



Australian
National
University

COMP3530

Systems Engineering for Software Engineers

Week 7 – Development of Industry Standards



LACK OF STANDARDS



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1990 BROWSER WARS

- Focus on “Netscape-only” or “Microsoft-only” proprietary technologies
- Browser developers paid little heed to Standards
 - supporting standards partially and incorrectly
- Developers had to write customized versions of (non-standard) markup for every browser
- Browser-detection scripts costly and expensive, required constant updating as new browsers were released

Best Viewed With



[Click here to download Internet Explorer Now](#)



<http://www.dejavu.org/>



STANDARD

“Formulation, publication, and implementation of guidelines, rules, and specifications for common and repeated use, aimed at achieving optimum degree of order or uniformity in a given context, discipline, or field.”

- Reduce Costs
- Interoperability
- Globalisation



BENEFITS

- Reduce Switching Costs
- Strong network effects
- Efficient Reduction in the variety of products or services
- Ensure industry Quality Management
- Efficient distribution of technical information
- Easier to meet obligations under regulations
- Creating or entering new markets
 - Reducing (technical, regulative) barriers to trade
 - Reducing production costs and offering opportunities for economies of scale

Cebr (2015): The Economic Contribution of Standards to the UK Economy. Available from: <http://www.bsigroup.com/LocalFiles/en-GB/standards/BSI-standards-research-report-The-Economic-Contributio>n-of-Standards-to-the-UK-Economy-UK-EN.pdf

Swann, G. M. P. (2000): The Economics of Standardization. Final Report for Standards and Technical Regulations Directorate Department of Trade and Industry. Manchester Business School 11th Dec 2000. Available from: <http://webarchive.nationalarchives.gov.uk/20070603164510/http://www.dti.gov.uk/files/file11312.pdf>



STANDARDS AND INNOVATION

- Standards are considered to have a catalytic effect on innovation
 - Reduces the time to market for inventions, research results and innovative technologies
 - Promotes the diffusion of innovative products
 - Levels the playing field and therefore promotes competition, and consequently innovation
 - Compatibility standards are the basis for innovation in network industries
 - Minimum requirements for environmental, health and safety aspects promote trust, especially in innovative products
- But
 - Issue around lag between the development of standards and the latest technological developments



