# UCAR COSMIC Support and Contribution to the IGS Real-time Service (RTS)

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## Abstract

Since March 2017 the UCAR COSMIC Program has been supporting the IGS by hosting the rt.igs.org Network Transport of RTCM via Internet protocol (NTRIP) caster and disseminating Real-time Service (RTS) GNSS observation data and products. The IGS Central Bureau and UCAR/COSMIC worked for several months to ensure a smooth transition of the RTS caster host infrastructure.

Our RTS caster servers are hosted at the National Center for Atmospheric Research Wyoming Supercomputing Center in Cheyenne, WY. The NTRIP caster runs on dedicated, redundant servers configured in a high availability architecture to ensure robust and high uptime service provision. In the event of a hardware failure, a failover occurs automatically within 5-10 seconds. No additional procedure or effort from users and providers is needed as the public facing IP interface remains the same. However, a small amount of data loss may be incurred on failover. Currently the caster usage statistics show 55 users accessing the RTS caster per hour on average.

In addition to hosting the IGS RTS caster, UCAR/COSMIC is also contributing real-time observation streams from a set of GNSS receivers. These receivers provide full GNSS tracking at 1 Hz from various locations around the world. Our poster provides further details on the IGS RTS caster infrastructure and configuration, failover procedures, usage statistics as well as a summary of the real-time observation data provided by our receiver network.

## Computational Architecture, RTS Caster Infrastructure and System Management

- Supported by High Availability (HA) Linux cluster located at NCAR Wyoming Supercomputing Center (NWSC) in Cheyenne (CH)
  - 24/7 support, redundant power and communication
  - NWSC and UCAR facilities connected via high-speed fiber optic network
- New user account management
  - Email notification sent to new user
  - NTRIP configuration files are updated to reflect new user account and RT data access permission
  - Checks on new user accounts are done every hour
