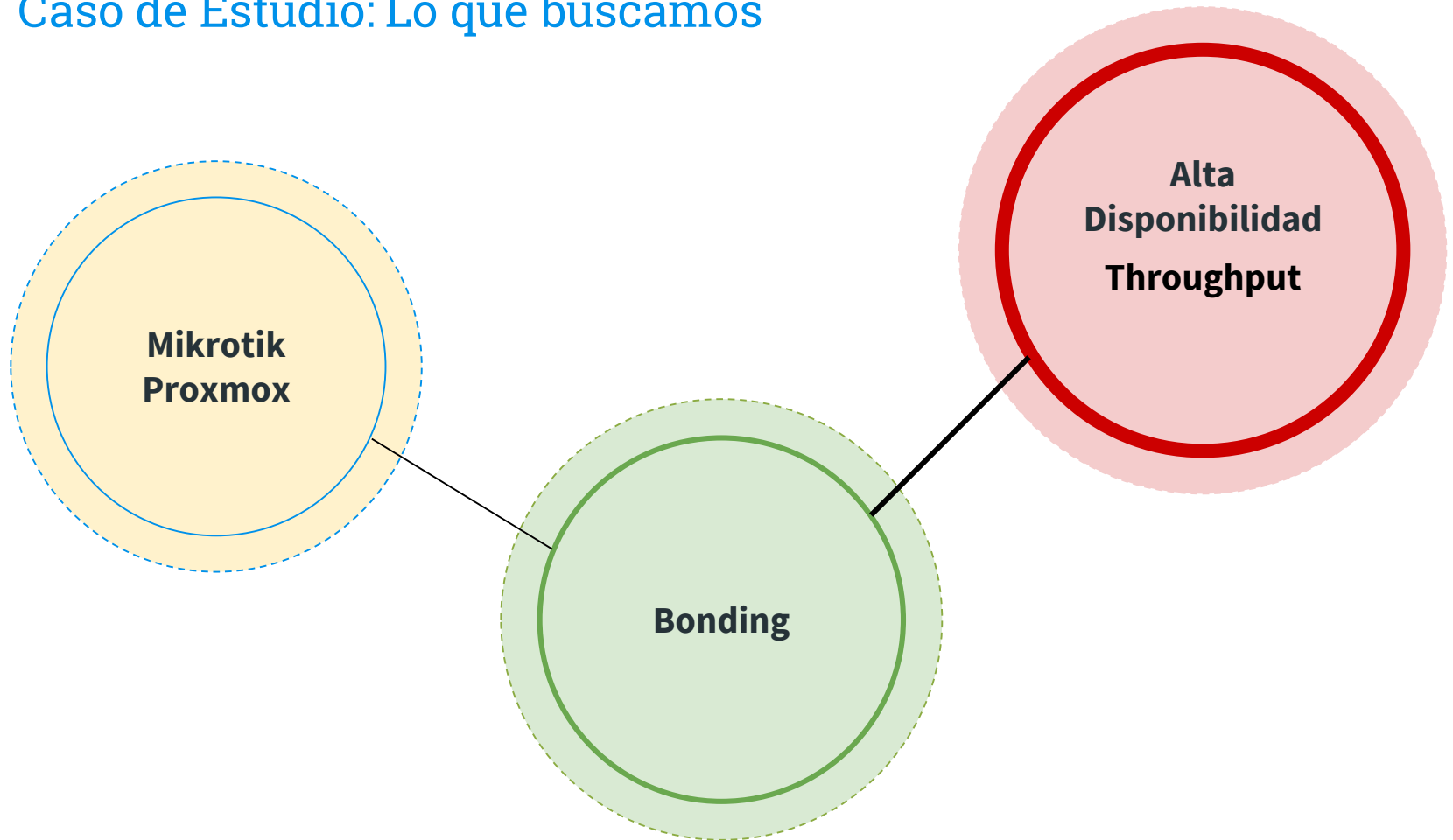
Mikrotik + Proxmox

“

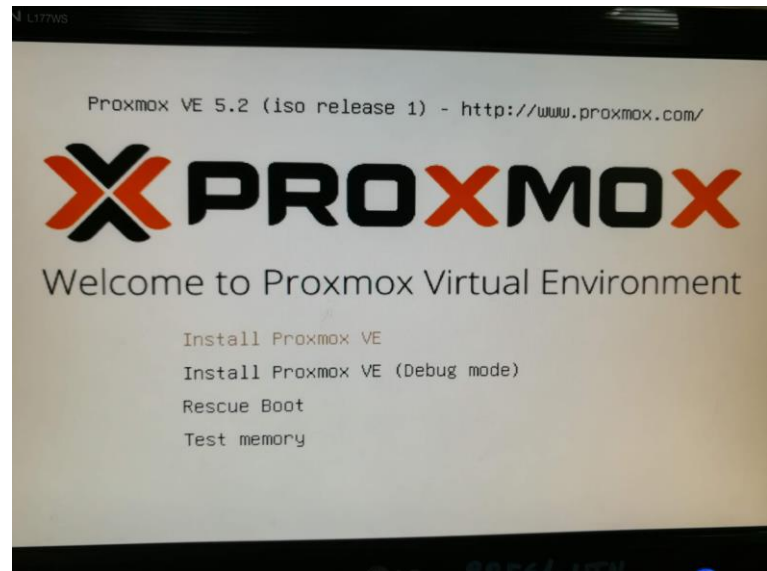
Lograr fortalecer el uso del bonding en dos aspectos críticos en la implementación de una nube privada como lo son:

