



MANET Internetworking

IETF 125 MANET Session

<https://datatracker.ietf.org/doc/draft-templin-manet-inet>

<https://datatracker.ietf.org/doc/draft-templin-manet-inet-omni>

<https://datatracker.ietf.org/doc/draft-templin-6man-mla>

March 17, 2025

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Boeing Technology Innovation (BTI)

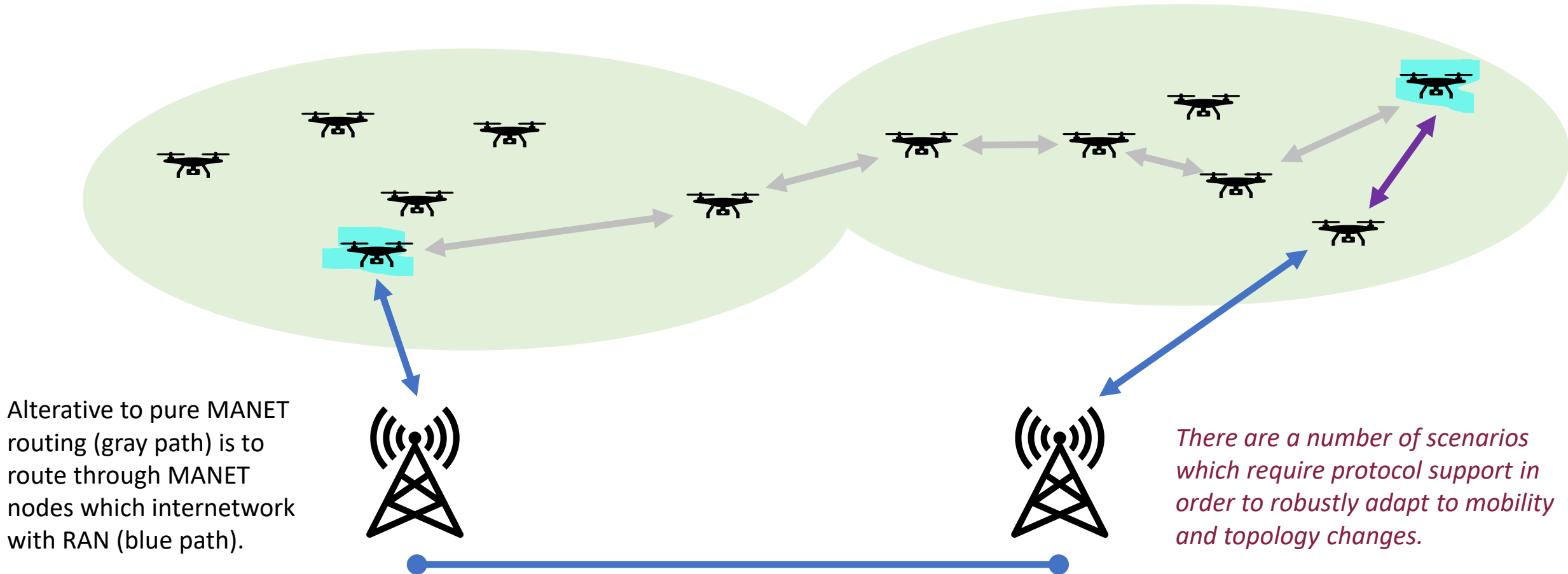
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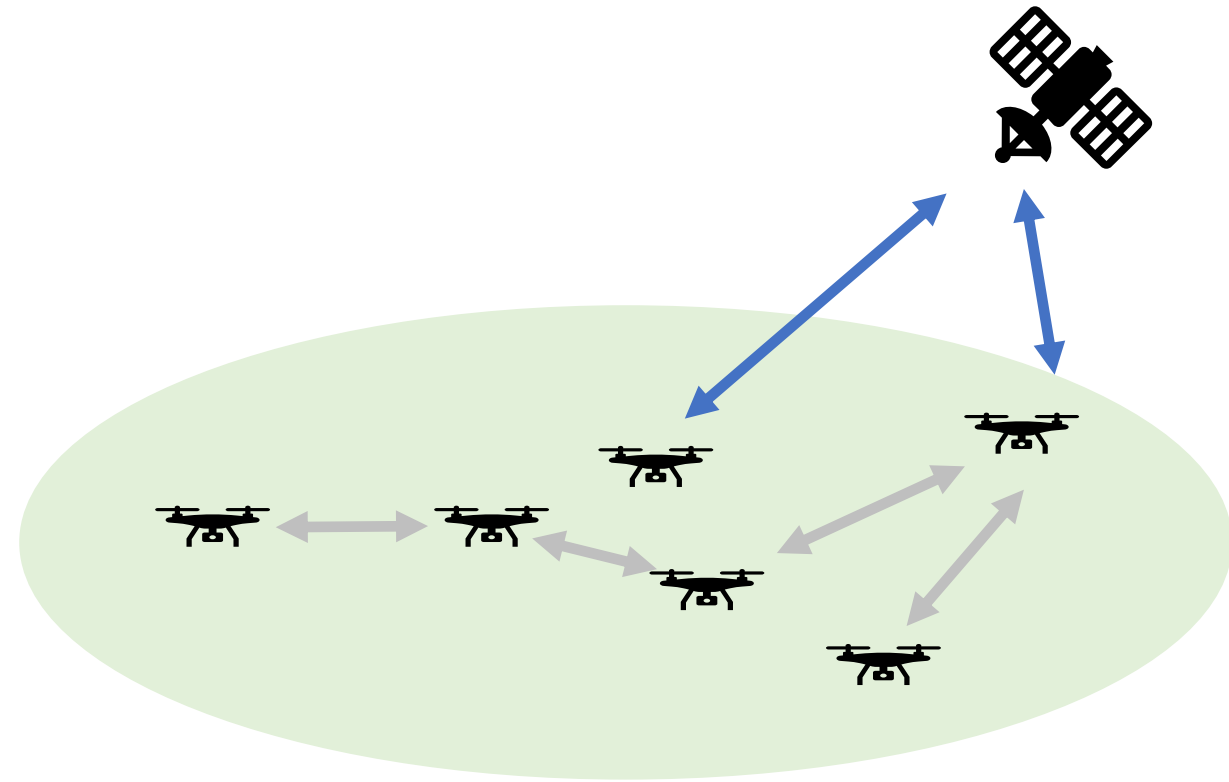
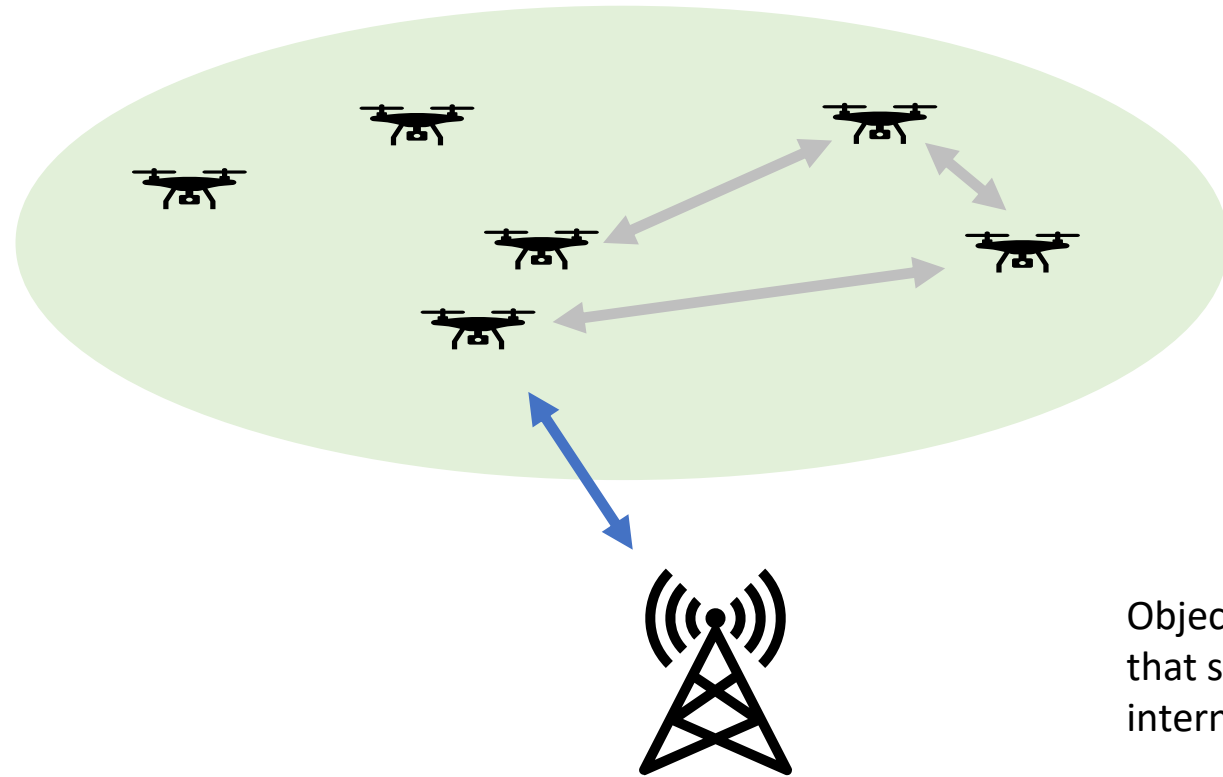
Mobile Ad-hoc NETWORKing (MANET) Background

