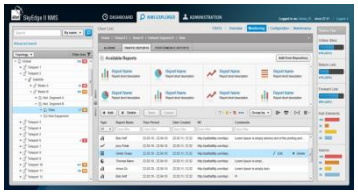
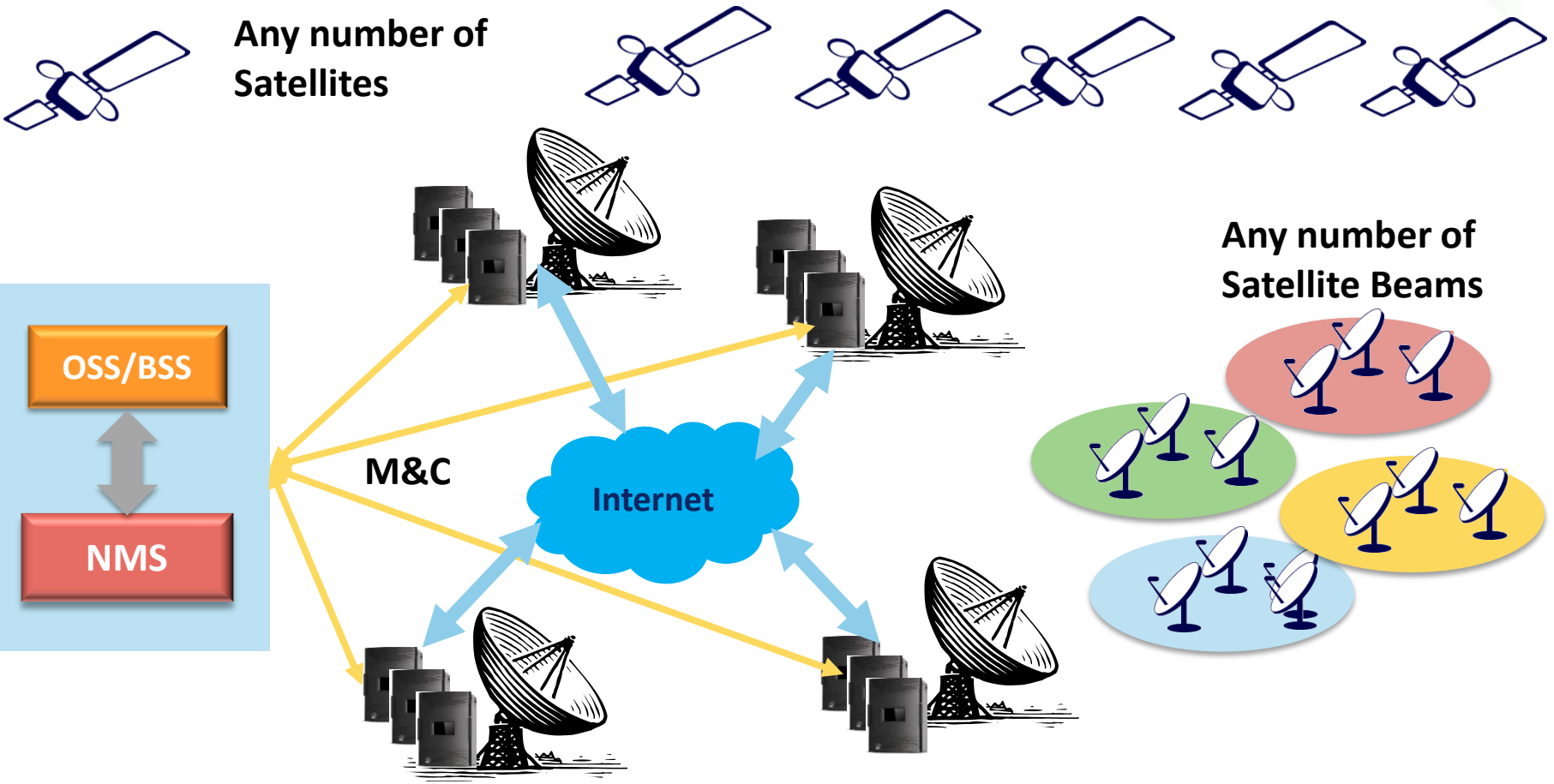
Boundless Communications



SkyEdge II-c overview

Aug 11, 2014

High Level Network Architecture

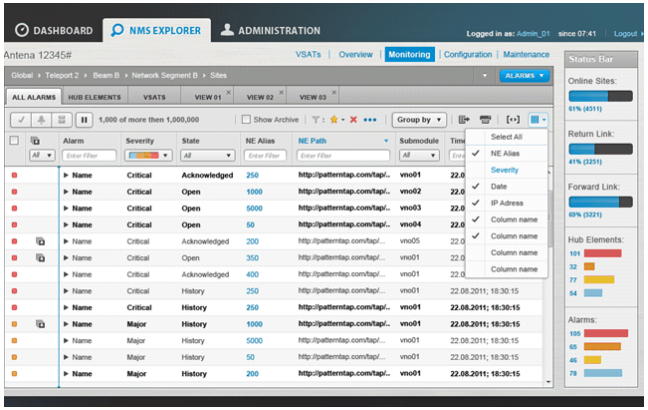


SkyEdge II-c c-Hub Chassis

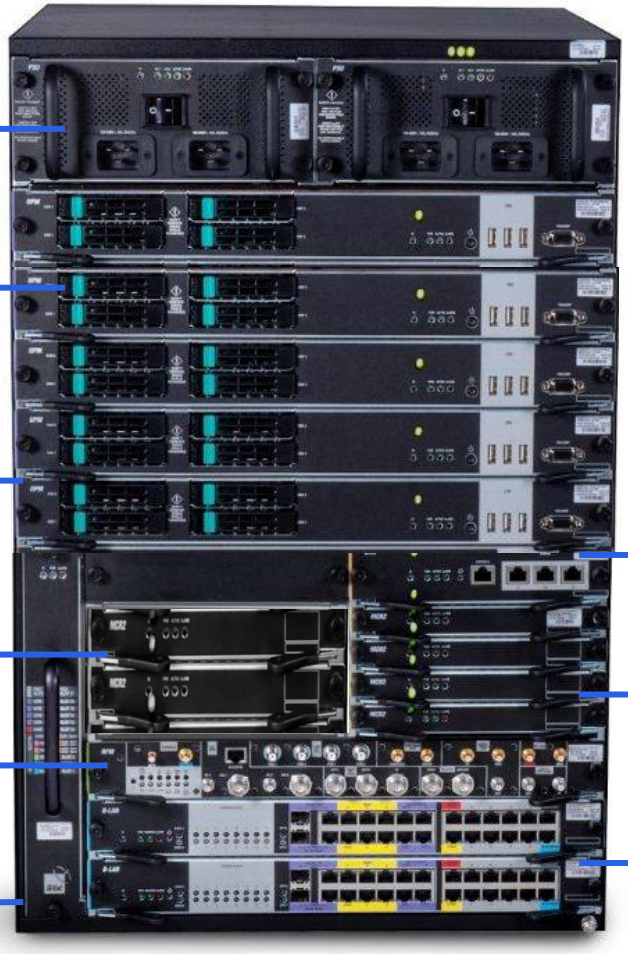
- **Chassis based**
  - Backplane design eliminates external wiring
  - Interfaces: RF in/out, WAN, Management
  - Plug in Modules
  - Remote troubleshooting

- **High Availability Architecture**
  - Redundant network elements including switches
  - No single Point of Failure design

- **Total NMS – support 100s of segments spread across multiple Gateways**



Baseband - c-Hub Chassis



Support full range of customer types

Terminal Portfolio

	Libra Q4/2014	Gemini June-2014	Capricorn June-2014	Capricorn Pro Q2/2015	Taurus Q1/2016
					
	Consumer & Ent (Multicast)	Consumer & Enterprise	Enterprise	Enterprise	Trunking, CBH, Mobility
	20Mbps	40M/8Mbps	200M/8Mbps	200M/8Mbps	100M/100Mbps
	1 LAN, USB	1 LAN	1 LAN	4 LAN, Serial	8 LAN, Serial RackMount
	Cellular	TDMA	TDMA	TDMA	SCPC/TDMA

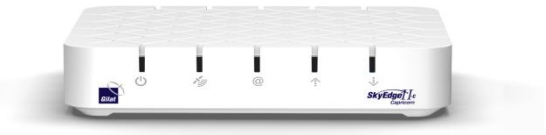
Total NMS - Network Management

Support full range of customer types

SkyEdge II-c Terminals

- **Broadband Access (Gemini)**
  - 10Mbps download (upgradable to 40Mbps)
  - 1 Gbit LAN port
  - 4Msps (8Mbps) TDMA

- **Enterprise (Capricorn)**
  - 20Mbps download (upgradable to 200Mbps)
  - 4Msps (8Mbps) TDMA; upgradable to 20Msps
  - Integrated CacheMode!

