Off-Grid Spotting with SOTAmāt

Stephan Schmid, HB9EAJ
HAM RADIO 2023

Presentation Overview

- Purpose and overview of SOTAmāt

- Existing spotting possibilities

- Setup and configuration of SOTAmāt

- Self-spotting example

- How it works and caveats

- Tips & tricks and outlook

- Questions anytime, please!

SOTAmāt Overview

- Website: sotamat.com

- Developed in 2022 by Brian Mathews, AB6D

- The system consists of a server application and a smartphone app (iOS and Android)

- Allows self-spotting on HF, typically using FT8

- The name is pronounced differently than you might think, but you'll get used to it ;-)

Sounds Familiar to You?

- You've hiked for several hours to a summit and have no mobile network coverage

- OK, let's try to spot with APRS, choose one:

  - No digipeater reachable

  - Handheld UI is tedious

- I should've learned CW and posted an alert beforehand!

SOTA Spotting Possibilities 1/2

- SOTAWatch, SOTA API (used by 3rd-party applications like SOTLAS)

- SOTA SMS Gateway Service

- Doing CW after posting a corresponding alert

- APRS to SOTA on 144.800 MHz FM (Europe)

- JS8Call on HF (needs a laptop or a single-board computer)

SOTA Spotting Possibilities 2/2

- Ask another ham on the air to spot you (hopefully, there's no contest going on)

- A satellite messenger, e.g. Garmin InReach, Zoleo or SPOT-X:

  - They use Iridium or Globalstar low-Earth-orbit satellites and need a clear view of the sky

  - Requires a subscription

- New: Use SOTAmāt with your SSB transceiver!

Why is SOTAmāt so Cool?

- It's free and you probably already have all the equipment!

- Basically, works with any smartphone

- FT8 audio is generated by the app itself

- Works with any HF SSB transceiver with a microphone (audio cable is optional)

- Once everything is set up, it's quick and easy to spot

Further SOTAmāt Features

- POTA self-spotting

- Self-alerting, mainly useful for CW operators

- Send a predefined email or SMS message

- Several two-way commands, by SMS, email or satellite communicators

SOTAmāt Setup – Server 1/4

- Register on sotamat.com

- Go to menu **HF PREPARATION**:
    - Add **SOTA REGIONS** (including association) with your call sign, e.g. **DM/BW** with **DL/HB9EAJ/P**

Edit entry   ×

Region ID: *   (DM/BW)   ▾

My Notes: Baden-Württemberg

Posting Call   (DL/HB9EAJ/P)
(optional):

✖ Cancel   ◄ Prev   Next ►   ✓ Apply and add new   ✅ OK

SOTAmāt Setup – Server 2/4

– Optional: Add **POTA LOCATIONS**
e.g. **HB/SO** with call sign **HB9EAJ/P** used:

– Add **FREQUENCIES & MODES**
e.g. SSB, 14.310 MHz base frequency with 2'500Hz step increment and 17 steps (14.310 MHz to 14.350 MHz*):

Edit entry

Mode: *   SSB

Base KHz: *   14.310

Step HERTZ: *   2,500

Steps: *   17

My Notes: 20m SSB

✗ Cancel ◄ Prev Next ► ✓ Apply and add new ✓ OK

* Do you see the mistake?

SOTAmāt Setup – Server 4/4

– Optional: **MESSAGING COMMANDS**
e.g. email, SMS or REST, with predefined content

SOTAmāt Setup – App 1/3

- **Install the SOTAmāt app:**
  - Android ≥ 5.0: [Google Play] [amazon appstore] or as [APK file]
  - iOS/iPadOS ≥ 14.5: [Download on the App Store]

- **Go to menu Setup:**
  - Enter login credentials and press [LOAD CONFIGURATION FROM SERVER] button:

Step 2:

After ANY configuration change on the web site, you MUST load it here before going offline. The server and phone must stay in sync:

HB9EAJ

•••••••••

LOAD CONFIGURATION FROM SERVER

SOTAmāt Setup – App 2/3

– Optional: Press button [DOWNLOAD CHANGES] (SOTA and POTA offline data):

Step 3: (optional)

To display optional Summit/Park information offline, download the 202,000+ database records. The first download takes several minutes with a stable internet connection. Subsequent downloads grab only changed records.

