

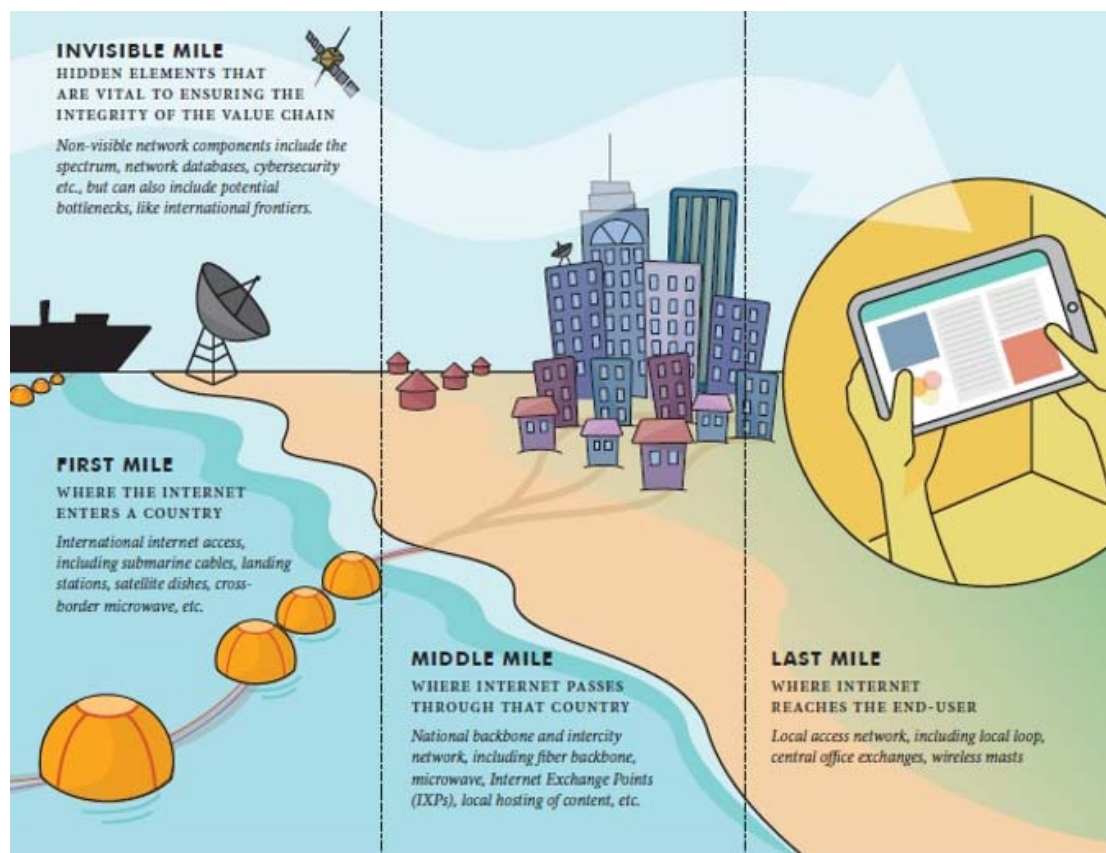
Digital Infrastructures 4D

What is it?



