



DOWNSTREAM SPACE SERVICES AND SPACE-BASED APPLICATIONS

***ISO TC20 SC14 – WG creation proposal
13rd July 2022***

SUMMARY

- ▶ *Title proposal*
- ▶ *Scope*
- ▶ *Rationale*
- ▶ *Potential Structure*
- ▶ *Current TC20 SC14 WG1 Work program – PNT*
- ▶ *Current TC20 SC14 WG1 Work program – Remote sensing*
- ▶ *Potential already identified TC20 SC14 WG1 new proposals – PNT*
- ▶ *Potential already identified TC20 SC14 WG1 new proposals – Remote sensing*
- ▶ *Leadership*
- ▶ *Schedule*
- ▶ *Resolutions*

TITLE PROPOSAL

▶ *Downstream space services and space-based applications*

SCOPE

▶ This new WG will be dedicated to space downstream standardization activities including

- ▶ Space services (data, products) :
 - PNT (Position, Navigation and Timing)/GNSS
 - Remote sensing/Earth Observation
 - Communication (mobile, fixed, internet acces, digital broadcasting, IoT, ...)
 - Space weather downstream application and effects
- ▶ Space-based applications specified for dedicated user (data, products) (supported by Space services)

▶ This would include :

- definition of terminology,
- system performances definition,
- tests procedures,
- characteristics of embedded equipment (GNSS, telecom, Earth observation...)
- Products, data, signals, interfaces, securities(or safeties) ... specifications
- etc.

RATIONALE

1/2

- ▶ Today, WG1 is mixing space **downstream** and **upstream** activities
 - ▶ Since 2015 downstream standards developed in WG1 (see Back Up Slides => 7/33 downstream projects)
 - ▶ However engineering competencies , industries and operators are not the same for both streams
- ▶ Downstream activities need to be addressed in a specific WG with clarified scope to:
 - ▶ Federate experts, industries and operators in this domain
 - ▶ Highlight and strengthen downstream activities in ISO/SC14
 - ▶ Develop common international downstream standards to promote this market (which is also pulling global Space market)
 - ▶ Support large-scale deployment of space services and applications, including safety and critical ones (eg disaster management)

Downstream Standards: Standards relating to exchange, processing and utilization of space mission data in support of end user applications

Upstream Standards: standards relating to the design, development, testing, launching and operation of space and on-ground associated systems and products



