

Real-time Distribution of EPN Data

Experiences from the ROB Broadcaster

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<http://www.epncb.eu/>

Background

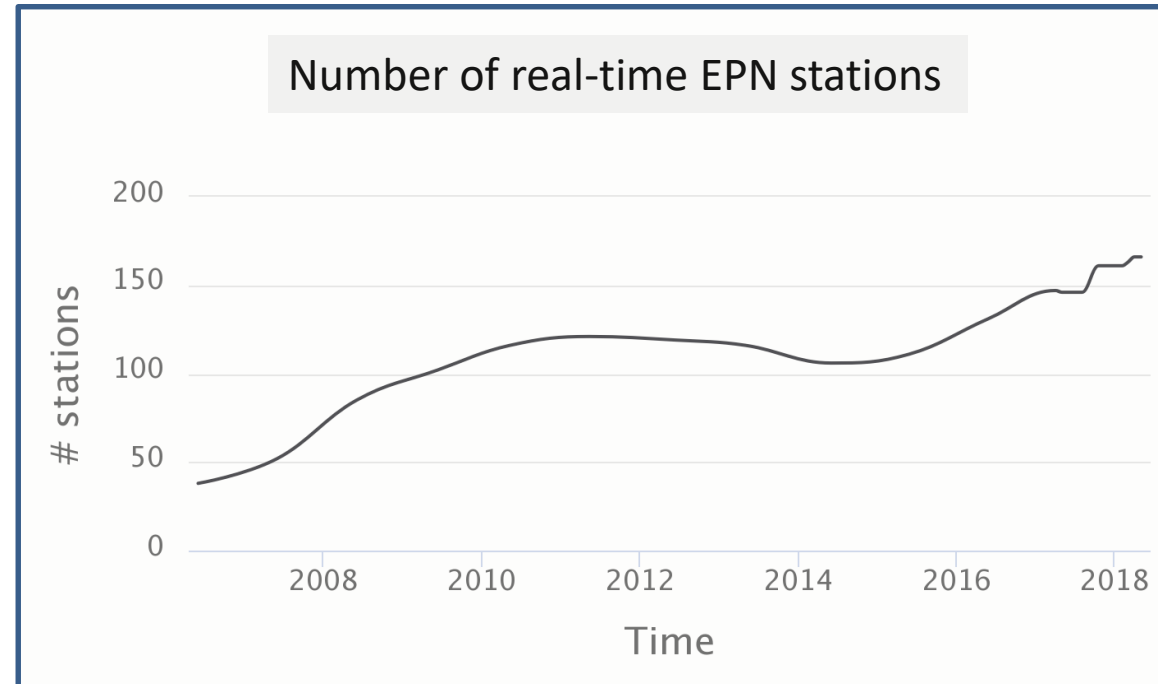
2002-2007: EUREF-IP project

- Development of NTRIP software
- Call for Participation for EPN stations streaming real-time data
- One broadcaster, located at BKG

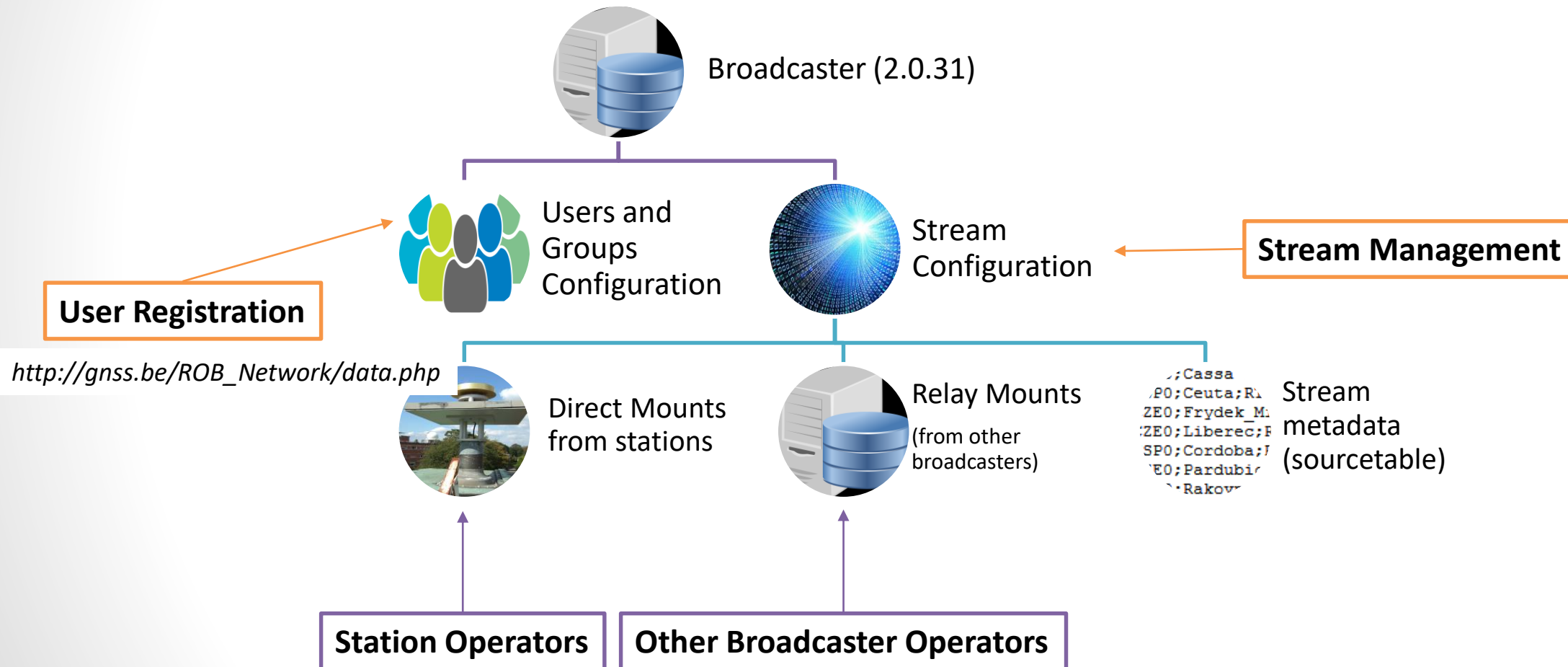
After closing of EUREF-IP project, real-time streams were included in routine EPN operations

2009: Additional broadcasters at ROB (Royal Observatory of Belgium) and ASI (Italian Space Agency)

Motivation for ROB to operate a broadcaster: EPN monitoring, atmospheric remote sensing (troposphere/ionosphere)...



