Cape Verde
goes digital

In the Atlantic between the edge of the African continent and the westernmost edge of the world map, a small dot marks the location Cape Verde, a volcanic archipelago. Comprising 10 volcanic islands and a coastline of 965 kilometers, Cape Verde suffered from poor industry and agriculture due to its unique geographical location and unevenly distributed healthcare and education resources.

By Chen Yingying

Pearls in the North Atlantic

However, its service industry is very strong, accounting for more than 70 percent of the country's GDP. Now, though, it needs IT to thrive. The Cape Verde government is committed to building a more people-oriented government, creating more business opportunities to improve the nation's competitiveness, developing an open economy to promote economic development, and alleviating poverty through communications and network technologies.

In recent years, many West African countries have built national data centers to advance digitalization strategies. However, due to a lack of application software development capabilities, ICT talent, and a strong ICT ecosystem, many data centers have no loads.

The nation's eGovernment project includes a nationwide office network and national data center, designed to boost efficiency and enable resource sharing for education, healthcare, and other services. It will act as a springboard for digitalization and help transform the archipelago into an information hub for West Africa's coastal countries.

With 19 years of experience in the field, Cape Verde's Operational Information Society Nucleus (NOSi) was responsible for service development and O&M after the eGovernment system was built. The first phase of the eGovernment project was initiated in 2010 and delivered in 2014, including the construction of a national data center and an upgrade of the government communications network. This project phase completed the national government network system platform and island interconnection network platform. NOSi then deployed the government digital transformation system.

The national data center comprised only 200 Virtual Machines (VMs) in this first phase. With the gradual emergence of new eGovernment applications and rapid growth of service leasing to third parties, the data center became fully loaded, leaving no available space for new applications or services. Organizations in areas that weren't connected to the network were still using a paper-based system, leading to poor archive management, low work efficiency, and great difficulties in statistics collection and management. The education and medical care resources of the

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10 islands couldn't be shared and remote areas suffered from sub-par teachers, poor hardware, and a low overall education level. Likewise, the government couldn't obtain the population's health and medical information in those areas.

Due to the difficultly of inter-island transportation, government agencies faced high travel expenses each year, averaging out at US$340 per trip, easily totaling US$340,000 per month. An inefficient transportation network also hindered communication between government agencies.

These factors drove the project's second phase: a one-stop ICT infrastructure platform enabling cloud-pipe-device synergy, with NOSi selecting Huawei for implementation.

Cloud-Pipe-Device

In the first phase of the eGovernment project, Huawei completed the following:

•	A national data center with 54 IT standard cabinets covering 200 square meters for providing information services for the government, enterprises, and institutions of Cape Verde, and also the surrounding countries.

•	Intra- and inter-island backbone networks,

MANs, and wireless broadband access networks. These included constructing a fiber backbone ring using DWDM technology on six major islands to upgrade the Synchronous Digital Hierarchy (SDH) capacity from 622 MB to 20 GB, and providing broadband access through WiMAX to achieve network coverage for organizations throughout the country.

•	21 telepresence videoconferencing systems, giving the government the convenience of remote conferences.

One cloud, one lake, one platform

Huawei employed its 1 cloud, 1 lake, 1 platform architecture to help customers in various industries integrate their systems and enable information sharing for greater business value:

One cloud: A converged cloud resource pool that implements unified delivery, management, and services.

One lake: A data lake that aggregates a full range of data and provides the full-lifecycle processing capability of collection, storage, calculation, management, and use, thus helping customers transform data resources into data

assets.

One platform: An application-enabling platform, which integrates basic data services, general middleware, and industry middleware to enable customers and independent software vendors (ISVs) to quickly innovate services based on multiple types of middleware.

Currently, the Huawei cloud data center solution has served projects in more than 140 countries and regions, including more than 330 eGovernment cloud projects.

Phase two

In the second phase of the project, Huawei completed the following:

- Deployed new IT devices and system software and transformed the old data center into a disaster recovery center, providing secure and reliable IT leasing services for government agencies and enterprises through an active-active data center.

- Deployed internal office networks and videoconferencing systems for the government, schools, and hospitals to expand office informatization coverage in those places and improve the efficiency and quality of government administration, education, and medical services.

- Jointly developed the integrated ICT training system WebLab with the Cape Verde Ministry of Education to support ICT talent cultivation and promote information sharing and development.

To expand the capacity of the solution's cloud

data centers, Huawei built 1,000 VMs and upgraded the system from 480-core CPUs with 400 TB of storage capacity to 1,656-core CPUs with 1,000 TB of storage capacity. If the national data center's demands for VMs continues to grow at the annual rate of 60 percent, as it did from 2011 to 2015, this round of capacity expansion could meet business development requirements for the next five years.

In addition, Huawei provided 1,000 sets of FusionCloud desktop cloud systems for government agencies and national informatization training centers, solving key admin problems such as patchy data protection, inefficient maintenance, insufficient resource usage, and difficult network isolation and switchover.