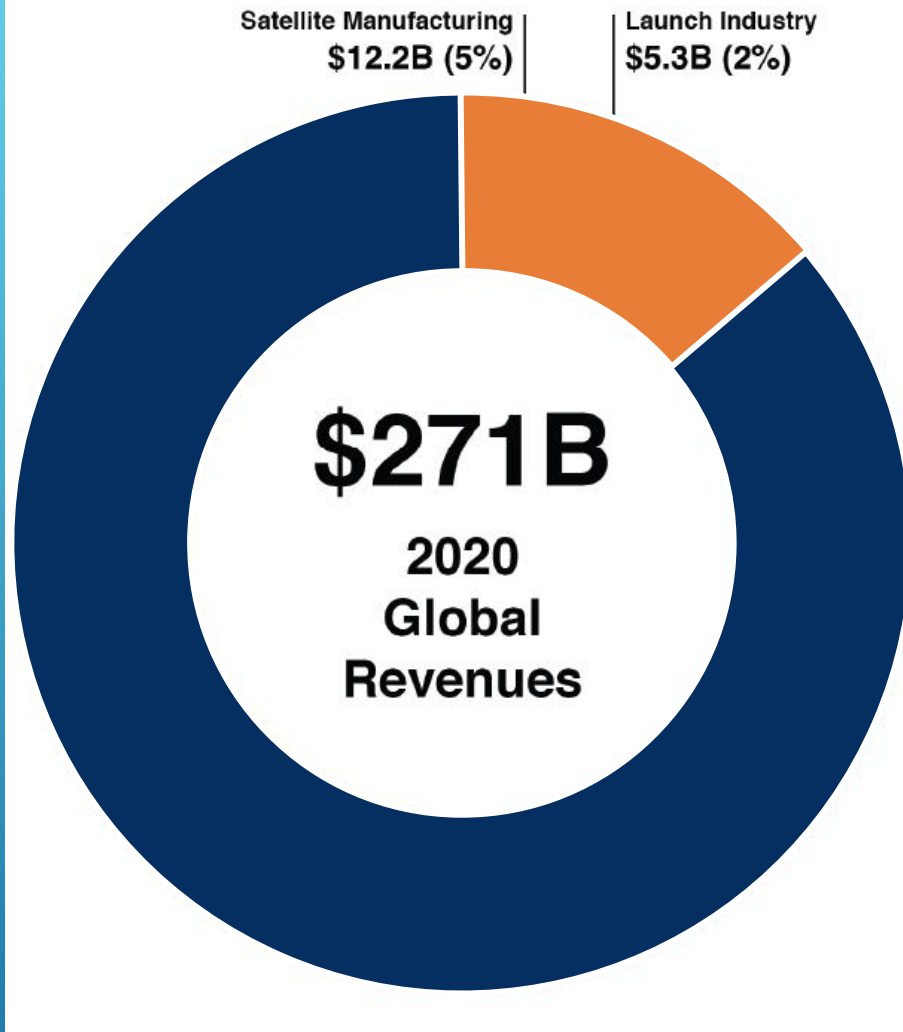
Downstream

Upstream

RATIONALE

2/2

2020 Top-Level Global Satellite Industry



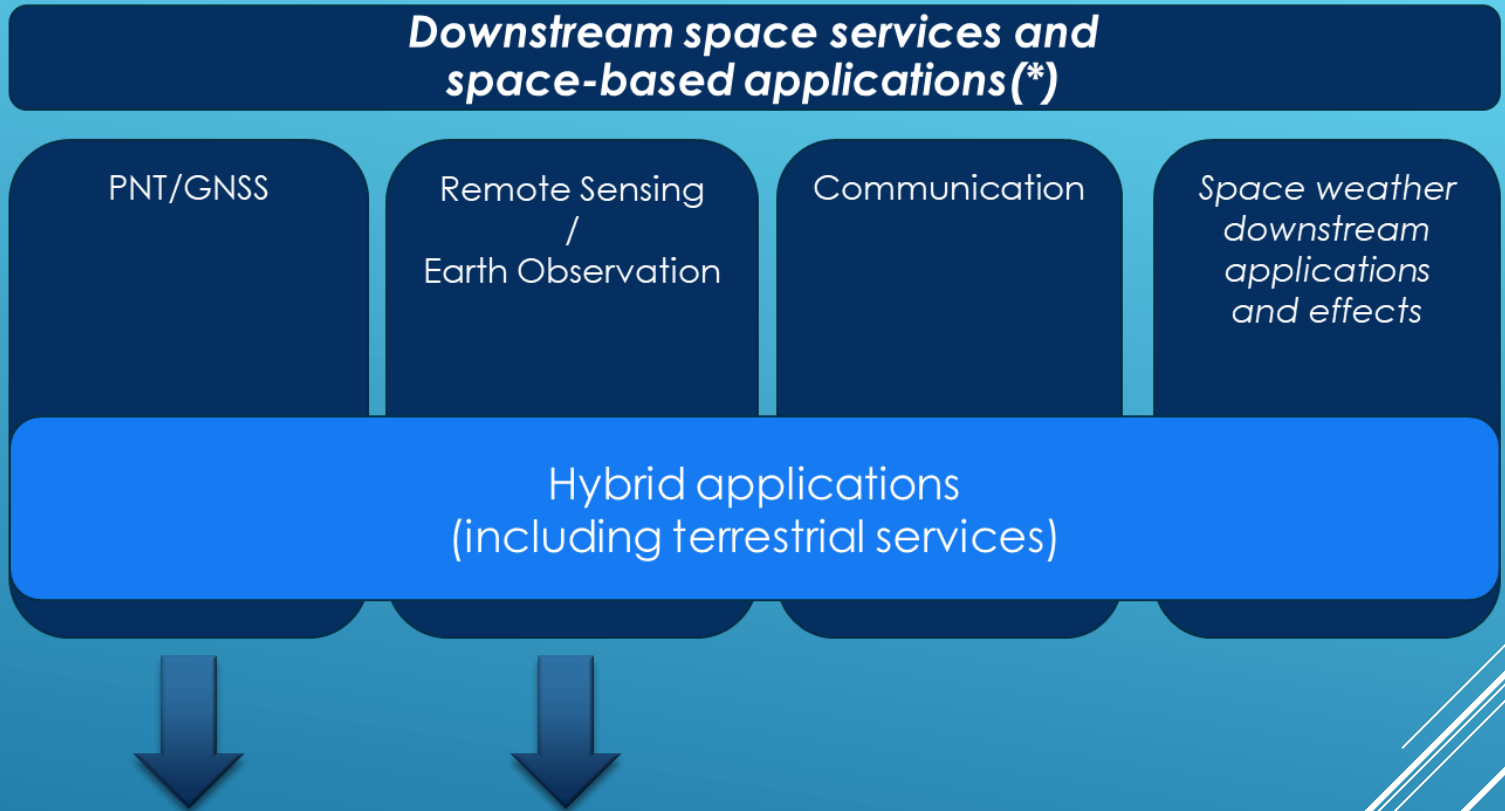
Source: BRYCE, SIA State of Satellite Industry Report 2021

Downstream Standards: Standards relating to exchange, processing and utilization of space mission data in support of end user applications

