

# 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 5

## PROCURE MENT



# VSAT Procurement

- Define your needs
  - Business requirements
  - Bandwidth requirements
  - Technical considerations
- Acquire the vsat
  - Procurement approaches and strategies
  - Prepare bids and inviting proposals
  - Evaluating proposals
  - Negotiate and award the contract

# Define your needs

- Add satellite connectivity to .....
- Support T1 / E1 rates.....
- Integrate CISCO management solution..
- Connect 500 small villages in harsh enviironmental and logistical conditions..
- 2 phones per site with field upgradable capacity...
- Converged legacy voice equipment with high speed data services.....
- Client has no Vsat operations experience...
- Central management.....
- Reliability.....
- Cost effective solution.....

# Define your needs (business requirements 1)

- Client service description, e.g

	QoS	Throughput	Resp. time
Voice	fulfill	fulfill	fulfill
Data	fulfill	fulfill	fulfill
Data & Voice	fulfill	fulfill	fulfill
Interactive data	fulfill	fulfill	fulfill
One-way broadcast	fulfill	fulfill	fulfill
Videoconferencing	fulfill	fulfill	fulfill
Internet	fulfill	fulfill	fulfill

# Define your needs (business requirements 2)

- Estimation of traffic in the PBH, e.g

	Service X	Service Y
Traffic ( erl)	fulfill	fulfill
Msg size	fulfill	fulfill
Call duration	fulfill	fulfill
Service priority	fulfill	fulfill
Response time	fulfill	fulfill
Setup time	fulfill	fulfill
App protocols	fulfill	fulfill

# Define your needs (business requirements 3)

## Constraint

	<b>Cli. A</b>
Obstacles	fulfill
Building projects	fulfill
roads	fulfill
Radio links op same freq	fulfill
Zoning restrictions	fulfill

## Growth traffic / year (estimated)

	<b>Cli. A</b>
Nodes / year	fulfill
Services / node	fulfill
New services / existing node year	fulfill
Ppriority services / node	fulfill

# Define your needs (voice traffic 1)

Year	1	2	3
Number site with 2 ch	60	100	150
Number site with 4 ch	25	50	70
Number site with 8 ch		20	30
Total site	85	170	250
Total number channels	220	560	820
Traffic intensity 0,1 Erl <sup>n</sup> / line	22	56	82
Number sat. Ch. With B <sup>n</sup> =2%	31	67	85



# Define your needs (voice traffic 2)

Node	1	2	3	4	5	6
1		161943	150139	1295144	95713	395774
2	161943		719180	40701	1891282	197720
3	150139	719180		84565	831489	241145
4	1295144	40701	84565		247042	111363
5	95713	1891282	831489	247042		174757
6	395774	197720	241145	111363	174757	

Note - clients providing the traffic information in traffic minutes

# Define your needs (voice traffic 3)

Node	1	2	3	4	5	6
1		1,0	0,9	7,6	0,6	2,3
2	1,0		4,2	2,0	11,1	1,2
3	0,9	4,2		0,5	4,9	,4
4	7,6	0,2	0,5		1,5	0,7
5	0,6	11,1	4,9	1,5		1,0
6	2,3	1,2	1,4	0,7	1,0	

Node	1	2	3	4	5	6
1		5	5	15	4	7
2	5		10	3	19	5
3	5	10		4	11	6
4	15	3	4		6	4
5	4	19	11	6		5
6	7	6	5	4	5	



N. Erlangs



N. Channel

# Define your needs (data traffic collection)

- In each branch office there will be one or several data terminals that will offer traffic to the VSAT network (Nu),
- The number of transactions per minute, bytes per transaction, and response time ( $T_m$ ,  $C_l$ ,  $C_o$  and  $RT$ ) depends on the client application
- Internet is a special case because the number of transactions per day is not yet well characterized. To date, the manufacturers and Internet VSAT Service Providers (ISPs) use the following assumptions as conventions for Internet traffic
  - Most of the traffic is browsing traffic.
  - Of the registered users, only 10 percent are logged-in at any given time,
  - Of the logged-in users only 20 percent are active at any given time, and most of these are reading received information or performing other short term tasks
  - The inbound to outbound traffic ratio is 1/10.
  - For browsing purposes, a minimum throughput of 9.6 kbit/s is required for the inbound channel.



