

# Smart Radio for Smart Nations

## An Asean Experience

Wireless Innovation Forum Europe  
6 October 2015 | Erlangen, Germany

Jim Beveridge  
Technology Policy, Microsoft Corporation

- Transition to Digital Economy and Digital Living
- Spectrum From Scotland to Singapore (via Africa)
- Lessons Learned

# Why we are excited about TVWS

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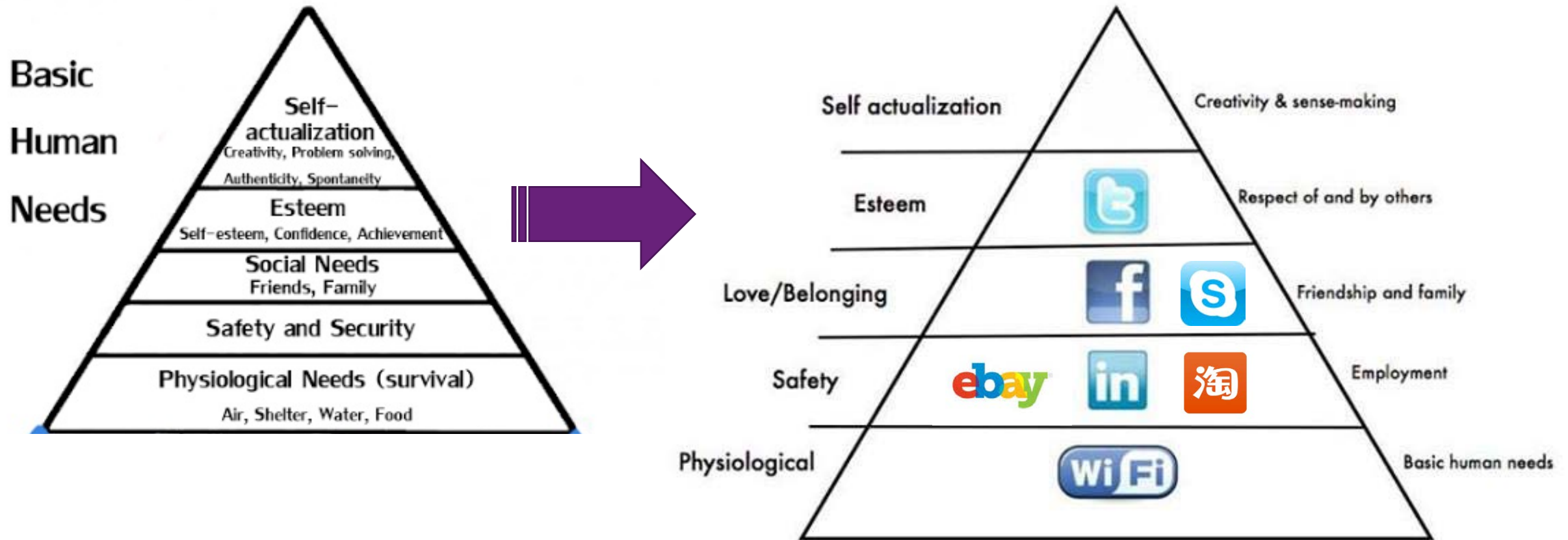


# Davos World Economic Forum

## The Future of the Digital Economy

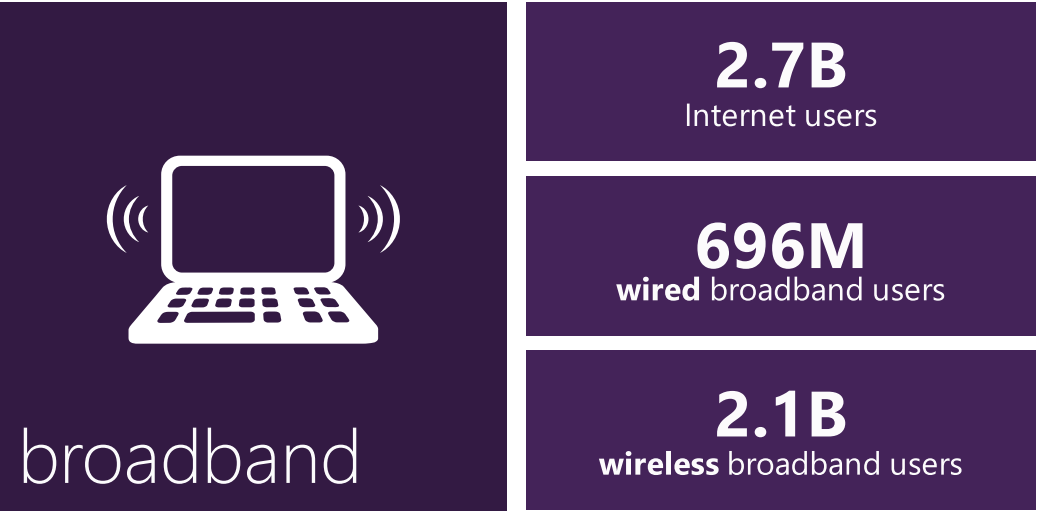


# Transition to Digital Living



Wireless Connectivity has become a ***Fundamental*** Human Needs in digital living.

