

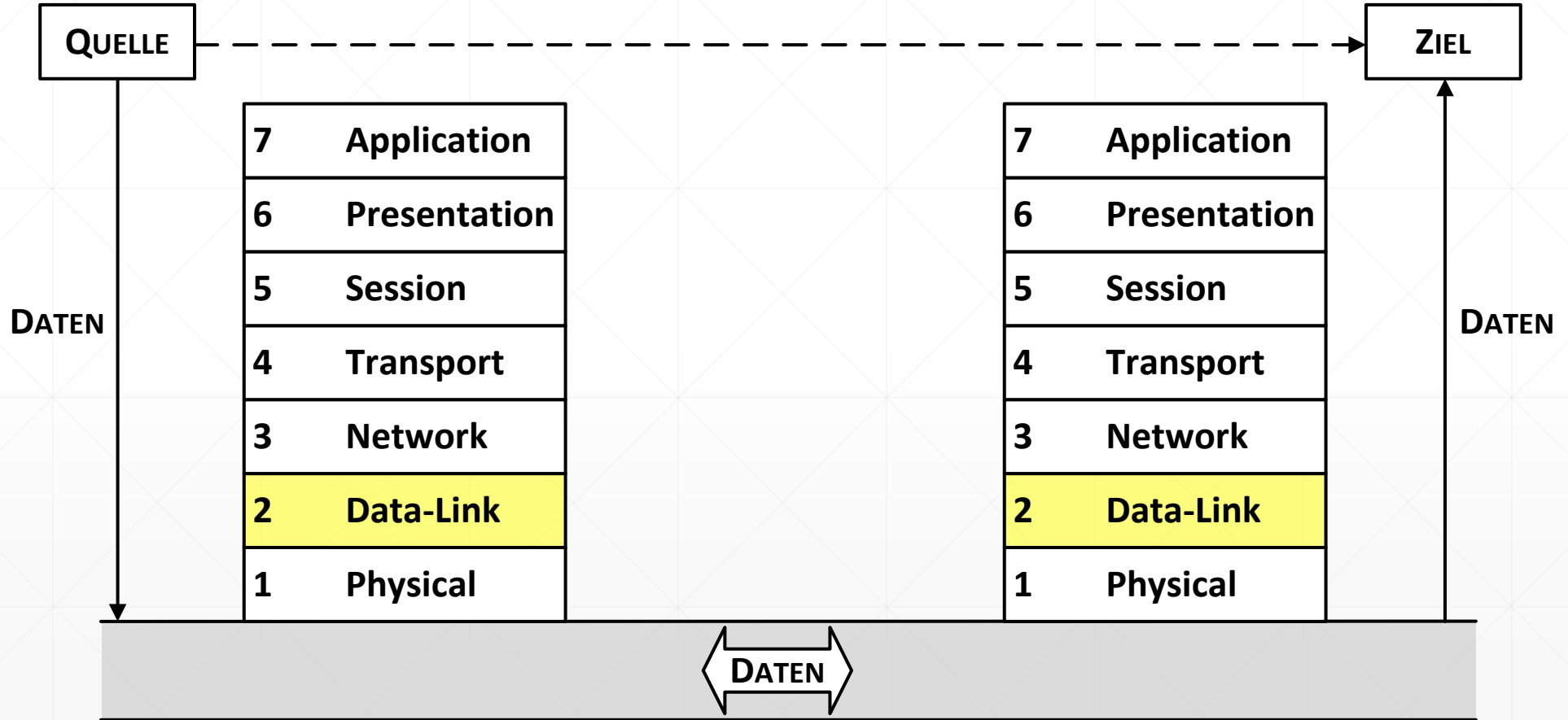
Ethernet for Things

Fortgeschrittene Ethernet Switch Features
Referat von Peter Voser

Agenda

- Grundfunktion Ethernet Switch (Frames, MAC Adressen, Learning)
- Fortgeschrittene Features (IGMP Snooping, VLANs, IRL, TCAM, Priorisierung)
- Redundante Leitungen (STP, Bridging Protokolle)
- Beispiele für MGMT Switch Designs
- Demos

Wo befindet sich der Ethernet Switch? Das OSI Modell



Layer 2

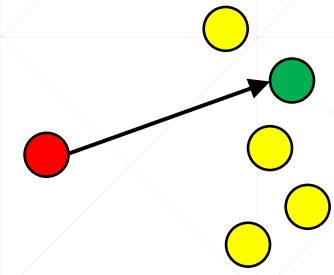
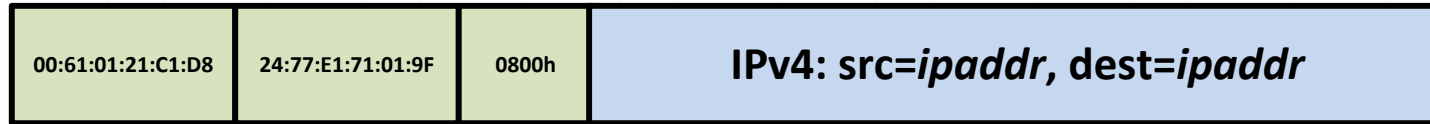
Das Ethernet Frame



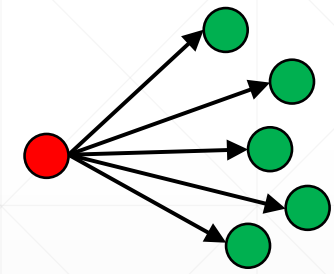
- P** Preamble
- DA** Destination MAC Address
- SA** Source MAC Address
- L/T** Length/Type
- FCS** Frame Check Sequence (CRC32)

