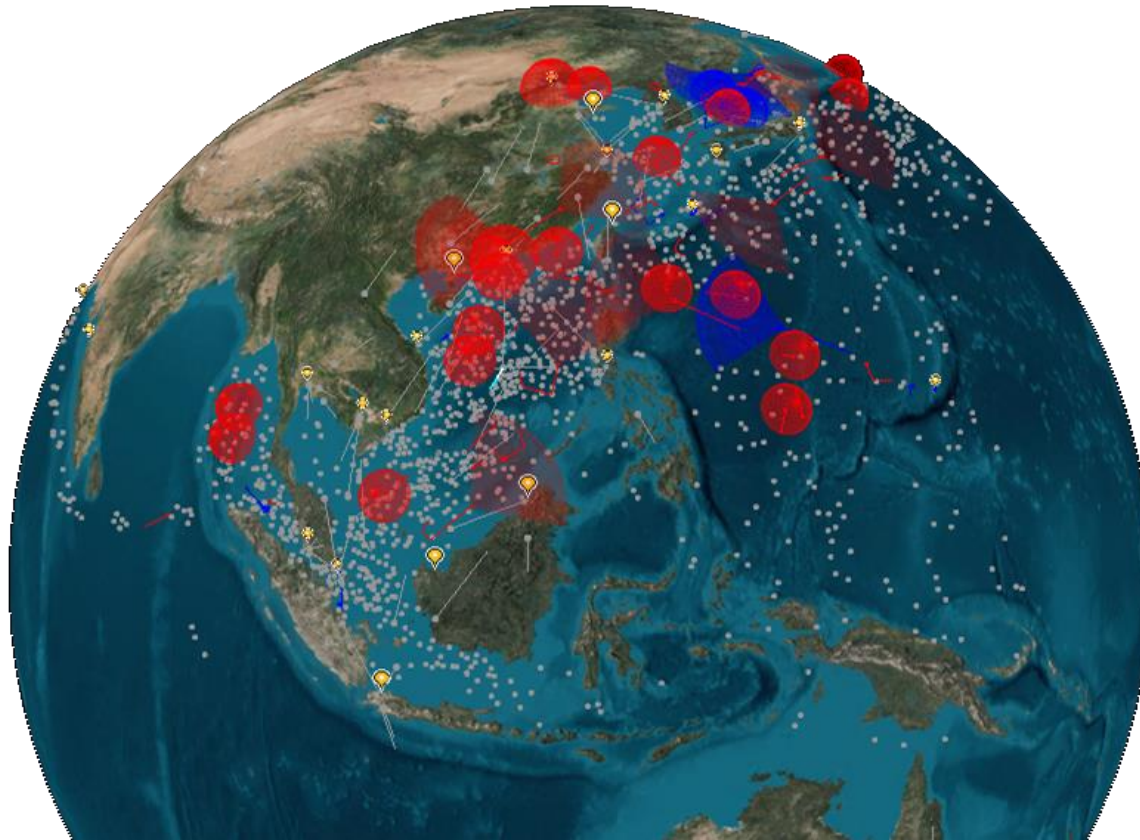


NATO Operations Research and Analysis Conference

Simulating the Asia Pacific Environment



Brede Wegener
October 2015

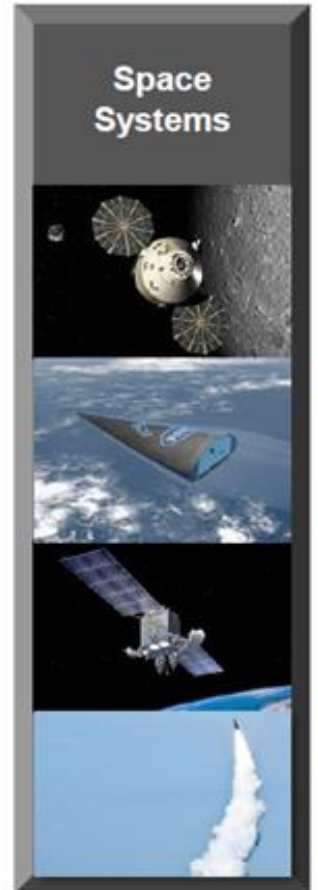
Topics



- Lockheed Martin Operations Analysis
- Regional Summary
- Civilian and Commercial Operations
- Representing Military Forces
- Modeling a Potential Conflict

A note on sources: All data, performance parameters, and numbers are based on unclassified research utilizing open source resources such as Jane's, GlobalSecurity.org, CSBA, SouthChinaSea.org, and the CIA World Factbook. The hypothesized scenario presented is purely based on unclassified conjecture for illustrative purposes only. The depicted order of battle is based on the numbers used for an unclassified Naval Post Graduate School course project. Any relation to potential real world events is purely coincidental and should not be construed as factual.

Business Structure



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People



- **112,000 Employees**
- **60,000 Scientists, Engineers and IT Professionals**
- **500+ Facilities Across the US**
- **And Operating in 70 Countries with Over 7,000 Personnel**

Lockheed Martin Operations Analysis (OA)



- **Studies activities and systems in operational contexts**
 - Uses an 8 step process as its framework
 - Supports a range of applications including product development and business strategy
- **Company strategic competency coordinated at the corporate level across the business areas**
- **Rigorous exploration performed in collaboration with customers and stakeholders**



OA Values

Ensure Customer Relevance	Embrace Transparency
Be the Honest Broker	Provide Concise Documentation
Present Clear Hypotheses	Demonstrate Conclusions
Follow Scientific Method	Establish Assumptions
Perform with Excellence	Maintain Customer Intimacy

Asia Pacific Environment

Area of Interest >6.5M sq. miles

- South China Sea: 1,400,000 sq. miles
- East China Sea: 482,000 sq. miles
- Straits of Malacca: 25,000 sq. miles

