Global Infrastructure Identity Standard (GIIS)

Establishing Persistent Digital Identity for Infrastructure Assets

GIIS-WP-01
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Developed by
The Global Infrastructure Identity Initiative

An initiative established and supported by **UMIP Inc.**

The Global Infrastructure Identity Standard (GIIS) and the Global Infrastructure Identity Initiative were created through research and development conducted by **UMIP Inc**., an organization founded by **Trevor Vick**.

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About the Global Infrastructure Identity Initiative

The **Global Infrastructure Identity Initiative** was established to support the development of persistent identity frameworks for infrastructure assets across the built environment.

The initiative promotes collaboration across infrastructure stakeholders including:

- infrastructure owners and operators
- engineering and architecture firms
- construction organizations
- insurance carriers
- infrastructure technology providers
- financial institutions
- government agencies

The initiative serves as a collaborative platform for advancing **persistent infrastructure identity systems**, standards, and interoperability frameworks designed to support lifecycle data continuity across the global infrastructure ecosystem.

The initiative is supported and stewarded by **UMIP Inc.**, the organization responsible for the initial development of the Persistent Infrastructure Identity framework and the Unified Modular Infrastructure Platform.

About UMIP Inc.

UMIP Inc. is the founding organization behind the **Unified Modular Infrastructure Platform (UMIP)** and the **Persistent Infrastructure Identity (PIID) framework**.

UMIP Inc. develops technologies designed to support lifecycle data continuity and identity interoperability across infrastructure systems.

Through research and platform development, UMIP Inc. identified a structural challenge within the built environment: infrastructure assets lack a persistent digital identity capable of maintaining continuity across the full lifecycle of the asset.

The Global Infrastructure Identity Initiative was established by **UMIP Inc.** to support industry collaboration around the development of identity frameworks designed to address this challenge.

Abstract

Infrastructure assets such as buildings, bridges, utilities, industrial facilities, and transportation systems form the physical backbone of the global economy.

These assets frequently remain in operation for **50 to 100 years or longer**, yet the digital records documenting their lifecycle are typically fragmented across multiple organizations and software platforms.

Engineering documentation may reside in design systems.
Construction records may exist in project management platforms.
Maintenance documentation may be stored in facility management systems.
Insurance data may reside in underwriting platforms.

Because these systems rely on independent identifiers, lifecycle data often becomes disconnected from the infrastructure asset it describes.

The **Global Infrastructure Identity Standard (GIIS)** introduces a framework for assigning **Persistent Infrastructure Identities (PIIDs)** to infrastructure assets.

Each PIID is represented by a **20-character globally unique identifier** designed to remain permanently associated with an infrastructure asset throughout its lifecycle.

The GIIS framework establishes the foundation for a new digital layer within the built environment: the **Infrastructure Identity Layer**.

This layer enables infrastructure assets to maintain persistent identity across systems, organizations, and decades of operational lifecycle.

Executive Summary

Infrastructure assets frequently operate for **multiple decades**, yet the digital systems used to design, construct, insure, and manage these assets rarely maintain consistent identity across their lifecycle.

As infrastructure assets move between organizations, software platforms, and ownership structures, lifecycle information is often fragmented or lost.

This structural challenge is referred to as the **Infrastructure Identity Gap**.

The Infrastructure Identity Gap results from the absence of a persistent identity framework capable of maintaining continuity across infrastructure systems.

Consequences of this gap include:

- fragmented infrastructure records
- incomplete lifecycle histories
- limited interoperability between software systems
- inefficiencies in infrastructure management
- increased risk uncertainty for insurers and investors

Industry research suggests that lifecycle inefficiencies across the built environment exceed **$2 trillion annually**.

The **Global Infrastructure Identity Standard (GIIS)** introduces a persistent identity framework designed to address this challenge.

Under the GIIS framework, each infrastructure asset receives a **Persistent Infrastructure Identity (PIID)** represented by a **20-character globally unique identifier**.

Once issued, this identifier remains permanently associated with the infrastructure asset and functions as a universal reference key linking lifecycle data across systems.

