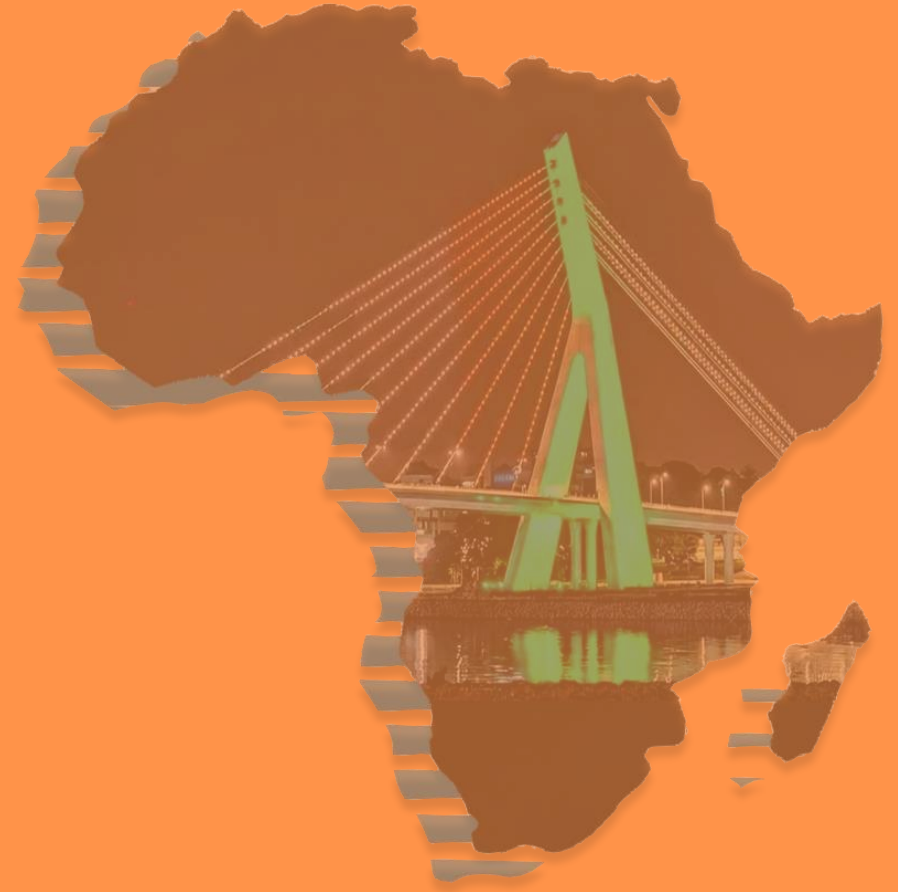


Jour 2

Avancement des systems techniques et des données



Enregistrement

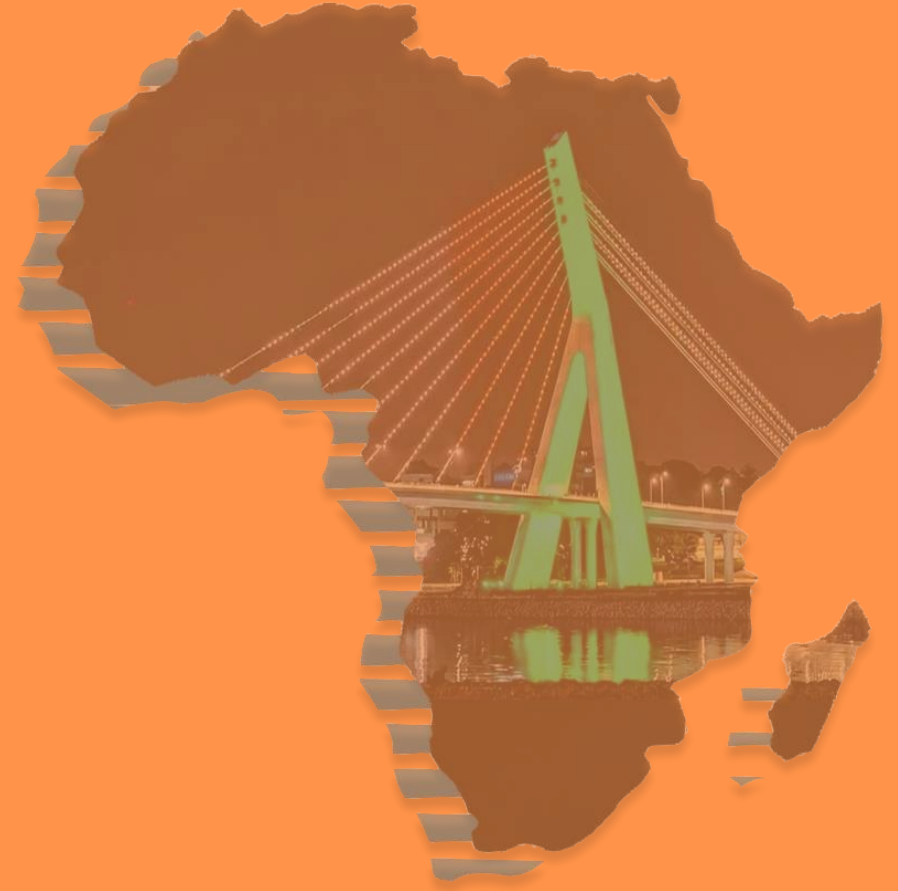
Systèmes Nationaux de cartographie à large bande en Côte d'Ivoire

