Capacity Building Workshop on Satellite Communications:
(Regulations, Licensing and latest developments)

Meridian Hotel, Nairobi - KENYA, 6 – 8 February, 2018

Topic: Satellite Communications and the Universal Broadband Agenda

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Presentation Outline

A note about ITSO

Basics of Satellites

Development of Satellite Communications

Unique Features of Satellite Communications

Satellite Broadband

A Note about ITSO$_{1/5}$

- **What is ITSO?**
  - ITSO, the International Telecommunications Satellite Organization (previously abbreviated as "INTELSAT"), is an intergovernmental organization, established in 1964, that ensures that communications by means of satellites are available to nations of the world on a global and non-discriminatory basis..
- **Who are the members of ITSO?**
  - ITSO currently has 149 member countries. Membership is open to any member country of the United Nations or the International Telecommunication Union (ITU). A country may join the Organization by officially depositing its instrument of ratification, acceptance, approval or accession to the treaty Agreement with the United States (Department of State), which serves as the Depositary.
- **What does ITSO do?**
  - ITSO ensures that all countries in the world have access to international public telecommunications services for voice, data, video communications and Internet access that are provided by Intelsat, Ltd., on a global and non-discriminatory basis, and with high-reliability and quality. ITSO also works to ensure that Intelsat provides new services to meet the future needs of the information and communications

A Note about ITSO 2/5

- **Is ITSO a United Nations Agency or is there a relationship between ITSO and the United Nations?**
  - ITSO is not an agency of the United Nations. However, the ITSO Agreement incorporates the principle set forth in Resolution 1721 (XVI) of the General Assembly of the United Nations that establishes that communication by means of satellites should be available to the nations of the world on a global and non-discriminatory basis. The Director General sends an annual report on the activities of ITSO to the Secretary General of the United Nations and its specialized agencies.
- **Is there a relationship between ITSO and the ITU?**
  - Although there is no institutional relationship between ITSO and the International Telecommunication Union (ITU), the organizations share the common goal of developing the telecommunications infrastructure. ITSO and the ITU maintain a close relationship to ensure efficient and equitable access to the limited radio spectrum and geostationary-orbital resources. They also cooperate in promoting access to new satellite services, such as broadband, in developing countries.

A Note about ITSO$_{3/5}$

ITSO underwent an important restructuring in 2001 in order to secure the long-term viability of its communications system in a market that is characterized by increasing competition, fast-paced innovations and rising capital costs, and in order to attract private investments. The Assembly of Parties, the highest decision-making body of the Organization, in 2000 approved the legal instruments and framework necessary to create a commercial and pro-competitive company named "Intelsat, Ltd.," to operate the satellite system and provide space segment capacity in a manner consistent with the core principles of global coverage and connectivity, lifeline connectivity and non-discriminatory access. For this purpose, ITSO transferred its global satellite system and the brand-name of "Intelsat," to Intelsat, Ltd.

A Note about ITSO$_{4/5}$

Capacity Building Partnerships

ITSO has implemented partnerships with the following organisations among others for Capacity Building of its membership:

ITU
ATU
CTO
EACO
SADC
WATRA

A Note about ITSO$_{5/5}$

Contacts

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- **http://itso.int**

Basic of Satellites

Types of Satellites

Communications satellites

Weather satellites: provide meteorologists with scientific data to predict weather conditions and are equipped with advanced instruments

Earth observation satellites

Navigation satellites: Using GPS technology these satellites are able to provide a person's exact location on Earth to within a few meters

Broadcast satellites: broadcast television signals from one point to another (similar to communications satellites).

•**Scientific satellites :** perform a variety of scientific missions e.g. the **The Hubble Space Telescope**

•**Military satellites**

The Spacecraft

Key aspects of Satellite Design:

- Electrical Power
- Station Keeping
- Attitude Control
- Orbital Control
- Thermal Control

The Space Segment 1/3

A telecommunications satellite comprises:

- A platform (or bus): propulsion system, fuel tanks, batteries, solar panels, attitude and orbit control functions, etc. It is usually standardized by the manufacturer.
- A payload: the equipment used to provide the service for which the satellite has been launched. It is customized for a given mission .

