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SOUTH AFRICA'S INFRASTRUCTURE INVESTMENT BOOM

By Andrew Owens

Technical Lead - Peering and Interconnection

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SOUTH AFRICA'S INTERNET HISTORY FROM 1974

70s

Early Days

- 1974** **Vint Cerf** helps South Africa build its first ARPANET node.
- 1988** **Mike Lawrie** leads a group of Rhodes students and builds an Internet gateway. Rhodes gets an IP address.
- 1989** The **Rhodes gateway** becomes an email carrier.
- 1990** **Rhodes and UCT** establish an Internet connection.
The Internet Corporation for Assigned Names and Numbers grants the .za domain to South Africa.

90s

International Connections

- 1991** **Telkom** is founded but initially refuses to install and lease a line to the US because of the cost.
Despite this, the **first IP connection** gets established to Portland, Oregon.
- 1992** The **.co.za second-level domain** gets registered.
- 1993** South Africa's **first commercial ISP**, The Internetworking Company of Southern Africa, is founded.
The **African Internet Development Action Team (AIDAT)** is created.
- 1995** **UniForum SA**, (now ZA Central Registry) tasked with administering the .co.za domain name.
- 1996** AIDAT members form the **Internet Service Providers' Association (ISPA)**. ISPA launches the first Internet exchange point in Johannesburg.
- 1997** The **South African Telecommunications Regulatory Association (SATRA)** declares the Internet an area of competition.

00s

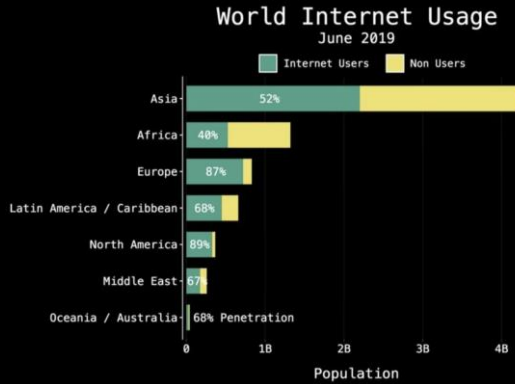
The Dawn Of Broadband

- 2002** Telkom launches its **first commercial ADSL product**.
- 2004** **3G, Sentech MyWireless launches**.
- 2005** Telkom launches **1 Mbps ADSL**. iBurst launches.
The **Altech Case starts**.
- 2008** **Altech wins the case**, and the liberation of SA telecoms begins.
- 2009** **Seacom submarine cable lands** in Mtunzini, Kwazulu-Natal.
Afrihost halves ADSL prices from R60 to R29 per GB.
First Neutral Data Centre - Teraco is opened
- 2010** Mweb launches **uncapped ADSL**.
- 2012** **NAPAfrica** is established as Africa's first neutral Internet exchange point with free peering.
Vodacom and MTN launch **Long Term Evolution (LTE)** — now known as 4G.
- 2014** **Vumatel breaks ground on FTTH** in Parkhurst.
- 2015** Telkom releases **uncapped LTE** packages.
- 2019** Rain launches **uncapped 5G**.
- 2020** **Vodacom** and **MTN** launch 5G.
- 2021** **MTN** launches uncapped 5G.
- 2022** **ICASA** holds South Africa's first radio frequency spectrum auction.

Source: mybroadband

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AFRICA IS ONLINE



In Kenya, 83% of the population are online already compared to South Africa (56%) and Nigeria (60%). But Nigeria's internet population of 112 million means that more than one out of five African internet users are from that country.

World Regions	Population (2019 Est.)	Population % of World	Internet Users 30 June 2019
Africa	1,320,038,716	17.1 %	525,148,631
Asia	4,241,972,790	55.0 %	2,200,658,148
Europe	829,173,007	10.7 %	719,413,014
Latin America / Caribbean	658,345,826	8.5 %	447,495,130
Middle East	258,356,867	3.3 %	173,576,793
North America	366,496,802	4.7 %	327,568,628
Oceania / Australia	41,839,201	0.5 %	28,634,278
WORLD TOTAL	7,716,223,209	100.0 %	4,422,494,622

Where will the Next Billion Internet Users come from?

