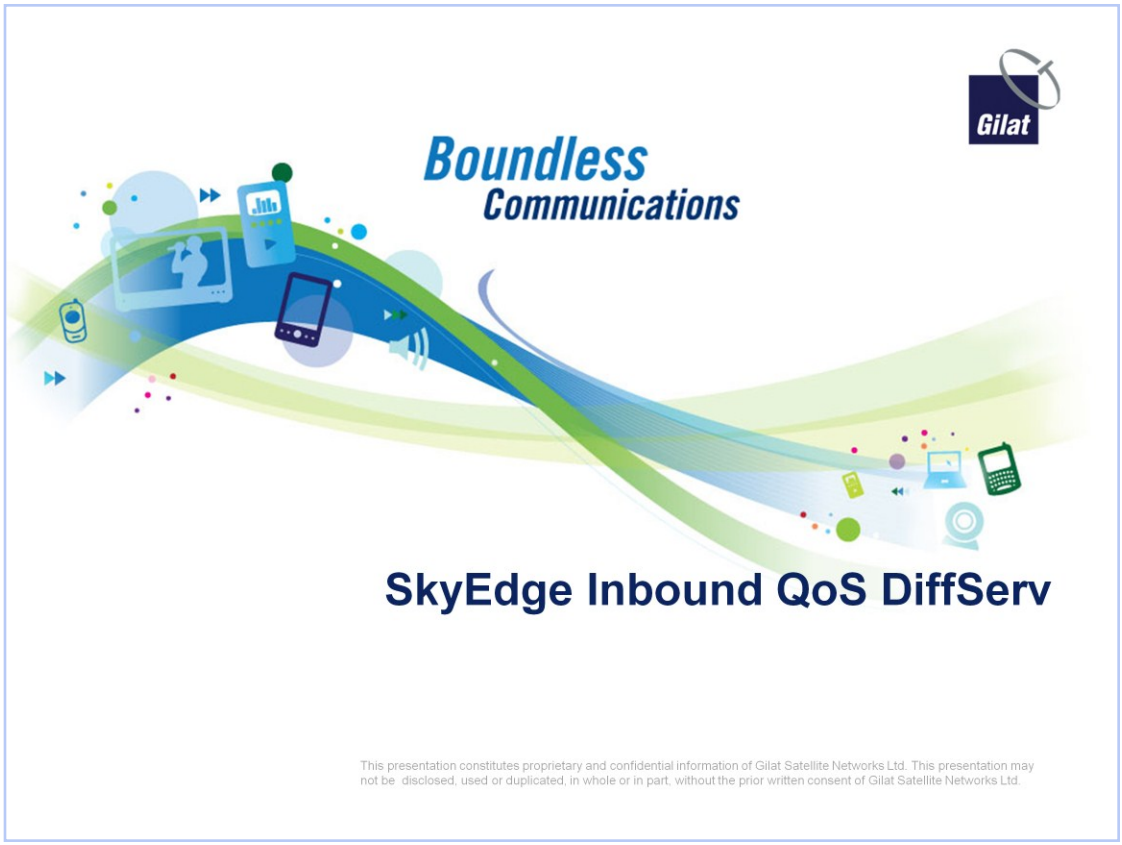
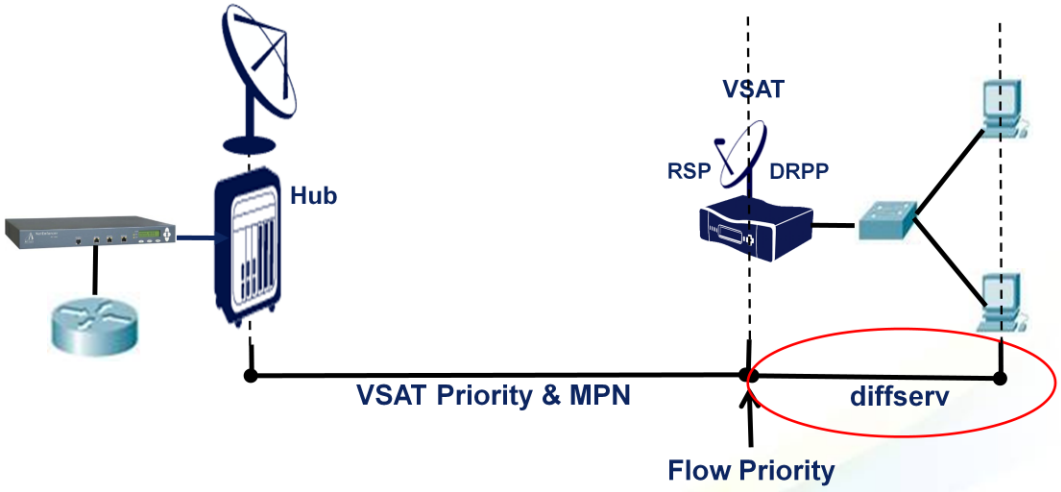
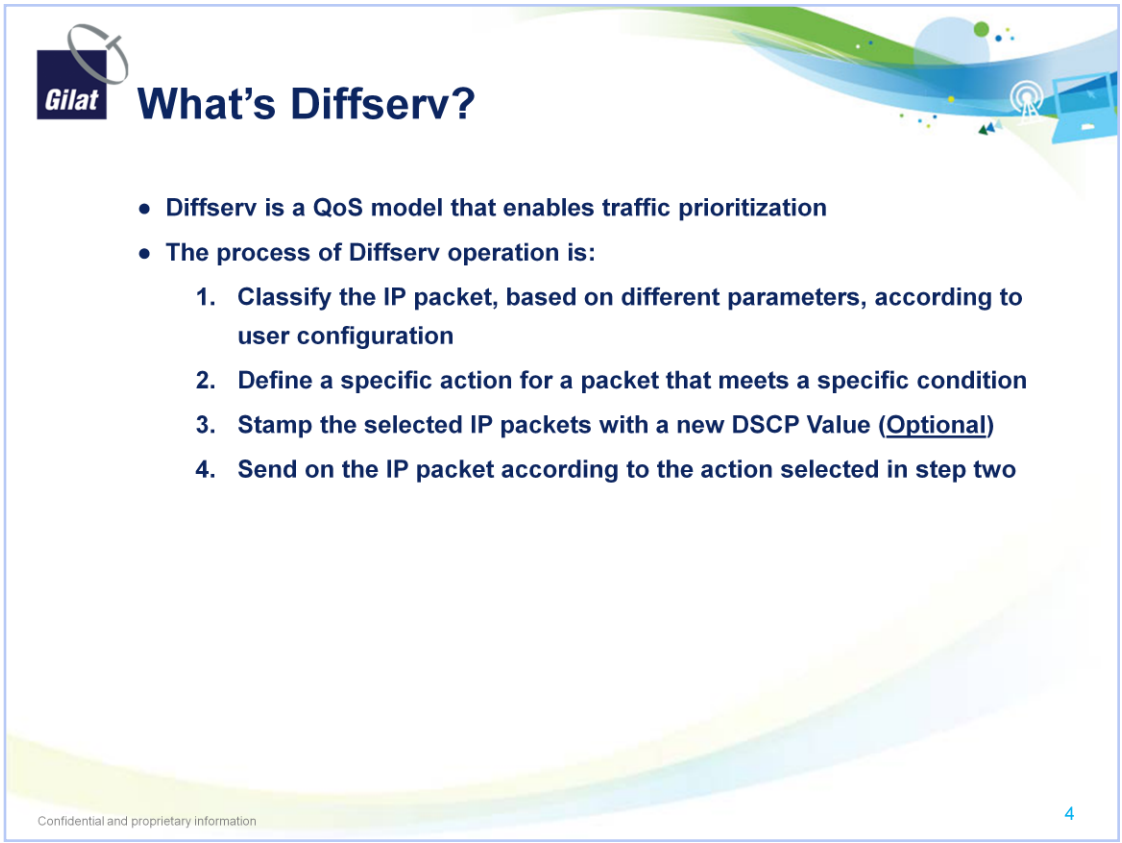