18—20 Août 2025

Abidjan, Côte d'Ivoire



Welcome Coffee



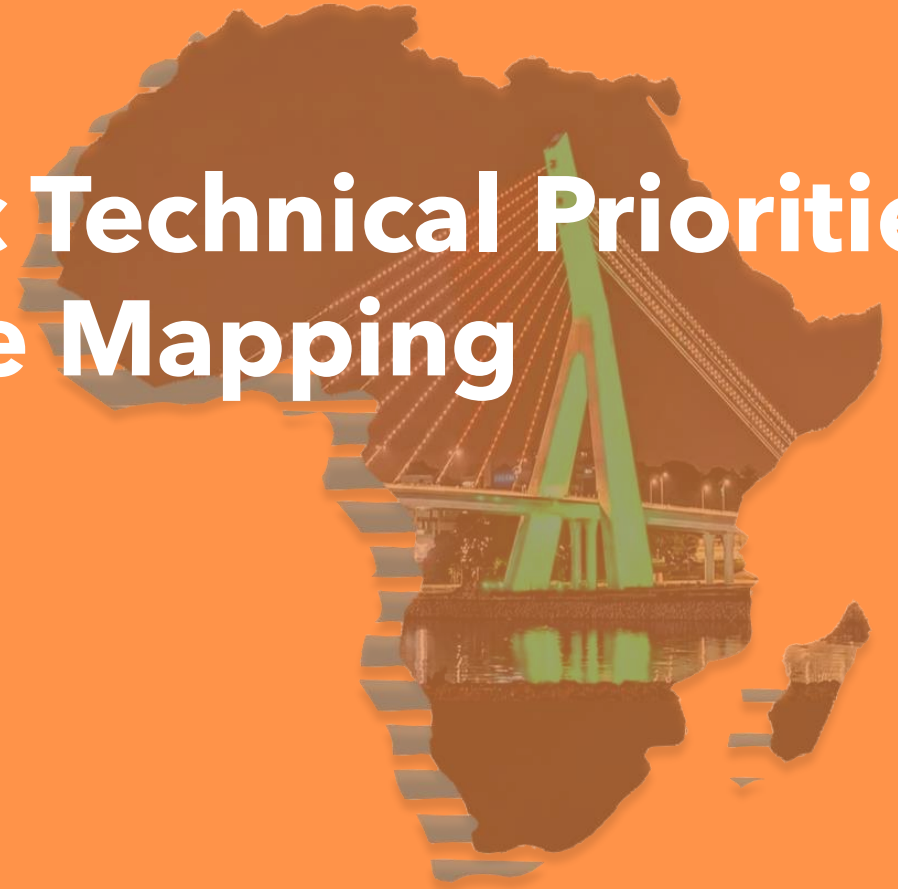
Objectives of Day 2

9:00 – 9:15	Récapitulatif du Jour 1 et objectifs du Jour 2 • Représentant ARTCI (ISSOUF-SRD)
9:15 – 10:45	SESSION 4 : Études de cas par des experts de l'UIT : quels apprentissages s'appliquent en Côte d'Ivoire ? Modération : Mr. Elind Sulmina, Project Officer, ITU Africa-BB-Maps • Expert 1, ITU • Expert 2, ITU • Expert 3, ITU <i>Q&R et discussion</i>
10:45 – 11:15	Pause-café
11:15 – 12:45	SESSION 5 : Approfondissement technique : Architecture, Standards, Outils et Données. Modération et mise en contexte : Mr. Dana Jon Kamason, Project Manager, Africa-BB-Maps, ITU • Expert, ARTCI <i>Q&R et discussion</i>
12:45 - 14:00	PAUSE DÉJEUNER
14:00 – 15:30	SESSION 6 : Présentation des futurs travaux d'analyse des politiques Modération et mise en contexte : Mr. Elind Sulmina, Project Officer, ITU Africa-BB-Maps • Expert, ARTCI • Expert 1, ITU • Expert 2, ITU • Expert 3, ITU <i>Q&R et discussion</i>
15:30-17 :00	SESSION 7 et 8 : Session de co-création : architecture, sources de données, contraintes techniques Session de co-creation : discussions de groupe sur le travail d'analyse des politiques Modérateur : Mr. Dana Jon Kamason, Project Manager, Africa-BB-Maps, ITU Sujets abordés; • Groupe 1: Architectures système et modèles de déploiements • Groupe 2: Technologies Open-Source & Données Ouvertes Open Data) • Groupe 3: Mécanismes de Standardisation et collection des données • Groupe 4: Statistiques, Validation, Contrôle Qualité et Certitude Modérateur : Mr. Elind Sulmina, Project Officer, ITU Africa-BB-Maps Co-modération: Experts ITU • <u>Group</u> 1: Secteur Public • <u>Group</u> 2: Secteur Privé

Opening Remarks: Strategic Technical Priorities for Broadband Infrastructure Mapping

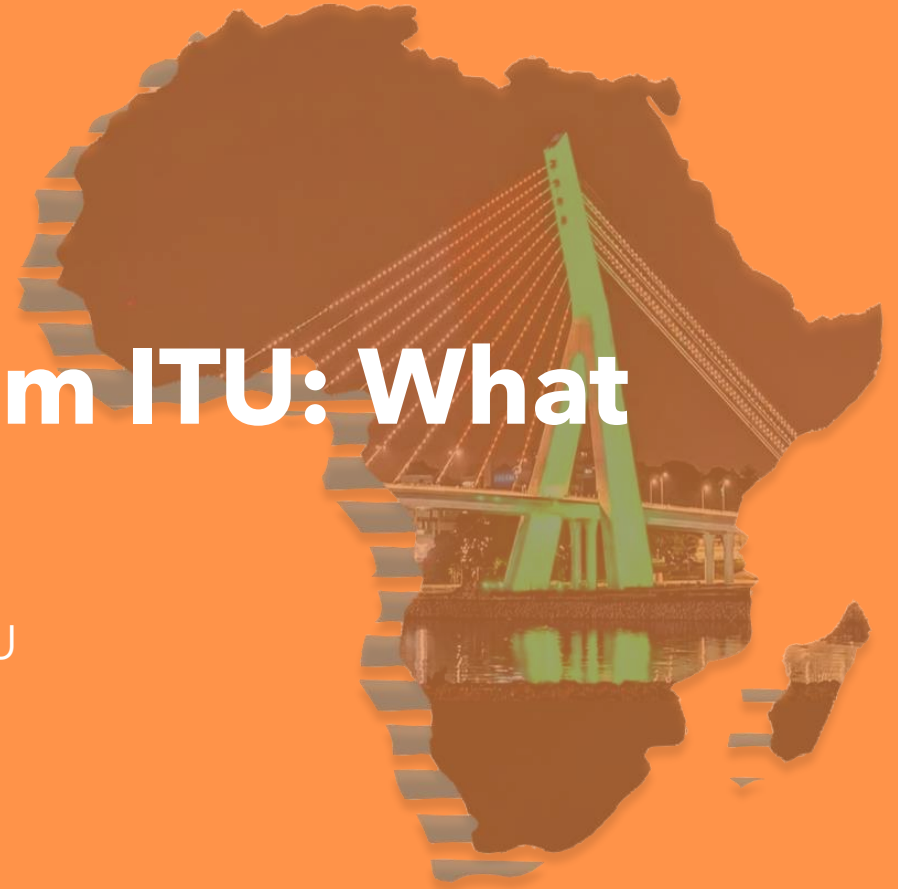


ARTCI



SESSION 3: Case Studies from ITU: What Lessons Apply ?

Moderation: Mr. Elind Sulmina, Project Officer, Africa-BB-Maps, ITU



SESSION 3: Études de cas de l'UIT : quelles leçons en tirer ?



Mr. Beert Klassens

ITU Speaker, Netherlands



Mr. Vaidotas Radzevicius

ITU Speaker, Lithuania

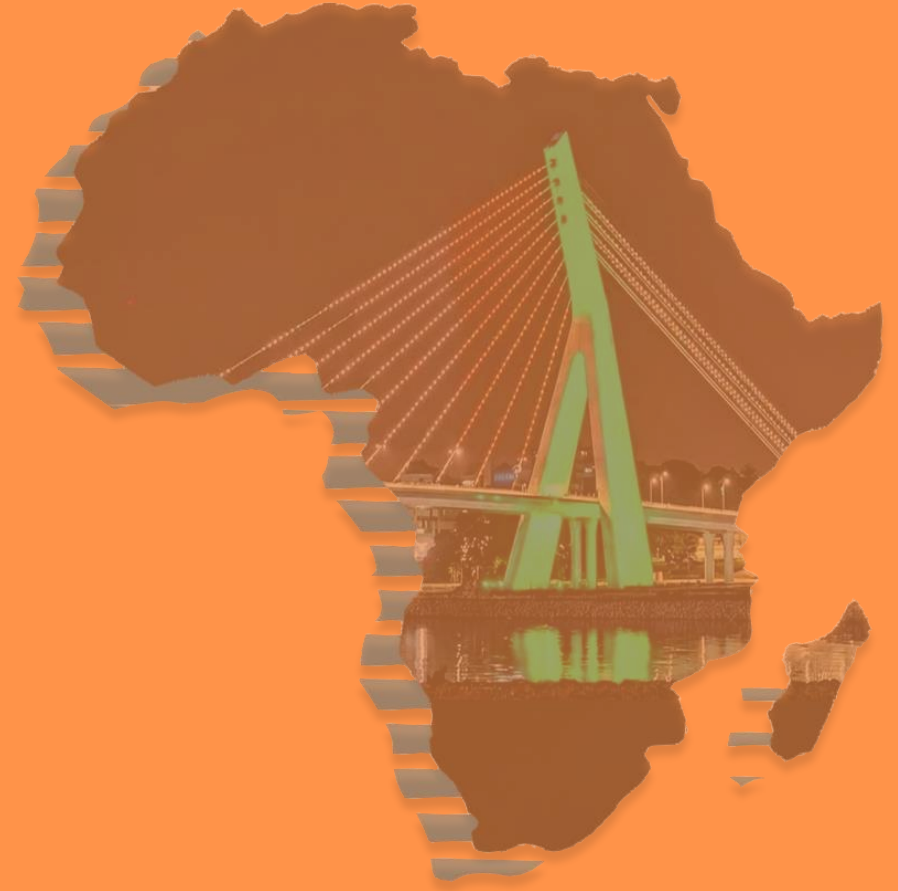


Mr. Catalin Costantinescu

ITU Speaker, Romania



Coffee Break



SESSION 4: technical Deep-Dive: Architecture, Standards, Tools & Data Ecosystem

Setting the stage & Moderation: Mr. Dana Jon Kamason, Project Manager, Africa-BB-Maps, ITU



Mr. Dana Jon Kamason

Project Manager, ITUAfrica-BB-Maps,



Mr. Issouf Toure

ARTCI



Africa-BB-Maps – Geospatial Software Choices for Cote d'Ivoire



Africa-BB-Maps – Geospatial Software Cote d'Ivoire's Choice



Africa-BB-Maps – Architecture Pillars

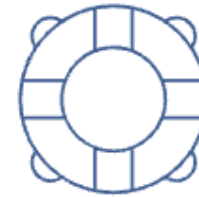
Best Practice and Design Recommendations



