



Prioritizing events with headline visualization

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Inspiration for the concept

Initial inspiration

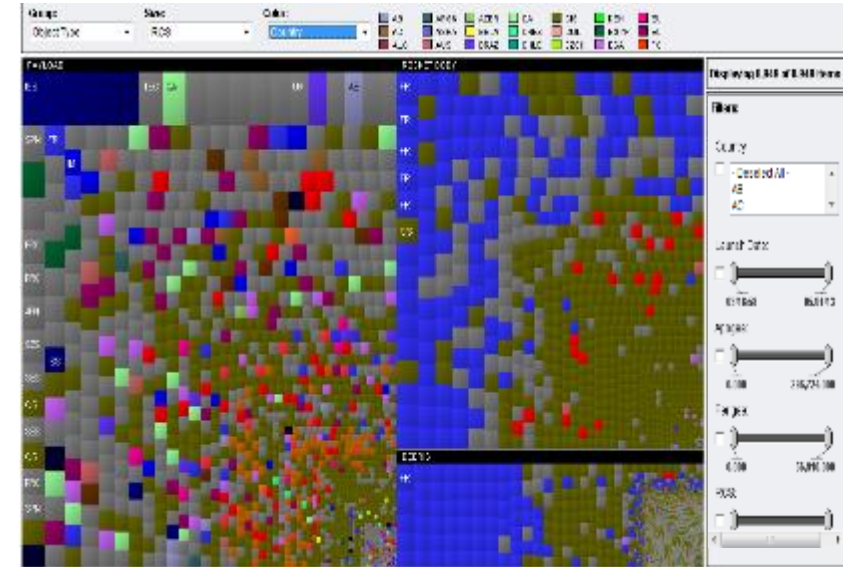
- Gen. Raymond: command and control systems not suited for leadership – no “bottom line”
 - Lack at-a-glance awareness of top priorities
- Additional issues:
 - System-of-systems lack logical navigation
 - Wall display content not legible from a distance
- Response to the standup of National Space Defense Center



Gen. John W. "Jay" Raymond
First Chief of Space Operations,
United States Space Force, as of Dec. 20, 2019

