

Agenda

- Day 1 - Basics of Satellite Communications
- Day 2 - Policy and Regulatory Guidelines for Satellite Services (first half / second half)
- Day 3 - Network Planning and Link Budget Analysis
- Day 4 - Vsat Installation and Maintenance
- Day 5 - Vsat Equipment and Bandwidth Procurement

Day 2

POLICY



Policy and regulatory Guidelines

- Radio Regulations Organizations
- Satellite policy principles
 - Non discriminatory Market entry
 - Open Borders for competitive access
 - Transparency of telecommunications “Rules and Policies”
 - Content neutral regulations
 - Technology neutral regulations and licensing requirement

Policy and regulatory Guidelines

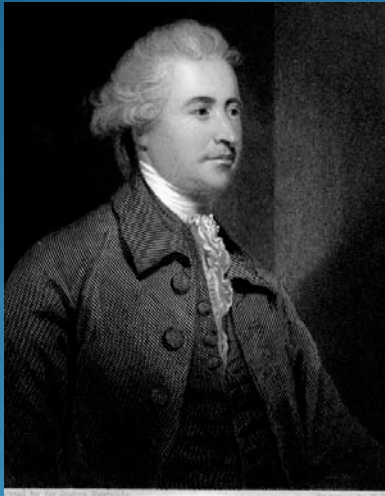
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- Legal framework of satellite communications
- Key regulatory and licensing trends
 - Space Segment
 - Ground Segment
 - Establishing appropriate fees
 - Enforcement
- Means of monitoring and controlling the spectrum



Regulation e.g balance

“All government, indeed every human benefit and enjoyment, every virtue, and every prudent act, is founded on compromise and barter we give and take; we remit some rights, that we may enjoy others.”



- Edmund Burke, English Statesman, 1775



Radio Reg. Organizations

With the increasing number of countries interested in launching their own satellites it has become necessary to discipline sky occupation and it was constituted the ITU-International Telecommunication Union (May 17th 1865) - currently with over 189 member states and more than 500 organizations public and private target on:

- ITU-T (ex-CCITT regulates telecommunications)
- ITU-R (ex-CCIR regulates radiocommunications and allocates freq.)
- ITU-D (technical assistance to developing countries)



Structure



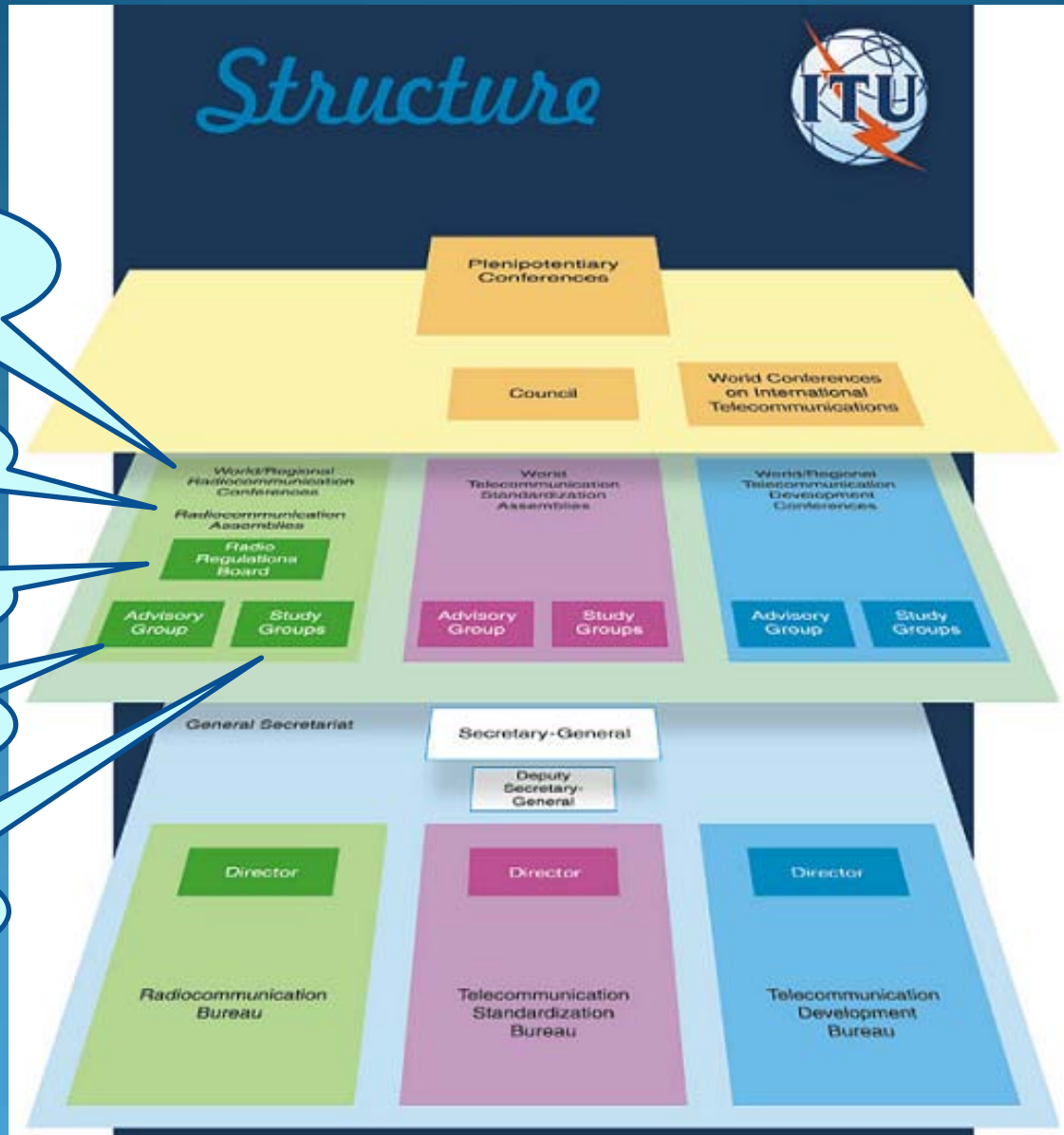
WRC

RA

RRB

AG

SG





World Radiocommunication Conference (WRC)

- Held every 3~5 years
 - WRC 2012 (Geneve 23 Jan-17 Feb)
 - WRC 2007 (Geneve 22 Oct – 16 Nov)
 - WRC 2003 (Geneve 9 Jun – 4 Jul)
 -
- Reviews and revises Radio regulations
 - International treaty – use of radio spectrum and satellite slots
 - Determine questions for study by RA, SGs



Radiocommunications Assembly (RA)

- Normally meets with WRC 3~5 years
 - WRC 2012 (Geneve 23 Jan-17 Feb)
 - WRC 2007 (Geneve 22 Oct – 16 Nov)
 - WRC 2003 (Geneve 9 Jun – 4 Jul)
 -
- Work priorities, urgency, time-frames
- Approves ITU-R recommendations , technical studies in support of WRCs



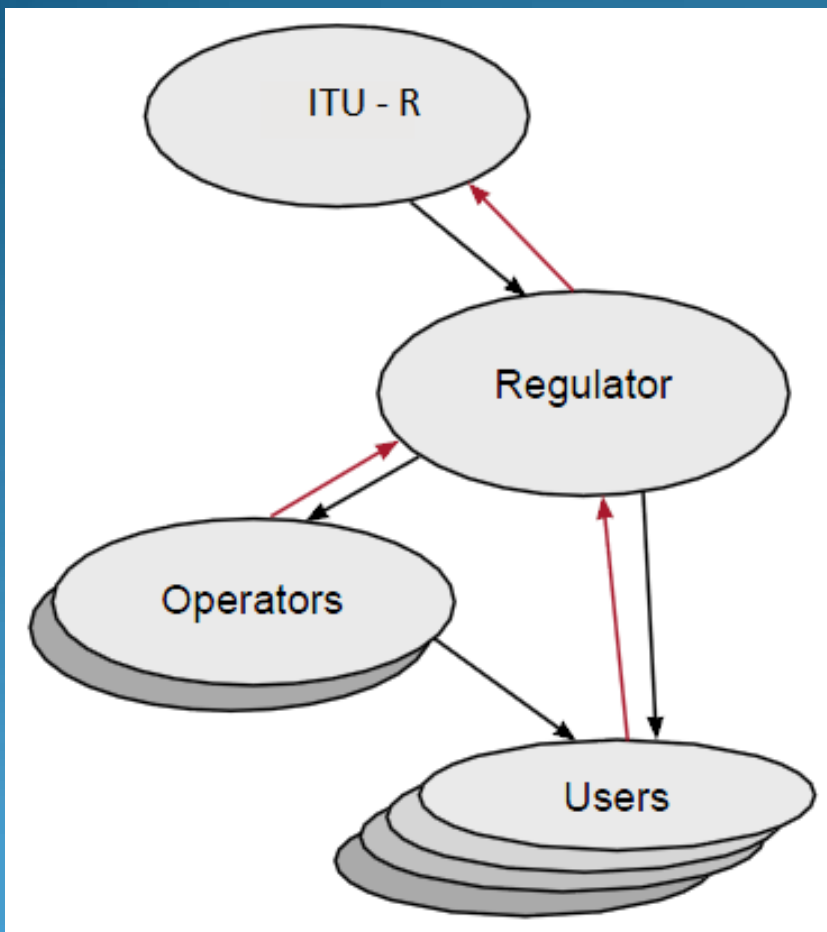
Radio Regulations Board (RRB)

- Approves Rules of procedure for applying Radio Regulations and registering frequency assignments made by Member States
- Addresses matters referred by the Bureau which cannot be resolved through application of Radio Regulations
- Provides advice to Radiocommunications Conferences and the Radiocommunication Assemblies
-

Study and Advisory Groups (SG - AG)

- SG 1 - Spectrum management
- SG 3 - Radiowave propagation
- SG 4 - Fixed satellite service
- SG 6 - Broadcasting services
- SG 7 - Science services
- SG 8 - Mobile, radiodetermination, amateur and related satellite services
- SG 9 - Fixed service
-
- CCV - Coordination Committee for vocabulary
- CPM - Conference preparatory meeting
- SC - Special committee on regulatory / procedural matters
- RAG - Radio advisory Groups

Inter-systems coordination (through all entities involved)



- The ITU-R coordinates the International Spectrum use, preventing the Satellite Operator (SO) from having interference problems in its systems.
- Once implemented the “open sky” policy for a country , there will be no more additional licensing requirements to the SO, which is indeed strongly supported by industry seeing the lack of definitions, as inefficiency.

Regulatory Agencies (National and regional)

- European Radiocommunications Office (CEPT)
- European Telecommunications Standards Institute (ETSI)
- Federal Communications Commission (USA)
- OFCOM (UK)
- Agence Nationale des Frequences (França)
- Telecommunications Regulatory Authority (UAE)
- Australian Communications and Media Authority (Australia)
- West African Telecom. Regulatory Assembly (ECOWAS)
- INACOM - Instituto Nacional Comunicações (Angola)
- ANAC - Agência Nacional de Comunicações (Cabo Verde)
- INMC - Instituto Nacional Comunicações de Moçambique
- ICGB - Instituto de Comunicações da Guiné Bissau