STANDARDIZATION BODIES

International

- ISO
- IEC
- ITU-T
- IETF
- IEEE
- W3C
- OASIS
- OGC

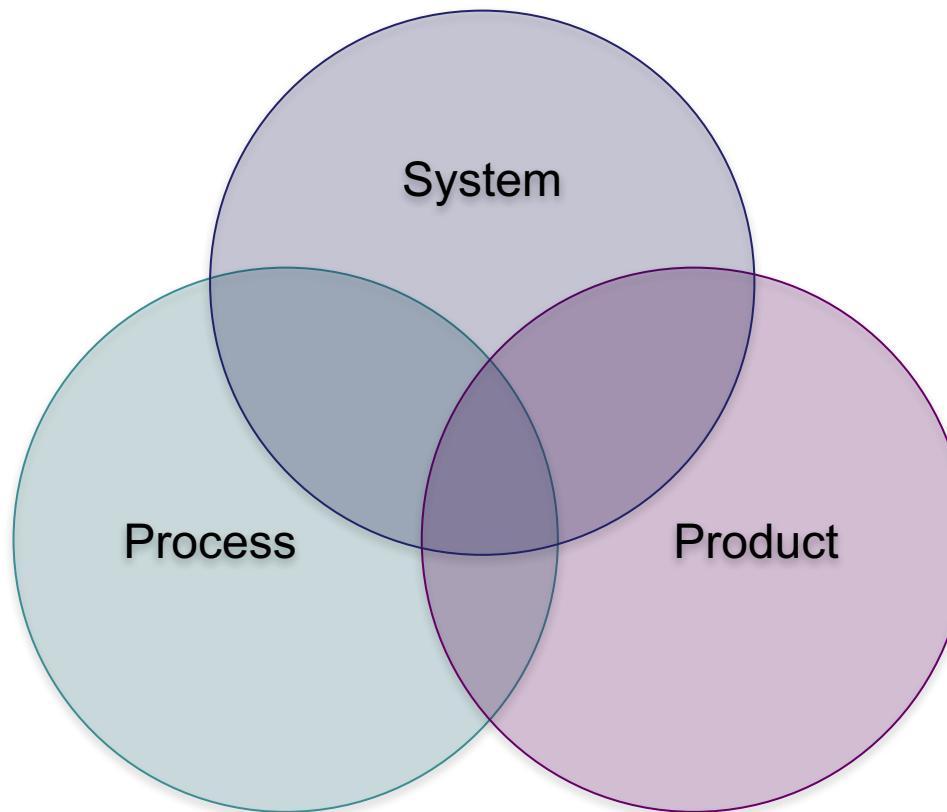


National

- DIN – Germany
- ANSI – USA
- BSI – Britain
- JISC – Japan
- Standards Australia



TYPE OF STANDARDS





PRODUCT STANDARDS

- **8802-3-2014** - ISO/IEC/IEEE International Standard for Ethernet
 - Specifies Ethernet local area network operation for selected speeds of operation from 1 Mb/s to 100 Gb/s using a common media access control (MAC) specification and management information base (MIB)
- **ISO/IEC 12862:2011**
 - Specifies the mechanical, physical and optical characteristics of a 120 mm and an 80 mm dual layer DVD recordable disk to enable the interchange of such disks



PROCESS STANDARDS

- **ISO 9241-210 – Ergonomics of human-system interaction**
 - Provides requirements and recommendations for human-centred design principles and activities throughout the life cycle of computer-based interactive systems
- **ISO 8000-110:2009 - Data quality -- Part 110: Master data: Exchange of characteristic data: Syntax, semantic encoding, and conformance to data specification**
 - Specifies requirements that can be checked by computer for the exchange, between organizations and systems, of master data



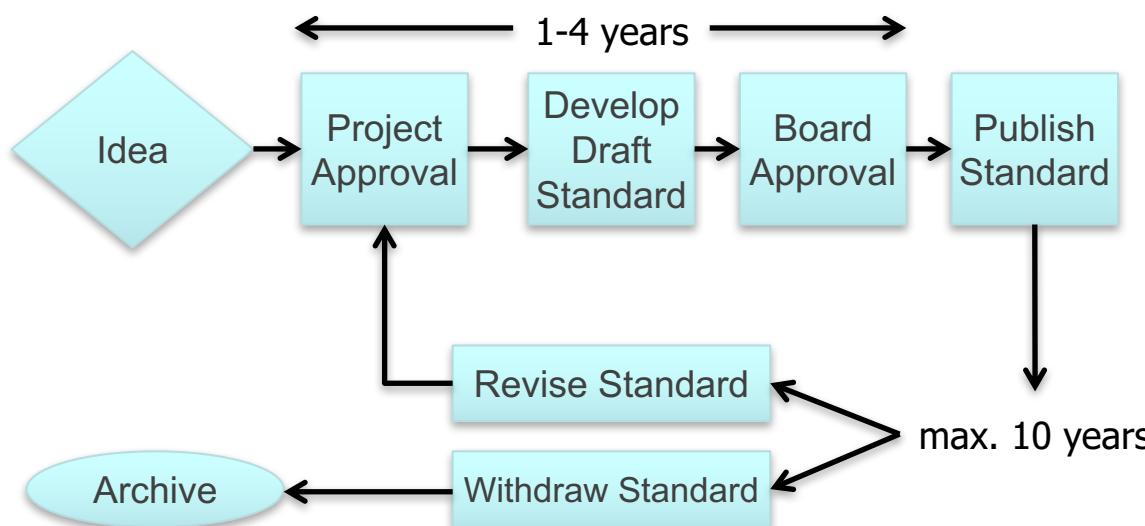
MANAGEMENT SYSTEM STANDARDS

- **ISO 9001:2015**, Quality management systems
 - Guidelines to continually monitor and manage quality across all operations
- **OHSAS 18001:2007**, Occupational health and safety management systems
 - Internationally applied British Standard for occupational health and safety management systems
- **DIN EN 62271**
 - High-voltage switchgear and controlgear - Part 1: Common specifications (IEC 62271-1:2007)
- **ISO 14001:2004**, Environmental management systems
 - Specifies requirements to enable an organization to develop and implement a policy and objectives about significant environmental aspects



