# *DRAFT*
# Encapsulation Considerations
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Design team report
Selected topics for NVO3

# Design team members

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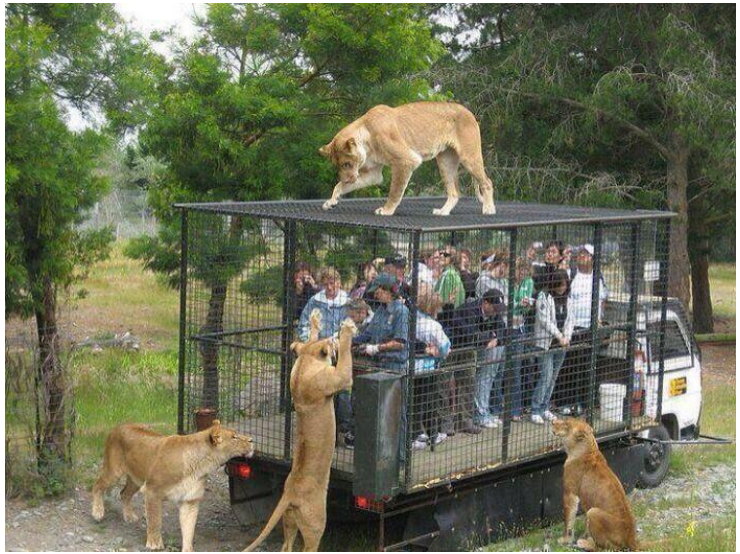
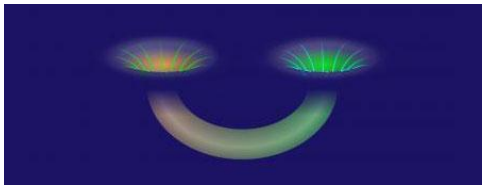


**Charter http://www.ietf.org/mail-archive/web/rtgwg/current/msg04715.html**

# Motivation for design team


- IETF doing new encaps - NVO3, SFC, BIER
  - And multiple might be used in the same packet
- Each encap has its own information, but also needs to handle common issues
  - Explore more common ways to handle those issues
  - Each proponent/WG doesn't need to reinvent
- Focus is on encaps packet format - *not* on control plane

# What this IS



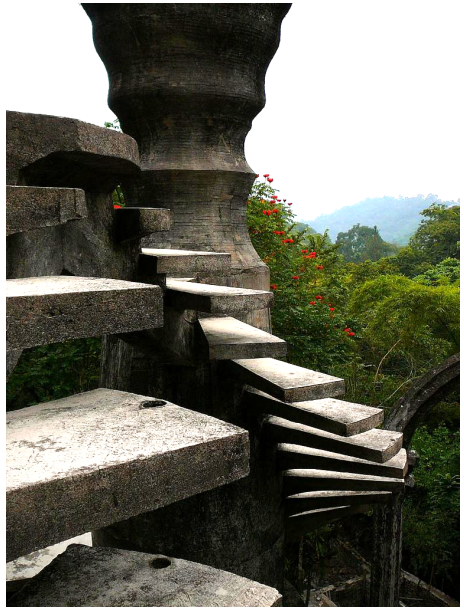
- A look across the three new encapsulations
  - While taking lots of previous work into account
- Focus on encaps that run over IP/UDP
  - Many encaps desire to run at least over IP
  - Avoided diving into control-plane interaction
- Turns out some “transport” independence fell out as a result
  - E.g., MPLS entropy label fits in

# What this is NOT

- A design of a new encaps to rule them all
- A design of a new NVO3 encaps
- A selection from existing encapsulations
- An evaluation of existing and proposed encapsulations
- A floor wax and/or dessert topping

# Set of common issues

## *A twelve-step program*

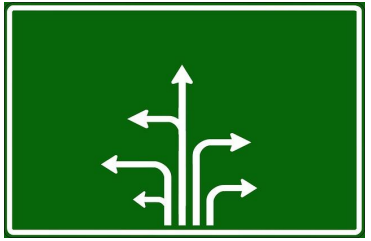


1. How to provide entropy for ECMP
2. **Next header indication**
3. Packet size and fragmentation/reassembly
4. OAM - what support needed in an encapsulation format?
5. **Security and privacy**
6. QoS
7. Congestion Considerations
8. **Header and data protection - UDP or header checksums**
9. **Extensibility - for OAM, security, and/or congestion control**
10. Layering of multiple encapsulations
11. Service model
12. Friendly to hardware and software implementations

# Different encaps - different information

- NVO3 needs to carry at least a VNI-ID
  - Carried edge-to-edge unmodified
  - Perhaps optional OAM info modified along path?
- SFC carries service path info
  - Some field modified for each service hop for loop prevention?
- BIER carries a bitmap of egress ports
  - Bitmap modified as packet is forwarded

# Next header indication



- Each encap want to carry different payload
  - Use Ethernet types? IP protocol number? Create new numbering space?
- When layering multiple encaps headers?
  - Define a common approach?
  - Define a common numbering space?
- But also needs to fit with existing schemes
  - UDP uses port numbers; GRE Ethernet types; etc.
  - Used to indicate the (first) encaps header

# Security and privacy


- At least three considerations for security
  - Anti-spoofing - prevent packet injection
  - Interaction with and use of IPsec
  - Privacy
- Different possible anti-spoofing mechanism
  - Cookie in encaps header - against off-path attacks
  - Secure hash of header fields (excluding fields modified in transit)

# Header protection

- RFC 6936 Applicability Statement for the Use of IPv6 UDP Datagrams with Zero Checksums
- Need checksum for the encaps header?
  - Misdelivery if e.g. VNI ID, BIER bitmap is corrupted
  - Using pseudo-header for important IP fields?
- Ties in with higher assurance for security
  - No need for checksum if secure hash is used

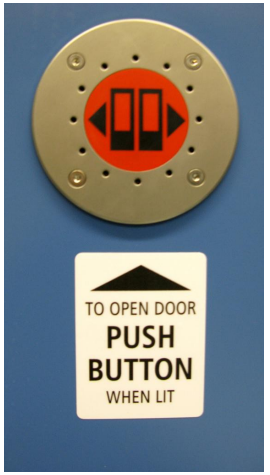
# Extensibility

- Needed semantics
  - New incompatible version
  - Stuff which can be ignored by the egress
  - Error/drop if egress doesn’t support
  - Handle on-path parsing (BIER routers, middleboxes)
- Different encodings
  - Use reserved bits/fields
  - TLVs; extension header chains
  - Flag-fields as in GRE
- Use it or loose it?

# Middlebox Considerations

- As encapsulations get widely deployed middleboxes might do more
  - Not just drop based on UDP port number
  - Gateways stitching could have similar effect
- Example would be to filter VNI IDs for NVO3
  - Better defense in depth
- Should the IETF document what not to do?
  - Avoid accidentally blocking OAM but not payload
  - Avoid interfering with ECMP?

# Open Issues




- Common OAM error reporting protocol?
  - Useful or a distraction?
- [DT] Next protocol indication - common across different encapsulation headers?
- [DT] Sequenced-delivery service layer on top vs. sequence numbers and timestamps for OAM and CC?

# Next Steps

- Finish our document and issue as I-D
- Present in RTGWG in Dallas
- Gather feedback from different groups in the IETF