



## Towards a Standards-Based Framework for Interoperable Sensor Networks

NIST Sensor Summit  
December 13, 2005

INTELLIGENT SYSTEMS

# Advancing Sensor Web Interoperability

SensorNet is a framework to tie together sensor data from all over the country to create a real-time detection and alert system for various threats, whether they are chemical, radiological, biological, nuclear, or explosive.

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**S**ensorNet is a vendor-neutral interoperability framework for Web-based discovery, access, control, integration, analysis, and visualization of online sensors, sensor-derived data repositories, and sensor-related processing capabilities. In other words, SensorNet attempts to create a wide-area system to collect and analyze data from sensors all over the country to monitor and detect threats, and then alert agencies, emergency responders, and others as necessary. It is being designed and developed by the Computational Sciences and Engineering Division at the Oak Ridge National Laboratory (ORNL), in collaboration with the National Oceanic and Atmospheric Administration (NOAA), the Open Geospatial Consortium (OGC), the National Institute for Standards and Technology (NIST), the Department of Defense, and numerous universities and private-sector partners. The purpose of SensorNet is to provide



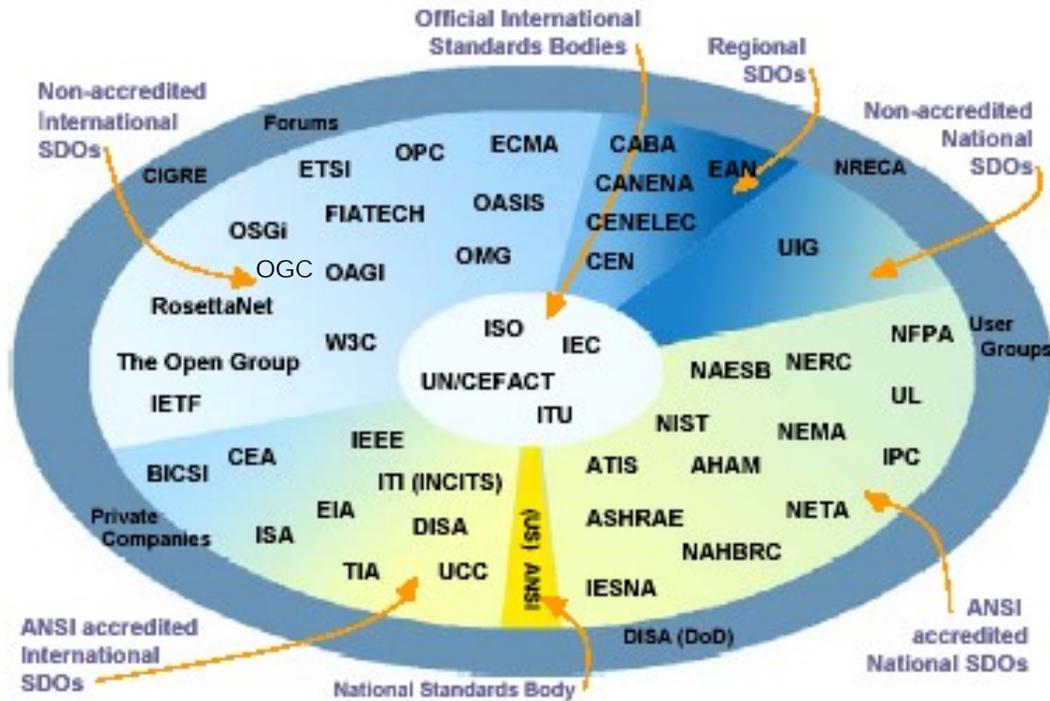
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# Navigating the Standards Maze

## Standards-Related Organizations



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# Standards Activities for CBRN Sensors

