

Una introducción a SPB(m)

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ALE | Where
Everything
Connects

Redes de Campus: Retos y Necesidades

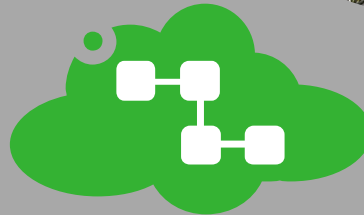
Alta Disponibilidad



Entornos Complejos



Rapidez de Provisión



MR. ROBOT

Seguridad



“Less is more”

SPB: Un ESTÁNDAR para cambiarlo todo - IEEE 802.1aq

Ethernet + 1Q + STP	SPBM
Flooding	ISIS learning
STP Single/Forced/Imposed Topology	Optimized, Always Shortest Path. Topology: Mesh, Partial... no matter
4094 VLANs	16M iSID
Node by Node Configuration (or legacy/tricky VTP/MVRP)	Native Service AutoProvision & AutoDiscovery (ISIS)
MACs learnt widely	MAC containment
Loops	NO LOOPS by definition
Convergence depends on size (seconds to ...)	Some 100ms for 1000 nodes
BUM traffic impacting the NETWORK	BUM traffic tunneled by the NETWORK
	Transparent Transport
	L2 (ELAN/VPLS) and L3 (IP-VPN) Services
	NO traffic Tromboning when topology changes

SPB: Plano de Control - ISIS + RFC6329

1) Definir al menos una BVLAN de topología (4000 y 4001)

```
spb bvlan 4000-4001 admin-state enable
mac-learning vlan 4000-4001 disable
spantree vlan 4000-4001 admin-state disable
```

2) SPB-ISIS

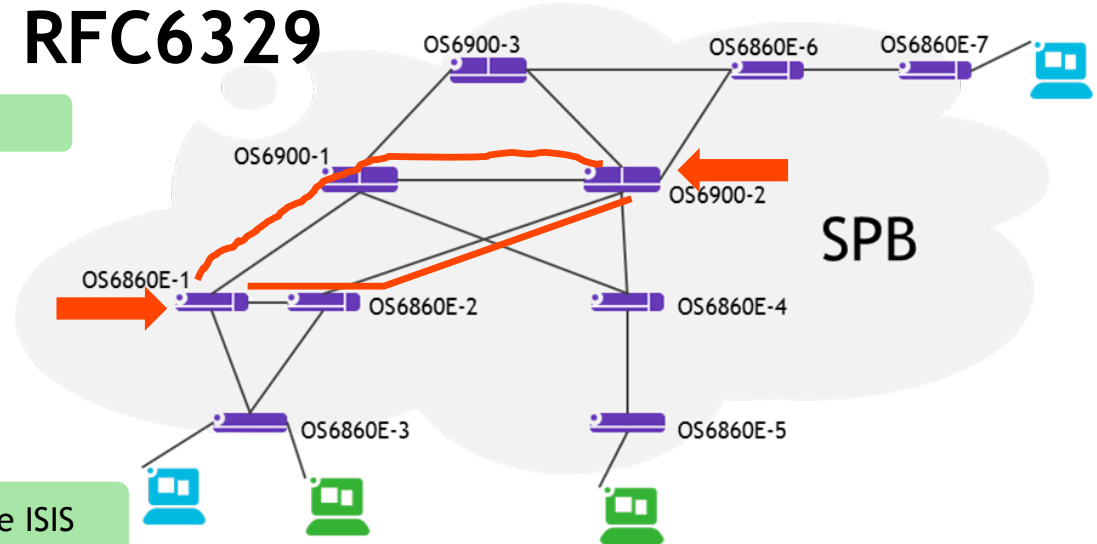
```
spb isis bvlan 4000 ect-id 1
spb isis bvlan 4001 ect-id 2
spb isis control-bvlan 4000
spb isis interface port 1/1/25-27
spb isis admin-state enable
```

3) Cada BackboneBridge (BB) construye su topología mediante ISIS

OS6860-1> show spb isis spf bvlan 4000

SPB ISIS Path Table:

Destination (Name : BMAC)	Outbound Interface	Next Hop (Name : BMAC)	SPB Metric	Num Hops
OS6900-1	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	10	1
OS6900-2	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	20	2
OS6860-6	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	30	3
OS6860-3	1/1/26	OS6860-3 : 2c:fa:a2:16:b8:23	10	1
OS6860-4	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	20	2
OS6860-7	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	40	4
OS6860-5	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	30	3
OS6860-2	1/1/27	OS6860-2 : e8:e7:32:f6:12:fb	10	1
OS6900-3	1/1/25	OS6900-1 : 2c:fa:a2:02:d7:41	20	2



Se establece SIEMPRE EL MISMO camino **BIDIRECCIONAL**.