- MANET concerns a multihop communications capability between low-end mobile nodes operating on a common multi-access packet radio medium within a coverage range locality
- Community interest in MANET began in late 20th century with programs such as DARPA Packet Radio, Army Task Force XXI, DARPA GloMo, others
- Intense work on first MANET-optimized routing protocols in the Internet Engineering Task Force (IETF) in the late 1990's and early 2000's produced 2 proactive (OLSR, TBRPF) and 2 reactive (AODV, DSR) protocols:
 - Beginning Y2K, Fred Templin contributed to RFC3684 (TBRPF); RFC4214 (ISATAP)
- IETF has since developed other MANET routing protocols
- MANET Internetworking is routing protocol agnostic and seeks to bridge disjoint local MANET clouds via an Internet overlay

Example Use Case: UAV Swarms

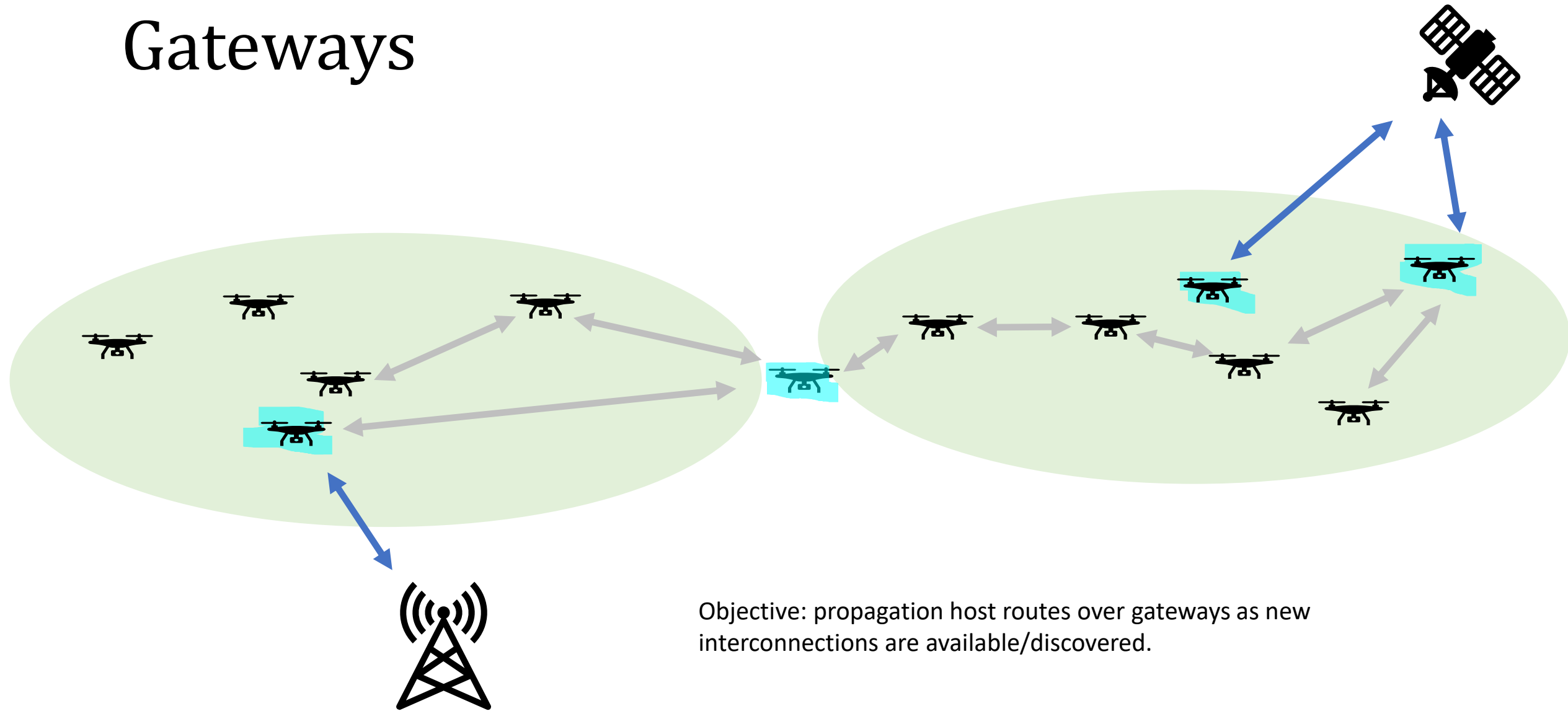


Local Regions



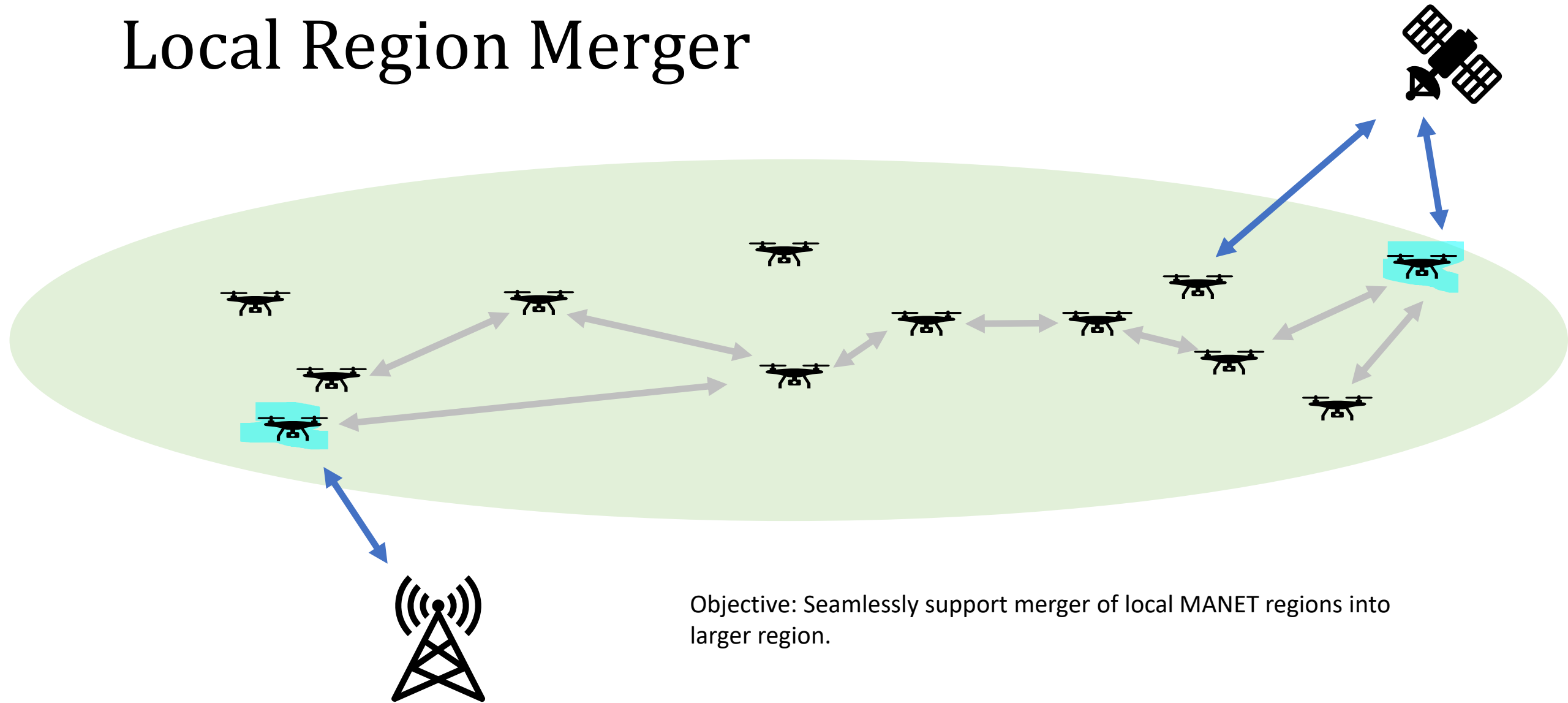
Objective: establish MANET local routing and border gateway protocols that support dynamic MANET-to-MANET and MANET-to-Internet internetworking.

