Traffic priority - IEEE 802.1p

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M. Baldi, P. Nicoletti, "Switched LAN", McGraw-Hill, 2002, ISBN 88-386-3426-2

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Non blocking Switching fabric + speedup: is that all?

No, if you want guarantee quality of service!

- Elimination of output interface contention doesn't eliminate transmission contention
  - It's not possible to send more than a frame at a time
  - One frame is transmitted, the other ones are stored
- The resulting service
  - Depends on contention's frame number
  - Depends on *instantaneous* traffic profile
- Interface speedup doesn't solve the general problem
  - Receiving speed get higher too !!!!

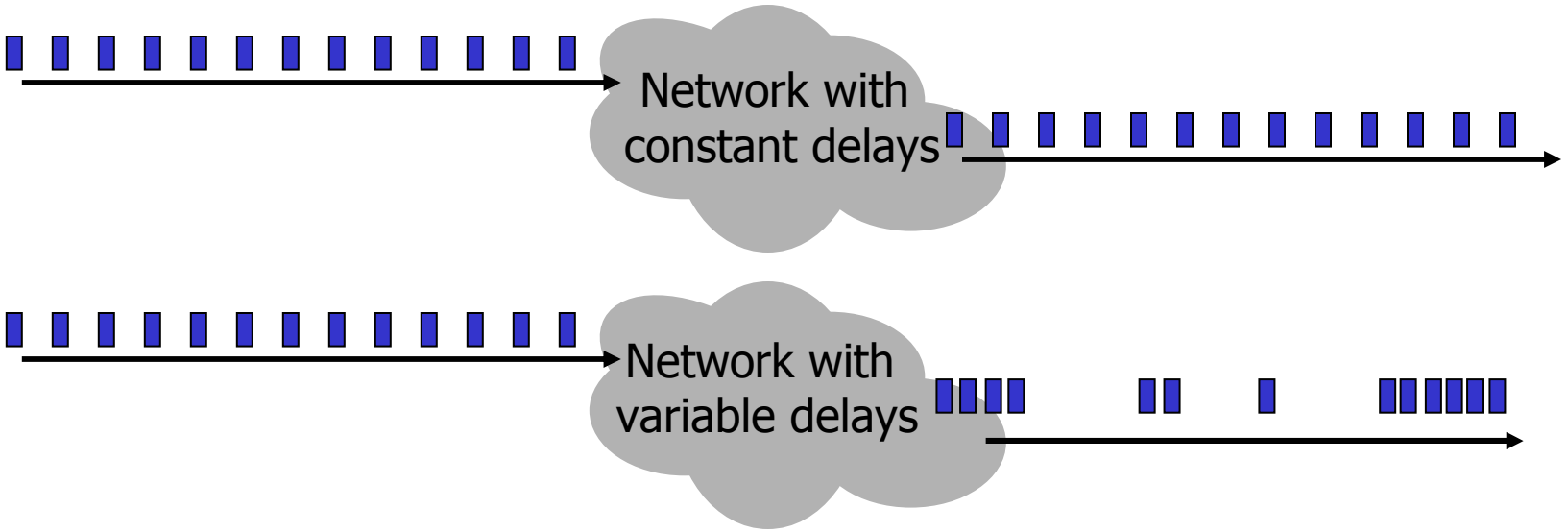
Consequences and their remedies

- Frame discarding
  - Large buffers reduce the problem
- Variable delay
  - Differentiated queueing and scheduling algorithm
  - Select the next packet in the buffer in optimal way(?)
    - Sophisticated algorithms offer better control over delay
    - Normally we don't want complicated layer 2 switches
  - Limitation on number of frame contention (admission control)
    - Normally it's not used in layer 2 switch

Real-time application

Receiving timings influence their behaviour

- Voice, telephony, music, video, videoconferency
- More and more used on LAN and WAN
- Source signal is sampled at regular intervals
- To have good quality samples must be played with the same regularity