Alta Disponibilidad y el máximo Throughput

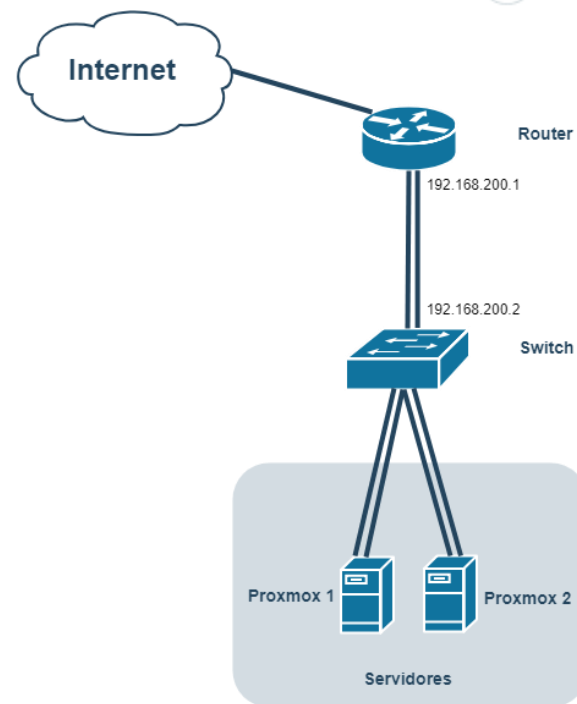
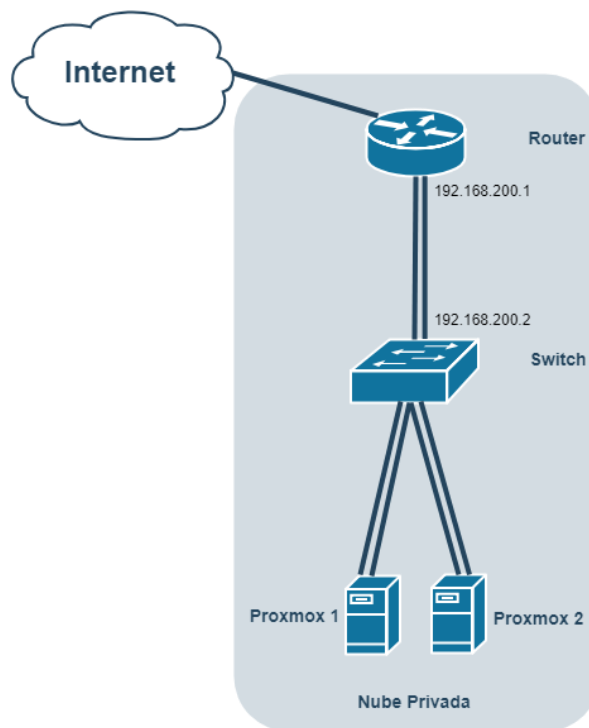
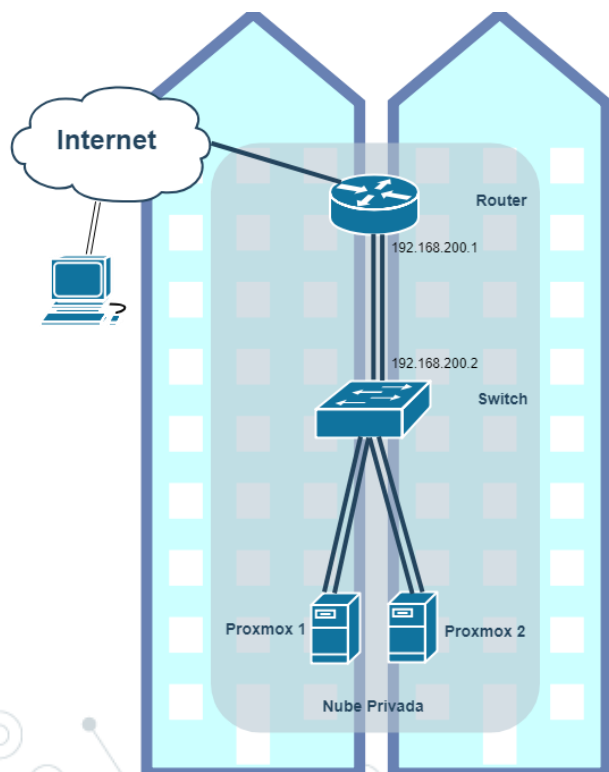
Caso de Estudio: Lo que buscamos



Caso de Estudio: Equipamiento



Caso de Estudio: Proxmox - Mikrotik



Proxmox

Proxmox - powerful open-sour X Nueva pestaña x +
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Proxmox VE 5.2 released!

Remove complexity. Increase elasticity. With the new version of the complete open-source platform for enterprise virtualization.

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Proxmox Virtual Environment

Proxmox VE is a complete open-source platform for enterprise virtualization. With the built-in web interface you can easily manage VMs and containers, software-defined storage and networking, high-availability clustering, and multiple out-of-the-box tools on a single solution.

