

# **Pskreporter.info & FT8**



Philip Gladstone -- N1DQ  
23 Feb 2018

# What is pskreporter?

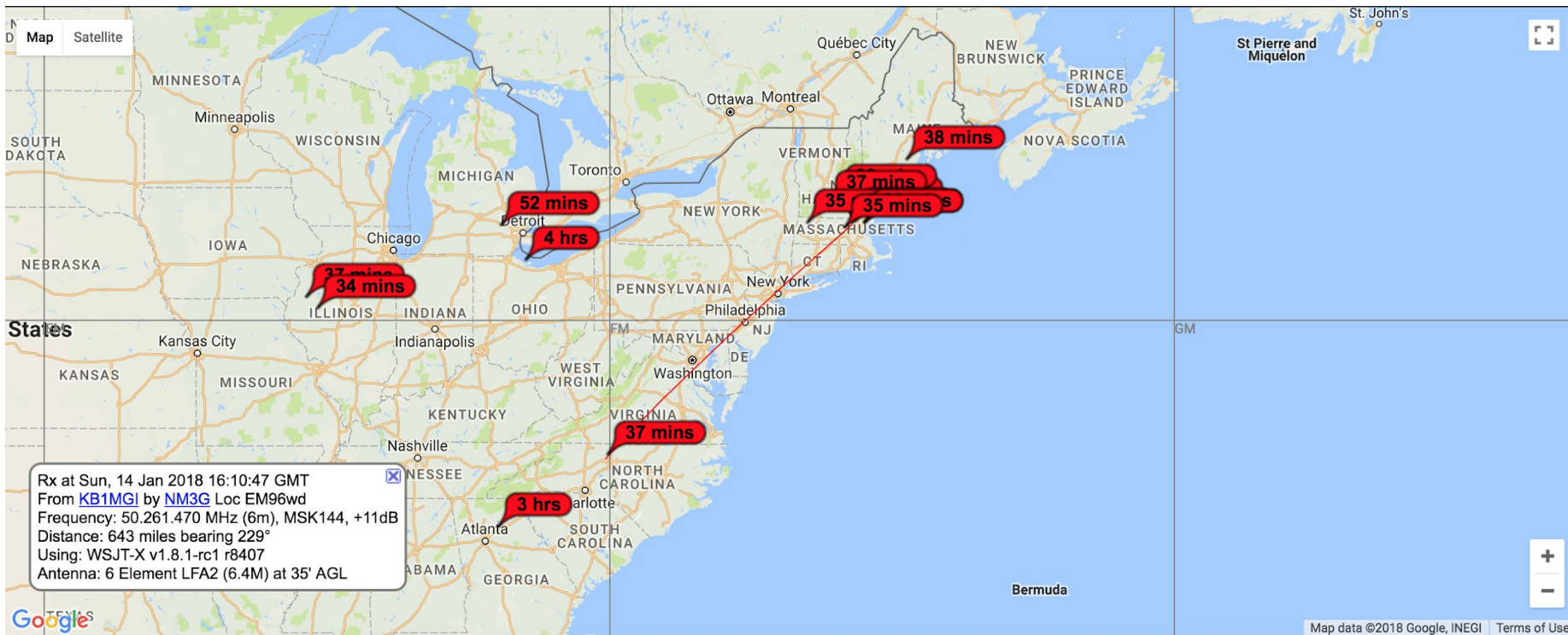
A way to see where your transmissions are being heard.

An answer to 'does my setup work?'

On  show  sent by  KB1MGI using  over the last  Go! [Display options](#) [Permalink](#)

Monitoring KB1MGI (last heard 34 mins ago). Automatic refresh in 5 minutes. 15 reception reports for KB1MGI are shown as times ([show logbook](#)).

There are [3501 active monitors](#): [1022 on 20m](#), [802 on 40m](#), [388 on 17m](#), [387 on 30m](#), [265 on 15m](#), [253 on 80m](#), [88 on 6m](#), [50 on 60m](#), [47 on 160m](#), [38 on 10m](#), [32 on 12m](#), [27 on 2m](#), [22 on 11m](#), 13 on unknown, [3 on 2200m](#), [2 on 4m](#), [1 on 70cm](#). [Legend](#)

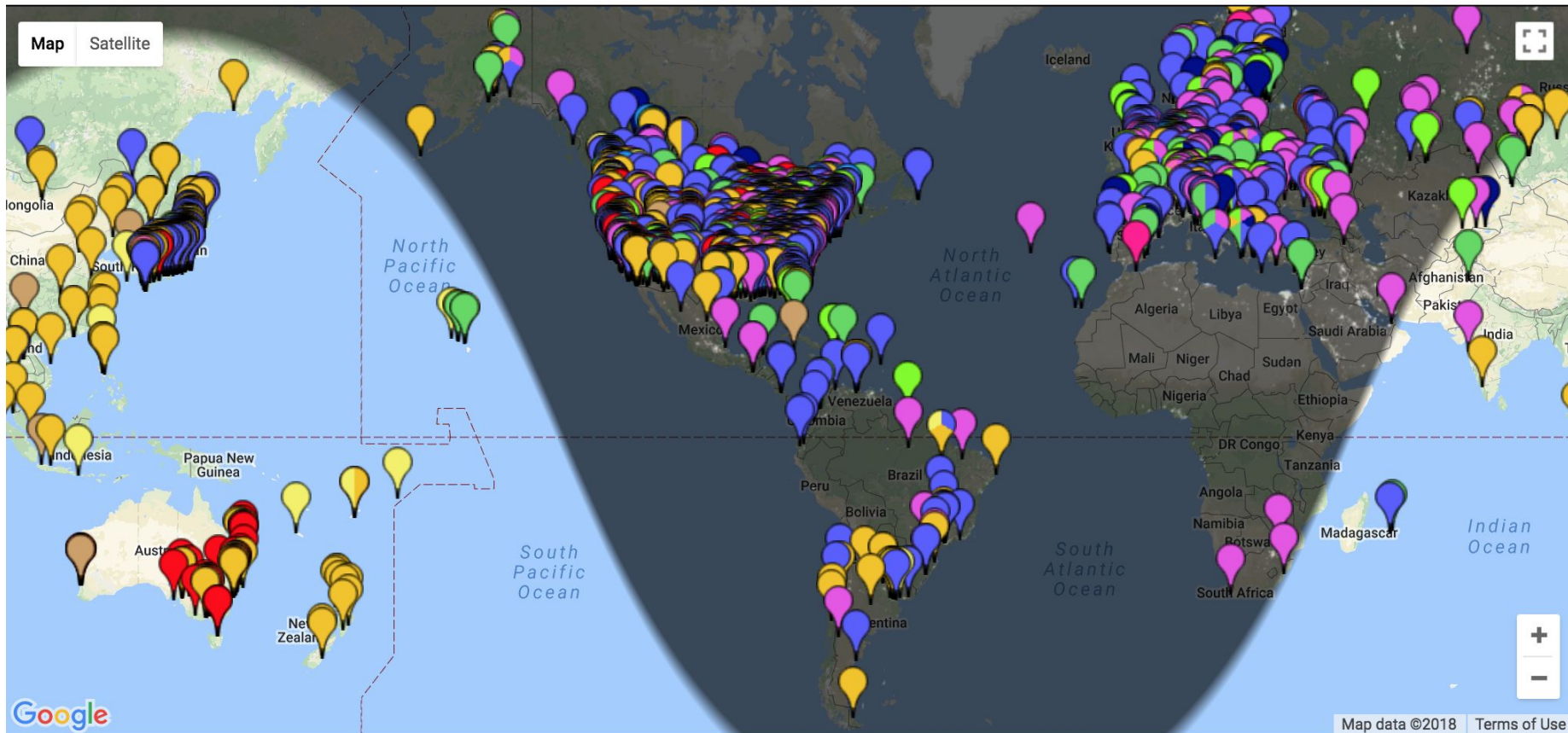


# A quiet evening

On  , show  sent/rcvd by  using  over the last  Go! [Display options](#)

Automatic refresh in 3 minutes. Large markers are monitors.