STANDARDS DEVELOPMENT PROCESS

- Process facilitated by a Standards Development Organization (SDO)
 - each SDO applies its own rules, processes, and terminology
 - fair and equitable processes that ensure the highest quality outputs to reinforce the market relevance of standards





STANDARDS DEVELOPMENT PROCESS

1. Formal request, submitted to an SDO by a Sponsoring Body
2. SDO approves request and assemble a “Working Group”
3. Working Group officers are assigned
4. Working Groups leverage SDO rules and establish their own modus operandi
5. Draft standards is compiled that may undergo multiple revisions
6. Draft submitted to the Sponsor for Sponsor balloting
7. Submitted to a Review Committee or Board for approval
8. Standard is published and made available for distribution



STANDARDS DEVELOPMENT – THE W3C AS A CASE STUDY



ABOUT W3C: “LEADING THE WEB TO ITS FULL POTENTIAL”



Tim Berners-Lee
WEB INVENTOR
AND
W3C DIRECTOR

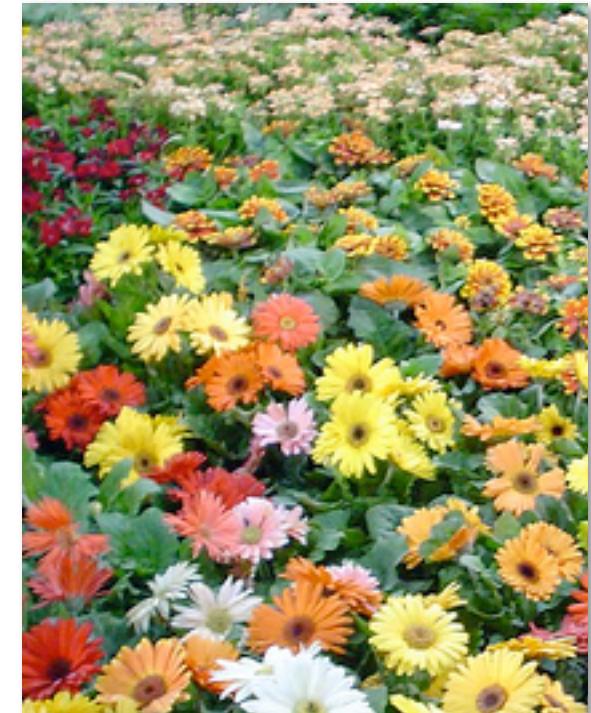
- Founded 1994 (<http://w3.org>)
- Australia Office at ANU (<http://w3c.org.au>)
- Membership organization with more than 400 members (90+ Global Enterprise Members)
- 70 staff in US (MIT), China (Beihang), France (ERCIM) and Japan (Keio)
- Focus on Web ecosystem: users, developers, browsers, etc.
- Developing new technologies for Open Web Platform that are transforming industries like Mobile, Entertainment, Automotive, Digital Publishing, Web Payments and Manufacturing (Web of Things)
- W3C focuses both on the Open Web, as well as specific industry requirements brought by industry segments





W3C DEVELOPS ROYALTY-FREE STANDARDS

- Standard platform levels playing field; reduces development costs
- Level playing field enables greater, faster innovation
- Participation allows organizations to shape platform, ensure their needs are met, standardize best practices across complex ecosystems
- Participants gain early access to insights and successful standards implementations





GLOBAL PARTICIPATION

	2012	2013	2014	2015
Members	358	370	378	413
Full	79	79	83	98
Community & Business Groups / People	82	128	193	206
Twitter Followers	>1.3K	>2.8K	>4K	> 6.3K



