Agenda

- Day 1 - Basics of Satellite Communications
- Day 2 - Policy and Regulatory Guidelines for Satellite Services (Analog TV to DTT)*
- Day 3 - Network Planning (Satellite trends, Link budget)*
- Day 4 - Vsat Installation and Maintenance
- Day 5 - Vsat Equipment and Bandwith Procurement

* - Eldo Kurian from Intelsat

Day 5

Procurement

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VSAT Procurement

- Define your needs
  - Business requirements
  - Bandwith 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
Why?

- The definition of the requirements is intended to list a necessity in equipment and / or services for the continued performance of a business, making it known to the potential supplier market. (with or without shortlist)
- The "competitors" are invited to pronounce themselves, offering their services, being common to do so in textual way - procedural documentation - and demonstrative way - visit to a client already in service - in order to clarify all doubts of the client
- Matter of RFI/RFP

Define your needs
example

- Add satellite connectivity to …..
- Support T1 / E1 rates……
- Integrate CISCO management solution..
- Connect 500 small villages in harsh enviironmental and logistical conditions..

Define your needs
example (cont)

- 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

	Cli. A
Obstacules	fulfill
Building projects	fulfill
roads	fulfill
Radio links op same freq	fulfill
Zoning restrictions	fulfill

Growth traffic / year (estimated)

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

Define your needs
voice traffic 1

Example customer with 250 installation site forecast in 3 years

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 ^{n} / line	22	56	82
Number sat. Ch. With B^{n}=2%	31	67	85

B = loss

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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

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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	

N. Erlangs

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. Channels - according table B Erlang conversion

Define your needs
data traffic collection 1

- 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 (Tm, CI, CO and RT) depends on the client application

Define your needs
data traffic collection 2

- 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 is1/10.
  - 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_I	C_O	N_U	N_{VSAT}	T_M	R_T
Bank X	account & ATM	18000	100	200	5	75	4	2
Insurance	LAN-to-LAN	5800	60	200	25	15	3	2
Manufact	inventory	300	500	500	1	25	1	5
Retail	POS	15000	50	100	8	75	8	2-5
POS	ATM & POS	50	40	100	10	50	0,5	2-5
Internet	Internet / Intranet	n/a	60	300	15	25	n/a	2

T - nº transactions day , Ci - nº character per transaction bytes
Co - nº character per transaction bytes, Nu - nº terminal per node vsat
Nvsat - nº vsat same application, TM - nº transactions minute HP
RT – response time

Define your needs
data traffic calculation

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

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 bandwith requirements

Client	Network size			Inbound traffic P_L=100BYTE			Outbound traffic P_L=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
Manufacturer	1	25	1	500	5	1667	500	3	1,667K
Retail	8	75	8	50	1	64000	100	1	128K
POS	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

bandwith requirements - carrier 1

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

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 x 64 kbit for the outbound (N<24).

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

Define your needs

bandwith requirements - carrier 2

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

where:

C_R	= 174 Kbits * (1+ 0,4) / (0,23 * 64 Kbps) = 14,99 **Inbound**
C_R	= 563 Kbits * (1+0,2) / (0,9 * 768 Kbps) = 0,97 **Outbound**

Define your needs
bandwith requirements

Satellite supplier	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 1

- 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 2

- 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 3

- 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 (D_E) and the availability of the satellite link (D_L) influence the total network availability, being the total value equal the minimum of both.
  - The total amount corresponding to the smaller of the two, being possible to increase the value by means of the diversity of network solutions and redundant equipment chains

Define your needs network performance 4

- 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 D_E is

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

Define your needs
network performance 5

- 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.

