

CONNECTING a continent



Innovative ways are being found to overcome rural Africa's poor access to the information superhighway.



A LOAF OF BREAD is still baked in much the same way today as it has been for thousands of years. But an impoverished rural South African community has adopted a high-tech telecommunications twist to obtaining their daily crust: the SMS.

In the developed world, most people use the humble SMS without a second thought. Yet, hugely complex technology underlies this mundane activity. And that technology is being put to good use in Sekhukhune, Limpopo, where bread is ordered by SMS from a centralised office. The bakery knows just the right amount to bake, and delivers to the client's doorstep.

It's a perfect example of how linking up to our connected world has changed people's lives. And that's the kind of thinking that is driving efforts to get Africa connected.

For around three-fifths of Africa's population, the Internet is just a dream. But that's changing thanks to efforts such as a new German initiative based on an interconnected web of radio networks and innovative technology.

Launched in January, the initiative arose out of the realisation that medical services, education and participation

in the economy and politics is limited for billions of people living in rural areas with – at best – limited access to the Internet and regional communication infrastructure. Called FOKUS NET4DC, it's driven by the Fraunhofer Institute for Open Communication Systems (Fraunhofer FOKUS). The Berlin-based research facility studies and develops communication and information technologies. Its goal is the implementation – in partnership with local suppliers and businesses – of modern information and communication technologies to enable sustainable access to global communication networks.

Essentially, NET4DC aims to find practical, effective ways of getting Africa's rural areas connected. Currently available technologies such as mobile networks or Wi-Fi are either too power-hungry or too sophisticated for often harsh rural environments.

Says NET4DC project leader Karl Jonas: "Wi-Fi, for one, lacks reliability, robustness, power efficiency and range. NET4DC, by contrast, is targeting distances of 100 kilometres – even more."

Two African sites have been identified for trials – Macha, a rural district in the southwest of Zambia; and Sekhukhune.

One of the first projects was the connection of the Ubuntu Campus, a remote settlement near Macha in Zambia. Specialists used directional radio to connect this settlement to existing satellite technology in Macha. As a result, the local primary school was able to connect to an affordable WLAN network, as was the local water board.

To provide the infrastructure for this, FOKUS NET4DC worked hand-in-hand with a local firm whose interests include running a small Internet café. Alongside this service, which is now being extended to further regions in Zambia, there are also plans to connect small medical stations to the Internet to improve the provision of

medical services. Among these is Mabombo, about 40 km from Macha. It has a doctor and two nurses to cater for about 8 000 people – with neither running water nor electricity, limited transport connections, and no mobile communication.

The obstacles are huge – chiefly environmental. "Sekhukhune, for example, is surrounded by mountains; Macha is situated in a very flat area. Both areas face heavy summer rain falls and high humidity," says Jonas.

Distance between towns is another stumbling block. NET4DC's aim is to develop communication technologies covering the distance from the rural areas to the closest broadband node – for example, to the nearest fibre optic cable.

Besides pure environmental challenges, there are technical, social, political and economical problems. "Visiting Macha and Sekhukhune, we learned, for example, that we have to train the people in the rural areas to enable them to maintain the communication infrastructure."

Intermeshed radio networks are being developed that are able to connect two or more radio stations – no matter what type of radio is available, whether there are Wi-Fi, satellite or cellular networks – and build "mesh islands". These communications infrastructures will be run by alternative power supply, and even a person with just a little knowledge of ICTs and a little knowledge of English will be able to maintain them.

In addition, the components of the infrastructure will be made of materials that can stand harsh environmental conditions.

Single nodes – radio routers – on the network will automatically connect to neighbouring nodes. If the pathway becomes congested or if one specific component fails, the system reacts independently, without human input. Based on

these technologies, the communication networks should be able to achieve the level of quality already familiar to Internet users in developed countries.

Appropriate, reliable power supplies are high on NET4DC's list of research and technical objectives. Although solar power is currently under investigation, it's become clear already that wireless devices would need several square metres' worth of solar panels – which is economically and technically not feasible for rural areas. As a result, they're aiming to reduce the energy consumption of the ICT devices.

"To avoid relying on a recharging battery system, which usually incurs high costs, a 12-hour service will be considered that enables Internet connectivity from sunrise to sunset," Jonas says. "(To strengthen) this type of service ... (we will) use a delay tolerance network concept. Non-critical data sent after sunset can still be transmitted as soon as the network starts operating the next morning." Alternative power sources being investigated are wind turbines, water and biofuel.

In collaboration with local business initiatives, they envisage the creation of ICT-based value-added services that are attractive to the locals, and with the potential to cover bandwidth costs.

In the long term, it's expected that local people would actively use the opportunities offered by broadband solutions.

"Providing Internet connectivity will initiate business activities in rural areas. Entrepreneurs can be an organisation, smaller businesses or just one person," Jonas said.

"Once the locals have seen the benefits coming with ICTs and value adding to their day-to-day life, further activities will be rolled out without additional effort from our side."

● Source: Fraunhofer Institute PM

Right and opposite: Going online has the potential to make huge changes in the lives of small communities around Macha in Zambia, with a German foundation implementing rugged, low-cost and power-efficient IT installations.

