สำนักงานพัฒนาเทคโนโลยีอวกาศและภูมิสารสนเทศ (องค์การมหาชน)
GEO-INFORMATICS AND SPACE TECHNOLOGY DEVELOPMENT AGENCY (PUBLIC ORGANIZATION)

UN virtual event on Space Sustainability
25 February 2021

Operational case-studies at GISTDA

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Geo-Informatics and Space Technology Development Agency (GISTDA)

Outline

- Introduction
- Operational case-studies
  - Registration of space objects launched into outer space.
  - Safety of space operations
- Lesson Learned

Introduction

Geo-Informatics and Space Technology Development Agency (Public Organization): GISTDA

Space and GIS Training Center

Bang Khen, Bangkok

Headquarter

The Government Complex, Bangkok

Ground control station and research center

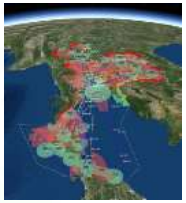
SPACE KRENOVATION PARK, Chonburi

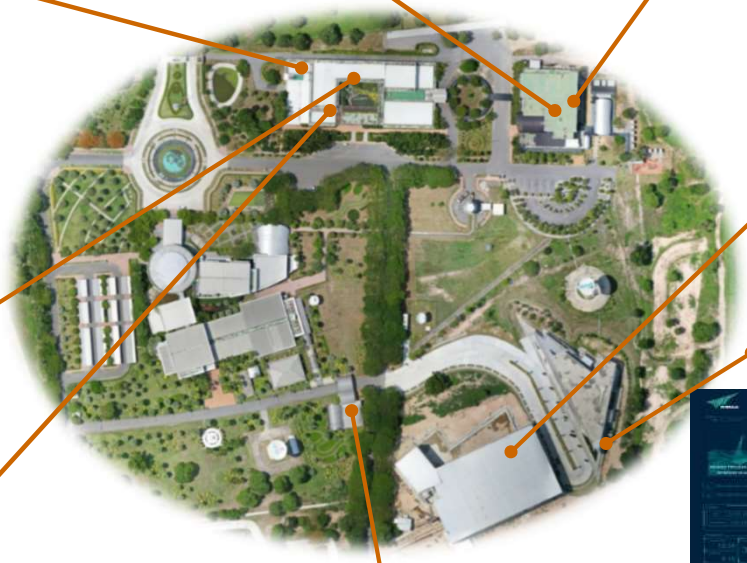
Innovation Units @SKP

GALAXI : Aerospace Structures and Materials

SCGI : Geo-informatics center

SOAR : Air-Space Management and Mission Planning





SPACE Inspirium : Space Learning Kingdom

GINNO : GNSS Innovation Center

AIT : Satellite Assembly Integration and Test

ASTRO LAB Astrodynamics Research Laboratory

SPACE INNOVATION PROJECTS

Space Innovation Projects
: In-house Ground - Satellite Innovation

Operational case-studies

1. Registration of space objects launched into outer space.

The Implement of LTS Guidelines in Thailand

National Registry Information

- Thailand is not a party to the Convention on Registration on Objects Launched into Outer Space; Registration convention (1975).
- However, Thailand complied with the Resolution 1721 B (XVI) by having voluntarily registered the Satellite of Thailand Earth Observation System (THEOS) to UNOOSA.

A/AC.105/INF/419/Add.1

Annex

Registration data on an object launched into space by Thailand*

International designator:	2008-049A
Name of space object:	Thailand Earth Observation Satellite (THEOS) ("Thaichote")
Name of launching State or States:	Thailand and Russian Federation
Date of launch:	1 October 2008
Location of launch:	Yasny, Russian Federation
Orbital parameters:	
Nodal period:	101.4 minutes
Inclination:	98.7 degrees
Apogee:	822 kilometres (sun-synchronous orbit)
Perigee:	822 kilometres (sun-synchronous orbit)
General function:	Earth observation
Operating agency:	Geo-Informatics and Space Technology Development Agency (Public Organization), Ministry of Science and Technology, Thailand

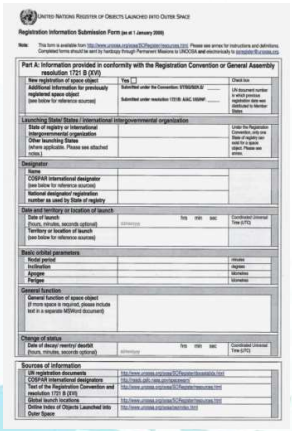
Registration of space objects

➢The Procedure of Objects Launched into Outer Space Submissions (2020)

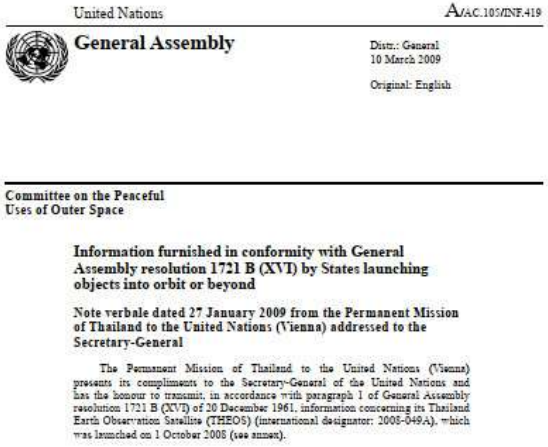
Responsible / Authority:

- Geo-Informatics and Space Technology Development Agency (GISTDA)
- Ministry of Foreign Affairs

Satellite owners



Ministry of Foreign Affairs, Thailand



United Nations A/AC.105/INF.419

General Assembly

Distr.: General
10 March 2009

Original: English

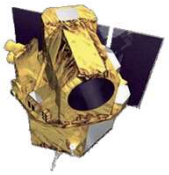
Committee on the Peaceful Uses of Outer Space

Information furnished in conformity with General Assembly resolution 1721 B (XVI) by States launching objects into orbit or beyond

Note verbale dated 27 January 2009 from the Permanent Mission of Thailand to the United Nations (Vienna) addressed to the Secretary-General

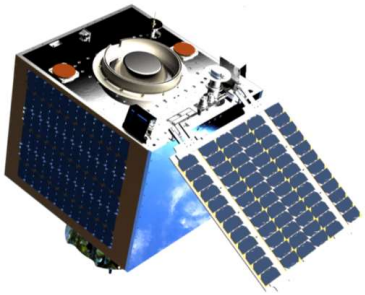
The Permanent Mission of Thailand to the United Nations (Vienna) presents its compliments to the Secretary-General of the United Nations and has the honour to transmit, in accordance with paragraph 1 of General Assembly resolution 1721 B (XVI) of 20 December 1961, information concerning its Thailand Earth Observation Satellite (THEOS) (international designator: 2008-049A), which was launched on 1 October 2008 (see annex).

Example of Thailand's objects launched into Outer Space (LEO)

GISTDA	 Thailand Earth Observation System (THEOS) THAICHOTE (Launched: 1 October 2008) Completed Registration	A high-performance optical Earth Observation satellite
	 Nanosatellite NAPA-1 (Launched: 3 September 2020) In process to Complete Registration	6U-CubeSat satellite
SPACE PROGRAM	 Nanosatellite BCCSAT-1 (Launch scheduled: Early 2021) In process to Complete Registration	An Educational Multispectral 1U-CubeSat

Future Planned Objects Launch into Outer Space

NAPA-2



THEOS-2 (Small SAT)

Operational case-studies
2. Safety of space operations

AstroLab introduction

ASTRO LAB

Mission

1. Research areas
    - 1.1 Space flight dynamics
    - 1.2 On-board flight software for small satellites
    - 1.3 Space debris and asteroid
    - 1.4 Space weather
2. Cooperate and build Network/Cluster to research and develop space technology both on local and global level.
3. Academic services: (development of space course modules and space application lectures)
4. Support and provide solutions for space industries.

COSPAR Member News

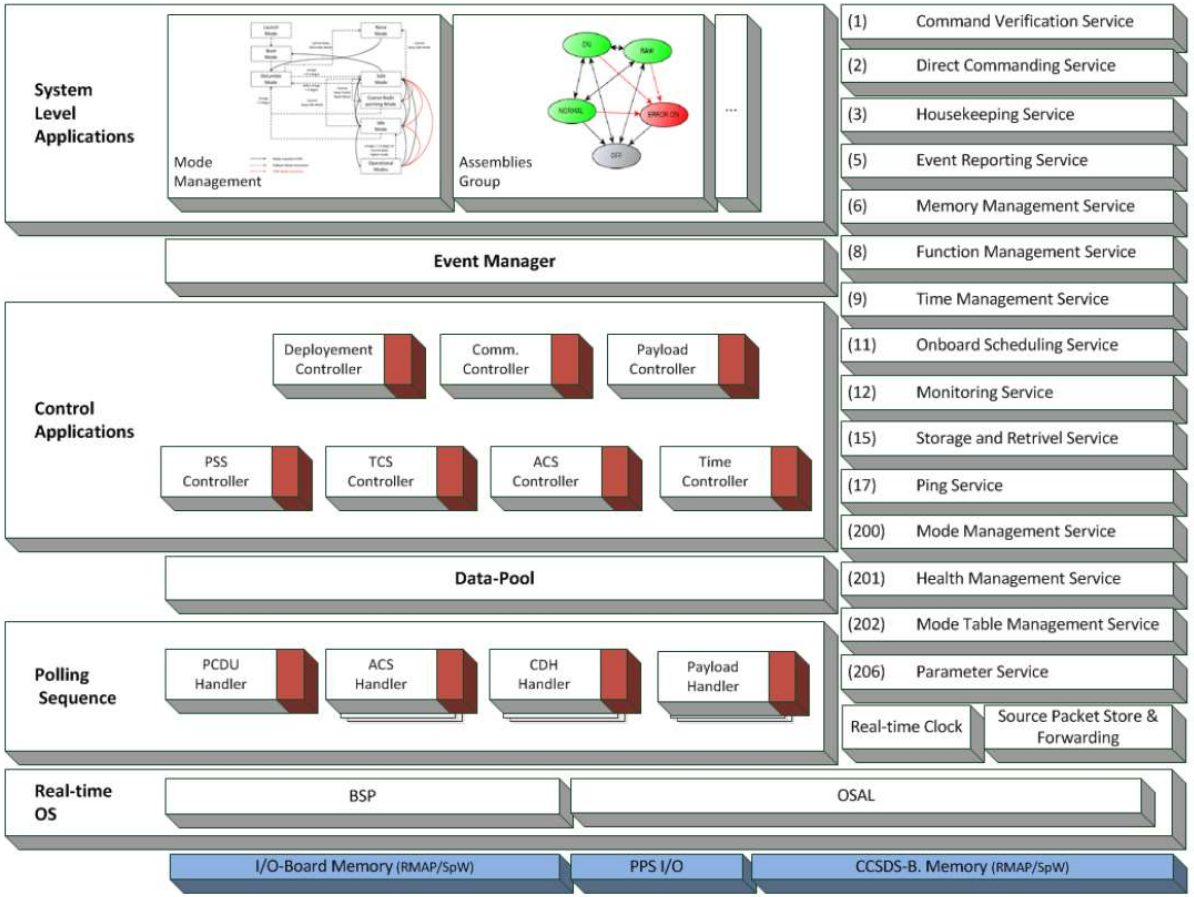
Thailand's AstroLab, an Important New Player in SE Asia, to Focus on 4 Essential R&D Topics