Visualization inspirations

News-
papers



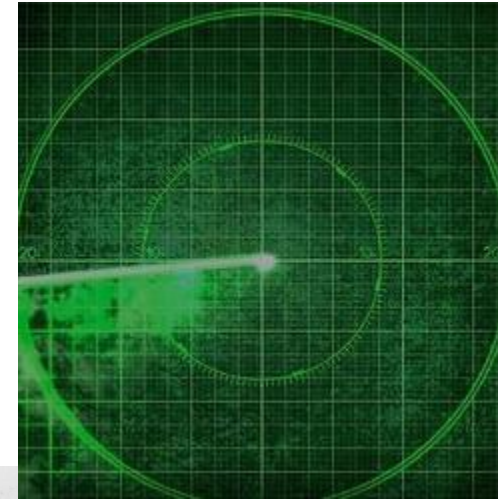
Tree
maps

Word
Clouds

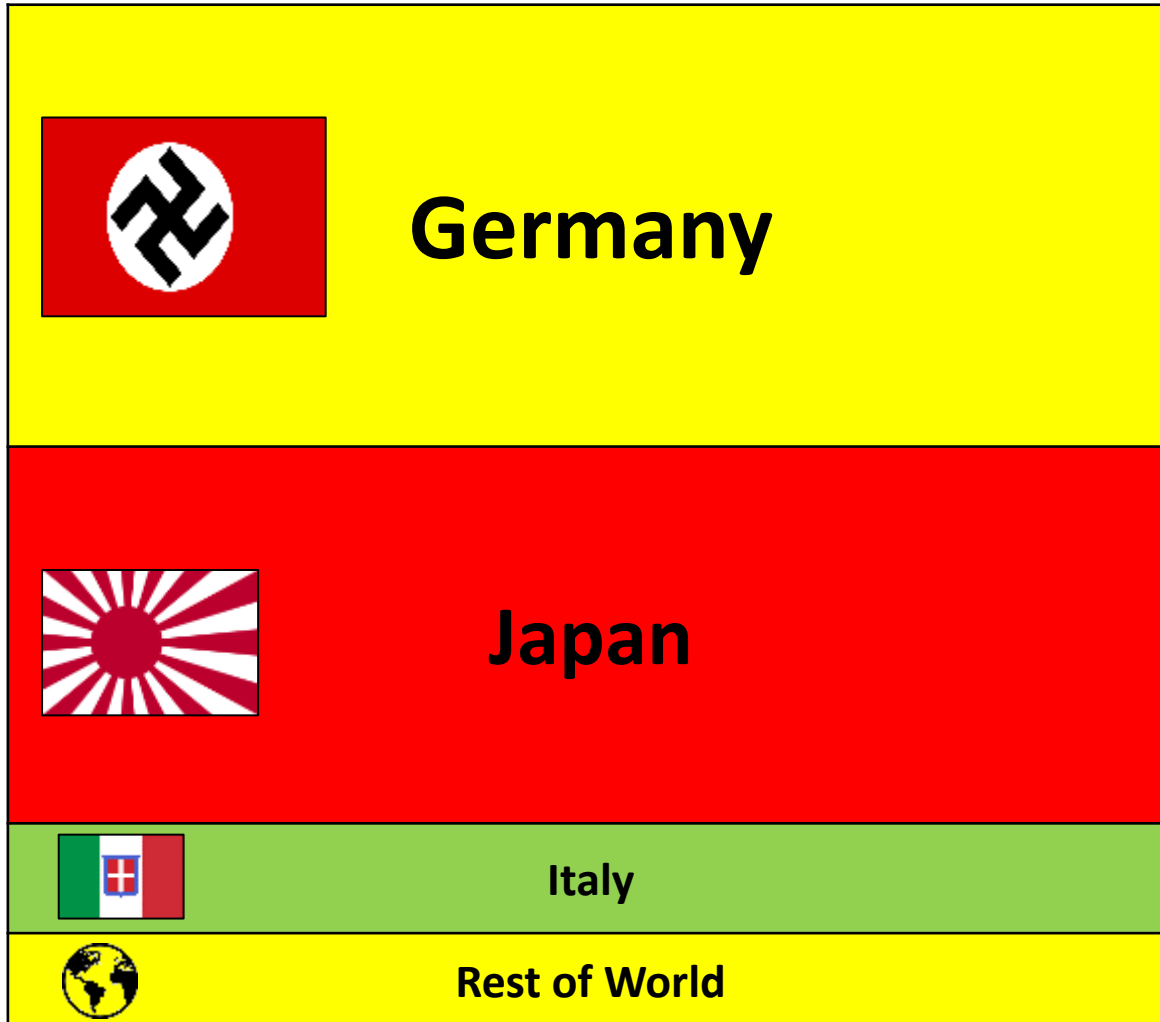


Scoring inspiration

- Eisenhower's importance/urgency grid
- Analytic hierarchy process
 - Criteria are weighted and scored
 - Used to compare courses of action
- Applied to anything needing prioritization
 - Pearl Harbor and 9/11 show that a barrage of threats can lead to confusion and chaos
 - Rapid resource prioritization can be critical
 - Need to assemble and make sense of pieces of the puzzle quickly