There are [2203 active monitors](#): [843 on 40m](#), [423 on 20m](#), [332 on 80m](#), [149 on 30m](#), [146 on 160m](#), [106 on 6m](#), [78 on 17m](#), [35 on 60m](#), [23 on 600m](#), [18 on 15m](#), [10 on 10m](#), [7 on 2m](#), 4 on unknown, [4 on 2200m](#), [3 on 12m](#). [Legend](#)



[System statistics](#). Comments, problems etc to [Philip Gladstone](#). [Online discussion](#) of problems/issues. Reception records: 2,326,761

[PSKREPORTER.INFO](#)

# Why do people contribute?

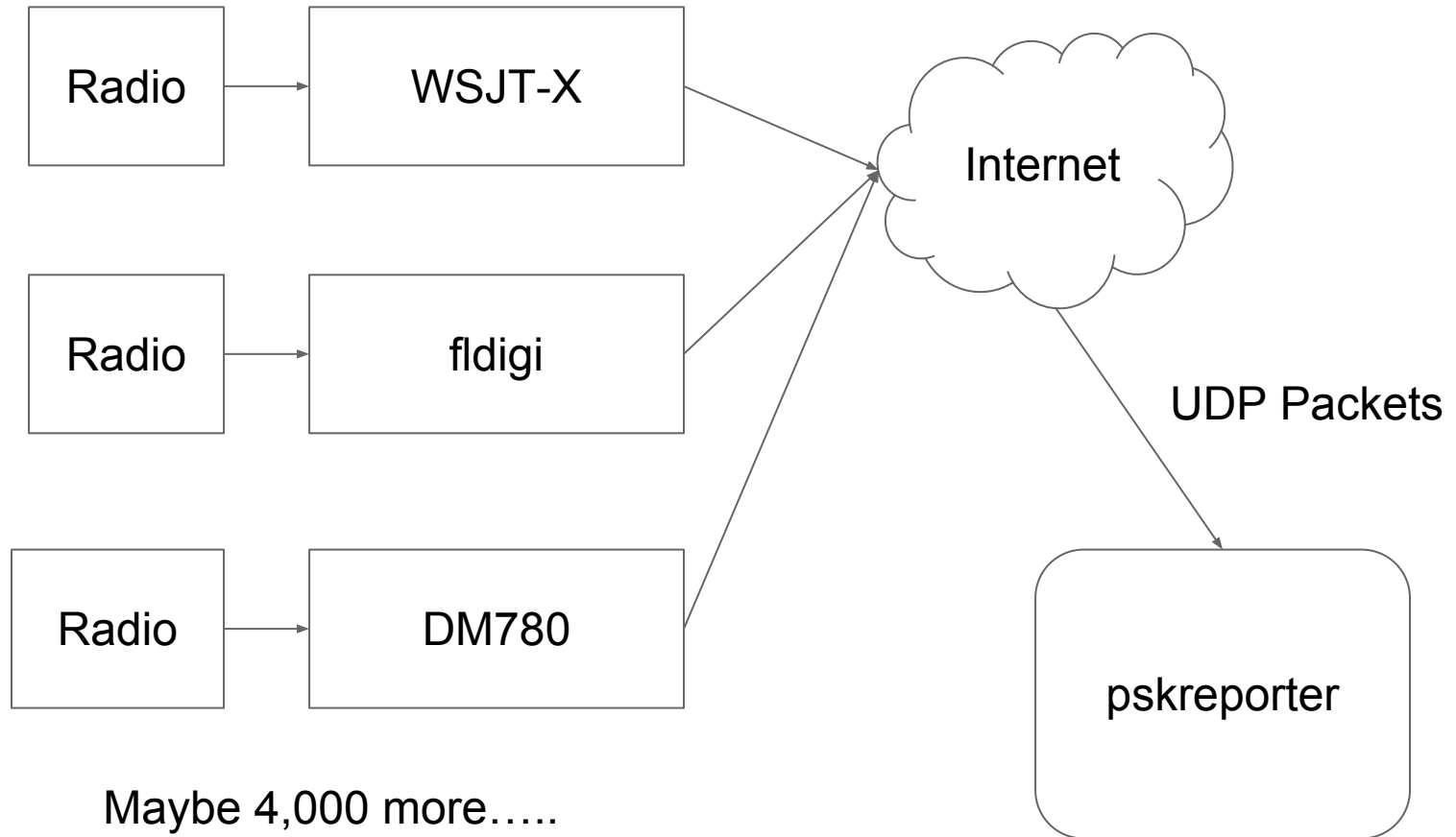
To get a good position on the leaderboard

