TDMoIP-LE

Using TDMoIP Loop Emulation for congestion control

PWE3 – 56rd IETF

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<table>
<thead>
<tr>
<th>FORMID</th>
<th>mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>raw bits</td>
</tr>
<tr>
<td>1100</td>
<td>AAL1 unstructured</td>
</tr>
<tr>
<td>1101</td>
<td>AAL1 structured</td>
</tr>
<tr>
<td>1110</td>
<td>AAL1 structured w/ CAS</td>
</tr>
<tr>
<td>0000</td>
<td>ATM PW compatibility mode</td>
</tr>
<tr>
<td>1001</td>
<td>AAL2 VBR</td>
</tr>
<tr>
<td>1111</td>
<td>HDLC</td>
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TDMoIP AAL2 mode

- **VBR without ATM 48 byte cells**
- Enables:
  - Dynamic allocation of timeslots
    - Signaling
    - VAD
  - Use of arbitrary NSP
    - VAD
    - speech compression
    - fax/modem/tone relay
- **BW can be reduced to < 5% of original TDM**
Congestion avoidance

- PWs are required NOT to interfere with neighboring flows
- Present approach: tear down the PW
- Removal of service is not acceptable for TDM
  - No provider will use an emulation designed to be torn down
  - Service outage impacts many users
  - TDM users are used to “five nines”
- Congestion can be due to:
  - overbooking - nothing can help (tear down can’t be helped)
  - short duration statistical peaks (seconds - minutes)

- Less drastic remedies for statistical peaks
  - Drop packets and use PLC - 10% reduction acceptable
  - NSP + AAL2 - 95% BW reduction possible
    - perceivable quality reduction
      but much better than service outage
Packet loss concealment

- Perceptual effect of packet loss on voice can be concealed
- Better concealment possible for TDMoIP than VoIP
  - Idea presented in draft-stein-pwe3-tdm-packetloss-00
- Progress since last meeting
  - Larger packet sizes (up to 40 samples per timeslot)
  - New, more general, PLC algorithm
  - Small scale tests

![Graph showing MOS vs. PL(%) with two curves: new PLC and zero insertion or replay.](image)
Proposal

- TDM encapsulation MUST provide for congestion avoidance
  - There MUST be a VBR mode
  - MUST be able to use NSPs such as VAD/compression
  - There MUST be a remote indication of packet loss (R bit)

- TDM control word MUST include a length field
  - BW reduced packets are small

- TDM control word MUST include a per-packet FORMID
  - signaling the format change is too slow
- Working systems on private networks
- Anecdotal evidence for public Internet

PACKMAN
- Software to collect packet loss and PDV data
- Generates periodic TDMoIP stream

Have already discovered several interesting facts
- Most packet loss events are isolated (not bursts)
- There are periodic packet loss phenomena