By establishing a persistent identity layer for infrastructure assets, GIIS enables:

- lifecycle data continuity
- interoperability between infrastructure platforms
- improved infrastructure transparency
- enhanced risk analysis for insurers and investors
- more efficient infrastructure lifecycle management

Foundational Declaration

The **Global Infrastructure Identity Standard (GIIS)** represents the initial public framework for establishing persistent digital identity for infrastructure assets across the built environment.

The concepts introduced in this document including **Persistent Infrastructure Identity (PIID)**, **Infrastructure Identity Registries**, and the **Infrastructure Identity Layer** form part of the foundational architecture supporting lifecycle data continuity for infrastructure systems.

This publication represents the **first formal documentation of the GIIS framework and associated identity concepts**.

The initial development of this framework was undertaken by **UMIP Inc.**, and the standard is published through the **Global Infrastructure Identity Initiative** to support collaboration across the global infrastructure ecosystem.

Future publications may expand upon the concepts introduced in this document.

Purpose of This Document

The purpose of this document is to define the foundational framework for persistent infrastructure identity across the built environment.

The standard aims to:

- establish a persistent identity model for infrastructure assets
- support lifecycle data continuity across infrastructure systems
- enable interoperability between infrastructure software platforms
- provide a foundation for infrastructure identity registries
- support long-term infrastructure lifecycle transparency

The GIIS framework is designed to support infrastructure systems operating across multiple jurisdictions, organizations, and technology platforms.

Scope of the Standard

The Global Infrastructure Identity Standard applies to infrastructure assets across the built environment including:

- commercial buildings
- residential structures
- transportation infrastructure
- energy infrastructure
- utilities infrastructure
- industrial facilities
- public infrastructure assets

The standard focuses specifically on the **identity framework associated with infrastructure assets**, rather than the systems used to store or manage infrastructure data.

The Infrastructure Identity Gap

Infrastructure assets often exist for decades, yet the digital records associated with those assets frequently do not persist across the same lifecycle.

Infrastructure data is typically created and stored within multiple software platforms across the lifecycle of an asset.

For example:

- engineering systems generate design documentation
- construction platforms manage project records
- insurance platforms store underwriting data
- facility management systems track maintenance records
- government systems maintain regulatory documentation

While these systems play important roles in managing infrastructure information, they typically rely on **independent internal identifiers**.

As infrastructure assets move between organizations and systems, these identifiers often do not persist.

As a result, infrastructure records become fragmented over time.

This structural challenge is referred to as the **Infrastructure Identity Gap**.

Fragmentation Across Infrastructure Systems

The built environment relies on a diverse ecosystem of software platforms and information systems.

Examples include:

- engineering and architectural design platforms
- construction project management systems
- facility management platforms
- insurance underwriting systems
- asset management software
- geospatial infrastructure databases
- municipal infrastructure registries

Each system typically represents infrastructure assets using its own internal identification method.

Because these identifiers are not standardized across systems, infrastructure records cannot always be easily associated with the same physical asset.

This fragmentation limits interoperability across infrastructure platforms.

Lifecycle Data Discontinuity

Infrastructure assets often undergo numerous lifecycle transitions, including:

- initial design and engineering
- construction and commissioning
- ongoing operations and maintenance
- renovations and upgrades
- insurance claims and damage assessments
- ownership transfers

Each transition may involve new organizations and software systems.

Without a persistent identity framework, lifecycle records generated during these transitions may become disconnected from the underlying infrastructure asset.

As a result, infrastructure assets often lack a **continuous and verifiable digital lifecycle record**.

Economic Impact of Infrastructure Identity Fragmentation

The absence of persistent infrastructure identity contributes to inefficiencies across the built environment.

Fragmented infrastructure records can lead to:

- incomplete asset histories
- redundant data entry across systems
- difficulty verifying infrastructure upgrades or maintenance
- limited visibility into infrastructure risk conditions
- inefficiencies in infrastructure operations

Industry research suggests that lifecycle inefficiencies across infrastructure systems exceed **$2 trillion annually**.

Persistent infrastructure identity frameworks have the potential to reduce these inefficiencies by enabling consistent identity references across infrastructure systems.

Persistent Infrastructure Identity (PIID)

Persistent Infrastructure Identity (PIID) is the foundational identifier defined within the Global Infrastructure Identity Standard.

