Setting the foundations for scale-up of smart city solutions

Martin Brynskov @brynskov

SYSTEMS OF SYSTEMS OF SYSTEMS OF SYSTEMS OF...

Toward open collaboration and minimal interoperability to drive and de-risk digital transformation

Martin Brynskov @brynskov



DILEMMAS

SMART CITY DILEMMAS

- 1. Flexibility, precision, productivity for whom?
- 2. We don't see the same city
- 3. Resilient or vulnerable?
- 4. Democratic immediacy or noise?
- 5. No-one left behind?
- 6. Overview or surveillance?
- 7. New public spaces without public authorities
- 8. Is planning possible?
- 9. Public institutions and their competences
- 10. Public service 2.0

Martin Brynskov @brynskov

Chair, Open & Agile Smart Cities (OASC)

Director & Associate Professor, Aarhus University DITCOM – Centre for Digital Transformation of Cities & Communities

Coordinator, SynchroniCity & NGIoT Chair, Danish Standards Committee on SSCC (ISO TC268) Partner, Smart City Cluster Denmark Vice-Chair, ITU-T FG-DPM IoT & SCC Chair, AU Smart Cities, Aarhus University





Martin Brynskov @brynskov

MA

Information Studies, Classical Greek, Semiotics (Digital Habitats)

PhD Computer Science (with LEGO)

Associate Professor

Digital Design & Information Studies, Interaction Technologies







Mission: To create a global smart city market based on the needs of cities and communities

Demand-side

Global network of national networks

140 cities29 countriesEurope, Latin America, Asia-Pacific

Council of Cities Coordinator: Ghent (Belgium) Board representative: Vienna (Austria)





Global community



A robust model for standards-based innovation and procurement of **IoT- and Al-enabled** services across domains

STANDARDS?



A voice for cities and communities towards the market.

Support local priorities, leveraging global dynamics.

Free flow of data with trust.

OASC <u>Minimal</u> Interoperability Mechanisms (MIMs)

Benefit for Cities:

• Choice, flexibility, efficiency, value-for-money, independence, economic development

Benefit for Businesses:

- Scale, agile development/deployment Benefit for all:
- Reduced risk, increased investments, innovation

Architecture Framework Model



- **IoT Management:** to interact with the devices that use different standards or protocols making them compatible and available to the SynchroniCity platform.
- **Context Information Management:** to manage the context information coming from IoT devices and other public and private data sources.
- **Data Storage Management:** to provide functionalities related to the data storage and data quality interacting with heterogeneous sources.
- **Marketplace:** to implement a hub to enable digital data exchange for urban data and IoT capabilities providing features in order to manage asset catalogues, orders, revenue management.
- **Security**: to provide crucial security properties such as confidentiality, authentication, authorization, integrity, non-repudiation, access control, etc.
- **Monitoring and Platform management**: to provide functionalities to manage platform configuration and to monitor activities of the platform services.

Baseline: SynchroniCity Cities/Reference Zones, OASC, FIWARE, EIP-SCC, NIST IES-CF.

Related standards: ITU-T SG20*/FG-DPM* (*drafts), ISO TC268.

Spec. doc.: Reference Architecture for IoT Enabled Smart Cities (D2.10) http://synchronicity-iot/docs



Interoperability Points



- Interoperability Points represent the main interfaces that allow a city (or any Reference Zone, RZ) and applications to interact with SynchroniCity platform
- Interoperability points are independent from the specific software components that realize them and can be implemented by cities in different steps to reach different levels of compliance
- The architecture has been designed following the OASC principles and the definitions of Minimal Interoperability Mechanisms (MIMs).
 MIMs, are the actual specifications of the interfaces at the Interoperability Points: they are standard API and guidelines that have to be implemented by a city in order to be compliant with the SynchroniCity framework

OASC Interoperability Mechanisms

1 2

2	
J	

Interoperability Point	Description
Context Information Management	This API allow to access to real-time context information from the different cities.
Shared Data Models	Guidelines and catalogue of common data models in different verticals to enable interoperability for applications and systems among different cities
Ecosystem TransactionIt exposes functionalities such as catalogue management, orderir management, revenue management, Service Level Agreements (management etc.("Marketplace")Complemented by marketplaces for hardware and services.	
Security API	API to register and authenticate user and applications in order to access to the SynchroniCity-enabled services.
Data Storage API	This API allows to access to historical data and open data of the reference zones.