# Define your needs (data traffic collection)

Client	Application	T	C <sub>I</sub>	C <sub>O</sub>	N <sub>U</sub>	N <sub>VSAT</sub>	T <sub>M</sub>	R <sub>T</sub>
Bank X	Account & ATM	18000	100	400	5	75	4	2
Insurance	LAN-to-LAN	5800	60	300	25	15	3	2
Manufact	Inventory	300	500	500	1	25	1	5
Retail	POS	15000	50	200	8	75	8	2-5
Credits	ATM & card verif	50	40	100	10	50	0,5	2-5
Internet	Internet / Intranet	n/a	60	600	15	25	n/a	2

# Define your needs (data traffic calculation)

$$T_R = \left( \frac{N_U \times N_{VSAT} \times P_L \times 8 \times P_T}{60/T_m} \right)$$

**Where:**

**Tr** = Total rate offered to the network, in bit/second

**Nu** = Number of data terminals or end-users per VSAT node

**Nvsat** = Number of VSATs servicing the same application

**PT** = Number of packets per transaction

**Tm** = Number of transactions per minute (in PBH)

**PL** = Length of the packet in bytes, 100 and 200 for inbound and outbound traffic respectively

# Define your needs (bandwidth requirements)

Client	Network size			Inbound traffic PBL=100BYTE			Outbound traffic PBL=200BYTE		
	$N_U$	$N_{VSAT}$	$T_m$	$C_I$	$P_T$	$T_R$	$C_I$	$P_T$	$T_R$
Bank X	5	75	4	100	1	20000	200	1	40K
Insurance	25	15	3	60	1	15000	200	1	300K
Manufact	1	25	1	500	5	1667	500	3	1,667K
Retail	8	75	8	50	1	64000	100	1	128K
Credits	10	50	0,5	40	1	1333	100	1	3,333K
Internet	15	25	n/a	60	1	72000	300	2	36K
Total traffic in bps during PBH				174000			563000		

# Define your needs (bandwidth requirements)

$$C_R = \frac{T_R \times (1 + OH)}{\eta \times R}$$

Where:

$C_R$  = Number of carriers at rate  $R$

$T_R$  = Total rate offered to the network in b/s

$OH$  = Traffic overhead, required for packet header and trailer, 20 percent for outbound (TDM) carrier and 40 percent for slotted ALOHA inbound carriers

$R$  = Information rate of the carriers. 64 kbit/s or 128 kbit/s for inbound and  $N \times 64$  kbit for the outbound ( $N < 24$ ).

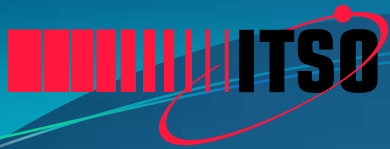
$\eta$  = Efficiency of the access protocol. 23 percent for Slotted ALOHA and 90 percent for TDM (for inbound and outbound carriers respectively).



# Define your needs (bandwidth requirements)

	Global	regional
SES	X	X
Intelsat	X	
PanAmSta		
Loral	X	
New Skies	X	
Avanti	X	
Eutelsat		X
Asiasat		X
Arabsat		X
Hispasat		X



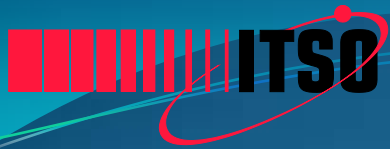


# Define your needs (technical considerations)

Once defined the number of carriers has been defined, it is important to define:

- Network performance
- Network size & design
- Network design versus available equipment





# Define your needs (network performance)

- Response time
  - The elapsed time between the moment an inquiry is received from the user by the hub or VSAT and the moment when the response is delivered by the VSAT or hub to the user. In a data network, the response time will consist of the time it takes to get the data from a distant end. For a voice network, the response time will consist of the setup time of a voice channel. When considering the response time, it is important to factor in the 520-msec. satellite round - trip propagation time.