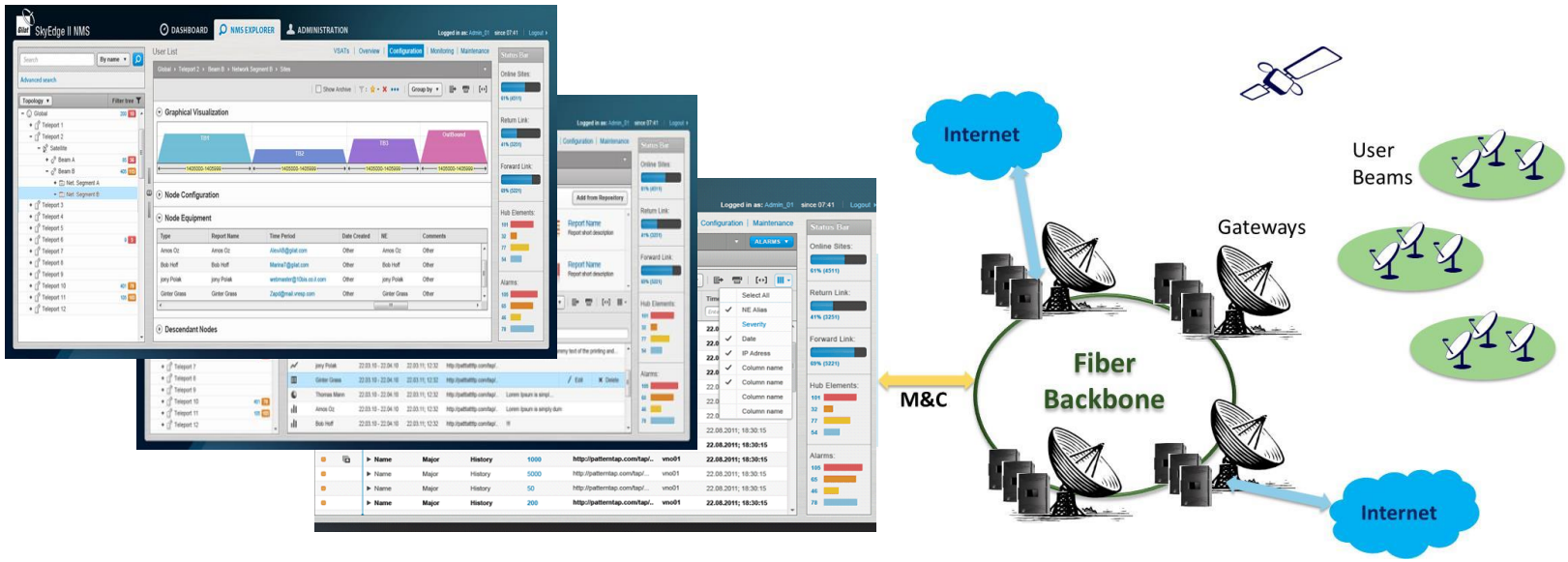


- **IP Trunking (Taurus)**
  - Dual Mode TDMA /SCPC RTN channel
  - 200Mbps/20Mbps TDMA
  - 100Mbps/100Mbps SCPC
  - Dynamic switching with no service disruption
  - Integrated CacheMode!
  - Rack mounted, DC insertion

Total Network Management

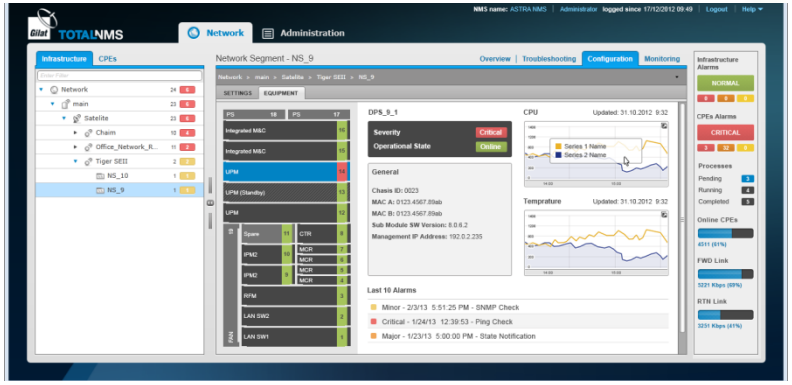
Total NMS simplifies Operations

- One NMS Supports all equipment across all beams & Gateways
- Centralized network operations reduces OPEX
- Robust M2M Interfaces enable integration to operator OSS/BBS



Total NMS - Architecture

- Scalable Architecture
  - Hundreds of Network Segments
  - Multiple user beams
  - Multiple Gateways
  - 100K to few Millions CPEs
- Global Access
  - Browser based client
  - From any PC connected to the secured management network
- Robust Interfaces to OSS/BSS
  - Full featured Northbound SOAP interface & SNMP
  - Enabling easy integration to the ISP service assurance and service activation processes
  - Enable full service automation



Total NMS - Scalable Architecture

End Users

Check usage, Top up usage, upgrade service, pay bill

ISP Users

Billing, Logistics, Installation, Data Mining

ISP

Customer Web Portal

Business Support Systems

NMS Clients

1st Level Helpdesk

HTTPS / XML / SNMP

NOC

Network Provider to ISP Mediation Interface

XML/SNMP

NMS Clients

Technical Support

HTTPS

XML/SNMP

NMS Server

Usage reports

FTP

DB

Engineering, 2nd level help desk

HTTPS

Gateways

GW Ops

Gateway A

Gateway B

Gateway N

NMS Clients

Service Oriented Configuration

- **Gilat NMS was designed under a a single guideline:**

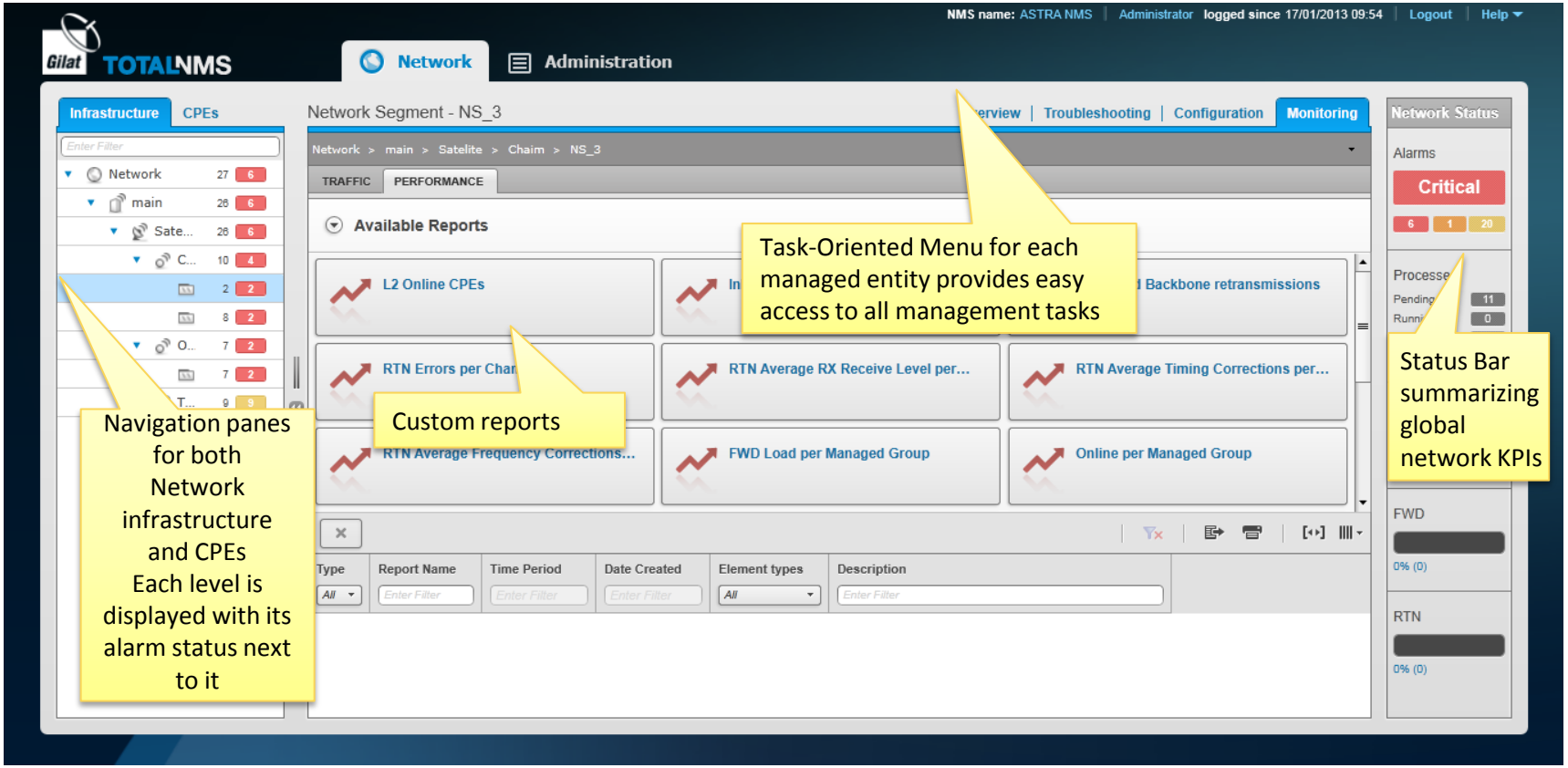
  "Service-Oriented Network Management"

- **What is it?**
  - **It's about telling the system what you want (the service) rather than how the system should be configured to fulfill this service**
  - **It's about placing the network-services above network devices**
  - **It's about placing the service customers (end-users, ISPs, network operator) above the network infrastructures**

