

Digital Video Broadcasting-Return Channel via Satellite (DVB-RCS)

Presentation by:

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Space Science Centre (SSC)

CNS Systems

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**Space Science
Centre (SSC)**

**Radio and
Satellite Communication,
Navigation and Surveillance (CNS)**

Durban University of Technology (DUT)

Special Benefits of DVB-RCS

The DVB-RCS is the best tool to be implemented in urban, rural and remote areas and to be provided backbone to terrestrial telecommunication and GSM or cellular networks for complete communication coverage in one Country.

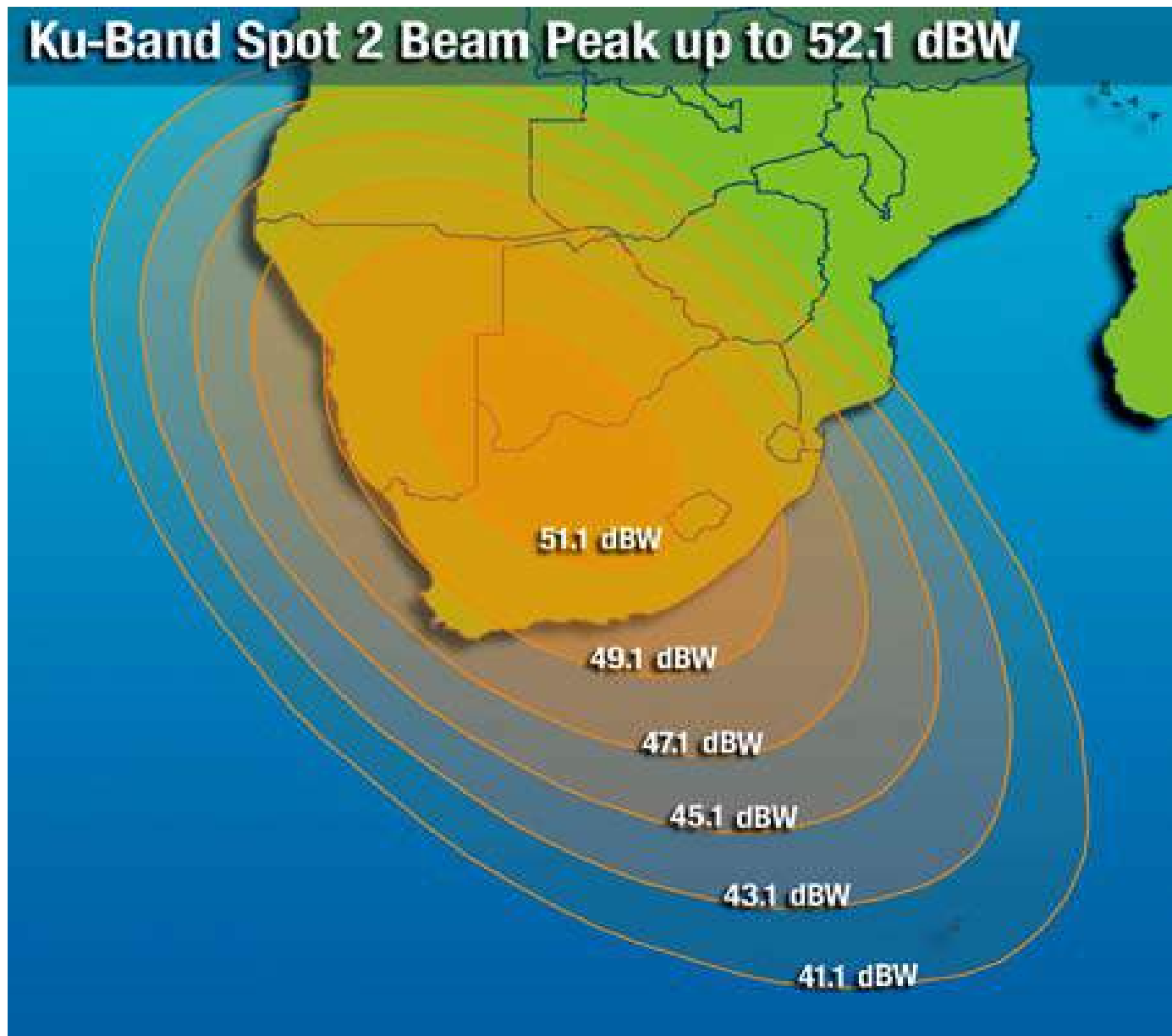
To provide modern IPTV and Voice, Data and Video over IP (VDVoIP) via Satellite Broadcast, Broadband, Multimedia and fast Internet is necessary to include Space Segment, Hub as Ground Earth Station (GES) and Interactive Satellite Terminals (IST) and Mobile Satellite Terminals (MST) or simply Remotes known as Very Small Aperture Terminals (VSAT).

SATELLITE OPERATORS FOR DVB-RCS FIXED SERVICE

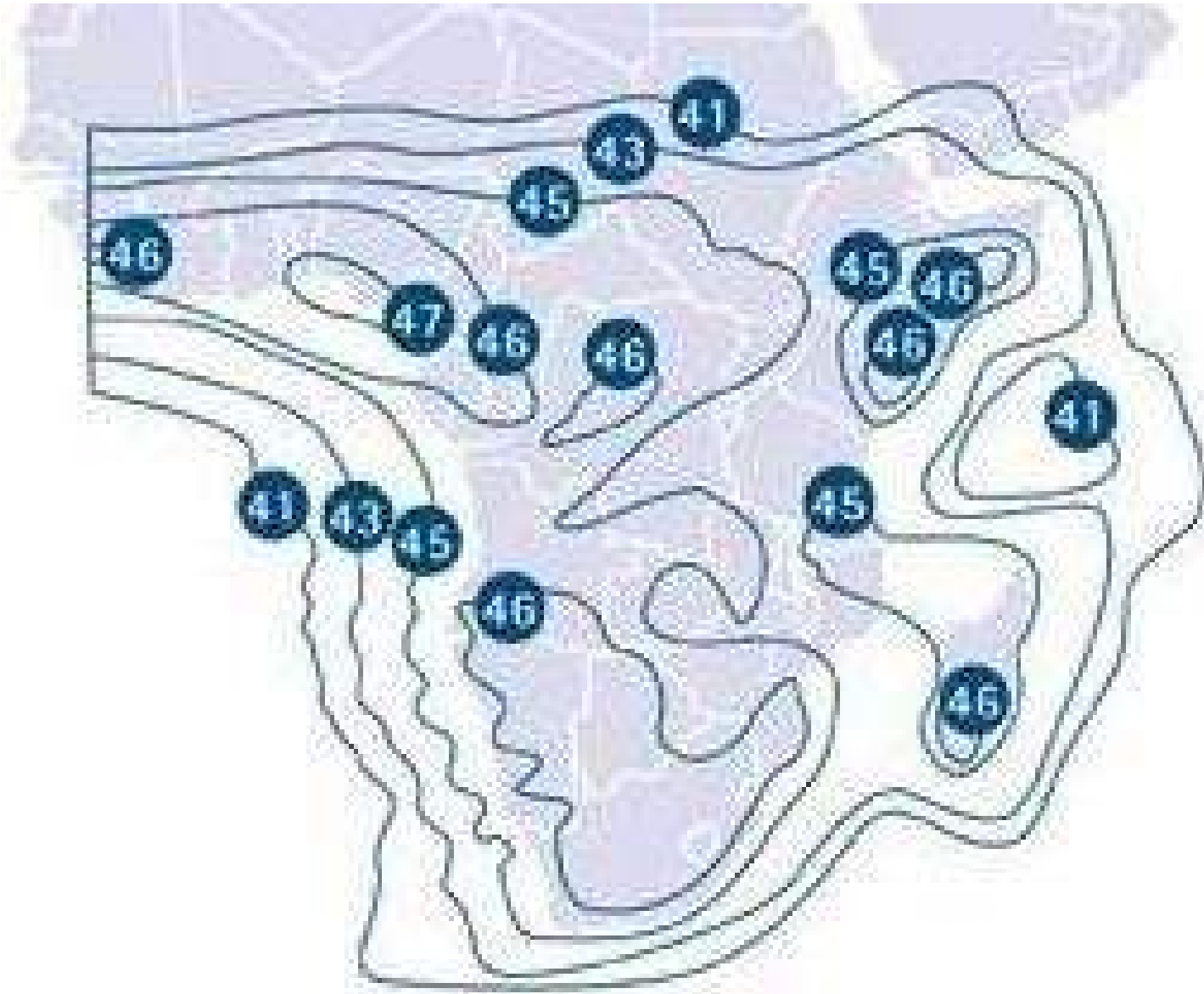
**Current Satellite
Constellations Suitable for
Fixed DVB-RCS Scenario:**

