Priority entered	Traffic class for AFS650 family AFS670 family (default)	Traffic class for MACH 4000 and Power MICE (default setting)	IEEE 802.1D traffic type
0	1	2	Best effort (default)
1	0	0	Background
2	0	1	Standard
3	1	3	Excellent effort (business critical)
4	2	4	Controlled load (streaming multimedia)
5	2	5	Video, less than 100 milliseconds of latency and jitter
6	3	6	Voice, less than 10 milliseconds of latency and jitter
7	3	7	Network control reserved traffic

Table 11: Assignment of the priority entered in the tag to the traffic classes

Note: Network protocols and redundancy mechanisms use the highest traffic classes 3. Therefore, you select other traffic classes for application data.

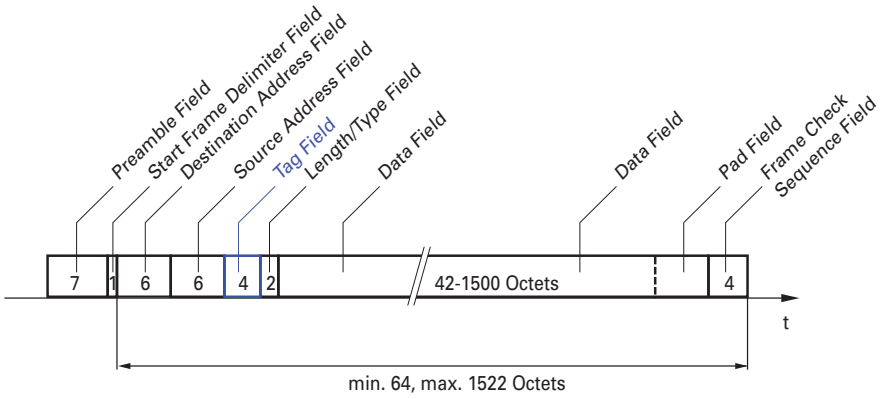


Figure 31: Ethernet data packet with tag

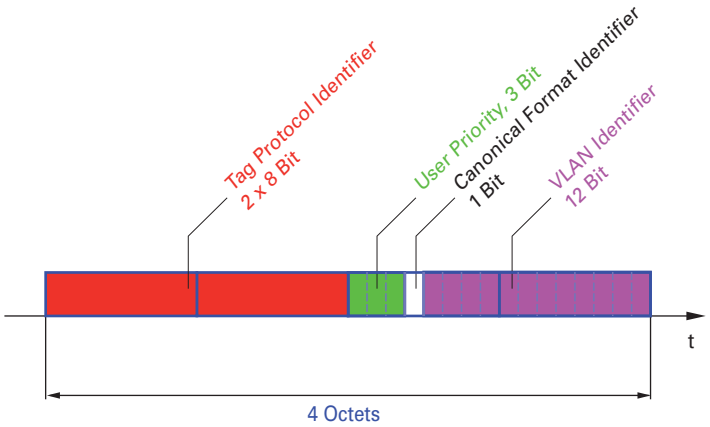


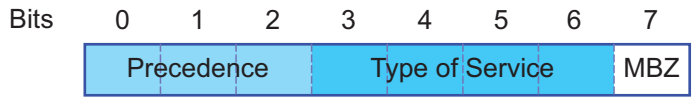
Figure 32: Tag format

Although VLAN prioritizing is widespread in the industry sector, it has a number of limitations:
- The additional 4-byte VLAN tag enlarges the data packets. With small data packets, this leads to a larger bandwidth load.
- End-to-end prioritizing requires the VLAN tags to be transmitted to the entire network, which means that all network components must be VLAN-capable.
- Routers cannot receive or send packets with VLAN tags via port-based router interfaces.

8.4.3 IP ToS / DiffServ

TYPE of Service

The Type of Service (ToS) field in the IP header (see table 12) has been part of the IP protocol from the start, and it is used to differentiate various services in IP networks. Even back then, there were ideas about differentiated treatment of IP packets, due to the limited bandwidth available and the unreliable connection paths. Because of the continuous increase in the available bandwidth, there was no need to use the ToS field. Only with the real-time requirements of today's networks has the ToS field become significant again. Selecting the ToS byte of the IP header enables you to differentiate between different services. However, this field is not widely used in practice.