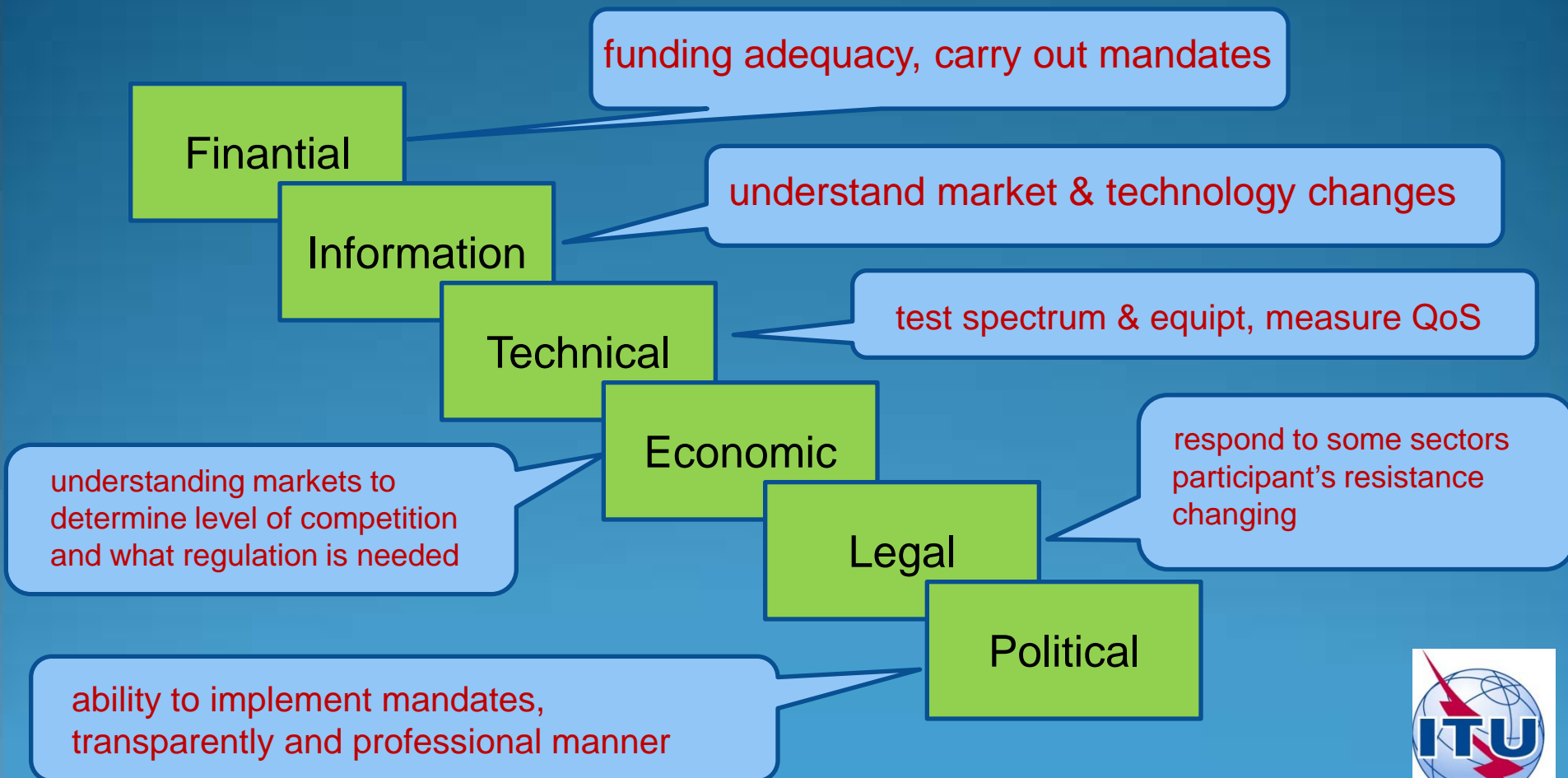
Other Agencies

International organizations interested in African telecommunications regulations

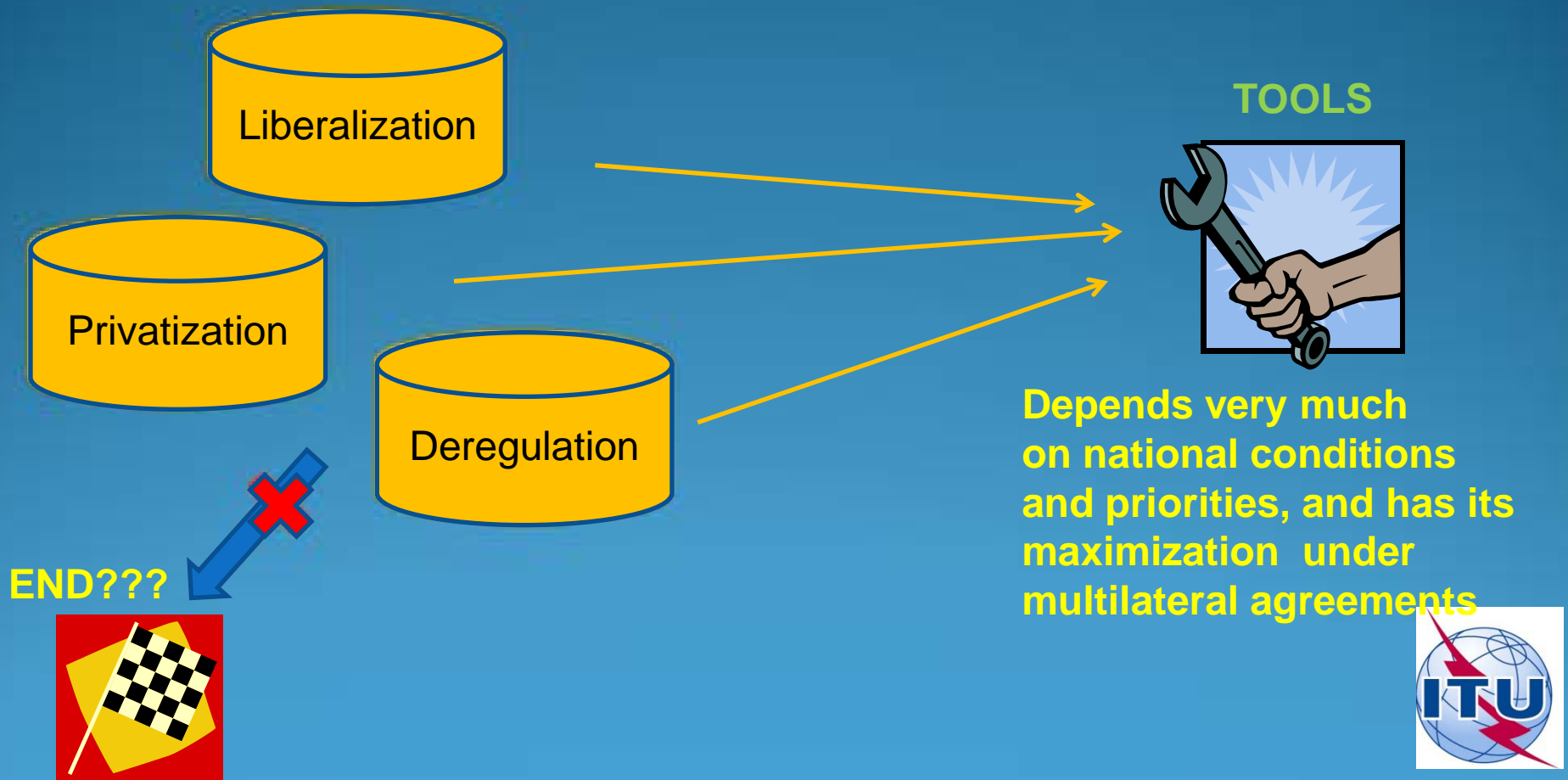
Designation	link
AFDB – African development bank	http://www.afdb.org
ATU - African Telecommunications Union	http://www.atu-uat.org (Formerly Pan-African Telecommunications Union)
COMESA-Common Market for Eastern and Southern Africa	http://www.comesa.org
RASCOM - Regional African Satellite Communications Organization	http://www.rascom.org
TRASA - Telecommunication Regulators Association of Southern Africa	http://www.trasa.org
WATRA - West African Telecommunications Regulators Association	http://www.watra.org



Regulators Challenges



Satellite Policy Principles





Satellite Policy Principles and achievements



Competition → lowering prices
Expanding services
Technical innovations

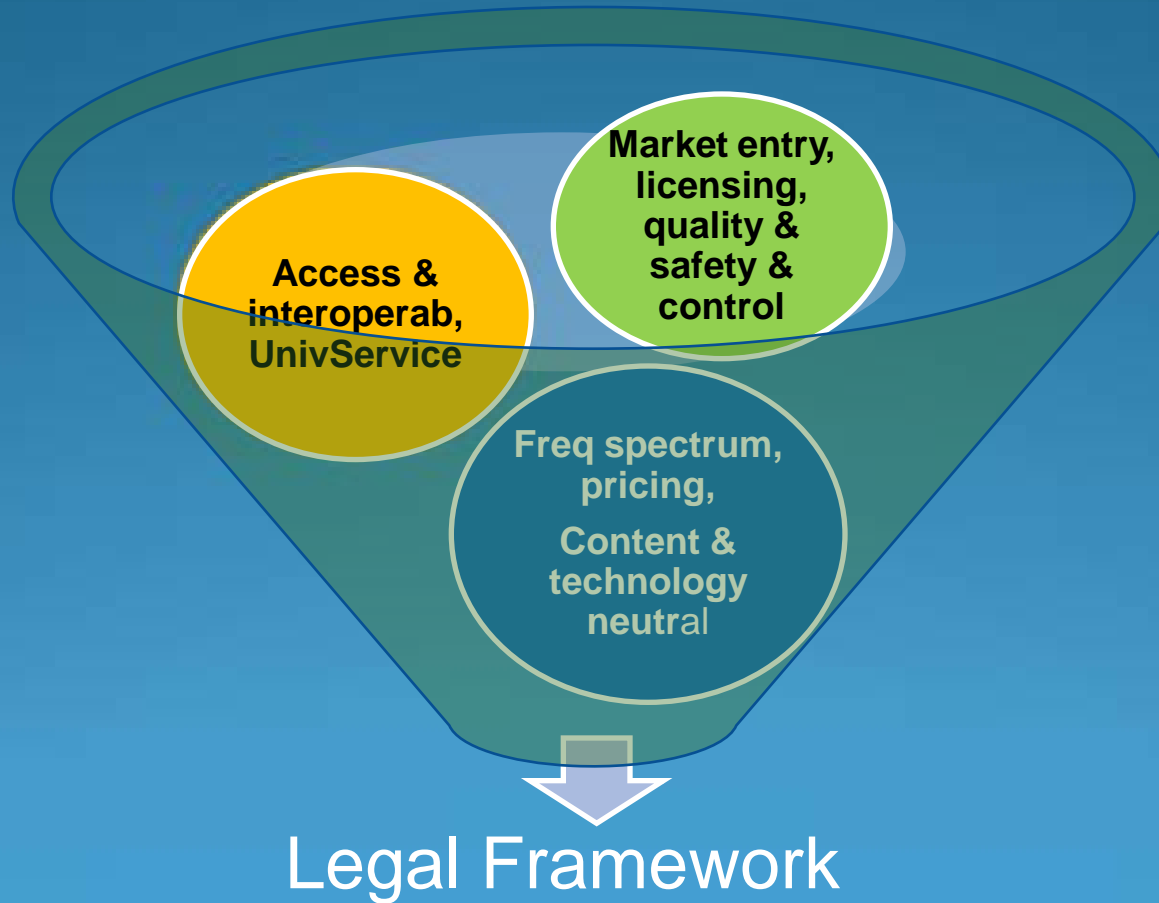
Define timeline,
but keeping use of
public resources (spectrum)



Transparency
Fairness
Consistency
Less regulatory means
more access to essential com.



Bottlenecks



1 - Non discriminatory mkt entry

- Restrictive regulatory procedures and unfavourable treatment on foreign SO, including burdensome licensing conditions
- Requirements for unnecessary and duplicative national infrastructure
- Changes in spectrum allocation decisions
- Disparate fiscal treatment
- High equipment importation, duties and requirements of national commercial presence



1 - Non discriminatory mkt entry

And even more subtle, as:

- Designing (domestic rules) to favour only the development of national satellite market
- Turning domestic SP towards using national SO, technical facilities, staff or
- Prioritizing access to the market of government services to national SO only
- Allegedly trying to support an implicit program of “universal access / service” for consumers, when the solution to the UA dilemma is not to restrict the number of independent service providers



1 - Non discriminatory mkt entry

With direct impact on:

- Ultimate choice of services (and costs) that distributors can offer to end-users
- Troubling cases where satellite coverage does exist today, but market access is denied
- Undermining the up front investment made by SO and denies users in a given territory the benefits of satellite services that would otherwise be immediately available
- Development a kind of “black market” in which non mainstream business, attempt to provide services and meet customer demands in violation of the government licensing requirements

2 - Open borders for competitive access

1. Make the provision of bare satellite capacity unrestricted.
2. Provide national treatment for foreign SO, favouring what is often referred as “open skies”.
3. Eliminate local entity / local presence requirements, e.g. satellite service providers should not be required to have a corporate presence in a country in order to provide services in that country.
4. Provide transparent, non-discriminatory authorization procedures, e.g. , if a satellite operator has already received a licence for its space segment from its home country and has co-ordinated the satellite through the ITU and abides by all relevant resolutions in the ITU Radio Regulations, then no duplicate licensing requirement should be imposed on the use of that space segment to provide services in any country.



2 - Open borders for competitive access (numbers speaks by itself)

- Huge strides in ICT - Information & Communications Technologies service penetration, have been made over the last decade, with strong gains in all telecommunications services, particularly in mobile voice. The leading causes are the lower cost of deploying (...) networks and competition in prices and services in the vast majority of countries. (...)
- According to ITU, the number of Internet users worldwide more than tripled between 2000 and 2008.
- In developing countries, the increase was tenfold and continued growth is widely anticipated

Trends in telecom. Reform 2009



3 – Transparency rules & policies

- Eliminate burdensome frequency coordination requirements, eliminate monopolies
- Allow free circulation and use of satellite consumer terminals
- Address security concerns adequately
- Regulators shall undertake publishing regularly their laws and regulations on satellite licensing, as well as licenses and authorizations. Making this information readily available - namely through Internet websites - to the public, is an extraordinary step in advancing the transparency of a country's policies.
- Regulators should also use their own Diplomatic Services to respond to petitions from foreign satellite network providers desiring access to their market.

4 – Content neutral regulations

How shall access and distribution of content be regulated in satellite networks, namely converged markets & industries???

- Due to (converged) common digital platforms, different types of content that, formerly were dedicated to specific industries can now be conveyed on different infrastructures, namely and ideally in the satellite world.
- Administrations that regulate “content” often apply those regulations to satellite operators....(ex. Call back services, private line resale, VoIP...)
- Restrictions on the number and types of international carriers that serve a country serve only to erode competition and raise prices for customers.



4 – Content neutral regulations

- In a convergent industry, content shall be treated the same way in all market segments.....
- Regulatory authorities shall ensure that the handling, distribution, and provision of content run homogeneously irrespectively of the underlying media.
- Countries must refrain from placing any restrictions on the content of international telecommunications services,



4 – Content neutral regulations

So...what shall be the steps ahead

- To help subsidize and reduce the costs of local telecommunications services, some mechanisms can be maintained through the imposition of universal service fees on international carriers, or through interconnection requirements
- In any event, content restrictions that are imposed by a country should be technology - neutral - applying equally to satellite-based and wirelined telecommunications service providers



5 – Technology neutral regulations & licensing

Should the rules and procedures be implemented towards an equal treatment (convergence) of different information and communication infrastructures (i.e. technology neutrality)???

- In order to facilitate fair competition between technologies (wired or wireless), regulators must strive, to the extent possible, to make their regulations, licensing requirements and regulatory fees technically neutral
- In order to ensure that regulations are technologically - neutral, regulators should strictly limit their regulations and licensing requirements for satellite services, using them solely to
 - Protect the public safety and
 - Manage scarce public resources, such as frequency spectrum when there is more than a negligible risk of harmful interference.



Legal Framework (what is usual)

- External support, due to big ammounts and technical knowledge involved, whatever be through a “technical co-operation program ...
- World Bank example, in terms of regulatory framework advocates separating governments’ policy and regulatory functions from telecommunications operations, namely:
 - Strenghtening government’s capacity to formulate an oversee policy and
 - Creating a regulatory regime and institutions that emphasize competition while keeping regulatory intervention to a minimum



Legal Framework (regulatory process)

- Depending on the legal framework, regulators may issue different types of “regulatory instruments”, such as regulations, decisions, orders, decrees, rules, policies, notices.
- In general, the effect of these instruments is to make “decisions” that implement regulatory policies, resolve disputes, or deal with other matters within the regulators’ mandate.
- The principles of good regulatory decision-making are well known, namely, transparency, objectivity, professionalism, efficiency and independence.
- Two fundamental rules, are very very important and followed:
 - Hear the other side (*maxim audi alteram partem*)
 - Don’t be a judge in your own cause (*nemo iudex in sua causa debet esse*)



Legal Framework (satellite communications)

► Why is it needed?

