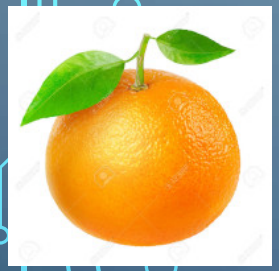


TANGERINE SDR SYSTEM ARCHITECTURE

OBSERVING THE IONOSPHERE FROM YOUR HOME QTH

BILL ENGELKE, AB4EJ - FEBRUARY 2020

OVERVIEW

- What is the PSWS Network?
- How is the system architected and designed?
- How will the TangerineSDR work?

GOALS

- Build a network of receivers that can observe the ionosphere by watching doppler shift in WWV and other stable signals
- Give hams a way to closely monitor propagation at their own stations

WHAT WILL PSWS NETWORK BE?

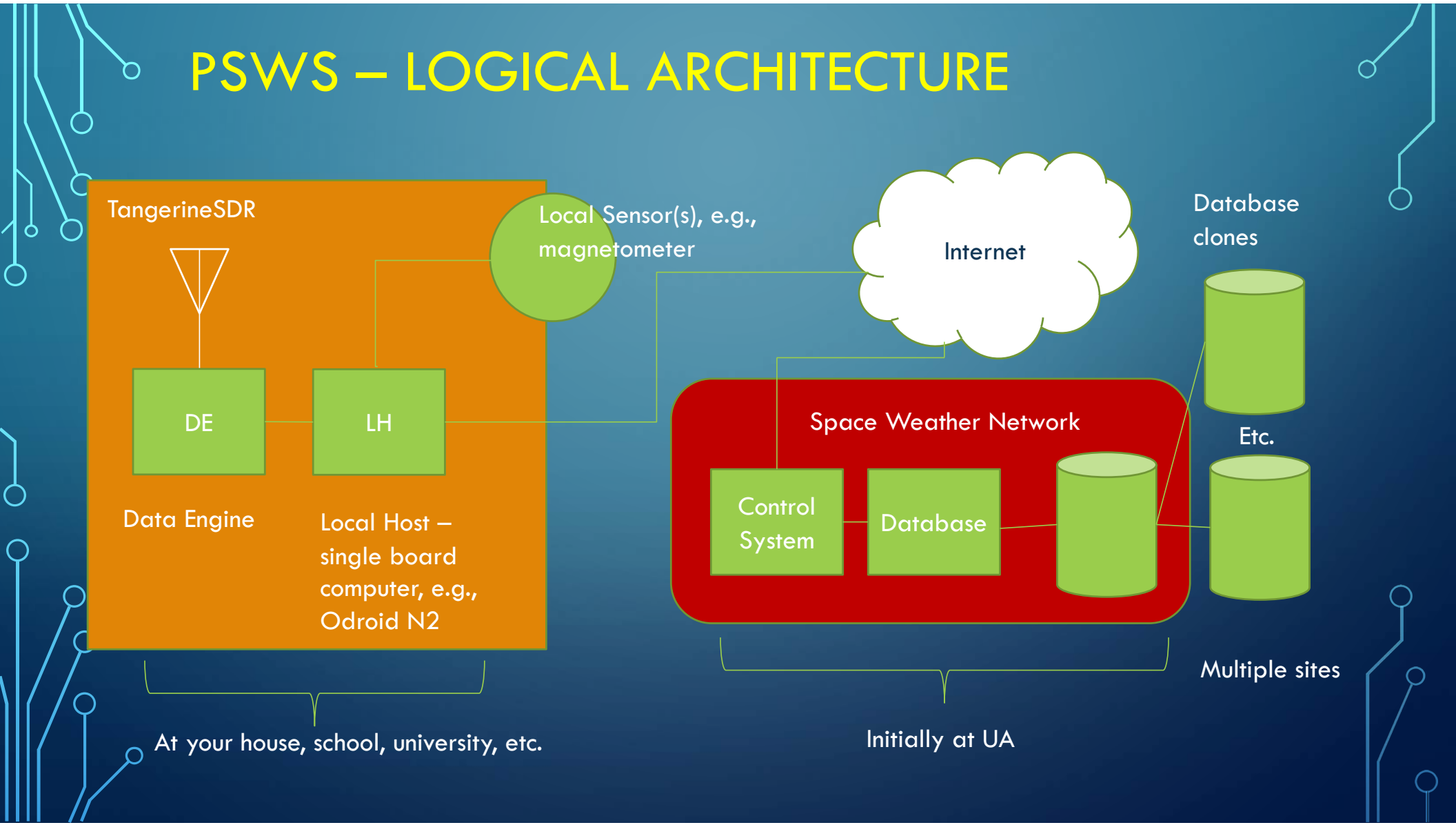
- Organized by a group of Universities and research facilities
- Several hundred (maybe thousands) - Inexpensive Software Defined Radios scattered across the globe – in ham shacks, schools, universities, etc.
- Each includes a low-cost yet powerful Single Board Computer
- All tied together into a network
  - Data analysis for science objectives PLUS
  - Each station is a personal propagation monitor