Bits (0-2): IP Precedence Defined	Bits (3-6): Type of Service Defined	Bit (7)
111 - Network Control	0000 - [all normal]	0 - Must be zero
110 - Internetwork Control	1000 - [minimize delay]	
101 - CRITIC / ECP	0100 - [maximize throughput]	
100 - Flash Override	0010 - [maximize reliability]	
011 - Flash	0001 - [minimize monetary cost]	
010 - Immediate		
001 - Priority		
000 - Routine		

Table 12: ToS field in the IP header

Differentiated Services

The newly defined Differentiated Services field in the IP header in RFC 2474 (see fig. 33) - often known as the DiffServ Code Point or DSCP, replaces the ToS field and is used to mark the individual packets with a DSCP. Here the packets are divided into different quality classes. The first three bits of the DSCP are used to divide the packets into classes. The next three bits are used to further divide the classes on the basis of different criteria. In contrast to the ToS byte, DiffServ uses six bits for the division into classes. This results in up to 64 different service classes.

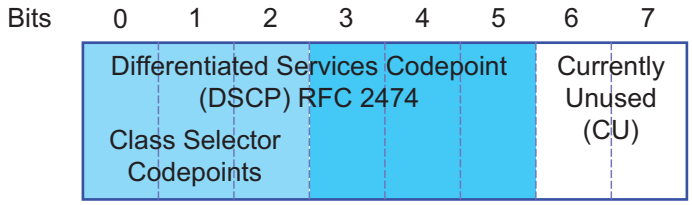


Figure 33: Differentiated Services field in the IP header

The different DSCP values get the device to employ a different forwarding behavior, the Per-Hop Behavior (PHB). PHB classes:

- Class Selector (CS0-CS7): For reasons of compatibility to TOS/IP Precedence
- Expedited Forwarding (EF): Premium service. Reduced delay, jitter + packet loss (RFC 2598)
- Assured Forwarding (AF): Provides a differentiated schema for handling different data traffic (RFC 2597).
- Default Forwarding/Best Effort: No particular prioritizing.

The PHB class selector assigns the 7 possible IP precedence values from the old ToS field to specific DSCP values, thus ensuring the downwards compatibility.

ToS Meaning	Precedence Value	Assigned DSCP
Network Control	111	CS7 (111000)
Internetwork Control	110	CS6 (110000)
Critical	101	CS5 (101000)
Flash Override	100	CS4 (100000)
Flash	011	CS3 (011000)
Immediate	010	CS2 (010000)
Priority	001	CS1 (001000)
Routine	000	CS0 (000000)

Table 13: Assigning the IP precedence values to the DSCP value

DSCP Value	DSCP Name	Traffic class for MACH 400, Power MICE (default setting)	Traffic class for AFS650 family AFS670 family (default setting)
0	Best Effort /CS0	2	1
1-7		2	1
8	CS1	0	0
9,11,13,15		0	0
10,12,14	AF11,AF12,AF13	0	0
16	CS2	1	0
17,19,21,23		1	0
18,20,22	AF21,AF22,AF23	1	0
24	CS3	3	1
25,27,29,31		3	1
26,28,30	AF31,AF32,AF33	3	1
32	CS4	4	2
33,35,37,39		4	2
34,36,38	AF41,AF42,AF43	4	2
40	CS5	5	2
41,42,43,44,45,47		5	2
46	EF	5	2
48	CS6	6	3
49-55		6	3
56	CS7	7	3
57-63		7	3

Table 14: Mapping the DSCP values onto the traffic classes

8.4.4 Management prioritizing

In order for you to have full access to the management of the device, even when there is a high network load, the device enables you to prioritize management packets.
In prioritizing management packets (SNMP, Telnet, etc.), the device sends the management packets with priority information.

- On Layer 2 the device modifies the VLAN priority in the VLAN tag.
  For this function to be useful, the configuration of the corresponding ports must permit the sending of packets with a VLAN tag.

- On Layer 3 the device modifies the IP-DSCP value.

8.4.5 Handling of received priority information

The device provides three options, which can be chosen globally for all ports, for selecting how it handles received data packets that contain priority information.

- trust dot1p
  The device assigns VLAN-tagged packets to the different traffic classes according to their VLAN priorities. The assignment is based on the pre-defined table (see on page 89 „VLAN tagging“). You can modify this assignment. The device assigns the port priority to packets that it receives without a tag.