



ROSCOSMOS

GLONASS GLOBAL SATELLITE NAVIGATION SYSTEM STATUS AND USE

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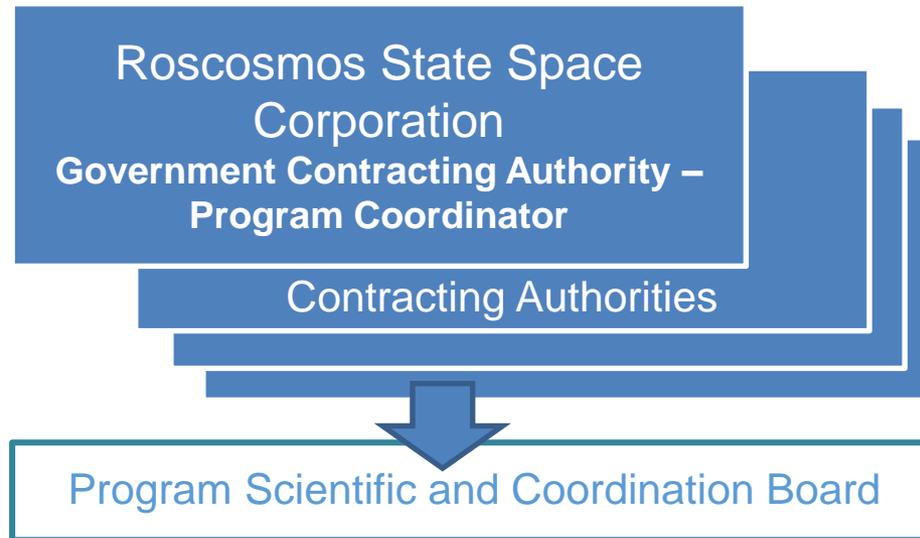
United Nations/Fiji Workshop on the applications of global navigation satellite systems,

Suva, Fiji

June 24, 2019

NATIONAL SATELLITE NAVIGATION POLICY

- ❑ Presidential Decree of May 17, 2007 No. 638 On Use of GLONASS (Global Navigation Satellite System) for the Benefit of Social and Economic Development of the Russian Federation
- ❑ Federal Program on GLONASS Sustainment, Development and Use for 2012-2020 – baseline for GLONASS development and use funding
- ❑ Budget planning for the forthcoming decade – GLONASS – 2030
- ❑ Program governance:



Program Goals:

- ❑ Improving performance – its navigation accuracy and integrity
- ❑ Ensuring navigation solutions under conditions of limited visibility of satellites, interference and jamming
- ❑ Enhancing of efficiency and scope of application