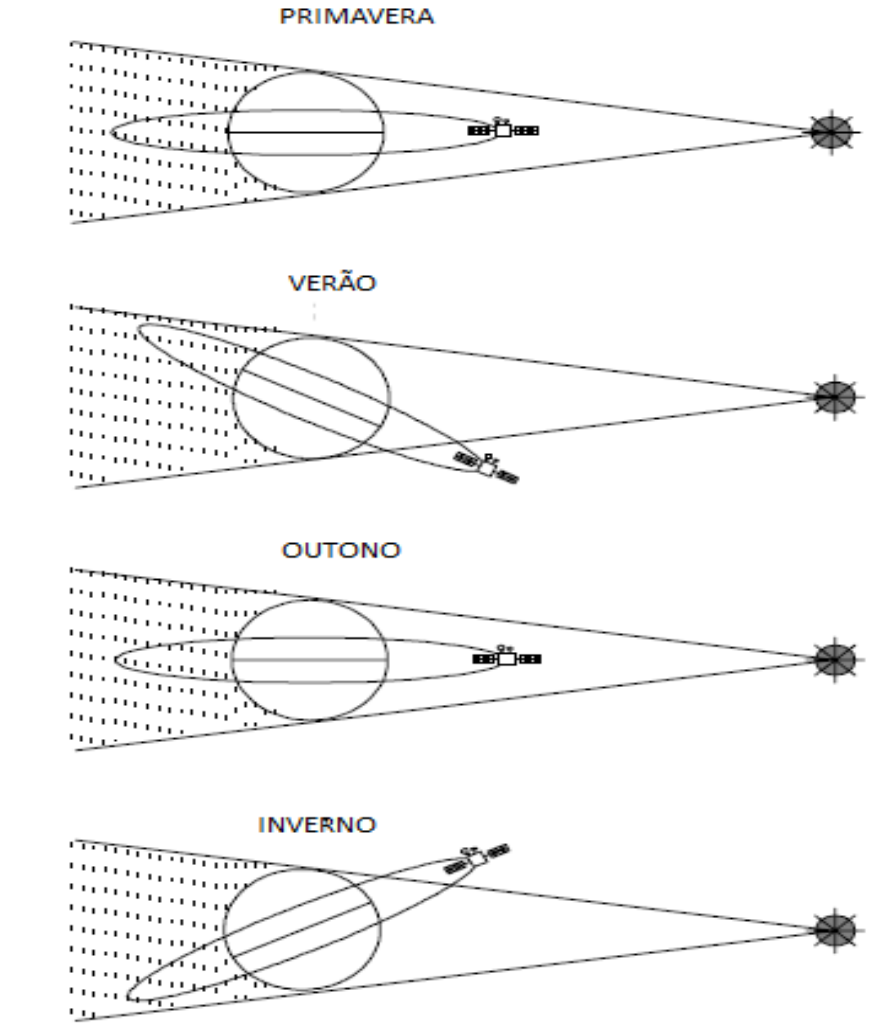
…

Define your needs
network design versus equipment

