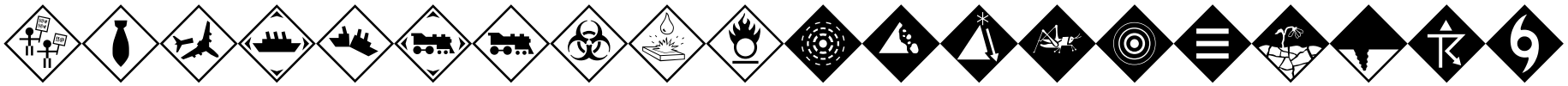

Challenges for Map Symbol Standardization in Crisis Management

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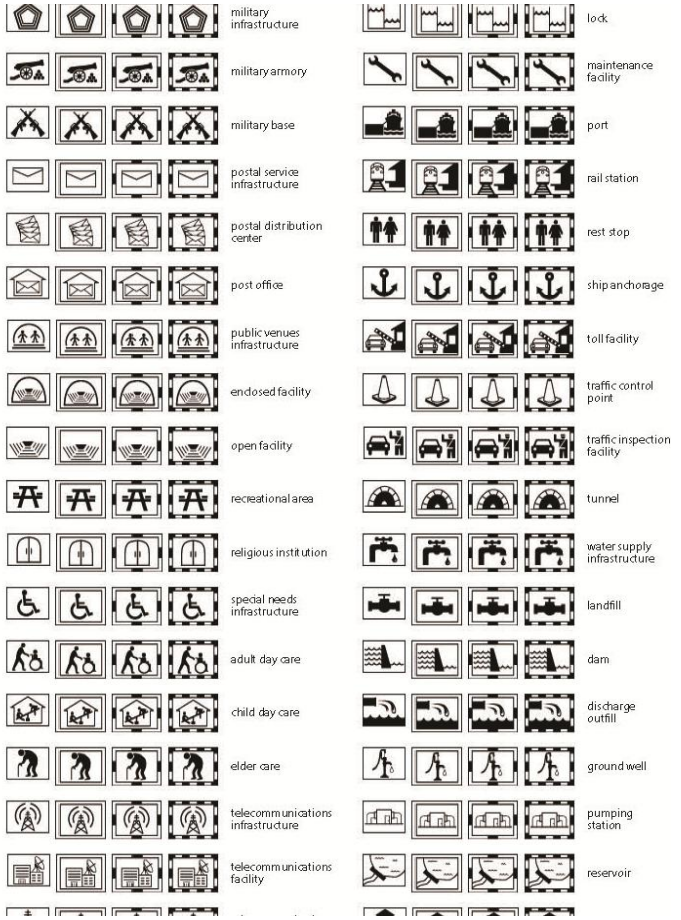
Outline

- **Motivation**
- **Approach**
- **Needs Assessment Results**
- **Process**
- **Challenges & Future Work**



