AFRICA-BB-MAPS DATA STANDARDISATION PACK

Foundation Data Model and Schema

Component 1 · Quick Reference Guide

At a glance

What it defines. What information a national broadband mapping system holds and how it is structured logically: the feature types, attributes, code lists, geometry, topology and validation rules for regulatory reporting.

Why it matters. It is the authoritative basis of the whole pack. Where any other document, workbook or script differs from it, Component 1 prevails (Volume 1, Table 5.1).

How to use it. Read it to understand the data before designing or building anything. Volumes 1 to 3 and the workbooks reproduce its content without alteration; they never change it.

Approved title: Foundation Data Model and Schemas. Reading time for this guide: about 15 minutes.

1 The six documents of Component 1

Document	What it establishes	Status of its content
Broadband Data Standardisation Guidance and Comparative Analysis	Strategic and policy foundation: international standards, European practice, the status of the 11 beneficiary countries and strategic priorities.	Guidance
Broadband Infrastructure Network Application Schema Specification	The BroadbandNetwork application schema (ISO 19109:2025): feature types, code lists, topology, geometry, CRS, metadata and exchange formats.	Normative schema for the Infrastructure domain
Mobile Service Coverage Reporting Specification	The 100 m reporting grid on EPSG:10592, 3 mandatory and 9 optional files, coverage rules and validation rules VR-MOB-001 to VR-MOB-015. Schema identifier MOB-COV-AFR-LAEA-1.0.	Normative schema for mobile coverage (Services domain)
Regulatory Implementation Plan	Phased roll-out in four steps and two workstreams: A (infrastructure) and B (mobile coverage, dataset waves M1 to M4), with maturity levels.	Implementation roadmap
Investment Mapping Methodology	Locality-level classification into white, grey and black zones, operator investment intentions and monitoring, in ten phases.	Regulatory process; no application schema
Demand Mapping Note	How demand may be identified or inferred from population, institutions, economic activity and other indicators.	Methodological note; no data schema

2 Data domains and their functions

Information is organised in five domains. Component 1 supplies the content of two of them in full and the method for two others. Volume 1 sets out how the domains relate and gives a national structure where Component 1 sets no schema.

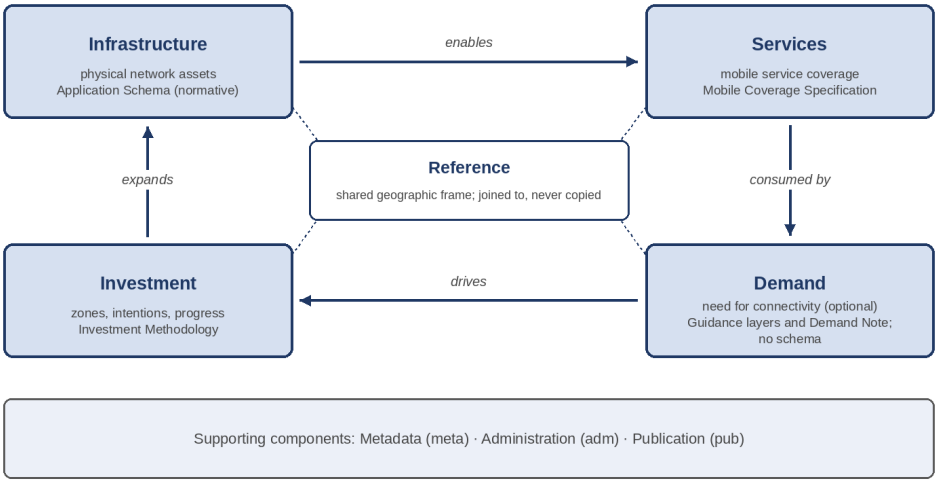

Figure 1 The five domains. The four broadband domains form a cycle; Reference is the common geographic frame to which all are related (Volume 1, clauses 20.2 to 20.4).