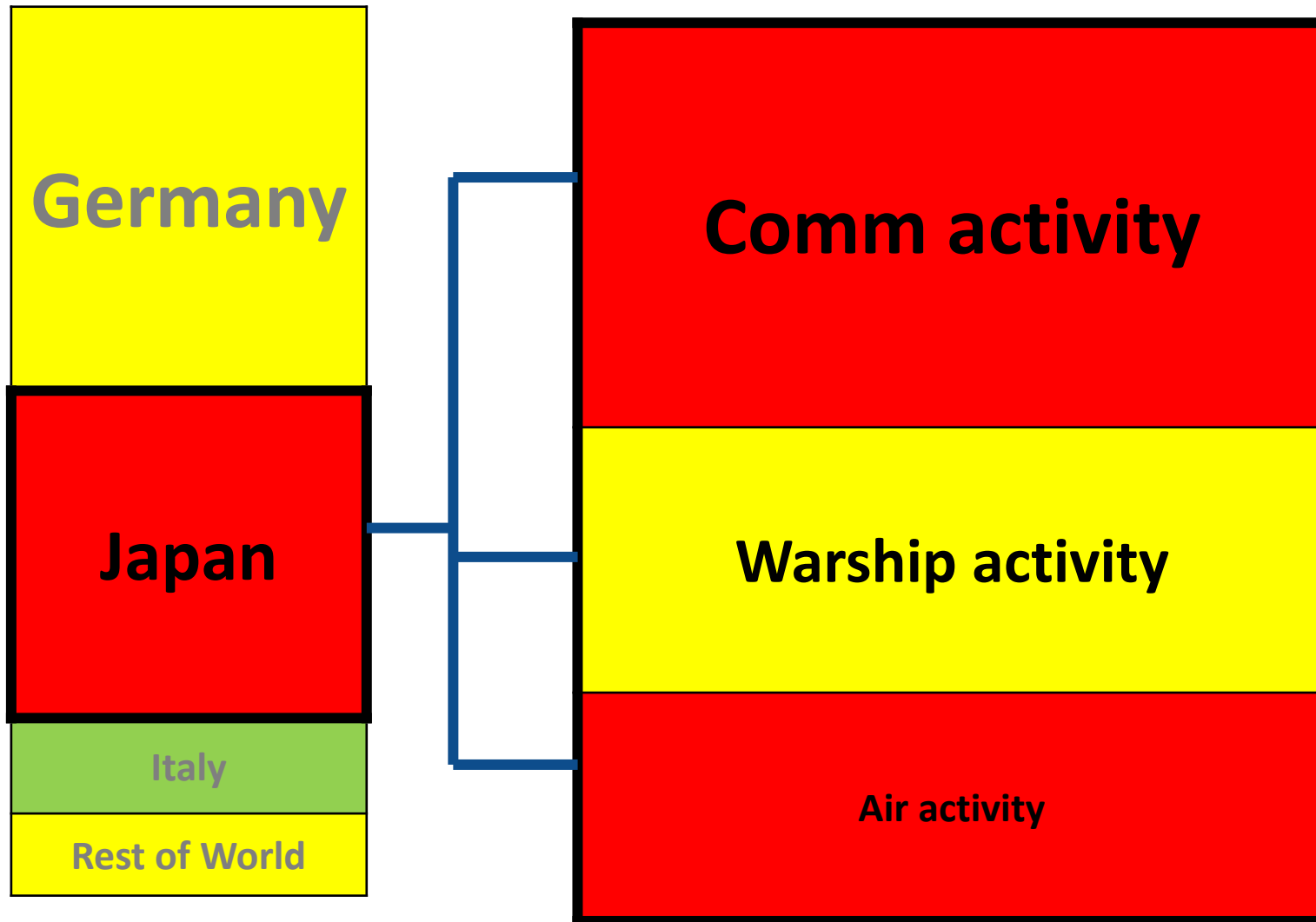


C Portal - Pearl Harbor example (US perspective)