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POTENTIAL STRUCTURE



Current projects	6	1	-	-
Potential projects (NWIP)	4	1	-	-

(*) Terrestrial, Maritime, Aeronautical, Space

- ▶ **ISO 18197** Space systems — Space based services requirements for centimetre class positioning (**PUB 2015**)
- ▶ **ISO 22591** Space systems — Space-based services for a high accuracy positioning system with safety requirements (**PUB 2021**)
- ▶ **ISO 24246** Space systems — Requirements for GNSS positioning augmentation centers (**PUB 2022**)
- ▶ **ISO 24245** Space systems — Global navigation satellite system (GNSS) receiver class codes (**Next step : FDIS**)
- ▶ **ISO 13657** Space systems — Space-based services — Positioning information exchange service (**Next step: CD**)
- ▶ **ISO 16215-1** Space systems — Space-based positioning, navigation and timing (PNT) services — Part 1: architectural basis (**Next step: CD**)

PNT / GNSS

CURRENT ISO TC20 SC14 WG1 WORK PROGRAM

- ▶ *ISO 20930 Space systems — Calibration requirements for satellite-based passive microwave sensors (PUB 2018)*

REMOTE SENSING / EARTH OBSERVATION

**CURRENT ISO TC20 SC14 WG1
WORK PROGRAM**

- ▶ **NWIP XXXXX** Use of GNSS-based positioning for road Intelligent Transport Systems (ITS)
 - ▶ **Part 1, Part 2 and Part 3 are published. Part 4 on-going.**
 - ▶ Methodologies developed in European Normalization series could be used on others domains than road domain

PNT / GNSS

POTENTIAL ALREADY IDENTIFIED
TC20 SC14 WG1 NEW PROPOSALS

- ▶ **NWIP 17459** Space systems — Positioning management for optical Earth observation (**NWIP ballot by 13th June 2022**)


REMOTE SENSING / EARTH OBSERVATION

POTENTIAL ALREADY IDENTIFIED
TC20 SC14 WG1 NEW PROPOSALS

LEADERSHIP

- ▶ *France proposes to convene the WG.*

SCHEDULE

- ▶ Meeting FR/JP for discussion on the creation of a new WG : 23rd November 2021
- ▶ 2nd Meeting FR/JP for follow-up of the discussion : 28th March 2021
 - ▶ Drafting of the resolution
- ▶ Official request to SC14 Secretary to add this topic at the June '22 Plenary agenda : Beg. April 2022
- ▶ Information to HODs and WG Convenors : 9th June (email)
- ▶ New WG Proposal - Presentation FR/JP to WG1 members : Spring meetings 2022 (22nd June)
- ▶ New WG Proposal - Presentation of the Resolutions to SC14 members : 24th June, Plenary 2022
- ▶  Launch of the resolutions in CIB Ballot : Summer 2022
- ▶ Call for experts under 6 weeks after official creation
- ▶ 1st WG meeting under 12 weeks after official creation

RESOLUTION #1

NO. XX Establishment of WG8 Downstream space services and space-based applications

ISO/TC 20/SC 14 decides to set up WG8, entitled "Downstream space services and space-based applications" after a call for experts of a duration of 6 weeks.

- Projects allocated: From list in enclosed pages*
- First meeting: Date will be set within 12 weeks.*

RESOLUTION #2

- ▶ *NO. XX Definition of the Scope of WG8 Downstream space services & space-based applications.*
- ▶ *ISO/ TC 20/SC 14 decides to define the scope of the new WG "Downstream space services & space-based applications" as below :*
- ▶ *This new WG will be dedicated to space downstream standardization activities including*
 - ▶ *Space services (data, products) :*
 - PNT (Position, Navigation and Timing)/GNSS
 - Remote sensing/Earth observation
 - Communication (mobile, fixed, internet access, digital broadcasting, IoT,)
 - Space weather downstream applications and effects
 - ▶ *Space-based applications specified for dedicated user (data, products) (supported by Space services)*
- ▶ *This would include :*
 - ▶ *definition of terminology,*
 - ▶ *system performances definition,*
 - ▶ *tests procedures,*
 - ▶ *characteristics of embedded equipment (GNSS, telecom, earth observation...)*
 - ▶ *Products, Data , Signals, Interfaces , ... specification*
 - ▶ *etc.*

RESOLUTION #3

*NO. XX Appointment of Convenor for WG8
Downstream space services & space-based
applications.*

*ISO/TC 20/SC 14 decides to convene a new
Working Group "Downstream space services &
space-based applications".*

ANSWER TO PLENARY COMMENTS 1/2

QUESTION

Which standards could be hosted by the new group?

ANSWER

-12 candidates in total. Project Leaders decide host WG according to Form 4 and relevant forms.

7 existing:

*ISO 18197, ISO 20930, ISO 22591, ISO 24246
ISO 24245, ISO 13657, ISO 16215-1*

5 potential identified:

NWIP from European EN -1, -2, -3 and -4.

-see details (title, date) in slides 8-9-10-11 inside this document

ANSWER TO PLENARY COMMENTS 2/2

COMMENT

Some satellite communication standards and GNSS standards are already hosted by other WG. We need to avoid duplication.

