Part 2

The Future

New insights

- A better way to start
  - Start in "verification phase"
  - Best guess MTU as "provisional MTU"
  - A safe fallback MTU
- Another view of layering and shared state
  - Not fully sorted out
- New combined transition and verification phase
  - Can overlap probing and verification
  - Greatly speeds convergence

Other possible ICMP changes

- Long ICMP attacks thread on TCPM
  - ID Gont-tcpm-icmp-attacks
    - Describes methods to make PTB processing more robust
    - Add TCP sequence and ACK number checks
  - Add suggested TCP sequence checks into pmtud
  - Add language about other optional checks
    - IP ID or IP image checks

The next steps

- Fully catch up on NITs and other input
- More progress on the implementation
- Fold in insights
- Preliminary MIB
- Advocate other implementers

Algorithm Review

(Updated slides from prior meetings)

Packetization Layer path MTU discovery

- *New* Start in verification phase
  - mtu=best guess from route or interface
  - Search_low (fallback)=1kB
- Probe with larger packets to test MTUs
  - Provisionally raise MTU if successful
  - (Optional) Process RFC1191 ICMP
  - Do not reduce TCP window on lost probe
- Verify provisional MTU for some interval
  - Additional losses imply problems

Layered Implementation

- State kept in path information cache in IP layer
  - Probing state and timers
  - Recent successful and unsuccessful probe sizes
- Algorithm runs in the Packetization Layer
  - PL cuts the data into packets
  - Probing and verification are intrinsically PL specific
  - New description facilitates sharing the rest of the code
    - The search heuristic and error logic can be shared

Key Properties

- Robust
  - Tolerates ICMP delivery problems
  - Verification phase addresses spurious delivery
- Progressive interoperation with classical pMTUd
  - Start large and process all ICMP
  - Start small and ignore all ICMP
- Parallel to congestion control
  - End to end algorithm: use loss as the feedback to adjust window or packet size
  - Well understood limitations

Robust

- Primary design goal: Do no harm
- Avoid problems with RFC 1191 pMTUd
  - Not affected by ICMP delivery problems
  - Not affected by tunnels and encapsulation
  - Not exposed to RFC 2923 problems
- Minimal new exposure
  - Spurious delivery of oversized packets
  - Verification phase provides protection

Progressive deployment

- Enhance RFC1191 pMTUd
  - Start with large MTU and process ICMP
  - Use PLPMTUD iff repeated timeouts
  - Maximally robust from a deployment perspective
- Replace RFC1191 pMTUd
  - Start with small MTU, ignore all ICMP PTB messages
  - Search upwards to raise MTU
  - Maximally robust from a security perspective

Parallel to Congestion Control

- End-to-end algorithm

- Adjust data stream parameters:
  - Packet or window size

- Use packet loss for feedback
  - Interactions with Congestion Control are specified in RFC2119 standards language

- Better fit with end-to-end principle(?)