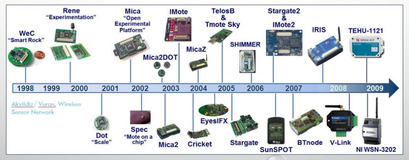
Features of WSN Systems

Prof. Adnan Al-Anbuky

Sensor Network and Smart Environment Research Centre (SeNSe), Auckland University of Technology, New Zealand

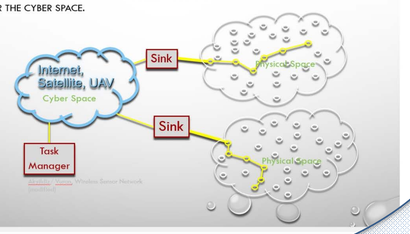
SENSOR MOTES TIMELINE

- **General features:** Processing Speed, Memory Size, Operating frequency, and transmission rate, IEEE 802.15.4 Protocol, CC2450 transceiver
- **Low end Platform:** Sensing and connectivity infrastructure
- **High-End Platform:** more involved functionalities (e.g. DSP), local processing and multi-hop communication, 6LoWPAN



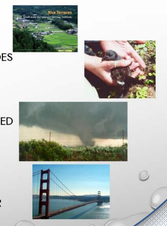
GENERAL TOPOLOGY

PHYSICAL SPACES ARE COVERED BY GROUP OF SENSORS RELEVANT TO EACH PARTICULAR PHENOMENA. DATA AND INFORMATION ON THESE PHYSICAL SPACES ARE GATHERED OVER THE CYBER SPACE.



GENERAL FEATURES OF WSN

- MONTORING THE PHYSICAL PHENOMENA
- COVERAGE OF LARGE SPACE
- LOW COST, LOW POWER, & MULTIFUNCTIONAL SENSOR NODES
- FEASIBILITY OF NODES THAT ARE SMALL IN SIZE AND ABLE TO COMMUNICATE WITHIN SHORT DISTANCES
- SPATIO-TEMPORAL CORRELATION: DENSE DEPLOYMENT COUPLED WITH PHYSICAL PROPERTIES OF SENSED PHENOMENON
- SELF-ORGANIZED COMMUNICATION PROTOCOL: RANDOM DEPLOYMENT, & MULTI-HOP COMMUNICATION.
- DATA FUSION: HELP REDUCING THE SIZE OF INSIGNIFICANT OR RAW DATA THAT ARE COMMUNICATED



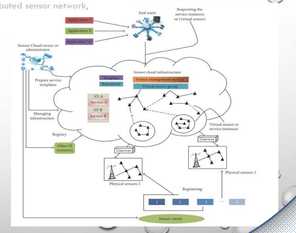
SENSOR CLOUD COMPUTING

A Alamri et al, A survey on Sensor-Cloud: Architecture Applications and Approaches, International Journal of distributed sensor network, Volume 2013

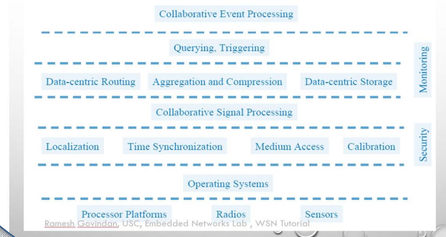
Sensor Cloud Definition: IntelliSys
"An infrastructure that allows truly pervasive computation using sensors as an interface between physical and cyber worlds, the data-compute clusters as the cyber backbone and internet as the communication media"

Sensor-Cloud Infrastructure
Open, flexible and reconfigurable platform for several monitoring and controlling applications

Flexible stack of massive computing, storage, and software services in scalable and virtualized manner



Components of Infrastructure

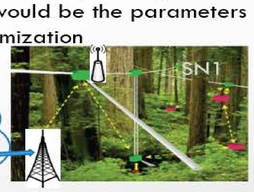


Ramesh Govindan, USC, Embedded Networks Lab , WSN Tutorial

INTEGRATING MULTIPLE PHYSICAL SPACES

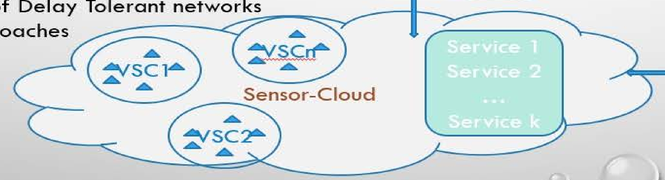
Dynamic complex system that concurrently interact with multiple processes and deliver timely services at a predefined QoS