Nodo a Nodo, si hay varios caminos de igual coste, se desempata. (ECT-ID)

Se puede modificar la prioridad para seleccionar un camino distinto (Traffic Engineering)

SPB: Plano de Control - ISIS + RFC6329

- El aprendizaje de MACs en el BackBone es vía ISIS
- El aprendizaje de MACs de cliente sólo se hace en el Acceso

OS6860-1> show mac-learning learning-state vlan 4000-4001
 Legend: # = BVLAN, learning disabled by default

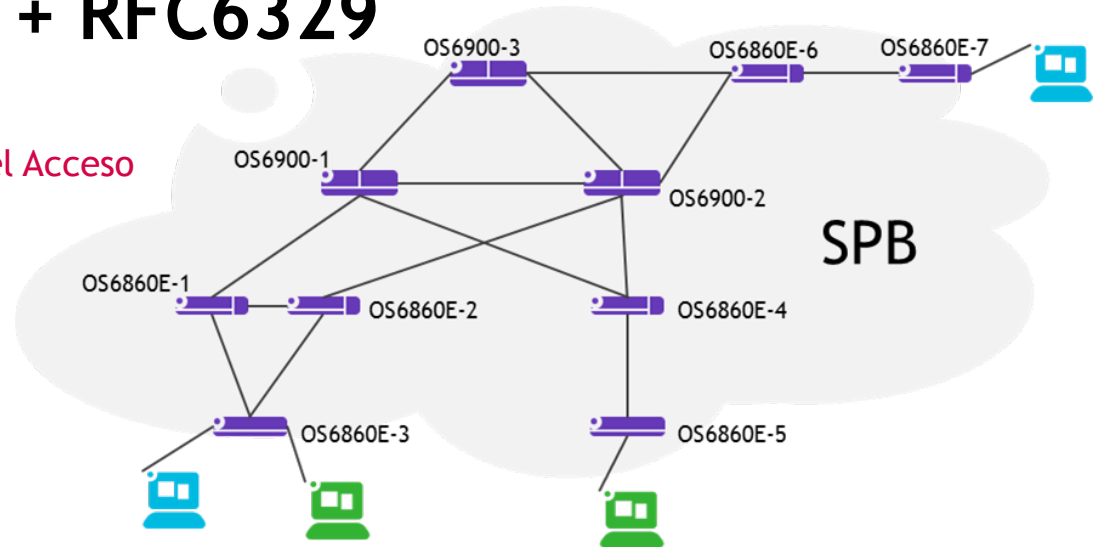
Vlan	Learning State
#4000	disabled
#4001	disabled

OS6860-1> show mac-learning domain vlan vlan 4000
 Legend: Mac Address: * = address not valid,

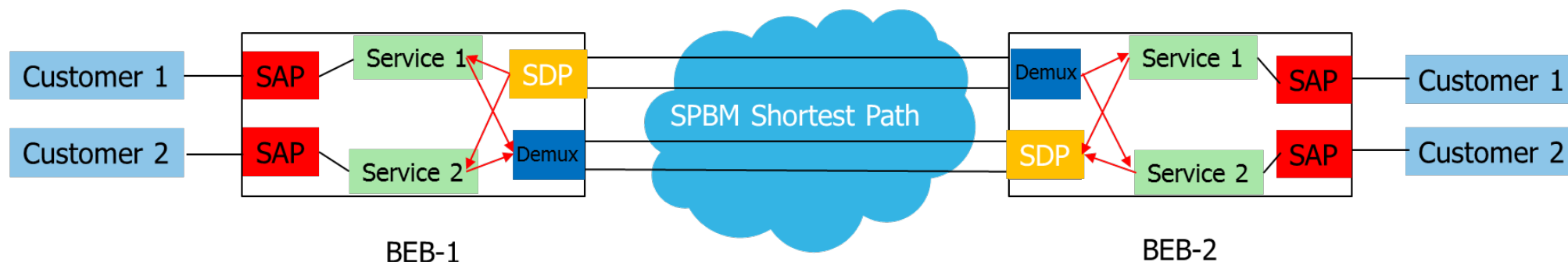
Mac Address: & = duplicate static address,

Domain	Vlan/SrvId[ISId/vnId]	Mac Address	Type	Operation	Interface
VLAN	4000	2c:fa:a2:02:d7:41	bmac	bridging	1/1/25
VLAN	4000	2c:fa:a2:02:e2:69	bmac	bridging	1/1/25
VLAN	4000	2c:fa:a2:11:24:87	bmac	bridging	1/1/25
VLAN	4000	2c:fa:a2:16:b8:9f	bmac	bridging	1/1/25
VLAN	4000	e8:e7:32:cc:e5:df	bmac	bridging	1/1/25
VLAN	4000	e8:e7:32:cc:f2:2d	bmac	bridging	1/1/25
VLAN	4000	e8:e7:32:fa:19:23	bmac	bridging	1/1/25
VLAN	4000	2c:fa:a2:16:b8:23	bmac	bridging	1/1/26
VLAN	4000	e8:e7:32:f6:12:fb	bmac	bridging	1/1/27