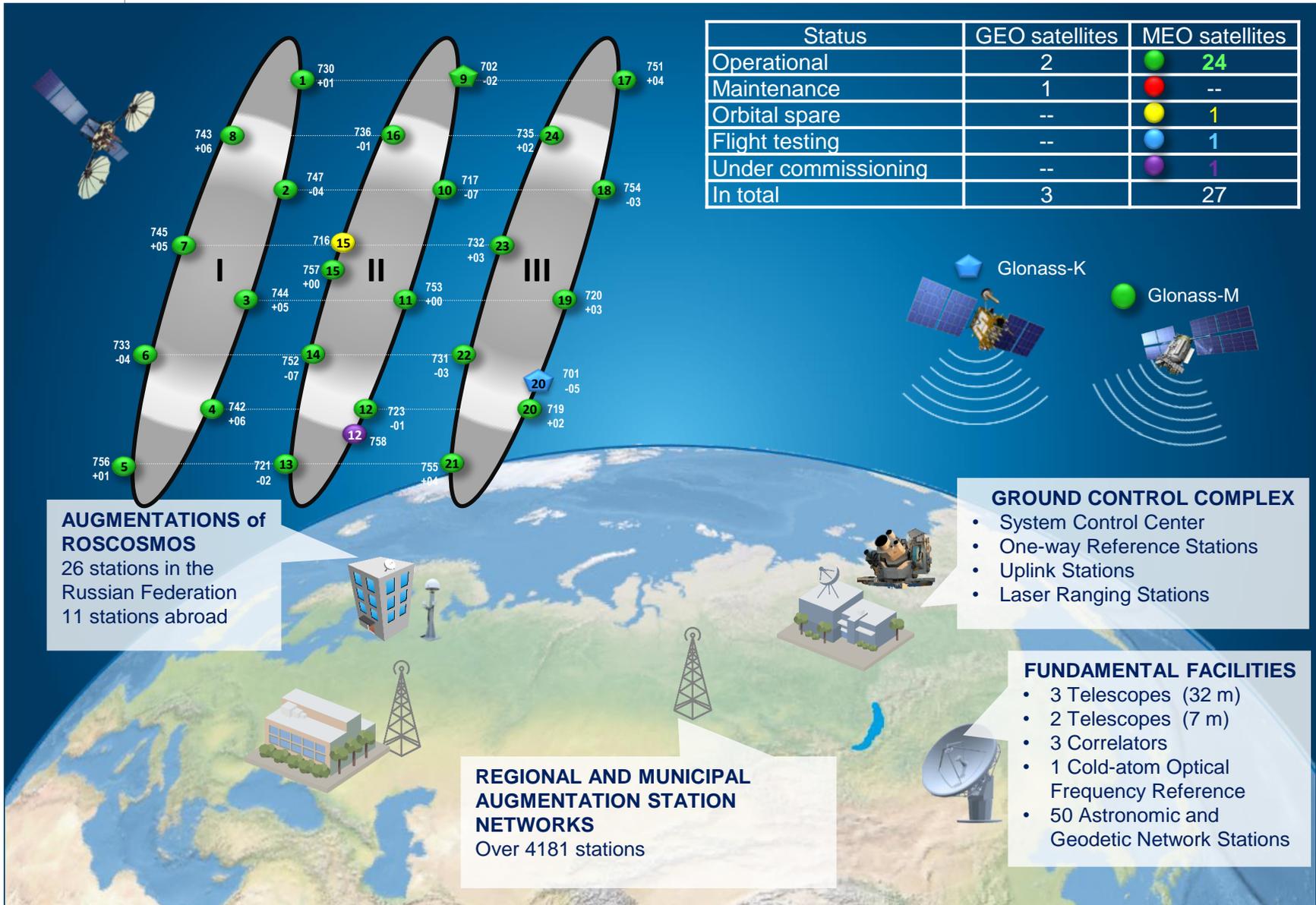


Accuracy improvement by means of:

- Ground Segment modernization
- introduction of new onboard synchronizing device with enhanced performance
- introduction of advanced satellite control and command, orbit and clock determination technologies based on intersatellite communication link in RF and optical bands
- transition to PZ-90.11 Geodetic System aligned to the ITRF with mm error level
- synchronization of GLONASS Time Scale with UTC(SU) with error less than 2 ns

GLONASS STATUS (AS OF 23.06.2019)

Status	GEO satellites	MEO satellites
Operational	2	 24
Maintenance	1	 --
Orbital spare	--	 1
Flight testing	--	 1
Under commissioning	--	 1
In total	3	27



The constellation provides continuous global navigation

Glonass-M satellites

- 2 Glonass-M satellites were launched in 2016 (February 7th and May 29th)
- 1 Glonass-M satellite was launched by Soyuz-2.1b LV in 2017 (September 22nd)
- 1 Glonass-M satellite was launched by Soyuz-2.1b LV in 2018 (June 17th)
- 1 Glonass-M satellite was launched by Soyuz-2.1b LV in 2018 (November 3rd)
- 1 Glonass-M satellite was launched by Soyuz-2.1b LV in 2019 (May 27th)

