



Precision at Scale

The Tanzania CORS Installation



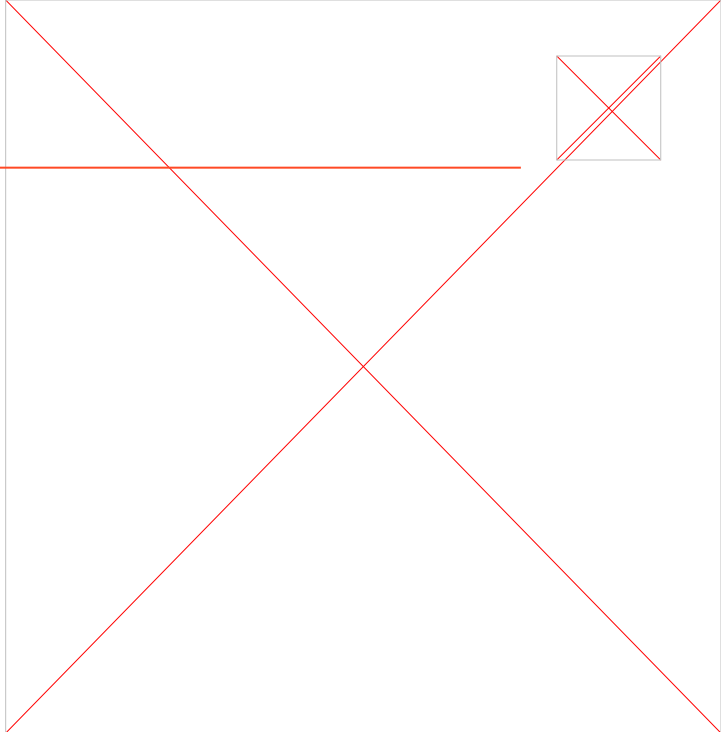
Introduction



Cobus Botha
Group Segment Manager
OPTRON (Pty) Ltd



Shayne Ayford
Director - Africa
OPTRON (Pty) Ltd



OPTRON Group overview

- OPTRON was established in 1986
- Trimble dealer since 1987, first outside USA
- Offices(5) in Centurion, Cape Town, Somerset-West, Durban, Nairobi and Resellers Network
- Resource for West Africa and Nigeria
- Staff complement of +100 | Technical & Domain expertise
- Group Structure with centralised Group Shares Services
- OEM trained and certified Technical Support Services
- Level 3 certified Service Center, with Support from OEM's
- ISO 9001:2015 certified



- Industry and Geographic Diversification Strategy

OPTRON Group Subsidiaries



OPTRON (Pty) Ltd

Supplies Geospatial hardware and software solutions used by surveyors in Mining, Construction, Private Practice, and Government sectors



SITECH SA (Pty) Ltd

Provides hardware and software solutions that support the concept of a digitally 'connected' Construction and Mining operations.



BuildingPoint SA (Pty) Ltd

The sole distributor in Sub Saharan Africa for the Trimble Buildings portfolio of industry-leading solutions.



OPTRON Moyo PB (Pty) Ltd

Providing professional services to enable and support technology in our customers' businesses.



Our Vision



YOUR WORLD - OUR WORLD
DEFINING THE ROLE OF SURVEYORS IN
SUSTAINABLE RESOURCE MANAGEMENT

To be a **world-class, leading provider of innovative location-based technologies and value-driven service.**

These technologies are primarily provided by Trimble, however, where there is a gap in their portfolio we may find other 3rd party providers, if it isn't in conflict with Trimble.

Industries we serve



GEOSPATIAL



MINING



**CIVIL ENGINEERING
& CONSTRUCTION**



**BUILDING
CONSTRUCTION**



GOVERNMENT



**UNMANNED
AERIAL VEHICLES**



ENERGY UTILITIES



WATER UTILITIES



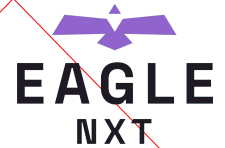
FORESTRY



RAIL



OPTRON OEMs | Suppliers





OEMs | Suppliers





BuildingPoint™

OEMs | Suppliers



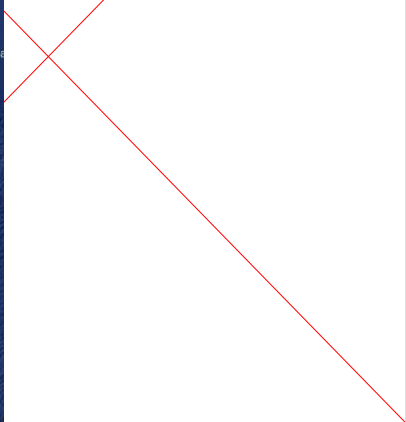


Our technology-forward solutions
deliver digital insights **that solve**
physical world problems

The background of the slide is a dark blue space scene. A large, curved horizon of the Earth is visible, showing the outlines of continents and oceans. Several satellites are depicted in orbit around the Earth, connected by a network of thin, glowing blue lines that represent data or communication links. A bright, glowing light source, likely the sun, is visible on the right side of the frame, casting a glow across the scene.

