OGC Standards for End to End Sensor Network Integration

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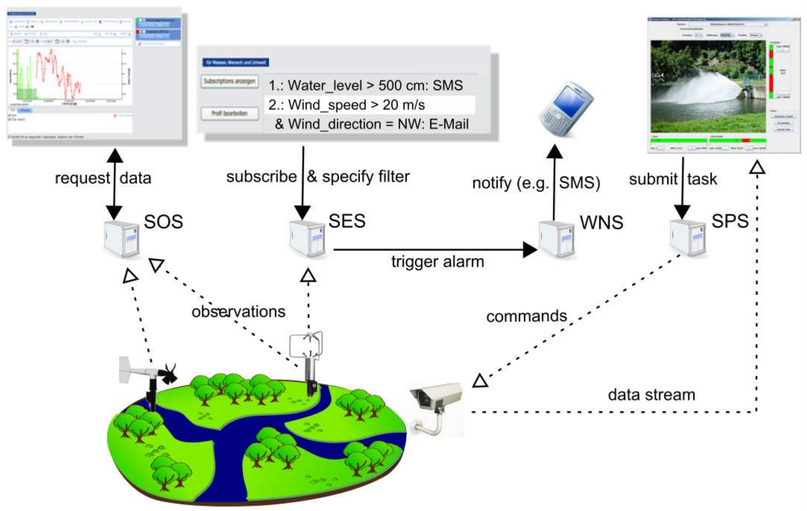
Background

Many sensor networks have been deployed to monitor Earth's environment, and more are planned for the future. Environmental sensors have continuously improved by becoming smaller, cheaper, more intelligent, and more reliable. But due to the large number of sensor manufacturers and accompanying protocols, integrating diverse sensors into observing systems is not straightforward, requiring development of driver software and manual configuration. Use of standard protocols and formats can improve and automate the process of sensor installation, operation, and data processing.

Sensor Web Enablement Standards

The Open Geospatial Consortium's Sensor Web Enablement (SWE) initiative defines standards which make sensors available over the Web. SWE standardized formats and Web Service interfaces hide the heterogeneity of sensor protocols from the application layer.



Sensor Observation Service (SOS) – provides standardized access to sensor data

Sensor Event Service (SES) – establishes a mechanism for complex event processing

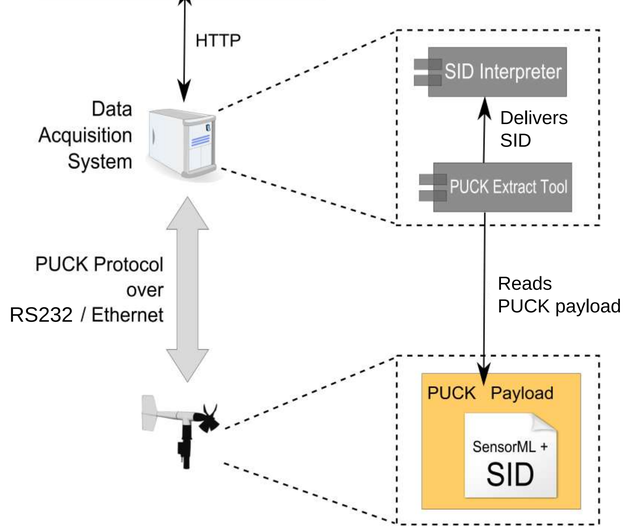
Web Notification Service (WNS) – enables notification of clients through SMS, E-Mail, etc.

Sensor Planning Service (SPS) – allows the standardized tasking of associated sensors

Problem: Interoperability Gap between Device and Sensor Web

In the oceanographic domain, there are no widely used standards at the instrument level for instrument configuration and control or data output formats.
For organizations who design and maintain observing systems of even moderate size, this makes it difficult and expensive to integrate new sensors and interoperate with other observing systems.
Current SWE standards do not deal with actual sensor protocols, and the connection between sensors and SWE services is usually established by manually adapting the internals of the SWE service implementation to the specific sensor interface.
Sensor driver software must be written for each new type of sensor interface and platform, and such efforts are time consuming and expensive.

Bridging the Gap: SID and PUCK



A pair of proposed OGC standards implement a new approach to sensor integration:

Sensor Interface Descriptors (SID)
- **extends SensorML to describe instrument control protocols**

PUCK
- **protocol specification for self-describing instruments**

SID Requirements

SID must be capable of describing a wide variety of protocols and data formats:
- binary/ASCII
- streaming/polled
- multiple record types

SID interpreters must run on a variety of platforms:
- embedded
- with/without OS
- desktop/server
- linux/MacOS/Windows

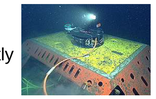
A **SID** describing an instrument's control protocol and data format may be created once for a particular sensor type and reused on different platforms.
A **SID Interpreter** uses the SID to control the instrument and translates and forwards its data to the SWE services.
The interpreter can operate any instrument that has a SID.

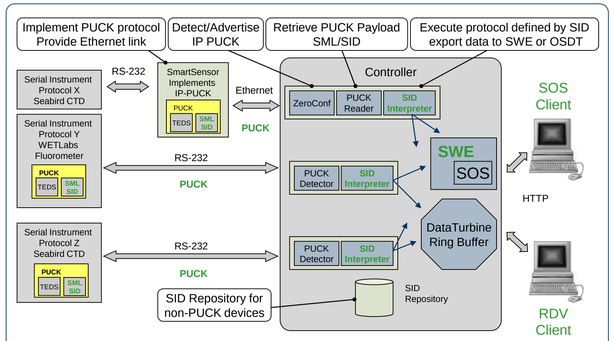
PUCK enables automated configuration and interoperability through the use of self-describing devices.
PUCK-enabled devices carry the resources they need to operate in different observing systems.
Here an instrument includes a SID in its PUCK payload.

Activities

PUCK at Work

PUCK-enabled instruments are currently being used to enable automated configuration for experiments on the Monterey Ocean Observing System (MOOS) and Monterey Accelerated Research System (MARS).





SID and PUCK technology demonstration
ESONET Best Practices Workshop in Marseilles, Dec 2010

PUCK Protocol In the Community

- Currently a proposed OGC standard
- Adopted by Smart Ocean Sensors Consortium (SOSC)
- Supported by Ocean Observing Initiative (OOI)
- Commercial implementations by major instrument manufacturers:

RBR · SBE · NORTEK AS · WET Labs

Try PUCK and SID

- Reference implementations of PUCK available at no cost through MBARI
- Open source implementations of an **SID Interpreter** and **SID Creator** and OGC SWE Web Services available through 52North.

More Information

52 North
http://52north.org
http://52north.org/sid

MBARI Plug and Work Website
(PUCK Reference Design Kit)
http://www.mbari.org/pw

Smart Ocean Sensors Consortium
http://groups.google.com/group/sosclist/web/smart-ocean-sensors-consortium

PUCK Instrument Manufacturers
http://www.rbr-global.com
http://www.seabird.com
http://www.wetlabs.com
http://www.nortek-usa.com

Open Geospatial Consortium
http://www.opengeospatial.org

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