PSWS NETWORK, TOP LEVEL – PHASE 1

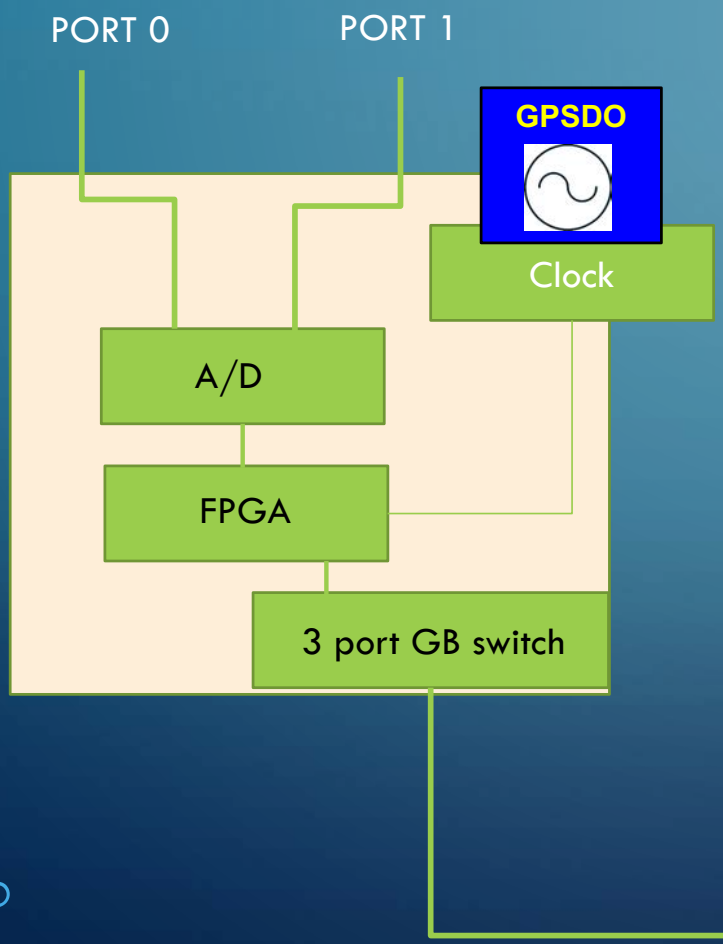
- Station locations are just examples. Emphasis is on North America, but users in other locations are also welcome
- Database will be at University of Alabama for Phase 1