Layer 2 Ethernet Frame Beispiele

Unicast Frame



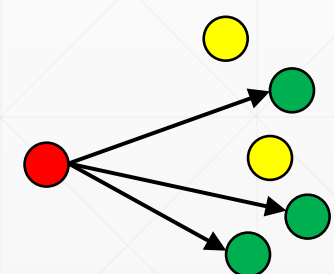
Broadcast Frame



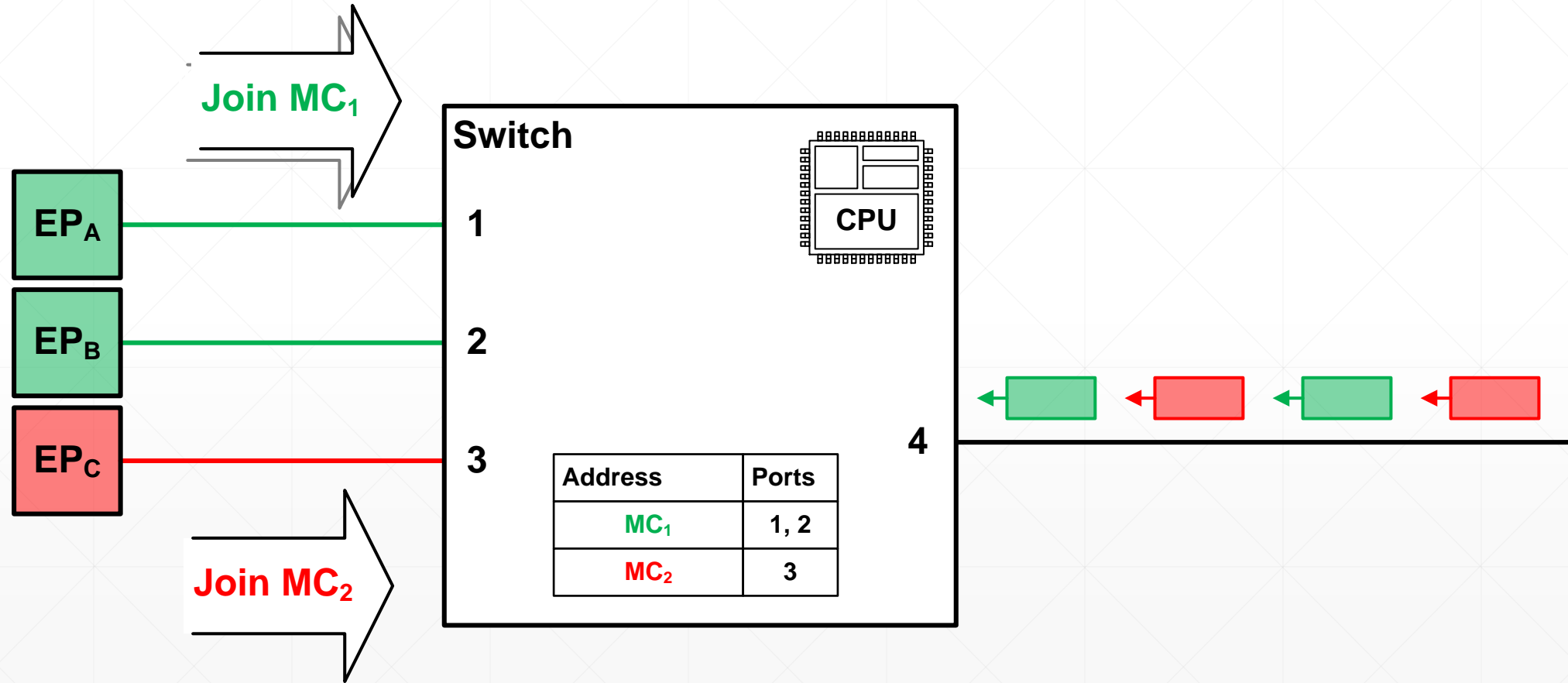
Multicast Frame



Bit0 = 1



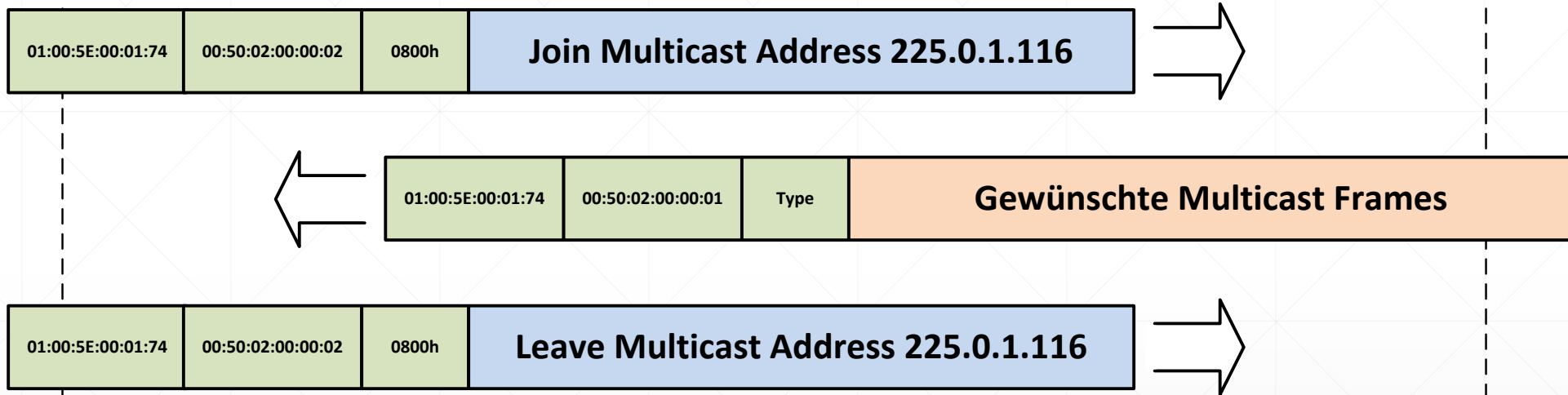
Multicast-Pakete unter Kontrolle IGMP/MLD Snooping