Gateways



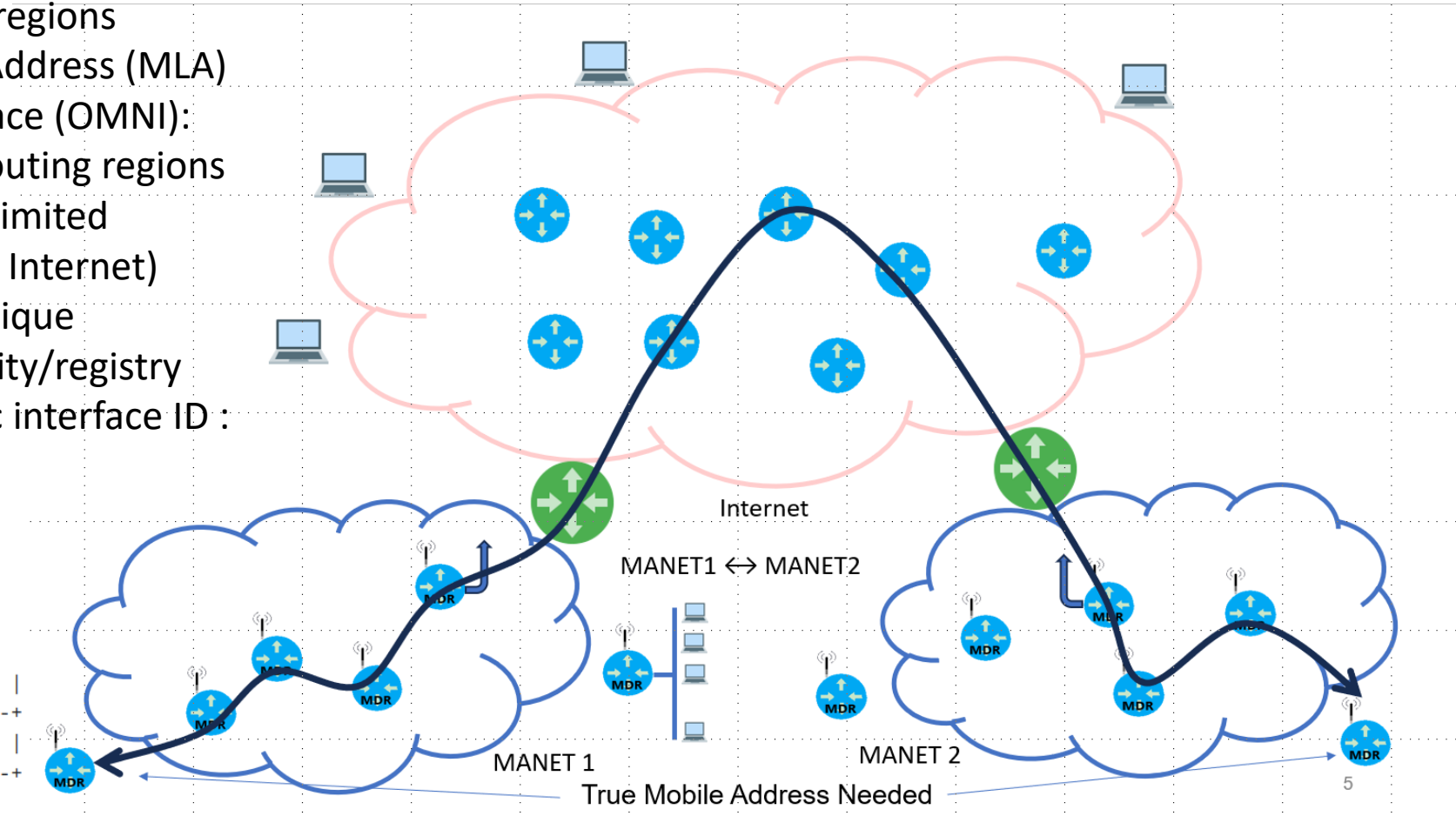
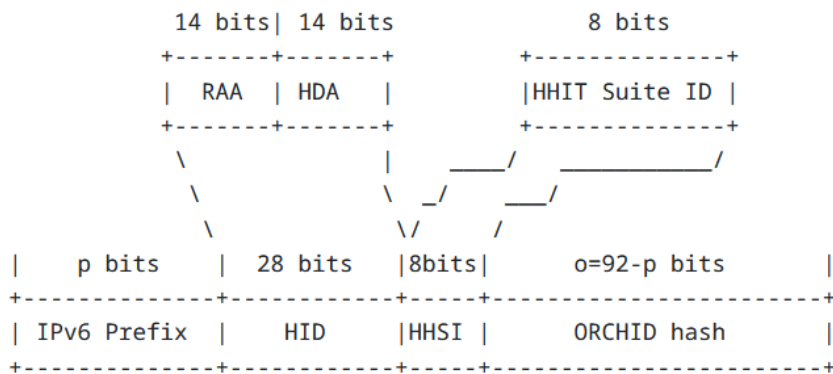
Objective: propagation host routes over gateways as new interconnections are available/discovered.

