





INTERNATIONAL TECHNOLOGY ALLIANCE
IN NETWORK & INFORMATION SCIENCES

MOBILE AD-HOC INTER-DOMAIN NETWORKING

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A FUTURE WITH MANY MANETS

- One day we'll want to inter-manet
 - Not talking about a cloud of manets clustered around the fixed internet
 - Actual inter-domain manet - traversing different routing schemes
 - Is a very hard problem
- Not even clear that one solution is sensible

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QUICK DRYING GLOSS



- MANET=Mobile Ad-hoc NETwork
 - Al Qaeda, swarm of bees, Man United
- IGP = Interior Gateway Protocol
 - E.g. OLSR, DLR, AODV, GPSR
- EGP= Exterior Gateway Protocol
 - E.g. BGP, IDPR, IDRP, as yet don't know
- AS = Autonomous System
 - BiCi, ETH, 18.0.0.0
- Nimrod
 - <http://ana-3.lcs.mit.edu/~jnc/nimrod/docs.html>

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DEFINITELY A MAD DISTRIBUTED SYSTEM!



1. Each domain has own goals
 - Routing on geo- or topo-, on demand or reactive, optimized for capacity, delay, loss, power, etc
2. Policies (ingress, egress, transit) are coloured
 - Interconnection is not just at "edges"
3. Synchronization of IGP and EGP non trivial
 - Does data follow control traffic (in space and time)
4. Heterogeneity of Addressing
 - Do we add level of hierarchy or translate?

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1. IGP TO EGP INTERFACE



- Reactive:Proactive?
 - Pro- trumps re-
 - can cause route and act as hello in same breath).
- Geographic versus Topological?
 - Topo- trumps Geo-
 - Can map one way not the other
- Distribute route or reachability (AS maps)?
 - AS Map (like nimrod) trumps route
 - Nodes associate in a MANET longer than route stability

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2. TORRENTS OF POLICY



- Each MANET is a community
 - Each has own incentive & recommendation & reputation mechanism
- Can we map these between different systems?
 - Or do we have separation of ingress/egress/transit policy from intra-manet routing?
- Seems like separation is required for technical reasons too (see previous and next slides)

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3. IGP TO EGP SYNCHRONIZATION



- IGP may not actually converge
 - Geo- and gradient- protocols don't need to
- EGP offer of probability of reachability
 - Should be output of EGP computation
- Like UDLR and other asymmetric schemes (IP over x.25:-) ...
 - AS map&reachability exchange control traverse more stable paths than users' data

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4. HETEROGENEOUS ADDRESSES



- Each MANET will assign addresses (identifiers for routing and end system) dynamically
- Need to report these in EGP as part of reachability
- Do we “re-prefix” them (like IPv6) or assume AS level uniqueness, or translate?
- TBD!

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CONCLUSION/FUTURE



- We're looking at using *metarouting* work
 - New postdoc looking at approach
- And further *plutarch* work
 - Collaborate on composable networks
- But first we have to have a clear problem statement
 - Strawman proposed - next: evaluate - criteria/topology/mobility/dynamics?!