IOOS

U.S. Integrated Ocean Observing System

Federal Agency & MACOORA Cooperative Maryland Emergency Management

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1 Federal Agency and MACOORA Cooperative Maryland Emergency Management

Maryland Emergency Management Agency, US Army Corps of Engineers, National Weather Service, National Hurricane Center, Baltimore County's Fire Department and its office of Homeland Security Management, MACOORA, and USGS form a community of interest based on public safety and public health issues specifically addressing two of the seven societal goals of IOOS:

1) Reduce public health risks.
2) More effectively mitigate the effects of natural hazards.

The specific events being addressed are category 3 and category 4 hurricanes that come on-shore in the Carolinas. Emergency plans need to be updated regularly. Part of the update includes making use of the latest high-resolution digital elevation maps provided by both the USGS and the near-shore maps provided by the USACE. USACE maps CONUS coastline completely every 5 years, so updates to models based on that mapping must take place at least that often as a regular activity. The SLOSH model is used to perform a major part of the analysis. Large sets of cases are input to get a robust Monte Carlo simulation producing Maximum Envelopes of Water (MEOWs). This intermediate product set is used to create new maps showing how much further inland flooding could stretch under various forcing conditions.

This Use Case is based in large part on an AP Wire article entitled "Storm surges could be twice as bad as those caused by Isabel" published April 30, 2006.

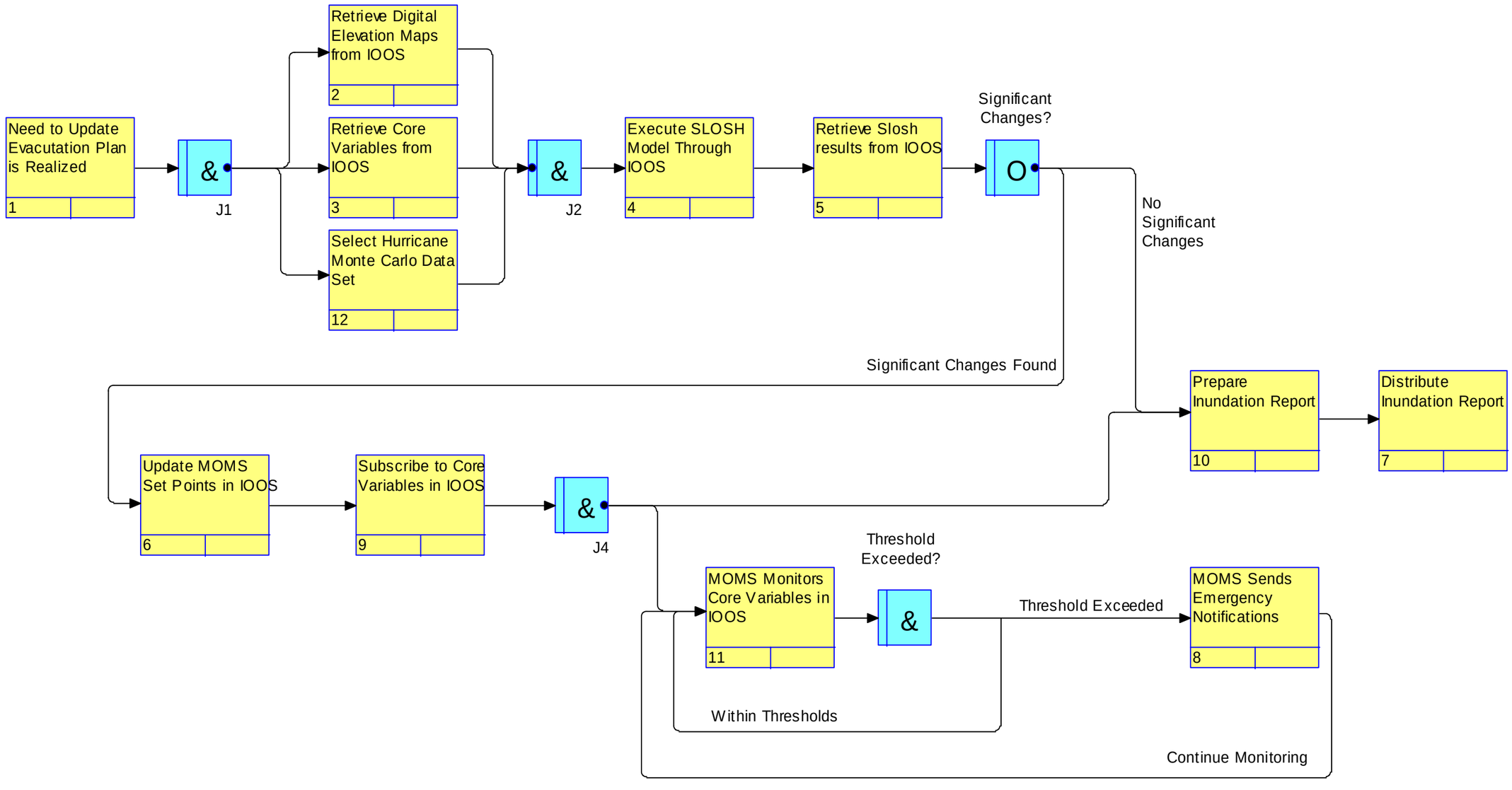

Figure 1, Maryland Emergency Management Use Case

Figure 1 has been extracted from Popkin's System Architect where it resides as an OV-6a diagram.

2 External Actors

Emergency management preparedness engages private health providers, the general public, and businesses in the disaster preparation process.

3 Interfaces

Interfaces for preparedness include postings on web sites providing information to the public, outreach through meetings, and dissemination through the news media. Internal interfaces include coordinated use of the SLOSH model and cooperation between Federal and State agencies.