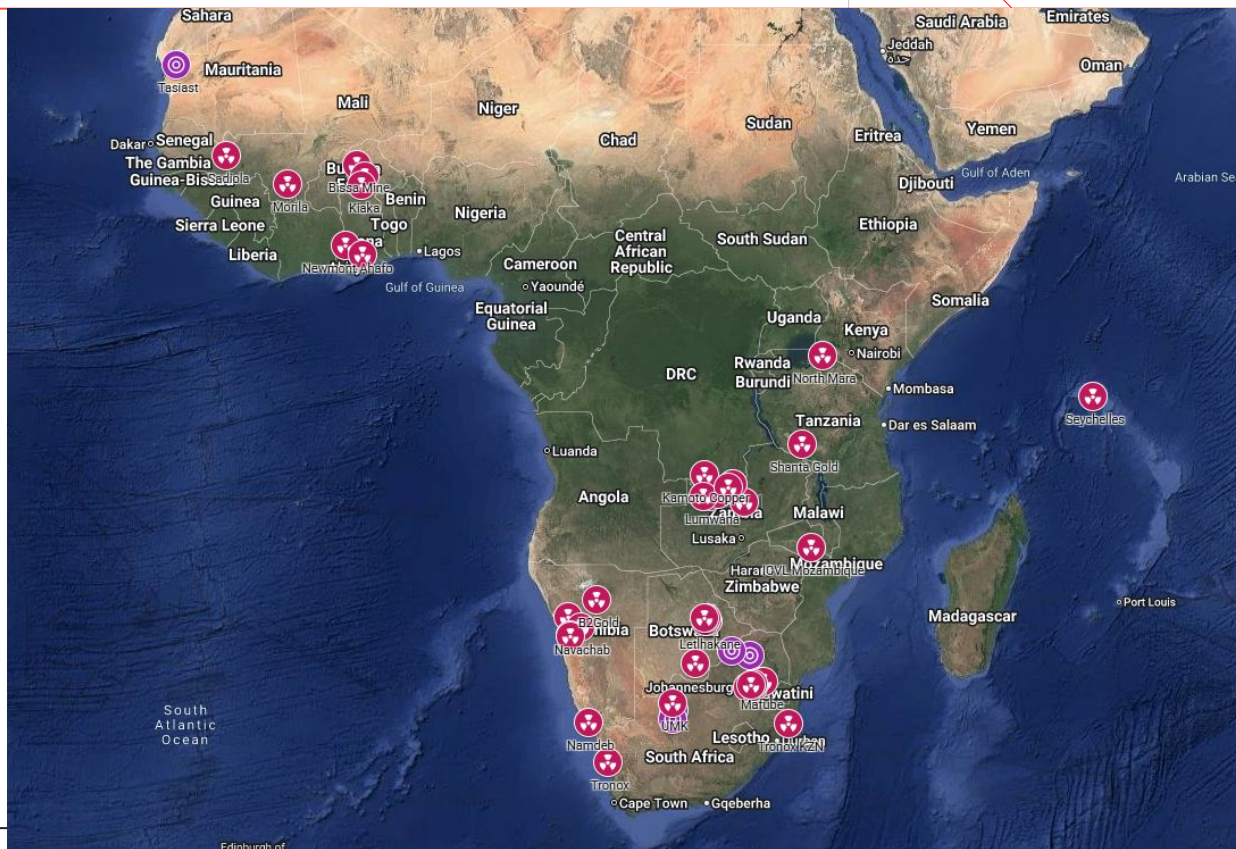
CORS Expertise

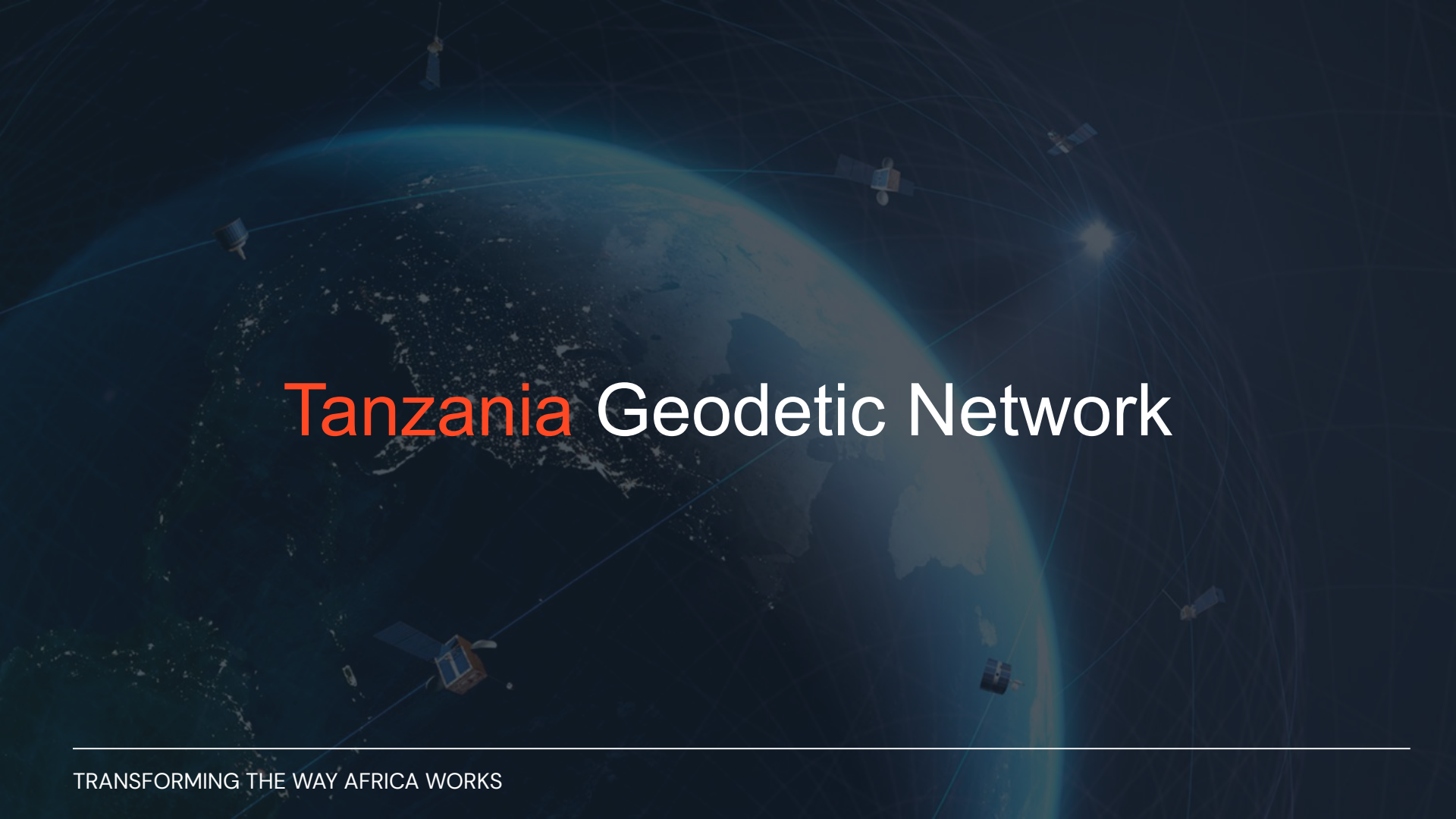
TRANSFORMING THE WAY AFRICA WORKS



Edinburgh of
the Seven Seas

Permanent Base Stations



A conceptual illustration of a satellite network. The Earth is shown from space, with the African continent visible. Several satellites are in orbit, connected by a network of thin blue lines. A bright sun or star is visible in the upper right, casting a glow. The overall color palette is dark blue and black, with the Earth's surface showing some green and white details.

Tanzania Geodetic Network

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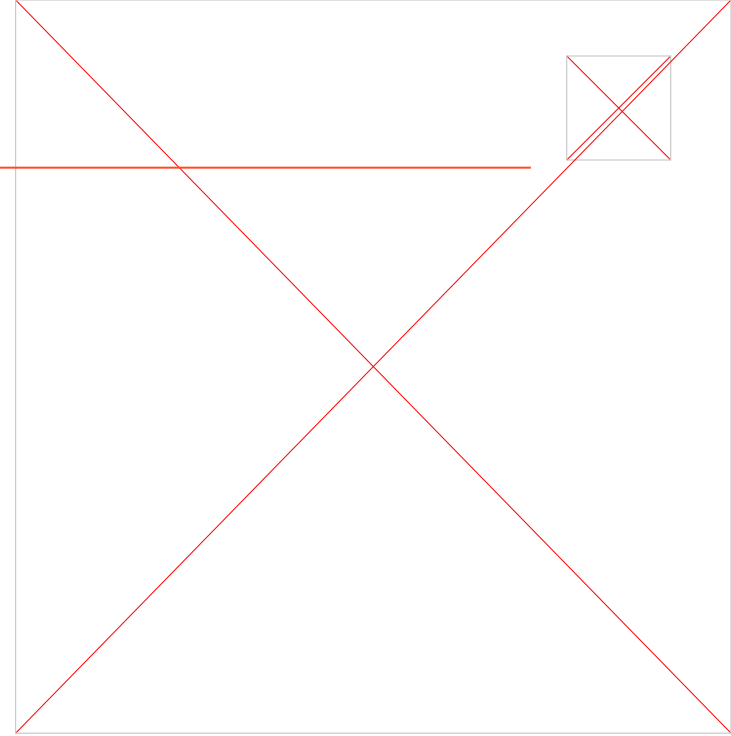
Objective

The **Land Tenure Improvement Project (LTIP)** is a World Bank–funded national programme aimed at strengthening Tanzania’s land administration system and improving tenure security.

A key technical component of LTIP is the development of a **national GNSS CORS network (often referred to as CONETA)**—a geospatial backbone that supports accurate positioning across the country.

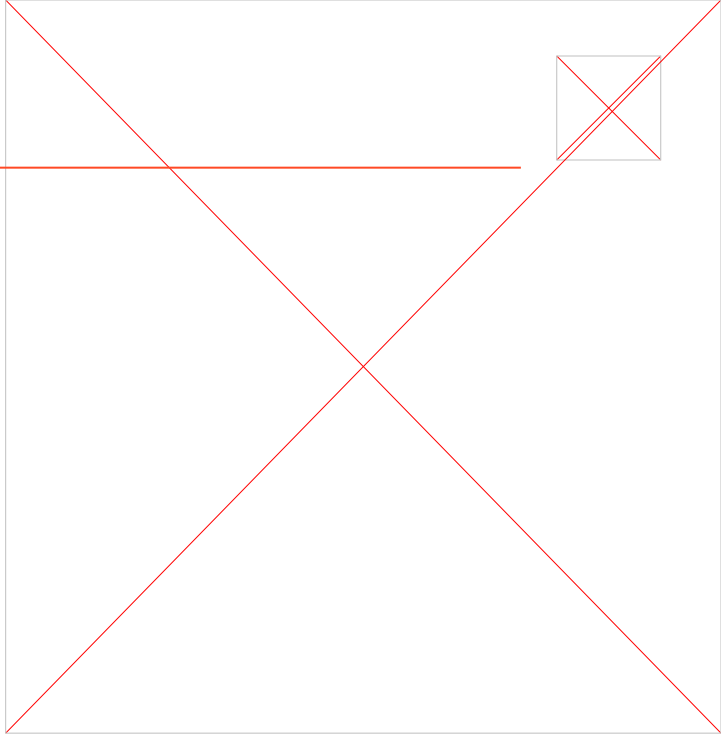
Project Phases

- Design
- Reconnaissance
- Implementation / Installation
- Training
- Operational Maintenance
- User Acceptance