They turned it on once, and forgot about it

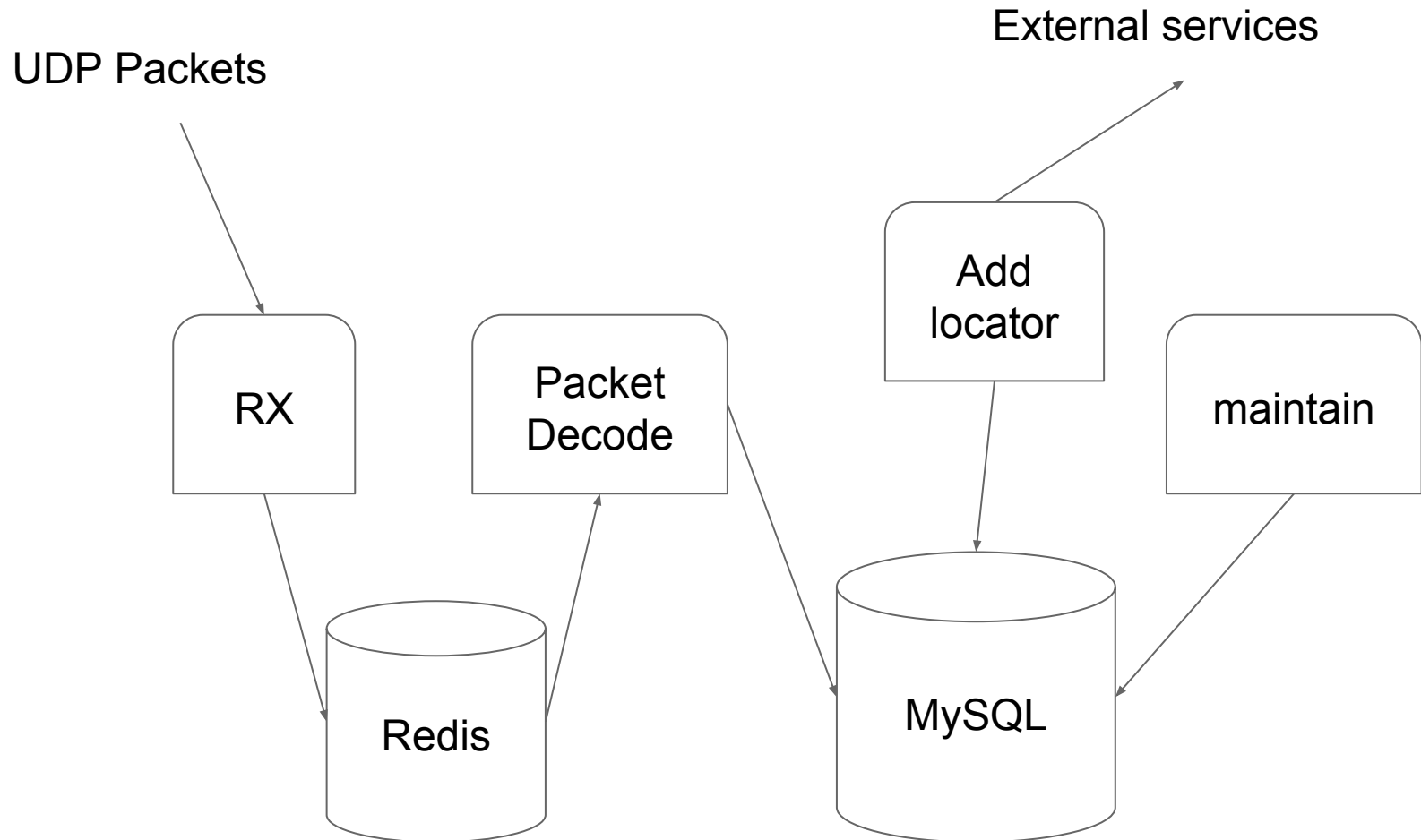
To be a good citizen

????

# Architecture - Submission



# Architecture - Insert





# Packet Format

Use UDP so easy to implement (both send and receive)

Standard binary protocol for efficiency.

Custom registered attributes for ham use. Easily extensible to carry new data fields.

Decodable with Wireshark

▼ Set 4 [id=20707] (29 flows)

FlowSet Id: (Data) (20707)

FlowSet Length: 715

[\[Template Frame: 7297\]](#)

▼ Flow 1

- ▶ Enterprise Private entry: (Philip Gladstone) Type 1: Value (hex bytes): 41 45 38 53
- Enterprise Private entry: (Philip Gladstone) Type 5: Value (hex bytes): 00 6b f5 01
- Enterprise Private entry: (Philip Gladstone) Type 6: Value (hex bytes): ff
- ▶ Enterprise Private entry: (Philip Gladstone) Type 10: Value (hex bytes): 46 54 38
- ▶ Enterprise Private entry: (Philip Gladstone) Type 3: Value (hex bytes): 45 4d 37 39
- Enterprise Private entry: (Philip Gladstone) Type 11: Value (hex bytes): 01
- StartTime: Jan 13, 2018 17:42:59.000000000 EST

▼ Flow 2

# Architecture - Database

stationInfo - 8M records - callsign, locator, software, antenna, dxcc entity. Most of them are false decodes with one report.

report - 2G6 records - sender, receiver, mode, timestamp, frequency, etc. Most record kept offline.

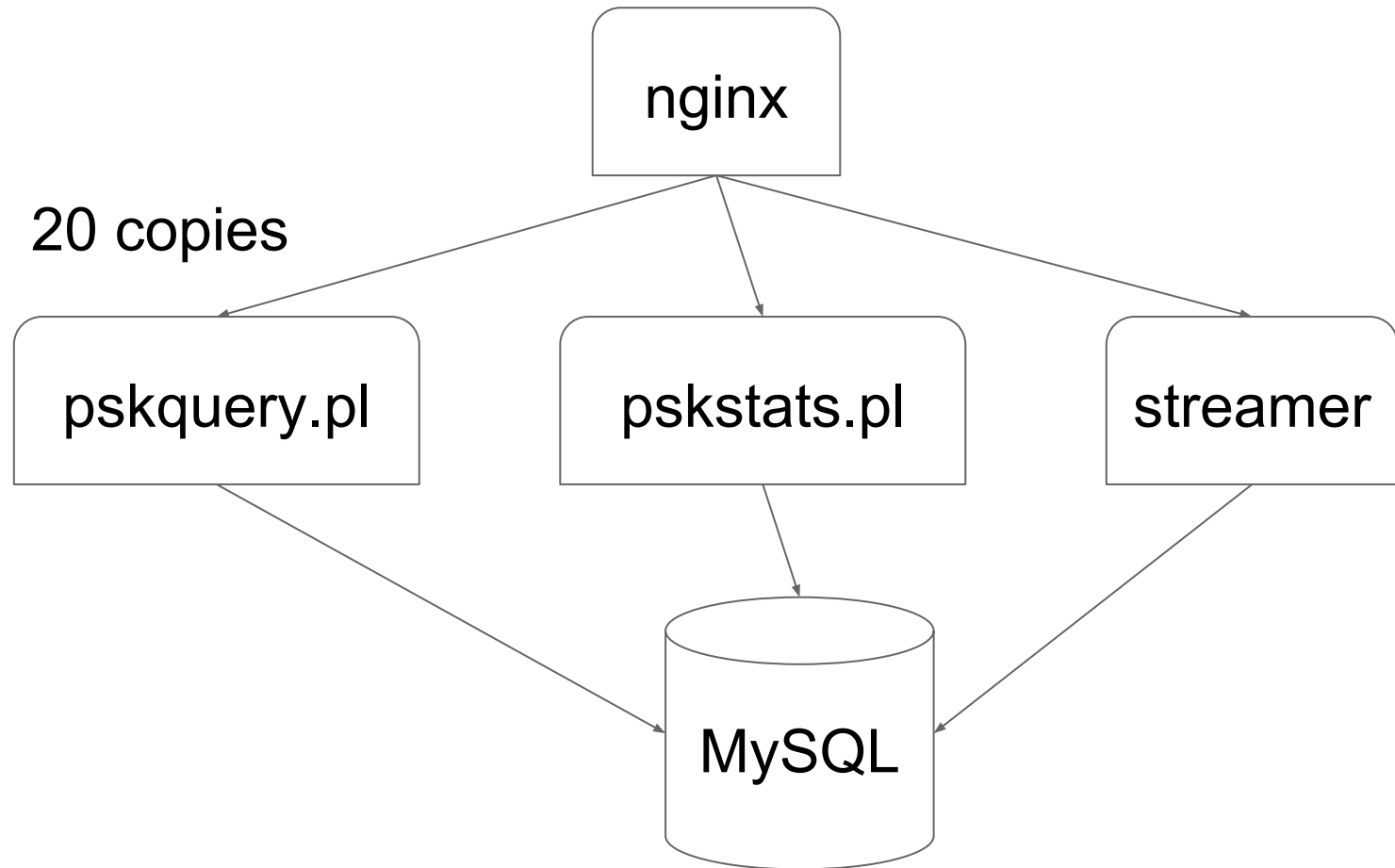
callsignProgram - 350K records - callsign to LoTW and eQSL status

dxcc - 346 records - name, lat/Ing of center, radius, match pattern

Various summary tables



# Architecture - Output



# Realtime Stream

Server built on node.js

URL to get almost real-time stream (possibly filtered)