GISTDA (Geo-informatics and Space Technology Development Agency) initiates the Astrodynamics Research Laboratory, or "AstroLab" at Space Krenovation Park, Chonburi Province, Thailand. The AstroLab is expected to be the complete research and development center on astrodynamics and space technology innovation in Thailand and Southeast Asia region. The AstroLab team (pictured below) focuses on four essential R&D parts, find out more here.

Team

Current projects

1. Onboard Fight Software

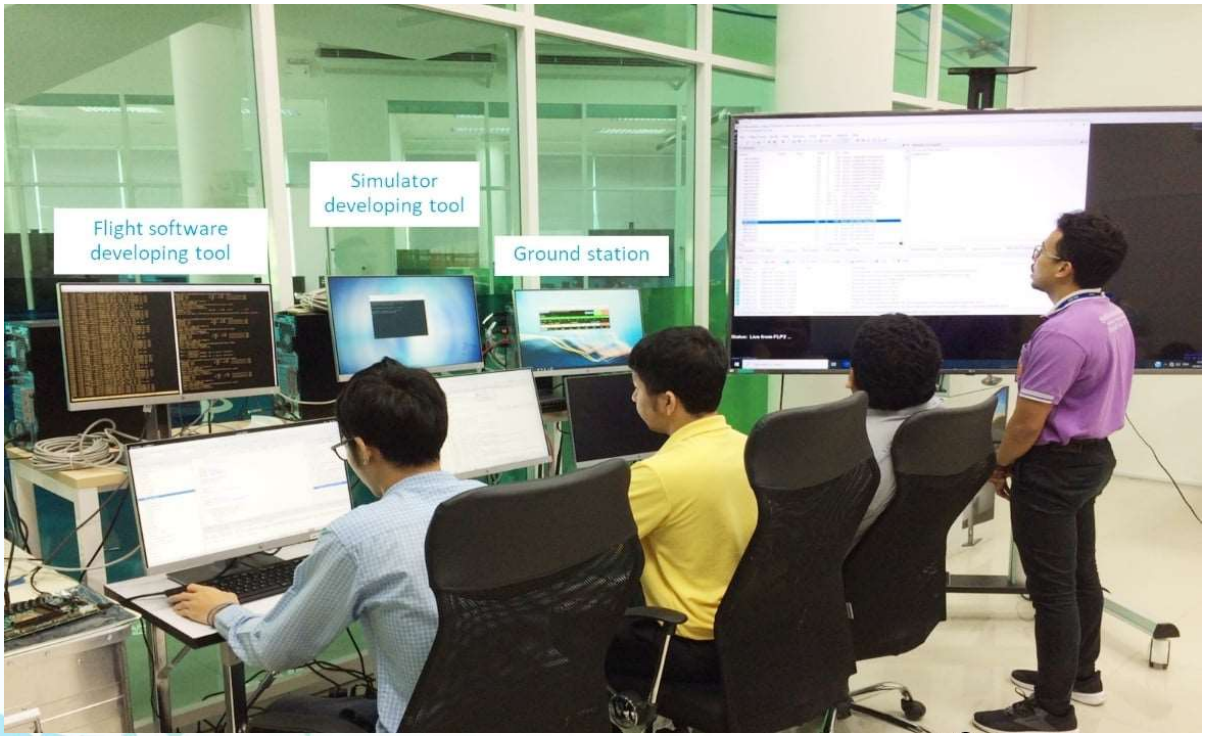


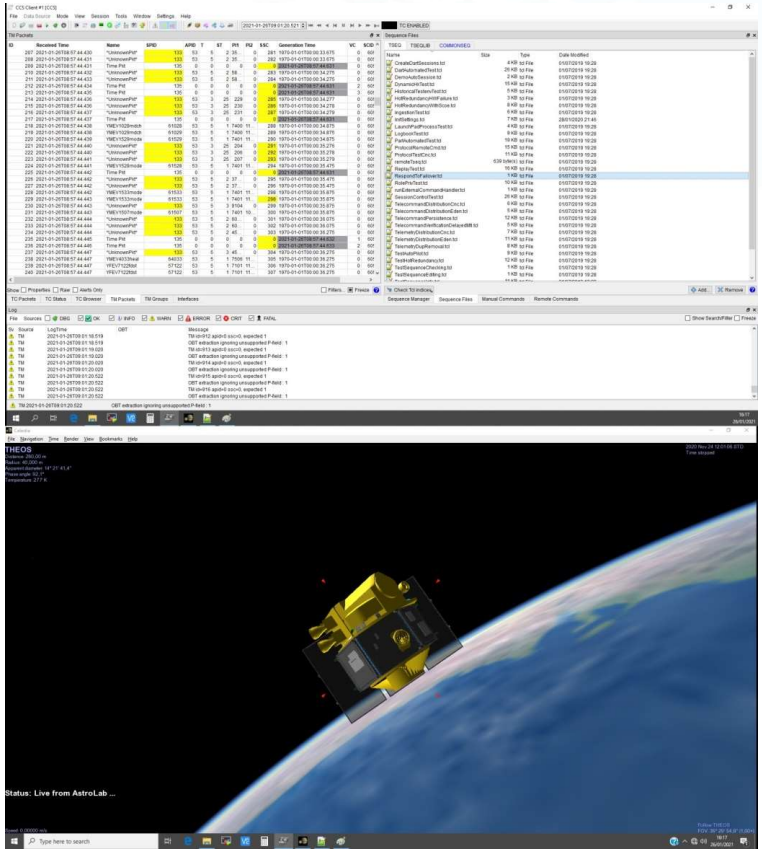
Credit : Eickhoff, Jens (Ed.), "The FLP Microsatellite Platform – Flight Operations Manual", Springer, 2016

Onboard Computer

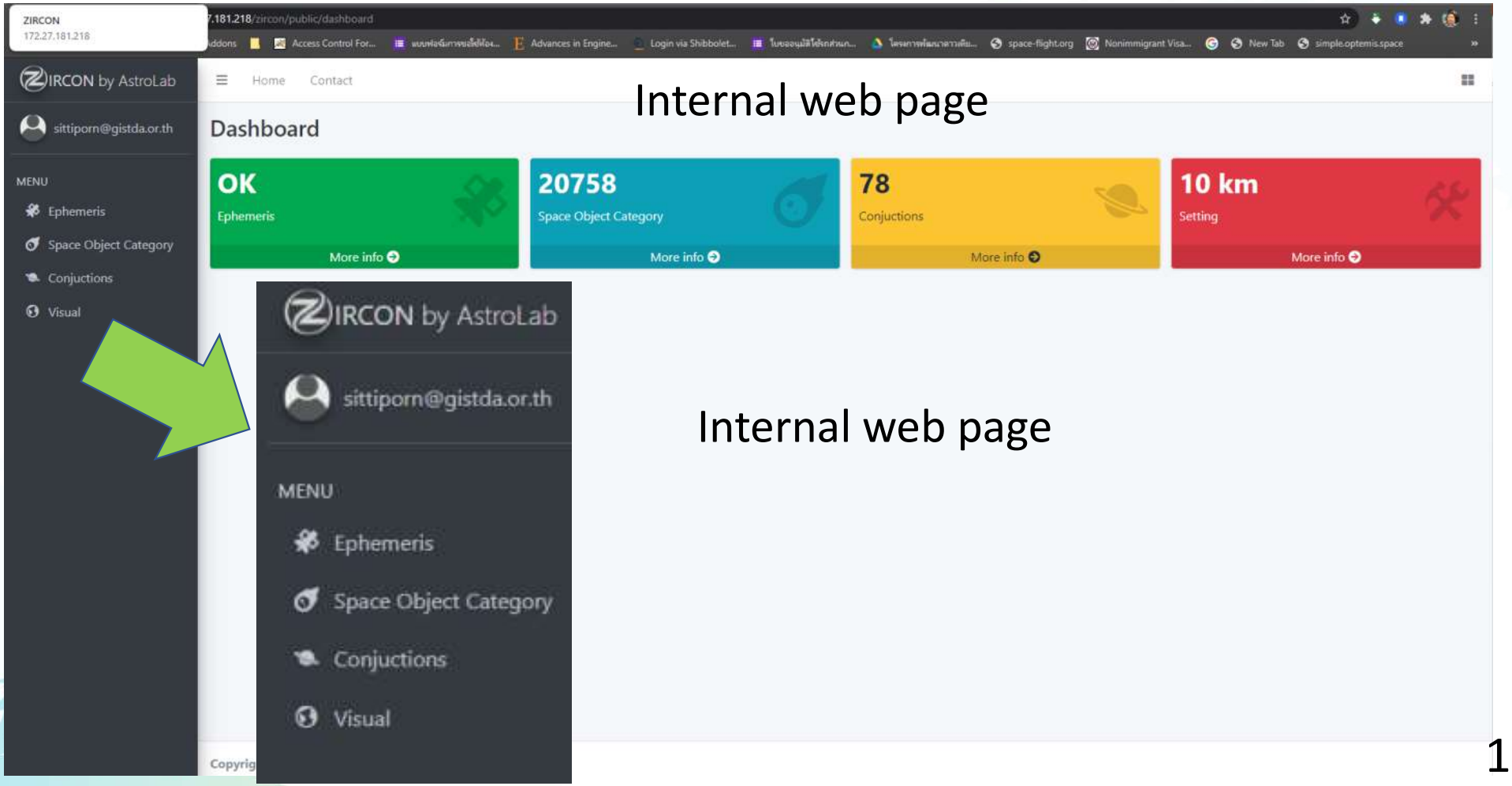
- GR712RC dual-core 32-bit fault tolerant LEON3-FT SPARC V8 processor
- SpaceWire Interface
- Radiation tolerant