Adopted by the OASC Council of Cities January 16, 2019

OASC MIMs: adopted by 140+ cities

- MIM 1: Context Information Management
 - Orion (CEF/FIWARE)
 - Scorpio (NEC)
 - Djane.io (Sensinov)
 - Obelisk (imec)
 - TBC (Atos)
 - TBC (South Korea)
- MIM 2: Common Data Models
- MIM 3: Ecosystem Transaction Management





MIMs: based on global open standards

MIM	Name	Standards & [Baselines]	Reference
1	OASC Context Information Management MIM	ETSI NGSI-LD API, OMA NGSI, ITU-T SG20/FG-DPM	Reference Architecture for IoT- Enabled Smart Cities (<u>SC-D2.10</u>)
2	OASC Data Models MIM	[SAREF, GSMA, schema.org, SynchroniCity RZ + partner data models]	Guidelines for the definition of OASC Shared Data Models (<u>SC-D2.2</u>) Catalogue of OASC Shared Data Models for Smart City domains (SC-D2.3)
3	OASC Ecosystem Transaction Management MIM	[TM Forum Business Ecosystem API]	Basic Data Marketplace Enablers (<u>SC-D2.4</u>) Guidelines for the integration of IoT devices in OASC compliant platforms (<u>SC-D2.6</u>)

MIMs status

• 20+ operational deployments worldwide

 Including Milan, Vienna, Porto, Helsinki, Santander, Eindhoven, Antwerp, Geneva, Manchester, Seongnam, Bordeaux

• 140+ formal adoptions worldwide

- Including London, Amsterdam, Brisbane, Edinburgh, Rio De Janeiro, Buenos Aires, Leon, Ghent, Almere, Sarajevo, Tampere
- Pending: Tokyo, Fukuoka, Osaka, Yokohama, Dubai, Montreal, Toronto, Chennai, Pune, Hyderabad, Shanghai, Yinchuan, Guadalajara

• 29 countries

- Currently average of 4.8 cities per country



SYNCHRONICITY IoT Large-Scale Pilot for Smart Cities & Communities



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No732240 Co-funded by



Deliver a market for IoT- and AI-enabled services for cities & communities in Europe and beyond

Project Objectives

- 1. Establish technical foundations
- 2. Establish marketplace enablers
- 3. Create reference zones
- 4. Pilot services that serve citizen needs
- 5. Establish ecosystem
- 6. Establish citizen-oriented methods
- 7. Establish holistic quantification of value
- 8. Provide insights into new busines models
- 9. Transform city policy-making and planning



Demonstrating the Power of MIMs

SYNCHRONICITY

Scaling up across cities:

- 50 services
- 21 cities
- 16 teams
- 6 months

Core project: 20m€ · 40 partners More information: <u>synchronicity-iot.eu</u>











SYNCHRONICITY OPEN CALL STATISTICS

"The SynchroniCity 3M€ open call invited proposals for new pilots and cities to join the European Large Scale Pilot for Smart Cities & Communities. The goal is to enrich the ecosystem beyond the project, thus helping foster a global market for IoT-enabled services for cities and communities based on a common technical ground. This fundamental interoperability offers cities choice, value-for-money, efficiency and independence, while supporting local economic development. Providers, will gain reusability and replicability for agile development of IoT solutions in a large addressable market".

133 APPLICATIONS RECEIVED

Lead applicants

Pilots groups

Lead applicants of the open call come from 22 different countries

Each pilot targeted from 2 to 8 cities

Challenges

Pilot Cities



HIGHLIGHTS



36 new cities applied



27% of the new cities are OASC members 36% of the new cities are members of EUROCITIES

EURO

CITIES



Most of the lead applicants are from Spain, the UK and Finland

> 11% of the new cities are part of EIP-SCC lighthouses









RONICITY BOOTCAMP KICKS OFF PILOT PHASE

CITIES & PILOTS

www.synchronicity-iot.eu

SYNCHRONICITY

Cities & Pilots Community Tech News Media \wp









www.synchronicity-iot.eu

QUAMTRA SMART WASTE MANAGEMENT

RainBrain

The smart blue-green roof

Healthier green roofs

- RainBrain monitors and predicts the vegetation's health
- Waters vegetation automatically when needed