- To break up monopolistic powers
- To decrease burdens on entering competitors
- To prevent anti competitive activity
- To allow everybody's knowledge of *who, what, how and when*

► Shall include (notes)

- Licensing procedures
- Interconnection to public network
- Competition policy
- Transparency and independence of regulators
- Universal Service safeguard

Legal Framework (World Context)

- 1st privatization & liberalization early 1980's (UK) , granted a variety of exclusivity rights, such as a limited monopoly for basic voice services and limitations on simple resale - **BT**
- Granted the license for **Mercury**, the first fixed-link competitor in the UK, contained a comprehensive regulatory code 1998
- In the **United States and Canada**, detailed regulatory rules are typically contained in regulations, decisions, orders or tariffs made or approved by the regulator.
- Accordingly, **Canada** implemented a licensing regime for certain telecommunications operators for the first time in 1998 the regulator issued very short (2 page) licenses international service operators



Legal Framework (European Context)

- Issuing of, Regulations & Decisions (applicable across EU) and Directives, which each member state shall draw and apply in their national law
- Stating the basic principles for satellite com services and networks in the 80's, represents kick off
- Directive 94/46/EC liberalizes the satellite com, market according to basic principles of “green books”
- Directive^{note} 97/13/EC defined two regulatory titles , license - case of scarce resources - and general authorization - lighter regulatory title, imposes more discipline in the medium. (no licensing requirements)



Legal Framework (Italian Context)

Kick off

- **Abolition** of exclusive and special rights
- **Liberalization of the satellite** telecommunication services (excluding voice services)

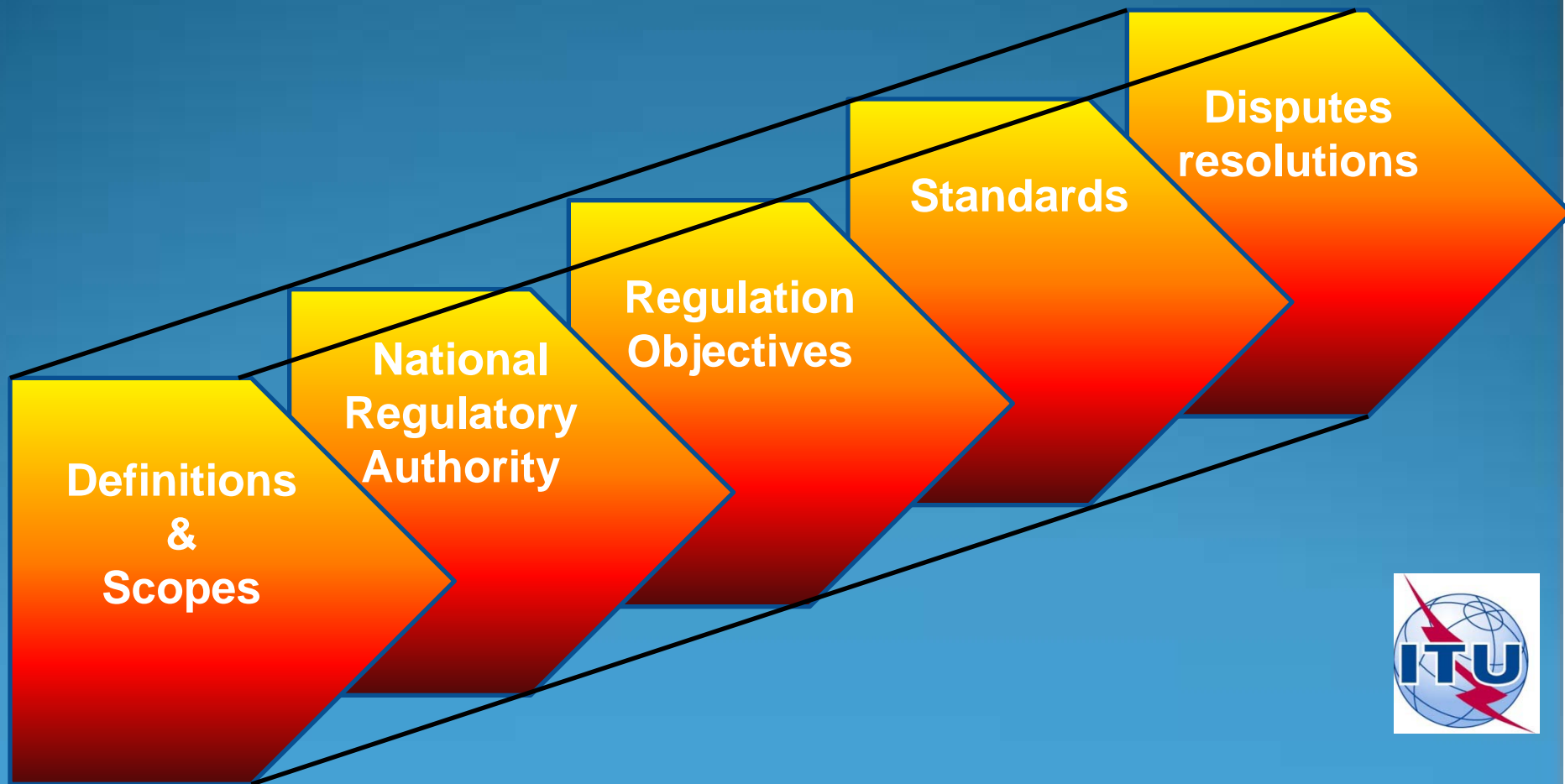
Specific

- **Liberalization** of the commercialization of **satellite earth station** equipment linked (or not) to the telecommunications public network
- **Liberalization** of the satellite **space segment**

Hands on

- **Issue of Authorization title** for undertakings willing to provide satellite network services
- **Issue of an Authorization title** for undertakings willing to provide satellite communication services

Legal Framework (satellite communications)



Legal Framework (satellite communications)

Definitions & Scopes

- Purpose of the framework, e.g establish harmonized framework
- Following Community of Inter-state agreement
- Definition of Satellite Network, Network Operator and Satellite Services Provider
- Definition of transnational markets
Conditional access
- Definition of National regulatory Authority
- Definition of user, consumers
- Definition of Universal Service
-



Legal Framework (satellite communications)

**National
Regulatory
Authority**

- Inter-State members shall ensure that each of the tasks assigned to national regulatory authorities is undertaken by a competent body
- Independence of National Regulatory Authority shall be guaranteed by the Inter-State members
- Power shall be assumed with transparency and impartially.
- National Regulatory Authority and National Competition Authority shall provide each other information for the implementation of consumer law, on matters of common interest.
- Accounting separation and financial reports
-

Legal Framework (satellite communications)



Regulation Objectives

- National Authority shall ensure, non discrimination Market entry, open borderstransparent rules & policies and content and technical neutrality
- National Authority shall promote competition in the provision of electronic communic. networks, by:
 - ensuring that users, including disabled users, derive maximum benefit in terms of choice, price, and quality
 - ensuring that there is no distortion or restriction of competition in the electronic communications sector
 - encouraging efficient use and ensuring the effective management of radio frequencies

•

Legal Framework (satellite communications)



Standards

- In the absence of Inter-State standards members shall encourage the use of ITU, ISO or IEC standards.
- Licensing procedures with:
 - Standards forms
 - Type of service
 - Authorization title
 - Release time
- Interconnection public network
- Transparency and independency regulation
- Price
- Universal Service secured safeguard (access)
-

Legal Framework (satellite communications)



Disputes resolutions

- Resolution of cross border disputes
- Harmonization procedures
- Exchange and publication of information
- Transitional measures
- Dispute resolution, between undertakings
 - The decision of the national regulatory authority shall be made available to the public, having regard to the requirements of business confidentiality. The parties concerned shall be given a full statement of the reasons on which it is based.
-

Legal Framework (ex satellite communications)

Type of sat service	Regulatory	Authorization title	Release time
Satellite service Operator	Deliberation	Individual license	4-8 week
Vsat service provider	Deliberation	Individual license	4 week
Vsat broadcast service provider	Deliberation	No license, just information	1 week
Allocation of space segment	Deliberation	Individual license	2 week
Private satellite network	Deliberation	General authorization	4-8 week



Key regulatory & licensing trend

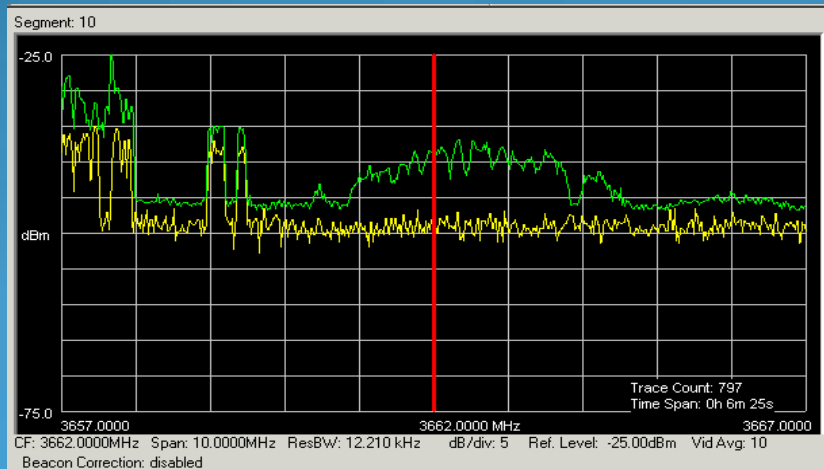
- Non-discriminatory licensing requirements provide a country with a useful tool to ensure **safety** and keep **up to date with technology** developments and demands
- Licensing requirements and their associated costs vary worldwide, but a **significant trend** has emerged toward adopting , publicly accessible licensing arrangements for **satellite network operators** and **service providers**
- Licensing of satellite services should be used solely for two purposes, to protect public safety and to manage spectrum resources in order to prevent unreasonable interference.



Space Segment



Landing rights (open sky)



Two areas focused

Specific frequency segments use

Landing rights

- In the past, governments have developed policies to protect their countries' satellite systems, named “**Closed Skies**” policies, requiring service providers to use only locally-owned capacity when providing VSAT services.
- But (..) the “footprint” of a satellite - the region of the Earth served by a satellite - does not match national borders, making it necessary to regulate this matter through international agreements such as those developed by the ITU. This approach is referred to as “**Open Skies**” and is being adopted by most administrations in every major region of the world

...



Landing rights

- Also, originally satellite operators such as Intelsat, Eutelsat and Inmarsat were inter-governmental organizations and owned by the PTTs and telcos around the world. Consequently, **in the beginning space segment could only be bought via the incumbent PTT or telco.**
- Nowadays, **“Open Skies” policies require satellite operators to compete for customers interested** in obtaining C-band, Ku-band and Ka-band satellite bandwidth. It has been proven that this competition can result in more options for local customers with significant boost in quality and lower prices.



Spectrum licensing

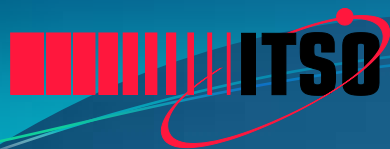
- The spectrum used via a satellite was historically distributed between the **incumbent, military and related public service** providers (police and emergency services).
- Today, the ITU coordination process safeguard avoiding technical problems such as interference among global operators. **Exclusive bands are often allocated for FSS and MSS services** and spectrum sub-segments are assigned to different operators through coordination.
- Accordingly it is not necessary to issue duplicate licenses to a foreign satellite operator because it has been coordinated and assigned by a foreign administration and no infrastructure is being installed or operated in the country.



Spectrum licensing

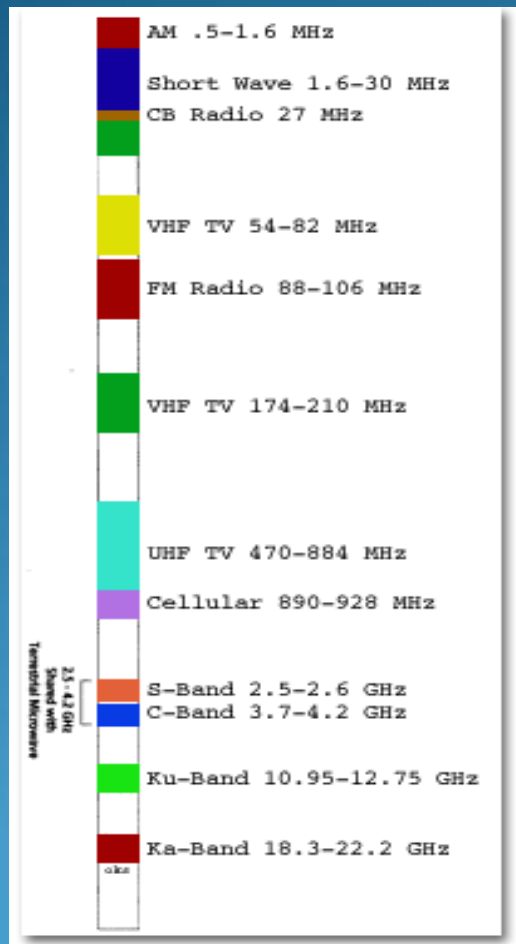
- In such cases, it is not necessary to issue duplicate licenses to a foreign satellite operator or the spectrum associated with the foreign satellite because it has been coordinated and assigned by a foreign administration and no infrastructure is being installed or operated in the country. Once inter-satellite co-ordination is accomplished at the ITU level, there is no further need to license spectrum use by networks operating in these exclusive bands.





Spectrum licensing

ex. Portuguese licensing case



SERVIÇO FIXO POR SATÉLITE (SFS)				
Entidade	Faixas de Frequências Tipo de ligação	nº de canais/tipo de utilização		âmbito de utilização
		Partilhado	exclusivo	
CPRM Contrato de subconcessão entre a PT e a CPRM Despacho MEPAT n.º 156/96 de 06-11-1996 Licença ICP-002/SRS	5925 - 6475 MHz Uplink	(1) (2)		g
	14 - 14,5 GHz Uplink	(1) (2)		g
	17,3 - 17,7 GHz Uplink	(3)		g
	3600 - 4200 MHz Downlink	(1) (2)		g
	10,95 - 11,2 GHz Downlink	(1) (2)		g
	11,45 - 11,7 GHz Downlink	(1) (2)		g
	12,5 - 12,75 GHz Downlink	(1) (2)		g
MAXITELSAT Licença ICP-003/RPT	5925 - 6425 MHz Uplink	(1) (2)		g
	14 - 14,5 GHz Uplink	(1) (2)		g
	10,95 - 11,2 GHz Downlink	(1) (2)		g
	11,45 - 11,7 GHz Downlink	(1) (2)		g
	12,5 - 12,75 GHz Downlink	(1) (2)		g



Ground Segment



Satellite Services Provider



Network Operator
E / S facilities access

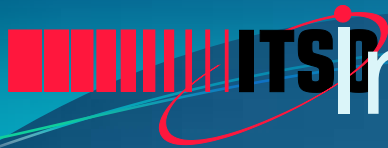
Two areas focused

Network Operator vs Satellite Services Provider

- Many countries require that public **network operators** hold licenses so that there is some quality assurance of the service being provided to their public, which in a few countries have also be adopted for private VSAT services.
- As VSAT it is not usually a public service, not usually connected to the PSTN, and can be privately owned, it is nowadays understood that this is a redundant licensing process - **satellite services provider** - that causes extreme time delays and confusion. The requirement for this type of license is declining,

...





