



Förhandstitt – Internationell Case Study för CIM och UDT

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2025-04-03



Internationellt samarbete mellan JTC1 och SyC Smart Cities

Urban Digital Twins och City Information modelling



Lokala Digitala Tvillingar / Local Digital Twins

Digitala tvillingar för större geografiskt område

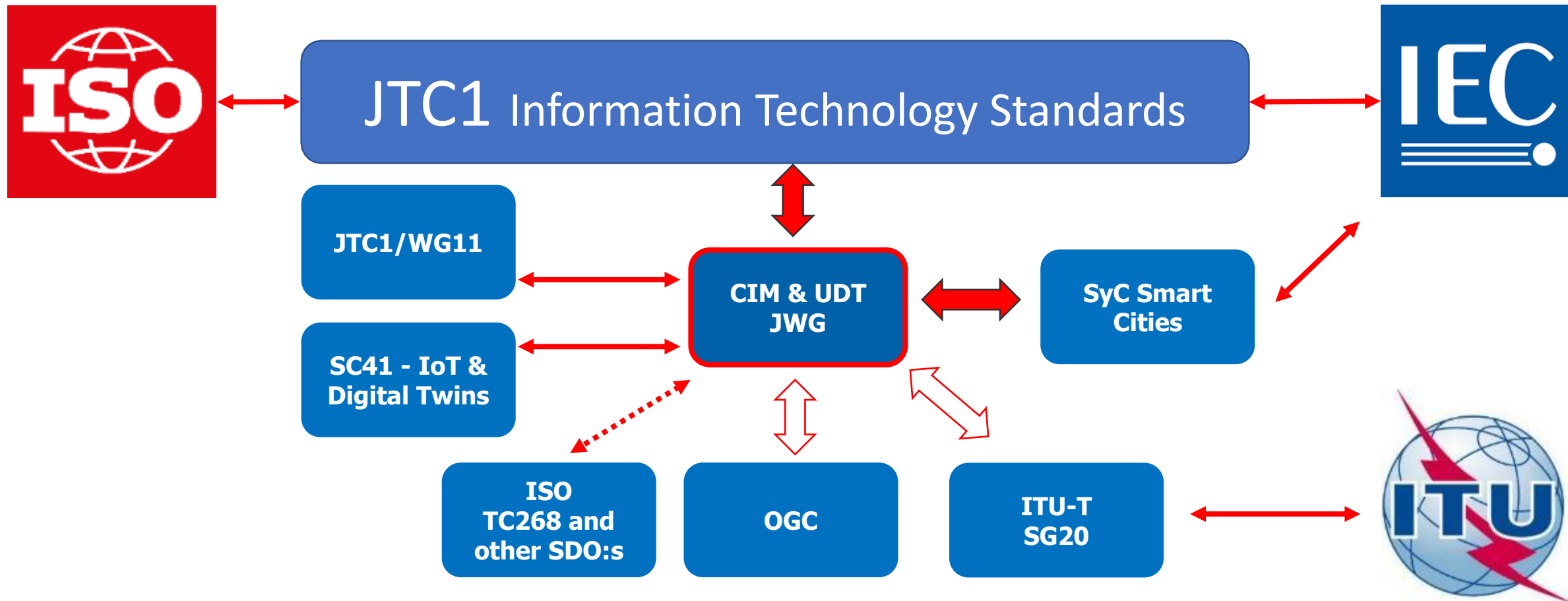
Finns i många olika former:

- CIM - City Information Modelling
- UDT - Urban Digital Twins
- City Digital Twins
- Spatial digital twins
- Infrastructure digital twins
- och liknande....

Begreppet "Digitala Tvillingar" i sig omfattar mer, t.ex. tillämpningar för enskilda objekt, t.ex. inom industrin, fordon etc.

Försedd med "tvillingförmåga" genom Internet of Things. Sensorer för att samla in data.
Aktuatorer/styrdon för att påverka verkliga objekt.