- 1. Intelsat**
- 2. PanAmSat**
- 3. SES – NewSkies**
- 4. Eutelsat**

Intelsat IS-802 Spot Beam



PanAmSat PAS-10 Ku-band Coverage

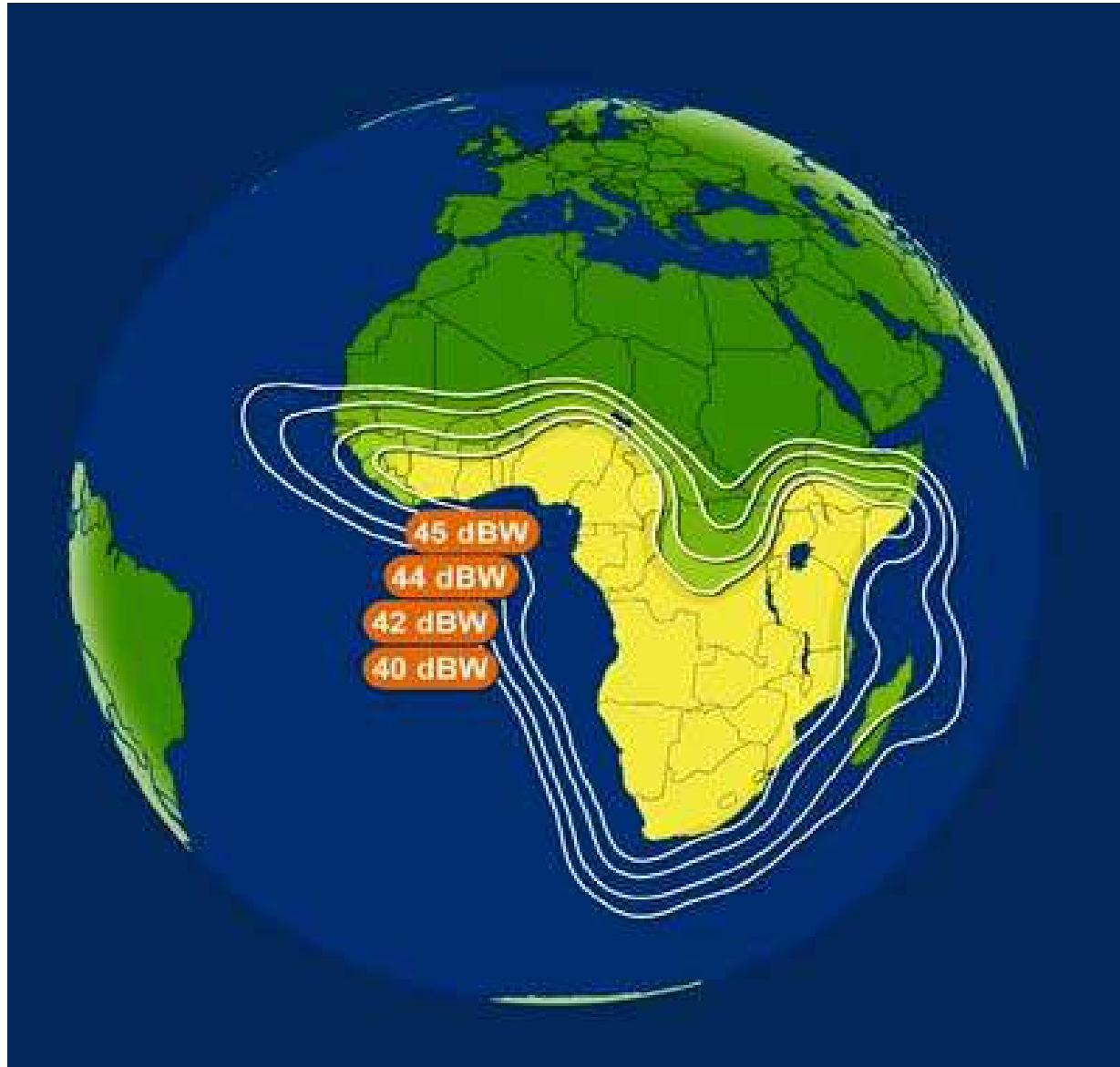


SES - NewSkies NSS-71

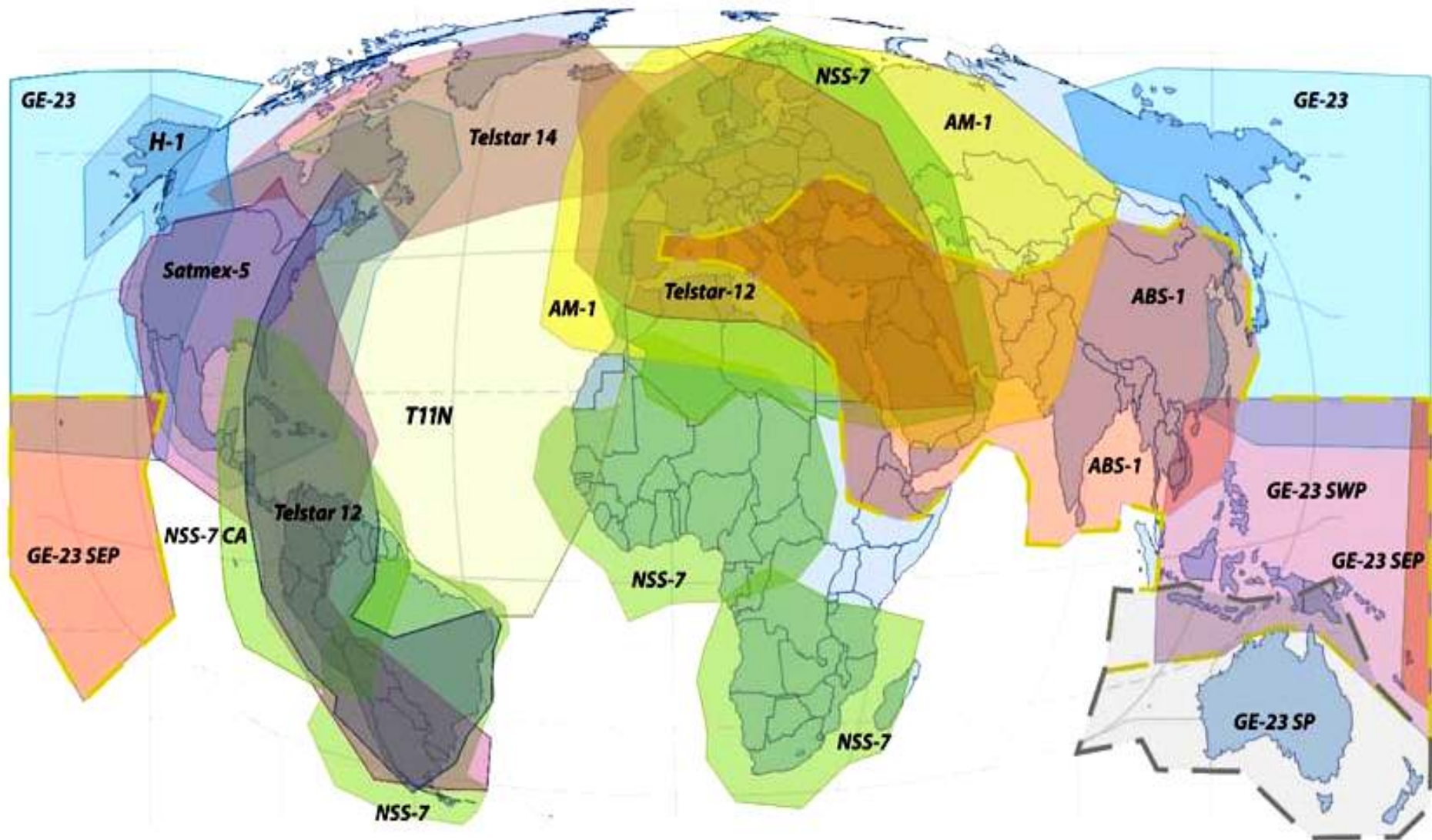
Ku & C-band Coverage



Ku & Ka-band Eutelsat W3A Satellite Coverage



Global DVB-RCS Ku-band Extended Multi Satellite Coverage

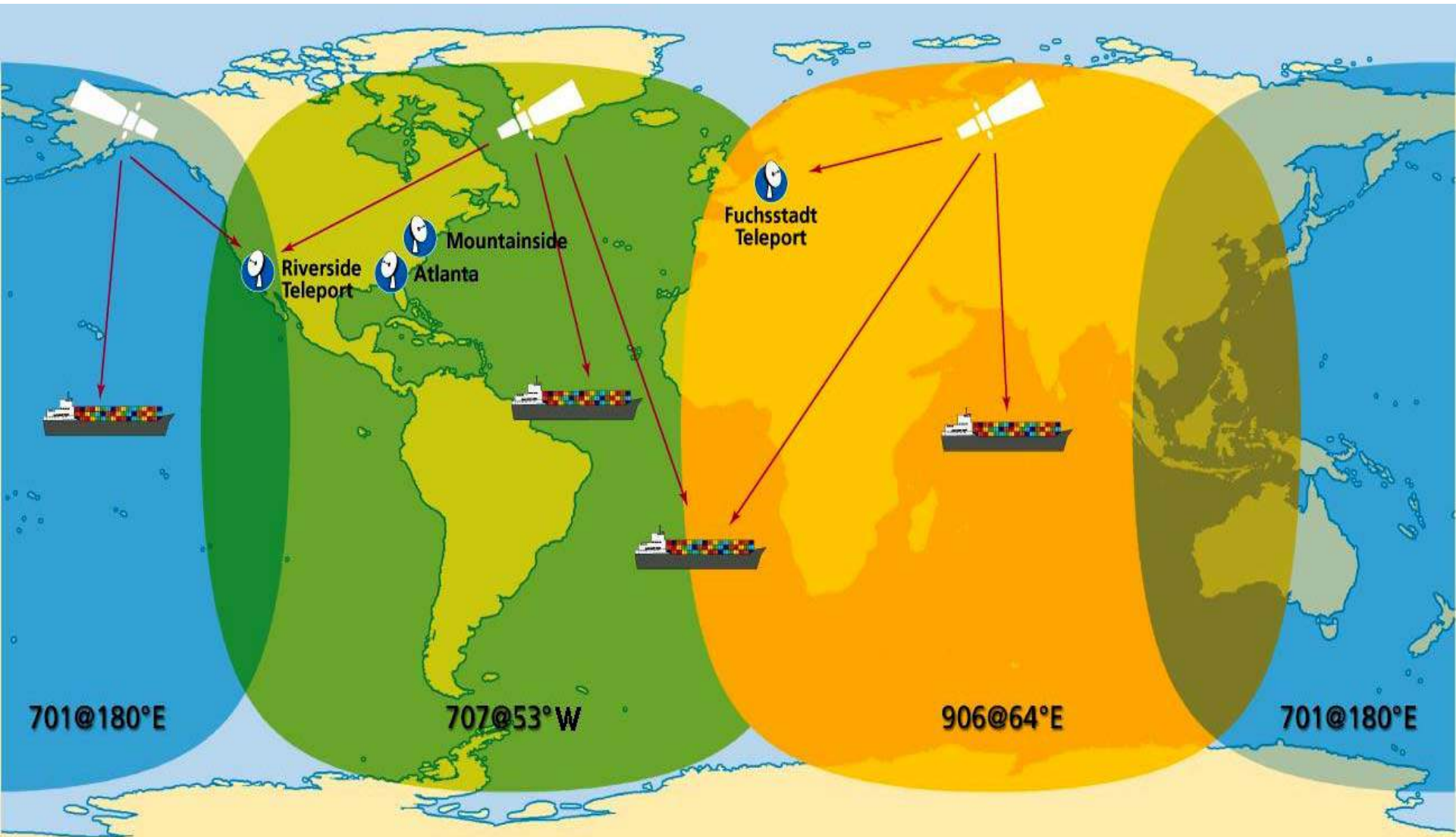


SATELLITE OPERATORS FOR DVB-RCS MOBILE SERVICE

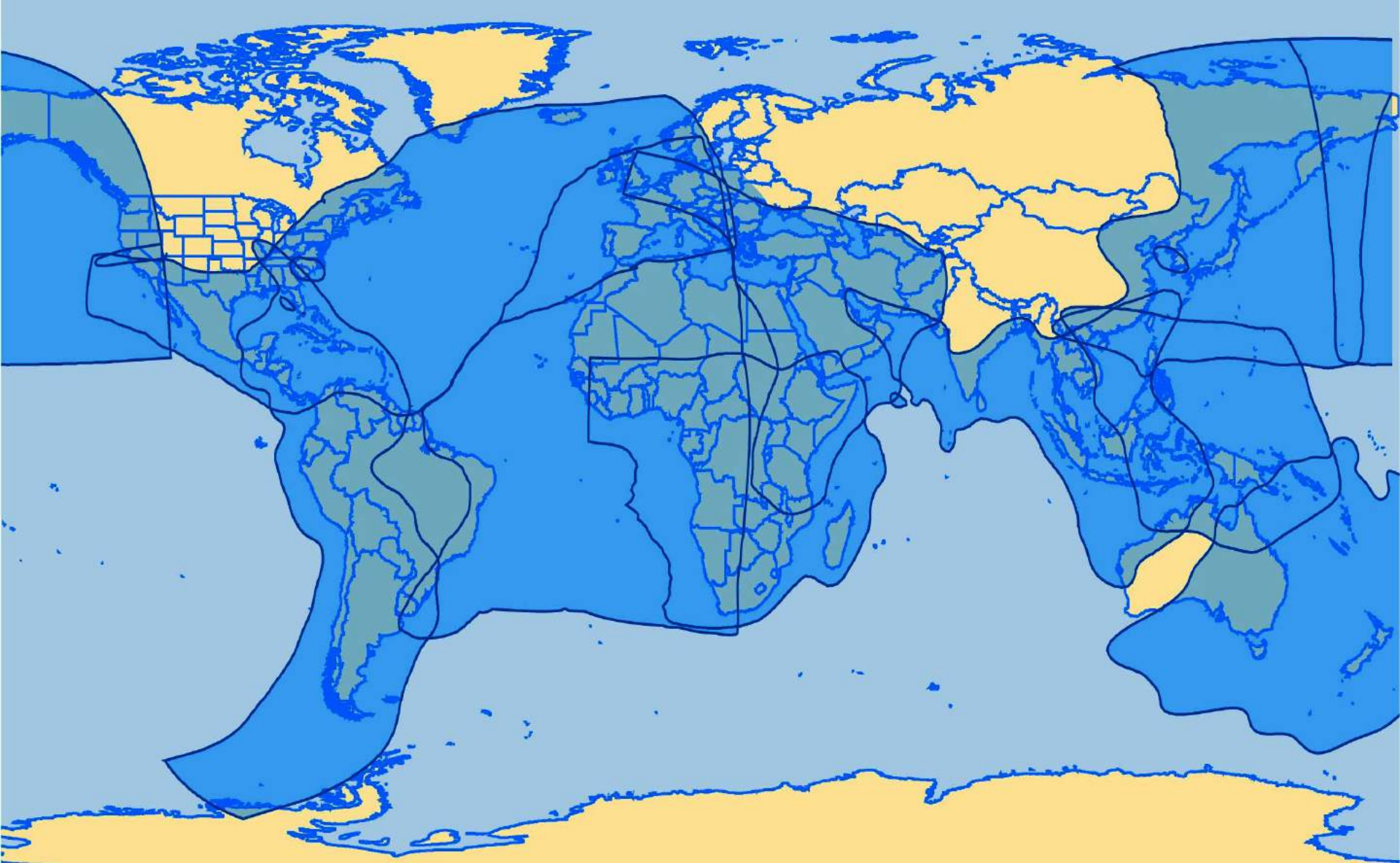
Current Satellite Constellations Suitable for Mobile DVB-RCS Scenario:

- 1. Intelsat C-band Maritime
Global Network**
- 2. Intelsat Ku-band Global Maritime
Network**
- 3. KVH VSAT Global Maritime Network**
- 4. Yonder Ku-band Global Aeronautical
Network**

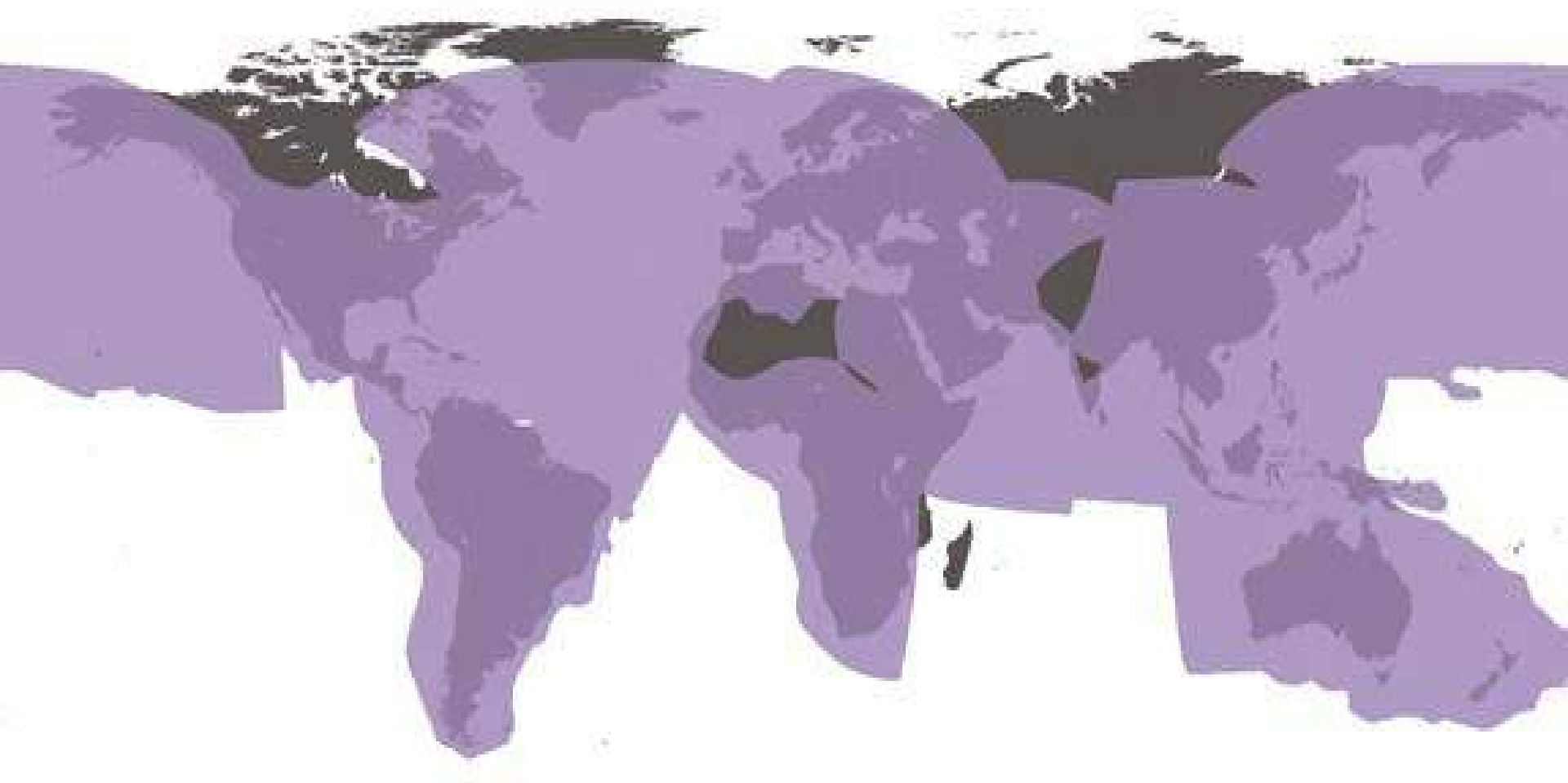
Global Intelsat DVB-RCS C-band Coverage for Maritime Applications



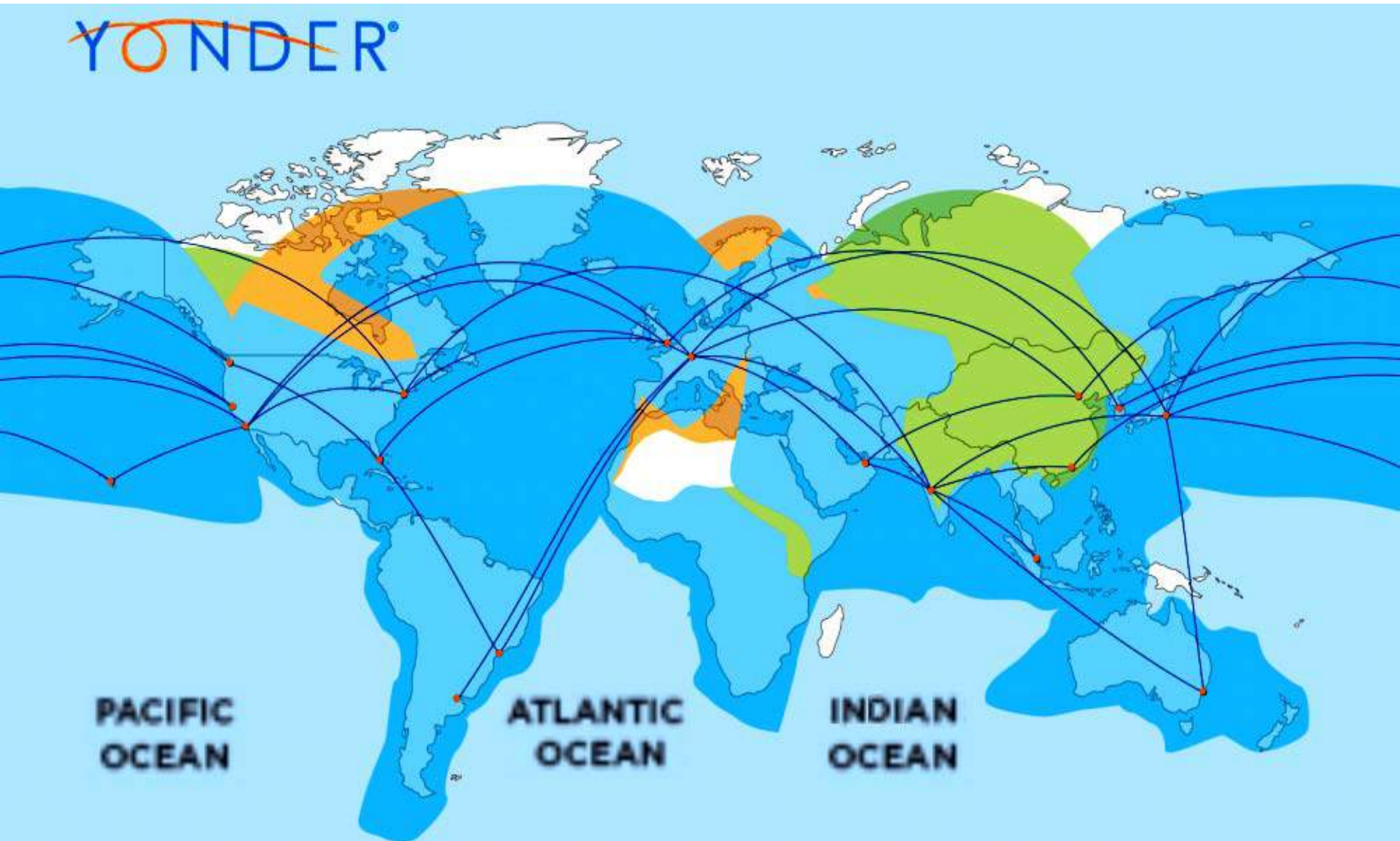
Global Intelsat DVB-RCS Ku-band Coverage for Maritime Applications



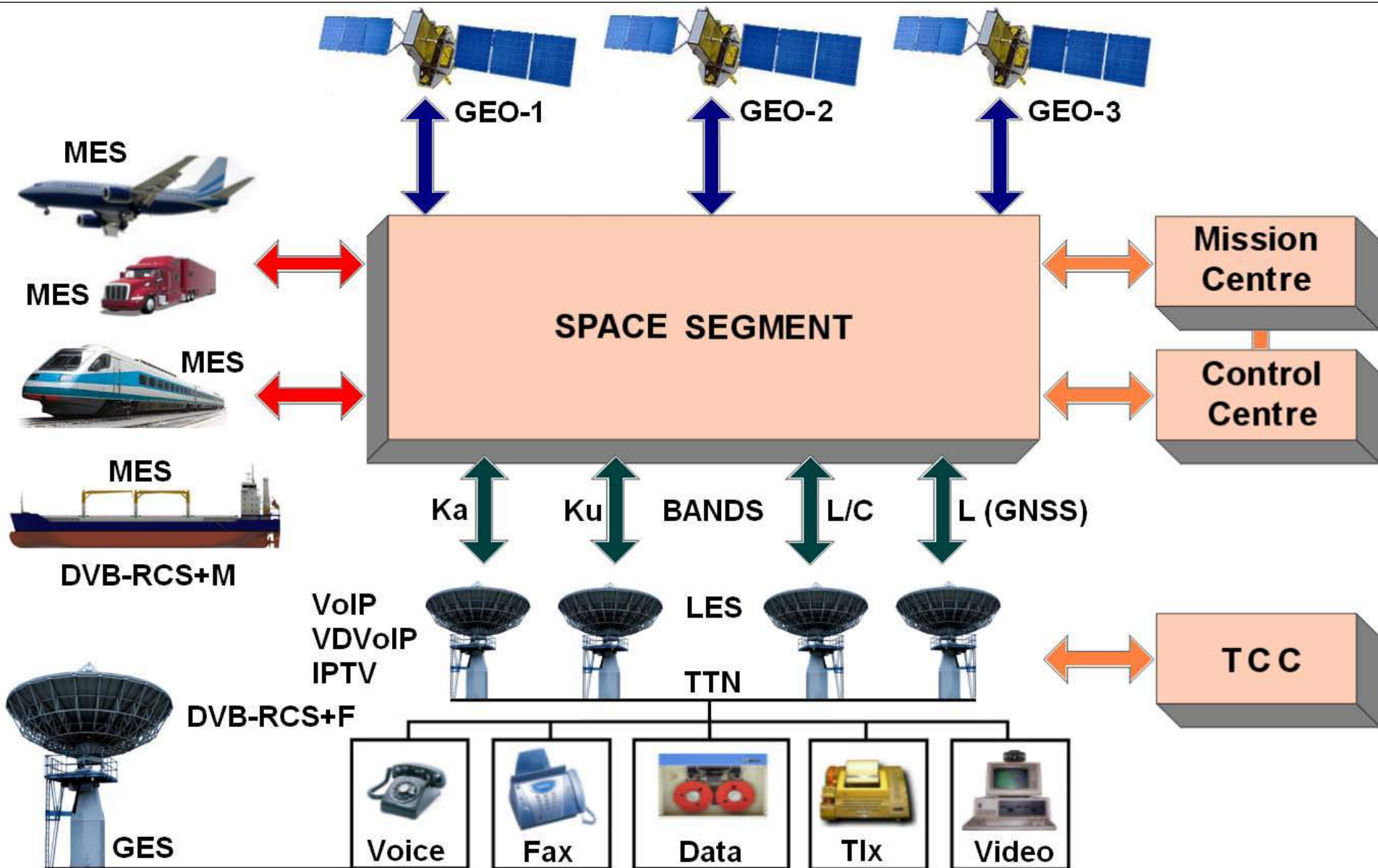
Global KVH DVB-RCS Ku-band VSAT Coverage for Maritime Applications



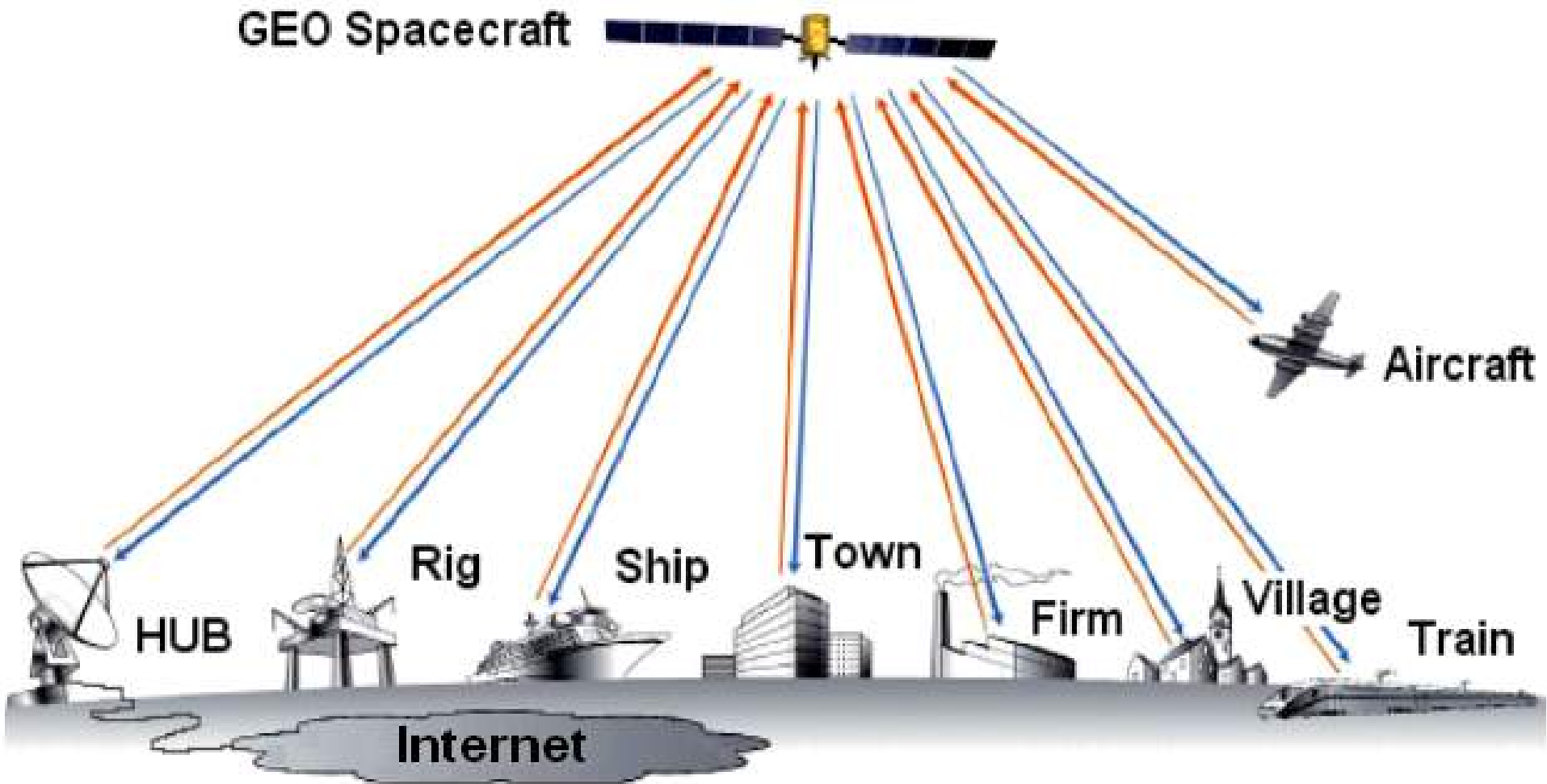
Yonder/ViaSat DVB-RCS Ku-band Coverage for Aeronautical Applications