- GNSSDATA-CH1 servers health status monitoring, failure detection and data synchronization between servers are done by heartbeat. The two servers exchange their states via this channel.
- During a failover, the active server executes an application stop procedure and activates a start procedure on the stand-by server. This switch-over occurs automatically and could take up to 10 seconds. Some data loss may incurred during this short time period.
- Data synchronization between the main and redundant server is done via Distributed Replicated Block Device (DRBD) device. This enables the stand-by server to be in a safe state and resumes operations without interruption when a switchover occurs.
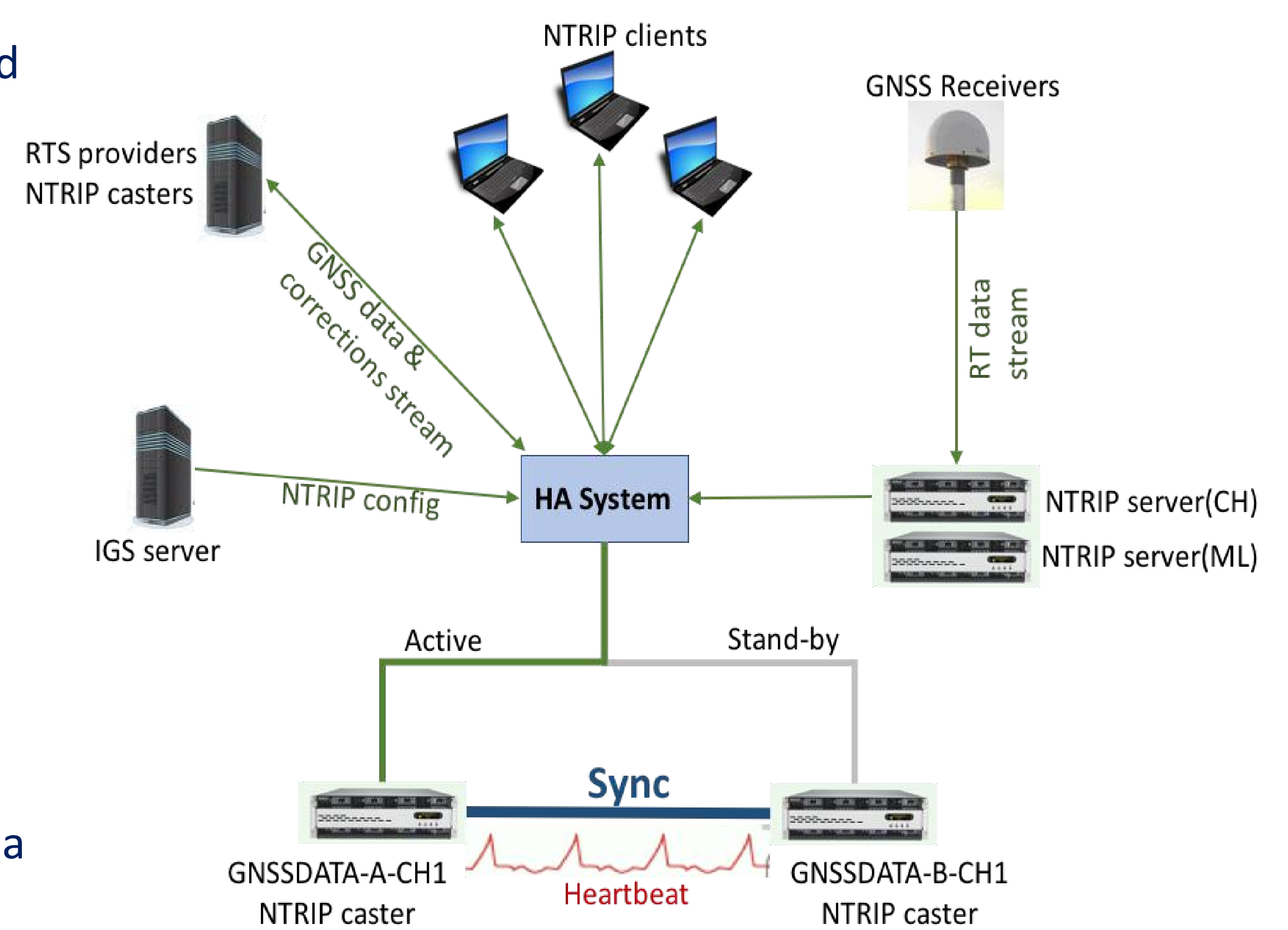
## UCAR COSMIC Contribution to IGS RTS
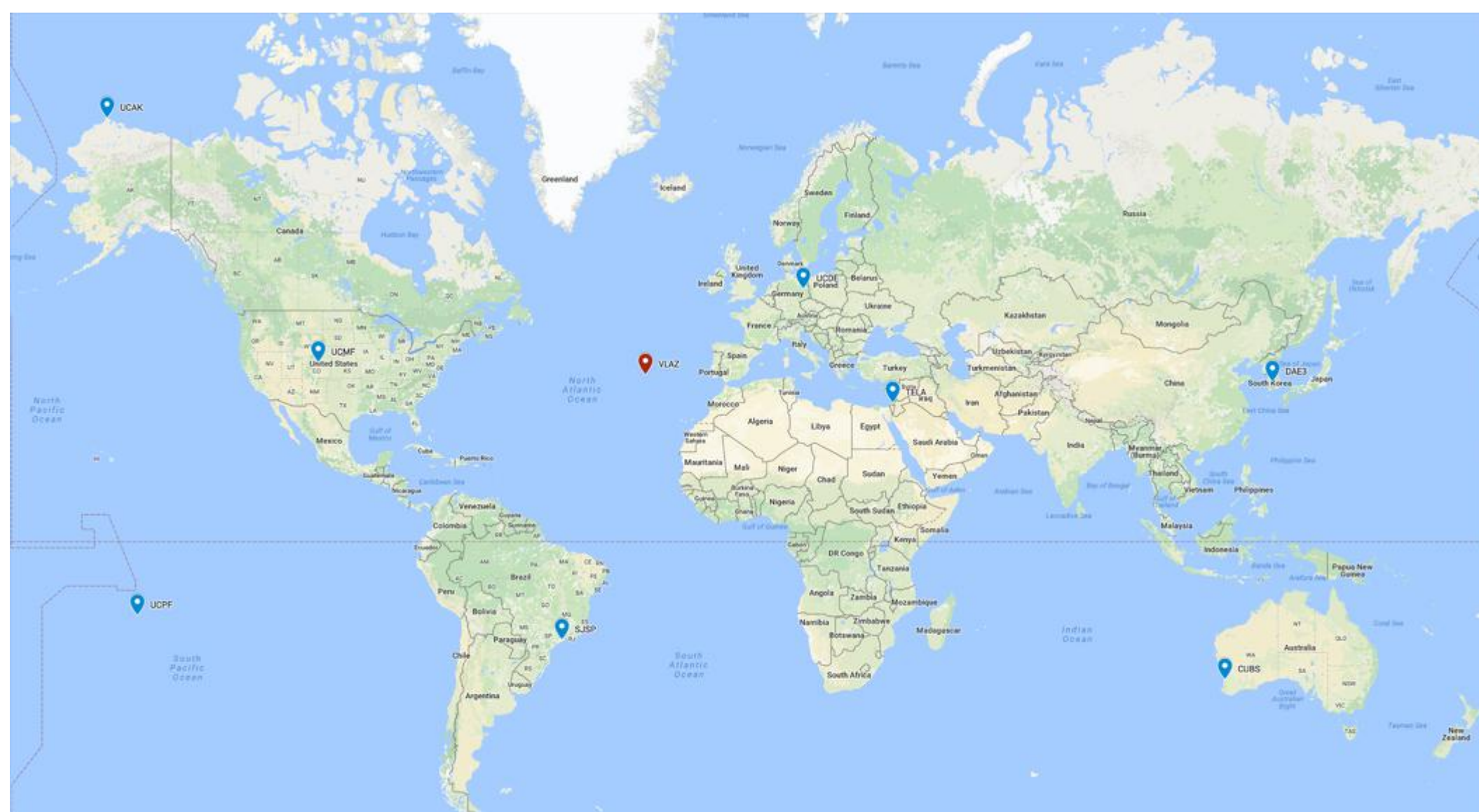
