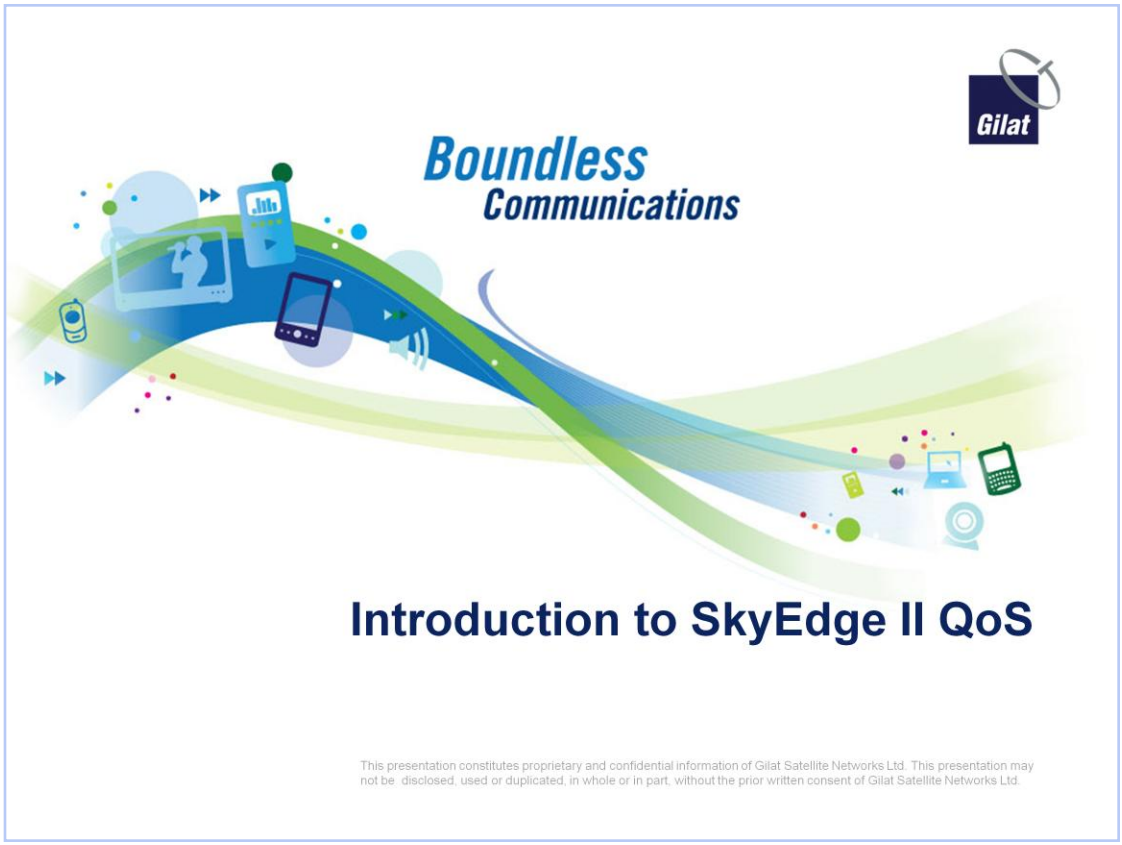


Agenda

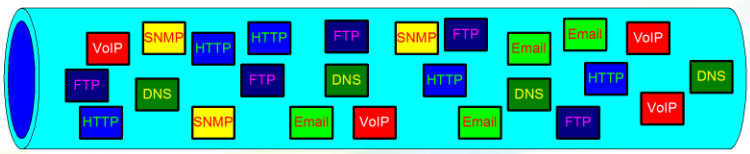
- QoS Definition
- Motivation for implementation
- QoS implementation rules
- QoS basic terminology
- SkyEdge QoS IB architecture
- SkyEdge QoS OB architecture
- Summary

Definition

"The ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance."

Motivation

- Broadband regulation
  - Satellite bandwidth is the most expensive resource of the network, and it is a limited resource, that has to be managed and controlled
  - Providing consistent performance at peak times as well as at off-peak times
  - Providing bandwidth according to client's needs and payment
  - Controlling applications behavior in the network to provide an acceptable performance



QoS Implementation

- When implementing QoS policy one basic rule must be followed:
  - Traffic shaping should be implemented as close as possible to the traffic originator
- A QoS Policy is usually implemented according to SLA

Using QoS Service Level Agreement (SLA), hub operator can design several SLA packages to fit it's customer market profile.

