|  |  |
| --- | --- |
| **TITLE:** | SmartCities Domain Working Group Charter |
| **Authors:** |   |
|  | **Name:** | **Organization:** | **Email:** |
|  | Carsten Rönsdorf | Ordnance Survey | Carsten.Roensdorf@osi.os.uk  |
|  | Dimitri Sarafinof | IGN, DGIWG | dimitri.sarafinof@ign.fr  |
|  |  Yanmei Wu | NRCan/RNCan | yanmei.wu@canada.ca  |
|   | John HerringEddie Oldfield | Oracle USAOldfield, Eddie | john.herring@oracle.comeoldfieldsqs@outlook.com |
| **Date:** | 31 August 2016 |
| **Category:** | Domain Working Group |

# 1. Introduction

The problems that confront humanity include climate change and its side effects, limited natural and other resources, energy consumption, pollution, traffic, transportation, noise, emergency management, health and safety. All have a better chance for solution in more densely populated areas where efficiencies of scale are more effective but are often the source of many of the problems. SmartCities is not a solution looking for a problem, it is a horde of very serious problems looking for a common set of solutions and tools for the planning, building and managing of efficient, livable, sustainable communities.

These problems are driven by human activity and, therefore, there is a fundamental belief that the best way to address these problems is at the same level as local government. The catch phrase, seen in many forms, “Think global, act local” in this original form is attributed to a Scottish town planner and social activist Patrick Geddes (see [4]). The promise of SmartCities may be based on the theory that by solving the problems at their source is the most efficient way. The city is that local level with the best hope of addressing this set of problems.

Simply put (see [3]);

"Smart cities are places where information technology is wielded to address problems old and new… combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems.” .

Since each smart city community is its own laboratory, many different solutions will be tried and compared so that near optimal solutions should arise out of the community of smart city implementers. Solutions will evolve, and the speed of the resulting optimization will depend on the speed of implementations. Thus, the key to the concept is emphasis on flexibility of tools developed for and available in the environment. This makes the smart city a near perfect test bed for AGILE programming techniques extended beyond the small group “project level” and reimagined for a large cooperative community. Thus, the major requirements for tools in the SmartCities environment will have to be flexibility to support the broadest set of clients possible.

This DWG charter defines the role for OGC activities within a Smart Cities environment and its creation and to provide an open forum for the discussion and presentation of interoperability requirements, use cases, pilots, and implementations of OGC standards in SmartCities. It will be showcased how OGC standards can be used to solve real world problems in cities, together with an outlook on standards needs in this area.

SmartCities discussion has arisen from a known very big set of big problems related to location both in source and affect. These include but not limited to:

* Controlling all pollution issues, e.g. greenhouse gases, water quality and sufficiency, air quality, waste recycling.
* Controlling and optimizing
	+ land and other resource use
	+ production capability
	+ energy use and production
	+ waste handling, reuse and minimization (both liquid and solid)
* Sustainability: the ability to supply all current resource needs without diminishing the future supply of those same resources (only renewable resource used at or below the level of renewability)
* Public security and safety
* Energy efficiencies in production, transportation, distribution and resource use.
* Eliminate all social negative effects.

The purpose of the SmartCities DWG must be essentially a subset of the purpose of the OGC, and the physical aspects of activities, such as waste disposal and energy production, are not directly within in the scope of the OGC. Therefore, the SmartCities DWG is nominally restricted to the virtual world but will include items in support of physical activities, such as simulation, modeling, optimization and creating the solutions to physically problems.

## 1.1 Definitions of SmartCities

The final report from the ISO/IEC JTC 1 / SG 1 [1] defines a Smart City as one that can…

* dramatically increases the pace at which it improves its sustainability and resilience,
* fundamentally improving
	+ how it engages society,
	+ how it applies collaborative leadership methods,
	+ how it works across disciplines and city systems, and
	+ how it uses data and integrated technologies,
* in order to transform services and quality of life to those in and involved with the city (residents, businesses, visitors)

For SmartCities in particular, heavy emphasis will be on system of systems issues of:

