



CUSTOMER SUCCESS STORY

ETHIOPIA TELECOM'S NEXT-GENERATION NETWORK SUPPORTS A NATION'S ECONOMIC TRANSFORMATION

EXECUTIVE SUMMARY

CUSTOMER NAME

- Ethiopian Telecommunications Corporation (ETC)
- Government of Ethiopia (via the Ministry of Capacity Building)

INDUSTRY

- Fixed and mobile telecommunications service provider

BUSINESS CHALLENGE

ETC needed to create a technology ecosystem that could:

- Support the country's drive to transform the economy by introducing information and communication technology (ICT) into government, educational, and healthcare institutions, and the agriculture sector
- Enhance the telecoms services offered to commercial and public customers
- Cater to significant growth in service offerings and customer base

NETWORK SOLUTION

ETC chose to:

- Build a core backbone broadband multimedia network, based on a fibre optic foundation (using the Cisco ONS 15454 SDH Multiservice Provisioning Platform, Cisco MGX 8850 multiservice switches, and various routers and access concentrators)
- Expand this network to neighboring towns and areas using a combination of fibre and microwave transmission technology
- Reach remote rural areas by interfacing with the hub of a countrywide VSAT satellite network
- Plan to expand this VSAT network to deliver connectivity and services across the rest of east Africa, with the potential for continent wide growth

BUSINESS VALUE

ETC now has a network that:

- Ranks as the first broadband optical switched network in Africa
- Supports the Ethiopian government's economic development initiatives
- Provides high-quality network access and telco services to the Ethiopian market that far exceed previous capabilities
- Can scale easily in terms of capacity and diverse next-generation service offerings
- Creates a series of new revenue streams for ETC through the delivery of secure IP/VPN, xDSL, high-speed FWA, Metro Ethernet, and Fibre Channel services

Landlocked in east Africa between the Sudan, Eritrea, Djibouti, Somalia, and Kenya, the Federal Democratic Republic of Ethiopia is one of the world's poorest and least-developed nations. It had an estimated gross national product (GNP) of a little under US\$6670 million in 2001, resulting in a *per capita* income of just US\$100 for each of its 67 million citizens. Adult literacy levels are low, as are average life expectancies.

Although mineral and energy resources abound within the mountainous country, the terrain has made them difficult to exploit. Agriculture has therefore reigned as the dominant economic activity since the transition from military rule to democracy in 1992. Subsistence and commercial farming involve more than 80 percent of the population, and account for half the gross domestic product (GDP) and 90 percent of export earnings (primarily through coffee crops).

In 2001, the government recognized that while these traditional agrarian practices were important, they were unlikely to fuel significant long-term economic growth for the country. A radical change of economic direction was required.

Through the government's Ministry of Capacity Building, bold plans were drawn up to enhance the national education system; improve the quality and breadth of healthcare services available to all; fund, develop, and support the agricultural sector; and significantly increase the level and quality of services offered by federal, regional, and local government departments.

The Ministry wanted to move the Ethiopian economy from one based solely on agriculture to one based on information and knowledge—a dramatic mission considering that, at the time the Ministry undertook the mission, there were only 4 telephones per 1000 people.

However, the World Bank, African Development Bank, and International Monetary Fund all agreed that it was a worthwhile goal, and made millions of dollars available as the catalyst for transition. And all parties agreed there was only one way to make it happen: introduce the very latest information and communication technology (ICT).

“With the completion of this project, Ethiopia puts itself in contention to lead ICT development in Africa. In terms of telecommunications, it’s a huge leap forward for ETC. And in terms of the social impact, it has the potential to improve Ethiopians’ lives irrevocably. Cisco is proud to be part of these important developments.”

—Reza Mahdavi, vice-president: Russia, Middle East & Africa, Cisco Systems

TRANSFORMING THE ETHIOPIAN ECONOMY

As a starting point for ushering Ethiopia into a new economic age, the government proposed three primary projects:

- A government network (known as ‘WoredaNet’) which would link nearly 600 local (‘woreda’) and 11 regional government offices across the country with each other and with the federal government headquarters in the nation’s capital, Addis Ababa. The project would provide these offices with videoconferencing, e-mail, Internet access, and file sharing capabilities—creating a foundation for e-government.
- An education network (‘Schoolnet’) which would provide more than 450 secondary educational institutions with access to general ICT, e-mail, and the Internet. Most importantly, though, it would allow these institutions to receive streamed Internet- and broadcast TV-based educational content from media agencies—creating a foundation for e-learning.
- An agriculture network (‘Agrinet’), which would link more than 30 research and operational agricultural centers to stimulate the growth of this cornerstone of the economy.

In addition, a healthcare network was proposed as an extension of the three primary projects. ‘Healthnet’ would connect all major referral hospitals around Ethiopia and form the basis for a nationwide telemedicine infrastructure.