SLA packages can define Guaranteed throughput (CIR), maximum throughput (MIR),

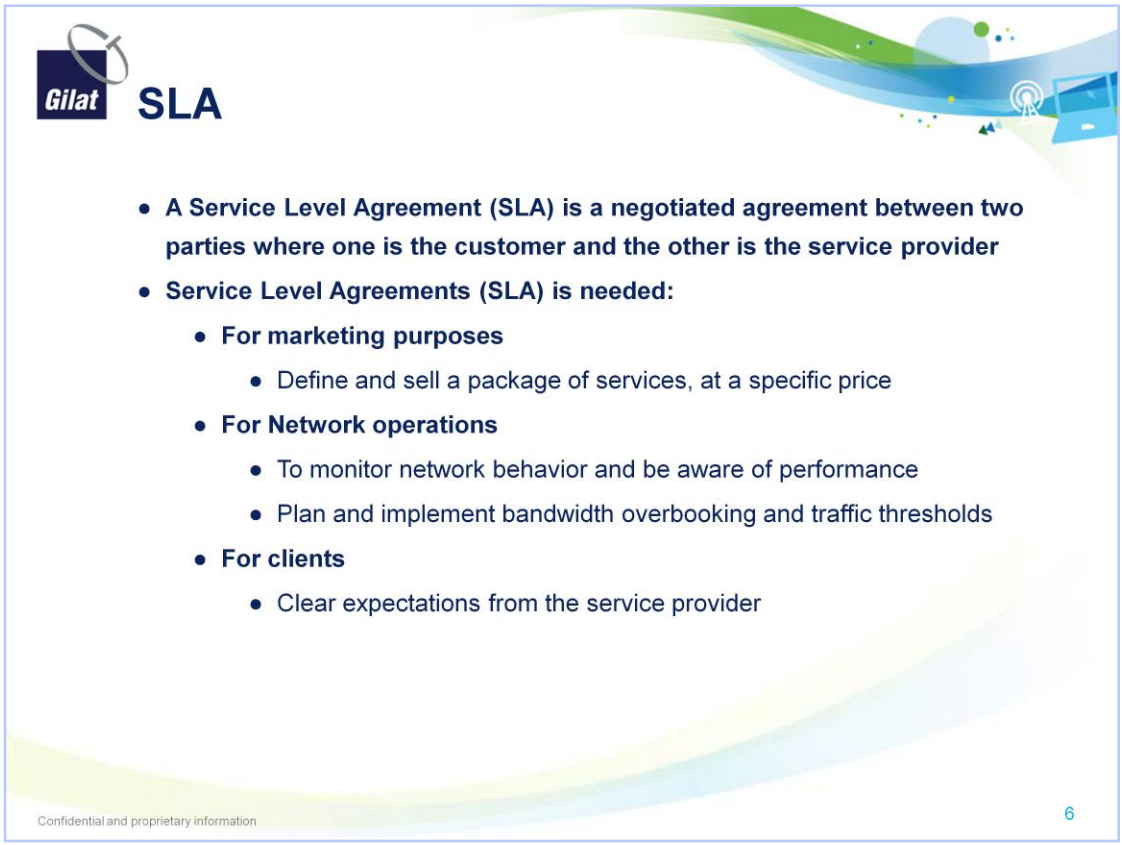
and to define application priority using the IB diffserv mechanism.

QoS is used for:

Providing different service packages to organizations and individuals (at different prices)

Ensuring consistent network behavior, even in congestion

Ensuring applications behave well, even in congestion



A Service Level Agreement (SLA) is a negotiated agreement between two parties where one is the customer and the other is the service provider. This can be a legally binding formal or informal 'contract'.