Individual Licensing vs Blanket Stations Licensing

- Accordingly each network operator, should own a vsat license individually (per each terminal).
- This strange environment (88's-90's EU legislation,) changed by 94's , allowing:
 - **Private operators to get licensing** and connection authorization to public networks, without being discriminated (special rights off)
 - **Validation of "blanket licenses"**, which means technical criteria, solely - power level or eirp, frequency of use - so vsat networks (R_xO , K_u and K_a band) with more or less terminals, would be exempted in a basis from individual terminal licensing requirements, provided that they meet specific technical criteria that assures adherence recognised safety standards....



authorization Directive

(on communications networks and services)

- Finally and under the terms of the new EU authorization Directive, the EU countries started implementing a “general authorization” system.
- As opposed to blanket licences - which are still administrative acts or explicit decisions - **general authorizations no longer require license** applications to be made prior to providing service or running a network.
- Administrations might require a notification, including basic information on the operator, the network location, the type of service provided, etc. However, the service can be offered under general authorization and cannot be put on hold awaiting a reply or consent of the Administration.



Authorization Directive

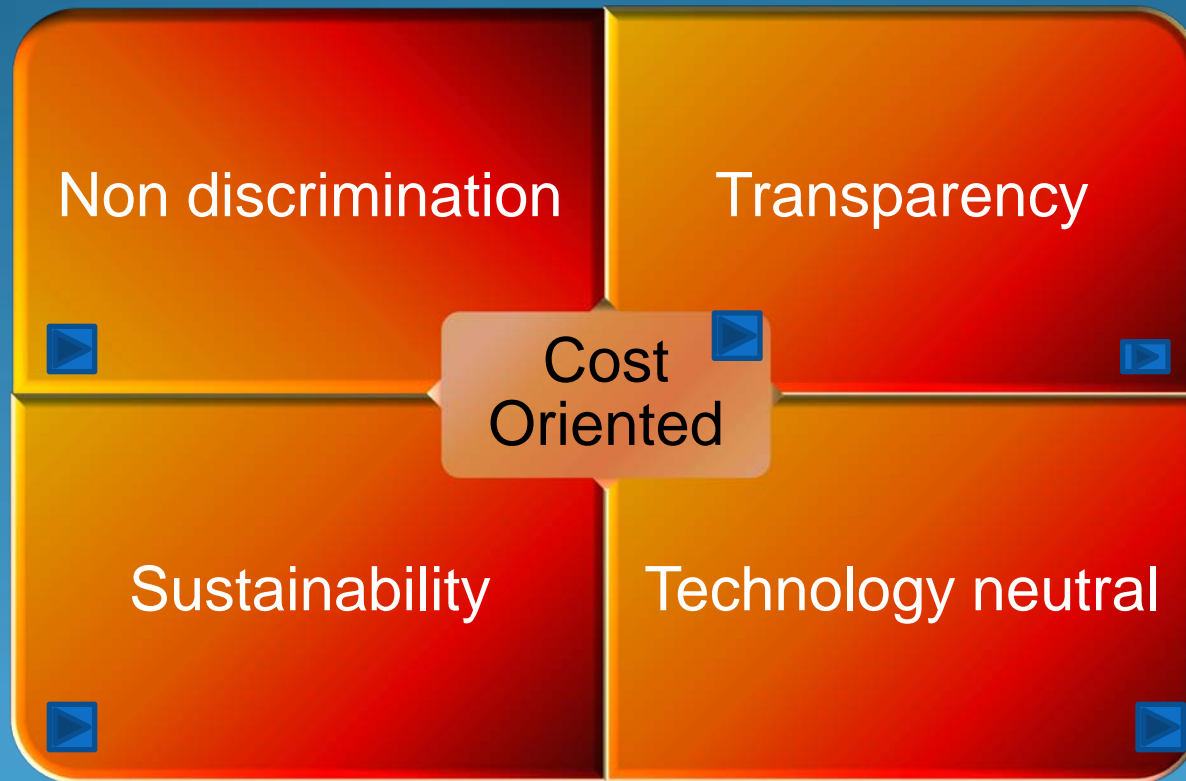
(on communications networks and services)

- General authorization also recognizes fully **the international nature of satellite services**, whereby there is no need to have a service provider located in each country. It overcomes, therefore, the difficulty of obtaining blanket licences in countries where a small number of terminals belong to several service providers, or where foreign ownership restrictions require the establishment of a national presence.



Faster services implementation
Lower costs

Establishing appropriate fees



Establishing appropriate fees (non discrimination)

- The principle of non-discrimination should ensure that operators with market power^{note} give fair treatment to other operators, service providers and consumers, and are not allowed to provide less favourable conditions to some parties for the same product or service.
- However, any operator may differentiate offerings and prices provided there are objectively justified conditions to do so.
- In addition to publicising rules regarding satellite licensing, fee structures should be clearly defined for public without discrimination



Establishing appropriate fees (transparency)

- **Transparency** -The Authorities should keep their procedures and decision making processes open to the public. The Authorities should also, whenever reasonable, consult all affected parties on matters that affect such parties. *Licensing fees* should compensate administrative costs to the regulator but *should not be used as a source of real profit for the government*.
- Operators should, in accordance with the regulators' requirements, provide transparent information that should be available to other companies and to the public



Establishing appropriate fees (sustainability)

- **Sustainability** requires that prices be established in a manner that compensates efficient operators for their service provision; that is, operators should have an opportunity to be compensated sufficiently to remain as a going concern over the indefinite future with respect to their provision of services.
- Sustainability, however, does not require full compensation for inefficient or imprudent service provision, such as mandatory services.
 - In fact in some countries, governments and regulators have imposed mandatory service obligations, on newly licensed or newly privatized operators. These may include obligations to provide service throughout certain areas (especially for wireless operators). Being the most current mechanisms used to expand telecommunications networks in developing economies, they may kill the sustainability of small operators





Establishing appropriate fees (technology neutral)

- A key objective of telecommunications sector reform is to promote **innovation**, particularly in the introduction of new services (technologies). The regulator must determine whether or not to subject new services to price regulation.
- To avoid confusion in the industry, the regulator may want to consider publishing a definition of a new service (technology) based on the criteria, such as:
 - Does the new service include a new technology or functional capability?
 - Does the new service replace an existing service and consequently not expand the range of services available?
- The principle of **technology neutrality** should apply, and will be assured if the application of the guidelines does not discriminate nor favours any specific technology, except to the extent that it will benefit the Community Members, users....



Establishing appropriate fees (cost oriented)

- **Cost orientation** refers to the principle that the prices and charges for products and services should be oriented towards the underlying cost of providing them.
- **Good price** regulation mimics the results of efficient competition. However, price regulation may have additional objectives, namely financing (on-going operations and future investments) efficiency (services be produced as efficiently as possible, that is by minimizing all inputs) and equity (fair distribution of welfare benefits among members of society)



Enforcement 1

- In a country where a business environment is able to return a modest, but predictable and consistent revenue stream, as opposed to a country where one company might receive an initially large, but unpredictable, risky and inconsistent revenue stream, how does the entrepreneurship behaves?
- And how does it behaves, if the sector is non discriminatory, transparent and highly predictable?

**DOES
THE
PLAYERS
(SUPPLIERS, USERS)
OR
REGULATORS
NEED SECURING
THE
ENFORCEMENT OF
LAW?**

Enforcement 2

- A significant **gap** between supply and demand encourages the growth of non - mainstream businesses, means willingness to provide **services in non - compliance** with national laws and regulations, but
- Such non - mainstream businesses are **less likely to promote local economic development**, because they are less likely to create sustainable well-paying jobs and they often take measures to avoid payment of national or local taxes.

...

Enforcement 3

SO THE ANSWER TO INITIAL QUESTION IS CLEARLY YES, e.g. IT IS NECESSARY THE ENFORCEMENT OF LAW, because:

- Such laws and regulations should also prohibit government actions that are arbitrary or discriminatory.
- All mainstream telecommunications service providers would be willing to pay an annual licensing fee to provide satellite services in a country - as long as the fee is reasonable and consistent from year to year - where they feel law enforcement

Monitoring & controlling spectrum (Why?)

- Spectrum is limited, so there is need spectrum management.
- Historically
 - market alone cannot work
 - congestion and interference are real
 - Markets without property rights → rules cannot work
- Spectrum allocation versus spectrum assignment

Monitoring & controlling spectrum

Prevent interference from or to.....

- High Priority Networks (eg radar..)
- Television and Radio Stations
- Mobile Telephony
- Fixed Service (domestic microwave links..)
- Radio Amateurs
- Private Mobile Radio Networks (Wimax, FWA..)

...

Monitoring & controlling spectrum (reason1)

- Satellite communications technology in the C band is used for broadcasting television signals, Internet delivery, data communication, voice telephony etc.
- The satellite systems that operate in the 3.4-4.2 GHz band (C band) are suffering substantial interference, to the point of system failure, in places where national administrations are allowing:
 - **Broadband Wireless Access** systems like wi-fi and wi-max to share the same spectrum bands already being used to provide satellite services.
 - The same will happen if **3G** (and the planned 4G mobile) systems (also referred to as IMT systems) are allowed to use the frequencies used in the C band for satellite downlink services as is being contemplated by some administrations in the context of WRC-07.



Monitoring & controlling spectrum (reason 2)

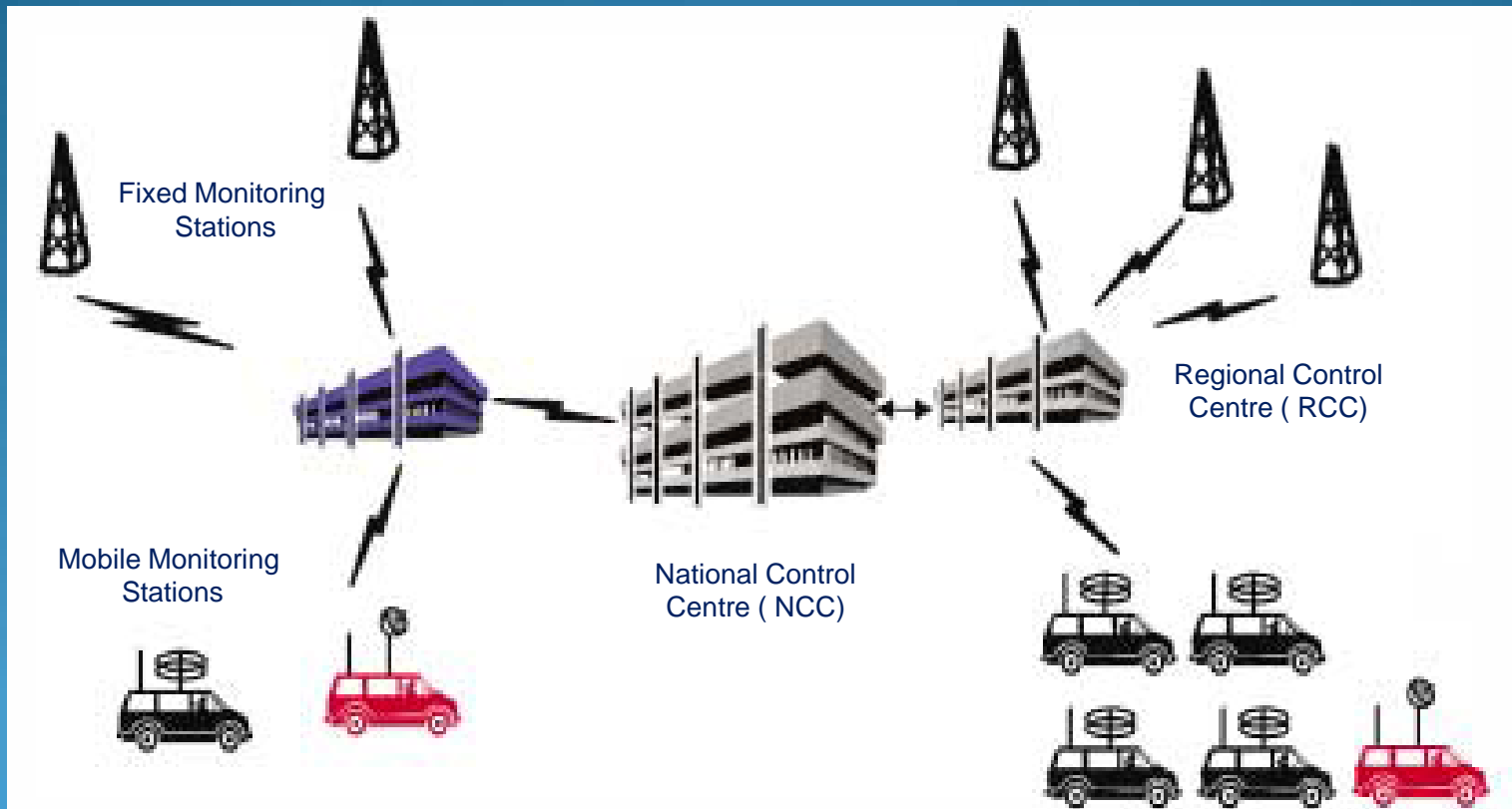
- To eliminate this harmful interference, operators of satellite earth stations and users of satellite communications services have united to communicate their positions and technical requirements to national and international telecommunications regulators.
- Regulators and radio frequency managers need to allocate spectrum in ways that recognize the reality of harmful interference and validate the right of incumbent operators to operate, and their customers to enjoy their services, without disruption by new users.

Monitoring & controlling spectrum (reason 3)

- C-band services are especially important for developing countries. The supporting equipment is relatively inexpensive and the signals easily cover large areas. Such services are well adapted to provide voice, data services and internet connectivity, distance learning and telemedicine, in remote areas underserved by other communications means. They are an essential component in the ITU's push to bridge the "digital divide" between the developed and developing world.
- So it is critical that **governments and spectrum management authorities** recognize the very real damage caused, and tremendous threat posed, to satellite services by use of the Standard C and Extended C bands for terrestrial wireless systems.