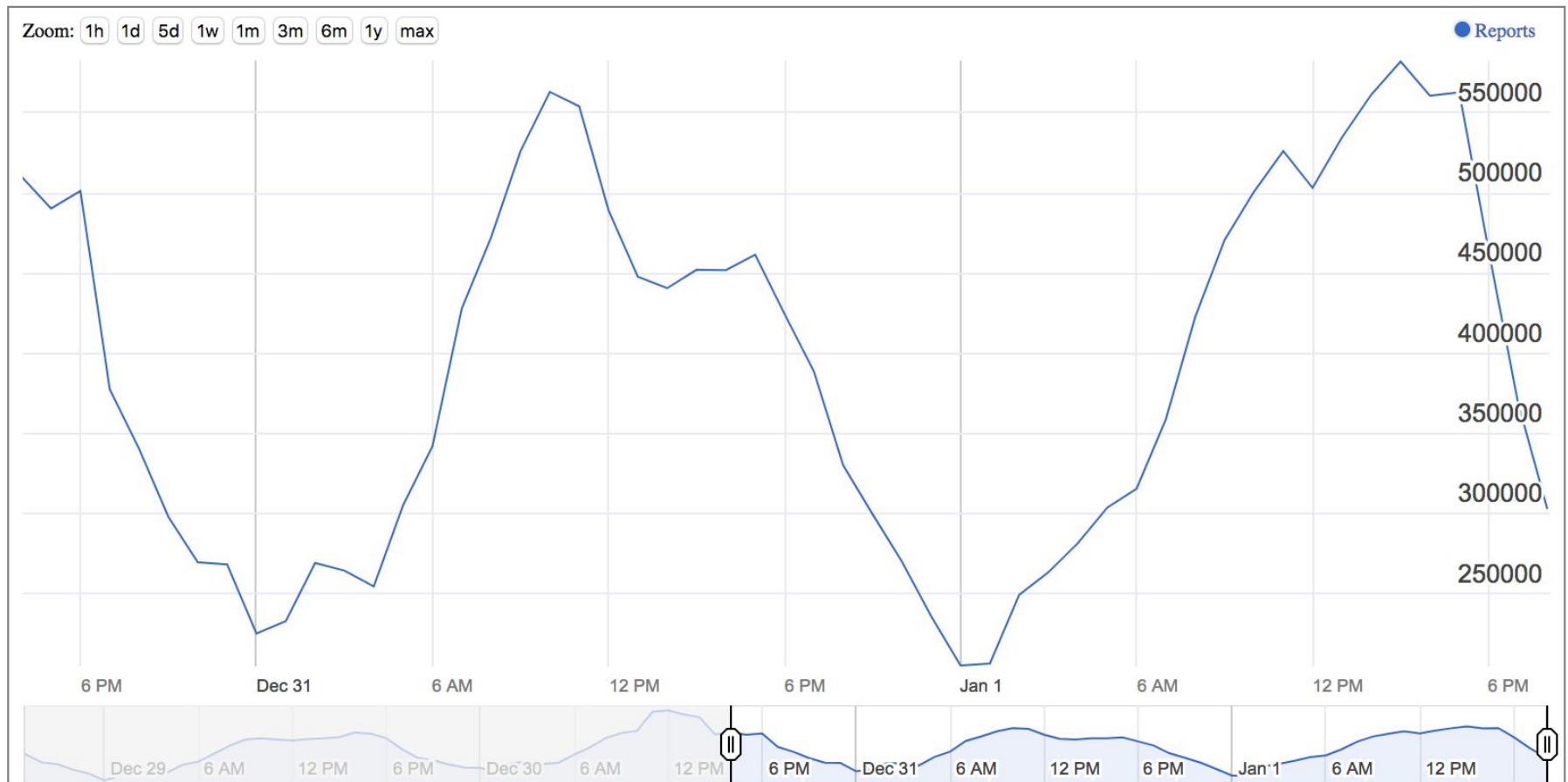
Authenticated by API key

One report per line in JSON format

```
{"sequenceNumber":2400358267,"frequency":7074294,"mode":"FT8",  
"sNR":-3,"flowStartSeconds":1515857114,"senderCallsign":"J  
K1OZS","senderLocator":"QM05GR","receiverCallsign":"JI1SZR",  
"receiverLocator":"QM06an","receiverDecoderSoftware":"WSJT-X  
v1.8.0 r8193"}
```

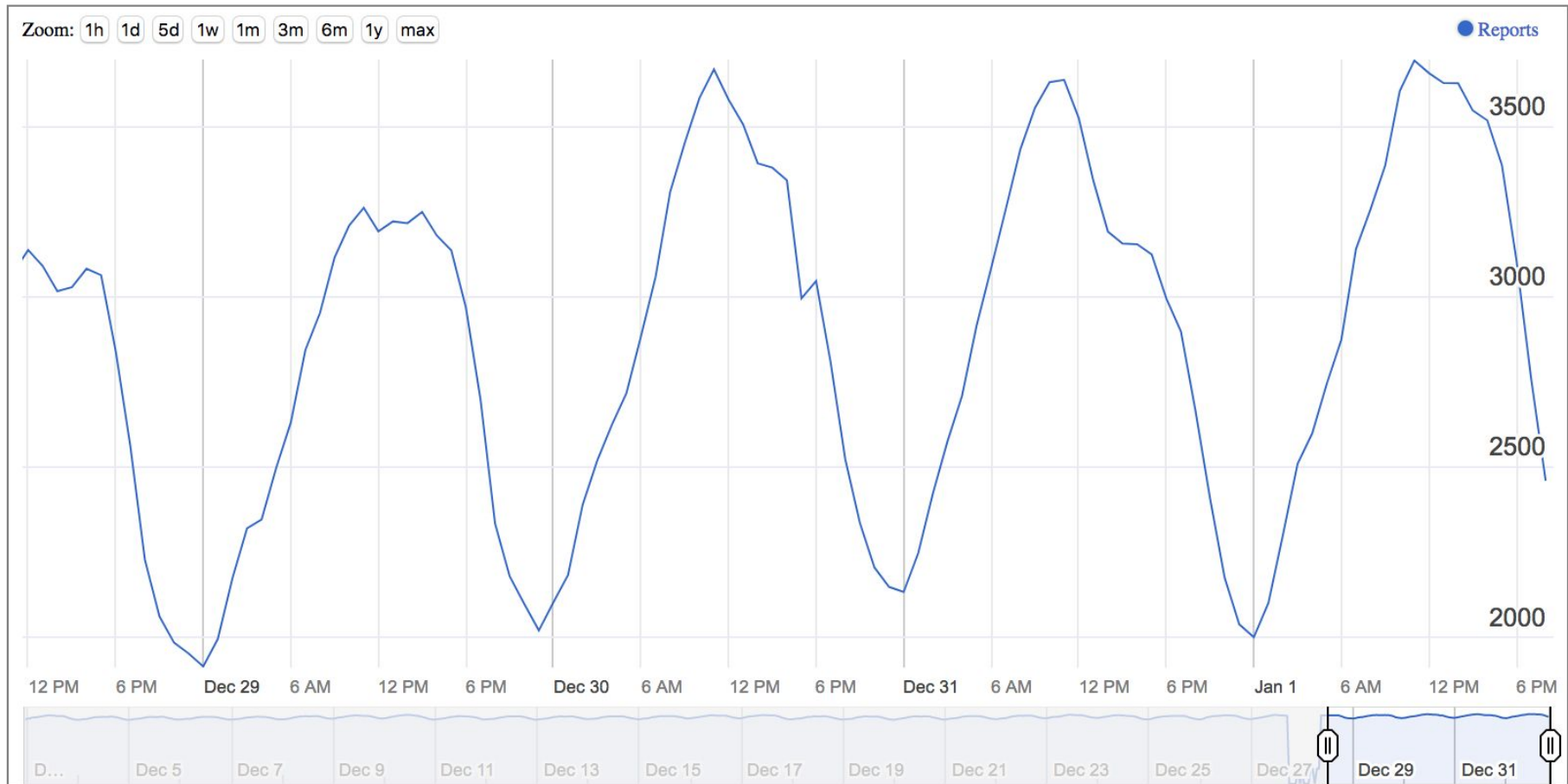
# How much traffic?