A PIID is assigned to a physical infrastructure asset and remains permanently associated with that asset throughout its lifecycle.

Once issued, the PIID serves as a **universal reference identifier** that can be used across infrastructure systems to reference the same physical asset.

The purpose of PIID is to enable infrastructure lifecycle data to remain connected to the asset it describes across organizations and software platforms.

PIID Identifier Format

Under the Global Infrastructure Identity Standard, infrastructure assets are identified using a **20-character globally unique identifier**.

The identifier format is designed to support:

- global scalability
- long-term identity persistence
- interoperability across infrastructure systems
- compatibility with enterprise software platforms

Each PIID identifier represents a **unique infrastructure asset** within the GIIS framework.

Example representation:

```
PIID: 4F8A7C2B91D3E6F5A8C1
```

The PIID prefix may be used when referencing the identifier within documentation or software systems.

PIID Character Specification

The PIID identifier consists of **20 alphanumeric characters**.

The structure is designed to support global infrastructure identity issuance while maintaining compatibility across software platforms.

Attribute	Specification
Identifier Length	20 characters
Character Set	Alphanumeric
Case Sensitivity	Uppercase
Special Characters	Not used

Restricting the identifier format to uppercase alphanumeric characters improves compatibility across enterprise databases and infrastructure systems.

Identity Anchors

To ensure that each PIID corresponds to a specific infrastructure asset, identity issuance may reference verifiable infrastructure attributes.

These reference attributes may include:

- geospatial infrastructure footprints
- address registries
- parcel identification frameworks
- infrastructure classification metadata
- jurisdictional infrastructure records

By referencing multiple infrastructure attributes, identity issuance systems can verify that each PIID corresponds to a specific physical asset.

The specific identity issuance methodology may vary across infrastructure identity registries implementing the GIIS framework.

Infrastructure Identity Layer

The GIIS framework introduces the concept of an **Infrastructure Identity Layer** within the infrastructure technology ecosystem.

The Infrastructure Identity Layer functions as a neutral identity reference layer that enables infrastructure assets to maintain persistent identity across systems.

The layer sits between infrastructure applications and physical infrastructure assets.

Conceptually, the infrastructure technology ecosystem can be viewed as three layers:

Application Layer

Software platforms used across the built environment.

Examples include:

- construction management systems
- insurance platforms
- facility management software
- geospatial infrastructure systems
- infrastructure analytics platforms