Monitoring & controlling (spectrum network control)



Means of monitoring (guidelines)

- Follow the ITU SM's, namely, SM-1047, SM-1050, SM-1393, SM-1880
- And specifically for satellite environment:
 - Real-time spectrum analysis
 - EIRP and EIRP stability
 - $C+N / N$, C/N , C/N_0 and E_b/N_0 (digital carriers)
 - Occupied BW, Center frequency, spurious signals
 - PSD - power spectral density
 - Cross - polarization isolation

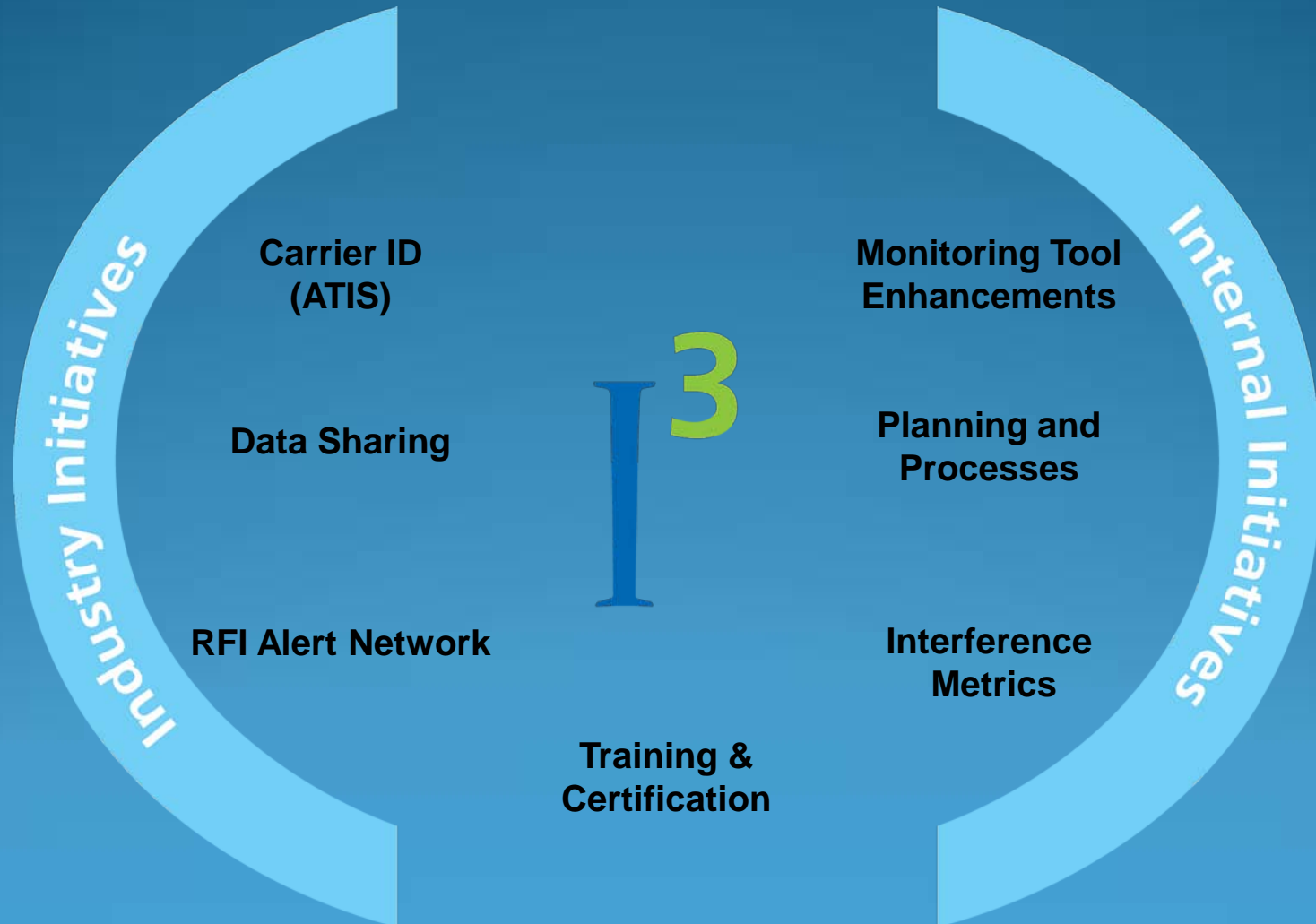


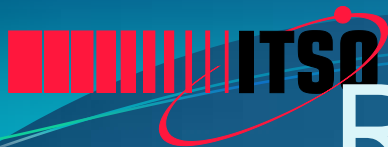


Establishing an Interference-free Space Environment



- What is
- Rallying the Industry
- Intelsat's I³ Strategy
 - Carrier ID
 - Data Sharing
 - RFI Alert
 - Training and Certification
 - Intelsat Internal Continuous Improvement
- WiMax and Terrestrial Interference
- The "Call to Action" – Working Together





Rallying the Industry

Satellite Operators		Industry Groups	Customer Advisors	Manufacturers/Suppliers
AMOS	Intelsat	GVF	ABC Television	Comstream
Arabsat	JSAT	NAB	Gateway	Comtech/EF Data
AsiaSat	SAT-GE	SUIRG	Global Crossing	Glowlink
Eutelsat	SES	WBU-ISOG	MTN/Seamobile	Paradise
Hispamar	StarOne		NHK	Tandberg
Hipasat	Telemex		US Government	TLS
Inmarsat	Telesat		Vizada	Newtec

F o c u s i n g o n R e s u l t s



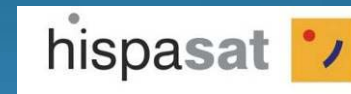


Rallying the Satellite Operators

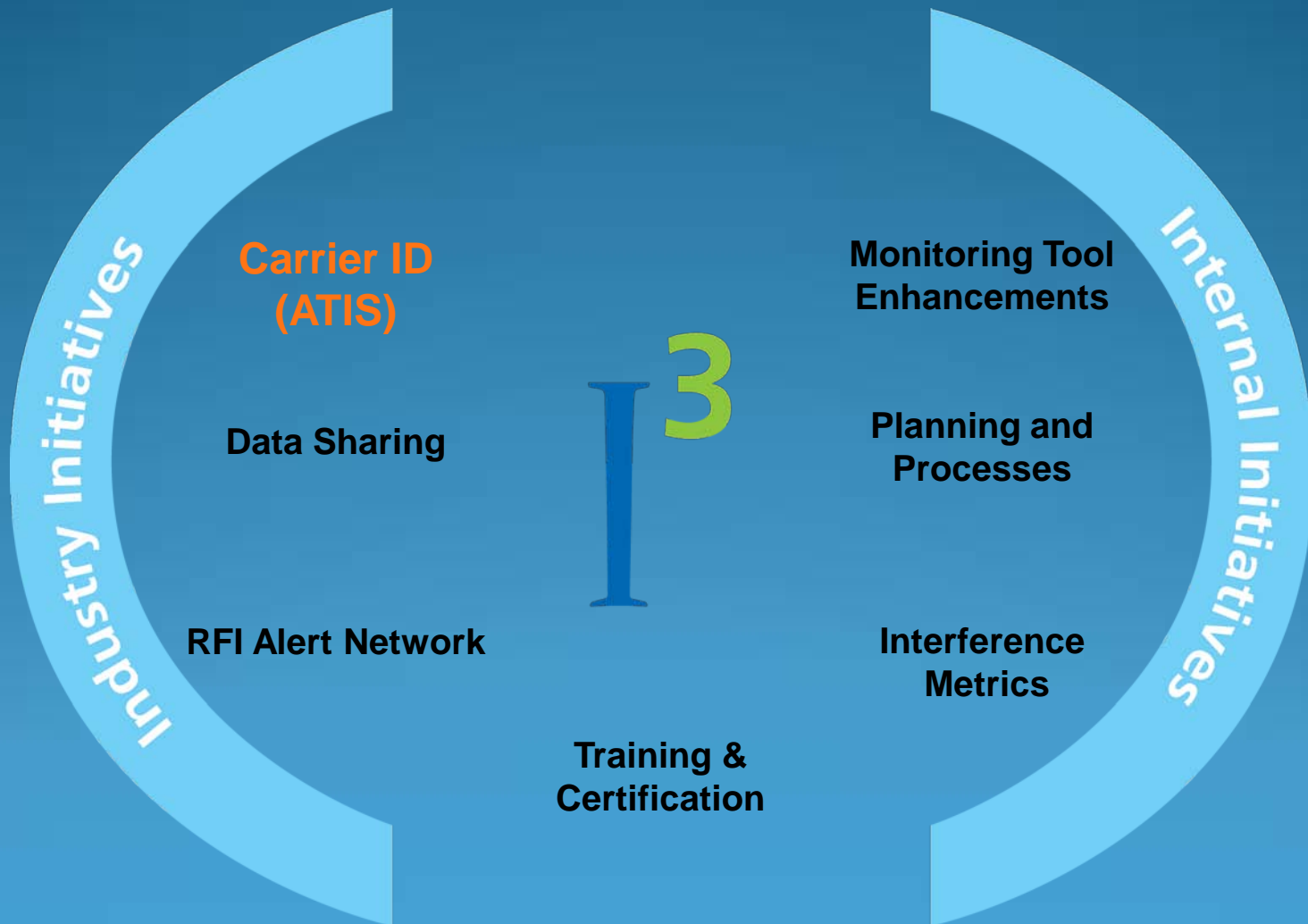
*Satellite Operators Interference
Reduction Working Group* – Formed
March 2009

18 satellite operators have joined

- Operator endorsement of I³ program goals
- Meeting monthly
- Subcommittees
 - Carrier ID
 - Operator RFI Alert Network

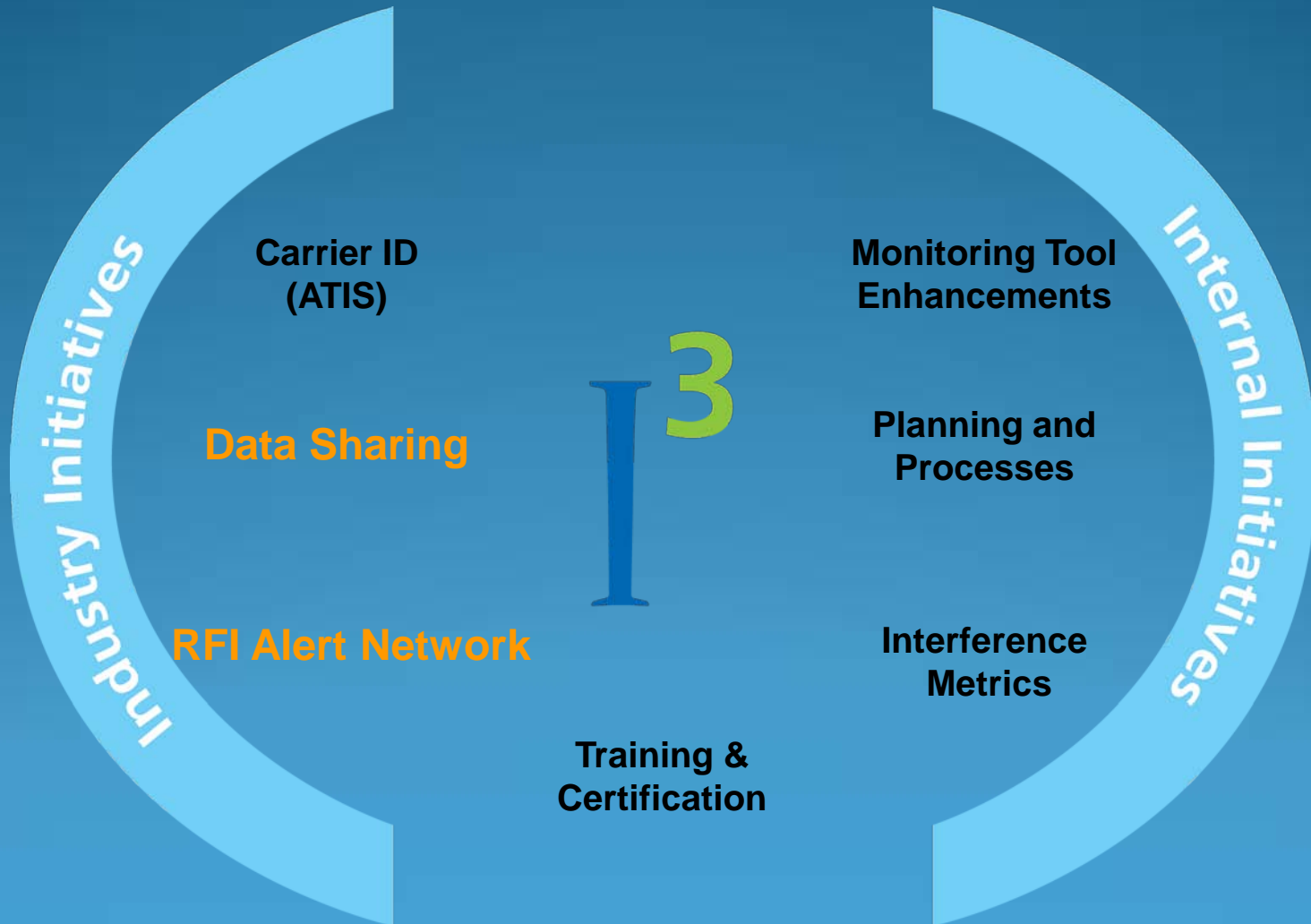


Carrier ID (aka ATIS)