## Number of reports per hour received



# Statistics

## Number of active monitors (in any hour)



# How many DX entities can you spot?

Monitor	Reports over 24 hours	Reports over 7 days
W4DJW	163	226
G0LUJ	145	186
HB9HFN	131	174
F5RRS	125	184
VU3KAZ	123	177
IW4EGP	123	161
IN3EJN	118	156
G8DJF	117	158
ANALYSIS	113	158
DG0OPK	113	156
SP7QJF	111	156
OH2BUA	111	140
SV1CDN	109	171
SP5OAB	108	140
SV3EXP	108	126
SV8RV	107	155
UA3ARC	107	147
OG5N	107	142
SM7CAD	106	145
PD2RPS	106	143

☒ All

☐ 160m

☐ 80m

☐ 60m

☐ 40m

☐ 30m

☐ 20m

☐ 17m

☐ 15m

☐ 12m

☐ 10m

☐ 6m

☐ 2m

☐ 70cm

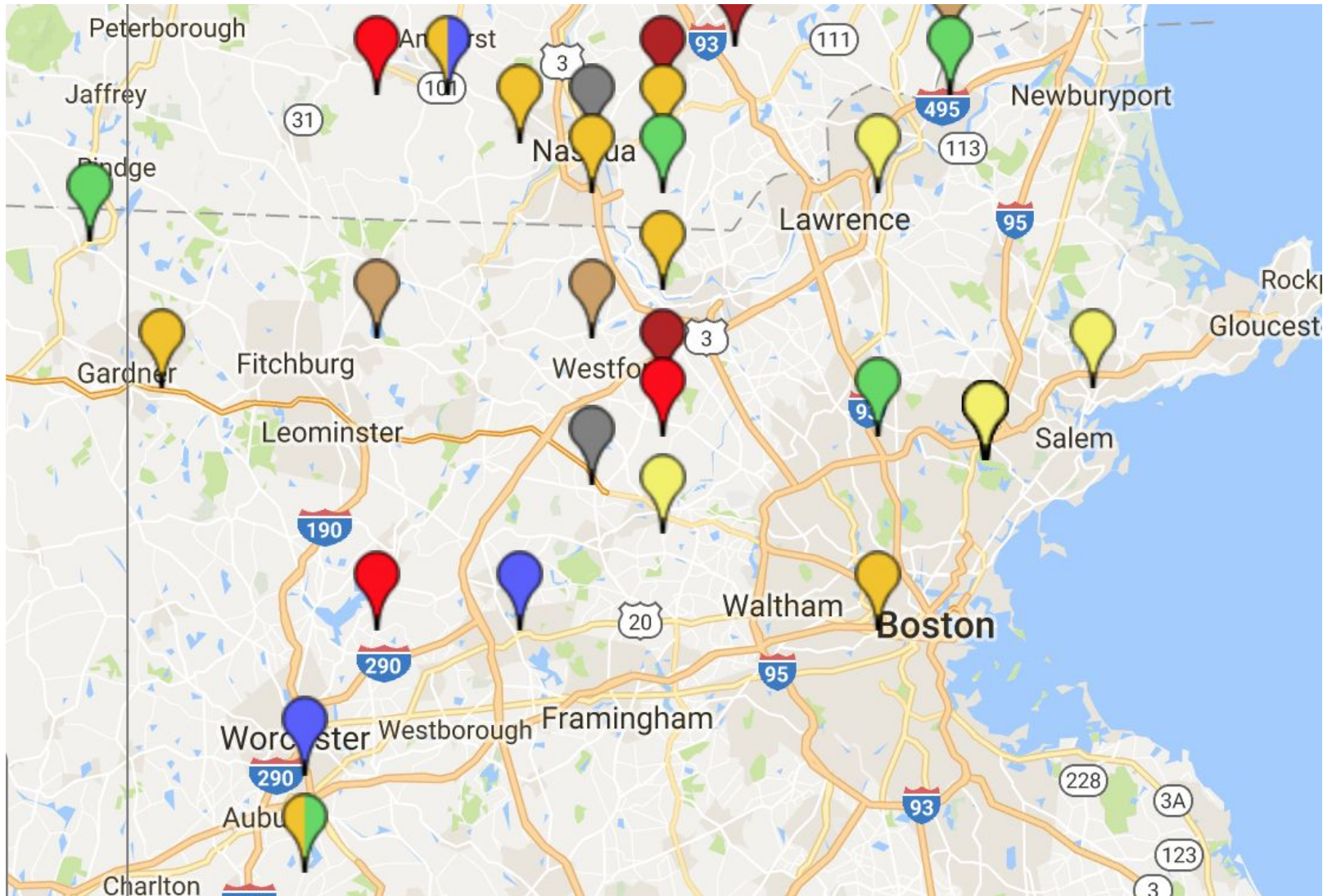
☐ unknown

# How many reporters?

Over a week:

WSJT-X	12973
JTDX	2999
JT65-HF	1006
UR5EQF log	823
Digital Master 780	584

# Reporters near QTH





# Hiccups - 1

July 2014: On vacation. Power loss at home. UPS doesn't last long enough. System down for many days. Migrated out of basement to Rackspace (provided by KF5WAY)

Feb 2017: Have to find another provider. Thanks to VA3ISP.