DOWNLOAD CHANGES

Records updated: 2,734

- Advanced settings:

Advanced (optional) settings

FT8 device time correction (default=0): 0.0 seconds

FT8 audio frequency (default=1,543Hz): 1,582 Hz

Shift FT8 51Hz per repetition (default=Y):

SOTA Spotting Example – Setup

- Spotting on DM/BW-001 for 7.190 MHz SSB:

SOTA Spot Me

Region: Summit:

DM/BW - **001**

Region: Baden-Württemberg

My notes:

Summits: 861   Post As: DL/HB9EAJ/P

Summit: Feldberg

Alt ft/m: 4,897/1,492   Activated: 231

Recent: DL/HB9HCI/P   Points: 10

Recent: 3/23/2023 12:00:00   Bonus: 3

Mode/Band: **SSB : 7.080 MHz**

Notes: 40mSSB

Frequency: **7.190 MHz**

Computed message to Xmit:

FT8:   **S HB9EAJ/QC8J**

PLAY FT8 AUDIO

FT8 Audio is Played - Notes

- FT8 band and spotting band may be different

- FT8 on 20m is best

- FT8 runs on USB

- Send it redundantly, duplicates are OK
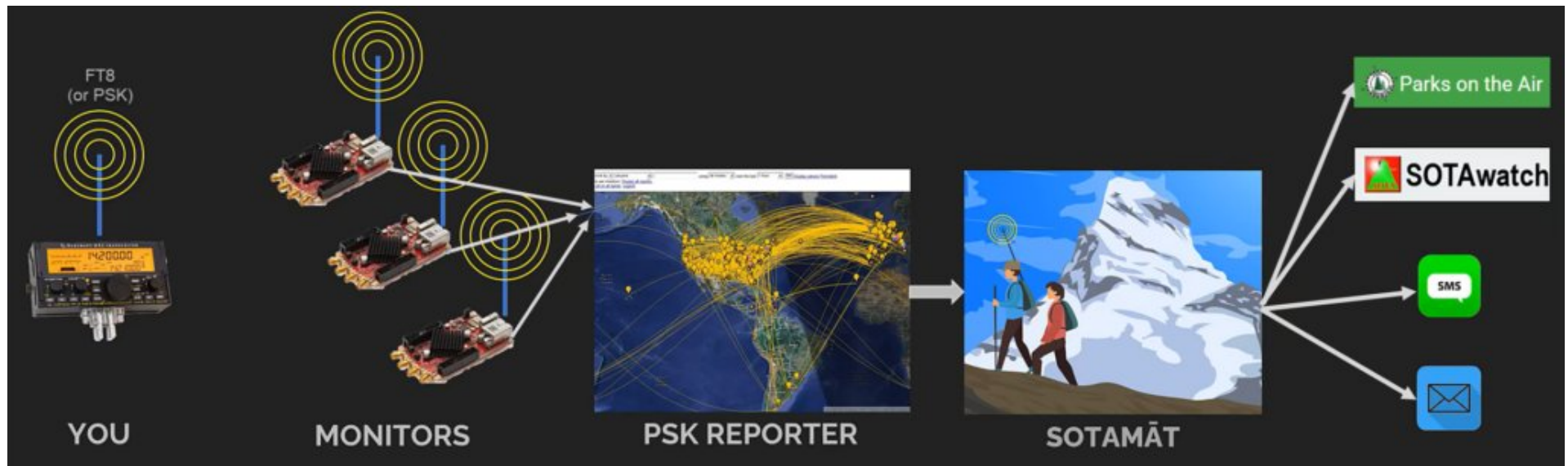