Goal is to have hundreds of these operating

PSWS – LOGICAL ARCHITECTURE

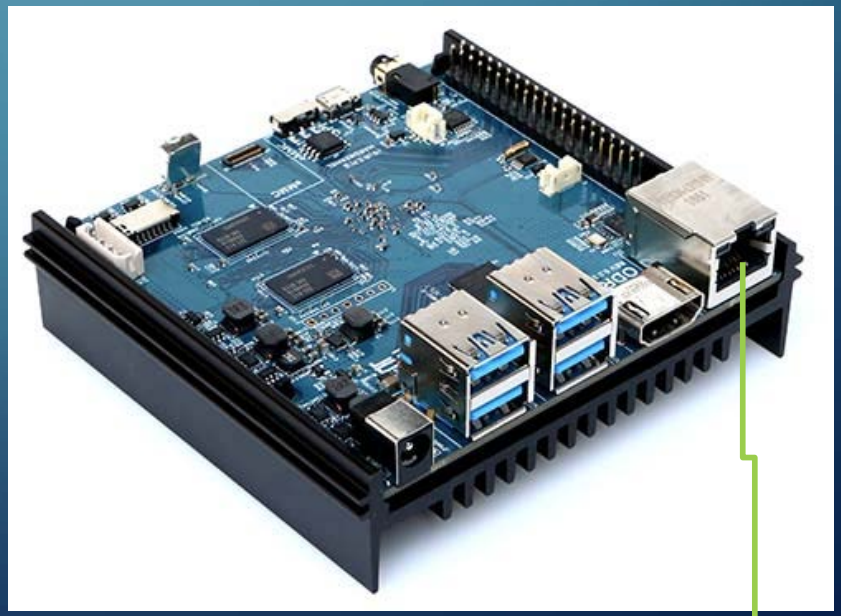


WHAT IS IN THE TANGERINE SDR?



A TangerineSDR consists of:

- Data Engine – A/D converter and FPGA
- Single Board Computer (Odroid N2 4GB RAM)
- Connected together by a gigabit switch
- (optional) – highly accurate clock



TANGERINE-SDR SOFTWARE

Internet

To Central Control System

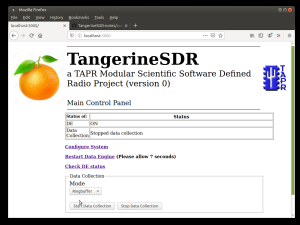
Data Engine

3 port GB switch

Mainctl – written in C

- Asynchronous package (libuv)
- Handles commands from local web server
- Handles high speed data feed from DE (UDP)
- Saves data in Digital RF format
- Decodes FT8 & WSPR signals
- Manages uploads to Central Control system
- Interfaces to GNURadio

Monitor



Local Browser-based UI "Web Controller" (running flask, flask-WTForms)

