Roger Hislop

Spectrum Sensing in the developing world

internet solutions
A DIVISION OF DIMENSION DATA

Quick facts about Interet Solutions

- Largest provider of alternate last mile services in South Africa
- Majority of SA's Blue Chip companies are clients (including all major banks, retailers)
- One of the largest MPLS networks in Africa
- Global MPLS via multiple international NNIs
- 16 000m^2 of Data Centre facilities

International PoPs: New York, London, Germany, Hong Kong, Singapore

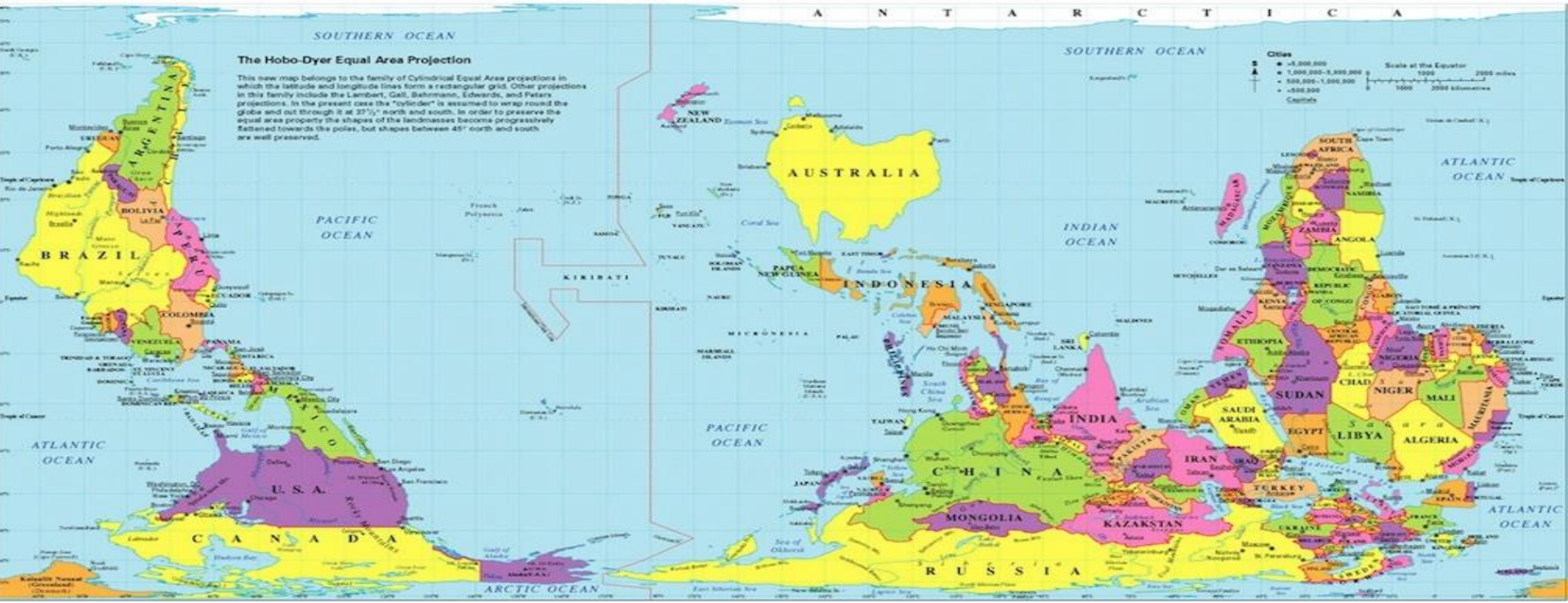
IRUs on key undersea cable systems:

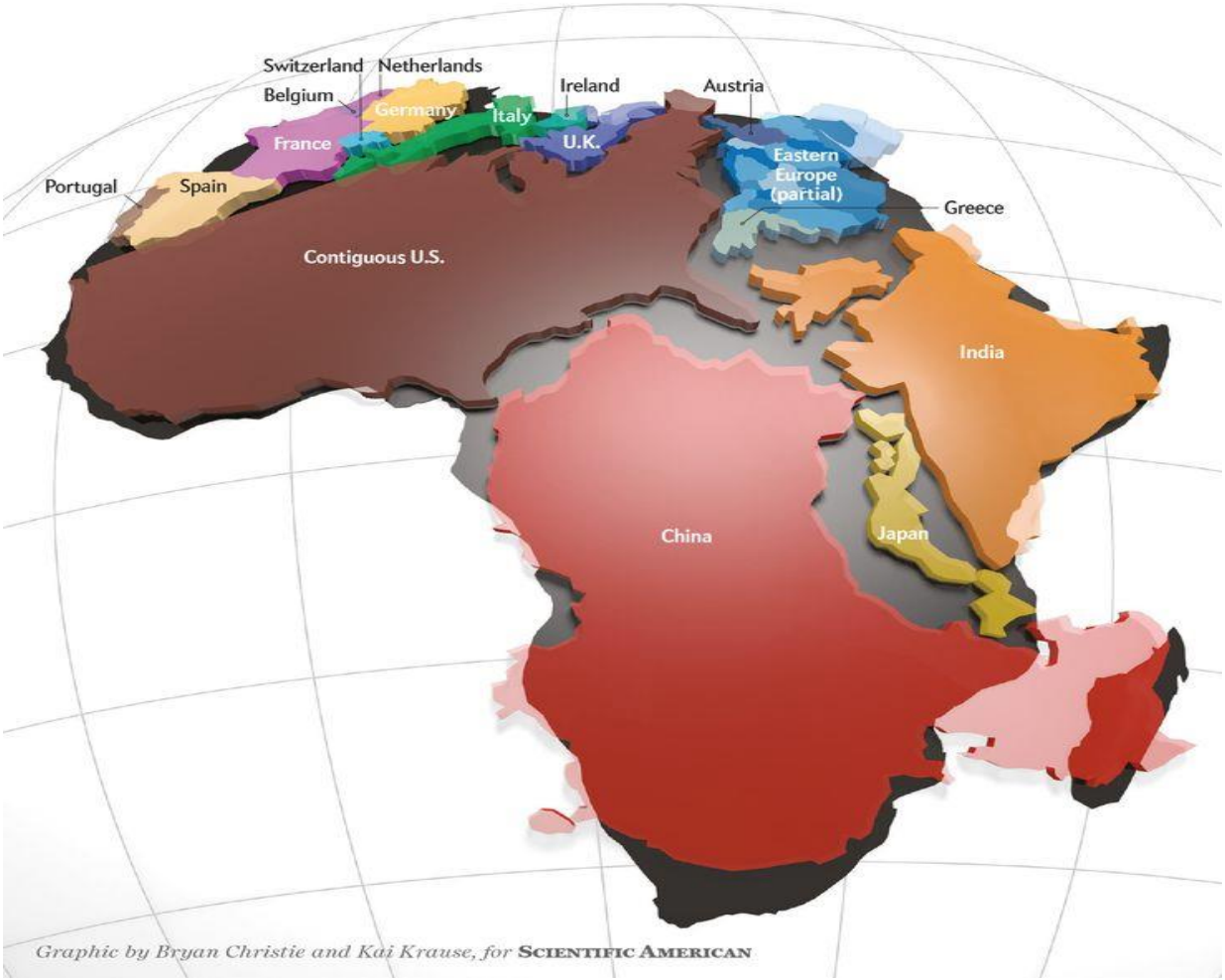
West Coast: **SAT 3, MAIN ONE & WACS**

East Coast: **SEACOM, EASSy, TEAMS & SAFE**

What the world looks like

What the world *really* looks like





AFRICA IS NOT A COUNTRY

A new way to monitor, manage and optimize spectrum use:

A swarm of low-cost, networked, autonomous Spectrum Sensing Devices

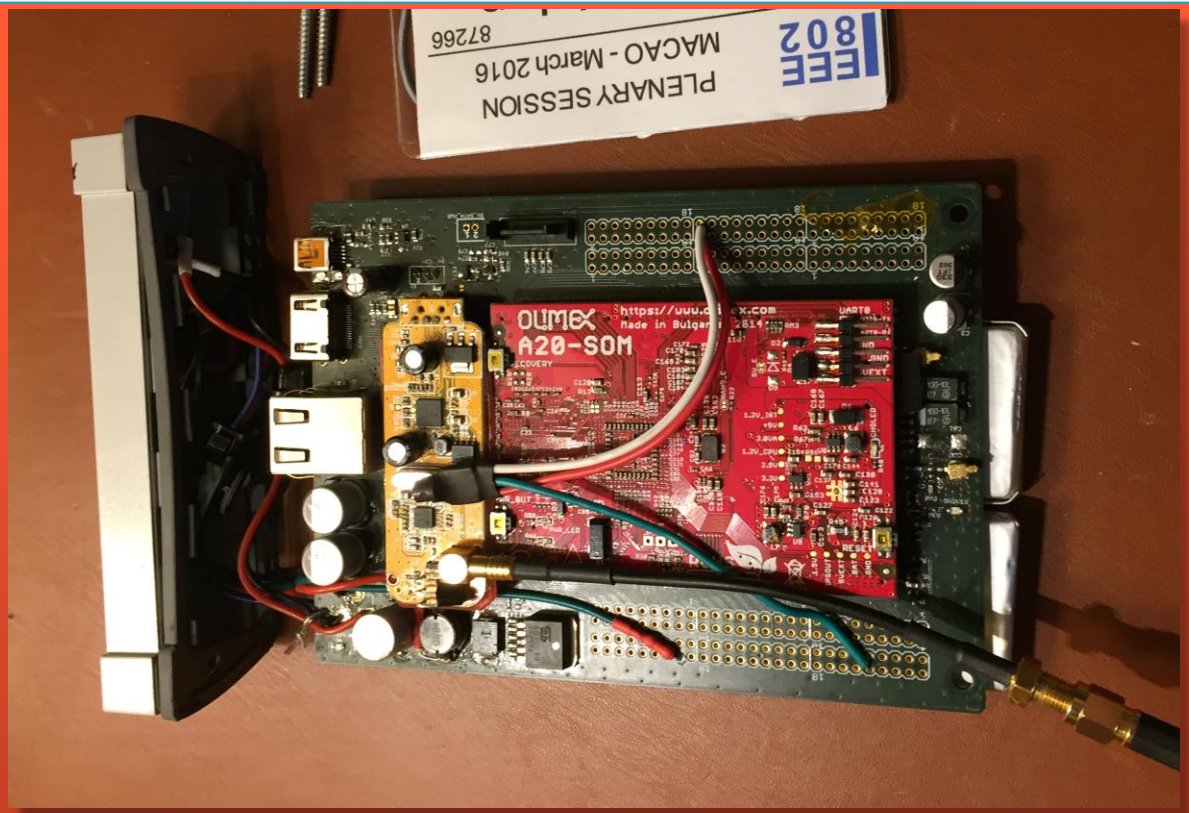
A distributed, open and intelligent Cloud-based White Space Management System

What Have We Built?

Prototype BOM: $160

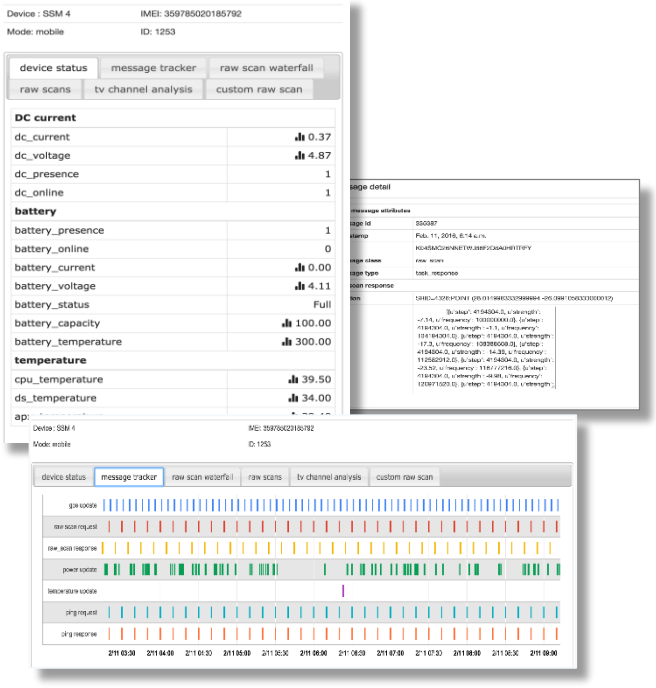
Olimex A20 Linux board
Custom motherboard
Telit GPS/GPRS
Rtl SDR (TV tuner dongle)
Monopole antenna
Enclosure (weatherproof)