Implementation challenges

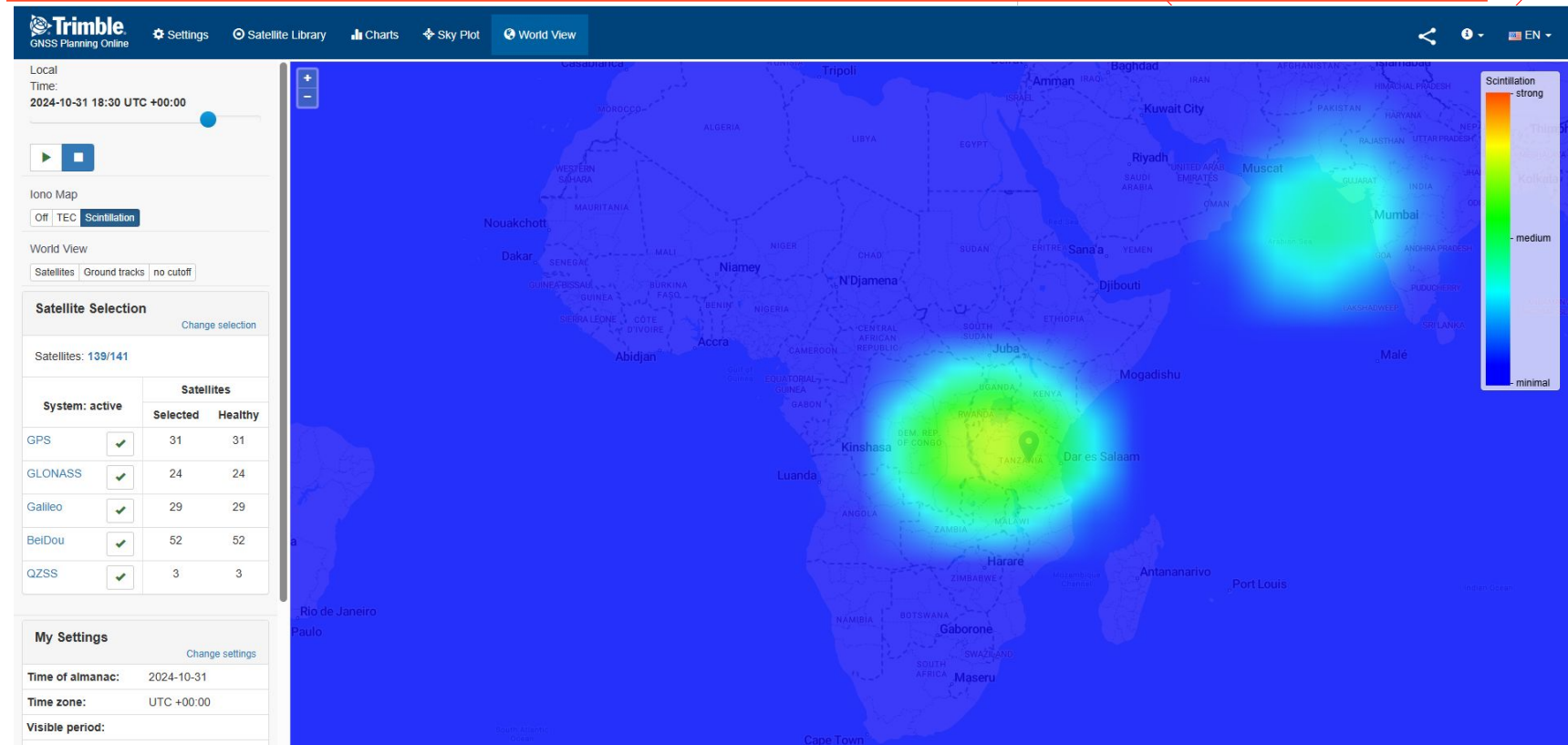
- Site Access
- Network
- Power
- Security
- Network
- Weather / Lightning
- Language Barriers / Culture



Reconnaissance

- Visit each site, plus a backup site
- Determine best position for GNSS antenna
- Determine best location for receiver
- Perform 48 hour static observation to check cycle slips, multipath and signal interference

Scintillation



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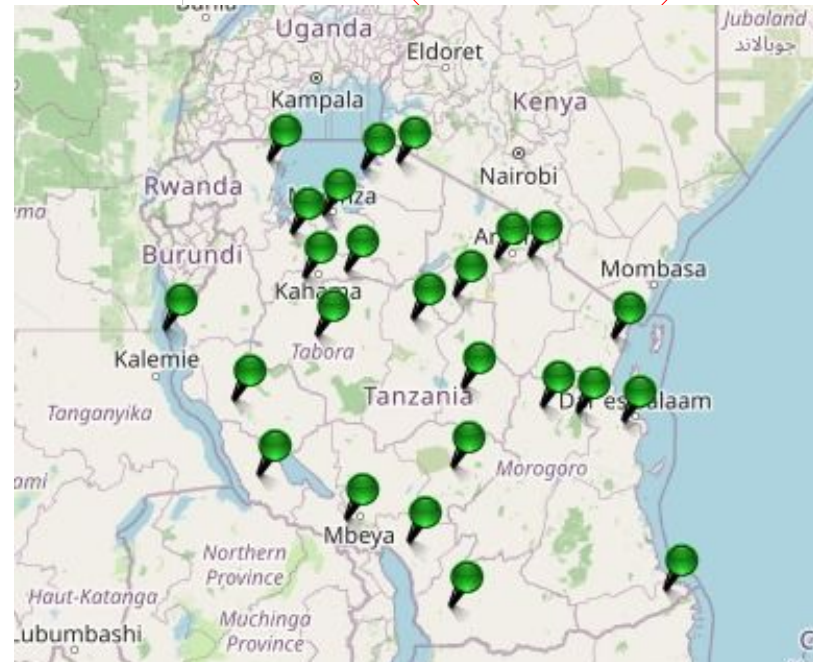
A conceptual image showing a network of satellites in orbit around the Earth. The Earth is shown from space, with the African continent visible. A network of thin blue lines connects several satellites, representing a global communication or data network. A bright light source, likely the sun, is visible on the right side of the frame, creating a lens flare effect.