# Most of the world's population is unconnected

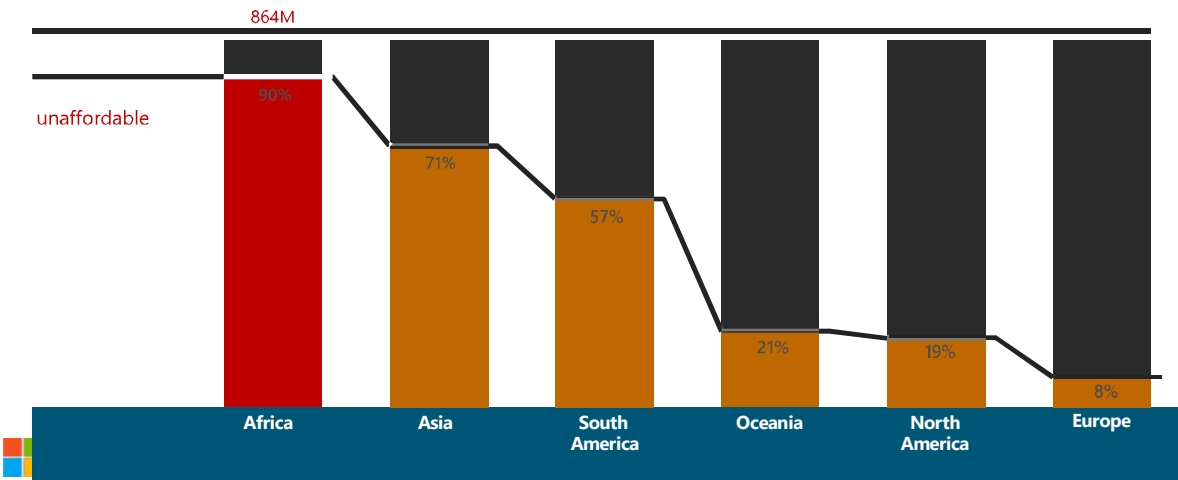


\*2013 Estimates: ITU World Telecommunications/ ICT Indicators database

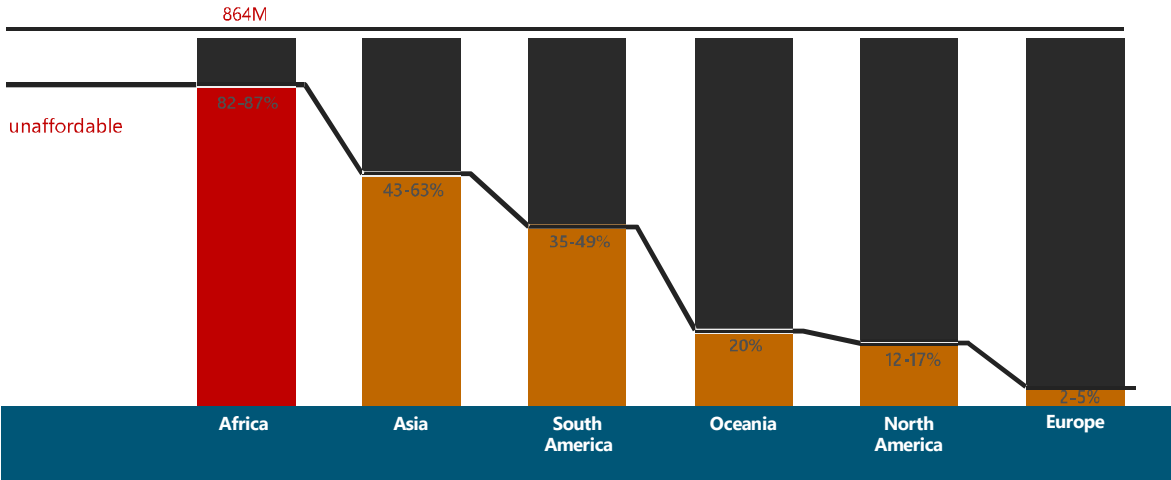
# More people will connect as costs decline



# The proportion of people who would find fixed broadband unaffordable by region

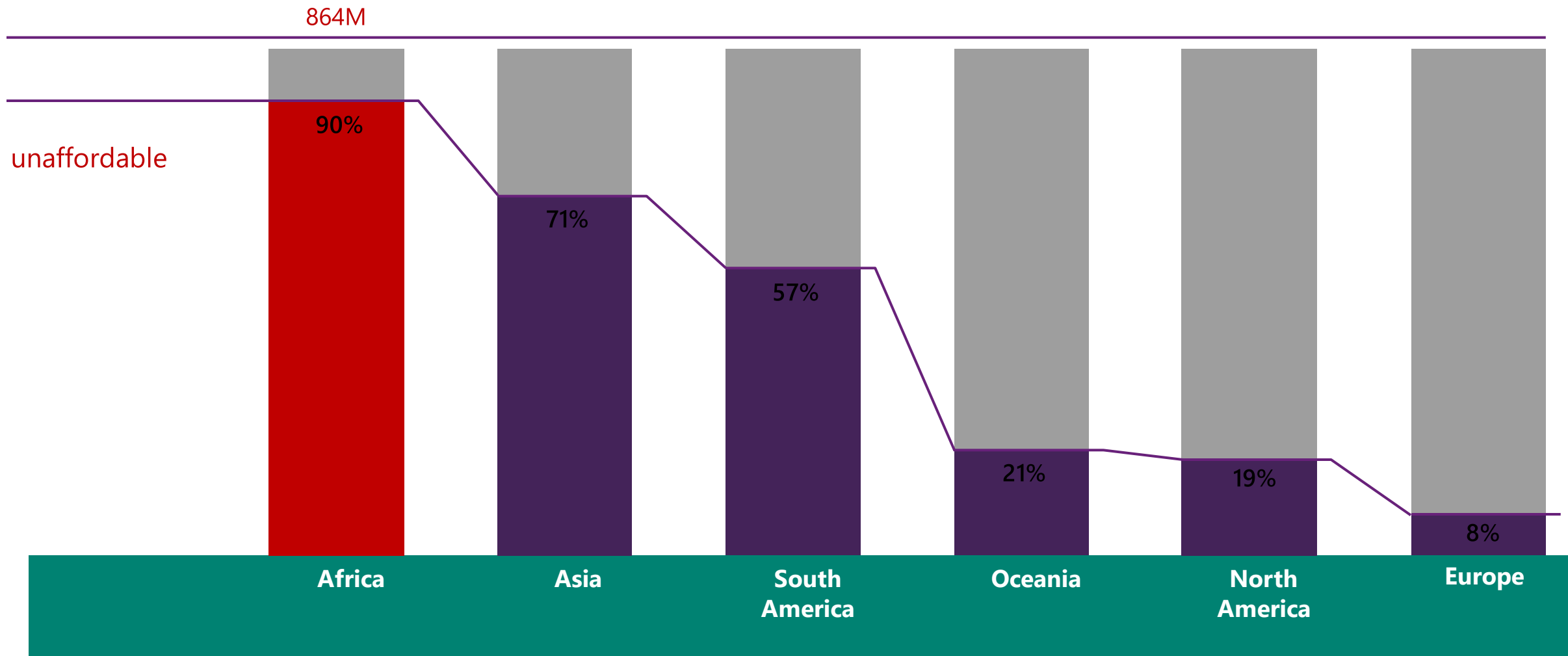


# The proportion of people who would find mobile broadband unaffordable by country



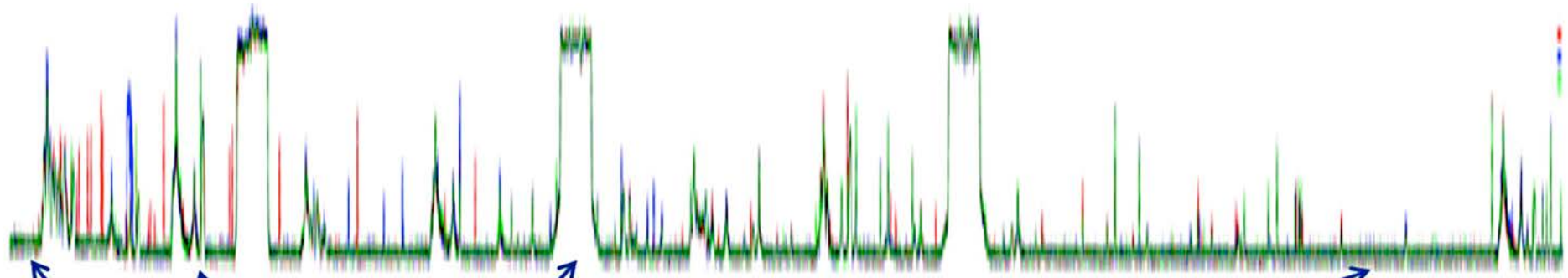
# Closing the Digital Divide – the *Affordability* Challenge

The proportion of people who would find fixed broadband unaffordable by country

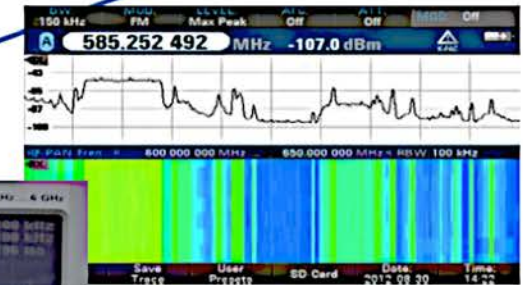




# Under the Lens of a Spectrum Analyser...



- 470 MHz – 854 MHz (8 MHz TV channels):
  - Analogue TV,
  - Digital TV and
  - White spaces









**Radio Spectrum = The Oxygen in a Digital Economy**

An iceberg floating in a deep blue ocean under a clear blue sky with wispy clouds. The small tip of the iceberg is above the water, while the much larger, jagged base is submerged. The text 'TVWS' is written in green on the visible tip, while 'Dynamic Spectrum Sharing' is written in yellow on the submerged part.

