Delay Variation Applicability Statement

`draft-ietf-ippm-delay-var-as-00`

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Status

- **Lots of comments, August and September 2007**
- **Reached WG item status in October 2007**
- **Milestone:**
  - ➔ **Jul 2008 Delay Variation Applicability Statement (Informational) to IESG Review**
- **Most comments addressed in Dec 2007, IETF-70**
  - ➔ **4th version of individual draft, file name wasn't changed**
- **Remaining issues raised at the meeting & on the list.**

Major Changes

- **Refined/Expanded Clock Stab. & Error section (6.3)**
- **Better Illustration for Lossless Path Change (6.2.1)**

Open Issues

3.5. <your favorite here> in the section of Task Descriptions:
   A few possibilities have been mentioned, but nothing concrete
   beyond the four tasks already described.
 >>> Authors ask, what important task still needs to be added?

6.2.2 Path change with Loss
   Bob Holley reminded us that this is the common case, yet IPDV does not
   detect it at all! This needs further study.
 >>> Authors ask: Do we rely on DV to detect path changes?
   At IETF-70, at least one person said they did.

8. Section on Measurement Considerations:
   Lots of prior comments have been addressed by adding material here.
 >>> Authors ask: Is this section now sufficient?
   Are there particular items in the "TO DO" list worth pursuing?

>   TO DO: Add info comparing methodological approximations for each
>   form, including on-the-fly statistics, memory requirements,
>   implications on the reference value (D(min)), quantiles not available
>   as a running measure, (possibly in a new subsection)

Open Issues (2)

Appendix 12 on Reducing Delay Variation in Networks:
   Loki suggested to include equipment & configuration dysfunction
   An earlier comment suggested to remove this section (Scott B.)
 >>> Authors tending toward deleting the section.

Appendix 13 on Calculating the D(min) in PDV
   Loki suggested consider including code fragments for the described
   method.
 >>> Authors asked for review to identify ambiguities in the current
    text, thus obviating the code or making a case why it's needed
    (and for which method, there are several in this Appendix).

Dan's Comment: Delete Section 5 and most of Section 6. Also Section 8,
   outside IPPM's traditional Scope?

>>> Authors disagree – these sections collect the information that answer
   the questions of the Novice reader, someone new to measurement, or
   who may be using IPPM specs for the first time.

Open Issues (3)

Comment from Fred Baker:

- **Some delay variation from minimum may not be due to queuing:**
  - ➔ **Could be due to media contention**
  - ➔ **Historical: Shared Ethernet and Slotted ALOHA**
  - ➔ **DOCSIS, 802.11, and so-called TDM radio technologies all introduce delay variation**
  - ➔ **MAC Queue: L3 packet in a L2 frame**
  - ➔ **Cal Tech's FAST TCP window control responds to this variation**
- **Would like to see a discussion of this in the draft**

Summary of Comparisons

- **Challenging Circumstances for measurement:**
  - ➔ **IPDV form offers advantages when**
    - ✦ **Path changes are very Frequent and lossy**
    - ✦ **Meas. System Clocks exhibit "some" Skew**
  - ➔ **PDV form is less sensitive to Packet Loss**
- **Spatial Composition of DV metric:**
  - ➔ **All validated methods use PDV,**
    - ✦ **IPDV sensitivities to sequence and spacing changes is an issue, and tend to break the IID requirement.**
- **Estimate of Queuing Time & Variation:**
  - ➔ **PDV estimates this, especially when sample min = true min**
- **Determine De-jitter Buffer Size Required**
  - ➔ **PDV "pseudo-range" reveals this property by anchoring the distribution at the minimum delay**
- **Specification Simplicity (SLA or SLS)**
  - ➔ **one constraint for PDV single-sided positive distribution**

Summary Table (section 7.3)