	DoD	DHS	IEEE	OASIS	OGC
POC Activity	JPEO-CBD	Standards Portfolio S&T Directorate	Sensor Interface Standards	Emergency Interoperability Consortium	Sensor Web Enablement
	Prof. Tom Johnson, NPS	Dr. Bert Coursey, DHS S&T	Mr. Kang Lee, NIST	Ms. Elysa Jones, OASIS	Mr. Sam Bacharach, OGC
Standards	JPM-IS Data CBRN Common Data Model  NATO NBC Standards (Allied Tactical Publication 45B)  STANAG 5523	ANSI N42.32 ANSI N42.33 ANSI N42.34 ANSI N42.35 ANSI N42.38 ANSI N42.42  ASTM E54  AOAC International	IEEE 1451.0 IEEE 1451.1 IEEE 1451.2 IEEE 1451.3 IEEE 1451.4 IEEE 1451.5 IEEE 1451.6	Common Alerting Protocol  Emergency Data Exchange Language	Sensor Observation Services  Sensor Planning Service  Sensor Alerting Service  Geospatial Markup Language  Web Feature Services

There are on-going and, in some cases, overlapping efforts to develop CBRN standards within industrial, federal, and international standards organizations. ORNL has invested a significant amount of R&D into implementing, testing, de-conflicting, and harmonizing these efforts to establish an overarching set of working interoperability standards to connect CBRN sensors, detectors, and data to emergency response, homeland security, and defense applications.



# Picking Winners

(Some succeed and others do not)

**TCP/IP**

**XML**

**Java**

**LDAP**

**IEEE 802.3/Ethernet**

**802.11x (WiFi)**

**SMTP**

**SNMP**

**OSI/TP4**

**CORBA**

**Ada**

**X.500**

**IEEE 802.5/Token Ring**

**ATM to the Desktop**

**isoEthernet**

**Home PNA/Home RF**

**X.400**

**TINA-C**



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# What is an Architectural Framework?

## A Framework *is*...

A posited design principle or methodology for constructing and studying architectures

A common, pragmatic guideline for designing architectures to enable comparison and integration

