IMPROVEMENTS AT THE NASA SATELLITE LASER RANGING (SLR) OPERATIONS CENTER (OC) AND LEGACY STATIONS

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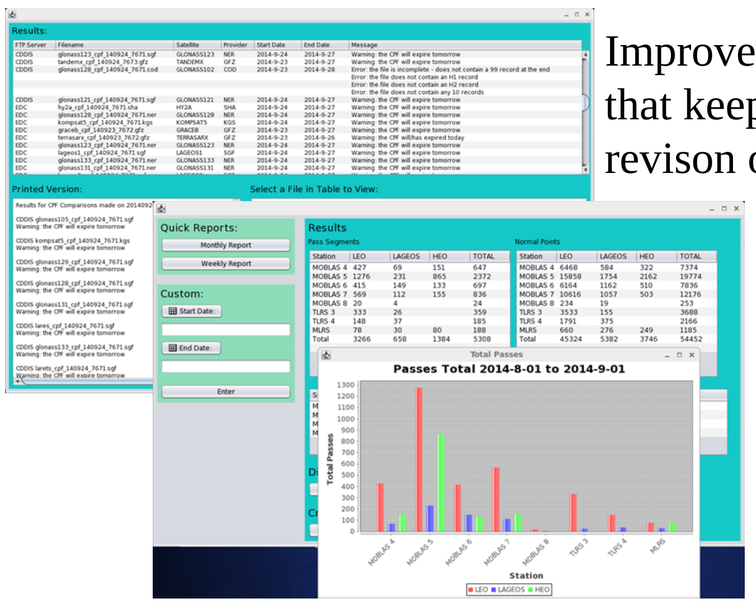
Operations (3028)

Abstract

The NASA Satellite Laser Ranging (SLR) Operations Center (OC) and Stations have been undergoing a series of changes to improve their efficiency, reliability, and performance, while also contributing to the overall International Laser Ranging Service (ILRS) network by providing new planning tools for the Central Bureau (CB). With these changes and improvements, the NASA SLR OC is better able to serve the SLR community. An overview of the changes and their impact are presented.

NASA SLR OC



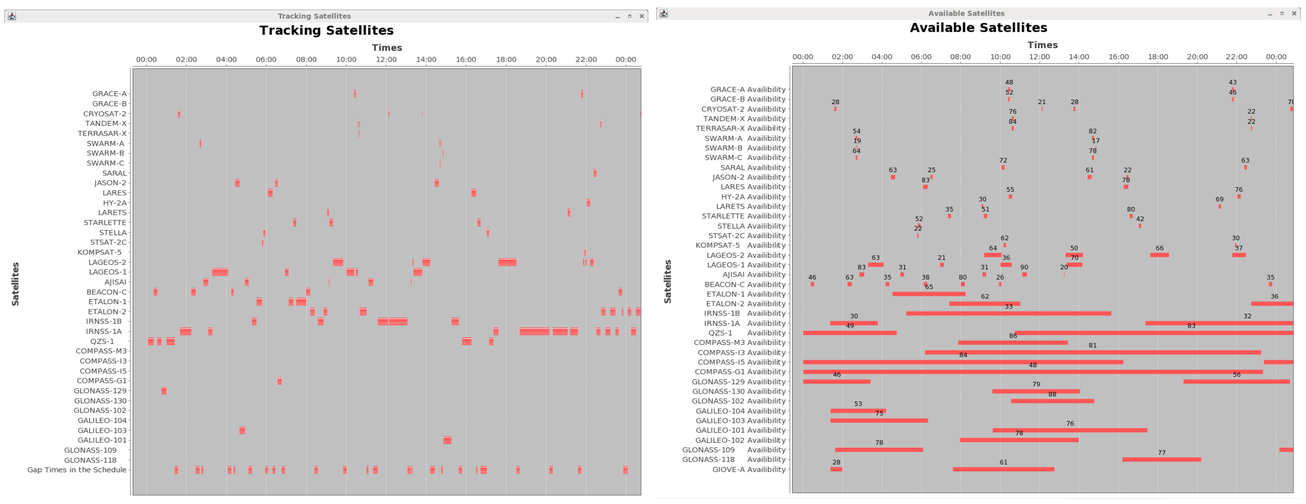
Images:
Left: CPF Check Results
Right: Report Generation: Passes/Points

Improvements at the NASA SLR OC have enhanced the efficiency of operations and include new tools that keep the network running smoothly. Changes include updating the prediction software to the latest revison of GEODYN II and building a standardized Graphical User Interface (GUI) for the SLR OC:

The SLR OC GUI includes the following tools that enhance operations:

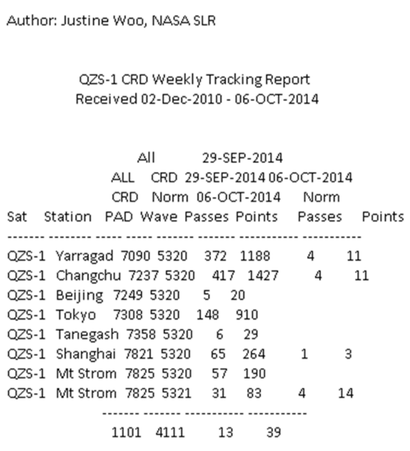
- Data Center Comparisons – Updated to provide more thorough checks
- Consolidated Prediction Format (CPF) Check – new tool that checks the CPFs for anomalies
- Monitoring of Normal Point (NPT) Errors – updated to reduce the amount of time taken to send error messages to station
- Report Generation: Passes/Points, RMS, Calibration Shift, System Delay, Weather – quickly generates reports pertaining to stations
- Schedule and Pass Visualizations – new tools used to support stations and queries

The GUI allows operators to more actively and efficiently generate reports and provide support to NASA stations and the ILRS network. The Data Center Comparisons, Monitoring of NPT Errors, and Report Generation tools reduce the amount of time operators need to spend doing these tasks. The CPF Check detects anomalies in the CPFs and also checks the expiration dates ; with early detection, the providers are alerted of errors in their CPFs before they become a processing error at the stations. Schedule Visualizations have been actively used by stations for scheduling including finding gap times for maintenance.



Images: Schedule Visualizations

Stations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QZS-1 CRD Weekly Tracking Report
Received 02-Dec-2010 - 06-OCT-2014

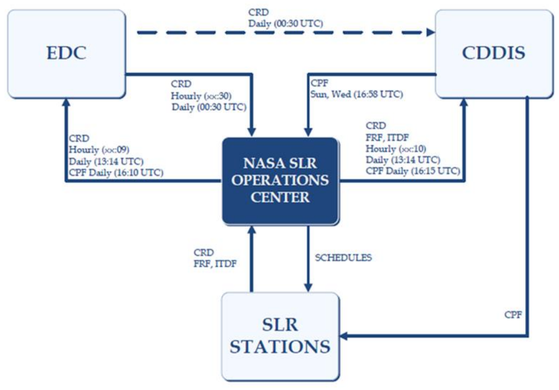
Sat	Station	PAD	All Wave	All Passes	All Points	29-SEP-2014 ALL CRD Passes	29-SEP-2014 ALL CRD Points	06-OCT-2014 Norm CRD Passes	06-OCT-2014 Norm CRD Points
QZS-1	Yarragad	7090	5320	372	1188			4	11
QZS-1	Changchu	7237	5320	417	1427			4	11
QZS-1	Beijing	7249	5320	5	20				
QZS-1	Tokyo	7308	5320	148	910				
QZS-1	Tanegash	7358	5320	6	29				
QZS-1	Shanghai	7821	5320	65	264			1	3
QZS-1	Mt Strom	7825	5320	57	190				
QZS-1	Mt Strom	7825	5321	31	83			4	14
				1101	4111			13	39

Images: Tracking Statistics for QZS-1

Updates to the stations + NASA SLR OC that affect the stations include:

- Simplifying retrieval of CPFs from the NASA SLR OC if the primary provider is temporarily offline
- Tracking Statistics – from manual generation to automatic process
- From IP address to URL based data transfer for flexible and seamless transition during IP provider or other outages
- New Radar test image system records all inputs simultaneously to steamline testing and evaluation

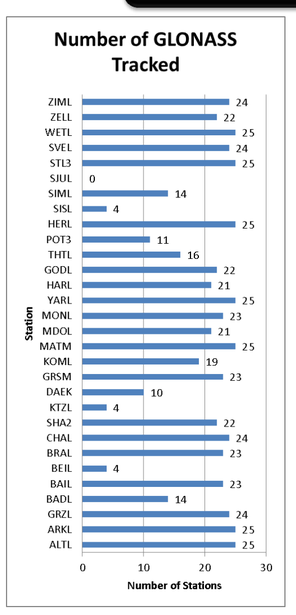
Data Centers



Images: Data Flow at NASA SLR OC

- Quality checks at the NASA SLR OC and the EDC have been aligned to filter SLR CRD data consistently.
- To ensure successful delivery to both data centers, the log files now contain delivery information and OC scripts were written to automate checks on data delivery. In cases of unsuccessful delivery or delay, the issues are now found more quickly..
- Remote monitoring of the OCs and DCs to check the status (online or offline) has been enhanced