Glonass-M launch
on September 22nd,
2017



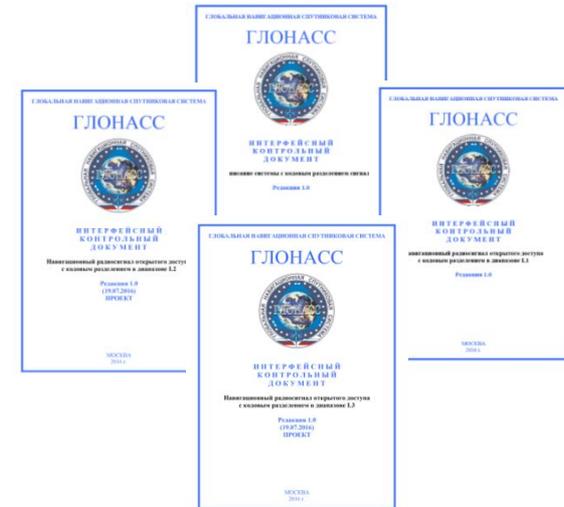
Glonass-M launch
on May 27th, 2019



GLONASS INTERFACE CONTROL DOCUMENTS

Released at <http://russianspacesystems.ru>

- Interface Control Document “General Description of Code Division Multiple Access Signal System”
- Interface Control Document “Code Division Multiple Access Open Service Navigation Signal in L1 frequency band”
- Interface Control Document “Code Division Multiple Access Open Service Navigation Signal in L2 frequency band”
- Interface Control Document “Code Division Multiple Access Open Service Navigation Signal in L3 frequency band”