City Information Modelling and Urban Digital Twins Joint Working Group



Co convenors

SyC Smart Cities: Chunlan GUO

JTC1: Torbjörn Lahrin

City Information Modelling and Urban Digital Twins Survey

Questionnaire (13 sections, 41 questions)

- 1. Screening: Individuals with experience in or involvement with projects related to City Information Modelling (CIM), Urban Digital Twins, or similar initiatives
- 2. The primary role of participants
- 3. The geographical location and scope of the application
- 4. The sector of the application
- 5. The primary organizer/owner
- 6. Data used
- 7. Technology/tool used
- 8. Interoperability
- 9. IoT utilization
- 10. AI capabilities
- 11. Metaverse and CitiVerse
- 12. Utilization of standards
- 13. Participant information



Help us shape the future of smart cities worldwide

Urban Digital Twins, City Information Modelling and similar initiatives

Global survey

Give your city, project or organization a voice in the direction and evolution of smart cities everywhere.

Smart cities are cities that leverage technology and data to enhance the quality of life, drive sustainable development and create more efficient, responsive environments for its residents.

International standards are essential tools to enable that. They not only ensure the safe and effective performance of technologies but are instrumental for interoperability globally, which is the foundation of innovation and international trade.

The leading international standards organizations IEC, ISO and ITU-T work together to develop international standards specifically for smart cities, including city information modelling (CIM) and urban digital twins (UDT).

In order to ensure we develop the right standards to meet smart city needs, we are conducting a global survey to gain insights into the current state of development and application of CIM, UDT and related initiatives.

Questions and comments about the survey:

Chunlan Guo, chunlanguo@outlook.com

Torbjörn Lahrin, tobbe@lahrin.se

Jun Seob LEE, juns@etri.re.kr

All data will be protected securely and only used for the purposes of the survey.



Your voice matters!

