National Digital Addressing System

Proposed Implementation Framework Based on Addressa Technology

Introduction:

The deployment of Addressa at national scale represents the establishment of a comprehensive digital addressing infrastructure rather than the introduction of a standalone address coding application.

The proposed implementation combines Addressa's precise geographic addressing technology with a nationally operated registration platform, sovereign data infrastructure, a centralized address registry, secure institutional APIs, and administrative management capabilities.

This integrated approach enables the national postal operator or government to establish a sustainable digital addressing ecosystem serving citizens, businesses, public institutions, and the wider digital economy.



1. Executive Overview

A national digital addressing project involves substantially more than generating unique digital location codes. Successful implementation requires an integrated technology, infrastructure, operational and governance ecosystem.

Addressa provides the core digital addressing technology, assigning a unique 10-character code and corresponding QR code to any geographic location globally. National deployment additionally requires a public registration platform, authoritative address registry, in-country infrastructure, APIs and administrative capabilities.

- ✓ ***National data sovereignty***: sensitive registration data is stored, processed and backed up within the country under national control.
- ✓ ***Centralized infrastructure***: a nationally managed registry is the authoritative source for registered digital addresses.
- ✓ ***Universal accessibility***: appropriate public and institutional interfaces serve residents, businesses and government agencies.
- ✓ ***Interoperability***: secure APIs support approved government, postal, logistics and commercial applications.
- ✓ ***Scalability and sustainability***: the platform supports nationwide adoption and long-term operation.

2. National Digital Addressing Ecosystem

Users (citizens, residents, businesses and government agencies) access a branded public portal or approved institutional systems through secure authentication and APIs. The national platform combines the Addressa code and QR engine, registration portal, address registry, verification and administration, API gateway, and GIS management. All sensitive registry data and backups are maintained in nationally controlled infrastructure. Authorized downstream consumers include postal and courier services, government agencies, banks, e-commerce platforms and other approved partners.

3. Detailed Implementation Components

Component A — Core Digital Addressing Technology

Subcomponent	Description
A1. Addressa Addressing Engine	Identifies locations through unique 10-character digital codes
A2. QR Code Generation	Generates QR codes corresponding to digital locations for sharing, scanning and printing.
A3. Address Search & Resolution	Allows authorized applications to find and resolve codes into map locations.
A4. National Geographic Coverage	Supports locations across the country, including urban, rural and remote areas.

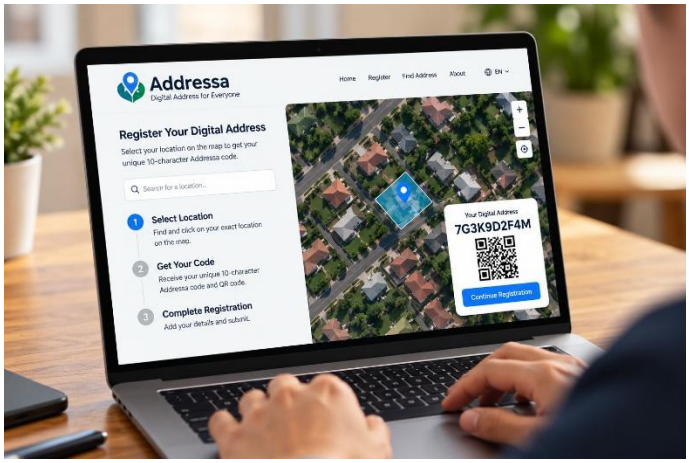
Implementation note: Geographic codes exist independently of registration. A registration creates an authorized record associated with an existing location, rather than generating the underlying cell.