Design

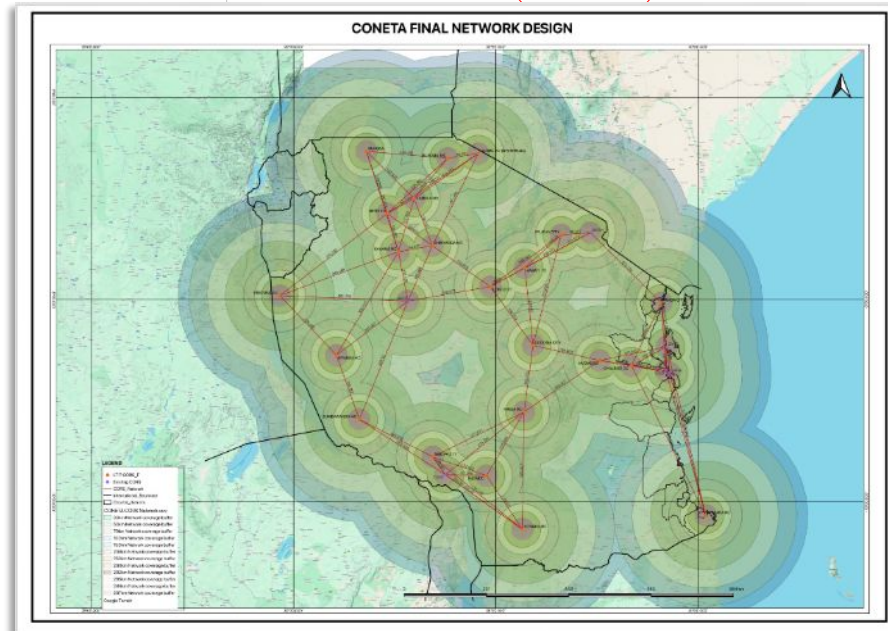
TRANSFORMING THE WAY AFRICA WORKS

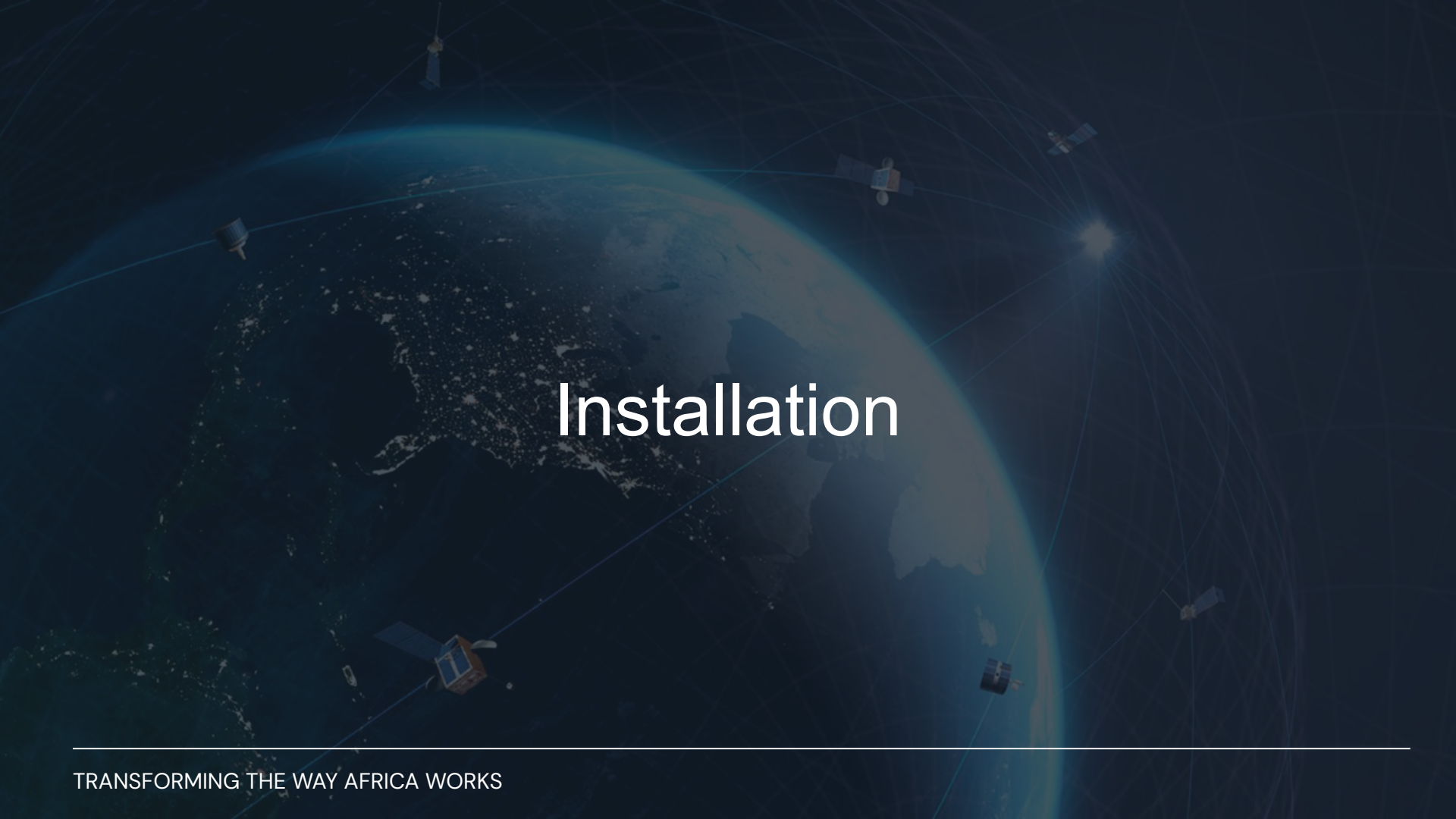
The Final CONETA Network Design

Locations were chosen to provide full coverage of the country where the population is the highest



Baselines and Buffers of the points at various buffer distances: 30 km, 50 km, 70 km, 100 km, 150 km, 200 km 250 km 280 km and 285 km.

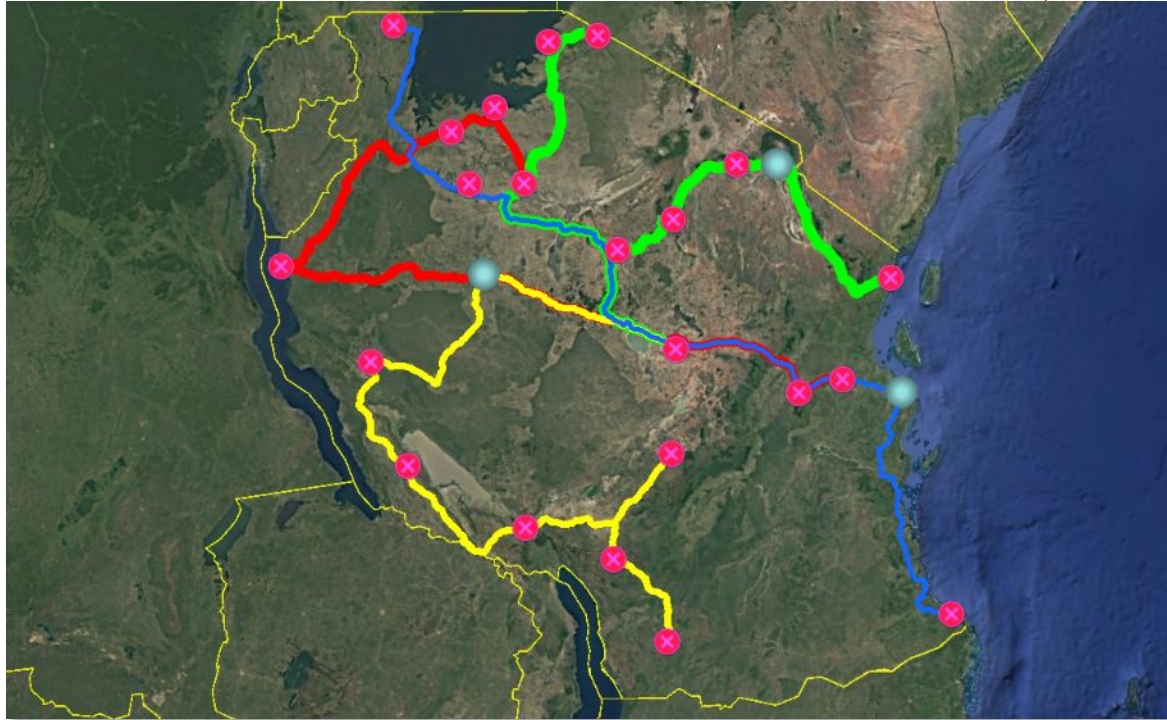


A conceptual illustration of a satellite network. The Earth is shown from space, with the African continent visible. Several satellites are in orbit, connected by a network of thin blue lines. A bright sun or star is visible on the right side of the frame.

Installation

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Installation Routes



The background of the slide is a dark blue space scene. A large, curved horizon of the Earth is visible, showing a thin blue atmosphere and a dark surface with some white clouds and city lights. Several satellites are shown in orbit around the Earth, connected by a network of thin, light blue lines that form a web-like pattern across the sky. The satellites are small, rectangular objects with solar panels. The title 'Hardware Components' is centered in the middle of the image. 'Hardware' is in a bold, orange-red font, and 'Components' is in a white, sans-serif font.