TVWS

Dynamic

Spectrum

Sharing





How school girls from rural India Skyped with the CEO of Microsoft



# Ghana TV White Space Pilot Project

Collaboration between SpectraLink Wireless, Microsoft, and Facebook.

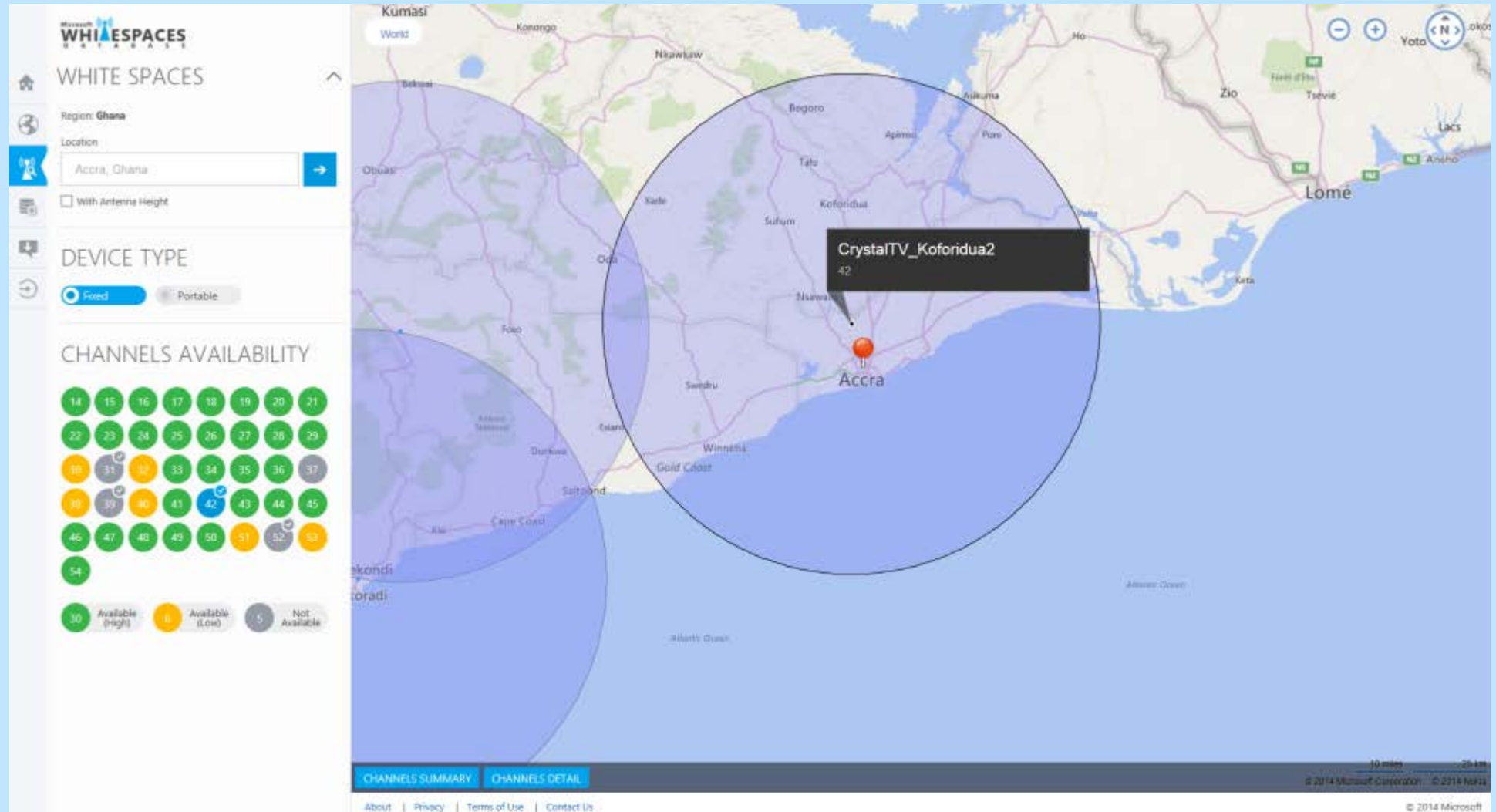
TVWS base stations deliver high-speed Internet access to schools in Koforidua, Ghana.

Pilot delivers broadband connectivity, Office 365, Windows tablets, and content to students and their educators.



The focus of the pilot will be to prove that TV white spaces can be used to provide low-cost Internet access for Ghanaians.

