



Global Conference on Space
and the Information Society

FINAL REPORT

6 - 7 June 2016

Geneva, Switzerland, ITU Headquarters

*Connecting the World via Space
– Policies, Technologies,
Applications*

www.glis2016.org





Summary

The Global Conference on Space and the Information Society was held in Geneva, Switzerland from 6 – 7 June. The theme for this year's conference was:

“Connecting the world via space – policies, technologies, applications”

The conference was co-organized by the International Astronautical federation (IAF) and the International Telecommunication Union (ITU). The main purpose of GLIS 2016 was to examine and discuss the different means by which space allows people to connect worldwide and the impact that space policies, space technologies and space applications have on the daily life of people, organisations and governments around the world.

The conference consisted of five plenaries:

- Plenary 1: The ITU and its Impact on Space Activities
- Plenary 2: Sustainable Development Goals (SDG) and the Contributions of Satellite Communications
- Plenary 3: Space Economy meets Information Economy
- Plenary 4: Space Services and Security
- Plenary 5: Big Data – Information Society

In addition to these plenaries, A SpaceUp session for young professionals and students was organized the day prior to the conference.

The conference was very well appreciated; the participants enjoyed the networking possibilities and the high-level presentations on very specific topics as well as the networking possibilities. Below can be found some of the main recommendations and conclusions from GLIS 2016:

- The border between space and ICT is fading and the focus is on specific services and information provided, regardless if the infrastructure is space or terrestrially based;
- Operators are facing challenges due to fragmentation of national policies and regulations; harmonization and barrier removal are strongly needed;
- Some regulatory limitations in securing spectrum for space activities still exist and enhancements would be required in particular for a more transparent application by individual administration;
- There is a clear need to bring Europe's know-how online with Copernicus and other Space data. Free, full and open data policies are seen as essential in this context;
- The issue of privacy and protection of personal data raises increasing concerns;
- The Space community must start working on compounding the benefits of the different space technologies to offer integrated applications of satellite based Earth Observation, global navigation, satellite systems and satellite telecommunications;

On the following pages you will find detailed reports from the plenaries.



SpaceUp GLIS

What do you get if you combine a space-themed unconference and a tweetup and the GLIS conference?
Answer: SpaceUp GLIS!



An unconference is an activity where the attendees decide – using a framework decided on by the organiser – what is presented, discussed and talked about, while a tweetup is a physical gathering of Twitter users. The two were first combined into a SpaceUp in San Diego, USA in 2010 and since then more than fifty have been organised all over the world. The non-profit SpaceUp Foundation (www.spaceup.org) provides tools, organisational support and publicity for the different teams that decide to organise SpaceUps.

SpaceUp GLIS was organised by the IAF Space Education and Outreach Committee (SEOC), the IAF Workforce Development/Young Professionals Programme Committee (WD/YPP) and the Space Generation Advisory Council (SGAC) supported by IAF staff and ran the day before the main GLIS conference at the ITU.

After registration and the traditional filling in of the SpaceUp grid by the participants who wanted to present, the SpaceUp GLIS was officially opened by IAF President Kiyoshi Higuchi, who had dressed for the occasion in one of the splendid blue event t-shirts, welcome all the participants and encouraged them all to imagine the space futures that they wanted to see and then to create them, saying, *"Our future is not what we predict, but what we create!"*

This was followed self-introductions by all the participants and then the first keynote by **Prof. Chris Welch**, IAF Vice President for Education and Workforce Development, called Preparing for Opportunity - How to get the Space Career You Want, highlighting the many opportunities available to students and young professionals through the IAF itself and its member organizations such as the Space Generation Advisory Council and the International Space University

During the SpaceUp there was a variety of presentations, though the theme of networking/communication was one that recurred in talks such as Innovation Networking by **Matjaz Vidmar**, Professional Networking by **Maxime Sixdeniers** and Quantum Satellite Communication by **Laszlo Bacsardi**.



After lunch and networking, a highlight of the afternoon was a guided tour of ICT Discovery, the ITU's museum of the evolution and future development of information and communication technologies, highlighting the role of the ITU in these and which also included the opportunity for the SpaceUp GLIS participants to take part in a cybersecurity simulation.

The SpaceUp concluded with an energetic and engaging closing speech about the ITU by **Attila Matas**, Head of the Space Publication and Registration Division in the ITU Space Services Department.

Many thanks to all those involved in making the day so enjoyable!