4 Functional Flows

4.1 **Primary Flow –** Perform SLOSH/Inundation analysis.

4.1.1 Pre-Condition

Prior emergency plans and responses are maintained by the appropriate agencies.

4.1.2 Trigger

Mandated date for emergency plan update is reached.

Availability of improved tools and data forces emergency plan update.

4.1.3 Process Description

Use Case Steps	Architecture Viability Assessment
Step 10: Need to Update Evacuation Plan is Realized The all-hazards planner for the Maryland Emergency Management Agency (MEMA) has a process defined in which at prescribed intervals reassessment and update of evacuation (and other emergency) plans must to be done. This can be both at regular intervals and due to events. Events can include new digital elevation map availability, updated planning and modeling software, major changes in infrastructure and support systems within the area of interest and the impact of major natural events such as large scale erosion, river channel shifting, land uplift or sinking. In this case we assume notification of the availability of new digital elevation maps for	By subscribing to a specific data set from IOOS the hazard planner can get regular updates as data becomes available. IOOS data registry and subscription services permits users to build data discovery and reporting services to keep them apprised of data updates.

the regions of interest by the US Army Corps of Engineers.	
Step 20: Retrieve Digital Elevation Maps from IOOS The USACE National Coastal Data Bank provides near shore mapping. (Near shore means from 500 meters above water line to 1000 meters below) They have 12 data products in different forms, including: hydrographic, topographic data, digital and spectral imaging.	The all-hazards planner for MEMA can utilize a tailored IOOS data portal to receive regular updates on data availability and change. The metadata services and registry services ensure updates are recognized and broadcast as they become available.
Step 30: Retrieve Core Variables from IOOS Identify and retrieve data required fro SLOSH Model.	Subscription to IOOS data services ensures SLOSH input data sets are available as needed.
Step 40: Select Hurricane Monte Carlo data set on NWS IOOS Portal In addition to maps, SLOSH input includes hurricane: pressure, size, forward speed, track, and winds. This can be a data set of simulated/historical hurricanes for planning purposes available from NWS.	The SLOSH model is made available as an enterprise-wide modeling service. Maryland uses a verified and maintained version of the SLOSH model provided by IOOS through the National Weather Service.
Step 50: Execute SLOSH Model Through IOOS In the MEMA study, scientists ran 50,000 storm simulations over 18 months with different combinations of tide, storm strength, track, size and forward speed. (With continuing updates to SLOSH and advances in computational power this could take significantly less time in the future.) We anticipate the SLOSH model being integrated at level 2 or 3.	The Maryland hazard planner runs the SLOSH model over the IOOS network. The planner has mapped data input sources applicable to a SLOSH model run for Maryland. All this is accomplished through a tailored user portal available from IOOS.
Step 60: Retrieve SLOSH results from IOOS MEMA works with the U.S. Army Corps of Engineers and local officials to turn the simulation data into updated maps for emergency planning. Again this should be a level 2 or level 3 application where output goes into latest digital map of the area with isobar lines showing relevant inundation depths based on key operational needs such as where motor vehicles could travel, where emergency	Model outputs are routed to Maryland. Data are stored and archived locally.

shelters and hospitals are above or below water lines allowing operations, where people could travel on foot, where water levels are above typical 1'st floor and 2'nd floor heights. These are based on the MEOW (Maximum Envelope Of Water) output of SLOSH.	
Step 70: Junction – Significant Changes? If changes are not significant, proceed to Step 80. A map of differences between the last inundation map output and the latest could easily show significant changes. Significant changes would be based on policy developed by regional and federal emergency planners. If changes are significant execute Alternate Flow A.	Change mapping services are available as part of National Weather Service SLOSH service. Maryland uses this service through IOOS.
Step 80: Prepare Inundation Report Emergency plans are updated and reported.	Not a responsibility of IOOS. Performed by hazards planner.
Step 90: Distribute Inundation Report Distribute plan updates.	The new plans can be registered as IOOS data and made available through metadata and registry services to the enterprise. Security allows selective distribution of plans.

4.1.4 Post Condition:

Updated emergency response plans and information are maintained by the appropriate agencies.

4.2 Flow A – Monitor Maryland shore

4.2.1 Pre-Condition

The pre-condition and post-condition are the same, we assume the system is in operational condition.

4.2.2 Trigger

The shore is monitored on an on-going basis and data acquisition is triggered on the appropriate time scale.

4.2.3 Process Description

Use Case Steps	Architecture Viability Assessment
Step A10: Update MOMS Set Points In IOOS The threshold set points are updated based on the output from the SLOSH model	IOOS provides User Portals that permits the manipulation of model parameters.
Step A20: Subscribe to Core Variables in IOOS Acquisition core data products from IOOS – wave height, wave frequency, etc. based on the ocean forecast assimilated data product.	IOOS provides metadata and subscription services permitting users to discover and acquire specific data sets required by their applications.
Step A30: Junction – Dual Branching Proceed to Step A30 and Proceed to Step 80 in Primary Flow.	Nominal Flow Action
Step A30: MOMS Monitors Core Variables Through IOOS Analysis of core data products from IOOS – wave height, wave frequency, etc. based on the ocean forecast.	Metadata services identify changes and broadcast updates permitting monitoring of data sets.
Step A40: Junction – Threshold Exceeded? If Threshold is exceeded proceed to Step A50. If Threshold is not exceeded loop back to Step A30	Nominal flow action.
Step A50: MOMS Sends Emergency Notifications Notifications are sent to subscribers and posted on web portals.	MOMS can use IOOS to broadcast notifications. IOOS Metadata services notify subscribers of changes in data.

4.2.4 Post Condition:

The pre-condition and post-condition are the same, we assume the system is in operational condition.