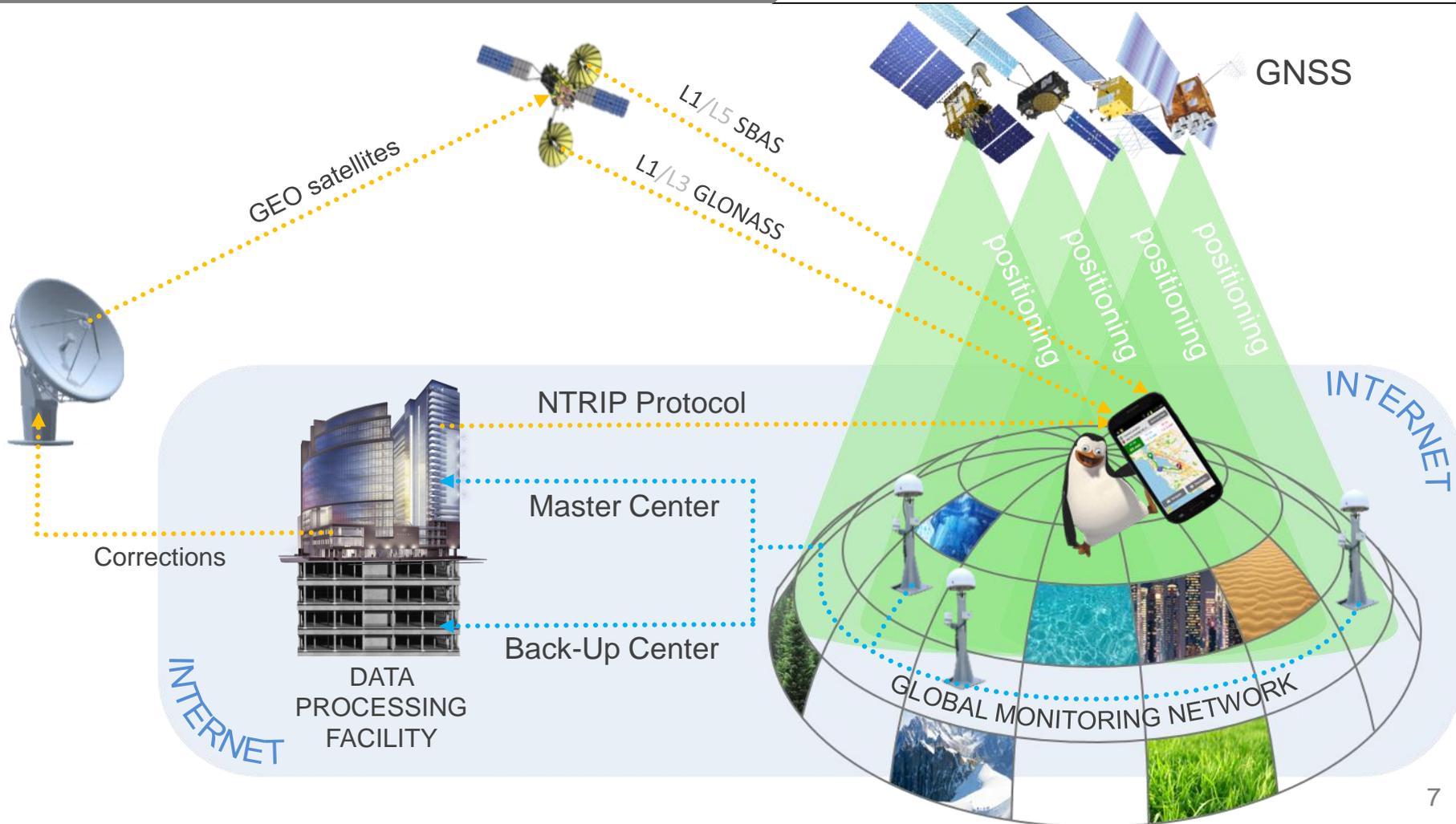


Type of difference	FDMA signal reference documents	CDMA signal reference documents
Variable number of SVs	0 to 24	0 to 63
Message structure	Fixed structure “superframe/frame/string”	Continuous sequence of strings, non-fixed length, variable composition depending on the number of operational SCs, types of strings can be added, backward compatibility with receivers currently in use
Time stamp length	30 bits	12 bits
Value of LSB	0.4 m	0.001 m
Signal health status periodicity	1 per 4 sec	1 per 2 sec for L1 and L2 1 per 3 sec for L3

GLONASS AUGMENTATIONS

All types of augmentations to support all types of high accuracy services are developed and continue to expand in the Russian Federation

- station network densification
- space segment modernization
- service coverage extension



GNSS MONITORING AND PERFORMANCE ASSESSMENT SYSTEM

- Independent monitoring and verification of performance characteristics against system requirements
- Generating input data to assess GLONASS Program KPIs
- Measuring user level GLONASS performance
- Providing input data for GLONASS certification