Development tool

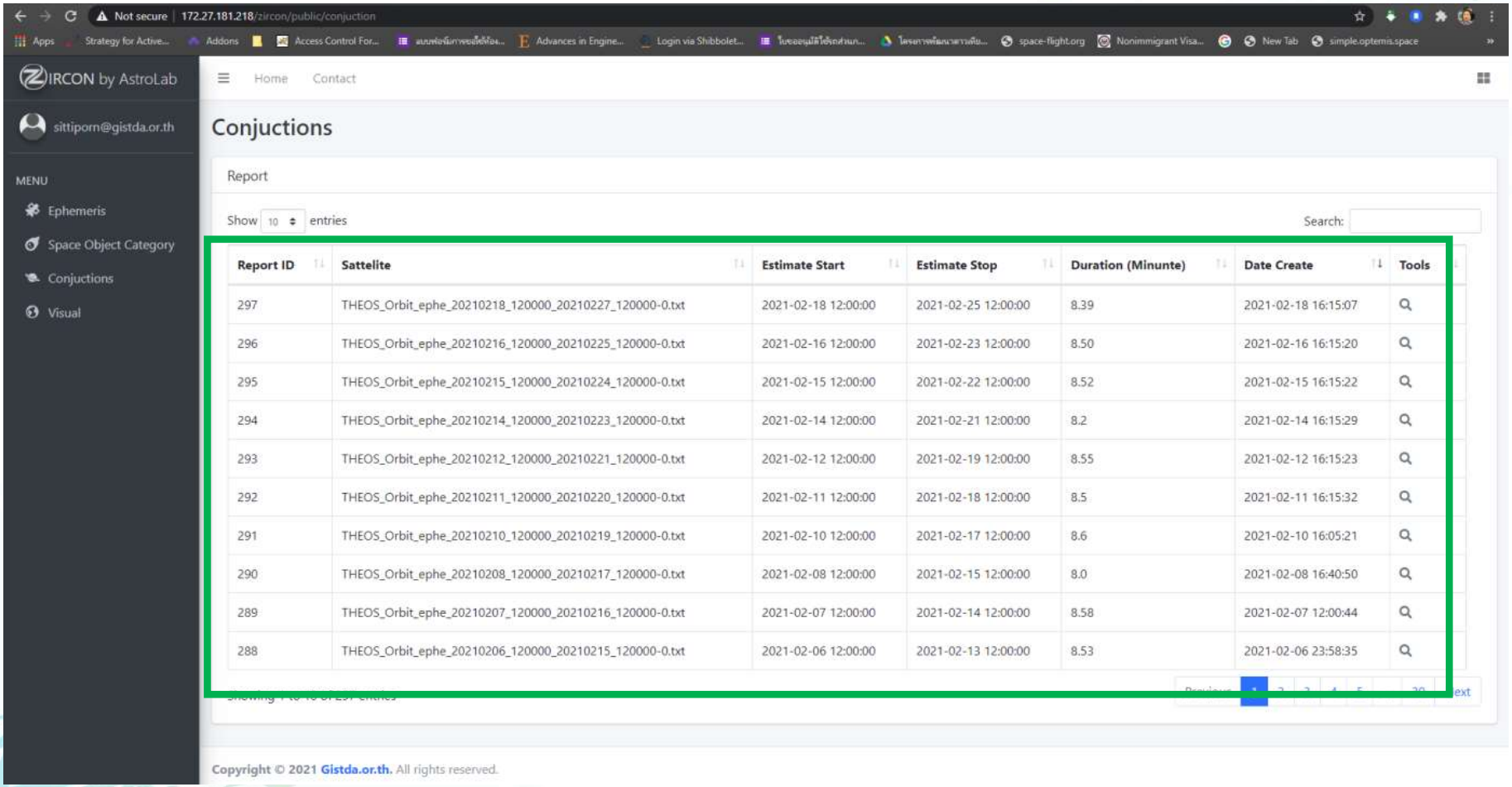




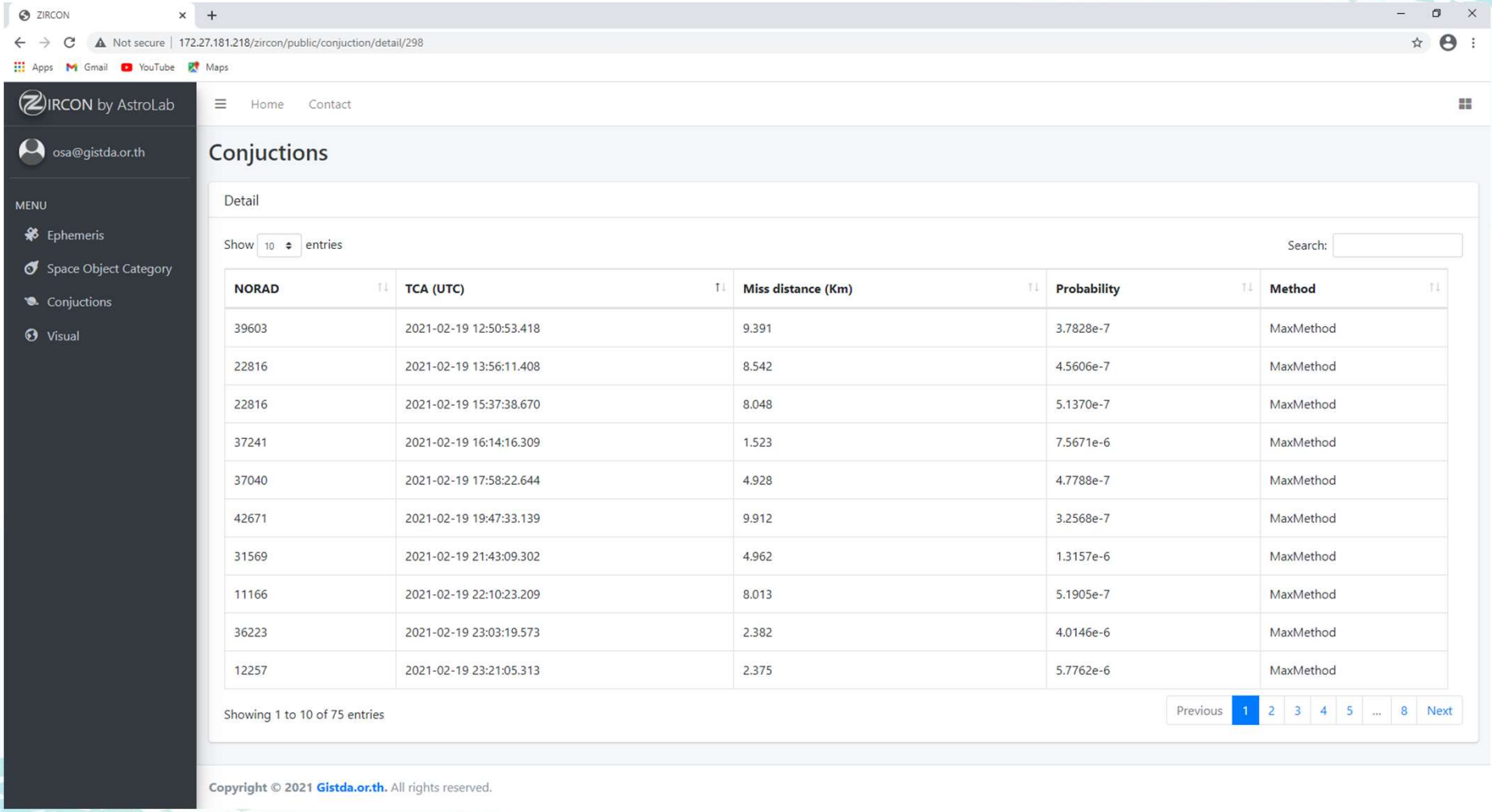
