

# BGP EN ROUTEROS V7

(cómo migrar de v6 a v7 sin morir en el intento...)

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# Sobre mi

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- ✓ Mario Clep
- ✓ Ingeniero en telecomunicaciones
- ✓ CTO MKE Solutions
- ✓ MikroTik Certified Consultant & Trainer desde 2010.
- ✓ Experiencia desde 2005.





# Sobre MKE Solutions

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- ✓ Consultoría en Telecomunicaciones.
- ✓ Capacitaciones / Entrenamientos Oficiales en MikroTik RouterOS.
- ✓ Implementaciones / Soporte a ISPs.
- ✓ Relevamiento y Optimización de redes.
- ✓ Desarrollo de software.

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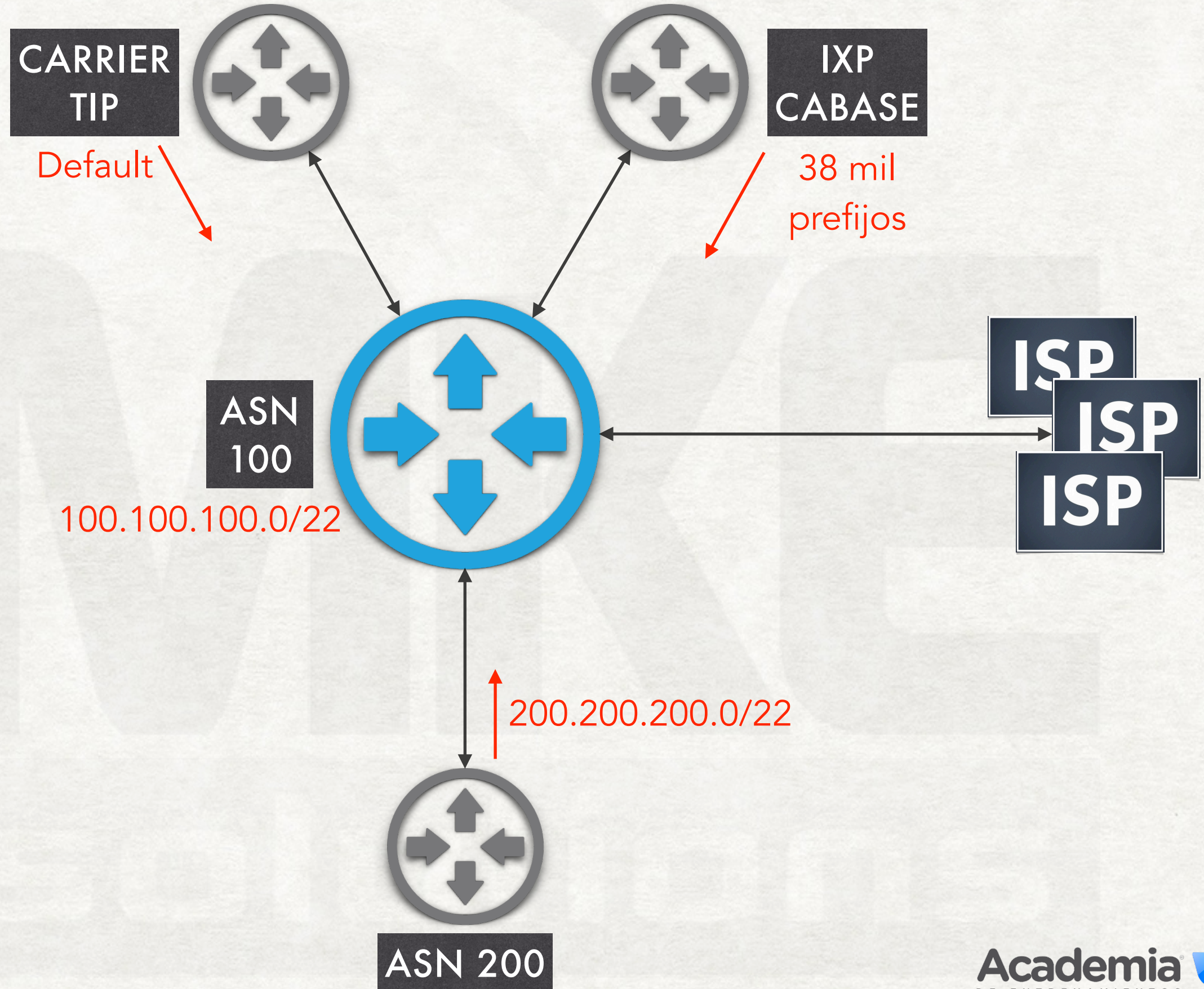
# Consideraciones previas

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- ✓ No todos los escenarios son iguales.
- ✓ Hay casos mucho más complejos y algunos más simples.
- ✓ No todos se resuelven de la misma manera.
- ✓ No hay una receta mágica para todas las implementaciones por igual.
- ✓ Esta no es una charla de BGP desde cero, sino más bien de las diferencias entre la versión 6 y la versión 7, por lo que se entiende que ya se cuenta con algo de experiencia en BGP en RouterOS v6.



# Caso de estudio simplificado





# Introducción

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- ✓ Históricamente RouterOS siempre respetó las configuraciones existentes al momento de realizar un upgrade.
- ✓ Al ir avanzando en versiones, siempre hay nuevas funcionalidades, mejoras en el rendimiento y corrección de errores y vulnerabilidades.
- ✓ La versión de RouterOS v7 implementa un nuevo kernel, con muchos agregados importantes: VXLAN, nuevas disciplinas de encolamiento, WireGuard, ZeroTier, ISIS y un rediseño completo de los protocolos de enrutamiento, entre varias cosas más...