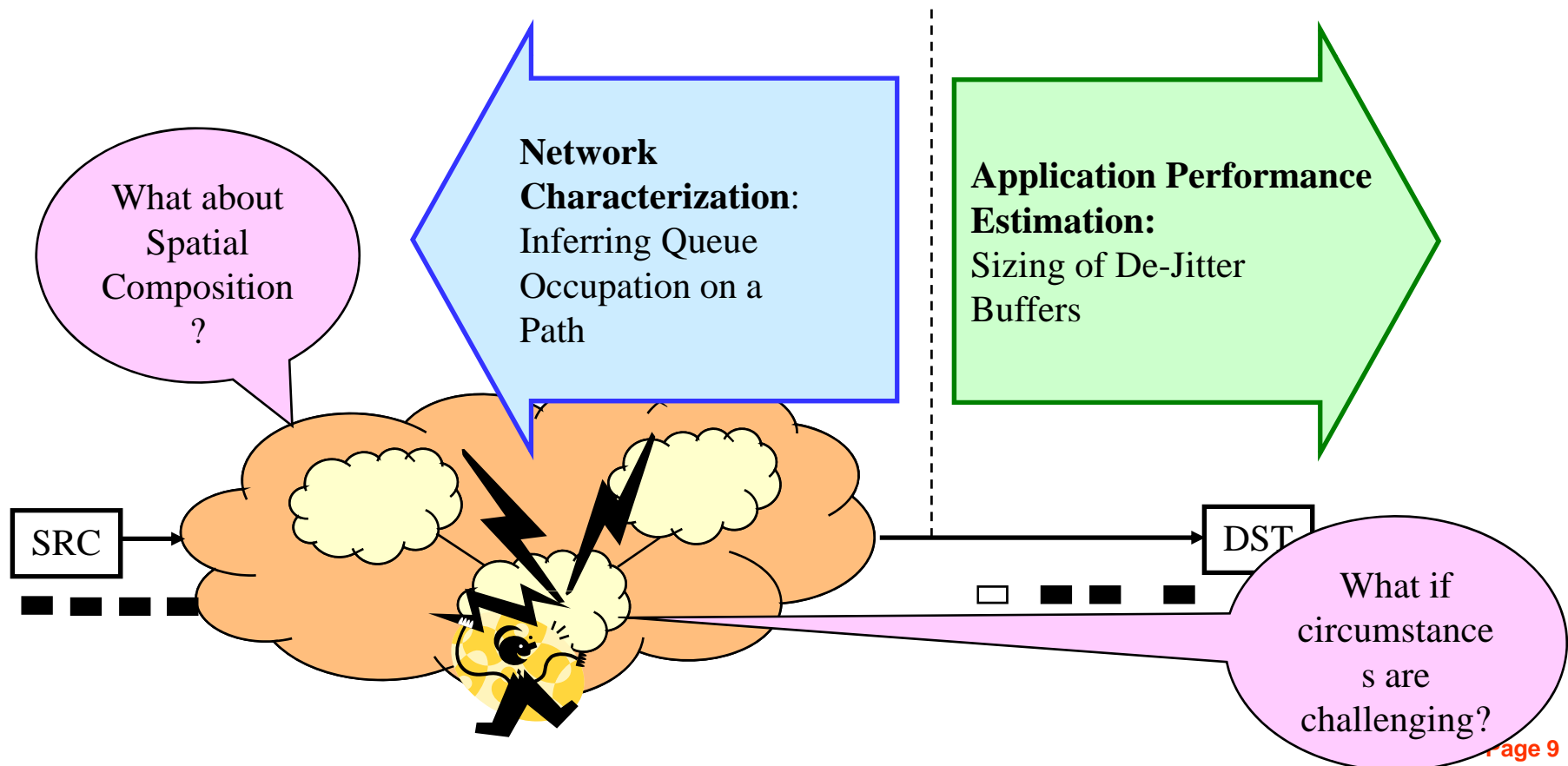| Comparison Area	PDV	IPDV
Challenging Circumstances	Less sensitive to pkt. loss, simplifies analysis with load balancing & mult paths	Preferred when path changes are frequent, or when measurement clocks w/ "some" skew
Spatial Composition of DV Metric	All validated methods use this form	Has sensitivity to seq. and spacing changes & tends to break IID req.
Determine de-jitter buffer size required	Range or "pseudo-range" reveals this	No reliable relation, but some heuristics
Estimate of Queuing time and variation	Dist. related 1-to-1 on stable path and sample = true min	No reliable relation, but some heuristics
Spec. Simplicity: Single number SLS	One constraint needed for single-sided dist. and rationale as above	2-sided dist., with no summary stat that relates to physical quantity (?)