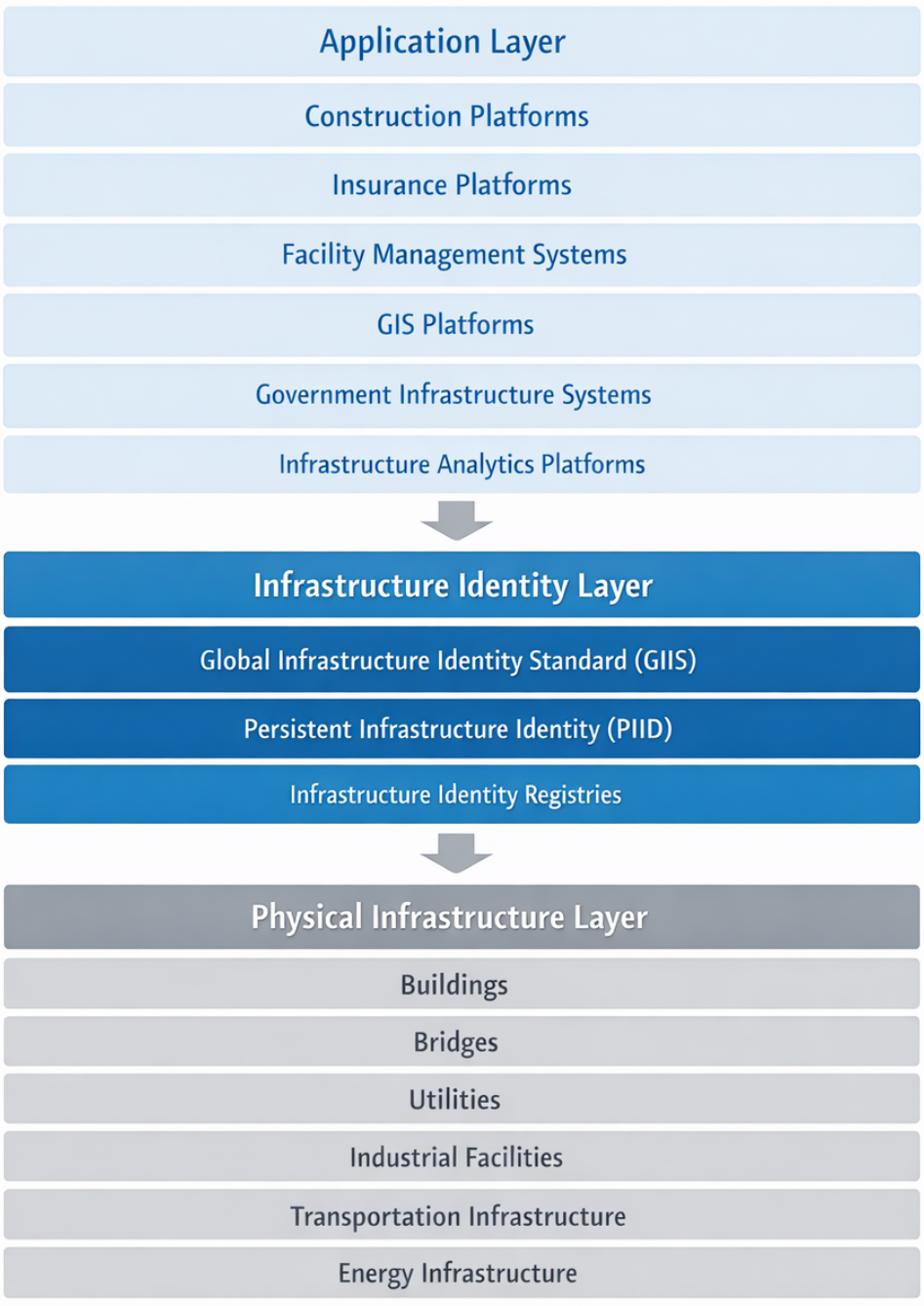
Infrastructure Identity Layer

Provides the persistent identity reference for infrastructure assets through PIID identifiers and identity registries.

Physical Infrastructure Layer

The physical infrastructure assets themselves, including buildings, bridges, utilities, and industrial systems.

Infrastructure Identity Stack



The Infrastructure Identity Layer enables persistent identity for infrastructure assets across application platforms and lifecycle systems.

Lifecycle Data Continuity Framework

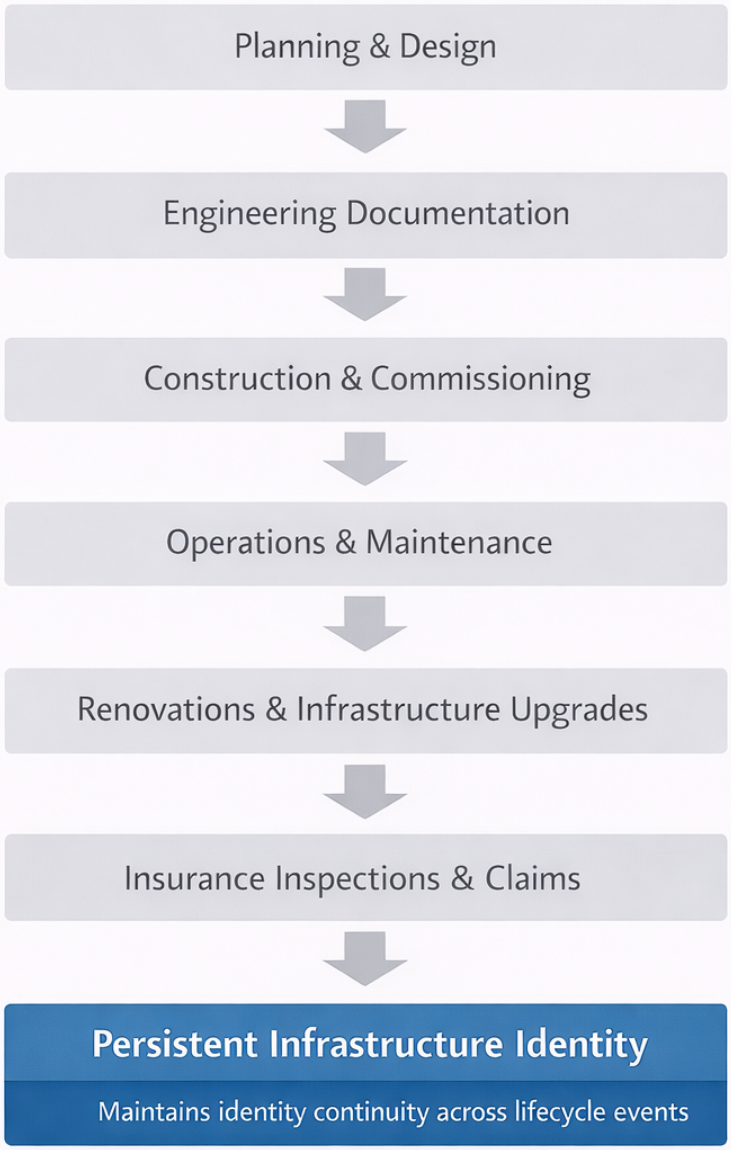
Under the GIIS framework, lifecycle events associated with infrastructure assets may reference the PIID identifier.

