I-Dream
Inclusive Development Research Association for Mankind

I-DREAM Appropriate Technology seminar

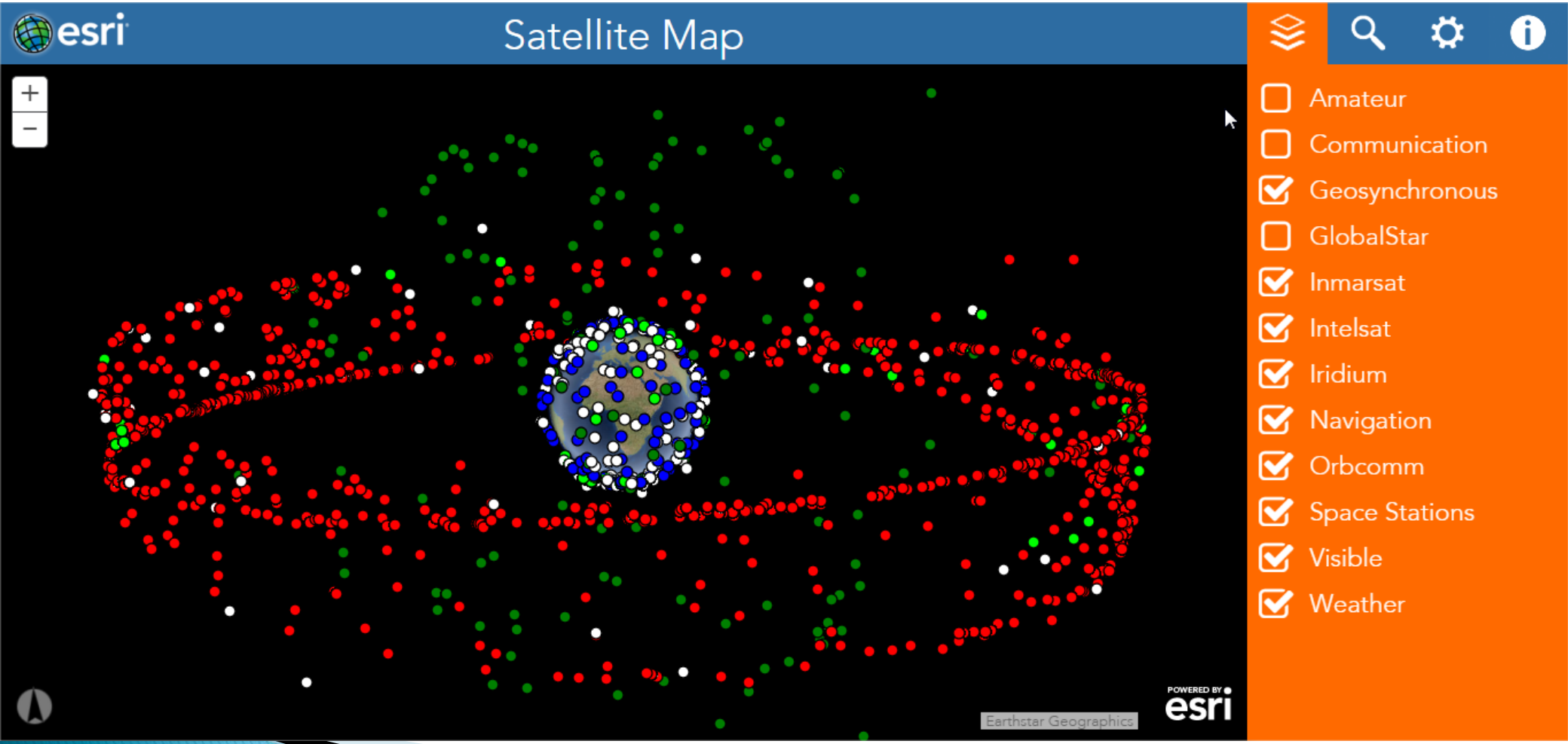
Internet Via Satellite

08 September 2015

Kevin K. CHOI

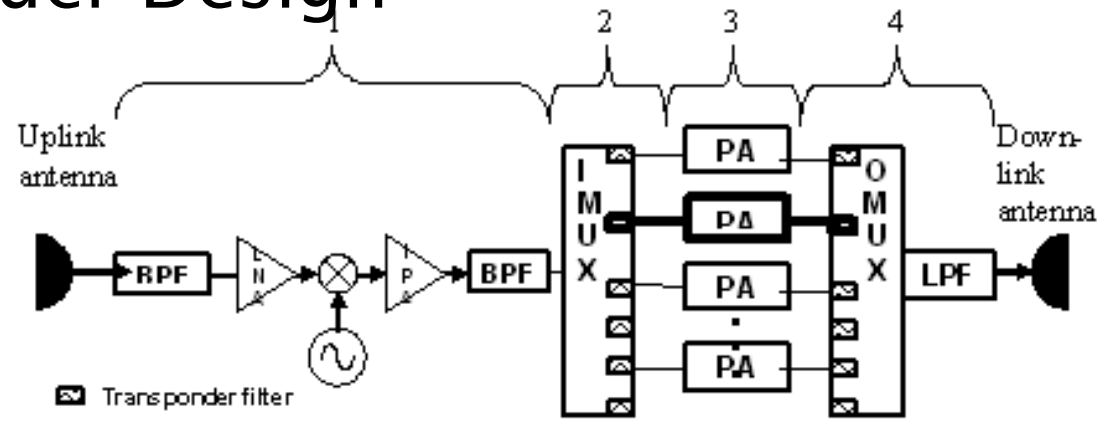
Satellites in general

- http://maps.esri.com/rc/sat/index.html



Telecommunication Satellite

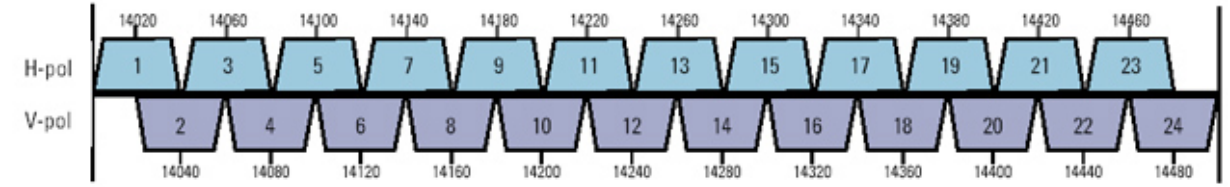