Enable simple operations and fast introduction and modifications of services for ISPs and CPEs

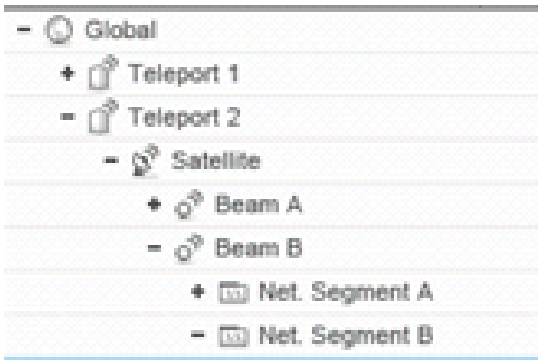
Total NMS - Standard Web Client

- Navigation panes, task bar status bar
- Quick links
- Custom reports



Simple Network Navigation

- **Tree based navigation simplifies management of multi spot beam - multi Gateway – multi satellite networks**



Network
- Tree root

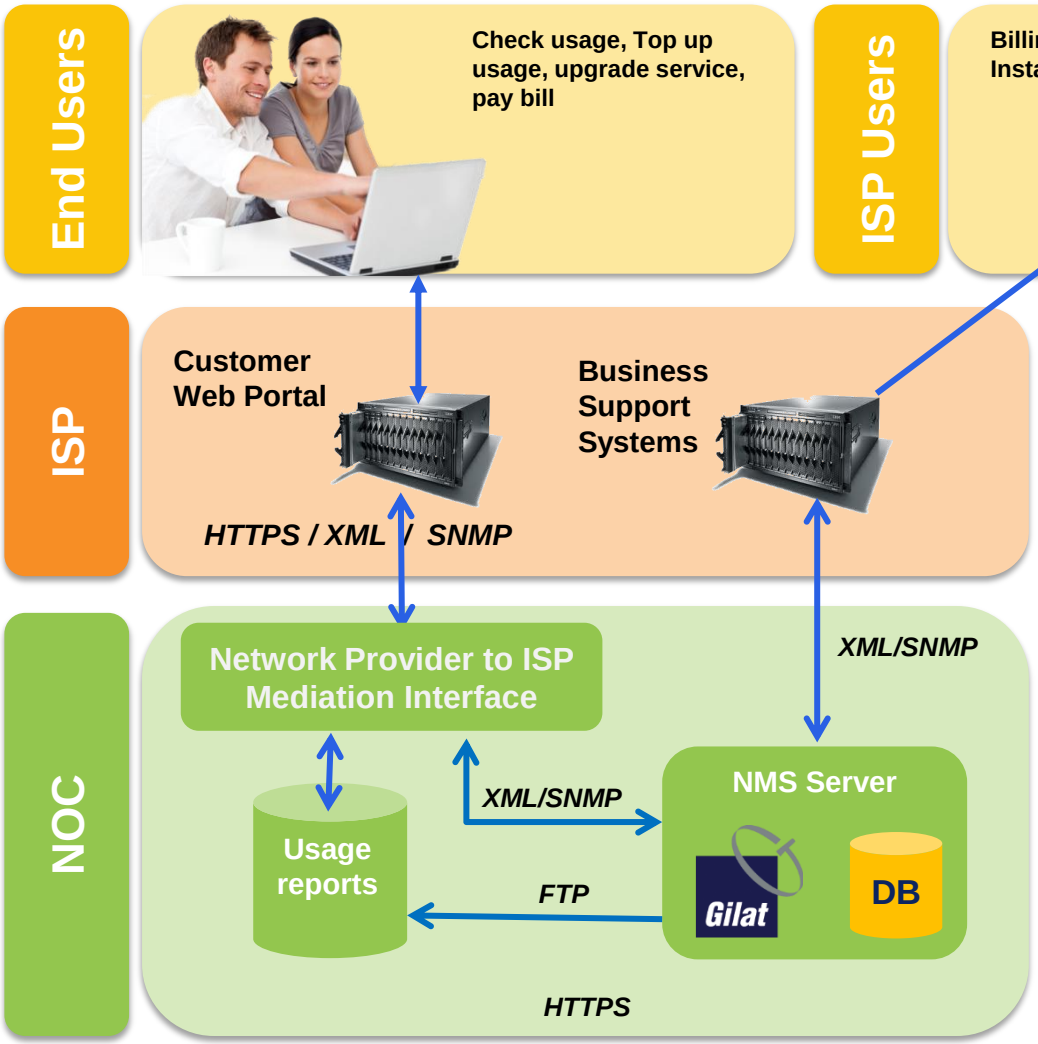
Teleport
- The root infrastructure element

Satellite
- As multiple satellites can be controlled via a single teleport

RF Cluster
- A resource pool identified by a specific sat' BW and CPE HW

Network Segment
- The basic network element (Op' view)

Total NMS – ISP Interfaces



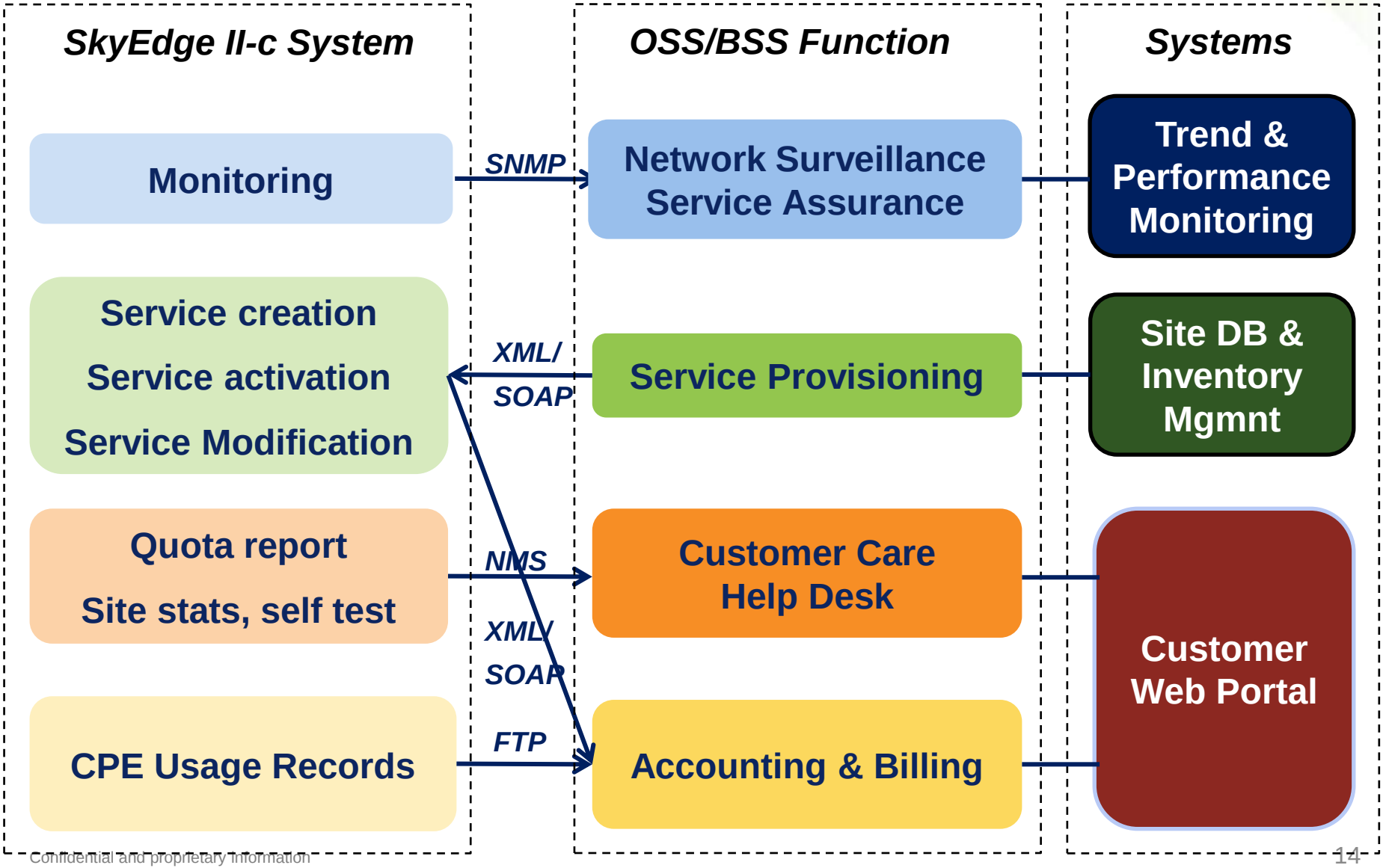
ISP:

- Define service – speeds, priority and usage quotas
- Site creation, logistics and data mining
- Automatic service activation + redirect to ISP customer web portal

End User:

- Billing, upgrades & detailed usage records

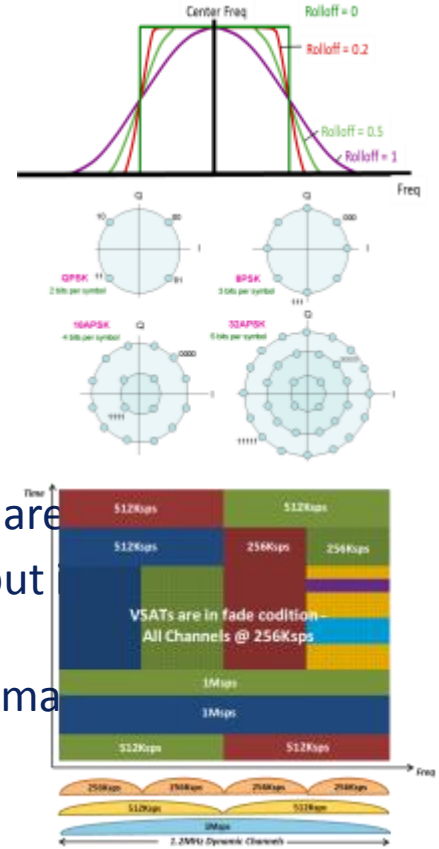
OSS/BSS Interfaces



High Spectral Efficiency

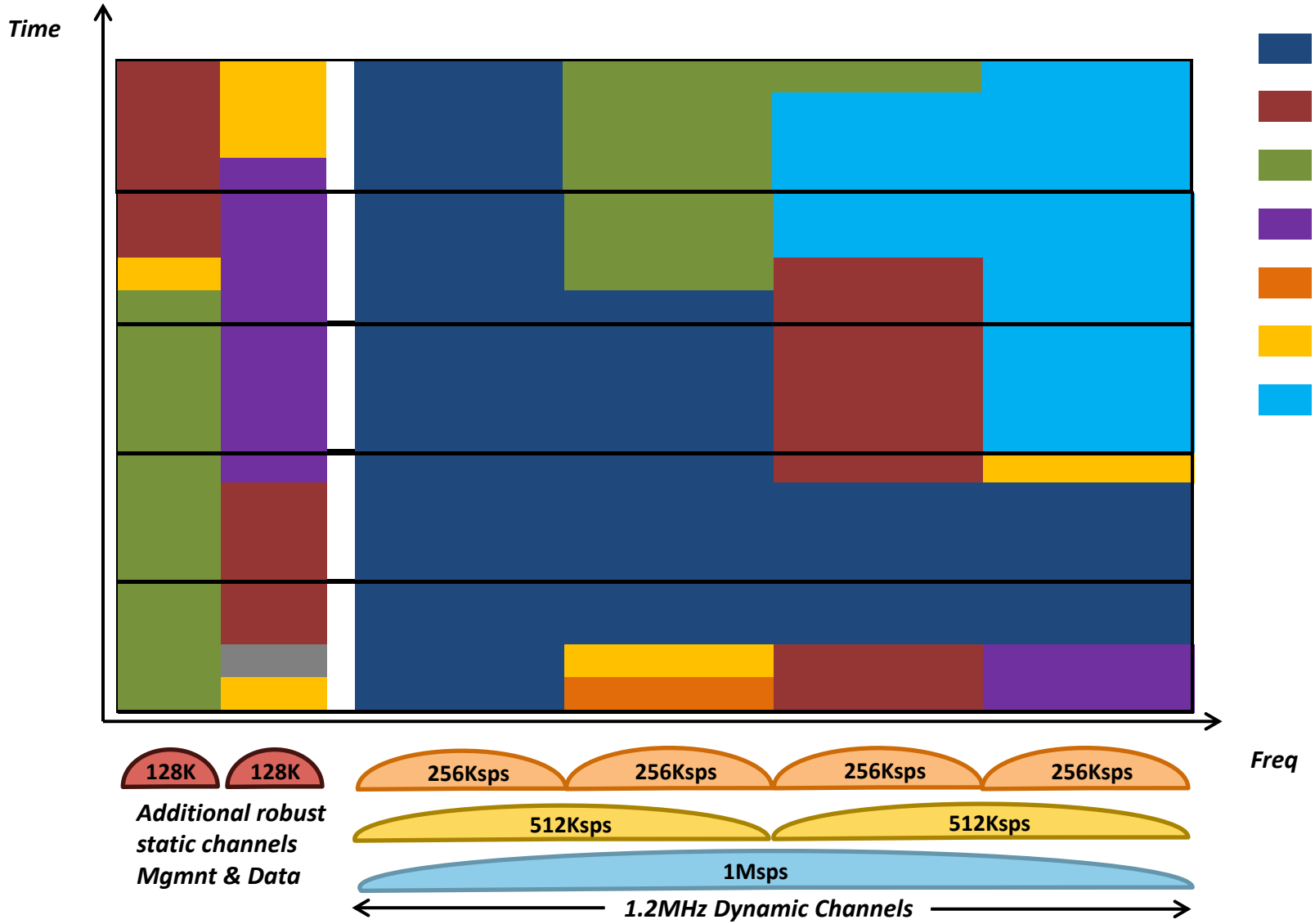
More b/Hz enable more remote terminals

- **Adaptive outbound and inbound transmissions**
- **High bandwidth efficiency**
  - **32APSK Outbound; 16APSK Inbound**
    - **67Msps (250Mbps) OB carriers, ROF 1.1**
  - **Inbound Dynamic Channels**
- **Max fill factor –** no idle channels, ever
  - **Max service up time –** low symbol rate transmission resources are
  - **Constant Network throughput –** total return channel throughput
    maintained
  - **Simple operations –** no need to monitor carrier utilization and ma
    carrier mix



More bits/Hz enable more sites in service

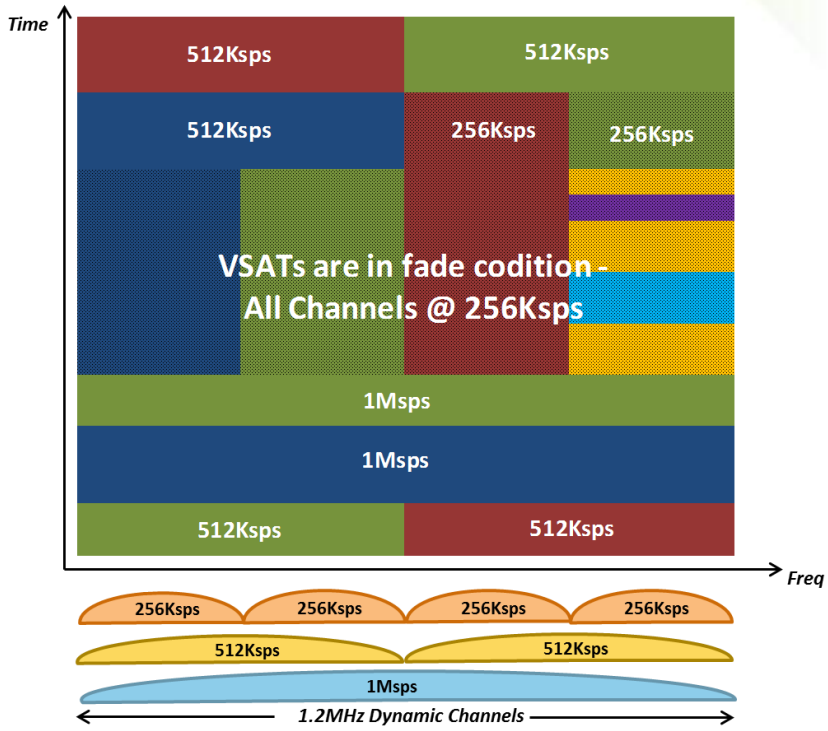
Dynamic Channels



More bits/Hz enable more sites in service

Dynamic Channels - Benefits

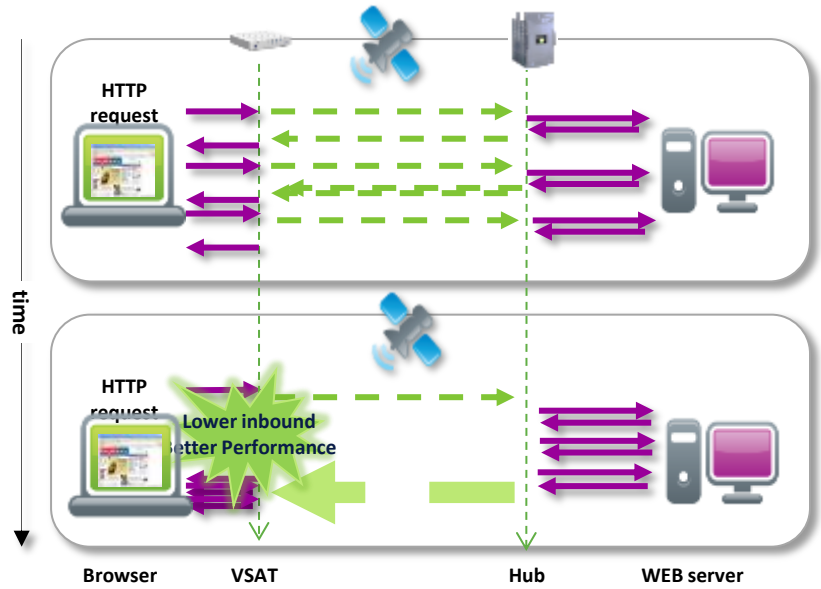
- **Self adapting return channel carrier plan provides:**
  - **Max fill factor** – no idle channels, ever
  - **Max service up time** – low symbol rate transmission resources are always available
  - **Constant Network throughput** – total return channel throughput is always maintained
  - **Simple operations** – no need to monitor carrier utilization and manually adjust carrier mix