[About Proxmox VE](#)

Proxmox Mail Gateway

Proxmox Mail Gateway is an open-source email security solution protecting your mail server against all email threats the moment they emerge. The full featured mail proxy can be easily deployed between the firewall and your internal mail server in only a few minutes.

[About Proxmox Mail Gateway](#)

Windows taskbar: e, 📁, 🛒, a, 📧, 🔍, 🌐, 🗂️, 📶, 🔊, 🎧, 🌐, 🇪🇸 6:43 p. m., US 3/11/2018

Proxmox: Download

The screenshot shows the Proxmox website's download page. The browser's address bar displays <https://www.proxmox.com/en/downloads>. The Proxmox logo is prominently displayed at the top. A navigation menu includes links for Home, Virtualization, Email Security, Downloads, Training, Partners, News, and About us. A search bar is located on the right side of the menu. Below the navigation, the page is titled "Download Proxmox software, datasheets and documentation". There are two main sections: "Proxmox Virtual Environment (12)" and "Proxmox Mail Gateway (13)". A second section titled "Download Proxmox software, datasheets and documentation Files" lists four download options, each with a "Download" button and a box icon. The first item, "Proxmox VE 5.2 ISO Installer", is circled in blue. The other items are "Proxmox Mail Gateway 5.1 ISO Installer", "Proxmox VE 5.2 ISO Installer (BitTorrent)", and "Proxmox Mail Gateway 5.0 ISO Installer". The Windows taskbar at the bottom shows the system tray with the date and time set to 3/11/2018 at 6:44 p.m.

Product	Version	Updated On	Download Button
Proxmox Virtual Environment	12		
Proxmox Mail Gateway	13		
Proxmox VE 5.2 ISO Installer	5.2-1	Updated on 16 May 2018	Download
Proxmox Mail Gateway 5.1 ISO Installer	5.1-1	Updated on 09 October 2018	Download
Proxmox VE 5.2 ISO Installer (BitTorrent)	5.2-1	Updated on 18 September 2018	Download
Proxmox Mail Gateway 5.0 ISO Installer	5.0-12	Updated on 01 February 2018	Download

Configuración: Router

admin@4C:5E:0C:DF:B7:89 (MikroTik) - WinBox v6.43.4 on CCR1009-8G-1S-1S+ (tile)

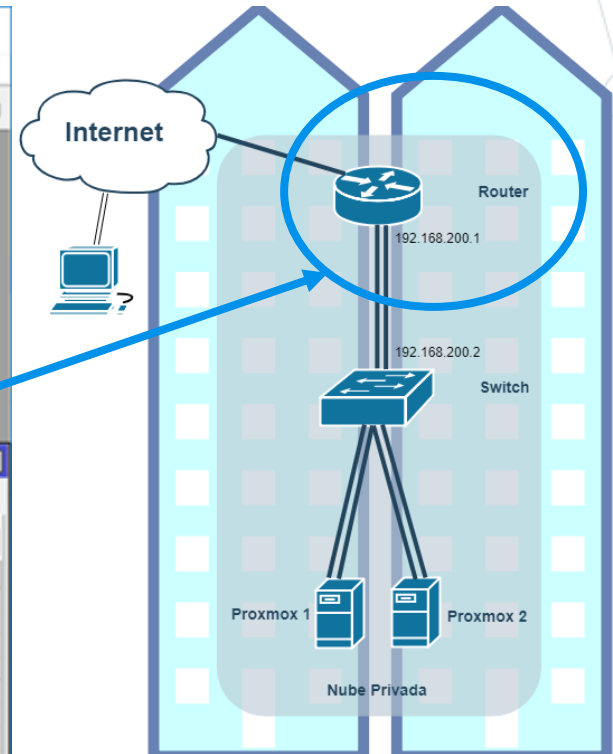
Session Settings Dashboard

Safe Mode Session: 4C:5E:0C:DF:B7:89

Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Switch
Mesh
IP
MPLS
Routing
System
Queues
Files
Log
Radius
Tools
New Terminal
LCD
Partition
Make Supout.tif
Manual
New WinBox

Interface List

Interface	Type	Actual MTU	L2 MTU	Tx	Rx
ether1	Ethernet	1500	1578		0 bps
Trunk					
ether2 - Trunk	Ethernet	1500	1578		0 bps
ether3 - Trunk	Ethernet	1500	1578		0 bps
ether4	Ethernet	1500	1578		0 bps
ether5	Ethernet	1500	1580		0 bps
ether6	Ethernet	1500	1580		0 bps
ether7	Ethernet	1500	1580		0 bps
ether8	Ethernet	1500	1580	103.6 kbps	6.4 k
afp-afplus1	Ethernet	1500	1580		0 bps
afp1	Ethernet	1500	1580		0 bps



Configuración: Router

The screenshot displays the MikroTik WinBox interface for a MikroTik CCR1009-8G-1S-15+ router. The main window shows the 'Address List' configuration for a bonding interface. The configuration is as follows:

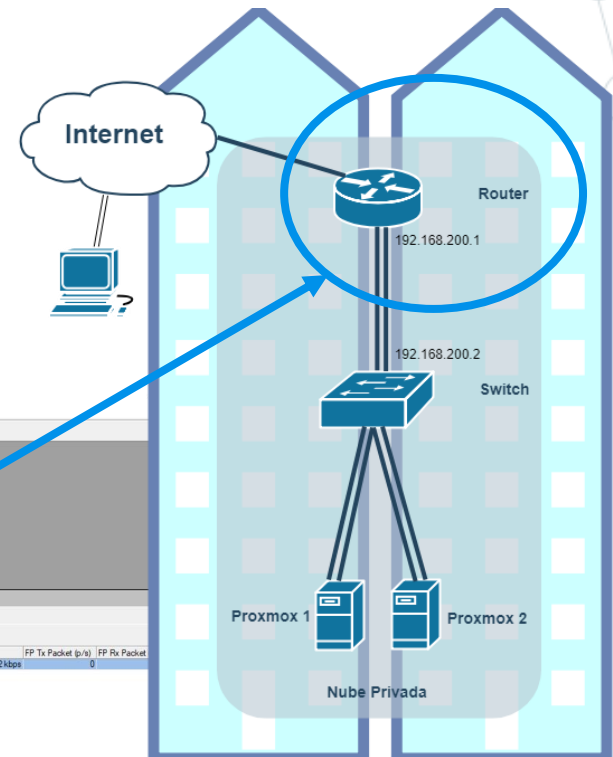
Address	Network	Interface
192.168.200.1	192.168.200.0	Bonding-Router...

Below this, the 'Interface List' shows the configuration for the bonding interface:

Name	Type	MTU	Actual MTU	L2 MTU	Tx	Rx
Bonding-Router...	Bonding	1500	1500	1578	3.2 Mbits	

The 'Interface <Bonding-Router-Switch>' configuration window is also visible, showing the following settings:

- Slaves: ether2 - Trunk, ether3 - Trunk
- Mode: balance rr
- Primary: none
- Link Monitoring: mii
- Transmit Hash Policy: layer 2 and 3
- Min Links: 0
- Down Delay: 0 ms
- Up Delay: 0 ms
- LACP Rate: 1 s
- MII Interval: 100 ms



Configuración: Switch

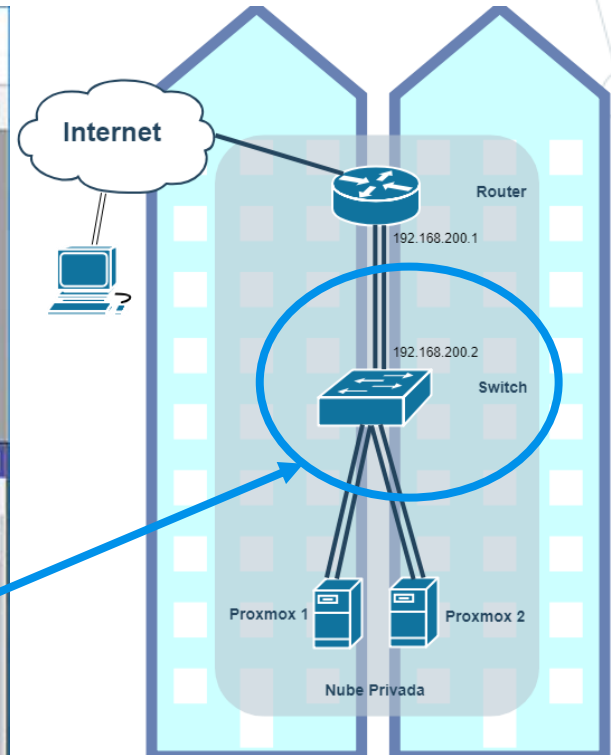
admin@6C:3B:6B:0B:0C:D9 (Switch) - WinBox v6.43.4 on CRS125-24G-1S (mipsbe)

