

# Asia-Pacific ground-base Optical Satellite Observation System APOSOS

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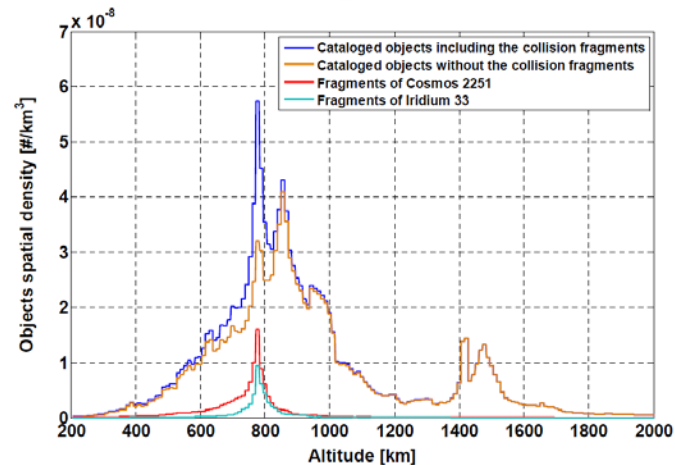
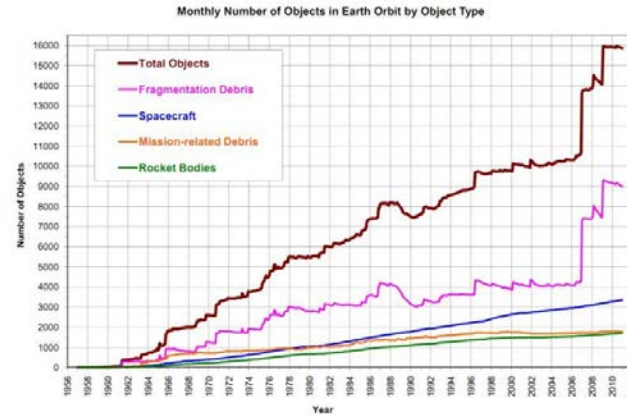
# Outline

- Space debris problem as the global concern
- Space Surveillance Network
- APSCO&APOSOS
- Summary



# Space debris problem as the global concern

- Space debris
  - micrometeoroid
  - space objects
- Population
- Distribution
- Size



# The security of the space assets

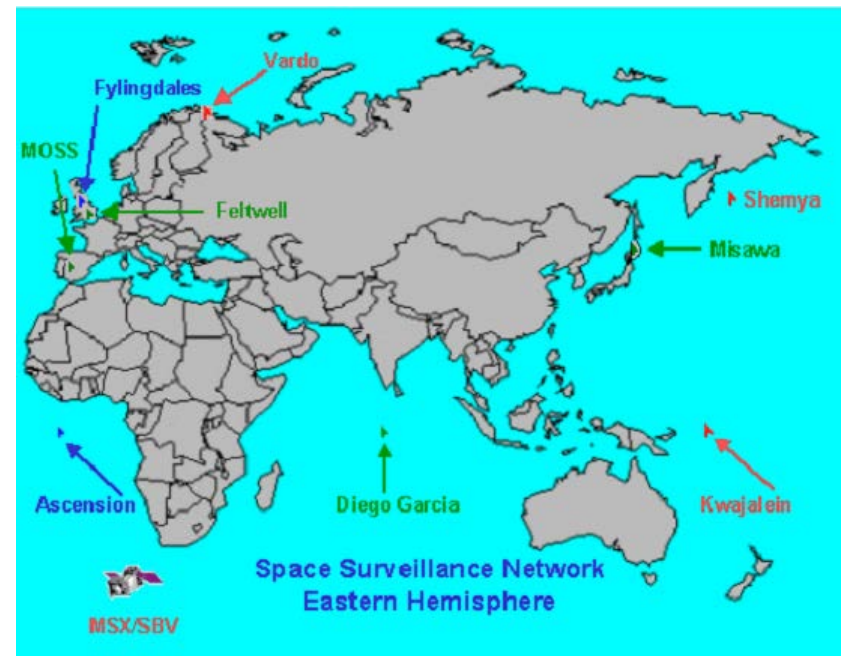
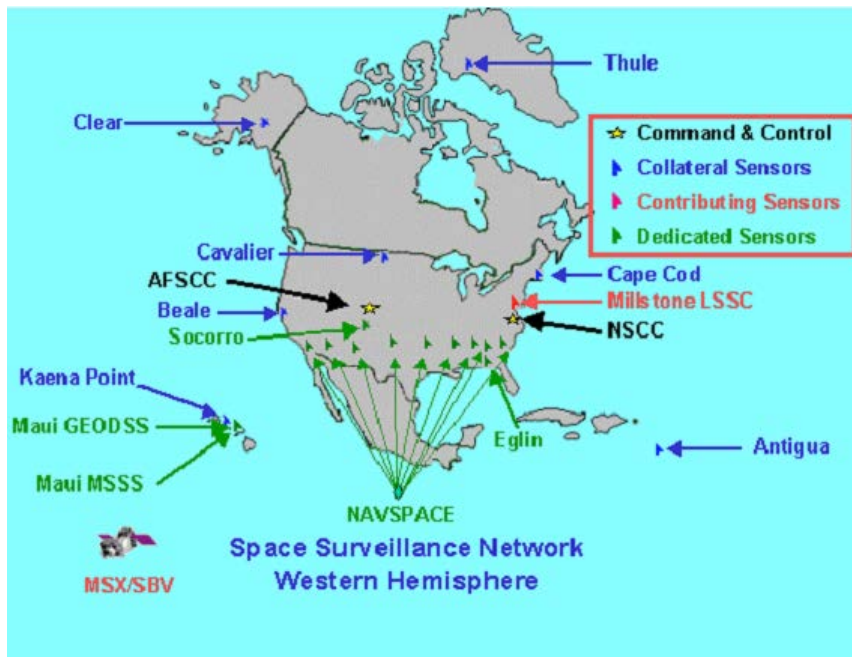
- Erosion/Penetration/Breakup
- The possibility of collision between satellites
  - Iridium-33/Cosmos-2251 in 2009
- Protection from the hazard of threatening collision
  - space-debris mitigation
  - passive shielding protection
  - active collision maneuver or avoidance