Early in 2003 the Ministry of Capacity Building issued a bid for technology and services for the basic Woredanet and Schoolnet infrastructures, including the videoconferencing solution. This was awarded on merit, price, and innovation to Business Connexion (formerly Comparex Africa) a pan-African systems integrator and Cisco Systems® Gold Partner, and GCS-NCR, a local Ethiopian partner. Cisco® equipment (including IP telephones) was chosen for the local-area networks (LANs) for these projects; the wide-area network (WAN) was also based on Cisco technology.

However, it was already clear that to be successful, these individual projects required a means of sending and receiving large volumes of voice, video, and data traffic around the country at high speeds. To address this challenge, the government enlisted the services of the traditional incumbent telco, Ethiopian Telecommunications Corporation (ETC).

BRINGING THE VISION TO LIFE

When it first became involved in the project, ETC had an installed base of 350,000 fixed phone lines and approximately 10,000 Internet customers. It also had an ambitious yet fledgling Global System for Mobile Communications (GSM) mobile service with 80,000 subscribers. A Synchronous Digital Hierarchy (SDH) ring over a mixture of fibre optic and microwave links provided limited carrier services to the voice switches; however, this was congested over many trunk circuits. A Frame Relay network also provided data services to some 500 commercial clients.

An analysis of the plans for the new project revealed that multimedia traffic would need to be carried across the urban areas of Addis Ababa, the less-developed areas outside the city and the rural settlements in some of the most remote and inaccessible parts of the country. This, coupled with the projected growth of fixed and mobile telco demand as the economy rebounded, made ETC realize its existing network would be inadequate.

The company therefore went out to bid for:

- A core high-speed network capable of routing many different kinds of traffic around the country, quickly, without regard to volume or physical location, and one that would fulfill the requirements of both the Ministry and the private sector
- A broadband satellite network capable of transmitting from the most remote areas of Ethiopia and interfacing back into that core network
- An additional layer to the backbone that could offer dedicated broadband access to the Internet and stimulate the creation of a commercial Internet service provider (ISP) industry

The tender for the core ‘broadband multimedia network’ project initially specified an Asynchronous Transfer Mode (ATM) backbone network, interfacing to spare dark fibre in Addis Ababa. Business Connexion proposed two alternative networks: an ATM network based on the Cisco MGX[®] Family; and an alternative design based on a Cisco ONS optical base layer with an IP/Multiprotocol Label Switching (MPLS) upper layer. The project was awarded to Business Connexion and, during a design review in which Cisco participated, an elegant design combining a Cisco ONS base layer with the Cisco MGX upper layer was finally chosen. The satellite network project became the responsibility of Hughes Network Systems, a company based in the United States. At the time of publication, suppliers for the ISP network bid remain under evaluation.

“The ETC multimedia broadband network has been one of the most exciting projects that the sub-Saharan systems engineering team has worked on. Success would not have been possible without the help of Cisco’s entire technical community: pre-sales engineers, Advanced Services engineers and consultants. Everyone involved has been impressed by the level of technology implemented—especially the combination of optical, ATM, ADSL, MPLS, and voice.”

—Antoine Perrault, systems engineer manager: sub-Saharan Africa, Cisco Systems

BUILDING THE SOLUTION

Because of the core network requirements, the convergence of voice, video, and data traffic was crucial, as was a technology solution based on open standards and a powerful transport layer capable of future growth. The solution is based on the Cisco ONS 15454 SDH Multiservice Provisioning Platform (MSPP), which provides the functions of multiple network elements in a single platform. This includes:

- A 16-node core fibre optic ring around key sites in Addis Ababa and the environs.
- A combination of E1, E3, and microwave links to expand the network from the capital into less-developed areas around the country. Voice compression is employed when transmitting over the microwave link to help ensure efficient and cost-effective transfer.
- Cisco ONS 15454 service interfaces attached directly to the infrastructure to provide predictable, high-speed, point-to-point time-division multiplexing (TDM) traffic using the SDH standard. ETC can attach fixed-line or mobile voice switches at this layer and route voice traffic around the country at STM-1 to STM-64 optical transfer rates. It also provides Metro Ethernet or Fibre Channel services capabilities, using the same core optical infrastructure.
- Cisco MGX multiservice switches attached to the Cisco ONS 15454 infrastructure that expand the network's capability, allowing ETC to offer ATM, secure IP virtual private network (VPN), and xDSL or fixed wireless access (FWA) services. ETC can also attach fixed-line and mobile voice switches at this layer, enabling the fast and varied transmission of voice traffic.
- Communication of IP traffic at the Cisco MGX layer of the network is facilitated by MPLS for better bandwidth management and faster transmission speeds.
- A microwave link into the hub of the Hughes very small aperture terminal (VSAT) satellite network to facilitate communication for all Woreda offices in rural areas.

The Cisco ONS 15454 MSPP was considered a perfect match for ETC's network challenges for several reasons:

- The infrastructure provides ETC with international carrier-class reliability.
- It creates a converged network solution that handles voice, video, and data over a single platform.
- The network is designed to meet current needs and scale far into the future.
- It allows multiple services to be transparently delivered over the same fibre optic core, regardless of the transport protocol being used (thereby offering ETC a large degree of flexibility in meeting its customers needs).