Session Objectives

- By the end of this session, we will:
  - Become acquainted with SkyEdge II DiffServ implementation
  - Know the different queue types and algorithms
  - Know how to configure Diffserv operations within a VSAT

IB QoS
Overview





The Diffserv QoS Model is based upon 6 RFCs:

1.RFC 2474 — Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers

2.RFC 2475 — An Architecture for Differentiated Services

3.RFC 2597 — Assured Forwarding PHB Group

4.RFC 3140 — Per Hop Behavior Identification Codes

5.RFC 3246 — An Expedited Forwarding PHB

6.RFC 4594 — Configuration Guidelines for DiffServ Service Classes

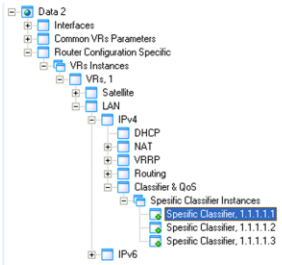
Per Hop Behavior – since Diffserv operate at layer 3 of the OSI model, any behavior defined on any IP Diffserv component, will be effective only until the IP packet arrive to another IP Diffserv component.

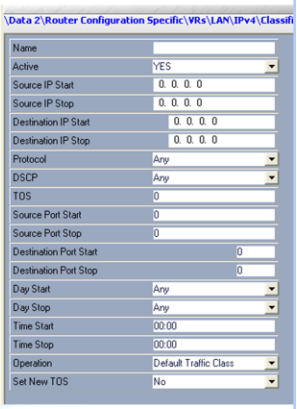
DSCP – differentiate Service Code Point, is a field in the IP header, within the TOS Byte. The DSCP length is 6 bits.

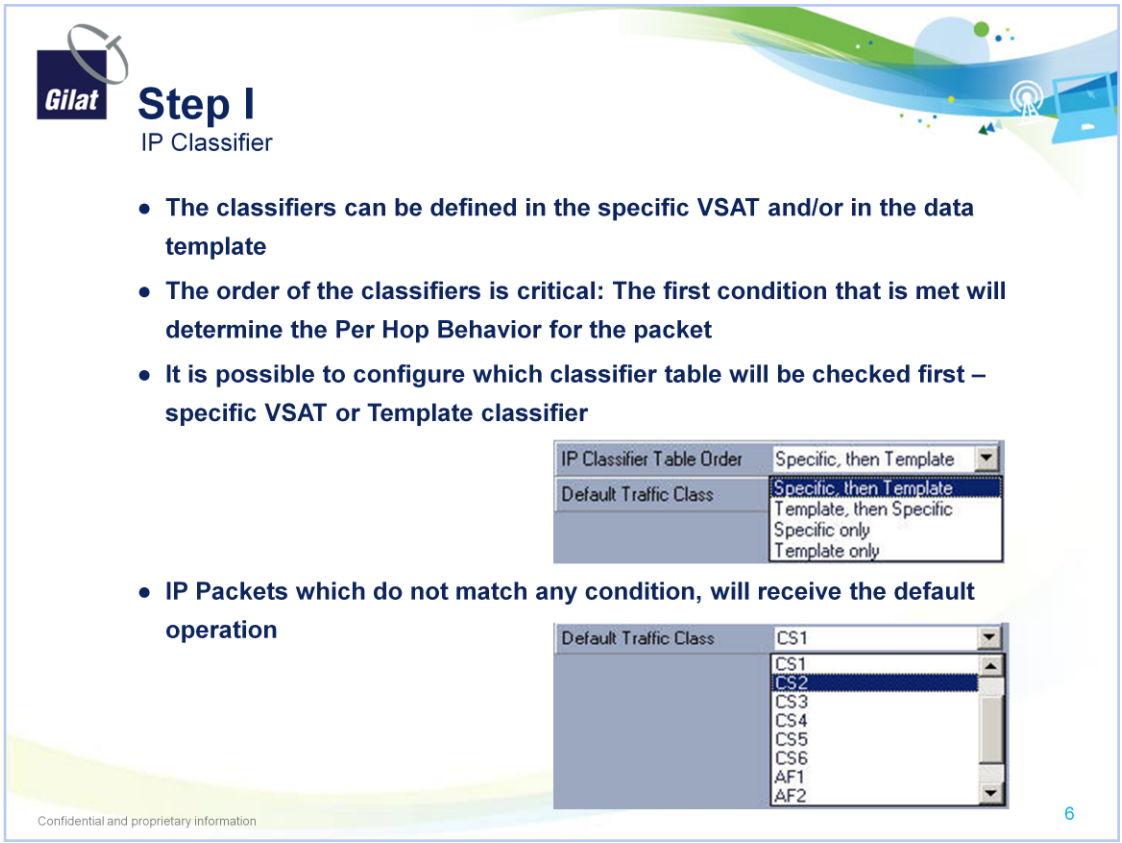
Step I

IP Classifier

- First we need to inspect the IP packet
- In SE II we can prioritize IP packets according to the following conditions:
  - Source IP range
  - Destination IP range
  - Source port range
  - Destination port range
  - Protocol
  - DSCP value
  - TOS Byte value
  - Day range
  - Hour range