Density Challenge: Threat, Civil, Commercial

Civil

- 80% of world natural disasters

Commercial

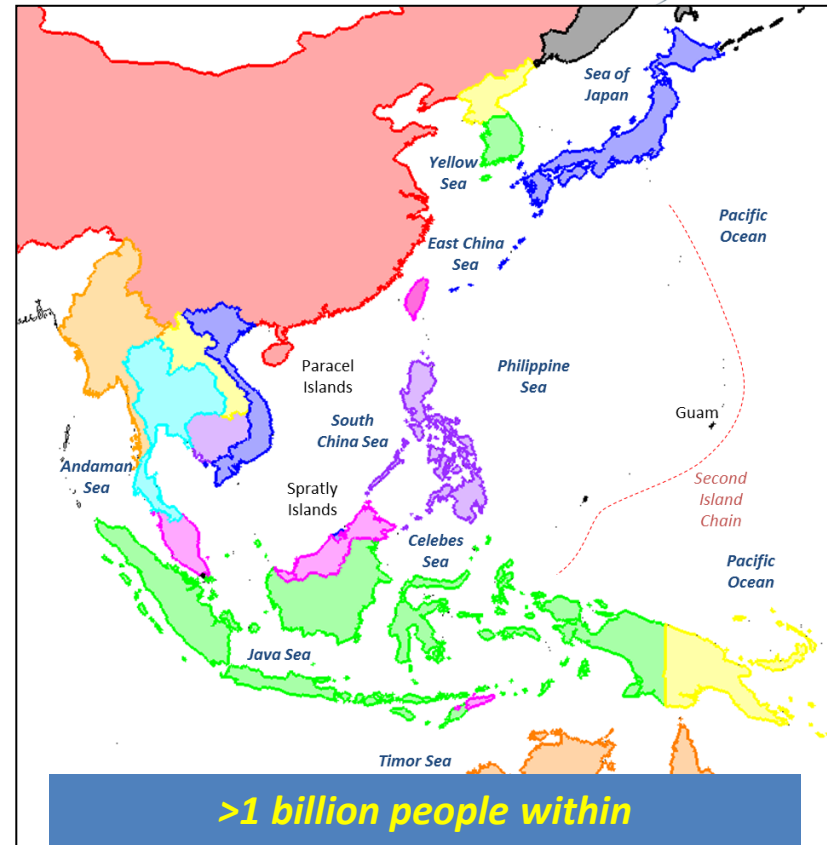
- Critical global trade routes
- World's busiest air and sea ports

Threats

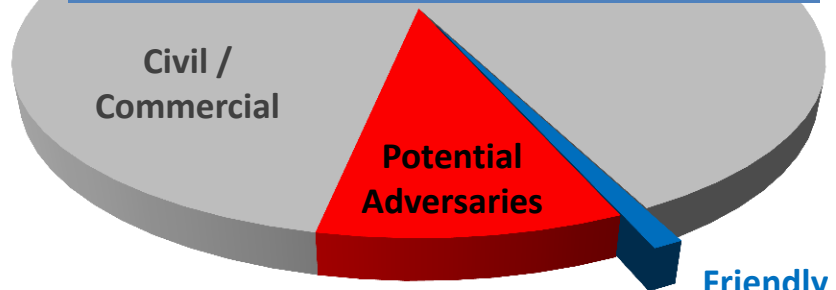
- State and non-state actors
- Peer and near-peer level capability

Politically Charged

- >20 countries and multiple ethnic groups
- Historical mistrust and competing claims



**>1 billion people within
100 miles of national borders/shores**



**Friendly
Forces**

Civilian and Commercial Operations



Fishing

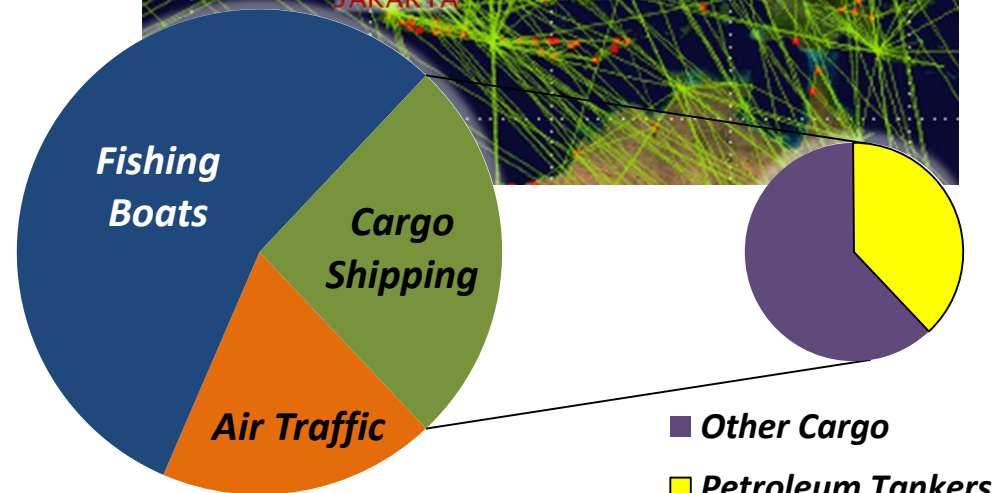
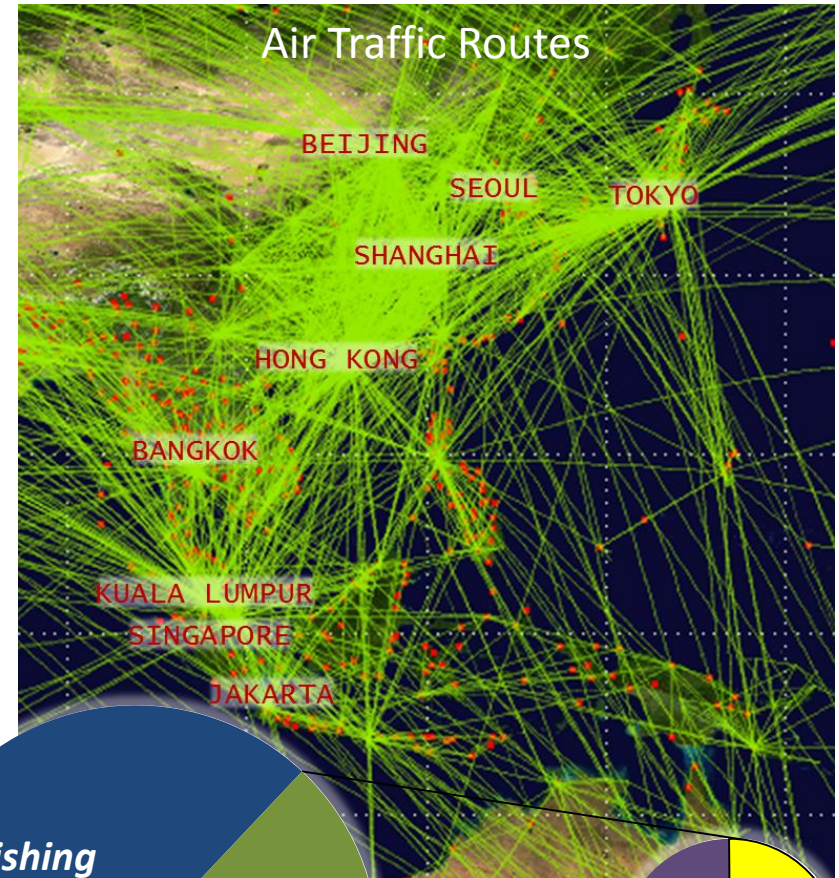
- >22% of the Asian diet
- >10% of global fish stock found in SCS

