


**Boundless  
Communications**



**SkyEdge II System Data Flow**

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## Agenda

- Describe the Inbound and Outbound system data-flow.
- Introduce the network elements and components involved in the overall data-path process.
- Introduce the synchronization mechanism.

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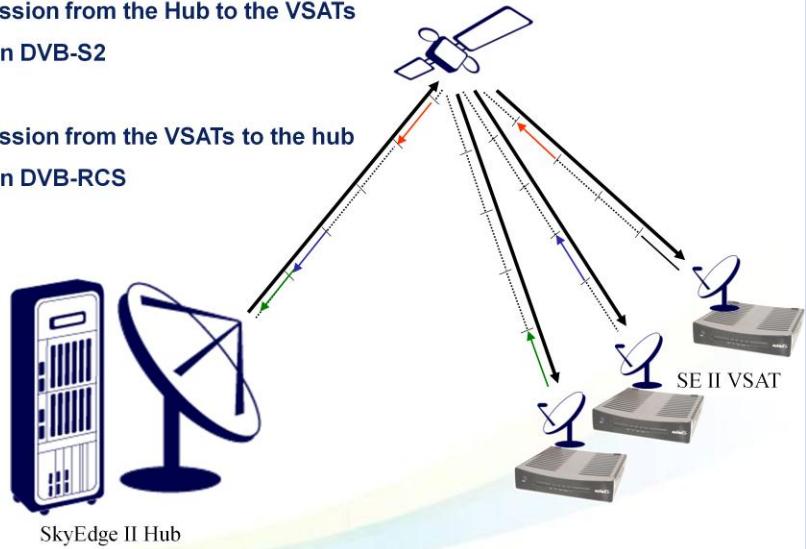
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# Transmission Modes

## System Overview

- **Outbound**
  - Transmission from the Hub to the VSATs
  - Based on DVB-S2
- **Inbound**
  - Transmission from the VSATs to the hub
  - Based on DVB-RCS



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# Inbound Data Flow



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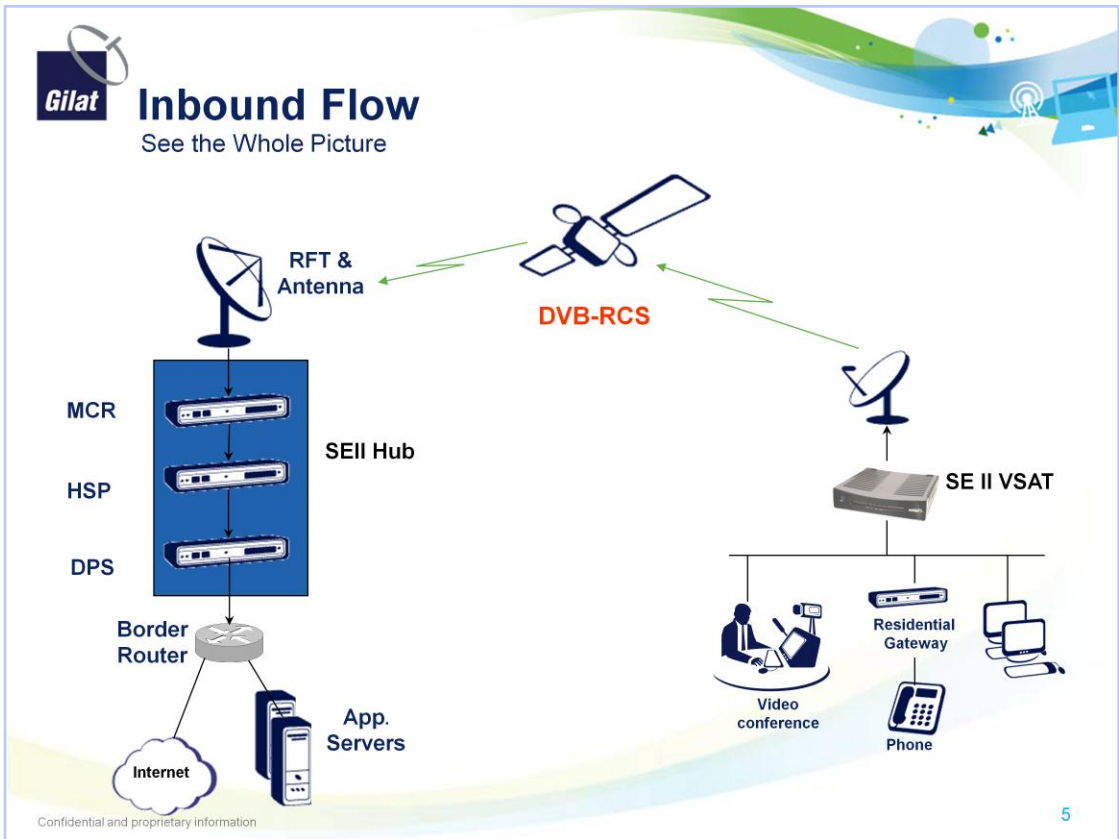
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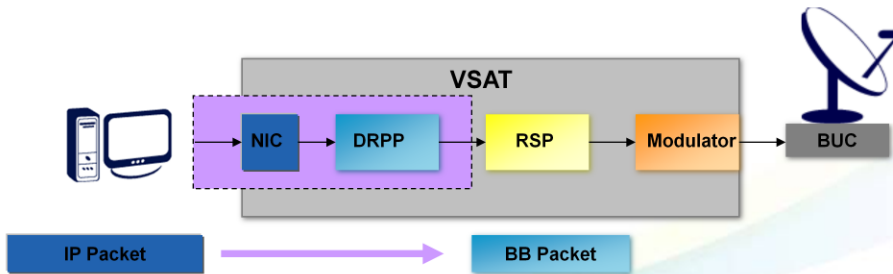
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## Detailed IB Data Flow – VSAT