Aside from providing the computational infrastructure and hosting the IGS NTRIP caster, UCAR is also contributing to the IGS RTS ground station network. Our ground network consists of:

- Ten GNSS receivers installed worldwide
- Eight sites are actively streaming RT data at 1 Hz (blue icons in map)
- Inactive sites are tagged in red as shown in the world map
- Types of GNSS receivers: Septentrio PolaRx 4 and PolaRx 5 that track all GNSS

## RTS Users and Data Statistics
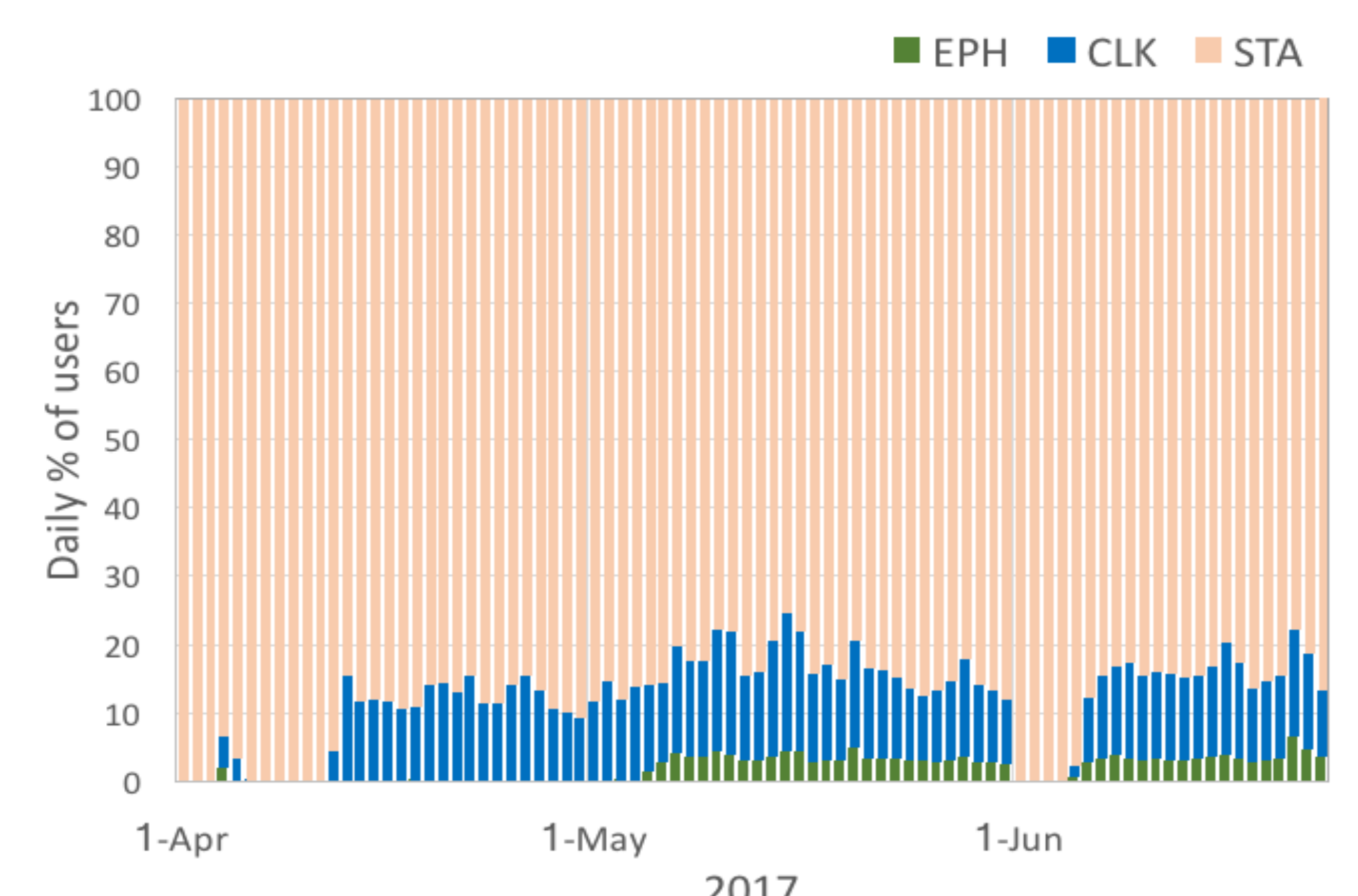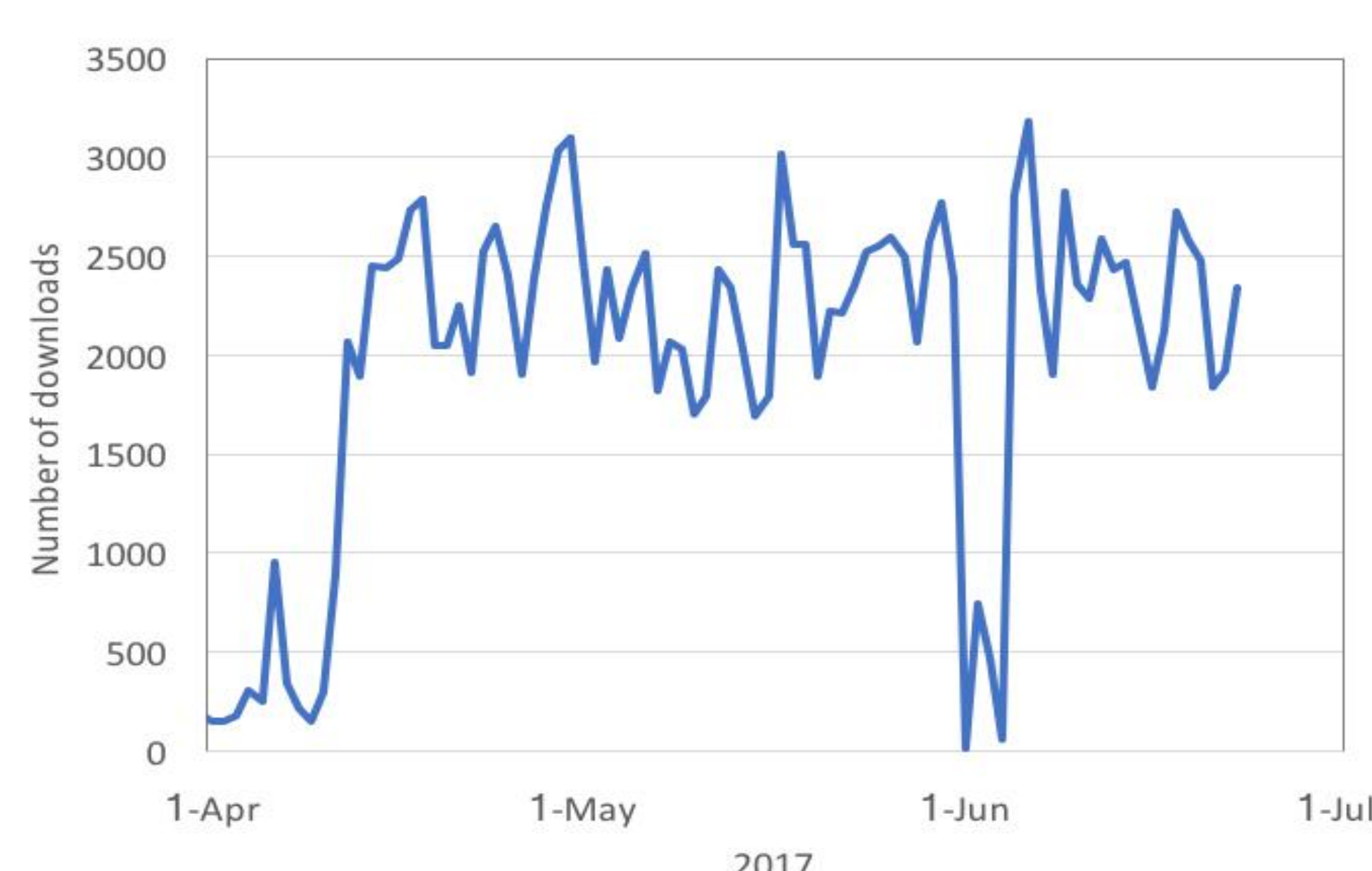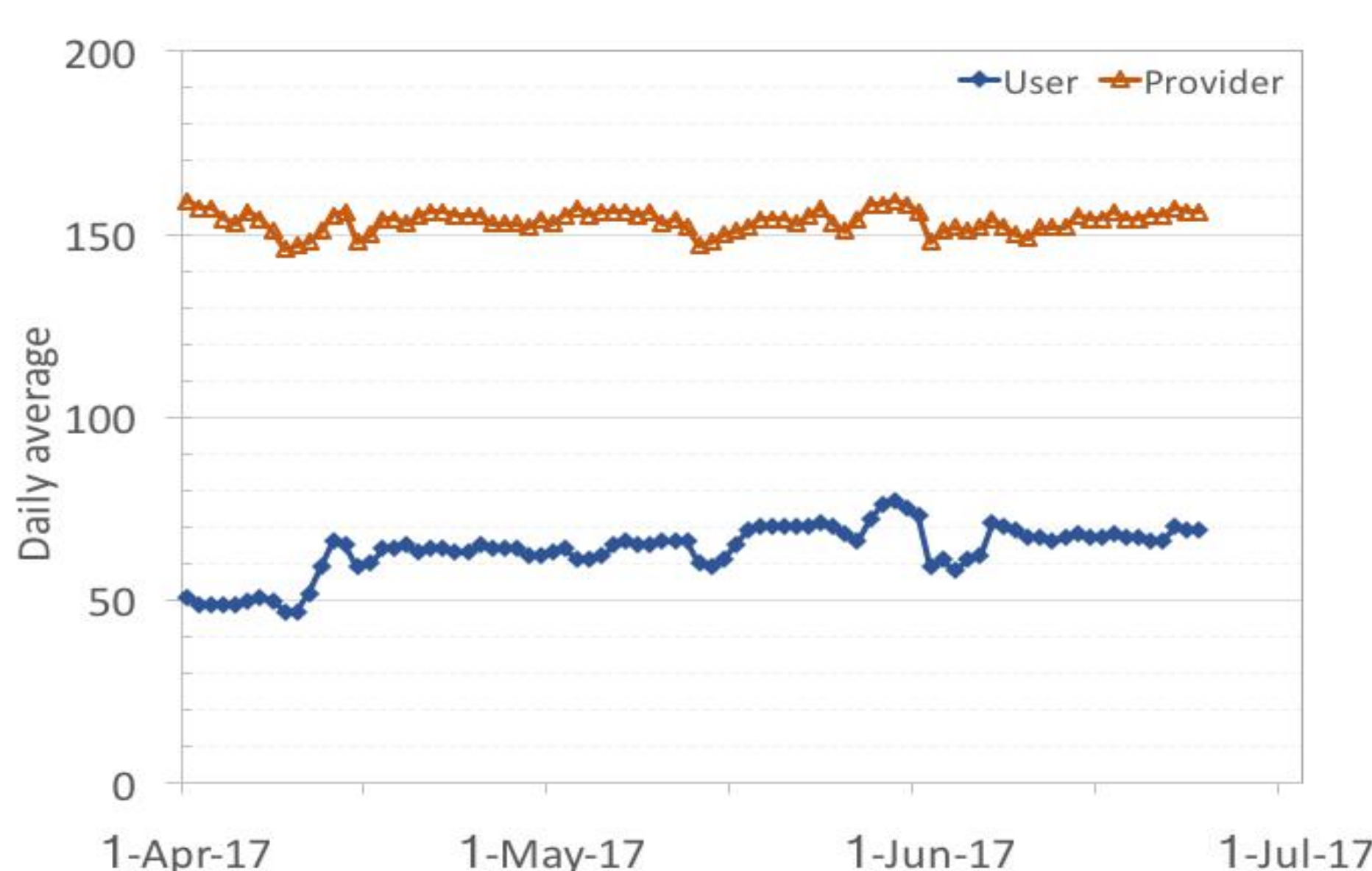
NTRIP caster host transition from IGSCB to UCAR COSMIC occurred at the end of March 2017. An increase in the number users connecting to UCAR's NTRIP caster during the switchover was observed thereafter. There are a total of 653 registered users as of 23 June 2017.

The above figure shows the total number of download requests for each day. During the transition period between end of March and beginning of April, UCAR and IGSCB were able to resolve data streaming and network connectivity issues of incoming data streams from RTS providers. The drop in number around June 1st was due to two failovers. The 2nd failover put the system back to the primary server.

A majority of the users are interested in obtaining data streams from individual stations within the IGS RT network. Approximately 1.3% of the users access the GNSS ephemeris stream on a daily basis, while 23% gain access to the combined GNSS clock solution.