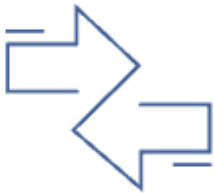
Security



Performance & Scalability



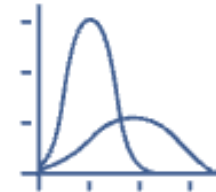
Reliability



Integration



Automation



Observability

Africa-BB-Maps – Architecture Systems Patterns

Geospatial in Nature, Supports Multiple Deployment Models



Location Services



Self-service mapping,
analysis, and sharing



Enterprise application
hosting and
management



Data editing and
management



Imagery data
management and
analytics



Mobile operation and
offline data
management

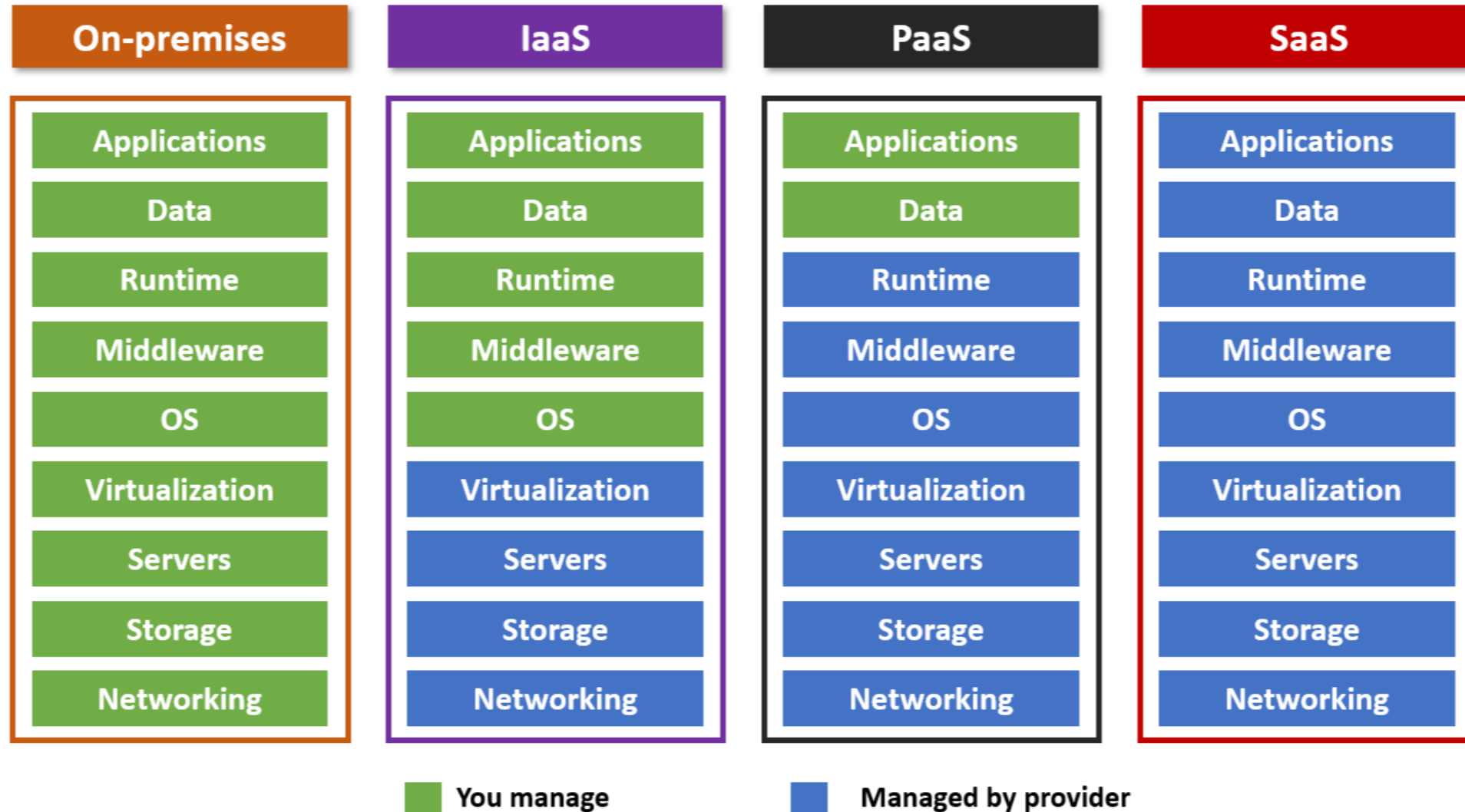


Real-time data
streaming and
analytics



Big data analytics

Africa-BB-Maps – Architecture Deployment Model



Geospatial Open Source & Open Data



Africa-BB-Maps – Geospatial Open Source Software



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The Open Source Geospatial Foundation

About OSGeo

Donate

Open source projects

Open source is so much more than technology.
Meet the projects that are here to help you!

Choose a project

All Projects

About open source geo

Powerful, secure and flexible; open source gives you
the freedom to "Do Geo" your way

Open source geo

Helping you succeed

Support provided by local chapters, service
providers and research collaboration.

Connect with OSGeo

Science and Education

<https://www.osgeo.org/>



Africa-BB-Maps – Geospatial Open Source Projects

 deegree deegree is open source software for spatial data infrastructures and the geospat... Website Source Documentation	 GDAL/OGR GDAL is a C++ translator library for more than 200 raster and vector geospatial ... Website Source Documentation	 GeoMoose GeoMoose is a Web Client JavaScript Framework for displaying distributed cartogr... Website Source Documentation	 gvSIG Desktop gvSIG is a powerful, user-friendly, interoperable GIS used by thousands o... Website Source Documentation	 Mapbender Mapbender is a web based geoportal framework to publish, register, view, navigat... Website Source Documentation	 MapServer Known as one of the fastest mapping engines in the world, MapServer is an Open S... Website Source Documentation
 GeoNetwork A catalog to manage spatially referenced resources. It provides powerful metadat... Website Source Documentation	 GeoNode GeoNode is a web-based application and platform for developing geospatial inform... Website Source Documentation	 GEOS GEOS (Geometry Engine – Open Source) is a C++ port of the Java Topology Su... Website Source Documentation	 Marble Versatile, yet easy to use. Use Marble similar to a desktop globe; pan around an... Website Source	 OpenLayers OpenLayers makes it easy to put a dynamic map in any web page. It can display ma... Website Source Documentation	 Orfeo ToolBox Orfeo ToolBox is an open-source project for state-of-the-art remote sensing, inc... Website Source Documentation
 GeoServer Designed for interoperability, GeoServer publishes data from any major spatial d... Website Source Documentation	 GeoTools An open source Java library providing a standards compliant approach for visuali... Website Source Documentation	 GRASS GRASS is a powerful computational engine for raster, vector, and geospatial proc... Website Source Documentation	 OSGeoLive OSGeoLive is a self-contained bootable DVD, USB thumb drive or Virtual Machine b... Website Source Documentation	 pgRouting pgRouting extends the PostGIS / PostgreSQL geospatial database providing routing... Website Source Documentation	 PostGIS PostGIS adds GIS spatial types and support to PostgreSQL. It is used by Database... Website Source Documentation

Africa-BB-Maps – Geospatial Open Source Projects



PROJ

PROJ is a generic coordinate transformation software that transforms geospatial ...

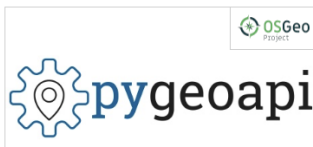
[Website](#) [Source](#) [Documentation](#)



pycsrw

pycsrw is an OGC CSW server implementation written in Python. Started in 2010 (mo...

[Website](#) [Source](#) [Documentation](#)



pygeoapi

pygeoapi is an OGC API to geospatial data

[Website](#) [Source](#) [Documentation](#)



Feature Data Objects

FDO

FDO Data Access Technology is an API for manipulating, defining and analyzing ge...

[Website](#) [Documentation](#)



GC2 VIDI

GC2/Vidi

A platform for building spatial data infrastructure and deploying browser based ...

[Website](#) [Source](#) [Documentation](#)



GeoExt

A JavaScript Toolkit for Rich Web Mapping Applications

[Website](#) [Source](#) [Documentation](#)



PyWPS

PyWPS is an implementation of the Web Processing Service standard from the Open ...

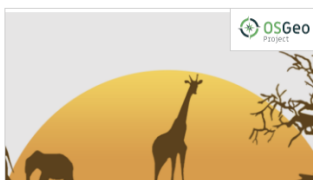
[Website](#) [Source](#) [Documentation](#)



QGIS Desktop

QGIS is the leading Free and Open Source Desktop GIS. It allows you to create, e...

[Website](#) [Source](#) [Documentation](#)



ZOO-Project

ZOO-Project is a C-based WPS (Web Processing Service) implementation. It is an o...

[Website](#) [Source](#) [Documentation](#)



GeoHealthCheck

GeoHealthCheck is a Python application to support monitoring OGC Web Services up...

[Website](#) [Source](#) [Documentation](#)



GeoServer Client PHP

GeoServer Client PHP is library for interacting with the GeoServer API.

[Website](#) [Source](#) [Documentation](#)



GeoStyler

generic styler for geodata

[Website](#) [Source](#) [Documentation](#)



actinia

Actinia is an open source REST API for scalable, distributed, high performance p...