Chris Welch

Opening Ceremony

Kiyoshi Higuchi, IAF President, and **Houlin Zhao**, ITU Secretary General, welcomed the international delegates and presented the general scope and aim of the event. **Chris Welch**, IAF Vice President for Education and Workforce Development, gave a brief report on the outcome of the SpaceUp workshop which took place on Sunday prior to the conference.

Karsten Geier, Germany's Federal Foreign Office, was the first keynote speaker and delivered a speech about potential international security risks connected to outer space and cyberspace. He



concluded his presentation saying that *"We need rules for responsible state behavior – both in outer space and in cyberspace; we need confidence that these rules will be respected, and we need capacity building to enable as many states as possible to engage in rule-abiding and confidence-building behavior."*

Jennifer Warren, Lockheed Martin Corporation, continued the discussion from an industry viewpoint. She talked about the importance of highlighting the role of space and the access to spectrum: *"We need a community to better tell our story about space as an integral component to the information society so that the decision makers have that dialog. Not as space versus wireless, but we are looking into an information society that must be comprised of it all."*

Badri Younes, National Aeronautics and Space Administration (NASA), enriched the discussion providing an agency perspective. He talked about communications and human exploration and explained that: *"Recently we have seen an increase in internet infrastructure to primarily terrestrial users. But at the same time NASA, along with our friends in the other agencies, have begun to infuse space data standards, advanced communication technologies and protocols that could help to extend internet into space and enable robust space to space networking and connectivity."*

Jean-Yves Le Gall, French Space Agency (CNES), presented the COP21 results and described the many means by which space can help face and overcome the climate change challenge. Amongst many other new initiatives, for instance, *"Satellites will monitor the decisions taken by the governments by measuring greenhouse gas emissions"*.



Panel 1: The ITU and its Impact on Space Activities

Plenary 1, "The ITU and its Impact on Space Activities" was devoted to the influence of the International Telecommunication Union on Space Activities with a main focus on the outcomes of the 2015 World Radiocommunication Conference (WRC-15) which achieved a great deal with decisions having a major impact on the future of the telecommunication sector in general and radiocommunications in particular aimed at maintaining a stable, predictable and universally applied regulatory environment that secures long-term investments for the multi-trillion dollar ICT industry including outer space activities.

The panel reviewing these results and coordinated by **Yvon Henri**, Chief of the Space Department of the Radiocommunication Bureau gathered **Khalid Al-Awadi** (Manager of Space Services at Telecommunications Regulatory Authority, UAE), **Aarti Holla** (President of ESOA), **Robin Geiss** (Professor at Glasgow University), **John Purvis** (General Counsel of SES) and **Badri Younes** (Deputy associate Administrator for Space Communications and navigation at NASA), that analyzed these developments and focused especially on the pertinence of the current regulatory framework with the satellite business reality.



The downstream work undertaken at ITU WRC to secure the fuel of the satellite industry – the access to radio spectrum and orbit resources – play an important role in the rather good shape of today satellite business.





Indeed, focusing on how to balance the more spectrum need for mobile data growth and the continuity of essential satellite services, WRC-15 decisions guaranteed continuing access to existing users receiving essential satellite services as the broadcast community and first responders for disaster relief, but also reinsured the satellite community on the long term availability of Ka spectrum for high throughput satellites. Also the heavily reliance on C-band due to favorable propagation characteristics in heavy rainfall regions was supported with no global identification in the 3.6 GHz to 4.2 GHz band for which IMT provides no alternative (broadcasting / disaster relief / rural backhaul & Internet connectivity).

Recognizing the relevance of the current ITU framework, some regulatory limitations in securing spectrum for space activities still exist and enhancements would be required in particular for a more transparent application by individual administrations. The differences in the ITU regulations application in national satellite procedures create some inequitable access to orbits and spectrum and a more strict observance of ITU rules, e.g. for coordination priorities, should be followed rather than practice rules that favor administration own national operator(s). More ITU enforcement role included in the regulations could be an approach that however would still require further thoughts.

WRC-15 achieved great and encouraging results for science services but some caution should be exercised on the many studies going on toward WRC-19 around 45 GHz for non-GSO FSS, IMT, Haps and Rlans and the consequence on science services. Indeed, every space and science mission (Space Sciences, Space exploration, Earth science aeronautical research) require very specific non-interchangeable radio spectrum.