# Define your needs (network performance)

- Throughput
  - For the clients, throughput represents time within which they expect their applications to achieve a given response. For VSAT service providers it indicates the efficiency of the network.
- Typical BER
  - The typical BER tolerated depends upon the application. Voice tolerates higher BER, while data needs lower BER. Typical values are  $10^{-5}$  to  $10^{-7}$  for voice networks and  $10^{-7}$  to  $10^{-9}$  for data.



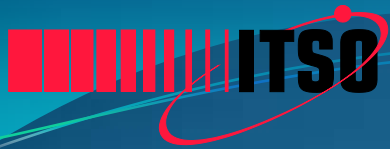
# Define your needs (network performance)

- Network availability
  - Network availability is defined as the percentage of the time in which the network operates above the BER threshold. The availability of the ground equipment ( $A_E$ ) and the availability of the satellite link ( $A_L$ ) influence the total network availability, being the total value equal the minimum of both.

# Define your needs (network performance)

- Equipment availability
  - Defined by the ratio of the time the equipment operates properly to the total time. The time the equipment operates is indicated by the Mean Time Before Failure (MTBF). The total time is the addition of the time needed to repair a unit as indicated by the Mean Time To Repair (MTTR) plus the total operating time or MTBF. The formula to calculate  $A_E$  is

$$A_E = \frac{MTBF}{MTBF + MTTR}$$



# Define your needs (network performance)

- Link availability
  - Defined as the ratio of the time the link is above the BER threshold to the total time. The link availability is influenced by the attenuation induced by the rain and other propagation effects together with outages caused by the sun interference. The attenuation induced by the rain is higher at Kuband than in C-band. The way to counter this attenuation is to introduce margins in the uplink and in the downlink. These so called rain margins must take into account, gaseous absorption, cloud attenuation, rain attenuation, cross-polar discrimination etc



# Define your needs (network size and design)

- The network design will seek to balance the requirements in the Earth segment and space segment to find the, overall, cost-effective solution. Optimum network design minimizes the capital and operating costs while meeting all service requirements, and involves a tradeoff among available **satellite capacity, antenna sizes, proposed connectivity, network topology, availability, quality**, e.g:
  - Satellite footprint and frequency band
  - Topology and access alternatives
  - Link budget

# Define your needs

## (Network design versus equipment )

- As indication, some precautions shall be adopted:
  1. In sequence of link budgets performed, the planner needs to compare the results with the available equipment, Antenna, SSPA, carrier rates, coding, and modulation schemes.
  2. Although manufacturers can tailor equipment to meet a requirement, the cost is high.
  3. It is better to match network requirements with the industry available equipment.

...



# Define your needs

## (Network design versus equipment )

...

4. If necessary, undertake additional iterations to see if an acceptable network design can be achieved using available equipment.
5. If industry information is available, it should be used as reference for the link budget calculations.
6. Satellite Organizations can help, but buyers must contact the manufacturer to get specific details on products, services, and costs.

# Acquire the Vsat (procurement strategies)



# Acquire the Vsat (procurement strategies)

- Entitle a central department or manager for acquiring services or equipments, giving him full authority (to coordinate the process ( centralized purchasing )
- Provide clear leadership, roles and responsibilities and performance management arrangements
- Choose an optimum mix of vendors who can provide the best prices and terms. This process usually means that the less able suppliers who cannot provide a quality service at the terms and prices required are discarded.
- Adopt e-procurement



# Acquire the Vsat (procurement strategies)

- Choose prices indexation formula using low variation currency
- Maximize volume discounts ( review other companies' procurements if applicable, compare short and medium term upgrades etc)
- Obtain “promised duration” discounts
- Request discounts in refurbished or used equipments
- Obtain “termination for convenience” protection