Component B — Public Digital Address Registration Platform

Subcomponent	Description
B1. Customized Public Web Portal	Nationally branded public website using a domain or subdomain selected and controlled by the client.
B2. User Registration & Accounts	Account creation, authentication and management for individuals and businesses.
B3. Map-Based Address Selection	Interactive map for choosing the relevant 3 m × 3 m cell and obtaining its code.
B4. Address Registration	Associates a selected code with permitted address details such as building, floor, unit, contact and business information.
B5. Address Verification	Supports identity-system, documentary, postal or field verification, according to national policy.
B6. Multiple Address Management	Supports residential, business and secondary address records per account.
B7. Digital Address Certificate	Downloadable or printable record containing the digital code, QR code and permitted information.
B8. Address Updates & Corrections	Permits updates and corrections subject to defined workflows and authorization.
B9. Multilingual Interface	Supports official and additional client-selected languages.
B10. Notifications	SMS, email or other permitted registration, verification and update notifications.
B11. Responsive Website	Provides primary functions on smartphones and tablets without requiring a dedicated app.

Implementation note: The client must define whether addresses are activated directly by users or only after institutional approval; the platform should support either method.



Component C — National Address Registry & Database

Subcomponent	Description
C1. Central Address Database	Stores registered digital addresses, coordinates, reference data and permitted attributes.
C2. Address-to-User Association	Manages relationships between locations and authorized persons or organizations.
C3. Administrative Boundaries	Links addresses to regions, municipalities, districts and other jurisdictions.
C4. Traditional Address Linkage	Associates codes with street names, building numbers and existing postal codes.
C5. Address Lifecycle Management	Tracks registration, verification, correction, deactivation and record history.
C6. Data Import & Migration	Imports relevant legacy records from existing postal, municipal and governmental systems.
C7. Data Quality Management	Detects incomplete, outdated, duplicate or conflicting records.
C8. Audit & History	Records changes, timestamps and responsible actors.
C9. Backup & Data Recovery	Supports protected backup copies and restoration of registry records.

Implementation note: A geographic cell, a service address and an associated person or company are distinct records. Multiple legitimate users can share a location without exposing private data.



Component D — Local Hosting, Hardware & ICT Infrastructure

Subcomponent	Description
D1. National Hosting Facility	Government, postal or approved domestic data center that houses the production environment.
D2. Application Servers	Physical or virtual capacity for public, administrative and integration applications.
D3. Database Servers	Computing and storage resources dedicated to the registry and related databases.
D4. Data Storage	Expandable secured storage for records, geographic datasets and logs.
D5. Network Equipment	Routers, switches and communications connectivity for the platform.
D6. Firewalls & Security	Network protection, segmentation and control of malicious or unauthorized traffic.
D7. Load Balancing & Scalability	Capacity to handle rising registrations, lookups and API transactions.
D8. Backup Infrastructure	Automated encrypted backups stored in-country.
D9. Disaster Recovery Site	Physically separate domestic recovery infrastructure.
D10. Power & Environmental Protection	UPS, backup power, cooling and on-site physical controls where appropriate.
D11. Infrastructure Monitoring	Observability for capacity, availability, networking and system health.
D12. Domain & DNS Management	Client-selected domain and secure DNS administration.

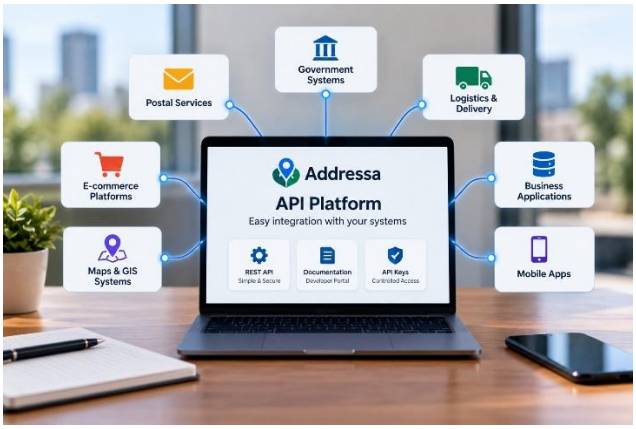
Implementation note: Domestic hosting may use government-owned servers, colocated dedicated hardware, or domestic private-cloud infrastructure. Sovereignty requirements should also cover keys, administrators, subcontractors and backup locations.