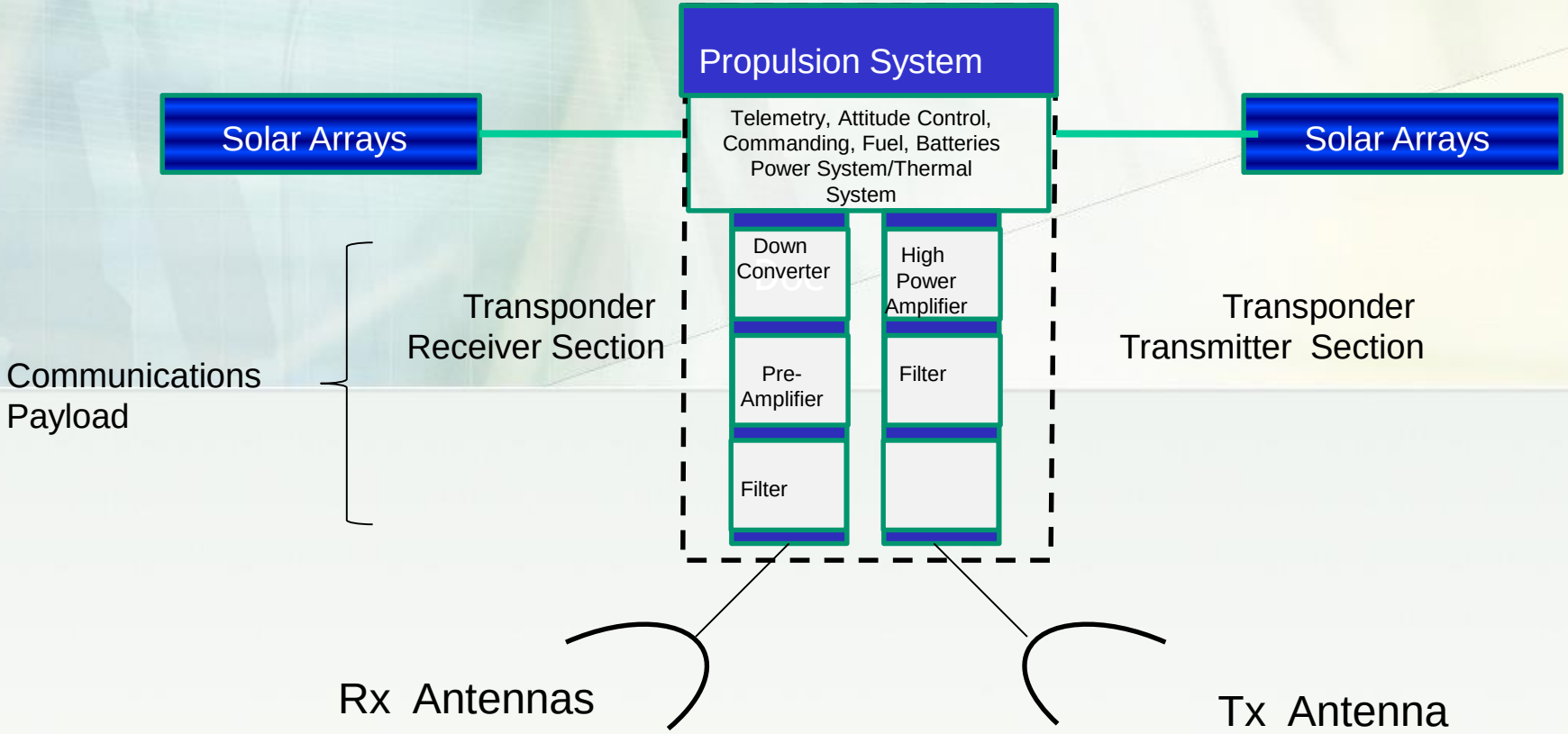
The Space Segment 1/3

The Transponder:

This is the equipment which provides the connecting link between the satellite's transmit and receive antennas. It forms one of the main sections of the payload, the other being the antenna subsystems.

The Space Segment 3/3

Block Diagram of a Communications Satellite



The Ground Segment

Development of Satellites 1/4

Back then…….