Total number of Valid MAC addresses above = 9
 5



SPB: Plano de Control - ISIS + RFC6329



SAP (Service Access Point)

- UNI Sub-Interface
- Asocia Tráfico cliente con un Servicio SPB Service (ISID)
- Traffic:
 - Todo el tráfico
 - Todo el tráfico sin tag (Nativo)
 - Una VLAN o un rango de VLAN
 - Combinación de VLANs internas/externas en Q-in-Q

SDP (Service Delivery Point)

- NNI Sub-interface
- Configurado Automáticamente
- Vincula BEBs
- Combina BMAC y BVLAN

SPB: Plano de Control - ISIS + RFC6322

Auto-Provisión y Auto-Descubrimiento

Todos los nodos intermedios de los SPT aprenden el nuevo servicio - AUTOMATICAMENTE !!!

Y además creación dinámica y AUTOMÁTICA de iSID y SAP con Reglas de Clasificación

1. Configurar el iSID (Service ID) Ej.: 1011
2. Configurar el SAP (Service Access Point)

1. Configurar el iSID (Service ID) Ej.:1011
2. Configurar el SAP (Service Access Point)

```
OS6860-3> show spb isis services isid 1011
Legend: * indicates locally configured ISID
SPB ISIS Services Info:
      ISID      BVLAN      System
      -----+-----+-----
      *   1011   4000   OS6860-3      : 2c:fa:a2:16:b8:23
      *   1011   4000   OS6860-7      : e8:e7:32:cc:e5:df
```

```
OS6860-3> show configuration snapshot svcmgr
! SVCMgr:
service access port 1/1/13 vlan-xlation enable
service 1011 spb isid 1011 bvlan 4000 description "VLAN 11" vlan-xlation enable
service 1011 sap port 1/1/13:0
```

```
OS6900-2> show spb isis services isid 1011
Legend: * indicates locally configured ISID
SPB ISIS Services Info:
      ISID      BVLAN      System
      -----+-----+-----
      1011      4000      OS6860-3      : 2c:fa:a2:16:b8:23
      1011      4000      OS6860-7      : e8:e7:32:cc:e5:df
```

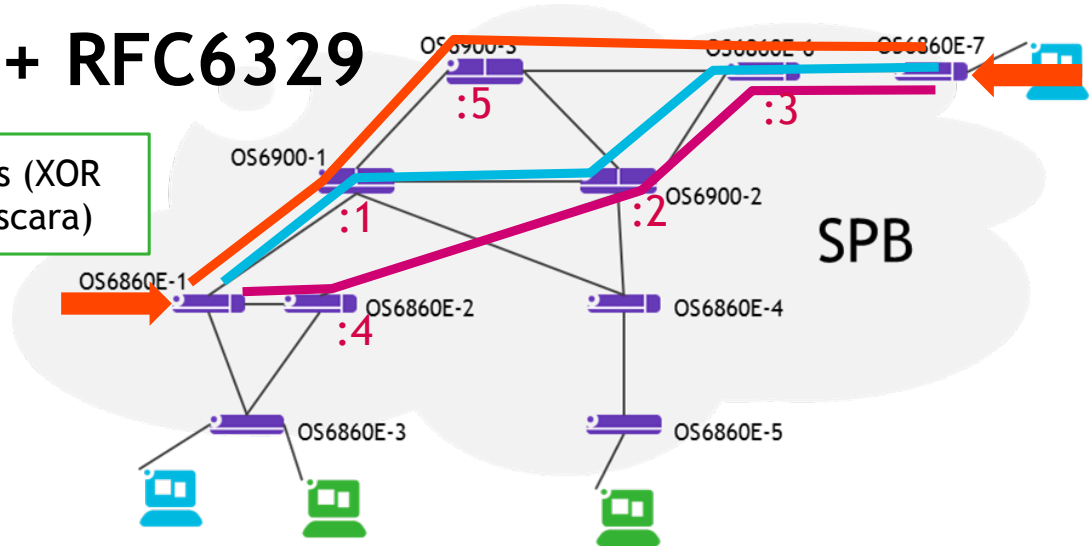
SPB: Plano de Control - ISIS + RFC6329

2) SPB-ISIS

```

spb isis bvlan 4000 ect-id 1
spb isis bvlan 4001 ect-id 2
spb isis control-bvlan 4000
spb isis interface port 1/1/25-27
spb isis admin-state enable
    
```

2 caminos posibles (XOR con diferente máscara)



Low →	MASKS	B-VID
	0x00	4000
	0x11	4001
	0x22	
	0x33	
	0x44	
	0x55	
	0x66	
	0x77	
	0x88	
	0x99	
	0xAA	
	0xBB	
	0xCC	
	0xDD	
	0xEE	
High →	0xFF	

```

OS6860-1> show spb isis spf bvlan 4000 bmac e8:e7:32:cc:e5:df
SPB ISIS Path Details:
    
```

