



Microsoft Airband the Global status of TVWS

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Microsoft mission

"Empower every person and every organization on the planet to achieve more." - Satya Nadella



The challenge across the world

Internet Access

Nearly 49% of the world is not using the internet¹



"With no internet access, there is no cloud access." - Satya Nadella



The connectivity gap in the LATAM, Asia, Africa

At least

3 billion people

are not using the internet¹

At least

1.1 billion people

lack reliable access to energy²



Focus areas



Healthcare

Telehealth services such as remote monitoring and videoconferencing can improve health outcomes while reducing costs



Agriculture

Farmers can boost income by improving agricultural productivity, finding new customers, and reducing costs through technology



Education

Schools can expand learning options, offer virtual courses, and enable remote collaboration



Small business

Small businesses can use broadband to work remotely, provide more services, and reach more customers around the world

Our approach

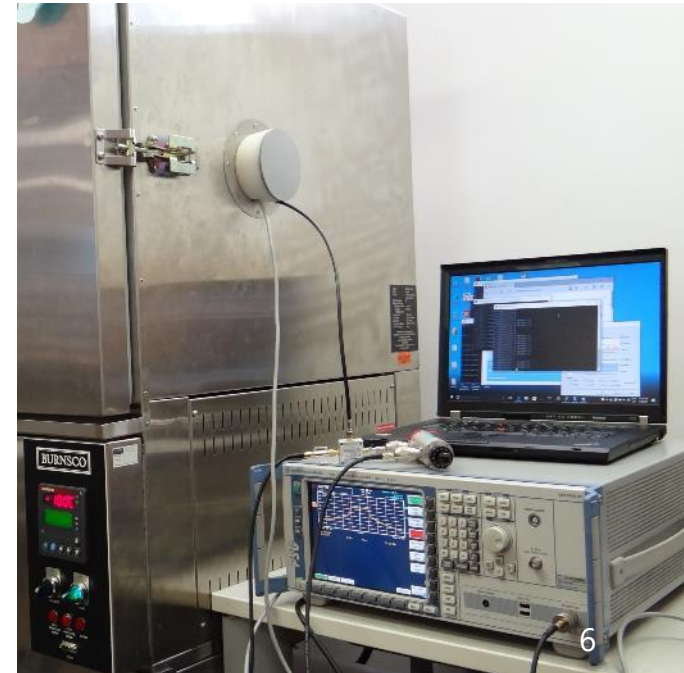
Incubate seed stage partnerships
and projects



Develop enabling technology
ecosystems

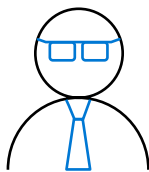


Commercialize scalable
technologies and deployments

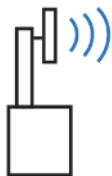


Airband offering for commercial partners

Expertise



Low cost TVWS
equipment, towers and
fiber infrastructure



Azure



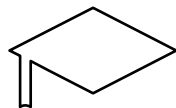
Microsoft
Reseller Programs



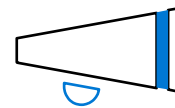
Funds



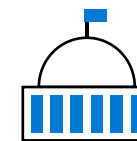
Digital skills &
educational content



PR &
marketing



Advocacy &
industry outreach



Airband projects around the world



United States of America

Maryland & Virginia - Declaration Networks

- Declaration Networks is changing the way families, small businesses, farmers, and others thrive in rural communities along the Eastern Shore of Virginia and in Garrett County, Maryland.
- By using a fixed wireless network leveraging 5Ghz and TV White Space, they plan to provide broadband connectivity to approximately 65,000 people by 2021.



Virginia - Closing the Homework Gap

- First deployment of wireless technology leveraging the TV white spaces & Wi-Fi to deliver high-speed Internet access
- Office 365 to 7,500 school children in 18 schools. Providing Internet access to unconnected students (50% of school children in these areas).