# The security of the space assets

- Mitigation
  - Legislation/regulation/guide line
  - Inter-Agency Space Debris Coordination Committee (IADC)
- Passive shielding protection
  - additional layer design
  - ISS
- Active collision maneuver and avoidance
  - space surveillance or satellite observations network
  - space objects catalogue
  - close approaches predictions
  - collision risk assessment or analysis
  - and more

# Space Surveillance Network

- the only powerful enough system to cover all most the terrestrial area from LEO up to GEO
- a comprehensive catalogue of space objects
- available to the community researchers



# Space Surveillance Network

- As the cost (both money and technique) is huge and the station should be built around the world to get a good tracking capability, it is better to do it with joint efforts.
- every member involved will get benefit from it.
  - data can be shared in member states.
  - observation technique results in the knowledge of satellites information for theirs and others.
  - precise collision risk assessment service can be provided for all member states, which is of great value for those who want to develop their own space technique, those who want to have their own space asset, and also those whose communication, trade or something else are relied on satellites.



**A P O S O S**

# APOSOS

- Asia-Pacific ground-based Optical Space Observation System
  - a project proposed and sponsored by APSCO
  - a regional or mission-oriented satellite tracking system
  - the state members' space assets, objects of interest or space-debris
  - international cooperation, communication and data sharing



