IEEE 802c

Some things are better left unmanaged

Local Address Space and CIDs

- **IEEE Standards Association "Guidelines for Use Organizationally Unique Identifier (OUI) and Company ID (CID)":**
  - "Local addresses are not globally unique, but a network administrator is responsible for assuring that any local addresses assigned are unique within the span of use."
  - There are no restrictions placed on using the local address space.
  - CIDs may be "used to create extended identifiers, protocol identifiers and context dependent identifiers." Referred to as "non-address applications."
  - "Use of a CID is appropriate when universally unique MAC addresses are not needed."
  - Nothing prohibits a CID from being used to construct MAC addresses but a CID is 24 IEEE assigned bits that gets ***no addresses*** assigned, therefore exclusivity cannot be inferred.
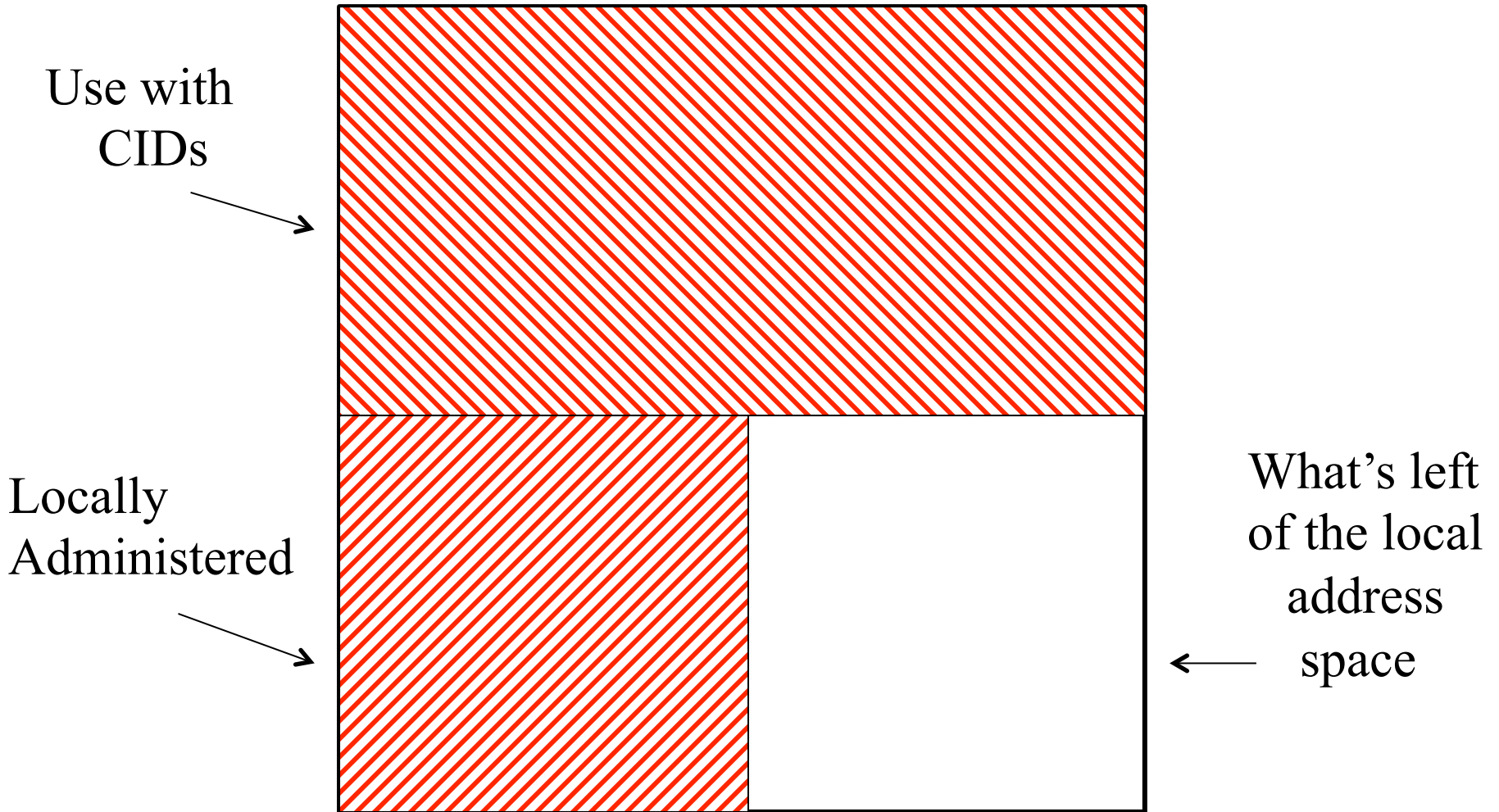
Using the Local Address Space