ANSWER

-As a reminder, this new WG would deal with downstream standardization (see slides 5 & 6 - Rationales in this document).

-All parts dedicated to upstream (satellite operation, launching, ...) will not be addressed by the new WG.

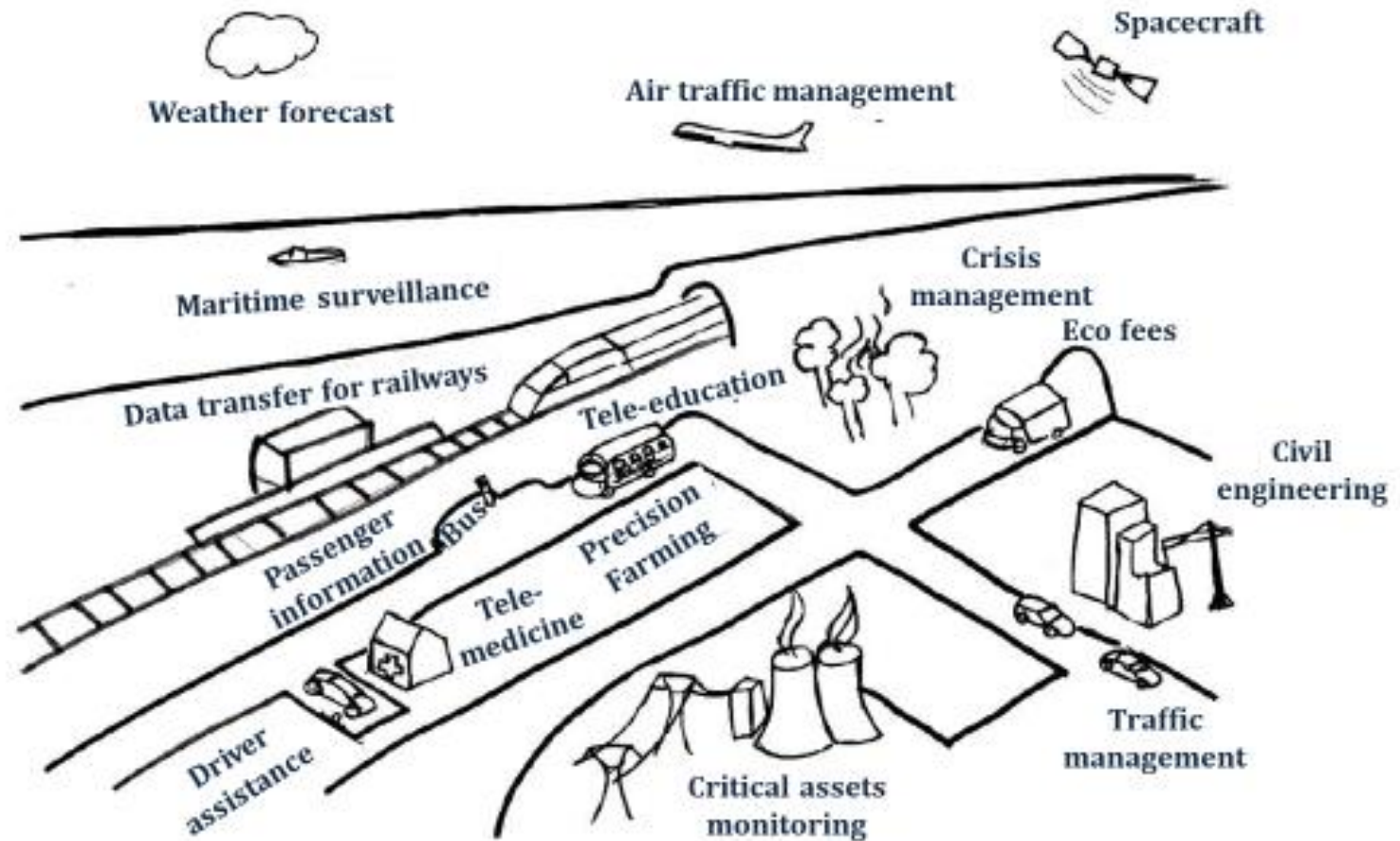
*-In order to be sure to avoid useless work, liaison could be establish with the following WG:
ISO TC204 , ISO TC211, ISO TC20/SC16, 3GPP, RTCM, NMEA*

Downstream Standards: Standards relating to exchange, processing and utilization of space mission data in support of end user applications

