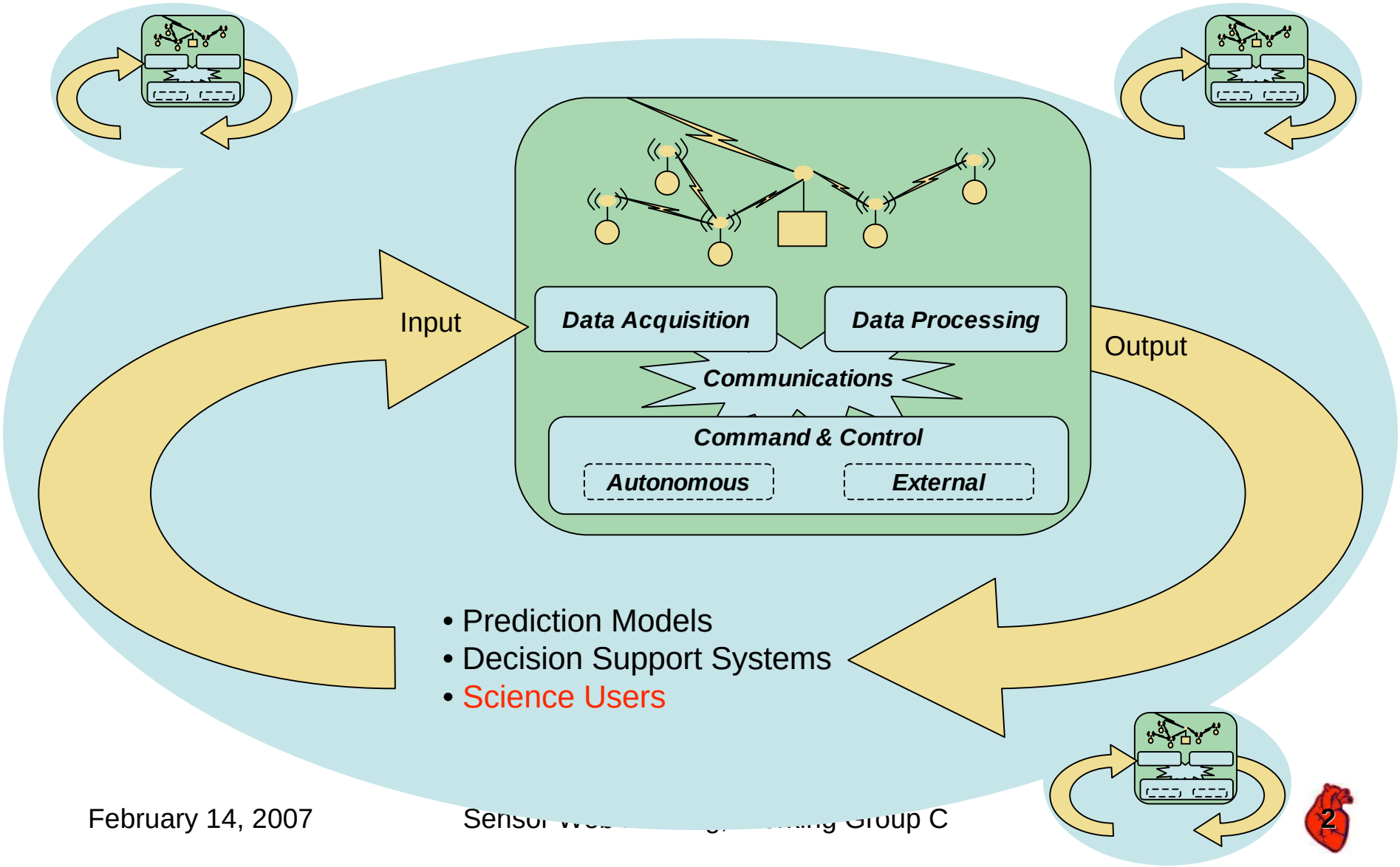
AIST Program
Sensor Web Meeting
Summary of Results