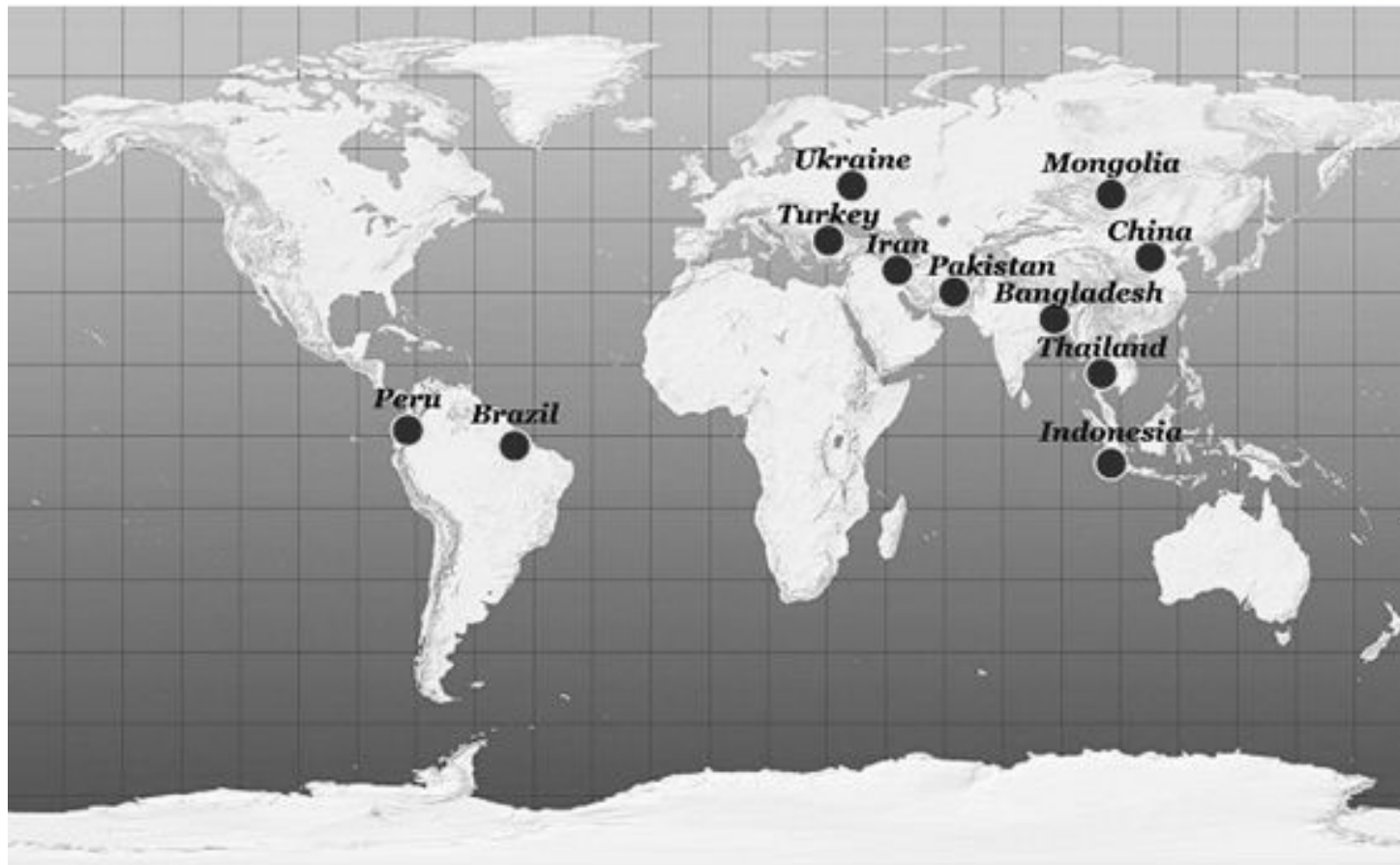


# APSCO

- Asia-Pacific Space Cooperation Organization
  - an inter-governmental organization
  - started since Dec 2008(back to 1992, Multilateral Cooperation in Space Technology and its Applications, AP-MCSTA )
  - peaceful uses of outer space in Asia-Pacific region
  - space science & technology and its applications
  - environmental protection
  - education & training
  - cooperative researchng



# APSCO



# APOSOS – General Introduction

- The project of Asia Pacific Optical Space Observation System (APOSOS) was originally proposed by China, Peru and Turkey in 2008, and was approved during the second Council Meeting of APSCO in 2009. China and Turkey were nominated as the lead countries of this project.
- The project aims to develop a unified space observation network based on optical telescopes in APSCO Member States and Participating Countries.

# APOSOS

- Equipments in SSN

- Radar

- Costs for building: High
    - Costs for maintenance: High
    - Technical difficulty: High

- Optical Telescope

- Costs for building: low
    - Costs for maintenance: very low
    - Technical difficulty: not high

} APOSOS

# APOSOS – General Introduction

- The first expert group meeting of APOSOS was held on April 13th, 2010. Existing facilities and requirements were preliminarily analyzed and the importance of satellite tracking and observation was emphasized.
- The second expert group meeting of APOSOS was held in Ankara from 26th to 28th, May 2010. The objective of APOSOS has been agreed upon and the system and network architecture has been discussed.
- The 2nd Administrative Heads' Meeting on Budget Planning for APSCO's Approved Projects was held at APSCO Headquarter in Beijing, China from 07-09 December 2010. **It was agreed that implementation of the data center would be defined as basic activity in which Bangladesh may participate at a later stage. Construction of new infrastructures would be defined as optional activity and will be taken up at a later stage.**