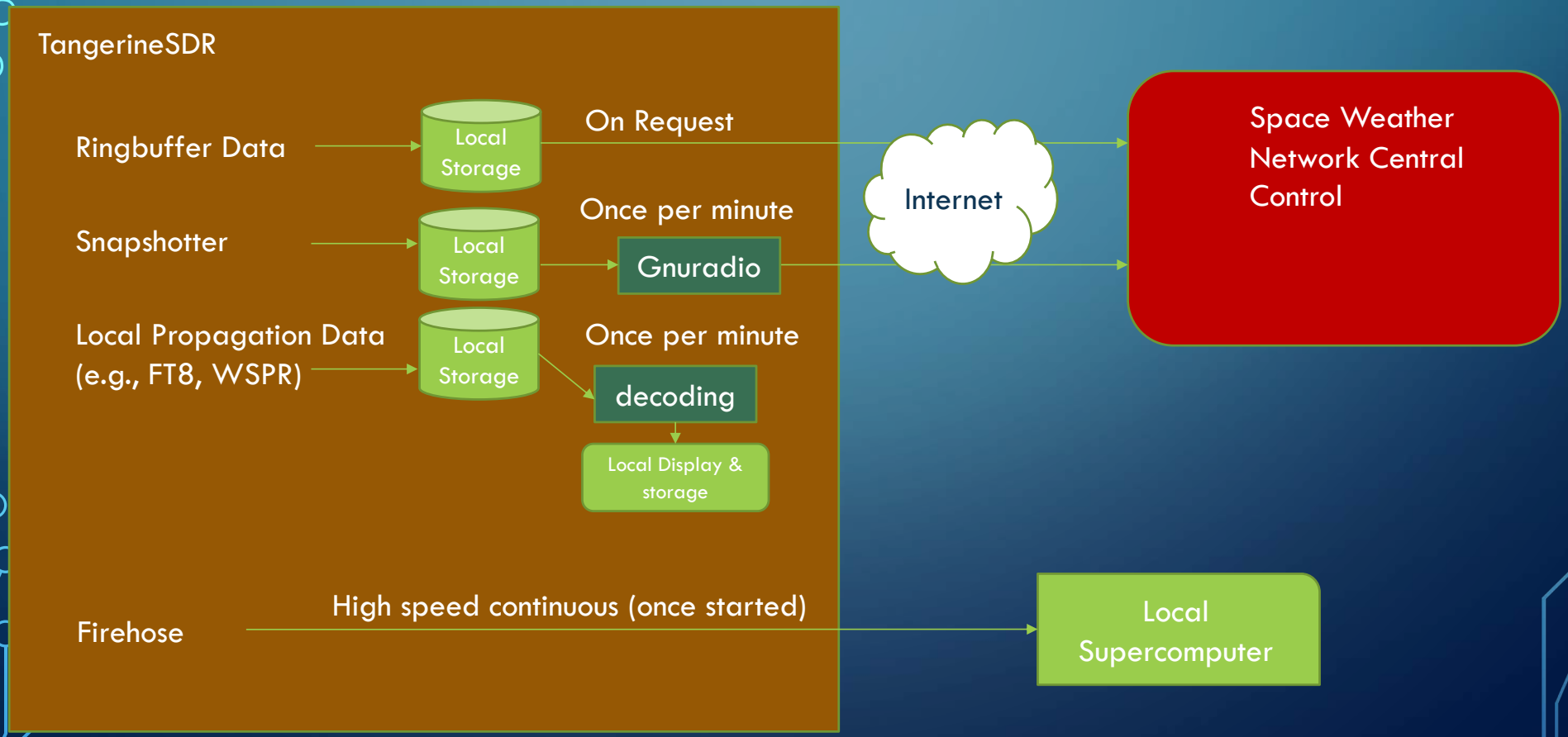
Local USB HD

RAMdisk

DATA COLLECTION

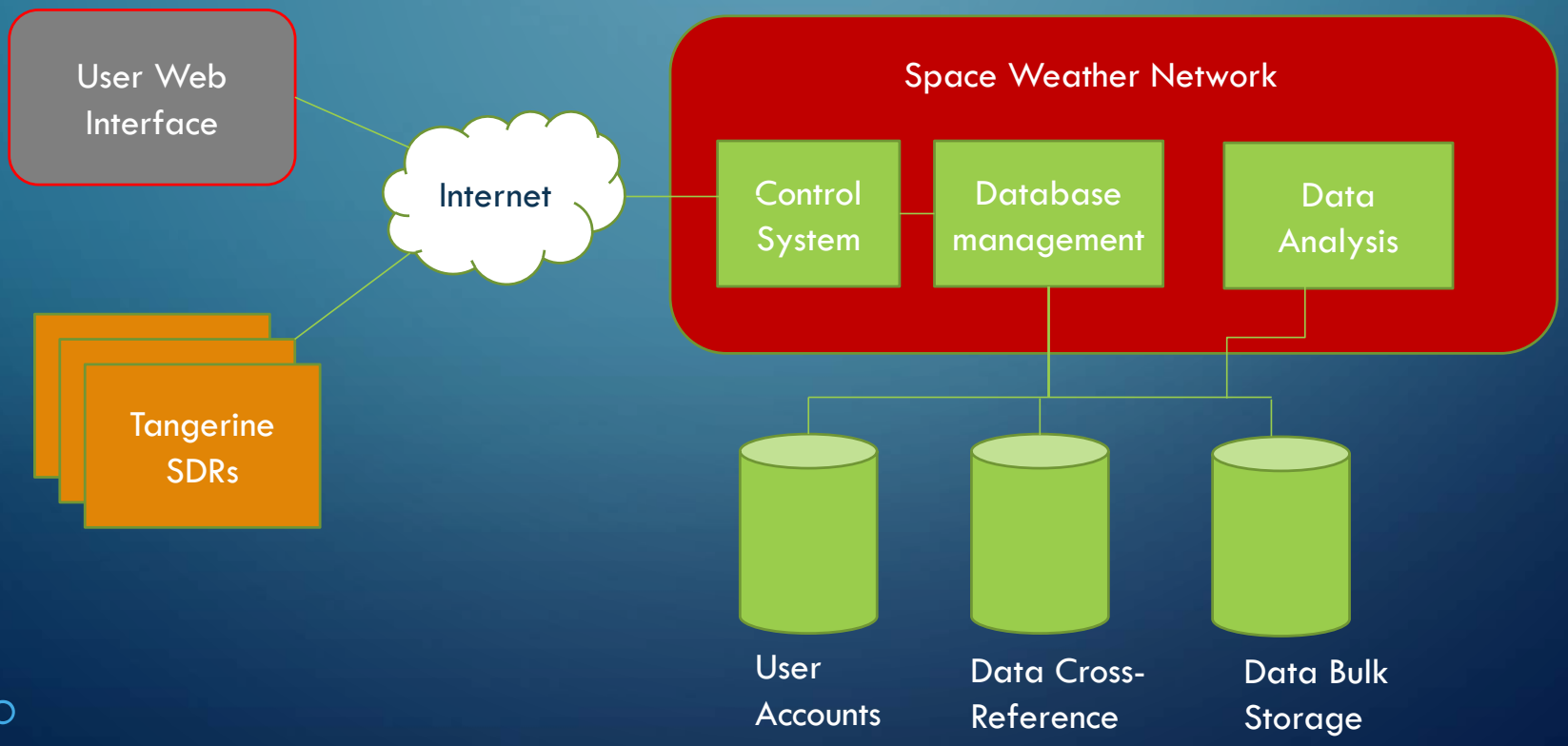
- Can monitor up to 16 band segments at a time
- 4 types of data collection
  - SNAPSHOTTER: Once-per-second waterfall snapshot upload
    - (good in cases of low internet bandwidth)
  - RINGBUFFER: Continuous local storage for 24 hours, then upload on request from Central Control (with throttling)
  - FIREHOSE: Continuous transfer to local supercomputer
  - Propagation Monitoring: once per minute decode of JT8 and WSPR on up to 8 bands each