Path Hop Name	Path Hop BMAC
OS6860-7	e8:e7:32:cc:e5:df
OS6860-6	2c:fa:a2:11:24:87
OS6900-2	2c:fa:a2:02:e2:69
OS6900-1	2c:fa:a2:02:d7:41

```

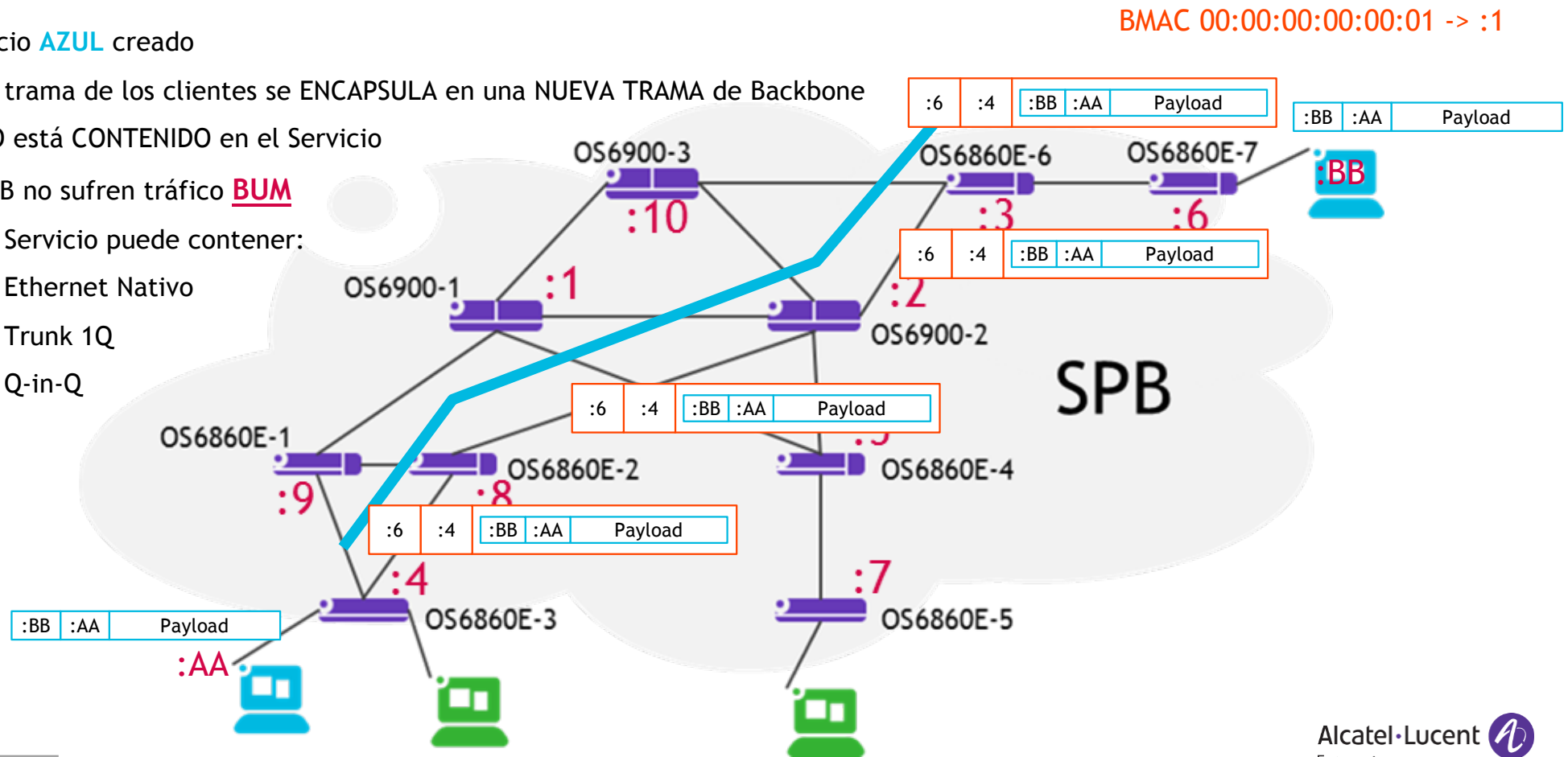
OS6860-1> show spb isis spf bvlan 4001 bmac e8:e7:32:cc:e5:df
SPB ISIS Path Details:
    
```

Path Hop Name	Path Hop BMAC
OS6860-7	e8:e7:32:cc:e5:df
OS6860-6	2c:fa:a2:11:24:87
OS6900-3	e8:e7:32:fa:19:23
OS6900-1	2c:fa:a2:02:d7:41