Working Group C

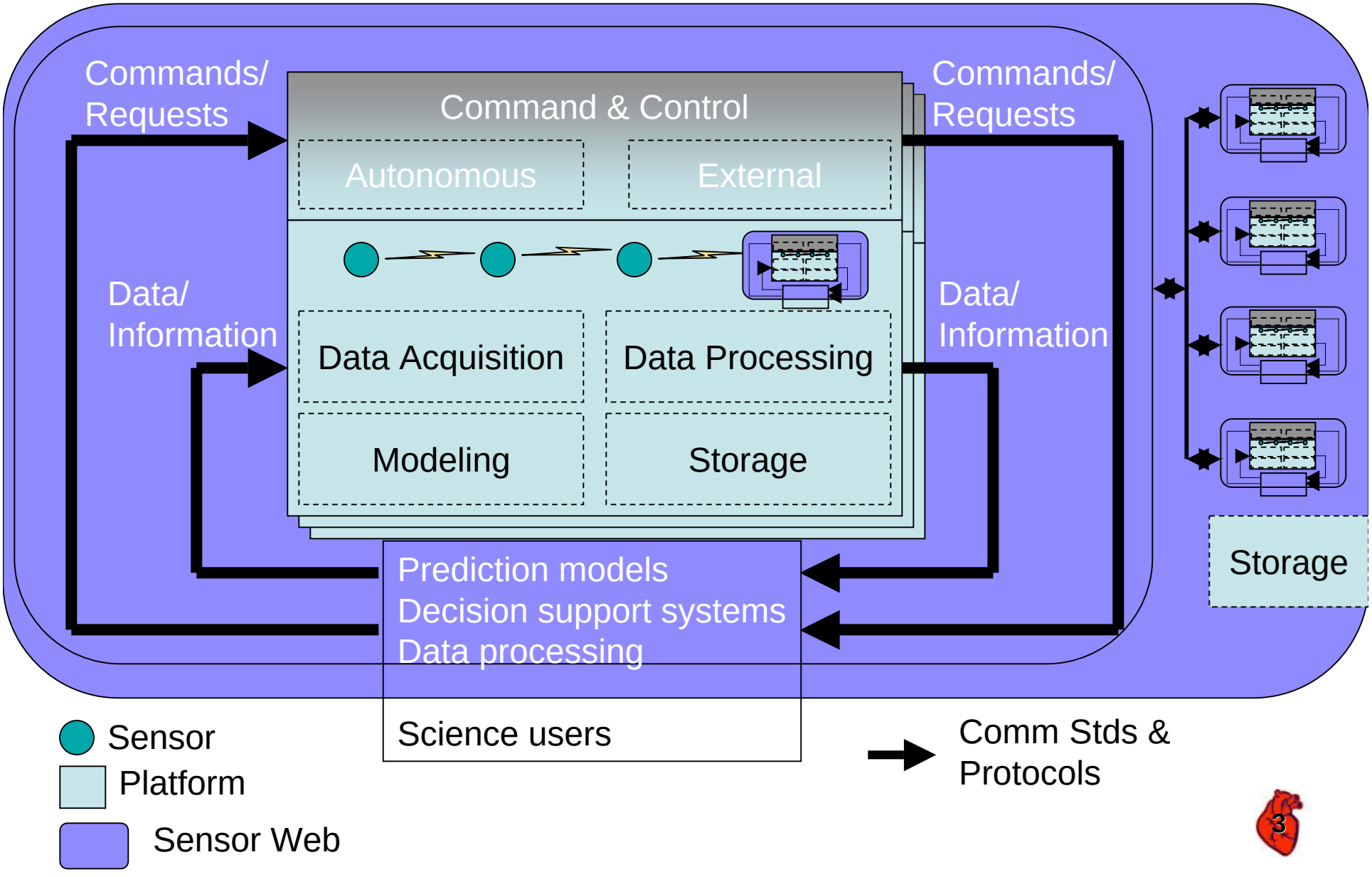
"Penny's Group"

February 14, 2007

Architectural Concept



Architectural Concept



Sensor Web Components

- Sensors (data acquisition)
- Platforms
- Communications infrastructure
- Standards [interfaces], algorithms and protocols
- Data processing
- Models (including predictive models)
- Command and control
- Storage (on-platform and archival)
- Decision support systems