- **There are no problems with using the same local address on distinct networks (separated by a router)**

- **Problems arise when distinct entities _on the same locally switched network_ (flat) use the same MAC address**

- **Provided the flat network doesn't get too large, addresses can be assigned randomly**

- **Large flat networks have their own set of problems**
  - Forwarding tables in switches fill up, get hard to manage
  - Problems are easily corrected: just add a router!

- **Administrators administer their own networks**
  - Assign locally administered addresses deterministically from any range
  - Allow locally administered addresses to be claimed from any range
  - Ensuring no conflicts is the administrator's job

IEEE 802c PAR *Scope*

- **"This will allocate a portion of the [local] address space for protocols using an IEEE Registration Authority assigned Company ID"**
  - But CIDs get <u>*zero*</u> addresses allocated
  - But CIDs are used when "universally unique addresses are not needed"
  - This imposes new restrictions on using the local address space

- **"Another portion of the local address space will be allocated for assignment by local administrators"**
  - The entire local address space is already available for assignment by local administrators
  - Administrators are "responsible for assuring that any local addresses assigned are unique within the span of use"
 - This imposes new restrictions on using the local address space

IEEE 802c PAR Proposes to Reduce Available Local Address Space by 75%

Use with CIDs

Locally Administered

What's left of the local address space

Impact of Reduced Address Space

- **Decrease addresses and increase probability of collision**
  - Small networks (<5000 or so MAC addresses on the locally switched network):
    - 46 bits: 0.000000177, or 1 in 5,630,626
    - 44 bits: 0.000000710, or 1 in 1,407,656
  - Medium-sized enterprise networks (~10000 MAC addresses on the locally switched network):
    - 46 bits: 0.00000071, or 1 in 1,407,516
    - 44 bits: 0.00000284, or 1 in 351,879
  - Arena-sized networks (30000+ MAC addresses on the locally switched network):
    - 46 bits: 0.00000762, or 1 in 131,076
    - 44 bits: 0.00003052, or 1: 32769