Domain	Function	Basis in Component 1
Infrastructure	Location, characteristics, ownership and status of physical network assets.	Application Schema: complete, normative.
Services	Availability and characteristics of broadband services. Mobile coverage is reported on a fixed grid.	Mobile Coverage Specification: complete for mobile. No fixed broadband coverage specification exists.
Investment	Locality zones, operator investment intentions and progress against them.	Investment Methodology: process and register content, described in prose.
Demand	Present and projected need for connectivity. Optional; developed once infrastructure and service data are in place.	Data Standardisation Guidance: two optional layers (end-user quality-of-service measurements, QoS3, and areas of demand interest); method in the Demand Note; no schema.
Reference	Administrative and statistical geography, settlements, localities, transport and base mapping.	None. National structure set by Volume 1, Chapter 15.

3 Core entities and how they relate

3.1 Infrastructure: the BroadbandNetwork schema

The schema is a generic network model, not one class per asset type. A node or link is classified by a code value, and type-specific attributes sit in specialisation tables that share the key of the base feature (Application Schema, Sections 4.1, 10 and 11).

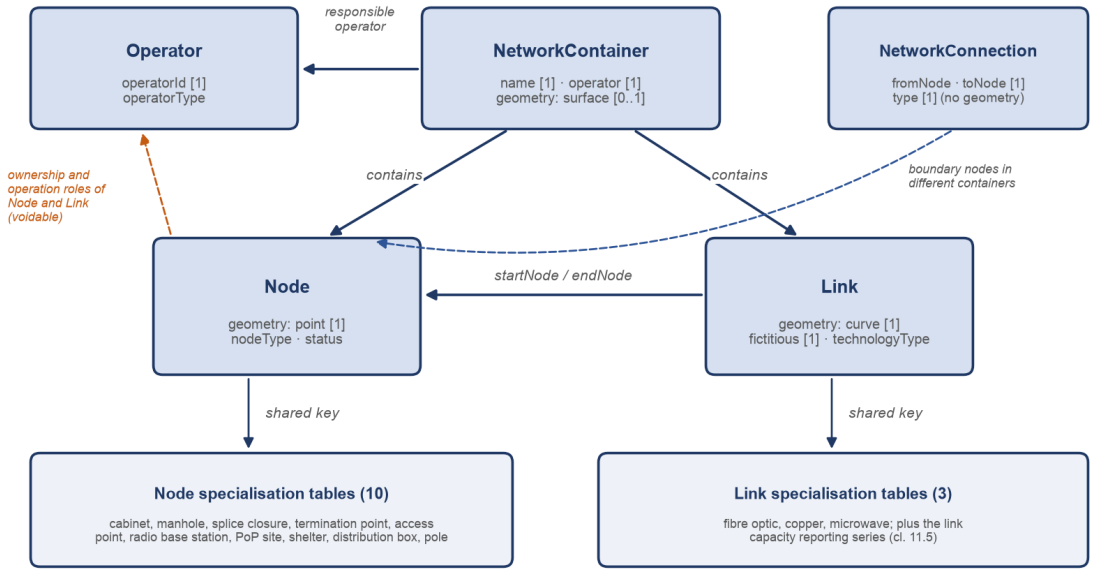

Figure 2 Simplified BroadbandNetwork model (Application Schema, Sections 5 to 7, 10 and 11). Multiplicities in square brackets.

Feature type	Represents	Geometry	Key points
NetworkElement (abstract)	Common parent	—	Supplies identifier, validFrom and validTo to Node, Link, NetworkContainer and NetworkConnection.
Node	A significant location: cabinet, manhole, base station, PoP and so on	GM_Point [1]	Classified by nodeType; carries status, sharing and ownership roles.
Link	A physical linear segment: cable, duct route, microwave hop	GM_Curve [1]	fictitious is mandatory; startNode and endNode record connectivity; container is mandatory in production submissions.
Operator	Licensed operator, or a registered host asset owner	none	Independent feature type; operatorId [1] and countryCode [1] (ISO 3166-1 alpha-2).
NetworkContainer	Named sub-network under one responsible operator	GM_Surface [0..1], informative	The only source of the responsible operator. Flat: containers are never nested.
NetworkConnection	Directed topological edge between boundary nodes of two containers	none	fromNode, toNode and type are mandatory; it is not a physical asset.