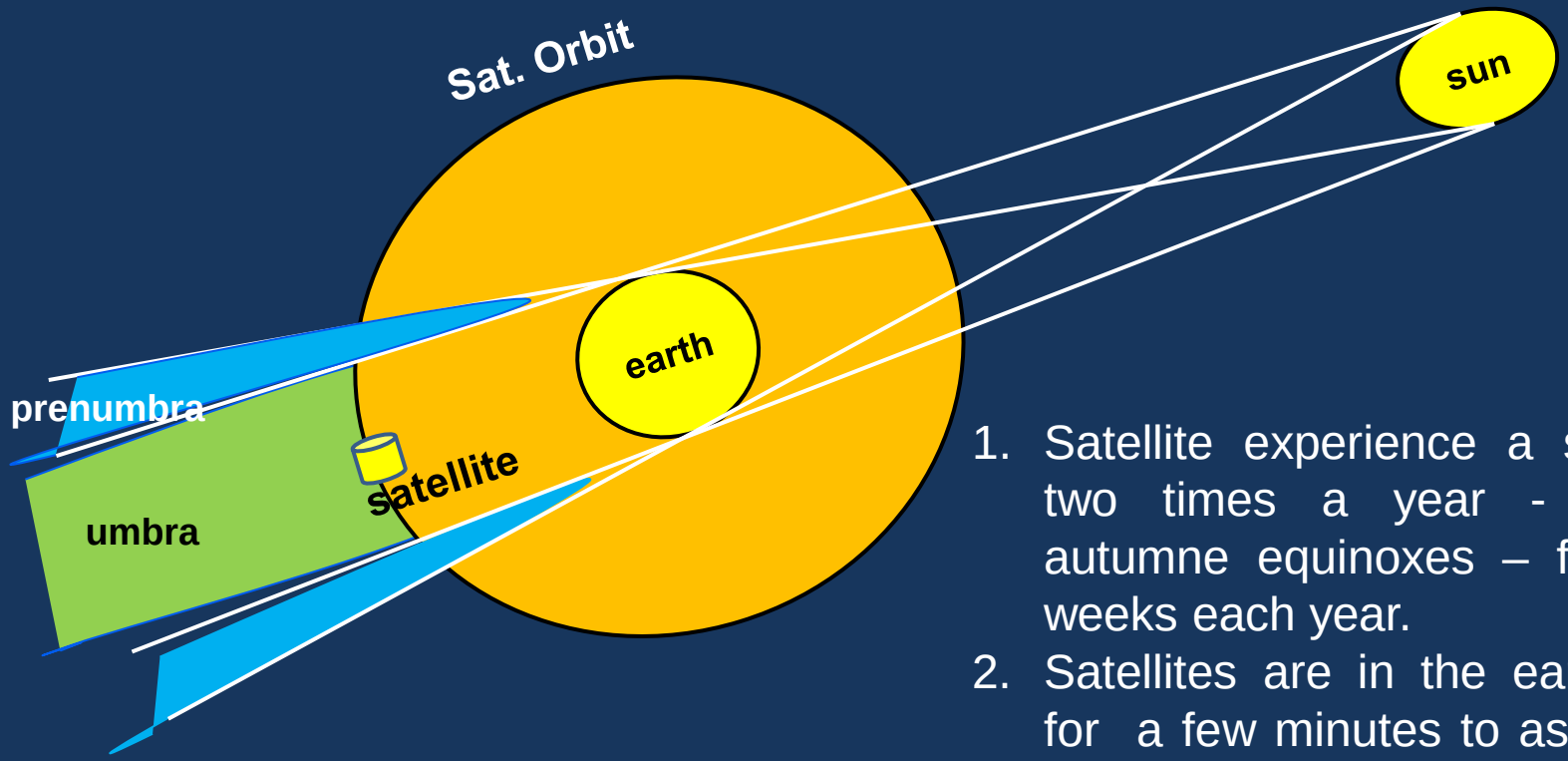
…

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.