2. Space traffic management (ZIRCON)



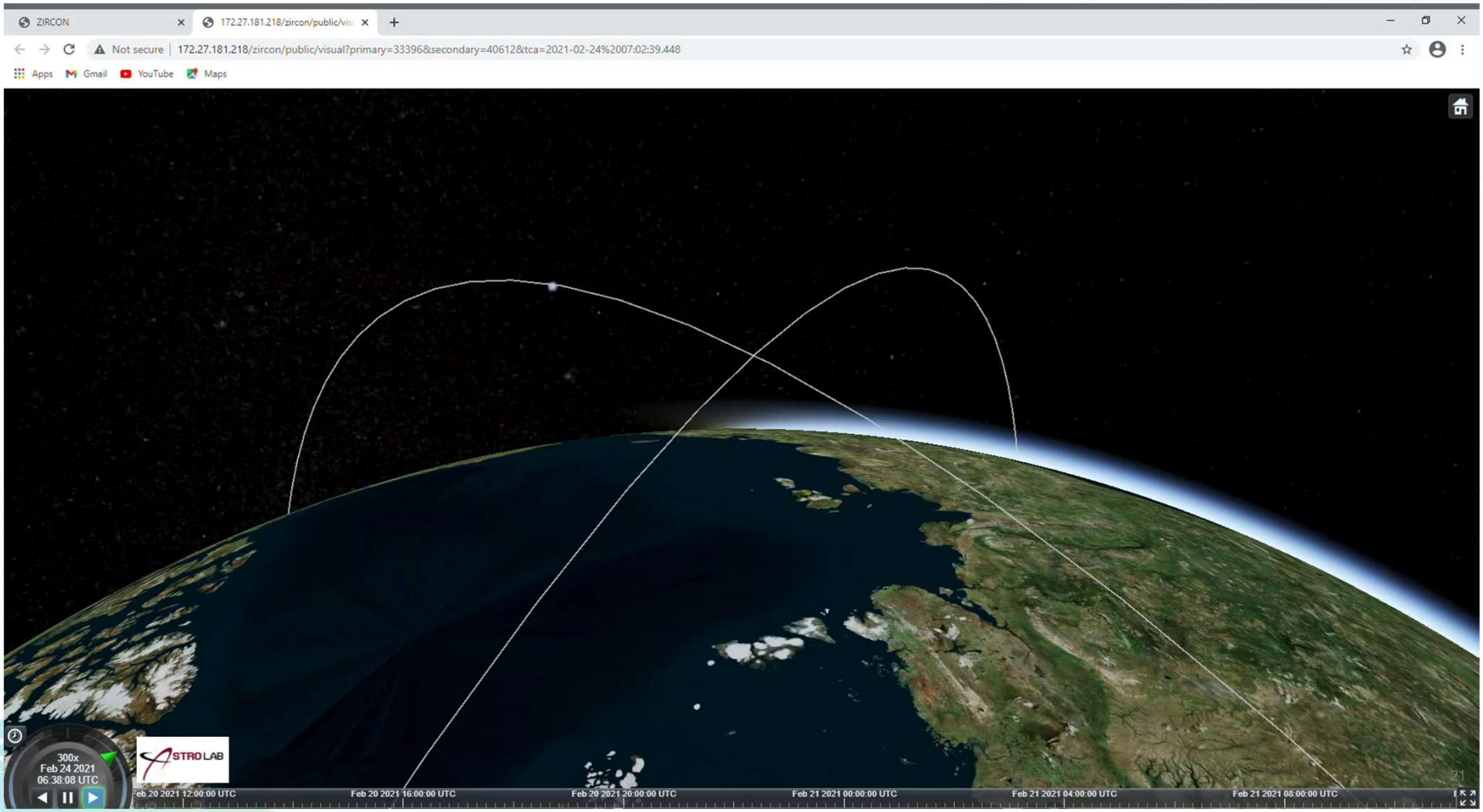
Space traffic management (ZIRCON)



