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Networked Airborne ISR&T Long Endurance - Communications Architecture (NAILE-CA)

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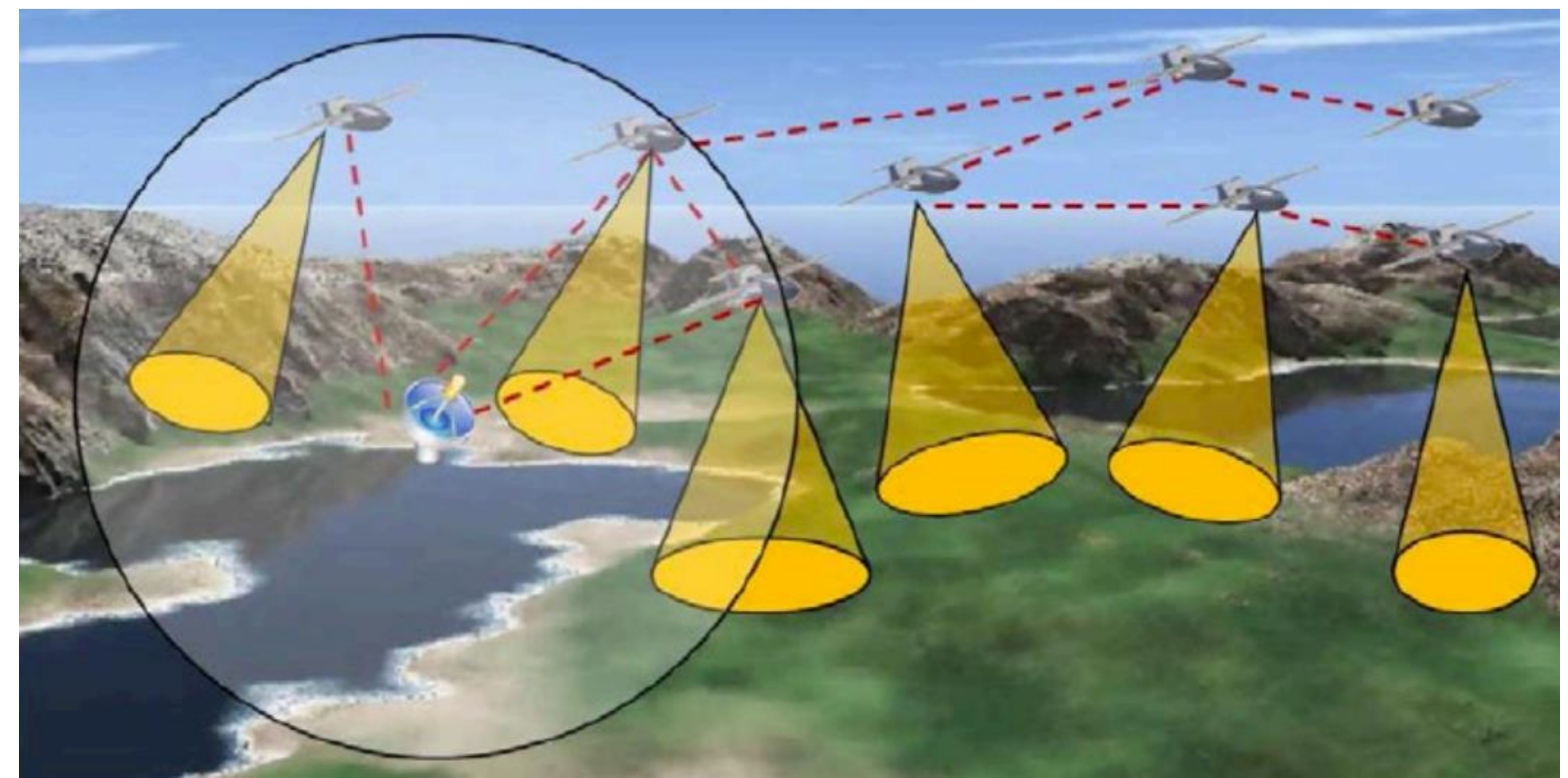
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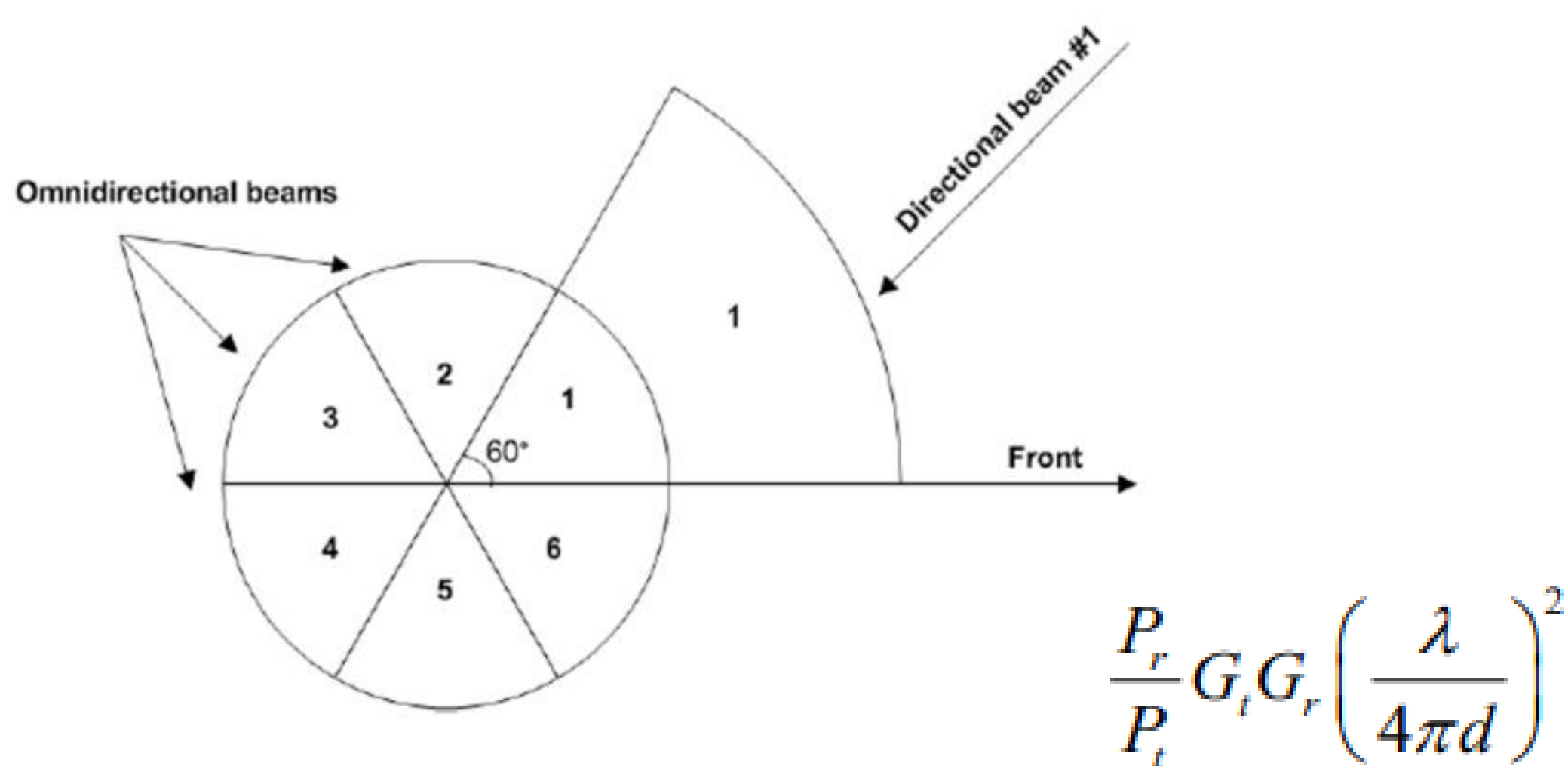
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Summary