AI-generated image by DALL·E

SOTA Spotting Example – Result

- G4BRK received and spotted me!
  (can be seen under sotamat.com/activity)

Receiver ▲	Locator ▲	sNR ▲	Command ▲	Result ▲	Target ▲	Content ▲
DL3EL	JO40HD	6				
G0KTN	IO81TI	5				
MM3NDH	IO86ha	-3				
LX3KR	JN39gt03	7				
G4BRK	io91hp	-3	SOTA-Spot	OK: Posted	HB/FR-028	HB9EAJ/P HB/FR-028 SSB 28.480 (Freq
MM3NDH	IO86ha	-8				
G4BRK	io91hp	-11	SOTA-Spot	OK: Posted	DM/BW-640	DL/HB9EAJ/P DM/BW-640 SSB 14.345 (
K1HTV-4	FM18ap	-12				
G4BRK	IO91HP	7	SOTA-Spot	OK: Posted	DM/BW-001	DL/HB9EAJ/P DM/BW-001 SSB 7.190 [F
MM3NDH	IO86ha	9				

SOTAmāt Workflow

- FT8 TX → skimmer RX →PSK Reporter → SOTAmāt → SOTAwatch, email, SMS, …

Notes about Spotting

- Only about 0.2% FT8 skimmers can decode FT8 free text and send it to PSK Reporter:
  - Currently only SparkSDR and WSJT-X plugin

- Spotting can take up to 6 minutes:
  - Skimmers cache for 5 minutes before sending to PSK Reporter
  - Remaining minute is spread over the systems
  - On average a spot needs 2-3 minutes

Encoding the Message 1/2

- Data is encoded in an FT8 free text message (max. 13 alphanumeric characters)

- Format example: `S HB9EAJ/WXYZ`

  - `S`: Free text start character(s), followed by a space

  - `HB9EAJ`: Call sign (max. 6 characters)

  - `/WXYZ`: Call sign suffix (max. 4 characters)

- Suffix with max. 4 alphanumeric characters (A..Z + 0..9) = Total 1'727'604 combinations

Encoding the Message 2/2

- Many of these 1.7M suffix combinations have a conflict or special meaning (e.g. /P, /W4, /HELP, ...) and can't be used

- 1 Mio possible combinations remain:
  - Only a limited combination of regions, modes and frequencies can be defined

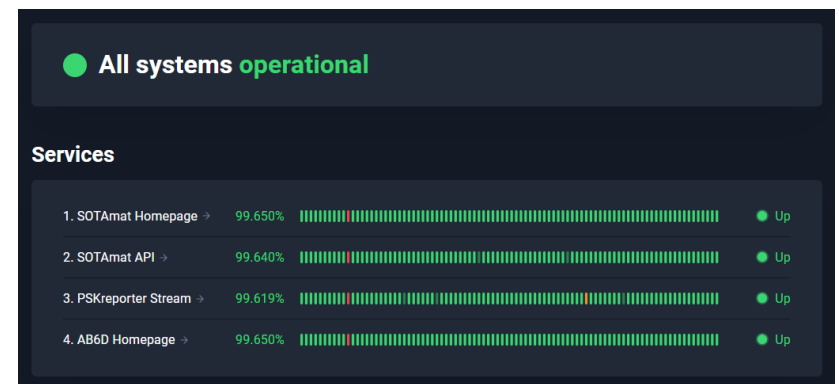| Summits	Parks	Freq Steps	Commands	Combinatio...
4,120	1	232	2	956,074

Caveats 1/2

- One-person project (with the help of others)

- Currently closed source, but will be opened

- No guarantee that it works when needed

- Few skimmers handle our FT8 format, even fewer support PSK31 (e.g. for KX2/3 owners)