Volume production BOM:
Less than $70



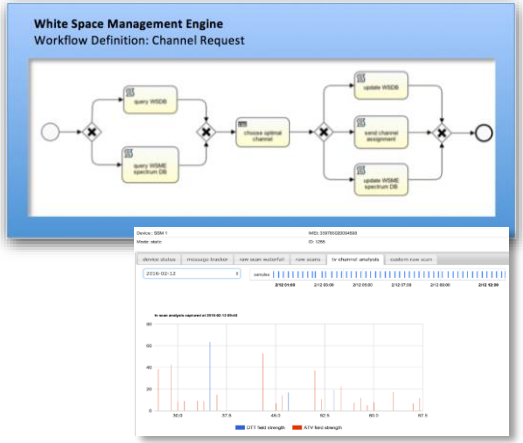
Monitor, manage, automate

Manage

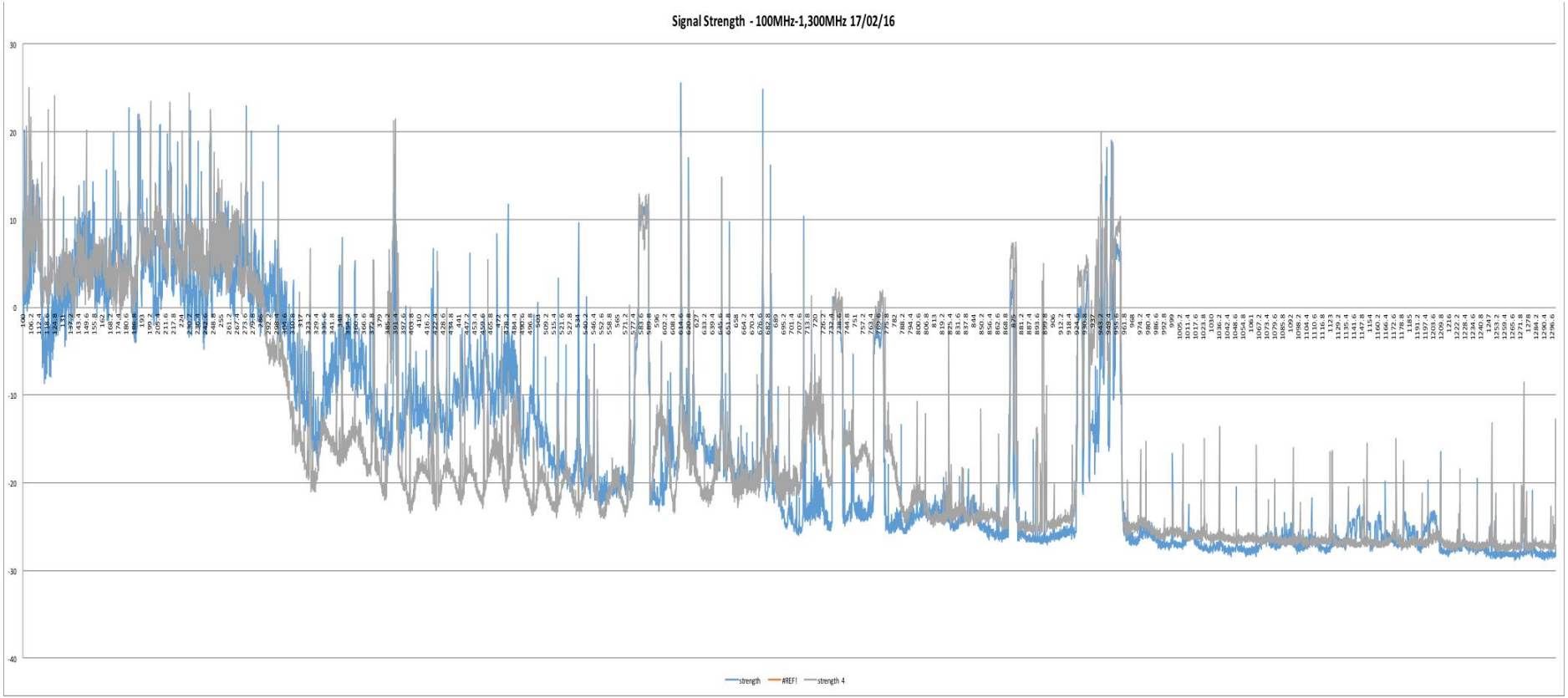


Visualise

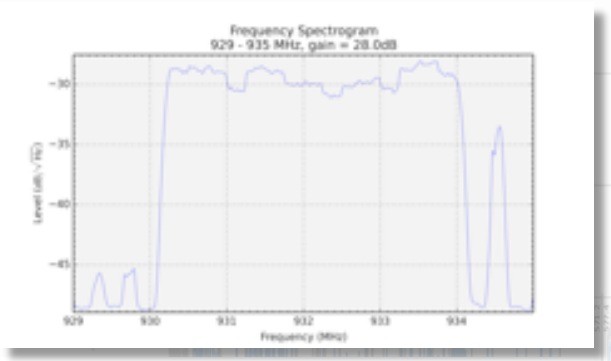
Automate

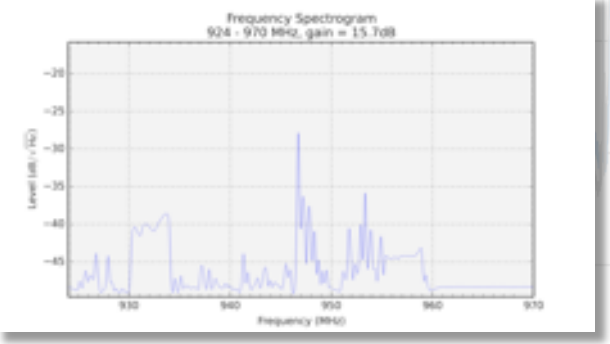


What does it tell you?



What does it tell you?