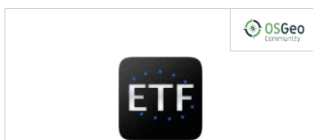
[Website](#) [Source](#) [Documentation](#)



EOEPCA+

EOEPCA+'s vision is to streamline the access to and processing of earth observat...

[Website](#) [Documentation](#)



ETF

ETF is a testing framework for validating data and APIs in Spatial Data Infrastr...

[Website](#) [Source](#) [Documentation](#)



GeoWebCache

GWC is a tile server and caching proxy written in Java.

[Website](#) [Source](#) [Documentation](#)



Giswater

An intelligent technology, free and open source for the integral water cycle man...

[Website](#) [Source](#) [Documentation](#)

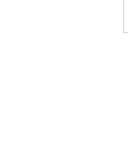
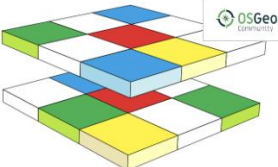


istSOS

istSOS is an OGC Sensor Observation Service server implementation written in Pyt...

[Website](#) [Source](#) [Documentation](#)

Africa-BB-Maps – Geospatial Open Source Projects

  Loader A loader for geographic data in GML and KML (that needs some preparation before ...) Website Source Documentation	  mapfish Create reports that contain maps! Website Source Documentation	  MapGuide Open Source MapGuide Open Source is a web-based platform that enables users to develop and d... Website Source Documentation	  OSSIM OSSIM is an open source, C++ (mostly), geospatial image processing library used ... Source	  OWSLib OWSLib is a Python package for client programming with Open Geospatial Consortium... Website Source Documentation	  Portable GIS GIS on a USB stick, for windows Website Source Documentation
  mappyfile A Python library to create, parse, modify, and format MapServer Mapfiles.... Website Source Documentation	  Mesh Data Abstraction Library (MDAL) Mesh Data Abstraction Library (MDAL) is a translator library for more than 15 un... Website Source Documentation	  MobilityDB An open source geospatial trajectory data management & analysis platform... Website Source Documentation	  PROJ-JNI PROJ-JNI provides a Java Native Interface for PROJ C/C++ library... Website Source Documentation	  Pronto Raster Pronto Raster is a C++ library for calculations with raster data. The library is... Website Source Documentation	  rasdaman Scalable datacube analytics Website Source Documentation
  Open Data Cube The Open Data Cube is a Python library and suite of supporting applications that... Website Source Documentation	  Opticks Opticks is an expandable remote sensing and imagery analysis software platform L... Website Source	  OSGeo4W OSGeo4W is a binary distribution of a broad set of open source geospatial softwa... Website Source Documentation	  TEAM Engine The Test, Evaluation, And Measurement (TEAM) Engine is a testing facility that e... Website Source Documentation	  TorchGeo TorchGeo: datasets, samplers, transforms, and pre-trained models for geospatial ... Website Source Documentation	  XYZ / MAPP Open source presentation, controller, domain, and service layers for cloud nativ... Website Source Documentation

Africa-BB-Maps – Geospatial Open Source Projects



Bezitopo

A land surveying CAD package under development

[Website](#) [Source](#)

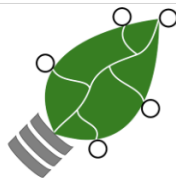


Coastal Modelling Environment

CoastalME

CoastalME (Coastal Modelling Environment) is a Free Open Source and Software for...

[Website](#) [Source](#) [Documentation](#)



DigiAgriApp

DigiAgriApp is a software solution aimed at anyone with cultivated land...

[Website](#) [Source](#) [Documentation](#)



GeoMesa

GeoMesa is an open-source, distributed, spatio-temporal database built on a numb...

[Website](#) [Source](#) [Documentation](#)



Geopaparazzi

Geopaparazzi is a tool developed to do very fast qualitative engineering/geologi...

[Website](#) [Source](#) [Documentation](#)



geOrchestra

geOrchestra is the free, modular, interoperable & secure Spatial Data Infras...

[Website](#) [Source](#) [Documentation](#)



eodash

Publish and integrate Earth Observation data in a dashboard application through ...

[Website](#) [Source](#) [Documentation](#)



EOxServer

EOxServer is a Python application and framework for presenting Earth Observation...

[Website](#) [Source](#) [Documentation](#)



ESA-NASA WorldWind

WorldWind is a free, open source API for a virtual globe. WorldWind allows devel...

[Website](#) [Source](#)



GeoTrellis

GeoTrellis is a geographic data processing library designed to work with large g...

[Website](#) [Source](#) [Documentation](#)



GeoWave

GeoWave is a software library that connects the scalability of distributed compu...

[Website](#) [Source](#) [Documentation](#)



GET-IT - Geoinformation Enabling ToolKIT starterkit®

The Geoinformation Enabling ToolKIT starterkit® (GET-IT) is the software suite f...

[Website](#) [Source](#) [Documentation](#)



First Draft GIS

First Draft GIS is an Artificial Intelligence that makes the first draft of a ma...

[Website](#) [Source](#) [Documentation](#)



Flexurba

Flexurba is an open-source R package to flexibly reconstruct the Degree of Urban...

[Website](#) [Source](#) [Documentation](#)



Geomajas - OSGeo Heritage Project

Note: This project is an OSGeo Heritage Project - it is no longer maintain...

[Source](#)



GIFramework Maps

GIFramework Maps

GIFramework Maps is a .NET based web mapping application designed and developed ...

[Website](#) [Source](#) [Documentation](#)



Giro3D

Giro3D is an open-source JavaScript framework for visualizing and interacting wi...

[Website](#) [Source](#) [Documentation](#)

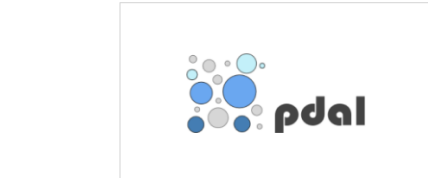
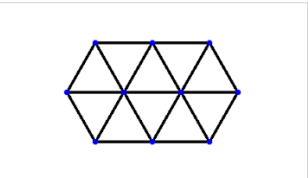
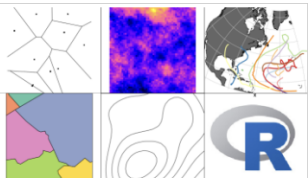
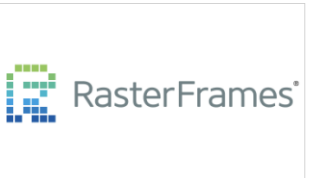
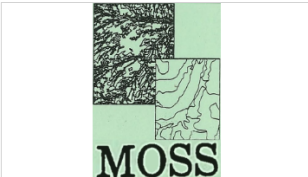
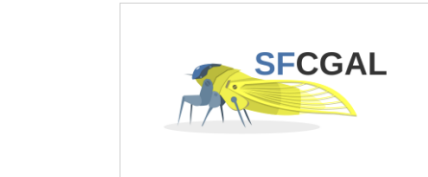
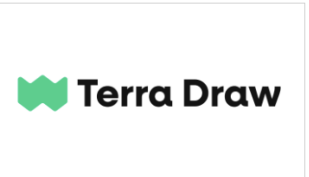


Gisquick

Let's share GIS much quicker!

[Website](#) [Source](#) [Documentation](#)

Africa-BB-Maps – Geospatial Open Source Projects

 HOT Tasking Manager The purpose of the Tasking Manager is to divide a large mapping project into sma... Website Source Documentation	 JTS Topology Suite JTS is an open source spatial library defining geometry, spatial relationships, ... Website Source Documentation	 Kaoto Kaoto is an integration editor to create and deploy workflows in a visual, low-c... Website Source Documentation	 pdal The Point Data Abstraction Library (PDAL) provides command line tools and a libr... Website Source Documentation	 PerfectTIN Converts point clouds to TINs Source	 py3dtiles Python library and command-line for 3dtiles Website Source Documentation
 Koop An Open Geospatial ETL Engine so you can leave geospatial data where it lives an... Website Source Documentation	 Leaflet Open-source JavaScript library for mobile-friendly interactive maps Website Source Documentation	 LERC Limited Error Raster Compression LERC is an open-source image or raster format which supports rapid encoding and ... Website Source Documentation	 QField Get your QGIS fieldwork done efficiently and comfortably. Website Source Documentation	 R-Spatial A set of R packages for handling and analysing spatial data, built upon OSGeo co... Website Source Documentation	 RasterFrames RasterFrames® enables analysts, data scientists and EO specialists to easily... Website Source Documentation
 Masterportal Masterportal is an open source geoviewer (WebGIS) compliant to OGC standards. It... Website Source Documentation	 MOSS Map Overlay and Statistical System (MOSS) The Map Overlay and Statistical System... Website Source Documentation	 MovingPandas Python library for movement trajectory data exploration and analysis. Website Source Documentation	 SFCGAL SFCGAL is a C++ wrapper library around CGAL (Computational Geometry Algorithms L... Website Source Documentation	 Tegola Tegola is a high performance Mapbox Vector Tile server written in Go. In a nutsh... Website Source	 Terra Draw Terra Draw is an open source JavaScript library for drawing and editing geometri... Website Source Documentation