Local Region Merger



MANET Internetworking

- Global Internet provides transit overlay bridging between distinct MANET local routing regions
- MANET routers assign Multilink Local Address (MLA) to an Overlay Multilink Network Interface (OMNI):
 - Locally routable in MANET local routing regions
 - Globally routable over OMNI link limited domain (a virtual overlay over the Internet)
 - MLAs must be assured globally unique
- MLA: RFC9374 IPv6 address with security/registry info in routing prefix and cryptographic interface ID :



MLAs in MANET Local Routing Regions

- MANET routers run MANET protocols to exchange MLA “host routes” (e.g., IPv6 /128s) for multihop forwarding in local routing regions
- MLA host routes in MANET local routing region “A” are mutually exclusive with those in local routing region “B”
- If regions “A” and “B” ever merge, both become aware of the union of all MLA host routes in the now-combined larger local routing region
- Clustering internally within (merged) local routing regions can limit extent of MLA host route propagation

MLAs in OMNI Link Virtual Overlay

- OMNI link virtual overlay provides a bridging service to connect disjoint MANET local routing regions over the global Internet
- Overlay must support routing between the MLAs in local routing region “A” and those in local routing region “B” for all local routing regions A and B that connect to the OMNI link
- Means that MLA host routes must be propagated over the OMNI link virtual overlay interdomain routing protocol
 - Overlay interdomain BGP routing protocol must propagate host routes (/128s)
 - Result: “MANET-of-MANETs” with BGP as a MANET routing protocol!
 - BGP scaling limitations suggest this could scale to O(1M) – O(10M) routes

OMNI Link Virtual Overlay Scaling

- OMNI link may join very large numbers of disjoint MANET local routing regions – on the order of the scale of the Internet itself
- BGP interdomain service alone would be challenged to deal with so many MLA host routes plus degree of mobility-related “churn”
- BGP interdomain service augmented with DNS next hop resolution lookup capability can address scaling limitations both in terms of numbers of host routes and mobility churn

Next Steps:

- Adopt draft-templin-manet-inet as MANET working group item
- Adopt draft-templin-manet-inet-omni as MANET working group item
- Adopt draft-templin-6man-mla as MANET working group item

Backups