scan here

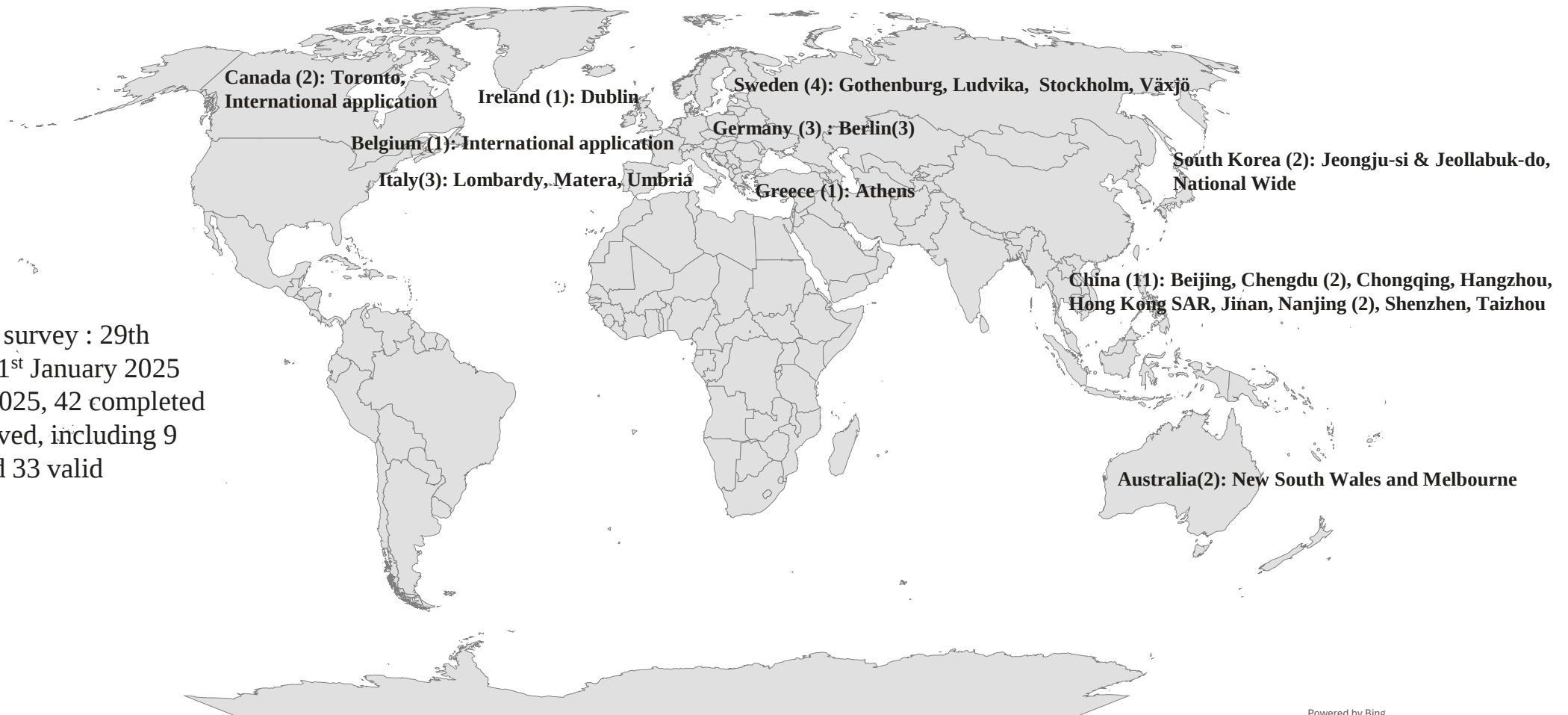


go.iec.ch/survey

Submission deadline:
30 November 2024

City Information Modelling and Urban Digital Twins Survey (September 2024 to January 2025)

No. of valid CIM & UDT global survey response



- CIM & UDT global survey : 29th September 2024 to 31st January 2025
- As of 31st January 2025, 42 completed responses were received, including 9 invalid responses and 33 valid responses.

What are the projects called?

Gives an understanding of different interpretations/view of Local Digital Twins

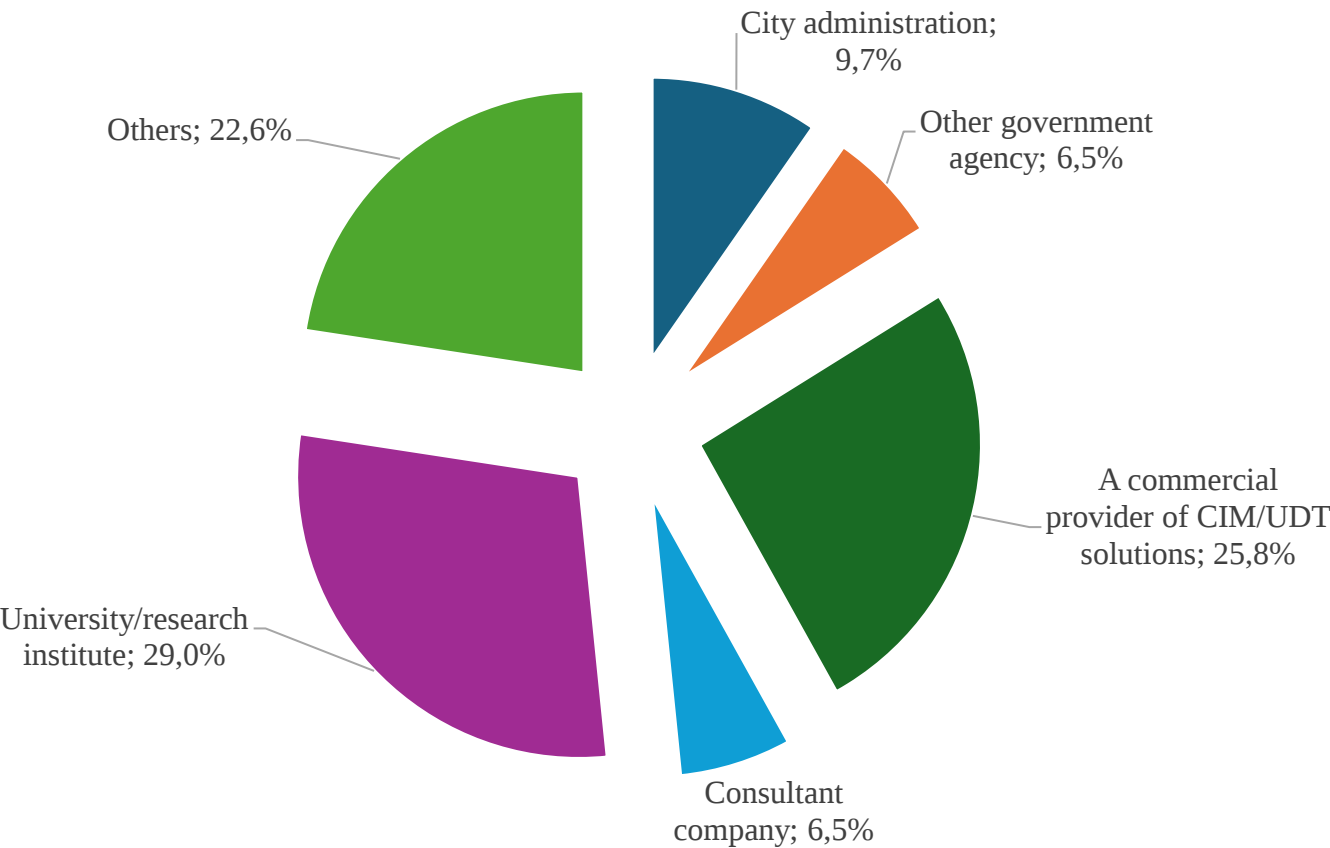
- General City Digital Twin
- CHENGDU JINNIU DISTRICT CITY BRAIN PROJECT
- Sydney Trains: Intelligent Asset Maintenance Program
- Digital Building Permit
- Digital Twins Sustainable cities
- Urban intelligence
- Nanjing City Information Modelling Construction
- Ludvika kommun Digital Twin
- Digital Land & Geospatial Platform
- Smart City Challenge Project
- "WiseTown"
- Apply City Information Modeling to Emergency Management and Rescue
- Taizhou Twin City Digital Base
- Jinan City Information Model (CIM) Basic Platform (Phase I) project
- Developing Linked and Integrated Data Models for Digital Twins of Cities
- Virtual Gothenburg (Digital Twin) Project: 3CIM (City Information Model of the built environment)
- NexusTwin
- Project PLATEAU
- Nanjing City's Pilot Project for Construction Project Review and Approval Using Building Information Modeling (BIM) System and Overall Design of City Information Modeling (CIM) Platform Construction

