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1 Executive summary

The “Satellite Field Guide” publication seeks to educate NGOs, activists, media organisations and technologists who use or are considering the use of satellite technologies for their operations.

It gives access to technical knowledge in an easy to understand manner, making ample use of infographics and draws on a range of existing technological expertise and research literature. It also makes available an initial series of testing protocols in addition to their results in order to promote a better understanding of satellite technologies from a security and privacy angle and support the emergence of evidence-driven awareness raising about existing issues.

1.1 Summary

This field guide was created as a resource for Human Rights defenders, Journalists and Activists, NGOs and donor organizations working with satellite technology in the field or wishing to deploy such tools.

1.2 Why this guide

1.3 Who started it

1.4 How to use it

2 Satellite fundamentals

2.1 Fundamendals

2.1.1 Overview

Key components of signal flow. Terminals, Antennas, LMB/BUC, Satellite (Orbits), Hubs.

Visual with key components at “scale”.

2.1.2 Signal

Signal to Noise vs Frequency/Power/Antenna Size
Bandwidth

- Orbits
- Spectrum basics
- Advanced considerations
 - Spot beams

2.1.3 Voice

2.1.4 Data

2.1.5 TV

2.1.6 Radio

2.1.7 Positioning

2.2 Key Technologies

Table 2.1: Major Technology Types

Criteria \ Tech	VSAT	GSM Derived	Low orbit	<i>GPS</i>
Key Benefits				
Key Weaknesses				
Setup Costs				Low
Recurring Costs				None/Low
Bandwidth				
Antenna Size	50cm -> 2m	20cm -> 50cm	Small Antenna	<i>Very Small</i>
Power Consumption	1w -> 2w	1w -> 2w		
Orbit	Geosync	Geosync	Low orbit	<i>Low orbit</i>
Transport	FDMA/TDMA (DVB)	UMTS/GSM	GSM/CDMA	
Providers	EutelSat /SES	BGAN /Thuraya	Iridium	

2.2 Key Technologies

2.2.1 VSAT

2.2.2 GSM derived

2.2.3 Low Orbit

2.2.4 GPS

2.2.5 Other Technologies

3 Satellite security

3.1 Vulnerabilities

3.2 Surveillance

3.3 Jamming

Jamming is the practise of willingly blocking or distorting the signal by introducing noise (another meaningless signal). Satellite Jamming is internationally condemned and forbidden, but still happens in a lot of areas. Examples are Iran . . .

Jamming is the mixing of the meaningful signal of the sender with another strong signal that is meaningless, so the receiver can not make anything of the original signal. It is like someone shouting through your conversation in the real world.

This can happen at two points in the process, First it can happen at the satellite, this is called *orbital jamming*. Secondly it can happen at the receiver side, then it will be called *Terrestrial(on earth) jamming*.

3.3.1 Orbital jamming

This acts by having a rogue groundstation that points a high power beam at teh

Mitigations

3.3.2 Terrestrial jamming

Mitigations

3.4 Other Threats

4 Technology review

4.1 Summary Table

Tech Provider	VSAT - SCPC		SES	VSAT MCPC		GSM Derived		Low orbit	
	?	?		EutelSat	Exede	Inmarsat (BGAN)	Thuraya	Iridium	Global-Star
Key Benefits									
Key Weaknesses									
Coverage									
Bandwidth									
Setup Costs									
Recurring Costs									
Antenna Size			50cm -> 2m			20cm - 50cm		Small Antenna	
Power			1w -> 2w						
Consumption									
Orbit	Geosync				Geosync			Low orbit	
Transport	FDMA	FDMA	TDMA (DVB)	TDMA (DVB)	TDMA (DVB)	UMTS/GSM	UMTS/GSM	UMTS/GSM	CDMA

4.2 VSAT

4.2.1 Use cases

4.2.2 Benefits

4.2.3 Threats

4.2.4 Geography

4.2.5 Equipment

4.2.6 Antenna

4.2.7 Power

4.2.8 GPS

5 Annexes

5.1 Annexes

5.1.1 Experiments