Developing an economic strategy for deploying broadband to rural South Africans by using TVWS

A consortium consisting of South African and US partners including Adaptrum, International Data Corporation (IDC), Microsoft and Project Isizwe and the Wireless Access Providers Association (WAPA) together with the United States Trade Development Agency are working on a feasibility study to demonstrate the technical, socio-economic, and commercial benefits of TVWS. This solution will then scale to connect South Africans country-wide to the internet and to the educational, healthcare, and community economic benefits this brings.

South Africa has been a driving force in TVWS from its early stages and is the first country in Africa to have published a TVWS regulatory framework. Encompassing an unreached population of over 20 million people in hard to reach terrain, makes it an ideal test location for a solution that scales affordably.

Feasibility Project

The purpose of the initial feasibility study is to demonstrate TVWS as a commercially relevant and the optimal solution for connecting rural South Africa. The end results of the feasibility study will be documented into a technical analysis, a financial feasibility and an executive white paper which will show:

- What density of population TVWS is best suited to serve?
- What topology is best suited to using TVWS ?
- What average revenue per user can be safely assumed once connectivity is in place ?
- What return on investment periods can be predicted ?

From this whitepaper, bankable projects across Southern and Eastern Africa can be developed. This will bring much needed connectivity investment to the continent by tackling issues such as the cost of infrastructure needed to reach the rural poor.

Project Background

The key advantage of a TV white space deployment is that the signal coverage can reach up to 10km radius from the base station without the requirement of line of sight. In South Africa this makes it ideal for connecting the rural undulating hills of Kwa Zulu Natal and Eastern Cape as well as areas in other provinces where there is poor existing backhaul infrastructure. Each TV White space base station will connect at a bandwidth of 20 Mbps to 30 Wi-Fi access points. These will be scattered

within walking distance of each citizen of the rural community. The project proposes deploying 1,600 such base stations reaching 50,000 hot spots servicing a potential 13 million rural citizens.
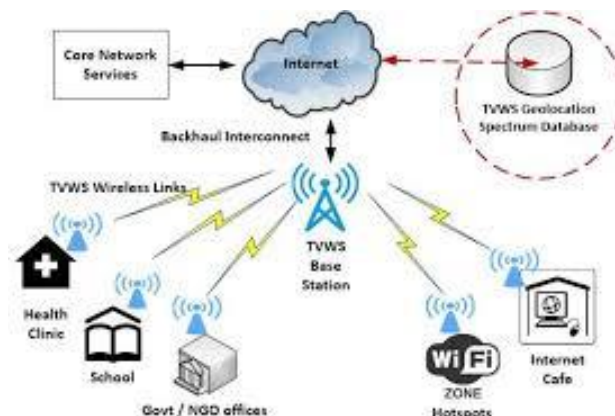
Project location

The project location will be the rural hills of Kwa Zulu Natal and Eastern Cape as well as extending to unreached rural areas in Limpopo, Mpumalanga, Free State and North West where TV White space technology has a clear advantage and then also in the most remote parts of the Northern Cape where the population density is the lowest.

Province	Population	Area	People / Sq.km
KwaZulu-Natal	11,065,240	94,361	117.3
Eastern Cape	6,996,976	168,966	41.4
Limpopo	5,799,090	125,754	46.1
Mpumalanga	4,335,964	76,495	56.7
North West	3,748,435	104,882	35.7
Free State	2,834,714	129,825	21.8
Northern Cape	1,193,780	372,889	3.2
Total	35,974,199	1,073,172	33.5
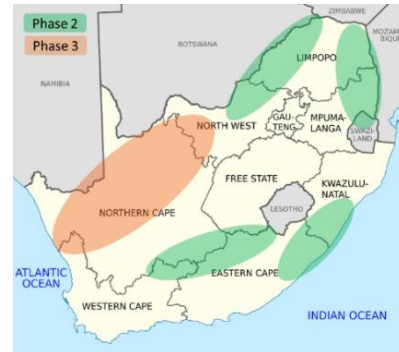
The typical area where this project focuses is on low-income rural communities where the population density is less than 500 people per km^2, and the number of dwellings is less than 100 per km^2.

The satellite picture on the left here shows the typical rural settlement in Kwa Zulu Natal and the Eastern Cape. The white shaded area is one km^2 and there are typically between 50 and 100 dwellings per km^2 in such an area

These areas typically either have no connectivity at all or only low bandwidth mobile data network options which cost around $40 per GB.

