REACT:
Event Data Search and Use

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ED3 Capability

• Event-Driven Data Delivery (ED3)
• ITSC technology project funded by NASA Applied Science for Disasters
• ED3 creates an album or virtual collection with user provided temporal, spatial, keyword, or parameter settings
• Process workflows created for collecting data details, and processing data if needed
• Web-based application on top of ED3 is called REACT
• Creating virtual collections of data for weather hazards or other events
• Resources collected via user defined subscriptions
• Can be a living collection with data added over time as it becomes available
• Can be a curated collection with data manually added or removed to make the collection more understandable, applicable or easy to communicate
User Workflow

1. User defines a data subscription for a future event.

2. An event matching a user's subscription occurs.

3. Data processes defined in user's subscription are executed for the new event.

4. Album is generated containing links to all event-related data (a virtual collection).

5. Multiple users and applications utilize data contents of an event’s album for decision making.

Subscription Examples:
- Category 4 hurricane
- Earthquake > 5 on Richter scale
- Water levels on lower Mississippi River 1 foot above flood stage
- Lightning fatality

REACT (Rapid Event Album Collections)

- Data Search of CMR or other data catalog
- Social Media Filters
- Generate Products
- Fuse products
- Run Models
- Task Sensors

Funded by NASA’s Applied Science for Disasters Program

November 13-14, 2018  GHRC User Working Group Meeting
The application could allow enhanced subscription services for requesting album or virtual collection creation in response to event occurrences, with capability like:

- **Science data** resulting from spatial and temporal searches based on detected events of specified type, location and level (criteria)
- Generation of **new products** triggered by an event
- Output from event-triggered **model executions**
- Results from event-triggered **tasking of sensors**
- Results of other **data workflows**
- Gathering of information from selected **social networks**, including messages, videos, pictures, etc., relevant to event occurrence
- Other data...

Can be manually triggered by a user or application can function as a listener.
Prototype web application developed as part of the funded ED3 project
**REACT Interface**

### Earthquake Subscriptions

Welcome keiser!

<table>
<thead>
<tr>
<th>Index</th>
<th>Subscription Name</th>
<th>Subscription Last Modified</th>
<th>Subscription Matched on</th>
<th>Magnitude</th>
<th>Location</th>
<th>Active</th>
<th>Update</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earthquake 1</td>
<td>12/Jul/2017 12:02:58</td>
<td>27/Sep/2017 23:16:19</td>
<td>4.0</td>
<td>-90,90,-180,180</td>
<td>False</td>
<td>Update</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Earthquake 3</td>
<td>12/Jul/2017 12:02:10</td>
<td>27/Sep/2017 23:21:19</td>
<td>3</td>
<td>-90,90,-180,180</td>
<td>True</td>
<td>Update</td>
<td></td>
</tr>
</tbody>
</table>

Showing 1 to 4 of 4 entries
### REACT Interface

#### GHRC User Working Group Meeting

**November 13-14, 2018**

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**Event Type** | **Description** | **Event Title** | **Matched by Subscription** | **Date** | **Info** | **Action**
--- | --- | --- | --- | --- | --- | ---
Earthquake | [Link](https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avq.json) | M3.2 - 14km NW of Harper, Kansas | Earthquake 2 | 2017-09-27 23:56:54 | Details | ![Details](#)
Earthquake | [Link](https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avq.json) | M3.2 - 14km NW of Harper, Kansas | Earthquake 3 | 2017-09-27 23:56:54 | Details | ![Details](#)
Earthquake | [Link](https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avq.json) | M3.4 - 8km N of Cot, Costa Rica | Earthquake 3 | 2017-09-27 21:41:56 | Details | ![Details](#)
Earthquake | [Link](https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avq.json) | M4.2 - 38km N of Komodo, Indonesia | Earthquake 3 | 2017-09-27 19:30:04 | Details | ![Details](#)
Earthquake | [Link](https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avq.json) | M4.5 - 75km NE of Vieques | Earthquake 3 | 2017-09-27 17:56:39 | Details | ![Details](#)

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Event Data

Magnitude = 3.2
Detail = https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us2000avqw.geojson
Place = 14km NW of Harper, Kansas
Time = 2017-Sep-27 23:56:54

Fema National Flood Hazards
http://hazards.fema.gov/gis/nfhl/rest/services/public/NFHL/MapServer

Noaa Social Vulnerability Index Census Block
https://coast.noaa.gov/arcgis/rest/services/sovi/sovi_blockgroups/MapServer

National Digital Forecast Database
https://tdpgris.ncep.noaa.gov/arcgis/rest/services/NWS_Forecasts_Guidance_Warnings/NDFD_temp/MapServer
There is no consistency in format across organizations for alerts or warnings.