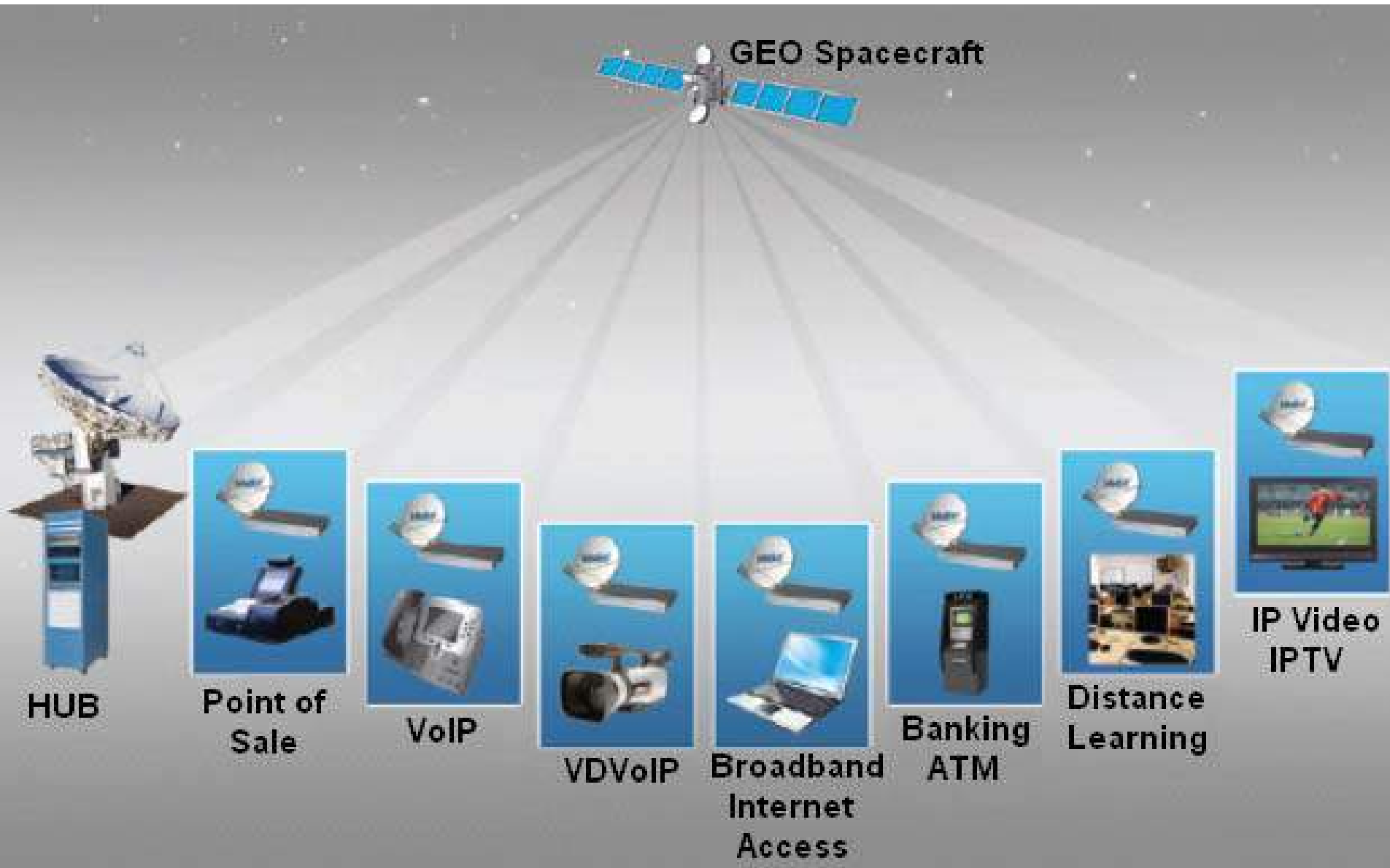
Space, Ground and User Segments for Fixed and Mobile DVB-RCS System



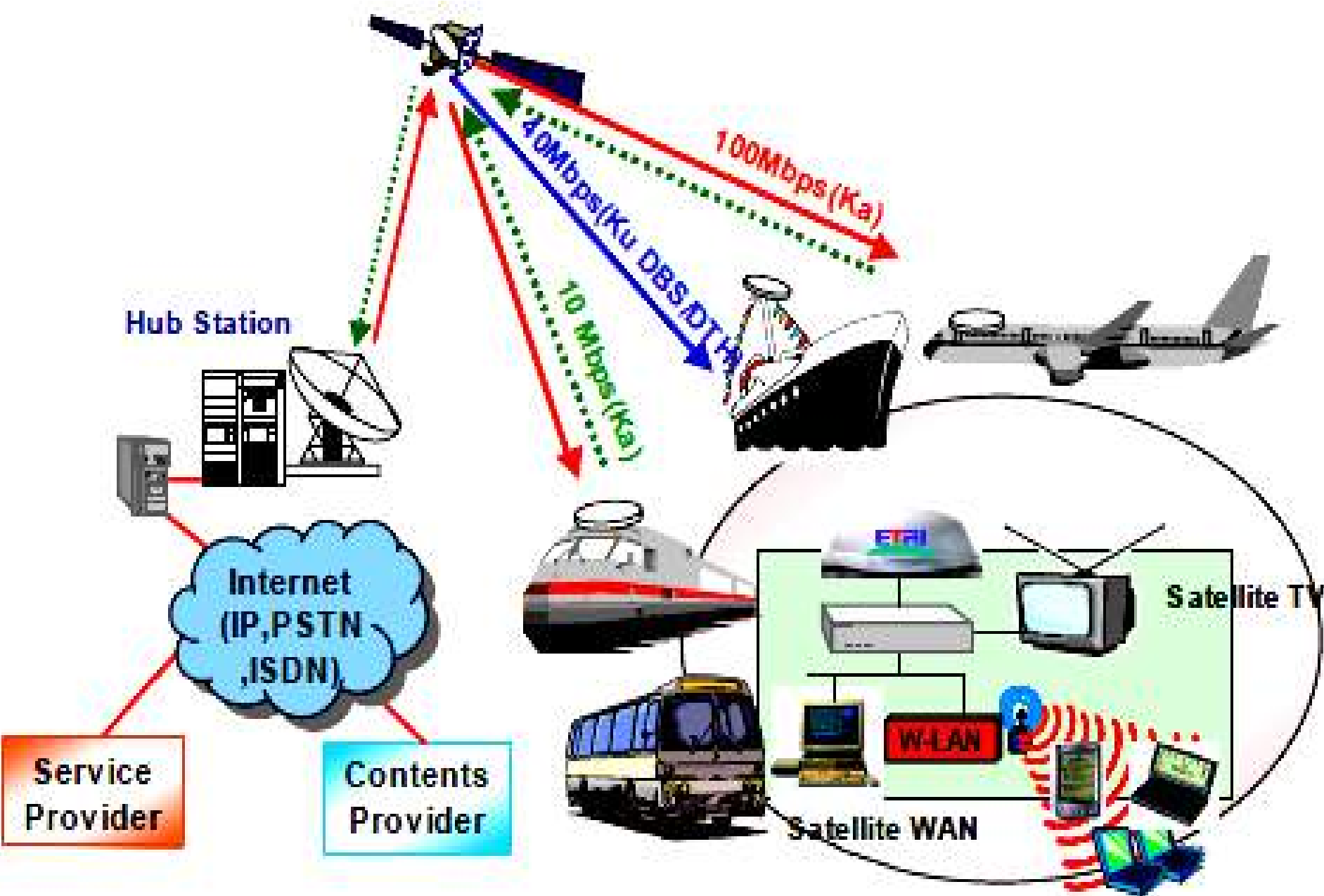
DVB-RCS Concept of Global Broadcasting Satellite System (GBSS)



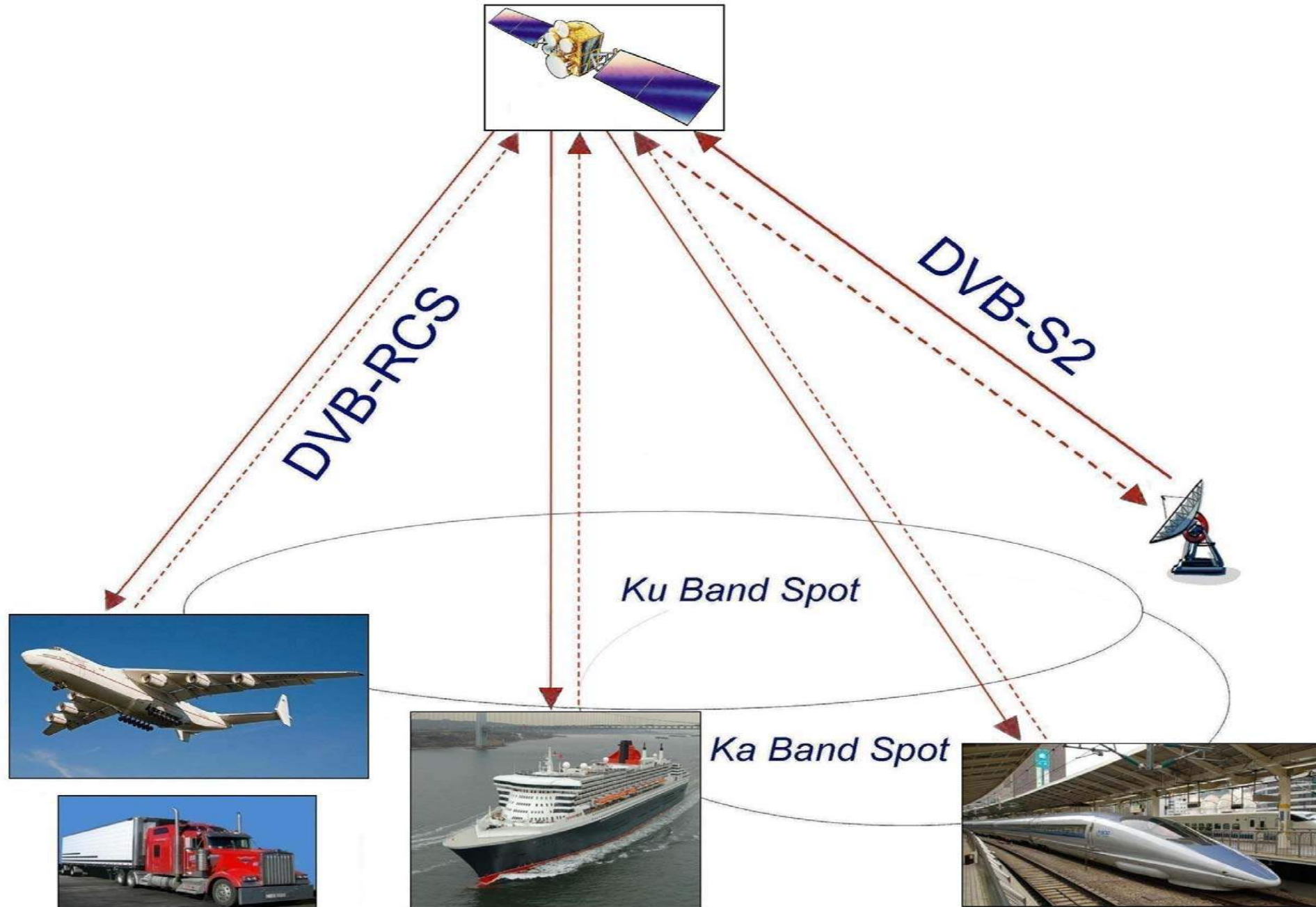
Digital Video Broadcasting-Return Channel via Satellite (DVB-RCS) Solutions



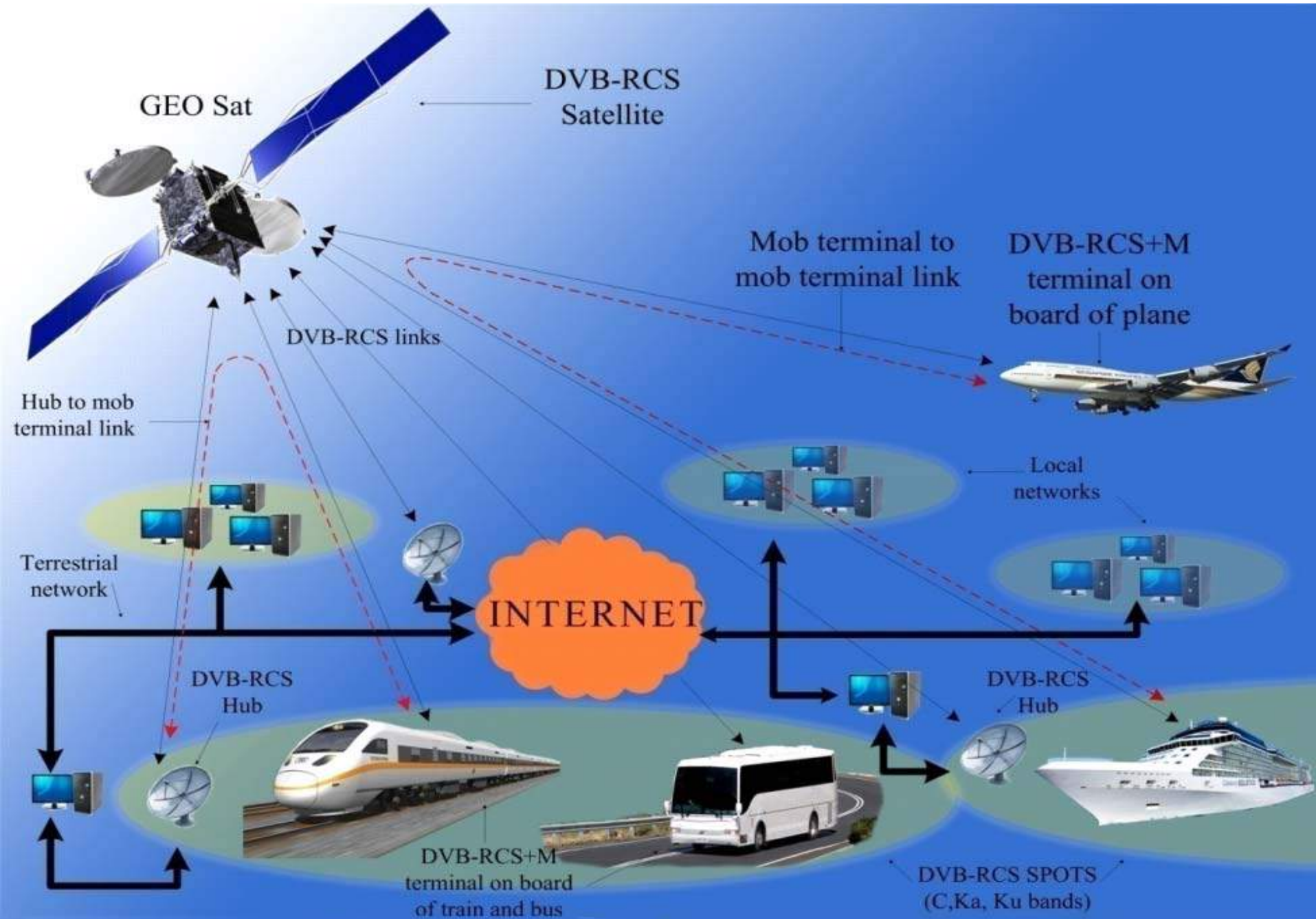
DVB-RCS Architecture for Mobile Broadband



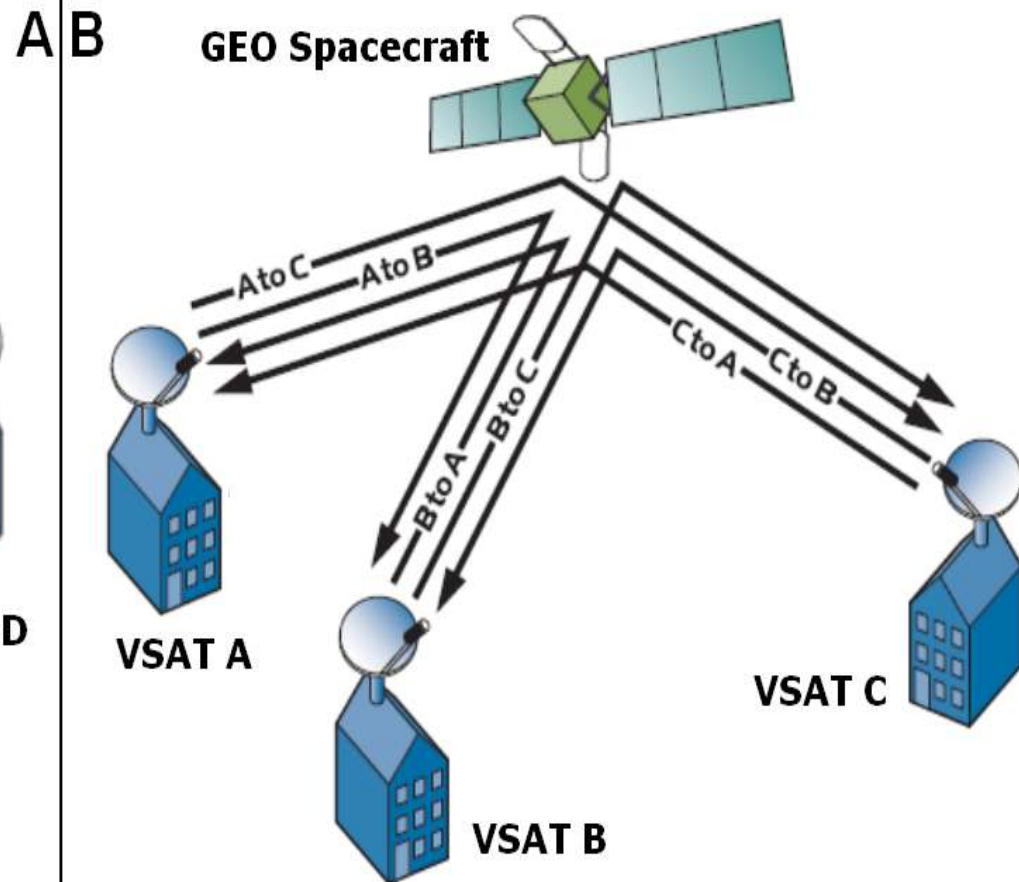
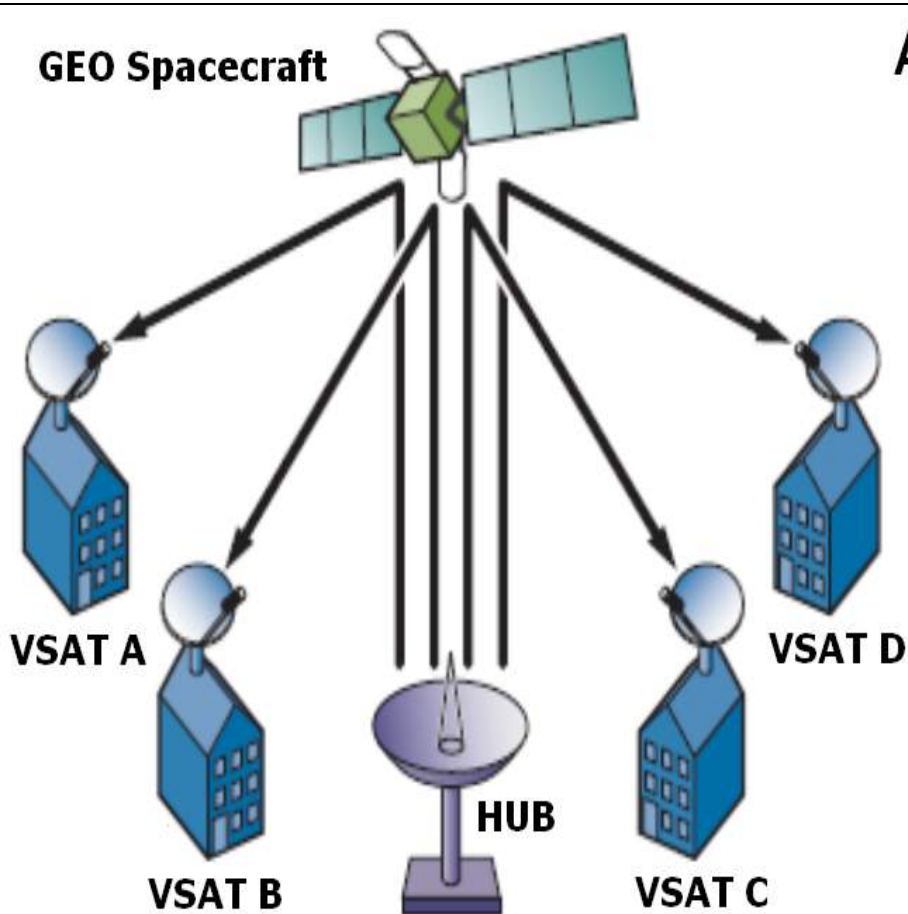
DVB-RCS for Mobile Users