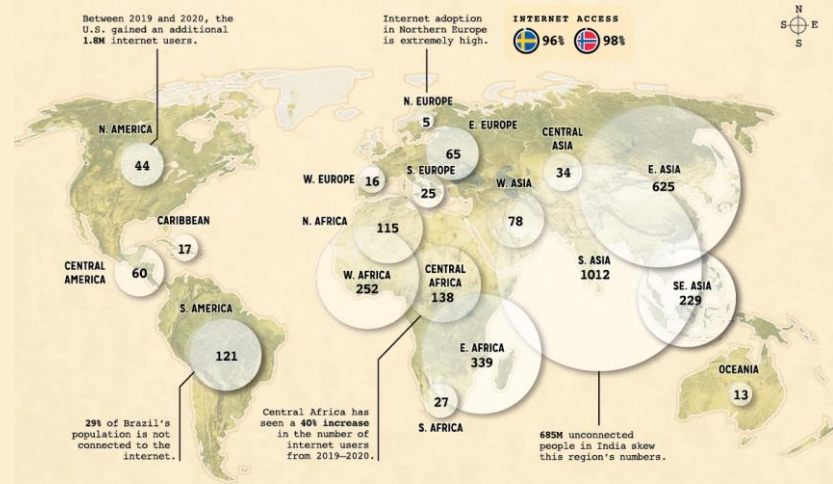


Over the years, internet adoption has steadily increased worldwide.

However, a significant portion of the population remains unconnected to the world wide web, and there's still a long way to go before we reach full connectivity.

Here's a snapshot of how many people don't have access to the internet, by region, showing us the greatest opportunities for growth across the globe.

Unconnected people BY MILLIONS

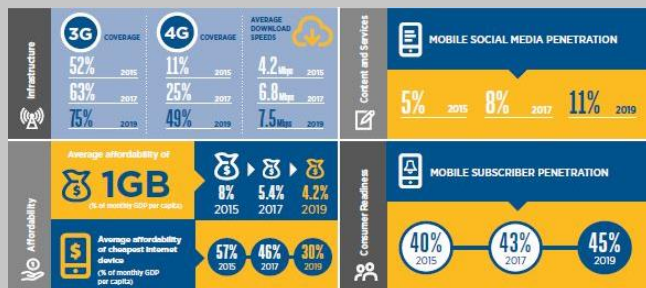


Source: DATAREPORTAL

Facebook: /visualcapitalist Twitter: @visualcap Instagram: visualcapitalist

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AFRICA THE MOBILE ECONOMY



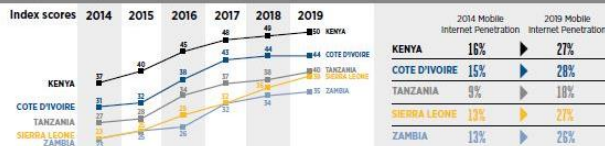
Overall

- There has been a continued acceleration in mobile broadband coverage, as operators upgrade existing 2G sites to 3G and 4G (with 4G networks now covering almost half the regional population).
- 2019 marked the first year that there were more mobile broadband connections than 2G, as consumers benefitted from more affordable smartphones and smart-feature phones.
- A large gender gap and rural-urban gap in mobile internet use persist, standing at 37% and 60%, respectively.
- The biggest barrier to mobile internet adoption reported by consumers who are aware of it is a lack of digital skills, especially for women and rural populations.

Top Five Countries by Index and Enabler (2019)

Index	Infrastructure	Affordability	Consumer Readiness	Content and Services
Mauritius	South Africa	Mauritius	South Africa	Mauritius
South Africa	Lesotho	Nigeria	Mauritius	South Africa
Ghana	Rwanda	Botswana	Namibia	Cabo Verde
Botswana	Mauritius	South Africa	Botswana	Ghana
Kenya	Kenya	Ghana	Cabo Verde	Kenya

Most Improved Countries (2014-2019)



Visit the Mobile Connectivity Index: www.mobileconnectivityindex.com

Mobile Economy Sub-Saharan Africa



Open: This document has unrestricted access. No restriction on distribution. Applicable to documents and records.