Who answered the form? Job titles.

- | | |
|--|--------------------------------------|
| 1. Chief Engineer | 13.CTO (Chief Technology Officer) |
| 2. Professor | 14.Program Lead |
| 3. Project Manager | 15.Researcher |
| 4. CEO | 16.International Cooperation Manager |
| 5. Digital Twin Specialist | 17.Product Owner |
| 6. Principal | 18.Standardisation Manager |
| 7. Student | 19.Deputy General Manager |
| 8. Technologist | 20.Solution Engineer |
| 9. Director (technical, senior, product) | 21.Co-President |
| 10.Urban Analytics Lead | 22.Department Manager |
| 11.GIS Developer | 23.Research Lead |
| 12.Team Lead | 24.Geo Data Strategist |

City Information Modelling and Urban Digital Twins Survey

The primary role of participants in cities (31 participants)



Others: Independent computer science research and education lab; consultancy; government-affiliated institutions; private institution on consulting smart space

Multiple roles in the CIM/UDT project

	Frequency	Total sample	Percentage
Real estate developer	0	31	0.0%
Urban planner	5	31	16.1%
Business owner	6	31	19.4%
Construction project manager	3	31	9.7%
Architectural designer	4	31	12.9%
CIM/UDT system owner	3	31	9.7%
CIM/UDT project leader	13	31	41.9%
IT architect	7	31	22.6%
IT specialist	10	31	32.3%
Data analyst	8	31	25.8%
Standardization expert	8	31	25.8%
Educator/trainer	4	31	12.9%
Researcher	12	31	38.7%
Other	5	31	16.1%

What tools are used?

Tool	Number of projects using it
City Information Modelling	14
IoT	13
GIS software	12
Urban digital twin platforms	12
Other 3D visualisation tools	12
Building Information Modelling	11
Artificial intelligence (AI)	9
Simulation tools	8
Big data tools	8
Cloud computing	6
Other	6
AR / VR / XR platforms	6
CAD software	5
Earth observation services	5
Game engines	4
Blockchains/DLT	1

What software packages are used?