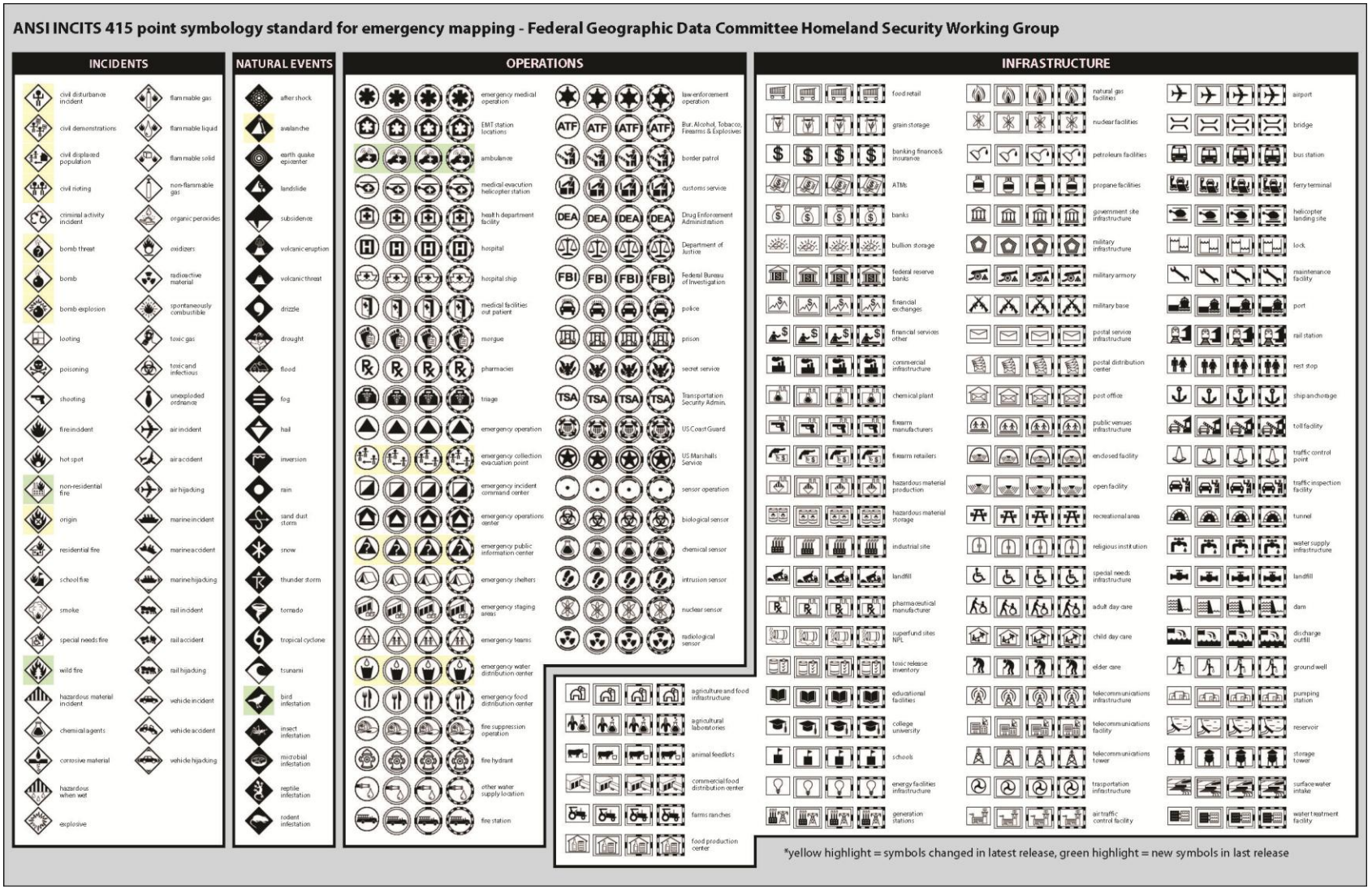
Motivation

- **Diverse DHS organizations produce or use maps daily**
  - Audiences range from geospatial analysts to general public
- **No consistent set of map symbols used across DHS**
- **ANSI INCITS 415-2006 intended for emergency management mapping**
  - Poorly adopted by practitioners
- **Objective: Develop process for symbol standardization**
- **Sponsored by DHS S&T Directorate's Command, Control, and Interoperability (CCI) Division**

ANSI Standard

- **Point symbol set designed for emergency response**
  - Goal was to facilitate common situational awareness
- **Federal/state/local stakeholders took part in the process**
- **Symbols designed to work in black & white**
  - Outline shapes used to distinguish between symbol types (incidents, natural events, operations, infrastructure)
- **Evaluation conducted with first responders**
  - Made use of an “accept” or “reject” methodology

ANSI Standard



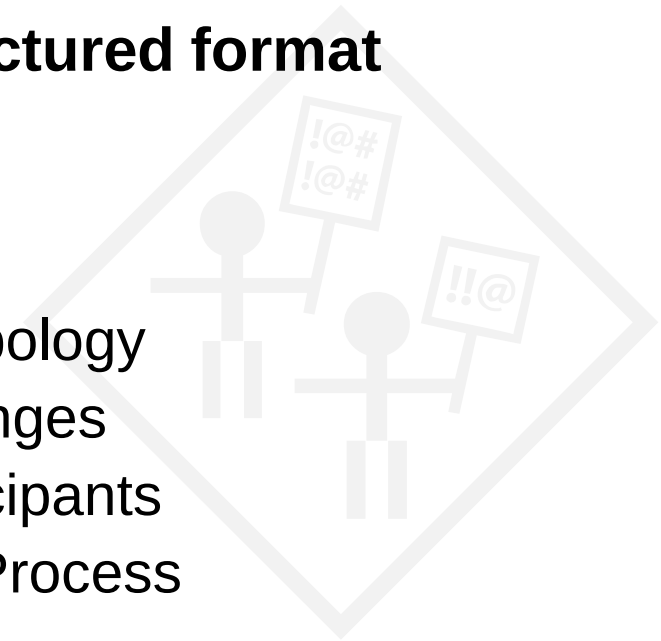
Basic Approach

- **Survey use of ANSI symbols and other point symbols across tasks and components within DHS**
  - Interviews (narrow audience)
  - Online survey (wider audience)
- **Develop a repeatable process for creation of symbol standard(s)**
- **Test the process on a selected domain or application area, refine tools & methods based on results**

Needs Assessment

Interviews

- **Conducted 14 interviews with map producers and users in various DHS missions**
- **Audio recordings for 10, written notes for 4**
- **Formative study using semi-structured format**
- **Question foci:**
  - ANSI Standard
  - Critical Incidents Related to Symbology
  - Technical / Organizational Challenges
  - Map Examples Provided by Participants
  - Ideas for New Symbol Standard Process



