

CGMS FUTURE DIRECTION 2022+ POSITION PAPER THEME: FUTURE INFORMATION TECHNOLOGIES

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TOPIC DESCRIPTION AND RATIONALE FOR CGMS ENGAGEMENT

A steep growth of satellite data amount and type is taking place not only public sector but also private sector because of the present and upcoming new generation meteorological satellites with state-of-the-art instruments and small satellite constellations of private sector. In order to promote satellite data utilization for key application area, it is needed to access and share data and its related information easily and quickly. Accordingly, data management and distribution system should be transformed for accessing and processing efficiently by users using future information technologies (IT) such as cloud platform, satellite internet access and AI/ML. Therefore, CGMS should develop baseline and guidance of inclusion future information technologies in operation by CGMS members and best practices for user community as well.

However, most this kind of technology is innovating and implementing by private sector (e.g. AWS, GCP, Microsoft, Starlink, Telesat, etc.). Therefore, CGMS member's agencies consider how we have relationship with private sector in usage of them as dealt with other theme (e.g. relationship with private sector). Regarding IT provided by private sector, there are several challenges to use them in CGMS member's agencies:

- extent of database, computing and networking in open cloud platform provided by private sector
- to sustain satellite data distribution and collection via space-based internet in collaboration with private sector as well as to secure governmental budgets
- extremely limited uplink bandwidth of space-based internet making it difficult to achieve complete and accurate data collection
- radio frequency interference (RFI) between the space-based internet and meteorological satellite operation
- reliability of connection, security assurance, free-space path loss, attenuation, etc.

==> to be updated

LONG- AND MEDIUM TERM GOALS FOR CGMS ENGAGEMENT

(Mid-term Goal)

- Identify the actual and potential cloud and AI/ML technologies for applying to the data management infrastructure, and develop best practices through case study for their applications
- Prepare demonstration to collaborate with private sector regarding the satellite data distribution and collection via space-based internet as well as cloud system
- Support to study the qualification of inter- and intra-connections between satellite and

Commented [A1]: NASA input:

Consideration should be given to the increasing emphasis on Open Source Science – e.g., the NASA-led TOPS effort that is part of the US effort ("Year of Open Science") – while the meteorology community has long been good about sharing data, the push for open source science means that there is interest in going beyond the sharing of "end results" to give people earlier access to the process. Of course, this has to be done in a way that protects the security and reliability of existing data streams, and also minimizes/avoids confusion that could come from having multiple data products out there.

ground network to collection and relay satellite data by an expert team under WG I

(Long-term Goal)

- Consider to establish more interoperable data sharing and exchange system architecture in common for new small satellite constellations of private sector as well as CGMS members satellites based on cloud structure and compatible with WMO's Information System (WIS) 2.0.
- Consider to build space-ground networked testbeds for data distribution and collection which can analyze the implementation feasibility of the above challenges including transmission rates of various data and their latency impacts on real-time and/or near real-time application such as NWP data assimilation over a variety links
- Suggest the guideline of the space-based information network according to the outcome of the expert team of WG I

IMPACT ON CGMS ACTIVITIES

- Develop new data distribution and collection guidance and best practice for users based on future information technology which is compatible with WIS 2.0
 - ✓ consider member agencies' level of data privacy and open platform based on cloud computing which consists of software and platform architectures
 - ✓ consider CGMS member's cloud service strategy with the governmental compliance and regulations: government-only or government-private sector cooperation
- Prepare for cloud optimized data format and related meta-data: service or business meta for users, IT meta for data link via landline and satellite internet, and observation meta for users

IMPLICATIONS FOR CGMS STRUCTURE AND KEY DOCUMENTS

- Establish joint task group including WG II and IV to deal with application of AI/ML to product algorithm development, data service and computing system based on the cloud system
- Establish expert team under WG I to deal with study and implementation strategy of satellite data distribution and collection via satellite internet access
- Update and/or include in CGMS baseline, high-level priority plan (HLPP) and new CGMS mission statement

IMPACT ON EXTERNAL INTERFACES

- WIS 2.0 architecture and technical considerations
- Technical and service area differences of each CGMS member agencies on account of their government policies (e.g.: security level, common services coverage)