# Abundance of white spaces in Accra



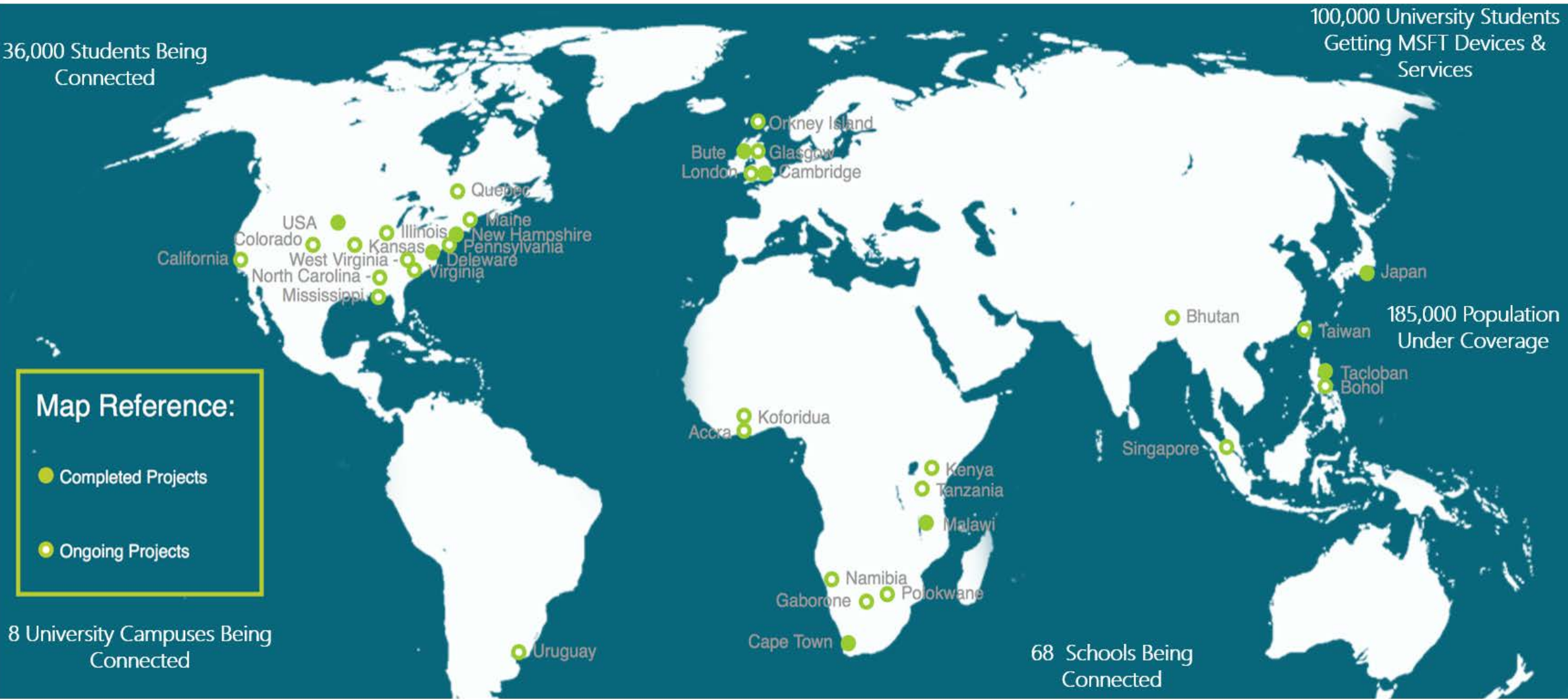


# Momentum is building around dynamic spectrum access

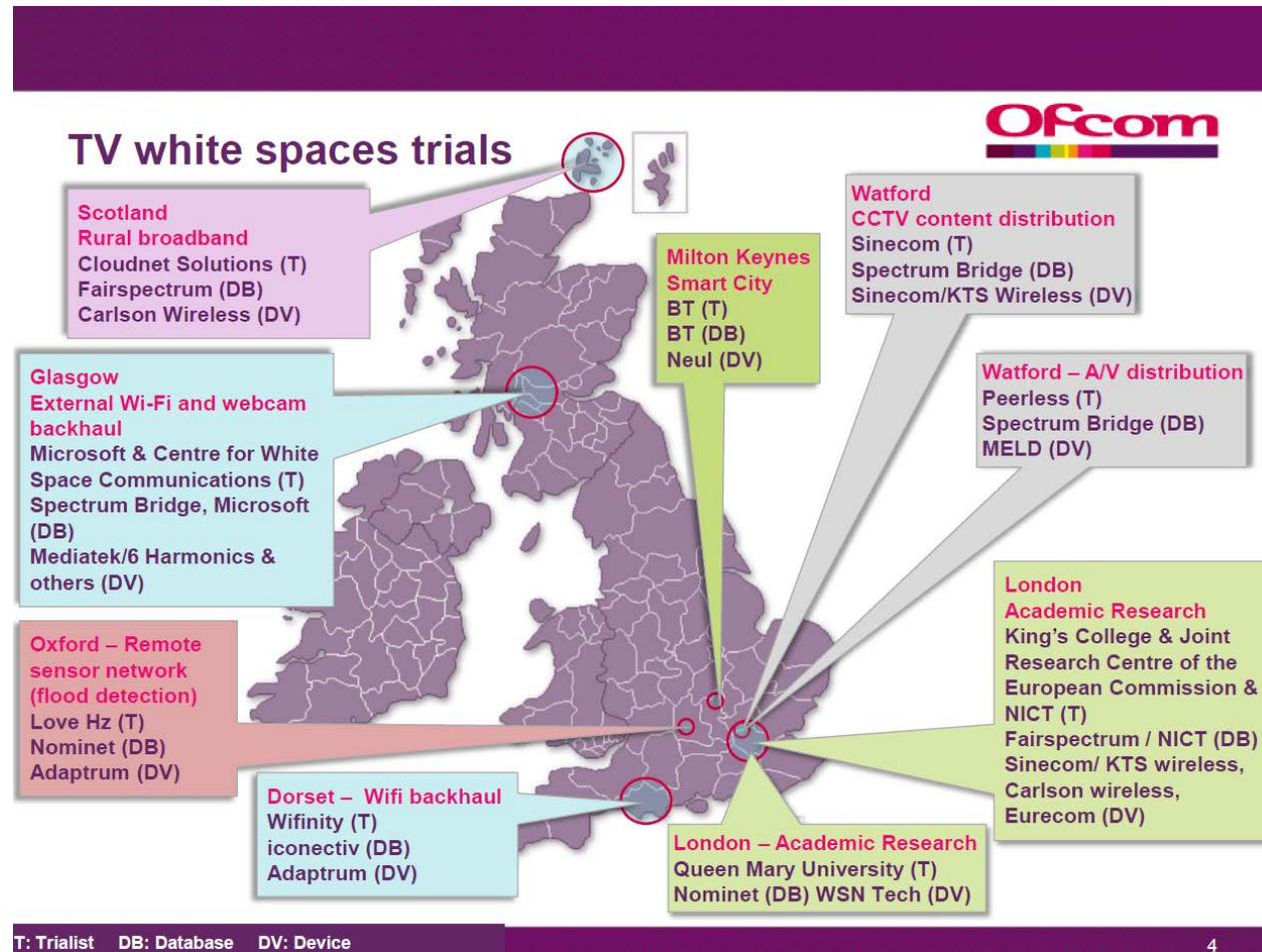


© 2014 Dynamic Spectrum Alliance

# Worldwide Commercial Deployments, Pilots, and Trials

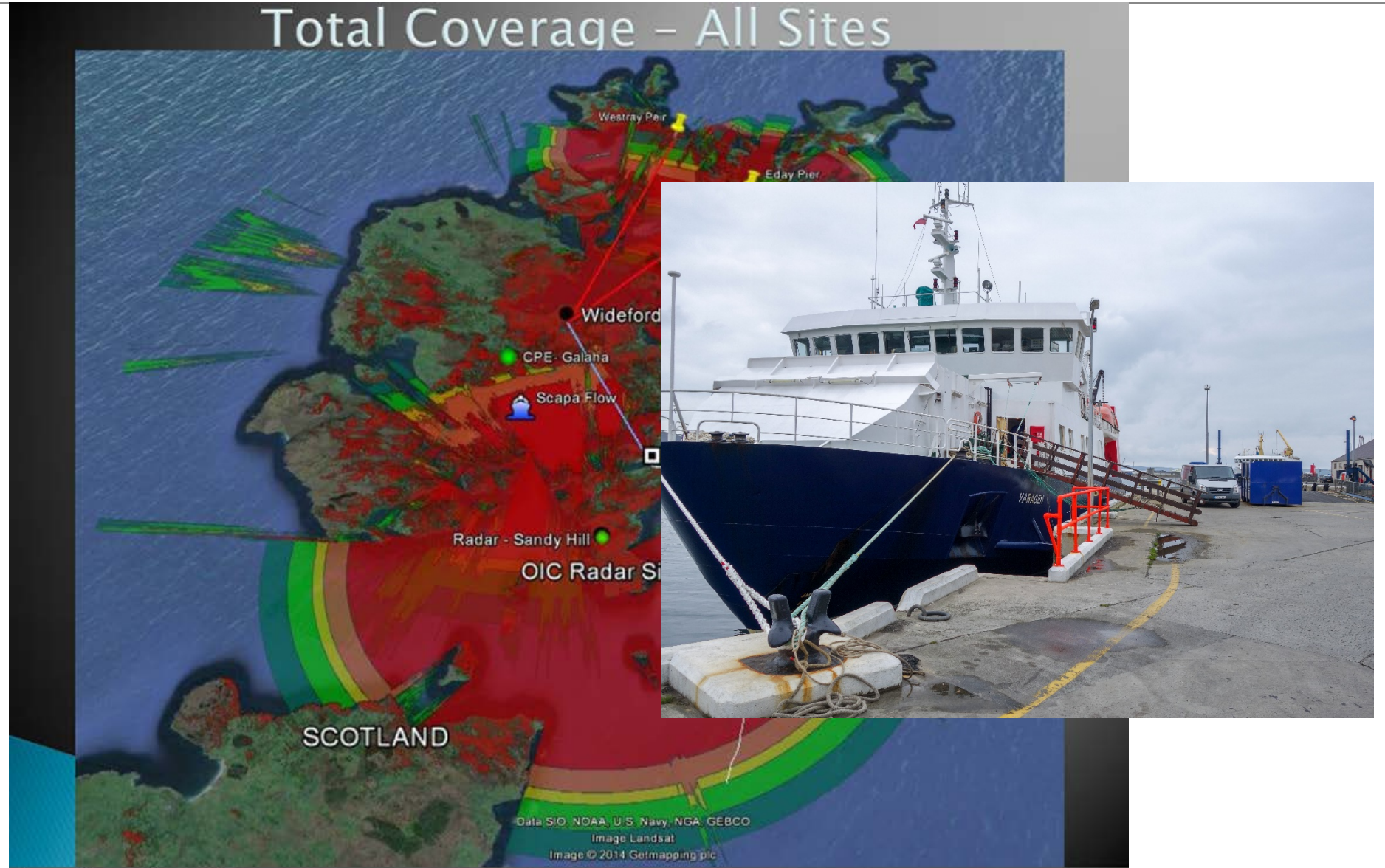


# Ofcom Pilot TVWS Trials



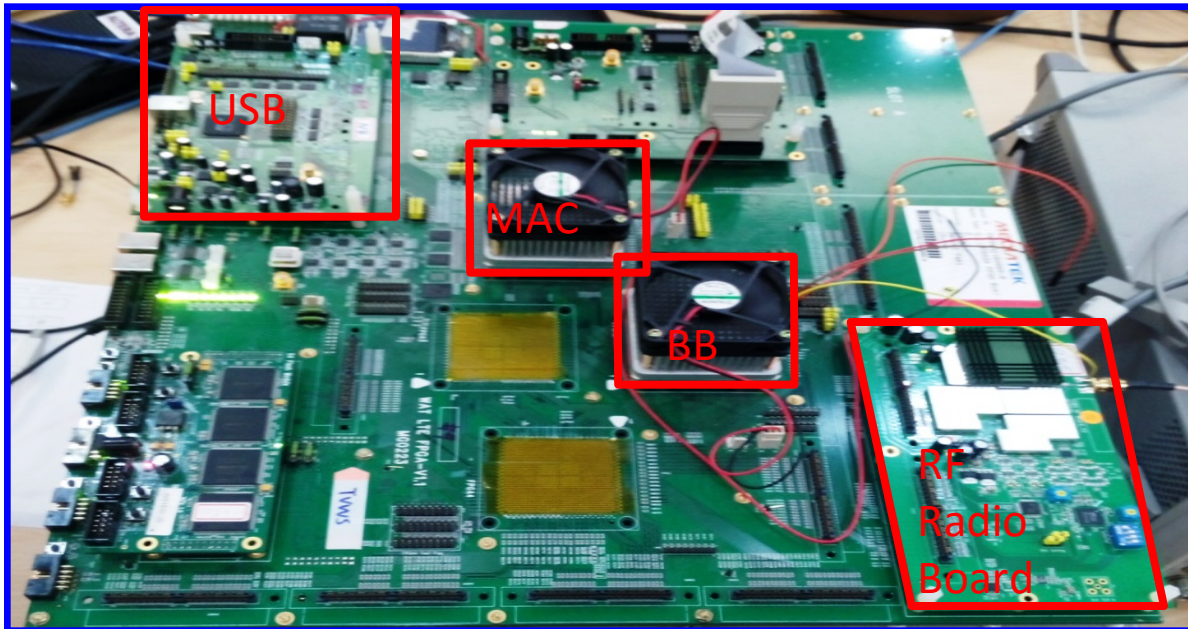