HANDLING COLLECTED DATA



CENTRAL CONTROL SYSTEM

- Similar to SATNOGS network



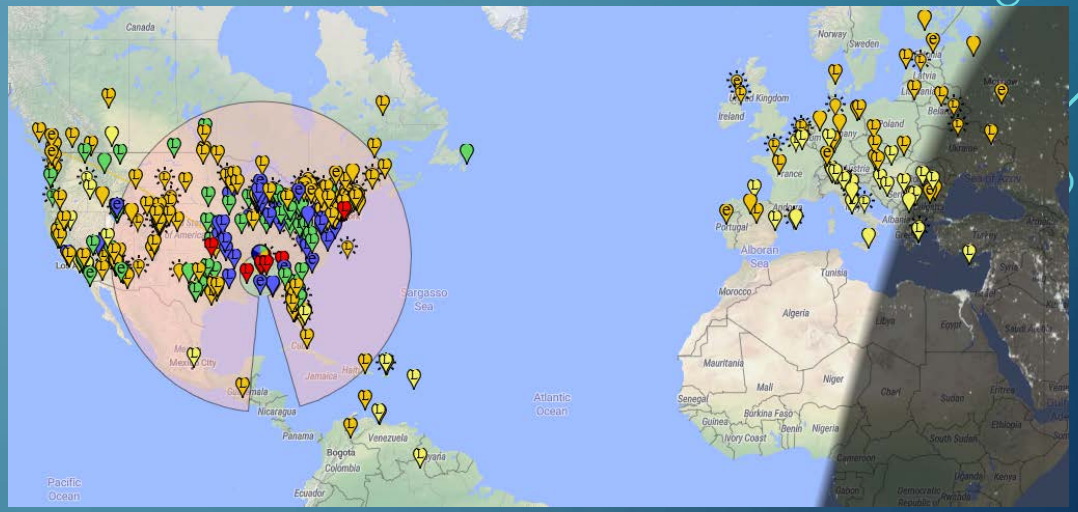
HOW YOU WILL USE THE NETWORK

- Build your TangerineSDR & get it working locally
- Browse to the Central Control System & sign up for account
- Get security token from Central & paste into Tangerine web interface: this identifies your Tangerine to Central
- Start collecting data!
- You can also do Local Propagation Analysis at the same time if you wish

DATA ANALYSIS

- TangerineSDRs collecting data using Snapshotter or Ringbuffer
- Central system will request data, which then get uploaded
- Data saved in database for analysis
  - Spectrum data to be stored in HDF5 format
  - Science users can run analyses; anyone can download data
- Local propagation reports via FT8, WSPR

WHY PARTICIPATE?



- Be part of new science
- Compete for wallpaper
- PSWS is planned to provide ongoing propagation monitoring at your location with multiband FT8, WSPR, etc., etc.

Q & A

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