Session Settings Dashboard

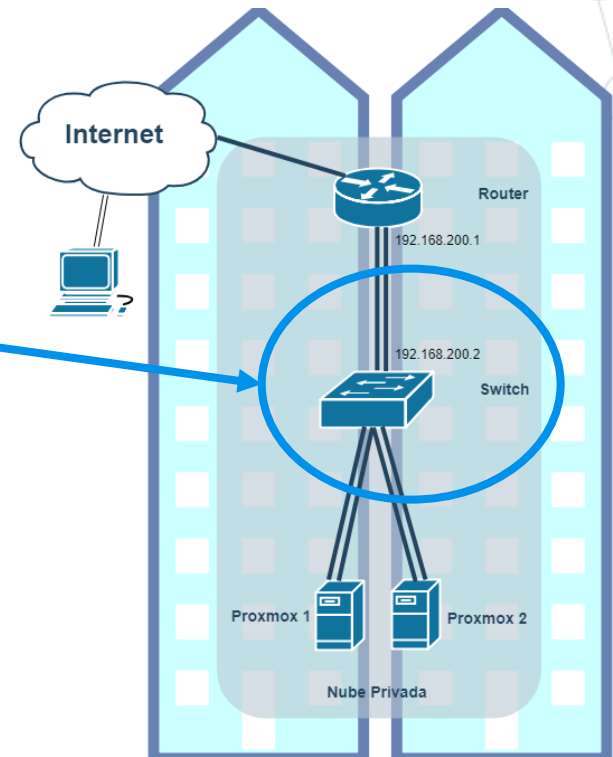
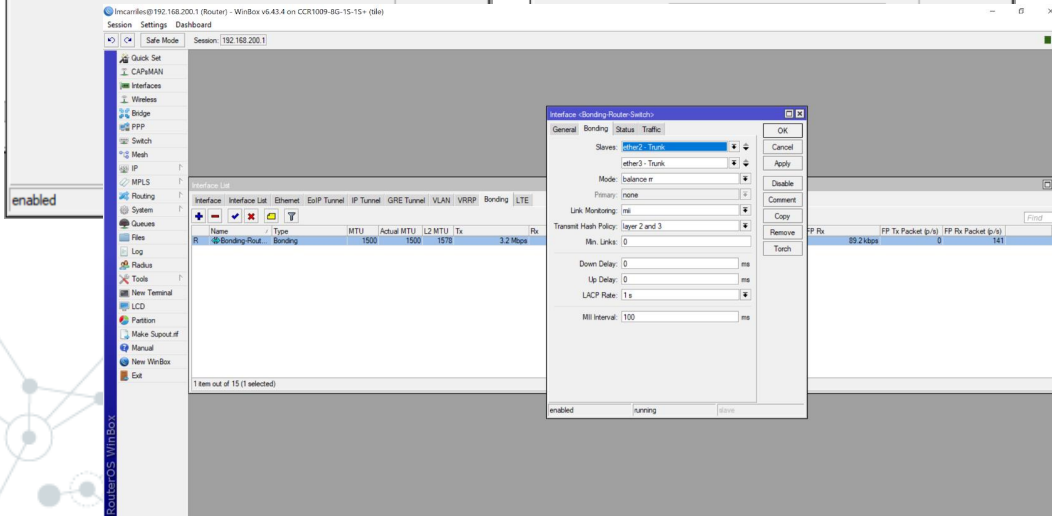
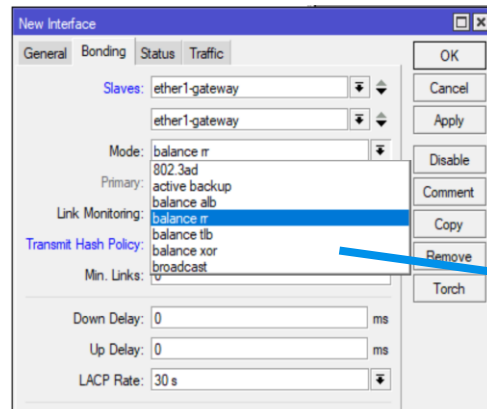
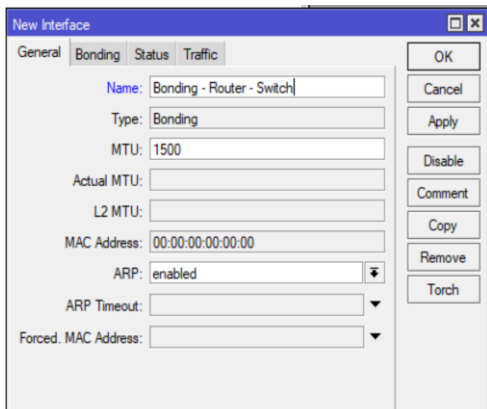
Safe Mode Session: 6C:3B:6B:0B:0C:D9

Interface List

Interface	Type	Actual MTU	L2 MTU	Tx
S ether11	Ethernet	1500	1500	1500
S ether12	Ethernet	1500	1500	1500
S ether13	Ethernet	1500	1500	1500
S ether14	Ethernet	1500	1500	1500
S ether15	Ethernet	1500	1500	1500
S ether16	Ethernet	1500	1500	1500
S ether17	Ethernet	1500	1500	1500
S ether18	Ethernet	1500	1500	1500
S ether19	Ethernet	1500	1500	1500
S ether20	Ethernet	1500	1500	1500
S ether21	Ethernet	1500	1500	1500
S ether22	Ethernet	1500	1500	1500
RS ether23 - Trunk	Ethernet	1500	1500	19.3
RS ether24 - Trunk	Ethernet	1500	1500	19.3



Configuración: Switch



Configuración: Switch

admin@6C:3B:6B:0B:0C:D9 (Switch) - WinBox v6.43.4 on CRS125-24G-1S (mipsbe)

Session Settings Dashboard

Safe Mode Session: 6C:3B:6B:0B:0C:D9

- Quick Set
- CAPsMAN
- Interfaces
- Wireless
- Bridge
- PPP
- Switch
- Mesh
- IP
- MPLS
- Routing
- System
- Queues
- Files
- Log
- Radius
- Tools
- New Terminal
- LCD
- MetaROUTER
- Partition
- Make Supout.rf
- Manual
- New WinBox