Join & Leave Group IGMP/MLD Snooping

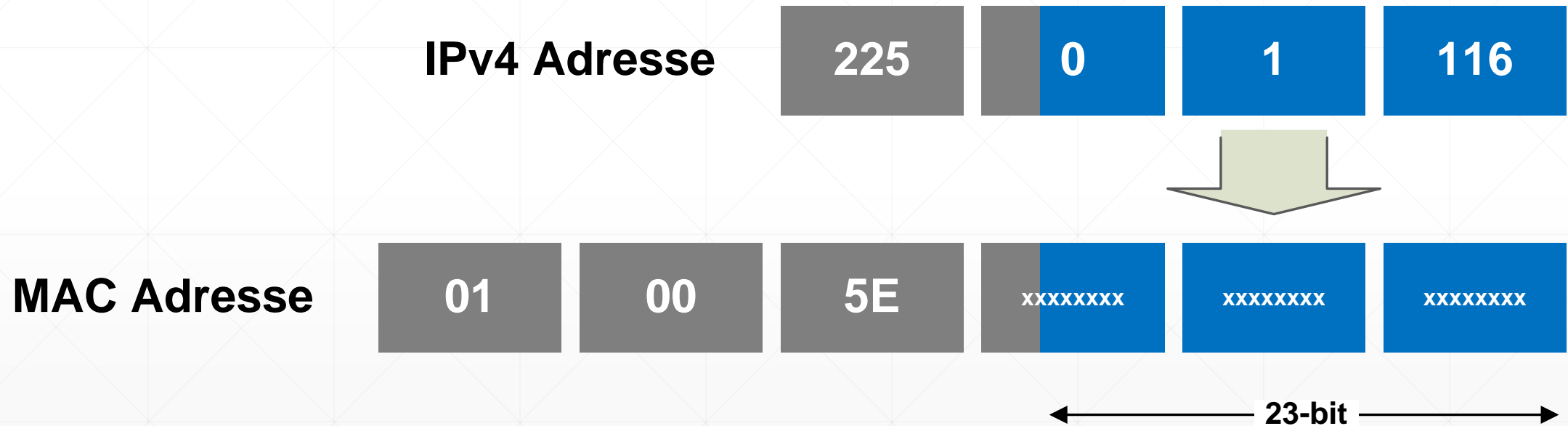
192.168.0.136

Switch Port

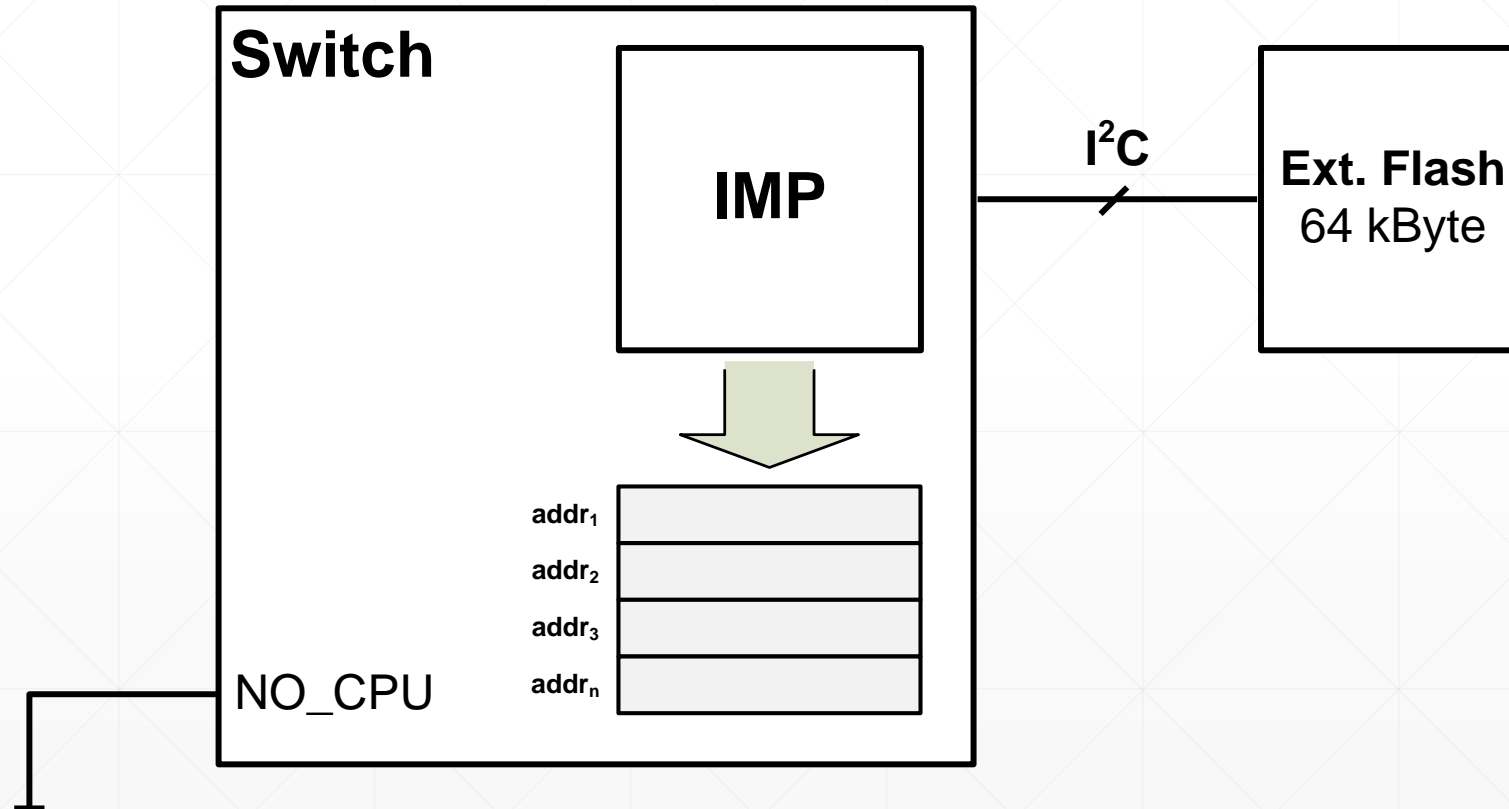


No.	Time	Source	Destination	Protocol	Length
19	*REF*	192.168.0.136	225.0.0.37	IGMPv2	60
20	0.023203	00:50:02:00:00:01	01:00:5e:00:01:74	HSR/PRP	1514
21	0.023236	00:50:02:00:00:01	01:00:5e:00:01:74	HSR/PRP	1514
22	0.023273	00:50:02:00:00:01	01:00:5e:00:01:74	HSR/PRP	1514
23	0.023282	00:50:02:00:00:01	01:00:5e:00:01:74	HSR/PRP	330