Equinoxes & solstices

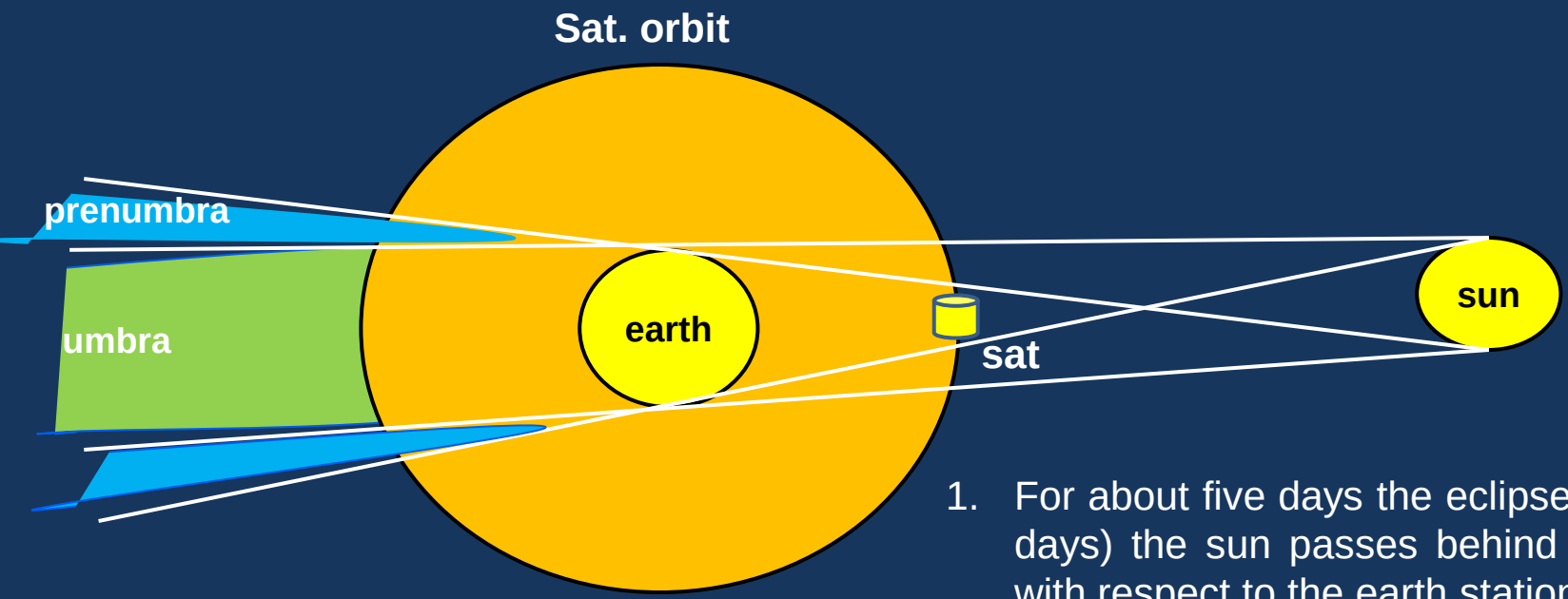


Outages 1
solar eclipse



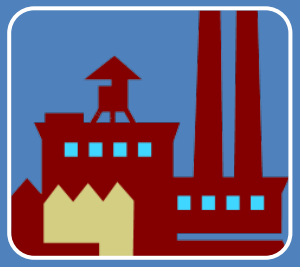
1. Satellite experience a solar eclipse two times a year - vernal and autumne equinoxes – for about six weeks each year.
2. Satellites are in the earth's shadow for a few minutes to as much as 65 minutes on the day of equinoxe.
3. During eclipse there is no solar energy and batteries are needed. Also no solar warming and thermal equilibrium needs batteries.

Outages 2
solar interference



1. For about five days the eclipse season (65 days) the sun passes behind the satellite with respect to the earth station.
2. The nackground noises builds up as this event unfolds for period of about 10 minutes. The service may be unavailable due to the lower C / N for this period.
3. Tracking mode is turned off to prevent the earth station from tracking the sun, which at this time is a strong source of energy.

Acquire the Vsat parties involved



Equipment manufacture

- Antenna
- Antenna and equipment (ODU, IDU …)
- Equipament (LNB, BUC, router..))

Satellite Operators

- Built and launching
- Footprint management
- Space segment rental

Service suppliers / Network Operator

- Satellite services specialized operators
- Spatial rent to satellite operators
- Installation & maintenance services providers

Acquire the Vsat procurement strategies 1

Acquire the Vsat procurement strategies 2

- 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 3

- Choose prices indexation phormula 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 4

- Get a very updated technical biders list, and give privilege to biders 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 bandwidth procurement 1

Preparation of the list with:

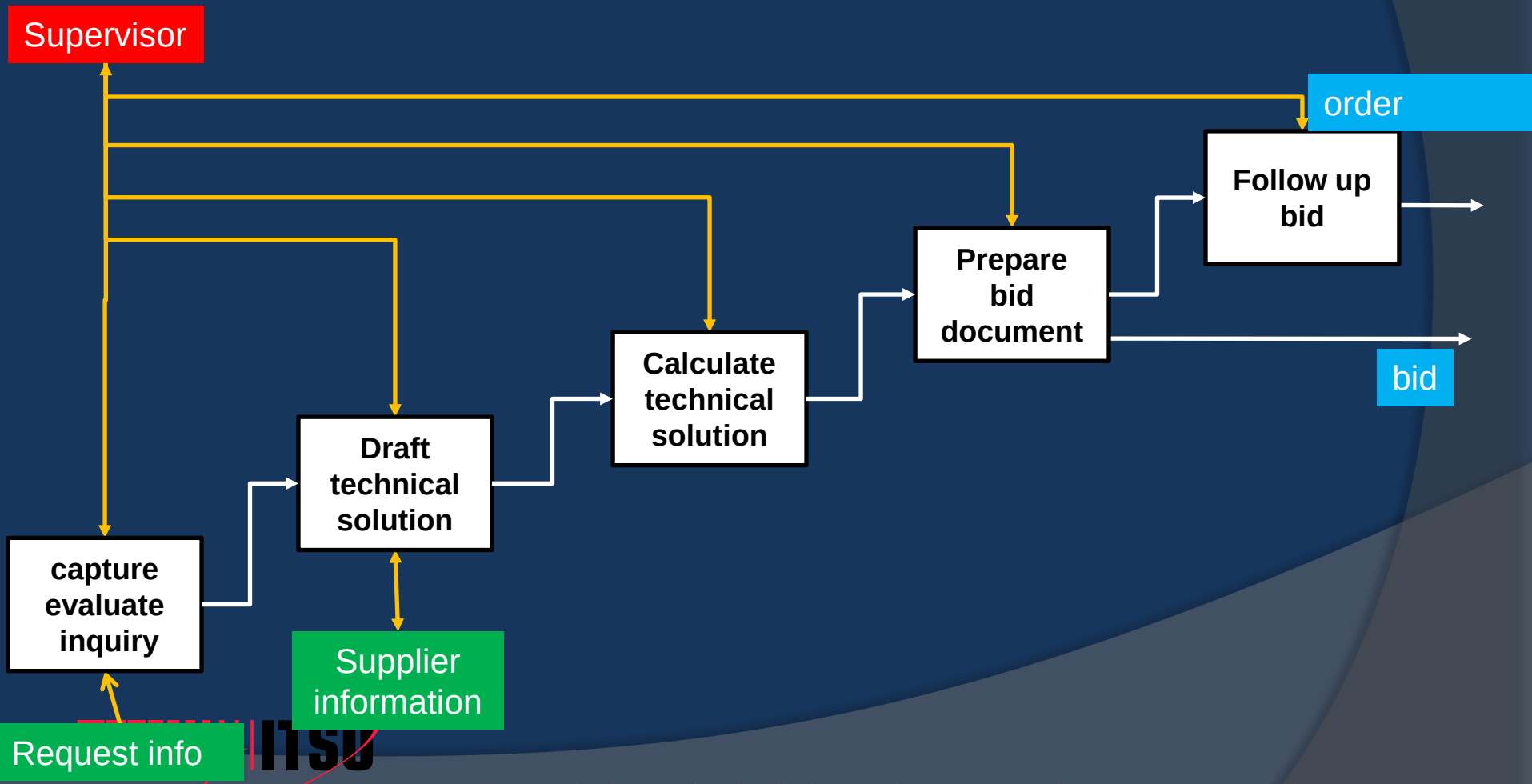
- Location of potential satelites
- Review the look angle to desired position
- Radiation diagram of satellites in powers (EIRP), and G/T
- BW available (rental conditions, pre-emptibility. Available capacity, prices)
- Age of satellites, orbit inclined
- Timing adjusted to our project, service activation times
- Position in a stabilization period adapted to our project (migration, not spots reorientáveis.)

Acquire the Vsat bandwidth procurement 2

- A good solution to purchase space segment will include it (without being in exclusivity) in the RFP for equipment. This can benefit in:
  - Obtaining preferential prices that space segment providers give to equipment manufacturers
  - Obtaining the appropriate calculation of the specificity of the equipment under offer, in addition to the manufacturer's liability if for any reason the band is not the most appropriate

Criteria	Vendor A	Vendor B	Vendor C
Equipments vendor A	$	$	$
Equipments vendor B	$	$	$
Equipments vendor C	$	$	$

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 intente
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. Negotiation,Contractor selection and award
6. Contracting
7. Monitor performance

1. The evaluation criteria has been already issued on the RFP, so apply it
2. 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 objectives control

S - Simple and (specific)

M - Measurables

A - Achievable

R - Realistic eand (responsable)

T - Touchable

Acquire the Vsat evaluating proposals

Criteria	Vendor A	Vendor B	Vendor C
Compliance Cost template	1 to 5	1 to 5	1 to 5
Compliance Start up, deliver,& insta deadlines	1 to 5	1 to 5	1 to 5
Compliance General & special conditions	1 to 5	1 to 5	1 to 5
Proff of After sales services capacity	1 to 5	1 to 5	1 to 5
Special liabilities Warranties, insurance……	1 to 5	1 to 5	1 to 5
Total aggregate price	1 to 5	1 to 5	1 to 5
Total	1 to 5	1 to 5	1 to 5

Acquire the Vsat special liabilities

Special Conditions	Description
Warranty / Guarantee equipments and sevices	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 the contracting parties

