

International Civil SSA as a Complementary Initiative

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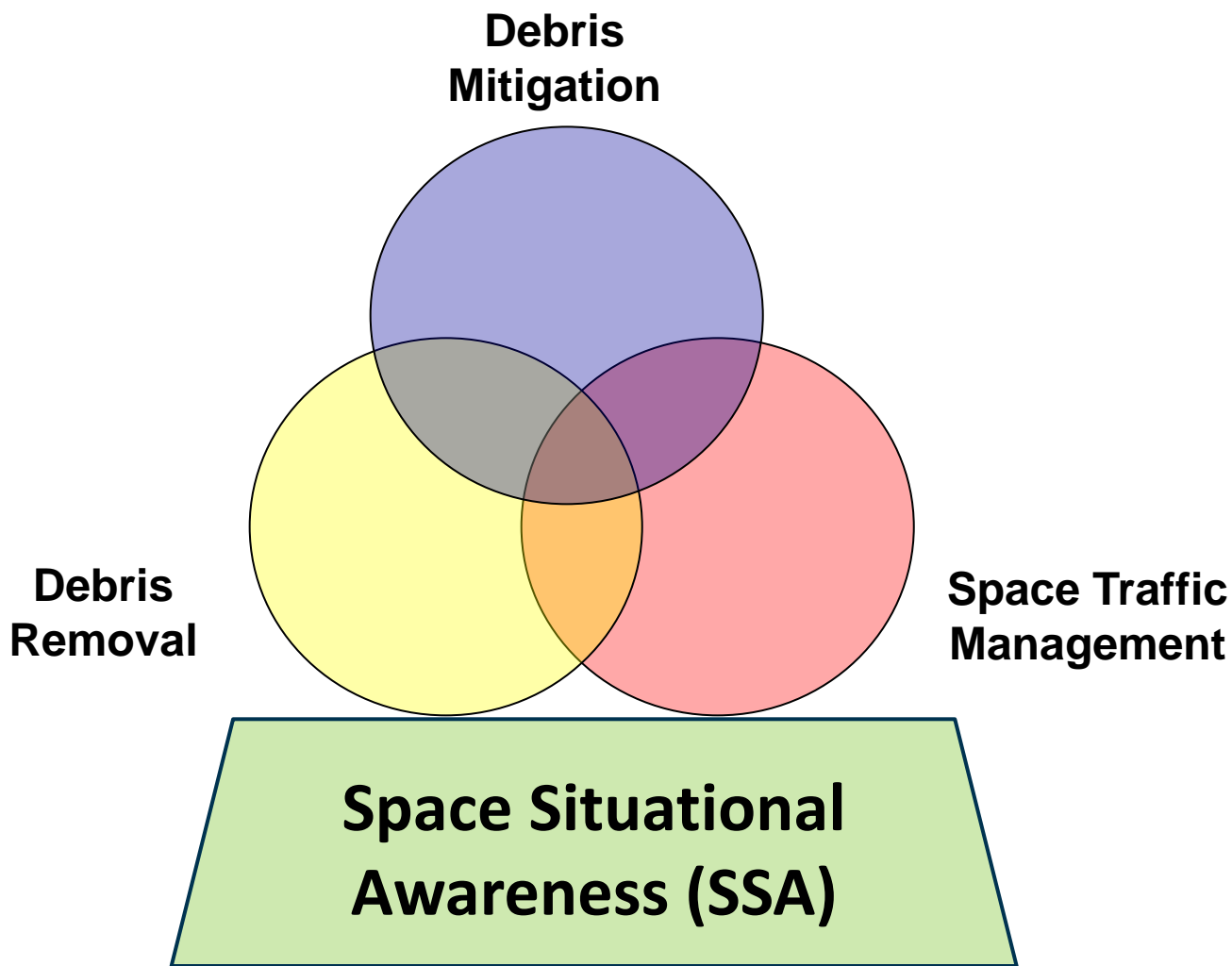
- What is space situational awareness?
- International civil SSA
- Civil vs military SSA
- Model for space sustainability
- Complementary benefits
- International aspects
- Drawbacks of current initiatives



- All actors in space have a responsibility to operate in a safe and secure manner
- Certain actions in space can have severe long term consequences
- The actions of one or two actors in space can potentially affect all actors
- Most actors in space do not have the resources to provide indigenous SSA capabilities
- States that do have resources to provide SSA are often limited by national security and military restrictions from sharing it

- To provide **all** space actors access to the tools needed for safe and sustainable activity in Earth orbit
 - Sensor Data
 - Orbits and locations of objects
 - Solar activity
 - Atmospheric density
 - Analytical capacity
 - Conjunction Assessment (predicted close approach between two objects)
 - Collision Avoidance (maneuvering to mitigate high risk conjunctions)
 - Space weather predictions
 - Anomaly resolution