VISUM	UE5	QuantumGIS	Esri
Rhino	SuperMap	Maptionnaire	Next Space
EnergyPlus	Revit	ChatGPT	Houdini
Unreal Engine	Game engine	FME	Geoscene
AlSWARE Digital Gemini	AgCIM	AsiaInfo Technologies	Bentley Context Capture
Linux	ArcGIS	AGG platform TUBerlin	FLASK
KAFKA	XBim and Cesium	Cesium	Bentley OpenCities Planner
Different AI/ML libraries and platforms	KIT Karlsruhe GrGen.NET	Smart City Integrated Platform	freedotech Digital Twins Secne(DTS)
Android	Graph Database - Linked Data - Ontologies	Azure (IoT Hub)	Docker
GNOSIS Software Development Kit platform	JDK	Palm4U	ROS
Unity	OGC API standards	City Engine	3DCityDB
GIS	IFC	PostGres	FME Flow
	Hubble	BIM	

How bring data from underlying data source?

Method	Number of projects using it
Manually copying data into CIM/UDT environment	16
Automated batch update	14
Real-time connections to underlying data sources	11

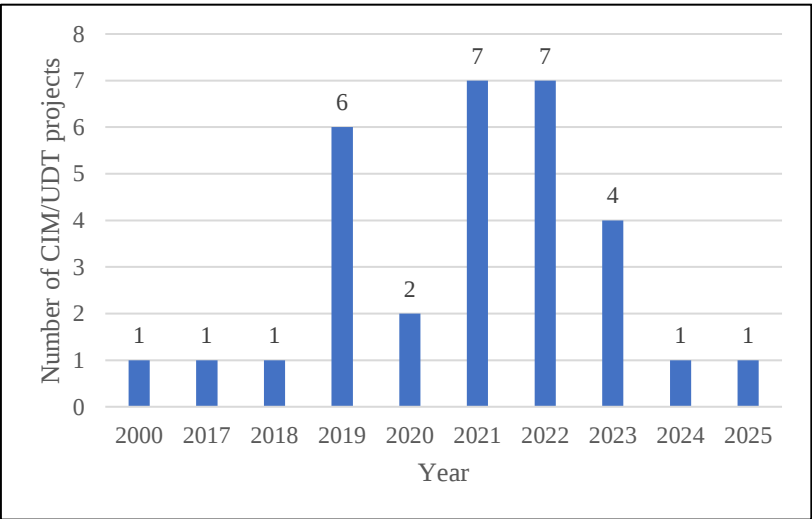
The geographical scope and owners of CIM/UDT projects

The geographical scope of CIM/UDT projects

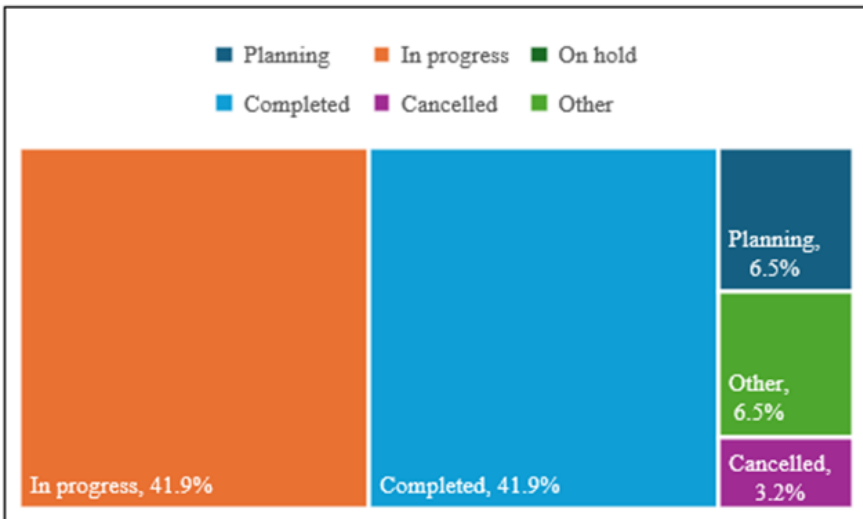
Geographical scope of the project	Frequency	Percentage
A city	12	38.7%
A country	2	6.5%
A district or neighborhood/part of a city	3	9.7%
A region/province/state	6	19.4%
Multiple specific locations	7	22.6%
Other	1	3.2%

Who is the primary organizer or owner of the application/platform/technology/solution in this project

The primary organizer or owner	Frequency	Percentage
City administration	10	32.3%
State/provincial government	2	6.5%
Federal/national government	3	9.7%
Private sector company	1	3.2%
Non-profit organization	2	6.5%
Academic institution	5	16.1%
Public-private partnership	4	12.9%
Other	4	12.9%



The year of the official start of CIM/UDT projects



The status of CIM/UDT projects

Have you established any integrations between your CIM/UDT solutions and other IT applications/systems/solutions in your organization?