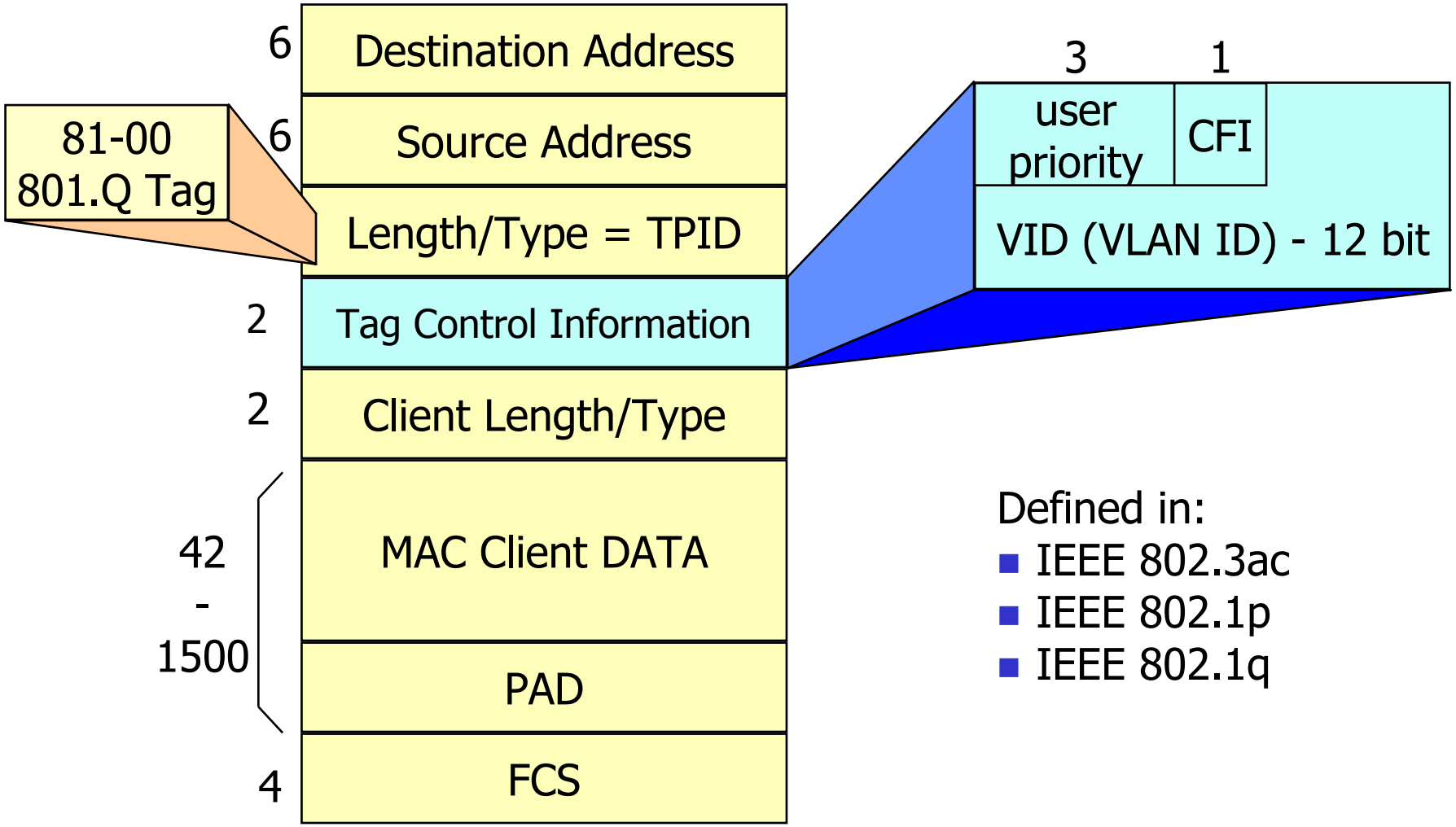
Delay control

- Replay buffer
  - At destination
    - Doesn't need changes on network equipments
    - Can be implemented in the application
  - Delay increase: not suitable for interactive application
- Queue advanced management
  - Solve the problem at his heart
  - Differentiated queues
  - Sophisticated scheduling algorithm
  - Traffic control
    - Network engineering
    - Traffic engineering
    - Resource booking (admission control)

IEEE 802.1p standard

- 8 priority level
- It doesn't mean levels are hierarchical relationship
  - Even if word *priority* is used
- A tag in the packet records the priority level
  - Encoded on 3 bit
- Logical split queues for different services
  - At last 2
  - At most 8

Tag coding: IEEE 802.1p e 802.1q



Defined in:

- IEEE 802.3ac
- IEEE 802.1p
- IEEE 802.1q

Priority assignment

- Tag insertion in the packet
- Sender's network card
  - Insert tag
  - Switching interface must be trunk in order to accept packets with tag
- Switching interface can assign priority to packets
  - Normally the interface to which the sender is connected

Priority/traffic association proposed

User Priority	Initials	Kind of traffic
0 (default)	BE	Best Effort
1	BK	Background
2	--	not defined
3	EE	Excellent Effort
4	CL	Controlled Load
5	VI	“Video,” < 100 ms latency and jitter
6	VO	“Voice,” < 10 ms latency and jitter
7	NC	Network Control