Acquire the Vsat standard contract items 1

- 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 2

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

Acquire the Vsat negotiation skills

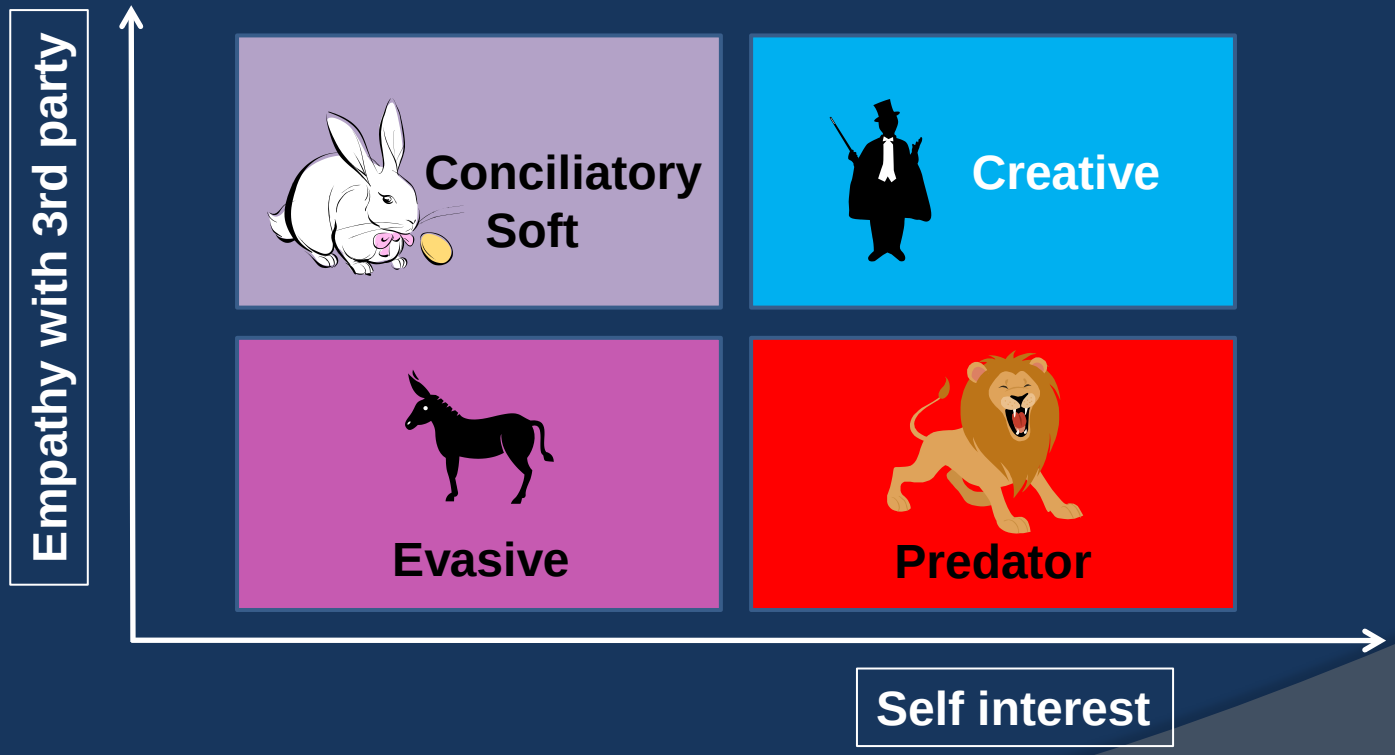
GOALS TO ACHIEVE

- Best agreement
- Stronger mutual knowledge
- Learning

PREPARATION

- Pontuality
- Who is involved (only necessary)
- Day matter only
- What you needs
- What third party needs
- Meetings conclusion

Acquire the Vsat negotiation technics



Acquire the Vsat negotiation principles

- Keep your target
- Do not react to provocation
- Get time to think
- Hard decisions are not taken on the table
- Be prepared
- Surprise

- Do not reject, reformulate
- Declare your interest not your position
- Listen more, speak less
- Use minimum staff members
- Make intervals, neutralize disagreements
- Create credibility and options

Acquire the Vsat negotiation tips

Never …

- Make initial concessions
- Say“never”. Take your time to think
- Ridicule third party
- Interrupt third party
- Make than two hours meeting

Always do…..

- Proposal with room to negotiate
- Find the third party position
- Be flexible and adapt to situation

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Day 4

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Day 5

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