* Interoperability between disparate applications, especially in the shared data models and processing models
* Smooth transitions and process flows including monitoring, planning, execution of changes and maintenance of the running system that will support applications appropriate to Smart City, including but not limited to:
	+ Smart Grid
		- Demand shifting/reduction
		- Renewable integration
		- Microgrid and local utility operations
		- Energy Management
	+ Continuous indoor/outdoor navigation
	+ Location-based services
	+ Intelligent Transportation Systems
	+ Urban Planning
	+ Security, Law Enforcement and Emergency Management
	+ Health and Environment
	+ Construction, Operations & Maintenance (buildings and infrastructure)
	+ Information/communication/control technologies
		- ICT (Information and Communications Technology)
		- C4I (Command, Control, Communications, Computers, and Information)
	+ Commercial and consumer applications

SmartCities applications will need to support all of the information communities that are related to urban activities and processes. The SmartCities Domain Working group will defines a user domain where:

* Distinct market, application or business approach exists,
* Common data definition, structure, syntax, and definitions exists,
* Common user requirements exist and
* Common approach to vendors exists.

The SmartCities data and applications will have to both replicate the state of the city and to simulate possible alternative futures. To do this, the modeling of the city will have to cover all aspects of the city relevant to the problems that will require smart solutions. The important modeling aspects would include, but not necessary be limited to:

* Networks and flows that can describe all motion in the city of persons and things, information and communication, to observe, plan and optimize the many flows that describe, model predict and optimize the “circulatory systems” of the “living” city.
* Building and facilities models, historic, as-is, and possible future plans, including all aspects that could impact the city, its environment, its residents and its activities, capable to support the planning for emergency management and day-to-day maintenance, including 4D aspects of zoning, cadastre and environmental factors.

## 1.2 SmartCities Domain Working Group

The SmartCities Domain Working Group will follow the policies and procedures of the [Technical Committee](http://portal.opengeospatial.org/files/?artifact_id=23325). The functions of a Domain Working Group are:

* Provide a forum for discussion and documentation of interoperability requirements including common data and application reuse including all aspects of the urban resident user community;
* Support communication and cooperation between and among the OGC and all other organizations and communities involved in the aspects of a potential Smart City, including but not limited to:
	+ ISO IEC JTC 1 WG11 Smart Cities
	+ Urban Planning
	+ Environmental modeling, pollution control and remediation
	+ Public Safety and Emergency and Disaster Management
	+ Smart Grid, Energy production, distribution and management
	+ Intelligent Transportation Systems (ITS)
	+ Internet of Things
	+ Augmented Reality
	+ Navigation, including Seamless Indoor-Outdoor and Multimodal Systems
* Propose or advance interoperability test bed or projects;
* Provide a forum to discuss and recommend document actions related to Interoperability Program Reports;
* Develop Change Requests Proposals (CRPs) for existing OGC Standards;
* Develop engineering reports with the intent seeking approval by the TC for release of these documents as OGC White Papers, Discussion Papers or Best Practices Papers;
* Informational presentations and discussions about the market use of adopted OGC Standards;
* Commission a foresight report on the need for standards in the OGC domain relating to smart cities;
* Have a formal approved charter that defines the DWGs Scope of Work and estimated timeline for completion of the work;
* Have all-member voting policies (unless otherwise stated);
* Have missions and goals defined by the TC.

The SmartCities Domain working group will be public, have a public Wiki, open public meetings and discussions. All announcements of meetings will be posted both to the OGC calendar and the public Wiki.

## 1.3 Basic scope of OGC in the SmartCities domain

The basic elements of SmartCities that fit in the scope of the OGC model and domain are applications and services based on both mobile and and static networks to support the data, application and monitoring requirements of the SmartCities, its applications, its datasets, its history and processes.

The need for smart cities standards within the OGC environment can be categorised into four different areas:

1. data / spatial data
2. policy and governance
3. data sharing platforms
4. applications, services and solutions

# 2. Purpose of the SmartCities DWG

SmartCities Applications will have to understand and use the design and regulation of the uses of space that focus on the physical form, economic functions, and social impacts of the urban environments (the city-scape) and on the location of different activities within it. In general, the purpose of a SmartCities Application is to improve the human geography of the designed environment; that is to facilitate how human activity affects or is influenced by the geography of city-scape, including transportation, communication and utility networks, to ensure the orderly design of and optimal use of the city-scape and its associated infrastructures, both physical and virtual.

In today’s world this also means to understand and facilitate the communication of information about the city-scape with the users of that space; to use this to optimize those interactions and potentially adjust the designs of that space to better serve those who related to that space (e.g. people living, working or visiting a given space).