- Satcom provided backhaul transmission of Public Switched Telephone Networks (PSTN)
- International connectivity between countries
- Private Networks of Large Corporations, Banks and Embassies

Development of Satellites 2/4

- With miniaturization of the Satellite Earth Station (SES) it suddenly became possible to place Ground Earth Stations (GES) at the end-user's premises. With this, Direct to Home (DTH) satellite television (or DSTV) was born and has grown in leaps and bounds

- **ISPs** could suddenly afford to land large IP bandwidths using VSATs and distribute it on **WiMax** and other wireless technologies

- **Teleports** "sitting" on the fibre backbone in Europe began distributing IP to "remote" places

- Cellular backhauls via satellite became feasible

Development of Satellites 3/4

Satcom and Universal Access….

In the 2000s, the use of Satcom in the last mile made possible achievement of universal access targets for public telephone (voice) services in sparsely populated countries.

With “Digital Convergence” and advances in the technology…...

The VSAT as a user terminal or device was able to deliver “triple play” services even to the remotest of villages.

Development of Satellites 4/4

Currently….

Satcom has been largely “commoditized” and “demystified”

Satcom continues to play its original role of core network backhaul transmission in geographies where fibre and microwave are not feasible

Satcom plays a crucial role as a restoration and backup to other backhaul transmission technologies and as a technology of first recourse when natural disasters such as typhoons strike

Satcom remains the only internet distribution and “last mile” connectivity for a large number of countries on our continent

Satcom is increasingly being used as a “backbone” solution in broadband networks

Unique Features of Satcom

Adaptable to customer requirements

Mobility

Cost advantage

Not affected by geographical obstructions

Quick implementation

Alternate routing or redundancy

Cost is independent of distance

Cost effective for short term requirements

Satellite Communication Services at a Glance 1/2

Network Services


Cell Backhaul


Maritime Communications


Oil & Gas


Aeronautical


Disaster Recovery


Enterprise

Media Services


DTH


Cable Distribution


MCPC Platforms


Special Events


Satellite News Gathering


Mobile Video

Government Services


ISR


Military Mobility


Hosted Payloads


End-to-End Communications


Embassy Networks


Space Situational Awareness

Satellite Communication Services at a Glance 2/2

The Commercial Satellite Industry

Voice/Video/Data Communications

- Rural Telephony
- News Gathering/Distribution
- Internet Trunking
- Corporate VSAT Networks
- Tele-Medicine
- Distance-Learning
- Mobile Telephony
- Videoconferencing
- Business Television
- Broadcast and Cable Relay
- VOIP & Multi-media over IP

Direct-To-Consumer

- Broadband IP
- DTH/DBS Television
- Digital Audio Radio
- Interactive Entertainment & Games
- Video & Data to handhelds

GPS/Navigation

- Position Location
- Timing
- Search and Rescue
- Mapping
- Fleet Management
- Security & Database Access
- Emergency Services

Remote Sensing

- Pipeline Monitoring
- Infrastructure Planning
- Forest Fire Prevention
- Urban Planning
- Flood and Storm watches
- Air Pollution Management
- Geo-spatial Services

Safety of Life, Search and Rescue, Disaster Response

- Aeronautical: Global Aeronautical Distress and Safety System
- Maritime : Global Maritime Distress and Safety System
- Search and Rescue: Search and Rescue Satellite-Aided Tracking-Cosmicheskaya Sistyema Poiska Avariynich Sudov)
- e-navigation (future)

Examples: Typhoon Haiyan (Philippines, 2013) and Hurricanes Irma and Maria (Caribbean 2017)

- Typhoon Haiyan struck as the deadliest typhoon on record in the Philippines.
- Hurricane Irma and Hurricane Maria (both Category 5 or higher) struck as the two of deadliest hurricane on record the Caribbean
- As expected, relief efforts were hampered by the loss of communications infrastructure. In both these disasters, **Emergency.Lu** was deployed


BURMA
THAILAND
LAOS
VIETNAM
CAMBODIA
PHILIPPINES
Andaman Sea
South China Sea
Philippine Sea
MALAYSIA
Medan
Pekanbaru
Sumatra
Palembang
MALAYSIA
Borneo
Celebes Sea
PACIFIC OCEAN
Kalimantan
INDONESIA
Sulawesi
Makassar
Ambon
New Guinea
PAPUA NEW GUINEA
JAKARTA
Semarang
Surabaya
Bandung
Java
Bali
Denpasar
Java Sea
Banda Sea
Kupang
EAST TIMOR
Timor
Arafura Sea
Timor Sea
INDIAN OCEAN
AUSTRALIA