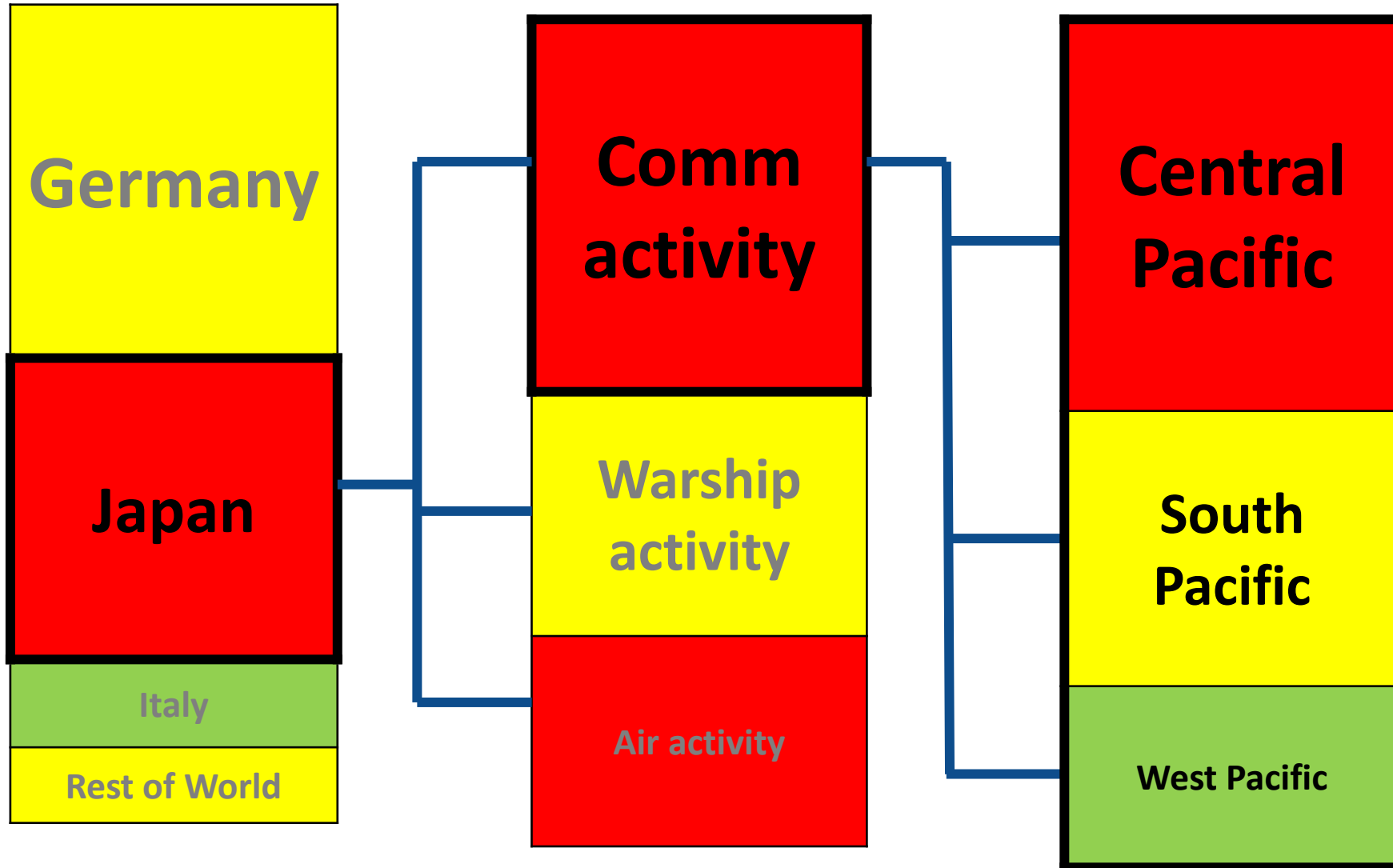
Hypothetical
for demo
purposes

C Portal - Pearl Harbor example (US perspective)



Hypothetical
for demo
purposes

C Portal - Pearl Harbor example (US perspective)