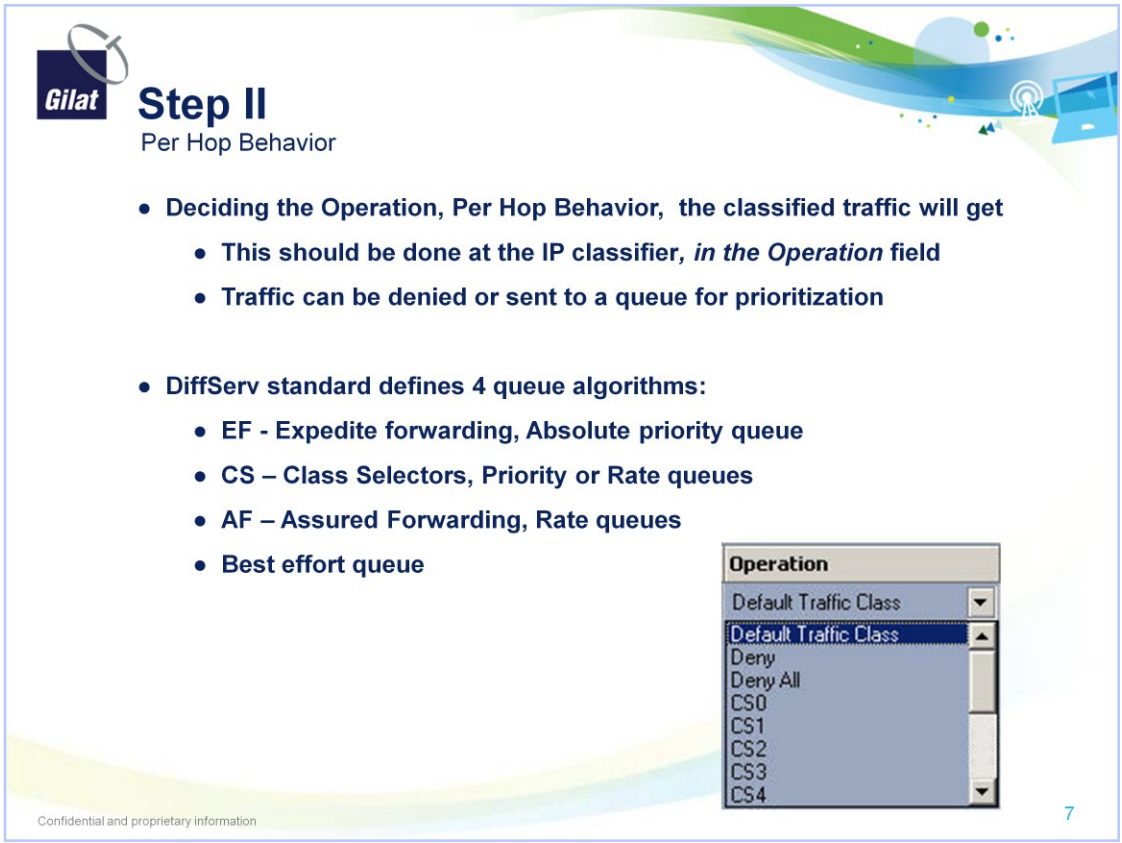


The IP classifier can be configured in the specific VSAT configuration and in the Data template.

Since there can be two operational tables of IP Classifier, the operator has to decide which table will be checked first by the IP classifier mechanism. In order to choose which of the tables will be checked first, in the Data Tab of the VSAT configuration, under *Router Configuration specific – VR Instances – VR # – LAN – IPv4 - classifier & QoS,* we can choose one of the following options:

- *Specific, then Template* – first the VSAT's specific IP Classifier table will be checked and then (if there is no match found), the Template IP Classifier table will be checked.
- *Template, then Specific* – first the Template IP Classifier table will be checked and then (if there is no match found), the VSAT specific IP Classifier table will be checked.
- *Specific only* – Only the VSAT specific IP classifier table will be checked.
- *Template only* – Only the Template IP classifier table will be checked.

The IP classifier mechanism will stop checking the list if it finds a match between the condition defined and an IP Packet arriving to the VSAT from the LAN port. Therefore, it is recommended that the list will be structured from the specific rule at the top of the classifier to the generic rule at the bottom of the classifier.



All three queue algorithms are implemented in SkyEdge systems.

Operation field explanation:

Default Traffic Class – The IP Packets which match the criteria defined will be sent to a default traffic queue, as defined in *Router Configuration specific – VR Instances – VR # – LAN – IPv4 - classifier & QoS*

Deny - will Deny the IP packets which match the criteria defined.

Deny All – The IP Classifier will not check other conditions defined after a condition which its operation field is defined as *Deny All,* therefore this option should be used only at the last line of the IP Classifier table and is equivalent to an *explicit deny* placed in the end of an access list.

