GEOSS/AIP and CEOS coordination on Disaster Management

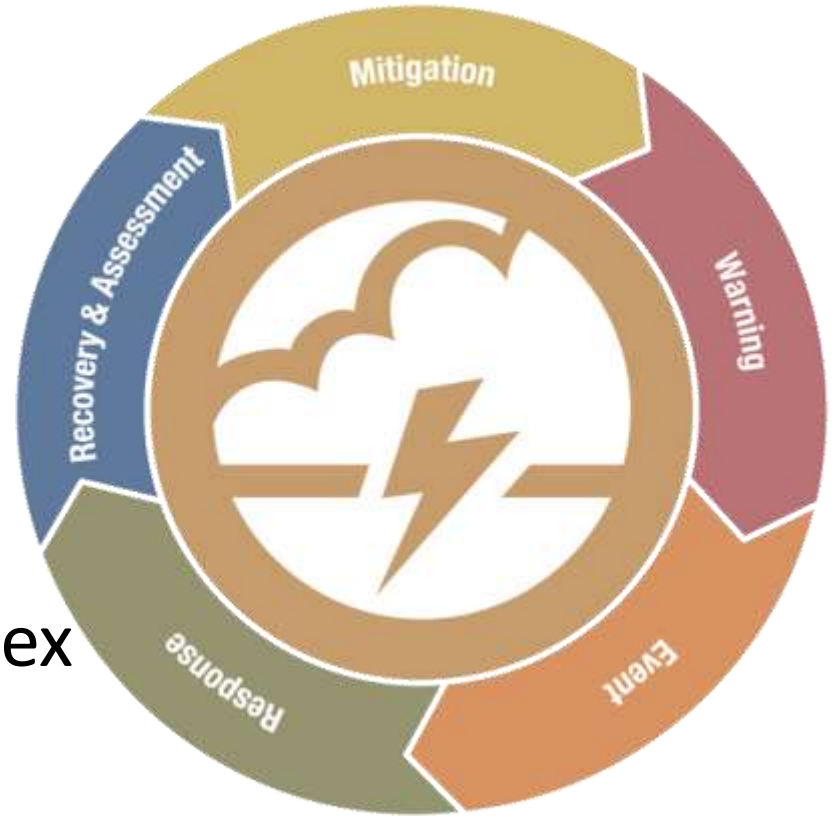
John Evans (GST)

Karen Moe (NASA)

George Percivall (OGC)

Introduction

- Satellite data can support all phases of disaster mgmt.:
  - Response
  - Recovery
  - Risk Assessment / Mitigation
  - Forecasting
- Challenge: Rapid, effective access to customized, complex data and services from multiple remote sensing sources, for diverse users, across international and organizational boundaries



Satellite data in Disaster Management: Barriers to efficient / effective use

- Int'l disaster management involves:
  - Many activities by many players
  - Many ad hoc arrangements
- New suppliers: Unclear how to apply their data / services for effective use in disaster management
- New users: Unclear what data / services are available / suitable for use, and how to access or use them
- I.T. & R.S. planners: Unclear what resources are most needed … redundant … shared … missing … interdependent … isolated
- Partnerships, roles, standards, shared vocabulary often unclear
- No shared, precise understanding of processes, information & computation resources, and various user needs

Other challenges

- Some data have restrictions (who; when): this prevents
  - Use by entire end user communities
  - Continued access to products for ongoing recovery and research
- Major effort involved in getting just the right data
  - When drawing on multiple data sources, many datasets may be available; most are complex; and not all are equally useful
    - Based on space, time, sensor characteristics, quality, and other factors
  - End users often under pressure in a crisis situation. Need to work with users and suppliers in advance of the crisis.
  - Need tools to help end users get (only) the information they need; to match products to audiences; and to facilitate rapid use of products.
- Degraded or inadequate network infrastructure
- Outdated or inadequate basemaps (e.g., DEMs)

GEOSS Architecture for The Use of Satellites in Disaster management and Risk Assessment

(GA.4.D)