# Introducción

<b>IS-IS</b>							
IPv4						Initial support	
IPv6							
Traffic Engineering							
<b>BGP</b>							
Convert BGP config from v6 to v7 after upgrade							
BGP Templates and dynamic peers							
BGP connect listen on a network							
BGP guess remote.as							
Show from which peer route received	OK ( /routing/route/print detail --> belongs-to)						
BGP Address Families							
BGP input.accept-*							
eBGP nexthop self							

<https://help.mikrotik.com/docs/spaces/ROS/pages/28606515/Routing+Protocol+Overview>



# Introducción

## Feature list compatibility

As previously stated, nearly all RouterOS systems can use the "Check for updates" functionality and upgrade to v7 in a few clicks,

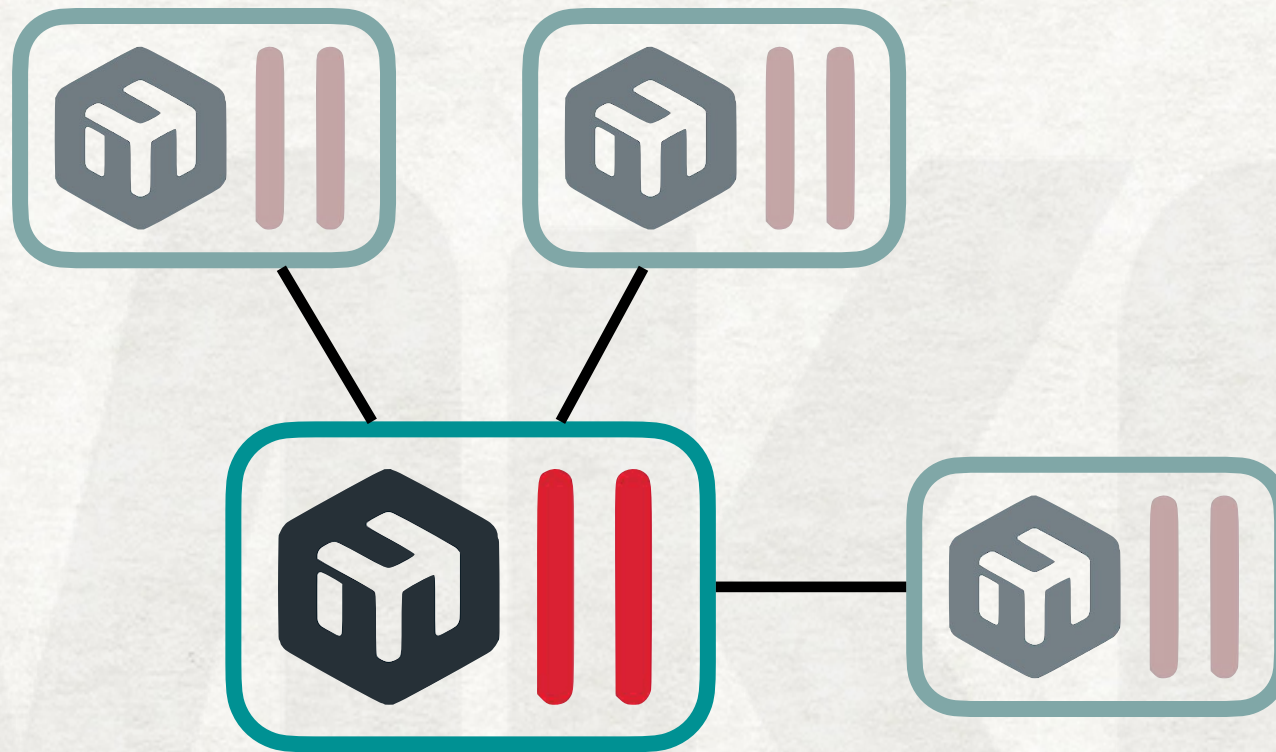
Feature	Status
CAPsMAN	OK
Interfaces	OK
Wireless	OK
Bridge/Switching	OK
Tunnels/PPP	OK
IPv6	OK
BGP	OK, but attention is required *
OSPF	OK, but attention is required **
MPLS	OK, but attention is required ***
Routing filters	OK, but attention is required ****
PIM-SM	See <a href="#">notes</a>
IGMP Proxy	OK

<https://help.mikrotik.com/docs/spaces/ROS/pages/115736772/Upgrading+to+v7>



# Introducción

✓ Ante la duda de una correcta migración en la configuración de BGP, se me ocurrió armar el laboratorio con máquinas virtuales.

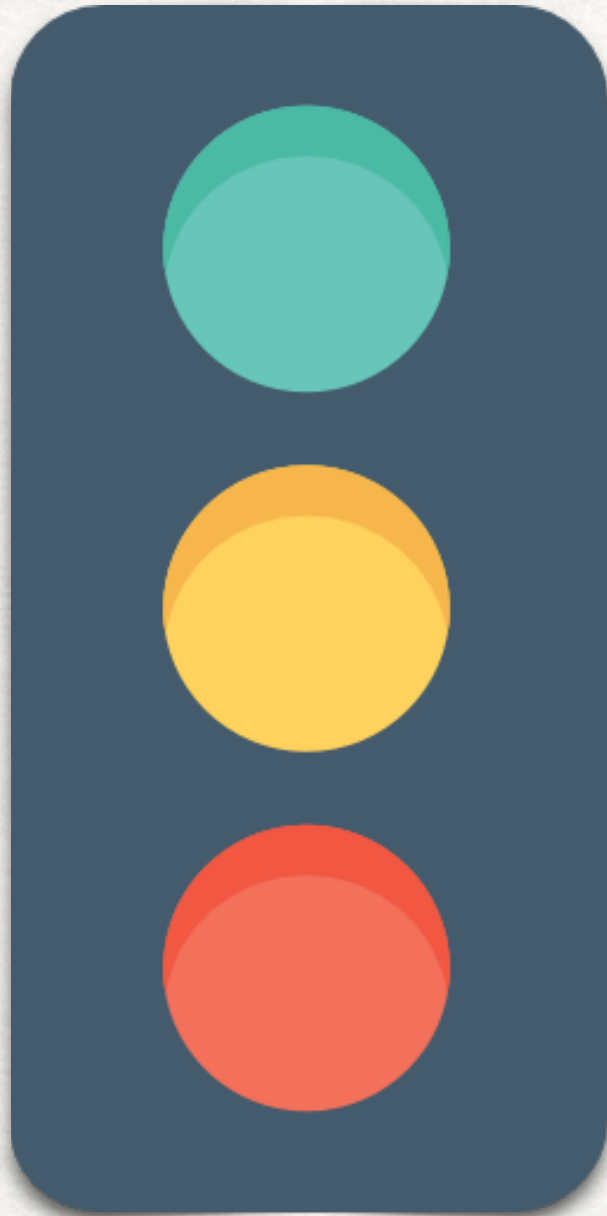


✓ Al actualizar de v6 a v7 me encontré con que **se había perdido el 100% de la configuración de BGP.**



# Complejidad para migrar de v6 a v7

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Configuración de pares para la sesión de BGP.