# APOSOS - Objective and Requirement

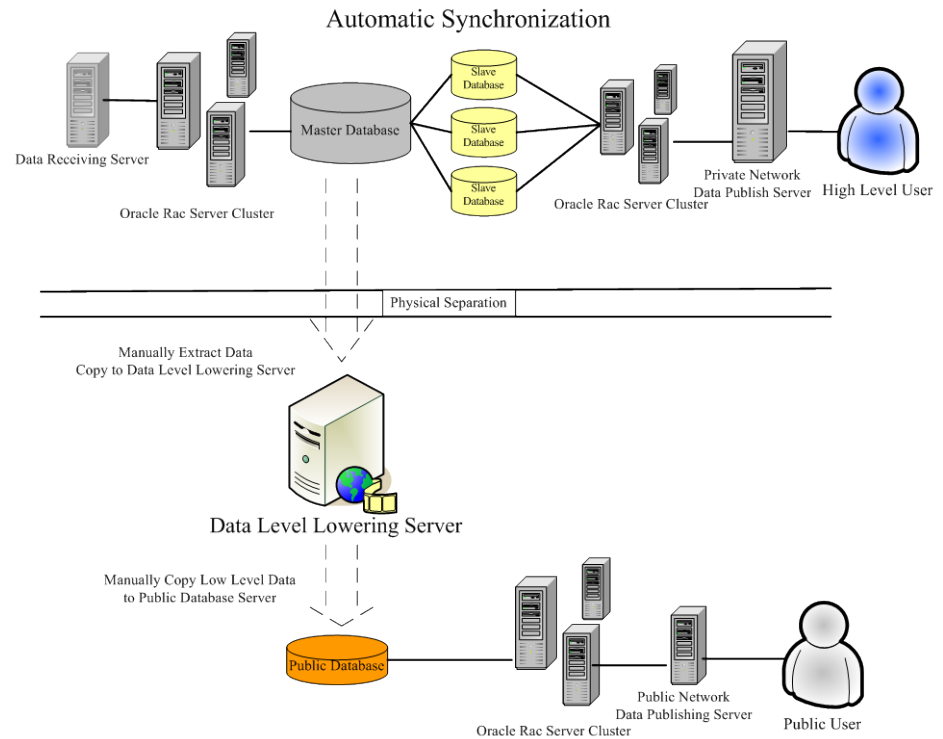
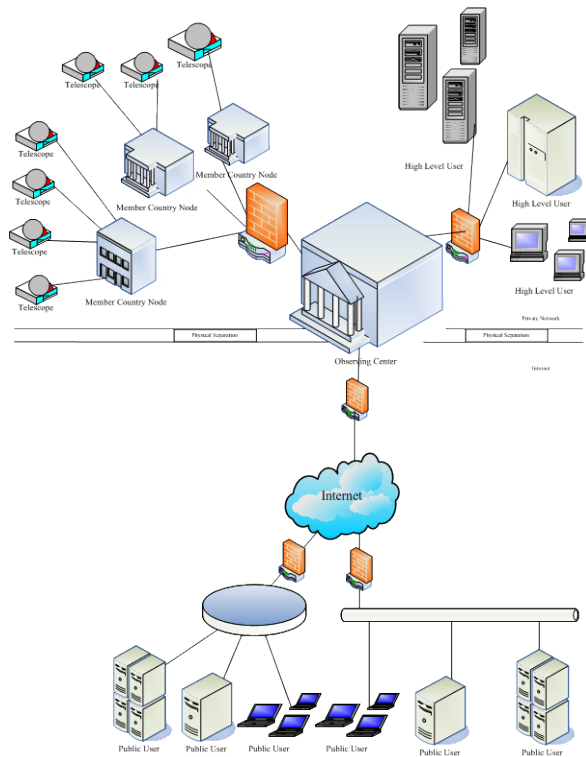
- **Basic objective:**
  - Build the network with existing facilities, with the aim of tracking objects and space debris in LEO.
- **Optional objective:**
  - Bring new facilities, and extend the ability to track objects and space debris in MEO and GEO, for peaceful purposes. The network is for the purpose of establishing the infrastructure for a collision avoidance early warning service in the future.

Step	Content	Requirement of Detection Capability	
Step 1	Establish observation network with existing facilities	Detecting and tracking satellites and some space debris.	
Step 2	Enhance the detection capabilities with new facilities	Detection Magnitude	11.5 (LEO); 16 (HEO, GEO)
		Detection Size	10cm (1000km); 20cm (2000km)
		Accuracy	3"

# APOSOS - Mission

- **Space Object Detecting & Tracking:**
  - The network shall be able to perform the basic functions of detecting, tracking and identifying man-made objects in space.
- **Orbit Determination & Cataloguing:**
  - Determine the orbits of observed space objects and predicate their position and paths; produce a running catalogue of man-made space objects;
- **Collision Early Warning:**
  - Inform whether or not space objects may interfere with the space assets orbits, such as space shuttle, satellites or international space station orbits.
- **Re-entering Space Object Prediction:**
  - Predict when and where a decaying space object will re-enter the Earth's atmosphere; determine which country owns a re-entering space object; and prevent a returning space object, which to radar looks like a missile, from triggering a false alarm in missile-attack warning sensors of participating countries.
- **Technical Consultation and Training:**
  - Promote the development of space observation technique and its applications among participating countries.

# APOSOS - Mission





THANK YOU

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