Summer 2017: On vacation. FT8 explodes. Performance problems. Added processing delay message

August 2017: Eclipse webgl overlay -- rendering problems

## **Hiccups - 2**

Fall 2017: FT8 popularity explodes. Database size issues

Nov 2017: Emergency maintenance

Dec 2018: Migrate to new faster server

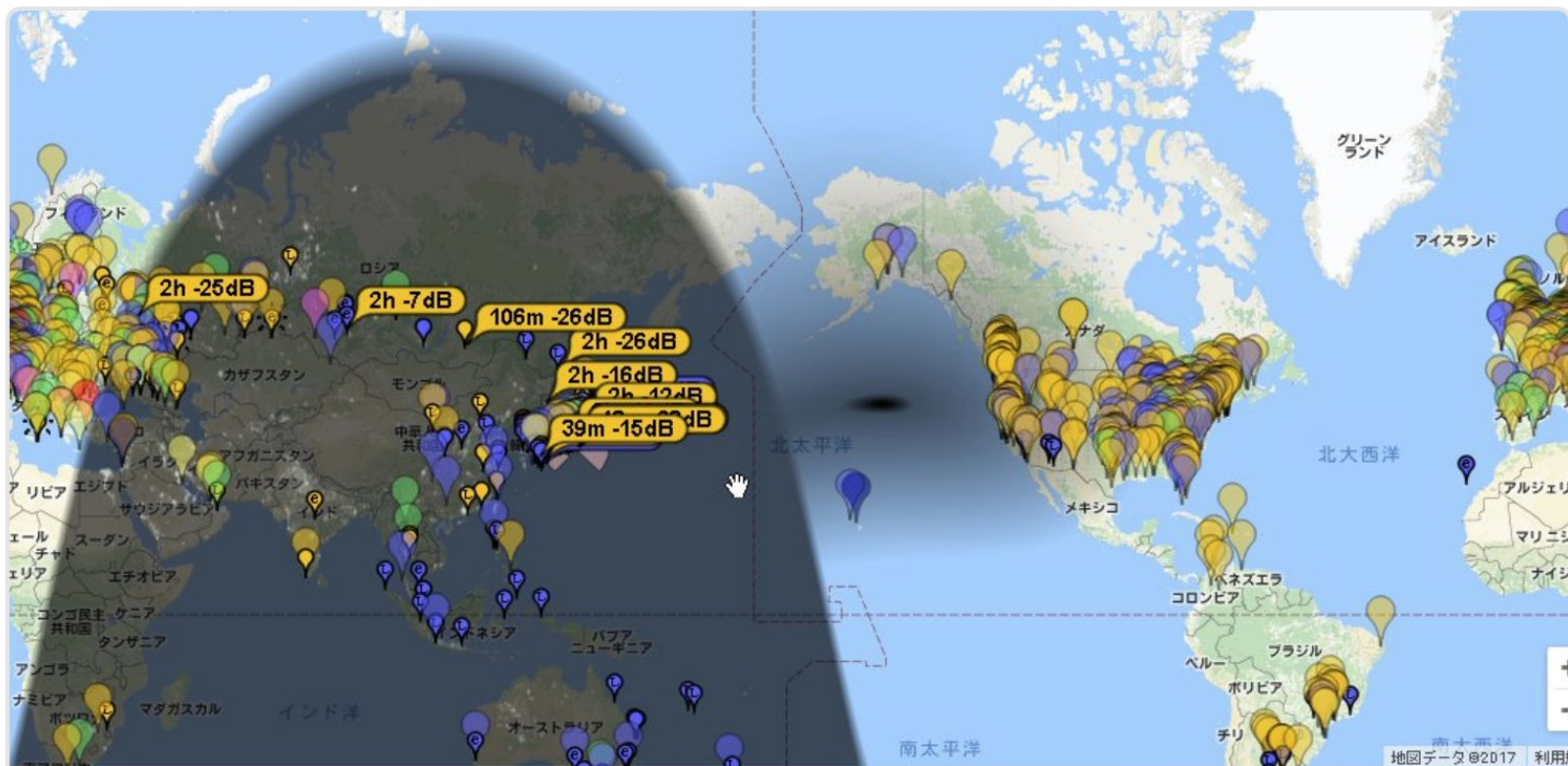
# Eclipse

JF3GFH\_K6QJ @JF3GFH\_K6QJ · 21 Aug 2017



PSKREPORTER の太平洋の影ってひょっとして皆既日食を示している？！ Solar eclipse is shown on the **pskreporter** map?!

Translate from Japanese



ts, problems etc to [Philip Gladstone](#). [Online discussion](#) of problems/issues. Reception records: 1,664,519,758

PSKREPORTER.INFO

# Day / Night terminator

Calculated in the browser

Use WebGL if possible

- Calculates each pixel

- Uses the GPU

- Takes eclipses into account

Merges nighttime lights image tiles

Issue: Doesn't always paint the entire screen.

Issue: Maybe should take gamma into account.

# Sample complaints

My tx-marker in the PSK-reporter does not contain L.

A W6 station is operating portable from VA and including the FM19 grid square in his data. PSK Reporter however shows him in California while he is fairly local to me in Va.

kb7qag should be in Tacoma not Purdy

My location is wrong please correct to DN06ah near Sunnyside Wa.

.@n1dq Hi OM Philip, CB radio spots are missing on #pskreporter when "11m" is selected.They are shown when "all bands" is selected. vy 73

Do you have a facility to donate for your services and great service?

# Wrong reported Frequency (band)

Some reporters do not set the reporting frequency correctly.

No CAT connection

People complain to me....

Most FT8 signals reported multiple times -- can vote on **right** frequency

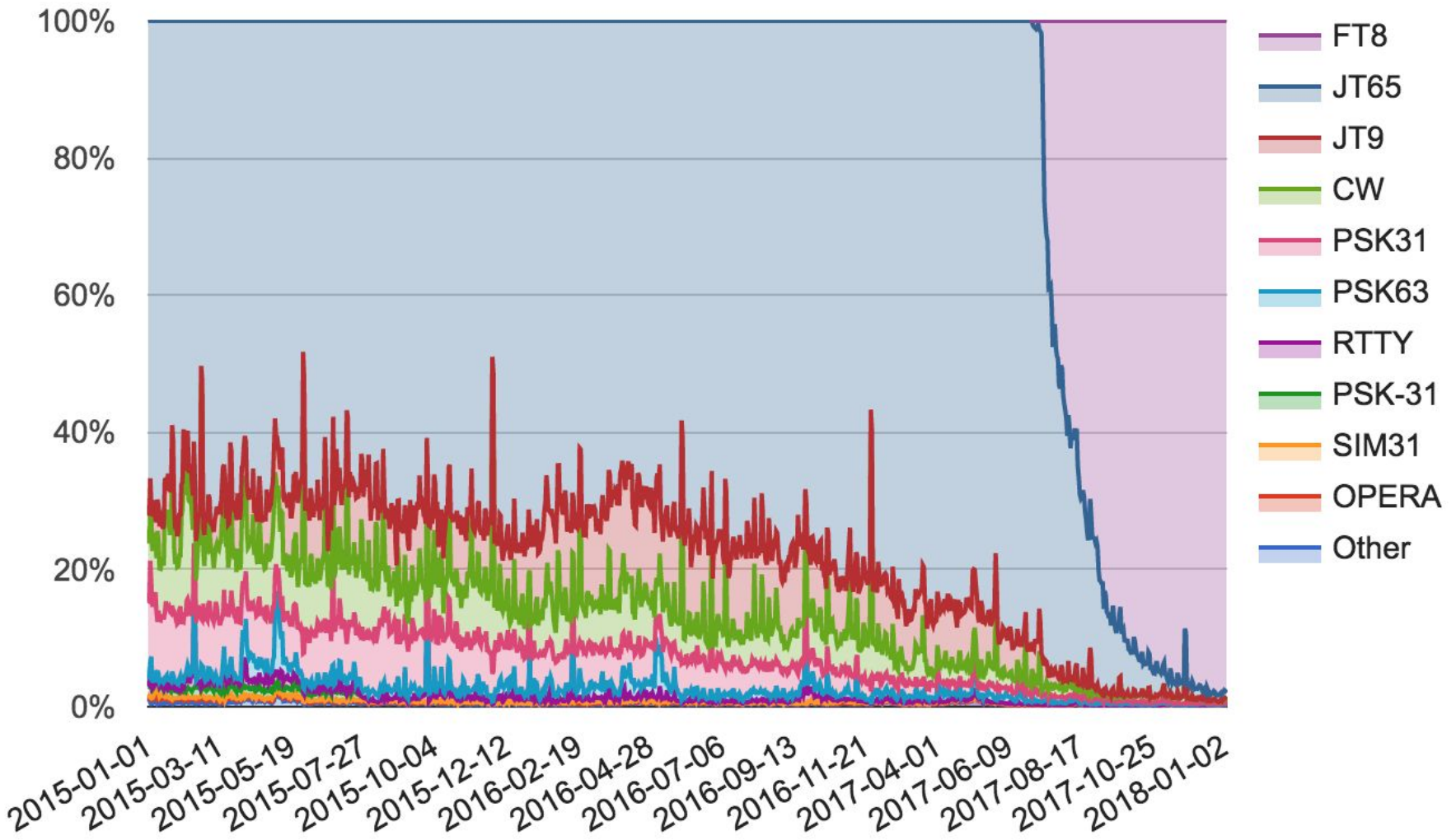
Assign goodness score to monitors based on percentage of frequency matches.