- Characterize and evaluate disaster response processes
- Draw on case studies and proof-of-concept prototypes
  - to ground the architecture in real-world practice
- Use a well-defined architecture framework to describe the GEOSS disaster management enterprise as a whole
  - Using RM-ODP viewpoints: enterprise, information, computation
  - Key classes of people, components, processes, services, products
  - Shared understanding of relationships and interdependencies
  - Common terminology and high level interfaces
  - Apply and extend GEOSS Architecture Implementation Pilot (AIP)
- Infer requirements and opportunities for data systems
  - *e.g.,* CEOS, UN-SPIDER, and other portals
    - e.g., search indexing; access interfaces; data priorities
  - Capture lessons learned; recommended standards and products suitable as building blocks for sustainable capability

GA.4.D – Content & Structure

Building on practitioner experience,
GEOSS priorities and principles,
and AIP-5 RFP architecture

Scope, purpose, structure

Enterprise Viewpoint

- Scope & purpose based on CEOS WGISS charter; GEOSS Strategic Targets; GEO Task DI-01
- GEOSS principles
  - System of Systems
  - Data Sharing Principles
  - Interoperability Arrangements
- Disaster types [1]
  - Flooding Earthquakes Volcanoes Drought
  - Windstorms Landslides Wildfires Tsunamis
- Lifecycle phases [1]
  - Mitigation Warning Response Recovery

[1] *CEOS / GEO DI-06-09 report, Use of Satellites for Risk Management (11/2008)*

Information content & semantics

Information Viewpoint

- General-purpose concepts from AIP-5 Architecture
  - Spatial referencing – Feature Model – Data Quality / Provenance – Data Policies and Licensing – etc.
- Observation needs by disaster type & phase – based on
  - CEOS / GEO DI-06-09 report, Use of Satellites for Risk Management (Nov. 2008)
  - GEO report, Critical Earth Observations Priorities (Oct. 2010)
  - GEOSS 10-Year Implementation Plan Reference Document (2005)
- Metadata
  - Locating & identifying relevant data
  - Assessing fitness for use
  - Georeferencing
- Semantics / semantic translation

Information content & semantics

Information Viewpoint

- Cross-cutting needs:
  - Frequent, high-resolution observations
    - Esp. for earthquakes, floods
  - Basemaps – e.g.,
    - Digital terrain models – Water boundaries – Ground control points
- Data operations
  - Preprocessing (e.g., decoding, georeferencing, atmospheric correction – “Level 1”)
  - Analysis & Interpretation (incl. feature extraction)
  - Product creation (incl. “image pyramids”)

Computation and Services

Computation Viewpoint

- Generic service types – from AIP-5:
  - Catalog Registration & Search
  - Portrayal / Display / Styling
  - Data Access & Ordering
  - Processing algorithms
  - Sensor access & control
  - User management
- Disaster-specific service types:
  - Event detection
  - Sensor tasking
  - Data Analysis / Interpretation
  - Modeling / Prediction