Data Remote Protocol Processor (DRPP)

- The IP packet is sent from the PC via LAN
- VSAT NIC forwards the IP packet to the DRPP
- DRPP converts the IP packet to a Backbone packet and forwards Backbone packets to the RSP



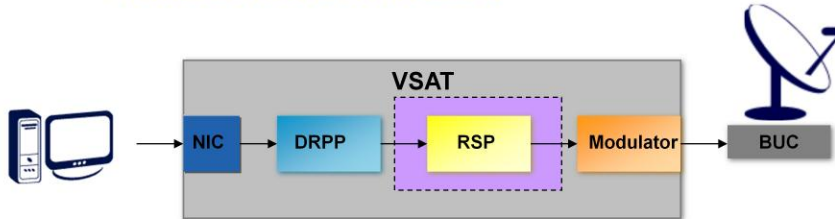
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## Detailed IB Data Flow – VSAT

Remote Satellite Processor (RSP)

- RSP performs:
  - Backbone fragmentation to ATM cells
  - Arranges 2 or 4 ATM cells into TRF time-slot
  - FEC coding (turbo coding)
- Forwards TRFs to the modulator



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The Remote Satellite Processor (RSP) divides the packets into ATM cells, by using the ATM Mediation layer (AAL5), and assigns 2 or 4 ATM cells to a TRF (2 by default), and arranges them in the allocated traffic slot, according to the HSP assignment.

ATM Adaptation Layer 5 (AAL5) is used to send variable-length packets up to 65,535 octets in size across an ATM network.

Unlike most network frames that place control information in the header, AAL5 places control information in an 8-octet trailer at the end of the packet.

Each AAL5 packet is divided into an integral number of ATM cells and reassembled into a packet before delivery to the receiving host. The last cell contains padding to ensure that the entire packet is a multiple of 48 octets long. The final cell contains up to 40 octets of data, followed by padding bytes and the 8-octet trailer. In other words, AAL5 places the trailer in the last 8 octets of the final cell where it can be found without knowing the length of the packet; the final cell is identified by a bit in the ATM header, and the trailer is always in the last 8 octets of that cell.

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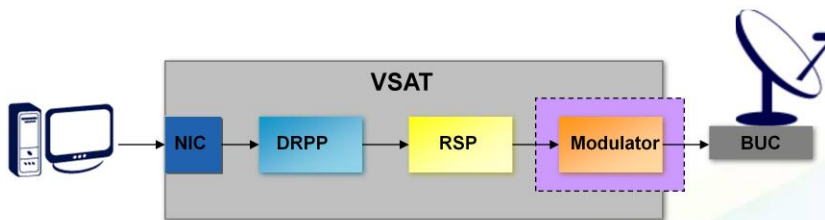
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## Detailed IB Data Flow – VSAT

### Modulator

- Bit mapping and modulation (QPSK/8PSK)
- Setting attenuators to adjust and control the IB transmission power level
- The BUC amplifies and Up converts the RF frequency
- RF is being transmitted towards the satellite



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The VSAT can control the IB transmission power level by adjusting its attenuators. This is done automatically and maintained by the power loop mechanism between the VSAT and the Hub. There is a limit to the maximal power the VSAT can transmit in (The BUC's saturation point).

The BUC up converts the RF frequency from the internal L-band frequency (around 1 GHz), to the appropriate satellite communication frequency (C-band, Ku or Ka bands).

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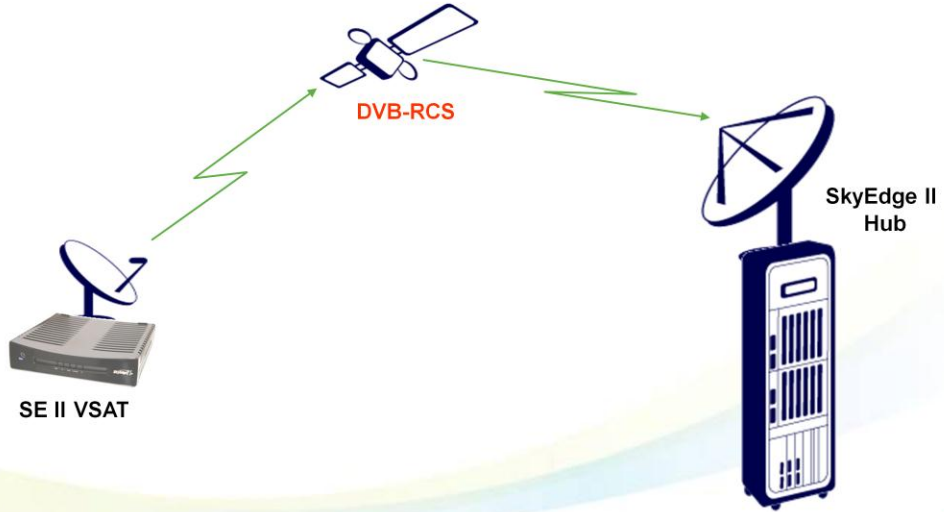
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## Detailed IB Data Flow