- General Transponder Design



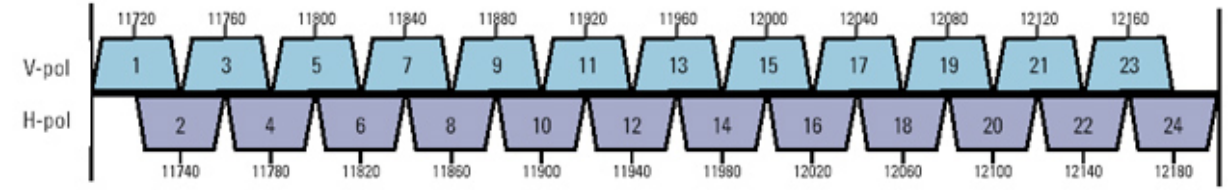
- Frequency plan

Ku-band Frequency Plan

Uplink (MHz): 14000 - 14500

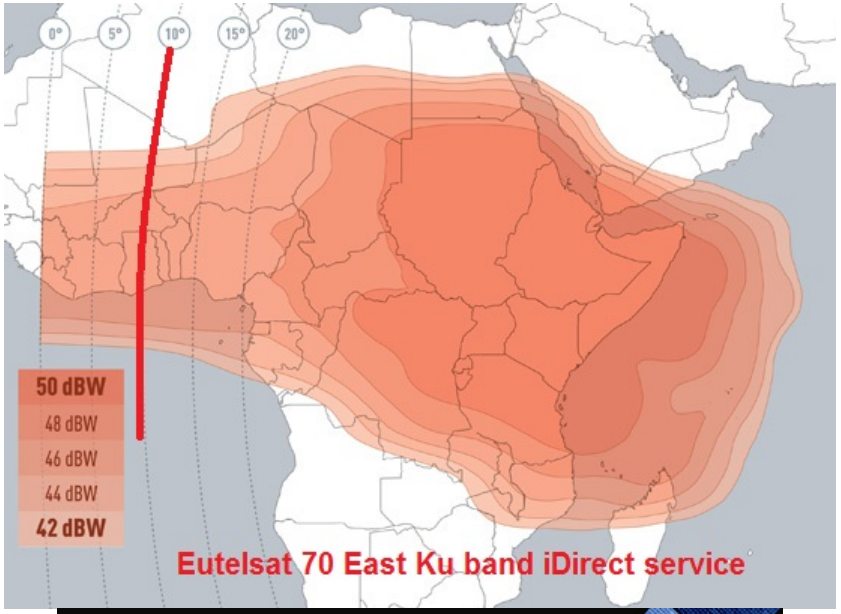


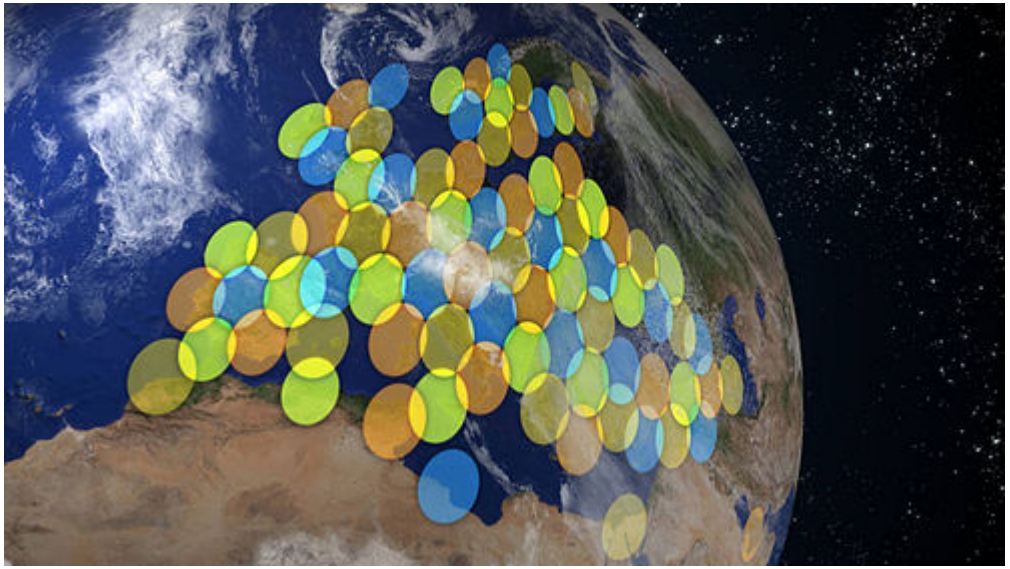
Downlink (MHz): 11700 - 12200



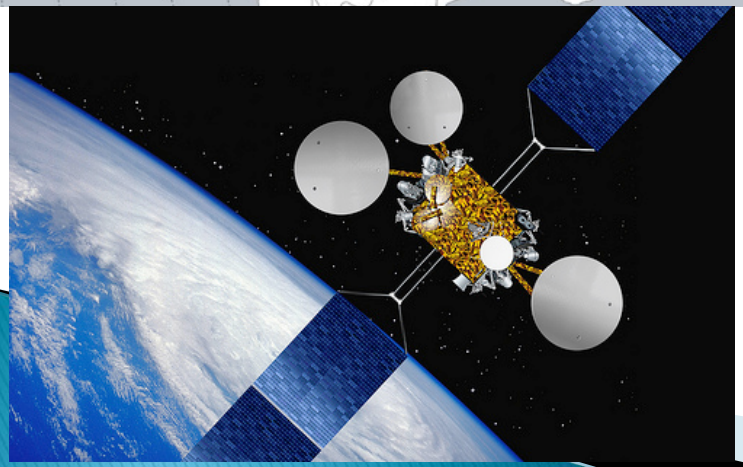
Telecommunication Satellite

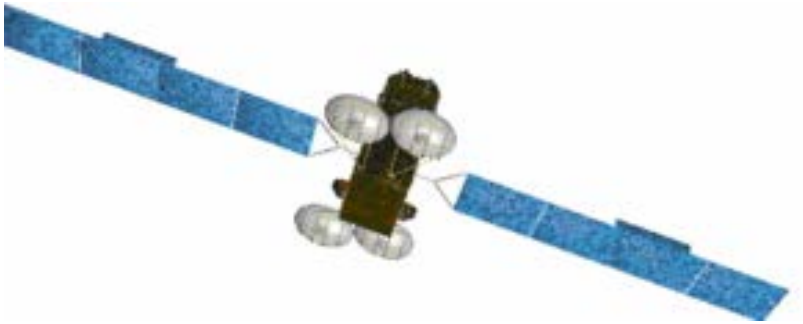
- Coverage (Traditional vs. HTS)