Maritime Cargo

- >30% of global cargo shipping
- >30% of global petroleum
 - 80% of Japanese and South Korean petroleum through SCS

Air traffic

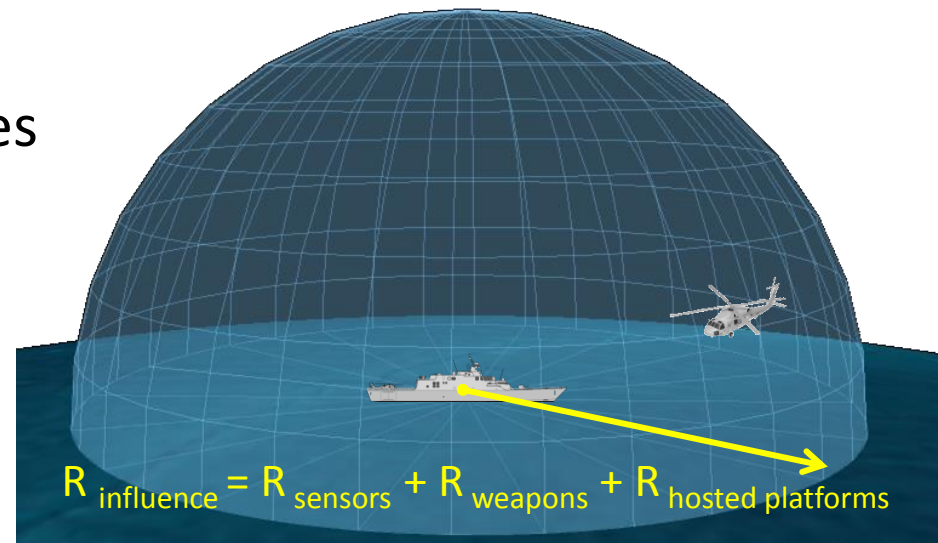
- 30% of the world's busiest airports
 - Passenger and freight routes



Modeling Red and Blue



- Air, land, and sea forces modeled as effective areas of influence
 - Sensors: active and/or passive
 - Weapons: kinematic and sensor range
 - Hosted platforms: range of mobile platforms relative to host
 - e.g. ship based patrol aircraft
- Unclassified performance values
 - Effective ranges and velocities
 - Numerous sources such as Jane's
- Unclassified Order of Battle
 - Naval Post Graduate School course war game



Potential Conflict: Aggressive Action in the SCS



Scenario

- China demonstrates ability to control claimed South China Sea territory
- “Anti-piracy” proclamation provides notional justification to hinder international FON

Fishing

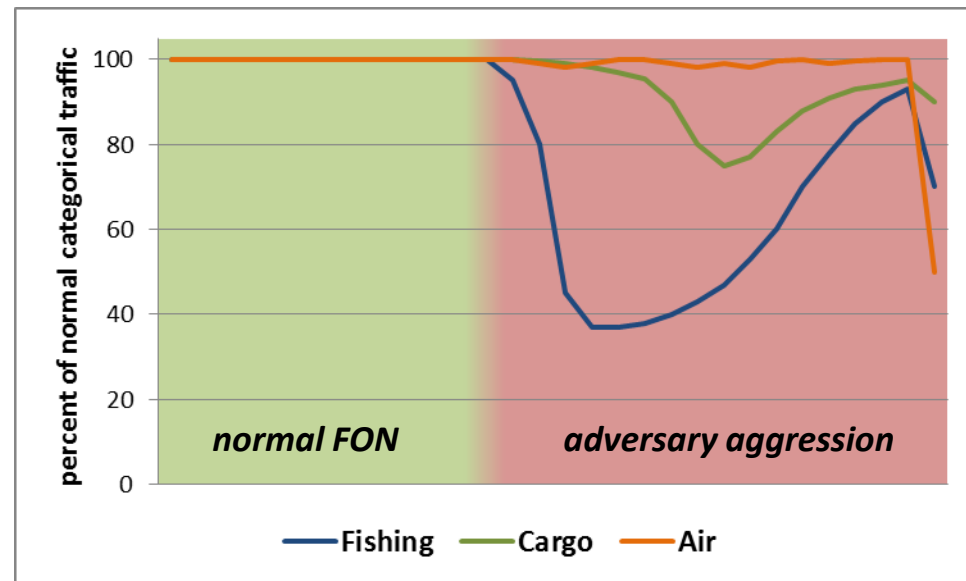
- Activity in conflict area subsides momentarily as local risks are assessed
- Population demand for fish continues as few alternatives are available
- Fishing resumes despite escalating tension

Maritime Cargo

- Delayed response as ships continue to transit from the area
- SCS detour is about 1000 miles

