Digital Adoption:
A model for capacity and sustainability in digitally marginalized communities

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Digital Participation for the Next 50%

The N50 Project accelerates digital adoption and community enrichment through innovative applications, network design, and business models to *enable the next 3.9 billion people to participate in the digital world*. Broadband adoption will be accelerated and sustained, globally, through commercial, non-profit, government, and community partnerships.

The N50 Project focuses on tech-neutral connectivity, literacy, language, and convening partners to deliver human-enriching applications around education, healthcare, agriculture, and local entrepreneurship. We believe this model in partnership with private enterprise is the opportunity to scale.

Overview

Digital enablement could help marginalized rural communities like Luumbo to overcome some of the challenges they face, through the provision of on-line learning. Luumbo is situated approximately four hours' drive from Zambia's bustling capital city, Lusaka. It is home to some 2,000 residents, who predominantly have difficulty reading and writing. The rate of unemployment in Luumbo is high, with livestock farming as one of the main sources of income. However, as only a small portion of Luumbo's residents own a smartphone, laptop, or have access to the Internet, the opportunity to benefit from participation in a digital world seems almost impossible.

The N50 Project partners with rural communities such as Luumbo, to identify their unique needs and priorities. It has invited international public, private, NGO and academic entities to collaborate in the creation of an open ecosystem that harnesses the most effective architectures and technologies available to develop affordable and sustainable internet services. The objective is to support local businesses, as well as education, agriculture and healthcare institutions and to empower individuals to reach their full capacity for growth. The success of such projects will allow architecture blueprints to be developed, replicated and shared across digitally-disadvantaged communities around the world.

Luumbo: Proving the Concept

Digitally-marginalized communities face a number of socio-economic and geographical challenges which contribute towards high levels of poverty and illiteracy. These are some of the challenges which the N50 Project seeks to address. It is a new, international partnership of industry, academia and public sector leadership.

The N50 Project's quest is to accelerate digital adoption for some 3.9 billion people living in underserved communities around the world. Luumbo, a remote community in the Gwembe district of southern Zambia, is where it all begins.

Investing in the individual capacity for growth

Zambia is a country characterized by a large population of young people, the majority of whom are under the age of 18. Many of them (54.5%) live below the national poverty line and are deprived of education and healthcare[1].

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According to the GSMA, over half a billion people in Sub-Saharan Africa who are living in areas covered by a mobile broadband network are not using mobile internet.[2] Their research also indicates that people in rural areas are less likely to use mobile internet compared to their urban counterparts. Aside from the widely-recognized obstacles of last mile connectivity, the primary reasons for low uptake are affordability and a lack of relevant content, skills and literacy.

1 https://www.unicef.org/zambia/children-zambia
2 Impact of Natural Disasters

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Creating affordable, sustainable services

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The N50 initiative requires a flexible approach that spans network-as-a-service business models and scalable digital platforms, including online social groups to enable individuals to participate more fully in a connected world. The expansion of existing 3G, 4G, 5G, WiFi 6E networks and the prioritization of fiber and low latency satellite, as well as Fixed Wireless Access (FWA) broadband connectivity are a few examples of how the telecommunications infrastructure can address some of the challenges related to sparse population densities and remote locations.

For the N50's Luumbo project, technology leaders Intel, Dell, the GSMA, Africa's largest mobile operator MTN, PicoNETS and local businesses AMN, FreedomFi and Mwabu have collaborated to bring mobile broadband access to Luumbo using an innovative edge network solution. Geeks Without Frontiers, a non-profit platform for global impact, is responsible for managing the project.

The Luumbo project will deliver digital curricula via Mwabu's customized e-learning platform, in addition to lesson plans and teaching videos. It will also offer access to telemedicine as well as agricultural, financial and business data.

Meaningful connectivity

Key to the success of building solutions that have enduring value is adaptable hardware and software integration, along with rapid deployment. Measuring and improving broadband internet connectivity criteria such as speed, quality, availability and device capability can also help to ensure content delivery and support best-practice sharing across multiple parties.