The best of IoT and analytics combined

- Vegetation sensors, solar panel and LoRaWAN
- Weather data, machine learning and modeling
- RainBrain insights and controls through a mobile app

Optimized water availability

- RainBrain analyses the current and future water availability
- Anticipates on extreme weather: stores water to survive droughts, empties buffers to prevent floods





Antwerp (Belgium) Eindhoven (Netherlands) Funded by SYNCHRONICITY synchronicity-iot.eu/

RAINBRAIN: THE SMART BLUE-GREEN ROOF

www.synchronicity-iot.eu



ASAP-VALUE : A STANDARDS-BASED APPROACH TO ENHANCING VALUE FROM CITY DATA LAKE

www.synchronicity-iot.eu

SynchroniCity Catalogue

- Data
 - Open
 - Personal
 - Commercial
- Hardware

- Services/Software
 - Applications
 - Atomic services
 - Components
- Training

These marketplaces are already live in <u>SynchroniCity</u> and partly in <u>IoF2020</u> (IoT LSP Food & Farming)



Next Generation Internet of Things



Research, Innovation and Implementation Roadmap for Europe and Beyond for the period 2021-2027





BUILDING A ROADMAP FOR THE NEXT GENERATION INTERNET OF THINGS RESEARCH, INNOVATION AND IMPLEMENTATION 2021-2027

SCOPING PAPER





European Commission

EPSC Strategic Notes

Issue 30 July 2019

Rethinking Strategic Autonomy in the Digital Age

European **Political Strategy** Centre

In the 21st century, **those who control digital technologies are increasingly able to influence economic, societal and political outcomes.** Policymakers around the world are waking up to the critical imprint that digital technologies have on their countries' strategic autonomy and a global race for technological leadership has ensued.

Some international trends

METROLAB

- USA
- China
- Japan, Korea, India ...
- EU
- Networks
 - World Economic Forum
 - Open & Agile Smart Cities
 - UN U4SCC, SDGs





EU-initiatives

- 5 "missions"
 - One about "Climate-neutral smart cities"
- Research & Innovation
 - Horizon Europe (>12b€ digital)
- Implementation
 - Digital Europe Programme (9b€)
 - Connecting Europe Facility (3b€)
 - DESI-local
 - Scale-up declaration
- Infrastructure
 - Regional/Structural funds



CEF DIGITAL 2021-2027 - €3 billion

- Alignment with Gigabit Society Strategy objectives: supporting MS in addressing the overall funding gap (€155 bn) with strategic projects
- Complementarity with Digital Europe, structural funds & InvestEU

- Cross-border 5G automotive corridors (but also railways, inland waterways)
- Gigabit connected hospitals, schools, business parks, public Wi-Fi & coverage of surrounding areas (5G communities)
- Key international/ cross-border connectivity



For scale-up, cooperate in/with the networks

To join forces and share learnings, consider joining in or cooperating with the relevant networks for scaling up digital solutions in smart cities and communities, such as:

EU Committee of the Regions, see e.g. https://cor.europa.eu/en/news/Pages/digital-europe-for-all-smart-digital-solutions.aspx EUROCITIES, see: http://www.eurocities.eu/eurocities/forums/knowledge-society&tpl=home Open & Agile Smart Cities (OASC), see: https://oascities.org/ European Network of Living Labs (ENOLL), see: https://enoll.org/ Digital Transition Partnership Urban Agenda for Europe, see: https://ec.europa.eu/futurium/en/digital-transition



Cities and businesses rally around European IoT large-scale pilot

MINIMAL



Cintal network of local networks of

Standards-based innocation and

148 citizes in 29 separations

Otion and communities

INTEROPERABILITY MECHANISMS (MIMS)

A reading based or evening standards

and readlancers, governed by cities, supported by sugglar's and

And it is not

SYNCHRONICITY

Gif Large Scale Piller an Smart Close & Communities (15/2014)

fail up to validate and instane the ORSC NON of scan.

25 cities, 50 services - running int the same contract beforids ground.