Examples of lifecycle events include:

- construction activities
- renovations and upgrades
- maintenance and inspections
- insurance claims
- ownership transfers

By associating lifecycle events with a persistent identity, infrastructure assets can develop a continuous lifecycle record over time.

Infrastructure Lifecycle Identity Model



The Infrastructure Identity Layer enables persistent identity for infrastructure assess acros application platforms and lifecycle systems.

Infrastructure Identity Registry Model

The Global Infrastructure Identity Standard supports the creation of **Infrastructure Identity Registries** responsible for issuing and maintaining Persistent Infrastructure Identities (PIIDs).

Infrastructure Identity Registries serve as authoritative systems responsible for managing identity issuance and identity resolution within the GIIS framework.

Core functions of an Infrastructure Identity Registry may include:

• issuing Persistent Infrastructure Identities (PIIDs)
• maintaining infrastructure identity records
• supporting identity lookup and resolution services
• verifying identity uniqueness across infrastructure assets
• maintaining long-term persistence of identity records

Infrastructure Identity Registries may operate at various levels including:

• national infrastructure registries
• regional infrastructure registries
• industry-specific registries
• global infrastructure identity registries

Registry operators implementing the GIIS framework are responsible for ensuring that issued identifiers comply with the identity specifications defined within this standard.

Registry Governance

Governance of infrastructure identity registries is essential to ensure the long-term integrity and trust of the identity system.

Infrastructure identity registries operating under the GIIS framework should implement governance mechanisms designed to ensure:

• identifier uniqueness
• long-term persistence of identity records
• transparency of identity issuance policies
• auditability of identity registry operations
• interoperability with other identity registries

Registry governance frameworks may evolve through collaboration across infrastructure stakeholders and organizations participating in the Global Infrastructure Identity Initiative.

Terminology and Definitions

The following terms are used throughout this document.

Infrastructure Asset
A physical structure or system forming part of the built environment, including buildings, bridges, utilities, industrial facilities, and transportation infrastructure.

Persistent Infrastructure Identity (PIID)
A globally unique identifier assigned to a physical infrastructure asset designed to remain permanently associated with that asset throughout its lifecycle.

Infrastructure Identity Layer
A digital reference layer that enables infrastructure assets to maintain persistent identity across software platforms and organizations.

Infrastructure Identity Registry
An entity responsible for issuing, maintaining, and resolving Persistent Infrastructure Identities.

Lifecycle Event
Any event associated with the design, construction, operation, maintenance, modification, or ownership of an infrastructure asset.

Normative Language

The following terminology is used in accordance with standard specification practices.

MUST indicates an absolute requirement of the standard.

SHOULD indicates a recommended practice.

MAY indicates an optional implementation.

Unless otherwise specified, references to PIID identifiers and infrastructure identity registries should be interpreted within this normative framework.

Security and Data Integrity Considerations

Persistent infrastructure identity frameworks are intended to support identity interoperability across infrastructure systems.