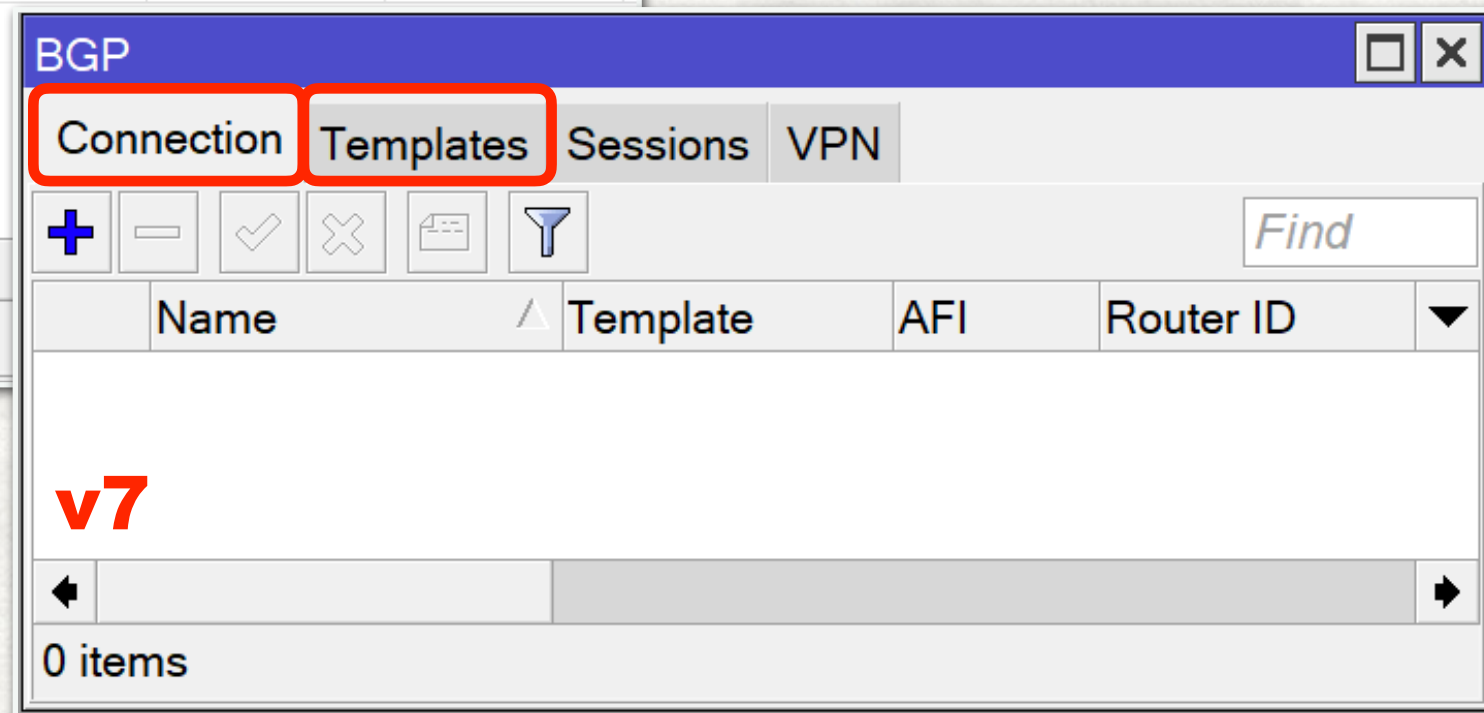
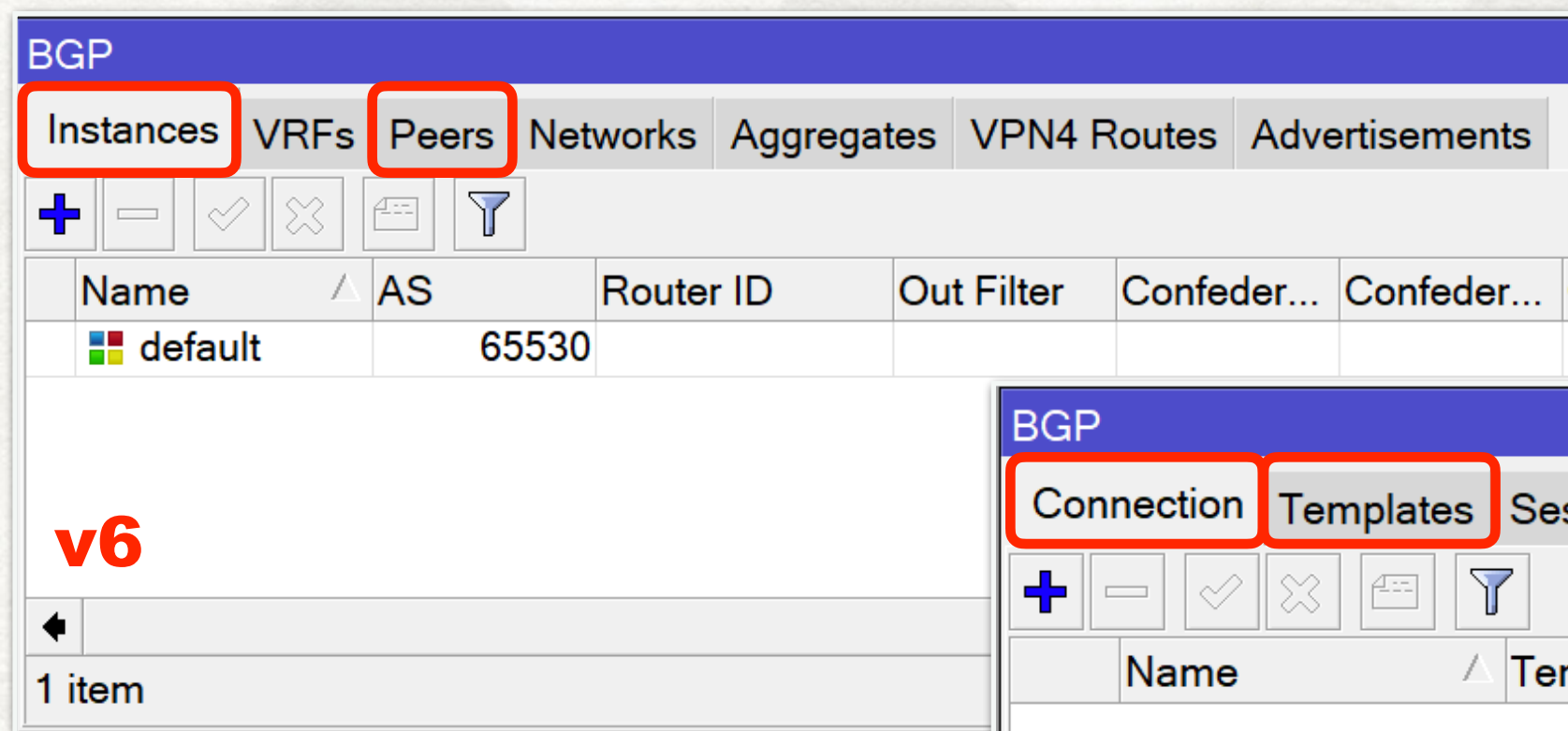
Configuración de redes para originar.