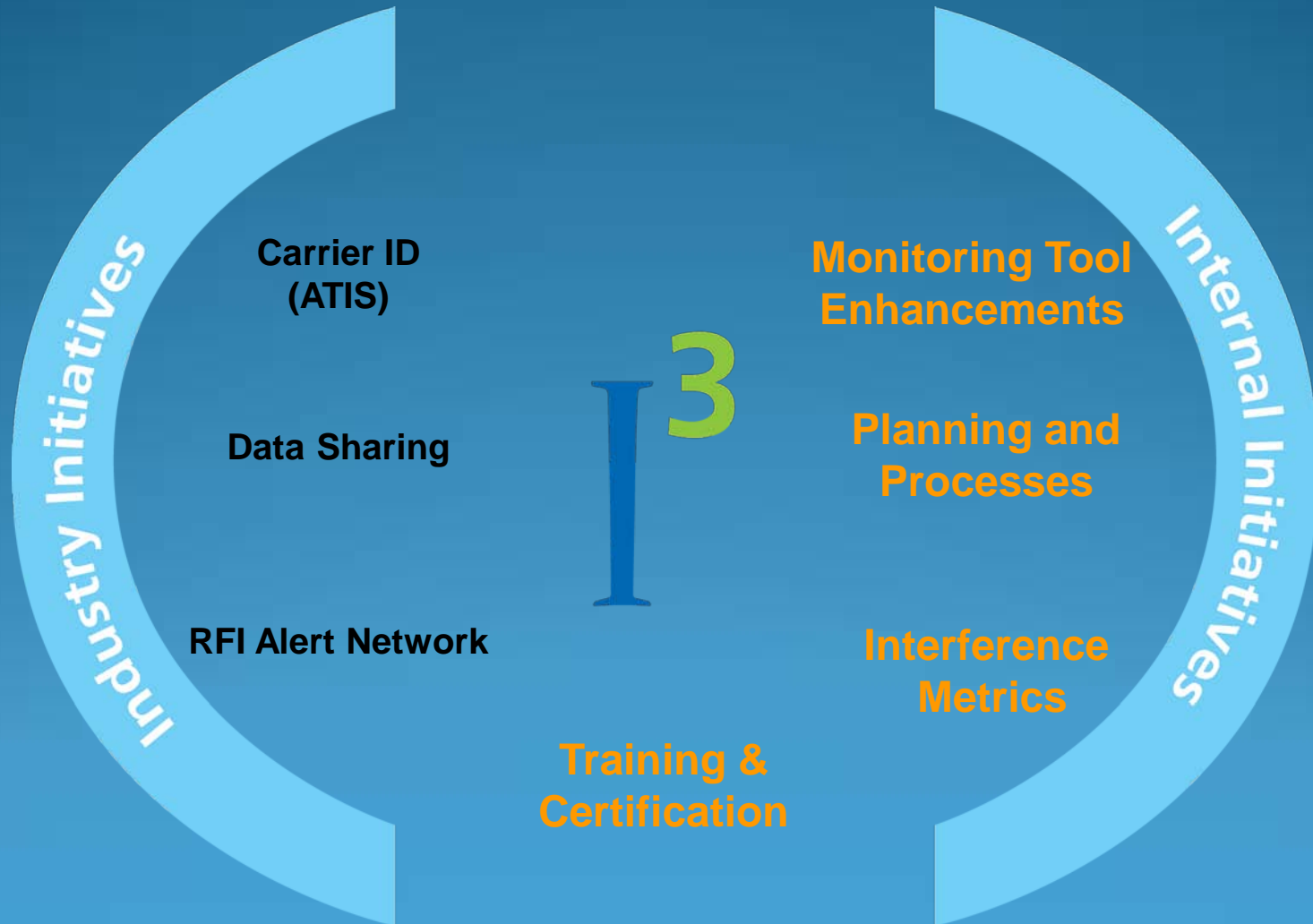




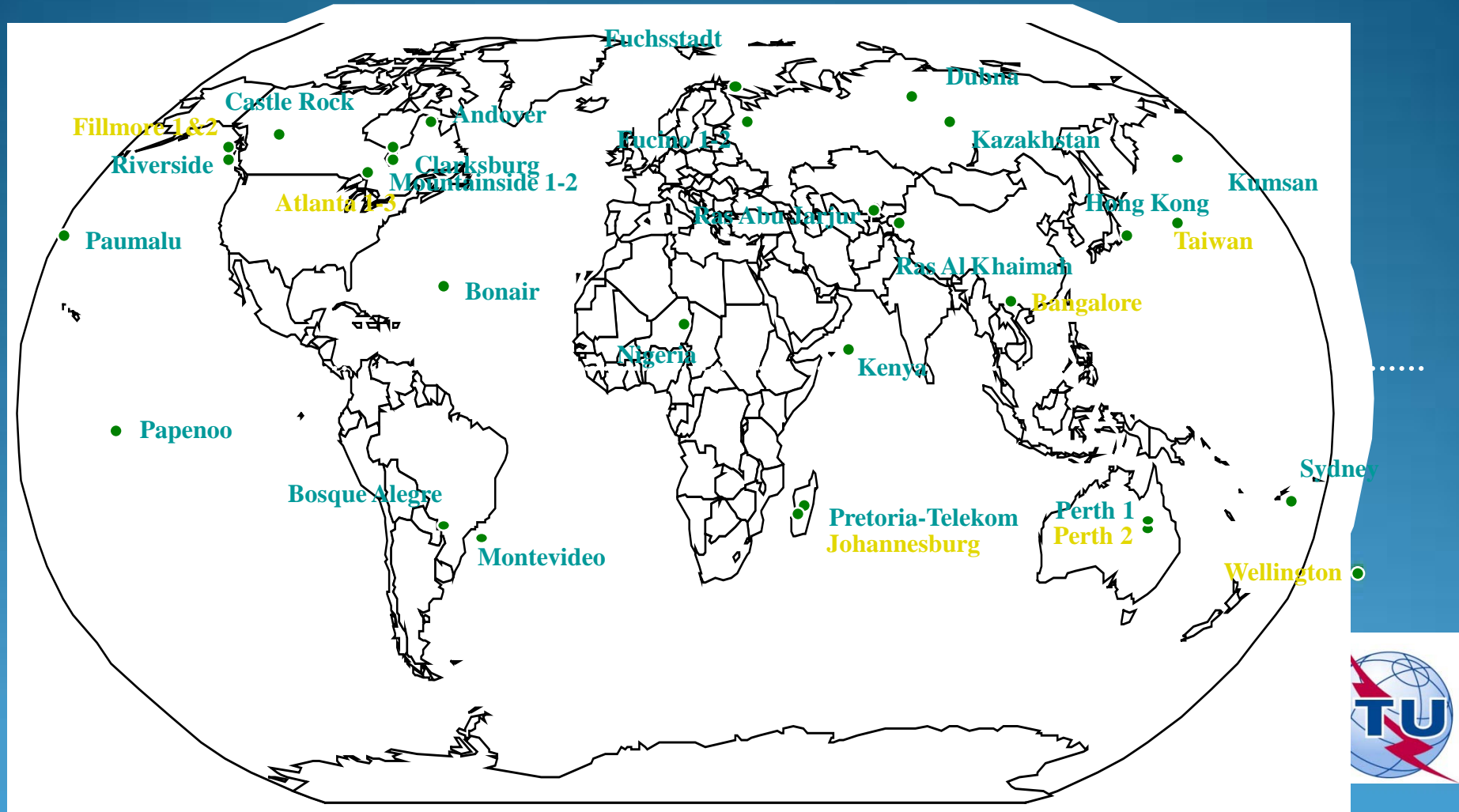
Data Sharing & RFI Alert



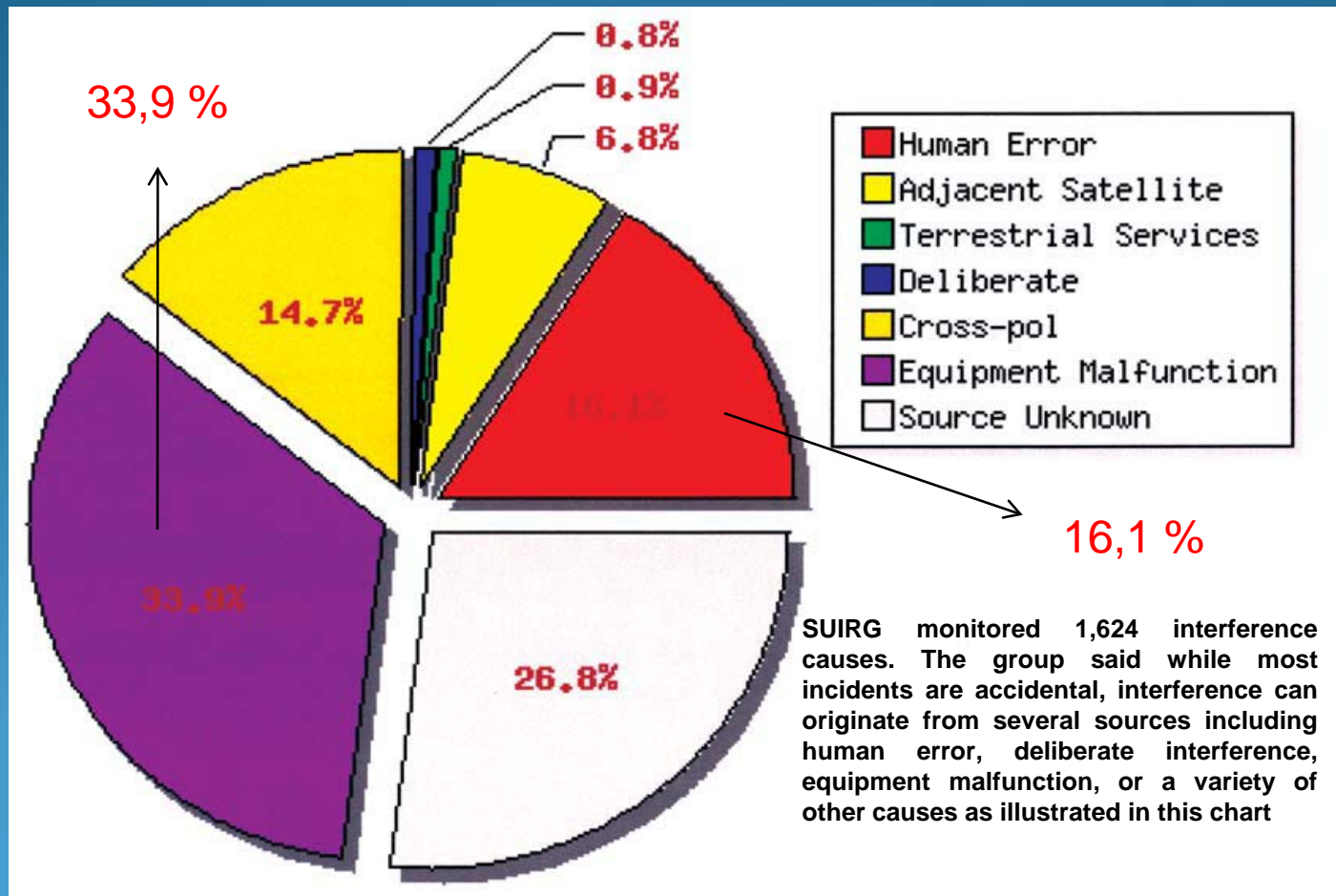
Internal Initiatives



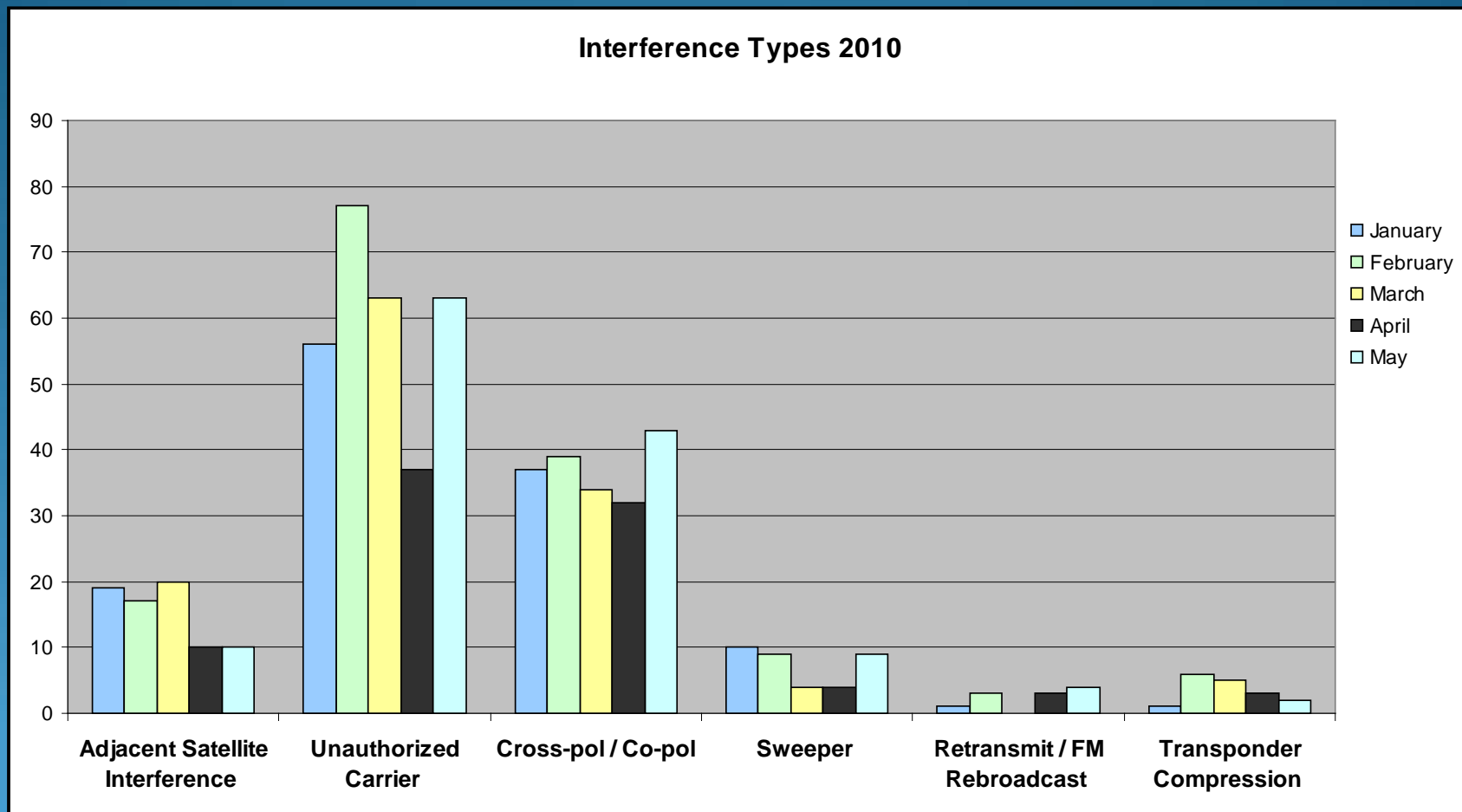
Intelsat Satellite Monitoring Network



Monitoring & controlling spectrum (2007)

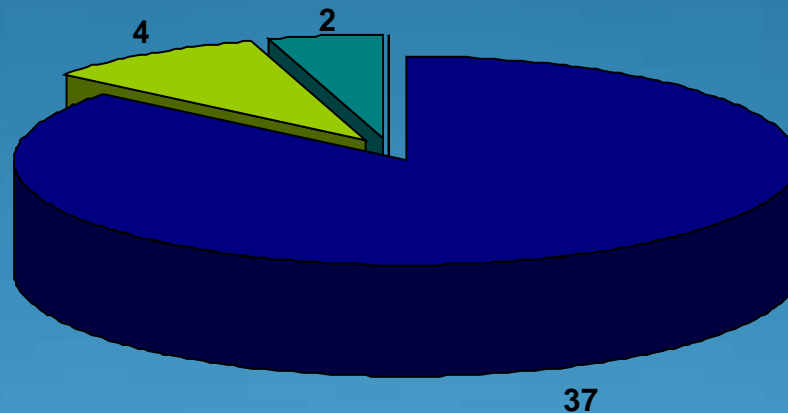


Interference Types - 2010



Interference Metrics cont.

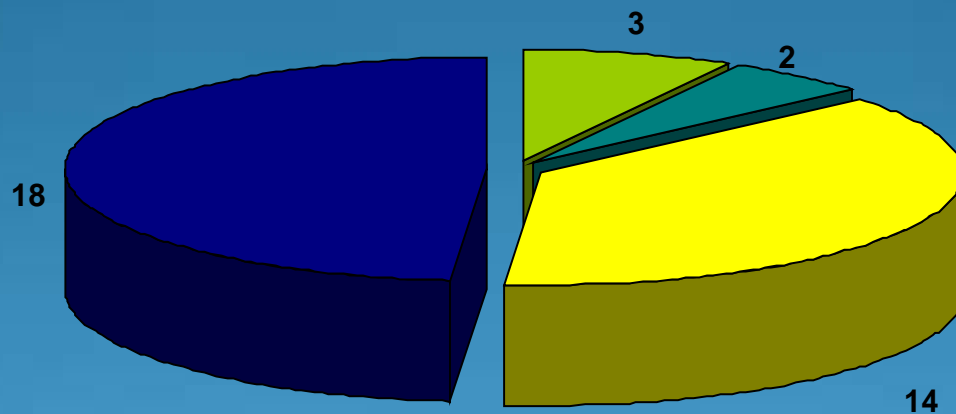
Copol / Xpol (May'10)



■ Customer Caused ■ Unknown Source ■ Satellite

Interference Metrics cont.