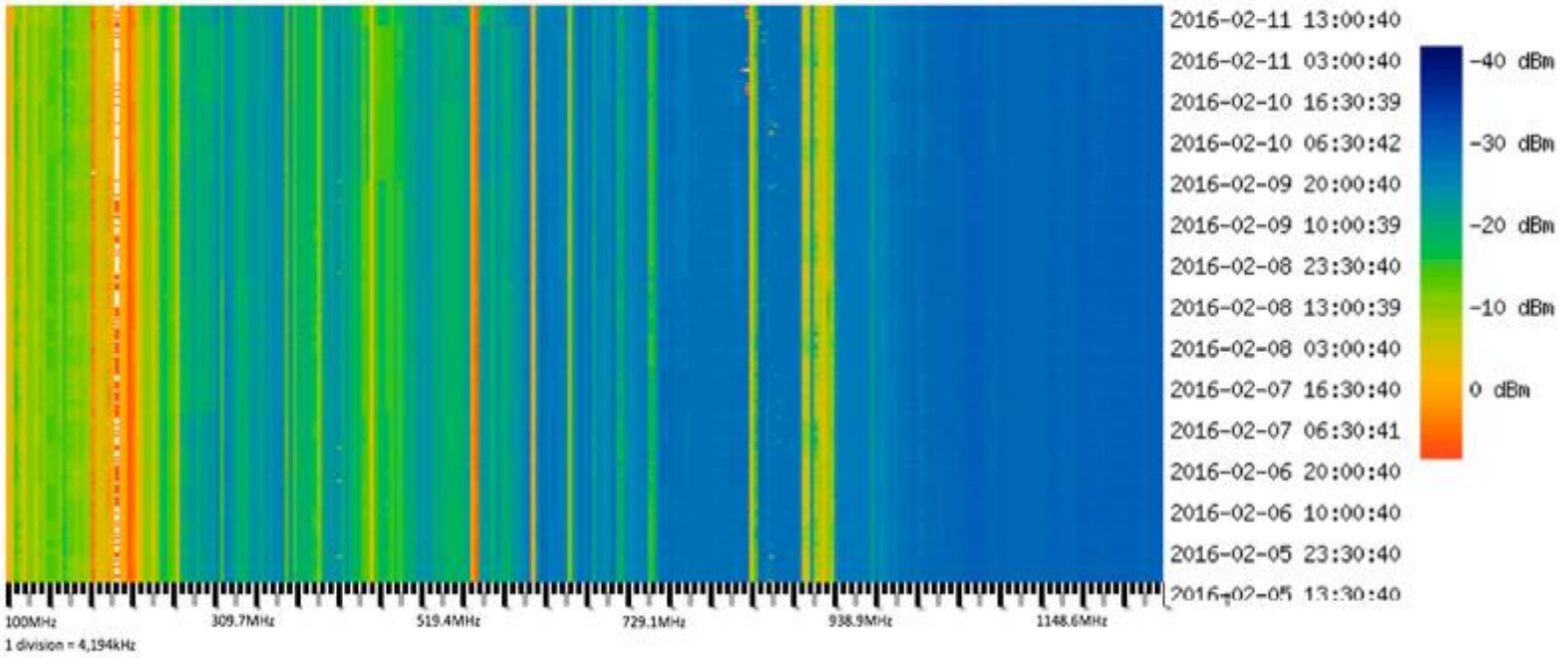




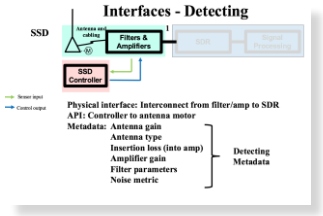
Wideband and detail scan of 2G and 3G cellular by Cell C at 925-960MHz confirmed against National Radio Frequency Plan

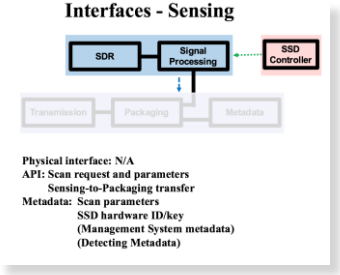
Signal detected (wideband sweep)	Signal detected (narrowband sweep)	Assignment	Comment
	214.2-215.6 221.2	Analogue TV (SABC2)	Legacy VHF Ch9 (215.25 V, 221.25 A)
213-216MHz	217.2-217.8 218.4-218.8	216.2-217.7 DAB 05 (11a)	T-DAB in 214-230
225-228MHz	223.6-225	223.2-224.7 DAB 06 (12a)	T-DAB in 214-230
477-480MHZ	471	470-854 TV broadcasting	Ch 21: (MNet, Pretoria txmitter?)
582-585MHz 586-589MHz	580-590		DTT characteristic – Klerksdorp mx NW4?)
	824.8		Ch65: SABC3, Menlo Park?
		827.7 – 832.7 Neotel 872.8 – 877.7 FDD	Nothing detected
871MHz	854, 856 864.2 867.2-868.4 868.8-870.2 871.6, 872 872.6-875.2	868-870 gen SDR	Sort distance radio, alarm systems links
	876.4-877.6, 878.2	877-880 GSM (pair w 920) 921-925 GSM (pair w 877)	GSM-R run by Transnet Low levels detected in paired link
883-886 890-896 897-902 -- 925-935 935-946 947-950 938-959	883-889.2 890.8-900 -- -- 924.8-934.4 935-945.6 949-950 950.2-960	880-890 Cell C uplink 890-900 Voda uplink 905-915 MTN uplink 915-925 guard band 925-935 Cell C downlink 935-945 Voda downlink 946-949 gap 950-960 MTN downlink	Low levels in uplink band Low levels in uplink band Close to zero level detect Guard band for IMT FDD Strong 3G signal (Cell C refarmed band) Strong signal of P-GSM Anomalous strong signal detected Strong signal of P-GSM and 3G (MTN part-refarmed band)

