Agence nationale des fréquences (ANFR)

Case study: the contribution of blockchain to the use of free frequencies

ANFR
AGENCE NATIONALE DES FRÉQUENCES

ANFR in a few words

Identity card:

- Public agency
- Management of all radio frequencies in France
- ≈ 300 employees; 11 locations in mainland France; 4 overseas locations

Our main tasks :

International negociations
"Diplomat of the Spectrum"

Management of national rights
"Notary of the Spectrum"

Interference resolution, monitoring
"Guardian of the Spectrum"

EMF exposure
"Trusted third party"

Free frequencies

- **Frequencies subject to general authorization**

- **Main features of this authorization scheme**

  - ☑ **No application for authorization**
  - ☑ **Collective right of use**
  - ☑ **Free to use**
  - ☑ **No guarantee of protection**
  - ☑ **Limitations on power and transmission time**

- **Numerous uses of free frequencies**

  Examples

Interference during major events

Intervention of the agency requested to avoid or resolve PMSE Audio interference during major events

- **Causes of interference**

  Mostly not due to a lack of space within the allocated bands but to

  - ✓ **the reuse of the same frequency or the use of frequencies that are too close**
  - ✓ **the use of frequencies occupied by DTT (shared bands)**

Without a centralized individual authorization process, how can optimal spectrum use be fostered ?

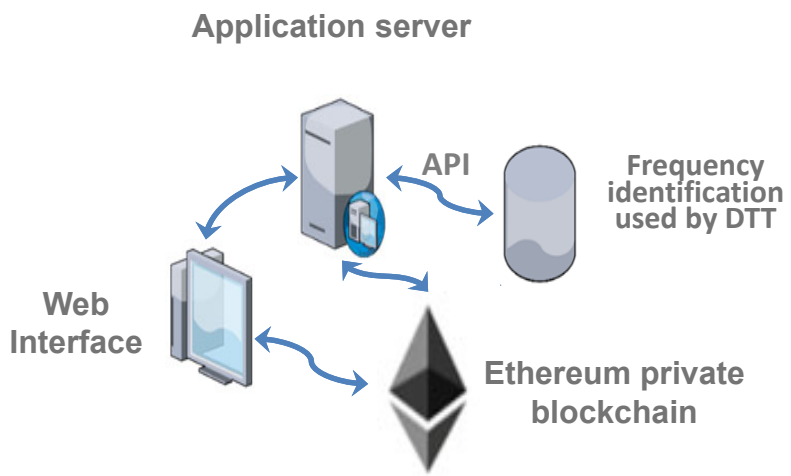
The solution investigated

Key features regarding the situation to be taken into account:

- Need for coordination but no centralized management of authorizations → Decentralized coordination possible with a blockchain
- Same rules to be followed by all frequency users → Compliance with the same rules possible via a Smart Contract
- Professional context for the use of PMSE → Possible inclusion in an application

↳ use of a blockchain managing smart contracts and integrated into a web application

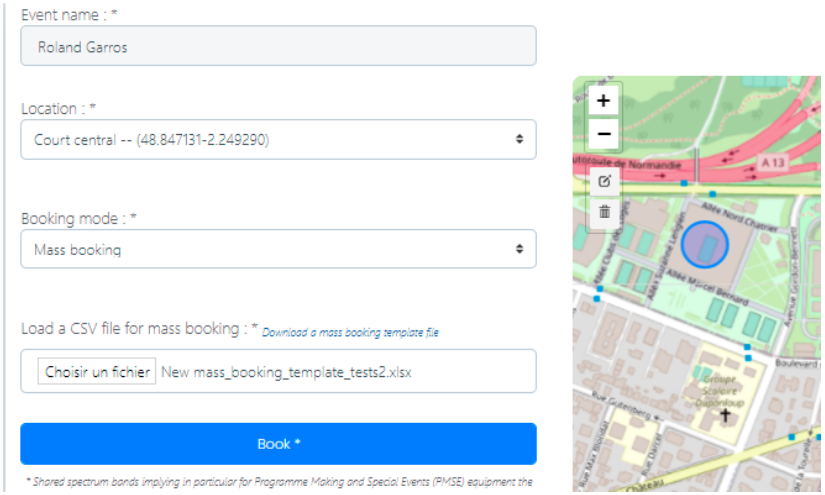
↳ a solution that ensures fairness and trust



The PMSE Audio Blcokchain

« Transactions » recorded on the Blockchain

- Events with their characteristics
- Validated frequency usage declarations on each event with the name of the broadcaster => validation by execution of a smart contract checking the availability of frequencies according to the same rules for all broadcasters
- Deletions of events and frequency use declarations



Benefits of blockchain

- Traceability, visibility, non-tampering of all actions of event organisers and broadcasters
- No entity centralizing the process; architecture natively allowing the installation of a node by each entity

Seeker	User	Locations	Booked frequencies (MHz)	Start date	End date
ANFR	ANFR	Court central	Min frequency : 174.000 Central frequency: 174.150 Max frequency : 174.300	5/24/2021	6/13/2021
ANFR	Videlio	Court central	Min frequency : 470.000 Central frequency: 470.150 Max frequency : 470.300	5/24/2021	6/13/2021
ANFR	IMG Media	Court central	Min frequency : 590.875 Central frequency: 591.025 Max frequency : 591.175	5/24/2021	6/13/2021
ANFR	France TV	Court central	Min frequency : 593.850 Central frequency: 594.000 Max frequency : 594.150	5/24/2021	6/13/2021

Possible transposition of the concept ?

- **Internal POC in the context of the opening of 6 GHz Wifi**

Framework set: protect authorized fixed services in the 6 GHz band while ensuring easy access to the frequencies available for WiFi access points

- For each microwave to be protected, calculation of geo-localized exclusion zones for Wifi access points according to their power and height

- Each time a Wifi access point is installed, transmission :
  location address, location height, SSID or MAC address, indoor/outdoor location, transmit power

- Cross-reference the siting characteristics with those of the exclusion zones and send a notification of refusal or authorization with the prohibited frequencies

- Transmission of the chosen Wifi channel

⇒ *Records in the blockchain: characteristics of the request, notification transmitted, channel chosen, possible withdrawal of the Wifi access point*

Advantages: guarantee of fairness in processing, traceability and transparency of information; possible installation of a node by all stakeholders; natively scalable architecture

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