Physically implementing the network was the responsibility of the Cisco Advanced Services team and Business Connexion. The latter had the skills to develop and deliver many of the solutions; Cisco Advanced Services support engineers and specialists brought specific skills to the project to complement Business Connexion.

The implementation itself was something of a challenge, especially when it came to certain areas within Addis Ababa and the majority of the areas outside the capital city. While fibre is used for the core ONS network, FWA terminals are deployed to bridge some of the line-of-sight hops in Addis Ababa. Existing microwave links are then employed to span the considerable distances between the capital and the outlying areas—sometimes as much as 700 km. Given the cost of these links, coding and compression algorithms are used for the transmission of voice traffic; these offer transfer rates four to eight times faster than those for uncompressed data.

Possibly the most challenging aspect of the project was the creation of the Woredanet infrastructure, however. Given the nature of Ethiopia's terrain, a large percentage of the VSAT and videoconferencing equipment is deployed in extremely remote towns and villages, some of which are three days' walk from the nearest road or three days' drive from the nearest town. ETC, the Ministry of Capacity Building, and the project partners enlisted the help of the country's military to air-drop the technology into these locales.

With the VSAT infrastructure established, a link needed to be formed with the core Cisco ONS and Cisco MGX infrastructure; this has been accomplished by creating a microwave link from the Cisco ONS and Cisco MGX hub in Addis Ababa to the hub of the VSAT network at the Sululta earth station, some 20 km west of the capital. With this complete, ETC has managed to create a highly capable nationwide, broadband multimedia network.

“ETC's development of this multimedia broadband network marks a milestone not only for ETC but also for the development of the Ethiopian economy. ETC's customers will benefit from a new 'class of service'-enabled VPN offering that will allow them to support business-critical applications such as IP voice, IP video, and data applications such as SAP, Oracle, and Siebel. Delivered primarily over DSL connections and a high-capacity MGX core network, the new broadband platform will offer unprecedented benefits to the Ethiopian community.”

—Adrian Pickering, sales manager: incumbent telcos, Russia, Middle East & Africa, Cisco Systems

HERE TODAY, DEFINITELY HERE TOMORROW

The impact of this project—and, indeed, its potential expansion—is difficult to overstate. Thanks to the successful deployment, Ethiopia has overcome years of technological exclusion with the creation of a next-generation network that is easily as capable as those found in more-developed countries. This has profound positive implications for government, businesses, farmers, students, healthcare workers, and ordinary citizens.

Because of Schoolnet, many of the secondary schools are already receiving educational TV broadcasts from the Educational Media Agency using the terrestrial and VSAT networks. Educational content is being broadcast to large flat-panel screens at those schools and the number coming online is increasing consistently. The second phase of the project, which will provide the schools with PCs, Internet access, LANs, and other technology, is currently being investigated.

In terms of Woredanet, the VSAT and local network infrastructure deployment is complete and quality testing is underway; it is expected to go live toward mid-2004. And for Agrinet, feasibility studies are still being conducted.

ETC's network is also affecting its own business positively. The telco now has a backbone infrastructure that not only facilitates the government's economic and social development projects but also creates a platform to support the expansion of its own initiatives.

The broadband multimedia infrastructure can handle all kinds of traffic, including Public Switched Telephone Network (PSTN) and GSM voice, IP, data, xDSL, Internet, and TV/video, for example. This capability gives ETC the ability to:

- Significantly increase the number and quality of fixed-line phone services throughout Ethiopia
- Create a platform for the provision of high-quality mobile services based on the GSM standard
- Create a series of new revenue streams by offering corporate customers the likes of secure IP/VPN, high-speed FWA, Metro Ethernet, and Fibre Channel services
- Provide small, medium-sized, and large businesses with access to the Internet via a permanent high-speed xDSL connection, thereby stimulating the growth of the ISP industry
- Present the TV stations in Ethiopia with an alternative broadcast infrastructure

Today, the Cisco ONS and Cisco MGX network is being supported just as ardently as it was implemented. Not only was the Cisco Advanced Services team involved in the low-level design and subsequent deployment, it is now continuing to support Business Connexion with the ongoing operational improvements that are required. Cisco Advanced Services also provided training sessions to Business Connexion and ETC representatives.

“Business Connexion is proud to be instrumental in the building of what is certainly one of the leading-edge telecommunications backbone and services networks in Africa.”

—Peter Retief, operations executive: Africa, Business Connexion

NEXT STEPS

As the use of Schoolnet grows and Woredanet comes online, the full effects of this project are beginning to be realized. Work is expected to begin on the agriculture and healthcare networks soon, thereby expanding the benefits of connectivity to even more of Ethiopia’s population.

The pioneering role that ETC has played is almost sure to continue. Because of the potential for growth in services in Ethiopia alone, the corporation will have much work to do. The possibility for extending the VSAT connectivity into the sub-regions also looms, and, if successful, other countries in Africa could also become part of the project.

Amid all this existing and potential activity, one thing remains certain: Ethiopia is on the path to economic diversity and growth thanks, in part, to its confident embrace of next-generation networking technology. All that remains is to watch its progress.



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