Configuración de filtros in/out.



# Diferencias teóricas entre v6 y v7

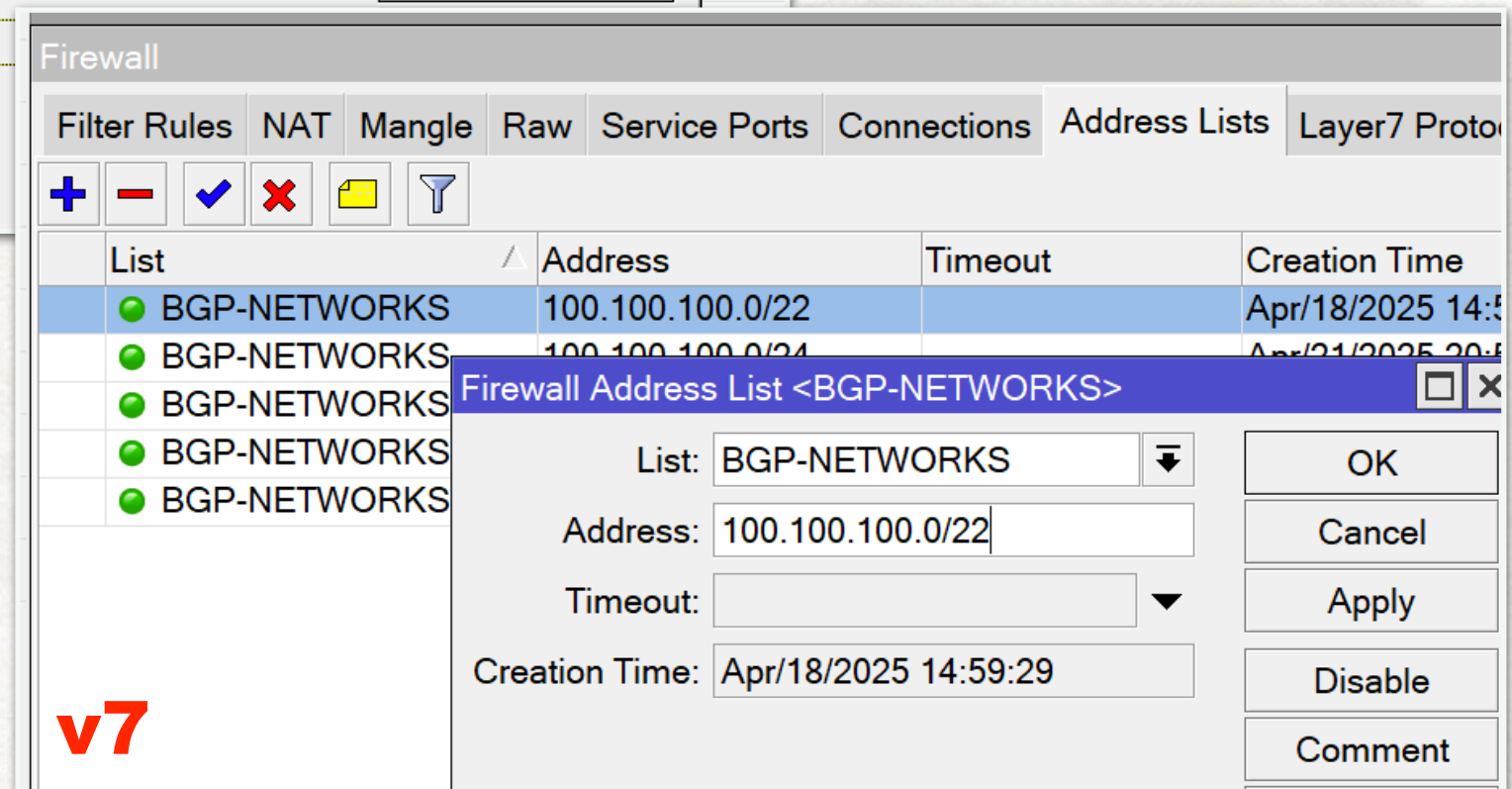
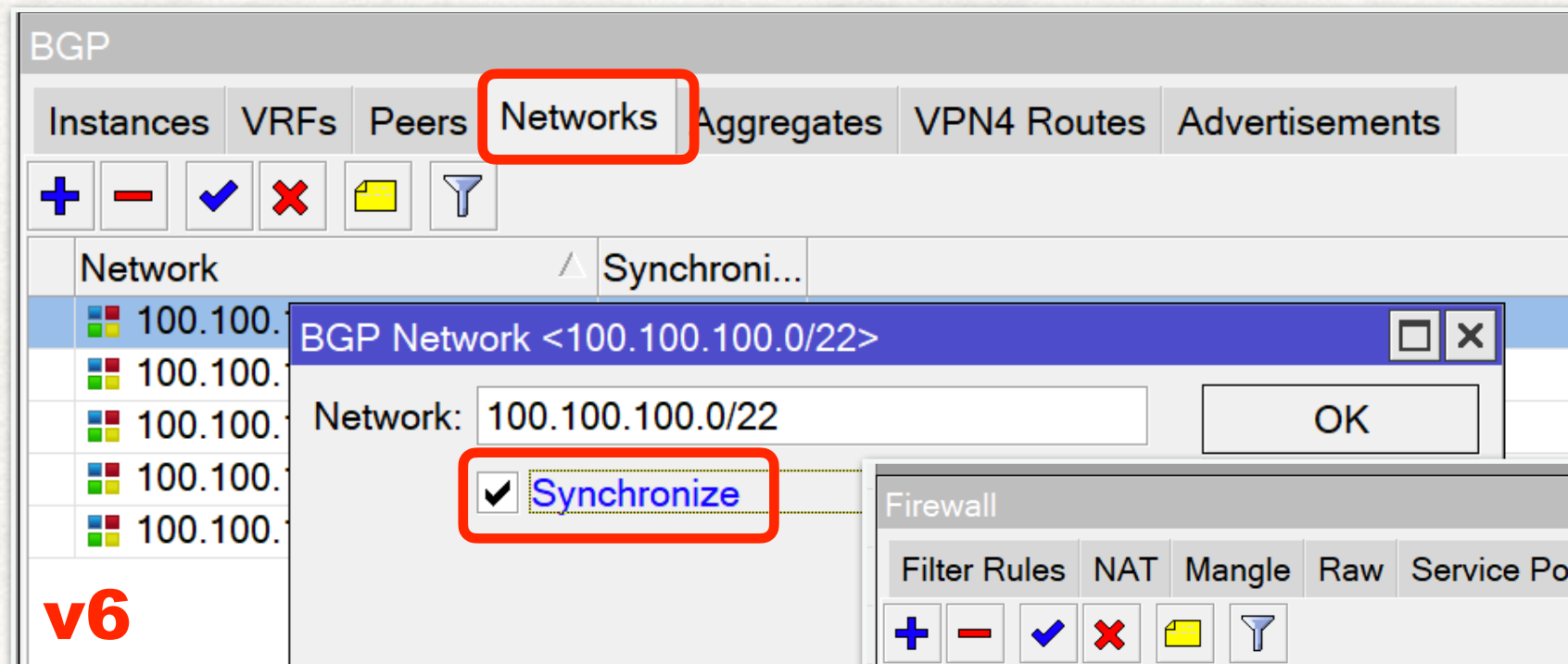
- ✓ Rediseño completo de la configuración de BGP.
- ✓ Ya no hay mas **Instances** ni **Peers**.
- ✓ En su lugar hay **Templates** y **Connection**.