Kenya - Mawingu

Through a combination of WiFi hotspots and fixed line connections, **Mawingu is covering over 500,000 people in rural Kenya.**

By leveraging Azure, Mawingu deploys services cost effectively, manages network assets and identifies customer needs... ultimately enabling them to scale sustainably.





India - Veriown

Veriown is serving **over 100,000 households globally**, using pay as you go technology to increase commercial viability and access to online banking services for end user.

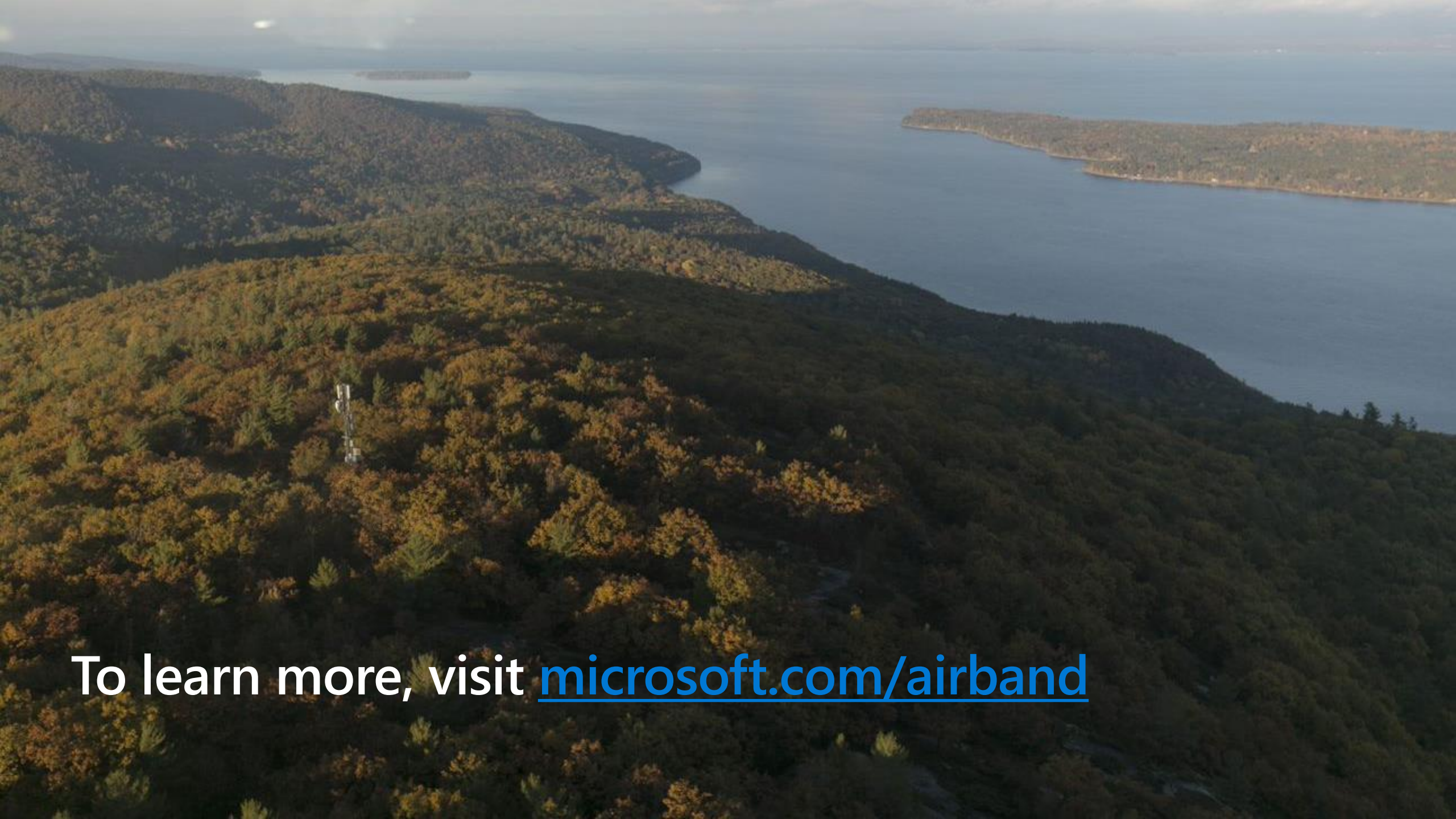
People have access to online education, entertainment and commerce all from a single device. In partnership with the Airband Initiative, they're deploying to off-grid communities throughout India.



