

Ontology Summit F2F Meeting ISO/IEC/IEEE P21451-1-4 Sensei/IoT*

1st International Semantic Web 3.0 Standard for the Internet of Things (IoT) William J. Miller Chairman

Internet of Things (IoT)



http://www.sensei-iot.org

Social Networking Driving the Evolution of the Internet



Social Media and Presentation/Virtual Conferencing Providers

- Facebook
- Twitter
- GoogleTalk
- MSN

- GotoMeeting
- WebEx
- Skype
- Yahoo

Semantic Web 3.0



Communications Technology Evolution (IEEE vs. ITU)

- CCITT Modem Standards
- IEEE 802.3 Ethernet
- IEEE 802.11 WiFi
- IEEE 802.11af SuperWiFi
- IEEE 802.11.ah SensorNet
- IEEE 802.15.4
- IEEE 802.16 WiMax 1
- IEEE 802.16m WiMax 2
- IEEE 802.22 WRAN (TV White Space)

- GPRS 3G
- LTE 4G
- LTE-Advanced (3GPP)

IoT Vertical Markets

- Wifi Backhaul
- Incumbent Service Provider Enhancement
- Public Safety (Alternate LTE Strategy)
- Utilities (Smart Grid)
- Federal Agencies
- Application Service Providers
- Local Schools/Universities
- Independent Networks
- In-Home (Internet of Things)
- Building (Internet of Things)

- Content Providers
- Broadcasters (2 way networks)
- Wireless Internet Service
 Provider
- Municipal Broadband Providers
- Media/Software Companies
- Temporary or Emergency Networks
- Digital Signage Distributions
- Video Surveillance
- Enterprise Networks
- Machine to Machine (M2M)

What is XMPP?

 XMPP Standards Foundation (XSF) is the foundation in charge of the standardization of the protocol extensions of eXtensibile Messaging and Presence Protocol (XMPP), the open standard of instant messaging and presence of the IETF.



IoT Protocols and Standards

- XMPP (XSF, IETF, W3C, ISO, IEC, IEEE, uPnP) eXtensible Messaging and Presence Protocol
- MQTT (OASIS)
 - Message Queuing Telemetry Transport
- REST (W3C)
 - Representational State Transfer
- CoAP (IETF)
 - Constrained Application Protocol

ISO/IEC/IEEE P21451-1-4

Smart Transducer Interface Standard for Sensors, Actuators, and Devices eXtensible Messaging and Presence Protocol (XMPP) for networked device communications

- ISO/IEC/IEEE P21451-1-4 (Sensei/IoT*) using ISO/IEC WD 29161, IoT Unique Identification
- XMPP is recognized by the IETF and W3C
- XMPP Extensions (XEPs) recognized by the XMPP Standards Foundation (XSF)
- XMPP offers assured interoperability, high scalability, and built-in security with capabilities that are technology agnostic and protocol independent allowing networked devices, users, and applications to exchange data.

ISO/IEC/IEEE P21451-1-4

- Co-sponsored by
- Dr. Kang Lee, NIST, Chairman of IEEE TC-9 Sensor Technology, and
- Dan Kimball, SRA, Chairman of ISO/IEC JTC1 SC31 Packaging – Supply Chain Applications for Logistics and work on ISO/IEC 29161 Unique Identification for the Internet of Things.



UNIVERAL UNIQUE IDENTICATION

- ISO/IEC/IEEE P21451-1-4 will use a JID (EUI-64) which is a Universal Unique IDentifier (UUID), defined in the draft ISO/IEC 29161 Automatic Identification for the Internet of Things developed by ISO/IEC/JTC1/SG31/WG6 Automatic Identification & Data Capture and ISO/IEC/TC122 Packaging and Internet of Things (IoT).
- jid = [node "@"] domain ["/" resource {device}]
- There are hundreds of ways to identify Things and ISO/IEC 29161 offers a unified approach.
- NOTE EUI-64 is a IEEE SA 64-bit Global Identification.
- Example: EPCglobal

Sensei/IoT* Cyber Defense

- Sensei/IoT* is technology agnostic and protocol independent
- Sensei/IoT* uses Transport Layer Security (TLS) to encrypt data traffic which is built-in to the protocol
- Sensei/loT* is firewall friendly utilizing port translation eliminating exposures common to use of Port 80
- Sensei/IoT* utilizes Semantic Web 3.0 (XML metadata to provide a semantic conversation between devices)