- The US military maintains two separate satellite catalogs, one low quality and one high quality, both derived from its sensor network
- The low quality catalog is publicly available at the US military's Space Track website, but is too imprecise for reliable conjunction assessment
 - Positional error in low Earth orbit is on the order of a couple kilometers
 - Iridium-Cosmos conjunction wasn't in Top 10 for that day calculated using low quality catalog (predicted ~600 meter miss)
- The US military does screen satellites each day for possible collisions
 - Limited list due to resource constraints (military/intelligence, NASA)
 - Iridium constellation was not part of that list before collision



- Civil SSA is interested in the following:
 - Location of an object in Earth orbit
 - Point of contact for that object
 - Space Weather
- Military SSA is interested in these additional data points:
 - What the function of an object is
 - What the intention of an object is
 - Capabilities and limitations of an object
- Tracking and publication of positions of military/intelligence satellites is not absolutely necessary for civil SSA
 - Hiding them implies responsibility for keeping them out of trouble

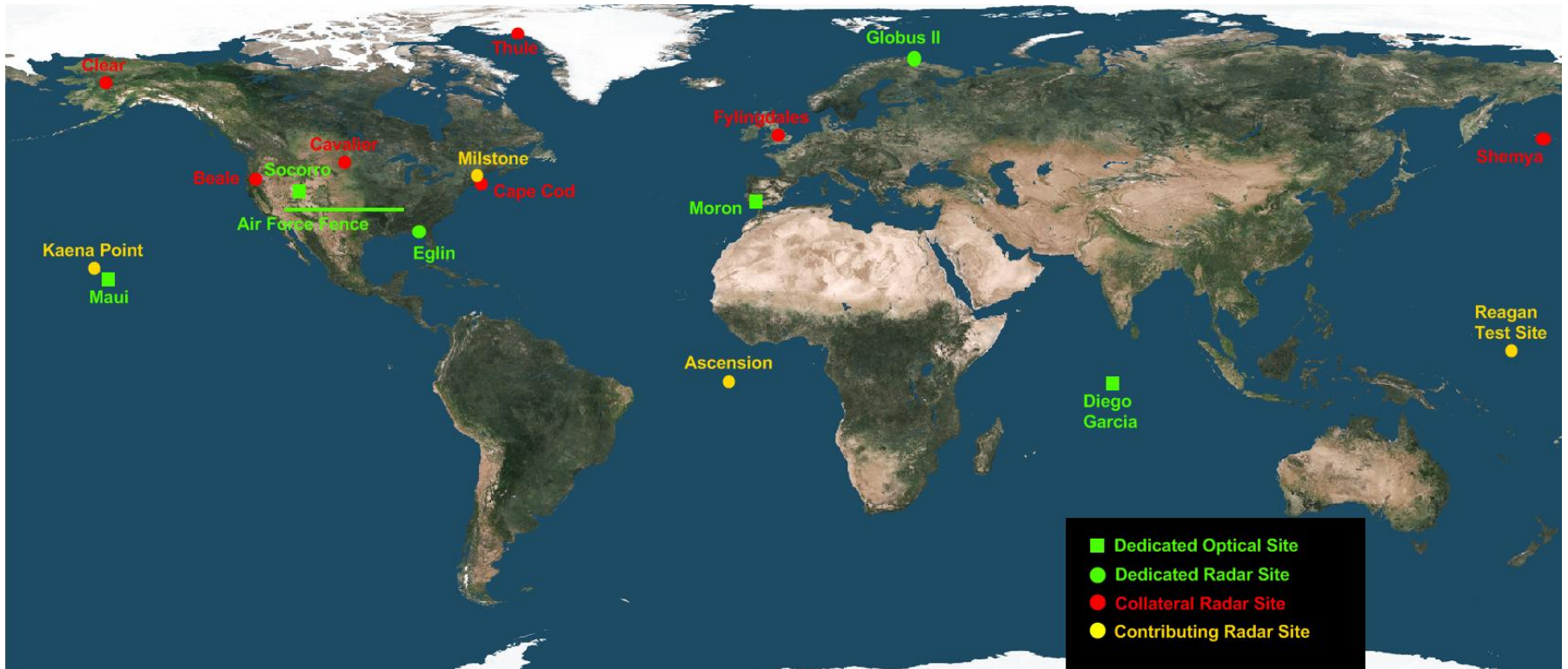
- Provide the basic data necessary for all space actors to make educated, safe, and efficient decisions
- Increase the international awareness and understanding of the space debris problem and long term sustainability
- Increase cooperation and transparency between States on space activities
- Potential verification mechanism future space governance mechanisms

- SSA requires a geographically distributed network for sensors to track satellites
- Building a geographically distributed network is expensive
- Owner-operator positional data is a critical supplement to third-party sensing