‘Open Data applies the principles of *free and open* to geospatial data’

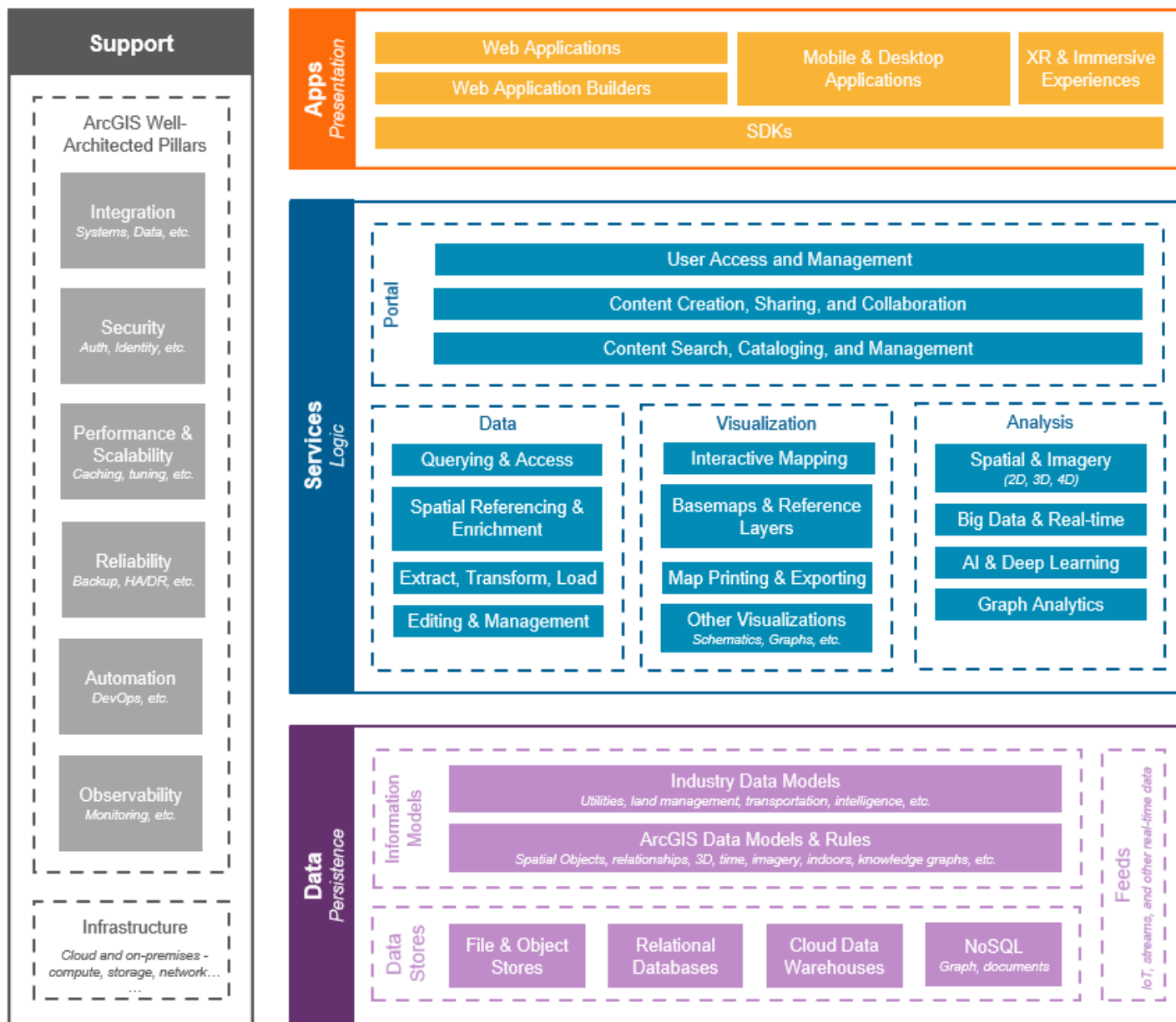
Africa-BB-Maps – Geospatial **Open Data** (Global)



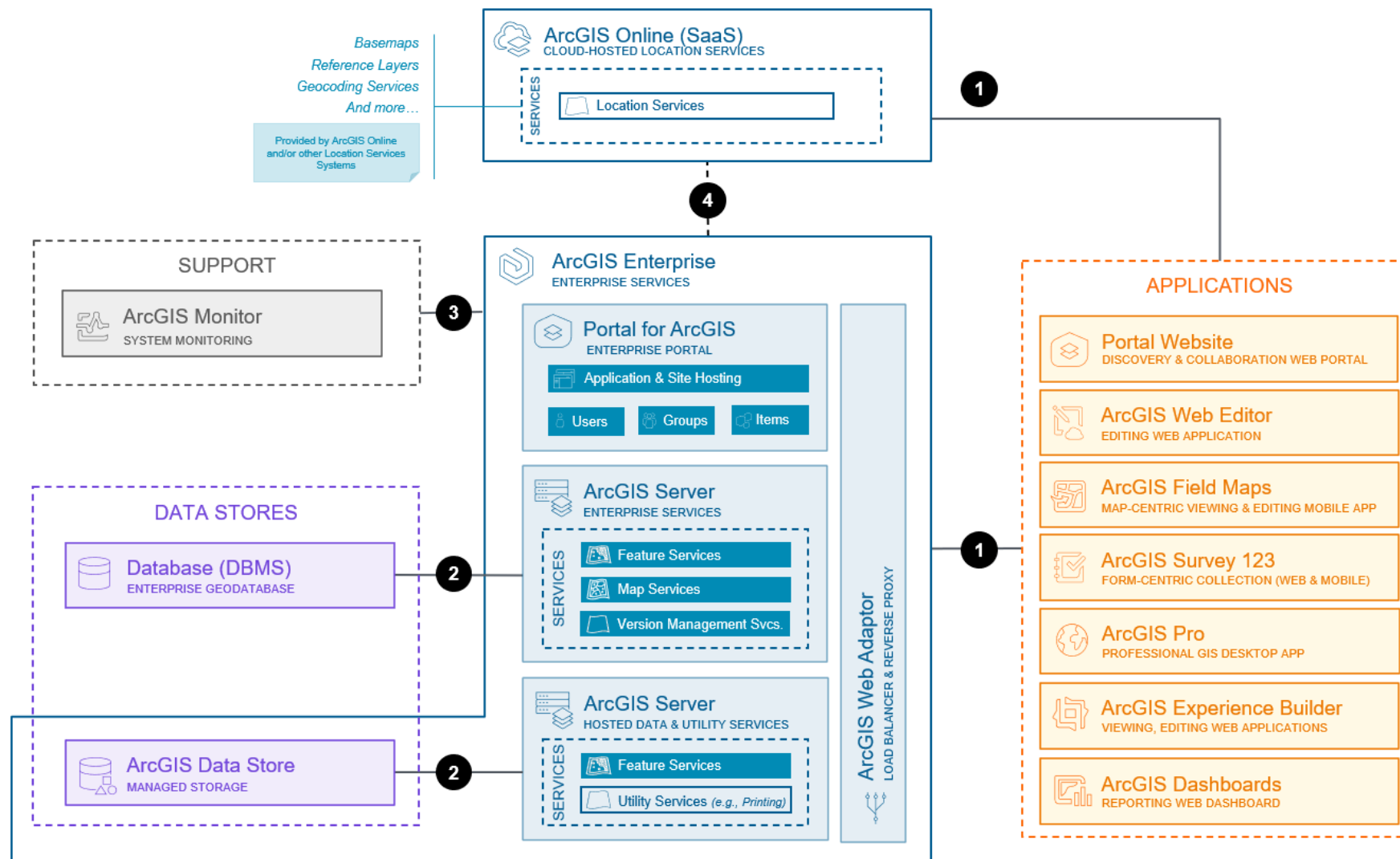
Africa-BB-Maps – Geospatial Open Data (Global)