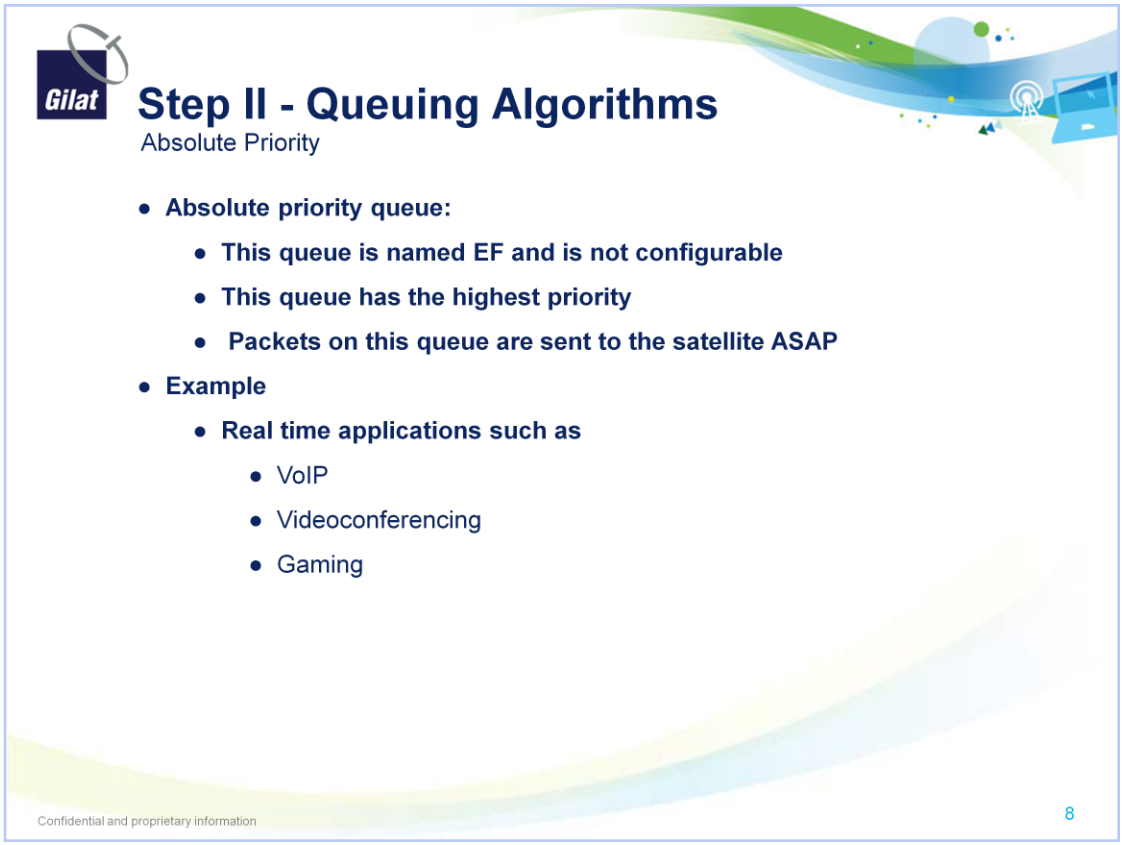
The other queues (as explained in the next slides) are:

CS1 – CS7 are priority or rate queues.

AF1 – AF4 are rate queues.

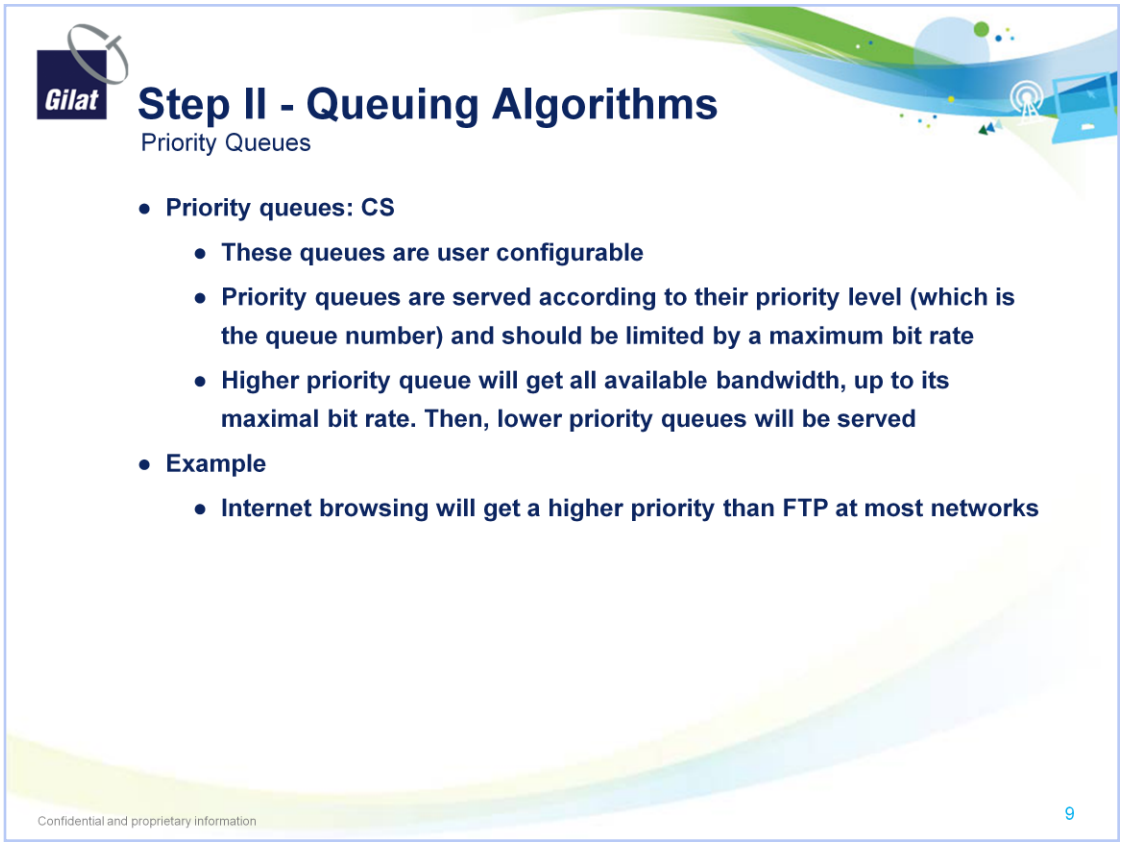
EF is expedite forwarding queue.

CS0 is best effort queue.



EF stands for Expedite forwarding (RFC-2598). EF Per Hop Behavior provides a premium service. It is specifically targeted towards the most critical applications, where jitter, delay and loss should be minimal. For Example: VoIP, Video and Online Trading. EF Codepoint value is 101110.

In SEII VoIP is automatically identified and sent to EF (based on SIP signaling or the RTP stream) and thus doesn't need to be configured to EF. Other traffic requiring real time treatment can be classified to EF, however use this queue with great caution as it receives absolute highest priority.