Interactive Internet via DVB-RCS+M Backbone for Mobile Applications



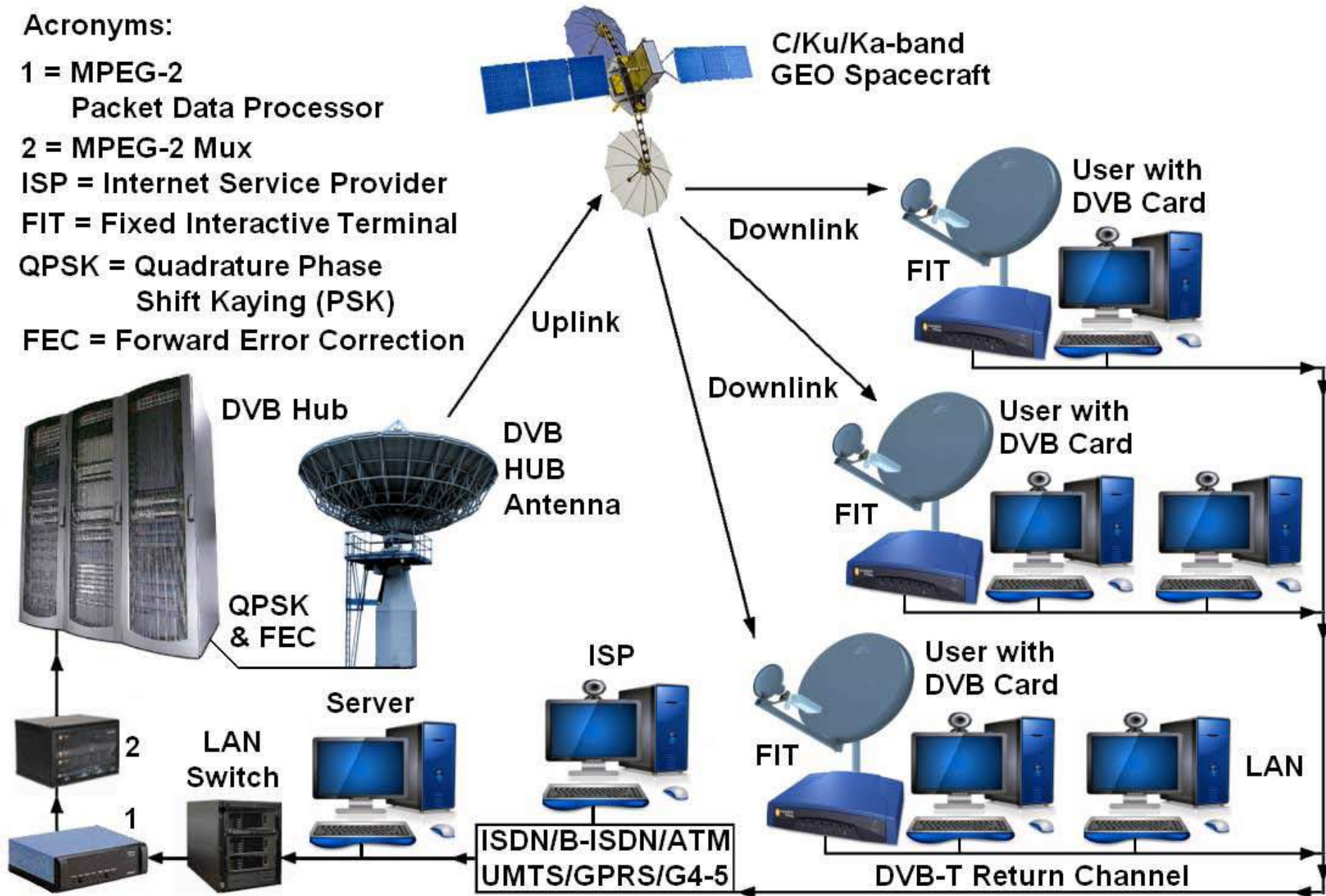
DVB-RCS VSAT (A) Star and (B) Mesh Connectivity with GEO Spacecraft



Acronyms:
 1 = MPEG-2 Packet Data Processor
 2 = MPEG-2 Mux
 ISP = Internet Service Provider
 FIT = Fixed Interactive Terminal
 QPSK = Quadrature Phase Shift Kaying (PSK)
 FEC = Forward Error Correction

The diagram illustrates the architecture of a DVB-T system. At the top, a **C/Ku/Ka-band GEO Spacecraft** is shown. It receives an **Uplink** from a **DVB Hub** on the ground. The DVB Hub consists of a **DVB HUB Antenna** and a **QPSK & FEC** block. The ground station also includes a **Server**, a **LAN Switch**, and two processing blocks labeled **1** and **2**. The ground station is connected to an **ISP** (Internet Service Provider) and a **LAN**. The spacecraft provides **Downlink** services to three types of users: **User with DVB Card**, **User with DVB Card**, and **User with DVB Card**. Each user setup includes a **FIT** (Fixed Interactive Terminal) and a computer. A **DVB-T Return Channel** is shown at the bottom, connecting the users back to the ground station. The return channel is labeled with **ISDN/B-ISDN/ATM** and **UMTS/GPRS/G4-5**.

FEC = Forward Error Correction



First Generation of DVB-RCS and DVB-S Interactive VSAT Network

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

R-u = Return uplink

ISP = Internet Service Provider

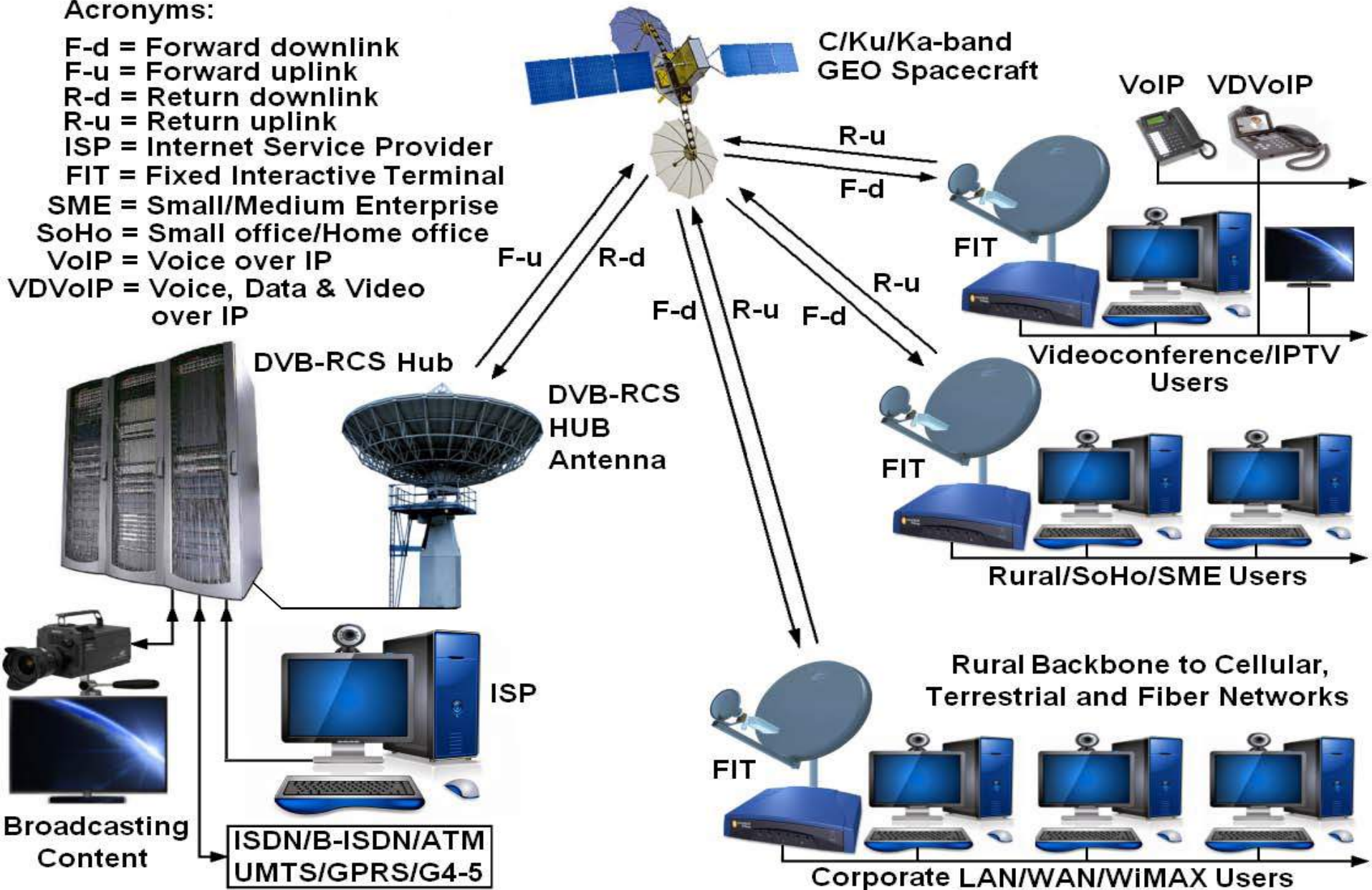
FIT = Fixed Interactive Terminal

SME = Small/Medium Enterprise

SoHo = Small office/Home office

VoIP = Voice over IP

VDVoIP = Voice, Data & Video over IP



Second Generation of DVB-RCS and Interactive VSAT Network with Constant Coding and Modulation (CCM)

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

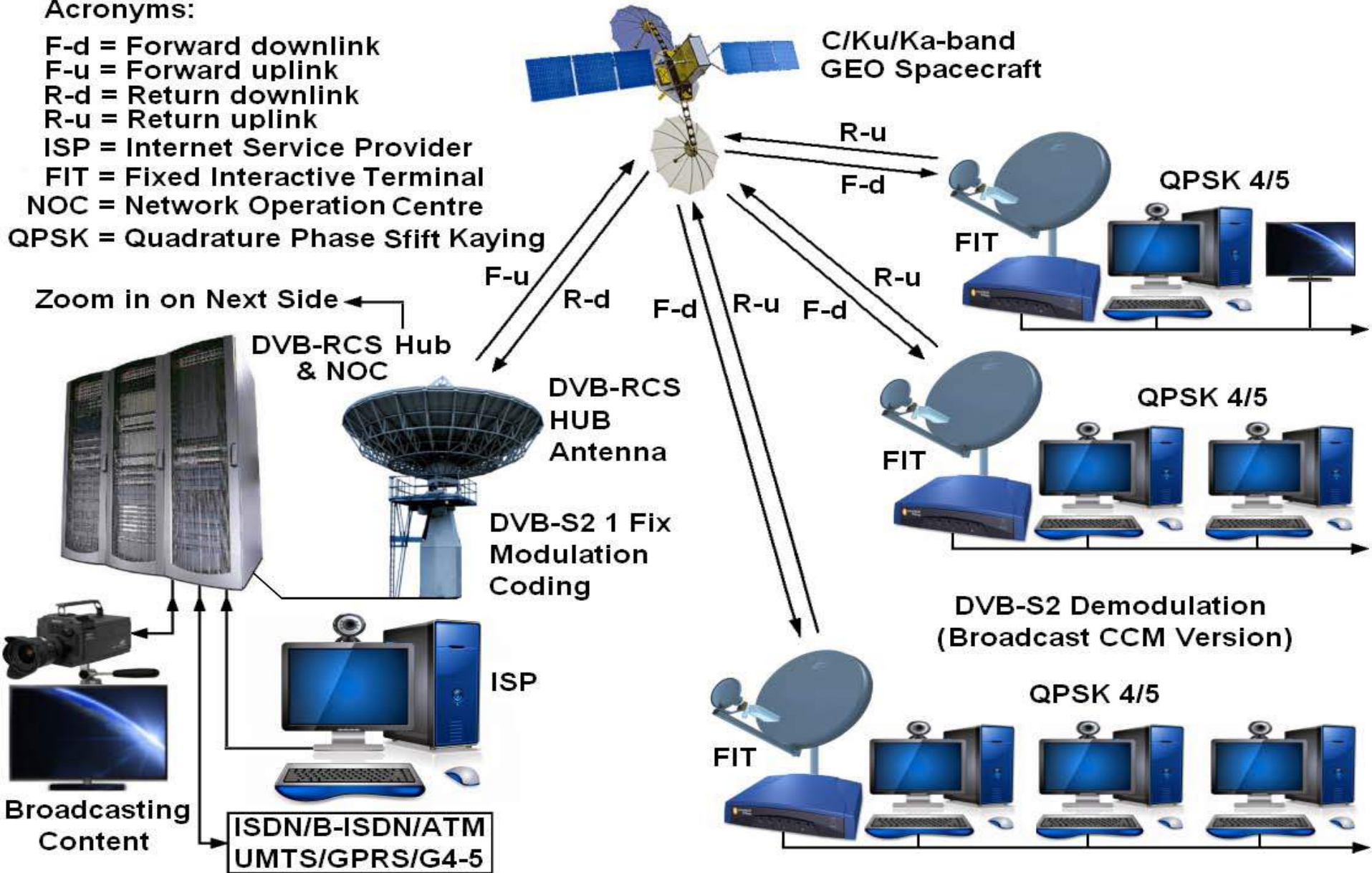
R-u = Return uplink

ISP = Internet Service Provider

FIT = Fixed Interactive Terminal

NOC = Network Operation Centre

QPSK = Quadrature Phase Shift Keying



Inter Generation of DVB-RCS and Interactive VSAT Network with Variable Coding and Modulation (VCM)

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

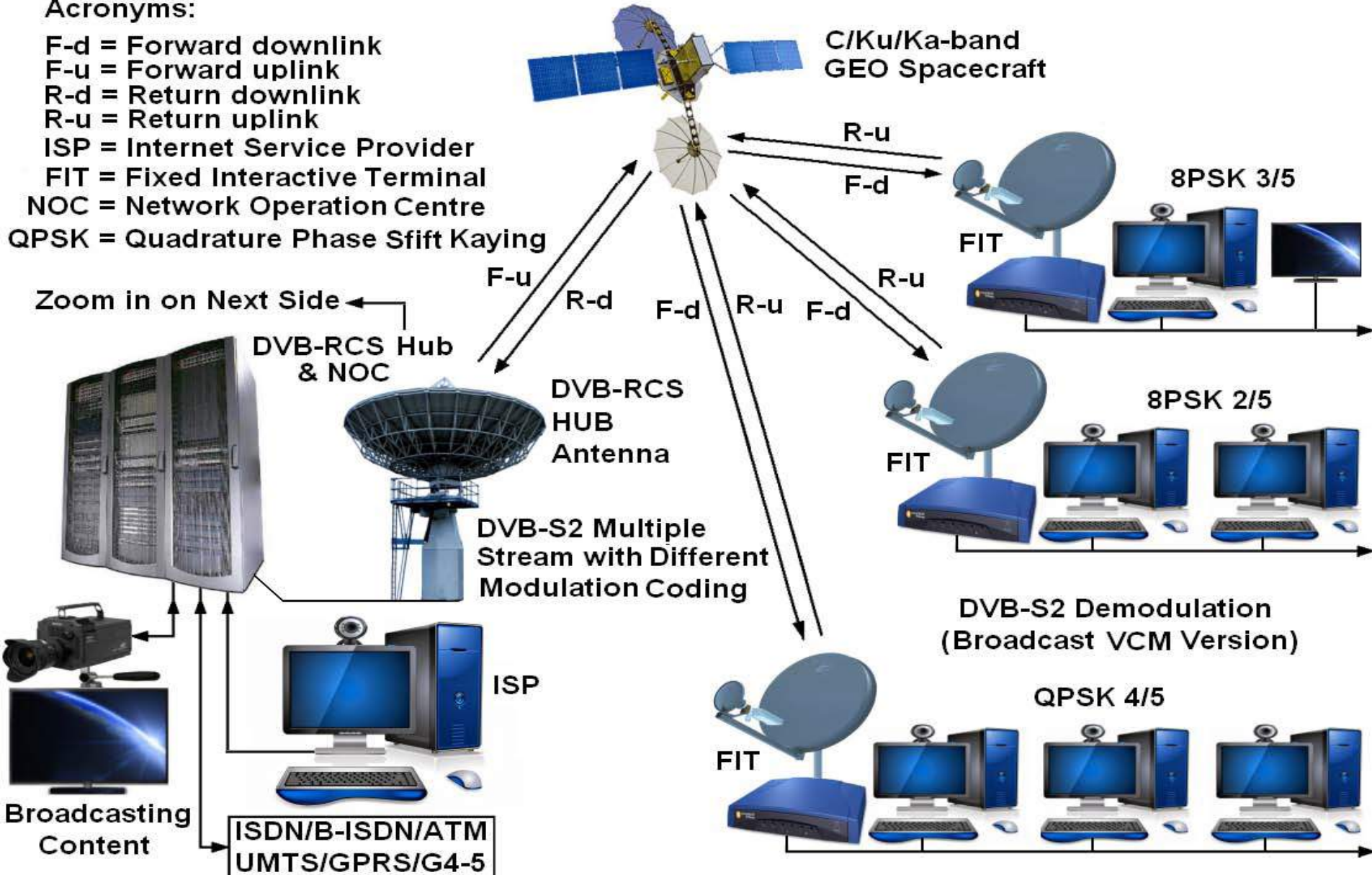
R-u = Return uplink

ISP = Internet Service Provider

FIT = Fixed Interactive Terminal

NOC = Network Operation Centre

QPSK = Quadrature Phase Shift Keying



Third Generation of DVB-RCS and Interactive VSAT Network with Adaptive Coding and Modulation (ACM)