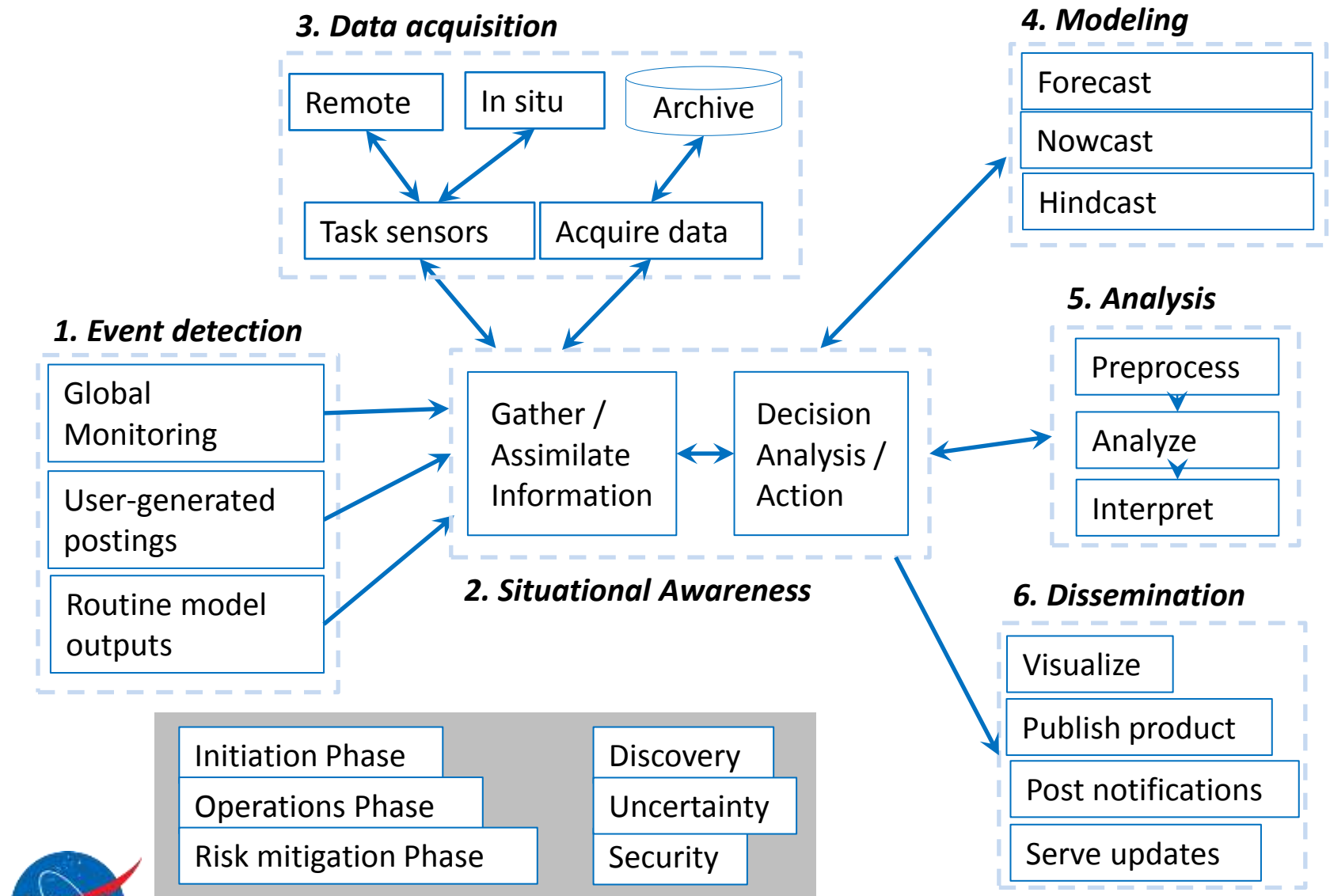
Namibia Flood Pilot Sensor Web Concept

Computation and Services

Computation Viewpoint

- Cross-cutting needs:
  - Near-Real-Time data access / delivery
  - Data broadcast
  - Cross-community interoperability
  - Ease of use; ease of operation / maintenance
  - “Last mile” to end-users (incl. telecommunications infrastructure)
- Service-Oriented vs. other
  - Broadcast / push (LDM, GeoNetCast)
  - Physical media delivery