A progressive formulation

## A Framework *is not*...

A precise, monolithic blueprint

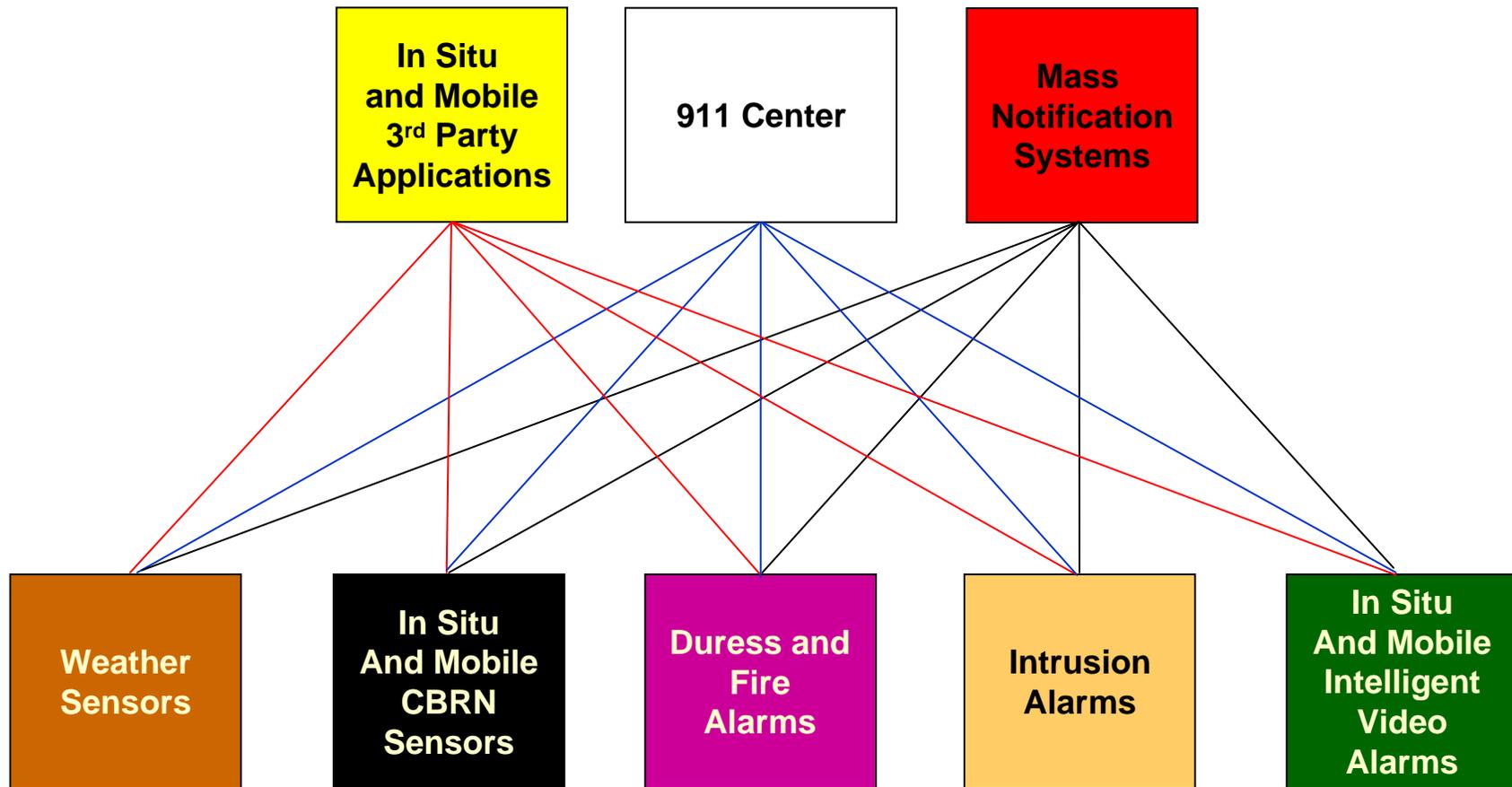
A conclusion or end state

A tool prescription

Source: Thomas Coty, SAFECOM, and Dereck Orr, NIST



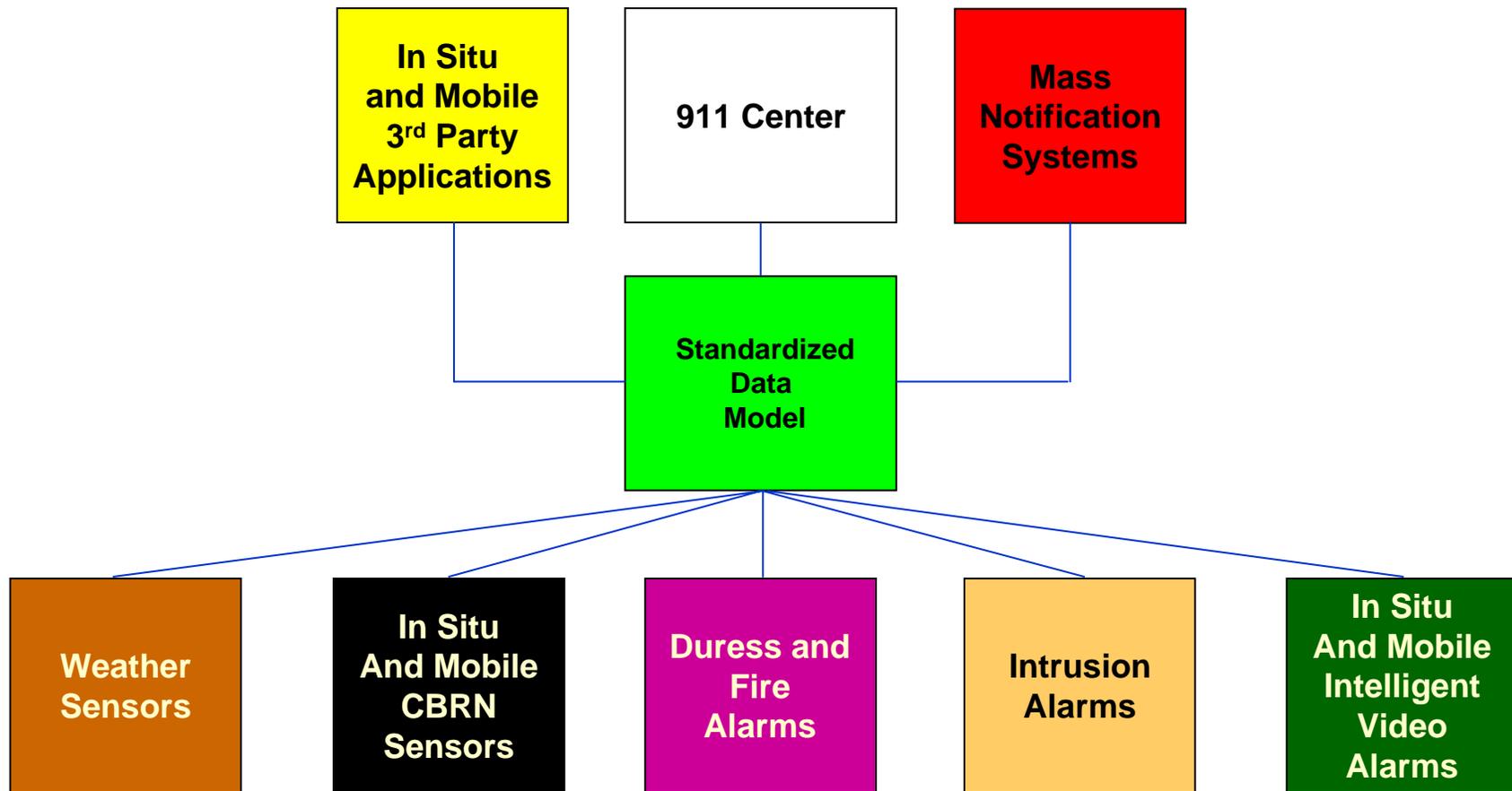
# “Application-Centric” Framework for Interoperability (1970’s to Present)