Inbound Path Through Satellite

- The DVB-RCS burst signal is sent from the VSAT to the hub
- The satellite relays the signal over the Inbound path



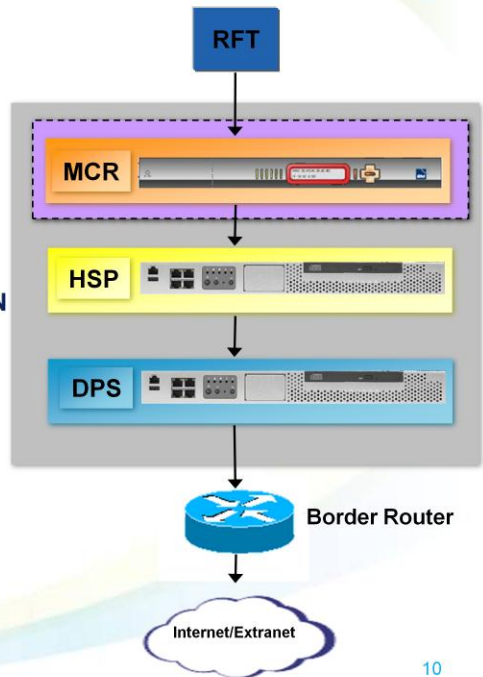
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## Detailed IB Data Flow – Hub

Multi Carrier Receiver (MCR)

- The MCR Receives IB data transmissions from the RFT
- Demodulates and decodes each TRF
- Adds reception information to each burst (time, frequency, power)
- Sends the bursts to HSP over the LAN



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RFT – Radio Frequency Transceiver

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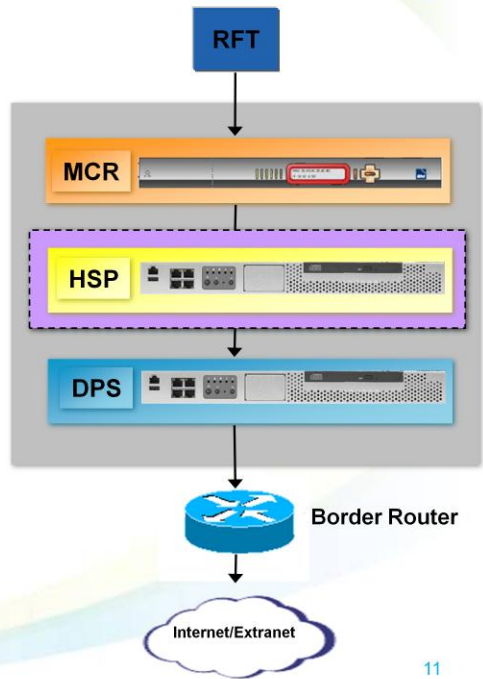
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## Detailed IB Data Flow – Hub

Hub Satellite Processor (HSP)

- Receives the TRFs from the MCR
- Reconstructs Backbone packets
- Forwards them to the DPS



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The HSP receives all the TRF packets, arranges the ATM cells and reconstructs the Backbone packets using the AAL5 (ATM adaption layer) and transmits them to the DPS over LAN.

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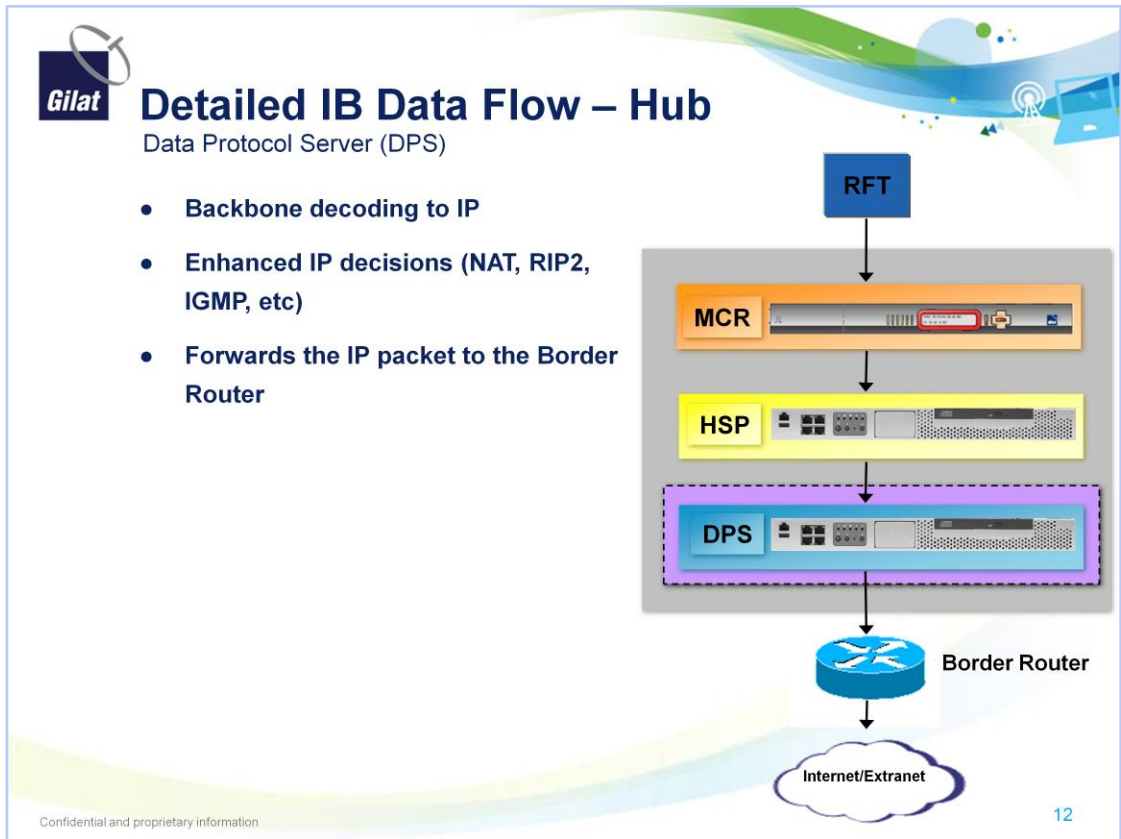
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The IP packet goes to the border router and from there on to the internet as any IP traffic.