The GIIS framework does not prescribe specific data storage architectures but encourages implementations that ensure:

• identity integrity
• prevention of identifier duplication or collision
• auditability of identity issuance
• long-term durability of identity records

Registry operators should implement governance mechanisms designed to maintain trust in infrastructure identity systems over extended infrastructure lifecycles.

Open Interoperability Framework

The Global Infrastructure Identity Standard is designed as a **neutral framework supporting interoperability across infrastructure systems**.

The standard is intended to enable collaboration across:

- infrastructure owners and operators
- engineering and construction organizations
- insurance and financial institutions
- infrastructure technology providers
- government agencies

Implementations of the GIIS framework may vary while maintaining compatibility with the identity principles defined within this document.

Industry Collaboration

The development of persistent infrastructure identity frameworks benefits from collaboration across multiple sectors of the built environment.

The Global Infrastructure Identity Initiative welcomes participation from stakeholders across:

- infrastructure ownership and operations
- engineering and architecture
- construction and infrastructure development
- insurance and infrastructure risk management
- infrastructure software platforms
- government infrastructure agencies

Future versions of the Global Infrastructure Identity Standard may incorporate insights and recommendations from industry participants.

Global Adoption Pathways

Adoption of persistent infrastructure identity frameworks may occur through multiple pathways across the infrastructure ecosystem.

These pathways may include:

Infrastructure Software Integration

Infrastructure technology platforms may integrate support for Persistent Infrastructure Identities within their data models and APIs.

Asset Owner Adoption

Large infrastructure owners and operators may assign persistent identities to infrastructure assets within their portfolios.

Insurance Industry Integration

Insurance carriers may reference persistent infrastructure identities when evaluating infrastructure risk and claims.

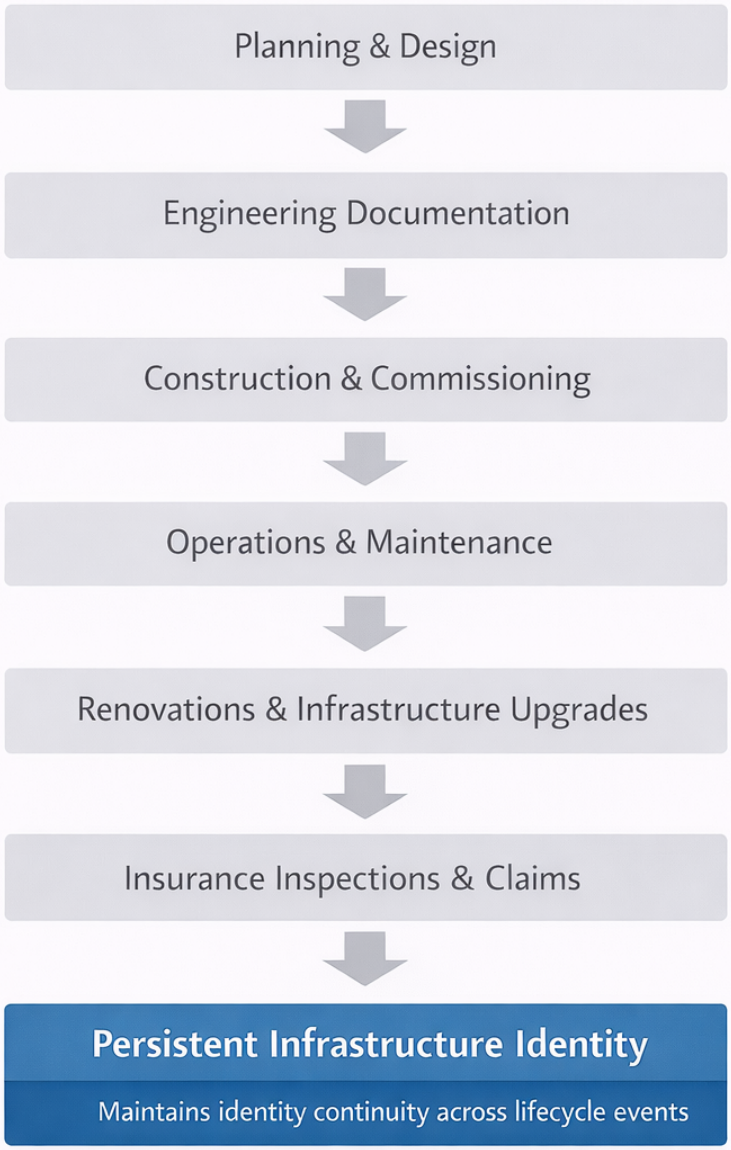
Government Infrastructure Programs

Public infrastructure agencies may adopt persistent identity frameworks within infrastructure registries and regulatory systems.