HERE I Logary Louise



---------------sees sent men ---seed they prove

tent this past



	12 September	
	8:30-9:00	Registration
	9:00-9:15	Welcome
	9:15-10:45	 Session 1: Digital innovation in cities FI Framework Paper on Digital innovation in cities ESPON Policy Brief 'Digital Innovation in Urban Environments' URBACT input on the URBACT workstreams on the theme Draft key points of the incoming 'Joining Forces'
52		 Declaration built by a network of stakeholders Martin Brynskov (OASC): Insights built on the findings of the Policy Brief
		Discussion on the key issues, perspectives and intended

Approaches to digital transformation

Models

- Anchor (sector)
- Platform (horizontal)
- Beta (iterative, diverse)

Aspects

- Trust
- Ecosystem
- Governance
- Data Life Cycle
- Commercialisation



Reflections

- Linking governance (including law and management) to tech development is key: Organisational change
- Finding realistic, implementable common ground
- Widen the public debate to rethink society without throwing out core values
- The sectors and departments must collaborate
- Good links between formal and informal networks (Governments, NGOs) is key in this transition



Save the Date

- Smart City Expo World Congress
 - 19-21 November 2019
 - Barcelona
- Connected Smart Cities and Communities
 - 22-24 January 2020
 - Brussels
- Cities Forum
 - 31 January 2020
 - Porto
 - SynchroniCity LIVE Summit
 - 16-18 June 2020
 - Copenhagen

Strictly Confidential. All rights reserved. Open & Agile Smart Cities vzw

WAY FORWARD

CIVIC Driven by public needs, backed by industry

COMMON Understanding & standards

CONCRETE

Linking instruments (projects, policy, financing, places)

FG-DPM IoT4SCC



https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20190719/Pages/programme.aspx

ITU-T Technical Specification

TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

(19 July 2019)

ITU-T Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities

Technical Specification D0.1 Data Processing and Management for IoT and Smart Cities and Communities: Vocabulary

Basic concepts of DPM in FG-DPM and their relationships under multi-dimensions (DPM-O-172, 38 terms)



minimal interoperability

Definitions

3.2.2 content owner: An entity that owns the rights to content and can be watched, listened or read online.

3.2.3 data commercialization: The process of creating commercial value from data. NOTE – It may encompass various activities, including, but not limited to, monetization, valuation, pricing, licensing, distribution, marketing and sales.

3.2.4 data exchange: Accessing, transferring and archiving of data.

3.2.5 data governance: Set of activities aimed to design, implement and monitor a strategic plan for data asset management.

3.2.6 data marketplace: An electronic marketplace whose main product is provisioning of data and/or related services around data.

3.2.7 data processing and management: The combination of all activities either directly performed on or indirectly influencing data.

NOTE 1 - Directly performed activities include among others [collecting/acquiring/capturing], exchanging, storing, securing, manipulating, reusing, aggregating, curating, disposing, monetizing and deleting data.

NOTE 2 - Indirectly influencing activities include among others policy and standards making, skills and innovation enhancement.

3.2.8 data sharing: The process of data exchange among different parties with specified conditions.

3.2.9 ecosystem: A set of organisations forming a distributed system with both technical and non-technical properties.

3.2.10 minimal interoperability: The minimal sufficient degree needed to meet a certain requirement for data sharing, use and reuse. NOTE – This is an approach to build a set of modular mechanisms, including information models, across multiple domains, locations and events. The definition aligns with the definition of "interoperability" in [b-ITU-T Y.101].

3.2.11 open data: Any information that has been made available for anyone under a legal framework to access, alter, and share without restrictions.

NOTE - It can be from a public source, e.g. government data, or from a business, e.g. company intelligence, and can be used for both commercial and non-commercial purposes.

3.2.12 Smart Cities and Communities: Effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens.

NOTE – This definition aligns with the definition of "Smart City" in [b-ISO/IEC 30182] and with the recommendation from the IEC/ISO/ITU Smart City terminology coordination Task team [b-IEC/ISO/ITU Draft White Paper].



ITU-T Technical Specification

TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

(19 July 2019)

ITU-T Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities

Technical Specification D2.1

Data processing and management framework for IoT and smart cities and communities