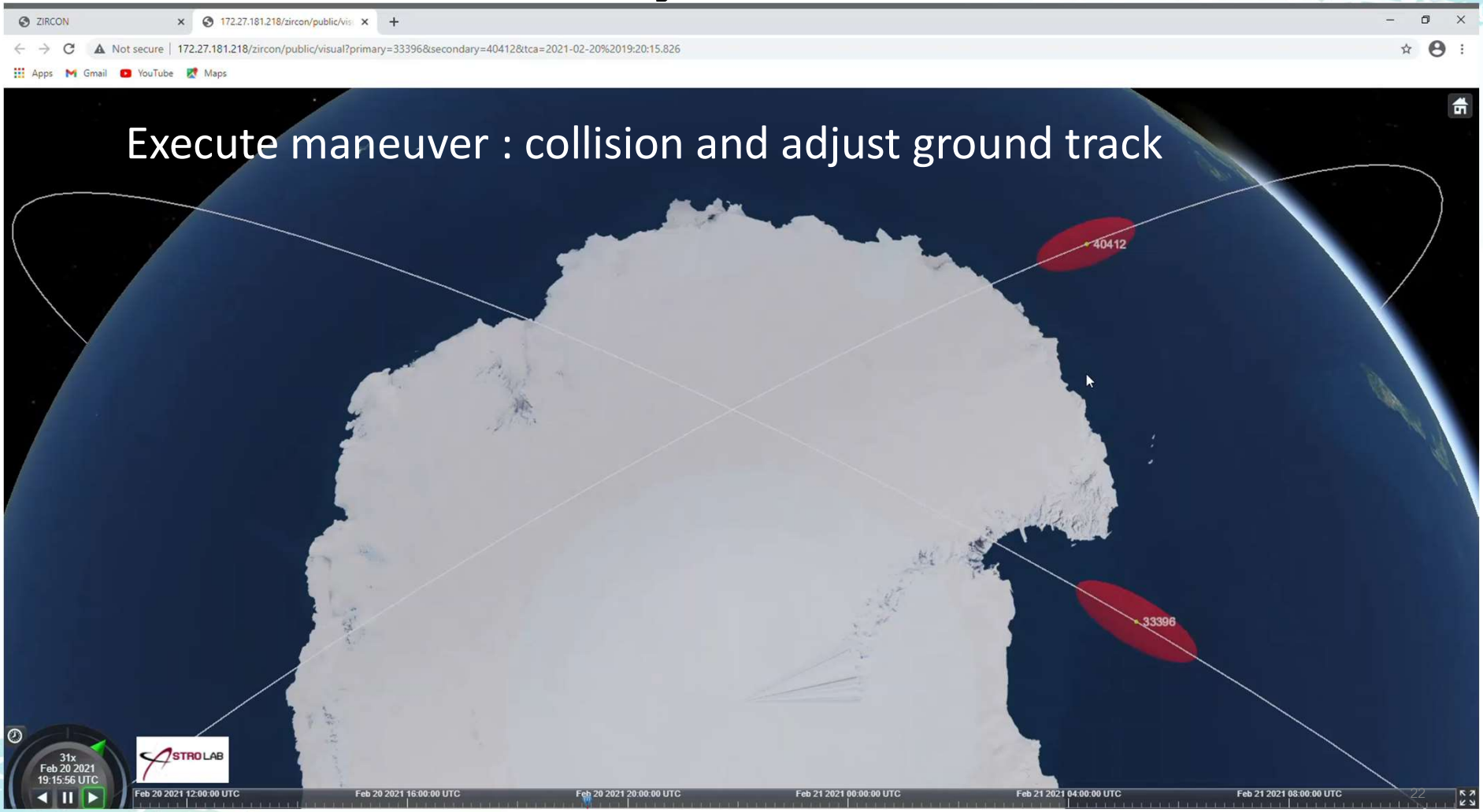
Space traffic management (ZIRCON)