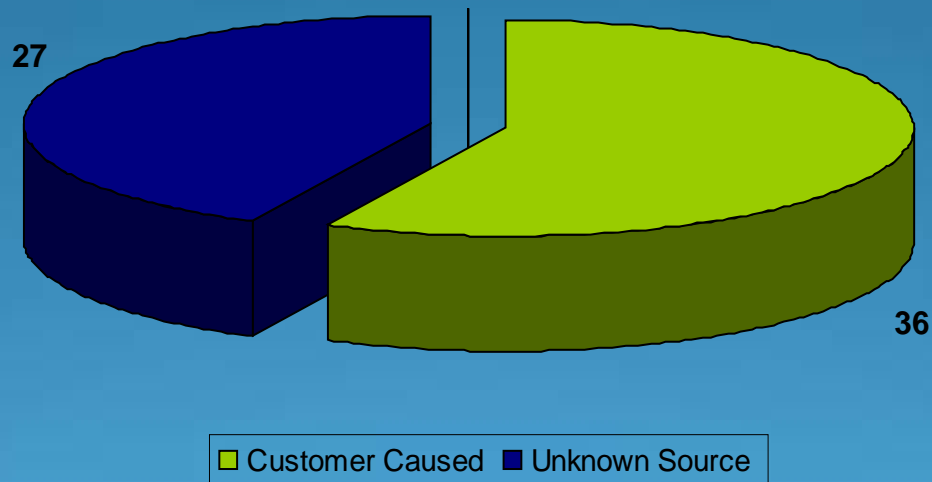
Customer Caused Copol / Xpol (May'10)



 Customer Source SNG	 Customer Source OU
 Customer Source Full Time Carrier	 Customer Source VSAT

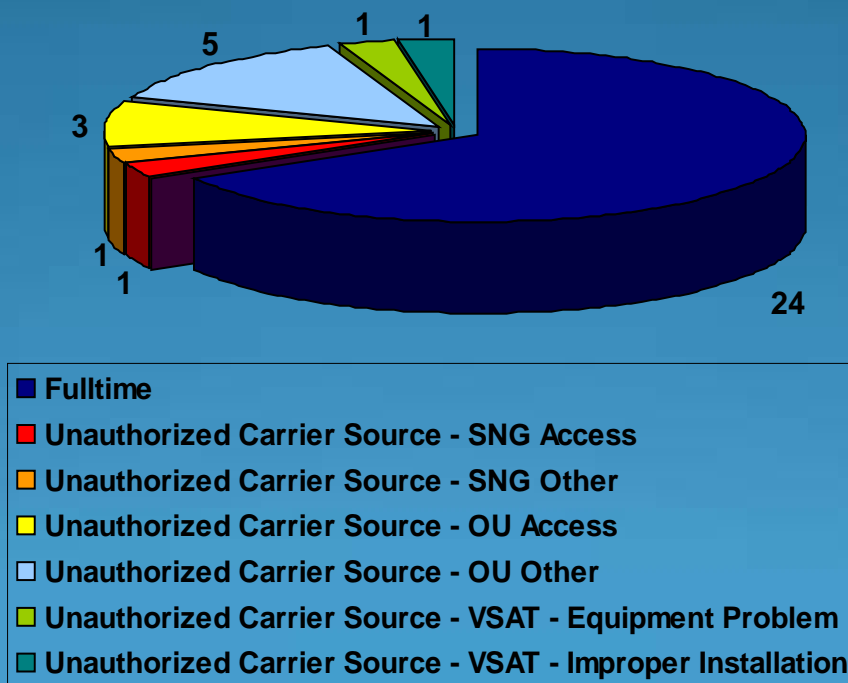
Interference Metrics cont.

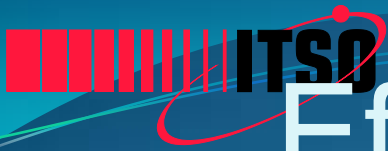
Unauthorized Carriers (May'10)



Interference Metrics cont.

Customer Caused Unauthorized Carrier (May'10)





Effects of Interference

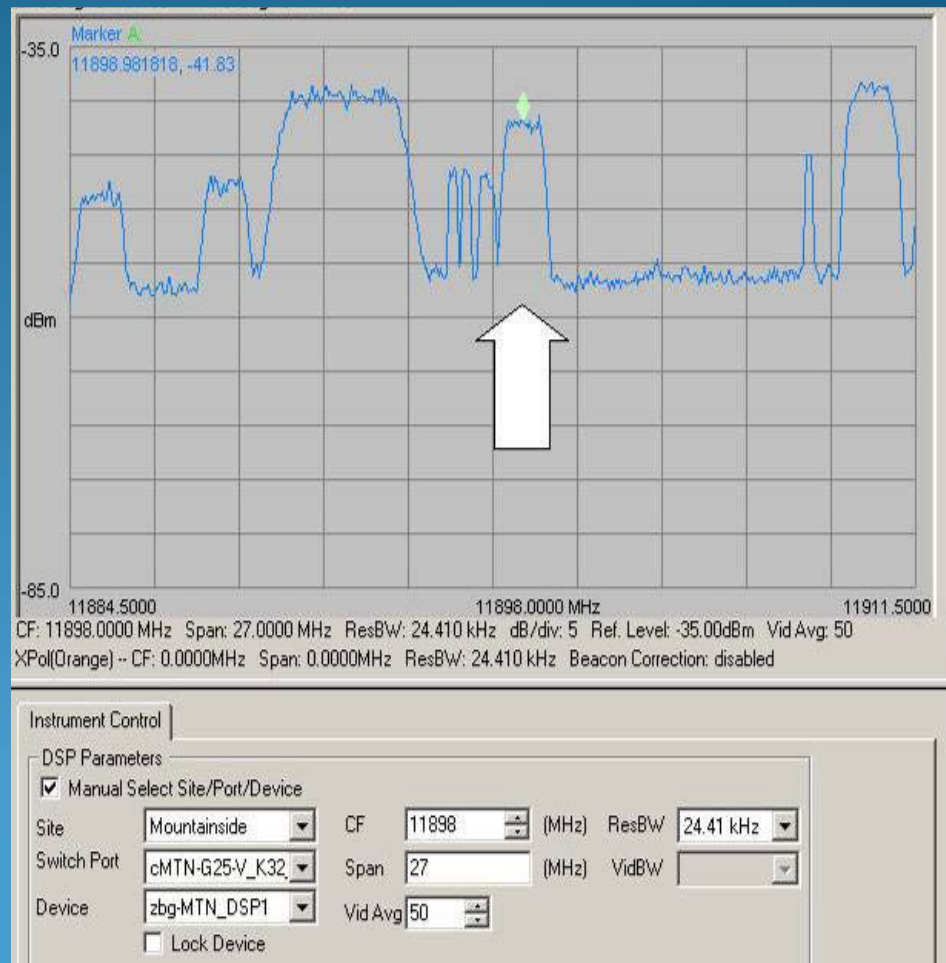
- Degradation of service – IP latency, video tiling, drop outs
- Loss of service
- Loss of revenue – ad revenue, loss of bandwidth to sell
- Manpower costs – satellite operator ops centers, customer ops centers to isolate and remove offending signal, escalations
- Tool costs – monitoring systems, geolocation systems

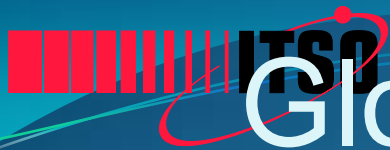


Carrier Management Center

RFI Checks

- Cross-pole Interference
- Adjacent Satellite Interference
- High Power Carrier
- Weather Conditions
- Transponder Saturation / Compression
- Satellite Flyby
- Sun Interference





Global Monitoring System (GMS)

- Supports a variety of Operator activities including
 - Satellite accesses
 - Power spectrums
 - Carrier and transponder measurements
 - Cross-pol support
 - Diagnostics
 - Carrier characterizations
 - Interference analysis (Signal Under Carrier)
 - Transponder compression (TOP)
- Background monitoring

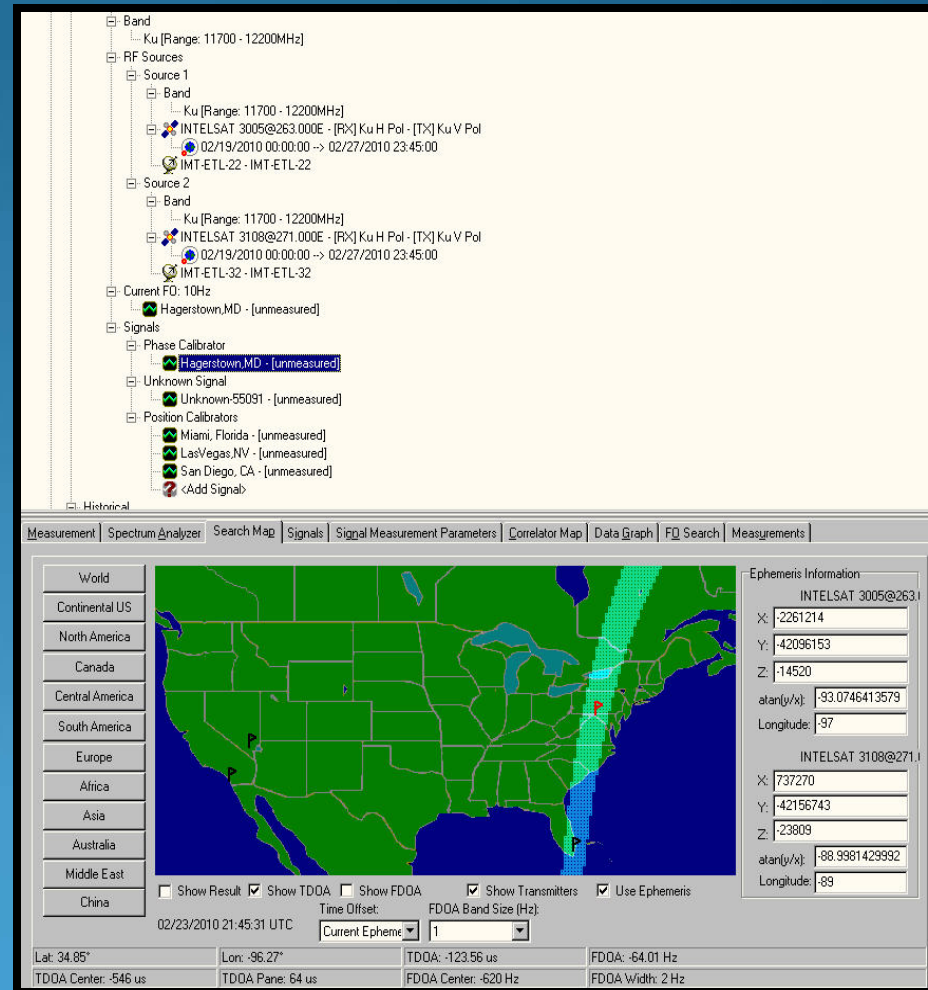


What is Geolocation?

- Both the Transmitter Locator System (TLS) and the Glowlink Systems are passive systems that identify the geographic location of ground based satellite transmitters.
- TLS has been in use for approximately 10 years.
- Glowlink has been in use for approximately 3 years.
- Both systems have been used effectively to locate the source of many interferences.
- Solutions from the TLS and Glowlink, when possible, helps significantly to reduce the time to identify the offenders.

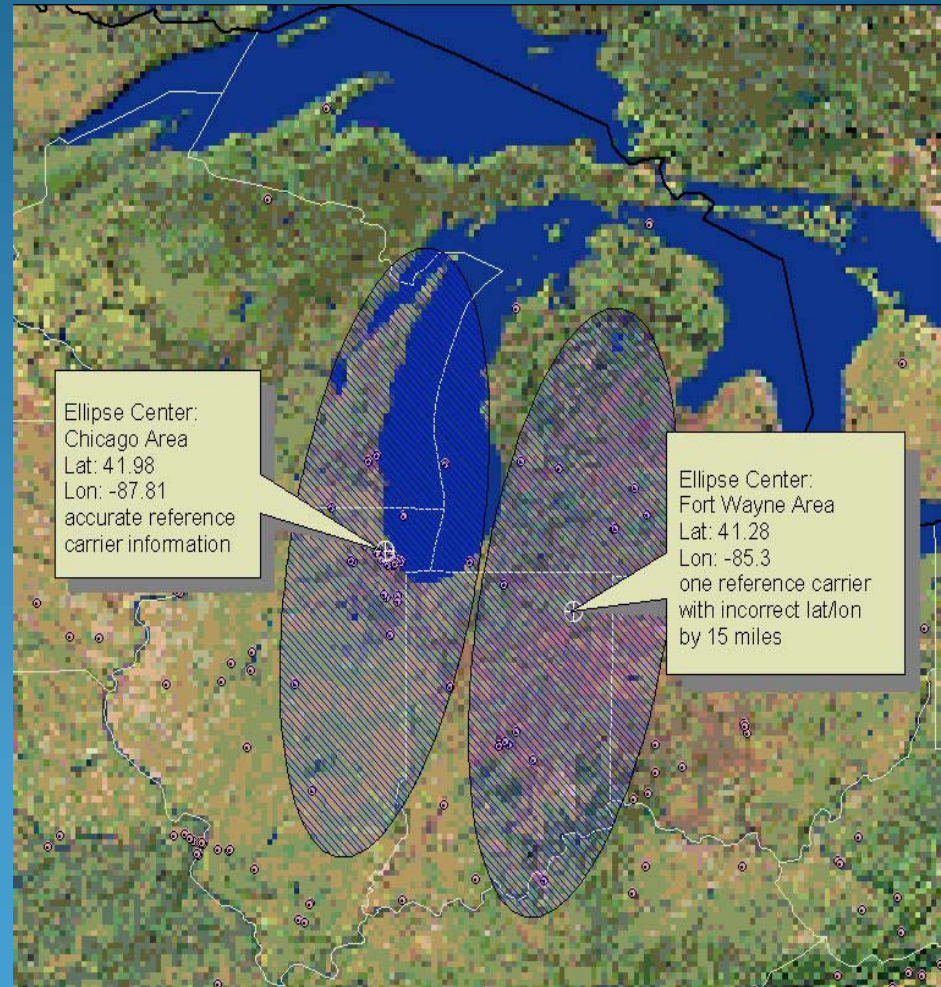
Geolocation View

- An adjacent satellite with comparable uplink beam coverage, frequency usage, and polarization
- Antenna connected to the system within the downlink beam for each satellite
- Carriers with known locations on the beam to be used for calibration
- Ephemerides for both spacecraft