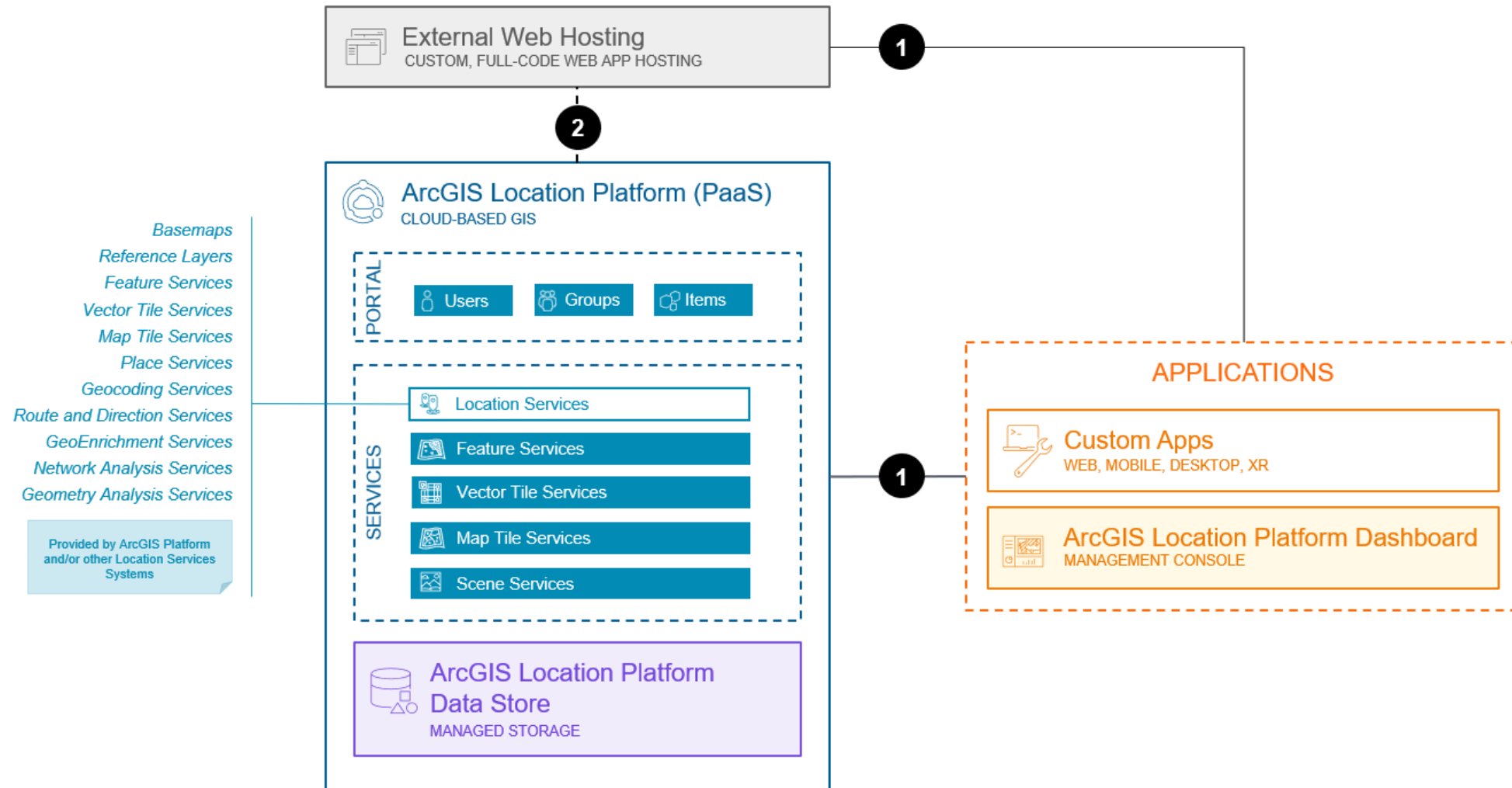
Africa-BB-Maps – ArcGIS Architecture



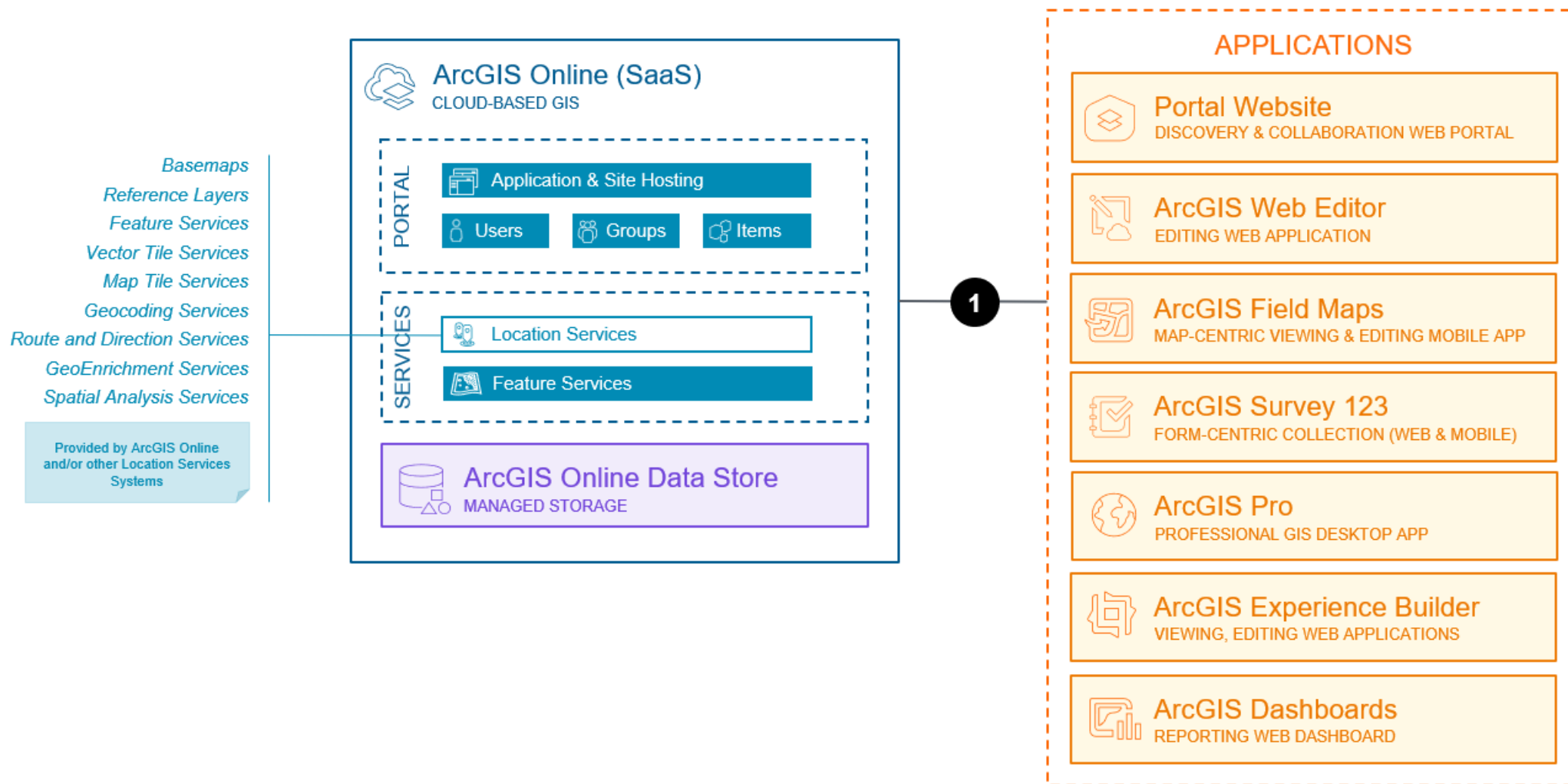
Africa-BB-Maps – ArcGIS IaaS/On-Premises