Setup of a Broadcaster



Individual Management of the Broadcasters

Individual user registration for each broadcaster

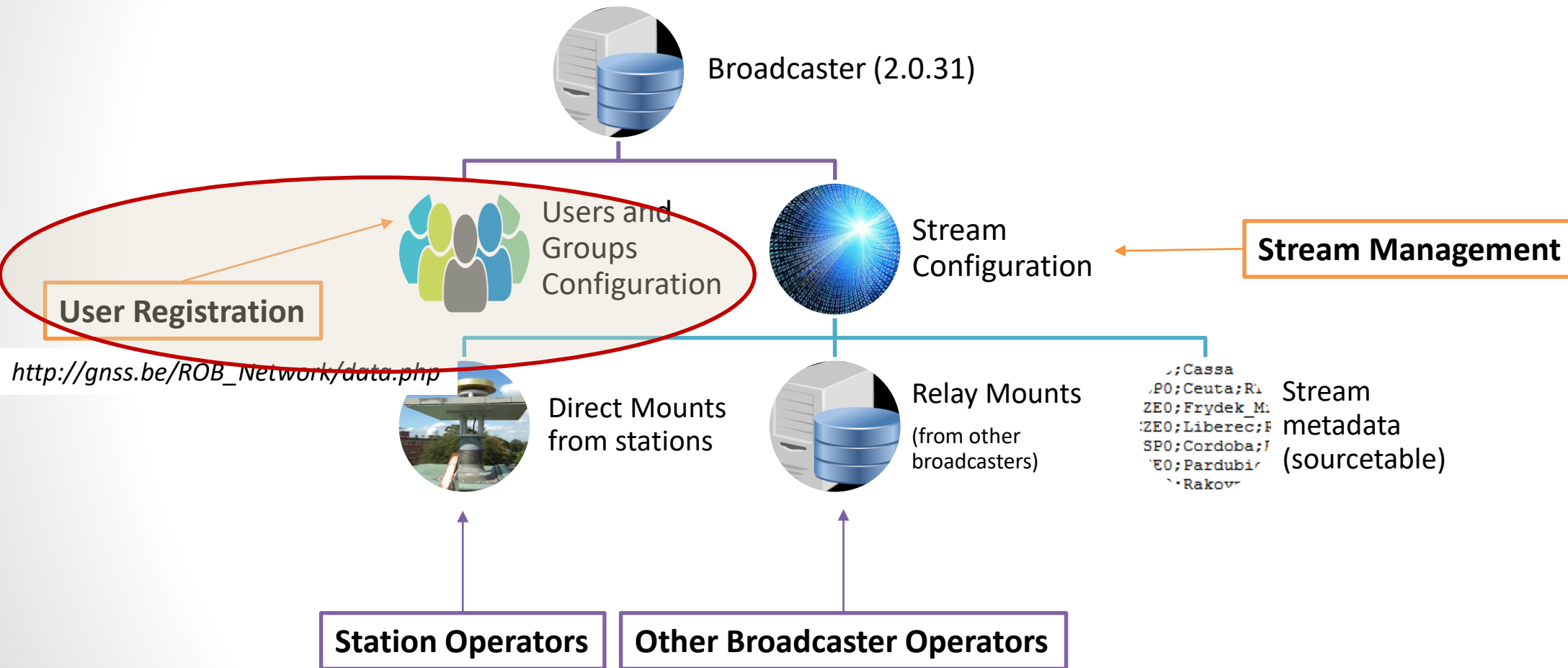
Stream management

- No automated procedure
- Station managers do not inform broadcasters of a change in a stream (or inform just one broadcaster operator)
- New or stopped streams are not added/removed in the same way by all broadcasters

Broadcaster	Streams set up	Running streams
ASI	147	89
BKG	157	134
ROB	164	147

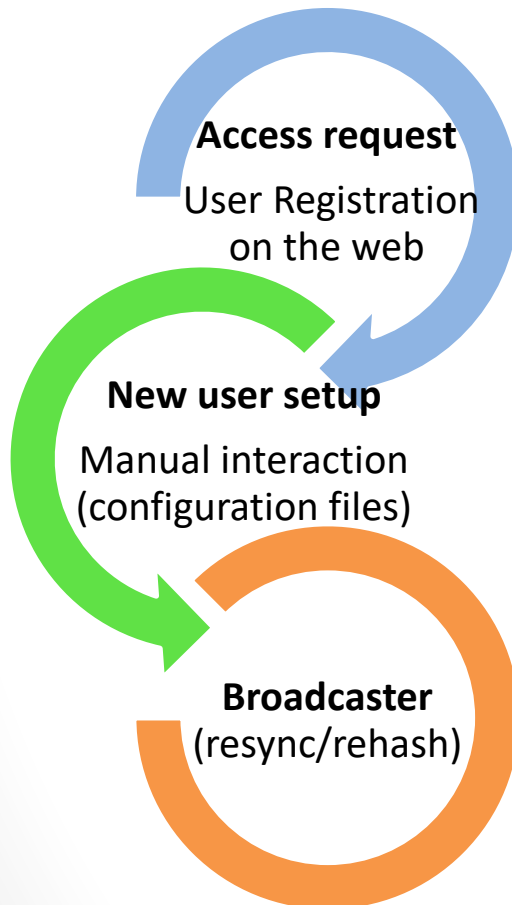
Status on May 17, 2018 – only EPN stations