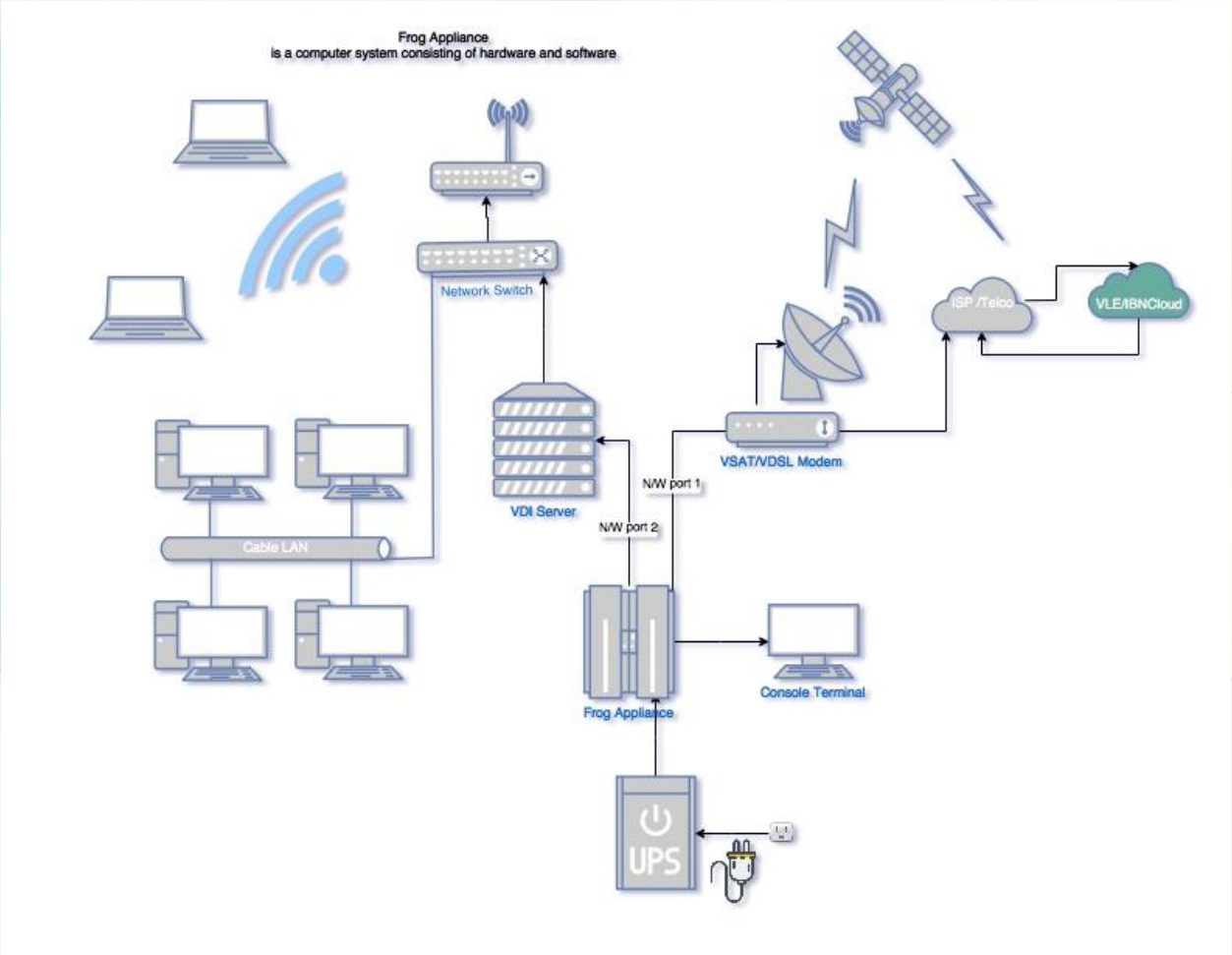

LOUISIANA
Houston
FLORIDA
Gulf of Mexico
Cuba
Mexico City
Dominican Republic
Puerto Rico
Guatemala
Honduras
Caribbean Sea
Nicaragua
Caracas
Costa Rica
Panama
Venezuela
Map data ©2018 Google, INEGI