Taking these considerations into account, the N50's Luumbo Project comprises a FreedomFi/Magma Edge-Based Evolved Packet Core and PicoNETS Caching and Content Delivery Network. This is integrated with the local cellular provider's 4G LTE network using VSAT backhaul. The network edge is extended through Points of Presence (PoPs) which can be situated on cellular towers, minimizing the number of user hops and volume of traffic to optimize performance. It allows content to be delivered to user devices (such as low-cost smartphones, tablets and laptops) via the LTE service. This reduces the need for a backhaul between the village and data center and improves the user experience by reducing latency and bandwidth restrictions.

Image Credits: Mwabu

Content-intensive applications such as e-learning modules and videos can be updated at off-peak times via VSAT multicast, to lower costs and enhance performance. Sophisticated AI-based algorithms could be deployed in the future to determine which content is accessed most frequently. This content can then be proactively cached to reduce bandwidth consumption and offer a better user experience. The effectiveness of the caching layer could also be significantly improved if third party applications are written to take advantage of it. Examples include social media content, training modules and individual news stories. The aim is to maximize service delivery and limit the operating costs associated with last mile connectivity, by processing, analyzing, storing and delivering data closer to the point of capture.

The N50 system is a cloud-based, Open Source network management platform that provides a simple and consistent method for monitoring the wireless network securely. It offers a unified view of performance status and traffic flow, as well as the ability to configure gateways and receive alerts, ensuring both the resilience and reliability of the network. The absence of electricity to power the network at Luumbo has been overcome through a solar energy system, which includes solar-powered charging units for individual devices.
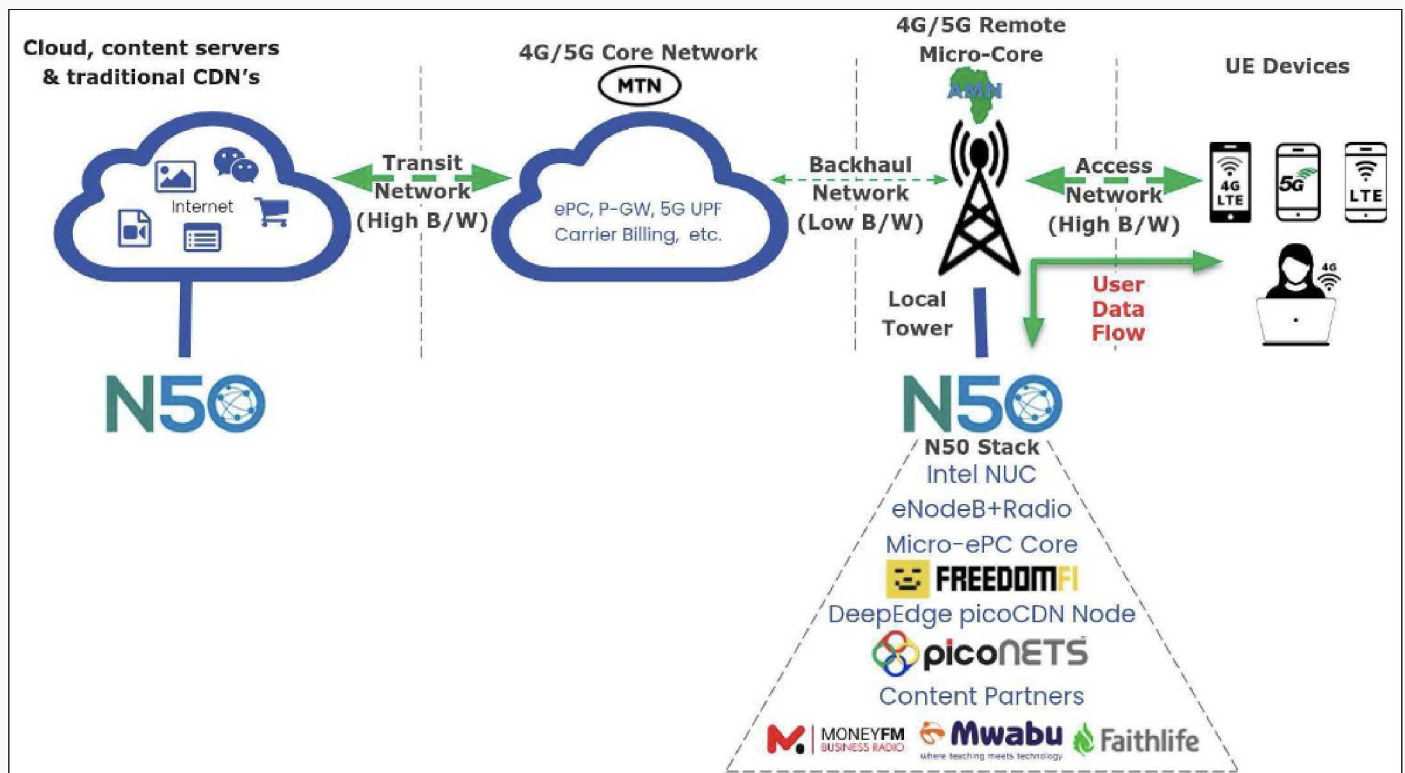
Community participation