Answer	Number of projects
Yes	21
No	12

Have you used IoT functionality to establish twinning capabilities in your CIM/UDT solution?

Answer	Number of projects
Yes, by using an IoT platform/IoT management system	15
No	8
Yes, by connecting IoT devices directly to CIM/UDT software	6
Yes, others	4

What application areas (e.g., air quality, traffic, water management) do you use sensors, actuators and other IoT devices for?

Traffic Management: This is the most frequently mentioned application area. It includes managing traffic conditions, streetlights, traffic cameras, and human flow.

Environmental Monitoring: This includes air quality monitoring, tracking pollution levels, and general environment quality such as temperature and moisture.

Water Management: This involves managing water quality, urban rainfall collection, water logging drainage monitoring, and water conservancy.

Smart Grids and Energy Management: This includes smart heating systems, air conditioning control systems connected to temperature sensors, and energy conservation.

Emergency Management: This includes emergency rescue and management of equipment rooms.

Urban Management: This involves urban management, pedestrian and active transport, micro-climate temperature monitoring, and parking area management.

Building Management: This includes tracking temperature in buildings as part of HVAC installations and digital building permits.

Miscellaneous: Other areas mentioned include ocean flow, meteorological sensors, and the identification of human behavior by intelligent cameras.

Are you using or planning to use any AI technology and functionality within or in conjunction with your CIM/UDT solution?

Data Analysis and Prediction: AI technologies are used for analyzing patterns in historical data, making predictions for disaster management, traffic prediction, routing adaptation, and decision support.

3D Modeling and Simulation: AI techniques are employed for the extraction and optimization of 3D models, reducing 3D modeling costs, and generating physical models for simulations.

Natural Language Processing: AI is used for grammatical pattern analysis, natural language interfaces, and enabling end-users to interact with their data through conversational digital twin scene construction.

Generative AI: This includes generative planning AI, text-generated graphics, image-generated graphics, intelligent review, and building large-scale planning models.

Data Collection and Compression: AI is used for data collection, segmentation of buildings/facades from aerials, and compressing data using deep networks.

Integration with Digital Twin Platforms: AI technologies are integrated into digital twin platforms for various purposes, including AI-driven automatic modeling technology, AI inference as an application, and AI-enhanced flow analysis.

AI Agents and Co-pilots: AI is used to build co-pilots that enable end-users to interact with their data, pose human-readable questions, and receive results from analysis.

Miscellaneous: Other areas mentioned include fire recognition, data formatting and standard conversion, and AI-enhanced segmentation for traffic cameras.

Have you implemented or are you planning to implement any CitiVerse or Metaverse technology and functionality within or in conjunction with your CIM/UDT solution?

Answer	Number of projects
Yes	11
No	21

Do you have the experience of working for global/national/regional/local/other types of standards?