# Diferencias teóricas entre v6 y v7

- ✓ Ya no hay mas **Networks** y el **Synchronize** es mandatorio.
- ✓ En su lugar, se declaran los prefijos a originar dentro de un address-list.





# Diferencias teóricas entre v6 y v7

- ✓ Los filtros cambian por completo, tanto la sintaxis, como la acción por default.
- ✓ Los filtros tiene un formato del tipo script:

```
if (condición) {  
    acción1;  
    acción;  
}
```

Route Filter <100.100.100.0/22>

Matchers BGP Actions BGP Actions

Chain: TIP-out

Prefix: 100.100.100.0/22

Prefix Length:

Match Chain:

Protocol:

Distance:

Scope:

Target Scope:

Pref. Source:

Routing Mark:

Route Comment:

Route Tag:

Route Targets:

**v6**

☐ Invert Route Targets

OK Cancel Apply Disable Comment Copy Remove

Routing Filter Rule

Chain: TIP-out

Rule:

```
if (dst == 100.100.100.0/22) {  
    accept;  
}
```

**v7**

enabled

OK Cancel Apply Disable Comment Copy Remove



# Configuración en v6

BGP

Instances VRFs Peers Networks Aggregates VPN4 Routes

+ - ✓ ✗ 📄 🔍

Name	AS	Router ID	Out Filter	Co
default	100			

BGP Instance <default>

Name: default

AS: 100

BGP

Instances VRFs Peers Networks Aggregates VPN4 Routes Advertisers

+ - ✓ ✗ 📄 🔍 Refresh Refresh All Resend Resend All

Name	Instance	Remote Address	Remote AS	M...
AS200	default	10.129.22.2	200	no
Carrier-TIP	default	10.32.36.5	7049	no
IXP-Cabase	default	201.182.132.254	64106	no

BGP Peer <AS200>

General Advanced Status

Name: AS200

Instance: default

Remote Address: 10.129.22.2

Remote Port:

Remote AS: 200

TCP MD5 Key:

Nexthop Choice: default

☐ Multihop

☐ Route Reflect

In Filter: AS200-in

Out Filter: AS200-out

BGP

Instances VRFs Peers Networks Aggregate

+ - ✓ ✗ 📄 🔍

Network	Synchroni...
100.100.100.0/22	no
100.100.100.0/24	no
100.100.101.0/24	no
100.100.102.0/24	no
100.100.103.0/24	no



# Configuración en v7

BGP

Connection Templates Sessions VPN

+ - ✓ ✗ 📁 🔍 Find

Name	AS	AFI	Router ID	M
* default	100			

BGP Template <default>

General Extra Attributes Filter

Name: default

AS: 100

BGP

Connection Templates Sessions VPN

+ - ✓ ✗ 📁 🔍

Name	Template	Remote Address	Remote AS	Local Role
AS200	default	10.129.22.2/32	200	ebgp
Carrier-TIP	default	10.32.36.5/32	7049	ebgp
IXP-Cabase	default	201.182.132.254/32	64106	ebgp

BGP Connection <AS200>

General Extra Attributes Filter

Name: AS200

Template: default

AS: 100 /

AFI:

Router ID:

Remote Address: 10.129.22.2/32

Remote Port:

Remote AS: 200

Remote Allow AS:

Local Address:

Local Port:

Local Role: ebgp

TCP MD5 Key:

BGP Connection <AS200>

General Extra Attributes Filter

Input Filter: AS200-in

Input Accept NLRI:

Input Accept Communities:

Input Accept Ext Communities:

Input Accept Large Communities:

Input Accept Unknown:







Output Filter: AS200-out









Output Selection Policy:








Output Network: BGP-NETWORKS



# Configuración en v7

Firewall				
Filter Rules NAT Mangle Raw Service Ports Connections Address Lists				
     				
List	Address	Creation Time		
● BGP-NETWORKS	100.100.100.0/22	Apr/18/2025 14:5...		
● BGP-NETWORKS	100.100.100.0/24	Apr/21/2025 20:5...		
● BGP-NETWORKS	100.100.101.0/24	Apr/21/2025 20:5...		
● BGP-NETWORKS	100.100.102.0/24	Apr/21/2025 20:5...		
● BGP-NETWORKS	100.100.103.0/24	Apr/21/2025 20:5...		