Technologies

How networks are build

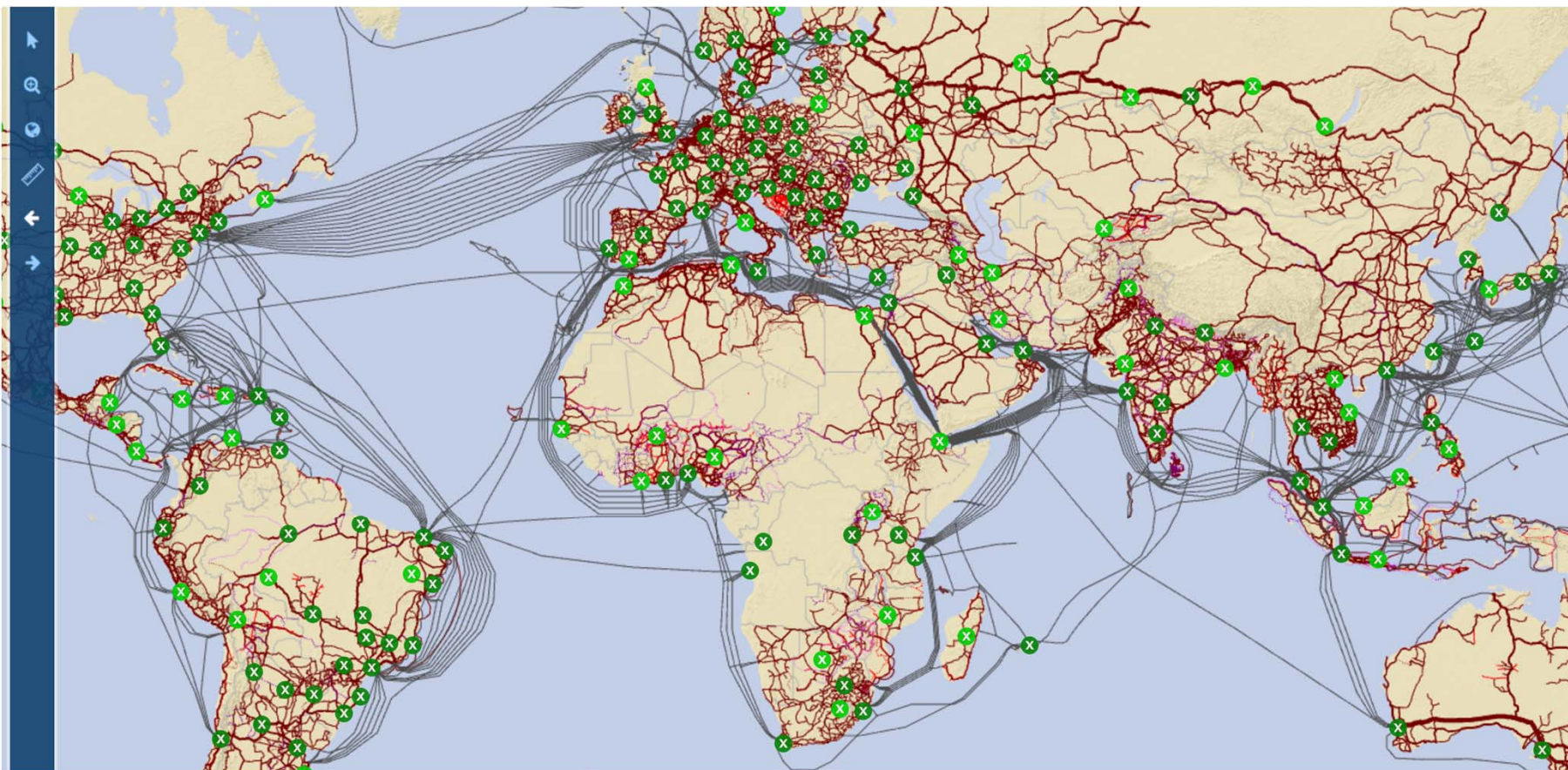


- **First Mile** often is covered by undersea fibre cables reaching coastal countries
- **Middle mile** is the fibre backbone running thorough countries. High capacity microwave might also be applied.
- **The last mile** (up to 100 km) is, as with every network, the most expensive one to build

A mix of different technologies are applied to reach every person. In developing countries these are by a vast majority radio-technologies