KA-SAT coverage over Europe showing frequency reuse by different colors

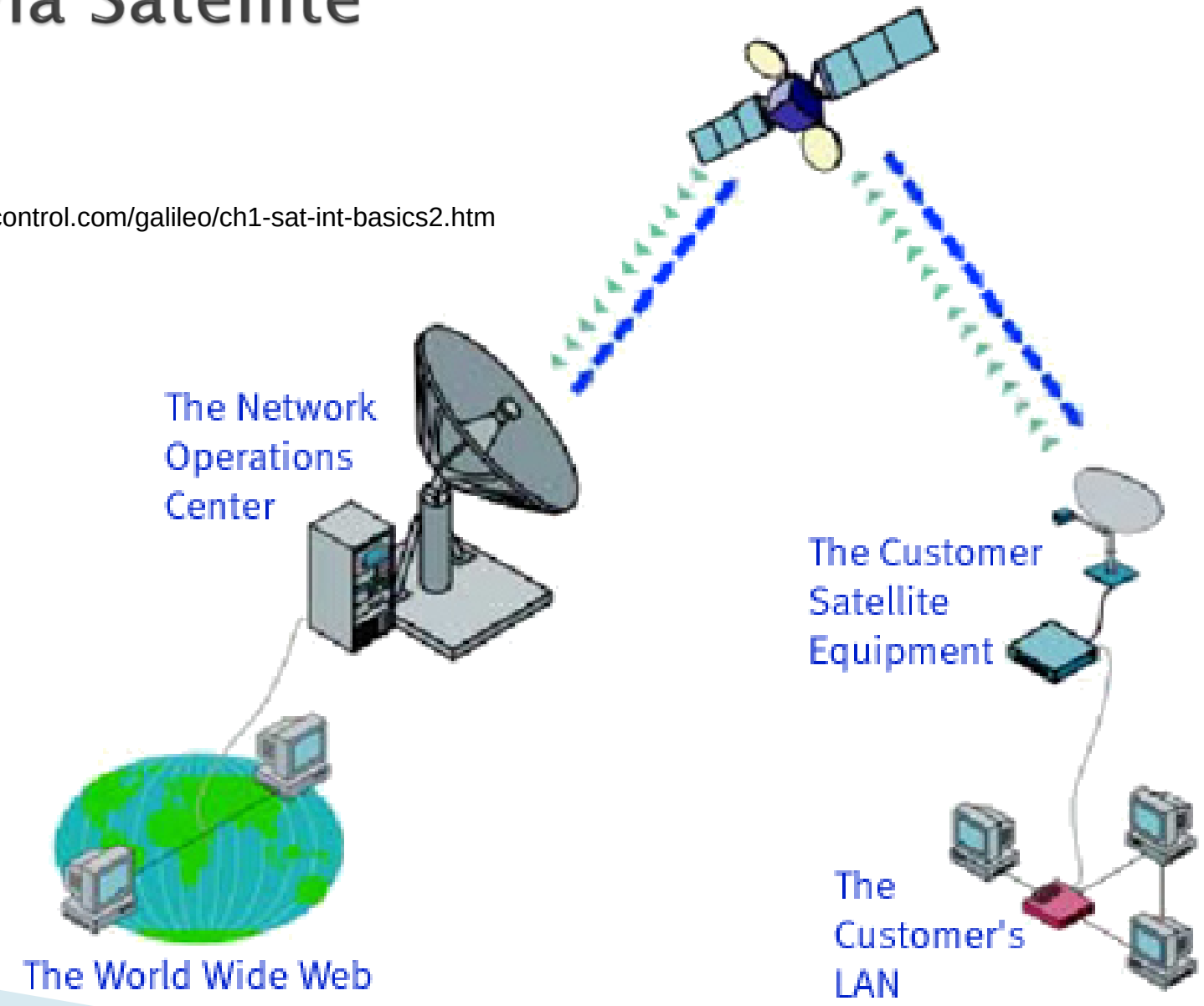




Internet via Satellite

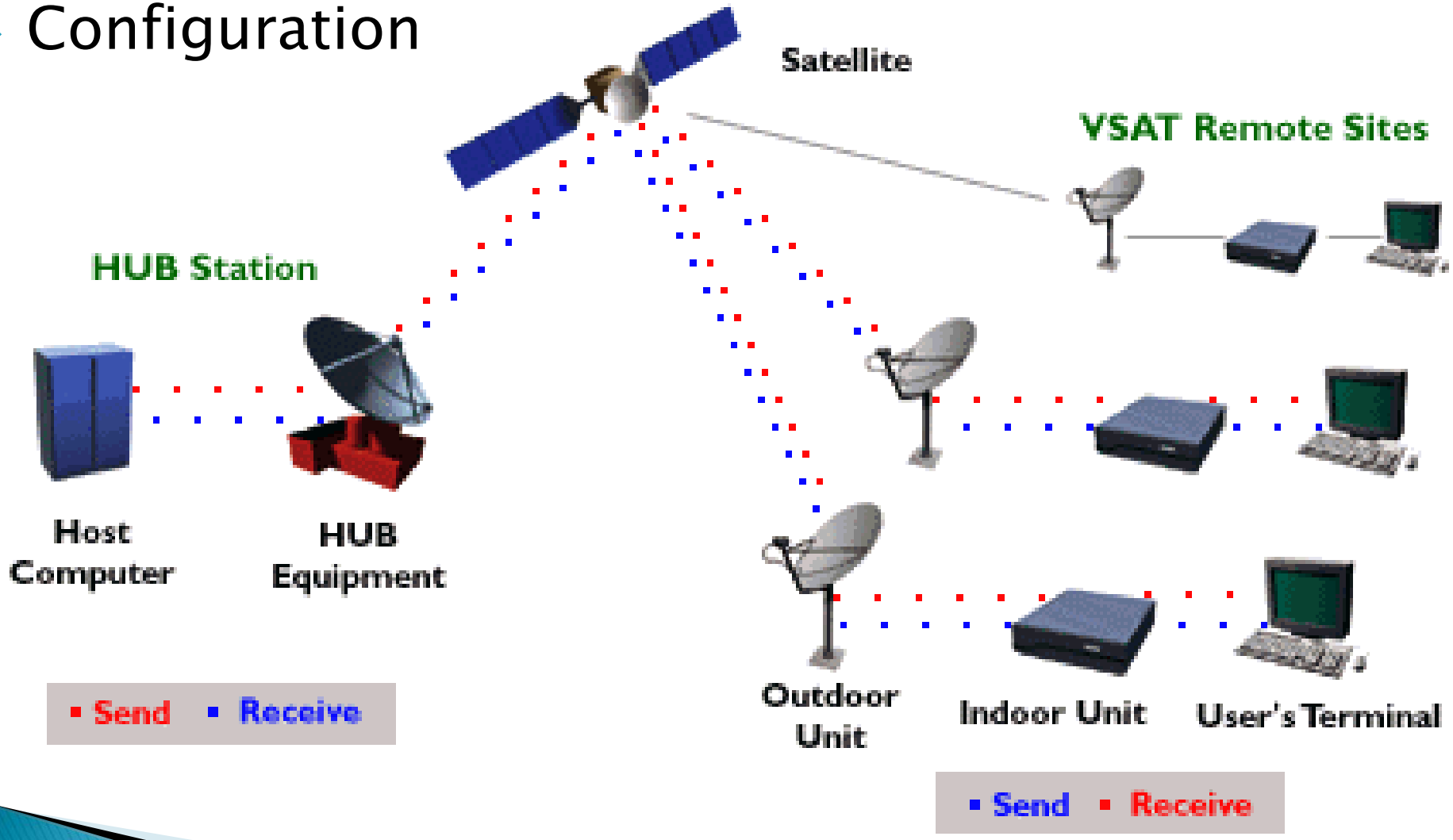
- Concept

Source: http://www.groundcontrol.com/galileo/ch1-sat-int-basics2.htm



Internet via Satellite

