FIG WORKING WEEK 2025 AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE

Identifier-driven sharing and application mechanism based on primitive topographic features: An example of buildings

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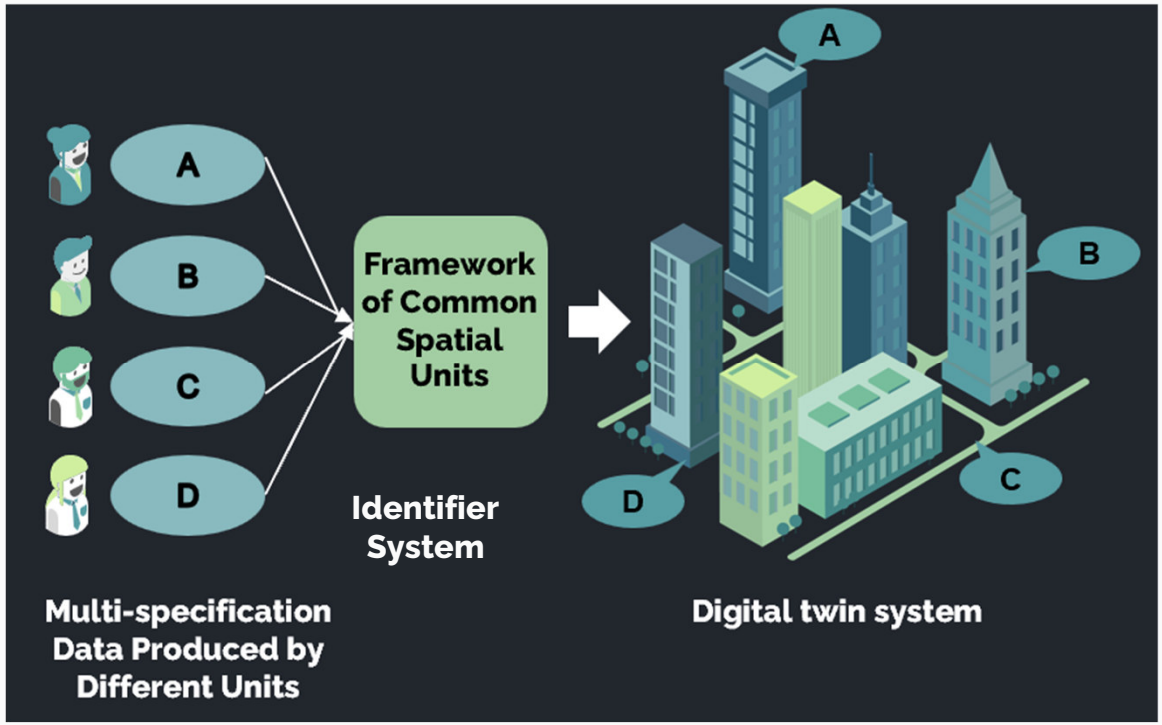
Introduction

Objectives



- GIS operates based on spatial units
- Establish a framework and develop an identifier system
- Enable cross-domain data to share a unified framework
- Facilitates Digital Twin development

02

Core Characteristics of Identifiers

Characteristics of an Identifier

Uniqueness

Each spatial object must have a unique identifier that cannot be duplicated.

Persistence

During the lifecycle of a spatial object, the identifier must remain unchanged. If it is modified, the change must be explicitly recorded.

Traceability

The concept of SDI requires the establishment of an effective mechanism that can locate and retrieve various spatial objects through unique identifiers.

Feasibility

The design of the identifier system must have the capability to map identifiers from existing national systems.