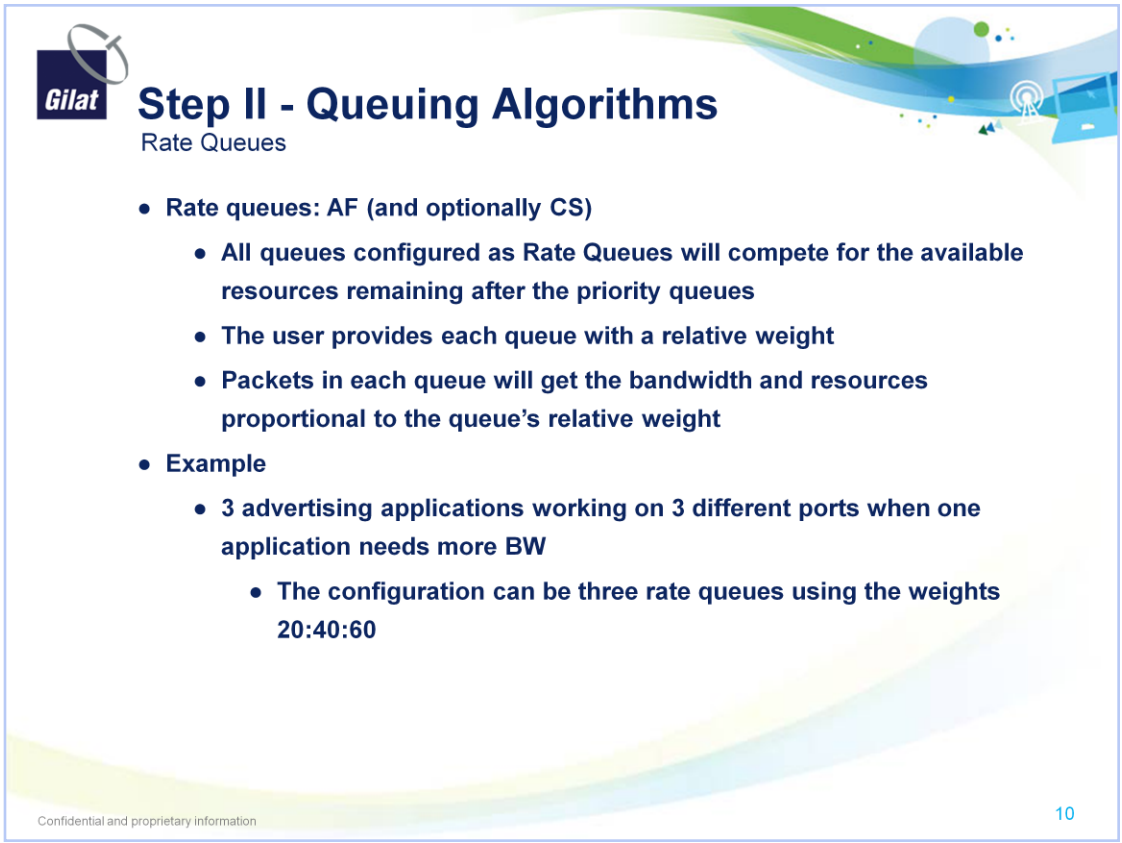


CS stands for Class selector (RFC-2474). These are DSCP values of the form `xxx000'. There are 8 CS values: CS7, CS6, CS5, etc. Higher values have priority over the lower (eg. CS7 have higher priority over CS6).

A major drawback for such an algorithm is 'application starvation' which means: as long as there are any packets to send from a higher priority queue, lower priority queue will not be served. To avoid such a problem it is recommended to limit the priority queues bandwidth.

The CS queues are shared queues between all VRs configured at the VSAT. Each VR has its own IP classifier. But all CS queues are shared. The CS queues are configured at the Data Template.

In SEII the CS queues can also be configured as Rate queues, which means they will operate with the same algorithm as AF queues.



AF stand for Assured Forwarding PHB (RFC-2597) defines a method by which Behavior Aggregates can be given different forwarding assurances, different resource priorities and even different drop-off probabilities at network congestion situations.

AF are defined with a AFxy value, such as AF11, AF23, etc.

There are four AFxy PHB primary values,(1<x<4, 1<y<3). which are defined by the four AFx classes; namely, AF1y, AF2y, AF3y, and AF4y. Each class is assigned a certain amount of buffer space and interface bandwidth, dependent on the SLA with the Service Provider/policy.

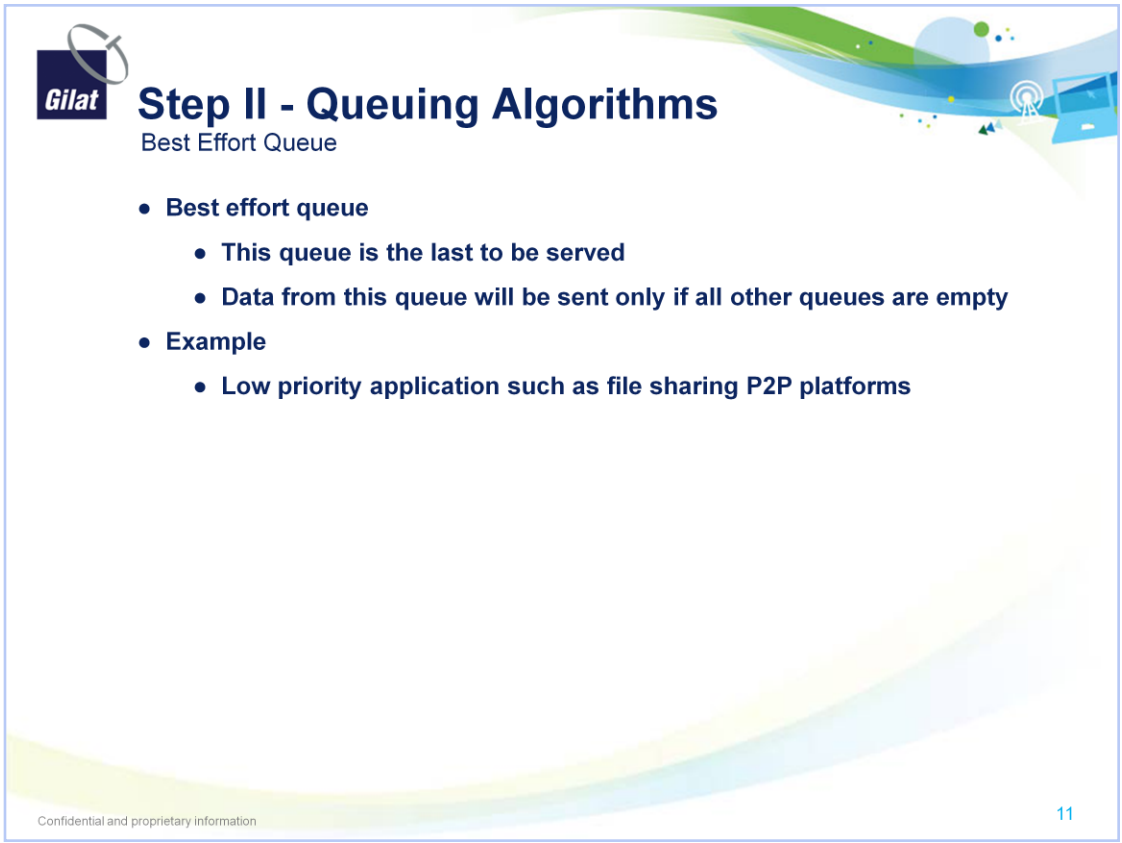
X is the decimal value of the first 3 bits of the codepoint while Y is the decimal value of the last 3 bits if the codepoint. In Gilat SkyEdge systems we use default Y Value of 1.