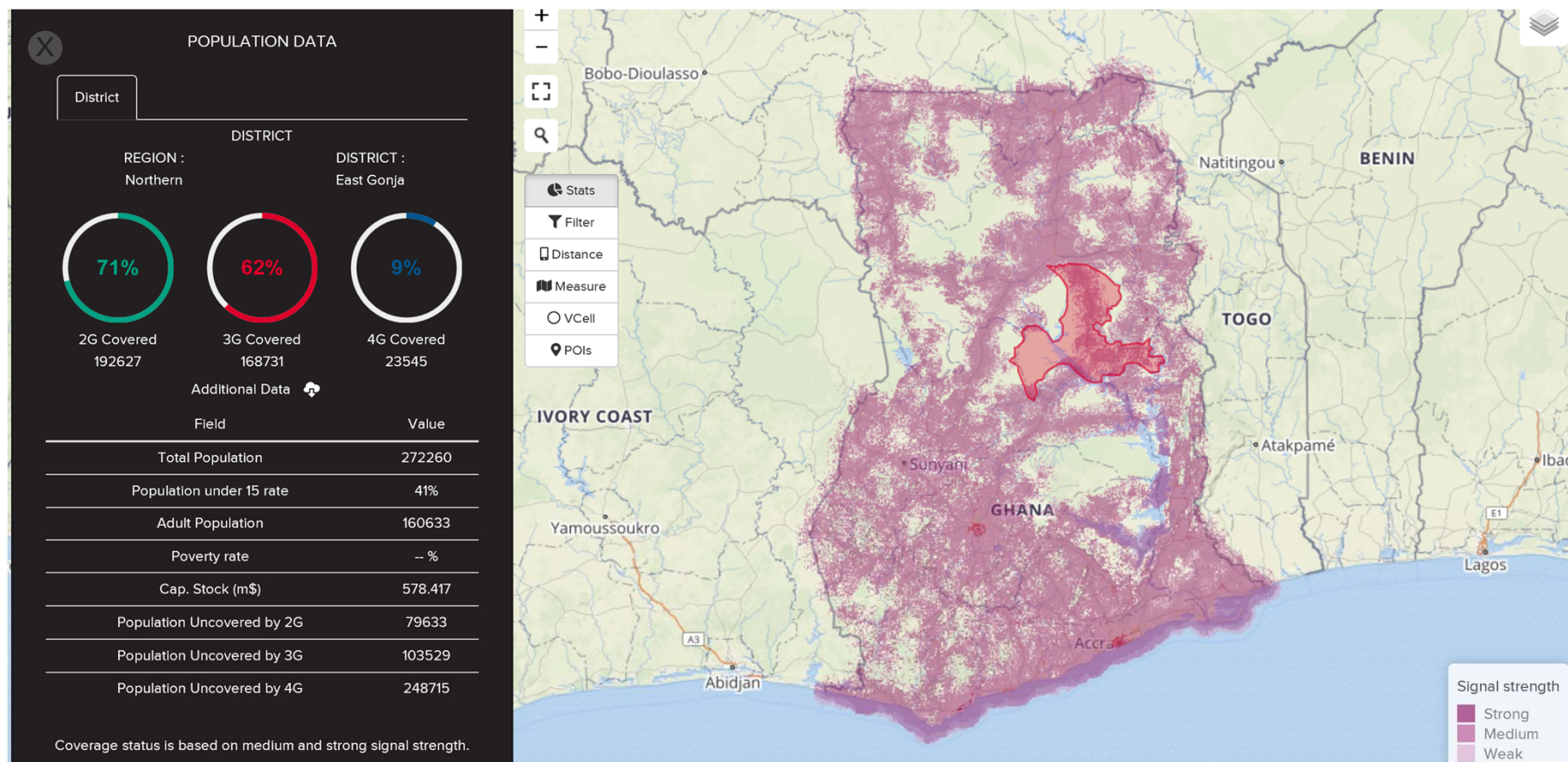
Status

Global digital infrastructures



Status

Regional digital infrastructures

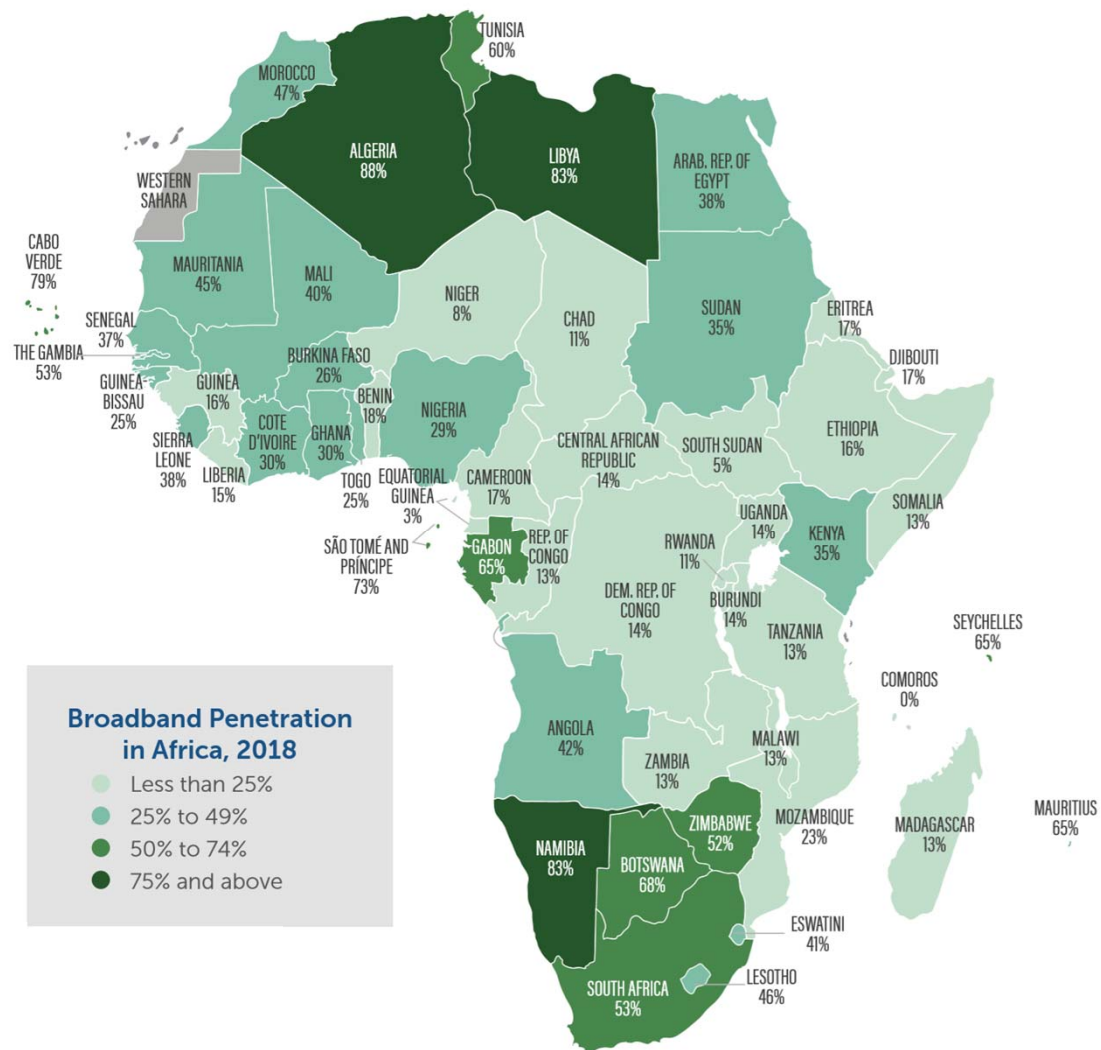




European
Commission

Status

Access Africa



- Regional average: 31% (2018 estimate)
- Estimates based on GSMA, UN, Xalam Analytics data.
- Penetration based on unique users and target population aged 10 and above.
- Broadband is defined as average download speeds of 256 Kbps or greater while the target download speeds by 2021 is 3 Mbps.

* Disclaimer: Figures may differ from the actual level of penetration and information available on other sources.