The SLA records a common understanding about services, priorities, responsibilities, guarantees and warranties. Each area of service scope should have the 'level of service' defined. The SLA may specify the levels of availability, serviceability, performance, operation, or other attributes of the service such as billing. The 'level of service' can also be specified as 'target' and 'minimum', which allows customers to informed what to expect (the minimum), while providing a measurable (average) target value that shows the level of organization performance. In some contracts penalties may be agreed in the case of non compliance of the SLA. It is important to note that the 'agreement' relates to the services the customer receives, and not how the service provider delivers that service.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QoS Parameters
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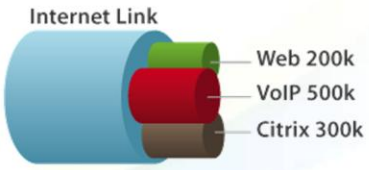
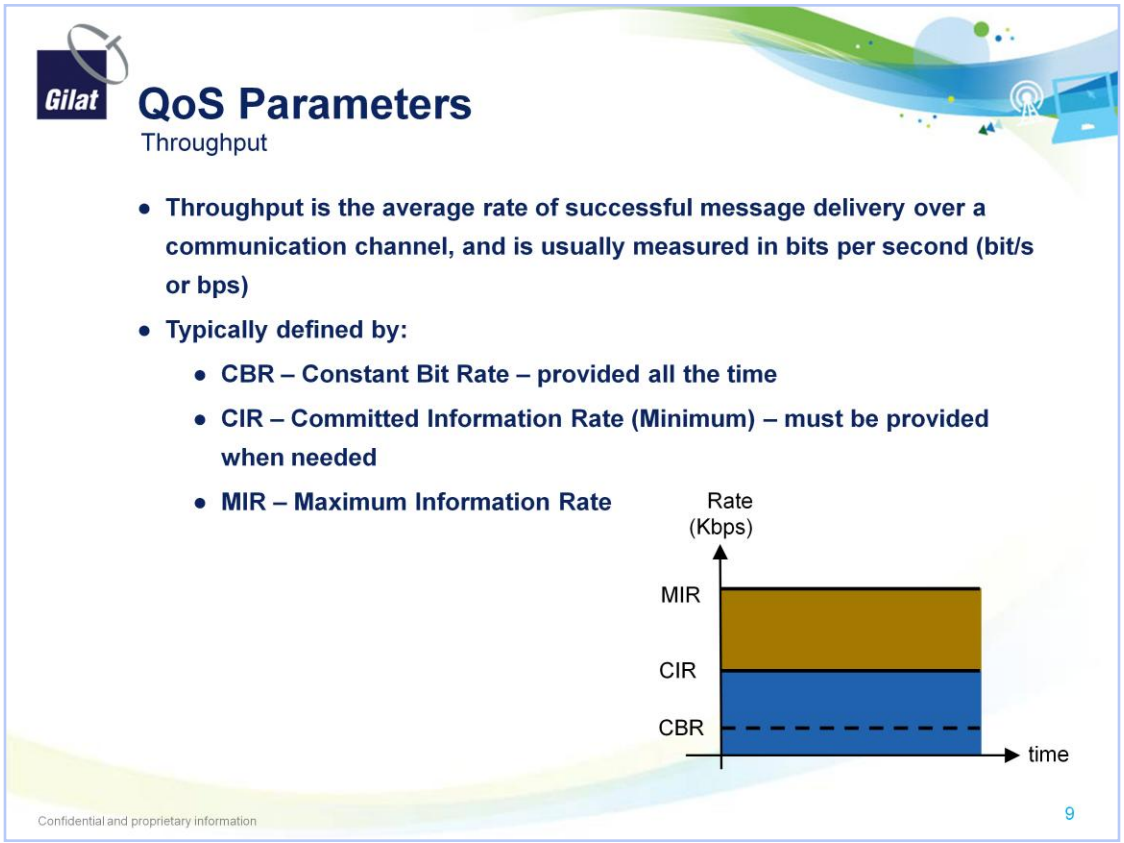
QoS parameters

Introduction

- The following QoS parameters are essential when defining/determining QoS
  - Throughput
  - Latency
  - Jitter
  - Packet-Loss





Throughput is the average rate of successful message delivery over a communication channel. This data may be delivered over a physical or logical link, over a wireless channel, or that is passing through a certain network node, such as data passed between two specific computers. The throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second or data packets per time slot.

CBR – can be defined for applications which consume constant and specific bandwidth, such as multimedia streaming.

CIR is the committed (minimum) throughput that is obligated according to an SLA, meaning it must be provided when needed.

MIR is the maximum throughput that should be provided according the an SLA(but is not guaranteed).

Where is the challenge?

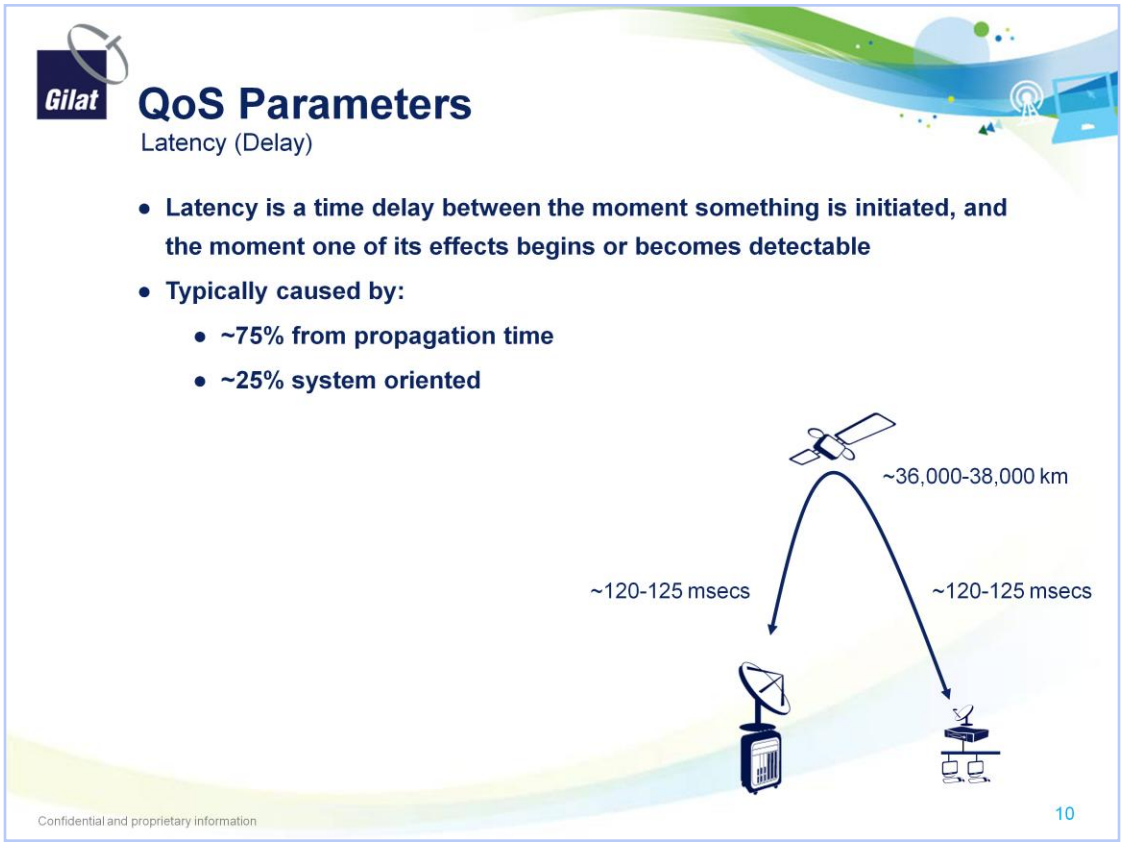
Meeting all throughput requirements is expensive!