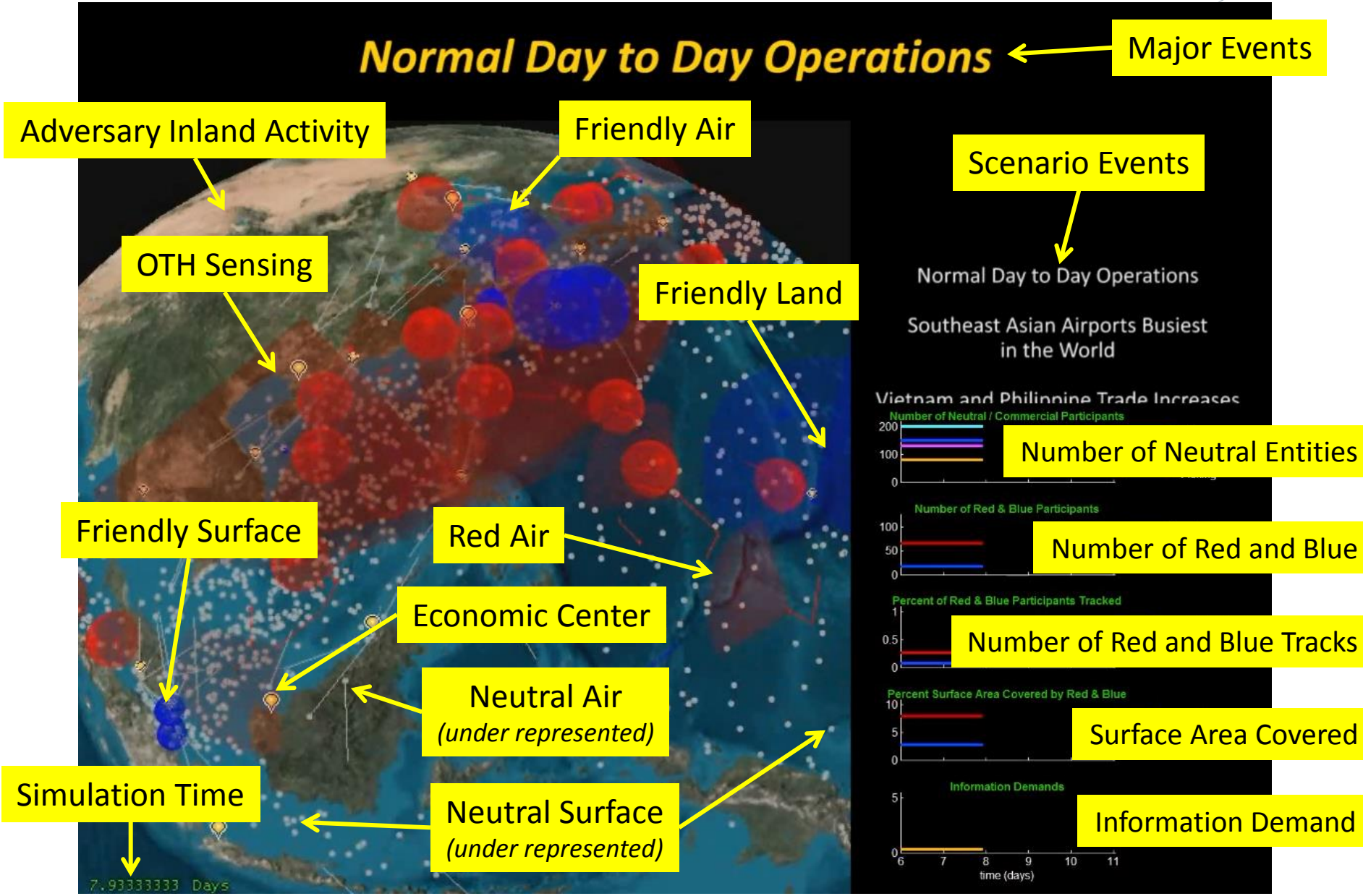
Air Traffic

- Flights may not be concerned with a surface conflict... until someone is shot down
 - Malaysia Airlines Flight MH17 shot down over Ukraine, 2014