Once the absolute priority queue (EF) and all other priority queues (CS) have been served, the remaining Inbound bandwidth will be divided between the rate queues.

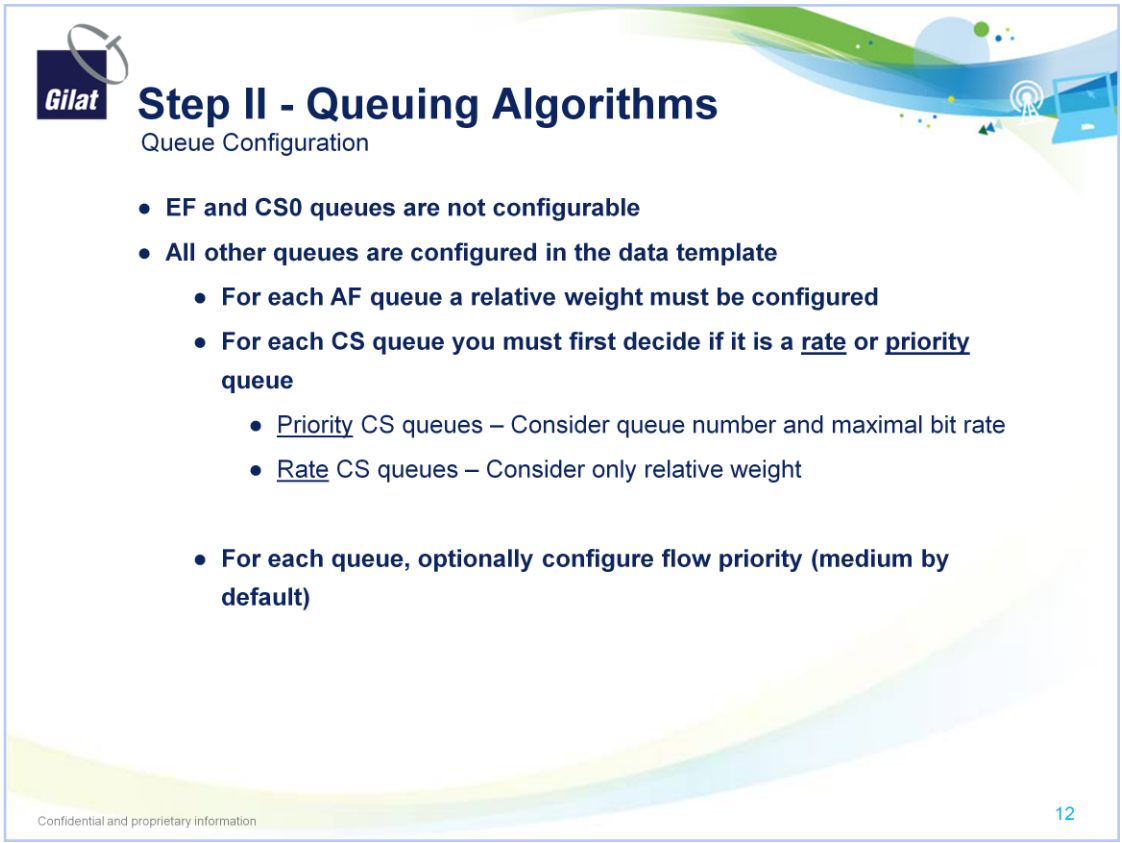
The rate queues with data to send, will compete according to their associated weight.

The weights can, but do not necessarily have to be in percentage, and they have no units – only the proportional ratio between the different weights matters. For example, configuring three rate queues using the weights 20:40:60, will yield the same results as using the weights 1:2:3 or 17:34:51.

The AF queues are shared queues between all VRs configured at the VSAT. Each VR has its own IP classifier. But all AF queues are shared. The AF queues are being configured at the Data Template.



A packet arriving with the default codepoint value of 000000 gets the standard best-effort service.

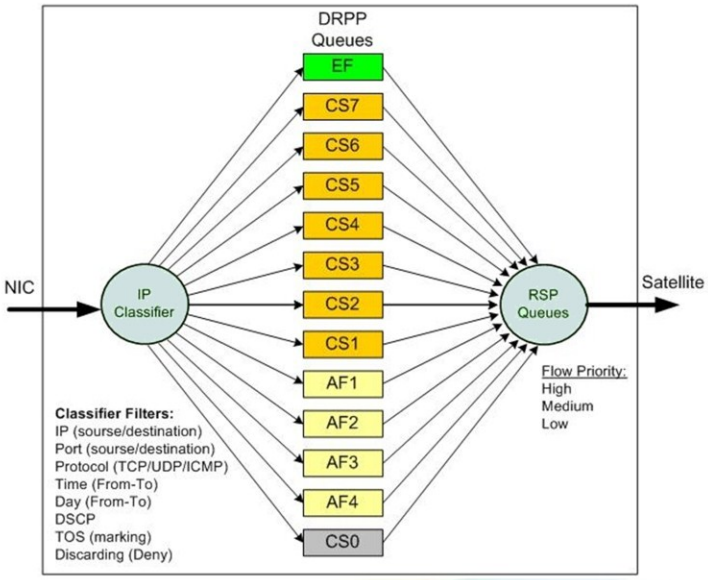


Flow priority affects the priority of the capacity request that will be sent for this traffic (High, Medium or Low). The affects of this priority will be taught in the next presentation.

The queue configuration is located in the Data Template, under “common VRs parameters”.