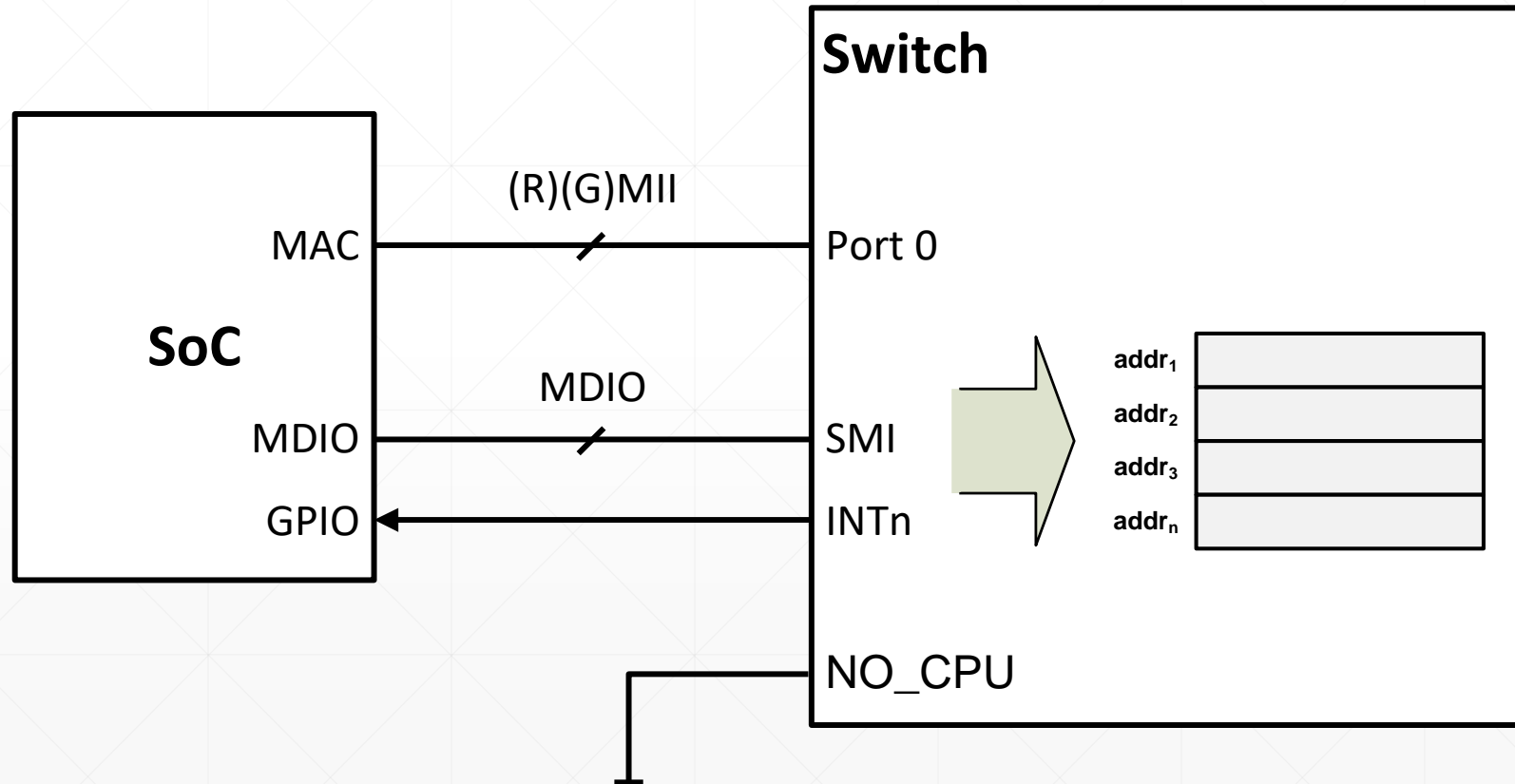
Multicast Adressen Adressberechnung



Managed Switch Design Mit IMP (*Integrated Management Processor*)



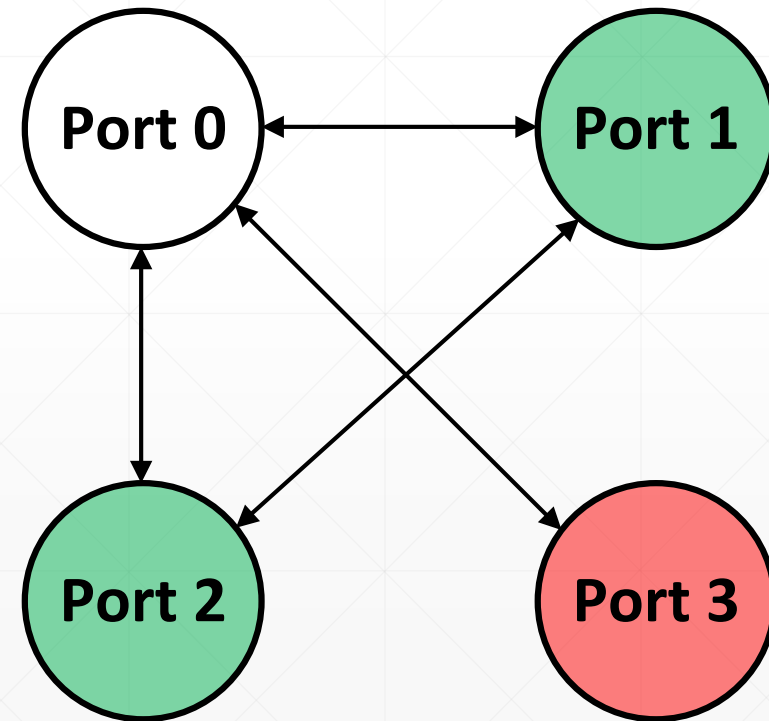
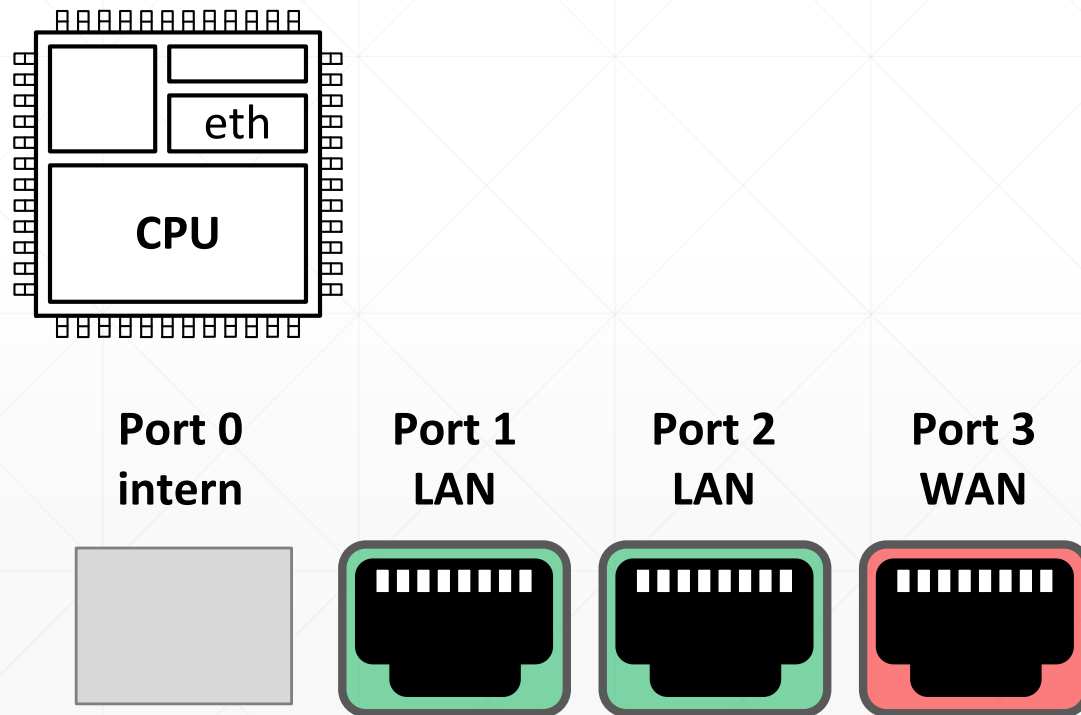
Managed Switch Design Mit externer MGMT CPU