Setup of a Broadcaster




User Registration (ROB Broadcaster)

Procedure



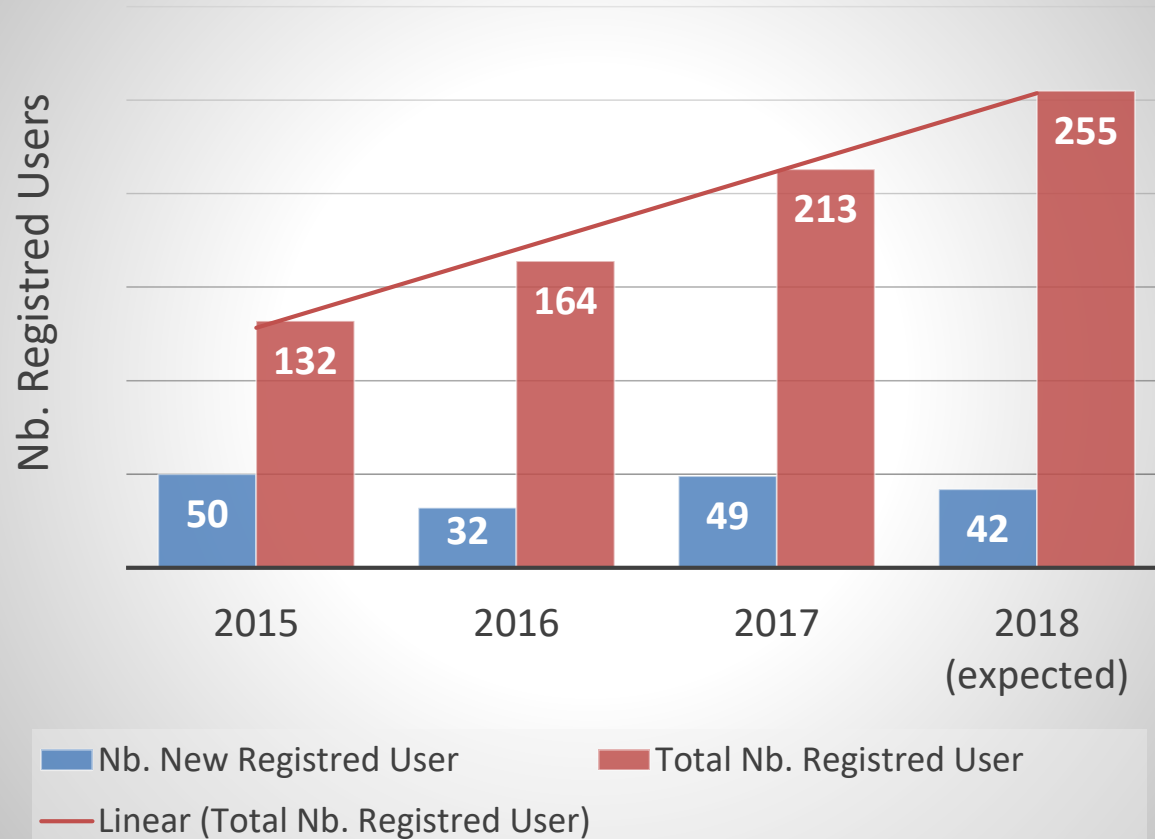
http://gnss.be/ROB_Network/data.php

Your personal information is collected and stored for reasons explained in the [privacy policy document](#). Also please note that for the NTRIP caster the [general disclaimer](#), [terms of use](#), and the restrictions mentioned in the [data policy document](#) apply.

Last Name:	<input type="text"/>
First Name:	<input type="text"/>
Affiliation:	<input type="text"/>
Address:	<input type="text"/>
City:	<input type="text"/>
Country Code (ISO 3166-1 alpha-3):	<input type="text" value="(select)"/>
E-mail:	<input type="text"/>
Username: (max 16 chars)	<input type="text"/>
Hash of your Password: (please no clear text passwords)	<input type="text"/> (calculate the hash for me)
Purpose, application for which the NTRIP streams will be used:	<input type="text"/>
Remarks, comments:	<input type="text"/>
<input type="checkbox"/> I grant permission to include me in the online users list on the website of the NTRIP caster.	
<input type="checkbox"/> Please inform me by mail on (configuration) updates of the NTRIP caster.	
To avoid spam abuse by internet bots, we request you to enter the sequence shown in the image below into the box on the right.	
	<input type="text"/>
<input type="button" value="Send Registration Form"/>	