Route List				
     				
Dst. Address  in  100.100.100.0/22				
	Dst. Address	Distance	Gateway	Blackhole
AS	▶ 100.100.100.0/22	222		yes
AS	▶ 100.100.100.0/24	222		yes
AS	▶ 100.100.101.0/24	222		yes
AS	▶ 100.100.102.0/24	222		yes
AS	▶ 100.100.103.0/24	222		yes

Route <100.100.100.0/22>		
General	Status	MPLS
Dst. Address: 100.100.100.0/22		
Gateway:		
Immediate Gateway: <a href="#">unknown</a>		
Local Address:		
Check Gateway: 		
<input type="checkbox"/> Suppress Hw Offload		
Distance: 222 		
Scope: 30 		
Target Scope: 		
VRF Interface: 		
Routing Table: main 		
Pref. Source: 		
<input checked="" type="checkbox"/> Blackhole		



# Filtros en v6 (TIP)

#	Chain	Prefix	Prefix Length	Route Targets	Set BGP Communities	Action	R
0	TIP-in	0.0.0.0/0				accept	
1	TIP-in					discard	
2	TIP-out	100.100.100.0/22				accept	
3	TIP-out	200.200.200.0/22				accept	
4	TIP-out					discard	

Route Filter <0.0.0.0/0>

Matchers BGP Actions BGP Actions

Chain: TIP-in

Prefix: ☐ 0.0.0.0/0

Prefix Length:

Route Filter <0.0.0.0/0>

Matchers BGP Actions BGP Actions

Action: accept

Jump Target:

Route Filter <100.100.100.0/22>

Matchers BGP Actions BGP Actions

Chain: TIP-out

Prefix: ☐ 100.100.100.0/22

Prefix Length:

Route Filter <200.200.200.0/22>

Matchers BGP Actions BGP Actions

Chain: TIP-out

Prefix: ☐ 200.200.200.0/22

Prefix Length:

New Route Filter







Matchers BGP Actions BGP Actions

Action: discard

✓ Siempre termino cada cadena con una regla de **DISCARD\***.



# Filtros en v6 (IXP)

Route Filters							
<div></div> <div>Find</div>							
#	Chain	Prefix	Prefix Length	Route Targets	Set BGP Communities	Action	Row
;;; opt OCA							
8	IXP-out				40000:40027	passthrough	
;;; no anunciar a HE							
9	IXP-out			52376:6939		passthrough	
10	IXP-out	100.100.100.0/22	24			accept	
11	IXP-out	200.200.200.0/22	24			accept	
12	IXP-out					discard	

Set Use TE Nexthop:

▲ Set Route Targets

Route Targets:

▼ Append Route Targets

▲ Set BGP Communities

Set BGP Communities:

▼ Append BGP Communities

Route Filter <100.100.100.0/22>

Matchers BGP Actions BGP Actions

Chain:

Prefix: ☐

Prefix Length: ☐

Route Filter <200.200.200.0/22>

Matchers BGP Actions BGP Actions









Chain:

Prefix: ☐

Prefix Length: ☐



# Filtros en v7 (TIP)

Route Filters					
Rule	Select Rule	Num Set	Community Set	Community Ext Set	Community Large Set
					
<input type="text" value="Find"/>					<input type="text" value="all"/>
					
#	Chain	Rule			
0	TIP-in	if (dst == 0.0.0.0/0) { accept; }			
1	TIP-in	reject;			
2	TIP-out	if (dst == 100.100.100.0/22) { accept; }			
3	TIP-out	if (dst == 200.200.200.0/22) { accept; }			
4	TIP-out	reject;			

Routing Filter Rule

Chain:

Rule:

```
if (dst == 0.0.0.0/0) {  
  accept;  
}
```

Routing Filter Rule

Chain:

Rule:

```
if (dst == 100.100.100.0/22) {  
  accept;  
}
```

Routing Filter Rule

Chain:

Rule:

```
if (dst == 200.200.200.0/22) {  
  accept;  
}
```

Routing Filter Rule

Chain:

Rule:

```
reject;
```



# Filtros en v7 (IXP)

Route Filters

Rule

Select Rule

Num Set

Community Set

Community Ext Set

Community Large Set

+

-

✓

✗

📄

🔍

Find

IXP-out

▼

#	Chain	Rule	
;;; opt OCA			
5	IXP-out	set bgp-communities 40027:40000;	
;;; no anunciar a HE			
6	IXP-out	set bgp-ext-communities rt:52376:6939;	
7	IXP-out	if (dst in 100.100.100.0/22 && dst-len == 24) {accept; }	
8	IXP-out	if (dst in 200.200.200.0/22 && dst-len == 24) {accept; }	
9	IXP-out	reject;	

Routing Filter Rule

Chain: IXP-out

Rule:

set bgp-communities 40027:40000;

Routing Filter Rule

Chain: IXP-out

Rule:

set bgp-ext-communities rt:52376:6939;

