MediaPlayer™ vs. RealPlayer™
A Comparison of Network Turbulence

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http://perform.wpi.edu/
Introduction

• Streaming video often does not like TCP
  - Wants smooth stream, so rate-based
  - Does not always want retransmissions
    → Chooses UDP
• UDP flows may be unresponsive to congestion
  → Handle with Active Queue Management (AQM)
• Typical AQMs model UDP flows as CBR (“firehose”)
• More realistic models of streaming UDP flows will make AQMs more effective
• We investigate size and distribution over time
  → Turbulence
• Big 3: RealPlayer, MediaPlayer, QuickTime [Jup01]
Methodology

- **Build** automated video players *(MediaTracker and RealTracker [WCZ01])*
  - Use commercial cores
  - Software Development Kits (SDKs)
  - Record application stats: frame rate...
- **Select** hosts with both RealNetworks and Microsoft Media video servers
- **Stream** identical content to players on the same host
- **Analyze** results
## Clip Selection

<table>
<thead>
<tr>
<th>Type</th>
<th>Bandwidth</th>
<th>Real (Kbps)</th>
<th>Microsoft (Kbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sports</td>
<td>High</td>
<td>284</td>
<td>323</td>
</tr>
<tr>
<td>3:46</td>
<td>Low</td>
<td>36</td>
<td>50</td>
</tr>
<tr>
<td>2 Commercial</td>
<td>High</td>
<td>268</td>
<td>307</td>
</tr>
<tr>
<td>0:39</td>
<td>Low</td>
<td>84</td>
<td>102</td>
</tr>
<tr>
<td>3 Sports</td>
<td>High</td>
<td>284</td>
<td>307</td>
</tr>
<tr>
<td>0:60</td>
<td>Low</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>4 Music T.V.</td>
<td>High</td>
<td>181</td>
<td>309</td>
</tr>
<tr>
<td>4:05</td>
<td>Low</td>
<td>26</td>
<td>50</td>
</tr>
<tr>
<td>5 News</td>
<td>High</td>
<td>218</td>
<td>250</td>
</tr>
<tr>
<td>1:47</td>
<td>Low</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>6 Movie Clip</td>
<td>Very High</td>
<td>637</td>
<td>731</td>
</tr>
<tr>
<td>2:27</td>
<td>High</td>
<td>271</td>
<td>347</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>39</td>
<td>102</td>
</tr>
</tbody>
</table>
Experimental Setup

• Player Platform
  - Microsoft Windows 2000 PC
  - P4 1.8 GHz, 512M RAM, AGP 32MB video card
  - mindspeed.wpi.edu (Worcester, MA, USA)

• Network
  - LAN: PCI 10M NIC Win2k professional
  - Campus uplink: ~50 Mbps (Yipes in 15 Mbps)

• Software
  - Microsoft Media Player version 7.1
  - RealNetworks RealOne Player build 6.0.10.505
  - Ethereal version 0.8.20
IP Packet Arrivals

- **RealPlayer** - single packets
- **Media Player** - groups of packets (3 in this example)
  - 2 at about 1500 bytes (typical MTU)
  - 1 "left-over" less than MTU

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Media Player IP Packet Fragmentation

Encoded Bandwidth (Kbits/s)

IP Packets w/out UDP Header

%
Normalized UDP Packet Sizes

- **Real Player** - More "Constant Packet Size"
- **Windows Media** - Less "Constant Packet Size"
UDP Packet Interarrival Times

Normalized Interarrival Time Interval

Cumulative Density

Real Player - More “Constant Packet Rate”
Window Media Player - Less “Constant Packet Rate”

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RealPlayer buffers at a higher rate
RealPlayer significantly higher at low bandwidth
Summary

• Microsoft **Media Player** typical CBR
  - Constant packet sizes and interarrivals
• RealNetworks **RealPlayer** less CBR
  - Range of packet sizes and interarrivals
  - Buffers at up to 3 times playout rate
• **Media Player** has significant IP frag.
  - 3-5 IP frags / UDP for broadband+ bwidth
• Results can be used for more realistic streaming simulations and emulations
• **MediaTracker** and **RealTracker** online:
  http://perform.wpi.edu/real-tracer/
Future Work

- Build simulated streaming application
  - In NS
- Server side control
  - Clip encoding, Content type
  - (We have server set-up, preliminary results)
- Bandwidth under congestion
  - TCP-Friendly?
  - (We have results for RealPlayer)
- More players and protocols
  - QuickTime (QuickTracker)
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