Industry Pilot Programs

Pilot initiatives involving infrastructure operators, insurers, and technology providers may demonstrate the operational benefits of persistent infrastructure identity systems.

Infrastructure Lifecycle Identity Model



The Infrastructure Identity Layer enables persistent identity for infrastructure assess acros application platforms and lifecycle systems.

Future Standard Development

The Global Infrastructure Identity Standard represents the **initial publication of a persistent infrastructure identity framework**.

Future GIIS publications may expand upon the concepts introduced in this document.

Potential areas of future development include:

• identity resolution protocols
• lifecycle event taxonomy frameworks
• registry interoperability standards
• infrastructure identity data exchange specifications
• governance models for global infrastructure identity registries

The Global Infrastructure Identity Initiative will continue collaborating with industry stakeholders to advance the development of persistent infrastructure identity frameworks.

Appendix A - Example Lifecycle Event Reference

Example lifecycle event associated with an infrastructure asset:

```
Infrastructure Asset Identifier
PIID: 4F8A7C2B91D3E6F5A8C1

Event
Roof Replacement

Date
2024-05-12

Contractor
Example Roofing Services
```

In this example, the lifecycle event is associated with the infrastructure asset through the PIID identifier.

Appendix B - Infrastructure Identity Layer Model

Conceptual infrastructure identity stack:

```
Application Layer
Construction Platforms
Insurance Platforms
Facility Systems
GIS Platforms
Government Infrastructure Systems

↓

Infrastructure Identity Layer
GIIS / PIID Identifiers
Infrastructure Identity Registries

↓

Physical Infrastructure
Buildings
Bridges
Utilities
Industrial Facilities
Transportation Infrastructure
```

Implementation Scenarios

Persistent infrastructure identity frameworks can be applied across multiple sectors of the built environment. The following scenarios illustrate how the Global Infrastructure Identity Standard (GIIS) may support interoperability across infrastructure systems.

Insurance and Risk Management

Insurance carriers frequently evaluate infrastructure assets when underwriting policies and assessing claims.

However, underwriting records, inspection reports, and claims documentation are often associated with internal system identifiers rather than persistent infrastructure references.

By referencing a **Persistent Infrastructure Identity (PIID)**, insurers may associate underwriting data, inspections, and claims history with a consistent infrastructure identity across policy periods and ownership transitions.

This approach may support improved risk transparency and infrastructure lifecycle visibility.

Construction and Infrastructure Development

During construction projects, infrastructure assets are documented through engineering records, construction documentation, and project management systems.

These records may not persist once construction is completed or ownership changes.

By associating project records with a PIID identifier, construction documentation may remain connected to the infrastructure asset throughout its lifecycle.

This enables future asset owners, operators, and insurers to reference verified construction history.

Asset Ownership and Facility Operations

Facility operators frequently manage large portfolios of infrastructure assets.

Asset data may be stored across facility management platforms, maintenance systems, and capital planning tools.

Persistent infrastructure identity enables facility operators to reference infrastructure assets using a consistent identity across operational systems.

Lifecycle records including maintenance activities, system upgrades, and inspections may be associated with the infrastructure identity.

Government Infrastructure Management

Public infrastructure agencies frequently manage infrastructure registries and regulatory documentation associated with infrastructure assets.

Persistent infrastructure identity frameworks may support improved coordination across public infrastructure systems by providing a shared identity reference for infrastructure assets.

This may enable improved infrastructure transparency and lifecycle documentation across government systems.

Infrastructure Lifecycle Identity Model

Infrastructure assets experience multiple phases throughout their lifecycle.

These phases may include:

1. Planning and design
2. Construction and commissioning
3. Operations and maintenance
4. Renovations and upgrades
5. Insurance events and inspections
6. Ownership transitions

Without persistent identity, infrastructure records associated with these phases may become fragmented.