1-2% seem to report bad frequencies..

These records are now marked in the database.

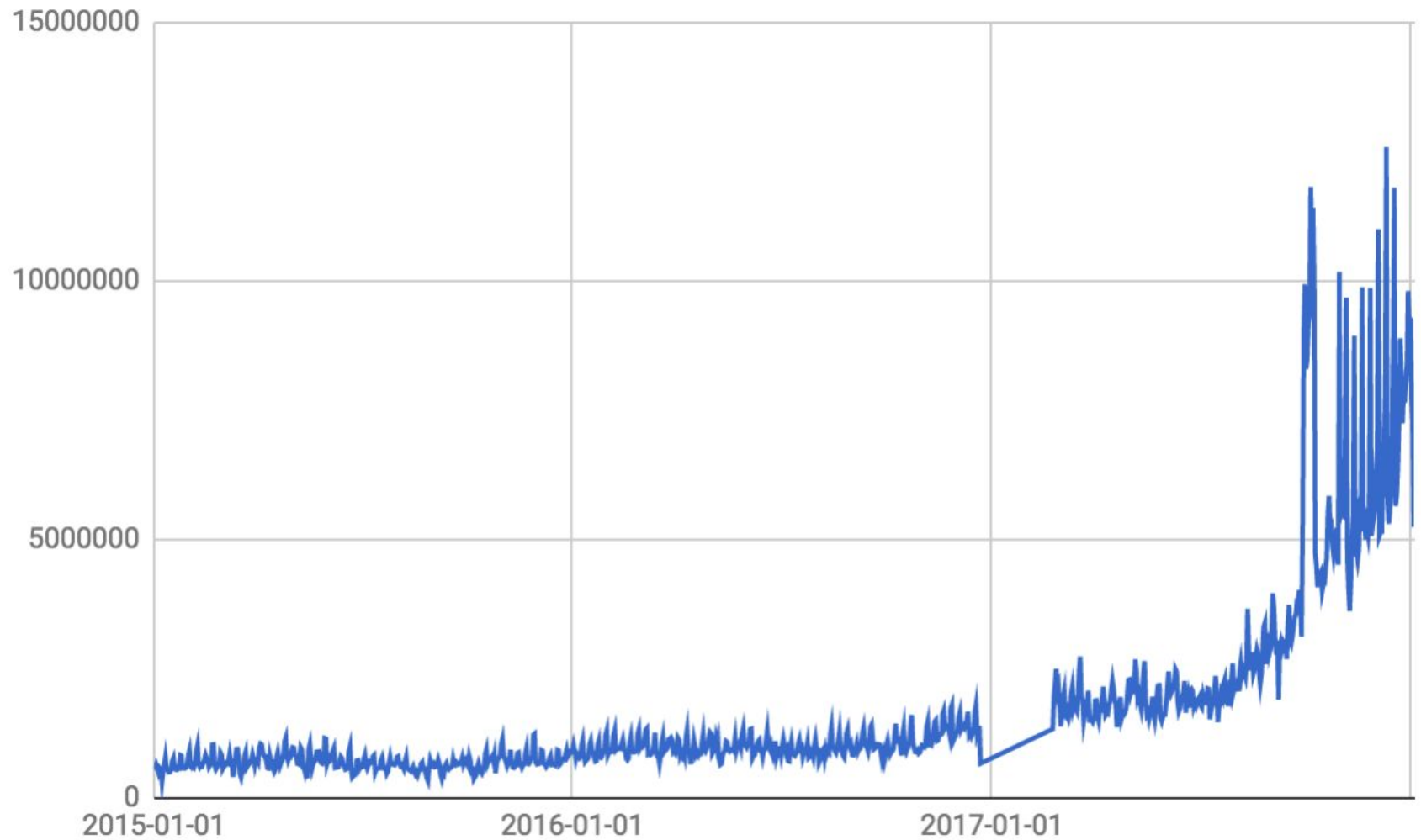
# Impact of FT8

## Reports by Protocol





# Impact of FT8



# Custom monitoring package

Build an image for RPi 3 to monitor multiple protocols

Should be simple to setup

- Pick Radio type (inc direct sample RTL)

- Set callsign and locator

- Done!

What is performance of RTL dongle?

Lost cost package for underserved areas of world:

- Africa, Middle East, Western China, Eastern Russia

# HamSCI Relevance

Large supply of receiver/transmitter/frequency datapoints that show that a path is open at that time.

Existing collection of people will to participate.

Limited software diversity (majority is WSJT-X)

Possibility to gather more data useful for ionospheric observations.