Routing Filter Rule

Chain: IXP-out

Rule:

if (dst in 100.100.100.0/22 && dst-len == 24) {  
accept;  
}

Routing Filter Rule

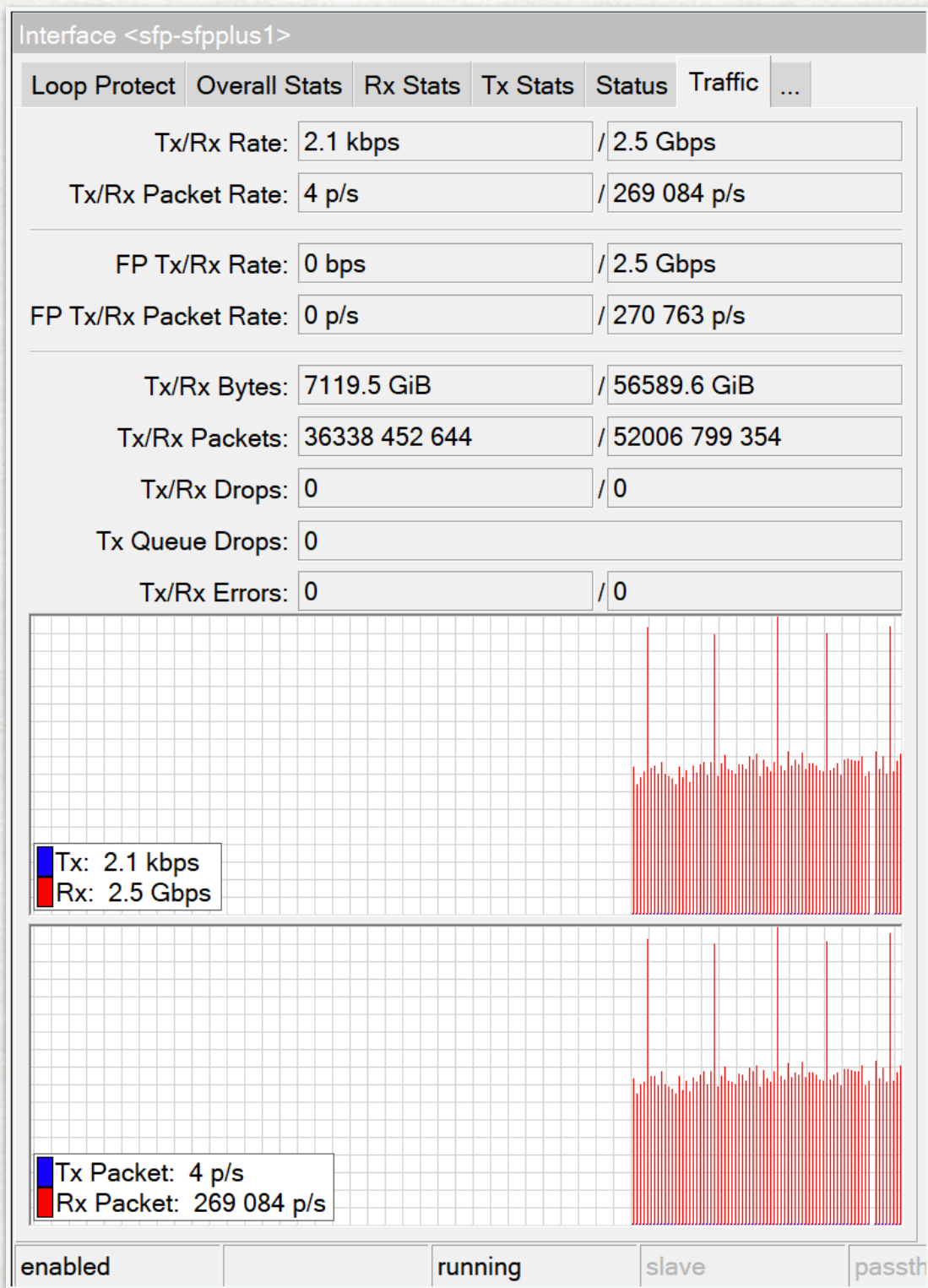
Chain: IXP-out

Rule:

if (dst in 200.200.200.0/22 && dst-len == 24) {  
accept;  
}



# ¿Qué pasó con el tráfico?



**Route List**

	Dst. Address	Gateway	Distance	Pref. Source
DFbl	▶ 1.0.128.0/19	45.68.8.93	20	
DFbl	▶ 1.0.128.0/19	45.68.8.93	20	
DFbl	▶ 1.0.128.0/24	45.68.8.93	20	
DFbl	▶ 1.0.129.0/24	45.68.8.93	20	
DFbl	▶ 1.0.130.0/23	45.68.8.93	20	
DFbl			20	
DFbl			20	

D - dynamic, F - filtered, b - BGP, l - inactive

**Route <1.0.160.0/19->45.68.8.93>**

General	Status	BGP	MPLS
Dst. Address: 1.0.160.0/19 Gateway: 45.68.8.93 Immediate Gateway: <a href="#">45.68.8.93%sfp-sfpplus1</a> Local Address: Check Gateway: <input type="checkbox"/> Suppress Hw Offload <input type="checkbox"/> Blackhole			

dynamic   **filtered**   BGP   Hw Offloa...   ECMP   inactive



# ¿Qué pasó con el tráfico?

### Route Filters

Rule	Select Rule	Num Set	Community Set	Community Ext Set	Community Large Set
<div><div>+</div><div>-</div><div>✓</div><div>✗</div><div>📄</div><div>🔍</div></div>					
Chain	↓	contains	↓	IXP	
#	Chain	Rule			
5	IXP-in	accept;			
;;; opt OCA					
6	IXP-out	set bgp-communities 40027:40000;			
;;; no anunciar a HE					
7	IXP-out	set bgp-ext-communities rt:52376:6939;			
8	IXP-out	if (dst in 100.100.100.0/22 && dst-len == 24) {accept; }			
9	IXP-out	if (dst in 200.200.200.0/22 && dst-len == 24) {accept; }			
10	IXP-out	reject;			

### Routing Filter Rule

Chain: IXP-in

Rule: accept;

Tx/Rx Packets:	36421 736 113	/	52133 286 838
Tx/Rx Drops:	0	/	0
Tx Queue Drops:	0		
Tx/Rx Errors:	0	/	0

Tx: 229.9 Mbps

Rx: 2.0 Gbps

Cable Test

Blink

Reset MAC Address

Reset Counters



# Ayuda memoria de filtros

## Routing Filter Rule

Chain: TIP-in

Rule:

```
if (dst == 0.0.0.0/0) {  
  set comment "RUTA POR DEFAULT";  
  set pref-src 100.100.100.1;  
  set bgp-weight 100;  
  accept;  
}
```