On the sensitive issue on the legal challenges of unmanned aircraft systems, the current lack of harmonization on frequency allocations but also safety, security, privacy, data protection and liability was stressed as well as the encouraging but shy response by WRC-15.

WRC-15 completed with success for the space community, the preparatory work for WRC-19 is already shaping up. The WRC process is submission driven and depends on delegations taking responsibility for the agenda items of interest for them and defending their interests at the national, regional and worldwide level. So the future is in the hand of the space community to contribute at all levels to the preparation of next conference.

In that respect ITU is committed to connecting all the world's people, wherever they live and whatever their means, and the WRC process is an essential element in that endeavor.

Yvon Henri

Panel 2: Sustainable Development Goals (SDG) and the Contributions of Satellite Communications

This Plenary on the topic of "Sustainable Development Goals (SDG) and the Contributions of Satellite Communications" gathered high level experts in the field of disaster management, space technology, climate change, tele health and tele education in order to understand how satellite communications can contribute to the implementation of the Sustainable Development Goals (SDG).

Gathered around the Director of the United Nations Office for Outer Space Affairs (UNOOSA), **Dr. Simonetta Di Pippo**, the President of CNES – **Mr. Jean-Yves Le Gall**; the Secretary General of the International Society for Photogrammetry and Remote Sensing (ISPRS) **Dr. Christian Heipke**; the Vice President of Humanitarian Affairs at EUTELSAT – **Mr. Simon Gray** and the Professor of Medical Informatics – **Prof. Antoine Geissbuhler** – discussed on essential topics such as disaster management, climate change and tele health.

As Dr. Di Pippo mentioned in her opening, 2015 was a milestone year for the international community and particularly for the UN, who successfully set some important and ambitious goals envisioning the upcoming 15 years, with the conclusion of several agreements such as:



- The Sendai Framework for Disaster Risk Reduction 2015-2030;
- The Paris Agreement on Climate Change and finally;
- The 2030 Agenda for Sustainable Development

The latter includes the 17 SDGs on which the discussion was focused.

Director Di Pippo also underlined the importance of the 50th anniversary of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE+50) – to be celebrated in 2018 – that will actively include in its priorities thematic from whom the SDGs will directly benefit, such as:

- Creating an international framework for space weather services;
- Strengthen space cooperation for global health;
- Increasing the international cooperation towards low-emission and resilient societies;
- Creating an effective and innovative approach to capacity-building for the 2st Century



Emphasizing on the importance of all of these topics – and in particular on the disaster management issue -, Mr. Simon Gray from EUTELSAT, presented the "Crisis Connectivity Charter" concluded by the EMEA Satellite Operator's Association (ESOA) and the Global VSAT Forum in collaboration with the Emergency Telecommunications Cluster (ETC), in October 2015. Such charter contains a set of commitments by the satellite operators and integrators to ensure and enhance connectivity in times of crisis, facilitating communications between all those responding to humanitarian emergencies, including affected communities.

The Charter also formalizes protocols designed to accelerate access to satellite-based communications when local networks are affected after a disaster. It seeks to support the ETC – a global network of humanitarian, private sector and governmental organisations that work together to provide communications services in crisis situations – in implementing its activities.



Finding efficient solutions to solve crisis situations is indeed an important aspect of the SDGs, and as mentioned by Mr. Jean-Yves Le Gall, global connectivity is one of the many ways in which this could be achieved. Global internet connectivity is one of the main focal points to be considered in the next few years by the satellite industries. The development of 5G Services will provide a new frontier of space based activities, allowing developing new ways of facing disaster management and crisis solution. Importance of increasing the awareness on how space activities are important for supporting the achievements of the 2030 SDGs.

The importance of connectivity was also underlined by Prof. Antoine Geissbuhler, who, over the last 15 years has been involved in deploying a large telemedicine and distance medical education network called the RAFT in order to support isolated healthcare professionals working in resource- and infrastructure-challenged settings. This network, who is now active in the African and Latin American regions, has been a grateful user of satellite communication as, in many situations, this was, and still is the only way to provide internet access to remote healthcare settings. Satellite-based communication are indeed the only way to connect and offer critical information services in emergency situations and humanitarian crisis situations. In particular, Prof. Geissbuhler underlined the importance of remote-observation and sensing capabilities – which by providing accurate maps, allow the identification of areas that could be targeted for the fight against vector-borne diseases – and, of the global navigation satellite systems – that enables to precisely map activities and resources using simple, consumer-grade devices equipped with GPS receivers, and to inform geographic information systems.