Each uniquely balances conflict risk with the economics of continuing operations

Putting It All Together in a Screenshot

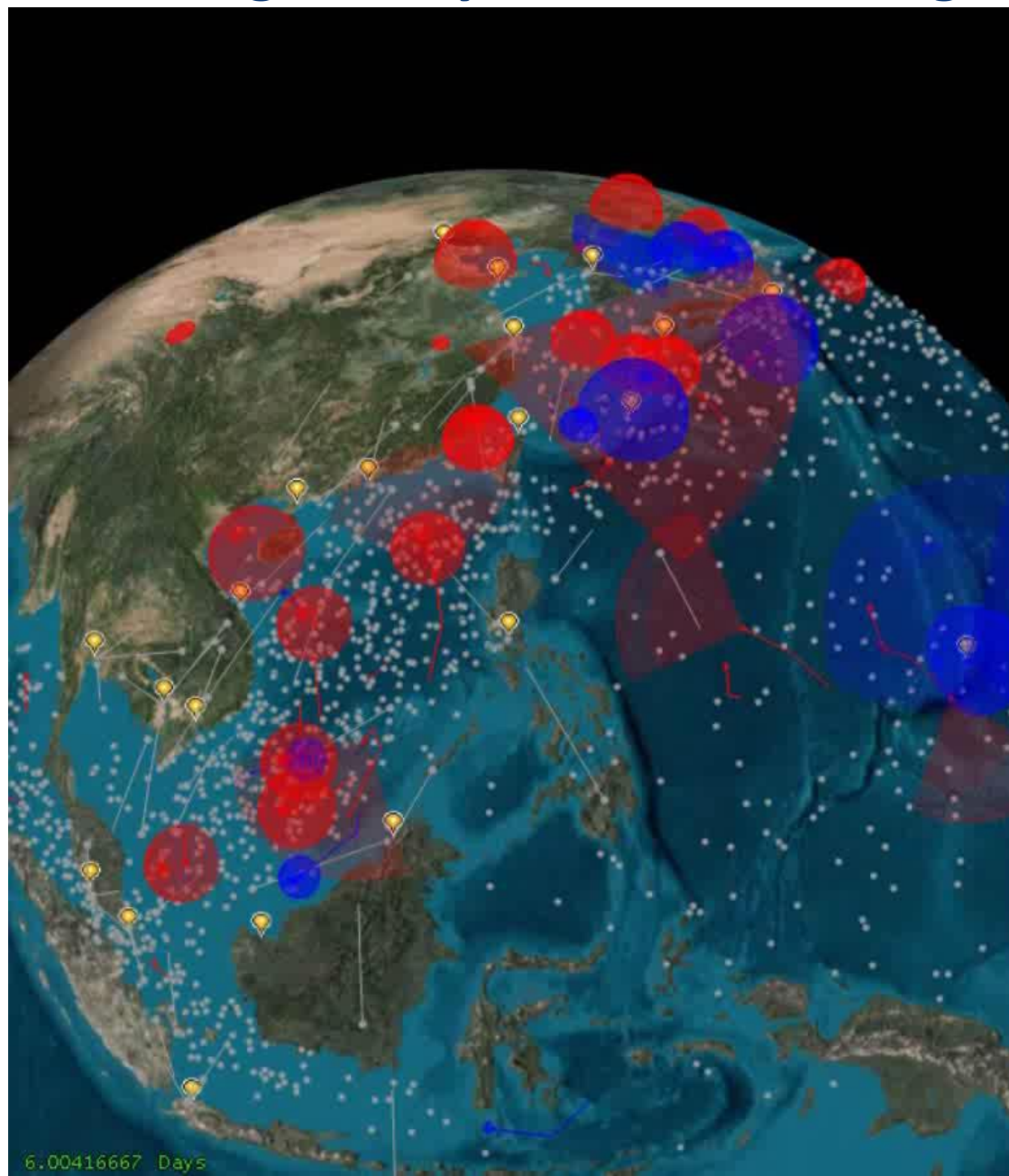


Metrics Represented

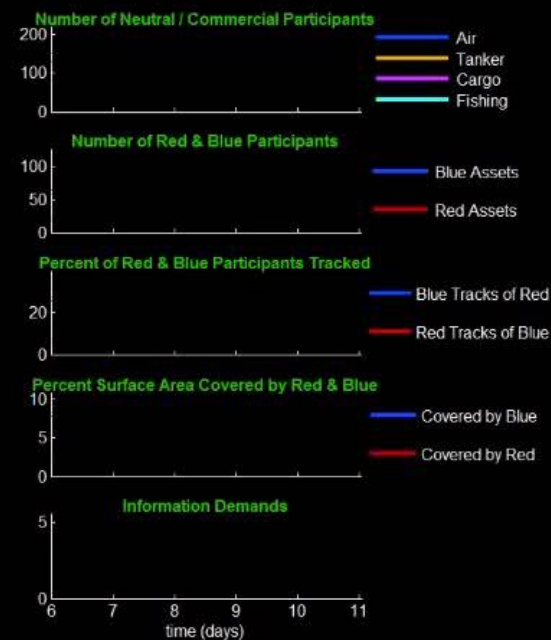


- Number of Neutral / Commercial Participants
 - Indicates a proportional number of white participants on each day of the simulation. Note, the scale vastly under represents the volume of white traffic.
- Number of Red and Blue Participants
 - Traces the number of Red and Blue participants in theater on each day of the simulation.
- Percent of Red and Blue Participants Tracked
 - Red line indicates the portion of blue participants within Red clouds of spatial and temporal influence
 - Blue line indicates the portion of Red participants within Blue clouds of spatial and temporal influence
- Percent Surface Area Covered by Red and Blue
 - A daily trace of the portion of surface area temporally influenced by Red and Blue platforms
- Information Demands
 - A daily trace on the volume of Blue tactical information demands. The y-axis may be thought of in terms of gigabytes transmitted per second

Simulating 30 Days of an Escalating Conflict



Normal Day to Day Operations



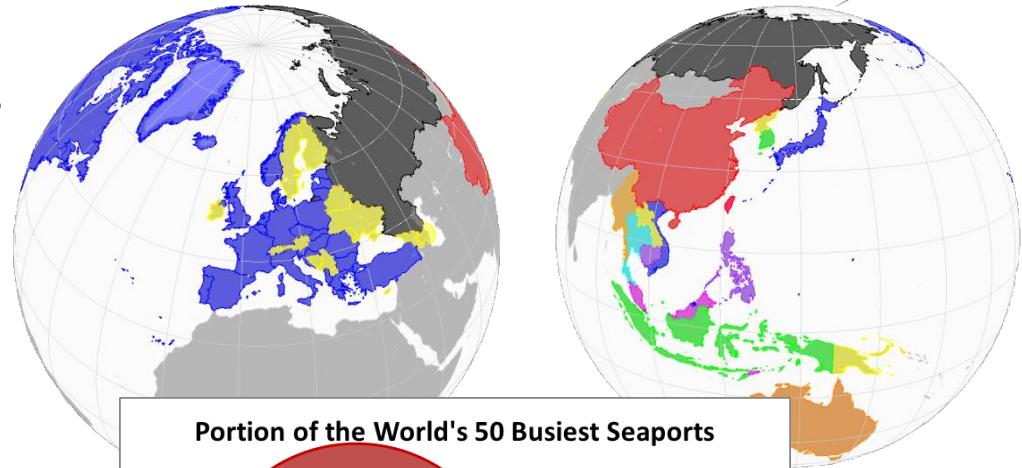
Similar Challenges → Similar Solution Needs

Challenges

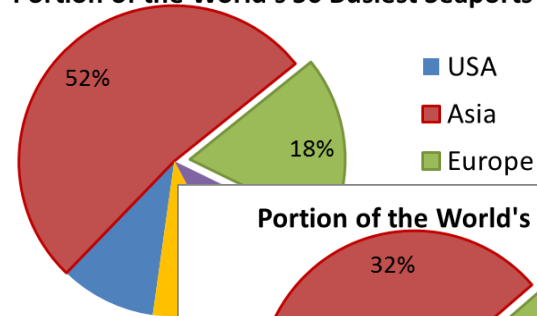
- Large geographic areas span all domains
- Densely populated regions
- Significant trade through congested global commons
- Multiple social, political, economic, and resource challenges
- Multiple operational phases occur simultaneously across domains