The end of static carrier configuration

Total Performance

- **Multi-tiered acceleration enables speedy (5-10x improvement) web surfing and fast application response – overall 50% savings**
- **TCP Acceleration (40% saving in IB)**
- **HTTP acceleration & optimization (15% savings in IB)**
  - **HTTP Pre-fetching** - Minimize traffic, Improve user experience
  - **HTTP compression** - Minimize traffic and download time
- **DNS Caching**
- **Payload Compression (20% saving)**
- **IP header compress (10% saving)**
- **SIP Header compression (10% saving)**
- **CacheMode! (20% - 40% saving)**

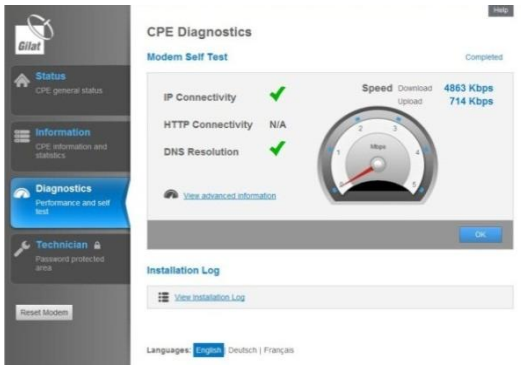


Thinking of the end customer

Enable High Customer Satisfaction

- High Performance CPEs
- QoS
- Integrated acceleration

- Advanced user Web GUI and VSAT Self test provides customers visibility to their service

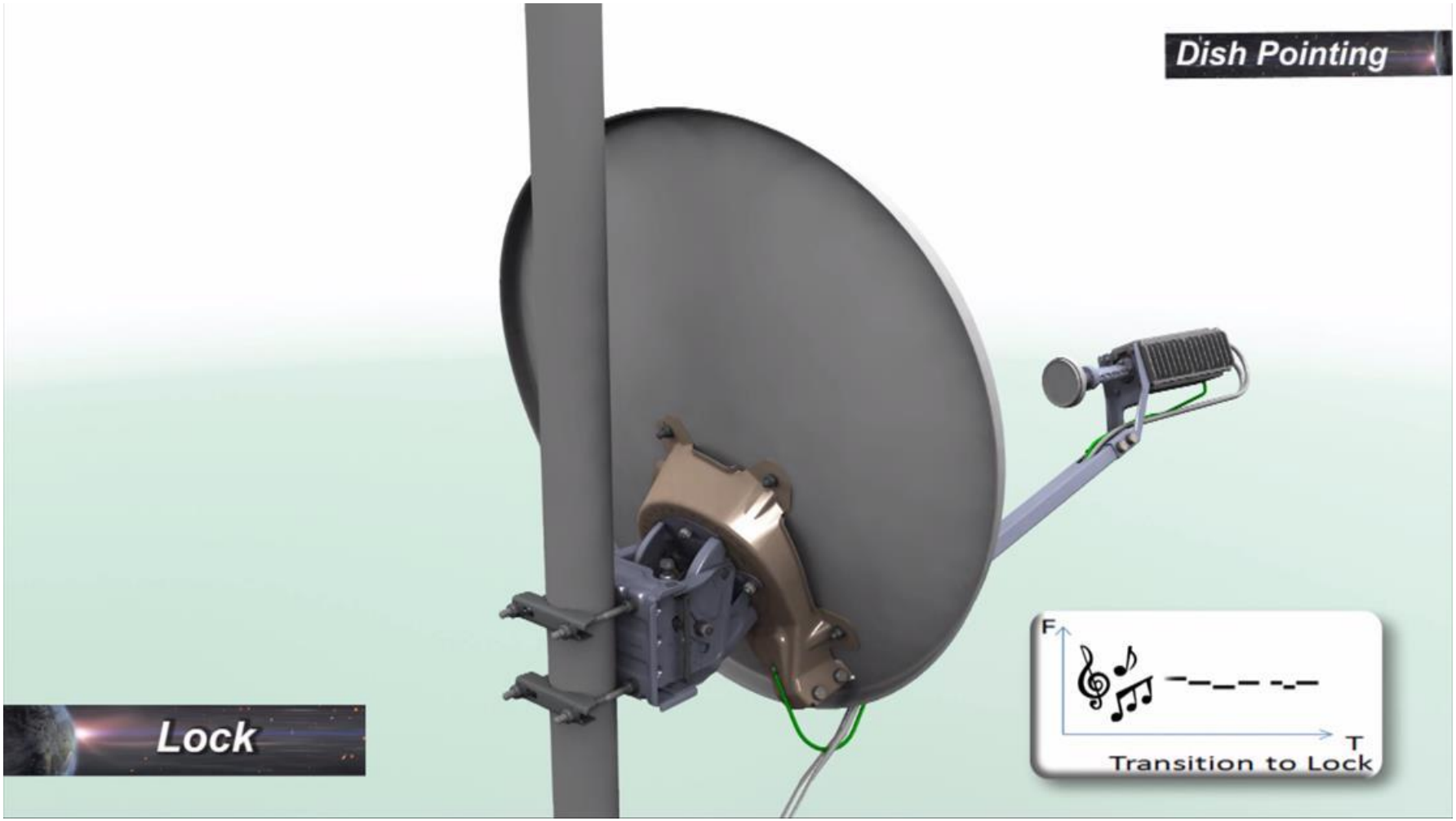


SkyEdge II-c VSAT CPE - Broadband

- Small IDU form factor
- High Speed broadband experience
- Fast browsing with embedded acceleration, compression & Caching technologies
- High Quality VoIP, Video and IPTV
- Enhanced Security via over-the-air AES-256 Encryption
- Self Installation & Automatic Commissioning
- Advanced self management interface
- Standard Based - DVB-S2, DVB-RCS

Simple Terminal Installation

http://www.youtube.com/watch?v=xohFf4-KyME



Multi-layer QoS

- **Bandwidth broker = Fair allocation of bandwidth between VSATs**

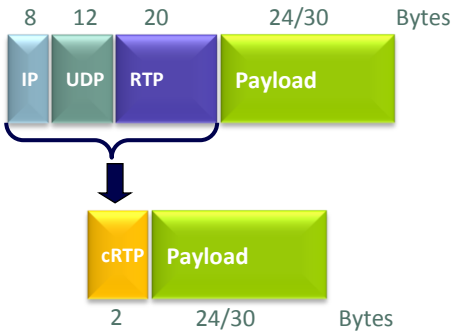
- **CIR/MIR per site**
- **Priority based services (metals)**
- **Group QoS**

- **Traffic shaping = Fair allocation of bandwidth between applications**

- **Critical applications perform well**
- **Improve service perception**
- **DiffServ / TOS /**

High Quality VoIP

- **Advanced VoIP features enables quality VoIP services**
  - **Automatic VoIP call recognition (SIP invite messages)**
  - **Allocation of exact BW needed (Codec recognition)**
  - **Dedicated tunnel for the duration of the call**
  - **Call admission Control - based on SIP domains (per ISP)**
  - **VoIP protocols: H.323, SIP, T.38 Fax**
  - **Jitter < 10ms at 90% of the time**
  - **Highly efficient cRTP Header reduction**



High Quality VoIP at Lowest OPEX

CPE Self Test

- **Automatic self test – initiated by user or via the NMS**
- **Measures upload/download, DNS, Ping,**
- **Report results, CPE information, VSAT status, RF status**
- **Requires test server at the Gateway**

WED OCT 31 23:50:58 2012

IP test results

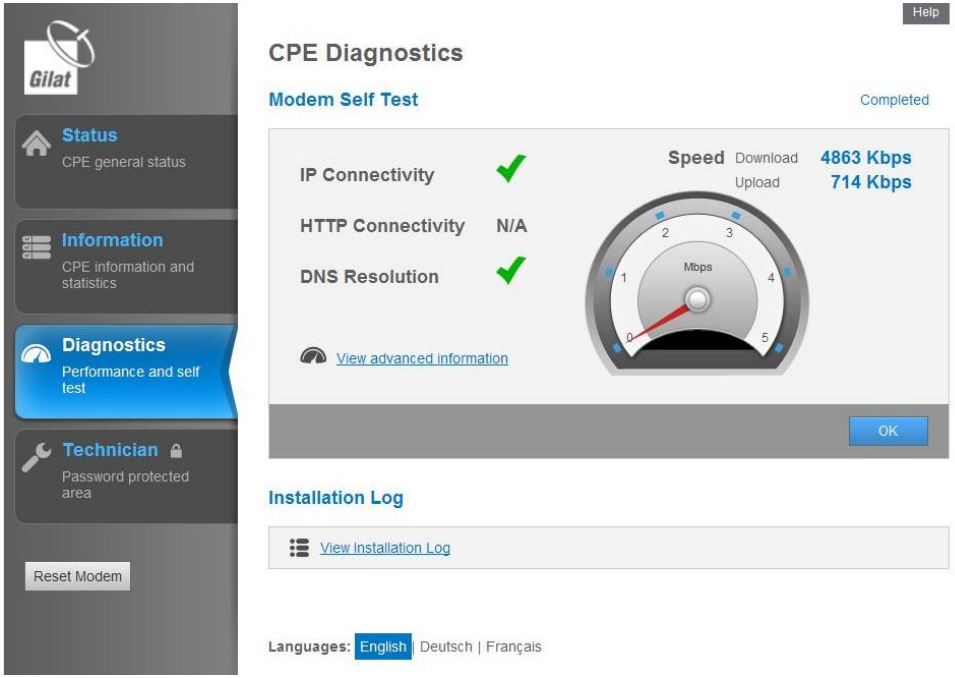
IP Connectivity: Succeeded
HTTP Connectivity: N/A
DNS Resolution: Succeeded
Speed Test: Succeeded
Download Speed: 4863 Kbps
Upload Speed: 714 Kbps