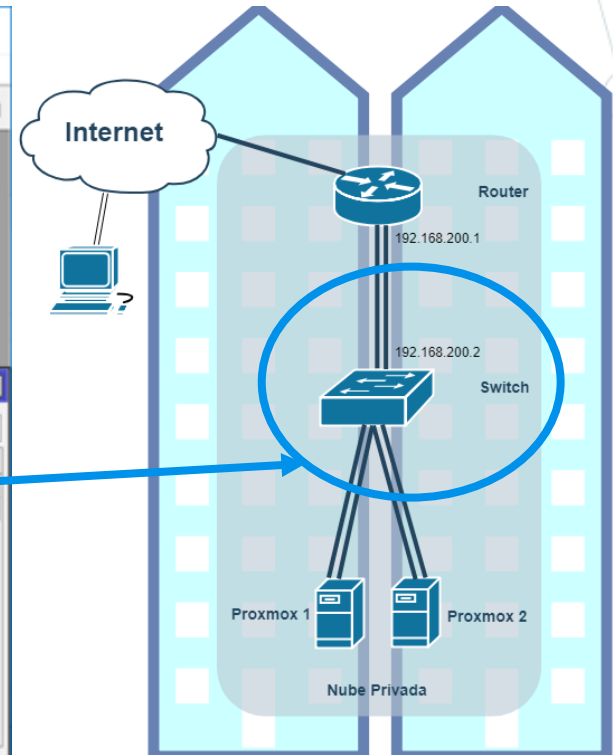
Interface List

Interface	Interface List	Ethernet	EoIP Tunnel	IP
R	Bonding - Router - Switch			

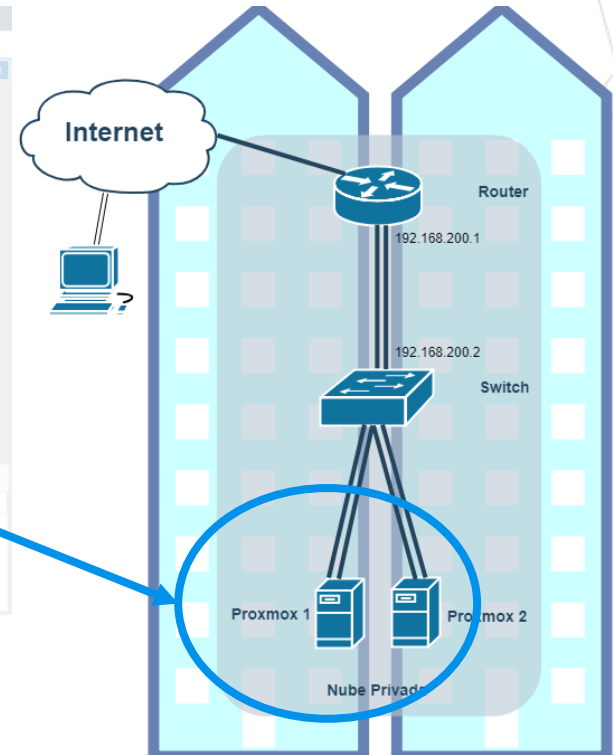
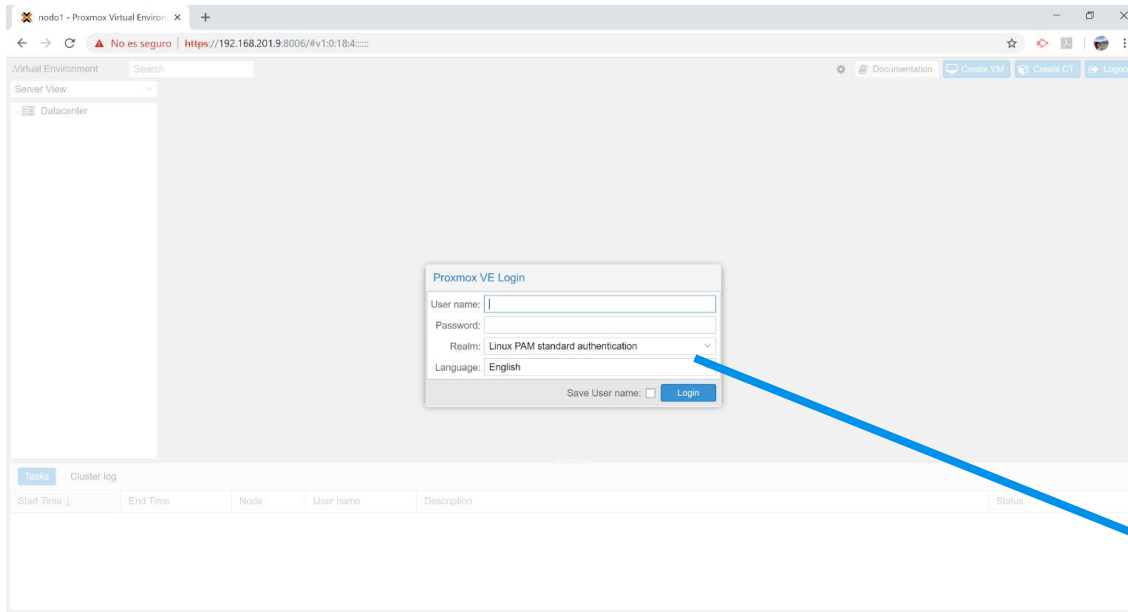
Address List

Address	Network	Interface
192.168.200.2	192.168.200.0	Bonding - Rout...