The Global Infrastructure Identity Standard introduces a persistent identity model designed to maintain continuity across these lifecycle phases.

Lifecycle Identity Framework

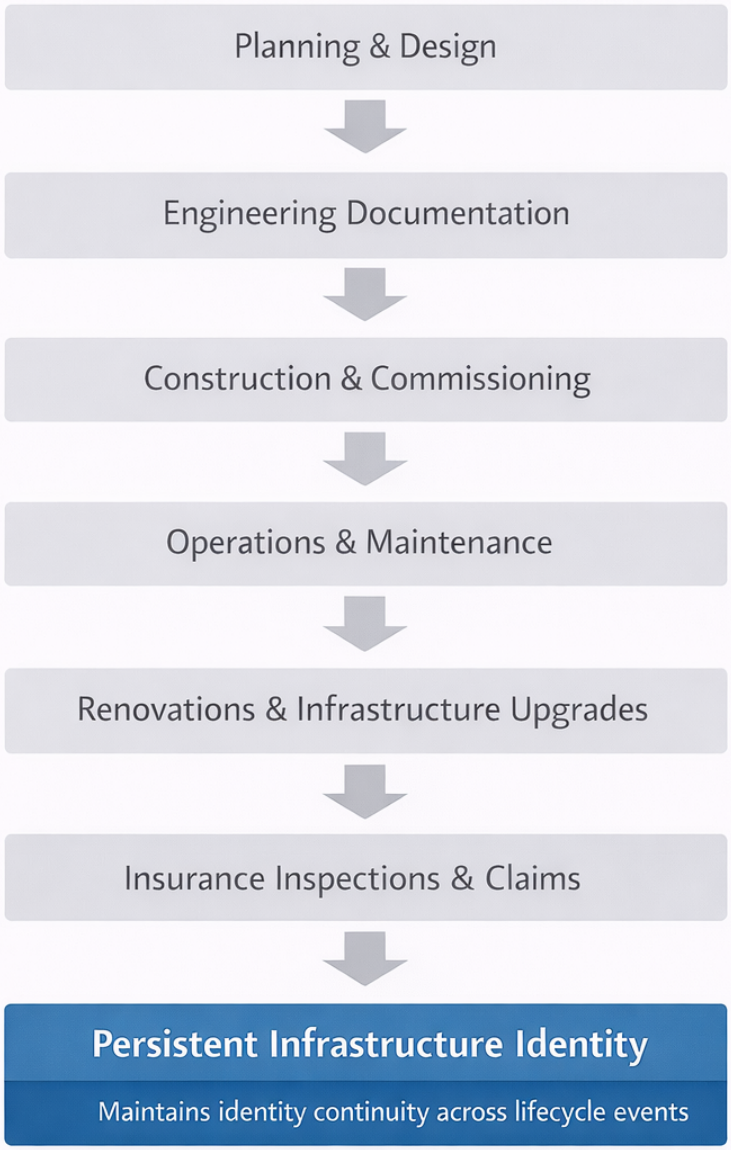
Conceptual lifecycle identity model:

```
Infrastructure Planning and Design
        ↓
Engineering Documentation
        ↓
Construction and Commissioning
        ↓
Operations and Maintenance
        ↓
Renovations and Infrastructure Upgrades
        ↓
Insurance Inspections and Claims
        ↓
Ownership Transfers
```

Under the GIIS framework, lifecycle records associated with each phase may reference the **Persistent Infrastructure Identity (PIID)** assigned to the infrastructure asset.

This identity reference enables lifecycle data generated across multiple organizations and software platforms to remain connected to the infrastructure asset.

Infrastructure Lifecycle Identity Model



The Infrastructure Identity Layer enables persistent identity for infrastructure assess acros application platforms and lifecycle systems.

Closing Statement

Persistent infrastructure identity frameworks represent a foundational step toward improving interoperability, transparency, and lifecycle continuity across the global built environment.

The Global Infrastructure Identity Standard introduces a framework for assigning persistent digital identities to infrastructure assets, enabling lifecycle data to remain connected to the physical assets it describes.

As infrastructure systems continue to digitize, the establishment of a persistent identity layer may play an important role in supporting the long-term management of infrastructure assets worldwide.

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