Expected Development Impacts

The impact would be to provide at least 1 GB of data per person per month to rural citizens at a price of $2 per GB per month. The current cost of data that these citizens (low income in rural areas) pay is about $40 per GB. The impact would be to make data access to the Internet less than 1/20th of the current price. The project would reach 13 million people of KwaZulu Natal, Eastern Cape, Limpopo, Mpumalanga, Free State, North West and finally the most sparsely populated province, the Northern Cape.

Expected Number of New Connections/Increased Access Capacity

The expected coverage of the network will reach 13 million people currently living in 3.5 million dwellings in these areas. 35% of these dwellings have access to the Internet using a smart phone. Expected number of new subscribers is 1.7 million including some coverage in the hardest to reach, most dispersed, rural unconnected people from the Northern Cape.

Subscribers by province
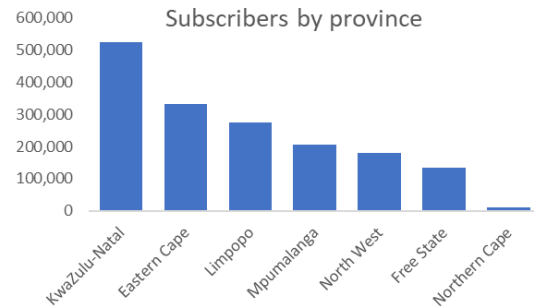
Expected Monetary Value of Economic Impact

The 1.7 million subscribers will receive data at 1/20th of the current cost. The monthly ARPU (average revenue per unit) is anticipated to be $2. The economic impact is anticipated to be savings of over $30 million per month benefit to the citizens accessing the network. This also aligns to the A4AI principle of 1-for-2 (1GB of mobile broadband data available for 2% or less of GNI per capita) that was adopted by the UN. With appropriate financing this second phase is expected to generate more than $100 million of infrastructure investment opportunities to extend broadband coverage to the furthest rural areas of South Africa with an expected return on investment in less than 3 years.

Project milestones

The initial one-year feasibility study will include a network build as well as the development of a business plan including financing aspects, to help ISPs and their investors understand and take advantage of the commercial opportunity. This phase will research diverse economic and technical issues including revenue projections and demand in rural areas, the impact of lightning & power surges on TVWS equipment, citizens seeing Wi-Fi hot spot data as mobile data, equipment stability and training, identification of high sites and Internet access not being available or too expensive, unrealistic cost operations budgets, target areas not generating sufficient ARPU, TV Whites space frequency availability, Digital Switch Over, impact of Spectrum Auctions, impact of political instability on service take-up and other relevant issues. The project provides connectivity at 5% of the current cost to the end citizen. The mobile network coverage remains and therefore the project gives additional redundancy and reliability to the citizens.

WAPA coverage map 2018

The second phase entails expanding the coverage of the commercial TVWS project into Kwa Zulu Natal, Eastern Cape, Limpopo, Mpumalanga, Free State, North West and the Northern Cape by offering WAPA ISP members to participate. Interested parties will be given the opportunity to leverage the findings and other resources such as financing, developed in the first phase to scale out the solutions.

Project Consortium

Project Isizwe is a member of the Wireless Access Providers Association (WAPA) a South African WISP association that currently represents approximately 180 members. WAPA as well as Microsoft and Adaptrum are members of the Dynamic Spectrum Alliance (DSA), a global association that develops policy for and mechanism in bands such as TVWS to help improve the affordability of broadband services provided to the underserved. WAPA also has an MOU with the South Africa government Department of Telecommunications and postal services to address affordable connectivity in the low-income regions.

 Project Isizwe is a not for profit, South African business. It has been operating for the last 5 years and has successfully managed over $23 million of funding to free Wi-Fi projects. The Tshwane free Wi-Fi project that they established reached 500 TB of data a month servicing 600,000 citizens a month and saving them over $10 million each month in data fees.

 Adaptrum is a Silicon Valley based industry-leading TVWS firm with the TVWS equipment and engineering expertise, and training and installation skills for the optimal deployment of the technical part of the project as well as experienced business solution architects to customize the solution to South Africa's needs.

 International Data Corporation (IDC) is a worldwide leader in ICT market research and analysis, whitepapers, and will provide in an executive whitepaper an overall assessment of the results of the technical and economic aspects of this TVWS solution.

 Microsoft's Airband team will provide the underlying support on TVWS Policy as well as project management and technical architecture capabilities and services on cloud-based CRM & billing systems, on education solutions, as well as on the spectrum database.

The initial commercial feasibility study will use leased and loaned equipment from Adaptrum, Isizwe, and Microsoft. The opportunity for deploying and running the network using the business model and equipment findings will be put out to members of WAPA who also meet South African Black economic empowerment criteria and will encourage Microjobbing with students to ensure affordable local support.

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