- May need up to 6 minutes to be spotted

- Strong wind and other sound may affect FT8 audio when using a microphone

Caveats 2/2

- Only previously defined data can be spotted, e.g. you can't spot a reference if you're on the "wrong" side of a border summit

- You can't change the spot comment

- Only one-way communication possible

- Only self-spotting/alerting possible

- System time should be within +/- 1 second

- Server and app configuration must be in sync

Tips & Tricks 1/2

- No spot after 6 minutes. What to do?
  - Check your settings (e.g. FT8 mode)
  - Check your system time and corresponding correction in SOTAmāt
  - Send it again, for redundancy, several times, maybe on another band
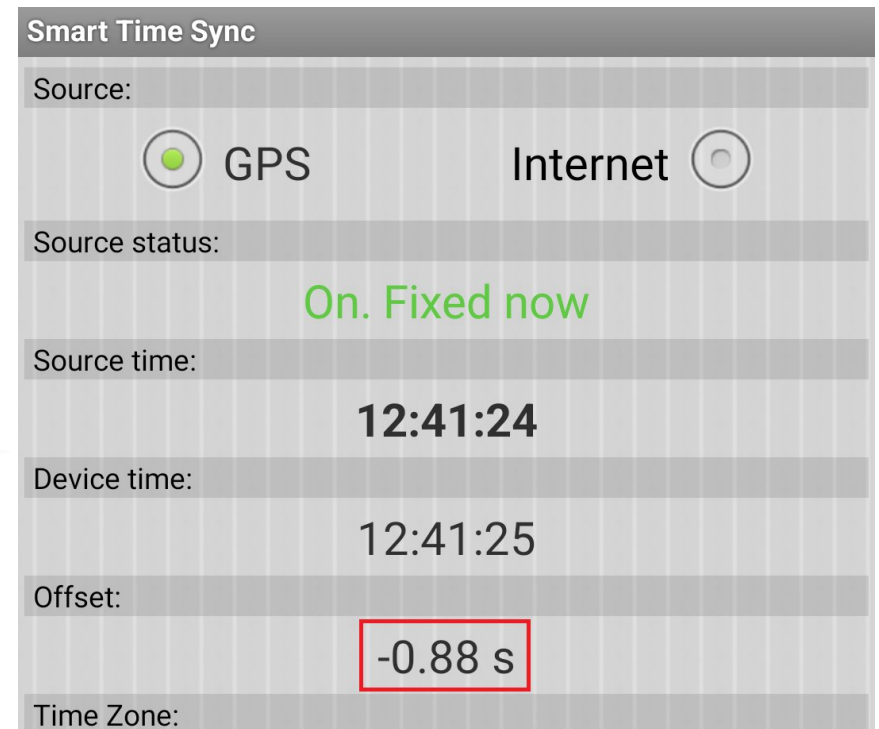 - Once you have internet access, check the [SOTAmāt status page](#)

Tips & Tricks 2/2

- Quickly switch between FT8 and spotting frequency/mode:
  - Toggle between VFO A/B
  - Toggle between VFO and FT8 memory

- Adjust FT8 audio level:
  - Stay below the max. power output or watch ALC

- You can use a special call sign, by adding it temporarily to the corresponding region

- Dedicated test mode available

Tips & Tricks 3/3

- Correct system time difference:

  - Do it "by ear" or with an app like Smart Time Sync (Android) supporting GPS time

  - Correct app time in the opposite direction

Advanced (optional) settings

FT8 device time correction (default=0): 0.9 seconds

Smart Time Sync

Source:
- GPS   Internet

Source status:

On. Fixed now

Source time:

12:41:24

Device time:

12:41:25

Offset:

-0.88 s

Time Zone:

SOTAmāt Outlook

- The app code will be made open source

- The server code will be donated (in escrow) to the SOTA and POTA organizations

- More skimmers will support SOTAmāt and you can be one of them (e.g. by running the WSJT-X plugin)!

- More features are planned to be implemented, like custom comments, WWFF, …

Questions?

System Overview