- Configuration



Source: http://www.all-satcom.com/gen2.aspx?mid=12&mcid=3&pt=VSAT%20Solutions

Internet via Satellite

- Equipment

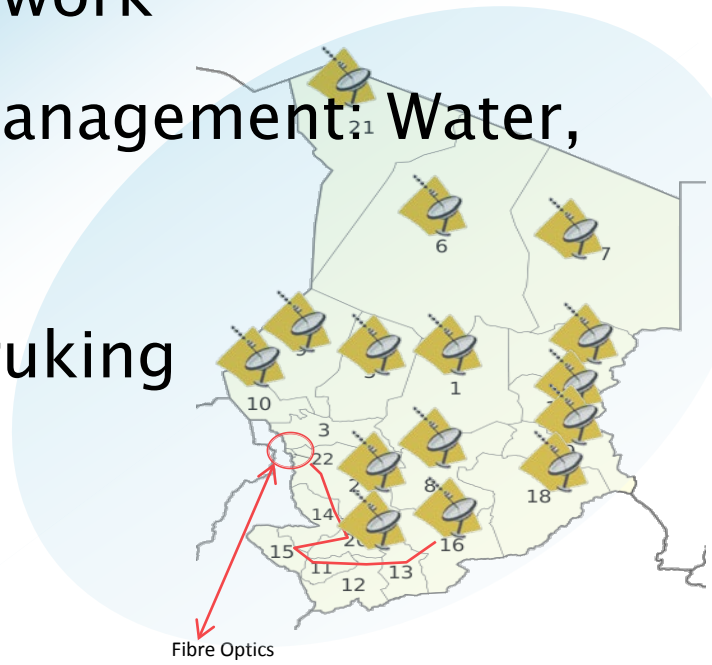




Source: https://militarycommunications.wordpress.com/tag/vsat/

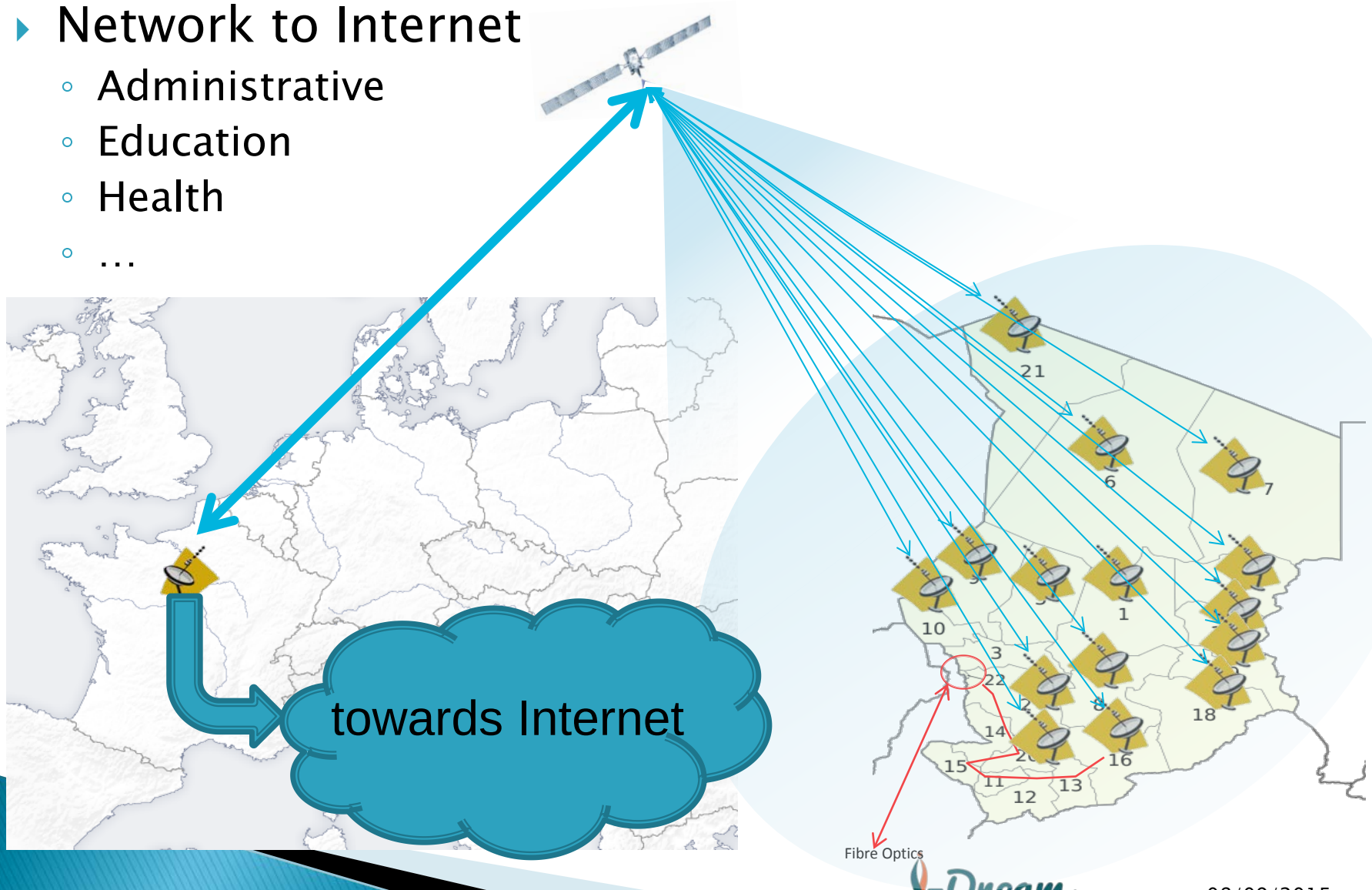
Satellite Communication Applications

1. eGovernement – Administrative Network
2. eHealth – Health Network
3. eEducation – Distant Learning
4. eSecurity – Police and Security Network
5. eRessources – Natural Resource Management: Water, Petrol, Mines, ...
6. eFeeder – GSM and 3G Network Truking