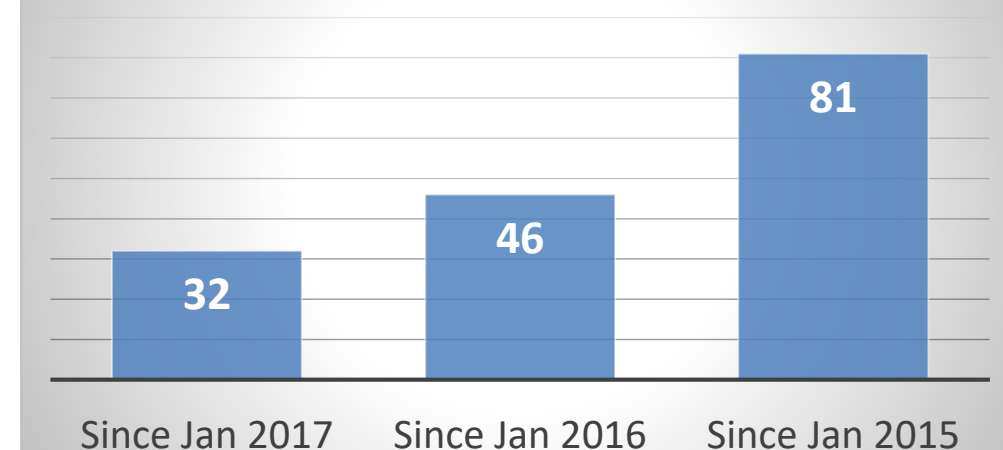
User Registration

Increase of Registered Users



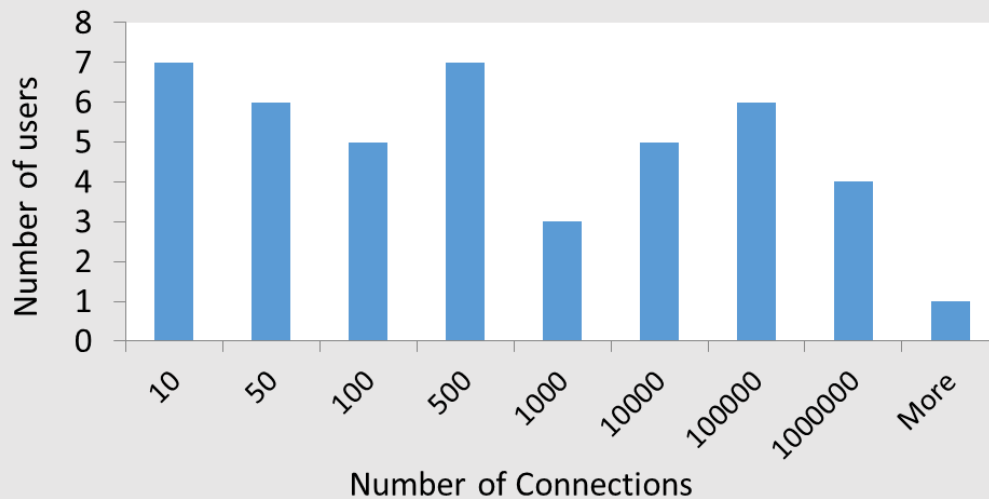
A significant amount of inactive registered users!

Nb. Active Users

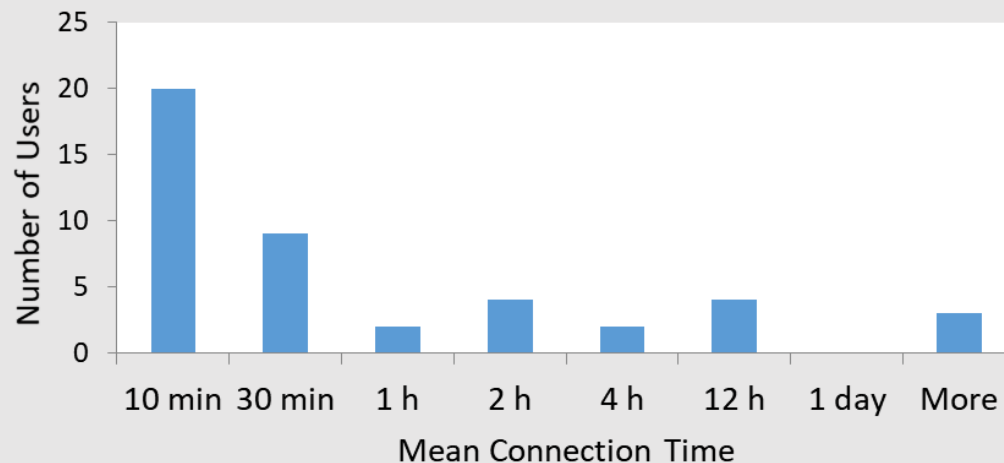


Broadcaster Usage – Since Jan. 2017

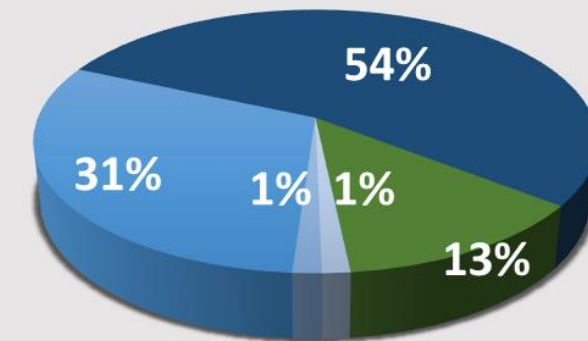
Numbers of Users / Number of Connections