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

R-u = Return uplink

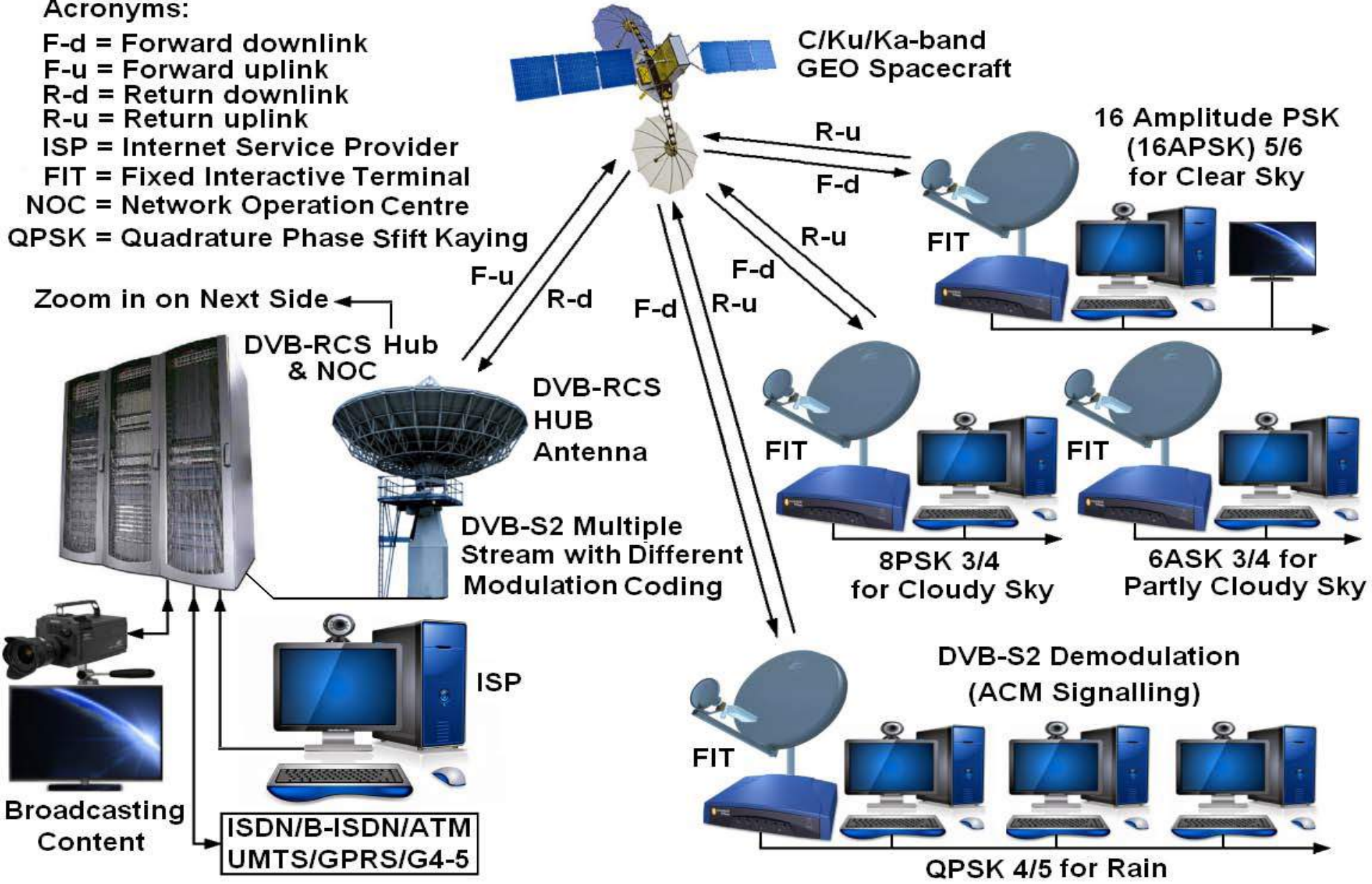
ISP = Internet Service Provider

FIT = Fixed Interactive Terminal

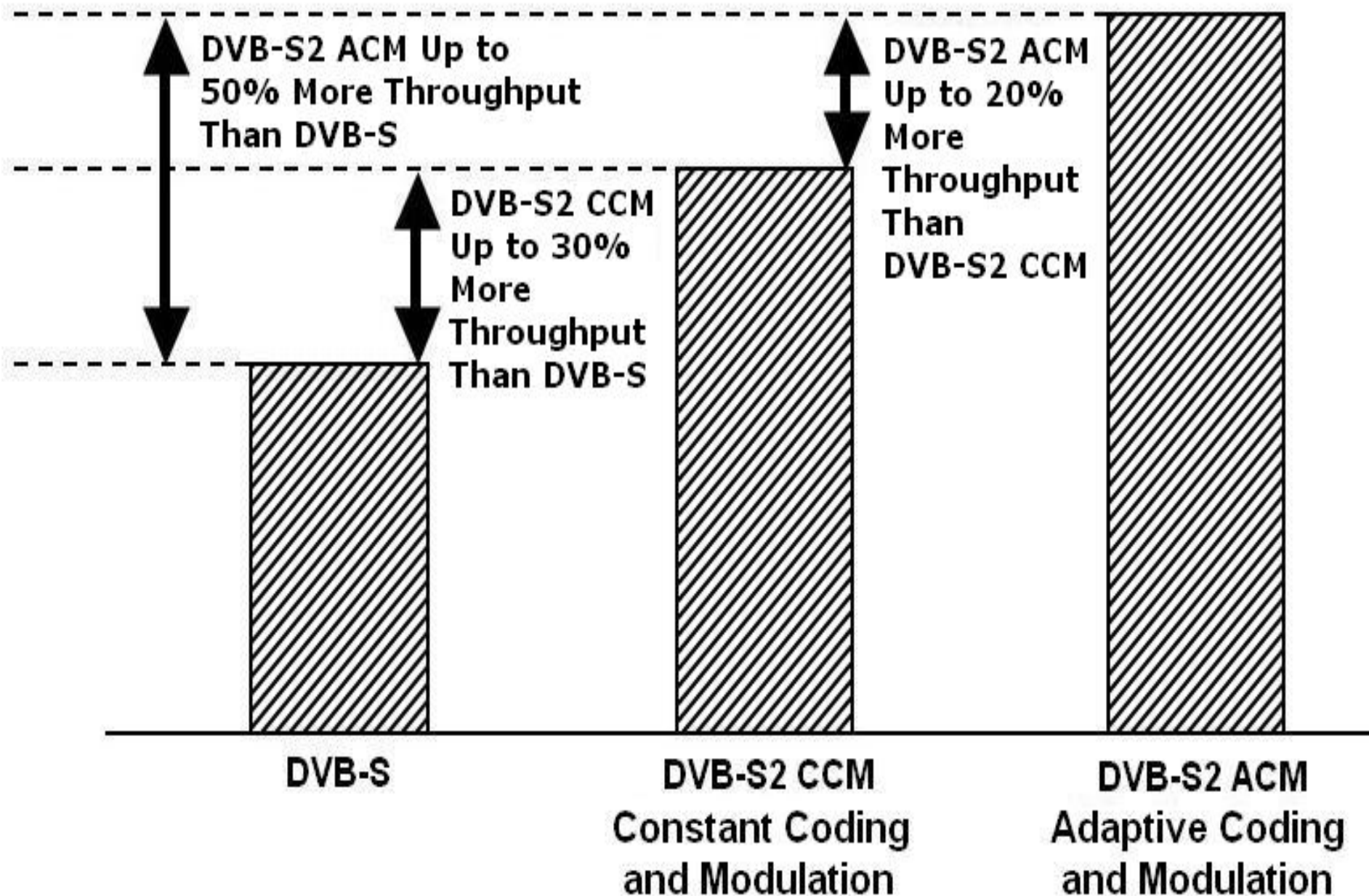
NOC = Network Operation Centre

QPSK = Quadrature Phase Shift Keying

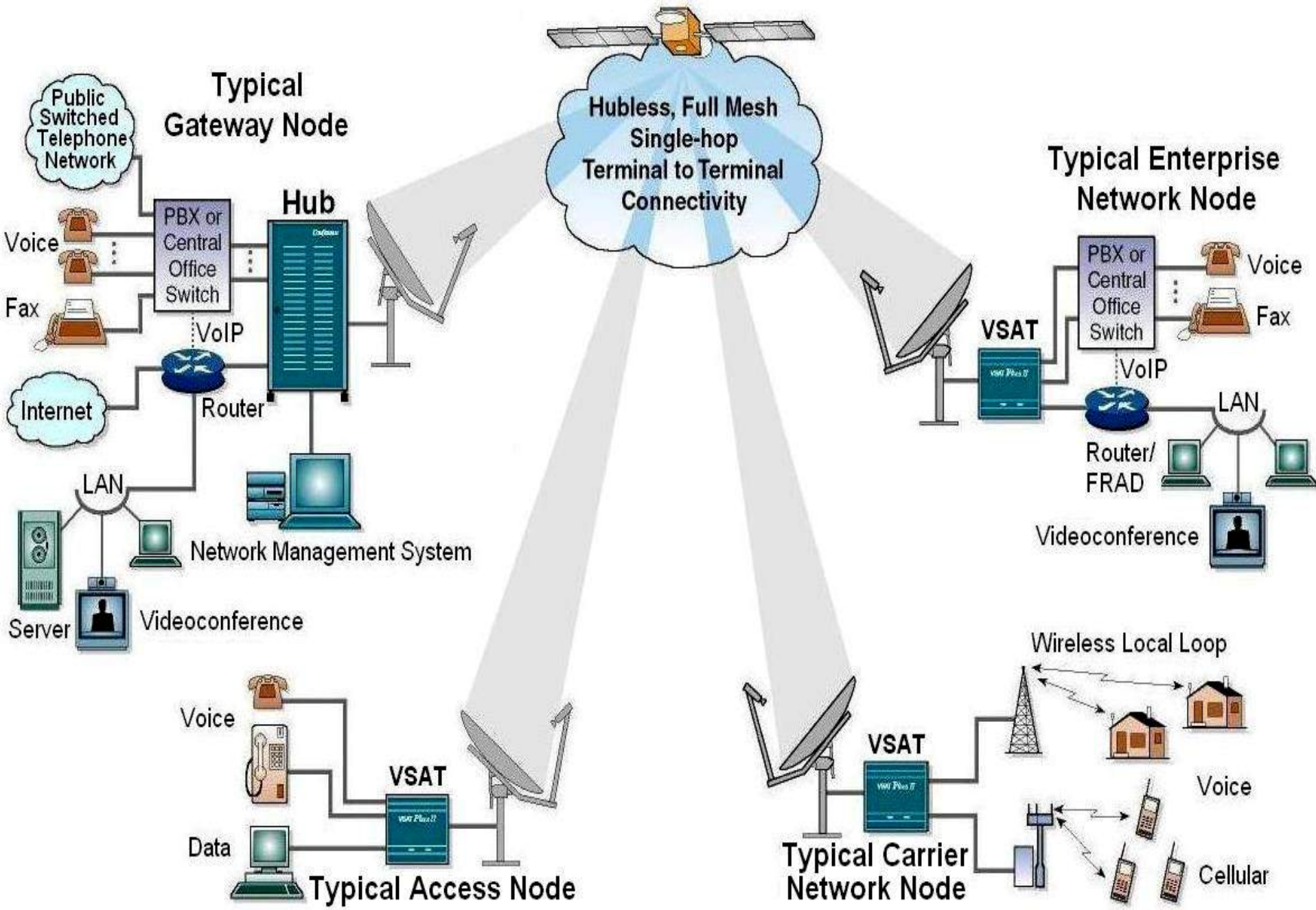
Zoom in on Next Side



Summary of DVB-S2 ACM Savings



DVB-RCS/S2 VSAT Network Configuration



DVB-RCS DVB-S2 Network for Fixed Applications

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

R-u = Return uplink

ISP = Internet Service Provider

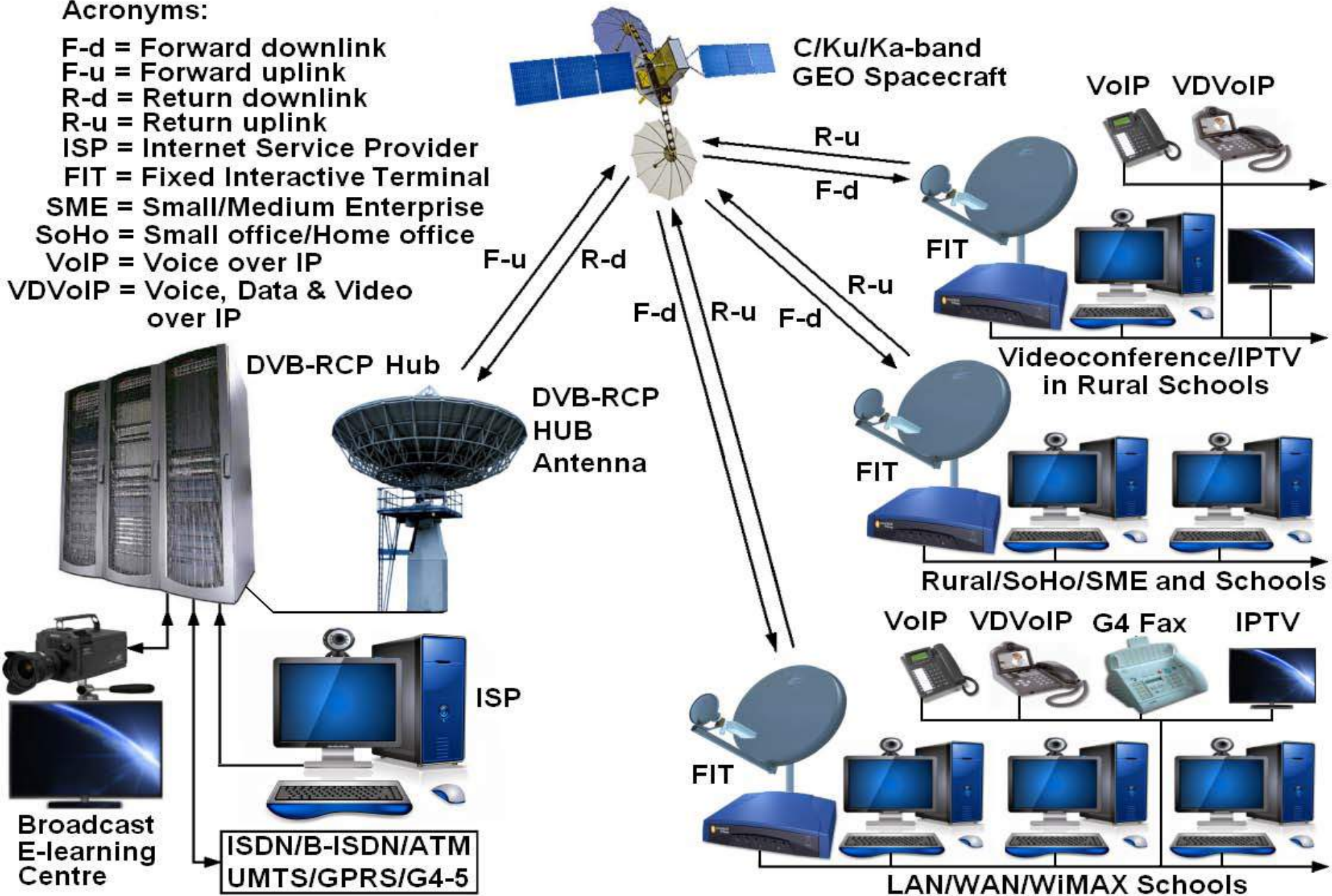
FIT = Fixed Interactive Terminal

SME = Small/Medium Enterprise

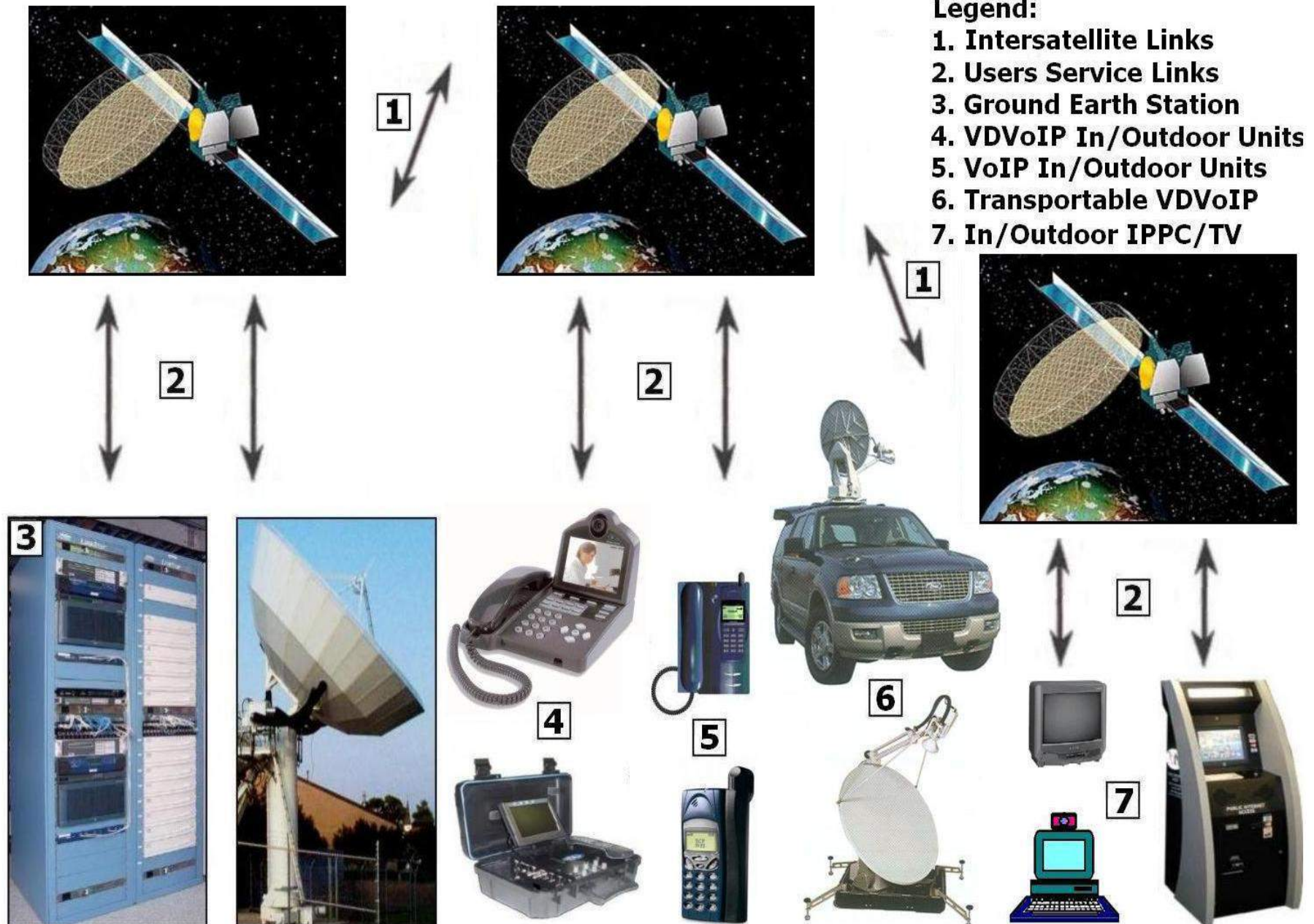
SoHo = Small office/Home office

VoIP = Voice over IP

VDVoIP = Voice, Data & Video over IP



DVB-RCS for Fixed and Portable Users



DVB-RCS DVB-S2 Network for Mobile Applications

Acronyms:

ISP = Internet Service Provider

IPTV = IP Television

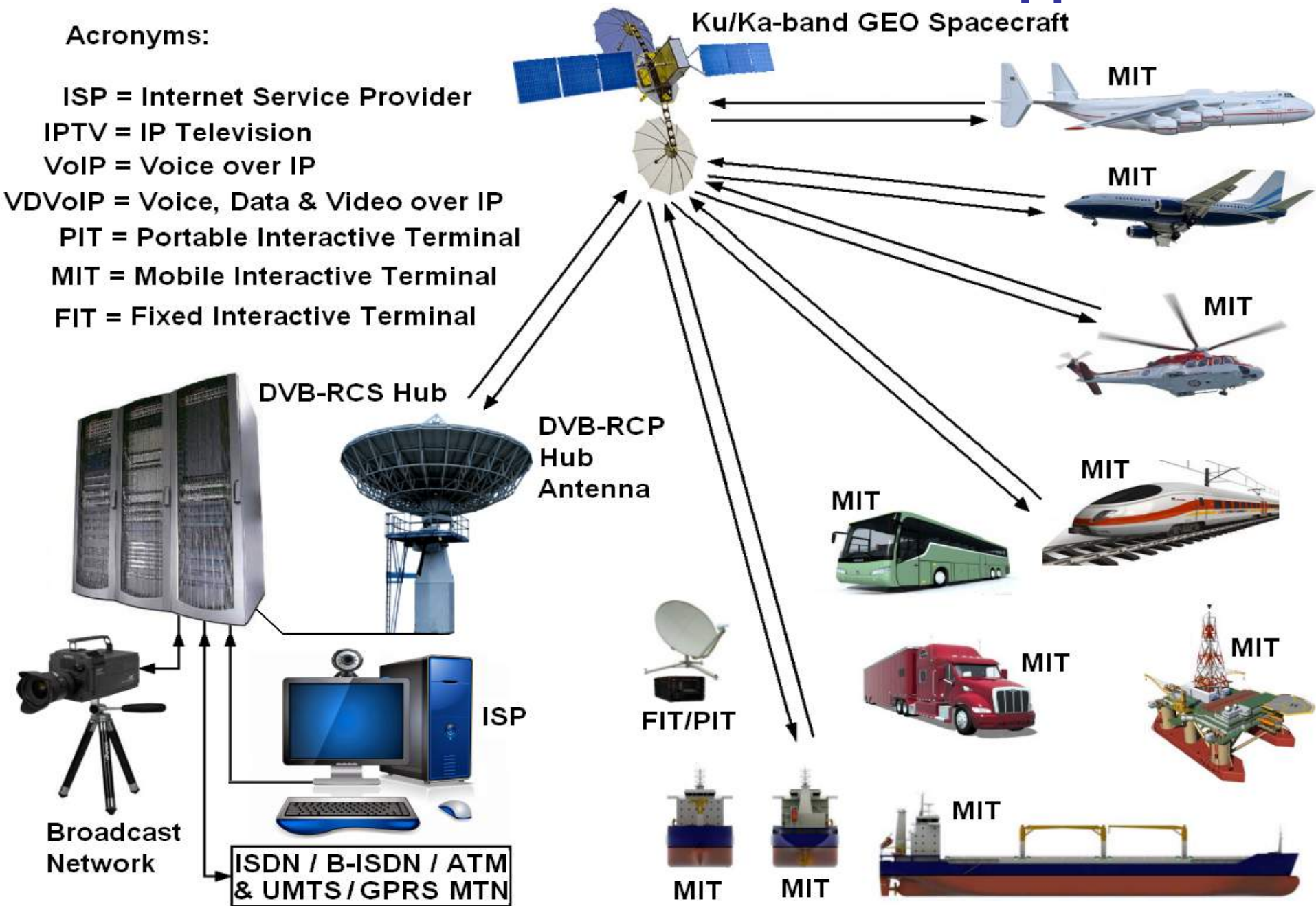
VoIP = Voice over IP

VDVoIP = Voice, Data & Video over IP

PIT = Portable Interactive Terminal

MIT = Mobile Interactive Terminal

FIT = Fixed Interactive Terminal



DVB-RCS LAN for Military Applications

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

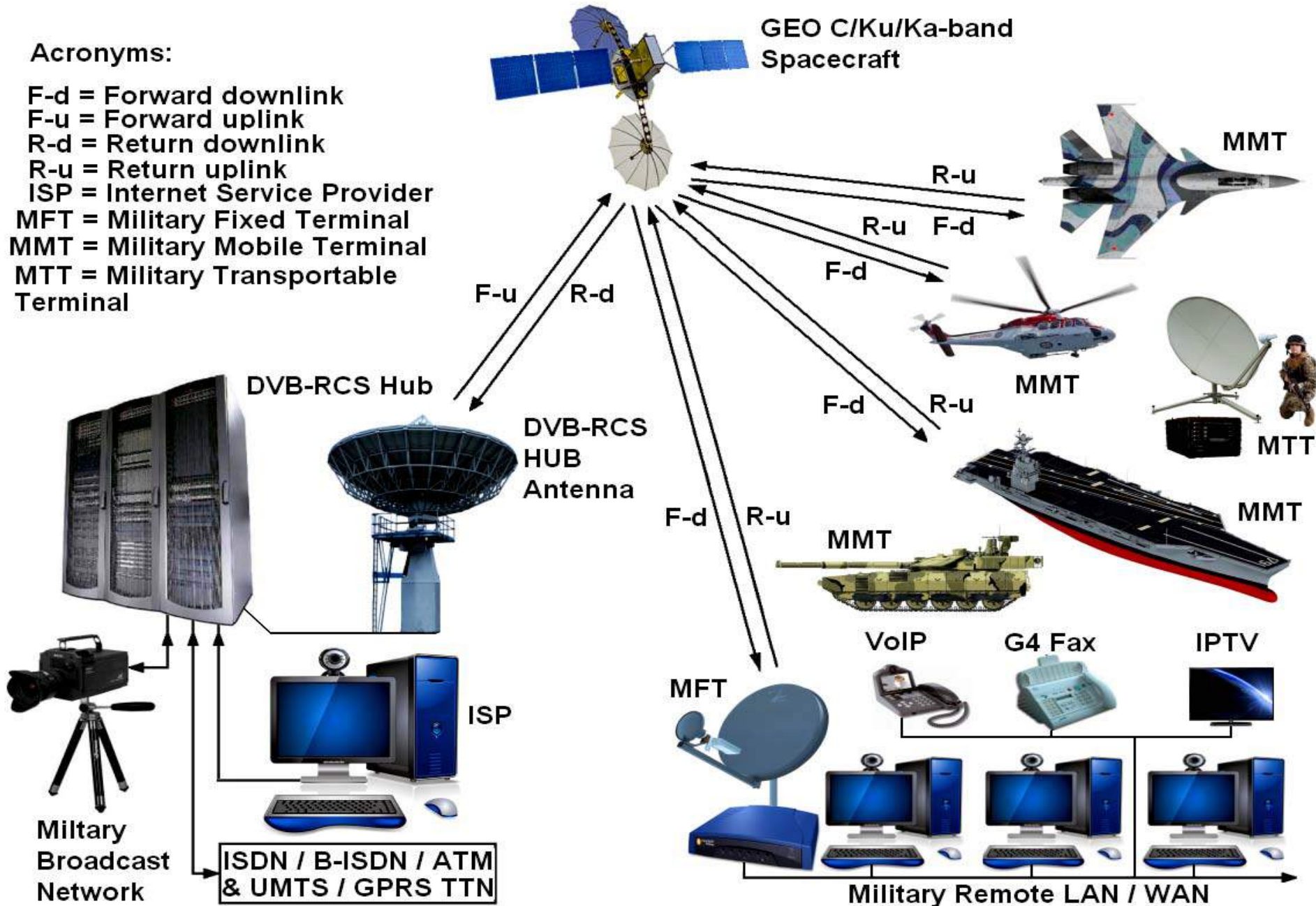
R-u = Return uplink

ISP = Internet Service Provider

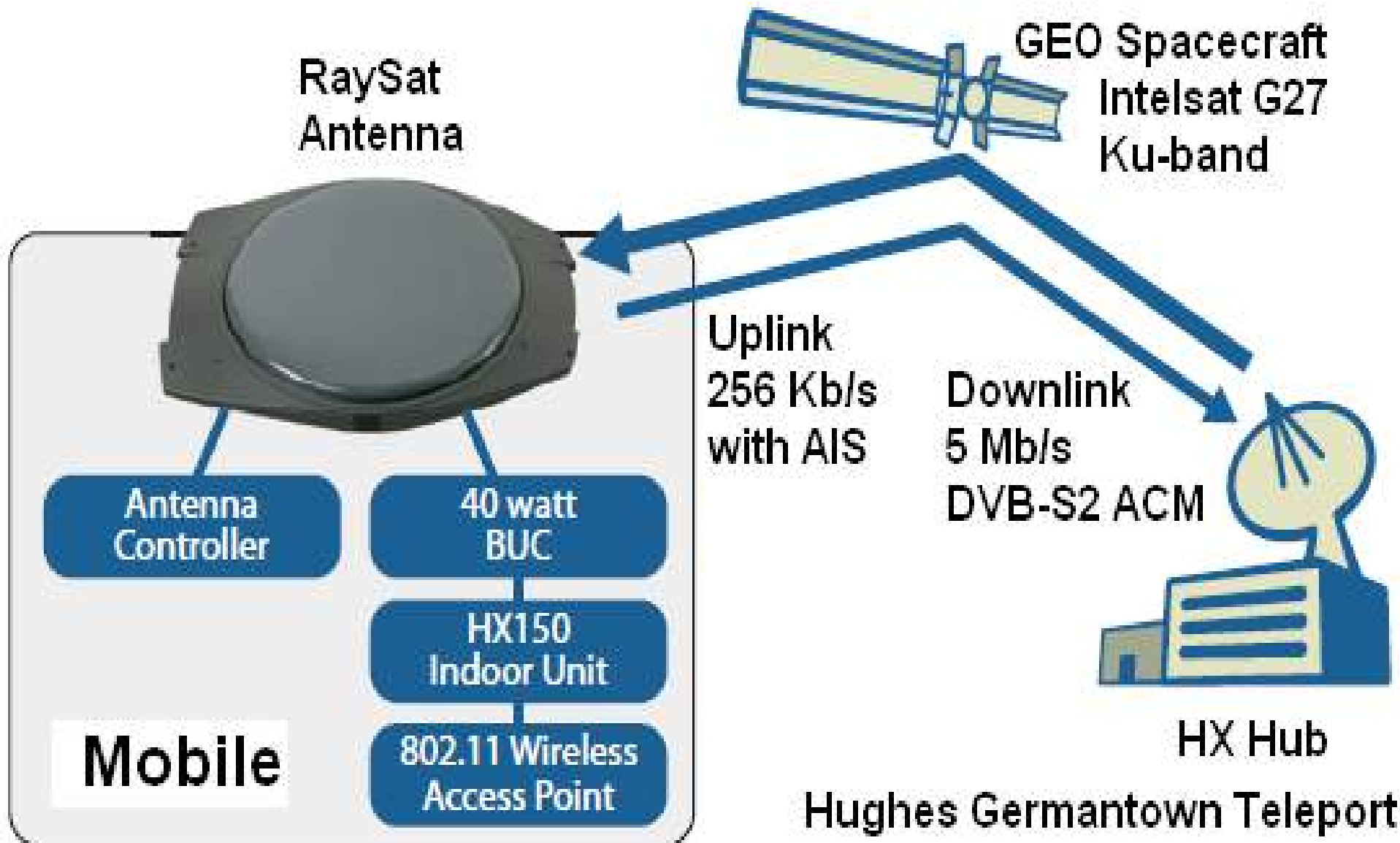
MFT = Military Fixed Terminal

MMT = Military Mobile Terminal

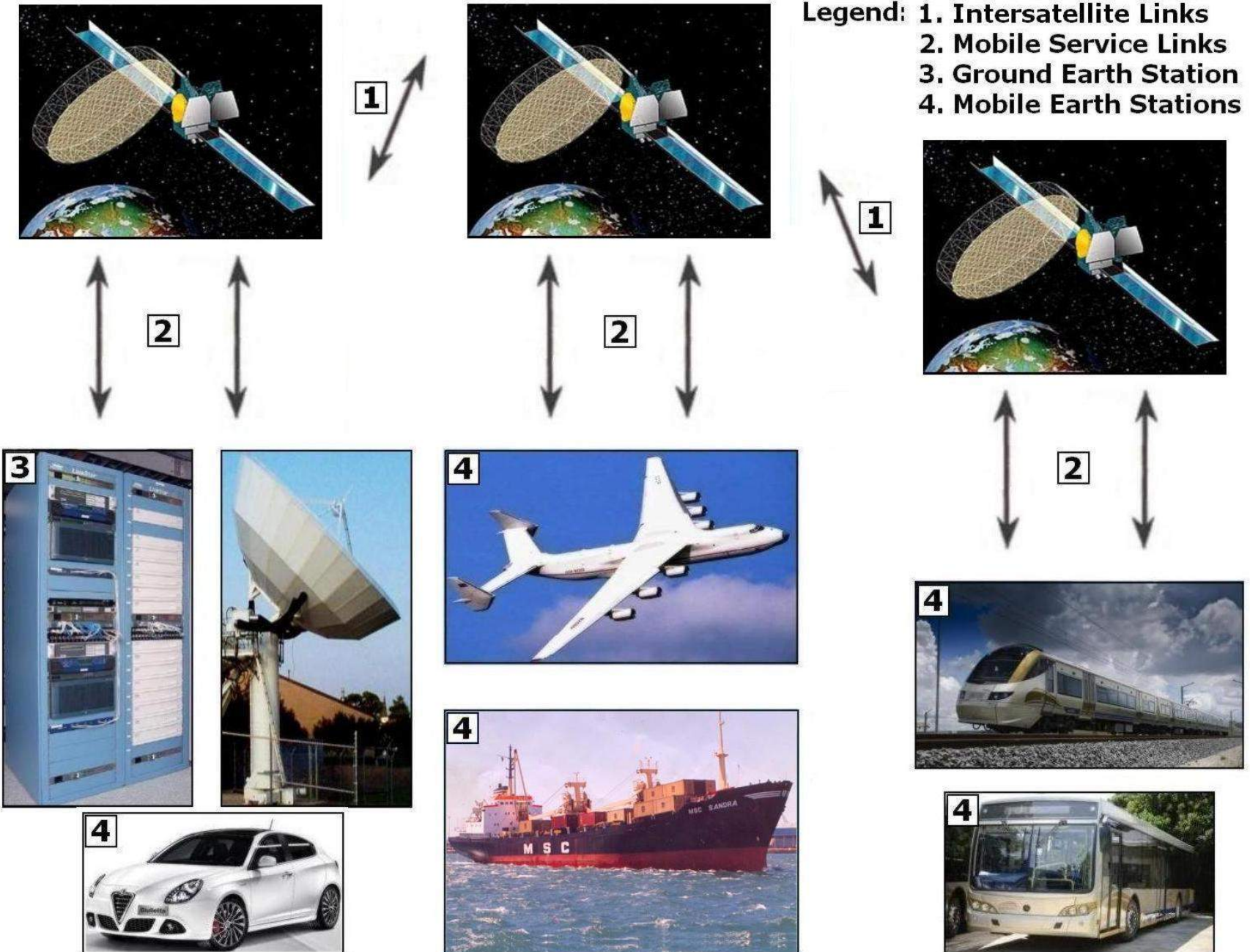
MTT = Military Transportable Terminal



DVB-RCS Mobile Network Architecture



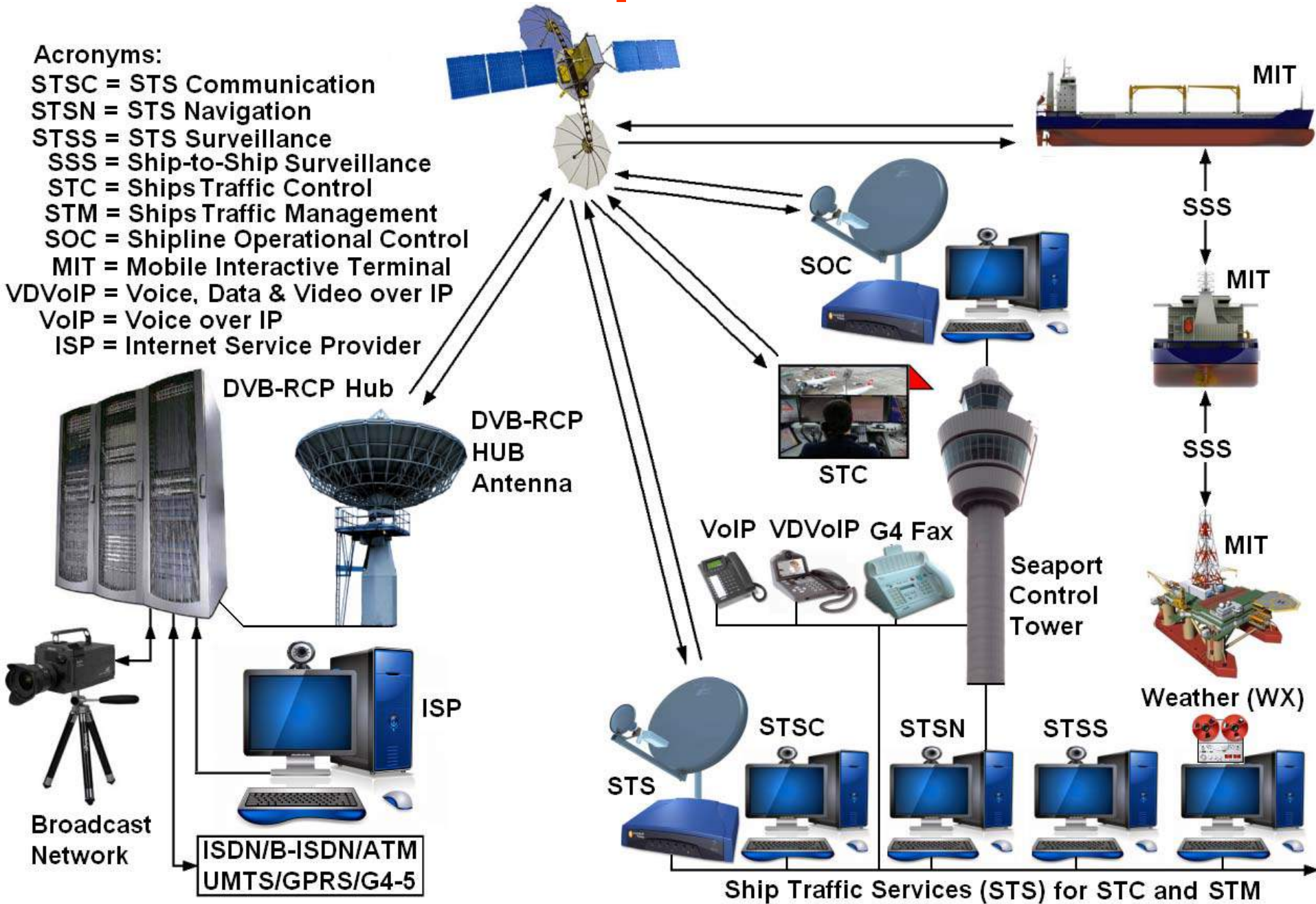
DVB-RCS for Mobile Users



DVB-RCS for Seaports Connectivities

Acronyms:

STSC = STS Communication
 STSN = STS Navigation
 STSS = STS Surveillance
 SSS = Ship-to-Ship Surveillance
 STC = Ships Traffic Control
 STM = Ships Traffic Management
 SOC = Shipline Operational Control
 MIT = Mobile Interactive Terminal
 VDVoIP = Voice, Data & Video over IP
 VoIP = Voice over IP
 ISP = Internet Service Provider



DVB-RCS for Airports Connectivities

Acronyms:

ATSC = ATS Communication

ATSN = ATS Navigation

ATSS = ATS Surveillance

AAS = Air-toAir Surveillance

ATC = Air Traffic Control

ATM = Air Traffic Management

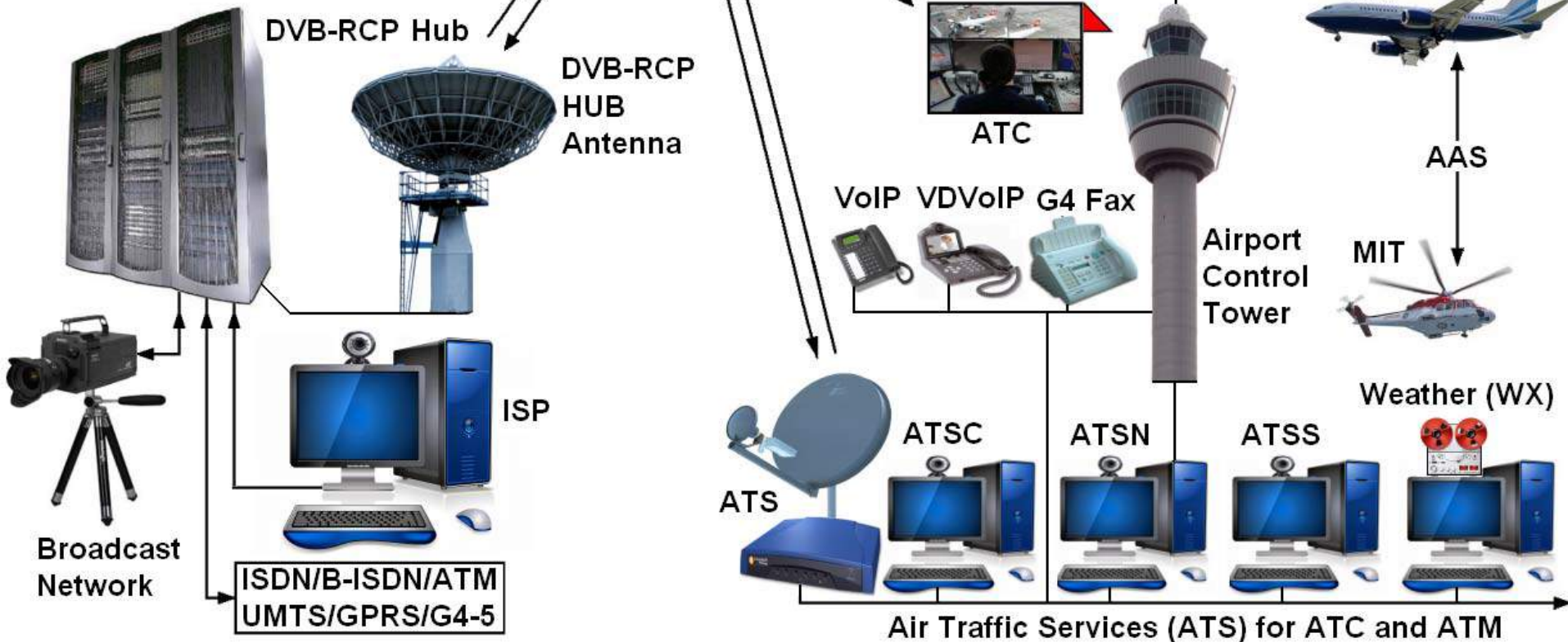
AOC = Airline Operational Control

MIT = Mobile Interactive Terminal

VDVoIP = Voice, Data & Video over IP

VoIP = Voice over IP

ISP = Internet Service Provider



DVB-RCS Bands and Backhaul

HUB provides Voice, Data and Video over IP (VDVoIP) & IPTV on C (4-8 GHz), Ku (12-18 GHz) or Ka-band (27- 40 GHz) antenna interfaces and extends the Terrestrial Broadband, ISP, Video Broadcasting, UMTS/GPRS (Universal Mobile Telecommunications System/General Packet Radio Service), Asynchronous Transfer Mode (ATM), ISDN/ADSL, Fiber Optic Lines, Terrestrial Telecommunication Network (TTN), Cellular Networks, Virtual Private Networks (VPN), etc.

DVB-RCS HUB Terminals of A) Advantech; B) ViaSat and C) Hughes

A




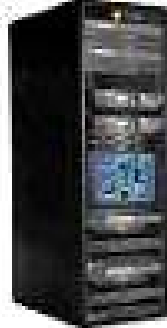


B



C



Advantech Family of DVB-RCS HUB Terminals

Type of Terminal	Discovery	Challenger	Millennium	Raptor
Advantech Hub Configuration				
Type of Service				
	Standard Rates Supported			
Throughput Mb/s*	155	n x 155	n x 155	155
Forward Link Mb/s*	135	n x 135	n x 135	135
Return Link Mb/s*	24	48 (2x24)	120 (5x24)	24
# of Terminals Supported	10 – 500	100 – 1,500	1,000 +	10 – 500
*Maximum. Other rates are available on special order. n = number of outbound links				

Main Components of the HUB

- **Network Control Centre (NCC)** interfaces Operator and HUB for billings assuring traffic management, supervision, protocol handling and bandwidth management.
- **Forward Link Subsystem (FLS)** provides the encapsulation of IP transfer of data packets into adequate MPEG frames, MPEG multiplexer and modulator according to the DVB-S transmitting specification.
- **Return Link Subsystem (RLS)** collects the Turbo-coded MF-TDMA bursts transmitted by all the terminals in the network. Each one of RLS receivers can be individually configured to operate at any frequency, bit-rate or coding rate. The modular design of the RLS enables the system to scale from small to very large networks.
- **Reference and Synchronization Subsystem (RSS)** delivers the synchronization and timing information in the gateway for synchronization of the entire satellite network.
- **Remotes or VSAT units** consist of two main transceiver units, the Indoor Unit (IDU) and the Outdoor Unit (ODU).