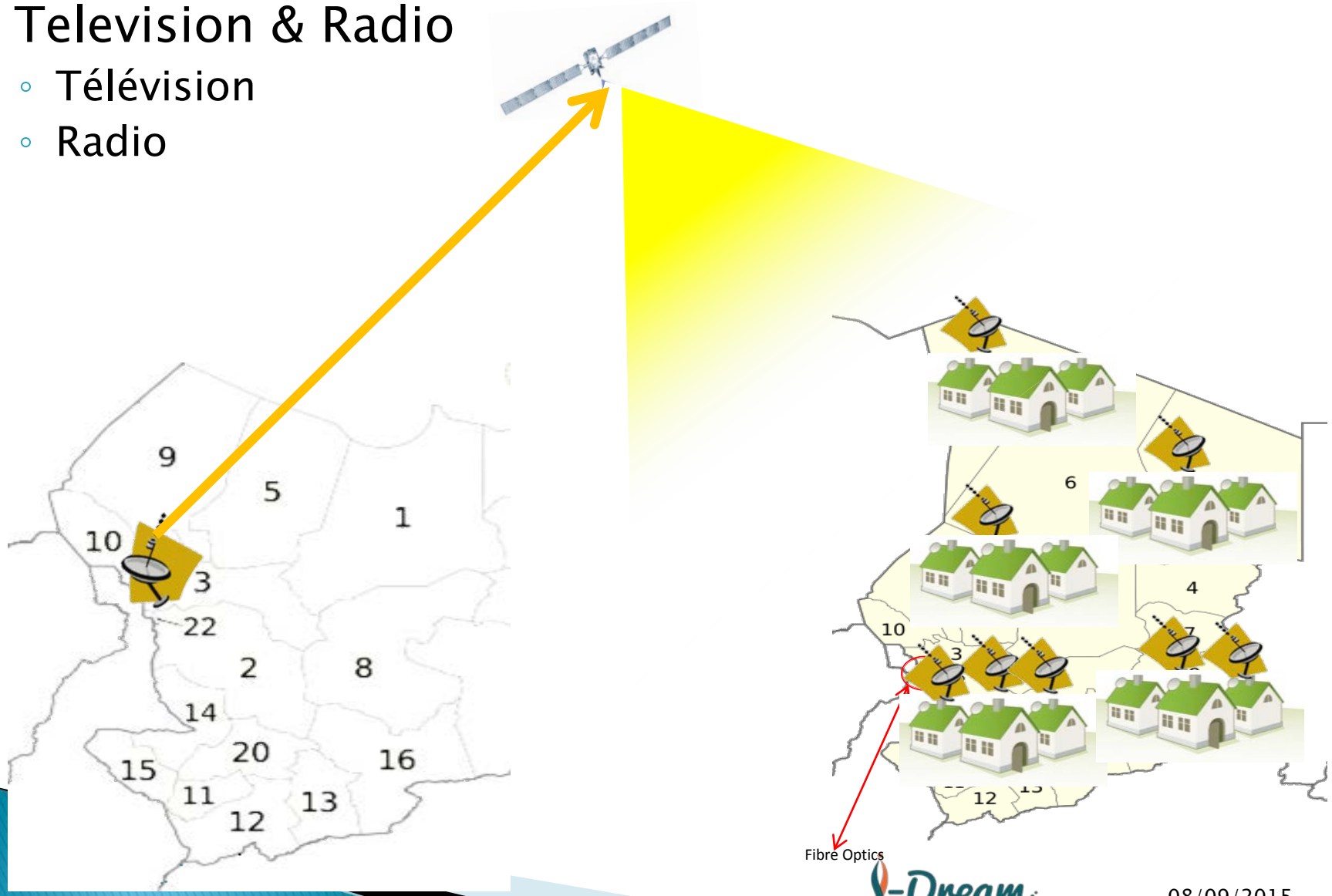
Bi-directional: Point to multi-points

- Network to Internet
  - Administrative
  - Education
  - Health
  - …



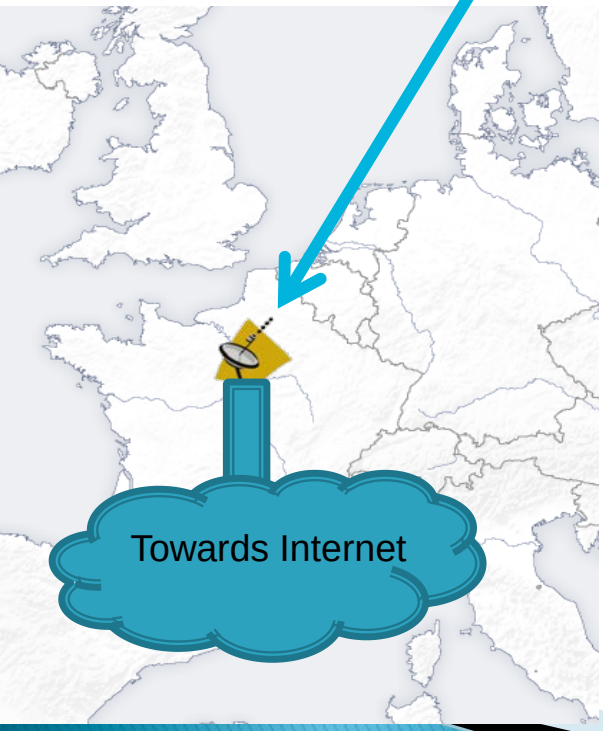
Uni-directional: Broadcasting

- Television & Radio
  - Télévision
  - Radio



System Configuration

- Internet



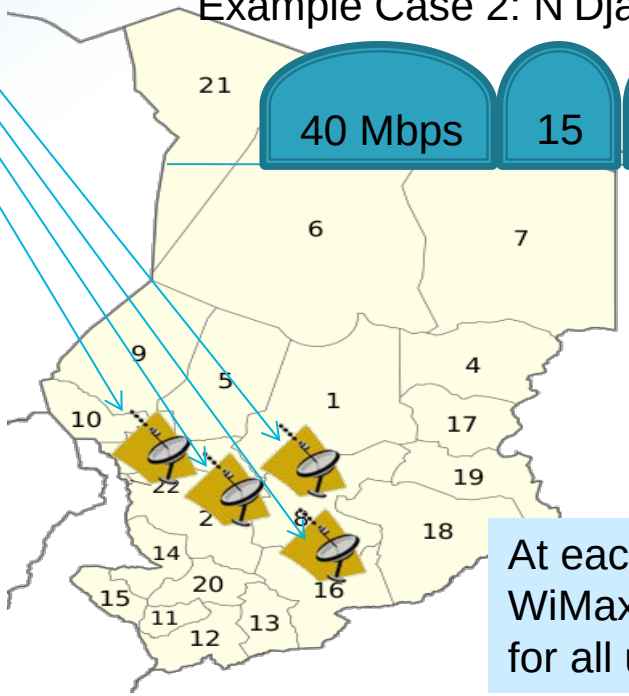
One transponder / repeater = 36, 54, 72 MHz