(:1,:5,:3) ; (:1,:2,:3) ; (:4,:2,:3)

SPB: Plano de Forwarding - IEEE 802.1ah

- 1) Servicio AZUL creado
- 2) Cada trama de los clientes se ENCAPSULA en una NUEVA TRAMA de Backbone
- 3) TODO está CONTENIDO en el Servicio
- 4) Los BB no sufren tráfico **BUM**
- 5) Cada Servicio puede contener:
 - 1) Ethernet Nativo
 - 2) Trunk 1Q
 - 3) Q-in-Q



Network Virtualization

Shortest Path Bridging - IP VPN

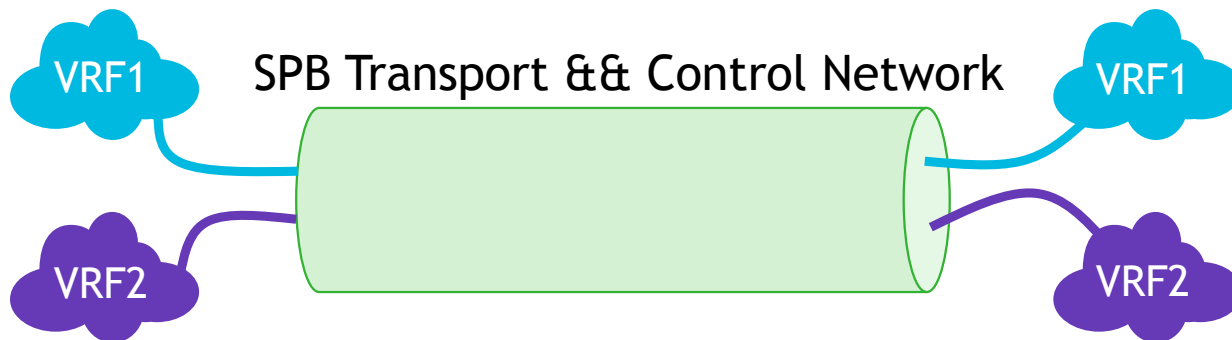
L3VPNs are similar to MPLS-L3VPNs

- ISIS-SPB protocol acts as an IP-IGP protocol
- ISID represents the VRF/L3VPN
- Segregates the routing information - one VRF to one ISID mapping

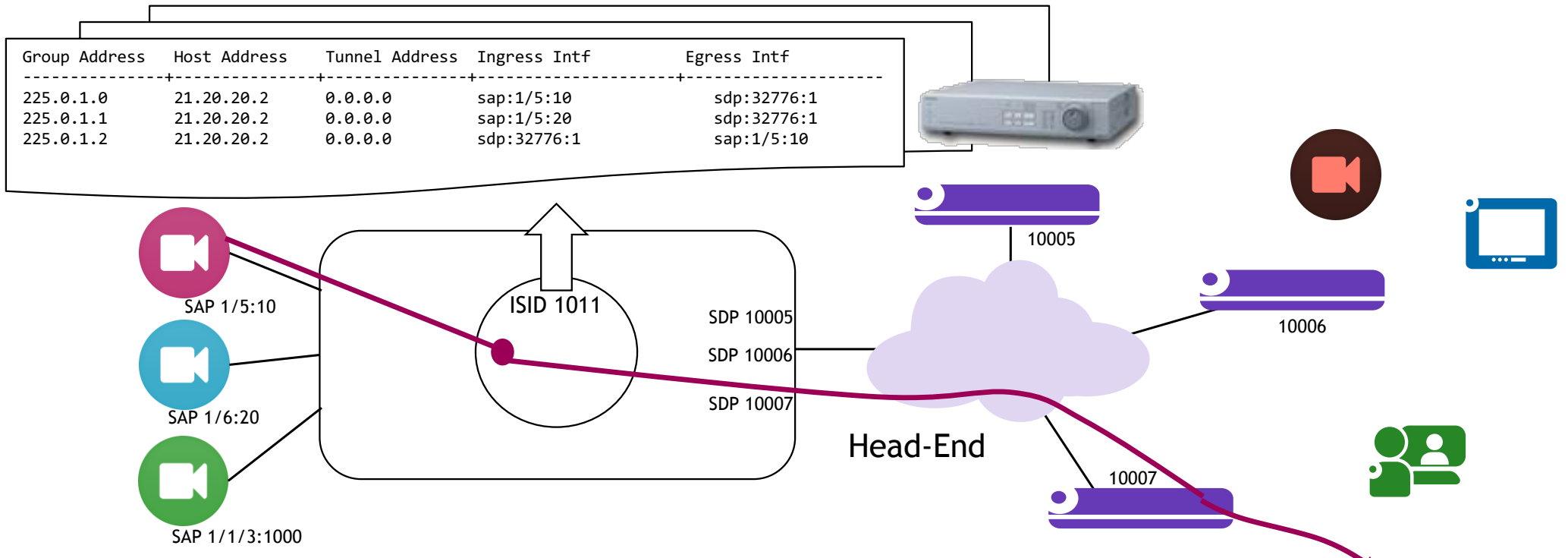
Route distribution support

- VRF routes are imported and exported from its IP route manager (IPRM) DB into the BEB global route manager (GRM) DB
- Advertised via ISIS-SPB, New ISIS TLVs