1 item



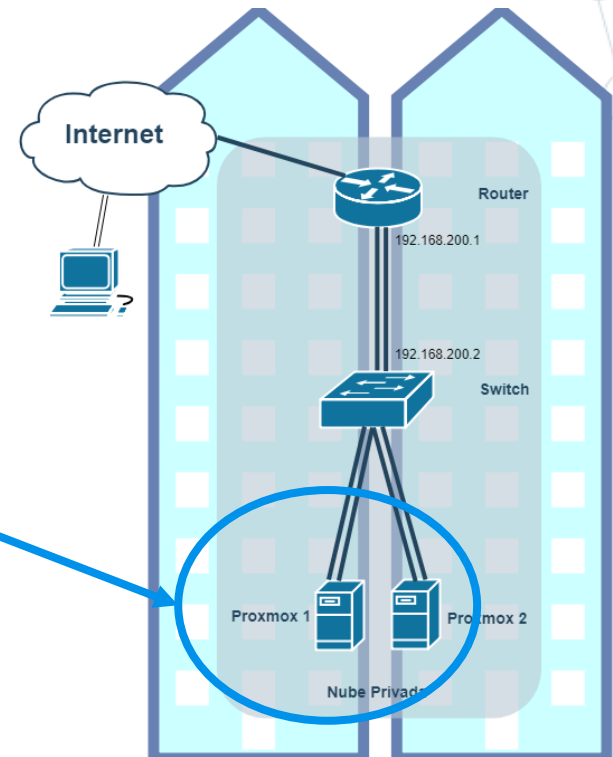
Configuración: Proxmox



Configuración: Proxmox

Name	Type	Active	Autostart	VLAN a...	Ports/Slaves	IP address	Subnet mask	Gateway	Comment
bond0	Linux Bond	Yes	Yes	No	esp0s8 esp0s9				Bonding
enp0s8	Network Device	Yes	No	No					
enp0s9	Network Device	Yes	No	No					
vmbr0						255.255.255.0	192.168.201.1		

Start Time	End Time	Node	User name	Description	Status
Nov 04 04:04:35	Nov 04 04:05:13	nod01	root@pam	Update package database	Error: command 'apt-get upd...
Nov 03 20:37:46	Nov 03 20:37:46	nod01	root@pam	Stop all VMs and Containers	OK
Nov 03 20:36:48	Nov 03 20:36:49	nod01	root@pam	VM/CT 100 - Console	Error: Failed to run vncproxy.
Nov 03 20:33:26	Nov 03 20:33:27	nod01	root@pam	VM/CT 100 - Console	Error: Failed to run vncproxy.
Nov 03 20:31:31	Nov 03 20:31:32	nod01	root@pam	VM 100 - Configure	OK



Configuración: Proxmox

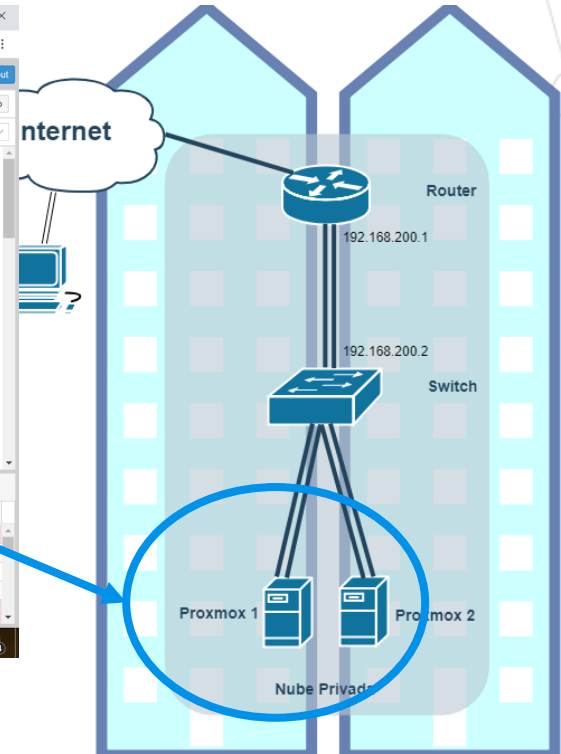
The screenshot shows the Proxmox VE 5.2-1 web interface. The main panel displays system statistics for 'node1' (Uptime: 5 days 20:00:30):

- CPU usage: 12.76% of 2 CPU(s)
- Load average: 0.54, 0.20, 0.07
- RAM usage: 24.42% (963.38 MB of 3.85 GiB)
- HD space(root): 4.84% (1.75 GiB of 36.17 GiB)
- SWAP usage: 0.00% (0 B of 4.00 GiB)

Hardware details: 2 x Dual-Core AMD Opteron(tm) Processor 1210 (1 Socket), Linux 4.15.17-1-pve #1 SMP PVE 4.15.17-9 (Wed, 9 May 2018 13:31:43 +0200), pve-manager/5.2-1/0fcd7879.

The 'Tasks' tab shows a cluster log with the following entries:

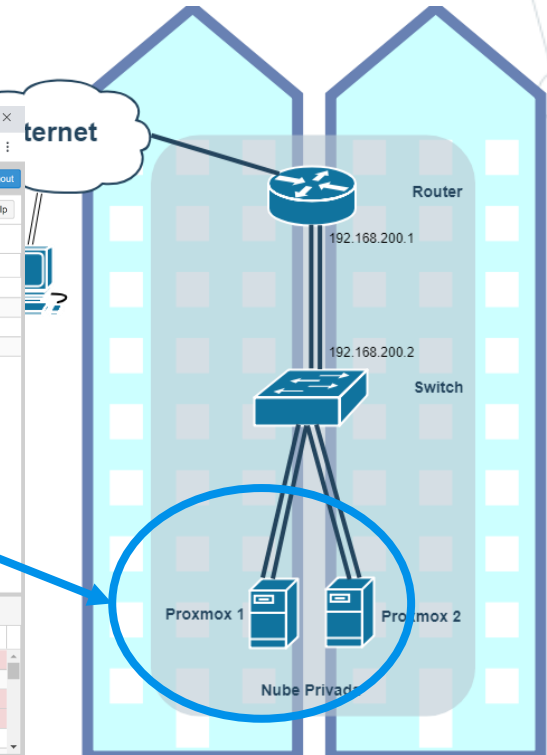
Start Time	End Time	Node	User name	Description	Status
Nov 09 10:16:38	Nov 09 10:16:40	node1	root@pam	VM/CT 101 - Console	Error: Failed to run vncproxy
Nov 09 10:16:17	Nov 09 10:16:37	node1	root@pam	VM/CT 101 - Console	OK
Nov 09 10:16:12	Nov 09 10:16:14	node1	root@pam	VM 102 - Start	OK
Nov 09 10:16:11	Nov 09 10:16:15	node1	root@pam	VM 101 - Start	OK
Nov 09 10:16:02	Nov 09 10:16:04	node1	root@pam	VM/CT 101 - Console	Error: Failed to run vncproxy