Number of Users/Mean Connection Time



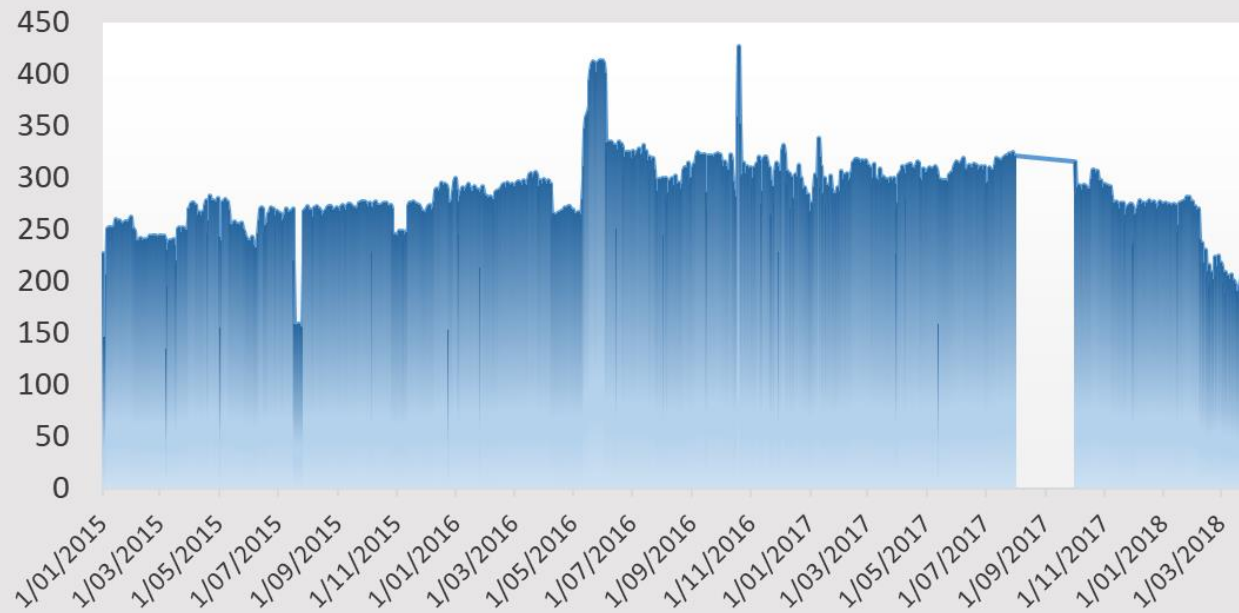
Usage of ROB Broadcaster



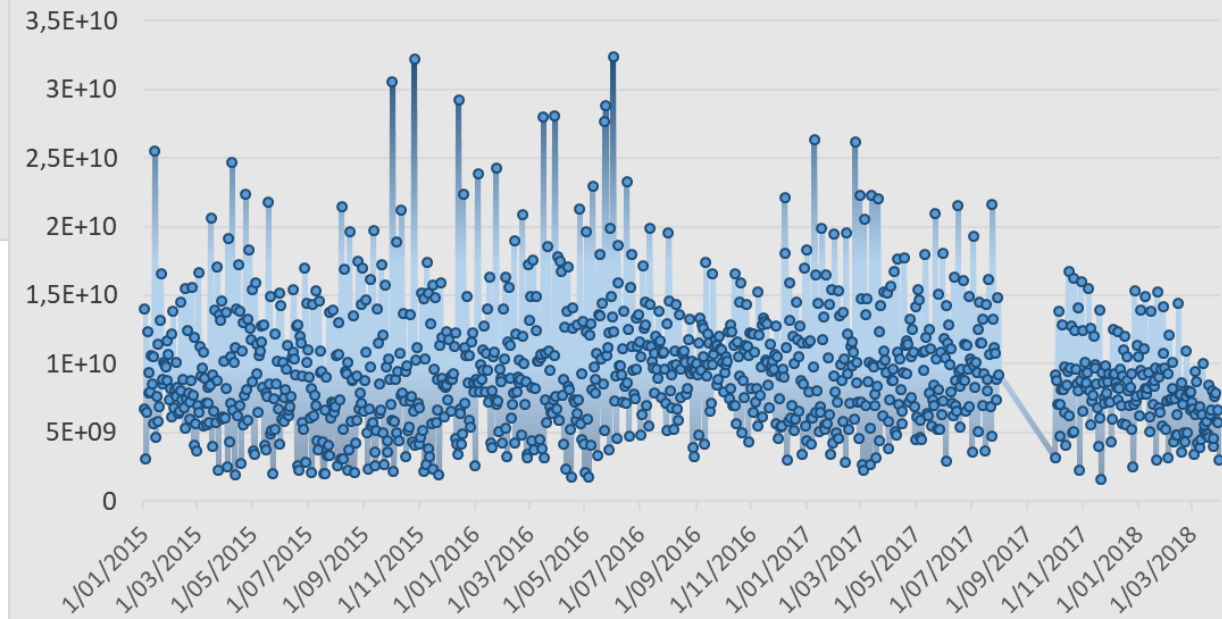
ROB Receiver tests
Positioning tests Broadcasters
Services