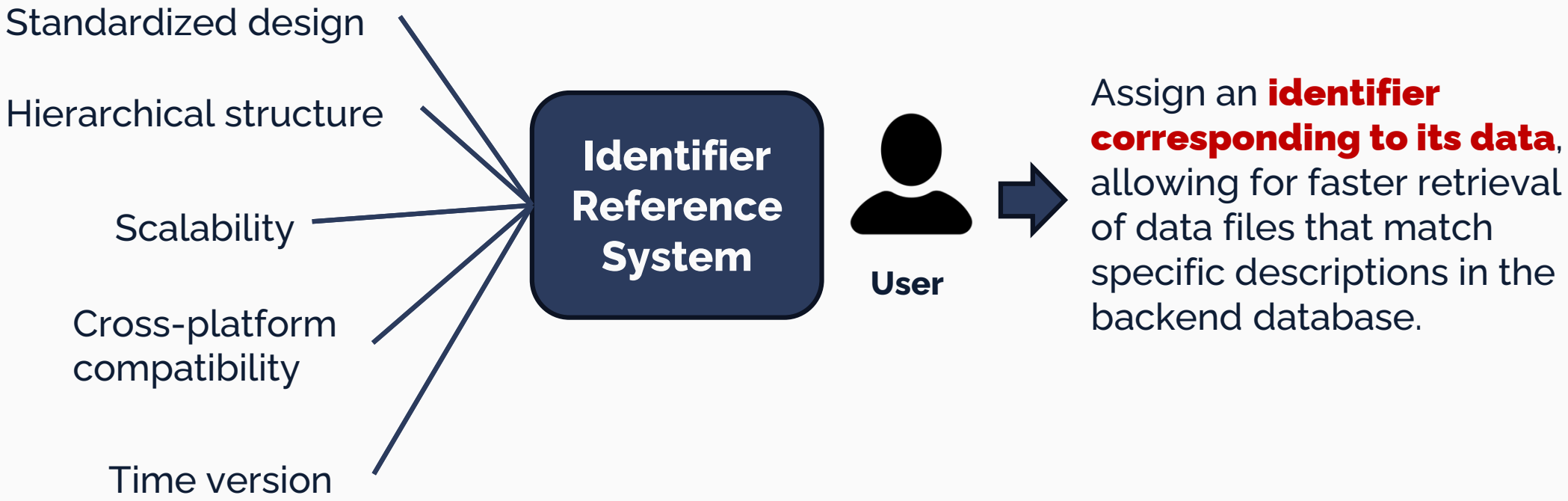
(GREMEAUX N, 2011)

Example - National ID No

Uniqueness	Each person has a unique national ID number, ensuring no duplicates nationwide.
Persistence	A national ID number usually remains unchanged throughout a person's life.
Traceability	It allows the government to trace records like healthcare, education, and taxes.
Feasibility	It is designed to integrate with other systems, such as health insurance cards, driver's licenses, and financial systems.

Design of Identifier Reference System

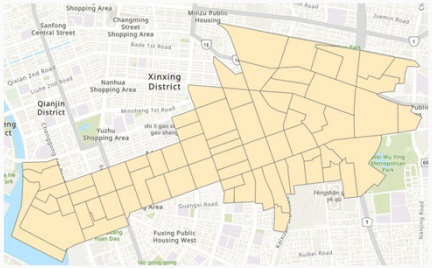
Database design behind the identifier

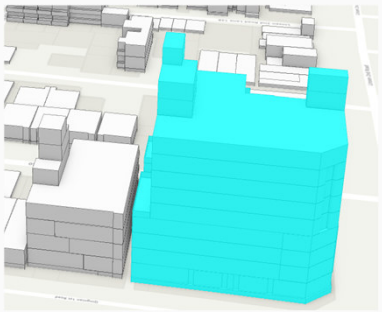


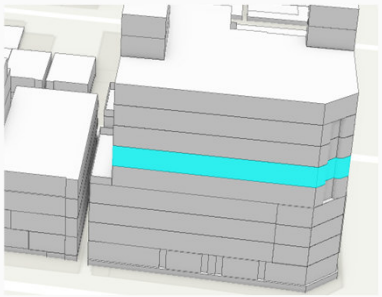
03

Inventory and Analysis of Identifier Systems for Buildings in Taiwan

Spatial Units & Identifier







		Identifier
Administrative region	→	Administrative region codes
Building	→	BUILD_ID
Household	→	Building Number Address

Address

Administrative division				Street				Address number
City	Township／District	Village	Neighborhood	Street／Road	Area	Lane	Alley／Sub-Alley	Number