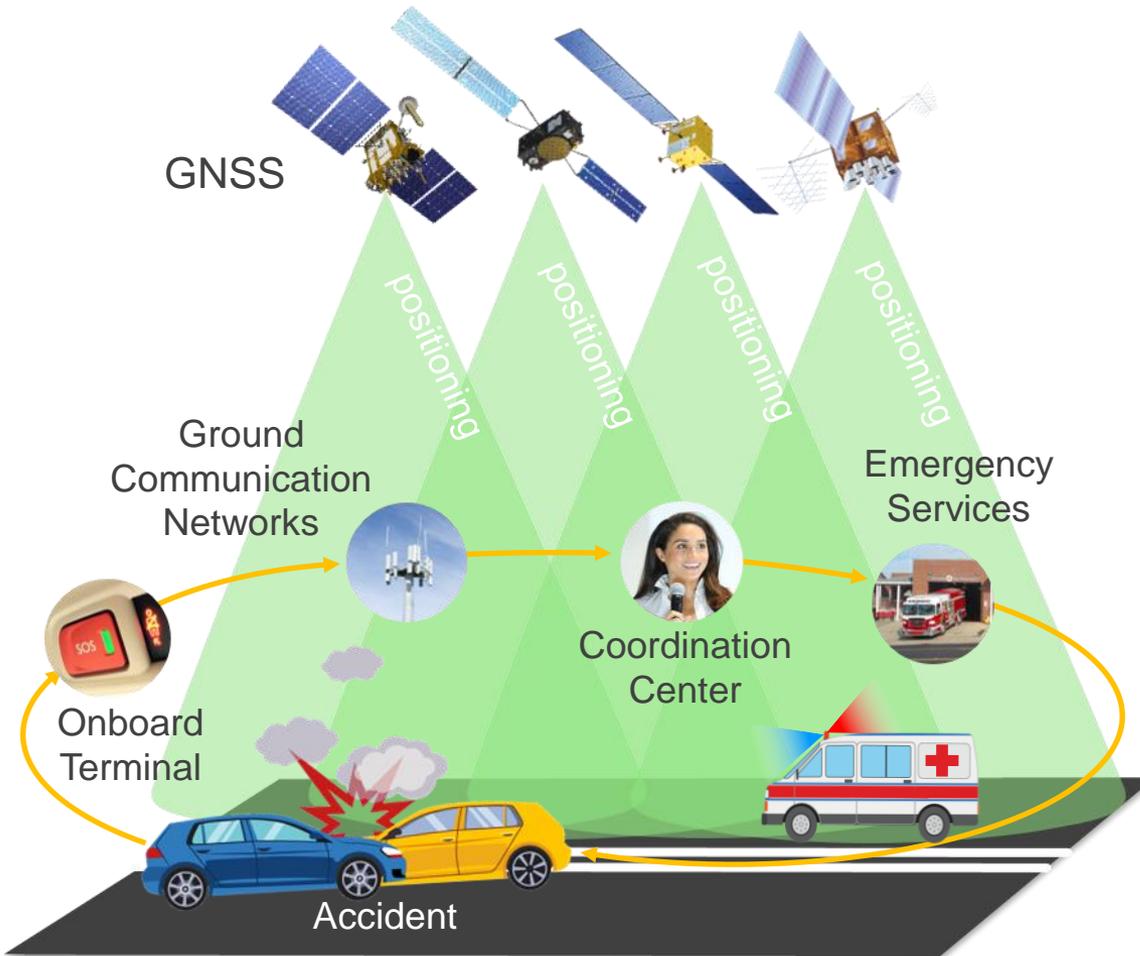
GLONASS CIVIL SERVICES

Name	Users	Current value	Means
<p>1 BASIC OPEN SERVICE</p> <p>Navigation in absolute regime using open signals code measurements</p>		2 m	SPACE SEGMENT
<p>2 SERVICE OF IMPROVED RELIABILITY AND ACCURACY</p> <p>Navigation in absolute regime using code measurements and information from wide area, regional and local augmentation systems</p>		1 m	SYSTEM FOR DIFFERENTIAL CORRECTION AND MONITORING
<p>3 RELATIVE NAVIGATION SERVICE</p> <p>Navigation in relative regime using phase measurements and a reference receiver (reference station)</p>		0,03 m	NATIONAL SYSTEM FOR HIGH-ACCURACY POSTIONING
<p>4 HIGH-PRECISION SERVICE</p> <p>Navigation in absolute regime using phase measurements (PPP) on a commercial basis</p>		0,1 m	HIGH-PRECISION SYSTEM FOR OBTAINING THE NAVIGATION AND EPHEMERIS-AND-TIME INFORMATION