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LAST MILE INVESTMENT GROWING

Terrestrial Backbone Fibre

- Cape to Cairo race continues – Pandemic did not slow down the race.
- Increase in cross border and regionalized fibre infrastructure allowing countries choice of operator
- Deregulation of markets driving down high price points
- Far more mature policies in place for infrastructure build outs – but not in all countries

FTTx Investment

- Access infrastructure has been expanding and improving
- Pricing of fibre-based products has seen some reduction
- Economic improvements in some markets
- Government policy changes
- Access to relevant content

Satellite

- Starlink investment going to reshape African connectivity – Here's hoping it will be affordable enough?

Spectrum

- Fight is on between operators to obtain utilized spectrum to support 5G rollout's
- Regulators grapple with Spectrum auctions



Ivorian women use mobile phones in Abidjan. Half of Africans — or just over 500m people — have access to mobile internet coverage but do not use it © Legnan Koula/EPA

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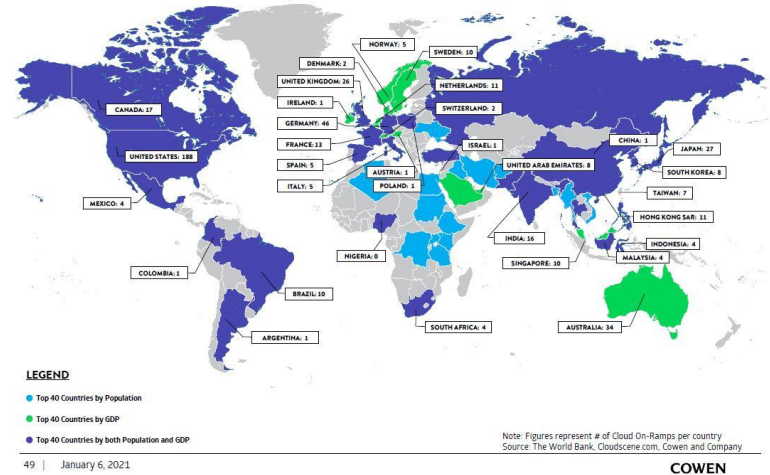
EXTENSIVE DATA CENTRE INVESTMENT

African's growing data centre capacity



Source: Xalam Analytics
© FT

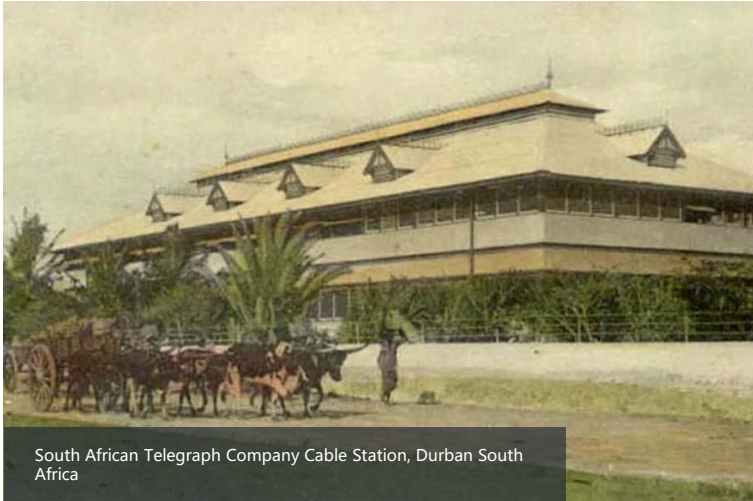
1. Globalization of Cloud is Driving Globalization of Data Centers



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DATA CENTRES: THEN & NOW

Then: Cable station, 1879



South African Telegraph Company Cable Station, Durban South Africa

Now: Modern Data Centre, 2022



Teraco JB3 Data Centre Isando, Johannesburg South Africa

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DATA ENVIRONMENTS

Teraco Data Environments

HUB OF AFRICA'S INTERNET

Equiano (2022)

- Connecting Portugal to South Africa
- 20x more capacity

2Africa (2024)

- 21 landings in 16 countries in Africa
- Capacity of up to 180Tbit/s on key parts of the system

