

# Operational Reality Check

DARPA FTN Panel

January 16, 2002

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# Wait a minute, this panel is about operators!

- I oversaw the IP Multicast Backbone (MBONE) from about 1995 to 1999.
- I am (newly appointed) one of the IETF Routing Area Directors

# PIM Sparse Mode

- In 1993, there were two proposals for interdomain multicast routing protocols: PIM and CBT.
- Both protocols used a central location for a given group to handle rendezvous.
- Deployment was slow.

# Third–Party Dependencies

- Finally we found out that the problem was that providers were unwilling to rely on a resource in someone else’s network.
- Bad assumption in the design of PIM.
  - Found out years after the initial design.
- PIM reclassified as intra–domain routing protocol.

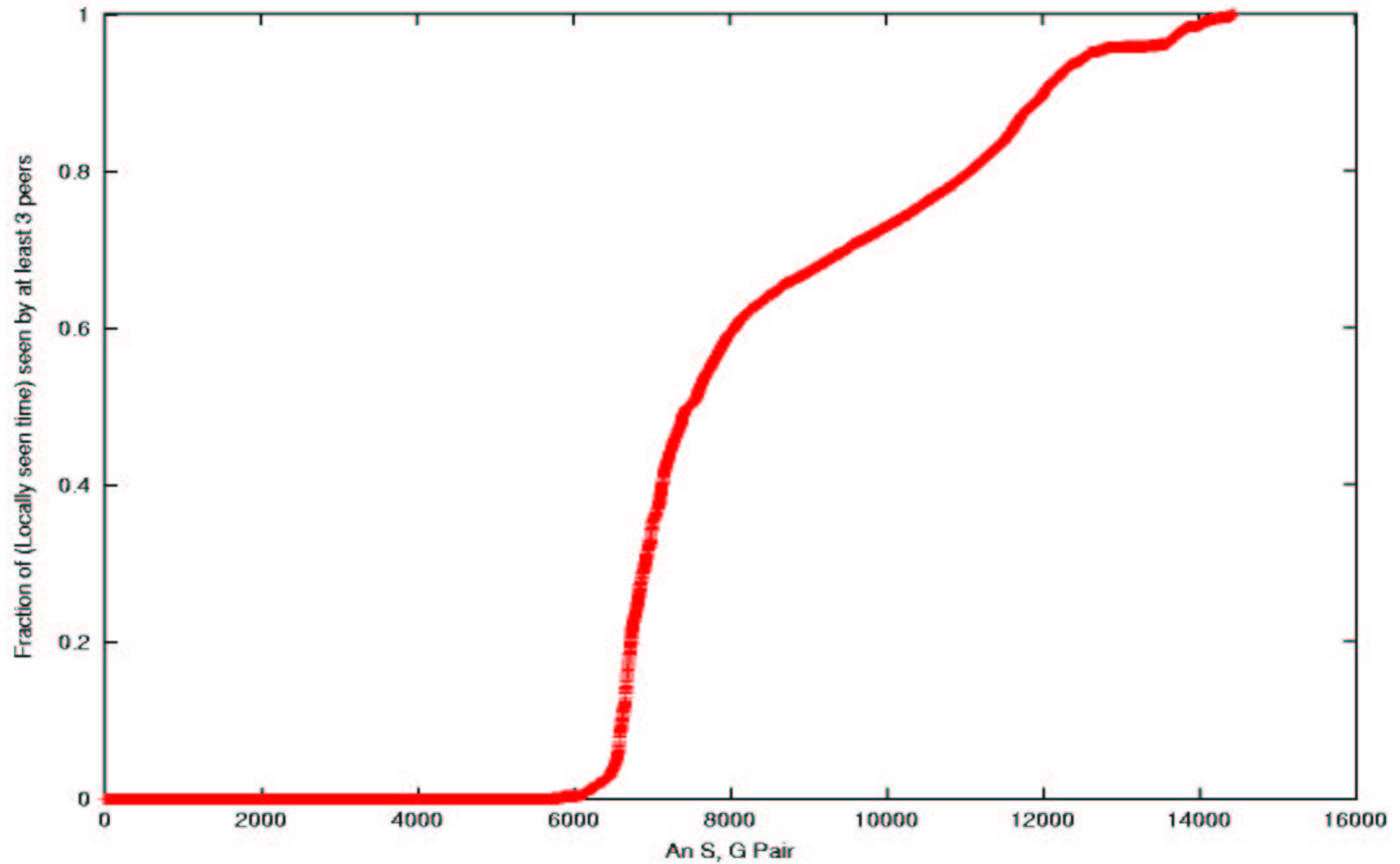
# Sometimes, there's nothing you can do.

- From 1994–1997, the DVMRP infrastructure was growing increasingly unstable.
- Analysis in ["Fault Detection in Routing Protocols," Massey and Fenner, Proc. ICNP '99]
- Upshot: implementation problems, not protocol problems.
  - After getting vendors to fix these problems, stability improved tremendously.

# Sometimes, there is.

- Design choices for MSDP's flooding algorithm:
  1. Accept first message from any neighbor, prevent loops by not forwarding messages from any but the first.
  2. Given the network topology, pick a neighbor from whom you expect to receive a message, and only accept it from him.
- #1 makes the network more robust to failures, especially in the knowledge of the topology; #2 allows for debugging and fixing a failure.

# Why do I think MSDP debugging is important?



# Monitoring and Debugging

- Monitoring and Debugging are *crucial*, and often must be considered in the design phase.
- Bolting them on later may end up with a less useful, or at least less elegant, solution than otherwise.
- However, implementations may again get in the way.
  - Multicast traceroute "rotting" in deployed systems.

# Summary

- Real–World feedback should inform even your earliest design decisions.
- Monitoring and Debugging should be considerations from the start.
- Consider implementation complexity and specification clarity.