SAMPLING OF MEMBERS BY INDUSTRY SECTORS

Browser and Internet Companies	Ebooks, Digital Publishing	Content Producers, Distributors, Broadcast TV	Telecommunications	Software, Hardware, Services
Apple	Adobe	Akamai	Alcatel-Lucent	Access, Adobe,
Alibaba	Apple	Asahi TV	AT&T	Avaya
Baidu	Antennae House	BBC	BT	Cisco
PayPal	Bloomberg	Bloomberg	China Mobile	Dolby
Espial	ETS	CableLabs	China Unicom	Ericsson
Facebook	Hachette	Comcast	Citrix	Gemalto
Google	IBM	Disney	Deutsche Telekom	HP, Huawei
Maxthon	Intel	HBO	Genesys	IBM, Intel, Irdeto
Microsoft	Kobo/Rakuten	Japan Broadcasting Corporation	KDDI	LG
Mozilla	Microsoft	Motion Picture Association of America	Orange	NEC, Nielsen,
Opera	Monotype	MovieLabs	NTT DoCoMo	Nokia
Qihoo 360	Nokia	NBC Universal	SK Telekom	Panasonic
Tencent	Pearson	Netflix	Smart	Plantronics
Twitter	Wiley	Turner Broadcasting	Communications	Qualcomm
Verisign		Rakuten	Telecom Italia	Sony
Yahoo		Sony	Telefonica	Unity
			Telenor	Verance
			Verizon	Verimatrix
			Vodafone	Yandex



RECOMMENDATION = STANDARD

W3C Recommendation (REC)

- W3C Recommendation is a specification or set of guidelines that, after extensive consensus-building, has received the endorsement of W3C Members and the Director
- W3C recommends the wide deployment of its Recommendations



EXAMPLE RECOMMENDATIONS

Structural languages

- HTML
- XML

Presentation languages

- CSS

Object models

- W3C DOM

APIs

- XMLHttpRequest
- Geolocation API
- Device APIs



OPEN WEB PLATFORM TRANSFORMING INDUSTRY





IN OTHER WORDS, THE WEB...WITH

- **APIs:** Geolocation, gyroscopes, near-field communications (NFC), cameras, address book, linked data, ...
- **Rich media:** Audio and video, vectorial images, graphics, animations, high-quality typography, ...
- **Cross-device:** screens of all sizes, touch, keyboards, voice, vibrations, beeps, ...
- **Communications:** client-server, real-time, peer-to-peer, sockets, ...
- **Society:** privacy, security, multilingual, accessibility, new business models for web payments



NEW MARKET: DIGITAL PUBLISHING

Digital Publishing Interest Group

- Workshops
 - [eBooks and the Open Web Platform](#) Feb. 2015, NYC
 - [Richer Internationalization for eBooks](#), June 2015, Tokyo
 - [Publishing and the Open Web Platform](#), Sept. 2015, Paris
- Keynotes
 - Tools of Change (hosted by O'Reilly)
 - International Digital Publishing Forum (IDPF)
 - EDUPUB Workshops
- Joint meetings - CSS Working Group and Publishers
- New Members: Bloomberg, Hachette, Pearson, Wiley
 - Pearson launched [Open Linked Education Community Group](#)





NEW MARKET: WEB PAYMENTS

Web Payments Working Group

- Web Payments Workshop in Paris, 24-25 March 2014
- Interest Group F2F meetings at W3C Technical Plenary, October 2014 and in February 2015
- Web Payments working group started in October 2015
- New members: US Federal Reserve Bank, Rabobank, Target, Merchant Advisory Group, Visa Europe, Alibaba, WorldPay





NEW MARKET: ENTERTAINMENT

Web and TV Interest Group

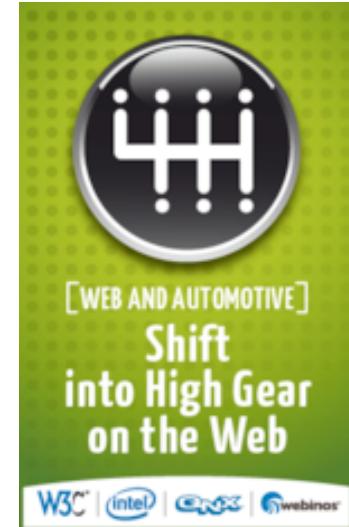
- Requirements to HTML Working Group led to Encrypted Media Extension (EME), Media Source
- Prioritized next requirements:
 - Testing, Recording and downloading, Terminal capabilities, Metadata, Stereoscopic 3D, Timed text and captions
- Liaisons with other organizations developing TV standards, software and for network-enabled TV sets
- Captions (TTML, WebVTT) [Timed Text Working Group Charter](#)
- [Web and Broadcasting Business Group](#) publishing a [number of documents](#)
- TPAC October 2014: New work on Second Screen, Media APIs