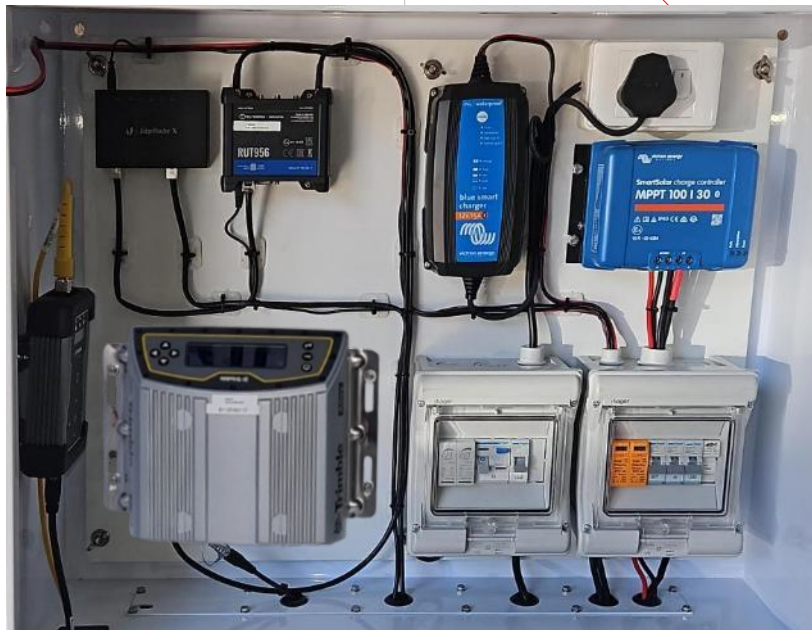
Hardware Components

Hardware

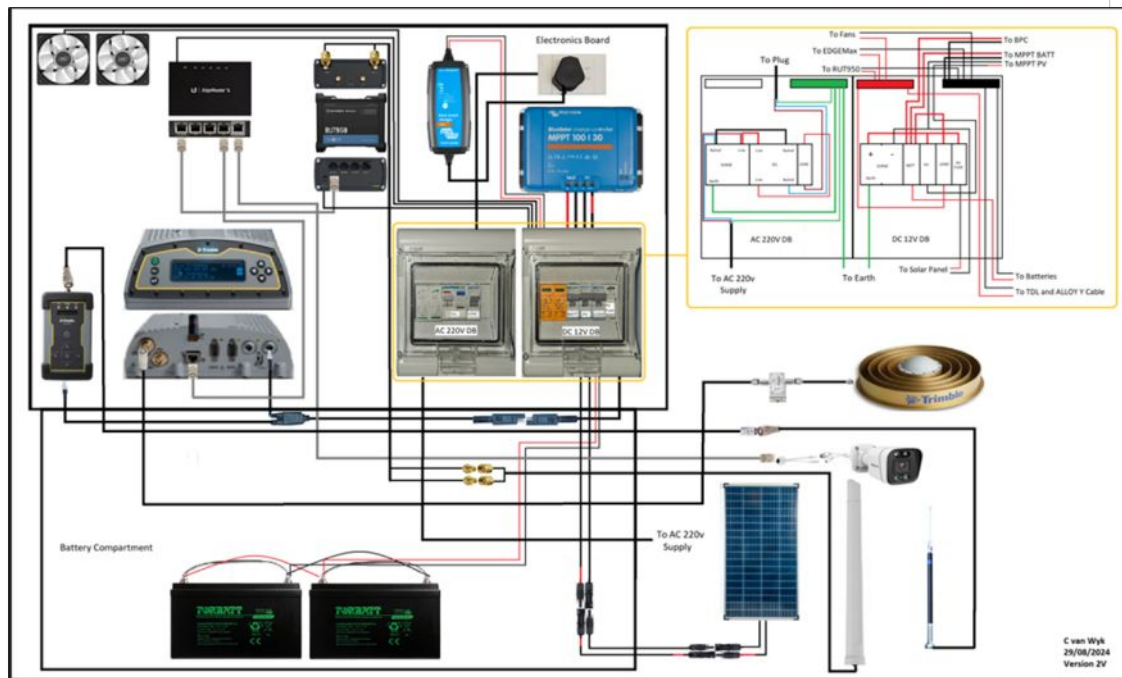
Standard system components:

- Equipment Protection Cabinet (EPC)
- Trimble Alloy GNSS Reference Receiver
- Antenna
- Antenna Mount
- Lightning Arrestor
- Solar Panel
- Communication
- Security Camera

Equipment Protection Cabinet



Equipment Protection Cabinet



Trimble Alloy GNSS Reference Receiver

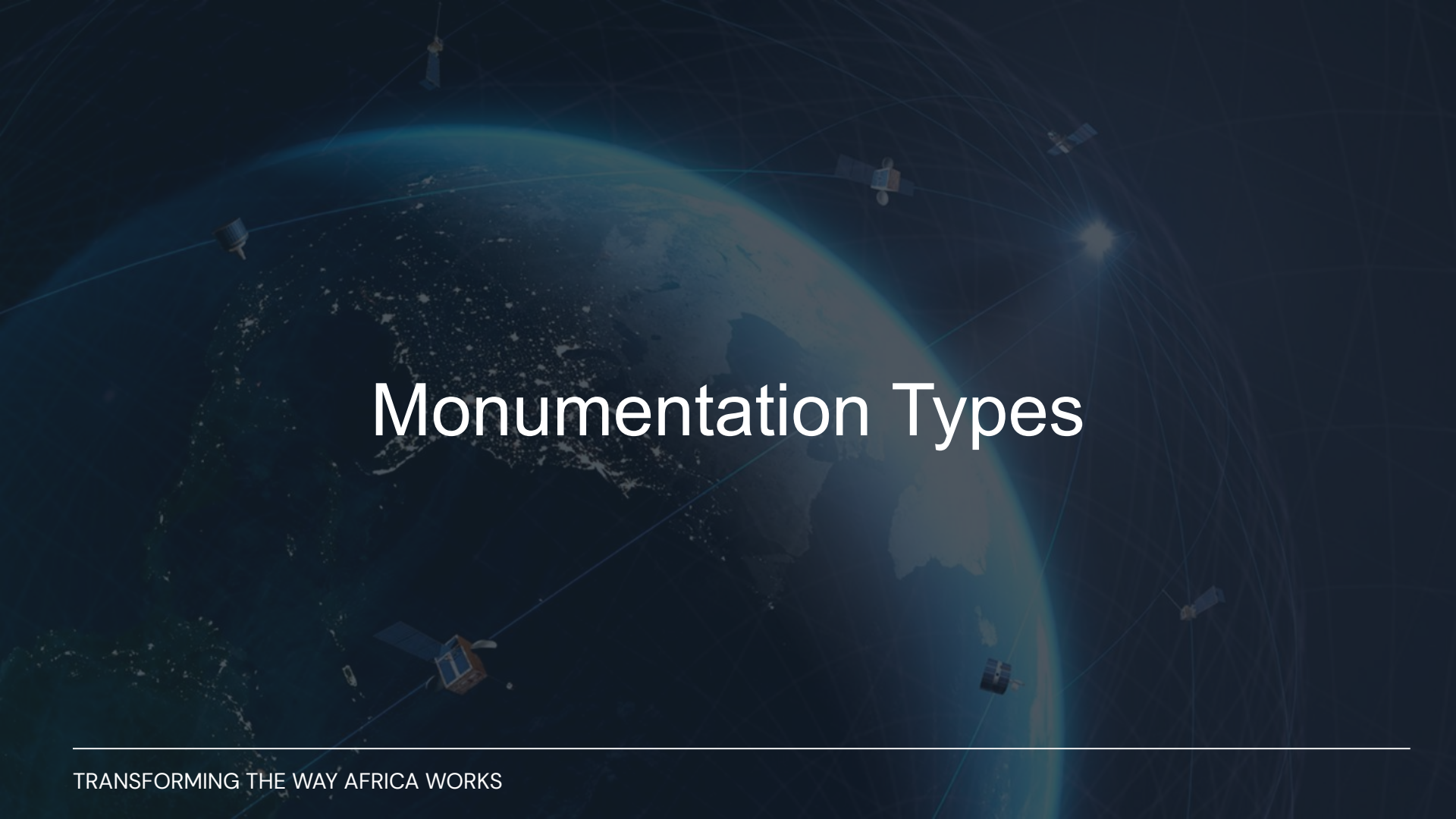
- **High-Precision GNSS Receiver:** Designed for geodetic, survey, and infrastructure monitoring applications.
- **Multi-Constellation Support:** Tracks GPS, GLONASS, Galileo, BeiDou, and QZSS signals.
- **Advanced Interference Mitigation:** Reduces the impact of signal interference for more reliable data.
- **Robust Design:** Built to withstand harsh environmental conditions with an IP68 rating.
- **Flexible Connectivity:** Offers multiple communication options including Ethernet, Wi-Fi, Bluetooth, and serial ports.
- **Data Logging:** Capable of extensive data logging with large internal memory and external storage options.