Summary

- **IPDV and PDV each have their Strengths and Weaknesses**

- **Initial (Nov 2006) Conclusions have seen agreement**

- **Need to Close the remaining open issues**

- **Time running out for Suggestions for additional Tasks & Circumstances**

- **WGLC when WG can focus their attention for a final read-through…**

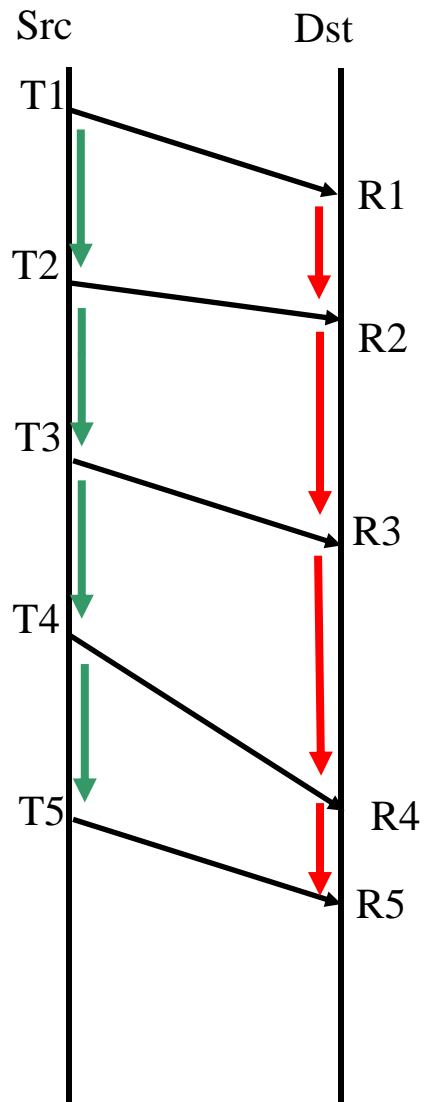- **Thanks to readers for their comments help finishing this up**

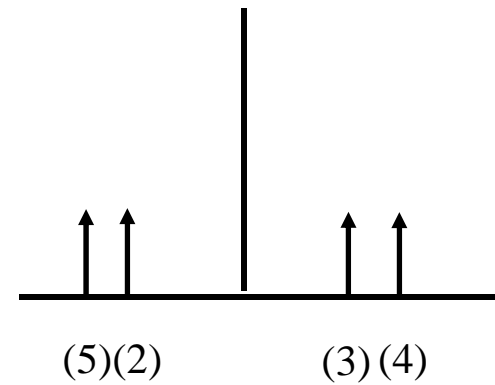## Applicability Problem:
"How will the results be used?"

- **Krzanowski introduced the Delay Variation Problem at IETF-64**
- **"How" Question asked at IETF-65, no suggestions yet**
- **RFC 3393 lists two key uses for the Delay Variation Metric**
- **Memo Considers these 3 Tasks and N Special Circumstances**

What about Spatial Composition ?

Network Characterization: Inferring Queue Occupation on a Path

Application Performance Estimation: Sizing of De-Jitter Buffers

SRC

DST

What if circumstances are challenging?

Inter-Packet Delay Var. (selection func = previous packet)
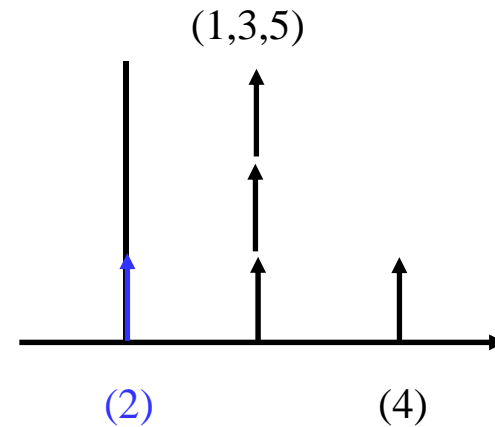