Solution Needs

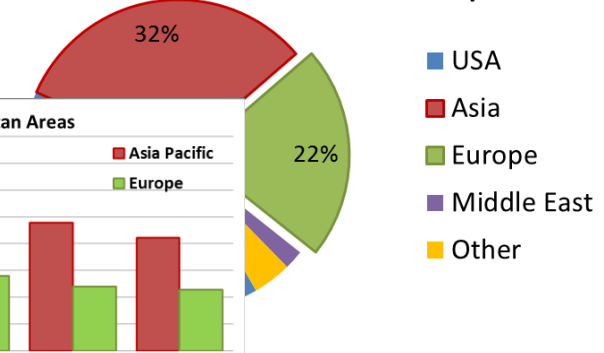
- Efficient data management, autonomous analytics, and smart user interfaces
- Unobstructed/beyond LOS sensing, communications, and targeting
- Cross-domain, cross-platform, theater wide battlespace awareness and C2



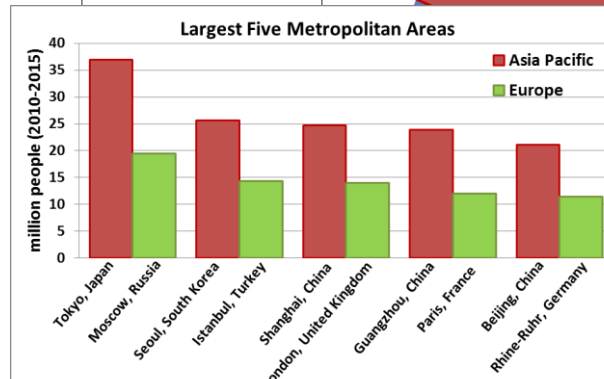
Portion of the World's 50 Busiest Seaports



Portion of the World's 50 Busiest Airports



Largest Five Metropolitan Areas



Cross-domain M&S increases understanding of complex system dynamics

Overcoming the Natural A2/AD Environment



Persistence

Integrated
Systems



Beyond Line of Sight:

- ✓ ISR and Weather
- ✓ Prompt Response
- ✓ Communications
- ✓ Battlespace Awareness
- ✓ PNT
- ✓ Data Management and Analytics

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Simulating 30 Days of an Escalating Conflict: Day 8



Windows Media Player

File View Play Tools Help

Normal Day to Day Operations

Normal Day to Day Operations

Southeast Asian Airports Busiest in the World

Vietnam and Philippine Trade Increases

South China Sea Traffic at Record Highs

Number of Neutral / Commercial Participants

Air	~180
Tanker	~150
Cargo	~120
Fishing	~100

Number of Red & Blue Participants

Blue Assets	~80
Red Assets	~60

Percent of Red & Blue Participants Tracked

Blue Tracks of Red	~0.2
Red Tracks of Blue	~0.2

Percent Surface Area Covered by Red & Blue

Covered by Blue	~3
Covered by Red	~7

Information Demands

Information Demands	~1
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8.86666667 Days

Paused

00:22 / 03:18

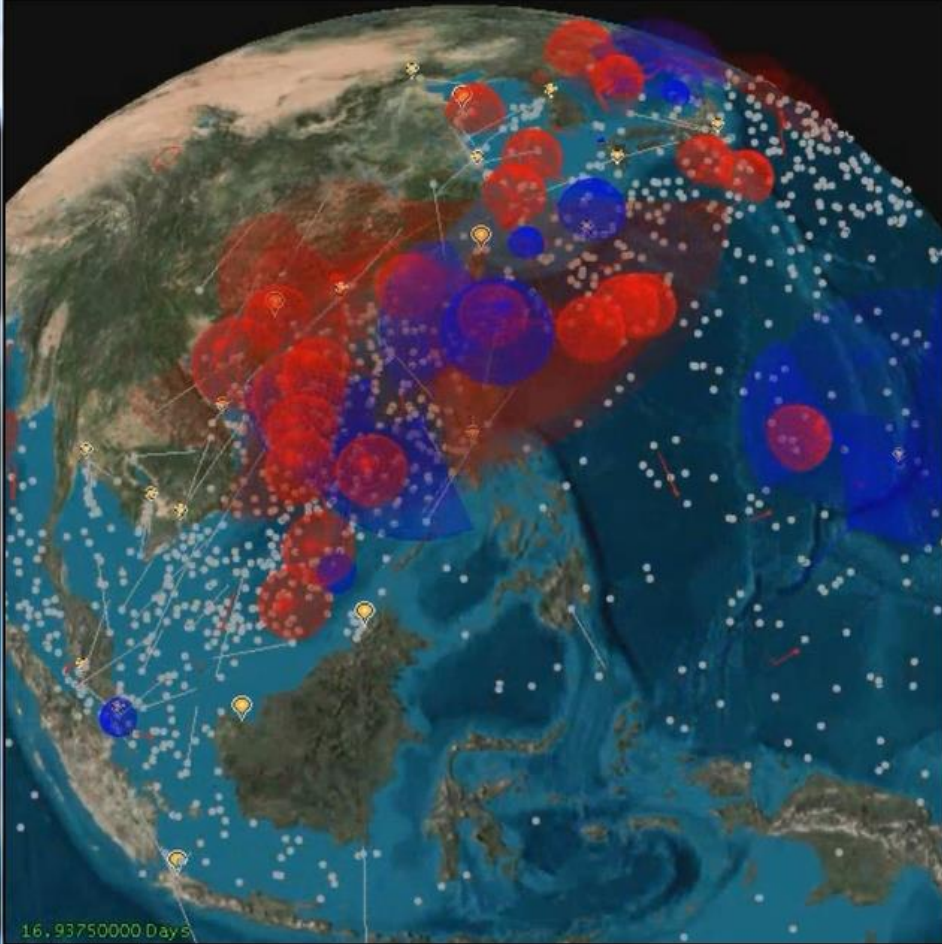
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Simulating 30 Days of an Escalating Conflict: Day 17