Through analysis of current radio and networking technologies, we simulated how to optimize network traffic for the NAILE-CA concept. We found by completing a thorough analysis of sensor network traffic and through correlation of data we were able to proffer recommendations on optimizing network links between airborne and ground assets and multiple airborne assets.



Performance of air to air and ground to air networking can continually be optimized and enhanced



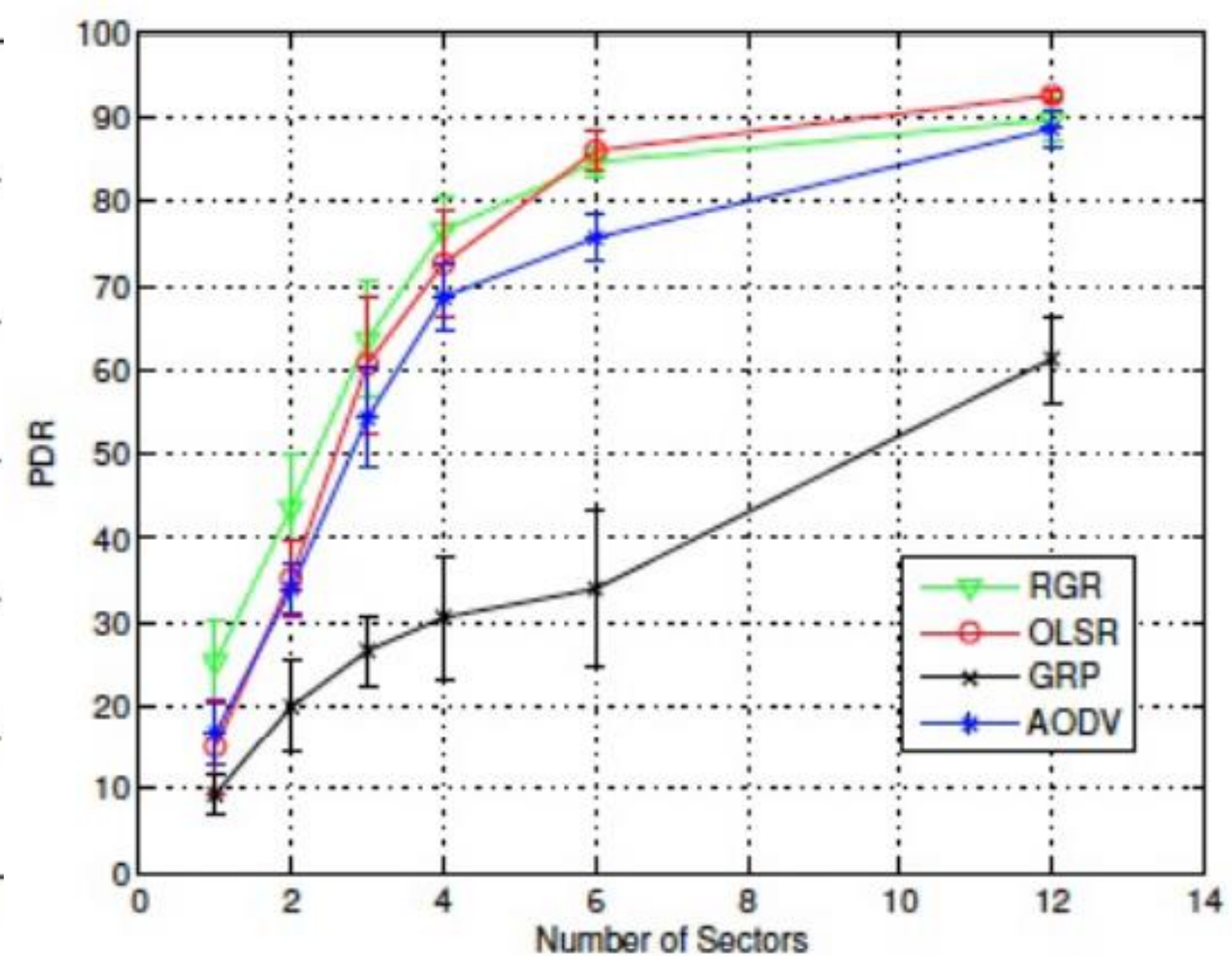
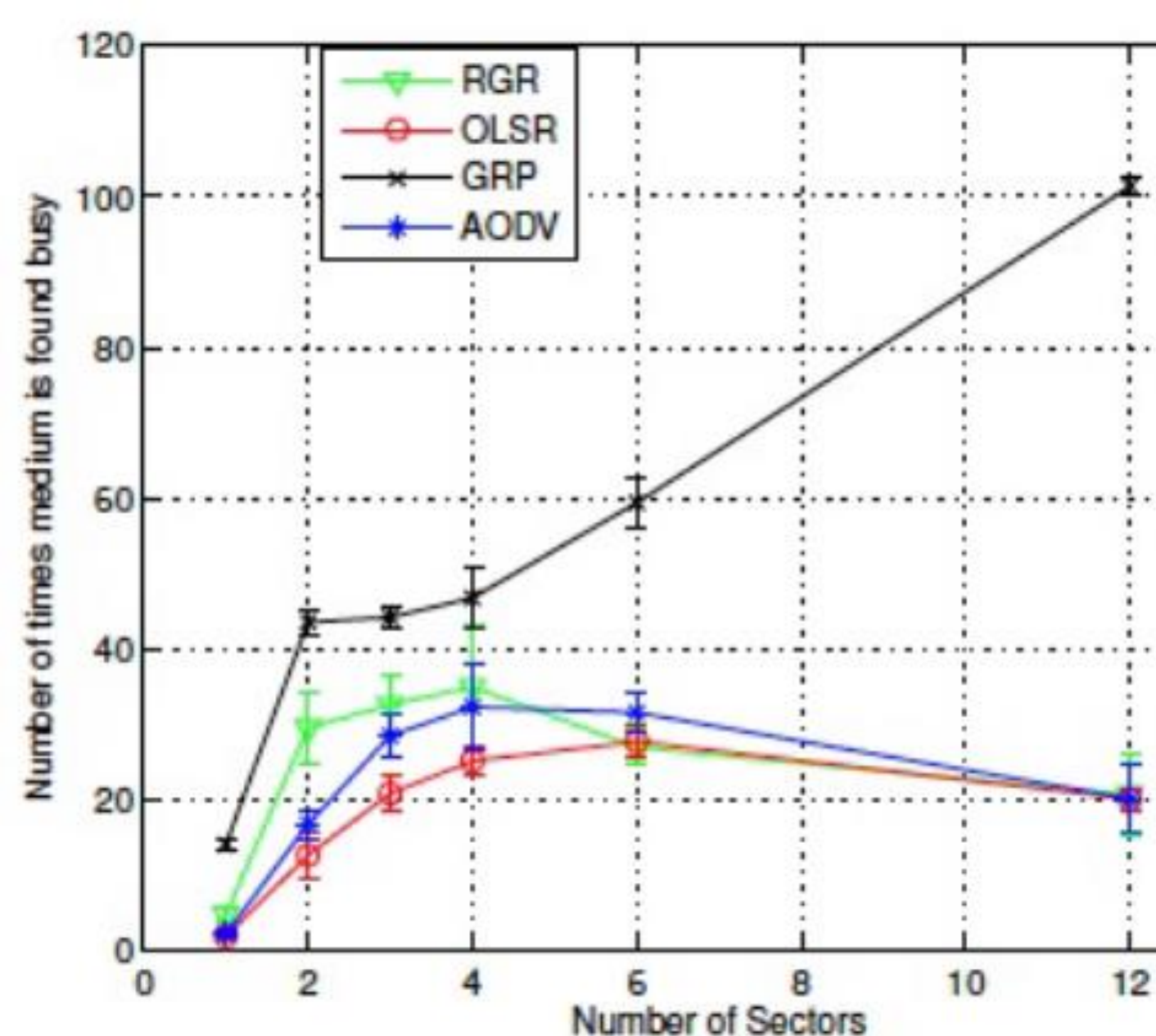
Directional broadcasts across sequential sectors rather than omnidirectional broadcasting greatly increased coverage range.