3.2 Services, Investment and Demand

- **Mobile coverage (Services).** The 100 × 100 m grid cell is the atomic unit. Every record joins to a cell by `grid_id`, and coverage is reported per technology (2G to 5G) and per service type independently. Cell identity is computed, not assigned: `LAEA100M_{col}E_{row}N`, from origin X0 = Y0 = −6,000,000 m (Mobile Specification, Sections 6 to 9).
- **Investment.** The unit of record is the locality, held in the national locality register. Per locality, operators report current coverage and investment intentions; the NRA grades credibility (A to E) and classifies the locality white, grey or black against a national threshold profile (Methodology, Phases 1 to 10).
- **Demand.** No entities are defined by Component 1. Volume 1, Chapter 18 sets a national structure that may be deferred without affecting conformance.

4 Important attributes and definitions

Attribute	Definition and rule
identifier	Voidable [0..1]; recommended. Persistent identifier of the real-world asset assigned by the data provider: canonical lowercase UUID, preferably UUIDv7. Kept separate from the database key; never a sequence number or geometry-derived value (Section 5.11).
validFrom / validTo	Real-world start and end of the feature's existence. Not database record versioning, which Volume 1 handles with record_valid_from and record_valid_to.
fictitious (Link)	True when the provider holds no as-built geometry. It does not mean the asset is hypothetical. geometrySource adds finer provenance (Survey, GNSS, Digitised and so on).
nodeType, technologyType, status	Classification of nodes and links, bound to NodeTypeValue, LinkTechnologyTypeValue and NodeStatusValue or LinkStatusValue.
container	The NetworkContainer of a node or link. Operator context is derived through it: Link → NetworkContainer → Operator.
Ownership roles	supportingInfrastructureOwner, transmissionMediumOwner and networkProvider. They record sharing but never assign a node or link to an operator for reporting; where absent, the responsible operator holds the role (Section 5.5.1).
coverage_flag	Output of classification: 1 only if covered_area_pct and service_success_probability_pct both meet the thresholds of the referenced rf_threshold_id. The two percentages are inputs (Mobile Specification, Section 12).
source_type	Basis of coverage data: Simulation, Measurement, Hybrid, OperatorDeclared, RegulatorMeasured or Crowdsourced. Crowdsourced may not be the sole source for a mandatory file.

Voidable means the value may be absent. In GML, GeoJSON and JSON exchange files an absent voidable value is omitted entirely, never encoded as null or an empty string (Application Schema, Section 4.1).

5 Keys and identifiers

Level	Key	Rule
Conceptual (Component 1)	identifier; operatorId; grid_id; locality_id	identifier identifies the asset across submissions. operatorId is mandatory for every operator; a host asset owner without a regulatory identifier receives one from a reserved national range. grid_id is deterministic from position. locality_id identifies a locality in the national register.
Associations	startNode, endNode, container, operator, fromNode, toNode	Conceptual association roles. In the database they become foreign keys, with the physical names set by Volume 1, clause 28.2: start_node, end_node, container_ref.
Physical (Volume 1)	feature_id	The database primary key, of the form <country>-<domain>-<uuid>. Distinct from identifier, which is kept alongside it and is the value exchanged.

Names exist at three levels (Application Schema, Section 4.4): PascalCase and lowerCamelCase conceptual names, the same names in exchange encodings, and snake_case physical names in the database. A physical name is an alias, recorded in the name mapping required by Volume 1, clause 26.5.

6 Code lists and controlled vocabularies

Code list	Values
NodeTypeValue	Cabinet, Manhole, SpliceClosure, TerminationPoint, AccessPoint, RadioBaseStation, PopSite, Shelter, DistributionBox, Pole, Pillar, TopologicalNode, Other
NodeStatusValue / LinkStatusValue	Operational, UnderConstruction, Planned, Decommissioned, Suspended, Unknown
LinkTechnologyTypeValue	FibreOptic, Coaxial, CopperTwisted, MicrowaveLink, FreeSpaceOptic, PowerLineComm, Other
InstallationMethodValue	Trench, Duct, CableDuct, Suspended, Shaft, Tunnel, MultipurposeGallery, SubseaCable, Other
OperatorType	FixedBroadband, MobileBroadband, FixedAndMobile, WholesaleInfrastructure, PassiveInfrastructure, Virtual, HostAssetOwner, Other
ContainerType · ConnectionTypeValue	Backbone, Backhaul, Access, OperatorNetwork, Other · boundaryConnected, boundaryIdentical, interOperatorHandover, interOperatorCoLocation, geographicBorderCrossing
Other infrastructure lists	TechnologyGenerationValue, SupportTypeValue, GeometrySourceValue, SharingTypeValue, CodeploymentValue (Application Schema, Section 5.9)
Mobile coverage lists	TechnologyValue (2G, 3G, 4G, 5G); ServiceTypeValue (voice, sms, mms, internet, broadband, emergency); SourceTypeValue; LoadAssumptionValue (NoLoad is the default for regulatory mapping); EnvironmentValue; CoverageRuleValue; SpeedClassValue (Mobile Specification, Sections 26 and 27)