Functions involved in Satellite Data Support to Disaster Management



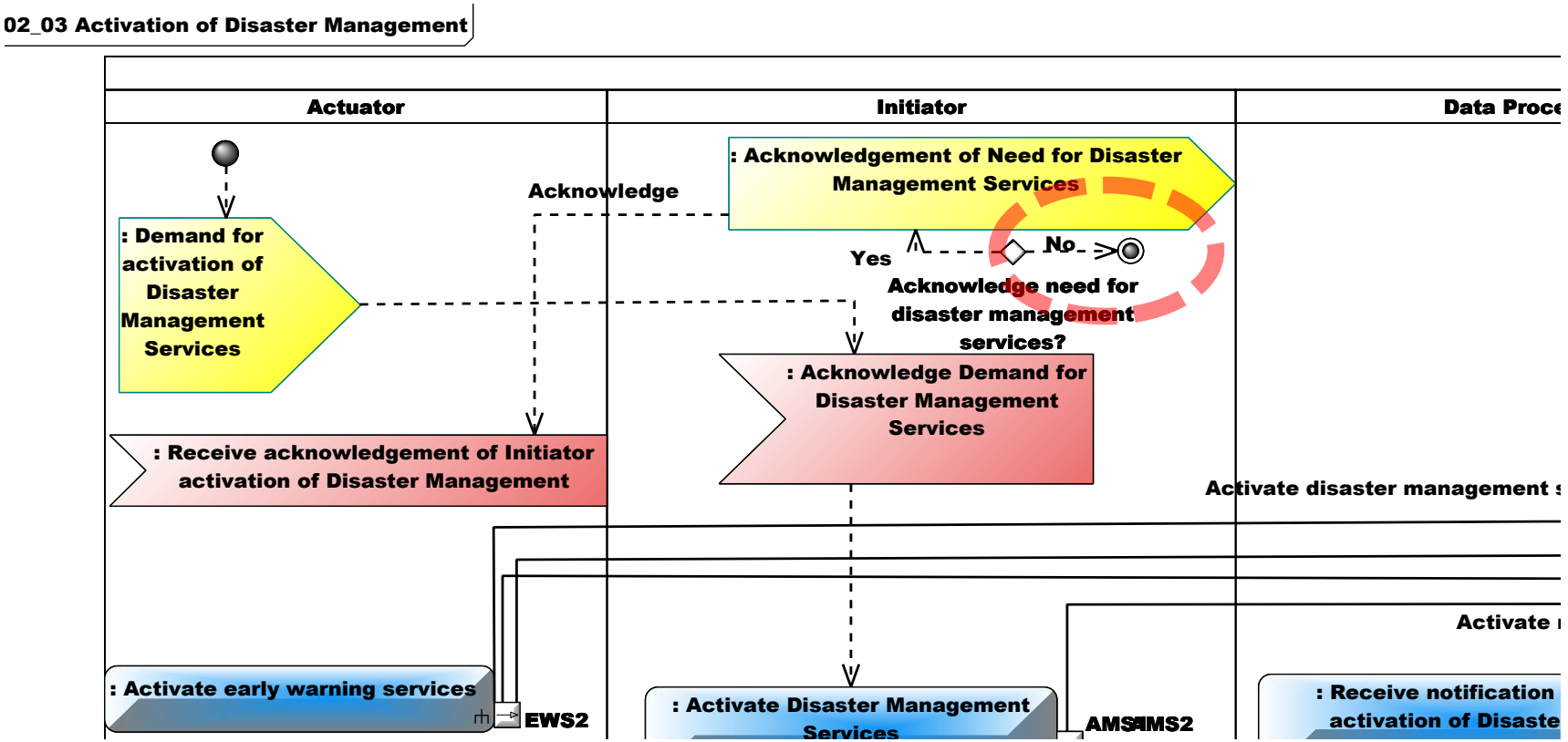
Phases of Capability

- System initiation vs. operations in each disaster lifecycle phase
- Initiation: identify or develop …
  - Inputs for event detection, event triggers
  - Indicators for situational awareness (e.g., flood extent)
  - Modeling elements (e.g., regional flood model)
  - Workflows and data flows (for processing and delivery)
  - Automation opportunities (e.g., subscriptions, custom products)
- Operations phase:
  - Monitor data streams, detect events & trigger workflows
  - Track key indicators
  - Task sensors; acquire data
  - Run models (hindcast, nowcast, forecast)
  - Analyze data
  - Disseminate / serve data products