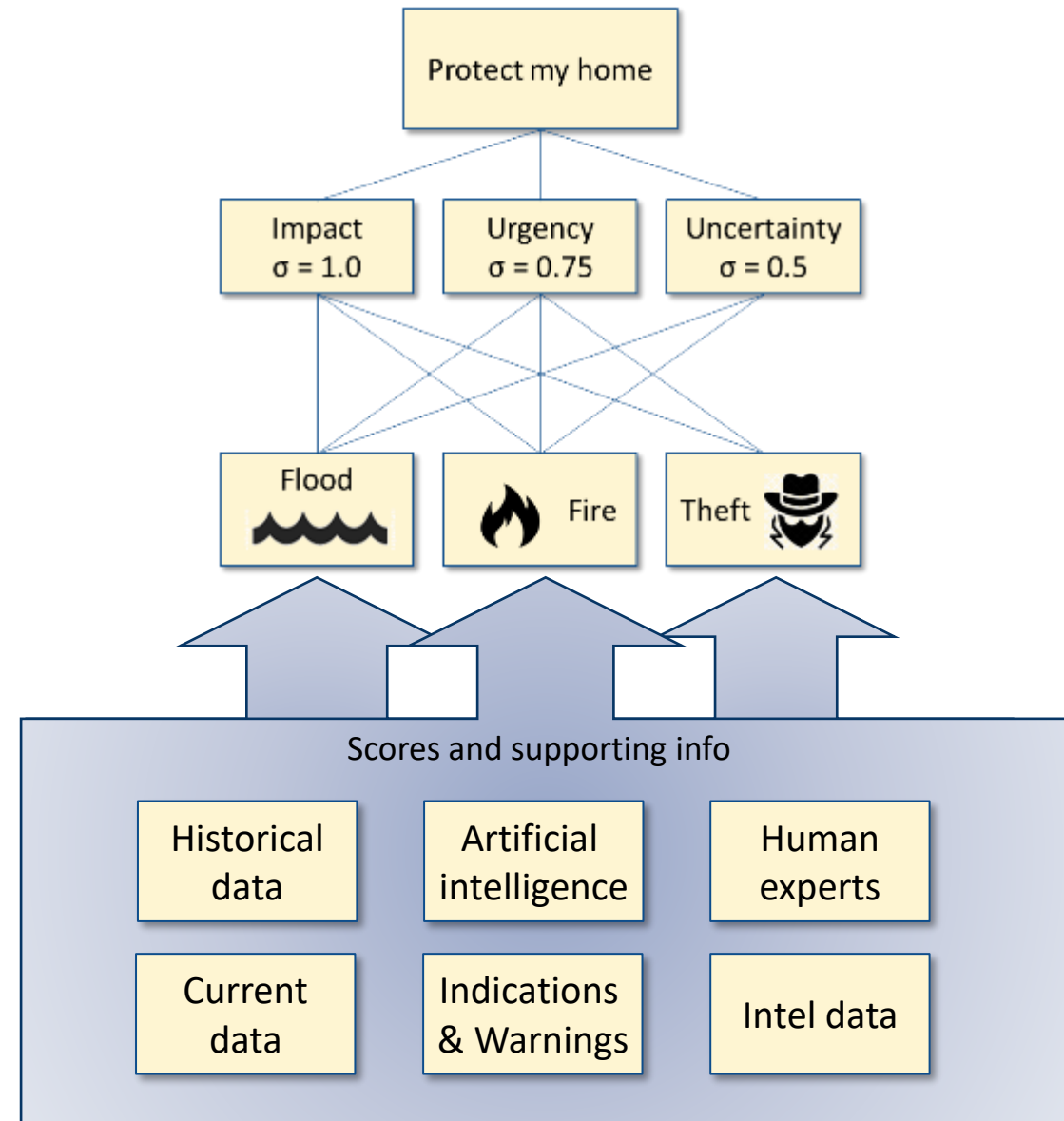


Hypothetical for demo purposes

Priority scoring

Analytic Hierarchy Process

- Threats scored using weighted criteria
 - Impact
 - Urgency
 - Uncertainty
- Scores can come from various sources:
 - Human experts
 - Automated tools
- Weights predetermined as much as possible but can be situational



Visualization

C Portal Visual Components

The dashboard is divided into two main sections: 'Space Defense Condition' (left) and 'Terrestrial Defense Condition' (right).