Note the key assumptions underpinning the 2021 target for details.



Challenges to network deployment

- Low profits / Cost of deployment
- Unfit regulation
- Lack of energy infrastructures

- Further reducing capacities:
 - Lack of data processing units



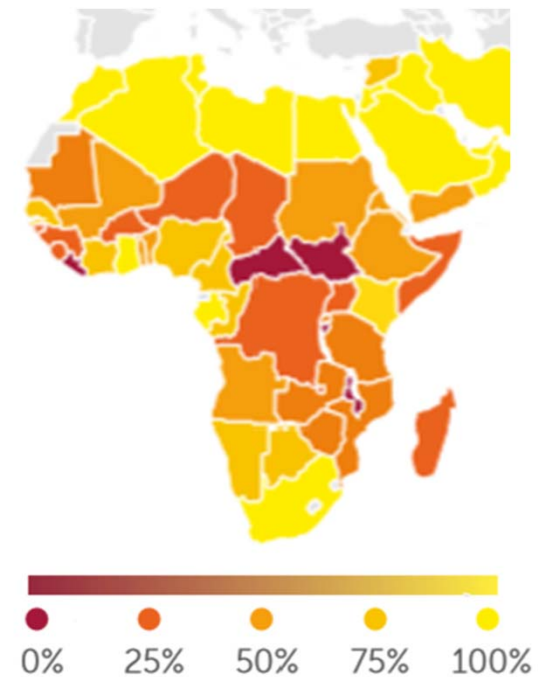
Challenges

- **Policy and Regulatory Framework**

Monopols hinder new market entrants (e.g. community networks), unfit regulation hinders utilization of new technologies (e.g. TVWS), tariffs and licence fees make network expansion expensive, public funding / investment programs need to be in place (e.g. USF)