Configuración: Proxmox

The screenshot shows the Proxmox VE web interface for Node 'nodo1'. The 'Network' tab is active, displaying a table of network devices. A blue box highlights the 'bond0' configuration, which is a Linux Bond with IP address 192.168.201.9 and gateway 192.168.201.1. A blue arrow points from this configuration to the network diagram on the right.

Name	Type	Active	Autostart	VLAN a...	Ports/Slaves	IP address	Subnet mask	Gateway	Comment
bond0	Linux Bond	Yes	Yes	No	enp0s8 enp0s9				Bonding
enp0s8	Network Device	Yes	No	No					
enp0s9	Network Device	Yes	No	No					
vmbro	Linux Bridge	Yes	Yes	No	bond0	192.168.201.9	255.255.255.0	192.168.201.1	



Algunos resultados

lmcarriles@192.168.202.254 (Switch) - WinBox v6.43.4 on CRS125-24G-1S (mipsbe)

Session Settings Dashboard

Safe Mode Session: 192.168.202.254

Quick Set CAPsMAN Interfaces Wireless Bridge PPP Switch Mesh IP MPLS Routing System Queues Files Log Radius Tools New Terminal LCD MetaROUTER Partition Make Suptout.rtf Manual New WinBox Exit

Interface List

Name	Type	Actual MTU	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	IF TX
RS Bonding-Nodo1	Bonding	1500	1588	2.9 kbps	1906.9 Mbps	5	157 032	
R Bonding-Router-Switch	Bonding	1500	1588	874.9 Mbps	127.6 kbps	71 870	16	
R vlan1-Administracion	VLAN	1500	65531	0 bps	0 bps	0	0	
RS vlan300-Servidores	VLAN	1500	65531	745.4 Mbps	0 bps	61 550	4	745.4
R vlan301-Internet	VLAN	1500	65531	0 bps	0 bps	0	0	
RS vlan302-Clientes	VLAN	1500	65531	0 bps	24.2 kbps	0	2	

```

defconf
R #bridge
R #bridge-Vlan300-Servidores
R #bridge-Vlan302-Clientes
S #ether1
S #ether2
RS #ether3
RS #ether4
S #ether5
S #ether6
RS #ether7 - Nodo1
RS #ether8 - Nodo1
S #ether9 - Nodo1 - Virtualizacion
  
```

Terminal

```

g-Nodo1
name: et
rx-packets-per-second:
rx-bits-per-second:
fp-rx-packets-per-second:
fp-rx-bits-per-second:
rx-drops-per-second:
tx-packets-per-second:
tx-bits-per-second:
fp-tx-packets-per-second:
tx-drops-per-second:
tx-queue-drops-per-second:
tx-errors-per-second:
[Q quit|D dump|C-z pause]
  
```

Algunos resultados

RouterOS WinBox

Session Settings Dashboard

Safe Mode Session: 192.168.202.254

Quick Set
CAPsMAN
Interfaces
Wireless
Bridge
PPP
Switch
Mesh
IP
MPLS
Routing
System
Queues

Files
Log
Radius
Tools
New Terminal
LCD
MetaROUTER
Partition
Make Supout.nf
Manual
New WinBox
Exit

Interface List

Interface	Interface List	Ethernet	EoIP Tunnel	IP Tunnel	GRE Tunnel	VLAN	VRPP	Bonding	LTE
RS	Bonding-Nodo1	Bonding							
R	Bonding-Flou...	Bonding							
R	vlan1-Admi...	VLAN							
RS	vlan300-Se...	VLAN							
R	vlan301-Int...	VLAN							
RS	vlan302-Cli...	VLAN							
...	defconf								
R	bridge	Bridge							
R	bridge-Vlan30...	Bridge							
R	bridge-Vlan30...	Bridge							
S	ether1	Ethernet							
S	ether2	Ethernet							
RS	ether3	Ethernet							
RS	ether4	Ethernet							
S	ether5	Ethernet							
S	ether6	Ethernet							
RS	ether7 - Nod1	Ethernet							
RS	ether8 - Nod1	Ethernet							
S	ether9 - Nod...	Ethernet							

34 items

tx-queue-drops-per-second:
tx-errors-per-second:
[Q quit|D dump|C-z pause]

Internet

Router
192.168.200.1

Switch
192.168.200.2

Proxmox 1

Proxmox 2

Nube Privada

RouterOS WinBox

ESP 10:33 p. m.
US 6/11/2018

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Gracias!

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