Space Defense Condition - Mission Priorities:

- HIO Activity:** 4:09, Plan: 25%
- Dual RPO:** 3 days, Plan: 80%
- HIO Activity:** 2 days, Plan: 40%
- New Foreign Launch:** >30 days, Plan: 10%
- Dual RPO:** 2 days, Plan: 80%

Terrestrial Defense Condition - High Interest objects:

- OBJECT PL 43599**
- USA 169 27711**
- USA 170 27875**
- High Value assets:**
 - ISS (ZARYA) 25544**
 - INTELSAT 905 27438**
 - MBSAT 28184**

Real world use

C Portal: Tile size

The screenshot displays two main sections: "Mission Priorities" and "High Interest objects".

Mission Priorities:

- HIO Activity:** Yellow tile, 4:09, Plan: 25%
- Dual RPO:** Orange tile, 3 days, Plan: 80%
- HIO Activity:** Green tile, 2 days, Plan: 40%
- New Foreign Launch:** Orange tile, >30 days, Plan: 10%
- Dual RPO:** Green tile, 2 days, Plan: 80%

High Interest objects:

- HIO Activity:** Yellow tile, 4:09, Plan: 25%
- Dual RPO:** Green tile, 2 days, Plan: 80%

Callout Box:

Height reflects overall **priority**
 $= \sum (\text{impact, likelihood, urgency})$

Clicking the main "body" of the tile provides details about the priority scoring hierarchy but there are other sections in the tile that link to other info.

C Portal: Tile color

Space Defense Condition 54321

Mission Priorities

- HIO Activity** (Yellow tile) 4:09 Plan: 25%
- Dual RPO** (Orange tile) 3 days Plan: 80%
- HIO Activity** (Green tile) 2 days Plan: 40%
- New Foreign Launch** (Orange tile) >30 days Plan: 10%
- Dual RPO** (Green tile) 2 days Plan: 80%

Terrestrial Defense Condition 54321

High Interest objects

- OBJECT PL 43599** (Orange tile)
- USA 160 27715** (Green tile)
- ISS (ZARYA) 25544** (Yellow tile)
- INTELSAT 905 27438** (Green tile)
- MBSAT 28184** (Orange tile)

Color indicates impact only (one part of the scoring)

C Portal: Timer

The screenshot displays two main sections: 'Mission Priorities' (Space Defense Condition) and 'High Interest objects' (Terrestrial Defense Condition). The 'Mission Priorities' section lists five items with their respective timers and plan percentages:

Event	Timer	Plan
HIO Activity	4:09	25%
Dual RPO	3 days	80%
HIO Activity	2 days	40%
New Foreign Launch	>30 days	10%
Dual RPO	2 days	80%

The 'High Interest objects' section lists three objects:

- OBJECT PL 43599
- INTELSAT 905 27438
- MBSAT 28184

A callout box points to the '4:09' timer, stating: 'Countdown timer indicating when action must be initiated. Click to get details about event timing – not all of these details is part of the priority scoring'.

C Portal: Planning status

The screenshot displays two main sections: 'Space Defense Condition' and 'Terrestrial Defense Condition'. The 'Space Defense Condition' section is titled 'Mission Priorities' and contains five items:

- HIO Activity** (Yellow bar): 4:09, Plan: 25%
- Dual RPO** (Orange bar): 3 days, Plan: 80%
- HIO Activity** (Green bar): 2 days, Plan: 40%
- New Foreign Launch** (Orange bar): >30 days, Plan: 10%
- Dual RPO** (Green bar): 2 days, Plan: 80%

The 'Terrestrial Defense Condition' section is titled 'High Interest objects' and contains four items:

- OBJECT PL 43599** (Orange bar)
- USA 169 2771I** (Green bar)
- USA 170 27875** (Yellow bar)
- MBSAT 28184** (Orange bar)

A callout box with a white border and black background points to the 'Plan: 40%' text in the third 'HIO Activity' item. The text inside the callout reads: 'Status of mitigation planning or execution, clicking on it brings up the planning tool (not used in scoring)'.