Port Based VLANs

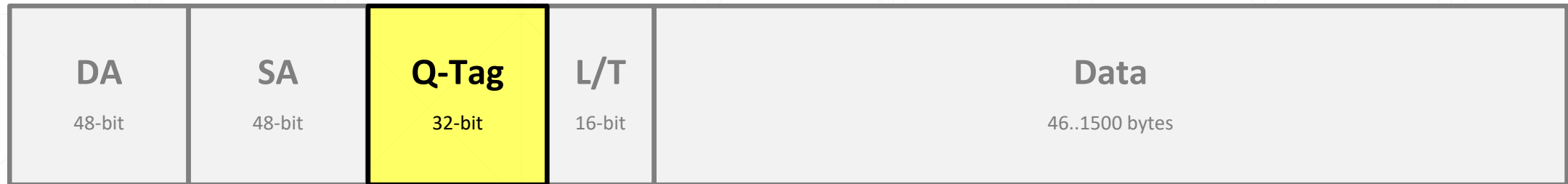
Welche Ports dürfen miteinander kommunizieren

Beispiel: Gateway WAN nach LAN über die CPU (NAT)



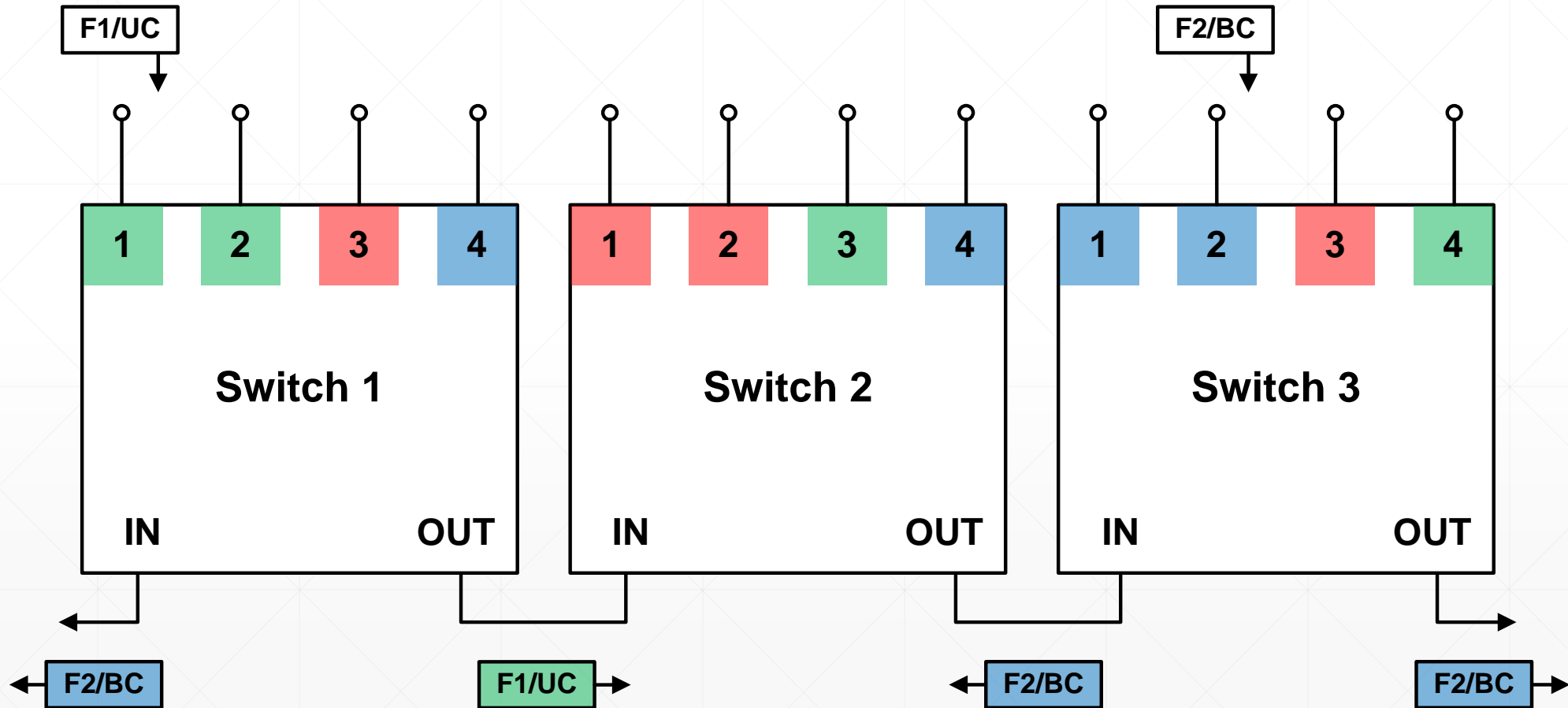
Packed Based VLANs

Getaggte Frames gemäss 802.1q

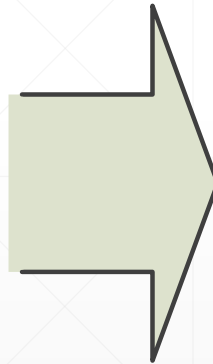
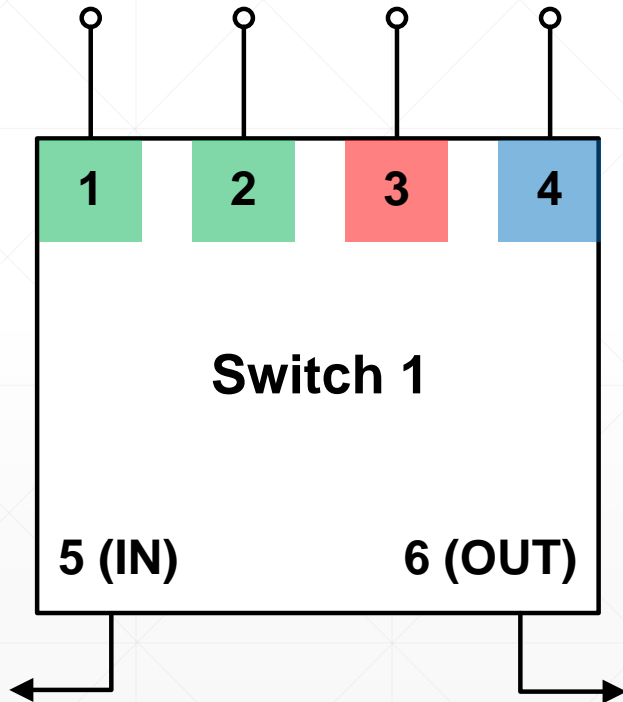


TPID 16-bit Erkennung 8100h
VID 12-bit VLAN ID 0..4094