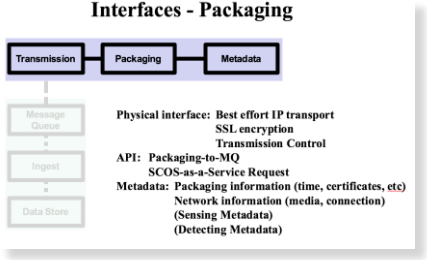
So much unused spectrum

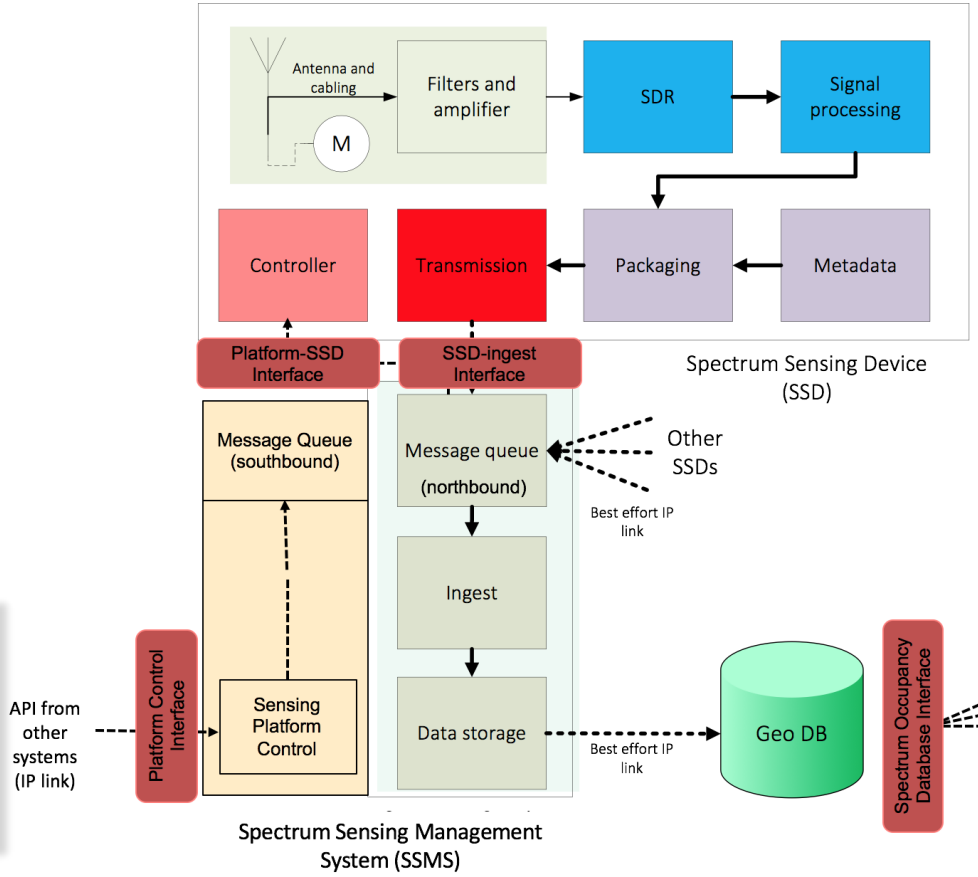


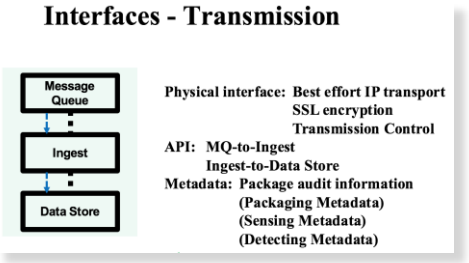
The future is SCOS-as-a-Platform: IEEE802.22.3

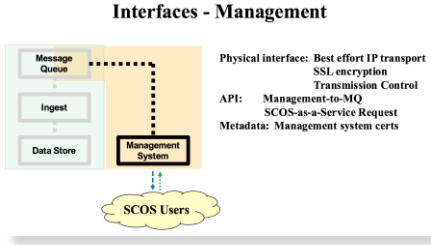












A future where only one thing is certain: wireless everything

The history of radio regulation is that of a few establishment players with clear lines between them, and a few, unchanging technologies.

The future is a profusion of wireless devices that make people’s lives better.

And devices that enable criminality and lots of stupidity.

Actually, two things are certain:

Everyone. Wants. More. Spectrum