Windows Media Player

File View Play Tools Help

Red Anti-Piracy Actions



Palau Bracing for Tropical Typhoon

Red Committed to Protecting Commerce in the South China Sea

Red Anti Piracy Inspections Commence

Blue Forces in Theater Redirected

Illegal Harassment of Friendly Fishermen

16,93750000 Days

Paused

01:27 / 03:18

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Merchants Exposed to

Number of Neutral / Commercial Participants

Asset Type	Day 12	Day 17
Air	~180	~150
Tanker	~100	~100
Cargo	~100	~100
Fishing	~100	~100

Number of Red & Blue Participants

Asset Type	Day 12	Day 17
Blue Assets	~100	~100
Red Assets	~50	~100

Percent of Red & Blue Participants Tracked

Track Type	Day 12	Day 17
Blue Tracks of Red	~0.2	~0.2
Red Tracks of Blue	~0.2	~0.2

Percent Surface Area Covered by Red & Blue

Covered by	Day 12	Day 17
Covered by Blue	~5	~5
Covered by Red	~10	~10

Information Demands

Day	Information Demands
12	~1
13	~1
14	~1
15	~1
16	~1
17	~1

Simulating 30 Days of an Escalating Conflict: Day 22

Windows Media Player

File View Play Tools Help

Blue Carriers Tasked to the South China Sea

Merchants Frustrated with Inadequate Protection

Regional Governments Request Blue Assistance

Ten Friendly Fishermen Detained

Blue Carriers Tasked to the South China Sea

Manila Concerned with Neighbors Actions

SAG - Pacific
Dist. to SCS (km): 10406
Time to SCS (days): 9.64

SAG - Indian
Dist. to SCS (km): 3903
Time to SCS (days): 3.61

21.97083333 Days

Paused 02:07 / 03:18

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Number of Neutral / Commercial Participants

Participant Type	Day 18	Day 19	Day 20	Day 21	Day 22
Air	150	145	140	135	130
Tanker	100	95	90	85	80
Cargo	100	95	90	85	80
Fishing	100	95	90	85	80

Number of Red & Blue Participants

Asset Type	Day 18	Day 19	Day 20	Day 21	Day 22
Blue Assets	100	100	100	100	100
Red Assets	100	100	100	100	100

Percent of Red & Blue Participants Tracked

Tracking Type	Day 18	Day 19	Day 20	Day 21	Day 22
Blue Tracks of Red	0.4	0.4	0.4	0.4	0.4
Red Tracks of Blue	0.4	0.4	0.4	0.4	0.4

Percent Surface Area Covered by Red & Blue

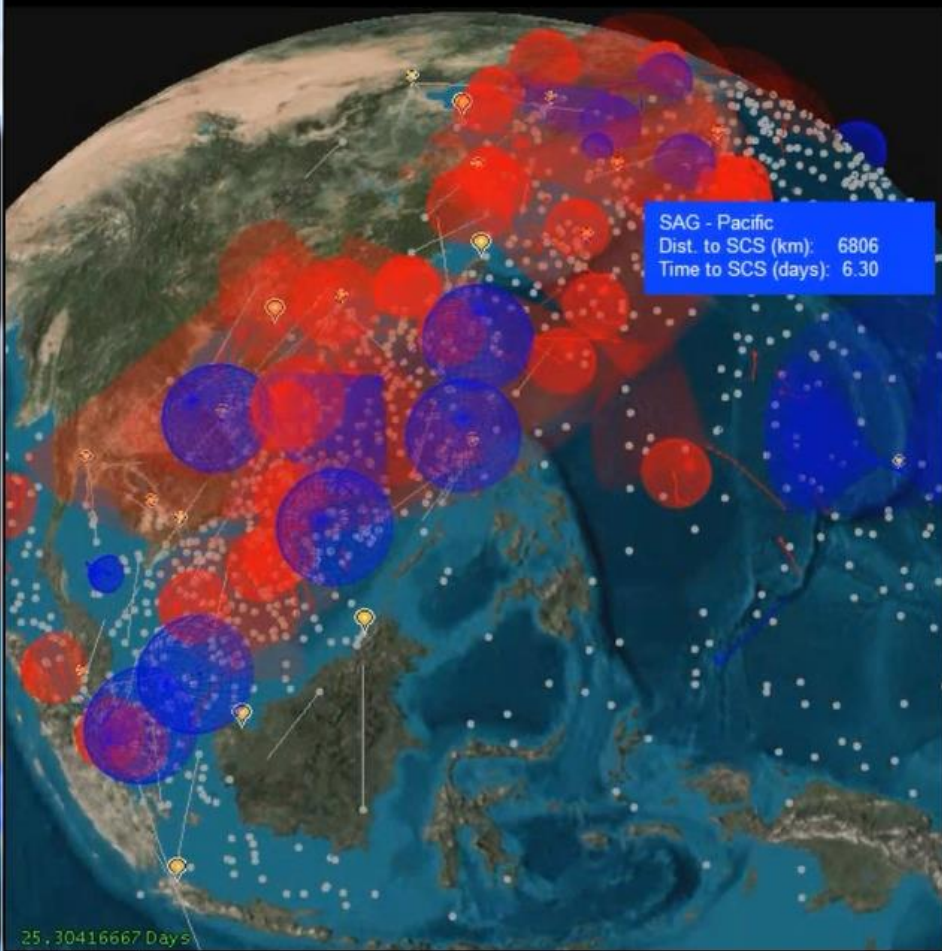
Coverage Type	Day 18	Day 19	Day 20	Day 21	Day 22
Covered by Blue	5	5	5	5	5
Covered by Red	5	5	5	5	5

Information Demands

Day	Information Demands
18	1
19	1.5
20	2
21	2.5
22	3

Simulating 30 Days of an Escalating Conflict: Day 25

Red Claims GPS Attacks Will Hurt the Economy



SAG - Pacific
Dist. to SCS (km): 6806
Time to SCS (days): 6.30

25.30416667 Days

BLUE CARRIERS TASKED TO THE SOUTH CHINA SEA

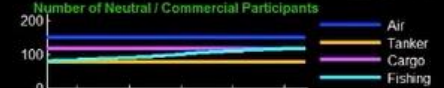
Manila Concerned with Neighbors Actions

Vietnam Asks: "Where are the Pirates?"