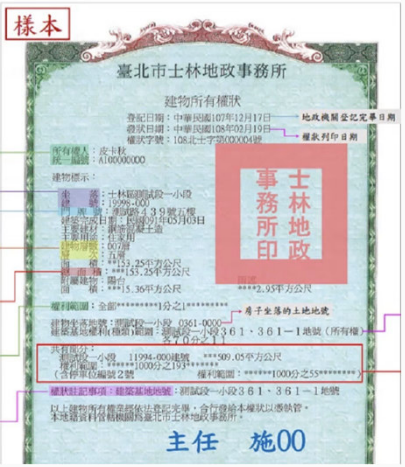
Initial assignment

Addition／Merge Reorganization Modification

Abolition

- **Addition: Newly assigned addresses are named using extensions like - 1, - 2, etc.**
- **Merge: The merged numbers are reserved for future new buildings.**
- **Reorganization: A new set of address data is generated for the restructured area. To prevent duplicate identifiers, a reorganization mechanism resolves numbering conflicts caused by long-term changes.**
- **Modification: Residents can apply for partial address adjustments.**

Building Number



Mother number	Sub-number
00427	013

00427-013

Initial assignment

Division, Merge

Abolition

- **Division: One building retains the original building number, while others are numbered sequentially after the last building number of the lot.**
- **Merge: The first building number before the merger is retained, while all other numbers are deleted and cannot be used.**

Due to these update rules, maintaining a creation time version record is crucial.

BUILD_ID

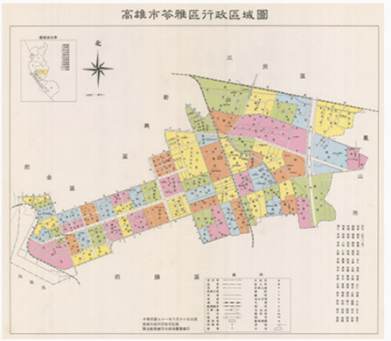
- **Build_ID is generated by recording the building's central point location using the TWD97 coordinate system and converting it into a 32-bit code.**
- **Coordinates change with the physical boundaries of the building, and the building code as an identifier also changes accordingly. However, the implementation focuses on the 3D building structure and does not specify whether historical data is recorded in the database.**

0	1	2	3	4	5	6	7
0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
8	9	A	B	C	D	E	F
16	17	18	19	20	21	22	23
G	H	J	K	L	M	N	P
24	25	26	27	28	29	30	31
Q	R	S	T	U	V	W	X

(187658.315 , 2599366.865) → 1R8K75NV65

	坐標	平移	取到小數第1位(四捨五入)	編碼轉換
E	187658.315		1876583	1R8K7
N	2599366.865	2000000	5993669	5NV65
	Coordinates	Translation	Rounding to the first decimal place	32-bit conversion

Administrative region codes



Example 1

Administrative region	Taiwan Province	Yilan County	Jiaoxi Township	Baige Village
Administrative region codes	10	002	050	012
The total code	10002050012			