Results: ANSI Standard

- **Standard not used by most participants**
  - Only FEMA / IICD use a small subset of the symbols (nobody using the complete set)
- **Lack of use is not related to technical constraints**
  - Minor problems using fonts, etc… seen as easy to fix
- **Key reason is poor match to missions/information customers**
  - Participants only use the symbols from the set that could be considered in common use (hospital “H”, airport, etc…)

Results: ANSI Standard

- **Many of the symbols are too intricate and difficult to parse without explanation**
  - Especially symbols that attempt to mix together information from a type of event happening to a type of infrastructure
  - One participant suggested it's easier to simply put two symbols next to each other to indicate the type of feature and its current condition
- **The ANSI symbols do not scale well beyond local situations**
- **Participants assume ANSI symbols should work for local responders**

Results: Key Design Issues

- **Some label every symbol put on maps by default, adding to clutter issues**
- **Some are applying different meanings apart from the standard**
- **Outline set (damage levels) does not match all mission types, and few data sources provide such details**
- **Different groups assign common colors (red, green, etc…) to conditions that do not match the ANSI standard**
- **No participants are required to design for b/w**

Map Example Feedback

- **Many maps are thematic / analytical in nature and symbols must co-exist with a range of additional data**
- **Web mapping tools are becoming more important than printed matter**
  - Systems include iCAV, DHS Earth, eGIS, HSIN
- **Few participants can provide examples of instances in which they needed to transform output media substantially (e.g., to a phone)**

Symbology Development Process

- **Key issues are organizational, not technical**
  - Must involve all groups that generate and use maps in the process of developing symbols templates
  - Need mandates for standard creation and application
  - Need training materials to disseminate standards
- **A single common symbol set is judged to be reasonable for only a small subset of features**
  - E.g., for basic infrastructure that everyone must show
- **Participants suggest that divisions should develop their own standards and share with others**

A New Standardization Process

Standardization Process

- **Distributed, web-based activities through a customized Drupal site**

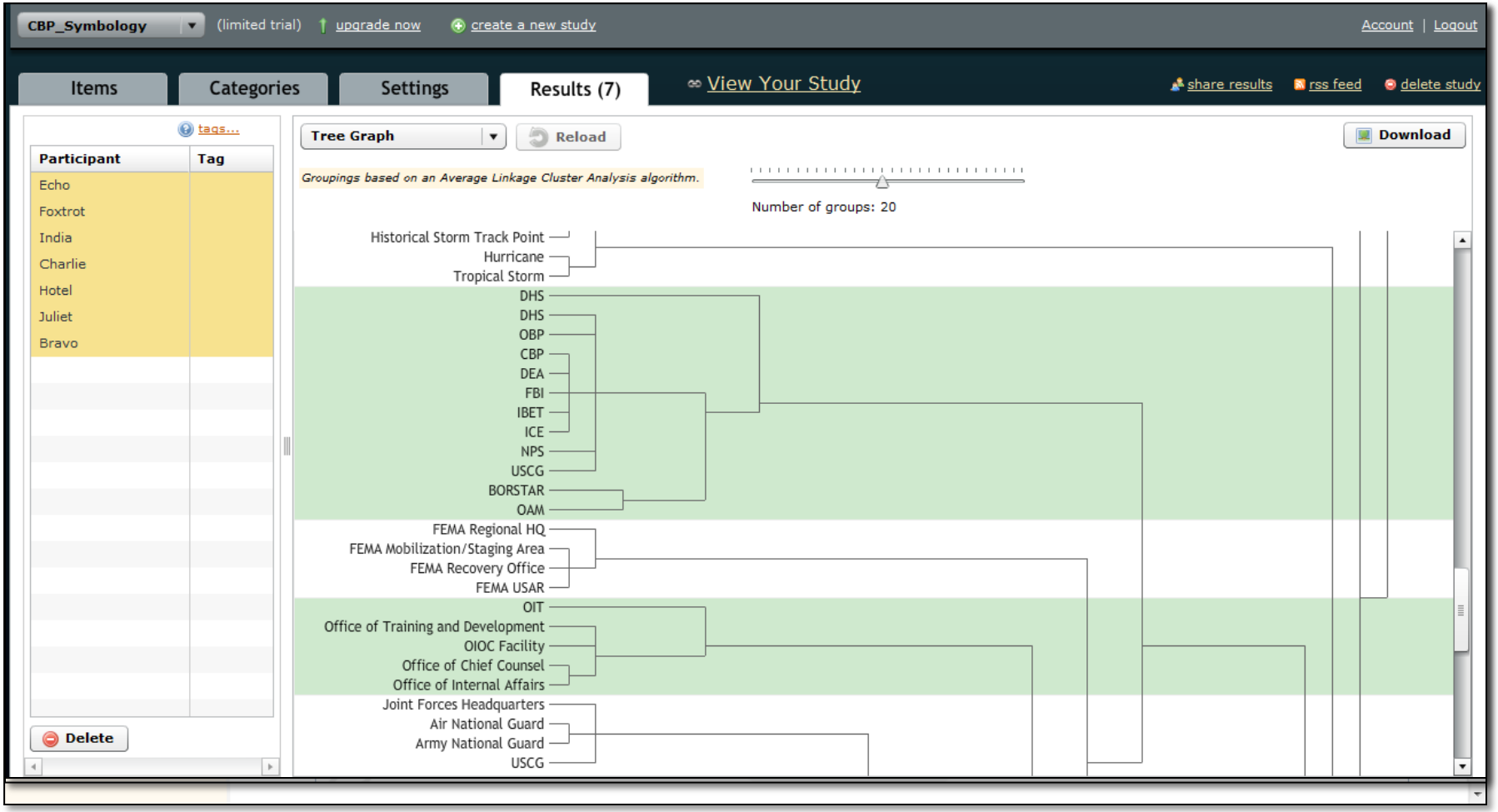
- **Phase 1: Needs Assessment**
  - Review current symbology, identify new symbol needs, problems with current symbols
- **Phase 2: Initial Standard Development**
  - Develop symbol categories, vote on changes to current symbology
- **Phase 3: Standard Refinement**
  - Discuss, refine & vote on final categories
- **Phase 4: Implementation & Quality Control**
  - Test new symbology in exercise, submit standard for graphical refinement by cartographers