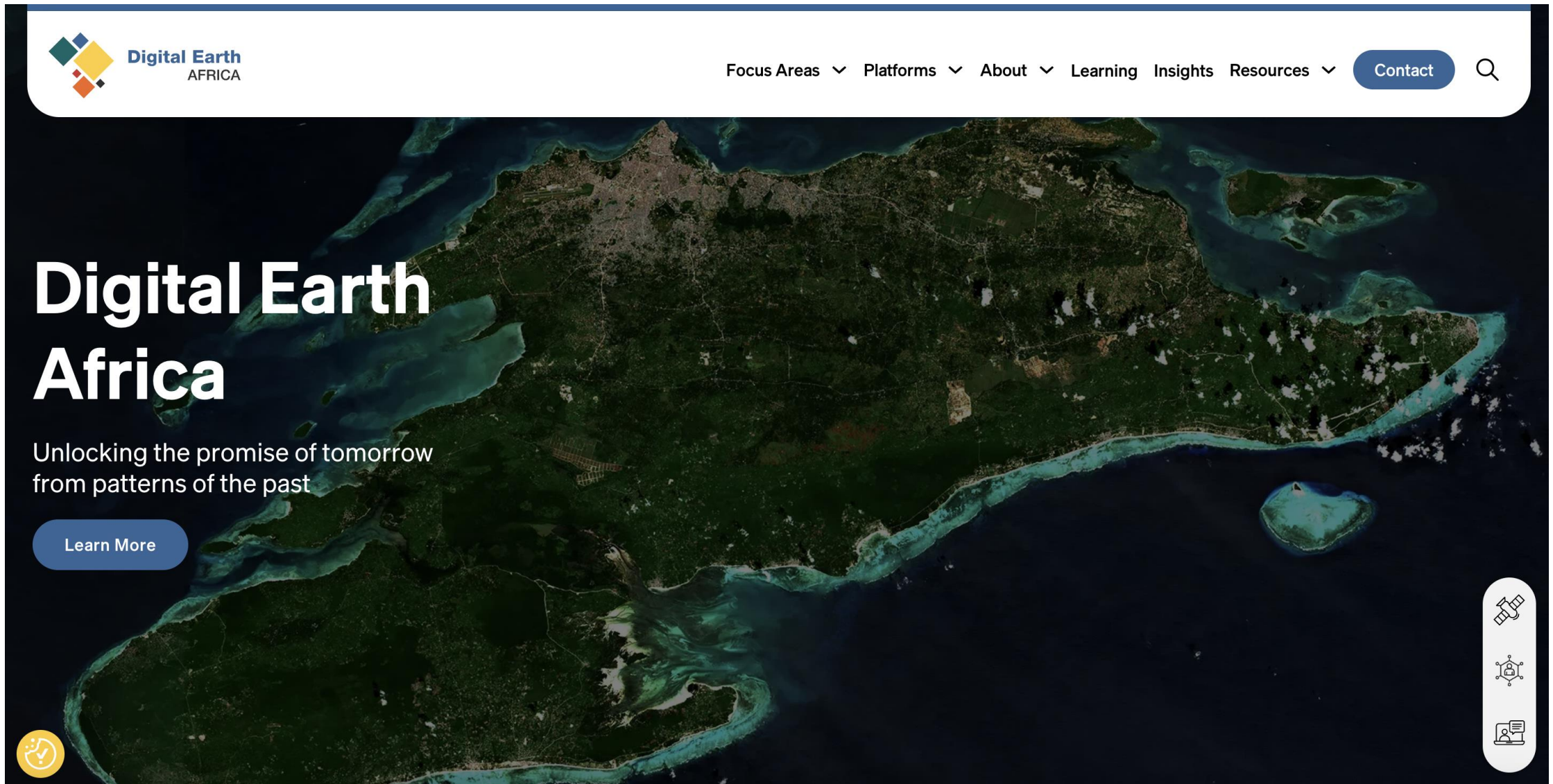
Africa-BB-Maps – ArcGIS PaaS



Africa-BB-Maps – ArcGIS SaaS



Africa-BB-Maps – Geospatial Open Data (Africa)



Africa-BB-Maps – Geospatial Open Data (Africa)

[Data Library](#)[Learning Center](#)[Geospatial Tools](#)[Community ▼](#)

The Africa GeoPortal

Inspiring communities through geography



Location intelligence is the ability to analyze and find spatial patterns in data, to provide powerful insights into understanding our world and communicating our needs. This is made possible through a combination of local data and advanced geospatial tools, along with training that's included for anyone working on geographic challenges across the continent.

[GET STARTED](#)

Africa-BB-Maps – Geospatial Open Data (Cote d'Ivoire)



Q [Sign In](#)



Le Géoportail de la Côte d'Ivoire



bnetd

Le Géoportail de la Côte d'Ivoire s'appuie sur les référentiels du BNETD et sur des producteurs de données institutionnels et privées pour vous proposer une information fiable sur le pays.

<https://www.africageoportal.com>

Q&A and Discussion for session 4

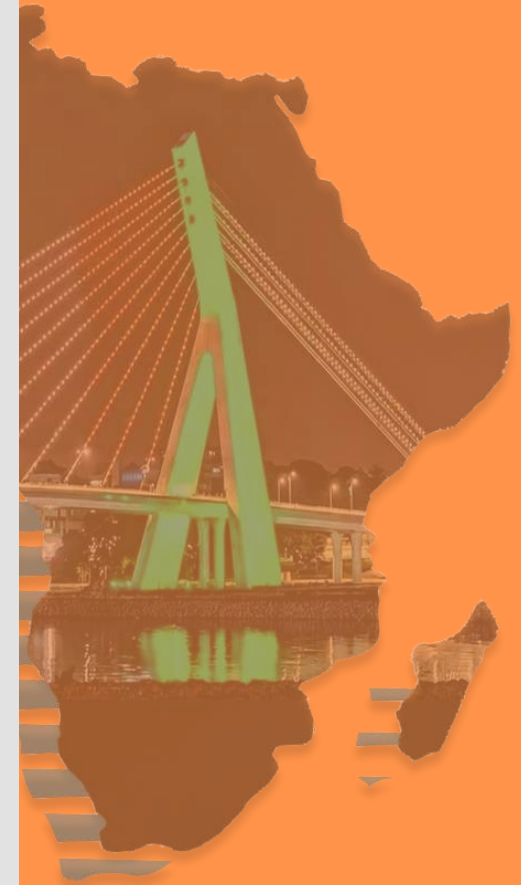
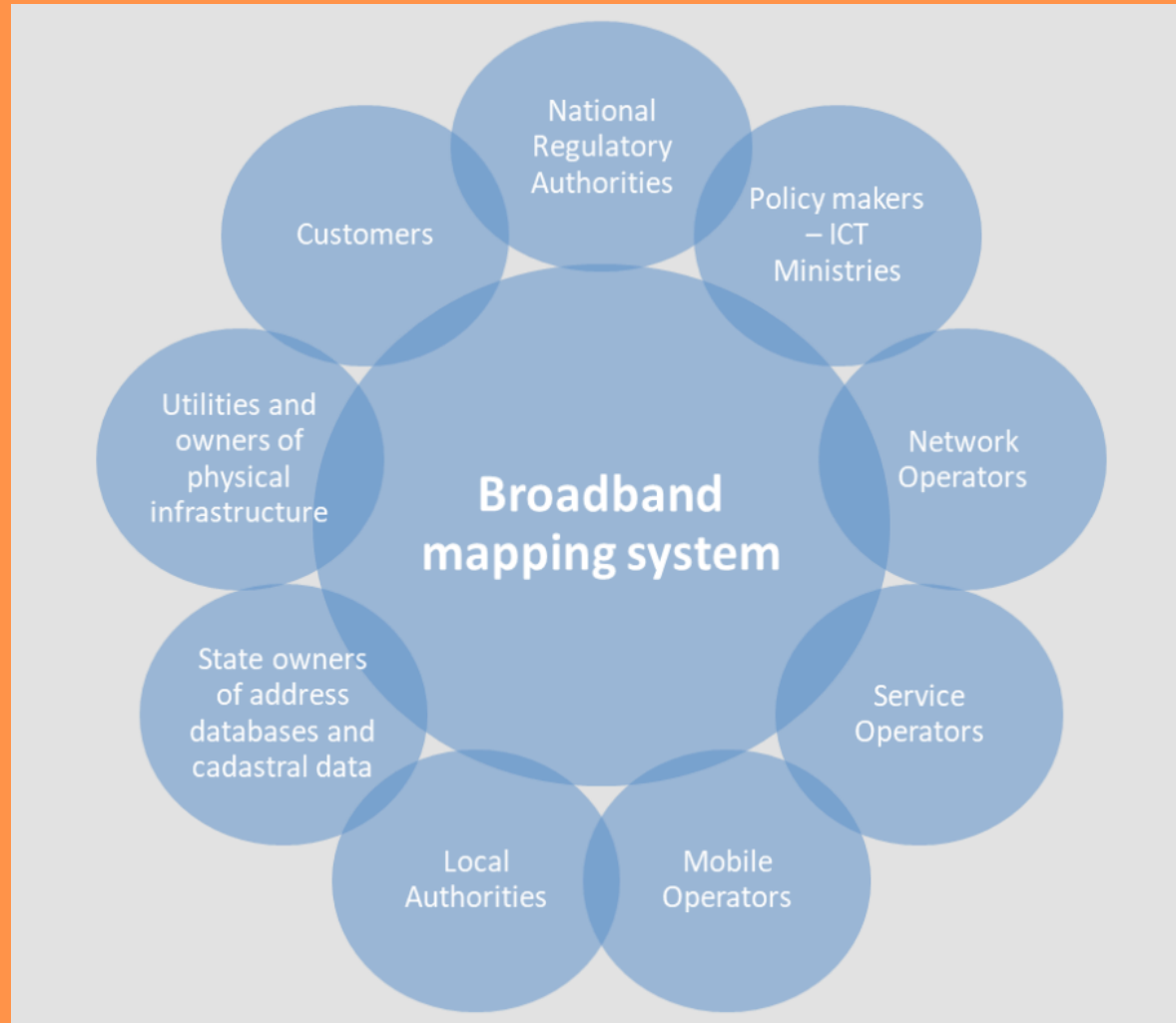
Estimated end time: 13:00