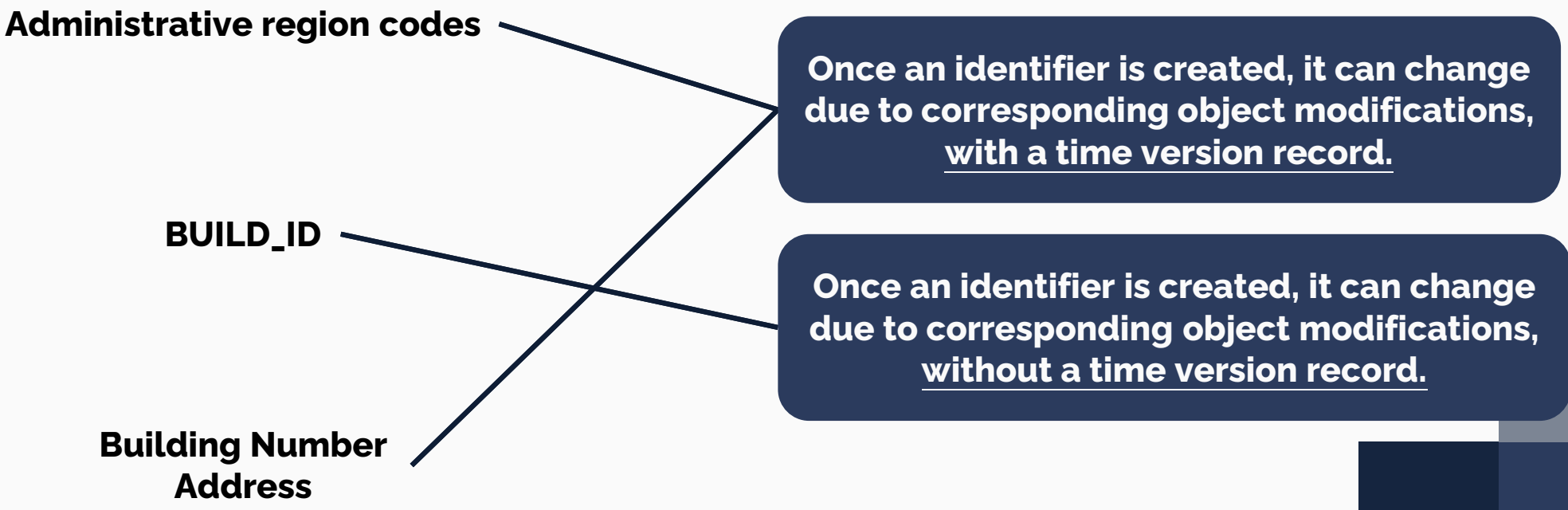
Example 2

Administrative region	Kaohsiung City	Gushan District	Shaochuantou Village
Administrative region codes	64	020	037
The total code	64000020037		

Fill the blank space with zeros.

Administrative region codes change typically due to the addition or reduction of regions and boundary adjustments.