Research Questions

- What are the networking requirements to support the NAILE concept?
- What are the routing, distance, and antenna requirements to support the NAILE concept?

Ever Improving Solutions

Comparison of the number of times medium is found busy, and packet delivery ratio (PDR), vs. number of sectors by networking routing protocols (AODV, GRP, OLSR, and RGR) in DA-FANET



What We Accomplished

- NAILE will require an efficient and dependable FANET routing algorithm that can find and build network routes with the highest throughputs between nodes and must also be capable of a fast recovery when network routes are broken as UAVs are routinely swapped out due to flight endurance limitations.
- Our results showed NAILE will require advanced UAVs that can carry large payloads. Even so, conservation of power will still be of utmost importance, since the UAV flight endurance will enable the persistence envisioned for NAILE.
- The implementation of a directional medium access control configured with RTS circular directional MAC to broadcast packets across sequential sectors will greatly increase the transmission range of NAILE and give a more efficient use of battery power on the airborne platform.

Next Steps

- Further research is necessary to determine the realistic antenna characteristics necessary for the operational deployment of the (NAILE) network. This includes assessing the antenna aperture, size, weight, gain, and directivity to support the desired distances between UAV nodes while also considering the size, weight, and power limitations of the potential UAV platforms.
- Evaluation of several unmanned aircraft system (UAS) platforms have been modeled for applicability, but more research is needed to find current and upcoming UAVs that may satisfy NAILE's requirements.
- A datalink mechanism is also necessary to enable nodes to find and track each other using directional antennas instead of omnidirectional broadcast.

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Thesis Title: THE NETWORKED AIRBORNE ISR&T LONG ENDURANCE (NAILE) CONCEPT DATA LINK AND MULTI-HOP ROUTING REQUIREMENTS
Thesis: LT Deck