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## Outbound Data Flow



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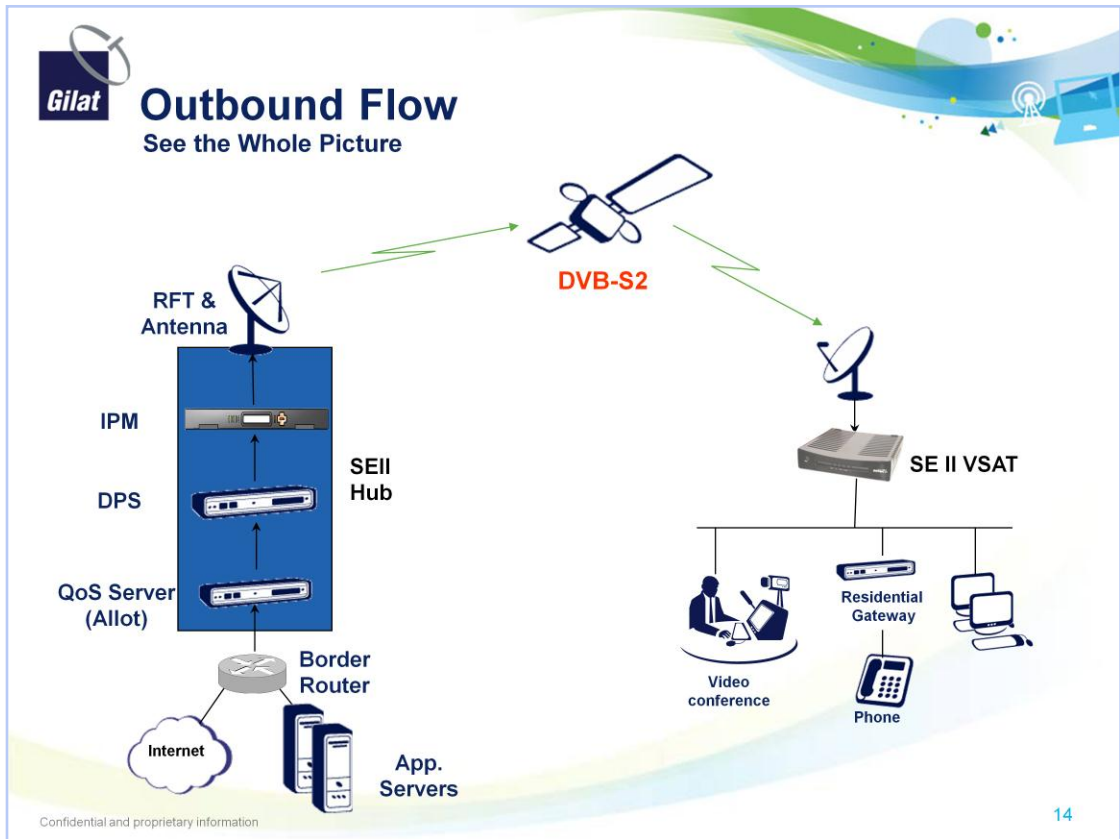
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The IPM replaces the current SkyEdge II IPE and Modulator for both DVB-S2 ACM and CCM networks.