# Orkneys starred in Ofcom's TVWS Pilot

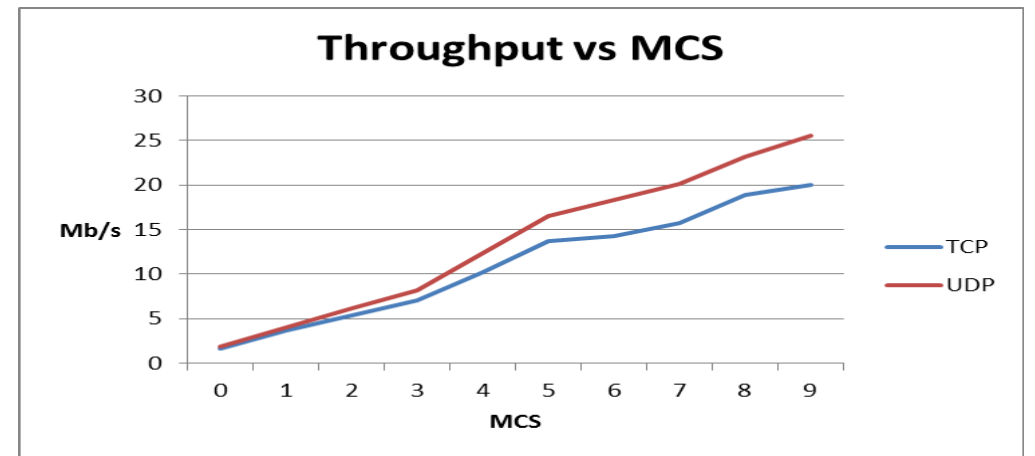


# IEEE 802.11af

- MediaTek and 6Harmonics have developed a 'tri-band' Wi-Fi radio:
  - IEEE 802.11af operating in the TVWS band (470-790 MHz);
  - IEEE 802.11n operating in the 2.4 GHz band;
  - IEEE 802.11n operating in the 5 GHz band.



- 802.11af capable of operating in 6, 7, or 8 MHz bandwidth.