Connected Clients

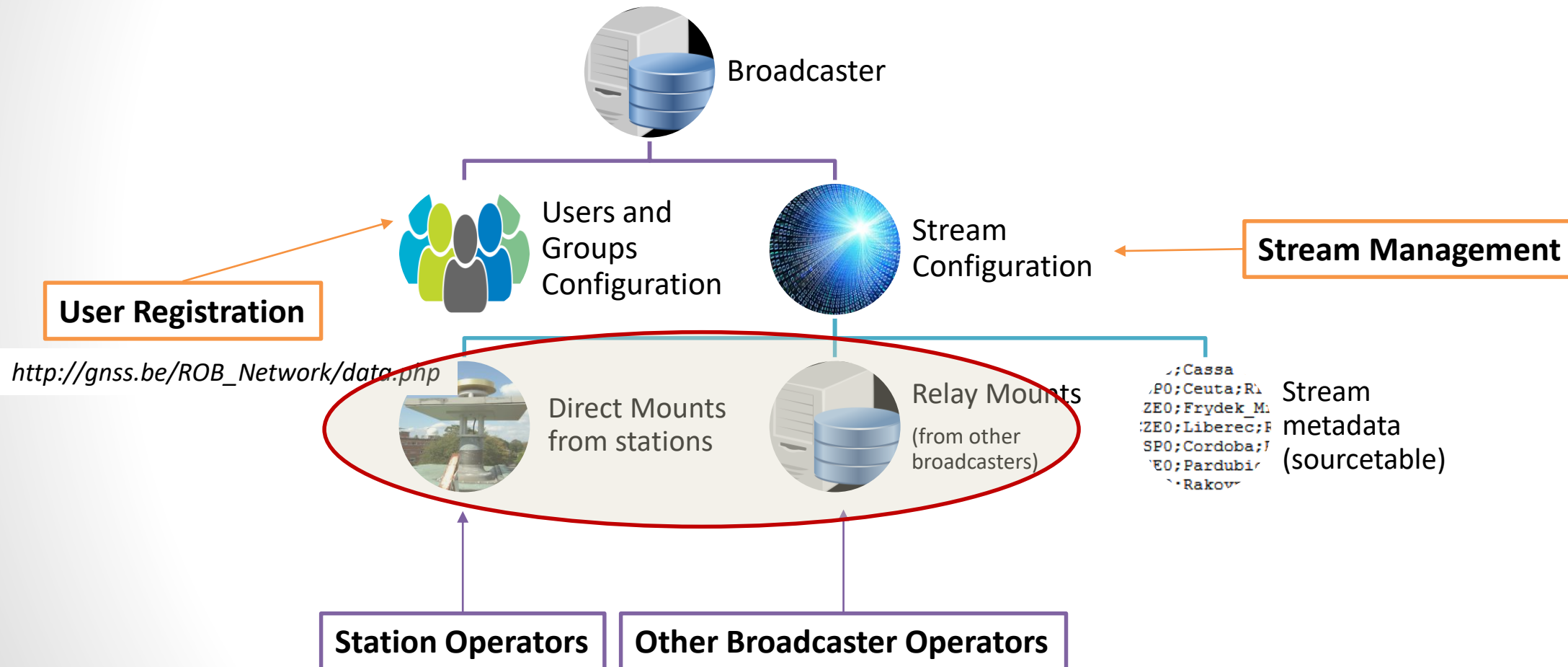
Mean number of connected clients



Amount of listened bytes/day

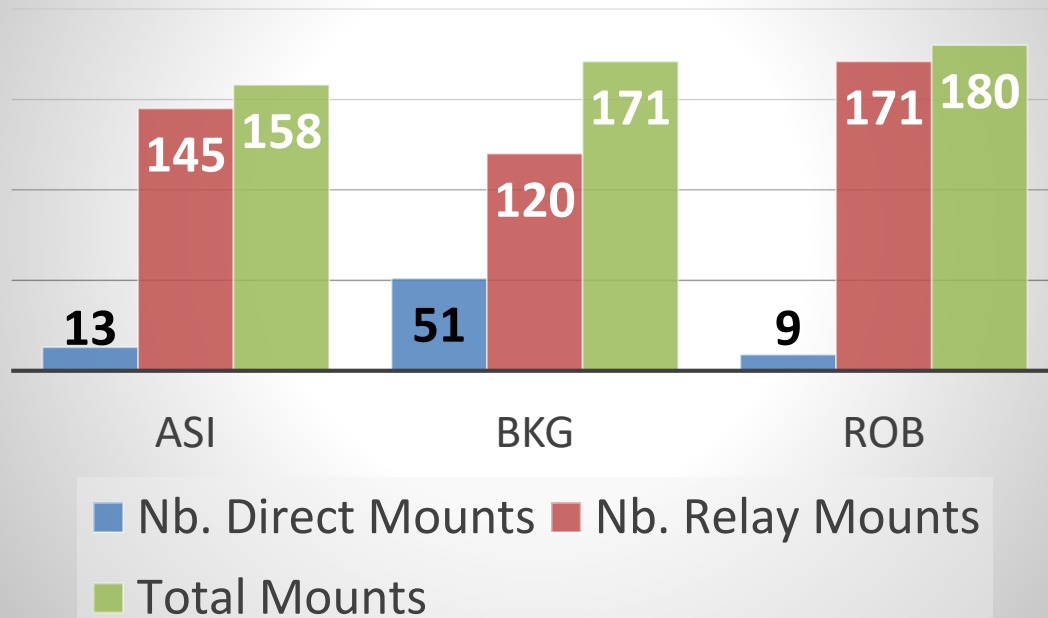


Setup of a Broadcaster



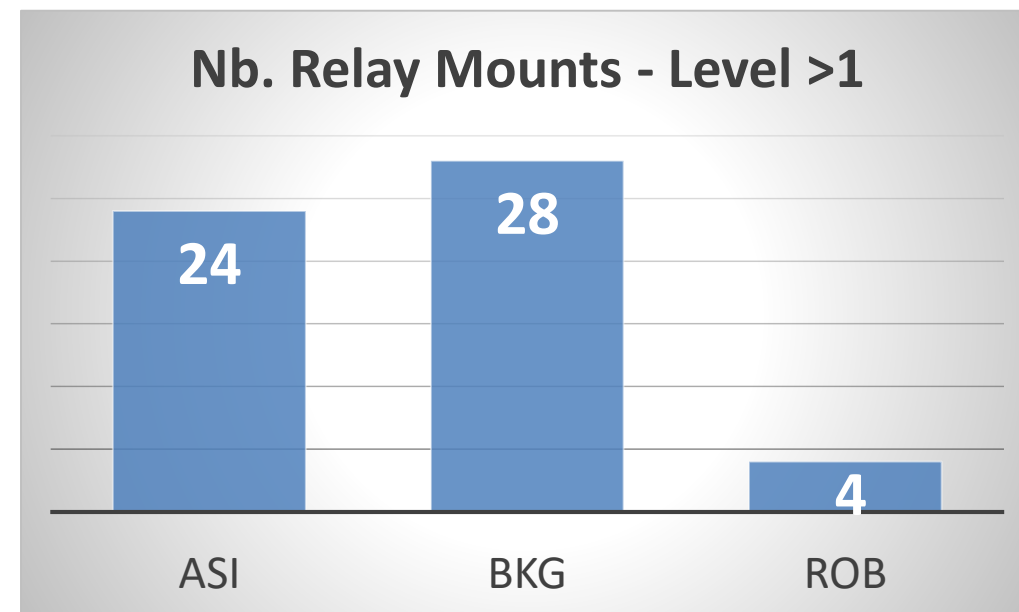
Direct Mounts and Relay Mounts

Direct versus Relay Mounts (static sourcetable)