C Portal: Menu

Space Defense Condition 54321

Mission Priorities

Activity	Time	Plan
HIO Activity	4:09	25%
Dual RPO	3 days	80%
HIO Activity	2 days	40%
New Foreign Launch	>30 days	10%
Dual RPO	2 days	80%

Terrestrial Defense Condition 54321

High Interest objects

- OBJECT PL 43599
- USA 169 27711
- USA 170 27875

Menu links to any related material (e.g., reports, simulations, apps, websites...) not necessarily related to the tile's scoring.

C Portal: Graphic

Space Defense Condition

Mission Priorities

Item	Duration	Plan	Origin
HIO Activity	4:09	25%	Czech Republic
Dual RPO	3 days	80%	Puerto Rico
HIO Activity	2 days	40%	USA
New Foreign Launch	>30 days	10%	Czech Republic
Dual RPO	2 days	80%	Puerto Rico

Terrestrial Defense Condition

High Interest objects

Object ID	Origin
OBJECT PL 43599	USA
USA 169 2771I	USA
USA 170 27875	USA
MBSAT 28184	USA

Graphic that best conveys the situation/object. Country flag used to indicate origin.

C Portal: Drill-down

The screenshot displays the C Portal interface with a drill-down view. On the left, the 'Space Defense Condition' is shown with a score of 3. A white arrow labeled 'HIO Activity' points to a central column of three categories: 'Impact' (Weight=3, Score=50), 'Likelihood' (Weight=2, Score=30), and 'Urgency' (Weight=1.5, Score=20). To the right, the 'Terrestrial Defense Condition' is shown with a score of 2. Below this, there are two lists of objects: 'High Interest objects' (OBJECT PL 43599, USA 169 27711, USA 170 27875) and 'High Value assets' (ISS (ZARYA) 25544, INTELSAT 905 27438, MBSAT 28184). Each object entry includes a small satellite icon and a color-coded bar.

Real world use

Response to Emergent Need

- Technology transitioned as part of the Space Command and Control (C2) Joint Emergent Operational Need (JEON)
- C Portal was envisioned to be the starting point for the human-computer interface
- Many lessons learned both technically and human factors
 - Usability (impacts training)
 - Workflow
 - Interfacing within a system-of-systems
- Counterspace alert status



Counterspace alert status

	(U) Threat				
(U) State		Earthquake	Explosions	Flood	Insects
	Colorado		↔		↔
	New Mexico	↑	↑		↔
	Ohio	↔		↔	

Human input of CAS feeds "headline view" of C Portal



Overview

Mission Priorities

- HIO Activity 4:09 Plan: 25%
- Dual RPO 3 days Plan: 85%
- HIO Activity 2 days Plan: 40%
- New Foreign Launch >30 days Plan: 10%
- Dual RPO 2 days Plan: 80%

High Interest objects

- OBJECT PL 43599
- USA 169 27711
- USA 170 27875

High Value assets

- ISS (ZARYA) 25544
- INTELSAT 905 27430
- IRISAT 28184

Awareness

Situation Analysis

NOAA 10

ISS

IRIDIUM 135

IRIDIUM 138

RPO

Red: 42798 (COSMOS 25...)

Blue: 42919 (COSMOS 25...)

2 thresholds broken

RAAN, Inc, DisL

Highly Sensitive

PROG: 303408 (ver: 07 1990)

Clouds: and 28 on 19/04/2018 14:08:00

Observe: 1802 19/04/2018 14:08:00 (inc)

SiteName Next: 25544 (ISS)

Full Next: 25544 (ISS)

Threats

C Portal

Planning/execution

Action

Mission Analysis

- Analyze Mission
- 1.0 Analyze Planning Activities, Strategic Guidance and Comm Planning Guidance
- 2.0 Determine/Document Facts & Assumptions
- 3.0 Determine/Analyze Operational Limitations
- 4.0 Develop Operational Objectives and Mission Statement
- 5.0 Determine Specified, Implied and Essential Tasks
- 6.0 Conduct Initial Force Analysis
- Develop Products
- 7.0 Develop Mission Analysis Products