The data plane follows the same path used by the IPVPN-lite



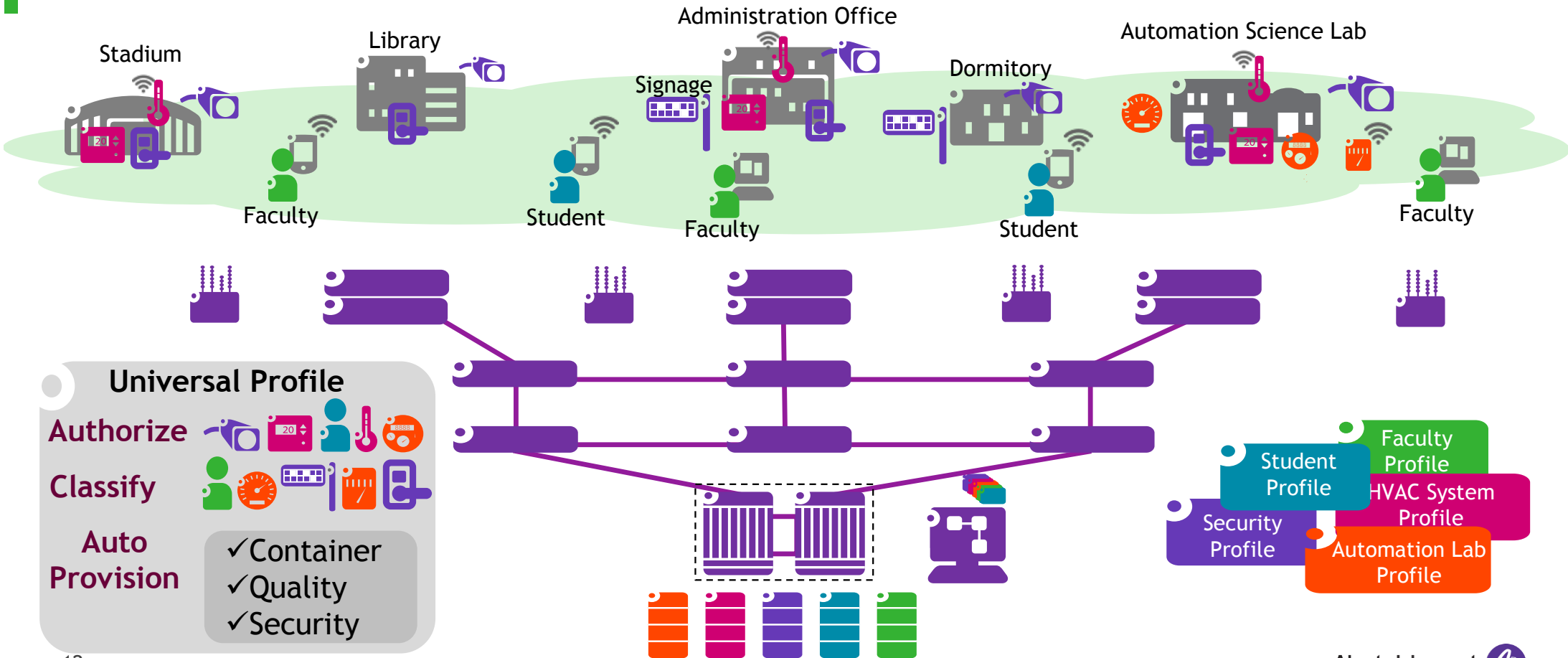
SPB: Optimización de Multicast. IP Multicast snooping por iSID