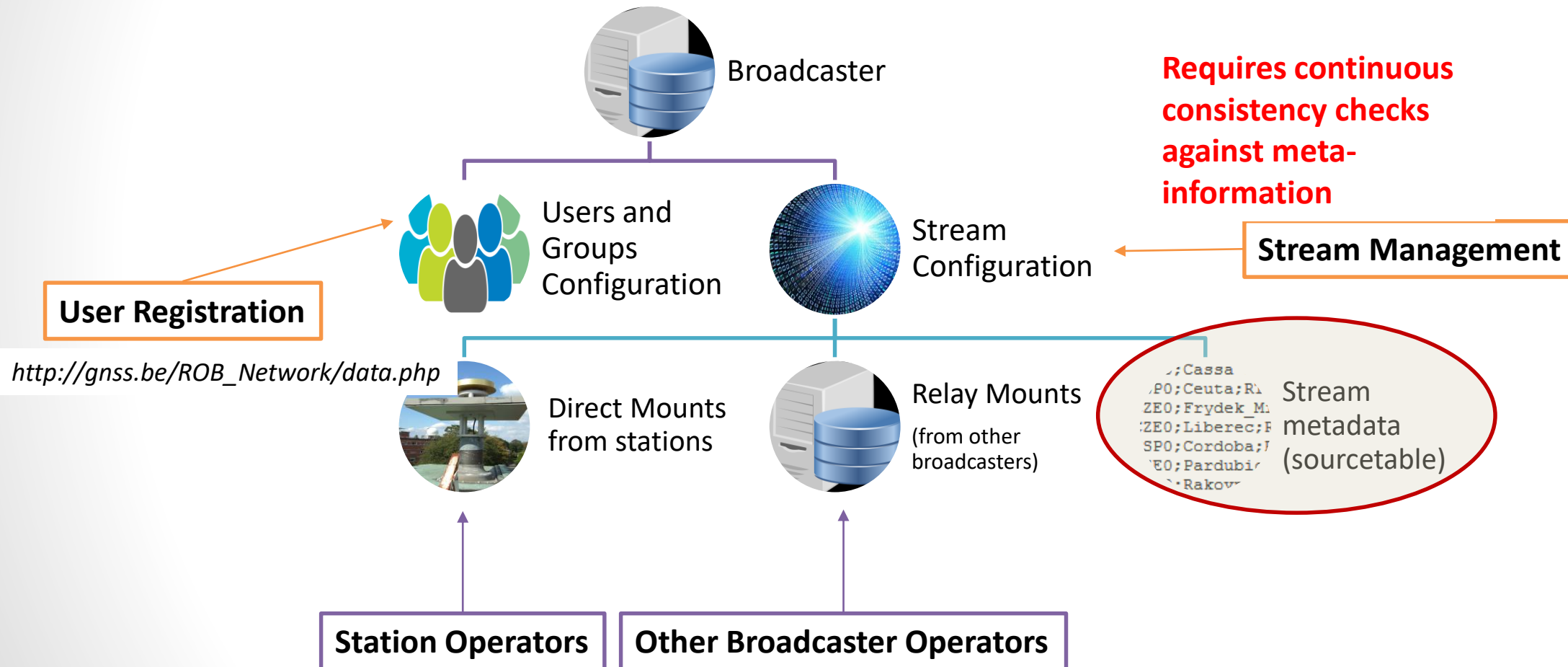


Status: May 8, 2018

Nb. Relay Mounts - Level >1



Setup of a Broadcaster



Set up of the Streams at the Broadcasters

In **sourcetable.dat** of the broadcaster:

```
STR;POTS00DEU0;Potsdam;RTCM 3.2;  
1006(10),1007(10),1077(1),1087(1),1097(1);  
2;GPS+GLO+GAL;EUREF;DEU;52.19;13.07;0;0;  
JAVAD TRE_G3TH DELTA;none;B;N;3000;kg3-dmz.gfz-  
potsdam.de/POTS0(1)
```

- Name of the **mountpoint** (station 4/9-Char ID + 0/1) → Identification of station
- **Format** that is streamed: RTCM 2.x, 3.x → Different format requires different decoding software
- **List of messages** that are streamed
- **Tracked constellations**
- **Receiver type**

Set up of the Streams at the Broadcasters

Inserted in sourcemounts.auth or ntripcaster.conf + **sourcetable.dat** of the broadcaster:

```
STR;POTS00DEU0;Potsdam;RTCM 3.2;  
1006(10),1007(10),1077(1),1087(1),1097(1);  
2;GPS+GLO+GAL;EUREF;DEU;52.19;13.07;0;0;  
JAVAD TRE_G3TH DELTA;none;B;N;3000;kg3-dmz.gfz-  
potsdam.de/POTS0(1)
```

All mountpoints are now set as long mountpoint names → new IGS standard

(+ alias for short mountpoint name POTS0 during transition phase)