- **Cost**

Long distances, **lack of energy grid**, **lack of** available and capable **technicians**, licence fees for frequencies combined with low population density and low income potential make the deployment of networks unprofitable



Proportion of Population with
Access to Electricity, 2017

Challenges

- **IXPs**

- An **Internet Exchange Point** (IXP) is where multiple local and international networks, interconnect to efficiently exchange Internet traffic. Regular IXPs help keep domestic Internet traffic local by offloading traffic from relatively expensive international links onto more affordable local ones.
- Currently, 42 percent of countries in Africa lack IXPs. There are about 44 active IXPs located across 32 countries in Africa.
- This means that most of their domestic internet traffic is exchanged through points outside their respective country, usually through satellite or submarine fiber across multiple international hubs to reach their destination.
- This costs money and congests networks

- ***Data Centers***

- Similar for data centers. If cloud services and servers are all based on other continents, the traffic has to travel far and congests the scarce network resource available

Opportunities

- **New technologies** promise to reach further and cost less
- **New business and operational models** offer more flexible approaches
- **Improve regulation** to enable new technologies, allow new actors to enter the market and to ensure fair markets

Technologies

Different options exist or are in deployment

Baloons, Drones

- **Pro:** Less need for infrastructure, can reach all areas
- **Con:** Capacity? Business Model? Technical viability?
- **Challenges:** Technology, regulation



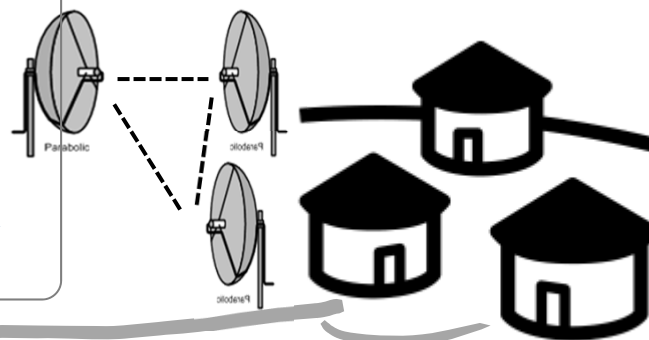
Low Orbit Satellites

- **Pro:** little ground infrastructure needed
- **Contra:** Cost? Business Case? Space is full? Capacity?
- **Challenges:** Business Case, Technology



Directional Radio

- **Pro:** low cost, decentral communal networks
- **Contra:** Challenging regulatory environment
- **Challenges:** Regulation, access to infrastructure, lack of finance options, trust



3G / 4G (5G not rural option)

- **Pro:** proven technology
- **Contra:** Frequency costs
- **Challenges:** Business Case for Rural if quality access to be provided



Fibreoptic Cable:

- Best technological option, but too expensive to reach every village any time soon
- Used for backbone network and backhaul in more urban areas