Earth observation is therefore recognized as one of the main ways of reaching the goals set by the SDGs, since as mentioned by Prof. Christian Heipke, is the only way to daily monitor every corner of the globe, providing real-time information on climate change, natural disaster and humanitarian crisis.



The Space community must start working on compounding the benefits of the different space technologies to offer integrated applications of satellite-based Earth Observation, global navigation satellite systems and satellite telecommunications. Increasing global cooperation and encouraging open data policies, as well as deploying efficient operation services and infrastructures are focal point that will surely accelerate the process of fulfilling the SDGs. Useful solutions are the results of combination of multiple tools and the synergies of diverse expertise. Achieving the ambitious Sustainable Development Goals will necessitate creative, innovative solutions, to which space science and technology can undoubtedly contribute significantly.

Simonetta Di Pippo

Panel 3: Space Economy meets Information Economy

Speakers

The speakers covered the following perspectives.

The first speaker, **Anne Sulling** from the Parliament of Estonia, gave an account of the successful implementation of an e-government system, demonstrating the benefits of taking the Information Economy to its logical limits.

The second speaker, **Aarti Holla** from ESOA, described the Information Economy from the perspective of implementing for 5G networks and the Internet of Things.

The third speaker, **Jennifer Warren** from Lockheed Martin Corporation, described the challenges faced by traditional satellite manufacturers and how they are responding to the new market demands.

The fourth speaker, **Luca del Monte** from ESA, spoke from an agency perspective about the change in priorities for the European Space Agency.

The fifth speaker, **Jeroen Rotteveel** from Innovative Solutions in Space BV, spoke from the perspective of the disruption in small satellite technology and the implications for future Space Economy possibilities.

The sixth speaker, **Sias Mostert** from Space Commercial Services Holdings, spoke from the perspective of disruption in the utilisation of new space economy output.

Remarks

The major remarks are:

- a. The full implementation of the digital economy has a significant impact on the GDP of a country.
- b. The information economy of tomorrow can best be described as 5G and Internet of Things.
- c. Satellite manufacturers have to respond to demands for shorter time scale and lower cost.
- d. Agencies, such as ESA, need to transform itself into an actor for value creation.
- e. Small satellite technology allows disruptions such as from initiation to launch in 6 months, new types of entrants into the market.
- f. Small satellite technology enables emerging space programs to increase their impact, but requires policy and federated capacity solutions to be effective.

Conclusions

The conclusions of the panel are:

- a. The Digital Economy is defined as services provided via a computer network and interface. The Space Economy is defined as the way to establish and operate the infrastructure that enables Digital Economy services.
- b. The Digital economy can benefit from the Space Economy in a number of areas where value is uniquely added. These areas include communication access to mobile assets such as ships, planes, trains and motor vehicles.
- c. The Space Economy is going through a number of transitions that include:
 - a. To enable faster and lower cost infrastructure solutions
 - b. A commercial return on investment by taxpayers and commercial investors alike



- d. The transitions in the space economy is enabled by:
 - a. Shorter time to market
 - b. Lower cost of infrastructure
 - c. New frameworks for collaboration and federated deployment

Final Recommendations

The border between space and ICT is fading and the focus is on specific services and information provided, regardless if the infrastructure is space or terrestrially based.

Sias Mostert



Panel 4: Space Services and Security

Panel 4 at GLIS 2016 was focused on the space technologies and applications in space and security. It tackled the question of defining space security and the role of regulations and policies in the field. A particular emphasis was given on exchanging views on the role of governments, space agencies, and industries in space and security, the challenges faced and areas for further consideration.

Christina Giannopapa (IAF CLIODN Chair, European Space Agency) was moderating panel 4. She provided an overview on what is space and security based on security on earth and security in space. She demonstrated with examples on how satellite technologies and applications can support in a number of areas e.g. boarder control, detection of illegal activities, identification of terrorist camps, maritime security, disaster management, migration.

Cath Westcott (BBC) illustrated the importance of satellites being the backbone of broadcasting and the need to ensure their protection as critical infrastructures from cyber attacks. She stressed the importance of ITU's role in ensuring their protection from harmful interference and jamming. Considered that the UNGGE work on transparency and confidence building measures in outer space needs to be strengthened.