NEW MARKET: AUTOMOTIVE

W3C Automotive Working Group

- Auto industry undergoing a transformation
 - More value and safety to drivers and passengers through connected services.
- Workshop: Shift into high Gear on the Web
(Nov 2012)
- Launch of Automotive and Web Platform Business Group (Feb 2013)
- February 2015 launch of new Automotive Working Group
- Participants from: Intel, Ford, GM, Jaguar Landrover, Continental Automotive, Porsche, GENIVI Alliance, Fiat, Pandora, Volkswagen, Nokia, QNX, Verisign, Sharp



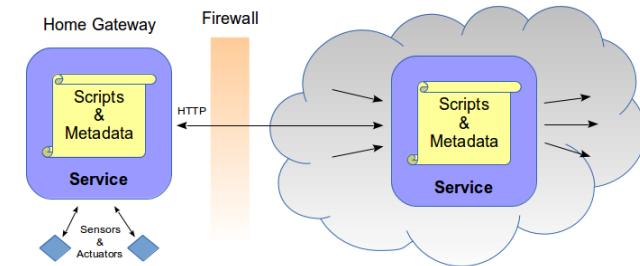


NEW MARKET: WEB OF THINGS

Web of Things Interest Group

- W3C held Web of Things Workshop in June 2014 in Munich, Germany
- Market potential for IOT held back by fragmentation and lack of common approach to enabling services:
 - Increased interest in use of scripting languages for defining services;
 - Need for APIs for drivers for specific IOT technologies; underlying use of HTTP for RESTful services
- Early stage work at W3C has been done in areas such as Near Field Communications

Web Of Things Working Group established on December 27th 2016





SPATIAL DATA ON THE WEB WORKING GROUP

- To determine how spatial information can best be integrated with other data on the Web;
- To determine how machines and people can discover that different facts in different datasets relate to the same place, especially when 'place' is expressed in different ways and at different levels of granularity;
- To identify and assess existing methods and tools and then create a set of best practices for their use;
- Where desirable, to complete the standardization of informal technologies already in widespread use.

<https://www.w3.org/2015/spatial/charter>





USE CASES & REQUIREMENTS

Use cases that demand a combination of geospatial and non-geospatial data sources and techniques.

Requirements derived from these use cases.

Editors

- Frans Knibbe (Geodan)
- Alejandro Llaves
(Universidad Politécnica de Madrid)

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Spatial Data on the Web Use Cases & Requirements

W3C Working Group Note 25 October 2016



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Alejandro Llaves (early drafts), formerly at OEG, Universidad Politécnica de Madrid

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Abstract

This document describes use cases that demand a combination of geospatial and non-geospatial data sources and techniques. It underpins the collaborative work of the Spatial Data on the Web Working Groups operated by both W3C and OGC.

Status of This Document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the [W3C technical reports index](#) at <https://www.w3.org/TR/>.

For OGC This is a Public Draft of a document prepared by the Spatial Data on the Web Working Group (SD-WWG) - a joint W3C-OGC project (see [charter](#)). The document is prepared following W3C conventions. The document is released at this time to solicit public comment.

The Working Group does not expect to publish further iterations of this document.

This document was published by the Spatial Data on the Web Working Group as a Working Group Note. If you wish to make comments regarding this document, please send them to public-sdw-comments@w3.org ([subscribe](#), [archives](#)). All comments are welcome.

Publication as a Working Group Note does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

<https://www.w3.org/TR/sdw-ucr/>



BEST PRACTICES

Discoverability,
accessibility and
interoperability.

Enable spatial data to be
integrated within the
wider Web of data.