IDU and ODU hardware test results

Part Number: 575000
Serial Number: 0412070020
IDU Self Test: Succeeded
ODU Connectivity: Succeeded

Software validity test results

MBC Validation Test: Succeeded



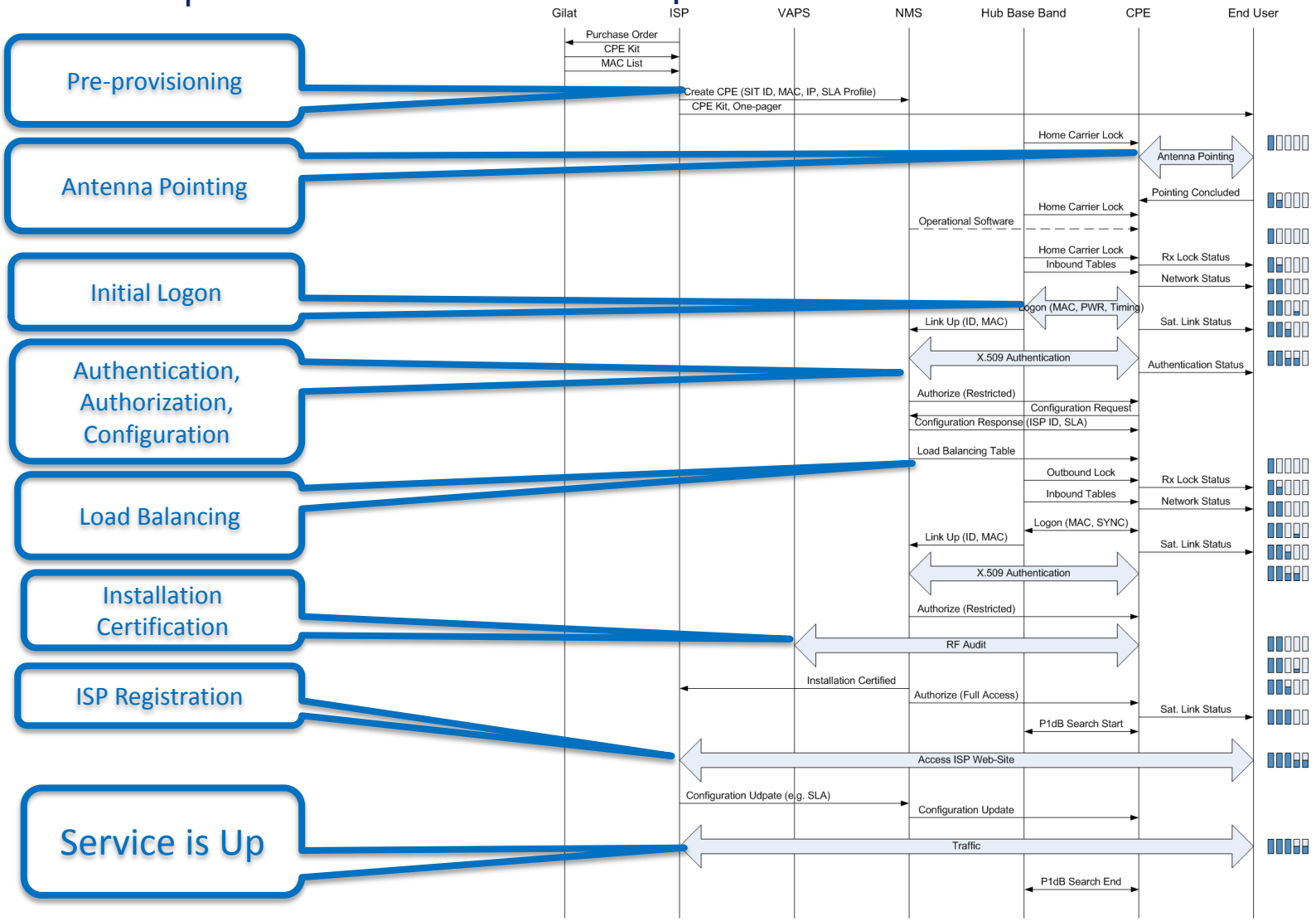
Simplifying Operations

Reducing Operators OPEX

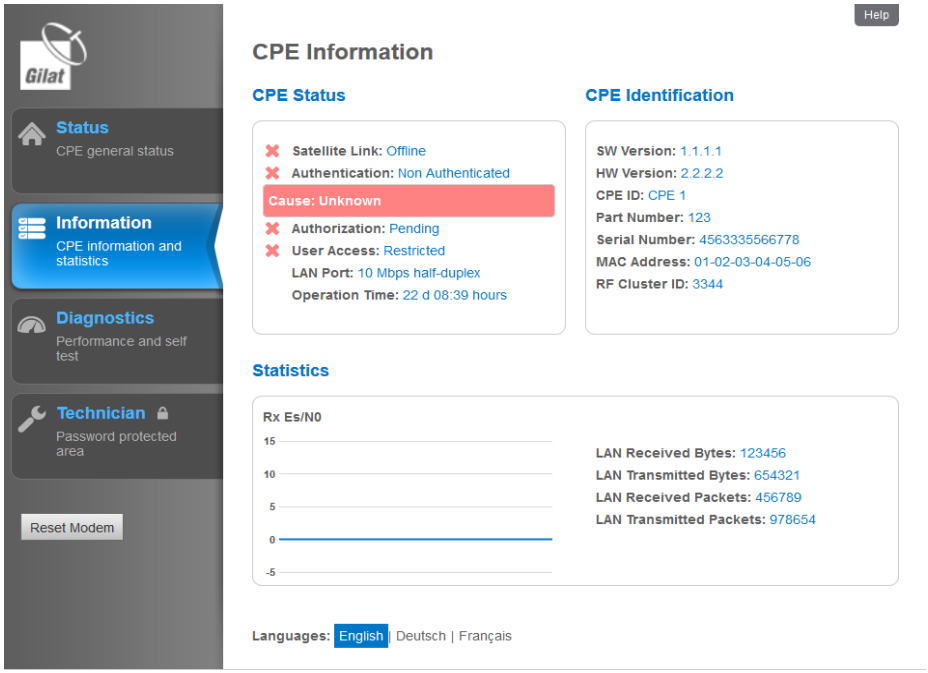
- Simpler to manage and operate
- Reduce OPEX costs by automation
- Flexible and customizable