Terms and Definitions

- **Sensor** – an information source. This includes models and not just physical instruments capable of sensing a phenomenon.
- **Sensor Web** – a coordinated observation infrastructure employing multiple communicating sensors/ platforms /predictive models and in which system behavior may be autonomously modified based on shared information and specific user-defined goals. The number, type and characteristics of sensors and the platform distribution in time and space are optimized to answer specific questions.
- **Platform** – the framework, consisting of hardware and software, that provides the power, navigation, physical support, computing, storage and communications infrastructure for sensors, data processing, and/or modeling
- **Communications infrastructure** – media, topologies, protocols, and devices that permit intra- and inter-platform communications

Terms and Definitions

- **Standard** – “a document, established by consensus and approved by an accredited standards development organization, that provides for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order and consistency in a given context.”
- **Protocol** – “a set of syntactic and semantic rules for exchanging information that includes (a) syntax of the information; (b) semantics of the information; and (c) rules for the exchange of information”

Key Features

- **Adaptive** (self and external guidance) within a time scale specific to the physical phenomenon being observed.
- **Fault-tolerant** – e.g., if a sensor goes out, it doesn't bring down the whole string
- **Fractal** – a sensor web can be an element in a larger sensor web or can contain subordinate sensor webs.
- **Interoperable** – sensors and sensor webs can work together to accomplish tasks
- **Scalable/extensible** – large numbers of sensors can be added and removed from a sensor web without impacting the infrastructure
- **Seamless integration** – sensors and platforms can be added to a sensor web with minimal effort
- **Self-healing** – e.g., if a sensor goes out, the other sensors work to fill in the gap