Impact of Reduced Address Space

*Percentage of collisions
as size of network grows*
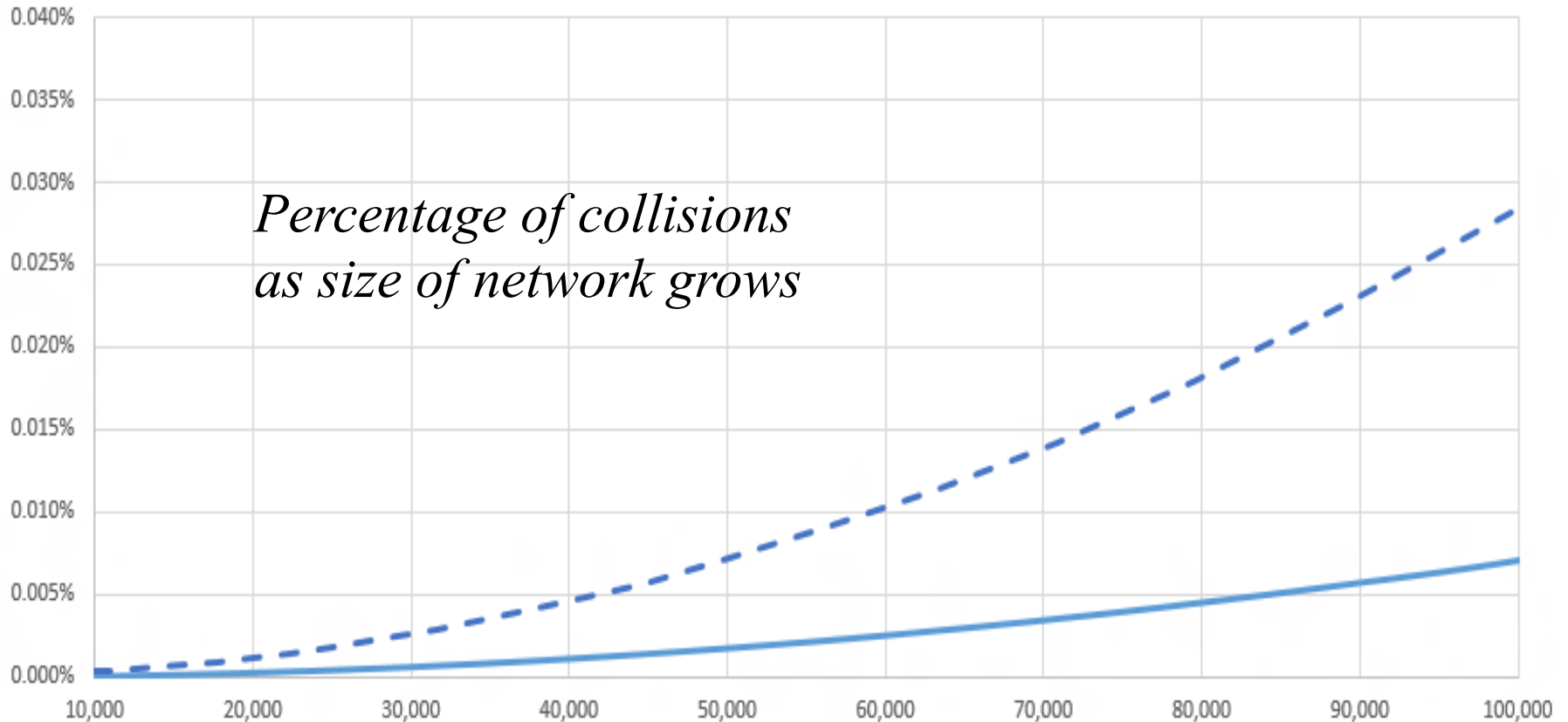
today (solid) and 802c proposal (dotted)

IEEE 802c PAR *Need*

- **"This project will enable protocols that automatically configure addresses from a portion of the local address space."**
    - But which addresses end up being used by these protocols is an entirely local matter and this does not compel establishment of IEEE rules for local address use or partition of the address space
    - Address assignment protocols can assign addresses out of any block, or the entire address space if they so desired
    - Address assignment protocols can reject requests or claims for addresses in any portion of the local address space without requiring partition or assignment of that space
- **The usefulness of such a protocol is not in dispute but the PAR says nothing about defining one**

Opinion on IEEE 802c PAR

- **The project is unnecessary**
  - Administrators are free to allocate addresses from the local address space on their local networks as they see fit– that is not a problem
  - Any address assignment protocol in use today that uses local addresses should be able to use the entire local address space, or use a CID to allocate addresses for assignment. It makes no difference and poses no problem

- **This project does not actually solve a problem**
  - IoT would be better served by using the whole local address space randomly
  - The entire local address space is already available for assignment and does not need any partitioning for the purpose of address assignment

- **The project causes harm**
  - Reducing size of local address space increases probability of collision; collision causes trouble on the local switched network
  - Places unnecessary burden on users of randomized MAC addresses

Conclusion

- **Don't approve the 802c Project**

- **Do not partition or allocate any portion of the local address space, do not restrict usage of all 2^{46} addresses**

- **Administrators that require coordinated address assignment can run a protocol for that purpose**
  - This can be advertised (in 802.11, other 802.* not sure), run pre-association
  - How that protocol administers addresses is its own business
  - Use of address assignment protocol is at the discretion of the administrator

- **Devices should choose locally administered MAC addresses randomly from the entire (2^{46}) local address space**
  - In the absence of an address assignment protocol (local administrator has made this decision) rely on probabilities based on network size to avoid conflict
  - In the presence of an address assignment protocol, use it to claim or request. Any network address usage restrictions will easily be enforced

References

- https://standards.ieee.org/develop/regauth/tut/eui.pdf