Trimble Choke Ring Ti-V2 Antenna

- **Multipath Signal Reduction:** Designed to effectively reduce the strength of multipath signals.
- **Comprehensive GNSS Support:** Tracks GPS, GLONASS, Galileo, BeiDou, QZSS, and NavIC signals.
- **Improved Signal Reception:** Enhanced low noise amplification for better signal reception in harsh environments
- **Precision Design:** Ensures less than 2 mm phase-center eccentricity and less than 1 mm phase-center repeatability
- **Radome Protection:** Equipped with a radome to protect the antenna from environmental elements, ensuring long-term durability.

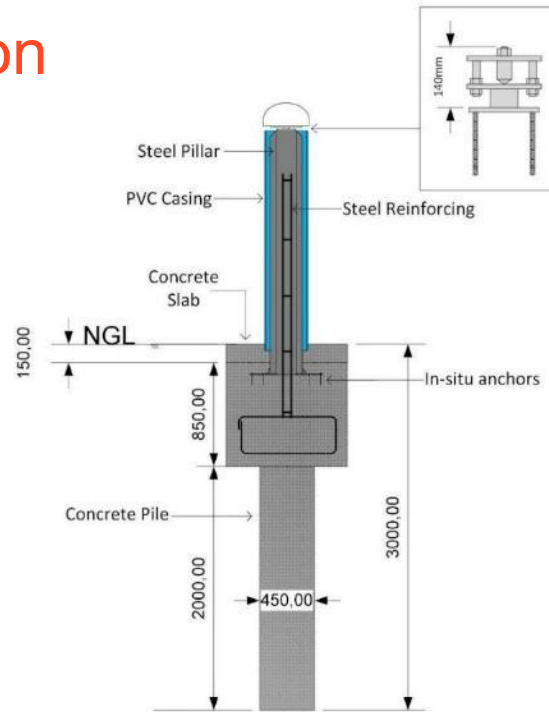


A background image showing a view of Earth from space, with a network of satellites and connecting lines, suggesting a global communication or data network. The Earth's horizon is visible, and the satellite network is depicted as a series of lines and nodes.