Tony Azzarelli (One Web) informed on the current status and plans of one web. He elaborated that the main objective is to bridge the digital divide through mega constellations. 57% of the world lacks internet access. The unconnected and unserved in developing countries are 18.7% and in developing countries 67%. Target is to bridge the digital divide for schools, homes, community centers, hospitals, small and medium enterprises. It was confirmed the need to take responsible measure while launching mega constellation to ensure long term sustainability of space actives by taking into consideration, spectrum allocation, registration, clean space and deorbiting after end of life.

Olga Volynskaya (Roscosmos) elaborated on the two levels of regulatory and policy elements, the international and the national. She provided an overview of the current international regulatory and policy framework with focus on the Outer Space Treaty. Listed the current for a of discussion on space security being the COPUOS (LTS), CD (PPWT, NFP), first committee, second committee and UNIDIR. National space law and policy, where showcased through the Russian approach. An overview of recent changes in Russia regarding space activities were provided. The importance of securing continuation of availability of highly skilled workforce through inspiring and motivating the next generations was demonstrated.

The panel discussion identified challenges and provided some concrete actions for creating the right environment for space and security. First, the difficulty to change regulations was expressed and the possibility to streamline the process and procedures of submissions to ITU need to be further conceded. Second, continue the dialogue for commonly accepted guidelines for space and sustainability at the UNCOPUOS.

Third, operators are facing challenges due to fragmentation of national policies and regulations and there is need for harmonisation and barrier removal. Fourth, ITC can provide additional support to enable growth for developing nation by assisting in removing current barriers and providing targeted assistance.

Christina Giannopapa



Panel 5: Big Data – Information Society Recommendations

Big Data is a term for data sets which are so large or complex that traditional data processing applications are inadequate. The associated challenges include data analysis, capture, data curation, search, sharing, storage, transfer, visualisation, querying and information policy. Extensive data sets are not today's phenomenon, however, an exponential growth particularly in Earth Observation archives can be observed. The projection for data ESA's Earth Observation download volume by 2022 is estimated to reach 50 Petabytes. Space systems are the only ones that can readily offer ubiquitous communication - e.g. for the Internet of Things, Industry 4.0 and Machine to Machine Communications - and are often the only way of ensuring a cost-effective access to global communication - especially in rural areas. Under such conditions, issues like data availability, privacy and security become extremely important.

This panel, organised by **Prof. Otto Koudelka** (TU Graz) and **Dr. Manfred Wittig** (MEW Aerospace) was moderated by **Dr. Norbert Frischauf** (Spaceteq Capital Partners). It addressed the opportunities and challenges coming along with the use of Big Data from, with and for Space systems. **Dr. Josef Aschbacher**, ESA's new Director for Earth Observation, **Prof. Roberto Battiston**, President of the Italian Space Agency, **Dr. Ingo Baumann**, Lawyer/Partner at BHO Legal, **Dr. Hector Fenech**, Director of Future Satellite Systems at EUTELSAT, **Prof. Irmgard Marboe**, Professor of International Law at the University of Vienna and **Mr. Andreas Veispak**, Head of Unit at the European Union provided insights into the ongoing discussions and presented options and ways ahead to better utilise the benefits of Big Data for the human society, both from a technical and legal perspective. Space resources and Space data have become a commodity. 60 % of the users of Earth Observation data still come from the public sector.

There is a clear need to bring Europe's know-how online with Copernicus and other Space data. Free, full and open data policies are seen as essential in this context.

Big Data clearly improves the ability to analyse and shape the real world and helps in the decision making processes. Developing a robust data distribution and access architecture, improving the usability and interoperability of earth Observation data with other data sources is considered important, as well as the translation of Space data into products relevant for the society and the decision makers. High throughput satellites like EUTELSAT's KA-SAT providing broadband access using small terminals are assets in the data distribution chain.



On the legal side, the issue of privacy and protection of personal data raises increasing concerns. Most states are bound by international human rights treaties which oblige them to ensure and protect fundamental human rights. The European Convention on Human Rights and the EU Charter of Fundamental Rights were discussed in more detail. In addition, the EU instruments on data protection and their recent reforms were introduced. The reason behind the EU initiatives was to ensure a uniform and coherent approach at least in Europe. Monitoring of compliance was identified as a challenge. As regards Earth Observation data, no specific legislation with respect to privacy concerns has yet been enacted. Also satellite navigation data are highly sensitive with respect to privacy and personal data. National legislation and Space contracts start to include provisions on data protection.

Otto Koudelka





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