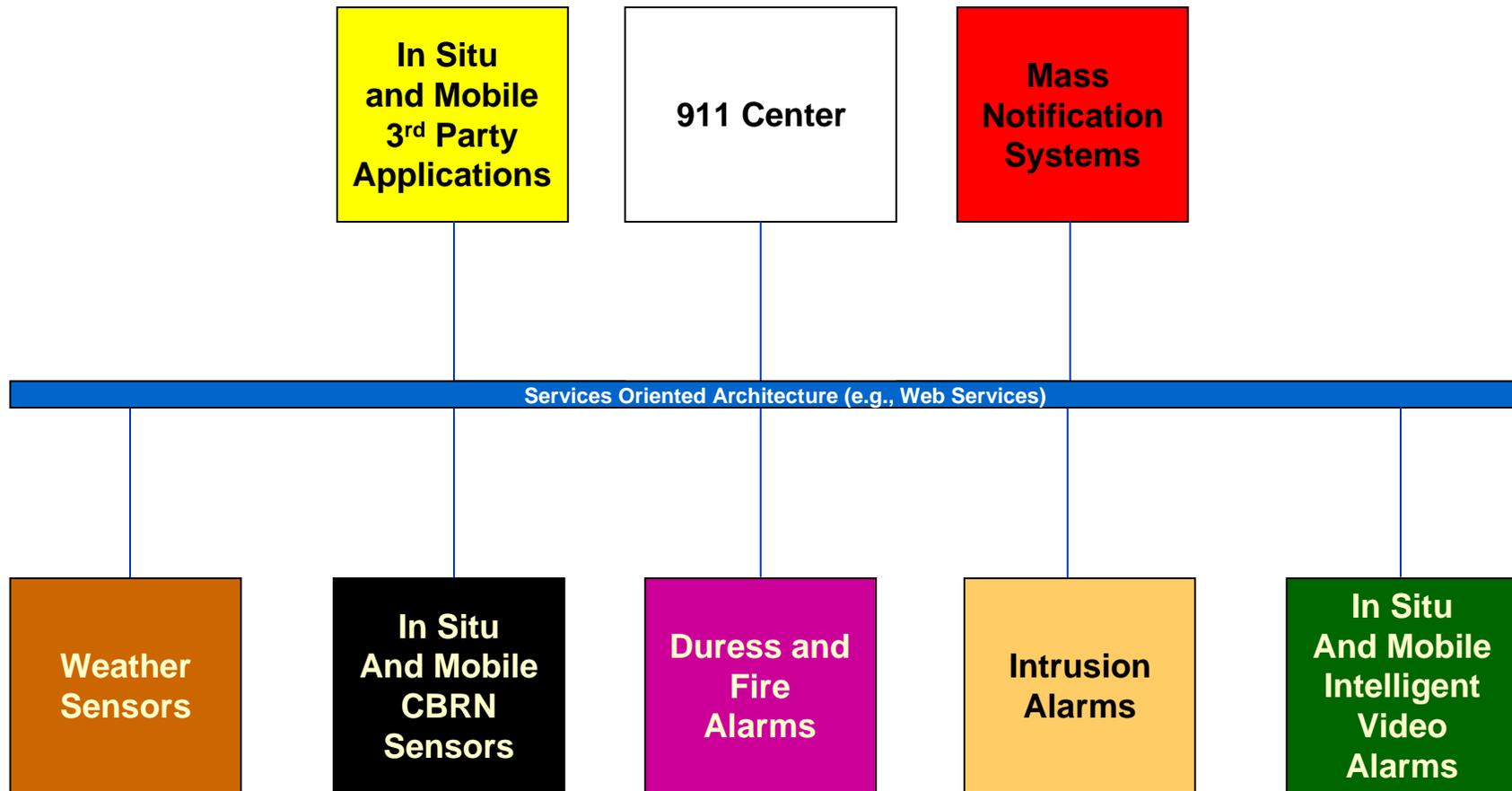
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# “Data-Centric” Framework for Interoperability (1980’s to Present)