Code values are used exactly as published. All Application Schema code lists except CodeploymentValue (closed) are extensible: Other and registered values are permitted, and validation warns rather than rejects on an unrecognised value (Section 5.9). Extensions add code values, voidable attributes or specialisation tables, so that existing datasets remain valid (Application Schema, Section 4.3). How each list is enforced in the database is set out in Volume 3 and the workbooks.

7 Geometry and spatial requirements

Subject	Requirement
Node	GM_Point, mandatory. Specialisation tables carry no geometry.
Link	GM_Curve, mandatory, normally a LineString. One continuous segment per Link; a run crossing a container boundary is split at a boundary node.
NetworkContainer	GM_Surface, optional and informative only. Never an as-built boundary.
Exchange CRS (infrastructure)	EPSG:4326 or EPSG:10592, declared in metadata and in the encoding. One CRS per dataset. Precision of at least 6 decimal places (4326) or 2 decimal places in metres (10592).

Subject	Requirement
Mobile coverage CRS	EPSG:10592 for all authoritative files (GeoJSON visualisation products excepted, Section 31): WGS 84 / GLANCE Africa, Lambert Azimuthal Equal Area, latitude of origin 5° N, longitude of origin 20° E. GeoTIFF files embed it.
Database storage	EPSG:10592 in every environment (Volume 1, clause 43.5); data received in another CRS is transformed and the operation recorded.

8 Principal integrity and validation rules

- In production submissions every Link carries its NetworkContainer (VR-LINK-001); otherwise the metadata explains why operator attribution is unavailable.
- A Link does not span a container boundary. Where no equipment exists at the crossing, the provider creates a boundary Node with nodeType TopologicalNode.
- A NetworkConnection joins two distinct nodes in different containers. Containers are not nested.
- An operator registered as HostAssetOwner is never the responsible operator of a container and never a networkProvider.
- Topology availability (complete, partial or absent) is stated in metadata for intra-container and cross-container topology.
- A mobile submission lacking any of its three mandatory files is rejected. mobile_thresholds.csv accompanies every service coverage file, and a manifest accompanies any GeoTIFF.
- The RF metric must match the technology (VR-MOB-005); speed class is populated only for internet and broadband services (VR-MOB-004).
- Only the version combination MOB-COV-AFR-LAEA-1.0, THR-V1 and GRID-AFR-LAEA-1.0 is conformant.

9 How Component 1 underpins the other components

Component	What it takes from Component 1
Volume 1 (Component 2)	Reproduces feature types, attributes and code values without alteration. Gives them physical names as aliases and places them in schemas and feature datasets. Adds management attributes such as feature_id.
Volume 2 (Component 3)	Files received under the schemas, such as operator submissions, are held unaltered in 1_receive.
Volume 3 and workbooks (Component 4)	The Infrastructure and Service workbooks are projections of Component 1: rows reproducing it are marked Projected, management attributes Derived. Database objects should be generated from them (P-22) rather than transcribed, and generated scripts are never edited by hand.

Where to find the detail

Feature types: Application Schema, Section 5 · Code lists: 5.9 · Topology: 7 · Geometry and CRS: 8 and 9 · Specialisation tables: 10 and 11 · Exchange formats: 13 · Scope: 16.

Mobile grid and identifier: Mobile Specification, Sections 6 to 9 · Coverage rule: 12 · Files: 13 to 25 · Validation rules: 30 · Versions: 33.

Roll-out by step and wave: Regulatory Implementation Plan, Sections 4 to 8 · Zones and phases: Investment Methodology, zone definitions (4.1 to 4.3), Methodology Phases and locality schemas (7.1 to 7.3).