

## Emrit - TiE University Global Hackathon -- biz challenge

### Helium Hotspot network topology PoC earnings optimization:

Emrit is a leading provider of Helium network compatible Hotspots (aka Emrit CoolSpots). The Helium network is the first global decentralized IoT network incentivising hosts through block-chain and cryptocurrency (HNT). Full background and documentation can be found:

- <https://emrit.io/>
- <https://www.helium.com/>
- <https://github.com/helium/HIP>

Unique to the Helium block-chain implementation is the concept of using Proof of Coverage (PoC) instead of Proof of Work (Bitcoin) or Proof of Stake (Ethereum) as a key token earnings and incentive engine. In principle, Hotspot hosts on the Helium network earn HNT for providing network coverage. The block chain algorithm and chain variables define the PoC rewards based on a Hotspots ability to verify coverage with other nearby Hotspots. This is detailed in:

- <https://github.com/helium/HIP/blob/master/0015-beaconing-rewards.md>

There are multiple factors that determine the amount of HNT earned by a Hotspot including;

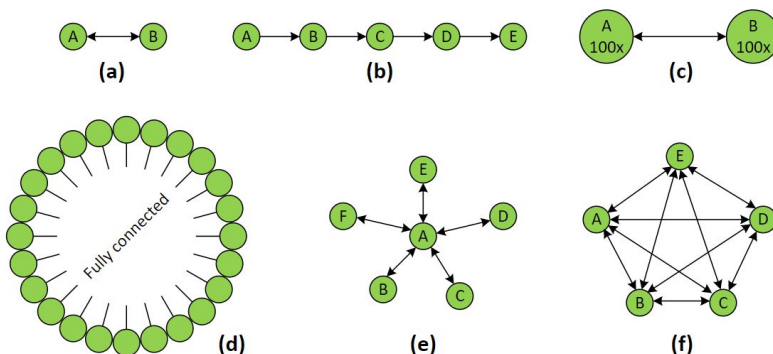
- Number of witness Hotspots
- Distance and RF signal quality (RSSI/SNR)
- Network topology

Emrit provides Helium network planning service to our customers and CoolSpot hosts and needs to quantify the effect of network topology on PoC HNT token earnings and work coverage.

### Challenge Expectation

Determine the optimal Emrit CoolSpot network topology to maximizing PoC HNT earnings for providing network coverage:

- Determine optimal network deployment topology using 6 Coolspots to provide network coverage to a geographic area.
  - Star, Ring, Bus, Point to Multipoint, hybrid.



- Optimization criteria:
  - PoC HNT earning per CoolSpot per topology (Larger is better)
  - Geographic area covered (larger is better)
    - RSSI coverage map
  - Comparison of Max HNT vs. Geographic coverage optimizations
    - Are they aligned or do they result in different topologies.
- Physically deploy and field test at least 3 of the topologies (prioritizing b, e, f) for at least one week each.
  - Capture and analyze HNT earnings results using ETL tools.
    - <https://explorer.helium.com/>
    - <https://www.sitebot.com/helium/hotspots/search>
    -
- Create a simulation tool that allows an estimate of HNT earning based on the different topologies.
  - Simulation comparison vs. measured results
  - Deliver simple simulation tool and algorithms to Emrit
    - Inputs:
      - Number of CoolSpots
      - Distance between CoolSpots
      - Network Topology
    - Outputs:
      - Estimated HNT earnings from Block Chain PoC

## Resources & References

- Emrit will provide participants with 6 loaner CoolSpots for the duration of the challenge.
- Emrit will provide one LoRaWAN end point for RF coverage and range testing.
- Participants must provide:
  - Ability and access to sites to physically deploy the Hotspots; these sites need 120V A/C power and Internet access (Wifi/Ethernet)
    - Solar power and Cellular are options but will need specific approval from Emrit due to added costs.
  - Proposed site deployment plan to Emrit prior to actual deployment - map and addresses.
- All Helium blockchain software and algorithms are published in open source - see links provided.

## Participant Skilset:

- Knowledge of RF and RF propagation; ability to interpret RF data and translate into coverage, QoS, and PSR reports.
- Block Chain coding and algorithm analysis; ability to inspect Helium block chain source code to extract PoC algorithm and chain variables (C-code). Translate and build simple simulation tool (python, excel spreadsheet, other).

#### Frequently asked questions

- Emrit will set-up a discord channel to provide support throughout the project.