US Announces Attempted GPS Cyber Attack

Red Denounces Cyber Attack as a Terrorist Attempt to Bring Financial Calamity


Number of Neutral / Commercial Participants




Number of Red & Blue Participants




Percent of Red & Blue Participants Tracked



Percent Surface Area Covered by Red & Blue



Information Demands



Paused
02:34 / 03:18

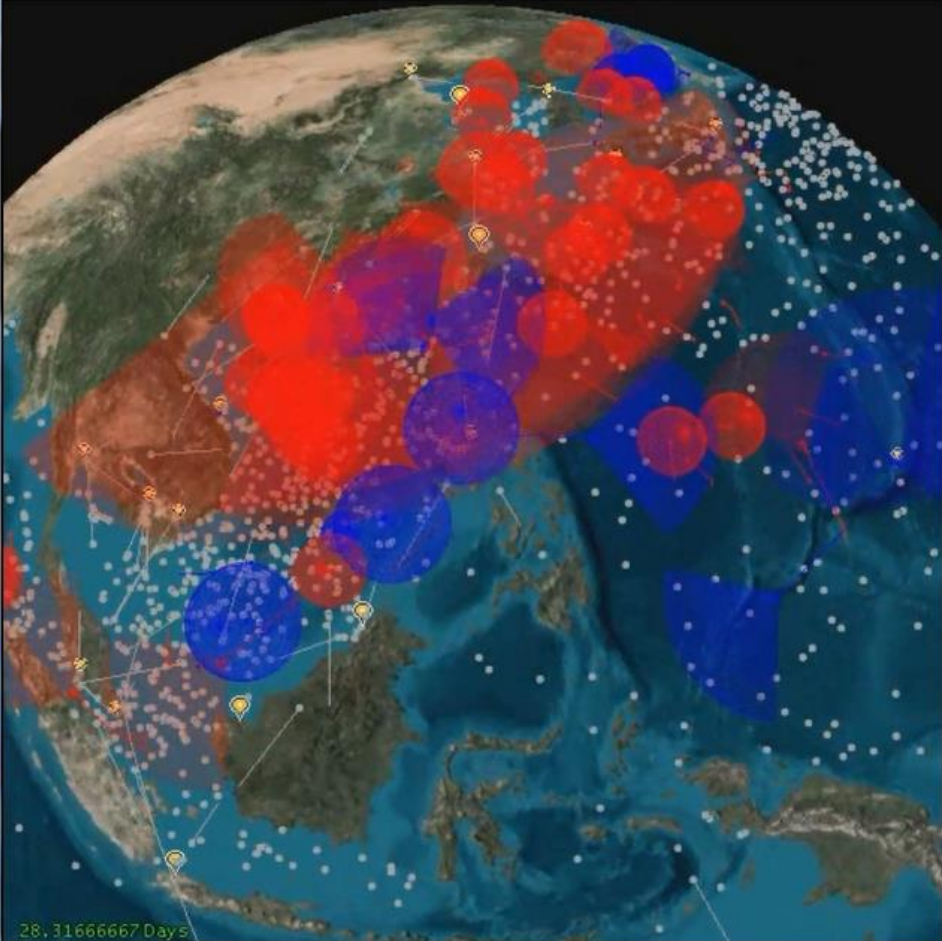
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Simulating 30 Days of an Escalating Conflict: Day 28

Windows Media Player

File View Play Tools Help

North Korea Announces New Missile Tests



US Announces Attempted GPS Cyber Attack

Red Denounces Cyber Attack as a Terrorist Attempt to Bring Financial Calamity

Minimal Impact to Southeast Asian Trade

North Korea Announces New Missile Tests

Blue Condemns Pyongyang

Number of Neutral / Commercial Participants

Asset Type	Count
Air	~150
Tanker	~100
Cargo	~100
Fishing	~100

Number of Red & Blue Participants

Asset Type	Count
Blue Assets	~100
Red Assets	~100

Percent of Red & Blue Participants Tracked

Tracking Type	Percentage
Blue Tracks of Red	~0.2
Red Tracks of Blue	~0.2

Percent Surface Area Covered by Red & Blue

Coverage Type	Percentage
Covered by Blue	~5
Covered by Red	~10

Information Demands

Time (days)	Information Demands
24	~2
25	~2
26	~2
27	~3
28	~4

28,31666667 Days

Paused

02:58 / 03:18

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Simulating 30 Days of an Escalating Conflict: Day 30

Normal Day to Day Operations
Red Anti-Piracy Actions
Blue Carriers Tasked to the South China Sea
Red Claims GPS Attacks Will Hurt the Economy
North Korea Announces New Missile Tests
Blue UAV Shot Down in South China Sea

Blue UAV Shot Down in South China Sea

Red Denounces Cyber Attack as a Terrorist Attempt to Bring Financial Calamity

Minimal Impact to Southeast Asian Trade

North Korea Announces New Missile Tests

Blue Condemns Pyongyang

Top 10 Reasons to Visit Palawan

Blue UAV Shot Down in South China Sea

Number of Neutral / Commercial Participants

Air	~150
Tanker	~100
Cargo	~100
Fishing	~100

Number of Red & Blue Participants

Blue Assets	~100
Red Assets	~100

Percent of Red & Blue Participants Tracked

Blue Tracks of Red	~0.2
Red Tracks of Blue	~0.2

Percent Surface Area Covered by Red & Blue

Covered by Blue	~5%
Covered by Red	~10%

Information Demands

Information Demands	~5
---------------------	----

29.86666667 Days

Paused

03:10 / 03:18

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