**MEDIA**TEK



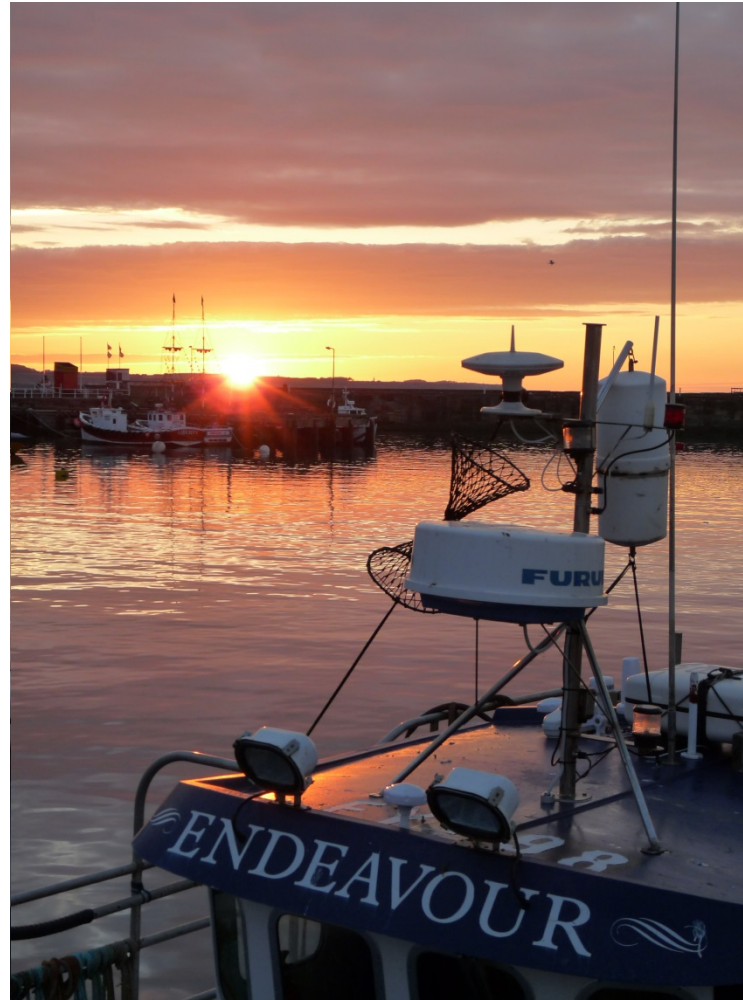
# TVWS Industry Readiness

- IEEE 802.11af (LAN)
  - Spec done! Based on 11ac. Allows for channel bonding of noncontiguous channels
  - Silicon vendors designing against D3.0+
  - SDR prototypes announced in SGWS (NICT and MSRA)
  - Small form factor prototypes being developed by silicon vendors (USB and mini PCI; SDIO will follow)
- IEEE 802.22 (RAN)
  - Done. Working on second generation spec
  - Market size is small
- **IETF - PAWS**
  - Protocol to Access White Space database
  - Merged proposal in place
  - FCC and OFCOM focused
- **DB-DB**
  - Done (US)
  - Interest in international Standard
- **Wi-Fi Alliance**
  - Marketing Task Group has approved MRD
  - Successful blind poll
  - Technical TG formation in Sept '14
- **ETSI BRAN - Harmonized EN 301 598**
  - Limits of operation will be defined by a TVWS database
  - The correct information exchanges between TVWS database, Master Device, and Slave Device



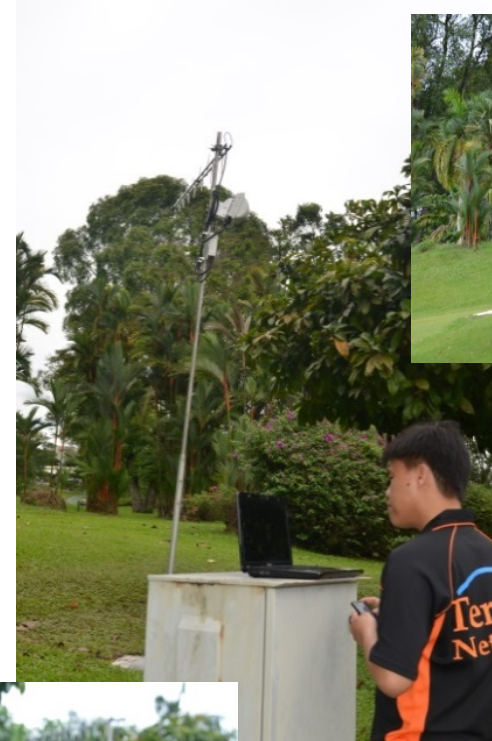
# Through the Trees, Over the Water, and Into Homes

## TV White Spaces Commercial Pilots Begin in Singapore





# On the Singapore golf courses...



PARTNERS: SICC, Terrabit Networks and Microsoft

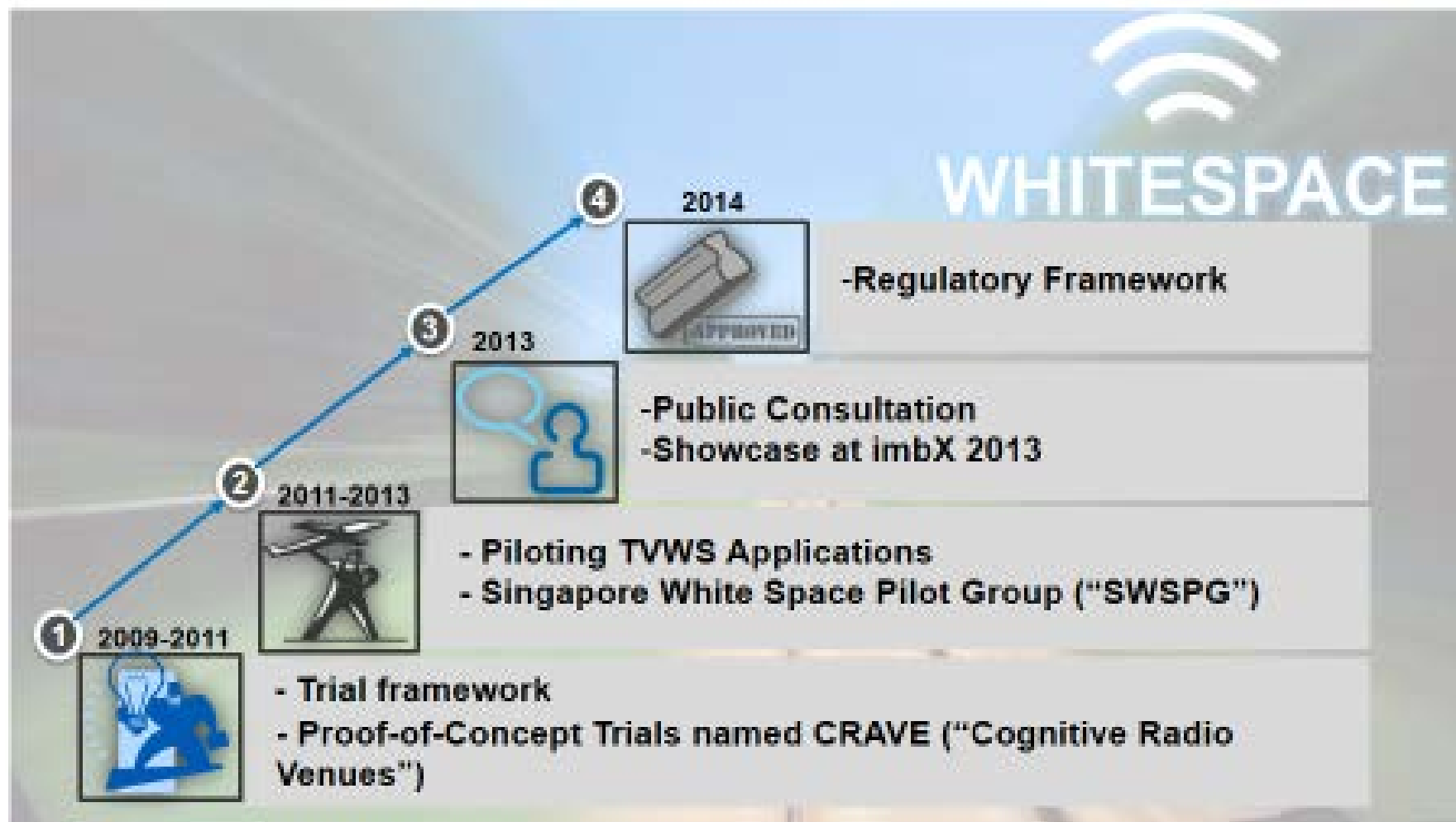


# Experience TVWS at Gardens by the Bay





# IDA Roadmap for TVWS

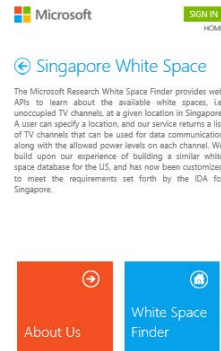


# Smart Radio for a Smart Nation

*...Singapore as a Global Leader in DSA/TVWS Technology and Policy Innovation*



Regulatory Innovation  
and Leadership,  
Regional Influence



Co-founder of  
SWSPG & DSA,  
provider of a trial  
TVWS Database for  
Singapore