PROVIDING USERS WITH GLONASS-BASED SERVICES



ERA-GLONASS STATE EMERGENCY SYSTEM FOR TRAFFIC ACCIDENTS RESPONSE

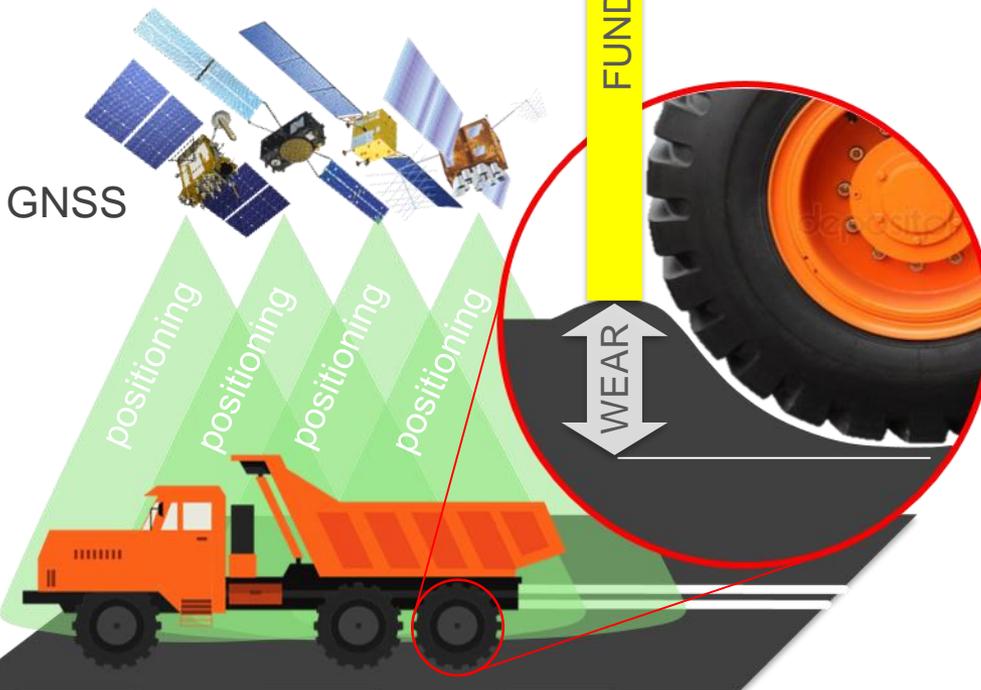


Integration of the opportunities provided by telecommunication, navigation, information technologies and microelectronics aimed at people's life and health safety



- In operation since January 1, 2016
- All new vehicles are equipped with ERA-GLONASS since January 1, 2017
- 30% reduction of time to respond to an accident
- 2.8 million calls processed
- 3.55 million vehicles equipped
- Saving more than 4 thousand lives annually (if 100% fleet equipped)
- Emergency call is free of charge
- Commercial application potential: **smart insurance, property protection and crime prevention, traffic monitoring, toll collection, distant diagnostics and etc.**

PLATON RUSSIAN FEDERAL TOLL COLLECTION SYSTEM FOR CARGO TRUCKS



- PLATON – Russian nation-wide GLONASS/GPS based automatic toll collection system
- In operation since November 15, 2015
- All trucks over 12 tons are equipped
- All Federal-owned highways – 50.774 km in total
- 90% of the total fleet equipped – 467 thousand cargo companies and 1.14 million trucks registered
- **68.6 billion rubles collected for road infrastructure support**