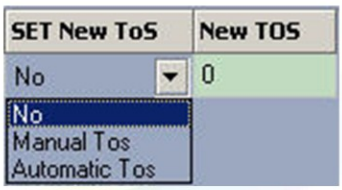
Step II - Queuing Algorithms

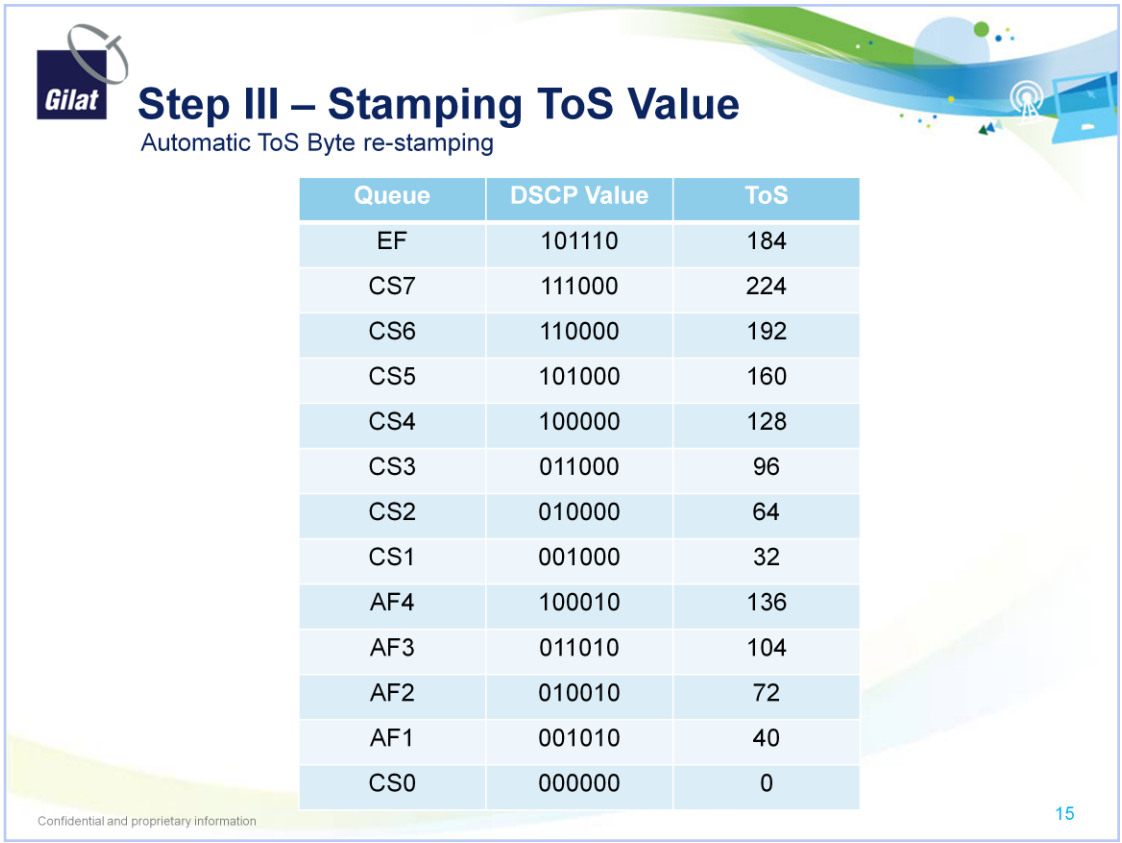
Summary



Step III – Stamping TOS Value

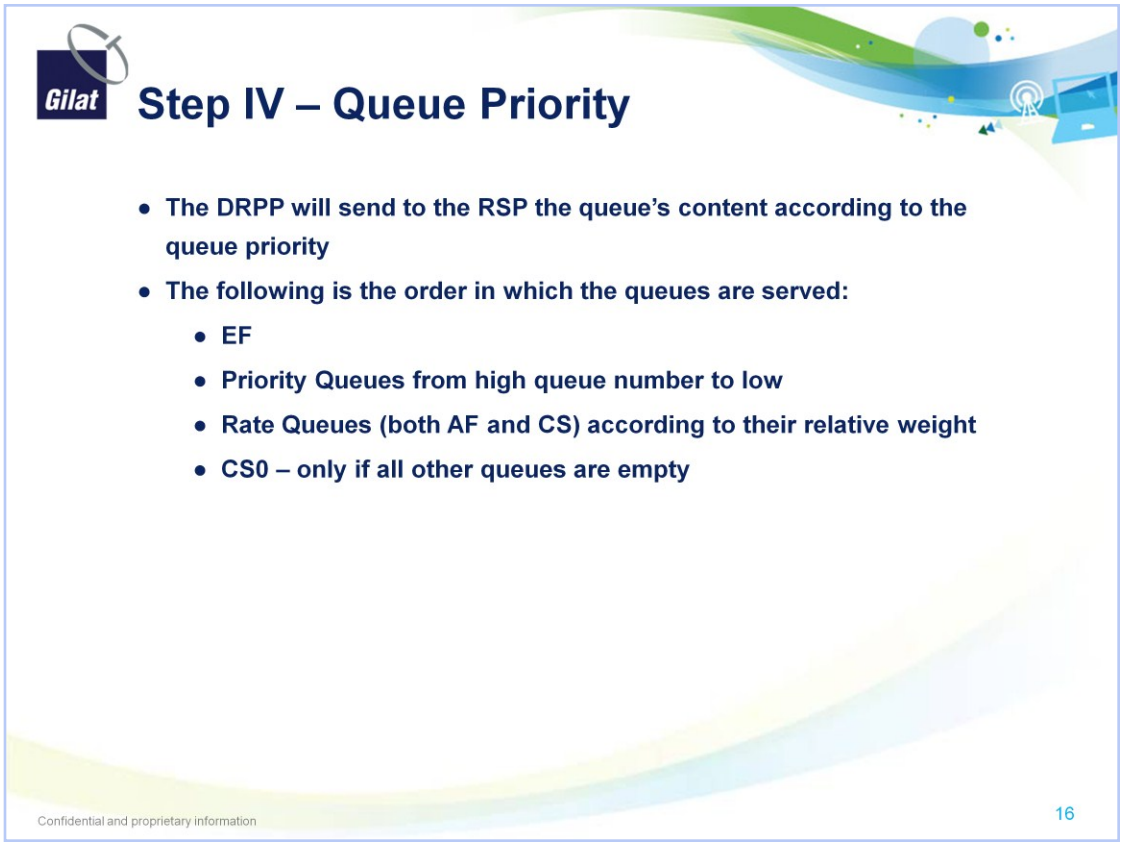
- Step III - Stamping the selected IP packets with a Diffserv value is optional and is implemented at each classifier
- Each IP packet which matches the criteria defined can:
  - Remain with the same TOS value it had before
  - Be stamped with a new TOS value (entered manually)
  - Be stamped with a new TOS value automatically, according to the queue the packet was sent to (see next slide)