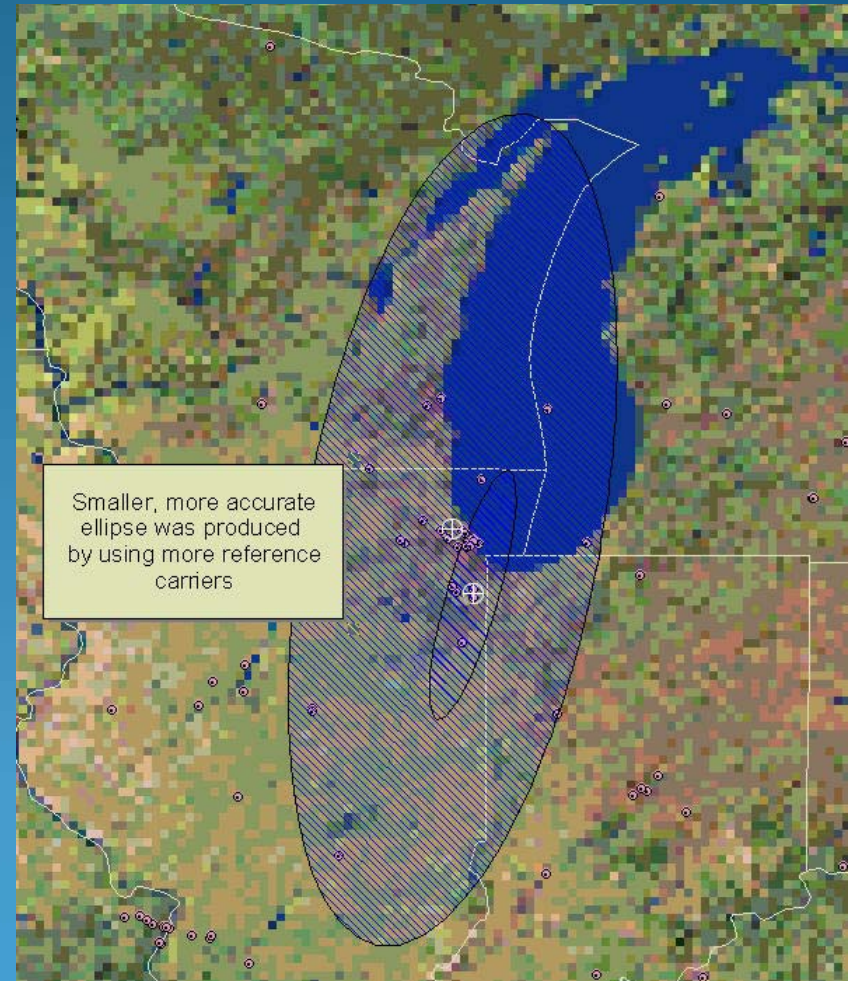
Geolocation results

- Geolocation operator must evaluate the results to determine if the system is indicating any errors such as inaccurate ephemeris or incorrect geographic locations on reference carriers.
- The errors would then be corrected and the results would be reproduced.

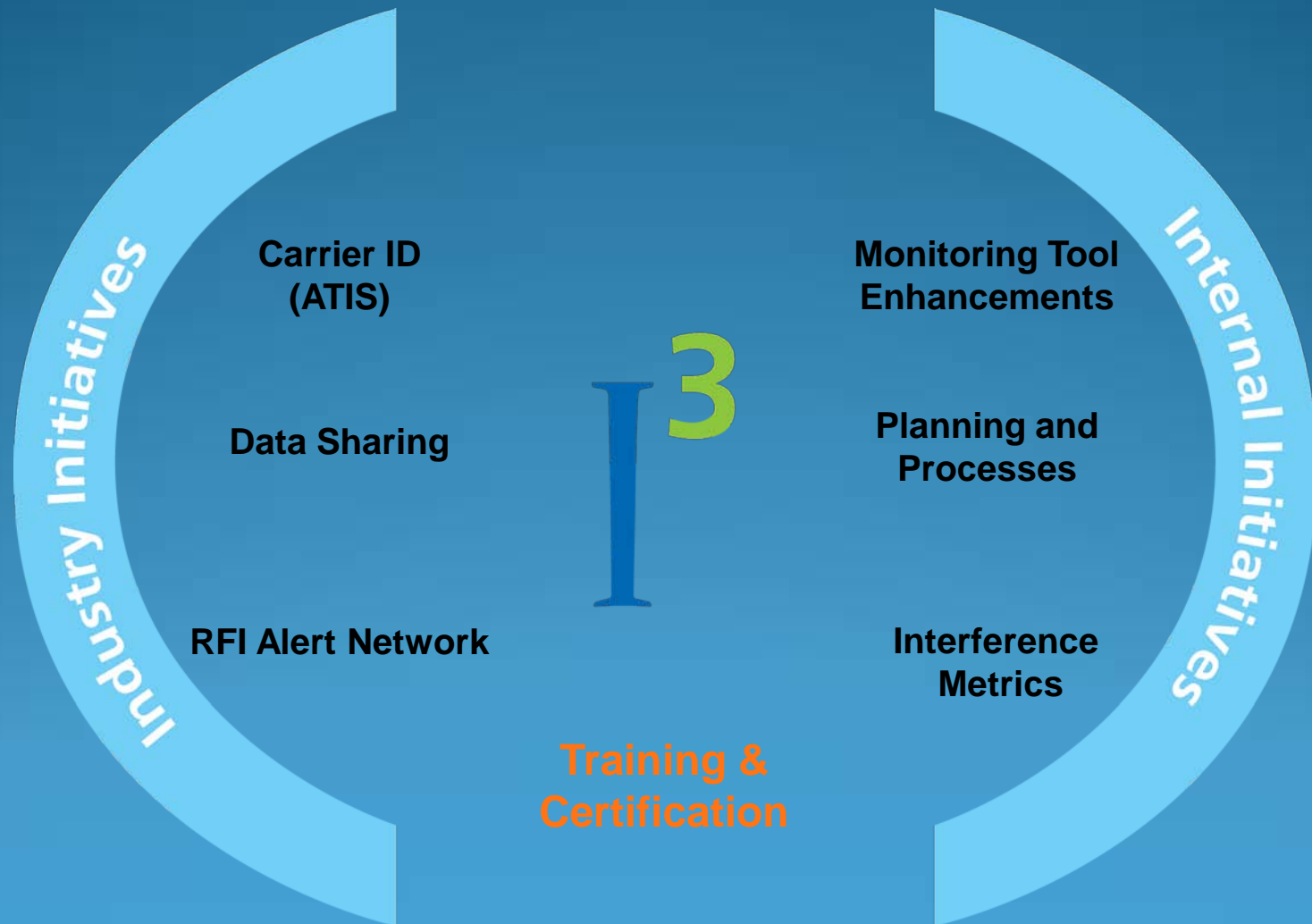


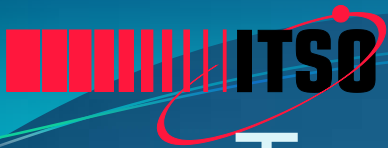
Geolocation results

- Operator would continue to evaluate to possibly fine tune the results.
- More reference carriers can be added from the region initially indicated to provide a much smaller and accurate ellipse in some cases.
- In other cases the measurements may need to be made over a longer period of time to provide the most accurate results.



Training & Certification





Training and Certification

- Over 90% of RFI is caused by uplinker error and/or faulty equipment
- Intelsat has established a 3-year training initiative
- Program goal
 - Identify customers with greatest RFI incidents
 - Invest in online training for up to 400 customer technicians annually, Provide training FREE of charge(GVF510 course)
- Program launched October, 2009
- Training vendors selected and endorsed by Intelsat:



 Training Certificates available
during this meeting...to be confirmed



 **INTELSAT.**
Closer, by far

**Free Training
Compliments of Intelsat**

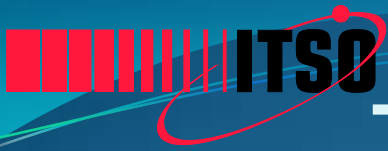
2 Free Passes for Online Training*

Register VSAT installer and operator candidates at: www.intelsat.com/GVF
Register SNG uplinker candidates at: www.intelsat.com/Slingpath **

*Offer available to Intelsat Customers only. Offer expires 31 December 2009

**** Offer extended into 2011??????????**



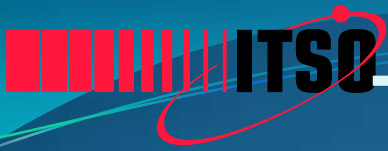


Tackling Interference

Goals for 2011 (to be confirmed)

- Data sharing
 - More eyes = quicker resolution
 - Better information = quicker identification of offender
- Training/Certification sign them up & certify them
 - Require certified operators only to access?
- Carrier ID... Customers need to speak up
 - Manufacturers skeptical unless their customers push
 - Video manufacturers implement ID in their systems
 - Data and VSAT agree on how to implement
 - Create a realistic timeline for implementation



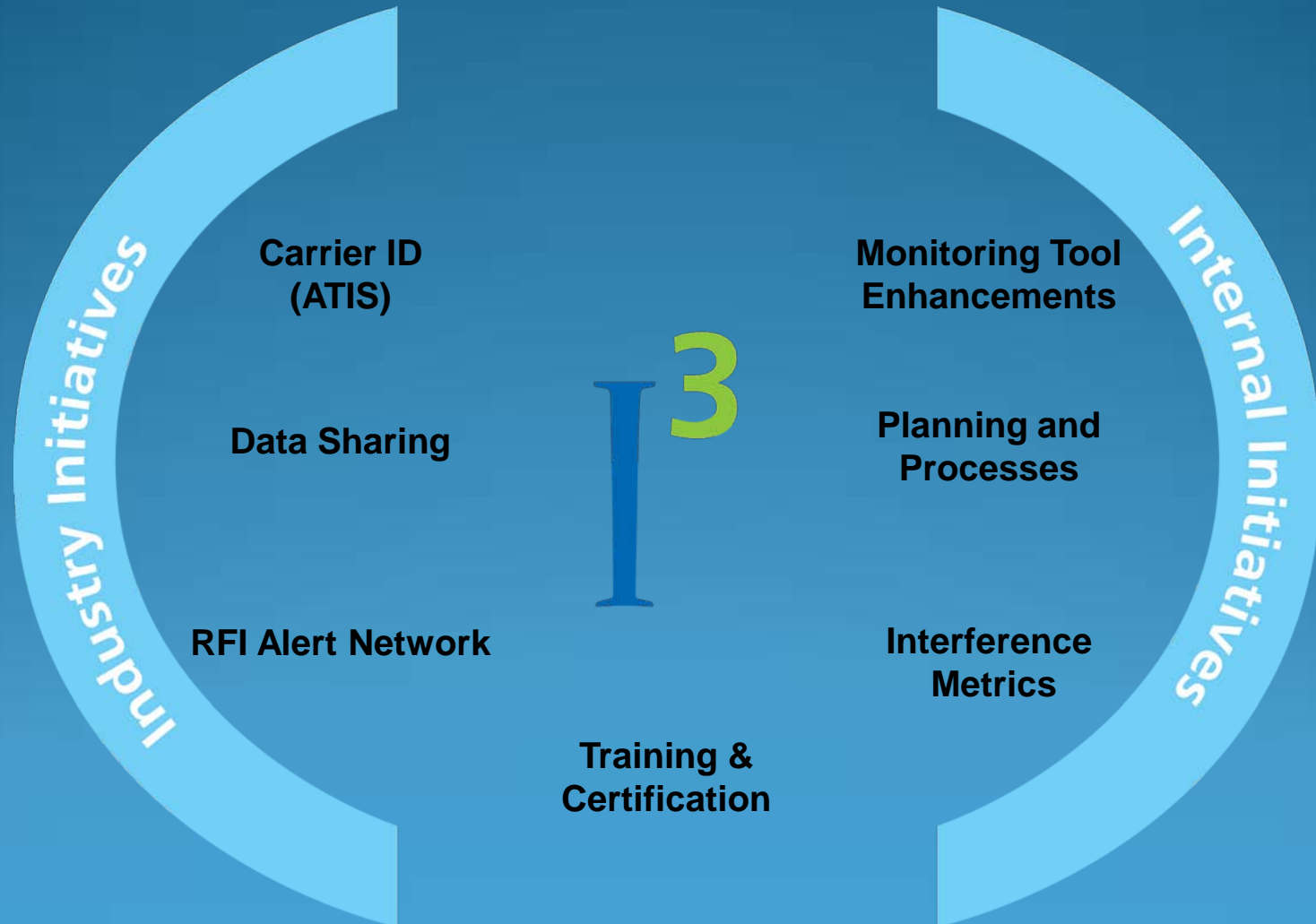


Tackling Interference

How can you help...

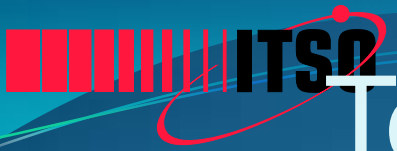
- Access properly
- Use quality and correct sized equipment
- Maintain approved carrier parameters
- Correct issues in a timely manner when they are the cause
- Train and certify your installers and operators
- Use certified installers and operators
- Vendors implement carrier ID
- Use equipment that has carrier ID capability





Combating Terrestrial Interference and WiMax

- The Wireless Access Debate... Far from Over
- Global Allocation Avoided
 - 2007 World Radiocommunications Conference (WRC 07)
 - No Change on C-band
- Shifting from a Global to National Level
 - Local licensing of WiMax-like applications in C-band
 - Wireless and Fixed Satellite Service (FSS) applications cannot coexist
 - Terrestrial services deployed in-band
 - Out-of-band signals generate interference to FSS above 3700 MHz



Terrestrial Interference

Intelsat Actions and Leadership

International Initiatives	Local Initiatives	Teaming with Industry and Trade Groups
Leadership in industry-wide initiatives: Satellite Spectrum Initiative	<p>Research into allocation and usage in extended C-band in Africa.</p> <p>ITU Registration of earth stations in strategic locations in Africa.</p> <p>Relationship building with regulators.</p>	<p>GVF (Global VSAT Forum)</p> <p>SIA (Satellite Industry Association)</p> <p>CASBAA (Cable & Satellite Broadcasting Association of Asia)</p> <p>SAP REG (Satellite Action Plan Regulatory Working Group)</p> <p>ESOA (European Satellite Operator Association)</p> <p>SUIRG (Satellite Users Interference Reduction Group)</p>



Want to Learn More?



Intelsat's "extra-net" will continue to host all materials related to the I³ program and WiMax & Terrestrial interference mitigation efforts



Intelsat's bi-monthly customer e-newsletter is a great way to keep up to date on the I³ program progress and milestones