Component E — API Platform & Third-Party Integration

Subcomponent	Description
E1. National API Gateway	Single controlled entry point for external institutional services.
E2. Address Lookup API	Resolves codes to locations and appropriately disclosed attributes.
E3. Address Validation API	Separately checks code validity and registration/verification status.
E4. Registration Integration API	Controlled registration, update and verification services for trusted institutions.
E5. Postal & Logistics Integration	Connects parcel, courier, sorting and delivery systems.
E6. Government Integration	Interfaces with authorized municipal and government service systems.
E7. Commercial Integration	Interfaces with approved e-commerce, banking, utilities and other businesses.
E8. API Security	Authentication, access tokens, authorization, rate limits and safeguards.
E9. Developer Portal	Technical documentation, sandbox and integration examples.
E10. Usage Monitoring	Transaction, performance, reliability and usage analytics.
E11. Service Management	Quotas, access plans, service levels and optional subscription pricing.

Implementation note: Recommended API access tiers: (1) public non-sensitive geographic lookup, (2) government and postal access to approved operational data, and (3) controlled commercial access. Never make personal registration information publicly retrievable via code or QR scan.



Component F — Government Administration, GIS & Operational Management

Subcomponent	Description
F1. National Administration Dashboard	National oversight of registrations, verification, accounts and operations.
F2. Regional Administration	Jurisdiction-limited interfaces for local governments and postal branches.
F3. Role-Based Access Control	Permissions for national, regional, field and support roles.
F4. GIS Management Interface	Maps registered locations and administrative geographic layers.
F5. Approval Workflow	Reviews registrations requiring institutional confirmation.
F6. Conflict Resolution	Resolves competing applications and erroneous or overlapping associations.
F7. Field Verification Workflow	Allows authorized staff to confirm locations and submit evidence.
F8. Reporting & Statistics	Reports adoption, registration progress and verification coverage.
F9. Institutional Accounts	Onboards and manages organizational users and service partners.
F10. Audit & Compliance Dashboard	Tracks administrative activity and misuse indicators.

Implementation note: Coverage reports should distinguish registered geographic locations from registered households or population coverage.



Component G — Cybersecurity, Governance, Training & Long-Term Operations

Subcomponent	Description
G1. Cybersecurity Framework	Security controls for applications, networks, data and organizational processes.
G2. Data Protection & Privacy	Data collection, sharing, correction, retention and deletion policies.
G3. National Governance & Ownership	Roles and accountability for registry owner, operating agency and suppliers.
G4. Registration & Verification Policy	Eligibility, verification rules, appeals and dispute-resolution procedures.
G5. Testing & Acceptance	Functional, integration, security, performance and user acceptance testing.
G6. Training & Knowledge Transfer	Training programs for administrators, IT staff, postal operators and field personnel.
G7. Public Awareness & Adoption	Communications and support to drive broad national uptake.
G8. Technical Support & Helpdesk	Operational assistance for the public and partner institutions.
G9. Maintenance & Updates	Security patching, corrective maintenance and application upgrades.
G10. Service-Level Agreements	Uptime, support response targets and responsible parties.
G11. Business Continuity	Recovery procedures, continuity plans and regular restoration drills.
G12. Legal & Regulatory Alignment	Compliance with national privacy, cybersecurity and administrative rules.

Implementation note: Define the government entity that owns the authoritative national address registry and controls authorized access. Align baseline security practices with recognized government-security frameworks and local laws.

4. Implementation Priorities

The national project can be delivered in three stages. Governance, privacy, cybersecurity and basic operational support must start with the first stage.

Phase 1 — National Core System

Establish the operational foundation and enable public registration.

- Addressa engine and QR codes
- National registration website
- Central address registry
- In-country hosting and backups
- Basic administration and GIS functions
- Core lookup and validation APIs
- Identity, privacy, security and verification controls
- Initial support processes

Phase 2 — Institutional Integration

Expand institutional use and nationwide adoption.

- Postal and logistics integration
- Government and commercial APIs
- Regional administration and field verification workflows
- Migration of existing address databases
- Advanced GIS reporting
- Staff training and national awareness campaigns
- Enhanced monitoring and disaster recovery

Phase 3 — Advanced Services

Add capabilities according to client priorities and demand.