A common alert protocol (CAP) is available but not many agencies use it.

Therefore, event types must be set up by system engineers individually.

Users can not specify an event of choice that is not already available.
Automatically generate media packages for major weather events

- Often when there is a major weather event, NASA PR folks ask for media-friendly items showcasing how NASA-funded activities can help society respond to the event. The general response seems to be a lot of scrambling to find relevant items. By having an event-based subscription that already pulls together the subscribed resources, GHRC can provide the requested material sooner.

- As better resources are identified, they can be added to the existing subscriptions, improving delivered package over time.

- Can also incorporate generated package into the GHRC website workflow, so that the material can be publicly distributed.

- Customer: GHRC Outreach Team

- Event Types: Major weather events such as hurricanes, severe storms, catastrophic lightning, etc

- Data Products: varied

- Entry point: GHRC admin interface for setting up subscriptions

This is one example of curated use. This is not the only way to use REACT. The application can also be used by individual scientists to create unique albums that they can publish and share with others.
Use Case: Album Integration with Applications

REACT Event Album (GeoRSS feed)

- Storm center created a REACT tornado subscription with a trigger of NWS tornado warning
- The subscription collected/filtered social media in the defined space and time and created a tornado event album (using GeoRSS xml)
- Storm center monitored the GeoRSS feed and plotted the data in their application
Questions

• Is this type of capability what you were thinking of when you recommended event-based data delivery for GHRC?

• Do you think REACT is a useful capability for GHRC users?

• Should REACT be provided as an auto-generated curated offering of event data albums (virtual collections) or with full adaptable capability for scientist use?

• GHRC could implement such a tool in phases: a curated album or two the first year, scientist specification of select albums the second year, full capability in the third year. Expand the functionality as interest grows among users. If no measureable interest, stop. Would this be satisfactory?

• The level of effort needed to integrate and deploy such capability at GHRC would need additional funding. Does the UWG feel strongly enough to recommend it as a priority for GHRC development efforts?
THANK YOU!

Questions?
Integration of Event-Based Subscriptions with GHRC Process Flow

Event Trigger → Subscription Repository → Event-Based Subscription User Interface

Event Criteria: - spatial - temporal - parameters other

User Interface

GHRC Data Search Interface

redirect

search
generate
catalog

Event-Based Subscription Components

Automated data search and/or data generation

Resulting Virtual Collection

Resulting Data Granules Downloaded

Data granules

GeoRSS or other with links

Interoperate with existing applications

Application

Other Data Centers Models Other Processes Social Networks

Interoperate with existing applications
(Future: Suggesting event-based subscription for search users based on behavior)

- **Track user's navigation / filtering actions** in order to find data
  - Facet-based searching
  - Always show a breadcrumb-style navigation menu
- Once the search narrows down to a manageable data size (total bytes? total files?), then begin showing **visual indicators for data subscriptions**
- When a user chooses to subscribe to data, **start with a simple subscription**
  - Simple subscription = simple selection criteria + list of actions
  - Simple selection criteria = specific datasets + geographic bounds (+ time?)
- **Present existing virtual collections** (as a set of selection criteria) + list of actions
- **Redirect to event-based subscription** - show candidate events (hurricanes, severe weather, flooding) that overlap the search
  - To be used as start of event-based subscription
  - Event-based subscription = event criteria + list of virtual collections + list of actions
While search for data in the GHRC system, the user is presented with event information coincident with their spatial/temporal searches and asked if they would like **additional data/information related to that (and similar) events**. The user could then be referred to the event-based subscription interface (along with current spatial/temporal settings) where they could complete a subscription request.

- **Customer:** anyone
- **Event Types:** any currently configured in the system to allow for coincidence with users searches.
- **Data products:** NASA science data, any other products (models, etc) that can be generated based on an event occurrence, relevant social media content, research analyses
- **Entry point:** GHRC data search - then redirected to event-based subscription interface