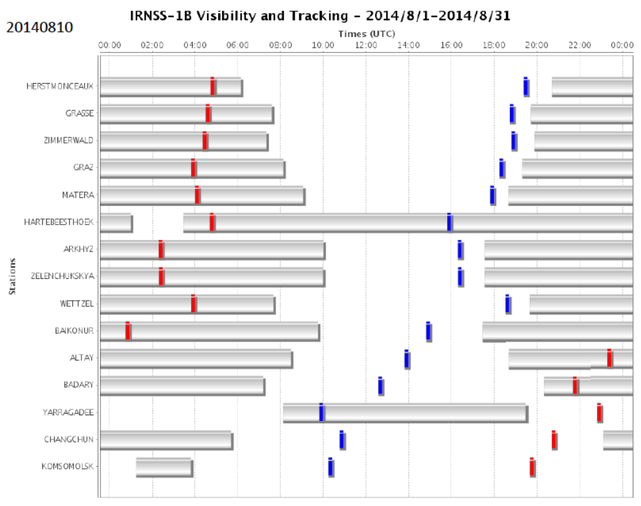
Central Bureau



The NASA SLR OC has been working to support the CB and various missions including the IRNSS and GNSS tracking campaigns. The OC has provided support through a various products including:

- Visualizations of IRNSS satellite pass visibility showing overlap to coordinate simultaneous ranging campaigns including sunrise and sunset times
- 1000 FR to NP Recipe: Tables on which stations are using the recipe and how often
- GNSS Tracking Campaign: Tracking Statistics for GNSS satellites

Points1000FRtoNP Total	AllSat	Lageos-1	Lageos-2	Lares	GNSS
90%+					
80-89%		GRZL,88%,176.0/201.0 CHAL,84%,243.0/291.0			GRZL,82%,889.0/1085.0
70-79%	GRZL,74%,5021.0/6806.0		CHAL,76%,90.0/119.0		
60-69%		SHA2,61%,23.0/38.0	SHA2,67%,8.0/12.0 GRZL,66%,119.0/180.0	GRZL,68%,362.0/534.0	
50-59%	CHAL,58%,3708.0/6391.0 SHA2,58%,294.0/511.0		KOML,57%,4.0/7.0	CHAL,52%,158.0/306.0	CHAL,54%,595.0/1093.0
40-49%	BEIL,48%,62.0/129.0 DAEK,45%,156.0/344.0	ZIML,40%,242.0/610.0		BEIL,47%,7.0/15.0 SHA2,41%,9.0/22.0	
30-39%		DAEK,38%,16.0/42.0		ALTL,37%,33.0/89.0	
20-29%	ZELL,28%,299.0/1055.0 KOML,22%,82.0/373.0	ALTL,21%,20.0/95.0 SVEL,21%,79.0/372.0	ZIML,22%,103.0/466.0	SVEL,23%,21.0/91.0	DAEK,28%,30.0/106.0 KOML,22%,66.0/306.0 BEIL,20%,1.0/5.0 SHA2,20%,15.0/76.0
10-19%	SVEL,18%,274.0/1548.0 ALTL,15%,168.0/1089.0 POT3,12%,13.0/112.0	BRAL,16%,28.0/179.0 KOML,14%,6.0/42.0	BEIL,17%,1.0/6.0		ALTL,11%,78.0/725.0 WETL,10%,42.0/417.0
0-9%	ZIML,6%,542.0/9386.0 STL3,5%,760.0/16542.0 BADL,4%,65.0/1479.0 BRAL,4%,29.0/705.0 MATM,2%,128.0/7032.0 WETL,2%,45.0/2929.0 ARKL,1%,10.0/1006.0	ZELL,7%,6.0/86.0 ARKL,6%,6.0/102.0 STL3,3%,24.0/919.0 MATM,1%,4.0/735.0	ALTL,6%,5.0/80.0 ZELL,3%,1.0/39.0 SVEL,2%,2.0/126.0 BRAL,0%,1.0/212.0 MATM,0%,1.0/587.0	ZELL,3%,3.0/104.0 BADL,1%,2.0/143.0 STL3,1%,5.0/704.0	MATM,9%,119.0/1372.0 SVEL,6%,14.0/247.0 ZIML,6%,106.0/1728.0 ARKL,0%,1.0/462.0 STL3,0%,2.0/2285.0



Images:
Right: GNSS Tracking Campaign Sample Statistic
Center: 1000 FR to NP Recipe Sample Table
Left: IRNSS Visibility for Stations