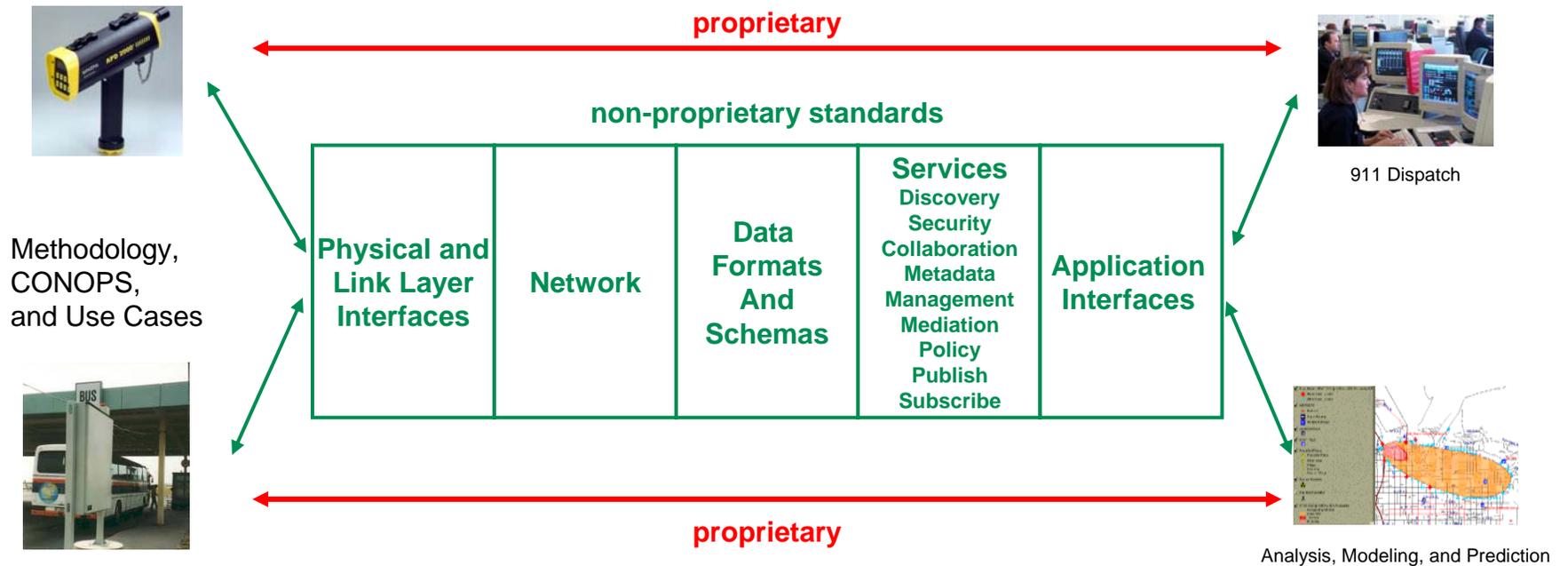
# “Net-Centric” Framework for Interoperability (Late 1990’s to Present)