African countries available directly from Teraco:

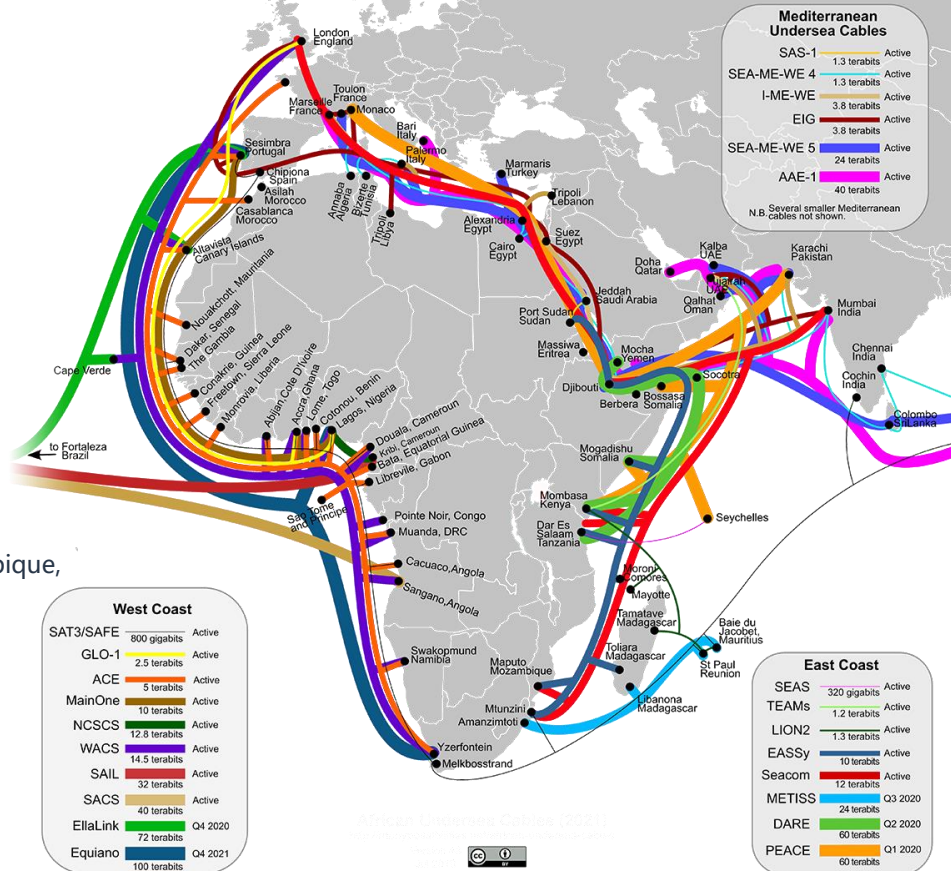
Angola, Botswana, DRC, Lesotho, Madagascar, Mauritius, Malawi, Mozambique, Namibia, Réunion, Seychelles, South Africa, Swaziland, Zambia, Zimbabwe

Access via terrestrial cables from Teraco:

Liquid Telecoms, Seacom, Telkom (Openserve), CMC Networks, WIOCC, Vodacom, MTN, Internet Solutions, Broadband Infracore

Access to subsea cables from Teraco:

- ACE (2020) - METISS (2020)
- PEACE (2021) - EASSY
- WACS - SAT3 / SAFE
- Seacom - SACS



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SUBSEA CABLE EVOLUTION



Laying an undersea cable in Cape Town



Commencing to haul the cable ashore at Blaauwberg in 1944



SAT-1

SAT-2

EQUIANO

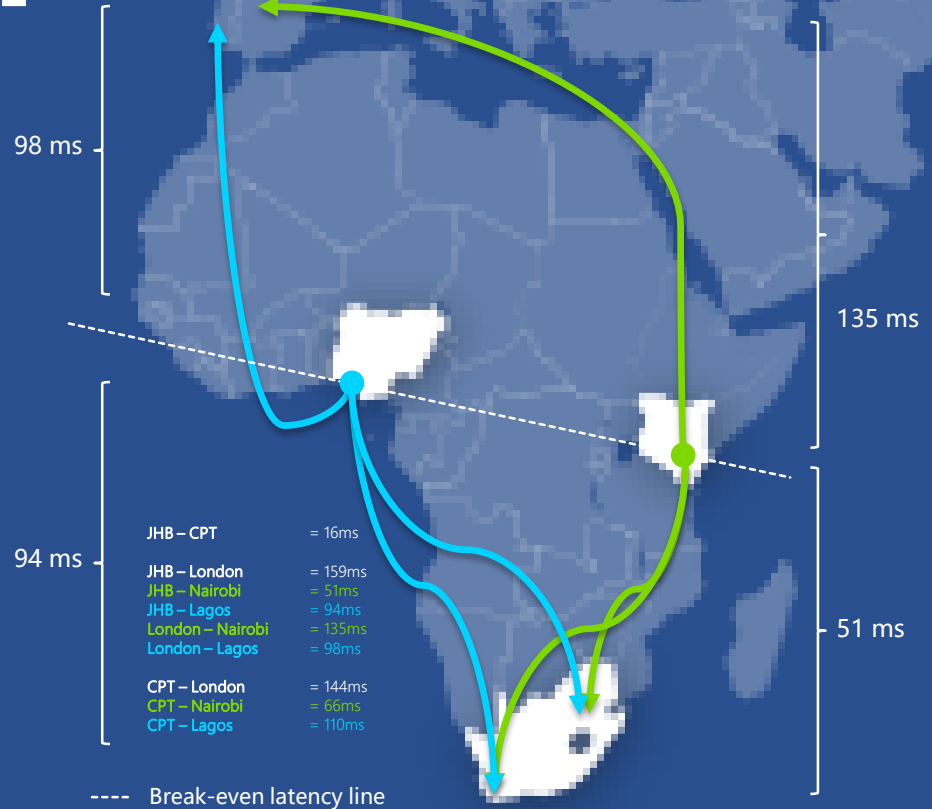
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PUBLIC CLOUD INFRASTRUCTURE INVESTMENT

- Large, addressable African market. Corporates moving into the cloud.
- Solving the Latency.
- Stable power infrastructure.*
- World-class data centre infrastructure available.
- High availability of fibre and undersea cable connectivity.
- Favourable regulatory environment.
- Stable political climate.
- Stable economic climate.
- Geographic location (furthest point south from European hub).

*Relative to sub-Saharan Africa.

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THE ADVENT OF PUBLIC CLOUD INFRASTRUCTURE

Why are they here?

Top 250 African Companies

Source: African Business May 2020



Rank 2020	Rank 2019	CompanyName	Country	Industry	Market Cap (US\$m)	Net Income (US\$m)
1	NEW	Prosus	South Africa	Technology	119,141	n/a
2	1	Naspers	South Africa	Media	62,259	380
3	2	Financière Richemont	South Africa	Luxury Goods	28,000	149
4	3	Anglo American	South Africa	Metals & Mining	22,618	195
5	8	Anglo American Platinum	South Africa	Metals & Mining	13,048	1,019
6	4	FirstRand	South Africa	Finance	12,553	1,701
7	7	Vodacom Group	South Africa	Telecoms	12,483	817
8	10	Maroc Telecom	Morocco	Telecoms	11,082	266
9	5	Standard Bank Group	South Africa	Finance	10,122	1,450
10	14	Safaricom	Kenya	Telecoms	9,966	598
11	29	AngloGold Ashanti	South Africa	Metals & Mining	8,760	-7
12	9	South32	South Africa	Metals & Mining	8,355	389
13	15	Mondi	South Africa	Paper & Forest Products	7,679	880
14	11	Sanlam	South Africa	Insurance	7,110	394
15	17	Attijariwafa Bank	Morocco	Finance	6,993	568
16	13	Capitec Bank Holdings	South Africa	Finance	6,824	292
17	16	Kumba Iron Ore	South Africa	Metals & Mining	6,105	896
18	27	Commercial International Bank	Egypt	Finance	6,061	747
19	50	Gold Fields	South Africa	Metals & Mining	5,494	175
20	12	MTN Group	South Africa	Telecoms	5,334	494
21	19	Dangote Cement	Nigeria	Construction Materials	5,188	523
22	65	Sibanye-Stillwaters	South Africa	Metals & Mining	4,895	-244
23	NEW	MTN Nigeria	Nigeria	Telecoms	4,767	n/a
24	24	Bid Corp	South Africa	Retail	4,586	226
25	51	Impala Platinum Holdings	South Africa	Metals & Mining	4,566	81

