Forward Error Correction For IP Datagrams

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Improved delivery of IP Datagrams
WHY?

● Bad things happen to IP Datagrams in the Internet
  - They tend to get lost or trashed
    • RED is real
  - It is called “best effort” for a reason
    • Wireless links are amazing that they work as well as they do

● There are times when “The Mail MUST Go Through”!
WHY?

• Don’t expect the Internet to fix your problem
  - It works well for everything else, why worry
  - Amazing things are done over wireless links!
  - What are you willing/able to pay?
  - Fast/Reliable/Cheap
    • Choose two
    • Or is it one?
Smart or Dumb Internet

Can we do better (smart things) with a dumb Internet?
- Cheaper for the Internet, pricier at the endpoints
  - In the apps ‘cheaper’ but never ending
  - Closer to IP better but how to change the stack?

And somethings we do need to make the Internet smarter
- Like RED!
Reliability through FEC

- Simple proposal: Provide IP datagram FEC
  - Compute FEC on datagram
  - Chop into pieces
    - Minimum of 3: 2 for datagram, 1 for FEC
    - Send these multiple pieces
    - Reconstruct datagram from pieces received
- At IP datagram level to limit total data sent
  - Manage cost to constrained links
Reliability through FEC

- Example
  - IP datagram is $N$ bytes (even for simplicity here)
  - FEC is $N/2$ bytes
  - Each datagram is $40 + N/2$ bytes
    - Total is $120 + 3N/2$
  - ‘Cheaper’ to send datagram twice if $N < 80$!
    - $T = 240$ if $N = 80$, which = 2 non-FECed IP packets

- Smarter FEC might exist
Reliability through FEC

• But how?
  – SCHC to the rescue!
  – Apply SCHC rules to IP datagram
  – Then apply FEC and send with SCHC as IP Protocol NH
    • See my presentation in LPWAN next session
  – Use SCHC RuleID to encode block # (lower 2 bits)
  – App signals SCHC on needing MUST deliver
Ta Da!

• Easy to implement and test to prove
  - End points need SCHC support
  - Internet needs to respect SCHC as IP Protocol #
    • Hopefully not just dropping it
  - Select FEC and plug into SCHC
    • Help needed here
  - Run tests over questionably reliable links
    • Measure success improvements
Ta Da!

THANK YOU

QUESTIONS?
Nah, this is easy! :)

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