DEI 1-bit drop indicator
PCP 3-bit priority code point

Getaggte Frames Beispiel

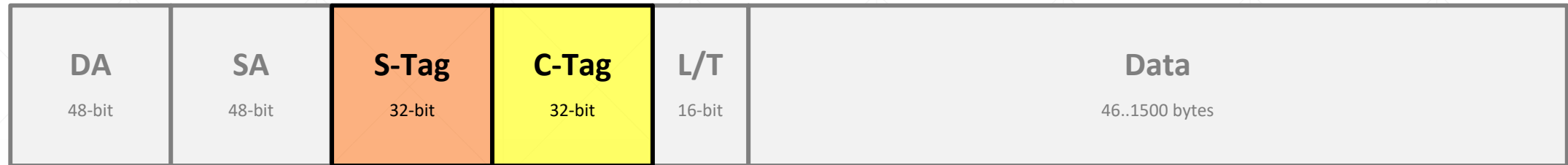


Getaggte Frames Konfiguration über Tabelle



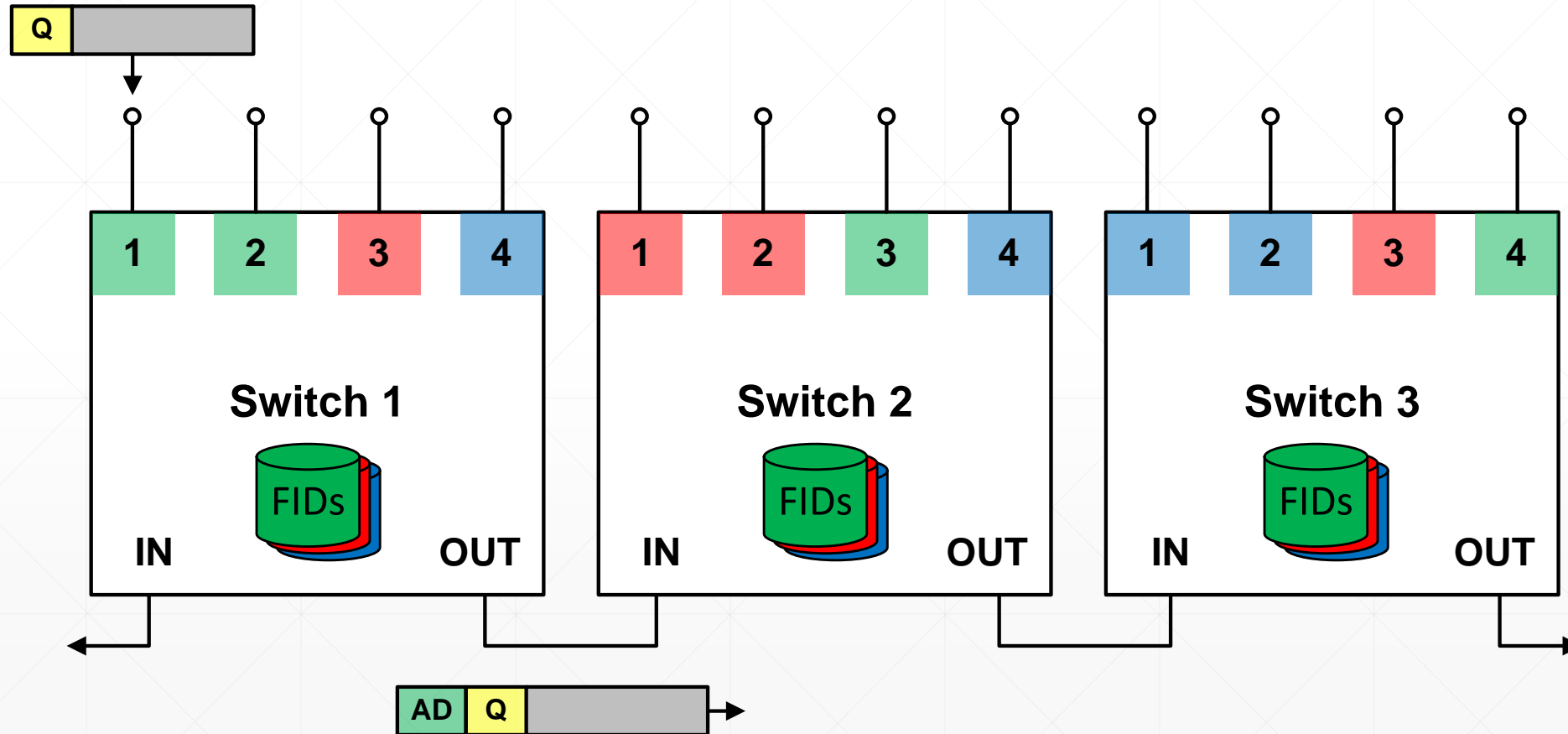
VID	Members
100	1, 2, 5, 6
200	3, 5, 6
300	4, 5, 6

Doppelt getaggte Frames Gemäss 802.1ad



- **C-Tag** = *Customer Tag* mit TPID **8100h**
- **S-Tag** = *Service Tag* mit TPID **88A8h**