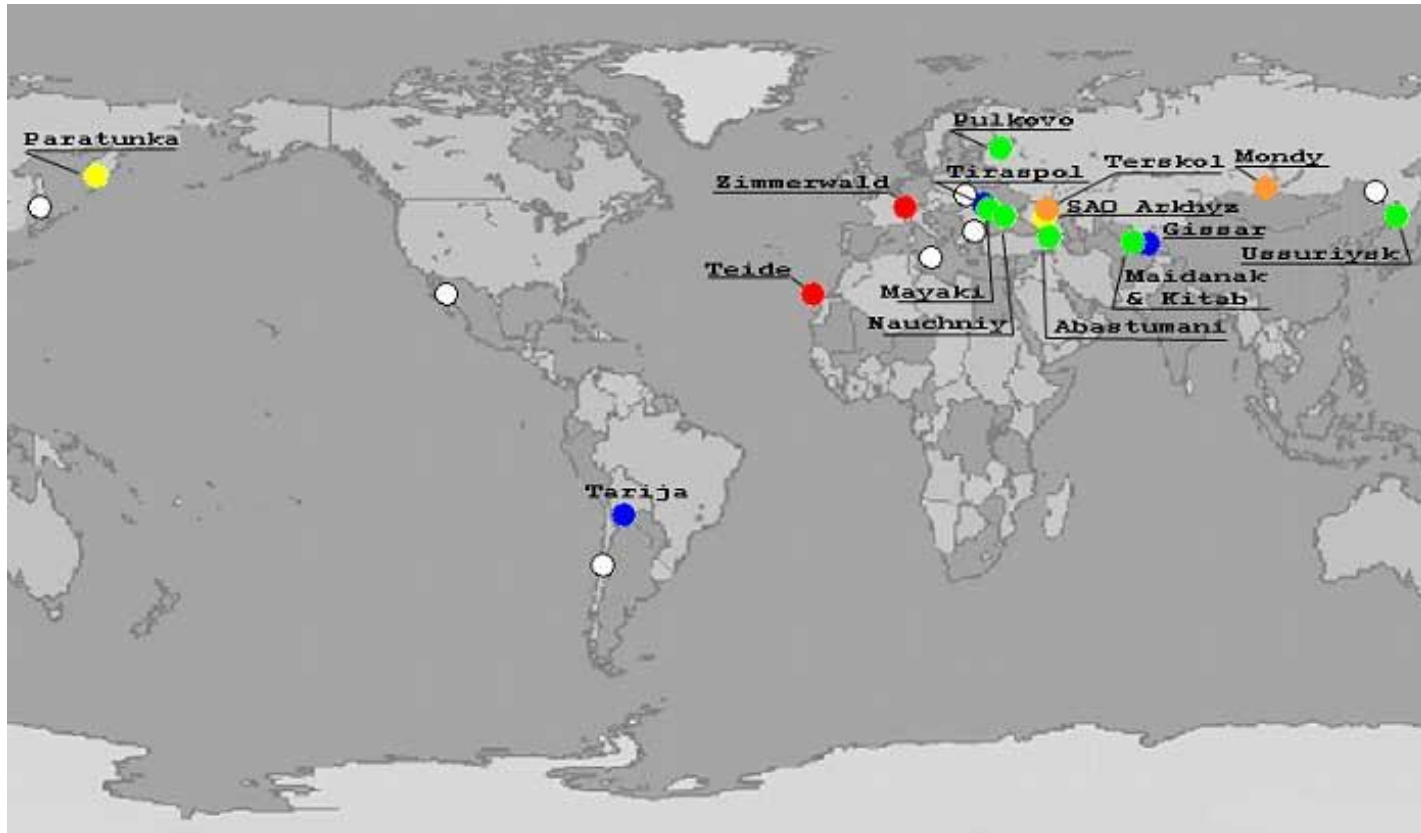
Many States working together can provide sensor coverage over the entire Earth for little cost to each

The US Space Surveillance Network (SSN)

Promoting Cooperative Solutions for Space Security



- No Southern Hemisphere coverage
- No coverage over South America, Africa, Asia
- Limited deep space capacity



- 25 telescopes at 18 institutions in 9 States
- Coordinated through Russian Academy of Sciences

- DoD CFE Program
 - Has best catalog on debris and inactive satellites
 - Poor data on active commercial satellites, holes in GEO data
 - Not much progress since inception in 2004, main stumbling blocks are policy and security
- CSSI Data Center
 - Has best catalog on commercial GEO satellites, including planned maneuvers
 - More computational and analytical capacity than CFE for emergencies
 - Only has access to low accuracy data on everything else
 - Experimental, only focused on GEO for now
- European SSA
 - Will take years to get anywhere close to a catalog and capacity

- Actions of any one actor has effects on all actors in space
- All actors need certain essential pieces of data to make safe and sustainable decisions
- This data in the past has come from military sources
- Difference between civil and military SSA
- All of the current SSA efforts have significant drawbacks and are unlikely to fulfill the need stated here
- SSA can be done unilaterally, but it is difficult because of the requirements for geographically distributed sensors
- Many States working together sharing data can achieve global coverage for much lower costs
- Such cooperation can have significant additional benefits

Thank you

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