- Advanced analytics and reporting
- Commercial API plans and subscriptions
- Extended institutional integrations
- Additional workflow automation and data quality capabilities

5. Proposed Division of Responsibilities

The following indicative model distinguishes Addressa licensing from implementation of the wider national solution. Responsibilities should be contractually agreed with each client.

Deliverable	Proposed responsible party
Addressa core technology	Onyx Space
Technology licensing and updates	Onyx Space
Public portal customization	Onyx Space or selected implementation partner
National registry implementation	Implementation partner under client oversight
Domestic infrastructure and hosting	Client or local ICT provider
GIS services	Onyx Space
API development	Onyx Space
Government and postal integrations	Local systems integrator with relevant agencies
Verification and registration governance	National authority and authorized agencies
Training, maintenance and support	Onyx Space, local partner and/or client IT team
National administration and data governance	Client-designated national authority

This structure allows Onyx Space to provide core technology and potentially act as lead integrator, while local providers and the client retain responsibility for designated infrastructure and operational functions.

6. Hardware Requirements

Proposed Hardware Specifications for National Digital Addressing System

The following is a preliminary hardware configuration for hosting the Addressa national digital addressing platform, including public registration, the national address registry, GIS services, APIs, and government administration.

#	Hardware Component	Qty.	Generic Technical Specifications
1	Application Servers	2	Rack-mounted servers, 16-core CPU, 64 GB RAM, 2 × 960 GB enterprise SSD, dual 10 GbE ports.
2	Database Servers	2	Rack-mounted servers, 24-core CPU, 128 GB RAM, 4 × 1.92 TB enterprise SSD, RAID 10, dual 10 GbE.
3	GIS / Mapping Server	1	16-core CPU, 64 GB RAM, 2 × 1.92 TB SSD, 10 GbE connectivity.
4	API & Integration Server	1	16-core CPU, 64 GB RAM, 2 × 960 GB SSD, dual 10 GbE connectivity.
5	Central Storage System	1	Enterprise NAS/SAN, 20 TB usable capacity, redundant controllers or equivalent high-availability design, RAID protection.
6	Backup Server & Storage	1	8-core CPU, 32 GB RAM, minimum 40 TB usable backup storage, automated encrypted backups.
7	Network Firewall	2	Next-generation firewalls, high-availability configuration, minimum 2 Gbps inspected throughput, VPN and intrusion prevention.
8	Network Switches	2	Managed 24-port switches, 10 GbE uplinks, VLAN and redundancy support.
9	Load Balancer	2	Virtual or hardware appliances supporting HTTPS traffic distribution, SSL/TLS termination, and health monitoring.
10	Server Rack & Accessories	1–2	Standard 42U rack cabinets, PDUs, cable management, and ventilation accessories.
11	UPS System	1–2	Online UPS, approximately 10–15 kVA total capacity, sized for installed equipment and required backup duration.
12	System Monitoring & Management	1	Virtual machine or dedicated server, 8-core CPU, 32 GB RAM, 500 GB SSD for infrastructure monitoring and logging.

Estimated infrastructure requirements

Parameter	Preliminary Estimate
Physical servers	7–8
Initial database capacity	5–10 TB usable
Central shared storage	20 TB usable
Backup storage	40 TB usable
Internet connectivity	200 Mbps–1 Gbps, scalable
Internal network	10 Gbps
Operating environment	Linux-based virtualization and database infrastructure
Availability target	99.9% or higher
Expansion capability	Additional servers and storage without major redesign

Additional considerations

1. National data sovereignty: All production databases, backups, and sensitive registration information should remain within the country's territory.

2. Server virtualization: Multiple services can run on virtual machines, reducing the number of physical servers and overall infrastructure costs. The quantities above represent a preliminary dedicated-server configuration.

3. Disaster recovery: A secondary domestic location is recommended for disaster recovery. This would require additional infrastructure and is not included in the quantities above.

4. Existing infrastructure: If the postal operator or government already operates a suitable data center, the system can be deployed using its existing servers, networking, storage, and security infrastructure.