Working with community leaders to plan and execute the roll-out of projects is essential to empower individuals to participate and contribute towards achieving the desired outcomes. Skills can be transferred through the training and support of community leaders, teachers and clinicians, as well as the delivery of educational content to families and businesses. Participants will have the opportunity to earn ownership of the hardware over the lifetime of the project.

Image Credit: Mwabu

A Community Liaison Officer and Project Manager will ensure that the content delivered serves the needs of the community and the success of the project will be monitored through regular surveys and Key Performance Indicators (KPIs) to measure impact.

The N50 Project has also partnered with Virtual Doctors, who have been providing telemedicine services across Zambia for over ten years. Lack of network coverage has prevented Virtual Doctors from reaching more remote areas, such as Luumbo. Using the Virtual Doctors proprietary app, Luumbo's clinical officers can now consult with UK-based NHS doctors, to support their diagnosis and treatment plans for complex patient cases. They will also have regular access to medical case studies, all of which can significantly improve patient outcomes.

Image Credit: Virtual Doctors

Impact Measurement

A survey to establish the requirements for digital inclusion indicated that the primary interests of the community of Luumbo were: 1) having access to the internet for educational, agricultural and healthcare purposes and 2) to support local businesses. Devices will be shared between families and community leaders to enable wider access to cached content and for learning opportunities to be extended to the home environment.

The success of the project will be measured in terms of increased engagement with the content provided and enhancements to the LTE experience for all users. A qualitative analysis of user satisfaction ratings from interviews will also be undertaken. Studies related to digital skills and literacy conducted at the outset of the project will be compared with results taken after a year of implementation, to measure the educational impact of the project.

Network performance KPIs will include the monitoring of daily statistics for:

- Voice call blocking, set-up and drop rates
- Average voice and data traffic
- Network availability (2G, 3G and 4G)
- Decongestion of the VSAT Uplink

Environmental, Social and Corporate Governance (ESG)

The N50 Project endorses the corporate social responsibility to support digital participation as an enabler for individual growth and opportunity. Through human-enriching applications, projects such as Luumbo can help to drive sustainable development by providing access to education, improving healthcare and well-being, promoting economic growth, advancing diversity and equal opportunities, monitoring environmental impact and helping to reduce poverty.

Next Steps

Following the deployment of the edge network with cached educational content, additional applications (including religion, news and fintech) will extend access to relevant content and further enhance the impact across the community. The digital ecosystem will then be expanded to include multiple communities in Zambia and other countries in Africa, with more content added as literacy and capacity increase. At this stage of the project it is anticipated that private enterprises will begin to contribute to the costs of network expansion through the upgrading of towers and that the mobile operator will begin to see a return on their investment from additional traffic and an increase in users.

The goal over the next five years is to engage local partners in the development of an App Store for community members, to support easy and affordable access to a broader range of localized content, bringing even greater benefits both economically and socially.

Image Credits: Mwabu

About the N50 Project

The N50 Project is the **Geeks Without Frontiers** led initiative that is focused on the next 50% of the planet that does not fully digitally participate. The N50 partners' primary focus is to launch projects for marginalized communities using best-practice playbooks for long-term delivery of ICT solutions. N50 is an open, inclusive ecosystem that is fueling transformation in some of the world's most challenging environments. Our live 'Digital Participation' projects in the field are designed to enable communities to access the education, health, social and financial benefits that flow from affordable and sustainable digital inclusion.

To learn more about the N50 Project, visit: www.n50project.org

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