Identifier System

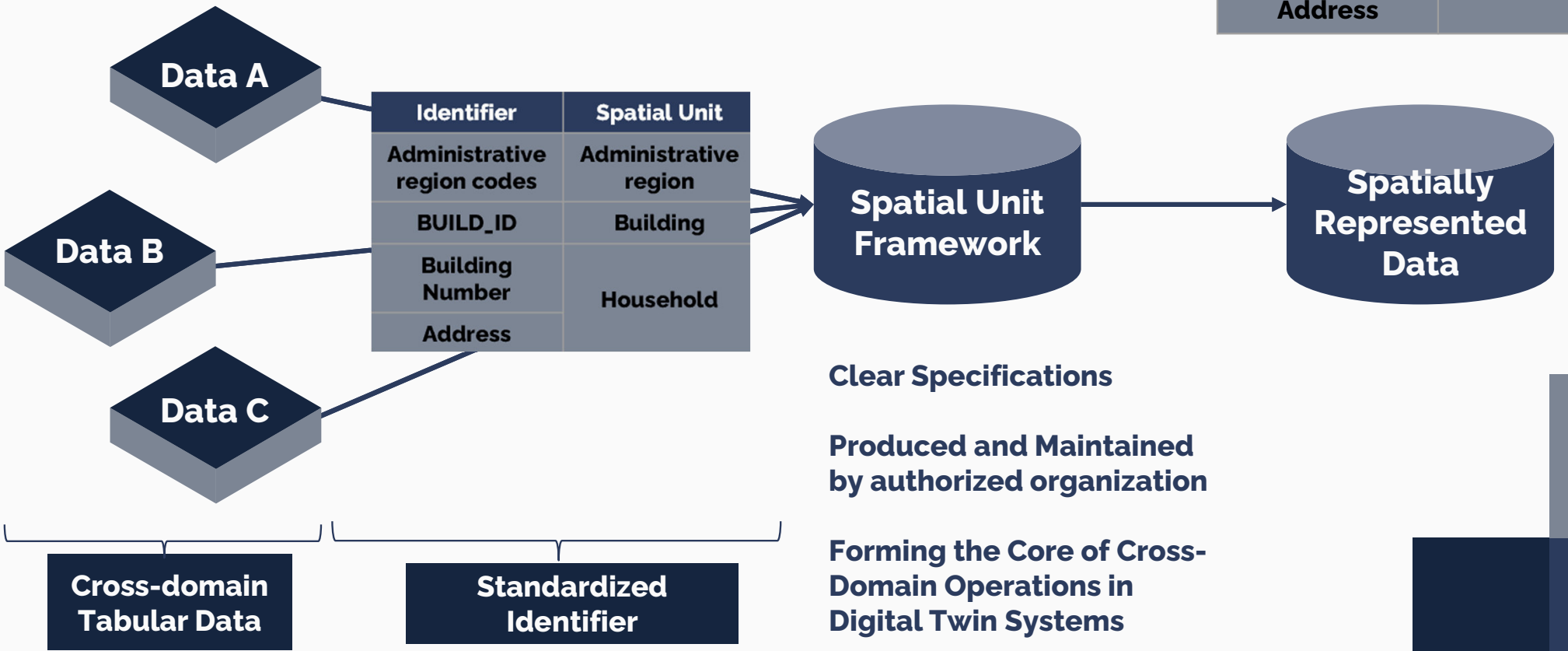


04

Achieving Cross-Domain Integration through Identifiers

Data Linking Mechanism

Identifier	Spatial Unit
Administrative region codes	Administrative region
BUILD_ID	Building
Building Number	Household
Address	



Clear Specifications

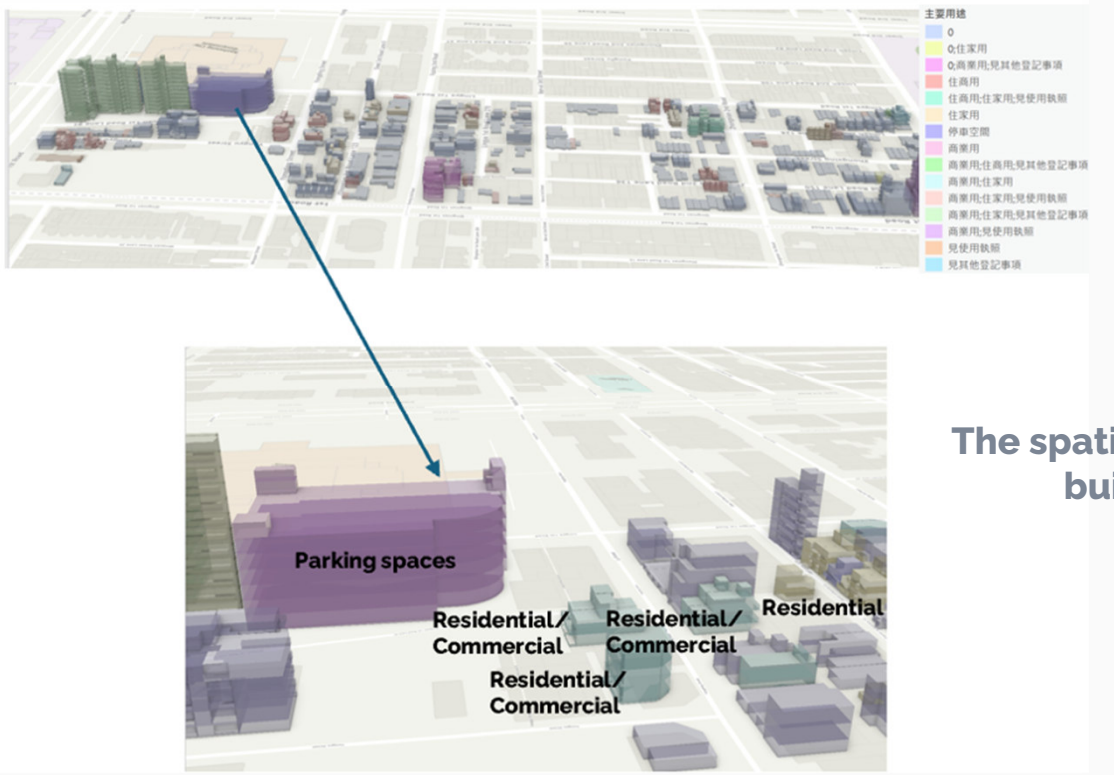
Produced and Maintained by authorized organization