Metadata of Real-time GNSS streams

<ul style="list-style-type: none"> • Station site log <ul style="list-style-type: none"> • Receiver type • Tracked constellations • Antenna (+Serial number)/radome type • Antenna height 	Maintained by Operational center, submitted to EPN CS unique
<ul style="list-style-type: none"> • Sourcetable of the broadcaster <ul style="list-style-type: none"> • Name of the stream mount point • Receiver type • Tracked constellations • Stream format • List of sent real-time messages 	Maintained by broadcaster operator not necessarily the same for each broadcaster
<ul style="list-style-type: none"> • Messages in real-time data stream <ul style="list-style-type: none"> • Receiver type • Antenna (+Serial number)/radome type • Antenna height • Reference position • To be derived: list of sent messages 	Maintained by the station operator (inserted in receiver) unique
<ul style="list-style-type: none"> • ETRS89 station reference position 	Maintained by EPN Reference Frame Coordinator unique

Not necessarily consistent! → ROB monitoring – site log – sourcetable
Stream content

Actions upon Detection of Errors in Sourcetable

- **Incorrect Receiver type in sourcetable compared to site log**
 - Email message to broadcaster administrator → Manual correction of sourcetable
- **Incorrect list of message types in sourcetable compared to stream content**
 - Manual correction of sourcetable for gross errors each ~2 weeks
- **Incorrect Constellations in sourcetable compared to stream content**
 - Email message to broadcaster administrator → Manual correction of sourcetable

EPN Real-time Streams

From real-time streams

- 7% GPS-only (3%)*
- 63% GPS+GLO (26%)*
- 30% GPS+GLO+GAL+... (71%)*

*According to receiver capability



Stream Content vs Site Log: Antenna Info

Antenna Type and Serial Number

Site log versus stream content

necessary for correct application of antenna calibration models (NULLANTENNA problems! → 6 cm offsets)

no antenna at all: 9 streams

incorrect antenna or radome: 17 streams

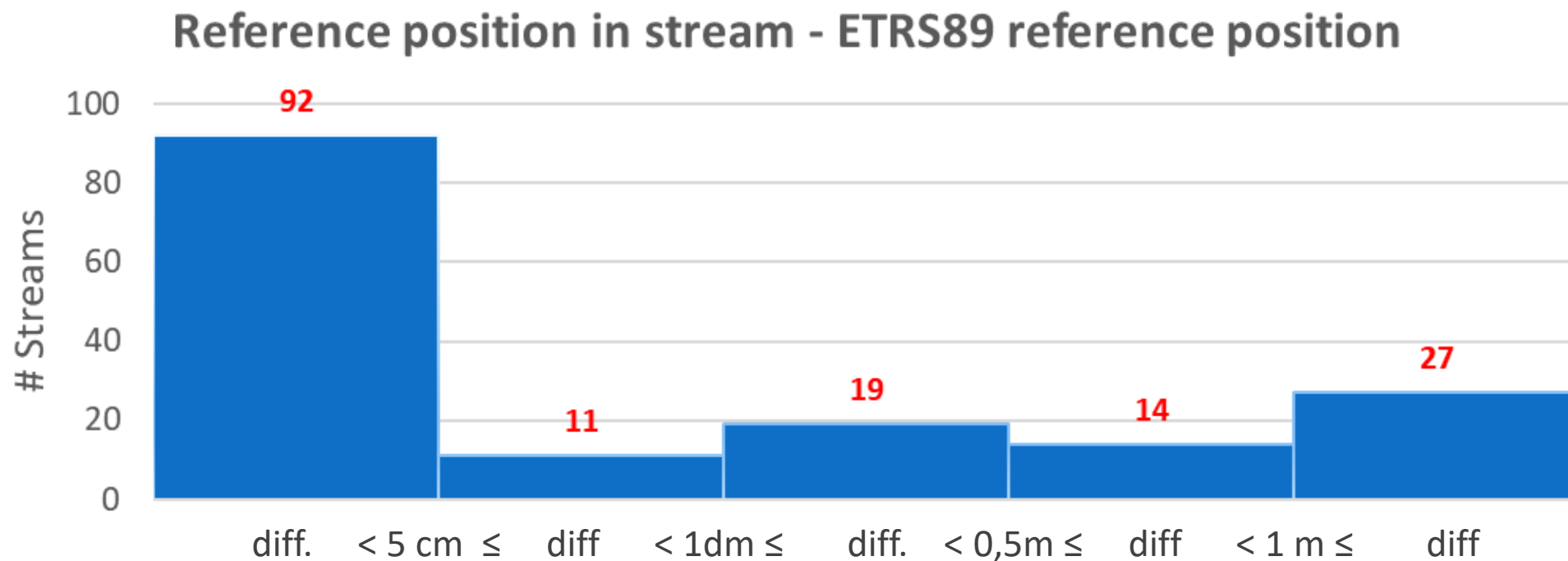
other: incorrect/missing antenna serial number (48)

Antenna Height

Incorrect antenna height (more than 5 cm): 7 stations/streams

Missing antenna height : 11 stations/streams

Stream Content vs Official ETRS89 Reference Position



25% of EPN streams : more than 50 cm of error

Actions upon Detection of Errors in Stream

- Not responsibility of broadcaster operator
- Responsibility of station manager (see info at EPN CB web site)

→ No action for :

- Incorrect ETRS89 position
- Unable to decode stream
- Incorrect Antenna/radome type, serial number

Exception: detection of NULLANTENNA

Conclusions

- ROB operates one of the regional EPN broadcasters
 - Upgraded to the last existing caster version (2.0.31)
 - Switched to long mountpoint names while keeping aliasing to short mountpoint names during a transition phase
- Broadcaster usage
 - ~240 registered users, but large majority not active anymore (~30 active users since Jan. 2017)
 - ~290 connected clients
- Cross-check metadata information from site log, source table, stream content
 - A lot of issues with metadata in streams
 - Time consuming to keep broadcaster sourcetables up to date

Conclusions

30 active users since 2017...

Usage/Utility of operating additional EPN regional broadcasters next to BKG?

Thank you

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BELGIUM

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