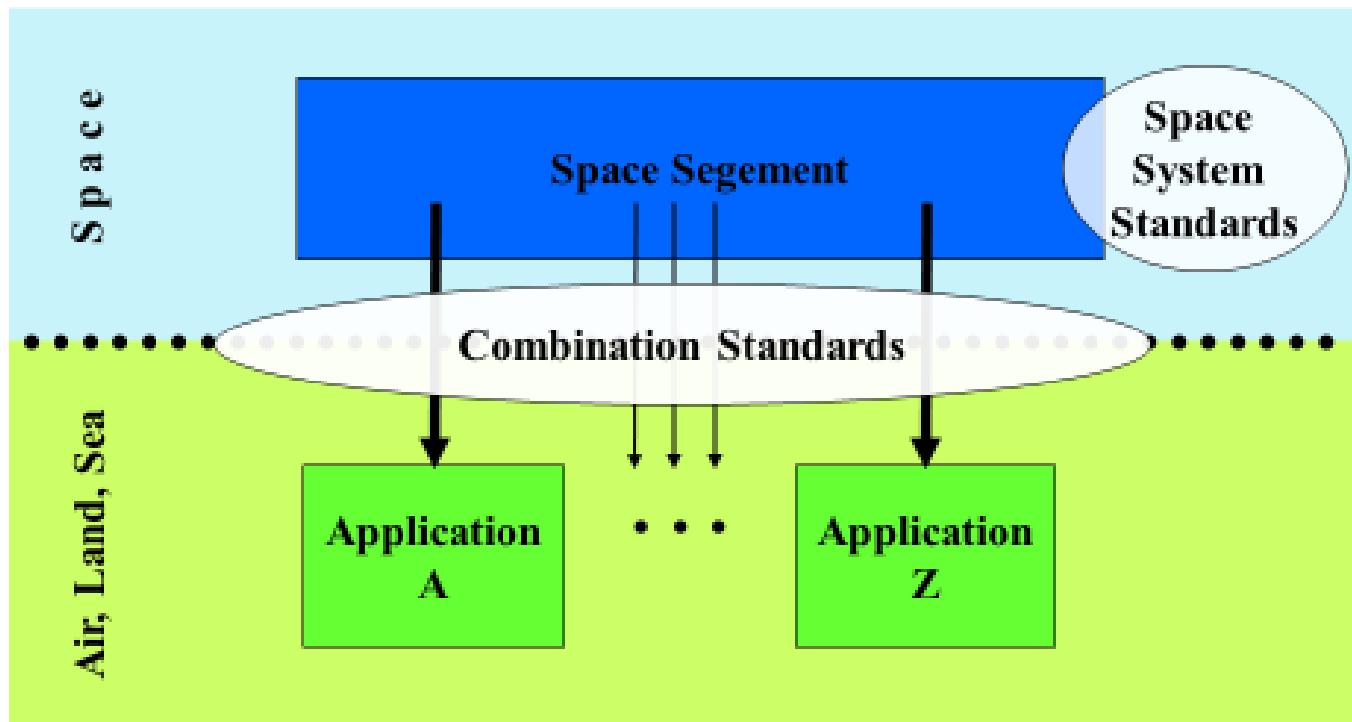
Upstream Standards: standards relating to the design, development, testing, launching and operation of space and on-ground associated systems and products

REFERENCE INFORMATION

EXAMPLES OF SPACE-BASED APPLICATIONS



Note: Ms. Alice de Cananove of France drew the above figure in 2011. The letters have overwritten using Cambria Font that ISO adopts.



Note: M. Kei Ichiro Eshima has recurringly issued the above figure and concept in ISO/TC 20/SC14 and its WG1 in past important meetings.

DOWNSTREAM SPACE SERVICES & SPACE-BASED APPLICATIONS

W1 Work Program March 2022

Upstream
Downstream

Project	Project Title
10785	*Bellows — Design and operation
10786	*Structural components and assemblies
14302	*Electromagnetic compatibility requirements
14622	*Structural design — Loads and induced environment
14623	*Pressure vessels and pressurized structures — Design and operation
14953	*Structural design — Determination of loading levels for a static qualification test of launch vehicles
14954	*Dynamic and static analysis — Exchange of mathematical models
15387	*Single-junction solar cells — Measurements and calibration procedures
16454	*Structural design — Stress analysis requirements
16781	*Simulation requirements for control system
17546	*Lithium ion battery for space vehicles — Design and verification requirements
17770	*Cube satellites (CubeSats)
18197	*Space based services requirements for centimeter class positioning
19683	*Design qualification and acceptance tests of small spacecraft and units
20780	*Fiber optic components — Design and verification requirements
20891	*Space batteries — Guidelines for in-flight health assessment of Li-ion batteries [Tech Rpt]
20930	*Calibration requirements for satellite-based passive microwave sensors
20991	*Requirements for small spacecraft [Tech Spec]
21347	*Fracture and damage control
21442	*General requirements for control engineering
21648	*Flywheel module design and test
22010	*Mass properties control
22591	*Space-based services for a high accuracy positioning system with safety requirements [Tech Spec]
23038	*Space solar cells — Electron and proton irradiation test methods
23835	*Mechanism design and verification
24245	*Global Navigation Satellite System (GNSS) receiver class codes
24246	*Requirements for Global Navigation Satellite System (GNSS) positioning augmentation centers
24637	*Electromagnetic interference (EMI) test reporting requirements
24638	*Pressure components and pressure system integration
26871	*Explosive systems and devices
N0949	*Design qualification and acceptance tests of small-scale satellite and units seeking low-cost and fast-delivery
N2032	*Space-based services — Positioning information exchange service
N2045	*Space-based positioning, navigation and timing (PNT) services — Part 1: Architectural basis