Doppelt getaggte Frames Beispiel

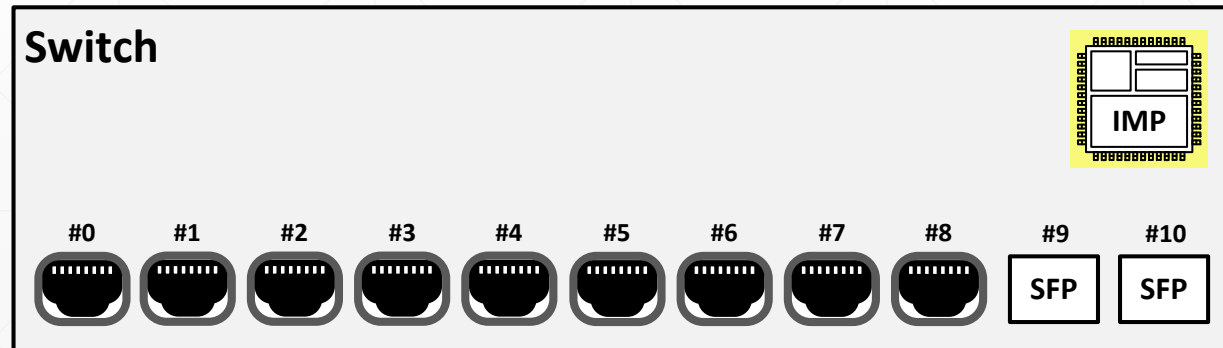
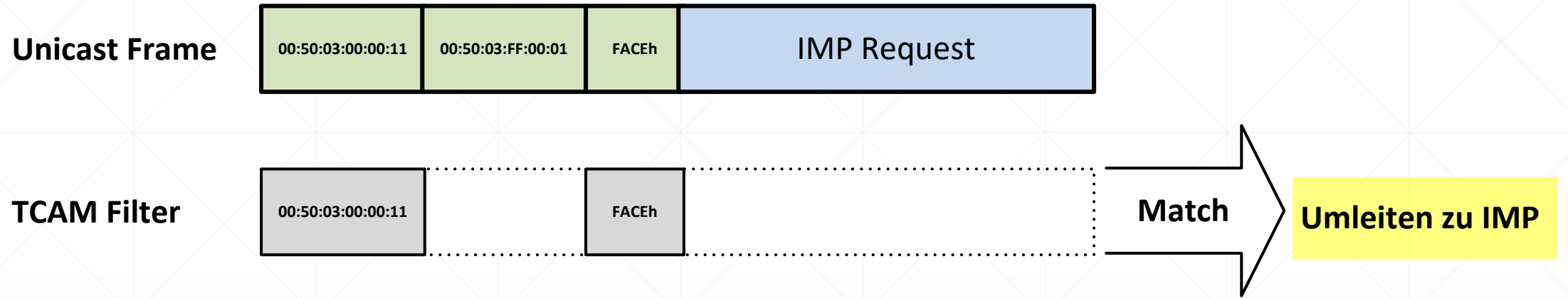


Ingress Rate Limit (IRL)

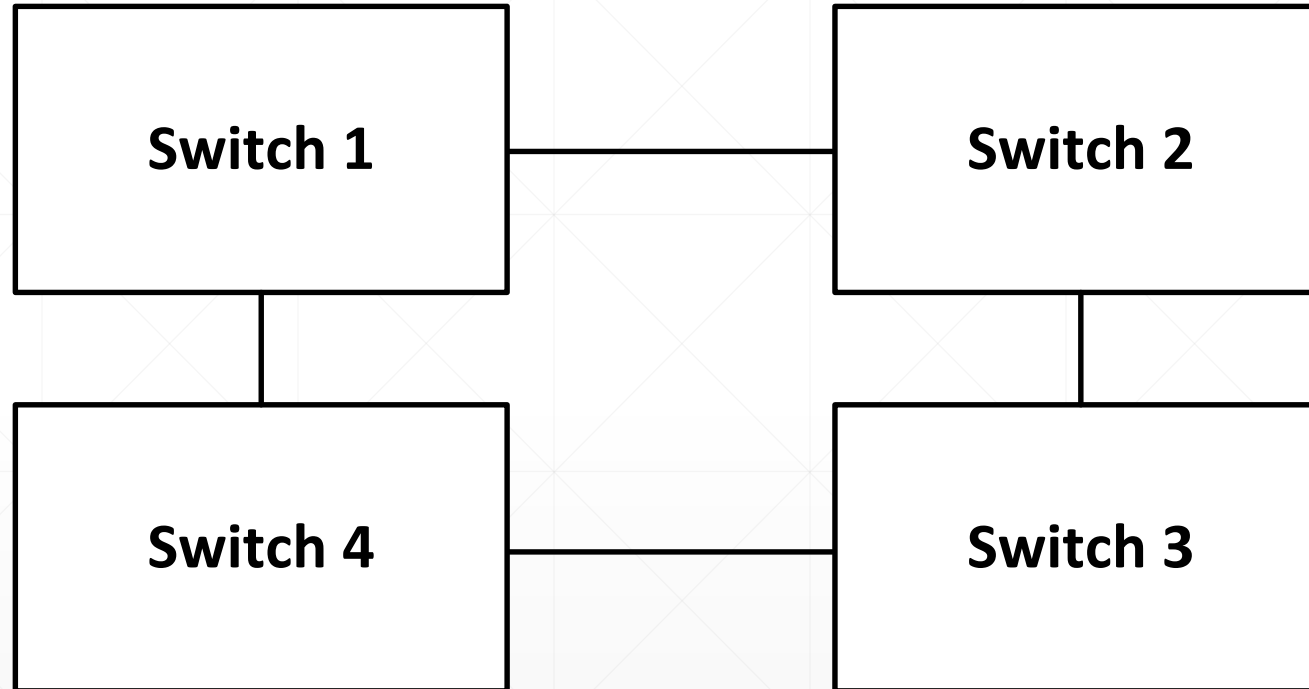
- Max. Bandbreite (kbps, mbps) pro Port
- Frame based (max. Anzahl Frames pro Sekunde)
- Traffic type based (UC, BC, MC, ARP, UDP, TCP Data, TCP Control)