Automatic Service Activation

From purchase order to Service up

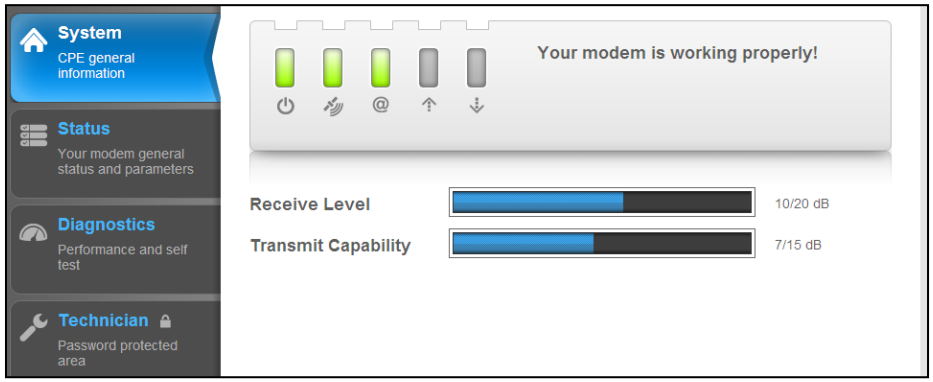


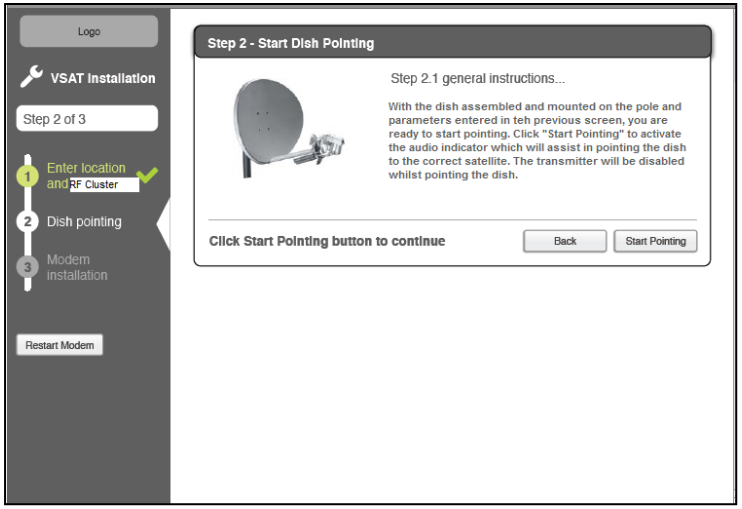
VSAT Web Interface



- **Status and Diagnostics**

Step by Step VSAT Installation guide



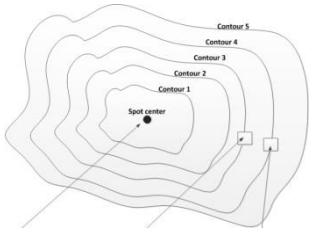


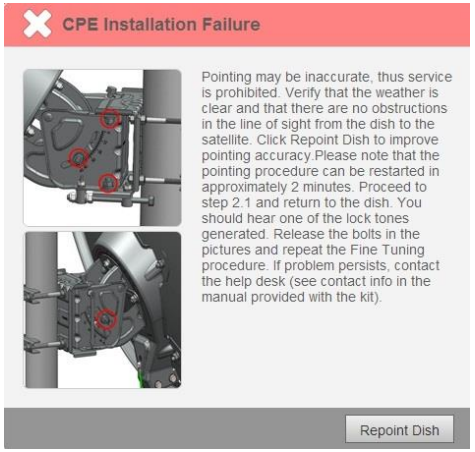
Simple Terminal Installation

- **Simple VSAT installation expedites installation process and reduce costs**
  - **Small size 0.76m antenna**
  - **Minimum assembly parts**
  - **Lightweight - 12kg**
  - **Do-it-Yourself Installation with audible indicators (Ka-band only)**
  - **Human engineered antenna mount design**
  - **Easy to mount & point - Skew, Azimuth, Elevation**
  - **Hand free Ka-band transceiver installation**
  - **Cables run through Boom**

Installation Certification & RF Audit

- Mandatory step before service go-live
  - RF certification thresholds are defined per VSAT location
  - The VSAT is switched to CW mode
  - Hub measures the received return signal C/N
- If the VSAT pass the RF certification, the NMS authorizes the terminal for full access per default SLA configuration
- If the installation is not certified, the terminal remains in restricted mode and installer is asked to re-peak the antenna





Flexible service packages

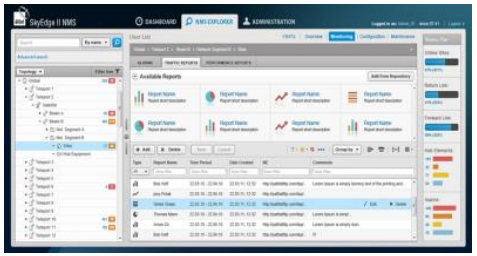
Support full range of customer types

- Consumer
- Enterprise
- Corporate
- IP Trunking
- Integrated Solutions

Broadband Hybrid VSAT (2014)

- Use Satellite Forward Channel
  - Offloading traffic from Cellular infrastructure
  - Higher and consistent download rates – better than most cellular networks under heavy load

- Return Cellular Channel
  - Technology agnostic –2.5/3G/4G or DSL
  - Use external USB cellular modem dongle
- Self installed 1-way antenna and LNB
- Total NMS supporting standard and Hybrid VSATs
  - Identical M2M interfaces
  - Acceleration, Encryption, and compression



Antenna & ODU

- Typical Antennas – 76cm, 98cm, 1.2m
  - Simple Installation
  - Minimum assembly parts
  - Easy mount & point
- Ka Band Transceivers - 2.5W, 4W, 8W* Integrated buzzer provides audio indicators for simplifies antenna pointing
- Wavestream 12W, 25W, 50W Wide Ka-band BUCs
- Designed for maximum link availability & High MTBF

**8W pending MOQ order*

1.2m

76cm

XCVR

3-Play Outdoor

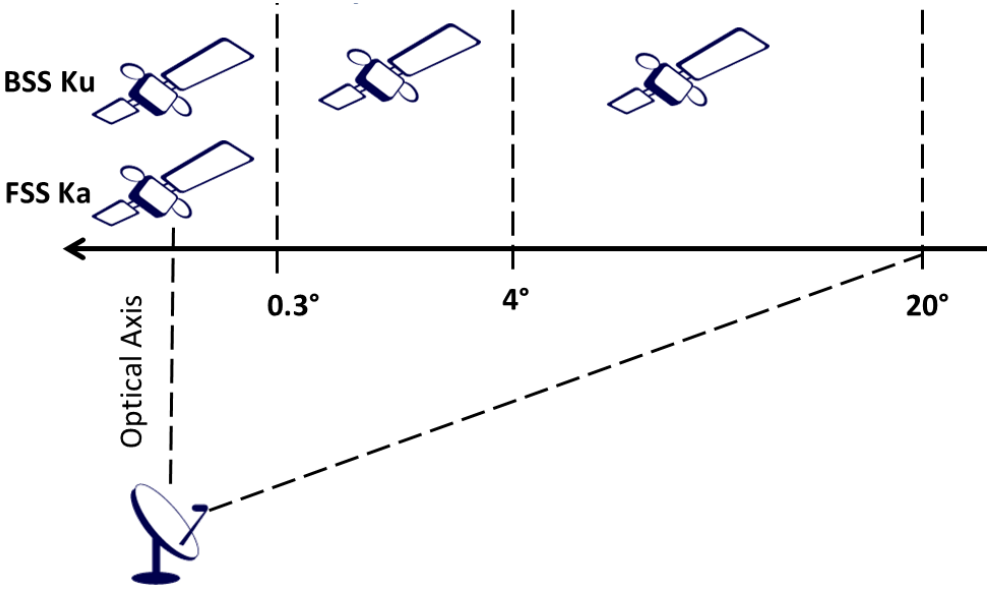
- Single antenna supporting DTH and Broadband services
- Use special bracket supporting separate feed for DTH LNBF
- Location on bracket is dependent on
  - DTH satellite relative location
  - Terminal relative location
- Custom bracket is required per satellite

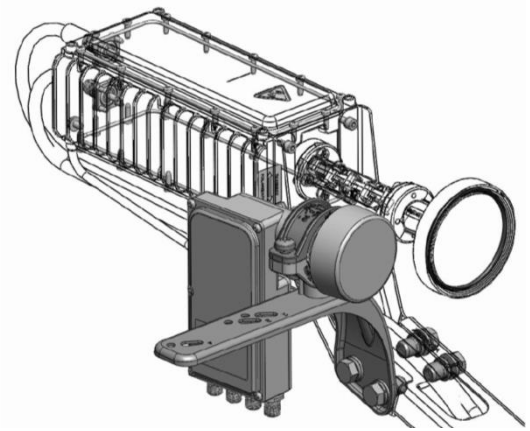
Kit content:

LNBF BRACKET

LNBF

LNBF Adaptor





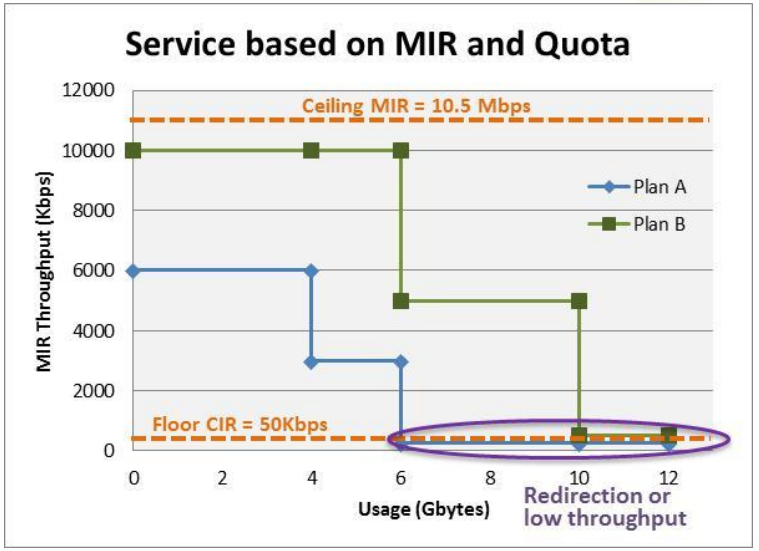
Complete IP

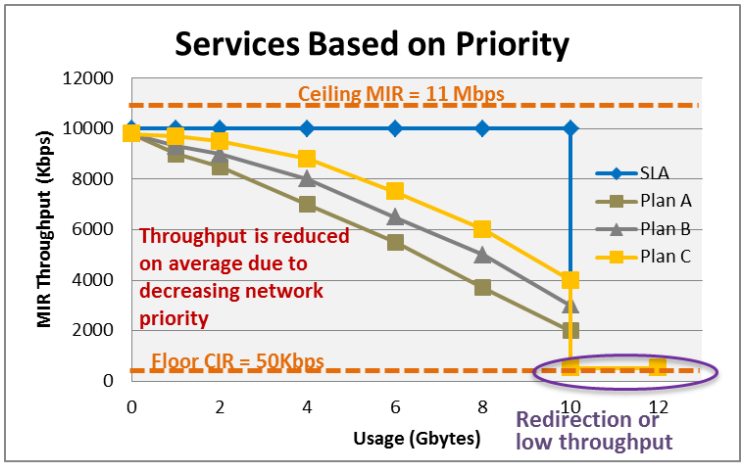
- IP protocols
  - IPv4, IPv6, RIP
  - DHCP, NAT/PAT
  - Multicast, IGMP v3
- Application
  - DNS Caching
  - TCP acceleration
  - HTTP pre-fetch acceleration
  - VoIP SIP-Aware, cRTP
- Security
  - AES-256, X.509
- Management
  - Total NMS, FCAPS
  - SNMP
  - Northbound Interface
- VLANs
  - Multiple VLAN and VRF per VSAT
  - 802.1q VLAN Trunking
- QoS
  - MIR/CIR, priority weight, Group QoS, Diffserv
- Fault Tolerance
  - Geographical redundancy