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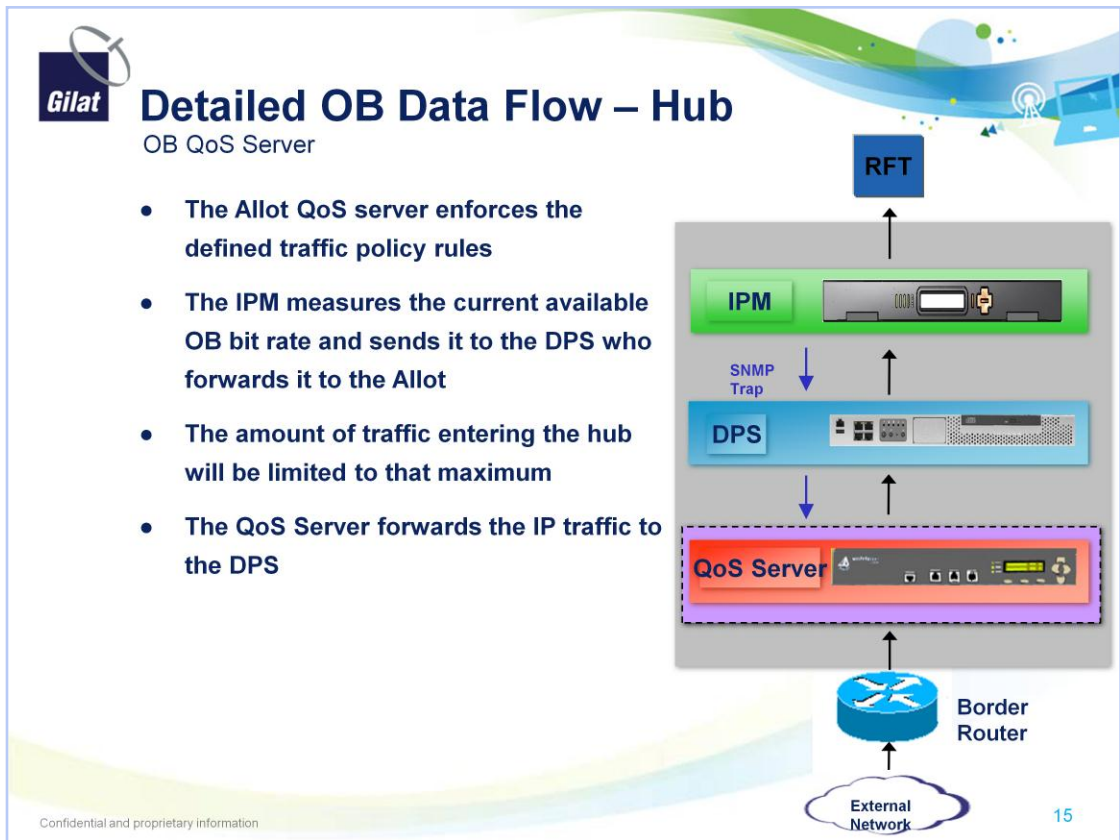
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When enforcing QoS rules on the OB traffic, the Allot machine must know what is the total OB bit rate (what its maximal rate is).

Since the ACM characteristics cause OB overall bit rate fluctuations, each Network Segment has a designated DPS who receives an SNMP trap (once every three second, unless there is a change of 10% since the last reported available bit rate) from the IPM that holds the current available OB data bit rate for that Network Segment.

The designated DPS uses this value to configure the QoS Server dynamically by Telnet command.

The designated DPS has the QoS Server IP address configured .

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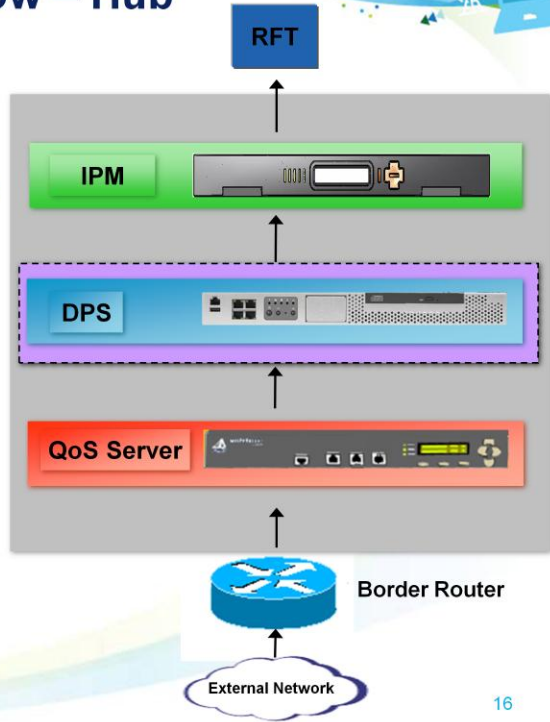
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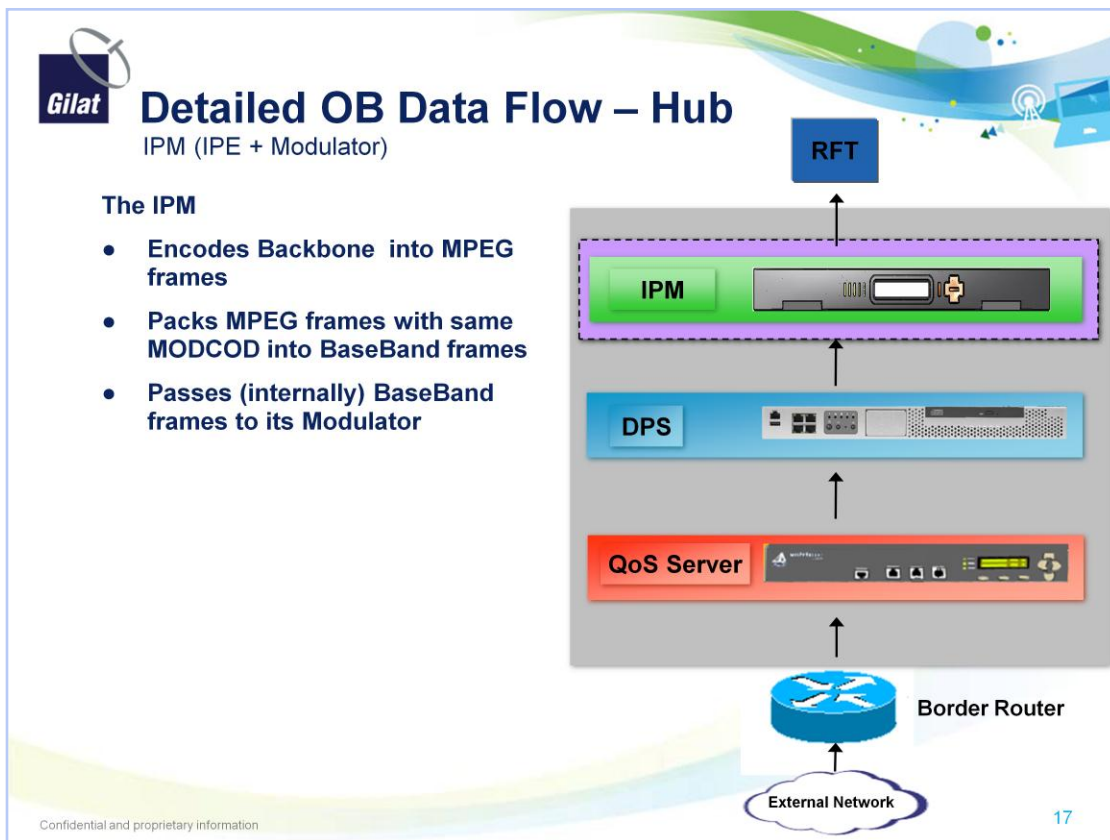
## Detailed OB Data Flow – Hub