Example Case 1: N'Djamena

100 Mbps U/L & D/L

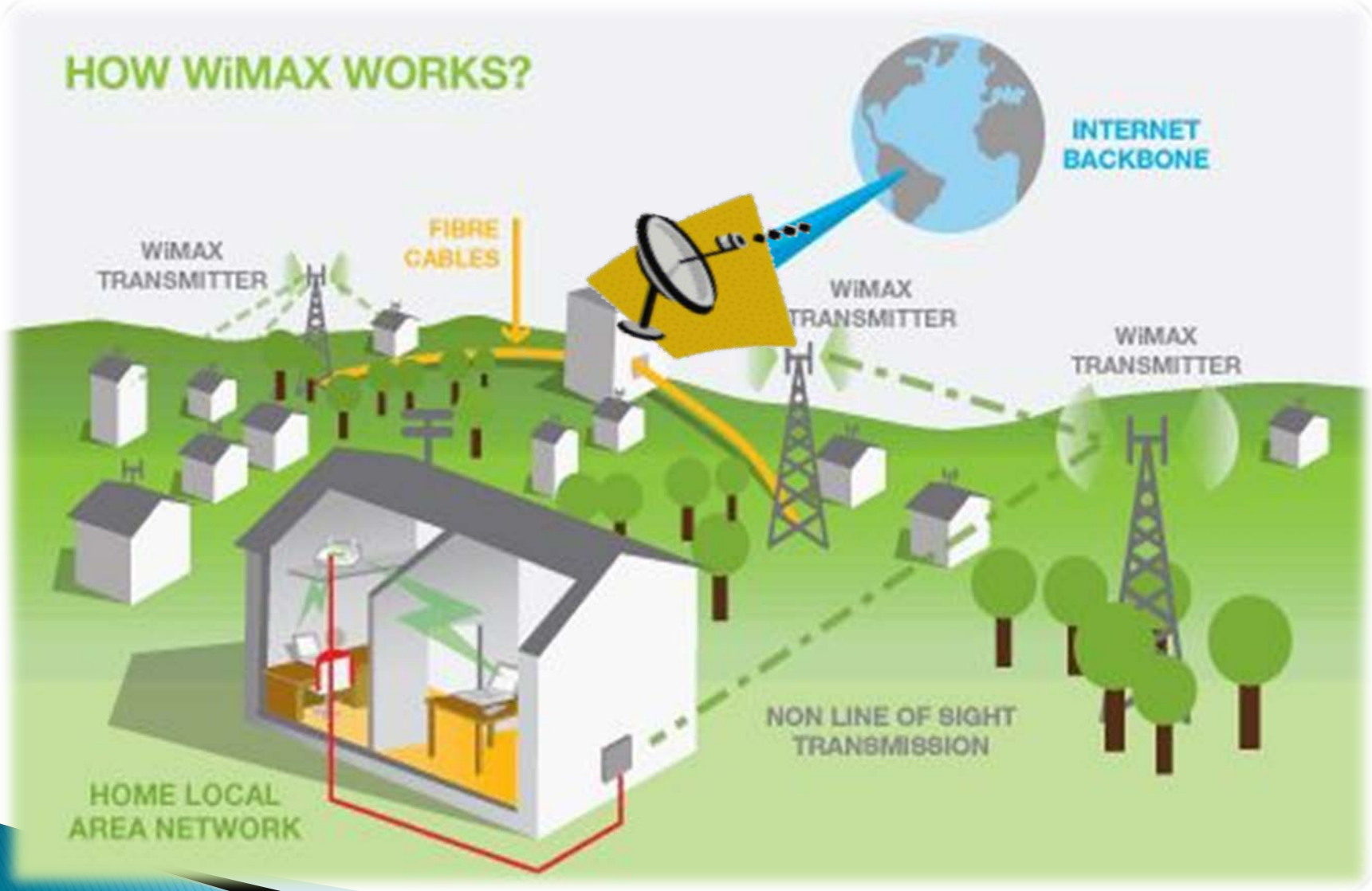
Example Case 2: N'Djamena + Ndou + Sarh

40 Mbps | 15 | 15



At each ground site WiMax / LTE connection for all users

WiMax / LTE

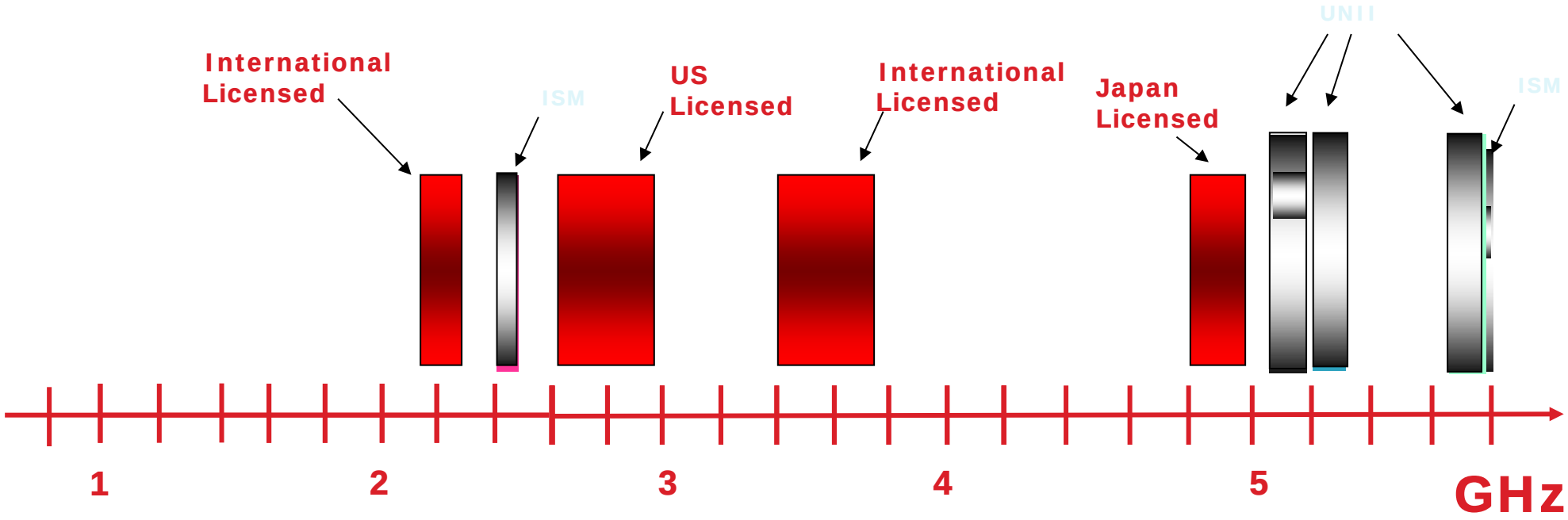

HOW WiMAX WORKS?
INTERNET BACKBONE
FIBRE CABLES
WiMAX TRANSMITTER
WiMAX TRANSMITTER
WiMAX TRANSMITTER
NON LINE OF SIGHT TRANSMISSION
HOME LOCAL AREA NETWORK

Solar Powered WiMax

- solar-powered WiFi router/WiMax router/surveillance camera that can be situated a top a streetlight. The access point may uses a high gain omni antenna and a high gain parabolic antenna to provide access/security to both developed and developing regions; it is already in use in Cameroon, with plans for deployment to India, China, and Morocco.