Forming the Core of Cross-Domain Operations in Digital Twin Systems

05

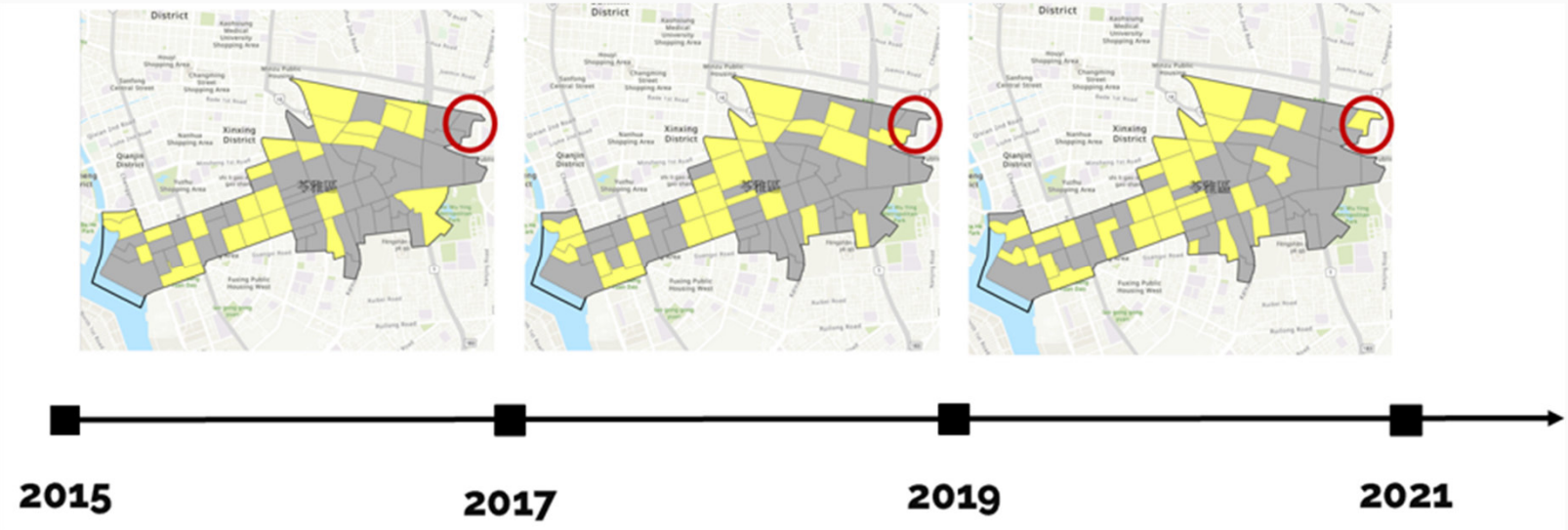
Benefits of Integrating Spatial Units with Identifier