Adversely affects other QoS parameters:

Latency (delay)

Jitter

Packet-loss



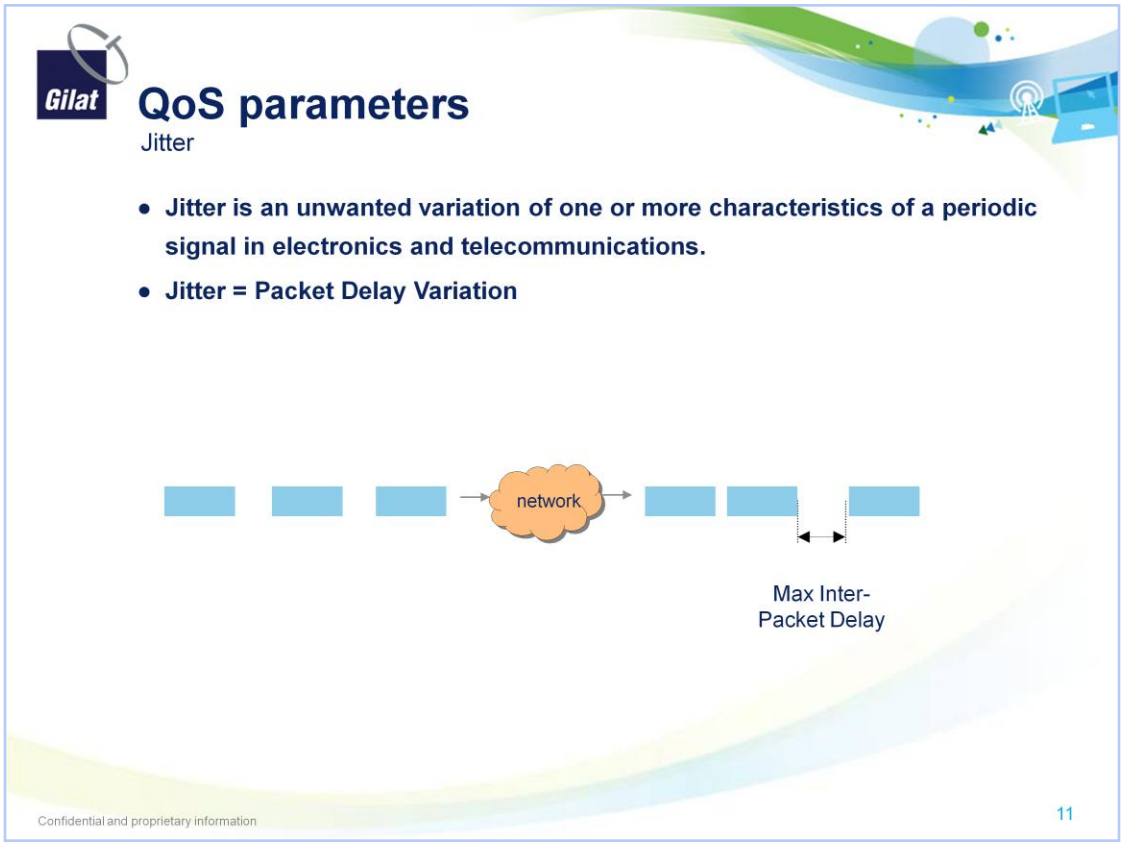
Latency is a time delay between the moment something is initiated, and the moment one of its effects begins or becomes detectable. The word derives from the fact that during the period of latency the effects of an action are latent, meaning "potential" or "not yet observed". Even within an engineering context, latency has several meanings depending on the engineering area concerned (i.e. communication, operational, simulation, mechanical, or biomedical fiber stimulation latencies).