Based on the 1 cloud, 1 lake, 1 platform architecture, the Huawei eGovernment Cloud solution provides NOSi with shared basic resources, open data support platforms, rich smart government admin applications, comprehensive eGovernment services, strong security assurance, and efficient O&M service assurance. Those services helped remove data barriers between departments, build cloud platform-based and cross-departmental data sharing and exchange platforms, and deliver ICT infrastructure to enable the proactive and efficient one-stop working practice of government agencies and enterprises.

Health and education

Like many African countries, Cape Verde has suffered from unevenly distributed public resources, with one-third of the country's schools located in just three cities: the capital Praia, the port city of Mindelo, and Santa Catarina. Moreover, over half the nation's hospitals are on the two islands of Santiago and Santo Antão.

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Telemedicine application system

The Cape Verde eGovernment network connects 1,142 organizations across the country through the same network, with 530 routers and 669 switches provided by Huawei expanding the network built in phase one to cover schools, health clinics, government departments, and enterprises in small and medium-sized cities and towns. The solution also includes data transmission pipelines for upper-layer applications. The network infrastructure broke geographical separation and brought network and eGovernment benefits to people in remote areas. For example, the telemedicine application system enabled faster and more precise services from the capital's medical teams.

With insufficient teachers and low education quality, schools outside the capital of Cape Verde were eager to access the national eEducation network to improve materials. Teachers were also expected to network with each other in schools in and outside of Cape Verde. This was enabled by 30 Huawei videoconferencing systems, installed in high schools and municipal governments across the archipelago.

Huawei also provided WebLab, an integrated ICT training system for cultivating local ICT talent, including communications equipment, programmable robot suites, electronic maintenance tools, and furniture, which were deployed in containers based on NOSi's current cloud national data center to provide basic ICT training for students on other islands. These containers can provide ICT training for middle school students and local people, and also serve as multi-functional classrooms to deliver other courses.

eGovernment cloud: Shining in West Africa

Based on Huawei's eGovernment cloud, NOSi developed more than 150 websites and 77 types of eGovernment software, covering social security, electronic elections, budget management, distance education and healthcare, and electric Effective Radiated Power (ERP) for all government departments, schools, hospitals,

and state-owned enterprises in Cape Verde. NOSi also provided eGovernment applications and data center hosting services for surrounding countries, including Equatorial Guinea, Mozambique, Burkina Faso, Guinea-Bissau, São Tome, and Principe.

The major NOSi eGovernment applications and websites are as follows:

• Government Resource Integration and Planning Framework (Integrated Government Resource Planning, IGRP)
• Financial Information System (SIGOF)
• Free Network Access Service (Konekta)
• Social Welfare System (SIPS)
• Medical Information System (SIS)
• Geographic Information System (GIS)
• Portal (Porton dinos ilha)
• Online Certificate System (Online-Certification)
• National System of Identity and Civil Identification (SNIAC)
• Land Registration Special Management System
• Municipal Information System (MIS)
• Student Information Management System

With IGRP, for example, developers can use a variety of pre-integrated application modules and components to quickly build upper-layer application software, improve the efficiency of the government's public departments, avoid duplicated resource investment, minimize public management costs, and maximize ROI.

Another example is the Medical Information System (SIS), which is a connection module used to manage hospitals, monitor population status, and improve institutions' functional capabilities. The SIS manages pharmaceuticals, clinical equipment, materials, laboratory

diagnosis, and reservations, analyzing a hospital's appointment information through the Internet and making schedules for doctors based on the results. It also collects statistics on hospitalizations, appointments, and deaths.

Antonio Joaquim Fernandes, NOSi's President, said, "Huawei provided valuable support for the national data center, data transmission network, and eGovernment construction in Cape Verde. It provided data, voice, and videoconferencing services for government departments and public institutions and delivers an innovative digital platform to help NOSi build an eGovernment platform. Based on the digital platform, we will develop the business center, enterprise incubation center, and training center to build a leading information service platform in Africa for Cape Verde."

According to the 2017 International Telecommunication Union (ITU) report, the ICT Development Index (IDI) of Cape Verde ranked it fourth in Africa, far higher than other coastal countries such as Nigeria, Angola, Gambia, and Mozambique. Under the regional ICT hub strategy of Cape Verde, NOSi has delivered eGovernment applications and services to neighboring countries in West Africa based on its ICT infrastructure and capabilities, and attracted government delegations from more than 40 countries.

Currently, every organization and government is in a critical period of digital transformation. Huawei is committed to bringing digital technology to every organization for a fully connected, intelligent world. Cape Verde's eGovernment cloud is a necessary step for government, education, healthcare, and enterprises in Cape Verde to enter smart society, making cloud Cape Verde a pearl of digital transformation in the North Atlantic region. ▪