Emergency.Lu

Satellite Communications in Education- Example of Malaysia

Malaysia is currently implementing its **Frog Virtual Learning Environment (VLE)** as a platform for teaching and learning in all primary and secondary schools. VLE is a part of the broader Malaysia Education Blueprint, 2013-2025, which aims to ensure that Malaysian students learn how to use ICTs, and can leverage them to enhance learning. Under the 1BestariNet initiative, all 10,013 schools in Malaysia must be provided with broadband access via either a 2-4 Mbps or 4-10 Mbps connectivity. The 2-4 Mbps bandwidth is for rural and remote schools via VSAT, while the 4-10 Mbps bandwidth uses wireless 4G technology.

Frog Virtual Learning Environment (VLE) Network Configuration



Addressing the challenges of Broadband deficit 1/2

- Wireless solutions often are the most effective option to address Internet access infrastructure needs quickly.
- The explosion in mobile broadband networks and subscribers is helping bring the experience of higher speed, broadband Internet to remote and rural areas.
- Satellites have the potential to enable the delivery of equitable, affordable broadband access to the Internet for all people, regardless of where they live.
- Satellite broadband radio communication systems are especially important for landlocked countries

Addressing the challenges of Broadband deficit 2/2

The role of satellite systems was recognized by ITU Member States at WTDC-2014 in three Resolutions acknowledging the benefits that satellites provide to remote areas, and in helping bridge the digital divide between urban, remote and rural regions with inadequate coverage via conventional fixed-line services. For example, in the Cook Islands, broadband, 3G/4G voice and video services delivered via O3b's satellite network mean that residents can now experience fibrelike Internet speeds via PCs and 3G mobile devices for the first time

Specifications and Standards for Satellite Broadband

- ITU-R Study Groups unite leading experts from network operators, ISPs, broadcasters, regulators and R&D organizations to develop technical standards for interoperability and performance of terrestrial and satellite broadband systems.
- An enabling environment for ubiquitous broadband is being forged with the putting in place detailed specifications for the satellite radio interfaces of IMT-Advanced (in December 2013) and new and revised standards on fixed-satellite service (FSS) broadband systems in the near future.

Achieving Broadband for All”

- Many modern broadband applications (such as multimedia videoconferencing and software distribution) are now based on distributing information to numerous widely dispersed sites. Satellites are a powerful and relatively inexpensive tool, especially for video links between multiple users.

- Satellite costs are constantly decreasing and satellites are a tested and reliable means for broadband communication. Broadband satellite systems have developed enormously to meet fast-growing demand, and now play an important role in air-space-ground integrated communications networks

Advances in Satellite Broadband Technologies

Timeline	2005	2010	2015	2020
Generation	Ku-band satellites	First generation multi beam Ka-band satellites	Second generation multi beam Ka-band satellites	Third generation multi beam Ka-band satellites
Service capability	Internet broadband	High speed Internet broadband	Superfast Internet broadband	Very high speed Internet broadband
Maximum service rate	2-3 Mbps	10-2 Mbps	30-50 Mbps	100 Mbps
Capacity per satellite	5	50-100	150-200	>500
Users per satellite	100	Several 100.000s	Up to 1 million	>1 million

Satellite Broadband Initiatives

- Large areas across Africa, the Middle East, and Latin America are characterized by low population densities, poor infrastructure and high connectivity costs.
- In Asia, satellite connectivity offers significant benefits across the region, especially in countries such as Indonesia that span thousands of Islands
- The use of hybrid satellite and terrestrial systems is also being considered for broadband, where satellites are used to feed terminals at local centres and terrestrial retransmission via wireless is used for last-mile connectivity. While much broadband communication today is carried via terrestrial links, a new era of satellite connectivity is dawning.
- With the latest KA-SAT high throughput communications and spot-beam technology, end-users can benefit from 20 Mbps links downstream and 6 Mbps upstream, regardless of their location.

Thank You!

Any Questions?

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