$$\text{IPDV}(2) = (R2\text{-}R1) - (T2\text{-}T1)$$

$$\text{IPDV}(4) = (R4\text{-}R3) - (T4\text{-}T3)$$

Packet Delay Variation (selection func = minimum delay pkt in stream)
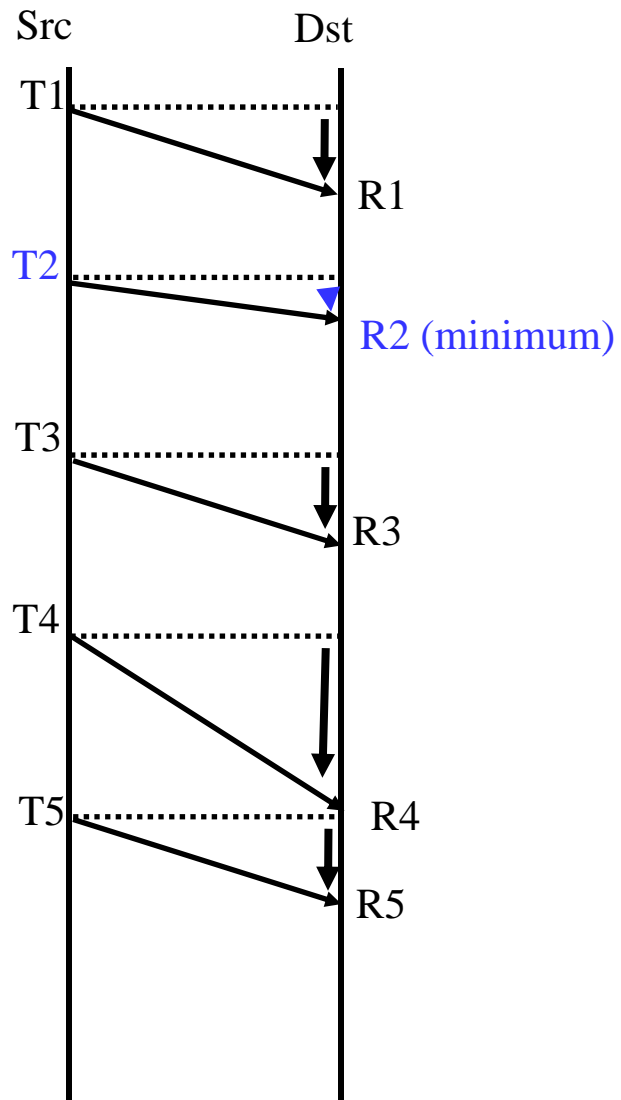
$$PDV(3) = (R3-T3) - (R2-T2)$$

$$PDV(4) = (R4-T4) - (R2-T2)$$

Current Outline of the Draft

- 1. Introduction
    - 1.1. Background Literature in IPPM and Elsewhere
    - 1.2. Organization of the Memo

- 2. Purpose and Scope

- 3. Brief Descriptions of Delay Variation Uses (four)
    - 3.2. **De-jitter Buffer size**

- 4. Formulations of IPDV & PDV

- 5. Earlier Comparisons

- 6. Additional Properties and Comparisons
    - 6.1. Packet Loss
    - 6.2. Path Changes
        - 6.2.1. Lossless Path Change
        - 6.2.2. Path Change with Loss
    - 6.3. Clock Stability and Error
    - 6.4. Spatial Composition
    - 6.5. Reporting a Single Number
    - 6.6. Jitter in RTCP Reports
    - 6.7. MAPDV2
    - 6.8. Load Balancing

- 7. **Applicability of the Delay Variation Forms and Rec**
    - 7.1. Uses
        - 7.1.1. Queue Occupancy
        - 7.1.2. De-Jitter Buffer Size
        - 7.1.3. Spatial Composition
        - 7.1.4. Service Level Specs
    - 7.2. Challenging Circumstances
        - 7.2.1. Clock Issues
        - 7.2.2. Frequent Path Changes
        - 7.2.3. Frequent Loss
        - 7.2.4. Load Balancing
    - 7.3. **Summary Table**

- 8. **Measurement Considerations for Vendors, Testers, and Users**
    - 8.1. **Measurement Stream Charac.**
    - 8.2. **Measurement Devices**
    - 8.3 **Measurement Units**
    - 8.4. **Test Duration**
    - 8.5. **Clock Sync Options**
    - 8.6. **Distinguishing Long Delay - Loss**
    - 8.7. **Accounting for Packet Reordering**
    - 8.8. **Results Representation and Reporting**
    …

- 12. Appendix on Reducing Delay Variation in Networks

- 13. Appendix on Calculating the D(min) in PDV

Newest Sections and Questions!!!

- **Section 8: Measurement Considerations**
  - ➔ **This section provides guidance in many areas – Useful?**
  - ➔ **Do we want to recommend measuring BOTH IPDV and PDV?**
  - ➔ **Do we want to reconstruct the IPDV and DV later on, with a different interval?**

- **Appendix: Guidance for reducing DV in networks**
  - ➔ **Useful?**
  - ➔ **One comment at IETF-69 to leave this out**