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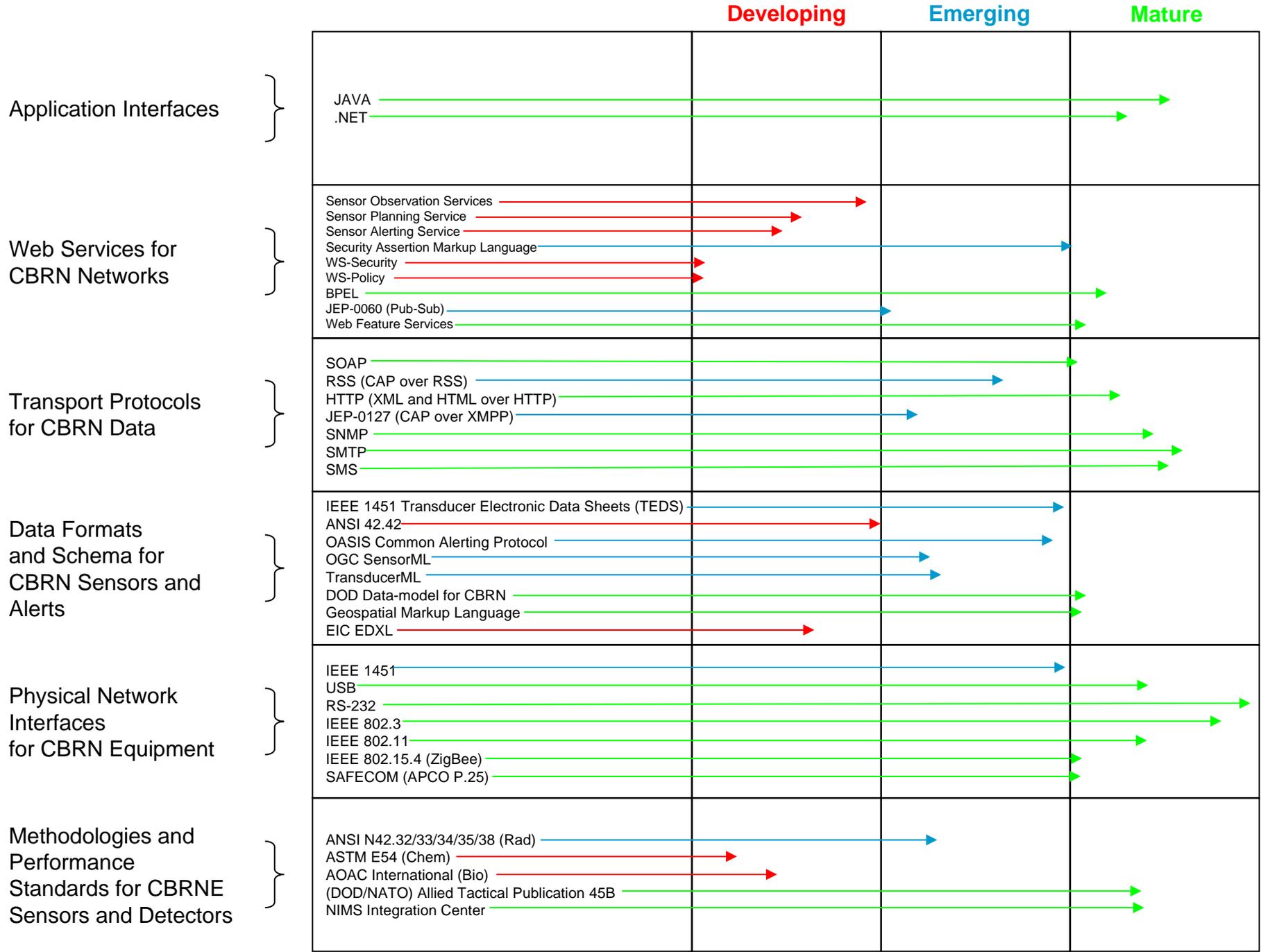