SESSION 6: Analyse approfondie des politiques : Présentation des travaux d'analyse à venir

Moderation: Mr. Elind Sulmina, Project Officer, Africa-BB-Maps, ITU





Introduction – Context – Background – Problem statement

Section	Title
1	INTRODUCTION
1.1	Background
1.2	Context
1.3	Problem statement
1.4	Purpose of the guidelines
1.5	Disclaimer

Strategies, policies and regulatory environments for broadband mapping

2.1	Strategic and policy drivers for broadband mapping
2.2	A regulatory framework for mapping
2.2.1	The EU Guidelines on State Aid for Broadband (2013)
2.2.2	The Broadband Cost Reduction Directive (2014)
2.2.3	The European Electronic Communications Code (2018)
2.3	Regulatory improvements and developments
2.3.1	Revision of the EU Guidelines on State Aid for Broadband
2.3.2	Revision of the Broadband Cost Reduction Directive
2.3.3	BEREC's implementation of the EECC
2.3.4	The European experience in the field of dispute settlement mechanism
2.4	Minimum policy and regulatory requirements to implement a broadband mapping system

Project setup and technical requirements for broadband mapping

3.1	Project setup
3.1.1	Project framework and objectives
3.1.2	Project design
3.3	Minimum technical and project requirements to implement a broadband mapping system

Project setup and technical requirements for broadband mapping

Project Management / Common Challenges

4.1	Data quality
4.1.1	Data confidentiality
4.1.2	Data sources
4.1.3	Reporting types
4.1.4	Regulation
4.1.5	Stakeholder costs

4.2 General Success Factors

- 4.2.1 Stakeholder involvement
- 4.2.2. Clear definition on types of mapping
- 4.2.3. Internal sponsorship
- 4.2.4 Efficient reporting tool
- 4.2.5 Reporting support

4.3 Long term sustainability

- 4.3.1 Investment in reporting tools
- 4.3.2 Collection tool adaptability and development
- 4.3.3 Visualisation tools
- 4.3.4 Tools' promotion
- 4.3.5 Data application
- 4.3.6 Open-source solutions
- 4.3.7 Change management

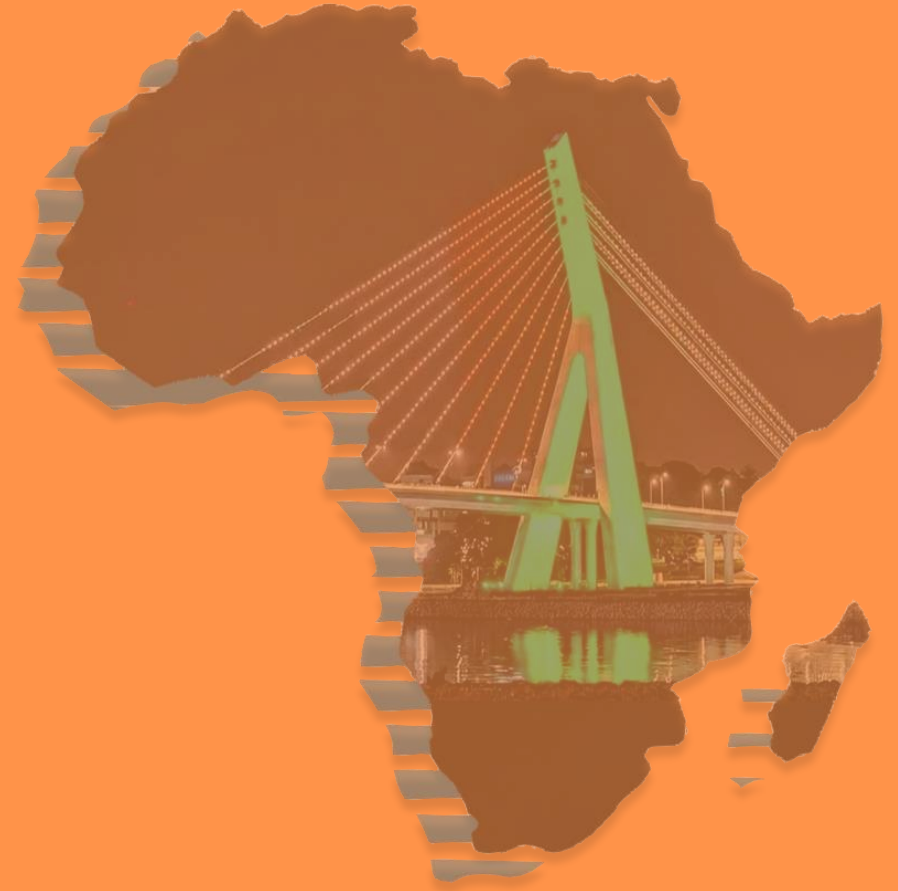
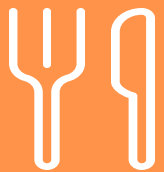
Infrastructure Mapping	Service Mapping
The activity entailing the gathering, structuring and representing: georeferenced data on passive physical infrastructure (e.g., pipes, ducts, poles, manholes, base stations, mobile towers, etc.) represented in lines and nodes; information about the type of infrastructure deployed (fiber/copper, water pipes, electricity); information about the owners of that infrastructure (fixed/mobile telecommunications, other network operators, national and local government, etc.)	The activity entailing the gathering, structuring and representing: data about service availability (including bandwidth and or type of technology used to offer the service), data about the number of broadband service offers from operators data about the estimated quality of service available for a specific address and/or a specifically defined geographical area (e.g., 100m x 100m grid)
Investment Mapping	Demand Mapping
The activity entailing the gathering, structuring and representing: data about planned investments aimed at developing broadband infrastructure and services in a defined geographical area (e.g., region, municipality), including relevant information about publicly and/or privately funded projects. Investment maps may include reports about areas characterized by market failure or sub optimal outcomes	The activity entailing the gathering, structuring and representing: data about the quantity and quality of broadband demand for bandwidth desired by the end user. the level of financial allocation foreseen in association with that given broadband fixed service.

Table 1 Four Types of Broadband Mapping Systems

Checklist 1 - Policy and Regulatory Checklist

1. Define the rationale and objectives for broadband mapping at the country level
2. Identify relevant institutions and stakeholders and their roles
3. Include the rationale and mandate in strategic documents (e.g., broadband plans, ICT strategies)
4. Provide a platform for long term engagement and consultation with all stakeholders (operators, regional and local administrations, etc.)
5. Analyse the legislative framework and propose reform as needed - Infrastructure sharing (infrastructure mapping) - Allocation of public funding (service mapping) - Objective of the map - Obligation for the authority to deliver the map - Obligation for stakeholders to provide information - Other
6. Ensure the NRA (or other Competent Authority) has the necessary mandate, budget and human resources to implement the provisions of the law
7. Define common technical definitions and methods to carry out the broadband mapping exercise. Consult with stakeholders.
8. Establish a dispute settlement mechanism fit for the national context
9. Plan regular evaluations of the mapping and of its the usefulness in fulfilling its objectives. adjust the map and any related normative provisions, if necessary, in accordance with the assessment, changes in objectives or legal/regulatory framework every 4-5 years to ensure they are fit for purpose
OUTPUT: <u>review of enabling environment and recommendations and/or report describing existing boundaries of the regulatory framework for broadband mapping</u>

Pause déjeuner



SESSION 5: Co-Creation Dialogue on Architecture, Data Sources & Technical Constraints

Moderation: Mr. Dana Jon Kamason, Project Manager, Africa-BB-Maps, ITU



2 SESSIONS: Dialogue de co-création sur l'architecture, les sources de données et les contraintes techniques



Technical Group 1

Data Quality & Verification

Key Area:

- Independent verification of coverage data (drive tests, audits, crowdsourcing).
- Automated validation checks.
- Use of GIS tools for consistency.
- Recommendations for trusted national datasets



Technical Group 2

Data Management

Key Area:

- Data Governance,
- Standardisation,
- Collection Mechanisms;
- Ongoing quality management and assurance across data lifecycle



Policy Group 1

Key Area:

- ☐ Internal, legal or policy barriers;
- ☐ Coordination challenges between data providers and ARTCI
- ☐ Data ownership and confidentiality
- ☐ Institutional limitations
- ☐ National & Regional harmonization



Policy Group 2

Pause Café