TCAM Filter

Beispiel eigenes MGMT Protokoll

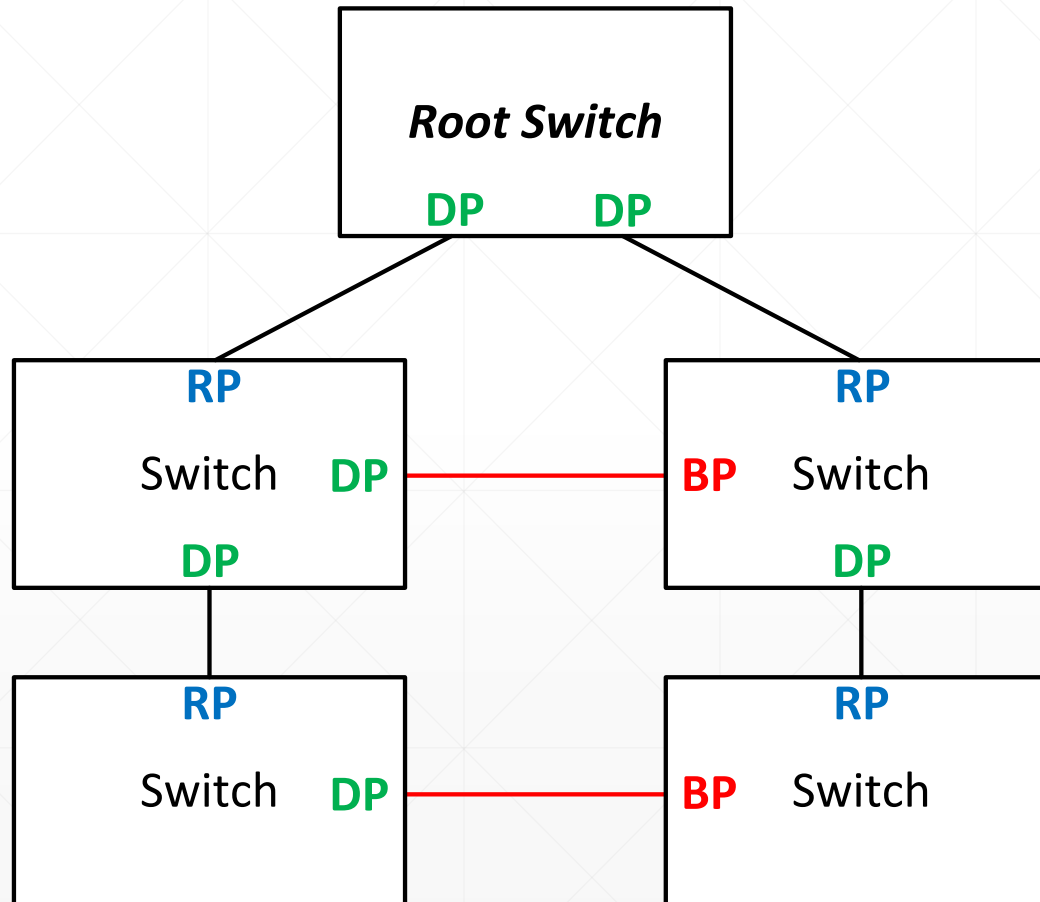


Redundante Leitungen Vorsicht Schlaufe!



Vorsicht: führt zum sofortigen Netzwerkstillstand!

Redundante Leitungen STP (Spanning Tree Protocol)

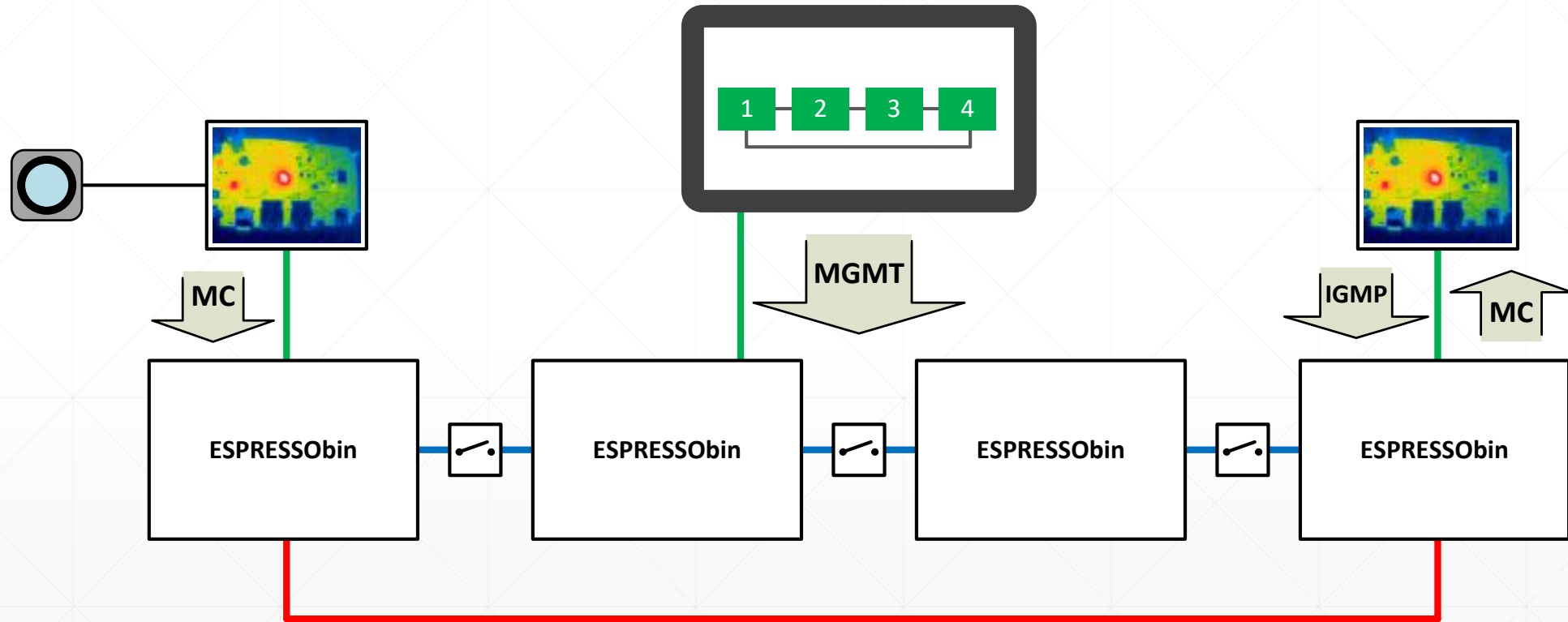


RP : Root Port

DP : Designated Port

BP : Blocked Port

Demo Multicast, IGMP, RSTP, TCAM und MGMT



ESPRESSObin Marvell Armada 3720LP dual core ARM Cortex-A53 processor plus 88E6341 «Topaz» switch

Fragen?

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