Where is the challenge?
Efficiency and features without increasing latency:

Efficient access

TCP/HTTP spoofing

ACM functionality (Adaptive coding and Modulation)



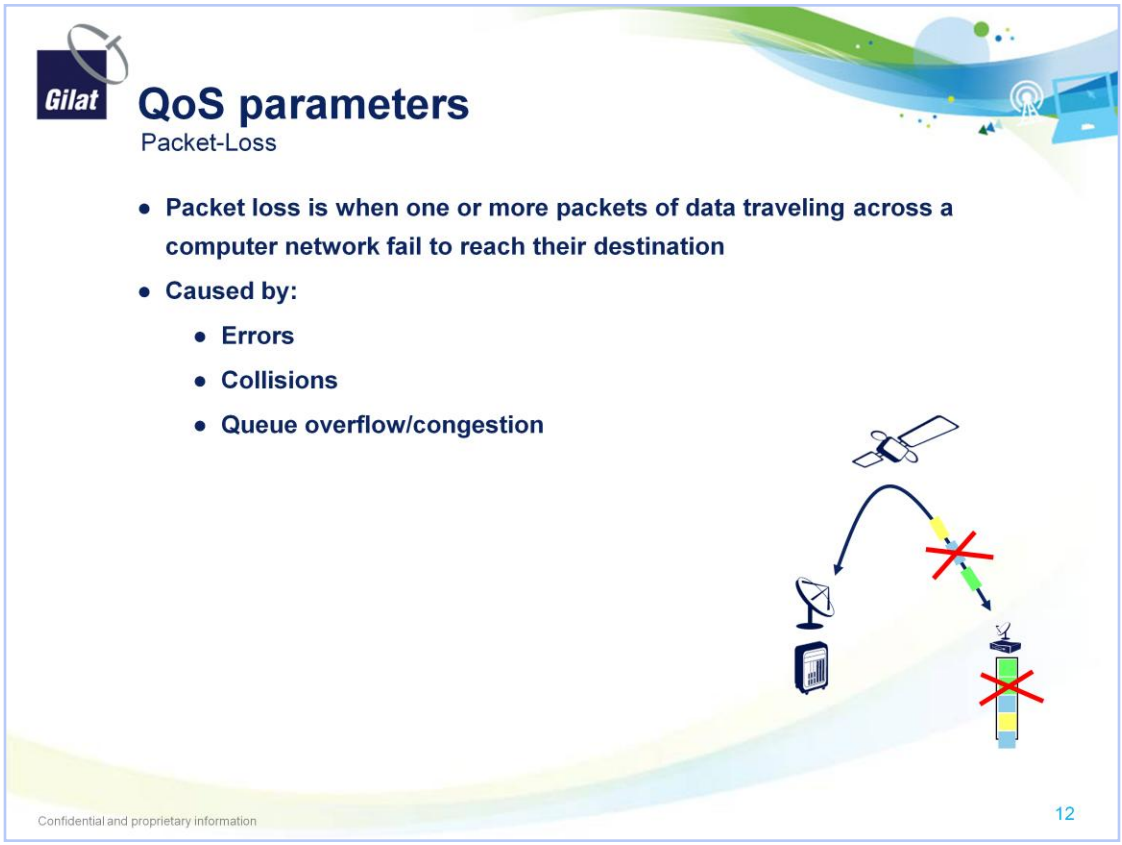
Jitter is an unwanted variation of one or more characteristics of a periodic signal in electronics and telecommunications. Jitter may be seen in characteristics such as the interval between successive pulses, or the amplitude, frequency, or phase of successive cycles. Jitter is a significant factor in the design of almost all communications links (e.g. USB, SATA, OC48). In clock recovery applications it is called timing jitter.

Increasing the **jitter buffer** improves the jitter however adds a constant delay factor for all traffic

Where is the challenge?
Reducing jitter without increasing delay

Jitter has drastic affect on voice quality

Jitter buffer = delay



Packet loss is when one or more packets of data traveling across a computer network fail to reach their destination. Packet loss is distinguished as one of the three main error types encountered in digital communications; the other two being bit error and spurious packets caused due to noise.

QoS can be used to decide which packets can be discarded.

Trivial packet loss is from errors in the RF – however, since BER is very low (10E-8) this is not a major factor.

More important is packet loss originating from packets being discarded – because of queue overflow.

Where is the challenge?
Which packets to discard?