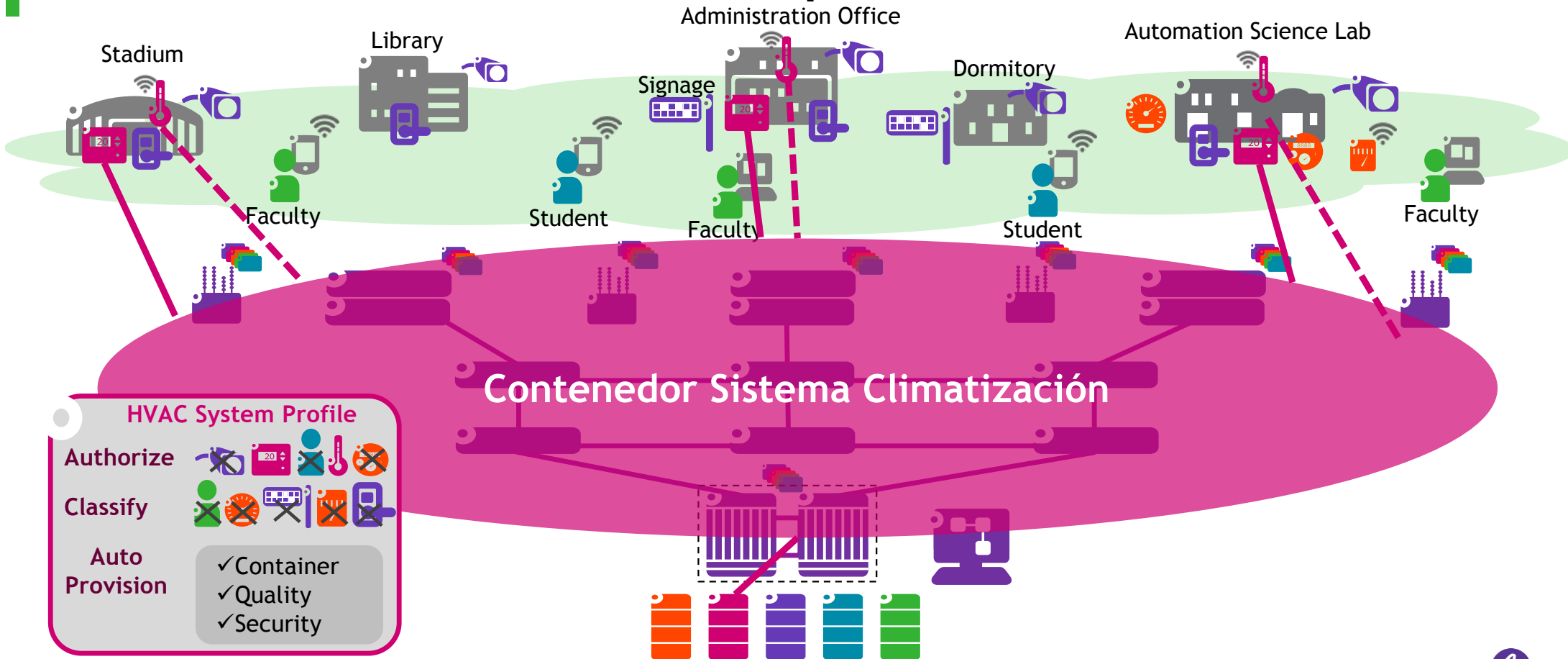
Habilitando el multicast en el servicio, se evita el flooding en SAPs y SDPs.

->ip multicast service 1011 admin-state enable

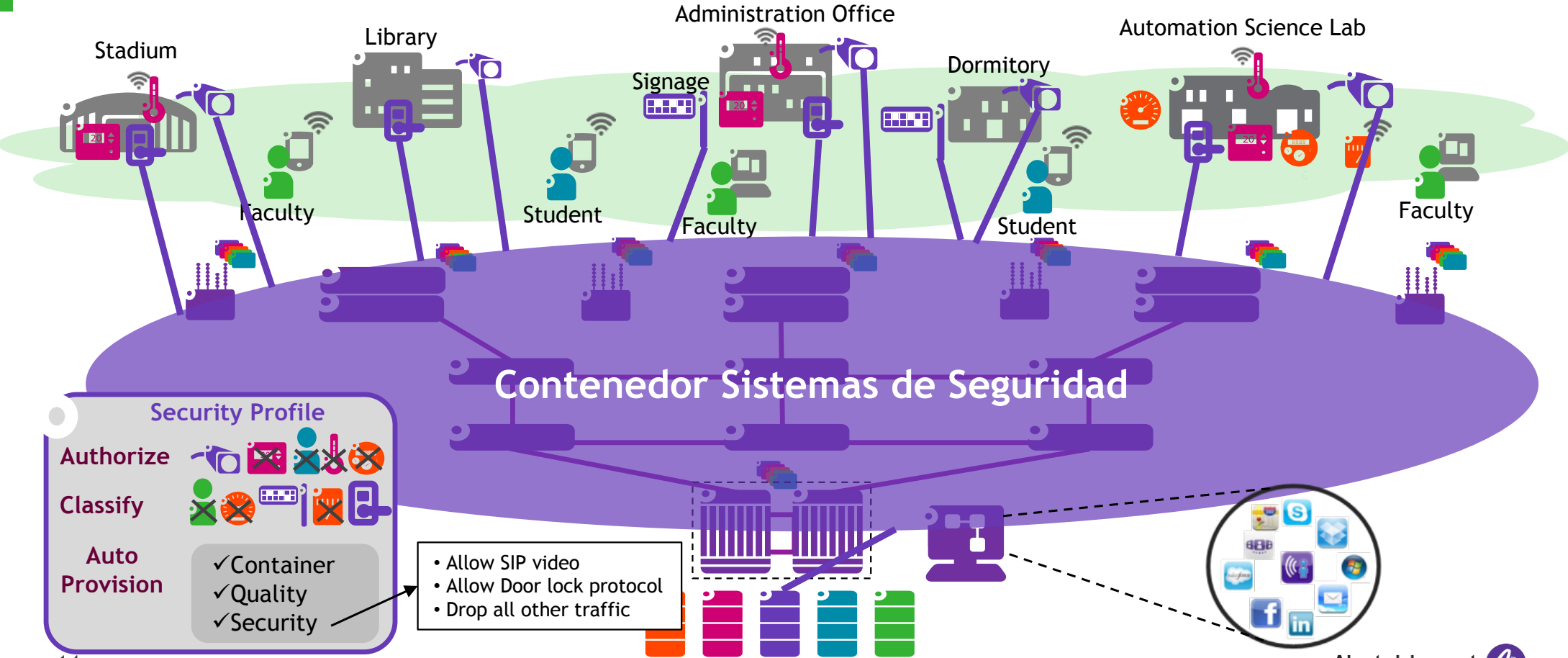
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Security Profile