Editors

- Jeremy Tandy (Met Office)
- Linda van den Brink (Geonovum)
- Payam Barnaghi (University of Surrey)

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Spatial Data on the Web Best Practices

W3C Working Group Note 30 March 2017



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Linda van den Brink, Geonovum
Payam Barnaghi, University of Surrey

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Abstract

This document advises on best practices related to the publication and usage of spatial data on the Web; the use of Web technologies as they may be applied to location. The best practices are intended for practitioners, including Web developers and geospatial experts, and are compiled based on evidence of real-world application. These best practices suggest a significant change of emphasis from traditional Spatial Data Infrastructures by adopting a Linked Data approach. As location is often the common factor across multiple datasets, spatial data is an especially useful addition to the Linked Data cloud; the 5 Stars of Linked Data paradigm is promoted where relevant.

Status of This Document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the [W3C technical reports index](#) at <https://www.w3.org/TR/>.

This Working Draft incorporates a significant set of changes (see [section F. Changes since previous versions](#) for details). The editors feel that in many places, this document is now in its final form. However, we anticipate one further set of changes (our last working iteration) plus another set of final editorial changes to be completed before the Working Group ends in June 2017. Our aim is to provide actionable advice and guidance to practitioners (e.g. those directly publishing spatial data on the Web themselves, or those developing software tools to assist that publication) through use of clear advice and examples.

Looking to the next release (planned for end of April 2017), the editors anticipate:

1. Reordering of the best practices to improve the readability of the document (note that the numerical identifiers will change as these are automatically assigned in sequential order).

<https://www.w3.org/TR/sdw-bp/>



TIME ONTOLOGY

An OWL-2 DL for expressing facts about topological relations among instants and intervals, together with information about durations, and about temporal position including date-time information.

Editors

- Simon Cox (CSIRO)
- Chris Little (Met Office)

W3C Working Draft

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Time Ontology in OWL

W3C Working Draft 02 February 2017



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Simon Cox, [CSIRO](#)
Chris Little, [Met Office](#)

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Abstract

The OWL-Time ontology is an OWL-2 DL ontology of temporal concepts, for describing the temporal properties of resources in the world or described in Web pages. The ontology provides a vocabulary for expressing facts about topological relations among instants and intervals, together with information about durations, and about temporal position including date-time information.

The namespace for OWL-Time terms is <http://www.w3.org/2006/time#>

The suggested prefix for the OWL-Time namespace is `time`

The (revised) OWL-Time ontology itself is available [here](#).

The original OWL-Time ontology is still available [here](#).

Status of This Document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the [W3C technical reports index](#) at <https://www.w3.org/TR/>.

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<https://www.w3.org/TR/owl-time/>



SEMANTIC SENSOR NETWORK ONTOLOGY

An OWL-2 DL ontology for describing sensors/actuators and the observations/actuations they make.

SSN is published in a modular architecture that supports the judicious use of "just enough" semantics for diverse applications.

Editors

- Kerry Taylor (ANU)
- Krzysztof Janowicz (UCSB)
- Danh Le Phuoc (TU Berlin)
- Armin Haller (ANU)

W3C Working Draft

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Semantic Sensor Network Ontology

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Abstract

The Semantic Sensor Network Ontology (commonly known as "SSN" or sometimes "SSNO") is an OWL-2 DL ontology for describing sensors and the observations they make. SSN is published in a modular architecture that supports the judicious use of "just enough" semantics for diverse applications, including satellite imagery, large scale scientific monitoring, industrial and household infrastructure, citizen observers, and the Web of Things. SSN is described and examples of its use are given.

The namespace for SSN terms is <http://www.w3.org/ns/ssn>

The suggested prefix for the SSN namespace is `ssn`

The SSN ontology itself is available at [http://www.w3.org/ns/ssn/](http://www.w3.org/ns/ssn)

Status of This Document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the [W3C technical reports index](https://www.w3.org/TR/) at <https://www.w3.org/TR/>.