Monumentation Types

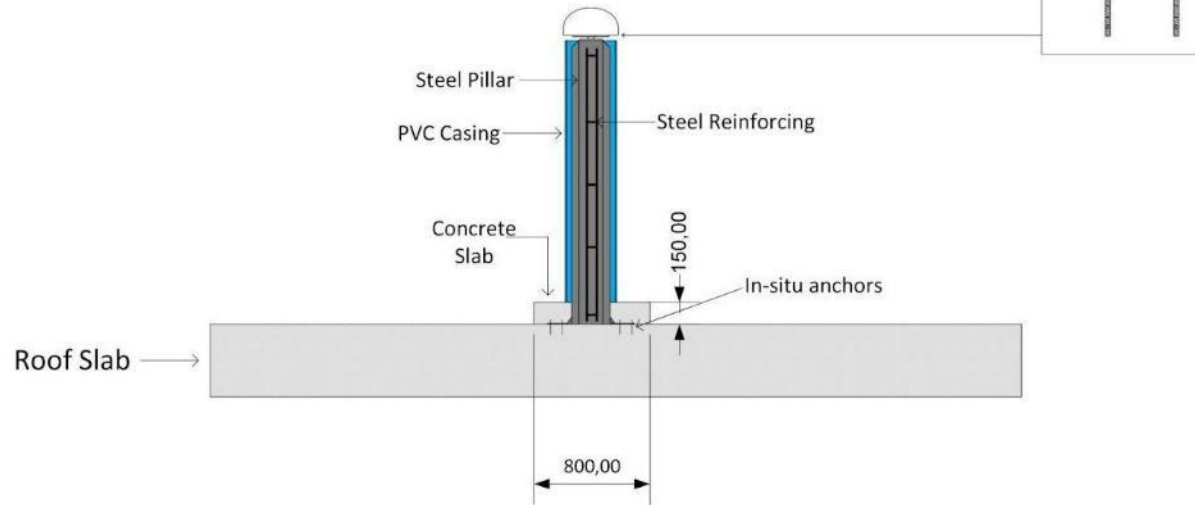
Monumentation Types

Ground Pillar Beacon



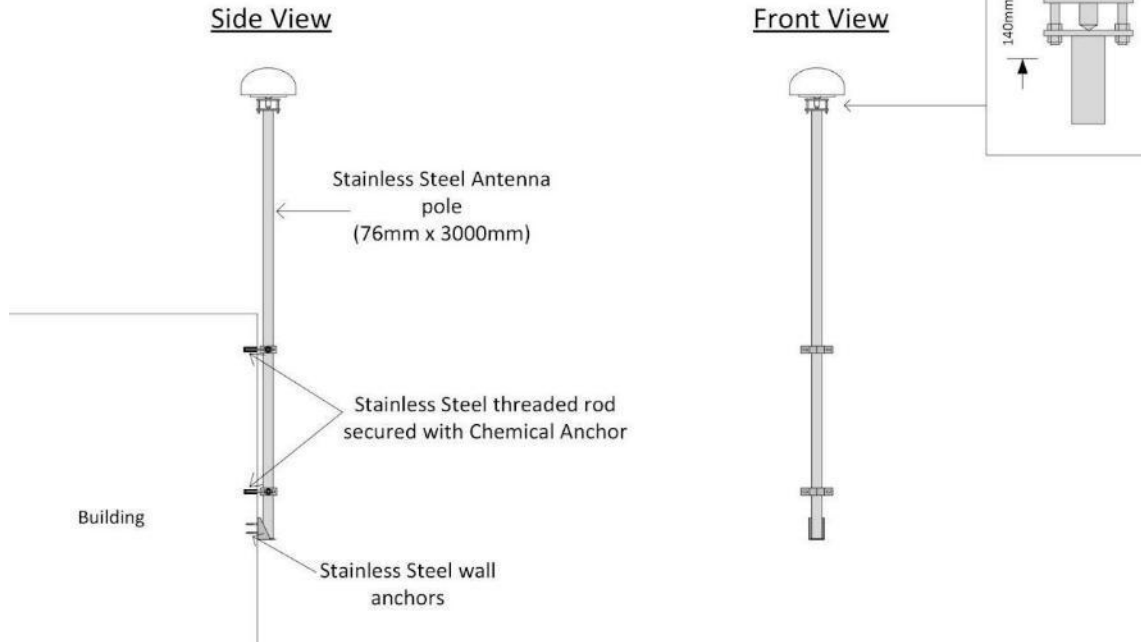
Monumentation Types

Rooftop Pillar Beacon



Monumentation Types

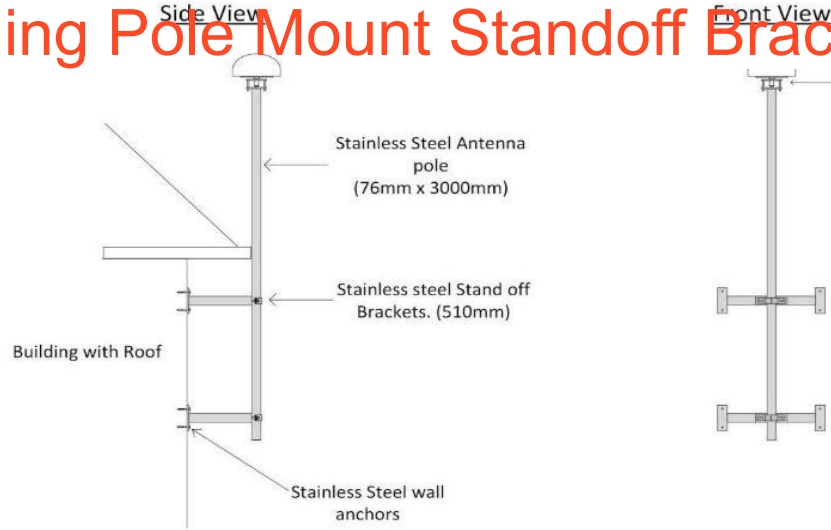
Building Pole Mount – Flush Mount



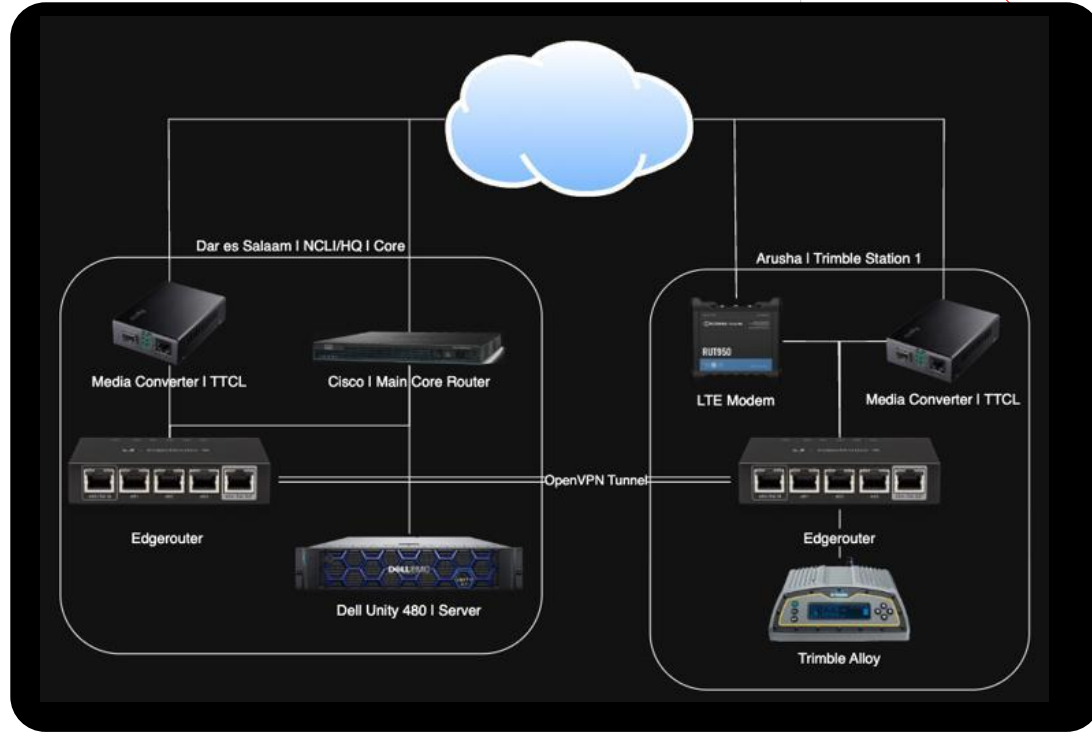
Monumentation Types

bracket mount

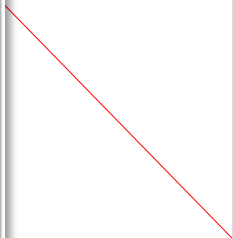
Building Pole Mount Standoff Bracket

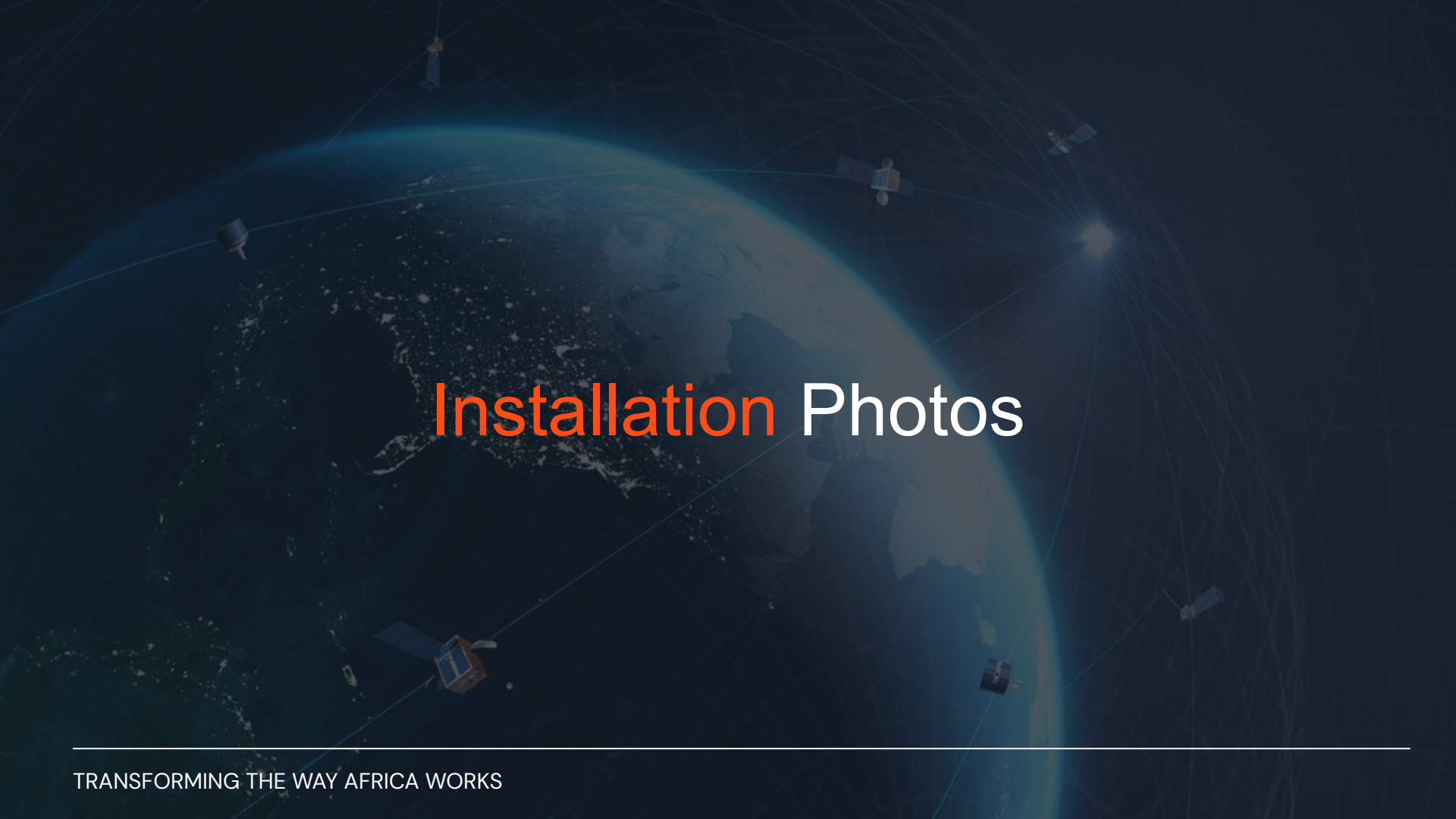


Topology Diagram Overview







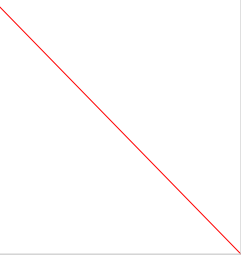
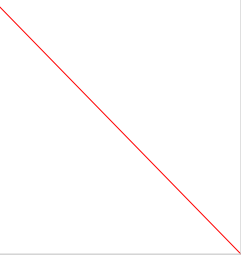
A background image showing a view of Earth from space, with a network of satellites and connecting lines forming a global grid. The Earth's surface is visible, showing continents and oceans, with a bright light source (the sun) on the right side creating a lens flare effect. Several satellites are depicted in orbit, connected by a network of thin lines.