Global Advocacy on  
Dynamic Spectrum  
Access

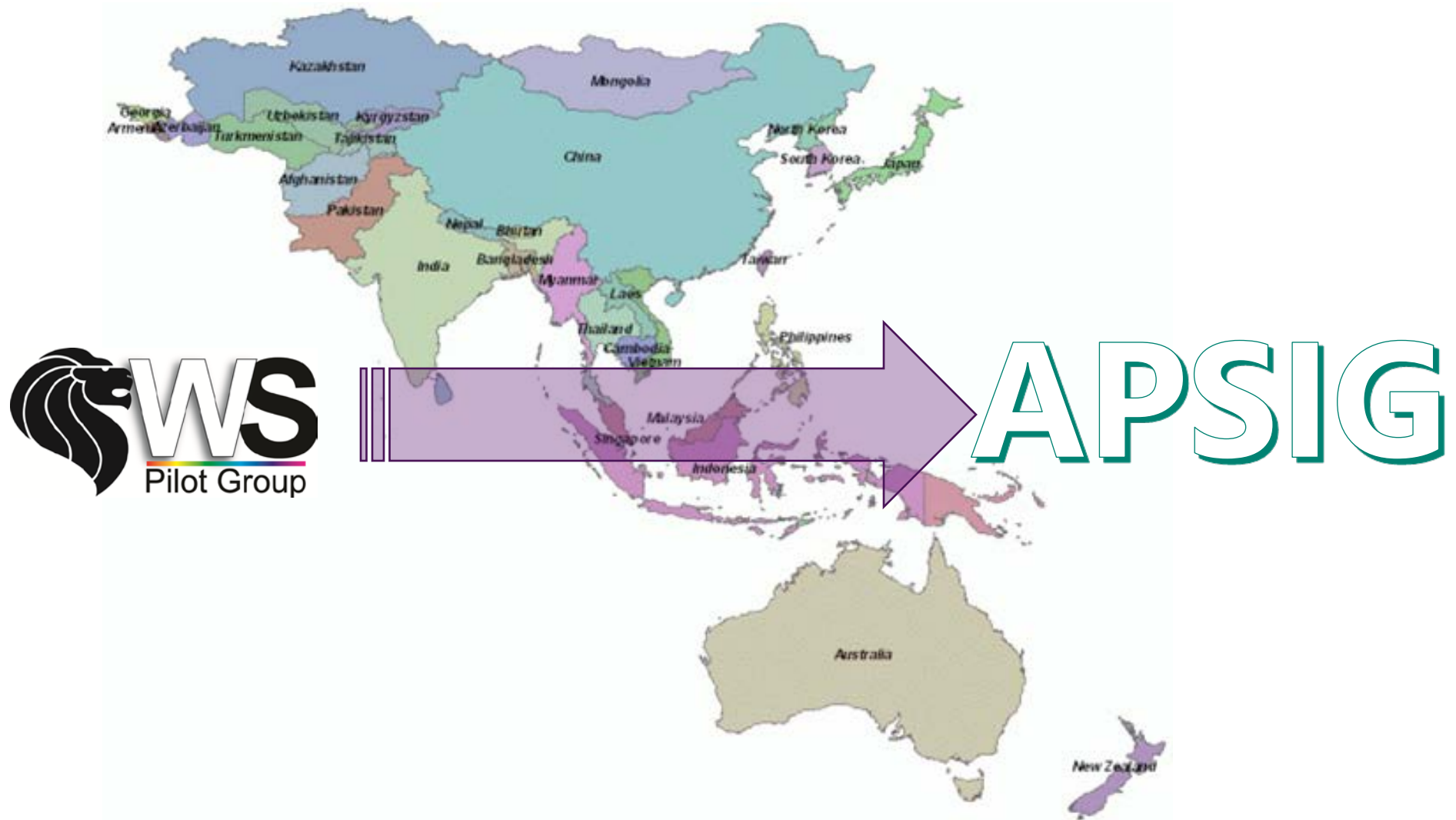


Center of Excellence  
for Cognitive Radio,  
TVWS Technology



Industry Readiness,  
Ecosystem, Use Cases,  
Innovation, and  
Commercial Viability



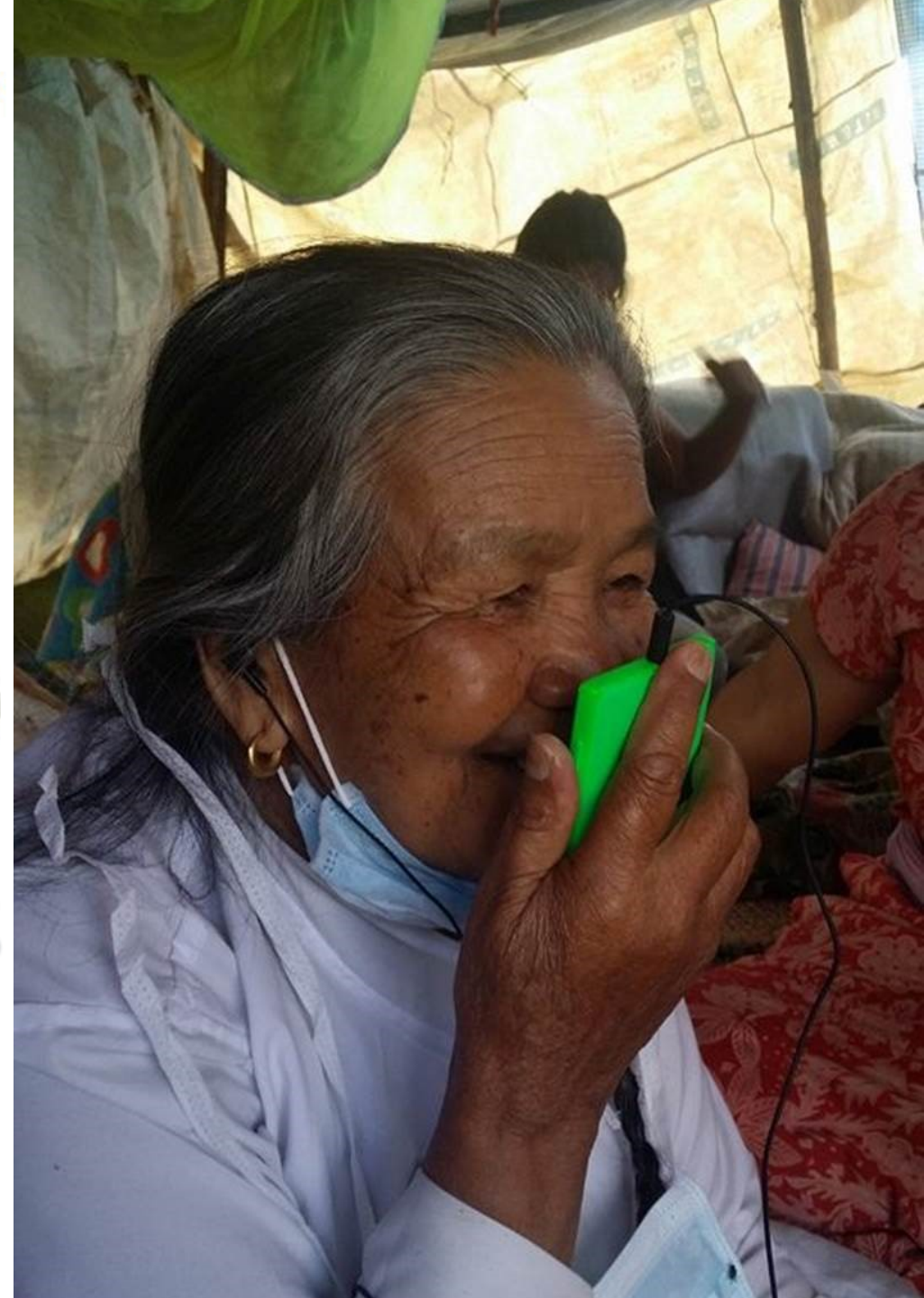




# Volunteers help earthquake victims make free international calls



TVWS



"I believe this was the first time she smiled after the earthquake with her eyes very emotional but dried of all tears."