5. Scalability: Hardware capacity should be finalized based on the expected number of users, concurrent registrations, API transactions, geographic datasets, and retention requirements.

7. Public Awareness & Marketing Campaign

The successful implementation of a National Digital Addressing System requires a coordinated public awareness and marketing campaign led by the designated government authority or national postal operator. The campaign should introduce the Addressa-powered system to citizens, businesses, and public institutions, explain its practical benefits, and encourage nationwide registration and adoption. A consistent national identity, recognizable slogan, and simple messaging should be developed to position digital addressing as an essential public service that makes every location easier to identify, find, and access.

Traditional Media Campaign: The authorities should launch a nationwide communication campaign using television, radio, newspapers, outdoor advertising, and local community media. Short television advertisements and informational videos should demonstrate how a unique 10-character digital address and QR code can simplify parcel deliveries, help visitors locate homes and businesses, and support access to public and emergency services. Particular attention should be given to rural and underserved communities where conventional addressing may be incomplete or unreliable. Local municipalities, postal branches, and community leaders should actively participate in promoting the system and assisting residents with registration.



Social Media & Digital Marketing: A parallel digital campaign should be implemented across widely used platforms such as Facebook, Instagram, TikTok, YouTube, and other locally popular networks. Short educational videos, animated demonstrations, practical examples, and step-by-step registration tutorials should explain how citizens can obtain, use, and share their digital addresses. Paid social media advertising can target different regions and demographic groups, while partnerships with local content creators, businesses, delivery companies, and community organizations can help expand public engagement. All communication materials should direct users to the official national digital addressing registration portal.

Community Engagement & Adoption: Beyond traditional and digital advertising, the campaign should include practical demonstrations, community registration events, and public information sessions. The initial pilot community, where residents receive their digital addresses and physical QR-code plaques, can serve as a visible success story for the national rollout. The authorities should document and promote real-life examples of digital addressing in postal deliveries, e-commerce, municipal services, and everyday navigation. Campaign effectiveness should be monitored through registration numbers, website traffic, public engagement, and geographic adoption rates, allowing promotional activities to be adjusted as implementation progresses.

The primary campaign message should be simple: Every location has a digital address. Register yours, share it, and make your location easier to find.

Pilot Project – Community-Level Digital Addressing Implementation

Objective



As part of the national digital addressing implementation, it is recommended to conduct a pilot project in a selected local community to demonstrate the practical application of the Addressa system and evaluate its effectiveness before nationwide deployment.

The pilot will establish a fully operational digital addressing model within a defined geographical area, where residential buildings, commercial establishments, and public facilities will be registered in the national digital addressing platform and assigned their corresponding unique 10-character Addressa codes and QR codes**.**

Each registered building entrance will receive a physical PVC address plaque displaying its digital address and QR code, allowing residents, postal operators, delivery companies, emergency services, and visitors to easily identify and locate the premises.

The pilot will serve as a practical demonstration of the national digital addressing ecosystem, including public registration, address verification, digital code generation, physical address identification, and operational usage.

Scope of the Pilot Project

1. Selection of the Pilot Community

In coordination with the national postal operator or designated government authority, a suitable community, municipality, village, or urban district will be selected for the pilot implementation.

The selected area should preferably represent typical local addressing challenges and include residential properties, businesses, public institutions, and locations with incomplete or inconsistent traditional addresses.

The geographical boundaries, estimated population, number of buildings, and expected registration volume will be established before implementation.

2. Community Mapping and Preparation

The selected community will be mapped using available geospatial data and satellite imagery to identify residential buildings, commercial establishments, public facilities, roads, and building entrances.

The corresponding Addressa digital codes will be identified for relevant locations, providing the geographical foundation for the registration process.

3. Resident and Property Registration

A field registration campaign will be organized to register residents, households, businesses, and public institutions within the selected community.

Authorized registration personnel will assist residents in identifying their locations and registering their digital addresses through the national registration platform.

Each registration will associate the selected Addressa code with the relevant address information, including building number, apartment or unit details where applicable, and other information required by the national authority.