- Multimedia – affects quality
- TCP – affects throughout
- Discard by FIFO or LIFO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SE QoS Overview & Architecture
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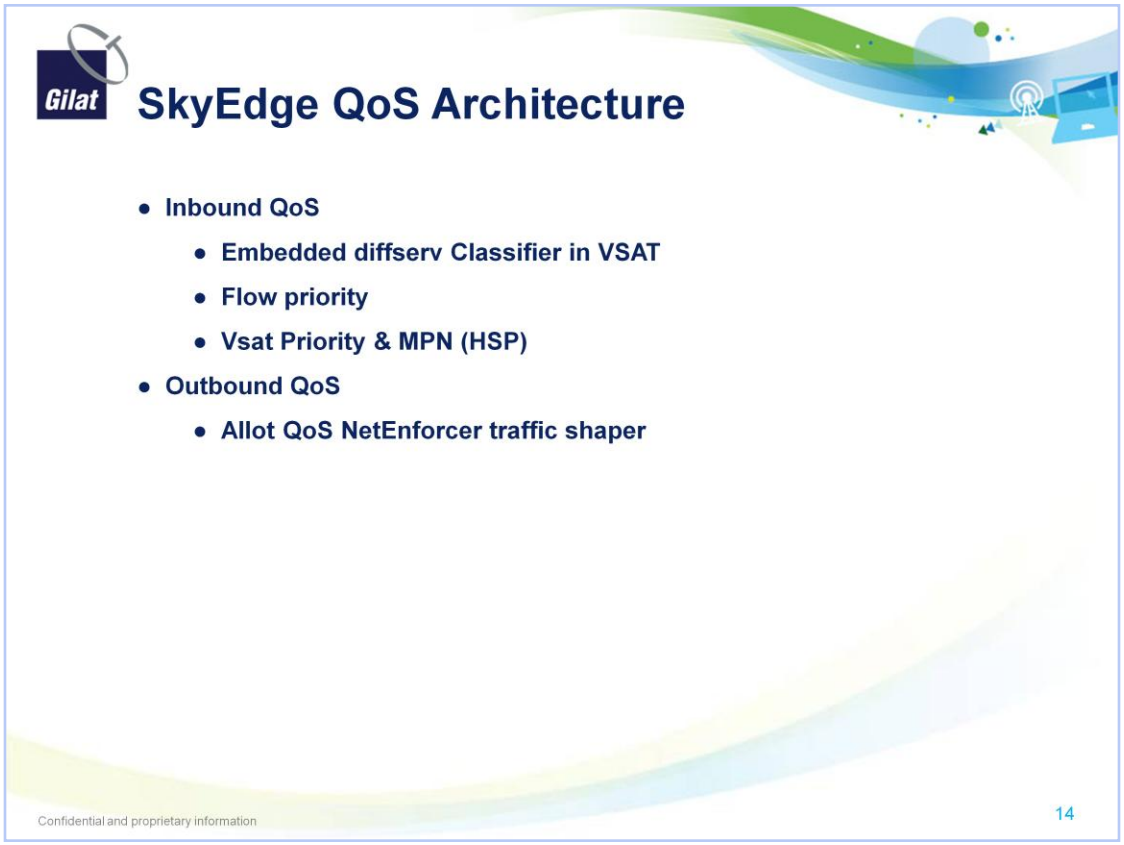


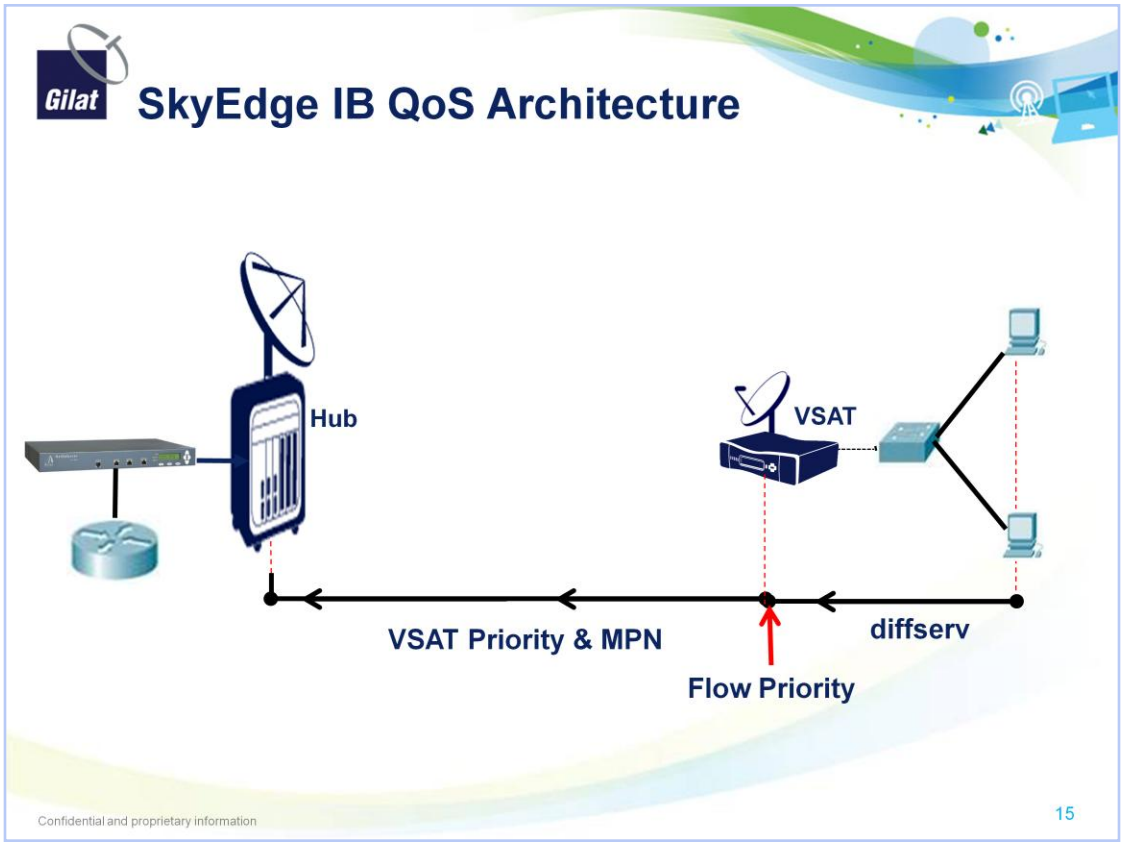
SE Network QoS mechanisms are located both on the IB and OB.