**Allen Bailochan Tuladhar** | Microsoft Nepal

# Disaster Relief: TVWS/VSAT network

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DOST Region 8 Office (showing solar-powered VSAT) where the base station was located



PSHS Administrative Building (the CPE antenna is the white square in the center of the photo).



PSHS Campus Dormitory

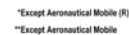


## FREQUENCY ALLOCATIONS

### RADIO SERVICES COLOR LEGEND



This chart is a graphic representation of the National Radio Frequency Allocations Table (NRFAT) used by the National Telecommunications Commission. As such, it does not completely reflect all aspects, i.e. footnotes and recent changes made to the NRFAT. For complete information, users should consult the NTC to determine the current status of frequency allocations in the Philippines.



**PLEASE NOTE:**

THE SPACING ALLOTTED IS NOT SCALED NOR PROPORTIONAL TO THE ACTUAL AMOUNT OF SPECTRUM OCCUPIED.

Philippines  
Internet  
Landscape

TVWS Area  
Connected

w Internet

w/out Internet

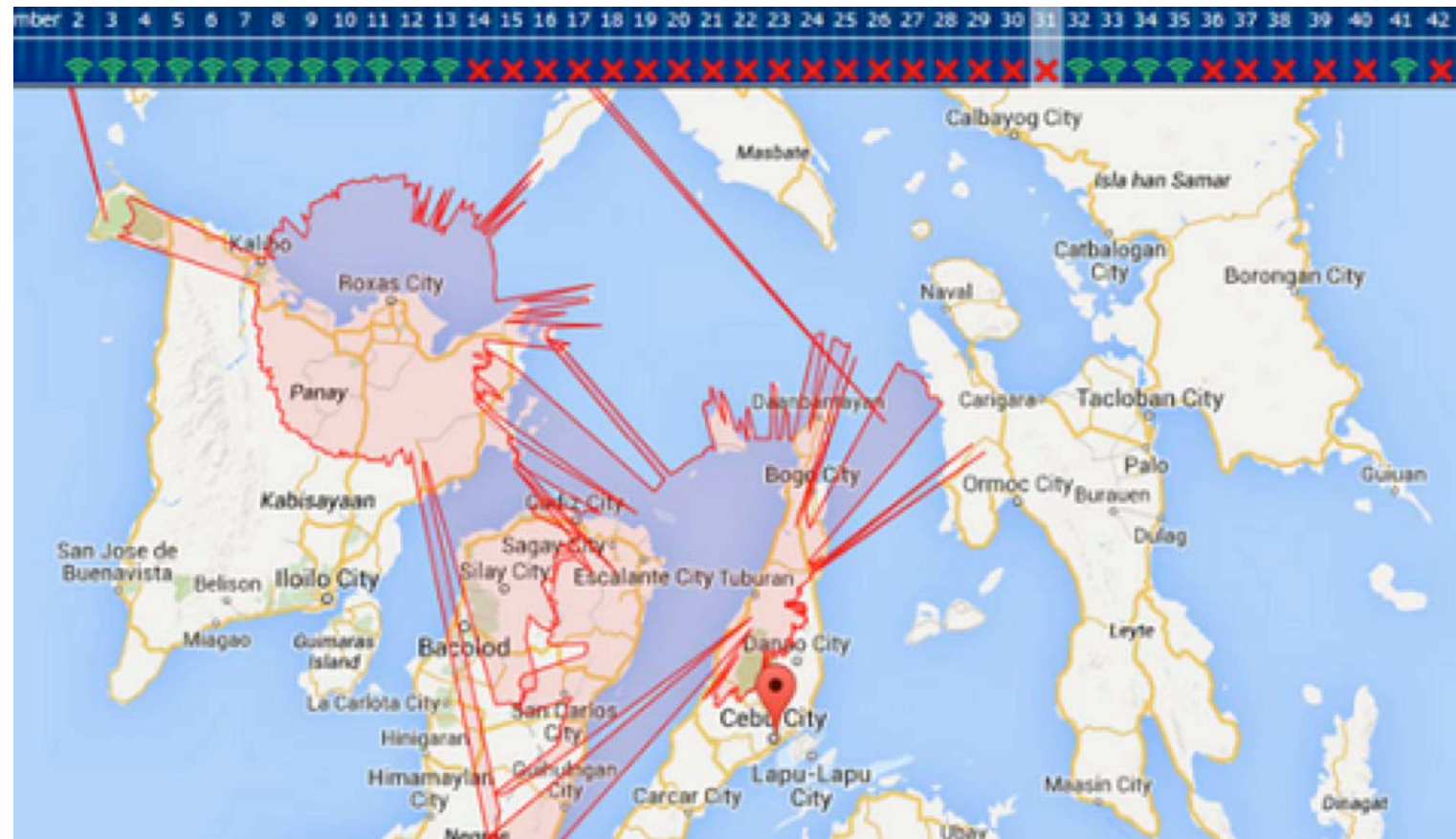


Based on DepEd Study

# Philippines Countrywide Free TVWS Wi-Fi

- Piloted the use of TV white spaces for connectivity in 2013
  - Typhoon Haiyan
- Now **rolling out free Wifi in 997 cities across the country** after tendering process (US\$31.6 million)
- Applications aimed to be connected via TVWS
  - Environmental sensor network
  - Education
  - Healthcare
- Database developed by Japan's National Institute of Information and Communications Technology

*The White Space Database running with TV broadcasting data of the Philippines*



# Lessons Learned

- TVWS Radios are commercially available NOW and do not cause harmful interference
- Geo-location Database is an effective approach in protecting incumbents
- TVWS signals demonstrate superior advantage in range and ability to penetrate obstacles, overcome hilly terrains, water, foliage, and rainfall.
- White Spaces are not really “white” – many shades of grey
- Singapore’s terrain is much more challenging than those in Africa!
- Close collaboration between industry and regulator is key
- Regulator and government support are essential
- Take an iterative approach– take small but fast steps
- Build an inclusive eco-system



# Recommended Steps towards enabling TVWS

- Capacity Building
- Identify Compelling Gaps
- Spectrum Inventory
- Build on top of others' experiences
  - DSA Model Regulation
  - References (e.g., FCC, IDA, Ofcom)
- Facilitate Commercial Pilots with Test Licenses
- Consider applying TVWS to Universal Service Programs
- Define Regulatory Agenda and Take an Iterative Approach (Don't wait until perfect)

"If you want to go fast, go alone. If you want to go far, go together!"

--- African Proverb

# Last sea going paddle steamer – PS Waverley



# Ghanaian regulator helps mount TVWS radio