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THE LATENCY DIFFERENCE: LOCAL REGIONS MAKING A DIFFERENCE

RTT (Round Trip Time) to resources deployed in the cloud from Teraco's Africa Cloud Exchange has improved from an average of 171ms down to **less than 2ms**.



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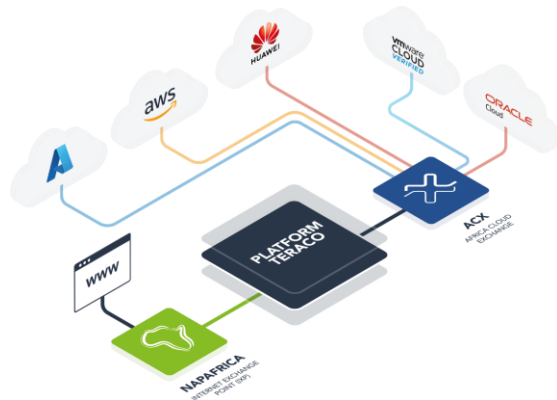
CLOUD EXCHANGES EMERGING

Amazon and Microsoft first operators to invest in Cloud regions in Africa

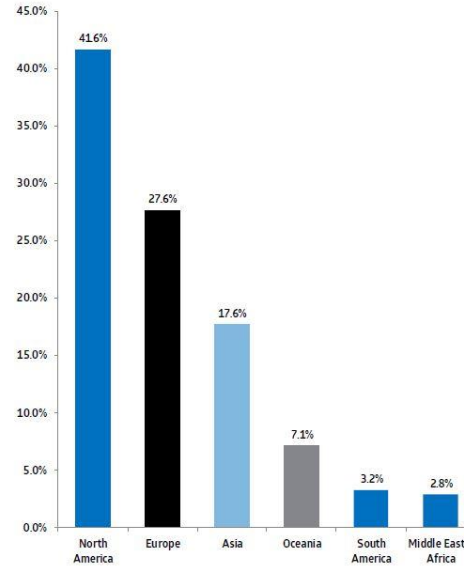
Incredible early adoption of Cloud Regions

48% Growth in 2020 on cloud connections in 2020 at Africa Cloud Exchange

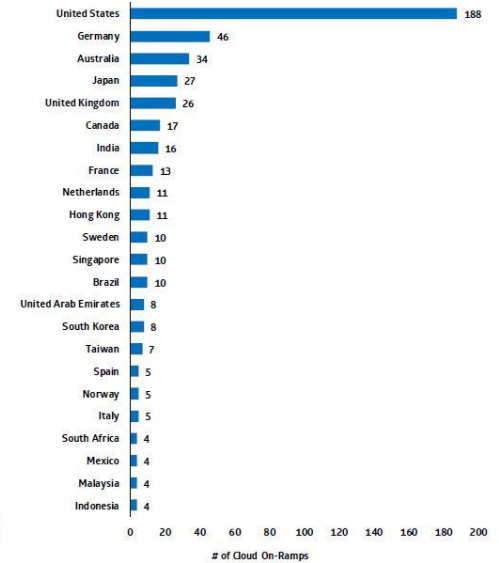
More Cloud Regions on the way



Market Share of Cloud On-Ramps By Region



Cloud On-Ramps by Country



NOTE: Cloudscene only lists cloud on-ramps for which the address is known, thus certain on-ramps are not captured
Source: Cloudscene.com (December 2020), Cowen and Company

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IXP's ARE UP AND TO THE RIGHT

46 active IXPs located in 42 cities in 34 countries

922 Active ASN's in the Southern Region

Countries reviewing benefits of deregulation e.g. Ethiopia, Congo

More Eyeballs.... As users now see internet access as a necessity rather than a nice to have IXP's see huge traffic growth in 2020