Interactions with AIP-5

AIP-5 interactions: Activity Diagram

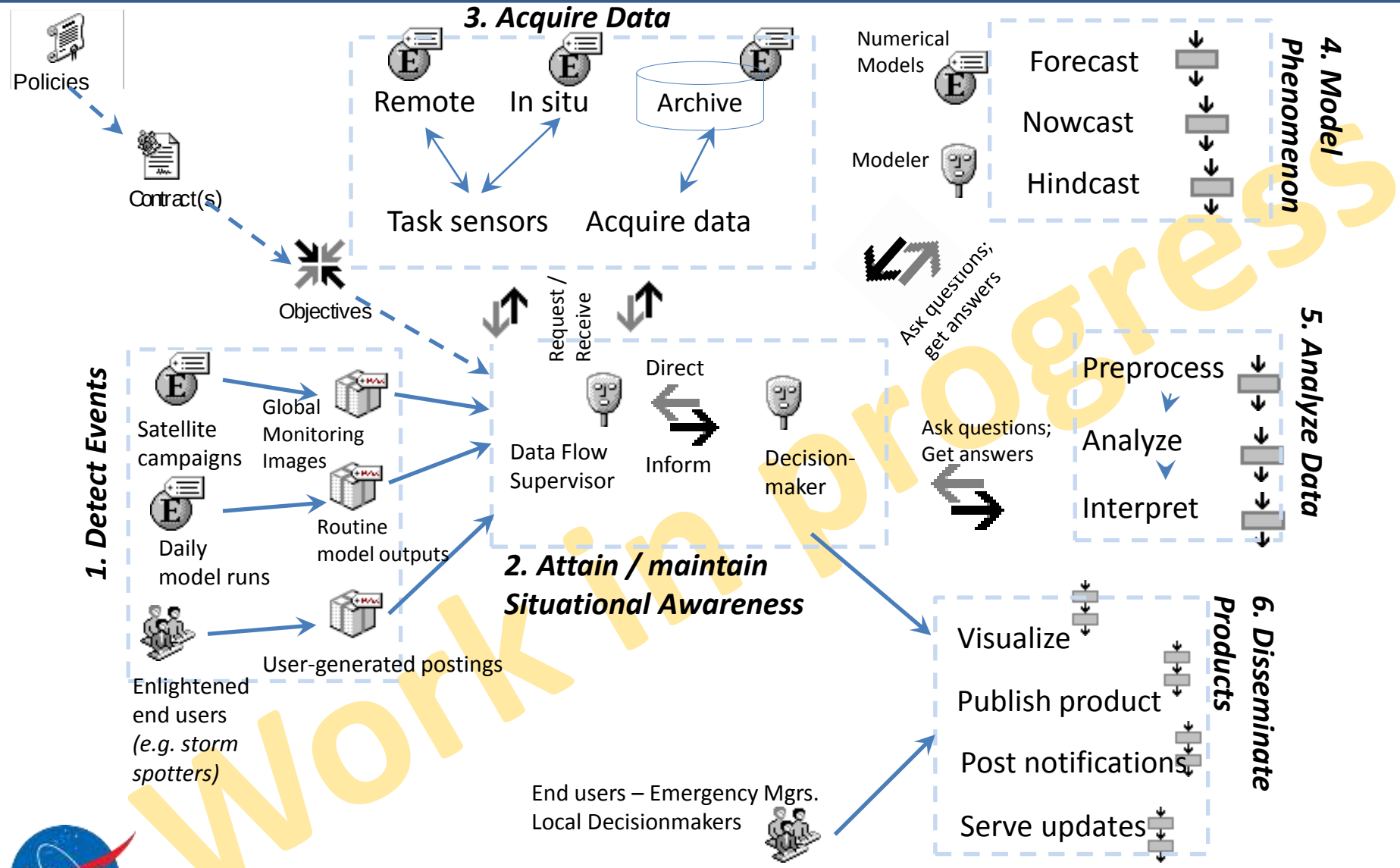
- UML Activity Diagram highlighted possible bottlenecks => opportunities to streamline



AIP-5 interactions: Enterprise Modeling

- Requires articulating important details:
  - The *community*(ies) of concern to the enterprise
  - The links between community *policies* & *objectives*, *contracts*, and *behaviors (=> actions => processes)*
  - The *actors* / *roles* who conduct actions & processes
  - The *resources* used by actions & processes
  - The *artefacts* produced / changed / deleted by actions

AIP-5 interactions: Enterprise Modeling



GEOSS Architecture Implementation Pilot (AIP-5)
http://www.ogcnetwork.net/AIpilot

GEOSS Architecture for the use of Satellite Data in Disaster Management and Risk Assessment (GA.4.D)
http://tinyurl.com/GA4Disasters

100%