The Global Space Situational Awareness Sensors Project

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SPACE SITUATIONAL AWARENESS
Fusing data on the space environment, human activities in space, and their interrelationships to create actionable information

- Metric Data (Catalog)
  - Locations of objects in space and the ability to predict where objects were in the past and will be in the future

- Space Weather
  - Measurement, warning, and forecasting of the effects of Solar activity on objects in orbit

- Object Status
  - Health, telemetry, planned maneuvers (usually provided by owner/operator)

- Intelligence
  - Information about objects in orbit (images, signals, capabilities, behavior) collected on objects in orbit
Paradigm shift in space regime...

- SSA was born during the Cold War as part of protecting the US and USSR from nuclear attacks
  - Nuclear threat progressed from airplanes to ballistic missiles (and satellites?)
  - Use of space for warning, intelligence, treaty verification
  - Two super powers controlled virtually all aspects of space

- Today’s world is vastly different
  - 10 countries have indigenous space launch capability (Iran is the newest)
  - Over 70 entities operate satellites
  - 21,000+ pieces currently tracked, about 1,000 active payloads
  - Space is “crowded, congested, & contested”
• Although the space regime is much different today, SSA has not kept up
  – Still done primarily for military/national security purposes by the military
  – Bureaucracy/security needs have hampered upgrades and modernization, particularly for computer hardware/software and algorithms

• Certain actions in space can have long-term negative consequences for all
• All space actors (launching/operating satellites) need a basic level of data and analytical tools to operate in a safe & efficient manner
• Most space actors do not have this basic data
SSA is inherently international

• “Good” SSA requires a *geographically distributed* network of both radar and optical sensors and *combining sensor observations with owner-operator data*

• Theoretically, building the sensor network can be done unilaterally
  – Large economic cost
  – Need “friends in the right places”, basing agreements
  – Long logistical tails

• Every space actor needs a certain level of SSA for safe and efficient space activities, but few have the resources to build a complete network
  – Many actors can make partial contributions
Space Sustainability

Debris Mitigation

Reduce the creation of new debris

Active Debris Removal

Reduce the growth in the debris population

“Space Traffic Management”

Minimize the impact of debris on operations

Space Situational Awareness (SSA)
THE GLOBAL SSA SENSORS PROJECT
The Global SSA Sensors Project

• Objective: To develop a database of global SSA sensors and networks
  – Based on open source information
  – Publicly accessible
  – Crowdsourced

• Rationale
  – Increase awareness of global SSA capabilities and highlight opportunities and deficiencies
  – Enable analysis of future shared/collaborative/cooperative architectures
  – Leverage the “wisdom of the crowd” in compiling the data set
Global SSA Sensors Website

• Initial set of data on sensors around the world published

• Developing a website to hold the database
  – Mash-up of a wiki and Google Earth
  – Still in beta
  – Hope to roll-out in early 2012

• Will be recruiting a global community of users to help update the website
Countries and Networks
CONCLUSIONS & FUTURE WORK
Conclusions

• It is impractical for a single actor to achieve “good” SSA by themselves

• Fundamentally, SSA requires data sharing and cooperation between different actors
  – Networks of telescopes and radars distributed around the globe to track debris
  – Satellite owner/operators with telemetry, health, and planned maneuvers

• Multiple independent sources of SSA data are good
  – Greater accuracy and redundancy
  – Independent monitoring and validation
Conclusions

• There is a global deficit in knowledge about what sensors/networks are available and their capabilities

• There is a lack of technical/political capability to combine or share data between sensors/networks

• There are significant hurdles to overcome with data sharing, but none appear to be insurmountable

• Global SSA Sensor Website/Database is seen as first step to increasing knowledge and awareness
Questions?

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