FOR GNSS-RELEVANT AREA

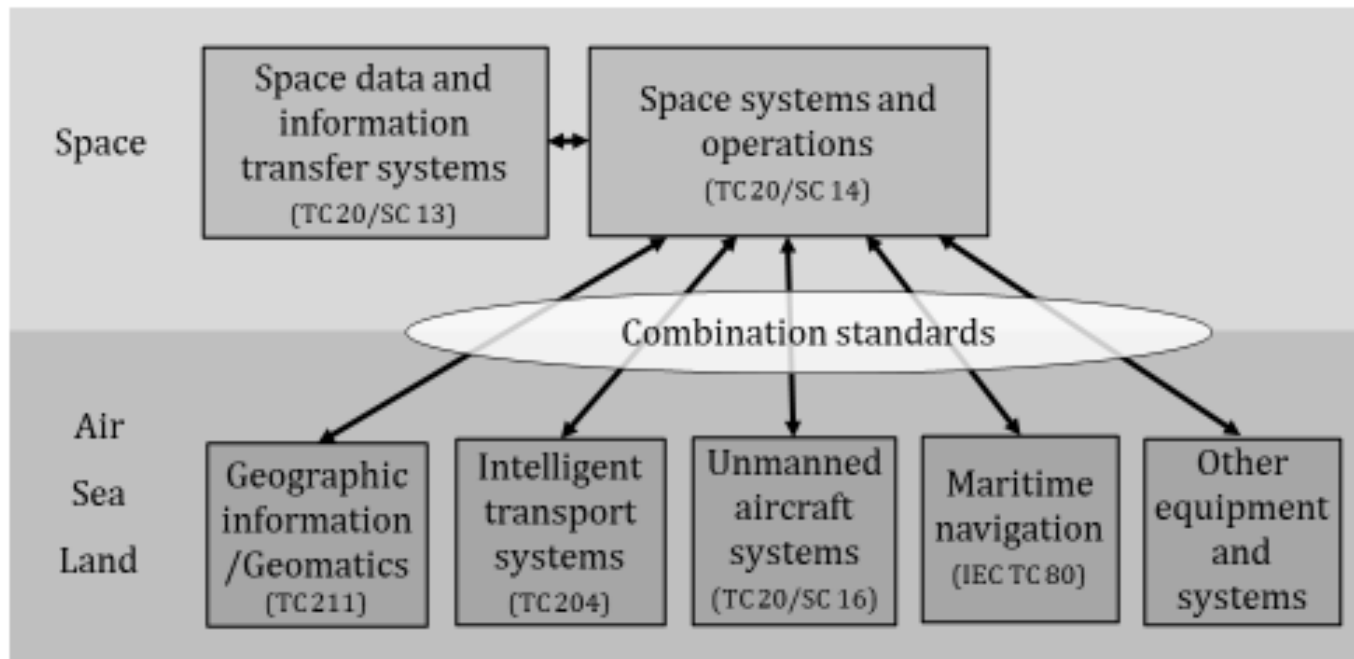
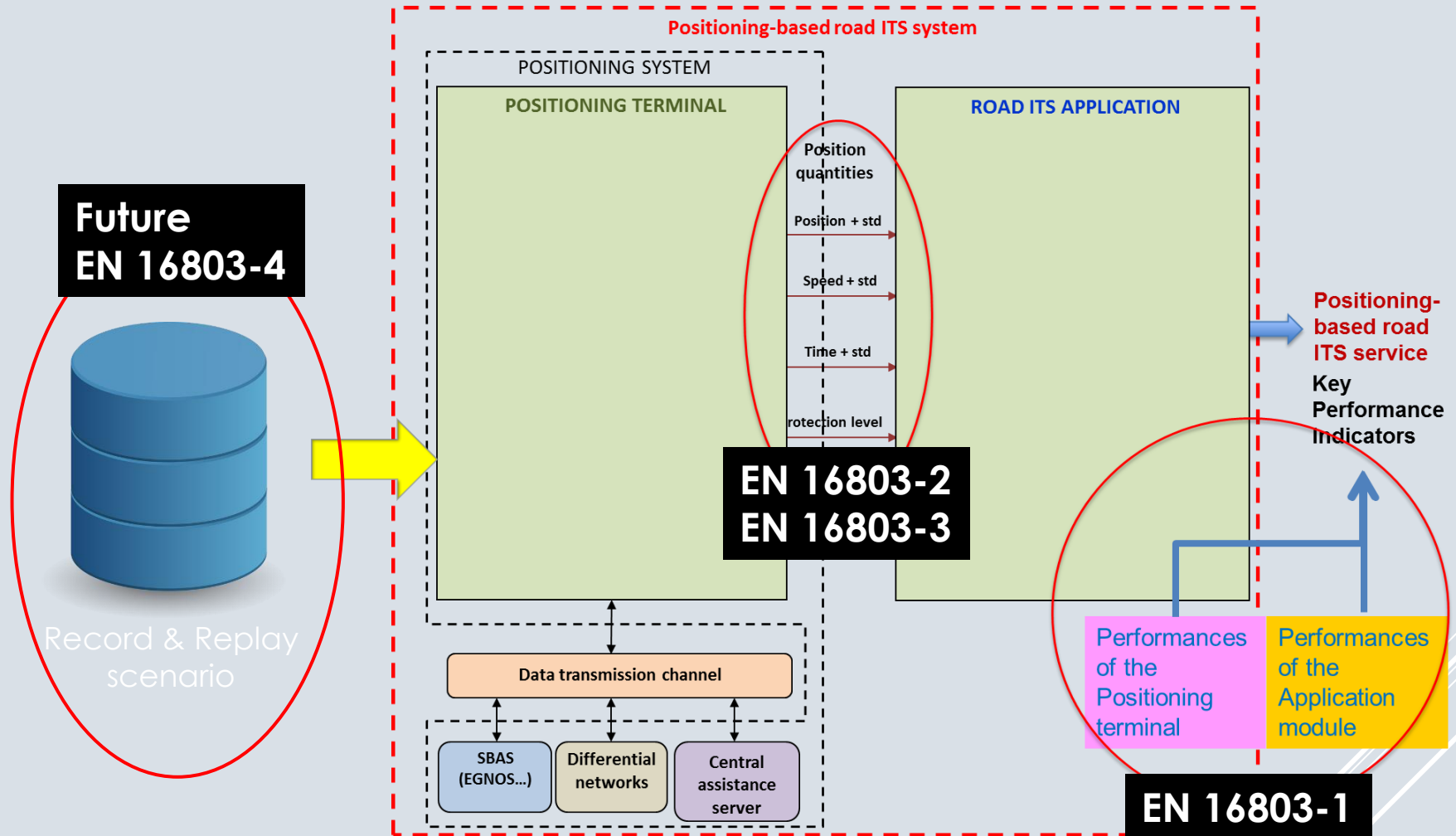