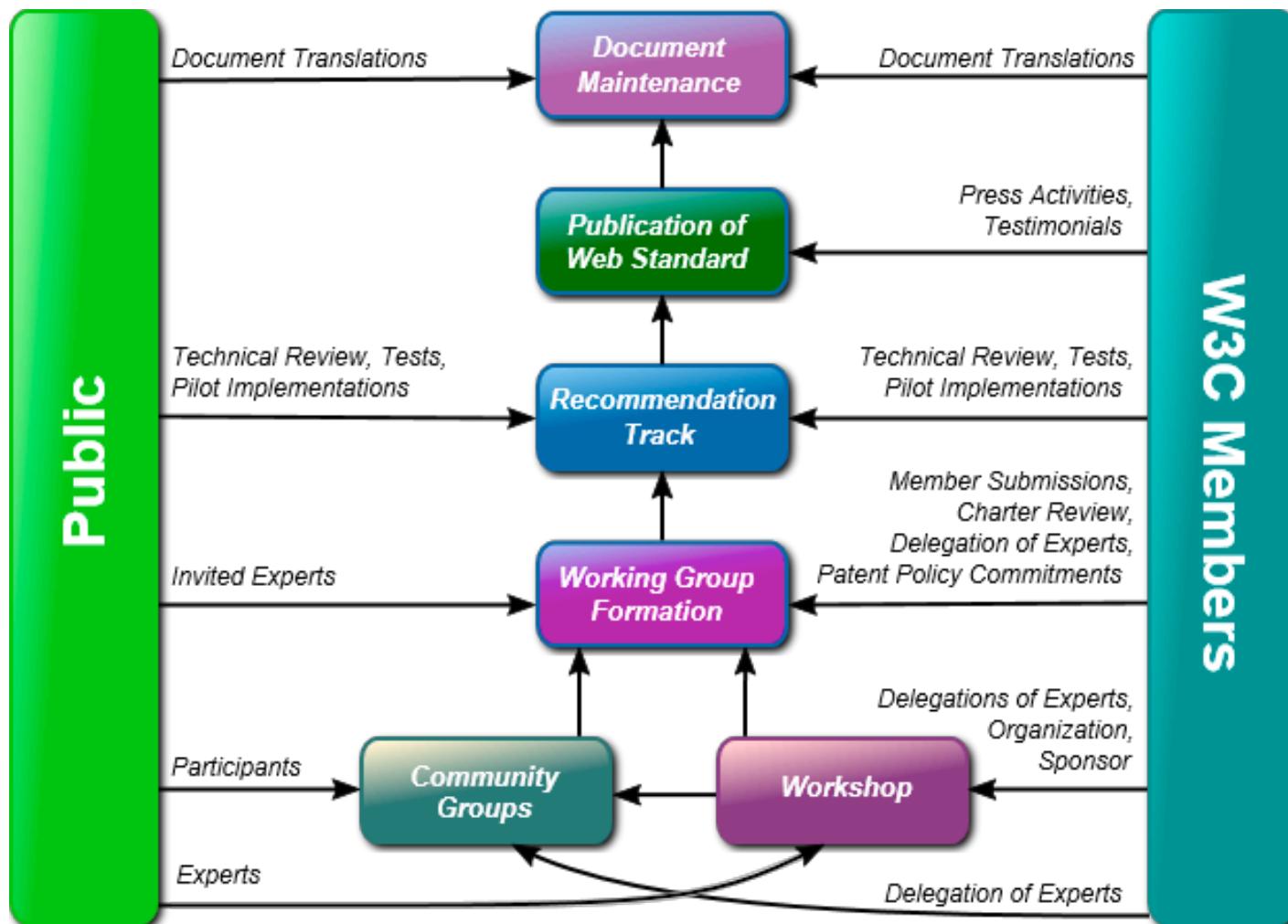
This is the second published draft of the SSN since its original publication by the SSN-XG, the Semantic Sensor Network Incubator Group of the W3C. This is an incomplete draft to indicate the scope and style of changes proposed to be made to the original SSN. This document is both incomplete and inconsistent, but is being published at this stage to solicit comment from the community of SSN users and would-be users.

For OGC This is a Public Draft of a document prepared by the Spatial Data on the Web Working Group (SD-WWG) — a joint W3C-OGC project (see charter). The document is prepared following W3C conventions. The document is released at this time to solicit public comment.

<http://w3c.github.io/sdw/ssn/>



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