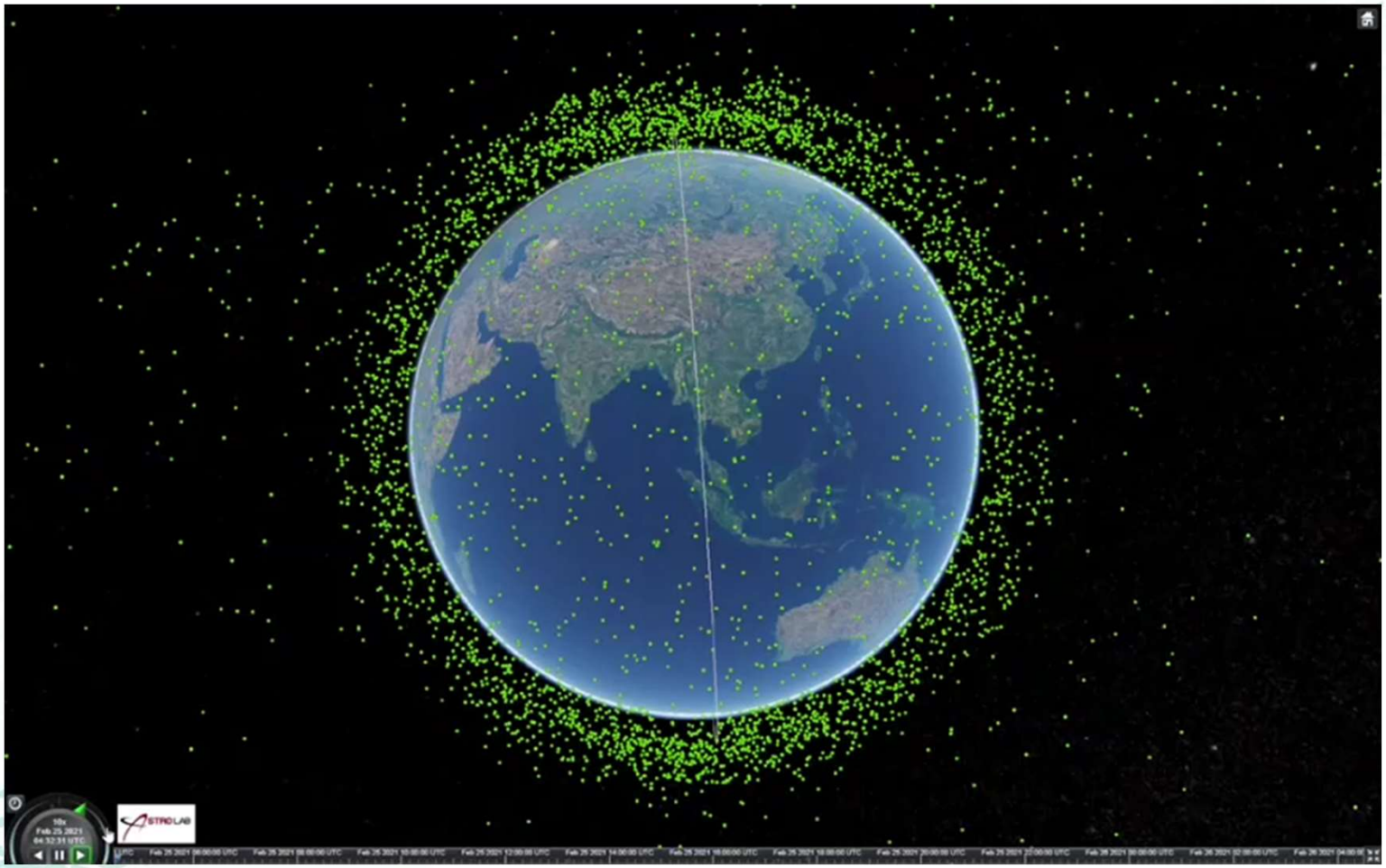
Conjunction visualization



Latest conjunction event



Visualization



Future development of ZIRCON

- Autonomous maneuver planning
- Radio frequency interference
- Space weather monitoring and forecast
- Launch and re-entry conjunction assessment

Connection with the LTS Guidelines

Current

- A.5: enhance the practice of registering space objects.
- B.4 Perform conjunction assessment during all orbital phases of controlled flight
- C.3 Promote and support capacity-building.

Near future

- B.5 Develop approaches for pre-launch conjunction assessment
- B.6 Share operational space weather data and forecasts
- B.7 Develop space weather models and tools and collect established practices on the mitigation of space weather effects

Lesson learned

Lesson learned

- **Registration of space objects launched into outer space.**

: the National Space Policy Committee (of Thailand) realized the importance of the registration. The endorsement of the procedure of objects launched into outer space submissions was officially approved by the cabinet of Thailand.

Safety of space operations

: The successfulness of this assurance on safety of satellite operation can be increase reliability of the operators for other space missions. ZIRCON can be one part to support full international space traffic management system in the future and promote the adopted LTS Guidelines with practices implemented by a developing country.

Thank you for your attention