Represent the state at a specific time using a unique identifier



The spatial distribution of building uses

Represent the state at a specific time using a unique identifier

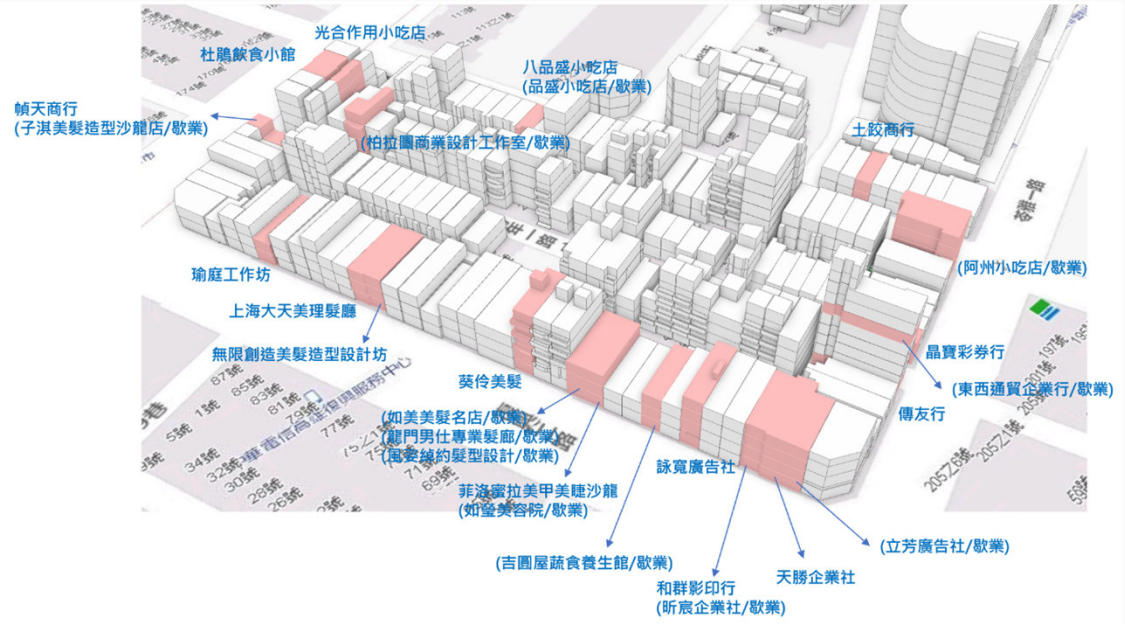


The change in the number of households from 2015 to 2021

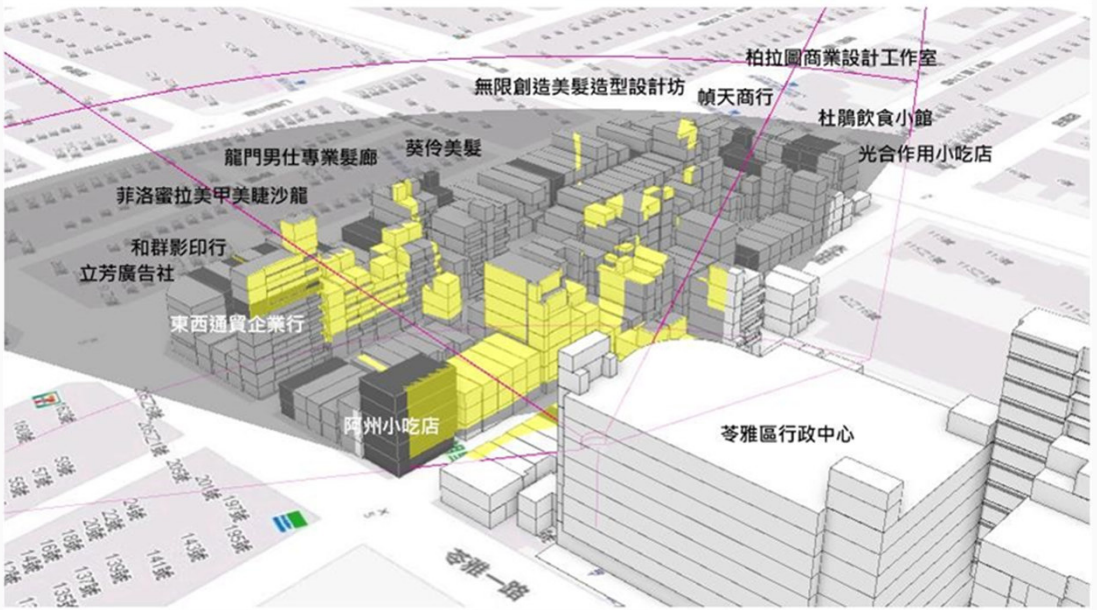
Yellow :
Villages where the number of households has increased

Gray :
Villages where the number of households has decreased

The benefits of cross-domain association for spatial enabling



The spatial distribution of enterprises



The integration of enterprises' distribution and visibility analysis

06

Conclusion

Conclusion

Key Role of Identifiers

Ensure cross-source data matching and maintain consistency.

Temporality and Version Management

Manage identifier versions as spatial units change to prevent data inconsistencies.

Digital Twin Applications

Link virtual and real worlds through identifiers to ensure model accuracy and data integration.

Cross-Domain Collaboration & Data Value

Enhance data integration and decision support, promoting multi-domain applications.

3D Spatial Enabling

Integrate cross-domain data with 3D spaces to drive smart city development.

Thanks!

Do you have any questions?

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