QoS mechanisms should regulate/enforce/shape the IP traffic **before** transmitted to the other side (I.e hub, VSAT).

Therefore:

The IB QoS is embedded in the VSAT.

The OB QoS is part of the hub backbone to the internet.



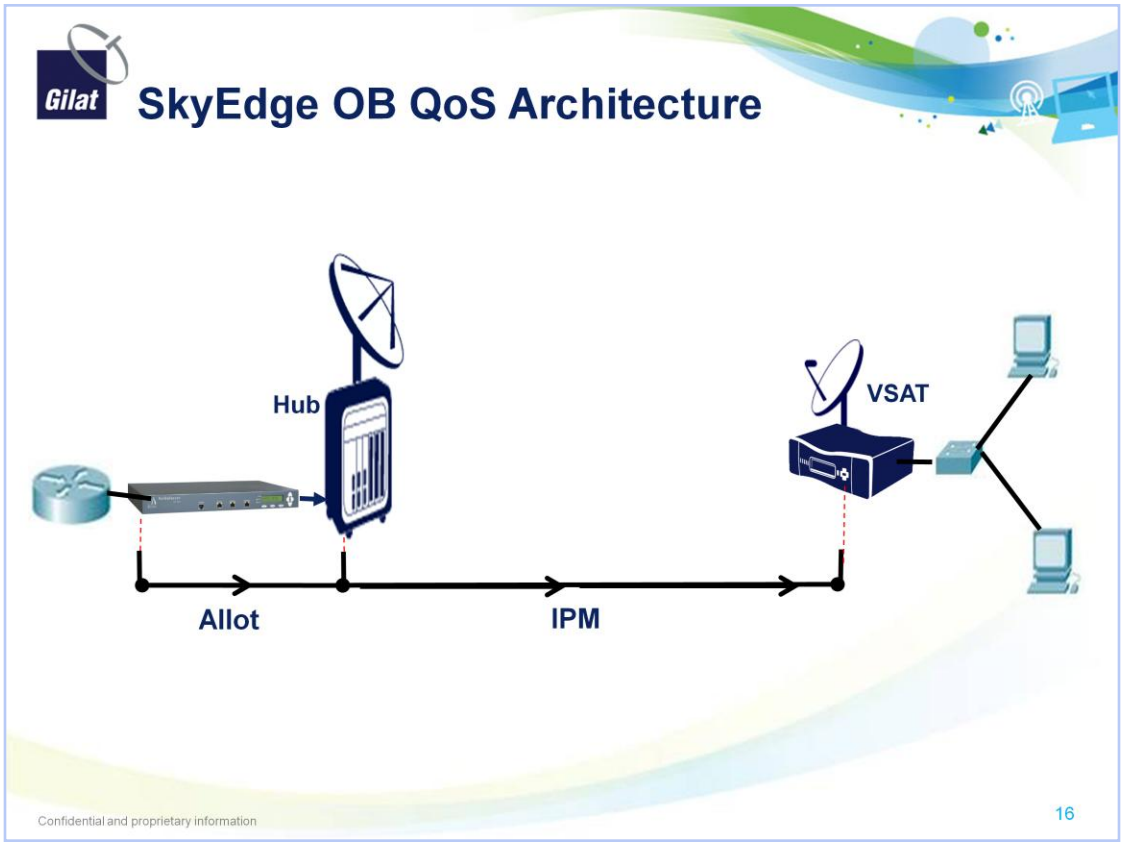
There are different mechanisms responsible for different segments of the network.

diffserv - The diffserv mechanism is responsible for terrestrial segment at the remote side. It is a layer 3 mechanism which is implemented at the DRPP, and responsible to classify IP traffic, received from the LAN, according to user predefined conditions.