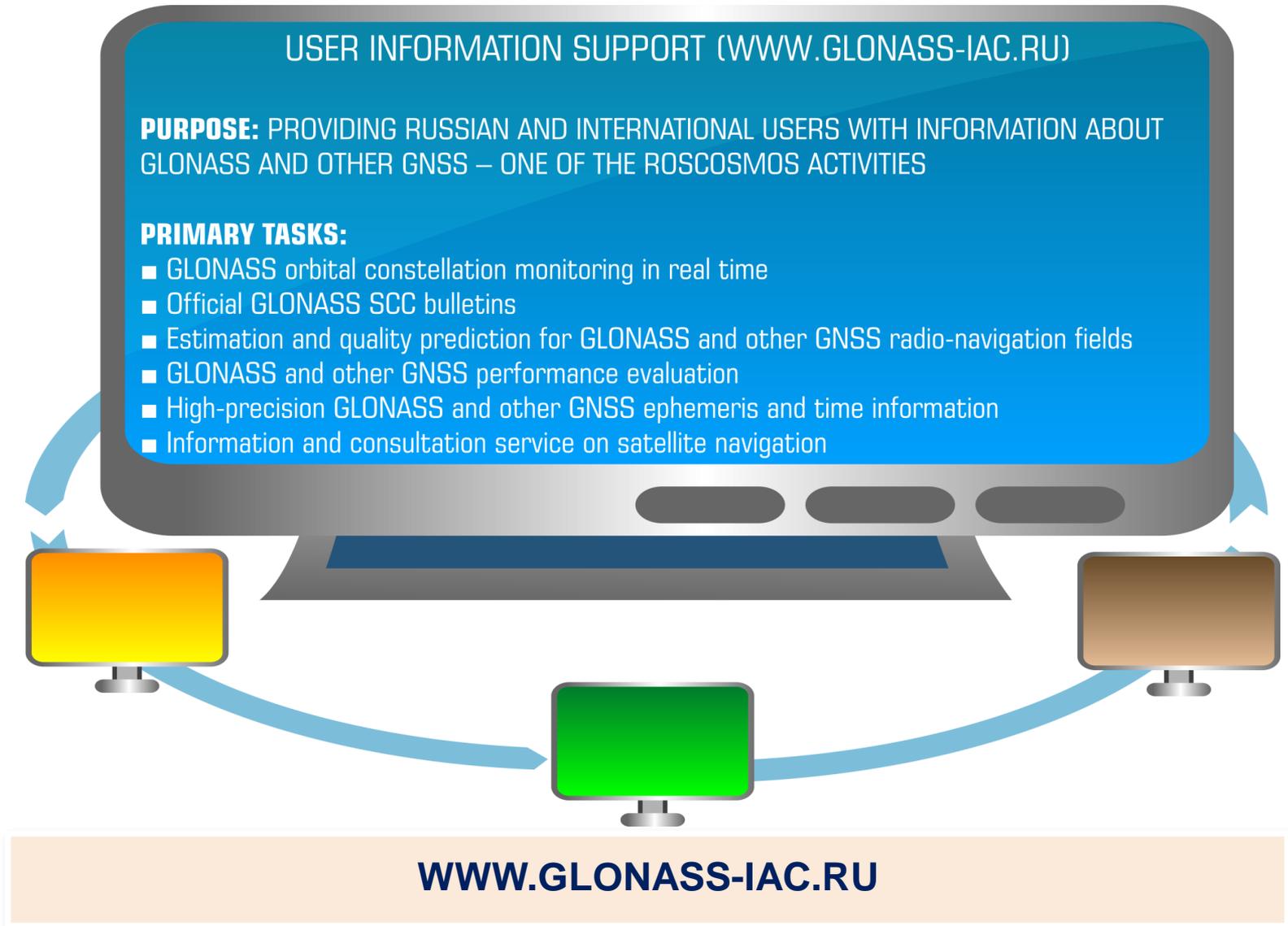
ROSCOSMOS STATE CORPORATION USER INFORMATION SUPPORT

USER INFORMATION SUPPORT (WWW.GLONASS-IAC.RU)

PURPOSE: PROVIDING RUSSIAN AND INTERNATIONAL USERS WITH INFORMATION ABOUT GLONASS AND OTHER GNSS – ONE OF THE ROSCOSMOS ACTIVITIES

PRIMARY TASKS:

- GLONASS orbital constellation monitoring in real time
- Official GLONASS SCC bulletins
- Estimation and quality prediction for GLONASS and other GNSS radio-navigation fields
- GLONASS and other GNSS performance evaluation
- High-precision GLONASS and other GNSS ephemeris and time information
- Information and consultation service on satellite navigation



**Thank you for your
attention!**