Appropriate procedures will be established to verify registration information, manage multiple households within the same building, and prevent incorrect or conflicting registrations.

4. Digital Address and QR Code Issuance

Upon completion of registration and the required verification, each registered address will receive its corresponding 10-character Addressa code and unique QR code.

Residents will be able to access and share their digital addresses electronically through the registration platform.

The QR code will provide a convenient way to retrieve or navigate to the corresponding geographic location without requiring the manual entry of the digital address.

5. Production and Installation of Physical Address Plaques

One of the principal deliverables of the pilot project will be the production and installation of physical digital address plaques throughout the selected community.

Each plaque will be manufactured using durable, weather-resistant PVC material suitable for outdoor installation.

The plaque will display:

- The unique 10-character Addressa code.
- The corresponding QR code.
- The logo or identity of the national postal operator or responsible government authority, where required.
- Optional community or municipal identification.

The plaques will be installed at clearly visible locations near the main entrances of residential buildings, commercial establishments, and public facilities.

For buildings containing multiple apartments or units, the installation approach will be determined according to the approved addressing policy. A common building entrance may receive a shared entrance plaque, while individual units may have separately registered address records where required.

The design, dimensions, colors, and branding of the plaques will be approved by the client before mass production.

6. Demonstration and Operational Testing

Once registration and plaque installation are completed, the pilot community will serve as a practical demonstration of the Addressa digital addressing system.

The pilot will enable the national postal operator, government representatives, delivery companies, and other stakeholders to test the system under real operating conditions.

Testing activities may include:

- Locating residential and commercial premises using Addressa codes.
- Scanning QR codes to retrieve geographic locations.
- Using digital addresses for postal and courier deliveries.
- Validating registered addresses through the national platform.
- Testing address lookup and verification APIs.
- Assessing the accuracy and usability of digital addresses in real-world conditions.

7. Community Awareness and Training

A public awareness campaign will accompany the pilot implementation to introduce residents and businesses to the new digital addressing system.

Registration teams will explain how digital addresses work, how to access and share them, and how QR codes can be used by visitors and service providers.

Training and practical demonstrations will also be provided to local postal personnel, municipal representatives, and other relevant stakeholders.

8. Pilot Evaluation and Reporting

Following implementation, the pilot project will be evaluated to assess the effectiveness of the digital addressing system and identify any improvements required before nationwide deployment.

The evaluation will consider:

- Number and percentage of households and establishments registered.
- Number of digital address codes and QR codes issued.
- Number of physical PVC plaques installed.
- Accuracy of registered address locations.
- Performance of the registration and verification processes.
- Functionality of the public platform and API services.
- Feedback from residents, postal personnel, and participating institutions.
- Technical, operational, and logistical challenges encountered during implementation.

A final pilot project report will document the results, lessons learned, and recommendations for nationwide expansion.

Expected Deliverables

The pilot project is expected to produce the following tangible results:

1. A fully mapped and digitally addressed pilot community.
2. Registration of all eligible households, businesses, and public institutions within the selected area, subject to participation and applicable registration requirements.
3. Issuance of unique Addressa codes and corresponding QR codes for registered addresses.
4. Production and installation of durable PVC digital address plaques at designated entrances.
5. A functioning community address registry integrated with the national addressing platform.
6. Practical demonstration of address lookup, QR scanning, and postal delivery applications.
7. Training and awareness activities for residents and local stakeholders.
8. A comprehensive pilot evaluation report with recommendations for nationwide implementation.

Strategic Value of the Pilot Project

The pilot project will provide the national postal operator or government with a **visible, fully operational model of a digitally addressed community**, demonstrating how Addressa technology can be integrated into everyday residential, commercial, and public-service activities.

Beyond technical validation, the pilot will provide practical experience in community registration, field operations, address plaque production and installation, institutional coordination, and public adoption.

The experience and results obtained will support the development of standardized procedures, realistic cost estimates, resource requirements, and implementation schedules for the subsequent national rollout.

The completed pilot community may also serve as a permanent demonstration site for government officials, international organizations, postal authorities, and other stakeholders interested in adopting or evaluating the national digital addressing system.