In the past, many of these process, such as urban planning and public safety, have been thought of as a government functions, but the improvement of communication and the rise of social media is changing that. The public, in general, are no longer pleased to be passive in acceptance of authority. Because of this, and other societal trends, the future of SmartCities will depend on “crowd sourcing” decisions and plans that affect residents. The plan, execution, and maintenance of the city-scape in the purposes to which it is involved will have to balance:

* Communitarian goals (“the common good”) with individual rights (e.g. privacy)
* Efficient management with public involvement and popular control.

Thus, SmartCities is a process for the design of the city-scape to ensure the orderly development of communities for the benefit of its inhabitants. A “Smart City” invests in human and social capital and traditional (physical) and modern information, communications technology (ICT) infrastructure to sustain quality of life in the city-scape. Aspects of the “Smart City” can also be seen in the technologies that support:

* Augmented Reality (AR),
* Urban Planning,
* Disaster Management and Amelioration,
* Smart Grids,
* Sensor Web Enablement (OGC SWE),
* The Internet of Things (IoT),
* Facilities Management,
* Building information modeling (BIM),
* CityGML and
* Land infrastructure (LandInfra).

Applications like LBS (Location Based Services), navigation (indoor and outdoor) and “Big Data” Analytics can play important roles in satisfying these targeted requirements.

# 3. Problem Statement

According to UN, since the end of 2008 more than half of the world’s population lives in urban areas and, by 2050, the world population will exceed 9 billion, most of whom will need to live in urban areas that will have to be designed and used to optimize resource use. The first part of this is the planning of the city, but the second require intelligence use of that plan. The planning and the use of urban areas cannot be dealt with as separate endeavors.

The SmartCities Domain Working Group has to address both issues – the planning of the space and the uses of that space; particularly the optimisation of spaces and infrastructure in the light of changing constraints and requirements need to be looked at and it is expected that Information Technology can help to adapt to changing circumstances and optimise the use aspect over time.

Additionally, societal and economic development have extended the scope from “public spaces” to a more general concept of “publicly accessible spaces” regardless whether these are outdoor, indoor or underground (e.g. shopping malls, large underground spaces etc.).

This connects the concerns of the urban population to those of e-government, planning, operations and maintenance. In general, e-Government is concerned with supplying to citizens electronic services to meet their needs in relationship to the government and the urban infrastructure; mostly concentrated in the as-built environment but also extending to the planning and executions of changes to that environment for the sake of optimization and efficiencies. The role of SmartCities in government is basically two arenas:

1. The improvement of e-government services through a more accurate computer model of the as-built urban infrastructure and environment, allowing for more accurate and efficient delivery of information and related services to the citizen-resident-user-planner.
2. The improvement of the urban infrastructure and environment though using usage information and other public input to optimize the environment to supply resident-citizen needs, while controlling the transitions inherent in the transition between as-built and as-planned configuration.

# 4. Charter

The scope of the SmartCities Domain Working Group will include anything that produces a clearer picture of the eventual properties of the potential SmartCities Application Environment. This will include both system architecture and application definition and implementation. This would include descriptions or design of the following:

* A microservices architecture dependent more on interoperability between independent applications than a large monolithic classical view of services (see [5], [6], [7] and [8]).
* This architecture would support microservices that:
	+ Directly serves needs of individuals citizens of the smart city,
	+ Implement data services so that common view of reality can be stored and served to microservices in a consistent manner to produce a common and seamless view of reality for all potential services.
	+ Microservices for collection of data through all the possible sources of information, including but not limited to:
		- Sensors (internet of things, sensor web, others as needed)
		- System activities
		- Intelligent transportation systems, including traffic monitoring, control and optimization (of both time and energy use) including the necessary organization and information supply for public transportation,
		- Smart grids and other mechanism for the monitoring and control of energy production and use,
		- Suppling status information of all monitored devices, vehicles and other items of interest in a timely and rational manner (e.g. transport location and projected actual schedules based on sensor web information),
		- Data structures, encodings, storage and exchange patterns that facilitate the utilisation of data in the microservices stated above.

## **4.1** **Charter Members.**

The initial membership of the DOMAIN WG will consist of the following members and individuals with extensive education and experience in DOMAIN issues, namely:

|  |  |
| --- | --- |
| **NAME** | **AFFILIATION** |
| Carsten Rönsdorf | Ordnance Survey |
| Dimitri Sarafinof | IGN, DGIWG |
| Yanmei Wu | Natural Resources Canada |
| John R. Herring | Oracle USA |
| Eddie Oldfield | Oldfield, Eddie (Spatial Quest) |

## **4.2** **Key Activities.**

The DWG will need to define key activities it intends on undertaking. Examples of such activity might be framed around the following considerations:

1. Determine OGC goals and organizational issues that impact DOMAIN data, technology and markets.
2. Define the business issues and approaches for OGC to incorporate so that DOMAIN considerations are brought into proper focus with the OpenGIS Specification initiatives. The approach includes defining business objectives, tasks and schedule.
3. Define approach for engaging with the DOMAIN community to enlist their support;
4. Commission a foresight report on the need for standards in the OGC domain relating to smart cities.

