Distributed Video Adaptation and Streaming for Heterogeneous Devices

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OUTLINE
- Motivation
- Objective
- Background
- Proposed Approach
  - DAg-stream
- Benefit
- Drawback
- Future Work

MOTIVATION

OBJECTIVE

BACKGROUND

MPEG-21 gBSD
And
Compressed-domain Adaptation

MPEG-21 Part 7
Digital Item Adaptation (DIA)
**Generation of Digital Item**

YUV → H.264 Encoder → H.264 Video + gBSD

**gBSD-based Adaptation**

1. Video Encoder
2. Compressed Video

**ADAPTATION ON THE DELIVERY PATH – Proxy based**

MSS = Media Streaming Server, PS = Proxy Server

**ADAPTATION ON THE DELIVERY PATH – Peer based**

**DAg-stream**

Serve peers based on a hierarchy of
- Adaptation requirement
- Streaming requirement

**DAg-tree**

Adapting & Streaming Peer (ASP) :: Streaming Peer (SP) :: Null Peer (NullP)
**Tree Administration**

- DAg-master determines incoming peer’s parental eligibility
  - Fan-out
  - CPUP
- ASP and SP may be intermixed based on the order of join requests

**New node joining**

- DAg-rules 1

**Node joining constraints**

<table>
<thead>
<tr>
<th>Parent</th>
<th>NullP</th>
<th>SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAg-starter</td>
<td>Fan-out ≥ 2</td>
<td>Fan-out &gt; 1</td>
</tr>
<tr>
<td>ASP</td>
<td>Fan-out ≥ 2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Node Departure**

- DAg-rules 2

**Tree Refinement**

Refine tree based on -
- Fan-out
- CPUP
- Stability Factor
- Delay

**Experimental Results**

ASP: 15%, SP: 35%, NullP: 50%, minCPU: 0.2
Experimental Results

Figure: Node joining success rate

Experimental Results

Figure: Tree refinement performance

BENEFIT

• Simple design

• It does not require an application or codec-specific schema so it is for intermediary nodes to adapt the video based on its gBSD.

• Small handheld devices are free from any adaptation operation

DRAWBACK

• Node failure

• Total utilization of resources
  
  • Bandwidth: Optimum – 38%, Simulation – 33%
  
  • CPU: Optimum – 45%, Simulation – 41%

FUTURE WORK

• Multiple Provider for a single peer

• Virtual resource concatenation

THANK YOU