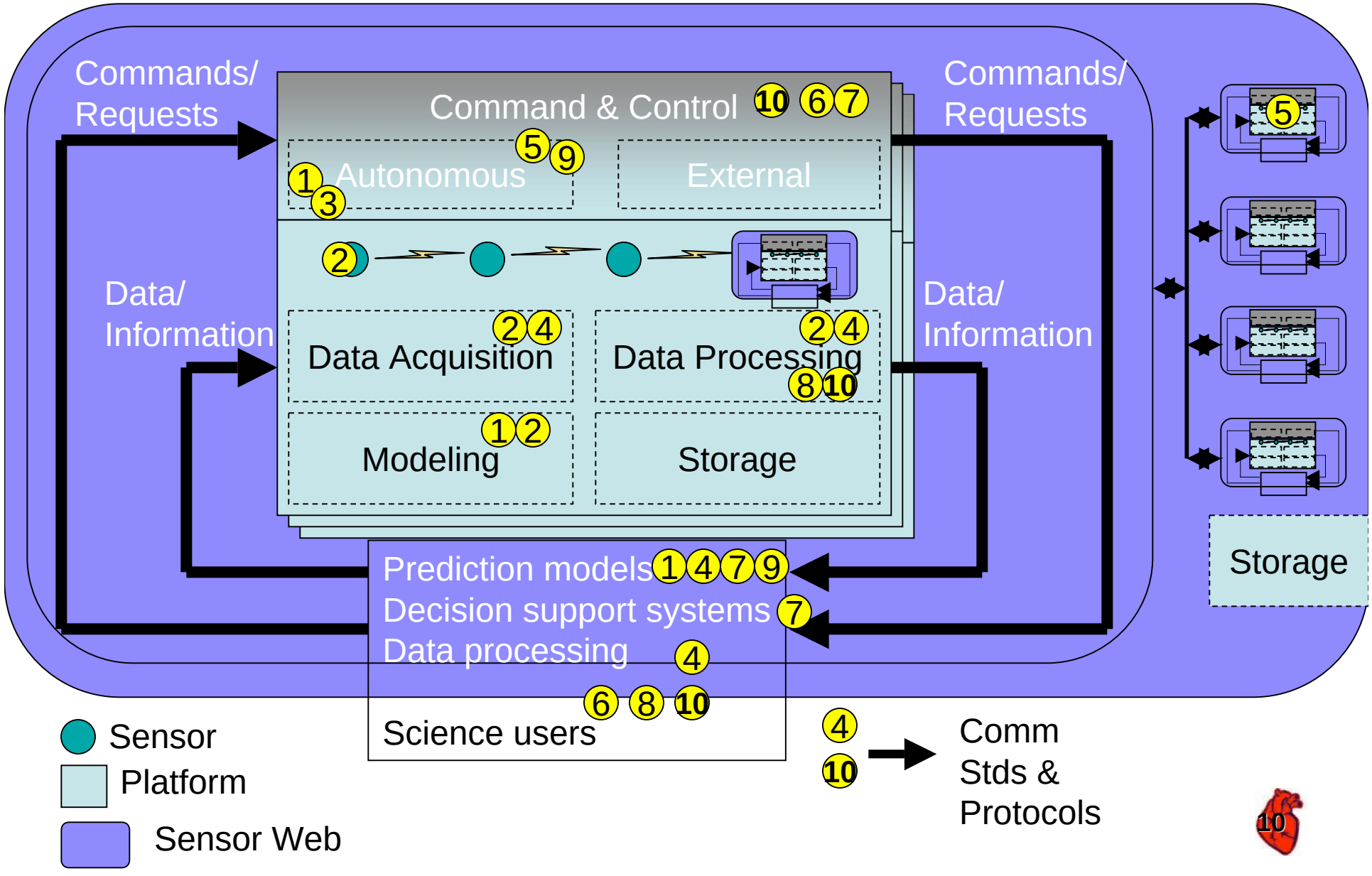
Key Benefits

- Reduced response time
- Reduced cost
- More efficient use of scarce resources
  - Sensor tasking / targeted observations
- Large coverage area in a short time
- Goal-oriented science
- Multi-modal coordinated observations/analysis

Interacting External Systems

- User communities
  - Policies and procedures
  - Work flow
  - Decision Support Systems
- Historical sensor databases
- Existing communication systems (backbone)
- Existing sensor networks
- Characteristics of the physical phenomena
- Models

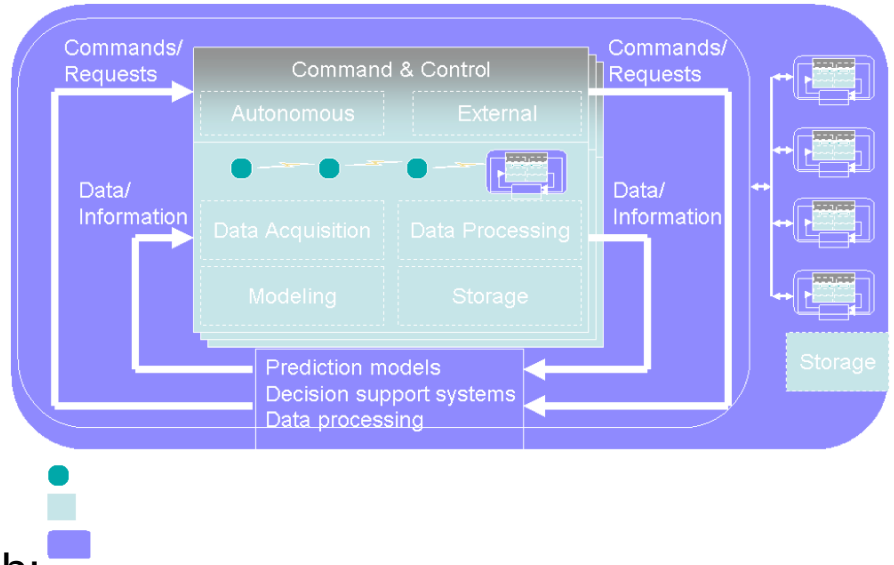
Architecture Concept / Project Mapping



Architecture Concept / Weather Forecasting

• Goal: Improve weather forecasting on a regional basis.

• Problem: Not collecting data where we need to collect data. Need to collect and assimilate complex heterogeneous data more intelligently.



• Opportunity afforded by the sensor web:
- Targeted observations
- Dynamic allocation of data collection assets
- Intelligent spatial (3-D), temporal and spectral coverage
- Collecting data from multiple viewing angles simultaneously
- Prediction based measurements drive targeted observations