Columbia – Coffee Growers Association

Key Takeaways

1. TVWS, Wifi and LTE are complimentary technologies. Today's networks include a hybrid of technologies
2. LTE only cost-effective when deployed at scale, the primary use case for TVWS is fixed or nomadic broadband, whereas LTE provides full mobility cellular data.
3. LTE has multi-billion dollar R&D budgets, plus a 5+ year head start. TVWS technology is produced by a handful of VC-funded startups. TVWS equipment costs will come down further with scale
4. Like for like base station equipment costs for TVWS are 10-20% of LTE base station equipment costs
5. TVWS base station power consumption cost is 5-10% of LTE base station power consumption cost.
6. Exclusive use spectrum licenses are a major cost driver for LTE networks. However, TVWS infrastructure is half the cost of LTE on a per GB basis for all scenarios modelled (*i.e.*, even excluding spectrum costs).
7. This is a capacity limited model, which means that throughput assumptions drive site count.
8. This model also assumes that last mile broadband access is the use case. Other use cases – for example, IoT sensors – would produce different results.
9. Further analysis would be needed to determine costs for specific deployments.



To learn more, visit microsoft.com/airband

ADDITIONAL REFERENCES

- More about TVWS technology: <http://research.microsoft.com/en-us/projects/spectrum/default.aspx>
- The Dynamic Spectrum Alliance <http://www.dynamicspectrumalliance.org/>
- Microsoft projects : <http://research.microsoft.com/en-us/projects/spectrum/pilots.aspx>
- Ofcom Spectrum Sharing framework <https://www.ofcom.org.uk/consultations-and-statements/category-2/spectrum-sharing-framework>
- The DSA provides resources for Dynamic Spectrum sharing in multiple bands: <http://dynamicspectrumalliance.org/resources/>
- Frequency Sharing for Radio Local Area Networks in the 6 GHz Band ([Full Report](#))
- Four Takeaways on the Future of Spectrum Sharing ([Article](#))
- DSA Model White Spaces Technical Rules and Regulations ([Web](#) | [PDF](#))
- Commercial Deployments, Pilots, and Trials ([Web](#) | [PDF](#))
- Dynamic Spectrum Management for Innovation and Growth
http://dynamicspectrumalliance.org/assets/Executive_summary_Spectrum_Mission_J-Toledano.pdf
- Dynamic “White Space” Spectrum Access <http://www.webbsearch.co.uk/wp-content/uploads/2013/09/Dynamic-White-Space-Spectrum-Access-by-William-Webb.pdf>
- The case for permissive rule-based Dynamic Spectrum Access http://research.microsoft.com/en-us/projects/spectrum/case-for-permissive-rule-based-dynamic-spectrum-access_thanki.pdf
- Recommendations for Implementing the Use of White Spaces: Conclusions from the Cambridge TV White Spaces Trial <http://research.microsoft.com/en-us/projects/spectrum/cambridge-tv-white-spaces-trial-recomms.pdf>
- Cambridge TV White Spaces Trial: A Summary of the Technical Findings : <http://research.microsoft.com/en-us/projects/spectrum/cambridge-tv-white-spaces-trial-findings.pdf>
- Report on White Space Spectrum Survey for Cambridge TV White Spaces Trial <http://media.crfs.com/uploads/files/1/crfs-cambridge-white-space-report-a04.pdf>
- Cambridge TV White Spaces Trial: PMSE Trials Report : http://www.csr.com/assets/documents/Cambridge_TV_White_Spaces_PMSE_Trials_Report_21.pdf