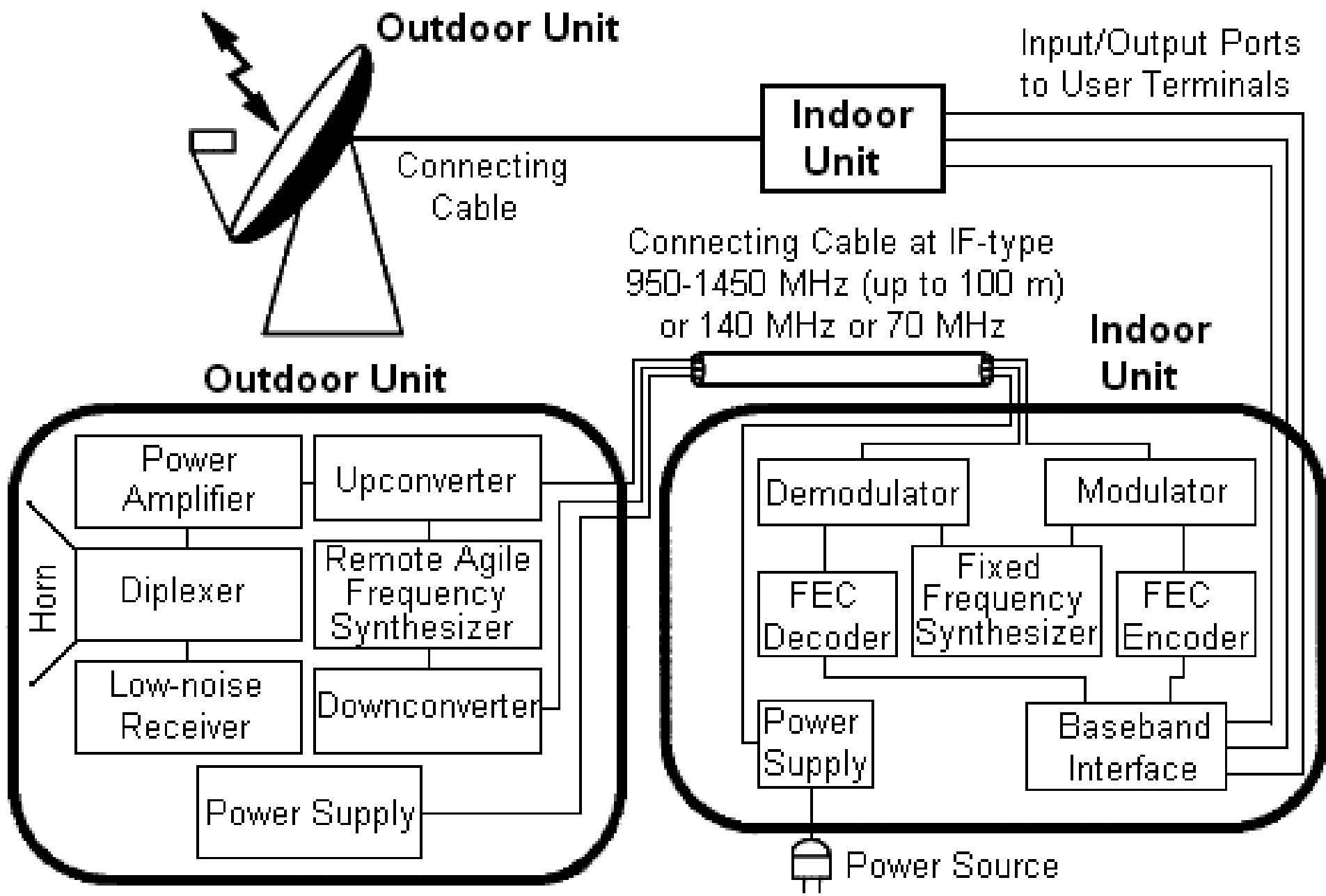
Characteristics of HUB Network

- Up to 1Gb/s: 5 x 200 Mbps Forward Links capacity with 5:1 redundancy and up to 3 x 240 Mb/s Return Links per rack capacity
- Downstream interface is MPEG/DVB-S (Moving Picture Expert Group/DVB-Satellite)
- Upstream interface is DVB-RCS
- Optimized for IP (Internet Protocol) and multi-media contenting Remotes or Satellite Interactive Terminals (SIT) or VSAT
- Open standard design (DVB-RCS) Broadband & Multimedia
- Qualified with multiple IP/DVB broadcast platform vendors
- The System is designed to support up to 80,000 SIT units
- Every Remote Terminal is able to support many PC or IPTV in LAN, depending on used bandwidth
- DVB-S can be upgraded by the most effective and cost less 2nd generation DVB-S2 CCM and 3rd generation DVB-S2 ACM platform, forward and reverse compatible

DVB-RCS Service and Applications

- **Broadband Service Provider Platforms (SPP) for Urban, Rural, Remote and Mobile Applications of Multimedia IPTV & ISP**
- **Enterprises and Private Networks (EPN)**
- **Broadcasting and Content Distribution (BCD) of IPTV**
- **Satellite News Gathering (SNG)**
- **Satellite Emergency and Security Management (SESM)**
- **Global Satellite Augmentation System (GSAS)**
- **Defense Information Management (DIM)**

DVB-RCS Indoor and Outdoor Units



Satellite DVB-RCS Outdoors Unit (ODU) or Transceiver Antenna

The ODU is transceiver antenna, which can be installed on the roof or mast and may provide to Satellite Interactive Terminal (SIT) or Indoor Unit (IDU) the following features:

- Full DVB-RCS compliance and very easy to install with RF Range of C, Ku or Ka-band antenna sizes of 0.75 - 2.4 m.**
- Standard ODU/IDU interfaces ensure full compatibility with any DVB-RCS or VSAT modem.**
- Two-way enhanced DiSeqC control capability, which provide Interface between IDU and transmitter supporting automatic line-up function at installation.**

Using special Mobile satellite tracking antennas, SIT equipment can be installed as Mobile Interactive Terminals (MIT) on board Mobiles, such as ships, land road and rail vehicles (cars, trucks, busses and trains) and airplanes.

Satellite DVB-RCS Indoor Unit (IDU) or Satellite Transceiver

This unit can connect remote end-user PC LAN or IPTV via DVB-RCS Satellite Network and can be fitted in office or with some modification on onboard mobiles. It provides two-way Multimedia IP connection via satellite at C, Ku or K-band RF.

The IDU terminal can be supplied for either desktop or rack mounting and comes in a scalable choice of performance with a variety range of data IP throughputs from 4 to 25 Mb/s. It can serve for government, corporations, institutions, private companies or Small office Home office (SoHo) in mobile, Small to Medium-size Enterprise (SME), rural and remote environments offering an open-interface for high-capacity satellite broadband communications and IP access that bypasses the “last mile” bottleneck associated with terrestrial infrastructure.

The DVB-RCS IDU terminals are capable to provide RLSS service up to 100 PC in LAN customer network simultaneously with Ethernet interface or, let's say with PC and IPTV fixed units.

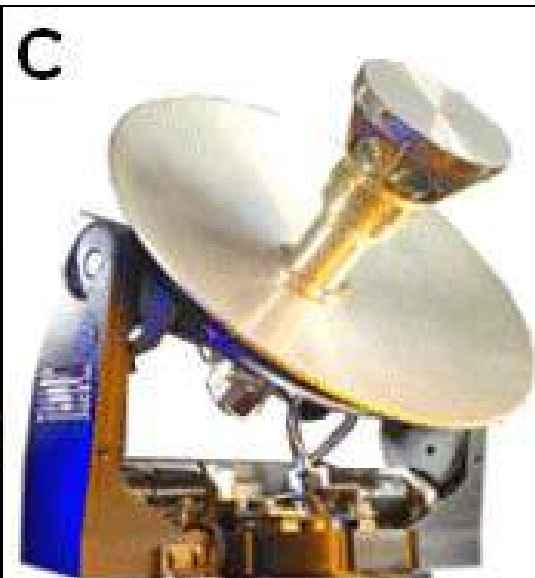
Remote IDU Terminals with Antenna ODU



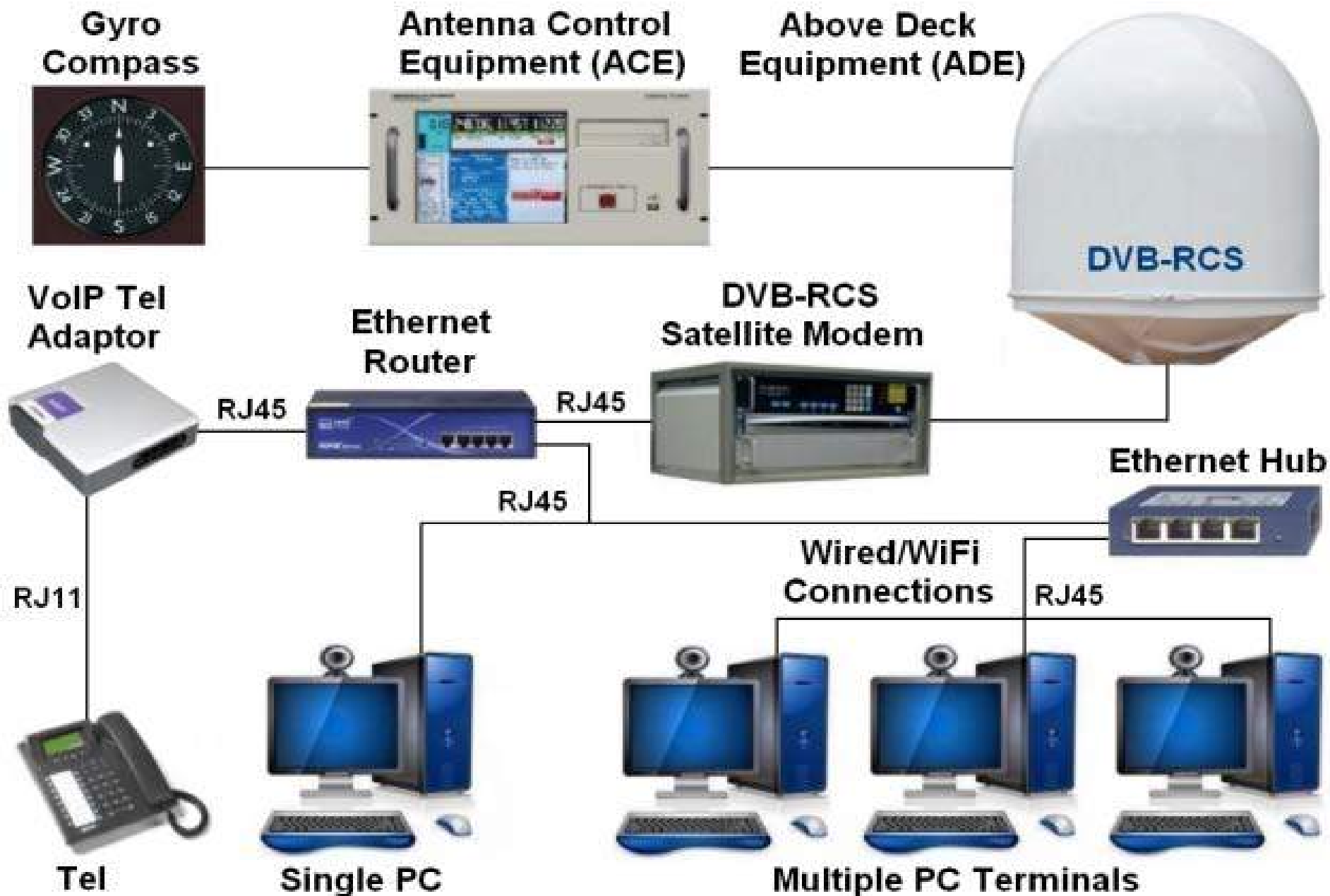
Satellite DVB-RCS MIT for Mobile and Remote Commercial and Military Applications

- The DVB-RCS MIT can be installed in mobiles, cars or somewhere in remote locations by utilization mobile, transportable and portable antenna systems for civilian applications suitable for two-way or interactive SNG, VDVVoIP and Audio, Data and Video (ADV) transmission.
- The Defense Information Management (DIM) solutions of DVB-RCS mobile and portable antenna equipment can be mounted in mobiles, cars, trucks or in remote locations by utilization of mobile, transportable and portable antennas for military applications suitable for ADV and VDVVoIP.

Broadband Antenna Systems for Ships (A), Trains or Busses (B) & Aircraft (C)



Maritime DVB-RCS



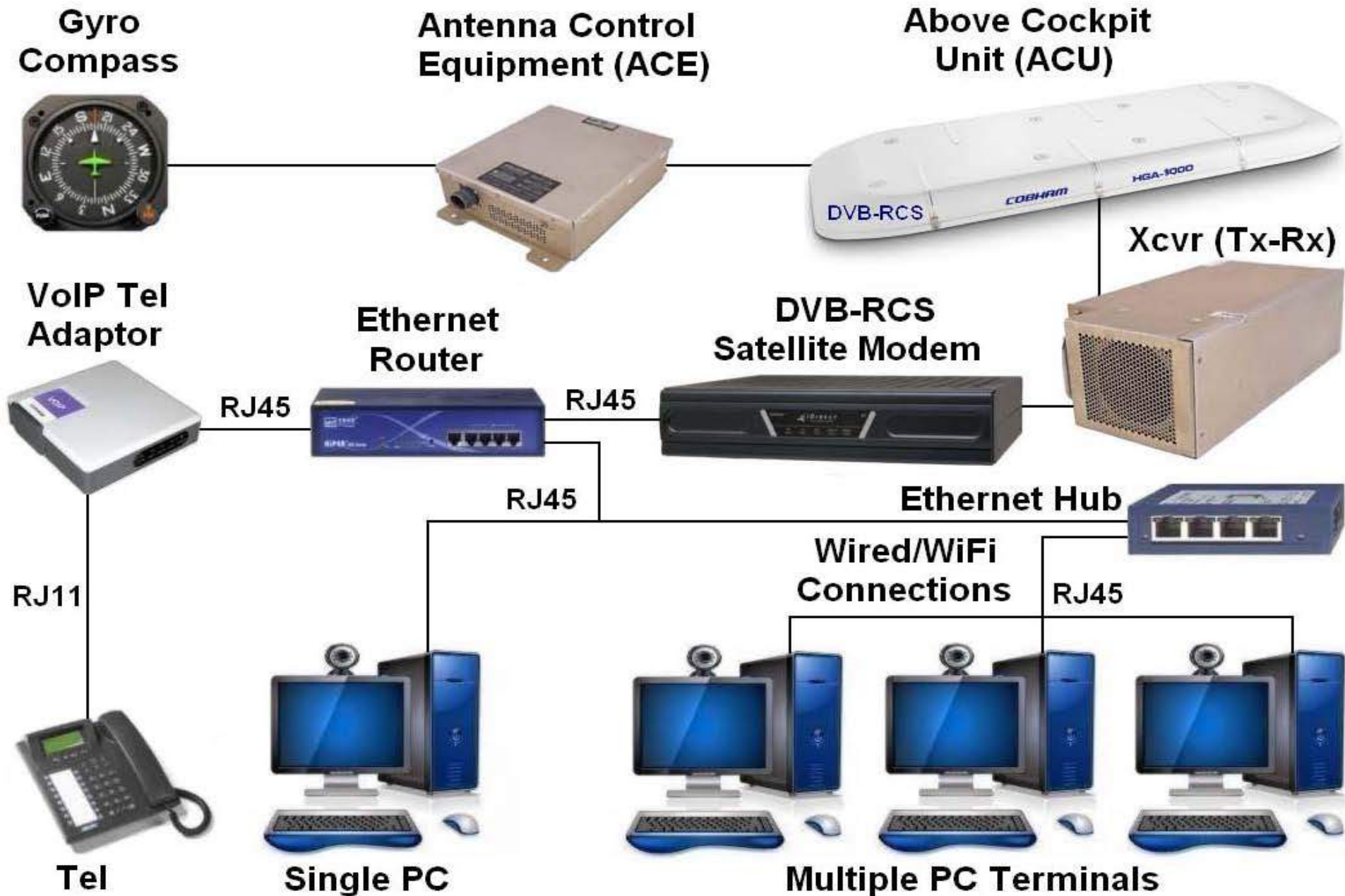
NERA DVB-RCS Ku-band Unit for Maritime Applications



KVI DVB-RCS Ku-band VSAT for Maritime Applications



Aeronautical DVB-RCS



ARINK DVB-RCS Ku-band Unit for Yonder Aeronautical Applications



DVB-RCS C, Ku and Ka-band (A) ViaSat and (B) Hughes Transceivers for Mobile Applications



DVB-RCS Transportable & Portable Antennas for Satellite News Gathering (SNG)



DVB-RCS Mobile and Portable Antennas for Military Applications



DVB-RCS Backbone to E-education Solutions

Acronyms:

F-d = Forward downlink

F-u = Forward uplink

R-d = Return downlink

R-u = Return uplink

ISP = Internet Service Provider

FIT = Fixed Interactive Terminal

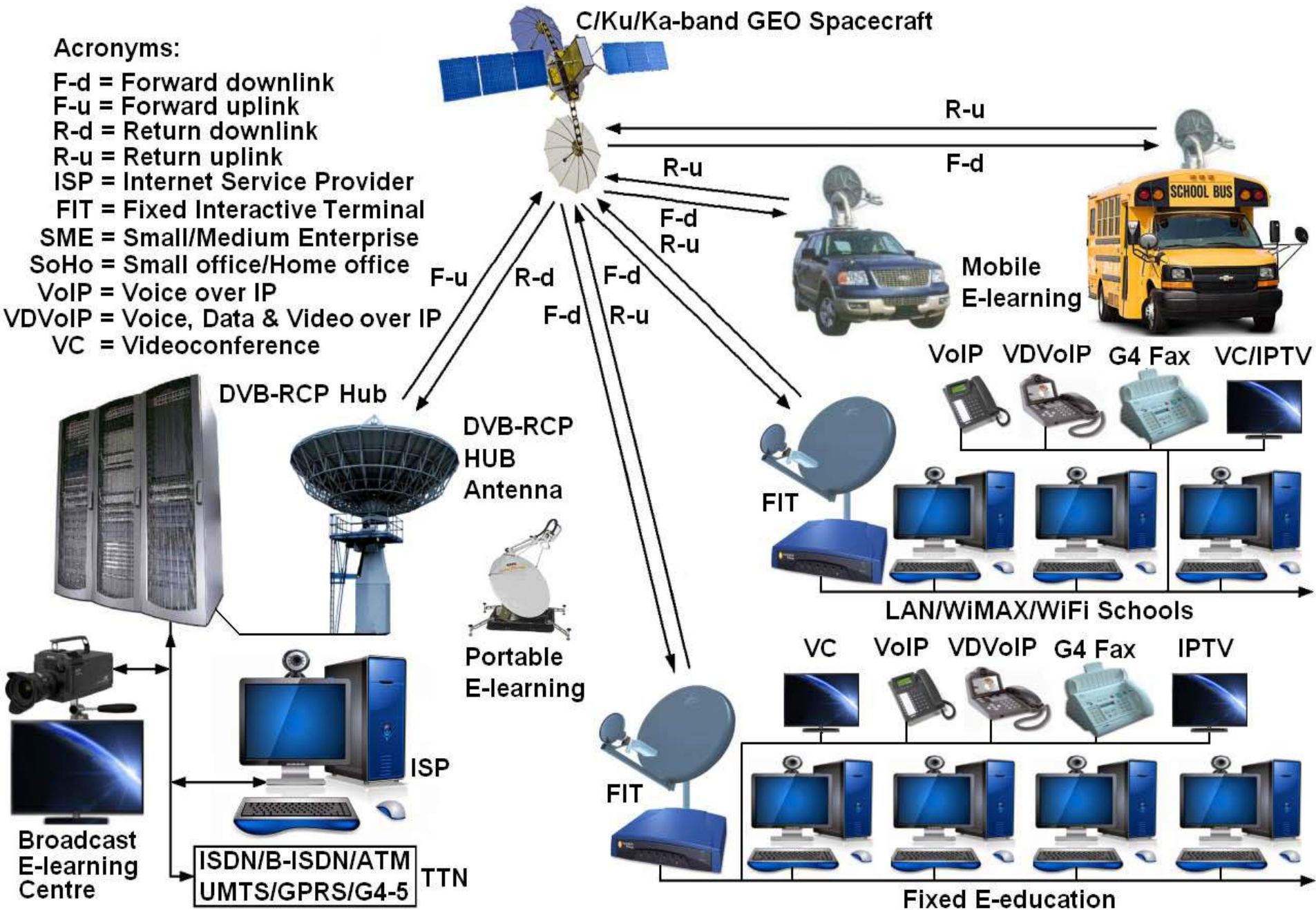
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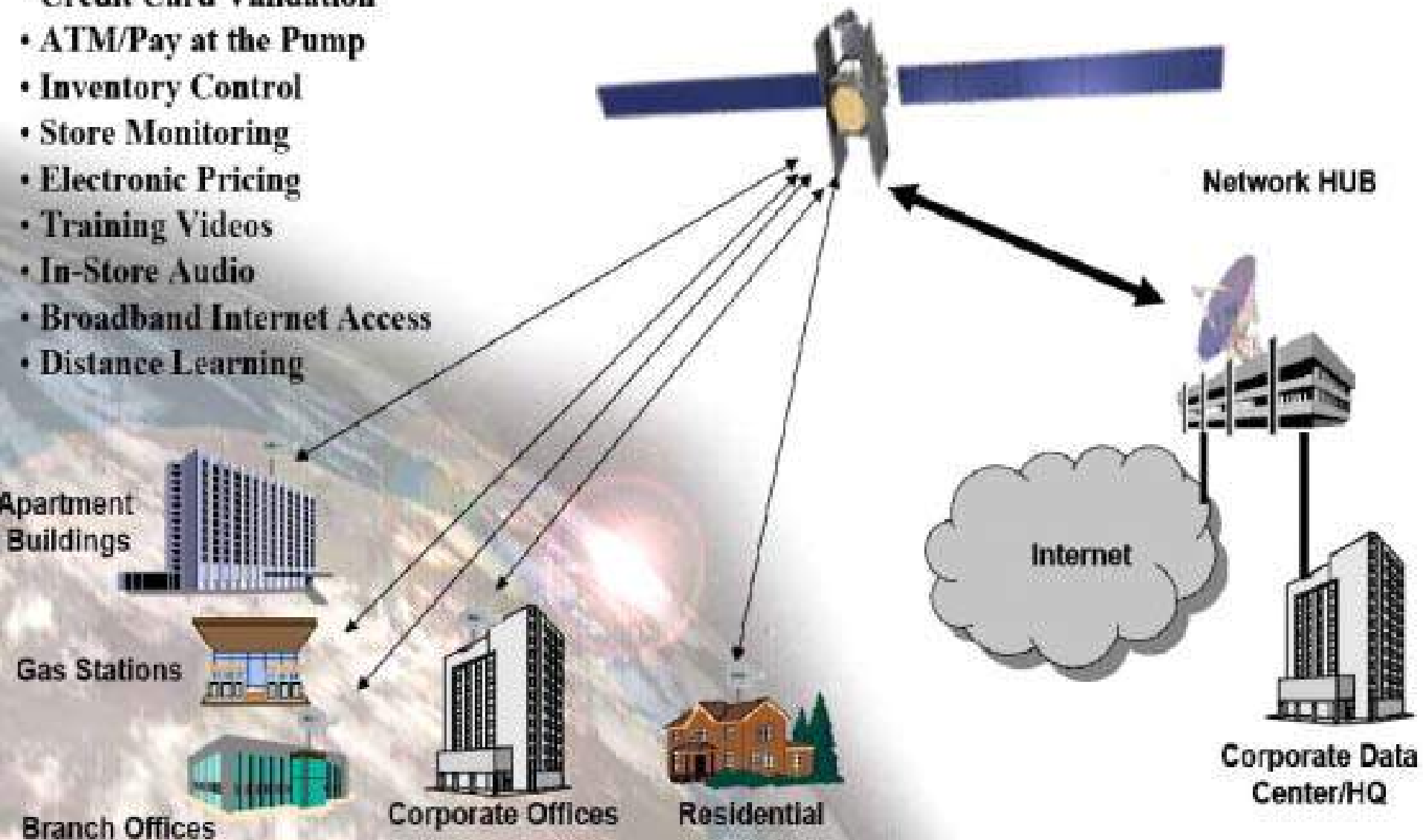
VC = Videoconference



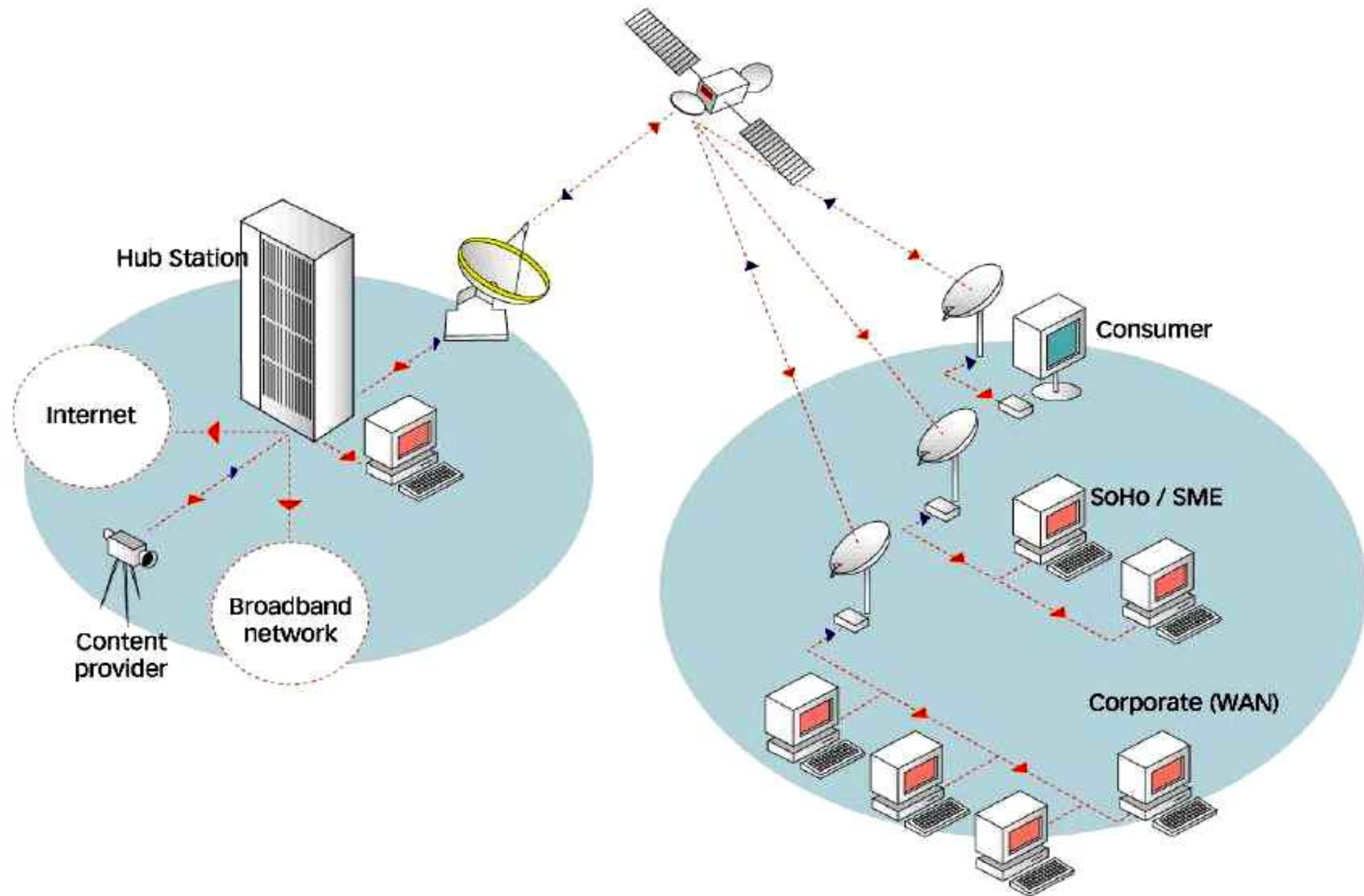
Typical Fixed VSAT Satellite Network

Applications

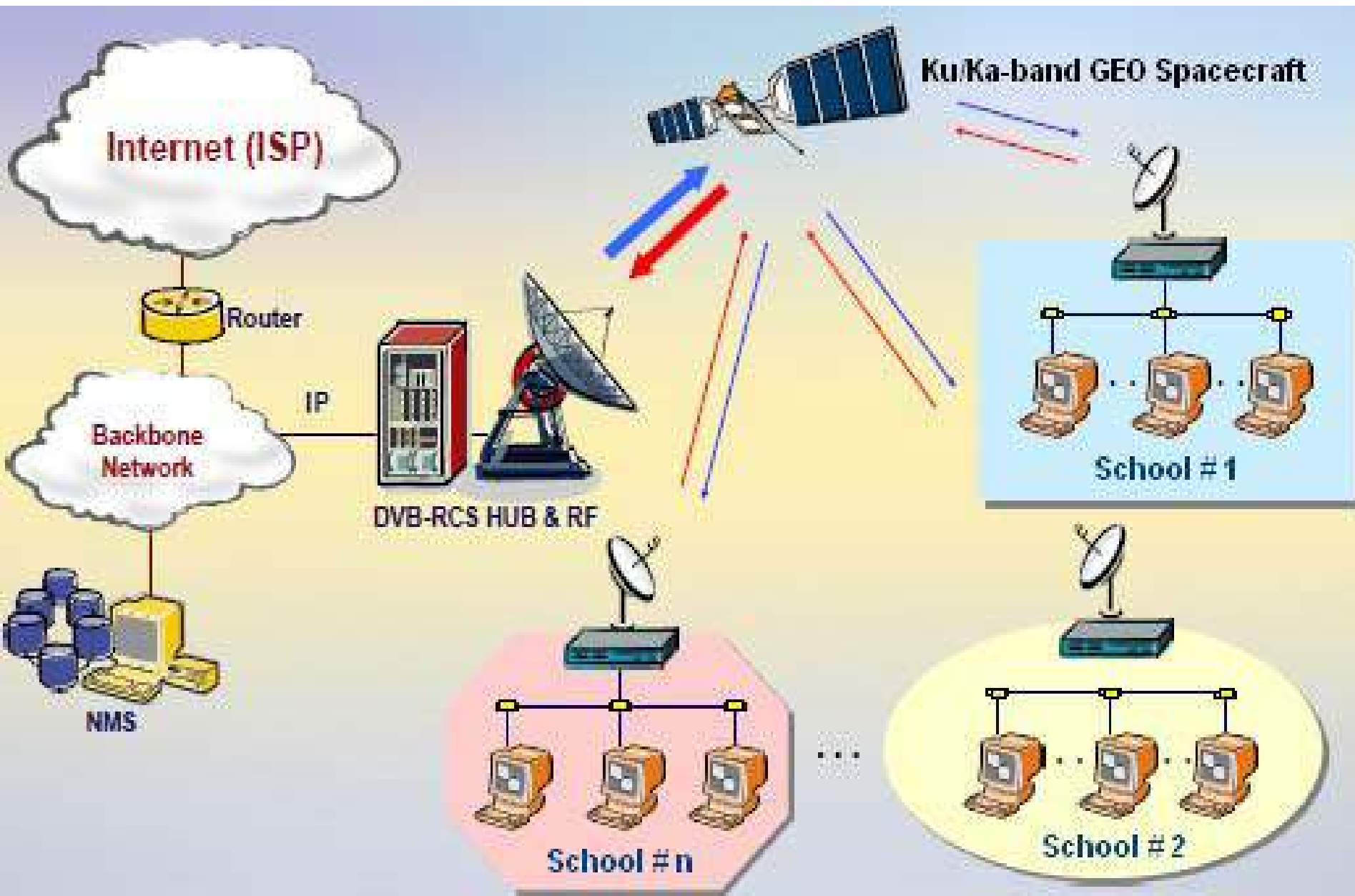
- Credit Card Validation
- ATM/Pay at the Pump
- Inventory Control
- Store Monitoring
- Electronic Pricing
- Training Videos
- In-Store Audio
- Broadband Internet Access
- Distance Learning



DVB-RCS Backbone to Rural Areas



E-education via DVB-RCS



E-medicine via DVB-RCS

● Tele-Medicare



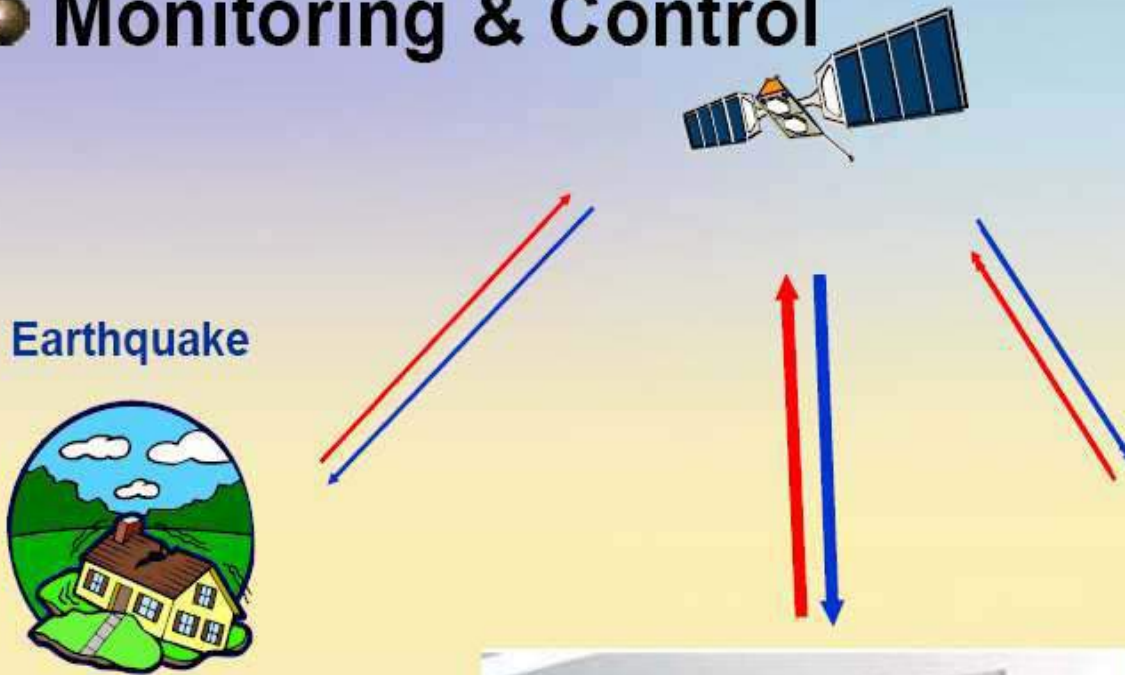
Remote



General Hospital

Emergency Response via DVB-RCS

● Monitoring & Control



Earthquake



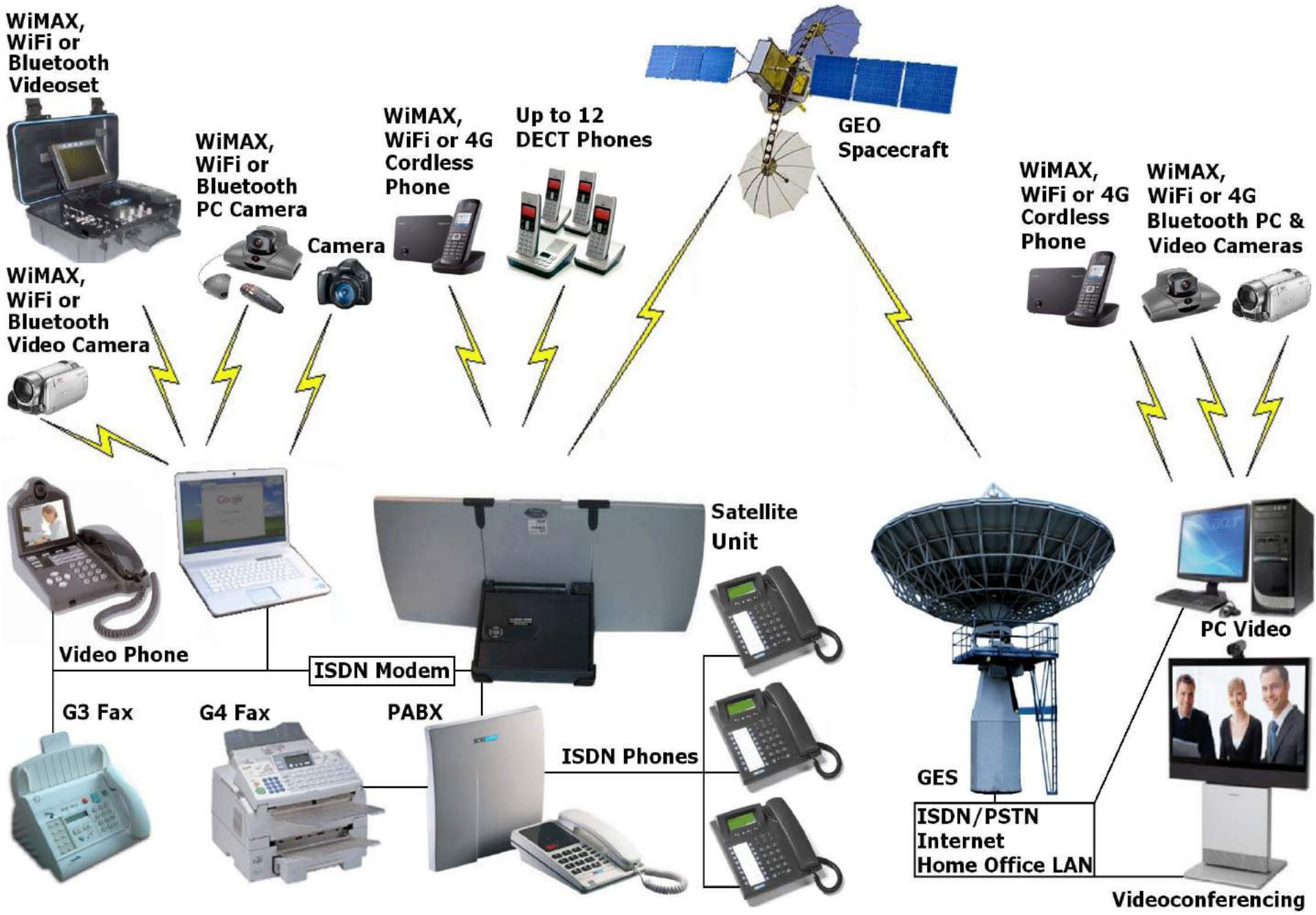
Forest fire



Wi-Fi Solutions via DVB-RCS



DVB-RCS LAN for Mobile and Fixed Applications



Who will Utilize DVB-RCS?

1. State and Provincial Departments:

DOD, DOT, Secretariat for Safety and Security, SA Police Service, Department of Home Affairs, DST, NIA, DOH, DOE and all other departments need to improve Broadcast, IPTV, Internet and Multimedia Fixed, Rural, Remote and Mobile Services

2. State and Private Organizations:

Transnet, ACSA, ATNS, Tourist and Sport Centres, Power/Chemical Plants, Oil Refineries, Corporate Organizations, Broadcasting, Broadband and Telecommunication Companies, Universities and Schools, Hospitals, Banks, Mines, Agriculture, etc

Which Type of Service will Provide DVB-RCS? - 1st Page

- 1. Improvement of Broadcast Content and SNG with VDVOLP, Internet and IPTV for any TV program better than any current systems;**
- 2. E-education for DOE to connect all primary and secondary schools including Universities;**
- 3. E-medicine for DOH to connect all hospitals and clinics in urban and remote environments;**
- 4. E-transport for DOT to connect EVR, SCADA and all Communications, Navigation and Surveillance (CNS) for enhanced Traffic Control and Management at the sea, ground and air.**

Which Type of Service will Provide DVB-RCS? - 2nd Page

- 4. E-defense for DOD to connect all Navy, Ground and Air forces including E-training and DIM**
- 5. E-tourism for Department of Environment and Tourism and to connect all tourist capacities**
- 6. E-government to connect all government departments need CNS, ICT and E-training**
- 7. E-banking (ATM) to connect all banks and ATM countrywide including rural areas**
- 8. E-commerce to connect all government and corporate companies via VDVVoIP and IPTV**

Thanks for your attention!!!



Please, any questions?!

The End

Thank you for your attention!

Space Science Centre (SSC)

DUT

CNS Systems

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