Data Protocol Processor (DPS)

- Converts IP to Backbone
- Adds required MODCOD information in the “option” field in the IP header
- Forwards Backbone packet to the IPM



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Inside the IPM are two main components. IPE and Modulator.

The IPE collects all the MPEG frames with the same MODCOD and packs them into a BaseBand frame. Every Spin Time period (between 10 and 40 msec, depending on symbol rate and network functions) he sends them to the modulator internally.

BaseBand frames are sent to the modulator from most robust to efficient so that the frames can be filled up to the maximum. If needed, an MPEG can be sent in a more robust MODCOD in order to fully utilize each BaseBand frame. (Since a VSAT can always receive frames in a more robust MODCOD than he is reporting).

In fact only the last BaseBand frame in every spin cycle can be not completely full.

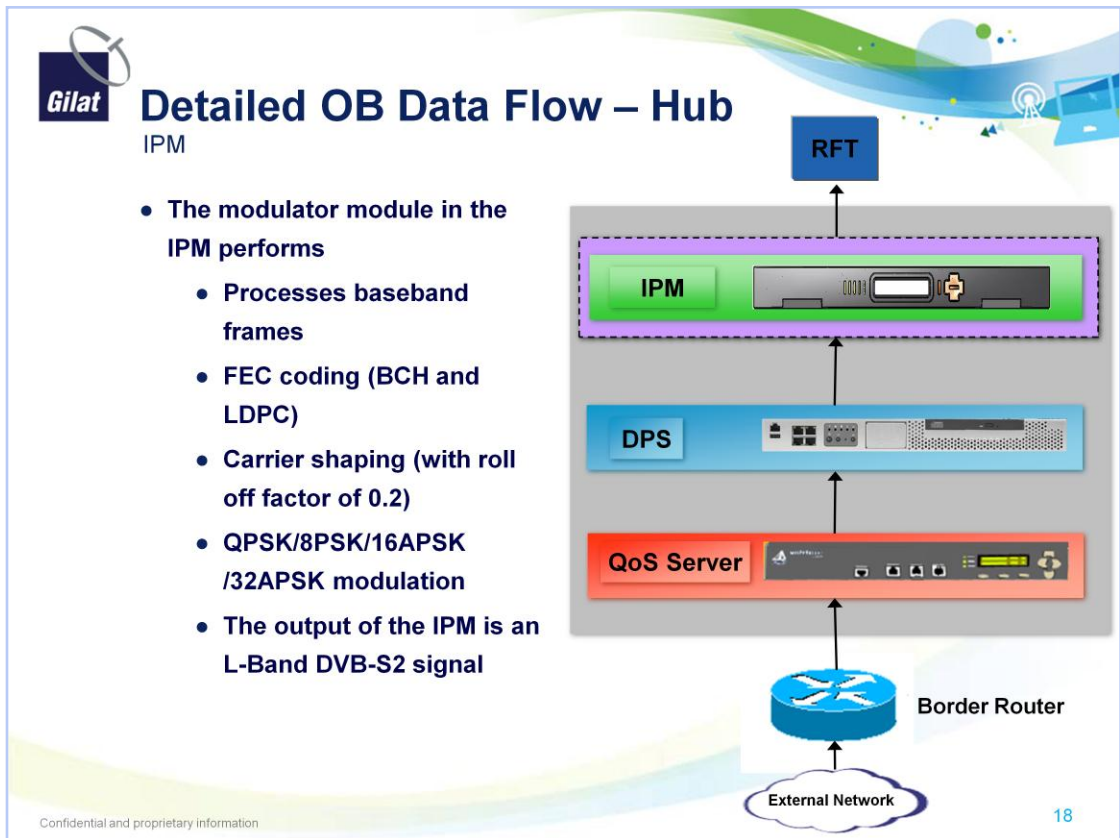
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The Modulator adds a header to the Physical Frame. The Physical Frame contains the MODCOD the VSAT should use to demodulate and decode the frame. The modulator functionalities include scrambling, interleaving and bit mapping into symbols.