802.11/802.16 Spectrum



ISM: Industrial, Scientific & Medical Band – Unlicensed band

802.16a has both licensed and license-exempt options

UNII: Unlicensed National Information Infrastructure band – Unlicensed band



Budget for Internet via Satellite

	ROM price / unit	Comment
Hub Station Installation (Antenna + Modem + Hut)	100,000 USD	Could be cheaper or weaved.
Satellite transponder lease	1,000,000 USD/year	
Terminal Cost (Antenna + Modem + Hut)	20,000 USD / terminal	
WiMax / LTE Terminal	20,000 USD / terminal	
Antenna Tower Civil Work	10,000 USD / terminal	
Installation Civil Work (Battery, Solar Panel, Gen., …)	20,000 USD / terminal	
Total 1st Year Cost	1,170,000 USD / year	
Total Yearly Cost	1,050,000 USD / year	2000 ~ 5000 Internet subscribers
Monthly Fee / subscriber	45 USD / month	For 2000 subscribers @ 1Mbps connection

Future Projects

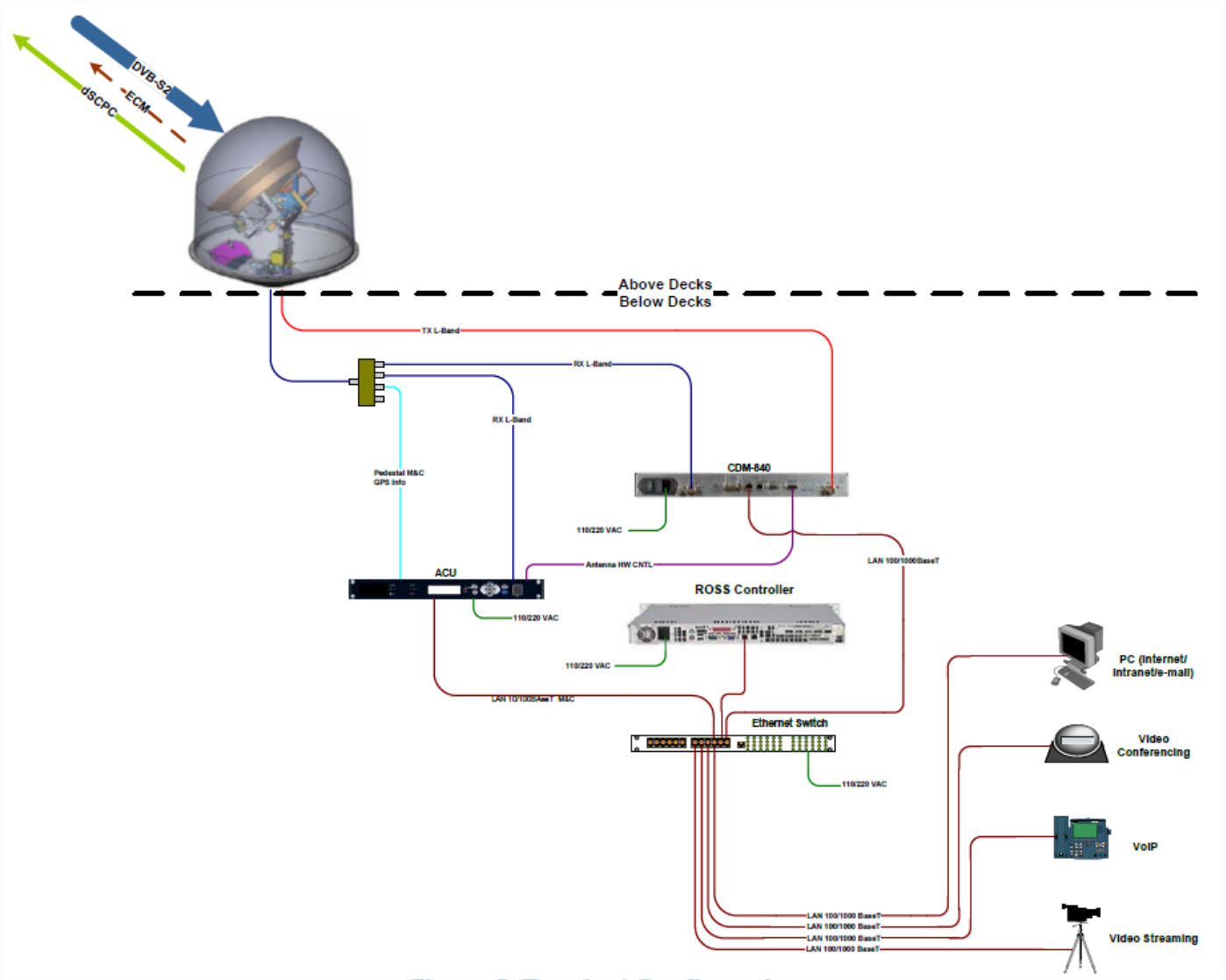
- OneWeb, Google, Facebook, etc… for 2020



For a price / user less than 10 USD/month.user…

Future Project

- OneWeb Ground Terminal



Future Project









Source: www.oneweb.world