SEII only uses part of the Diffserv queues. The full Diffserv standard queues can be seen below

Traffic Queue	Queue Type	DSCP Value	ToS	Typical Types of Traffic
CS0	Rate	000000	0	Standard (a bit of everything)
CS1	Rate	001000	32	Low Priority Data; Flow Without BW Assurance
AF1	Rate	Values are the same as AF11 *or* AF12 *or* AF13		
AF11	Rate	001010	40	High Throughput Data; Store and Forward Applications
AF12	Rate	001100	48	
AF13	Rate	001110	56	
CS2	Rate	010000	64	Network Operations, Administration/Management
AF2	Rate	Values are the same as AF21 *or* AF22 *or* AF23		
AF21	Rate	010010	72	Low Latency Data; Client-Server Transactions, Web-based Ordering
AF22	Rate	010100	80	
AF23	Rate	010110	88	
CS3	Rate	011000	96	Broadcast Video/TV; Live Events
AF3	Rate	Values are the same as AF31 *or* AF32 *or* AF33		
AF31	Rate	011010	104	Multimedia; Streaming Video, Audio on Demand
AF32	Rate	011100	112	
AF33	Rate	011110	120	
CS4	Rate	100000	128	Real Time Interactive; Interactive Gaming
AF4	Rate	Values are the same as AF41 *or* AF42 *or* AF43		
AF41	Rate	100010	136	Multimedia Conferencing; Video Conferencing
AF42	Rate	100100	144	
AF43	Rate	100110	152	
CS5	Rate	101000	160	Signaling; IP Telephony Signaling
EF	Priority	101110	184	Telephony; IP Telephony Bearer
CS6	Rate	110000	192	Network Control; Network Routing
CS7	Priority	111000	224	Administrative Services; Heartbeats



Packet which enter the EF queue, will be transmitted as soon as the VSAT can transmit them. After the EF queue is empty, the VSAT checks the rest of the CS Priority queues, from CS7 to CS1.

Only when all CS priority queues are empty, the VSAT starts checking the CS Rate and AF queues, and distributes BW according to relative weight.

CS0 queue is checked when all the queues mentioned above are empty.

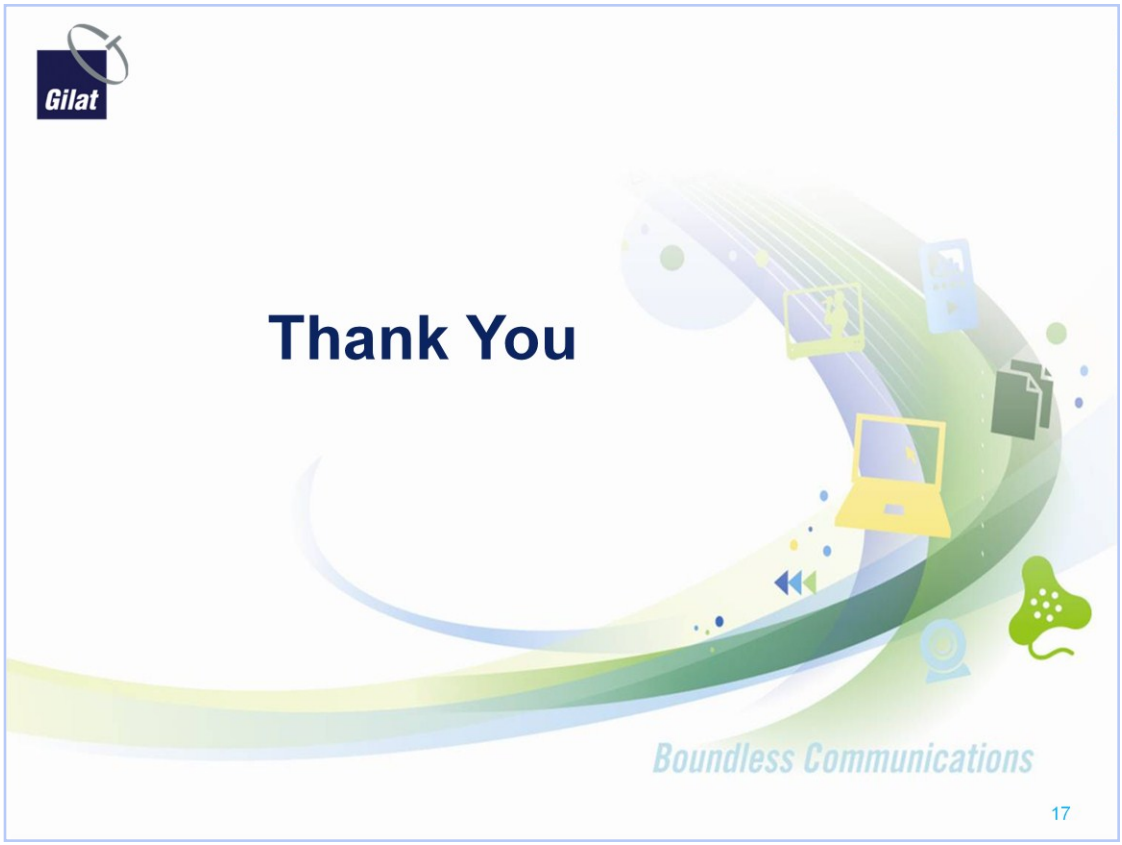
CS (Class Selector) traffic configuration contains 7 queues: CS1-CS7.

The CS1-CS7 Traffic Class Descriptors configuration is available at the level of the VSAT Data template, it is not available for specific VSATs.

CS0 Traffic Class is not configurable and is 'best effort' by definition.

CS Traffic Class descriptors can be configured either as priority queues or as rate queues. When configured as Rate queues, the CS queues will behave like AF queues (and then the CS number has no meaning – only its weight).

AF1-AF4 Traffic Class Descriptors can only be configured as rate queues.


Gilat
Thank You
Boundless Communications
17