BCH is an acronym formed by the last names of its inventors - Bose-Chaudhuri-Hocquenghem.  
 LDPC - low-density parity-check code

The modulator uses a concatenation of these two FECs to get the most efficient FEC for each link condition.

The roll-off factor is a measure of the excess satellite bandwidth needed, i.e. the bandwidth margin

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occupied beyond the channel.

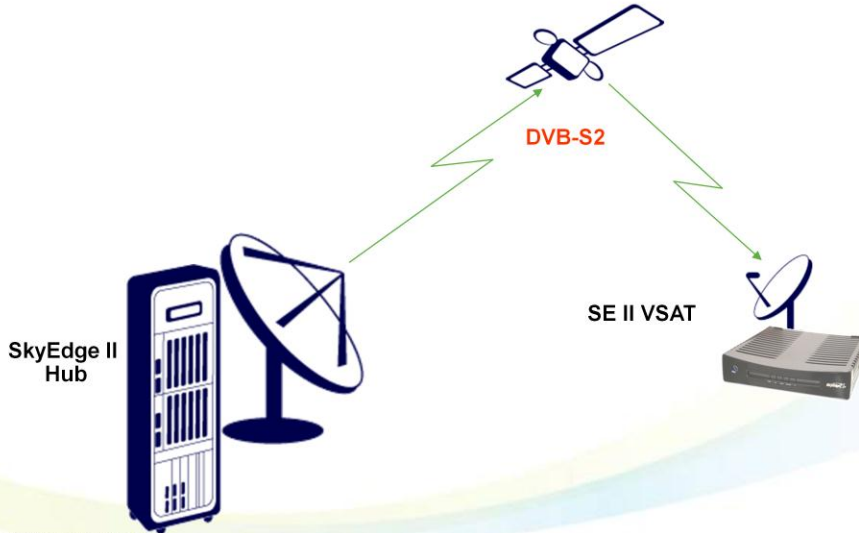


## Detailed OB Data Flow

Outbound Path through Satellite



- The DVB-S2 stream signal is transmitted from the Hub to the VSATs
- The satellite relays the signal to the Outbound path



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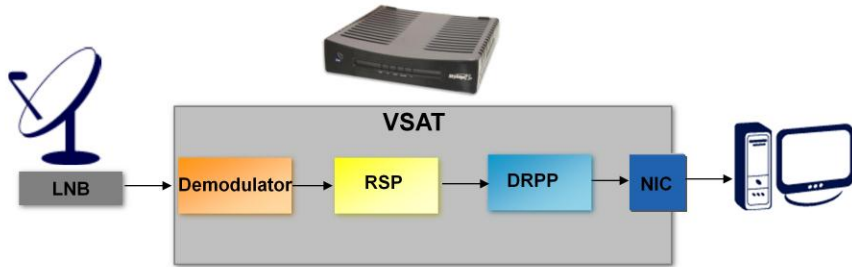
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# Detailed OB Data Flow

VSAT



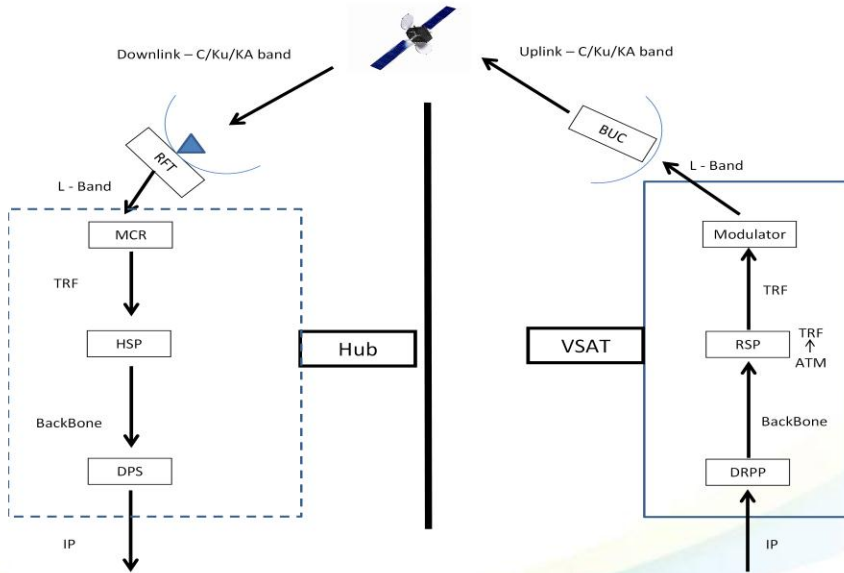
- The LNB amplifies and down converts the frequency of the RF signal to L-band. The Demodulator demodulates and decodes the received signal back into MPEG2 transport stream
- The RSP filters the packet from the MPEG2 transport stream, and recovers the backbone packets
- The DRPP performs the Backbone decoding back to IP
- The IP packet is sent via the LAN interface to the end user's PC