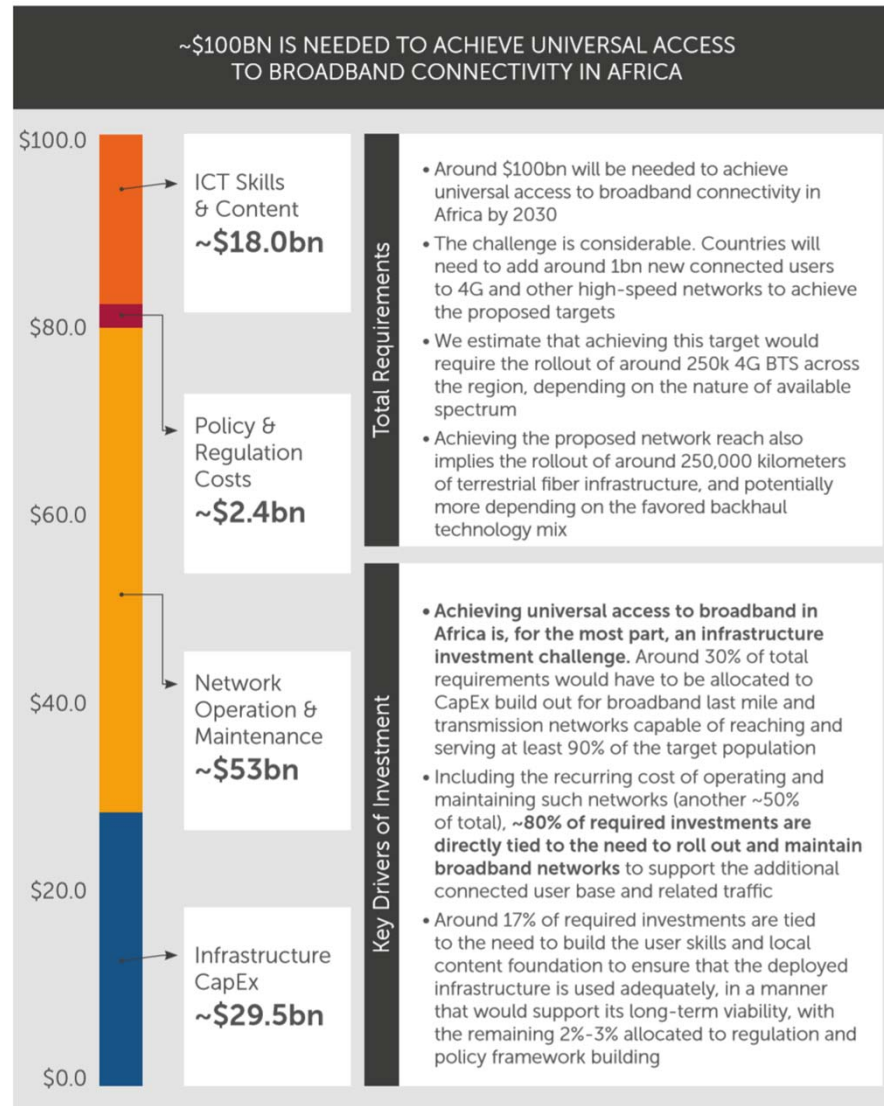
Business Models

New and traditional concepts

Classic Model	Alternative and upcoming models	
Classic Operator model <ul style="list-style-type: none">• Few operators per country• Single networks• Service provider owns network• Use of specific set of technologies	Layer model <ul style="list-style-type: none">• Technology ownership and service provision separated Open Access <ul style="list-style-type: none">• Owner of infrastructure allows third parties to use it for the delivery of services (internet access). This can be the network itself or radio towers (tower companies) for example	Communal / decentralized networks <ul style="list-style-type: none">• Small decentral networks spread over the country• Owned and operated by local communities• Relying on the community brings significant cost saving potential• Managable technology required

Policy Options

- **National ICT policy and digital strategies which sets broad** ICT development targets, roles, responsibilities for infrastructure and service expansion, while supporting improved access to information about the sector including the use of open data where feasible: such a policy framework should provide guidelines for all other policy initiatives, while defining the broad sector goals and linkage with other national development objectives and policies.
- **Licensing, market entry:** Regulatory practices to promote open competitive market entry on a nondiscriminatory basis, including unified licenses, licenses to new alternative operators, and reasonable licensing fees.
- **Competition regulation:** Regulatory principles and practices to promote fair and equitable competition among all service providers regardless of physical location, including cost-oriented interconnection charges, prevention and enforcement of unfair competitive practices, regulation of market dominance.
- **Legal mandates for access to rights of way, with limitations on local control, fees:** requirements that restrict the extent to which local authorities may impose unreasonable, excessive, or inconsistent costs or restrictions on the build out of infrastructure.
- **Spectrum:** Spectrum allocation policies which favor competitive access to frequencies, dynamic spectrum allocation, refarming, and availability for innovative services, reasonable spectrum fees, ensuring maximized efficiency of spectrum usage.
- **Infrastructure sharing, open access:** Rules supporting shared access to passive and active network infrastructure, including wholesale and supporting network infrastructure providers (for example, tower companies, wholesale fiber optic operators), equitable cost sharing, as well as access to excess capacity on alternative fiber optic networks (alongside energy grids, railways, and so on).



Investment Needed to Achieve Universal Access to Broadband Connectivity for Africa

(Universal defined as: 90 percent internet penetration of the population aged 10 and older.)

- There is more to growing the infrastructure than just deploying a network



Relevant initiatives and guidelines

- ITU's Connect 2030 Agenda for Sustainable Development
- World Economic Forum (WEF)'s Internet for All Initiative
- The African Union's Digital Transformation Strategy for Africa
- European Union-African Union Digital Economy Task Force (EU-AU DETF)
- The World Banks core principles for digital infrastructures

