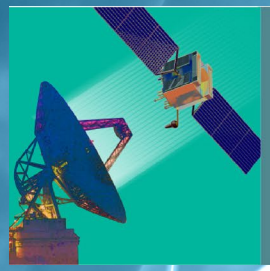
Working Group C Outbrief



25th Ground System Architectures Workshop

Adapting Critical Operations

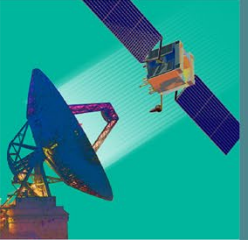
Starts March 1, 2021 | Special Online Series of Events

Earth Observation capabilities enabled by AI and other Advanced Technologies

Lead:
Hany Fawzy,
Canadian Space Agency

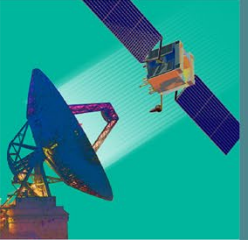
March 9, 2021

OTR202100610



Session Goals

- The panel will discuss the possible drivers and requirements for GS IT infrastructure capabilities and applications, both the ground and also ported on space assets.
  - *The discussion does not address spacecraft specific details such as spacecraft operations, raw data formats, etc.*
- Our panel would emphasize future Internet technologies in order to improve EO services by aiming to reducing the costs associated with on-premises deployment, by efficiency of data workflows while meeting data compatibility and access protocols for various clients and uses. Also, the discussion will explore on the advancement of EO data exploitation.
- Discussing the driving technologies for EO data exploitation in a modern GS architecture: Virtual Based Missions, Cloud Computing, AI, ML and ANN, Big Data and Data Analytics, Cyber security, Multi-Agents and IIOT, …



Presenters/Panelists

- Dr. Hany Fawzy, Senior Systems Engineer at the Canadian Space Agency. GS Lead for the RadarSat Constellation Mission and a member of the Systesm Engineering team for the agency's Lunar Gateway Program.
- Dr. Keith Beckett is the Chief Product Engineer at MDA – Canada's leading space, robotics and geointelligence company.
- Juan Carrillo is a Machine Learning Specialist at Global Spatial Technology Solutions (GSTS), PhD Candidate University of Toronto.
- Ms. Chantelle Dubois is a computer engineer at the Canadian Space Agency, primarily in the role of Avionics and Software Systems Engineering for the agency's Lunar Gateway Program.
- Dr. Rushi Ghadawala, is leading aerospace professional from Brampton, Ontario (Canada).
- Mr. Stephane Rondeau Senior GS Operations Engineer at the Canadian Space Agency has been leading the team designing and implementing this unique simulator used by all astronaut flight crew and ground staff who need to train to operate the Canadarm 2.

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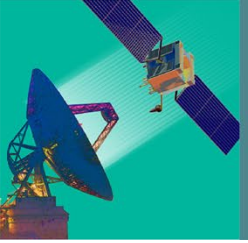

Key Points

- Driving Technologies:
  - *Cloud Computing: Bring Applications to Data*
  - *Cyber Security*
  - *AI and ML*
  - *Systems Engineering: Intelligent and autonomous systems would have the advantages of:*
    - Self-awareness
    - Self-control
    - Self-improvement through learning
    - Self-sufficient

- GS practitioners should give enough attention to the Space based EO, Data Exploitation and Market Demands.
- GS infrastructure should be scalable and allow reuse
- Access to space is affordable and will be more affordable in the future (target of 1000$/Kg)

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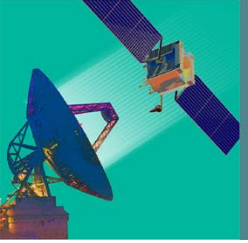
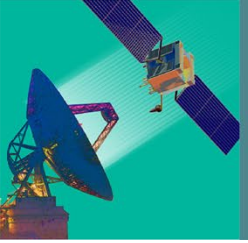


Key Points

- Predications:
  - *more GS infrastructure to support Meta (virtual) missions;*
  - *User require more insight ready analysis.*
- Major trends in Machine Learning algorithms
  - *Server less ;*
  - *Fog computing and Federated Data;*
  - *Multiple sources for learning data sets is a future trend.*
- UAV at high altitudes would be a cost effective solution for Space based EO data
- This would resolve EO data gaps, increase coverage and reduce costs
- Allow a real-time data analysis more easily
- Improve situational awarness



Conclusions

- Multiple driving technologies discussed specially; AI, Cloud Computing, Machine learning, Cyber security, Solar power, Meta (virtual) missions, etc.
- EO data industry business model could and would change to include in the future Service Level Agreements and content management.
- Industry is tending to fuse data from multiple sensors and multiple missions.
- User needs are moving towards insight ready analytics; Data cubes and ARD products.
- Machine learning algorithms are addressing smaller data sets, less need to computational power in space and time.
- ML is tending towards algorithms using serverless approach, federated learning and multiple resources as an input.
- Advanced UAVs at high altitude 65000 meters and higher using advanced power sources would reduce the EO data gap and provide a cost effective EO data source. It will provide also real-time data processing facility at lower cost. It can also work in swarm behavior and address issues like revisiting time and coverage gaps in EO data.

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