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# Data Flow Summary

IB

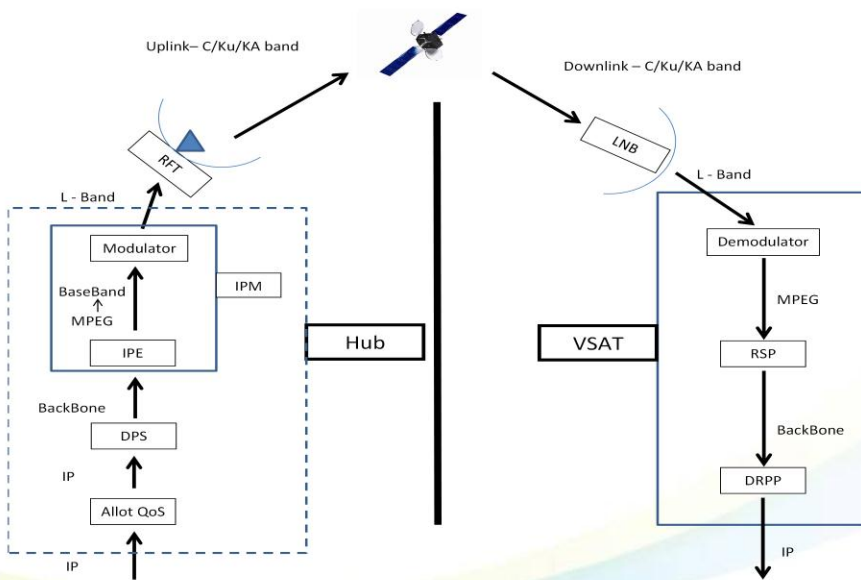


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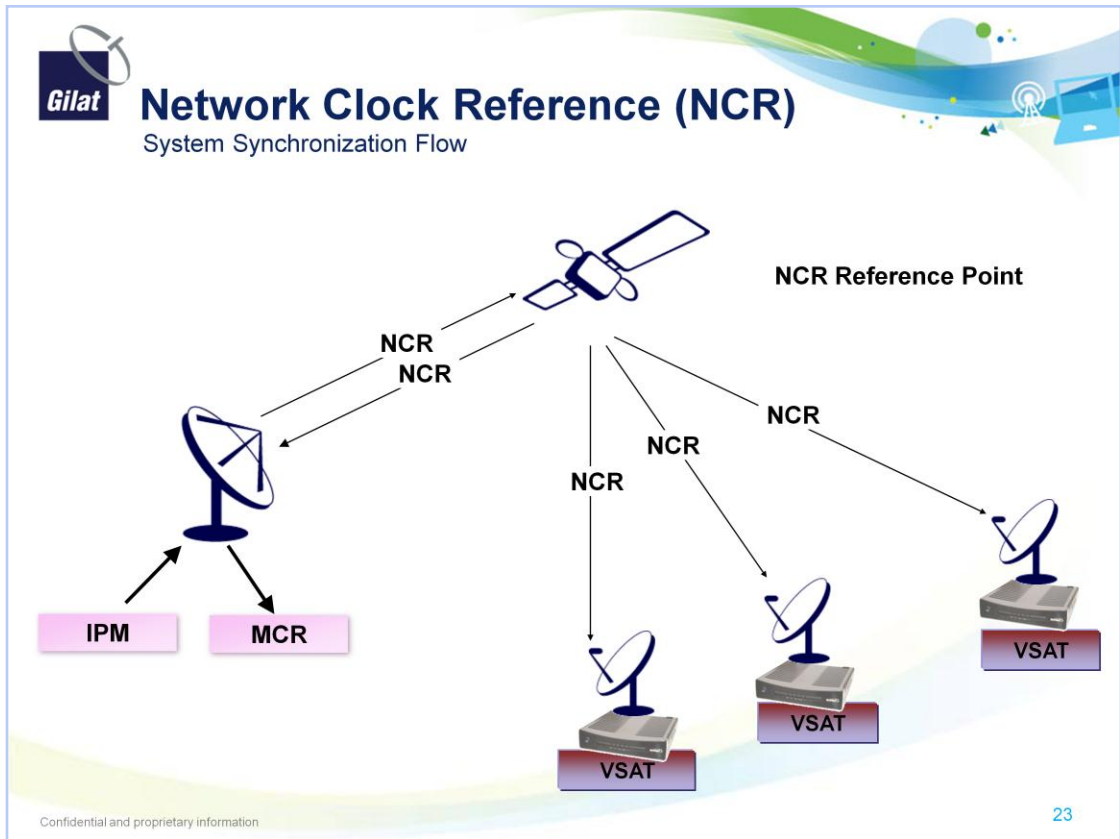


# Data Flow Summary

OB



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Because of the IB transmission's bursty nature, it requires synchronization. The synchronization mechanism is described as part of the DVB-RCS standard.

In SEII systems, the IPM creates a special packet and stamps it with a time value. It's called the NCR - Network Clock Reference.

NCR synchronization is the procedure of locking the VSAT timing to the NCR count at the Hub. This will be done by receiving the NCR Transport Stream Packet at the transmitted interval and deriving a synchronous NCR count and NCR clock locally in the VSAT. After successfully acquiring the receiver NCR, the VSAT continues to monitor it. To prevent problems, the VSAT stops transmitting

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if reception of the OB in interrupted.