Sensei/IoT* Cyber Defense

- Sensei/IoT* can utilize a Service Broker as an trusted intermediary to establish a trust relationship between users, applications, and devices
- Sensei/IoT* can use an Identity Provider (IdP) to provide Single Sign On (SSO)
- Sensei/IoT* end-to-end digital signing and encryption (RFC 3923) using Efficient XML Interchange (EXI)

Meta Data Isolation Protection Against Cyber-attack



IoT XEP's

ISO/IEC/IEEE P21451-1-4 Sensei/IoT*

XEP's for Sensor Networks

- XEP-0322-SN EXI Compression *
- XEP-0000-SN Battery Powered Sensors
- XEP-0326-SN-Concentrators
- XEP-0325-SN-Control
- XEP-0000-SN-Discovery
- XEP-0000-SN-Events
- XEP-0000-SN-Interoperability
- XEP-0324-SN-Provisioning *
- XEP-0000-SN-PubSub
- XEP-0323-SN-SensorData *
- XEP-0332-SN-HTTP over XMPP *

Examples of XMPP Messaging Request/Reply

ISO/IEC/IEEE P21451-1-4 Sensei/IoT*

SensorData (Request)

• <iq type='get'</pre>

•

```
from='requester@example.org'
    to='responder@example.org' >
    id='1'>
    <req xmlns='urn:xmpp:iot:sensordata' seqnr='1'
identity='true'/>
    </iq>
```

Sensordata (Response)

<message

from='responder@example.org'

to='requester@example.org' >

```
<fields xmlns='urn:xmpp:iot:sensordata' seqnr='1' done='true'>
```

```
<node nodeld='Device01'>
<timestamp value='2013-03-07T16:24:30'>
<string name='...ID' identity='true'
automaticReadout='true' value='1234567'/>
</timestamp>
</node>
</fields>
</message>
```

Service Oriented Architecture (SOA)



Scalability of Cloud Services







IoT Provisioning 遯 KTC GW CONSTR 100 Michael ... 5222 APPENDE: 5222 Internet UPHP MOTT ? **Hogbus** HTTP: 80, 8080-8082 Client-to-Server: 5222 HTTPS: 443, 8088 BO SH: 5280 WebSocket: 5290, 5291 100 10 SI TP: 25 Mall 驟 CARGER 5275 **Provisioning** XMPP Server 50100 1433 1433 SQL Server Management Cilent

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Sensor ID (Identification)

Transducer Electronic Data Sheets (TEDS)

- TEDS, a memory device attached to a smart transducer node, store Metadata, transducer identification, measurement range, calibration, correction data, user and manufacture-related information, which can be used for transducer self-identification and description.
- Different TEDS are defined:
 - Meta TEDS
 - Transducer Channel TEDS
 - Physical TEDS
 - Calibration TEDS
 - Frequency Response TEDS
 - Geo-location TEDS
 - and more....



Washington, DC



Global IoT Day 2015



APRIL 9TH, 2015



Global IoT Day 2015

Global Events



IoT Events











GLOBAL IOT DAY EVENT VIENNA 2015





Device explosion

MORE THAN 50 BILLION CONNECTED DEVICES

res 72 7



"The vision of more than

50 billion connected devices by 2020 may seem ambitious today, but with the right approach, it is within reach"

Ericsson whitepaper, February 2011





How many IP addresses can you have at home?

IPDX.NET UNIVERSE Federated Cloud Sensor Network

• **ISO/IEC/IEEE P21451-1-4** provides session initiation and protocol transport for sensors, actuators, and devices. The standard addresses issues of security, scalability, and interoperability. This standard can provide significant cost savings and reduce complexity, leveraging current instrumentation and devices used in industry today.

http://www.ipdx.net







IPDX.NET & XchangeCore

• Instant infrastructure when there is none!



XMPP Federated Service Broker



V2V US DOT Integration of Cloud and Mobility

- Electric Vehicle Recharging
- Real-time Collision Avoidance Systems



Connected Vehicle
PlugFest





Intelligent Energy Systems





· Point of Common Coupling (POCC) to the grid

· System coordination and optimization for asset utilization (electrical and thermal)

- · Grid-connected and/or island operation to increase availability
- · Achieve benefits to utility and end-user

WSN BPL Microgrid Automation



MaCT USA. February 15, 2014 | Slide 4

Home and Building WSN Automation



OPC UA over XMPP

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Thank You!