## Route List



	Dst. Address	Pref. Source	Weight	Gateway
;;	"RUTA POR DEFAULT"			
DAb	0.0.0.0/0	100.100.100.1	100	10.32.36.5
DAC	10.32.36.4/30			vlan100
AS	100.100.100.0/22			
AS	100.100.100.0/24			
DAC	100.100.100.1/32			lo
AS	100.100.101.0/24			
AS	100.100.102.0/24			

## Routing Filter Rule

Chain: TIP-out

Rule:

```
if (dst == 100.100.100.0/22) {  
  set bgp-path-prepend 3;  
  accept;  
}
```

```
[admin@MikroTik] > routing/bgp/advertisements/print  
0 peer=Carrier-TIP-1 dst=100.100.100.0/22 afi=ip nexthop=10.32.36.6 origin=0  
  as-path=sequence 100 100 100  
0 peer=Carrier-TIP-1 dst=100.100.100.1 afi=ip nexthop=10.32.36.6 origin=0  
  as-path=sequence 100 communities=7049:666  
0 peer=IXP-Cabase-1 dst=100.100.100.0/24 afi=ip nexthop=201.182.132.200  
  origin=0 as-path=sequence 100 communities=40027:40000  
  ext-communities=rt:52376:6939  
0 peer=IXP-Cabase-1 dst=100.100.101.0/24 afi=ip nexthop=201.182.132.200  
  origin=0 as-path=sequence 100 communities=40027:40000  
  ext-communities=rt:52376:6939  
0 peer=IXP-Cabase-1 dst=100.100.102.0/24 afi=ip nexthop=201.182.132.200  
  origin=0 as-path=sequence 100 communities=40027:40000  
  ext-communities=rt:52376:6939
```



# Ayuda memoria de filtros

---

```
if (dst == 0.0.0.0/0) {  
  if (dst-len in 25-32) {  
    if (dst in 200.200.200.0/22 && dst-len == 24) {  
      if (dst in 200.200.200.0/22 && dst-len in 22-24) {  
        if (dst-len == 32 && bgp-communities includes 65000:666 ) {  
          if (bgp-as-path 15169$) {  
            if (bgp-path-len >= 100) {  
              if (dst in 2803:13e0::/32 && dst-len in 32-48) {  
  
                set comment "Comentario FILTRO BGP";  
                set pref-src 100.100.100.1;  
                set bgp-weight 200;  
                set bgp-local-pref 200;  
                set bgp-path-prepend 3;  
                set bgp-communities 7049:666; / append bgp-communities 7049:666;  
                set bgp-ext-communities rt:52376:6939; / append bgp-ext-communities rt:52376:666;  
                set blackhole yes;  
                accept; / reject;  
              }  
            }  
          }  
        }  
      }  
    }  
  }  
}
```



# Información más detallada en v7

```
[admin@MikroTik] > routing/bgp/advertisements/print
0 peer=IXP-Cabase-1 dst=100.100.100.0/24 afi=ip nexthop=201.182.132.200 origin=0 as-path=sequence 100 communities=40027:40000
  ext-communities=rt:52376:6939

0 peer=IXP-Cabase-1 dst=100.100.101.0/24 afi=ip nexthop=201.182.132.200 origin=0 as-path=sequence 100 communities=40027:40000
  ext-communities=rt:52376:6939

0 peer=IXP-Cabase-1 dst=100.100.102.0/24 afi=ip nexthop=201.182.132.200 origin=0 as-path=sequence 100 communities=40027:40000
  ext-communities=rt:52376:6939

0 peer=IXP-Cabase-1 dst=100.100.103.0/24 afi=ip nexthop=201.182.132.200 origin=0 as-path=sequence 100 communities=40027:40000
  ext-communities=rt:52376:6939

0 peer=Carrier-TIP-1 dst=100.100.100.0/22 afi=ip nexthop=10.32.36.6 origin=0 as-path=sequence 100
[admin@MikroTik] >
```

Log				
<div><div></div>Freeze</div>				
#	Time	Buffer	Topics	Message
46	Apr/27/2025 00:15:18	memory	system, info	address removed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/ip address remove *3)
47	Apr/27/2025 00:15:19	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
48	Apr/27/2025 00:15:29	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
49	Apr/27/2025 00:15:38	memory	system, info	AS200 changed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/routing bgp connection set AS200 as=
50	Apr/27/2025 00:15:43	memory	system, info	AS200 changed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/routing bgp connection set AS200 as=
51	Apr/27/2025 00:15:43	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
52	Apr/27/2025 00:15:53	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
53	Apr/27/2025 00:15:54	memory	system, info	AS200 changed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/routing bgp connection set AS200 as=
54	Apr/27/2025 00:16:03	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
55	Apr/27/2025 00:16:08	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
56	Apr/27/2025 00:16:13	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
57	Apr/27/2025 00:16:23	memory	system, info	AS200 changed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/routing bgp connection set AS200 as=
58	Apr/27/2025 00:16:28	memory	system, info	AS200 changed by winbox-3.41/tcp-msg(winbox):admin@192.168.188.253 (/routing bgp connection set AS200 as=
59	Apr/27/2025 00:16:28	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
60	Apr/27/2025 00:16:38	memory	route, bgp, error	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Starter {openOk: false} Invalid remote AS (100), expected 200
61	Apr/27/2025 00:16:39	memory	route, bgp, info	AS200-1 {l_addr: 10.129.1.1, r_addr: 10.129.1.2} Established
62 items (1 selected)				



# Conclusiones

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Migrar de v6 a v7 no es imposible pero no hay que confiarse en que se haga todo automáticamente, y en lo personal... es **RECOMENDADO**.

¿Porqué migrar BGP a v7?

- ✓ Mejoras en el tiempo de aprendizaje de las rutas y en la carga de CPU.
- ✓ Corrección de vulnerabilidades y bugs.
- ✓ Soporte para nuevo hardware.
- ✓ Soporte para nuevas funcionalidades (VXLAN, IS-IS, RPKI, etc)

Documentación:

- ✓ <https://wiki.cabase.org.ar/books/bgp-en-cabase>



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# ¿PREGUNTAS?

# ¡MUCHAS GRACIAS!

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