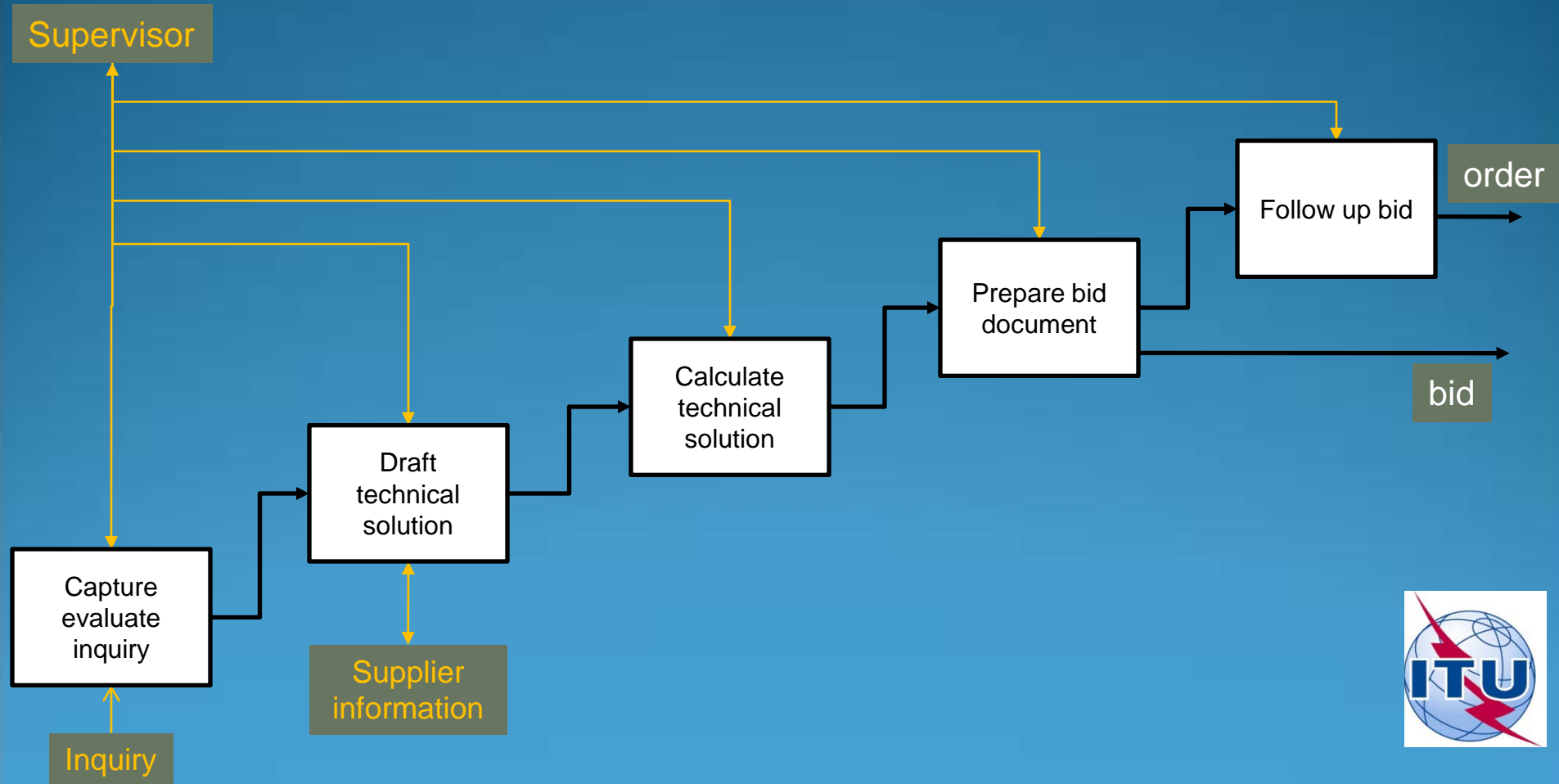


# Acquire the Vsat (procurement strategies)

- Get a very updated technical bidders list, and give privilege to bidders with environmental products
- Identify end users( inside or outside company ) to supply consultancy, and supply on site complaints, concerning the service / equipments you are procuring;
- Address minimum 3 vendors
- Establish schedule for followup meetings, or alternatively max processing time for clarifications answers