# Questions?

<https://pskreporter.info>

Philip Gladstone - N1DQ

philip@gladstonefamily.net

# Where is PSK31?

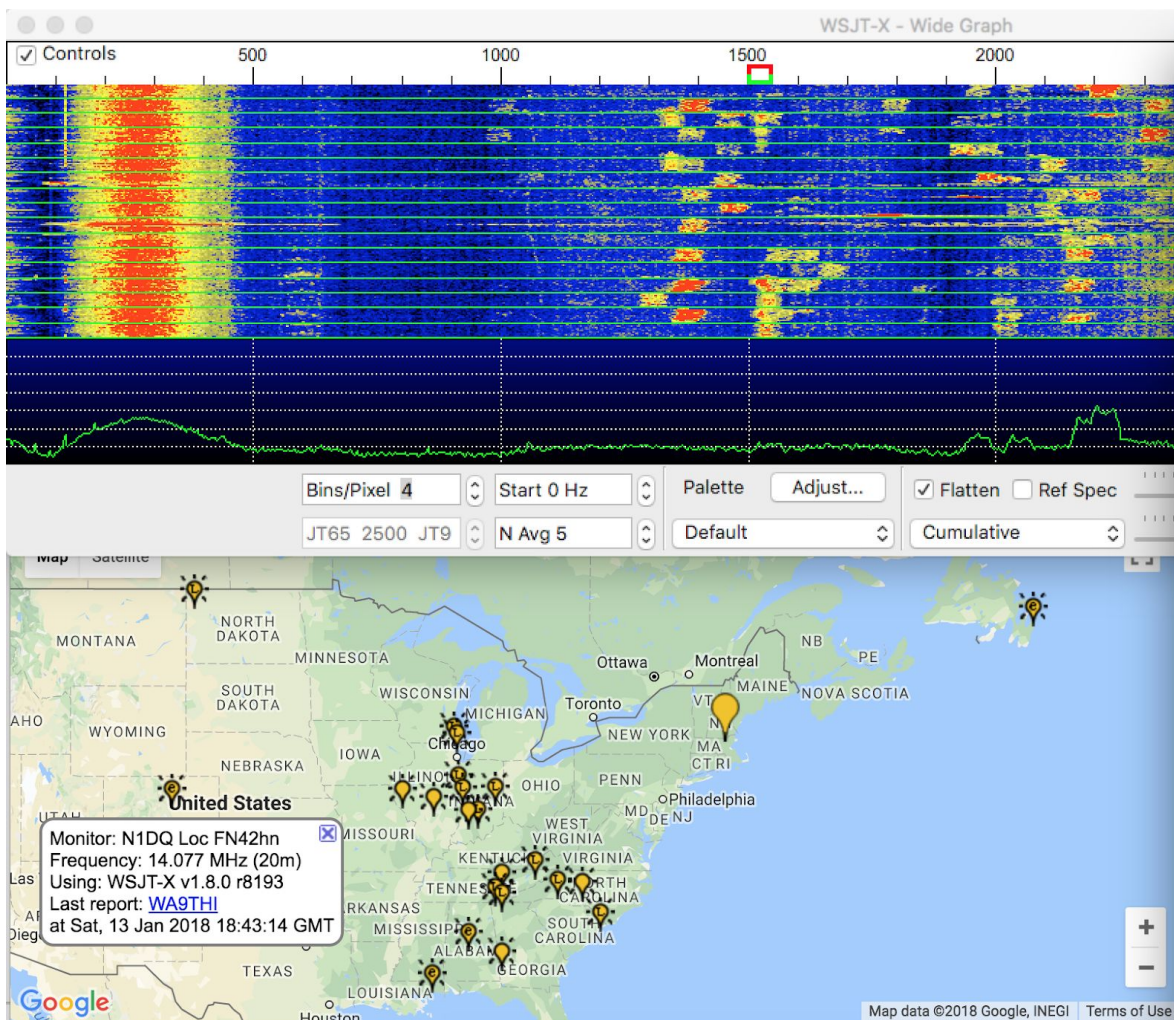
Mode	Count
FT8	563767
JT65	4938
CW	1617
JT9	335
PSK31	218
VARA	103
RTTY	60
MSK144	44
OPERA	41
ROS	12
OLIVIA	11
PI4	11
PSK63	6

## A photograph showing a vintage Sony TS-7200 radio receiver on the left and a laptop on the right. The laptop screen displays the WSJT-X software interface, which includes a wideband waterfall plot at the top, a map of the United States in the center, and various control panels on the right. The radio has a digital display and a numeric keypad. The setup is on a wooden desk.





# Laptop closeup



WSJT-X v1.8.0 by

### Band Activity

UTC	dB	DT	Freq	Message	UTC
184245	-11	0.2	2468	K4SHK VO1IRA -15	
184245	-12	0.1	2505	VE3COC KE4AZN EM71	
184300	-11	0.3	1541	VE3DVV NOAZZ 73	
184300	-11	-0.7	1594	K0HYZ K9BR EM49	
184300	-7	0.0	2147	LA1PTA N4KDW EM75	
184300	-10	0.1	2377	W1QLF K4ELI 73	
184300	-14	0.2	2738	CQ WA9THI EM69	
184300	-8	0.1	2844	K8NU AE0AF RRR	
184315	-11	0.2	2480	K4SHK VO1IRA R-16	
184330	-8	0.1	1367	LA1PTA WB9NEY EM59	
184330	-22	0.1	2158	LA1PTA N4KDW EM75	
184330	-20	0.2	2858	K8NU AE0AF RRR	
184345	-4	0.2	1450	CQ DX K4OP EM77	
184345	-22	0.1	2025	CQ KB9VK EM79	
184345	-17	0.3	2082	VE3MNX K4MY EM74	
184430	-12	0.1	1361	LA1PTA WB9NEY EM59	
184430	-9	0.1	2095	K1HK K4ELI EM74	
184430	-10	0.2	2298	CQ WA9THI EM69	
184430	-11	0.2	2350	W0ZAP W4USH 73	
184430	-4	0.2	2537	LA1PTA W9NED EM68	
184430	-17	-0.1	2726	CQ W9YSX EM79	
184445	-15	0.2	1438	UA1OLM K4OP EM77	
184445	-8	0.1	1912	W1GQQ AA4QE EM78	
184445	-14	0.1	1964	KC9TPY KB9VK EM79	
184500	-14	0.3	975	SV8DDT N4VV 73	
184500	-11	0.1	1362	LA1PTA WB9NEY EM59	
184500	-2	0.1	2298	CQ WA9THI EM69	
184500	-15	0.1	2537	LA1PTA WA9EIC EN60	
184500	-16	-0.1	2726	CQ W9YSX EM79	
184515	-11	0.2	1439	UA1OLM K4OP EM77	
184515	-21	0.1	1600	KA5TPJ K0HYZ -03	
184515	-19	0.1	1911	W1GQQ AA4QE EM78	
184515	-21	-0.2	2020	WASVGI KG0RG EN33	

Log QSO Stop Monitor Erase Decode

20m 14.074 000 Tx even/1st

DX Call DX Grid Tx 1500 Hz Tx ← Rx

Rx 1500 Hz Rx ← Tx

Hold Tx

Lookup Add Report -15

Auto Seq Call 1st

NA VHF Contest

2018 Jan 13 18:45:58

Receiving FT8



# WebGL

Code runs on GPU

Application draws shapes such as triangles

GPU processes vertexes

GPU runs shader for every pixel inside the shape and colors pixel

```
float fLatitude = v_latlng.x * 3.1415926 / 180.0;
float fLongitude = v_latlng.y * 3.1415926 / 180.0;
// Calculate difference (in minutes) from reference longitude.
float fDifference = (((fLongitude) * 180./3.1415926) * 4.) / 60.0;
// Caculate solar time.
float fSolarTime = u_fLocalTime + u_fEquation + fDifference;
// Calculate hour angle.
float fHourAngle = (15. * (fSolarTime - 12.)) * (3.1415926/180.0);
// Calculate current altitude.
float cc = cos(u_fDeclination) * cos(fLatitude);
float t = (sin(u_fDeclination) * sin(fLatitude)) + (cc * cos(fHourAngle));
```