Installation Photos

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Equipment Protection Cabinet





Pillar Design



Building Rooftop Mount



Ground Pillar

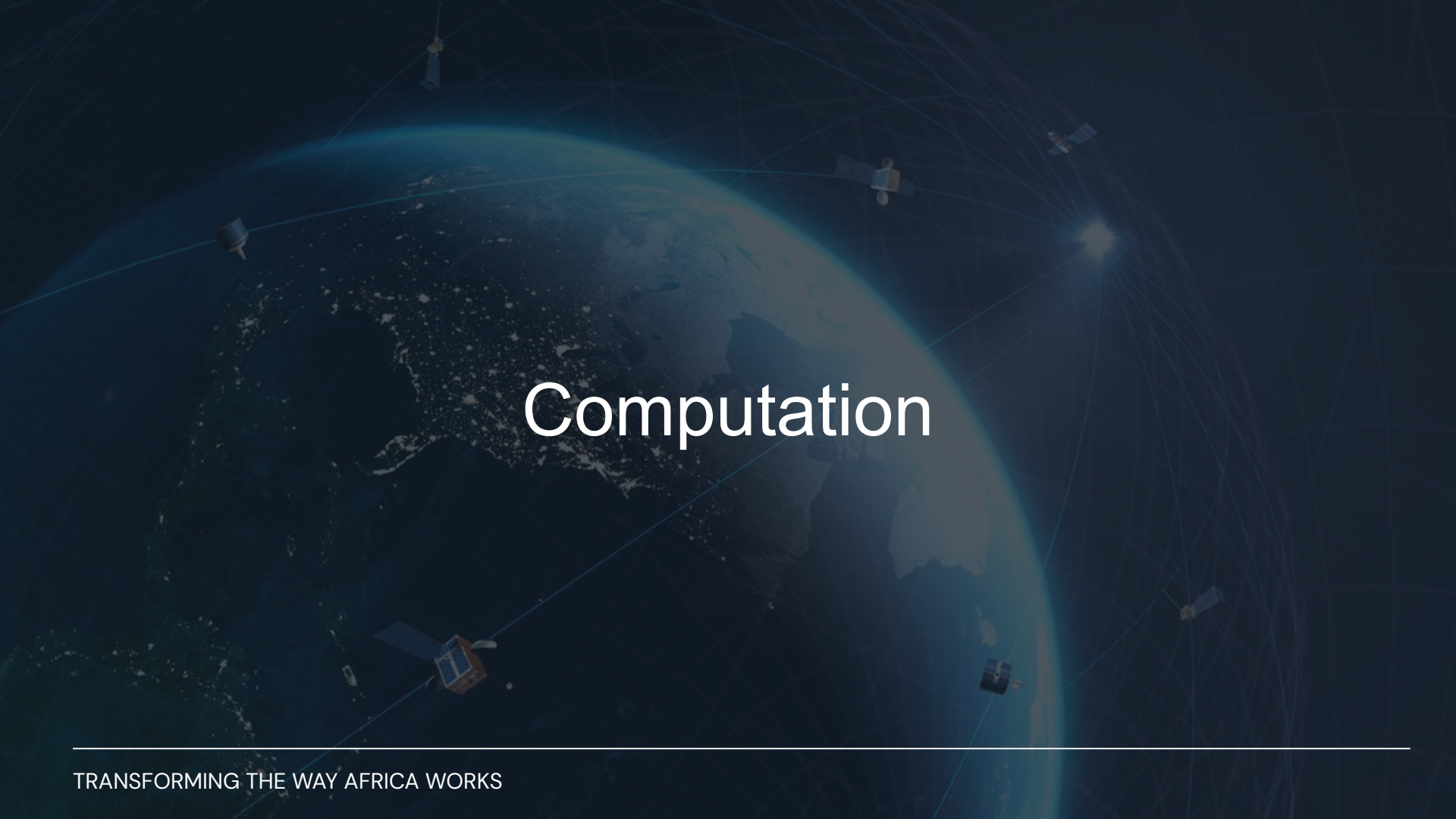


Ground Pillar



Building Side Mount



A conceptual illustration of a global satellite network. The Earth is shown from space, with city lights visible on the dark side. Several satellites are in orbit, connected by a network of thin blue lines that form a web across the globe. A bright sun or star is visible on the right side, illuminating the scene.

Computation

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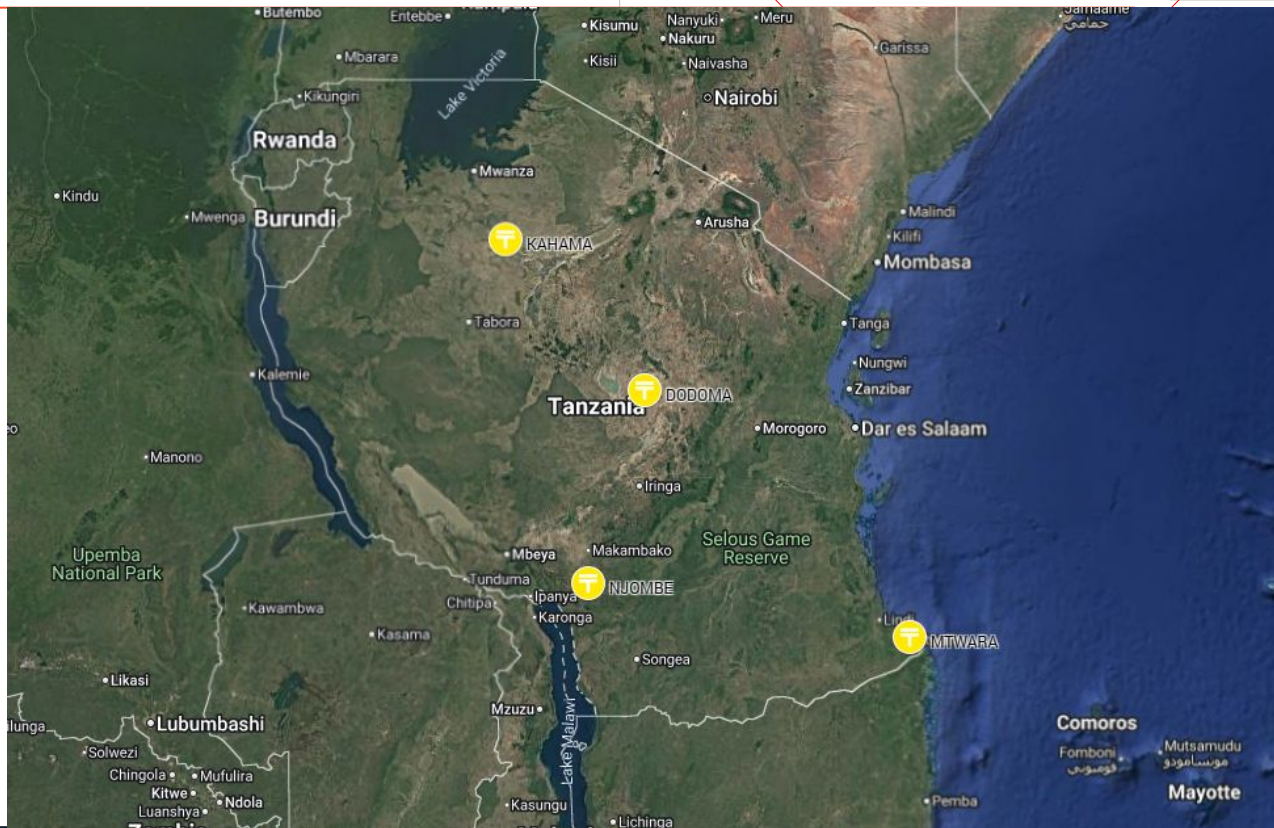
Computation

- Computation was done using Bernese
- Surrounding IGS stations were used to calculate the coordinates using ITRF2020
- Transformation parameters were calculated to transform ITRF2020 coordinates to the TAREF11 reference frame

IGS Stations

4 Stations
proposed for IGS

- Dodoma
- Kahama
- Mtwara
- Njombe





Questions | General Discussions

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Thank You

Icons