IEEE 802.1p recommended aggregation

Code No.	Kind of traffic							
1	BE							
2	BE				VO			
3	BE				CL		VO	
4	BK		BE		CL		VO	
5	BK		BE		CL	VI	VO	
6	BK		BE	EE	CL	VI	VO	
7	BK		BE	EE	CL	VI	VO	NC
8	BK	----	BE	EE	CL	VI	VO	NC

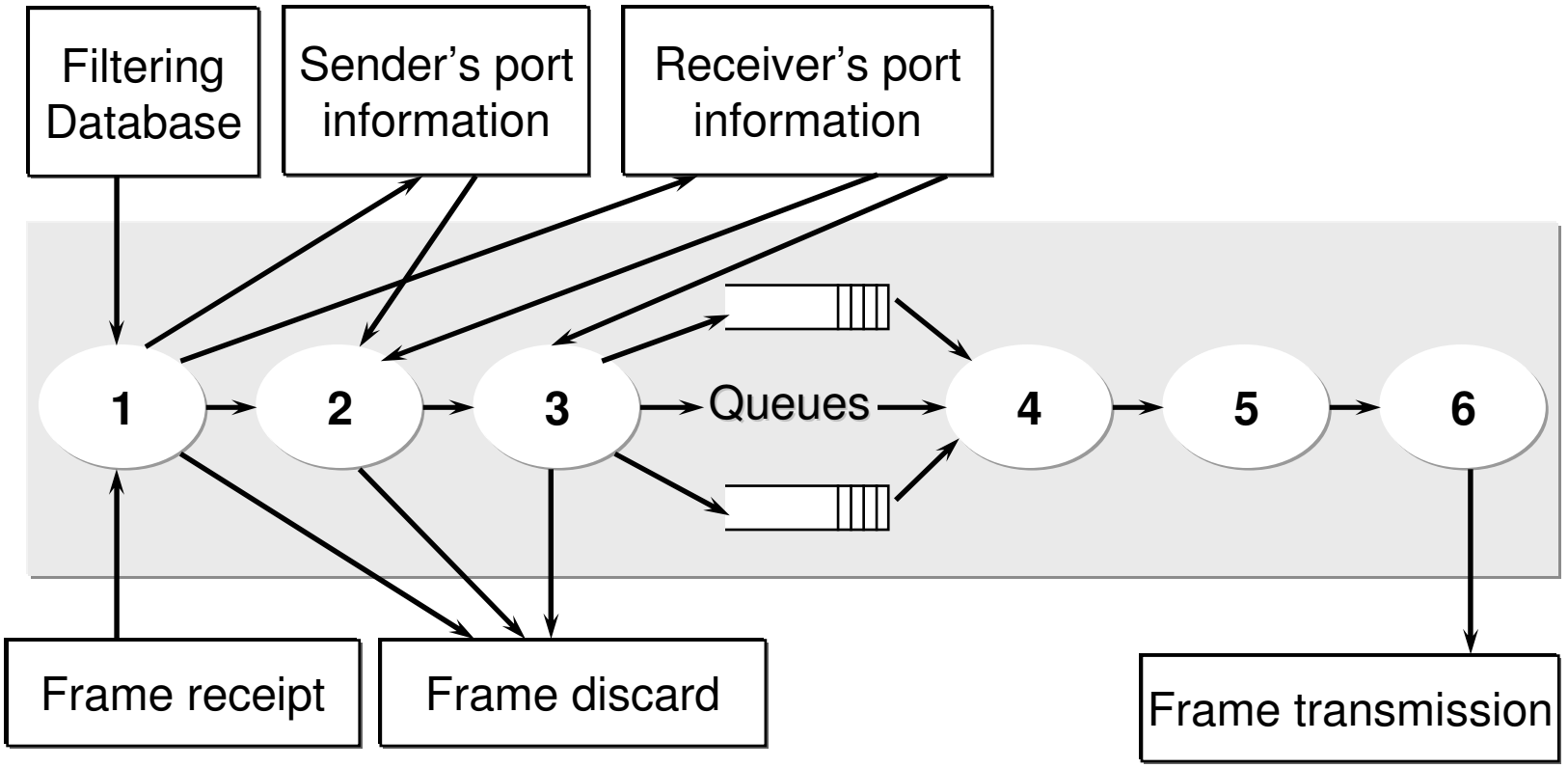
Scheduling

- IEEE 802.1p recommends *fixed priority* as traffic/queue association
- Possibility to use variable priority scheduling algorithms
  - Round robin, weighted round robin, weighted fair queuing
- Different range equipments can offer different algorithms

Configuration commands let to

- Assign priority value (user priority) to queue
- Set the scheduling algorithm

IEEE 802.1p switch functional architecture



1 Filtering Frames
2 Enforcing topology restriction (STP)
3 Queueing Frames

4 Selecting frames for transmission
5 Mapping priority
6 Recalculating FCS