Flow Priority – according to a user definitions, each IP Packet may have a different priority. Each capacity request issued by a VSAT will have the priority assigned to the data transmitted. If a VSAT has various packet priorities to send, it will issue a capacity request which matches the higher flow priority assigned.

VSAT Priority - each VSAT in the network is assigned a specific priority. When VSAT logs into HSP it reports this priority. Changing a VSAT priority requires a reboot of the VSAT. The HSP keeps track of all VSATS and their priorities. In each allocation round, when calculating the bandwidth needed for each VSAT, the VSAT priority is a factor of this calculation.

MPN – Managed Private Networks, each VSAT must be assigned to one MPN. If not defined otherwise, the VSAT will belong to MPN 1. The MPN mechanism enables the operator to define CIR & MIR for a group of VSATs that belong to the same MPN. MPN configuration is done at the RSP and HSP. Any change of the HSP MPN configuration require a reboot of the HSP. Any change of the VSAT MPN configuration requires a reboot of the VSAT.



Allot - The Allot Netenforcer traffic shaper resides between the Border Router (BR) and the SE hub. The Incoming IP traffic to the hub (OB direction), will be regulated/shaped, according to the policy definition applied to the Net enforcer.

Iplex – the Iplex receives different types of traffic through different ports. Within the Iplex configuration there is a minimum and maximum data rate configuration for each of the traffic types being received.

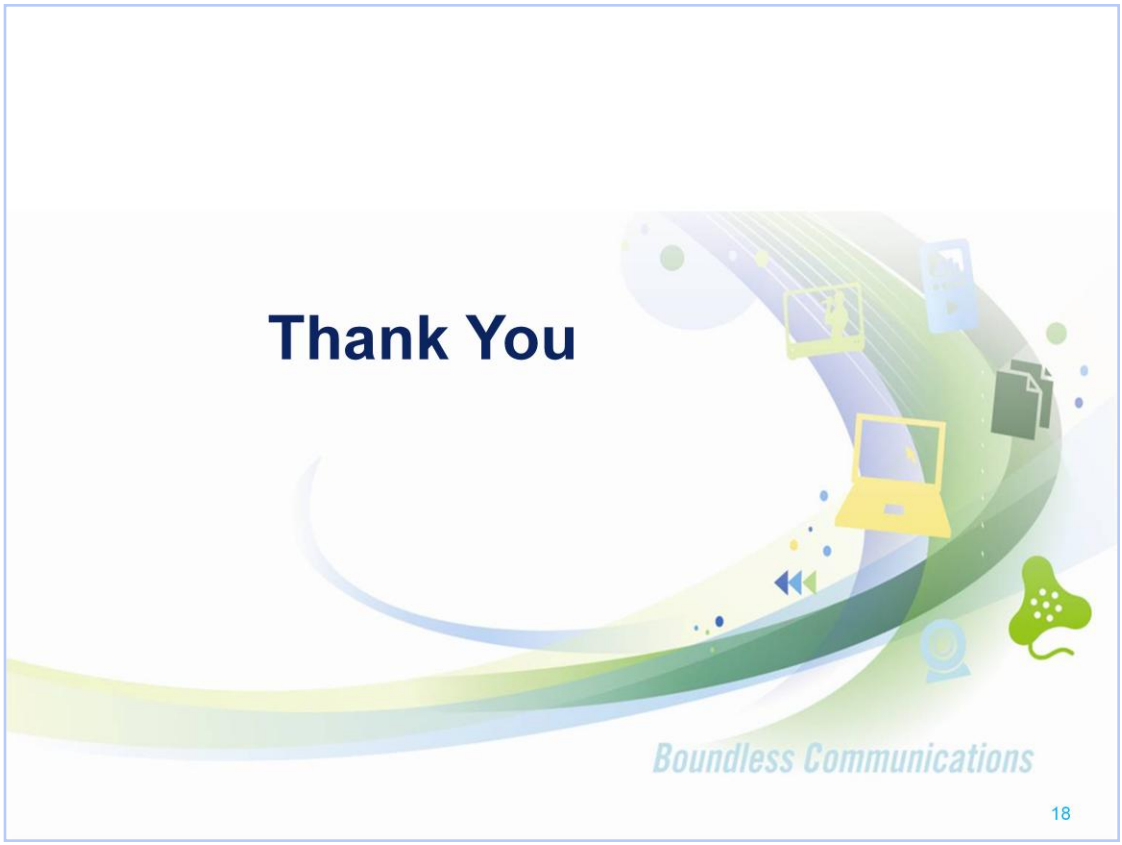
Test your knowledge

1. What is the difference between Jitter and delay?

2. What are the default values for CBR, CIR and MIR (no QoS configuration)?

3. What special QoS parameters must be considered for VoIP traffic?

4. Where is OB QoS configured? Where is IB QoS configured? Why the difference?


Thank You
Boundless Communications
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