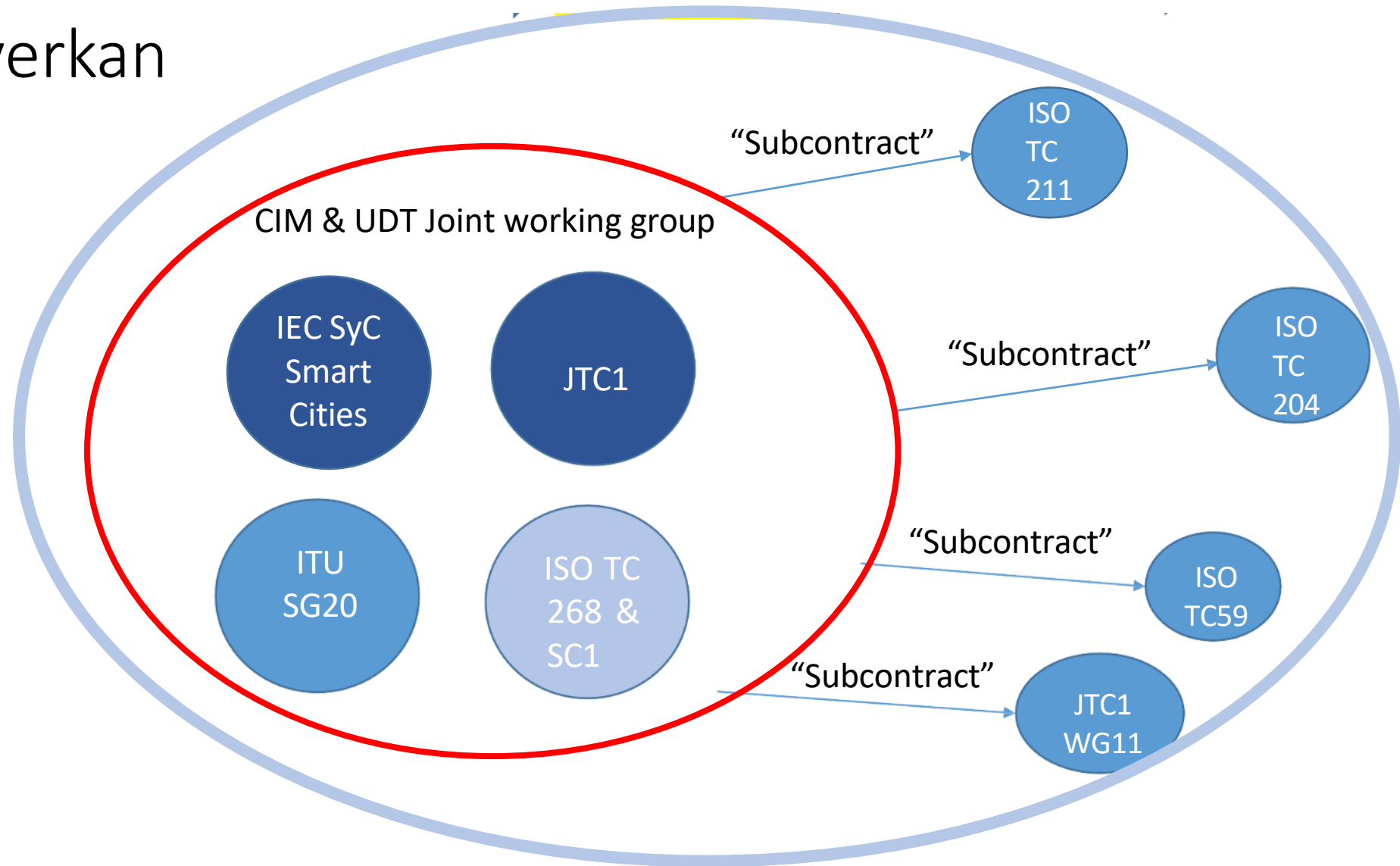
Answer	Number of projects
Yes	24
No	9

Förväntade resultat från fallstudien och GAP-analysen

En publicerad Teknisk Specifikation som:

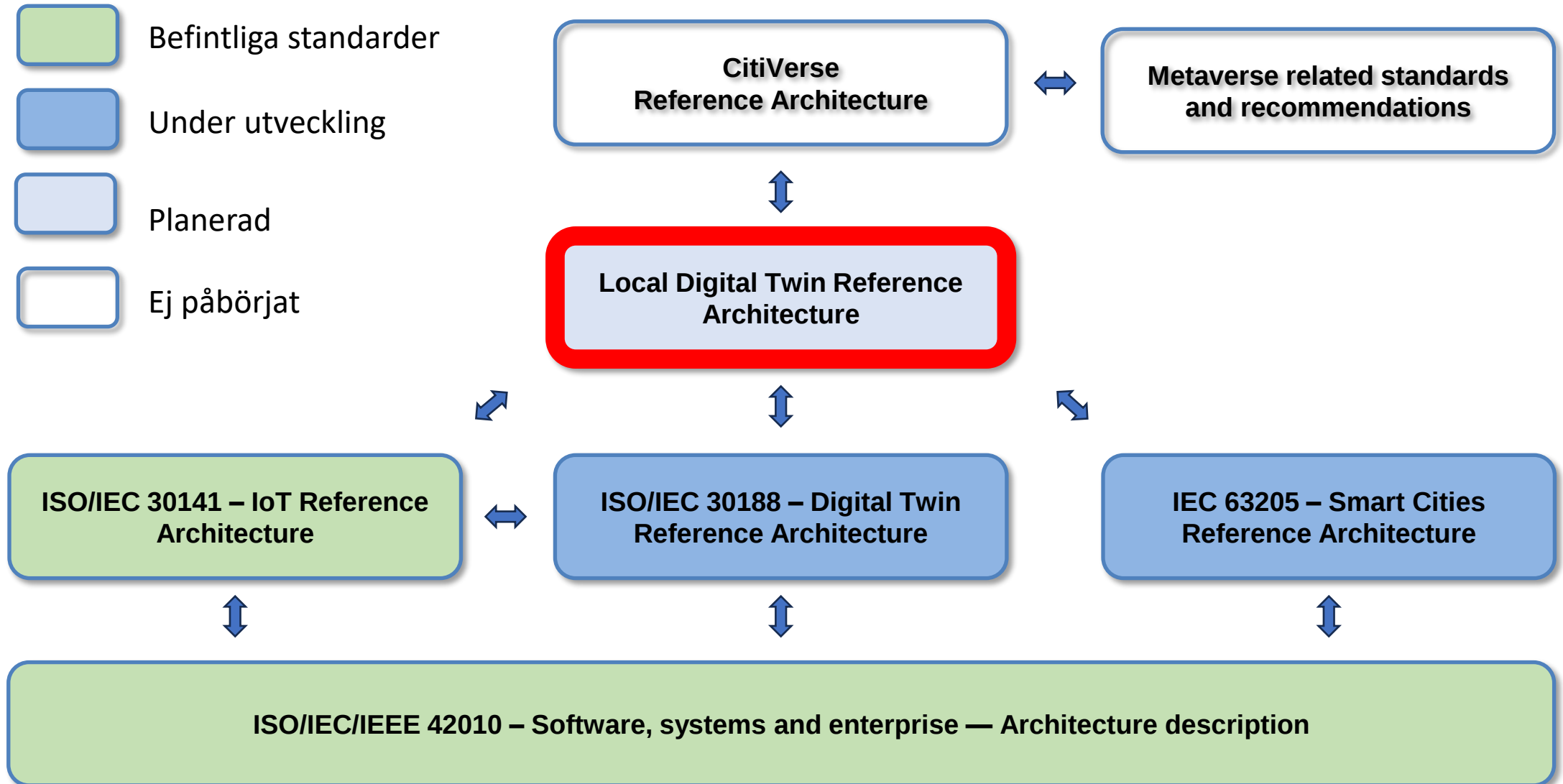
- definierar begreppen CIM och UDT i ett nutida context
- samlar in fallstudier av hur städer använder teknik för CIM och UDT
- identifierar de standarder som används
- kartlägger krav för nya standarder och eventuell revidering av befintliga standarder
- **ger rekommendationer till andra standardiseringsorgan (SDO)**

Bred samverkan



Ett fåtal övergripande standarder kommer att utvecklas av den gemensamma arbetsgruppen. Många andra standarder kommer att utvecklas av andra standardiseringsorgan.

JWG:n har också en referensarkitektur för LDT som mål



Aktiviteter från svensk sida

- **6 Svenska projekt** har svarat på den internationella enkäten
- Standardiseringsarbetet presenteras och diskuteras fortlöpande i **Arbetsgruppen Standarder & Plattformar**.
- Vi kommer få **mer info** från undersökningen och analysen
- Vi är med och **påverkar** utformningen av standarderna
- Till hösten kommer vi genom Arbetsgruppen att genomföra en **marknadsöversikt av plattformar för Lokala Digitala Tvillingar** (likt den marknadsöversikt för IoT-plattformar som genomfördes 2024).

Tack!

Välkommen att höra av dig!

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