Cost factors like level of complexity, energy involvement, delay tolerance, security and others would be the parameters for optimization



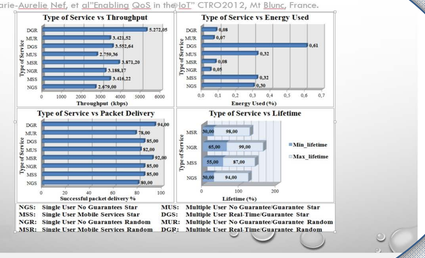
Network Characteristics?
End-to-End, Criticality, Bandwidth, Interactivity, Delay Tolerance, Network Dimension ..

Diversity among network technologies has encourage the use of Delay Tolerant networks approaches

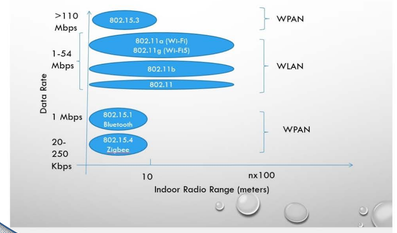


TYPE OF SERVICES

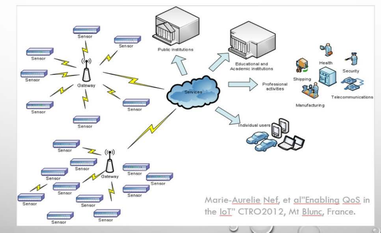
Marie-Aurelie Nef, et al"Enabling QoS in the IoT" CTRO2012, Mt Blunc, France.



WSN PROTOCOLS

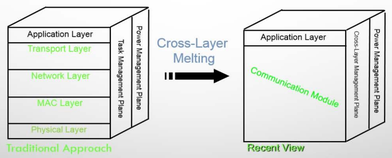


ENABLING QUALITY OF SERVICE



Marie-Aurelie Nef, et al"Enabling QoS in the IoT" CTRO2012, Mt Blunc, France.

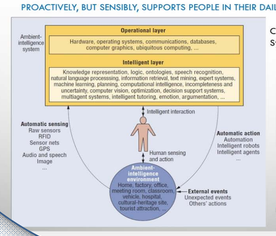
POSSIBLE VISION TOWARDS WSN COMMUNICATION PROTOCOL



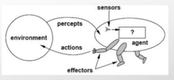
Akyildiz/ Vuran, Wireless Sensor Network

AMBIENT INTELLIGENT

THE EUROPEAN COMMISSION'S INFORMATION SOCIETY TECHNOLOGIES ADVISORY GROUP (ISTAG) INTRODUCED THE CONCEPT OF AMBIENT INTELLIGENCE. BASICALLY, AMI REFERS TO A DIGITAL ENVIRONMENT THAT PROACTIVELY, BUT SENSIBLY, SUPPORTS PEOPLE IN THEIR DAILY LIVES.



Carlos Ramos et al, IEEE Intelligent Systems, March /April 2008



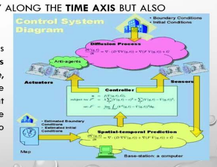
WSN & Spatial AmI Ibaraki University 5 August 2014

CYBER-PHYSICAL SYSTEMS

Optimal Observation for Cyber-physical Systems, Springer, e-ISBN 978-1-84882-656-4

- COMPUTATIONAL THINKING AND **INTEGRATION OF COMPUTATION AROUND THE PHYSICAL DYNAMIC SYSTEMS** FORM CPSS WHERE SENSING, DECISION, ACTUATION, COMPUTATION, NETWORKING, AND PHYSICAL PROCESSES ARE MIXED.
- DYNAMIC EVOLUTIONS HAPPEN NOT ONLY ALONG THE **TIME AXIS** BUT ALSO ALONG **SPATIAL AXES.**

Due to the complexity of the problems, it is usually very difficult to **balance the tradeoffs** by heuristic or ad hoc methods. For example, **energy costs and estimation precision** are counteractive under certain cases, in terms that putting too many sensors in the dormant mode may save precious onboard energy but also nullify the observation



TOWARDS SEMANTIC WEB

D Pfisterer, et al "SPITFIRE: Towards a Semantic Web of Things" IEEE Com Magazine, Nov 2011