# Acquire the Vsat (prepare the bids and invite)



# Acquire the Vsat (prepare the bids and invite)

1. Bidders' list
2. Prepare RFI / RFP →
3. Distribute RFP's
4. Evaluate proposals
5. Contactor selection & award
6. Contacting
7. Monitor performance

1. Information to bidders, with brief statement of purpose of intent
2. Technical Proposal Standard Forms
3. Financial Proposal Standard Forms
4. Terms and conditions
5. Evaluation criteria
6. Standard Form of Contract
7. Exhibits



# Acquire the Vsat (Evaluating proposals)

- It may seem obvious that proposals should be compared to one another in order to select the best one.
- The criteria evaluation refers to “qualitative” factors.
- While it’s true that a certain amount of comparison naturally occurs during the evaluation process, proposals must be evaluated or scored using the criteria set out in the RFP
- Normally, cost is taken into consideration after the “qualitative” factors have been evaluated.



# Acquire the Vsat (Evaluating proposals)

- Numeric rating system
  - Evaluation must be categorized, or scored
  - More objective form to evaluate
  - Easiest form to reach the award proposal
  - Less disputed from competitors
- Non numeric rating syst.
  - Decision must be explained.
  - Your explanation must be rational and consistently applied from competitor to competitor.
  - More disputed from competitors

# Acquire the Vsat (Evaluating proposals)

1. Bidders' list
2. Prepare RFI / RFP
3. Distribute RFP's
4. Evaluate proposals
5. Contractor selection and award
6. Contracting
7. Monitor performance



- The evaluation criteria has been already issued on the RFP, so apply it
- Best practice is to provide a costing template - with weighted criteria - for the bidders to complete so that you can compare the bids easily

# Acquire the Vsat (Evaluating proposals)

Criteria <sup>note</sup>	Vendor A	Vendor B	Vendor C
Compliance Cost template	1 - 5	1 - 5	1 - 5
Compliance Start up, deliver,& insta deadlines	1 - 5	1 - 5	1 - 5
Compliance General & special conditions	1 - 5	1 - 5	1 - 5
Proff of After sales services capacity	1 - 5	1 - 5	1 - 5
Special liabilities * Warranties, insurance.....	1 - 5	1 - 5	1 - 5
Total aggregate price	1 - 5	1 - 5	1 - 5
Total	1 - 5	1 - 5	1 - 5

# Acquire the Vsat (special liabilities)

Special Conditions	Description
Warranty / Guarantee equipments and services	Minimum period..and remedy
Quality assurance	ISO 9001
Language	The most appropriated
Currency of quotation	USD, Euros & local
Delivery	CIF .....
Delivery period	X weeks after P-purchase O-order
Payment terms	30-60 days after invoicing
.....	

# Acquire the Vsat (negotiation and award contract)

- Best and final offers should normally be submitted only once, however it is in the Enterprise's best interest to conduct additional discussions.
- Additional discussions shall be based on real alternatives to the equipment / services, e.g. refurbished equipments, local incorporation for ancillary services, spare lists ....
- Payment terms and conditions is always negotiable, taking special attention to INCOTERM for equipments.
- Upon determination of the apparent successful contractor, the next step is to draft a written contract identifying all terms of agreement between contracting parties

# Acquire the Vsat (standard contract items)

- General terms and conditions
  - Identification of the parties (with responsible parties)
  - Contents of agreement (terms & conditions and exhibits) and definitions
  - SOW-Scope of works and schedule (start and end dates)
  - Parties responsibilities
  - Acceptance (provisional and final)
  - Order and supply of products / services
  - Payments (price and terms)

....



# Acquire the Vsat (standard contract items)

- Other terms and conditions
  - Subcontractors
  - Contractors ( assignments )
  - Confidentiality
  - Warranty
  - Insurance
  - Indemnifications / limitation of liability
  - Force majeure
  - Termination ( and effects )
  - Export / Import licenses
  - Settlement of Disputes / governing law
  - General provisions

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“policy & regulatory guidelines for sat. services”
- ITU - Draft report on satellite regulation in developing countries
- Position Paper on Interference in C-band by Terrestrial Wireless Applications to Satellite Applications  
( CASBAA, GVF, SUIRG, APSCC )



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