# What are the Components of a Net-Centric Framework for CBRN Sensor Networks?



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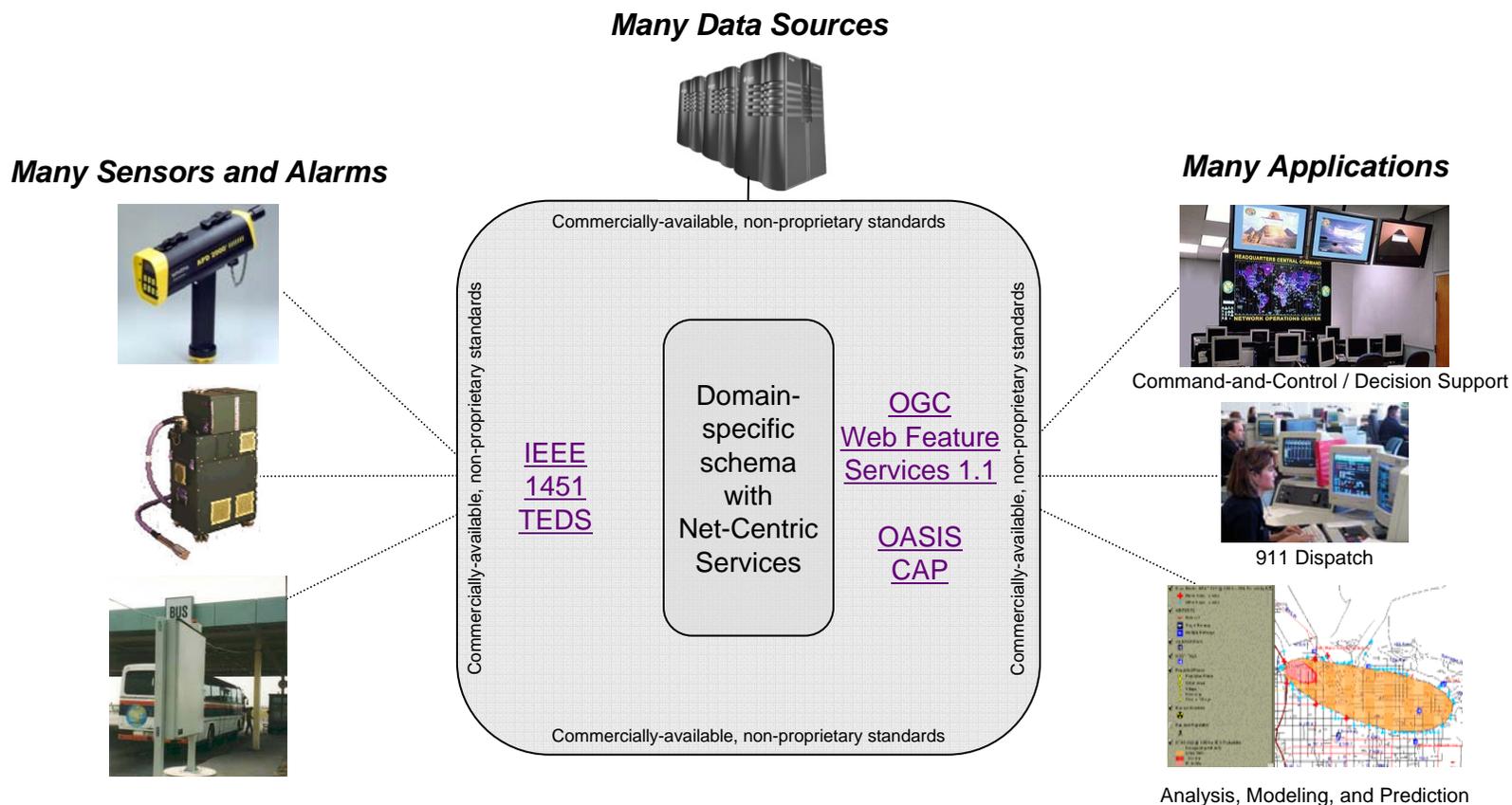


# Leveraging the Market Place

Technologies that are commercially available in the *competitive* market place are more likely to achieve acceptance than technologies that are not.



# Net-Centric Framework for a Standardized Architecture To Link CBRN Sensors to a 911 Center



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# The Prototype of a Net-Centric CBRN Architecture at Fort Bragg