Plan

- Plan Created
- Initiate PFB
- Initial Notifications

Develop COA

- Development
- Analysis & Wargaming
- Comparison
- Approval

Analyze

- Ops, Threat and Odb Overview
- Guidance Deconfliction
- Friendly Assessment
- Risk Assessment
- Prepare Decision Products

Decide

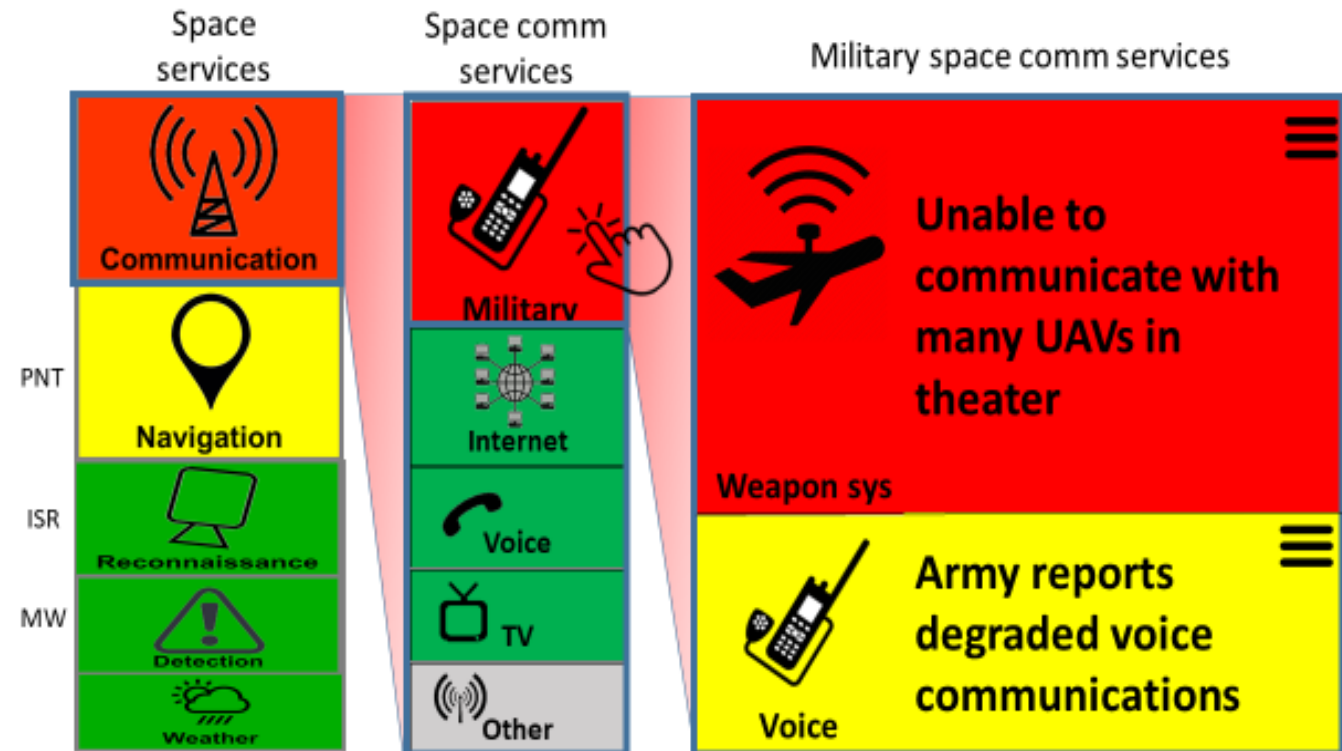
- Initial COA Proposal Briefing
- Analytical Results Briefing
- Mission Statement Approval Briefing
- COA Approval Briefing

Courses of Action



Final thoughts

- C Portal is meant to:
 - Provide all (esp. leadership) with big picture
 - Simplicity & legibility particularly well suited for wall displays
 - Act as a linkage to other tools in the system-of-system\
- C Portal has received input from:
 - Human experts
 - Automated tools
 - Direct data sources



Questions?