Figure 1 — Standardization of space-based services (GNSS-relevant area)

Note: ISO head office of Geneva has reviewed and changed this figure in 2019-2020, based on the ISO editing rules of standard documents.

EN 16803 series



Potential New Work Proposal

16803-1
Published

Use of GNSS-based positioning for road Intelligent Transport Systems (ITS) - Part 1: Definitions and system engineering procedures for the establishment and assessment of performances : *this standard defines an overall framework and operational procedures for the establishment of road ITS systems performances based on GNSS*

16803-2
Published

Use of GNSS-based positioning for road ITS - Part 2: Assessment of basic performances of GNSS-based positioning terminals : *this standard defines field and "Record and Replay" testing procedures to assess the basic performances (Availability, Accuracy and Integrity) of the GNSS-based positioning terminals*

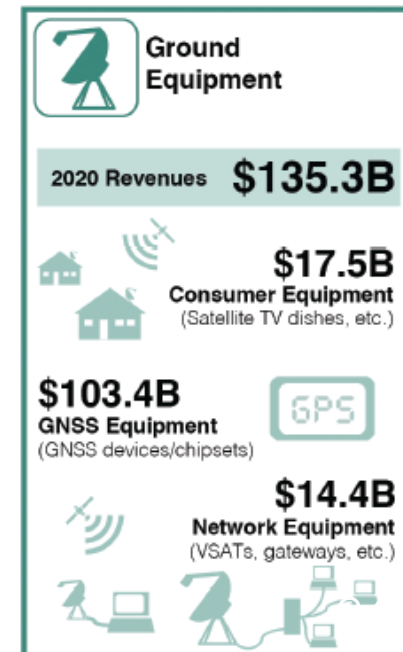
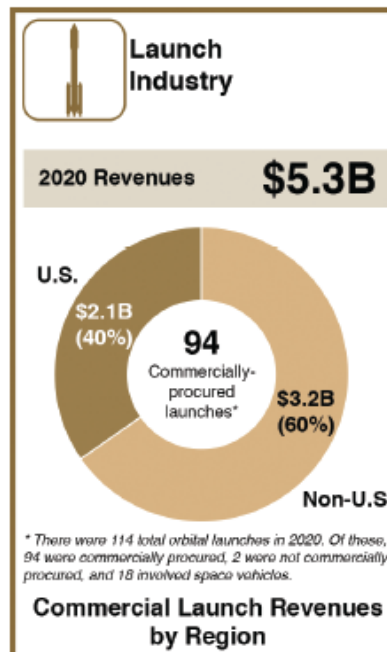
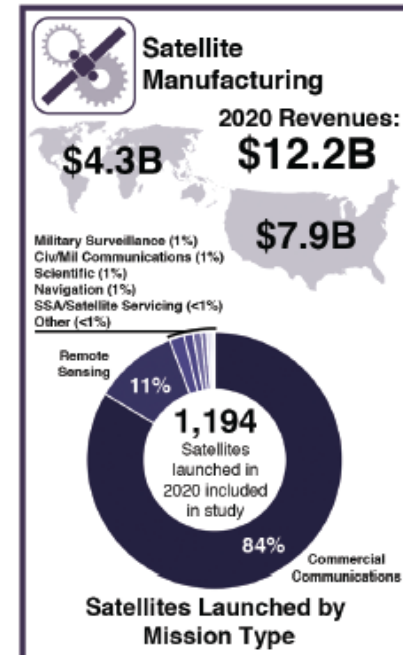
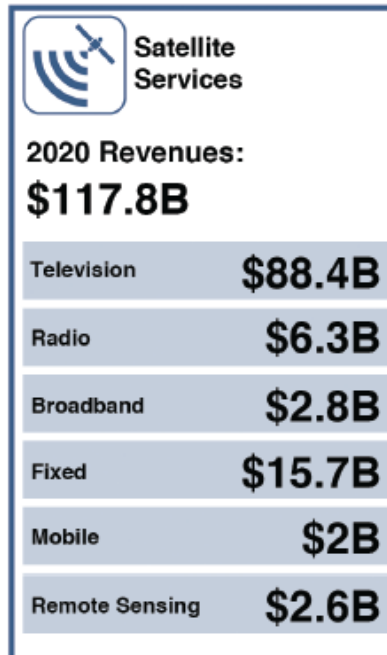
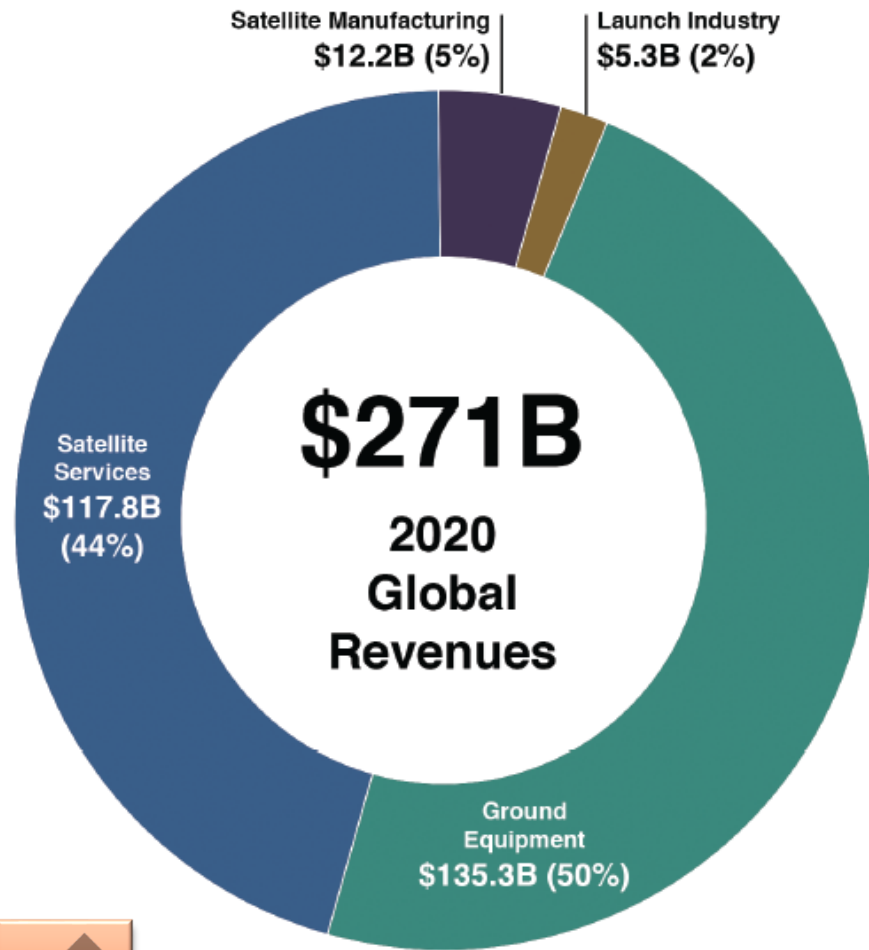
16803-3
Published

Use of GNSS-based positioning for road ITS - Part 3: Assessment of security performances of GNSS-based positioning terminals : *this standard defines field and "Record and Replay" testing procedures to assess the performances of GNSS-based positioning terminals submitted to RF attacks such as spoofing or jamming or non-intentional interferences*

16803-4

Use of GNSS-based positioning for road ITS - Part 4: Definitions and system engineering procedures for design and validation of recorded scenarios (TBC) : *this standard will define the way the data files are built and validated.*

2020 Top-Level Global Satellite Industry Findings



Source: BRYCE, SIA
State of Satellite Industry Report 2021