Total Control Service Definition & Accounting

- Integrated Accounting – inbound, outbound, VoIP
- Usage based service plans
  - Usage top-ups, reset quota
  - Free usage time zones
  - Automatic redirection
- Real-time dynamic BW distribution - Per carrier & per ISP/VNO according to:
  - Network load
  - MIR/CIR
  - Site-level priority

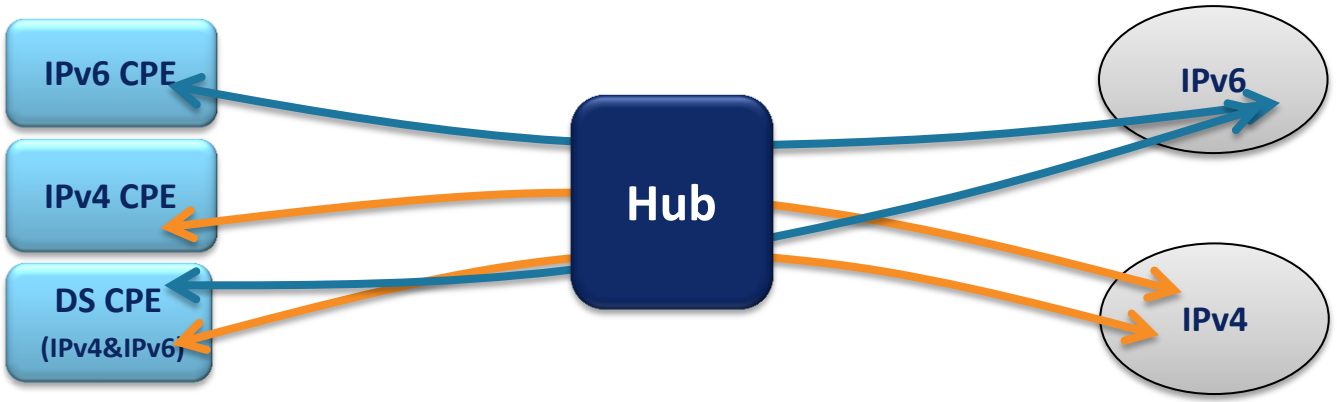
- Make sure 20% of the users don't take 80% of the capacity
- Maximize customer satisfaction
- Maximize service revenue





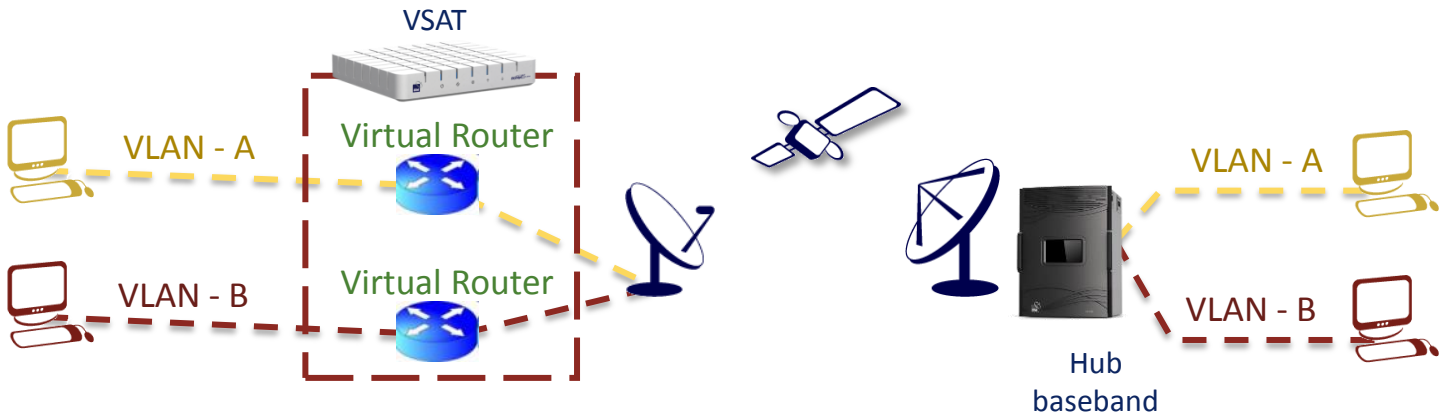
IPv6

- Support for next generation IPv6 relieve IP address limitation
- VSATs can be configured:
  - IPv4 Only; IPv6 Only; Dual Stack - IPv4 & IPv6
  - The modes are configured per ISP/VNO
- Dual stack approach:
  - IPv4 nodes can reach only IPv4 nodes and the same is correct for IPv6 nodes
  - Separate Networks, no direct connection



VLAN - Virtual Routing (VRF) solution

- **Each VSAT Ethernet port acts as a virtual router (VRF)**
- **Enable multiple customers/services on a single VSAT**
  - End to end traffic separation (VLAN tagging or trunking)
  - Full flexibility – separate routing per VRF (NAT, DHCP etc)
  - Flexible QoS control – priority and weight per VRF
  - Eliminates the need for an external VLAN switch
- **Allows traffic separation between applications**



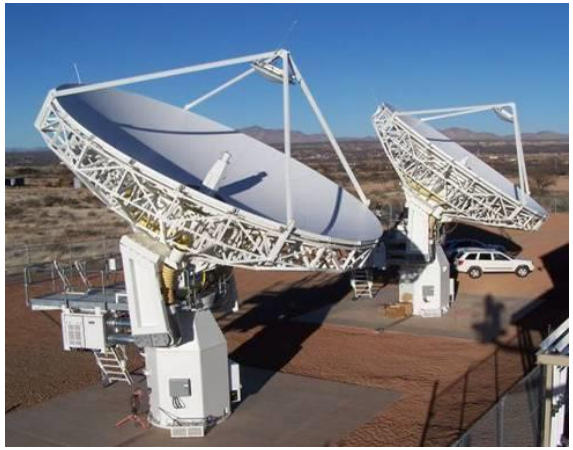
Enhanced Security

- System Security attributes and mechanisms provide secured service to the service provider and to end-users
  - Over-the-air HW-based AES-256 encryption
  - X.509 terminal authentication
  - SOAP/Northbound Interface via HTTPS
  - VNO/ISP management

Flexible Gateway Architecture

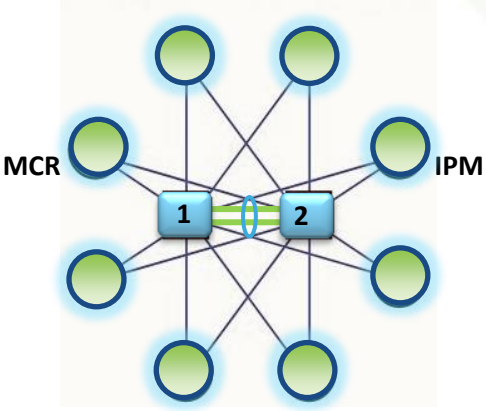
Flexible Baseband Design enables cost effective services

- High Availability
- High Integration
- Unattended Operations



Maximum Availability and Redundancy

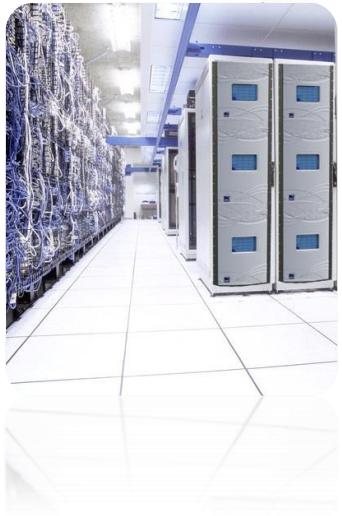
- **Unattended hub design reduce OPEX:**
  - **1:N redundancy on all components**
  - **Integrated active/active, dual star, redundant LAN switching architecture**
  - **Integrated active/active redundant power supplies**
  - **All components are hot swappable - eliminate maintenance downtimes**
  - **Total network-wide NMS with FCAPS (Fault, Configuration, Accounting, Performance, Security) management enables full visibility and control from anywhere**



Dual Star Chassis Packet Switching Architecture

Remote Management & Support

- **Full remote management, monitoring and technical support reduces trouble resolution times and lower OPEX**
  - **Included Spectrum Analysis Module for remote carrier monitoring**
  - **Gilat RF module – close local loop to debug RF issues**
  - **Remote power control enable to hard power on/off each of the hub modules**
  - **Out of band HW management**
    - Full visibility to the chassis HW configuration (all plug-in modules, of/off status, operating temperature)
    - Console access to all devices



Advance technical support capabilities enable to position engineers at one central location – minimize OPEX

Summary

Summary

- SkyEdge II-c is a comprehensive VSAT system the provides
  - Single Total management System
  - High Spectral efficiency with high availability
  - High Customer satisfaction and maximize service revenues
  - Minimize OPEX and simplify operations
  - Flexibility and customizability – hub and terminals

Thank You