NAPAfrica Traffic Example:

- Feb 2020 Traffic: **994.12Gbps**
- Feb 2021 Traffic: **1.63Tbps**



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ISOC 80/20 INITIATIVE



Moving Toward an Interconnected Africa: The 80/20 Initiative

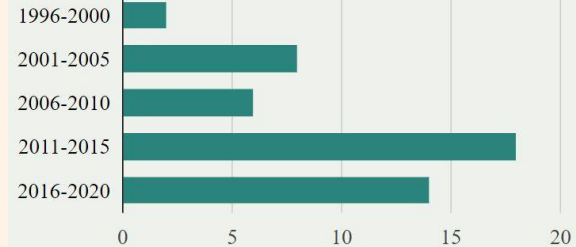
From Vision to Action - How the Technical Community Led the Way to Vision 80/20

In 2010, the Africa Internet technical community embraced an ambitious vision to have 80% of all Internet traffic locally accessible with only 20% being sourced internationally by 2020.

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	2010	2020
Number of IXPs	19	46
Countries with 70+% localized traffic	1 (South Africa)	3 (Kenya, Nigeria, and South Africa)
IXPs with 30+ networks	No data	10 (in 5 countries: Ghana, Kenya, South Africa, Tanzania, and Uganda)
Content Delivery Networks (CDNs)	No data	33 countries have at least 1 international CDN
Content hosting for data centres	Low demand	High demand

Number of IXPs in Africa: Years Founded



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REMEMBERING SOUTH AFRICA'S HEROS

MWEB offers free, open peering

Rudolph Muller 28 April 2010



A month after the launch of its affordable uncapped ADSL offering that shook up the local Internet and ADSL industry, MWEB is once again championing change in the market.

MWEB is calling on all internet operators to enter into open bi-lateral peering relationships to allow the free exchange of internet traffic.

Peering is the business relationship whereby ISPs reciprocally facilitate the flow of data between each other's customers. Open peering is the free exchange of internet traffic between two ISPs and is an international norm.

Rudi Jansen



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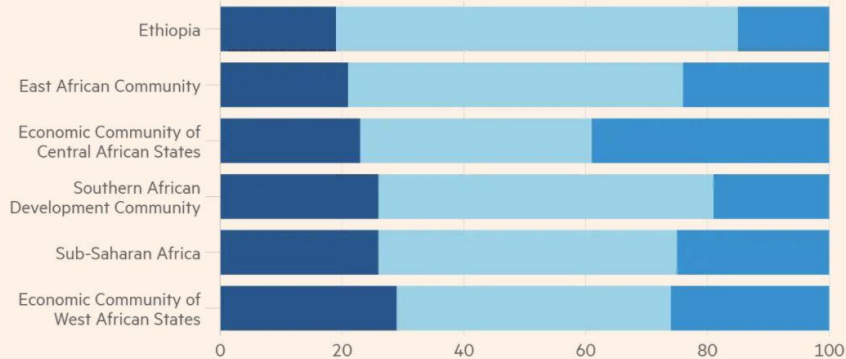
FORBES MAGAZINE: AFRICA IS THE NEXT FRONTIER FOR THE INTERNET

Still allot of work to be done...

Africa's lack of internet connectivity is largely unrelated to infrastructure

% of population in countries/regions

■ Mobile internet subscribers ■ Covered but not using internet
■ Not covered



Source: GSMA
© FT



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SOUTH AFRICA'S INVESTMENT BOOM

Vodacom's big 5G plans — including a R11 billion network investment

Myles Illidge 22 June 2022



Digital Realty Buys 55% of Teraco at \$3.5bn Valuation, Enters South Africa

By Mary Zhang January 3, 2022

Fibre network operators spend billions growing their networks

Staff Writer 17 August 2022



Google and Meta are now investing fortunes into building massive subsea cables, bringing internet infrastructure to millions



MTN Group accelerates investment into broadband coverage despite challenging macro environment



R5 billion boost for fibre in South Africa

Staff Writer 26 July 2022



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THANK YOU

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The world **connects here.**

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