## **4.3** **Business Case**

Define the business cases related to interoperability that confront the DOMAIN community. Examples of issues that might be discussed include:

1. GeoData and support data taxonomy and characterization
2. Data sharing, interface standards and approaches
3. Metadata standards
4. DOMAIN analysis models and processing standards
5. Data quality and accuracy
6. Data protection and truth in labeling
7. Data acquisition coordination
8. User education

# 5. Organizational Approach & Scope of Work

## 5.1 SmartCities Domain Working Group Business Goals

The SmartCities Domain Working Group will need to establish a set of business goals that frame the basis for determining the nature and type of recommendations made to OGC, framed around the above mentioned business issues. Examples of the types of discussion for framing goals include

1. Efforts should focus on working SmartCities issues and problems that result in a net gain for the community.
2. Minimize technical distinctions between SmartCities data processing systems that use geography, as this can lead to artificial barriers that limit the potential of all segments of the information community to come together and fully prosper.
3. Avoid placing artificial technical barriers on use of SmartCities data.
4. Establish the means by which OGC can achieve interoperability and yet preserve the proprietary nature of data.
5. Define the supporting infrastructure for the community to achieve these goals.

## 5.2 SmartCities Domain Working Group: Mission and Role

The DWG will concern itself with technology and technology policy issues, focusing on geodata information and technology interests as related to urban activities and the means by which those issues are appropriately factored into the OGC standards development process.

1. Define the **mission** of the DWG with focus on urban-activities-based interoperability standards for data and related processing services, under the auspices of OGC.
2. Define the **role** of the DWG to present, refine and focus interoperability-related issues to the Technical Committee.

## 5.3 Activities planned for SmartCities Domain Working Group

Define **scope of work and tasks** in terms of interoperability approaches for OGC Technical Committee consideration, define how this is to complement existing efforts and results produced by the OpenGIS Project, resulting in a specification for all forms of geospatial data and geoprocessing services. The following points should be discussed under scope of work and tasks

1. Define how the DWG will act as an impetus for the creation of whole new modes of operation and economic behavior which will influence the way businesses and governments operate in DOMAIN business activity. These could include business rules, standards and interfaces that must be common across a multidisciplinary and fragmented geographic information community, as well as conformance processes pertaining to DOMAIN data and technology.
2. Define DWG membership objectives
3. Define how user communities, both current and potential, should have access to the working group so that requirements and technology issues are addressed and results do indeed provide the technology they need.
4. Define technical tasks to be undertaken by the DWG

# 6. References

1. ISO/IEC JTC 1 / SG 1. **SG 1 Second Phase Report Submitted to 2015 JTC 1 Plenary**. ISO/IEC JTC 1 / SG 1. 2015-09-10. (to be published publicly at a later date).
2. Scientific American Editors. **Designing the Urban Future: Smart Cities**. Scientific American, 2014.<http://www.scientificamerican.com/store/books/designing-the-urban-future-smart-cities/>.
3. Townsend, Anthony M., **Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia**. W. W. Norton & Company. 2013.<http://www.iftf.org/smartcities/>.
4. Wikipedia, “Think global, act local”, retrieved 10 July 2016 from [https://en.wikipedia.org/wiki/Think\_globally,\_act\_locally](https://en.wikipedia.org/wiki/Think_globally%2C_act_locally).
5. Krause, Lucas. **Microservices: Patterns and Applications: Designing fine-grained services by applying patterns.** Copyright © 2014, 2015 by Lucas Krause. Kindle e-book.
6. Cambell, Edward. **Microservices Architecture: Make the architecture of a software as simple as possible.** Copyright © 2015 by Edward Cambell. Kindle e-book.
7. Nadareishvili, Irakli ; Ronnie Mitra; Matt McLarty; Mike Amundsen. **Microservices Architecture.** 2016. O'Reilly Media, Inc.
8. Atchison, Lee. **Architecting for Scale.**  2016. O'Reilly Media, Inc.