- **Methods feature**
  - Round-based discussion & voting (modified Delphi)
  - Card-sorting activities (using websort.com)
  - Anonymized participation

Process Testing

- 7 participants from Customs & Border Patrol
- All are part of the CBP GIS/Mapping unit
- Testing from mid-February to early March
- Each round designed to last approximately 1 week in duration
- Activities moderated by Justine Blanford and Robert Roth

Process Testing



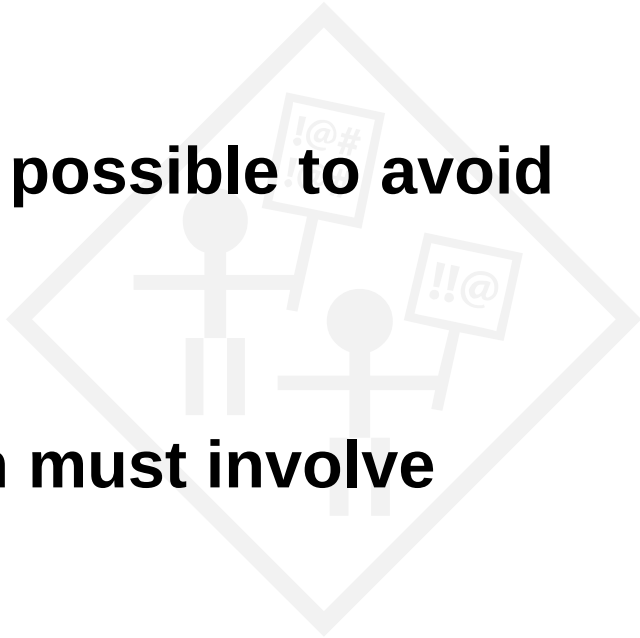
Preliminary Results

- **Participants identified 56 symbol issues**
  - new symbols, duplicate symbols, symbol definitions, symbol designs
- **Multiple rounds of card sorting resulted in a six-category standard**
  - this activity required more effort than identifying and fixing other symbol issues
- **Participant feedback survey results are positive**
  - usefulness, time commitment, methods, etc…
- **Implementation/testing is the next step**

Challenges & Opportunities

Challenges & Opportunities

- **Symbols must support a wide range of mission needs beyond basic emergency response**
- **Symbols must support wide range of output formats and map scales**
- **Symbols must be as simple as possible to avoid interpretation issues**
  - Able to be hand drawn?
- **The process of standardization must involve mapmakers *and* map users**



Challenges & Opportunities

- **Symbol categories can be as important as the symbols themselves**
- **The ability to see a map from one's preferred perspective is important during an emergency**
- **De facto symbol standards can be used to shape development of new formal standards**
- **Organizational structures must be implemented to foster the development and use of symbol standards**

Future Work

- **Complete process with another group**
  - Operational Center, FEMA
- **Create an on-line Symbol Store**
  - Place for users to upload, share, search, and download new symbology
  - Will also allow us to identify symbols in common across DHS mission areas
- **Determine ways to integrate symbol standards with Virtual USA effort**
  - Including a focus on dynamic symbol design

Thanks for your attention!

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