Authorize

Classify

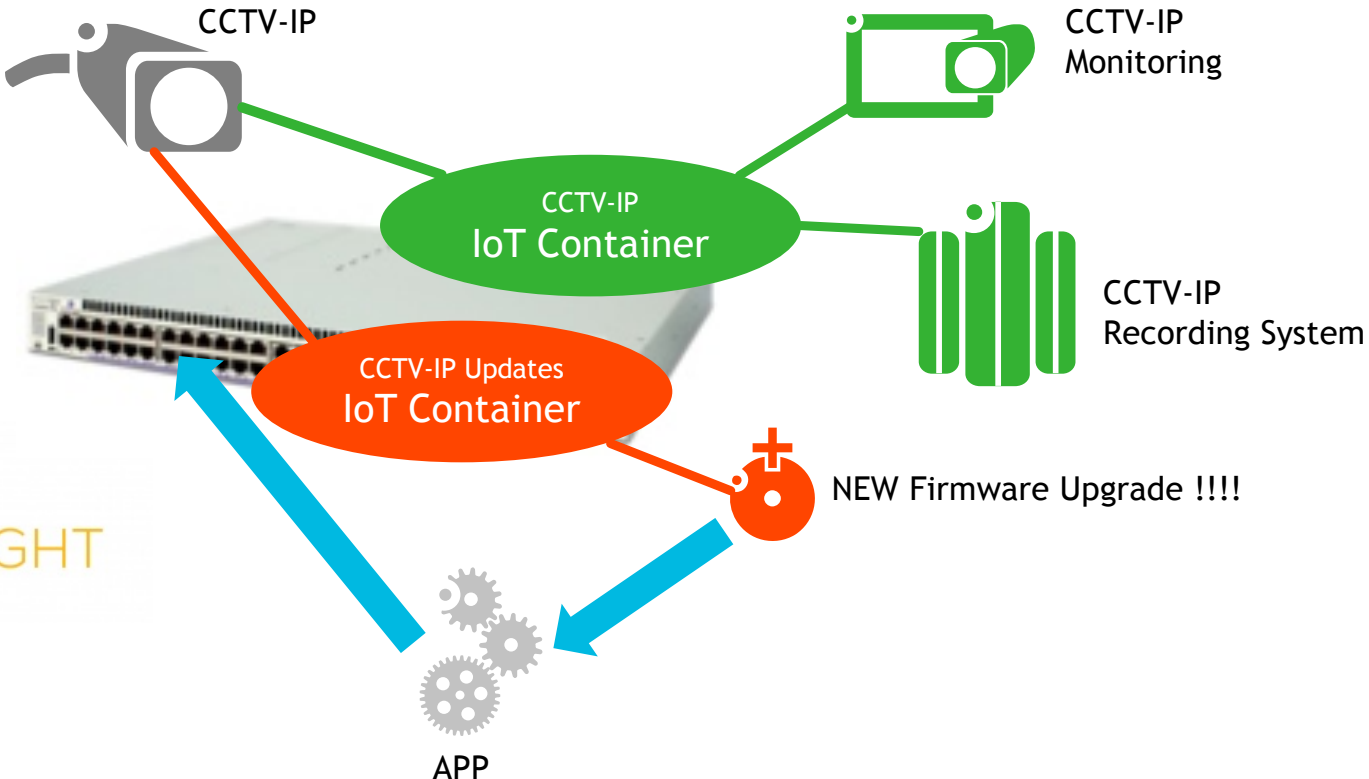
Auto Provision

- ✓ Container
- ✓ Quality
- ✓ Security

- Allow SIP video
- Allow Door lock protocol
- Drop all other traffic



Contenedores IoT: SPB y Redes Programables (SDN)





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