A Deadline-aware Extension for MoQ relays

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Basic agreements on MoQ relays

- Should get access to the header but not the payload
- Should Forward packets
- Can schedule or reorder the packets
- May drop packets under some circumstances
- Maybe other features …
Why do we need an extension?

• Two dimensional priorities in a single space
  • Time: newer > older
  • Importance: key frame > predict frame, audio > video

• Global priority v.s. Local priority
  • Single priority is difficult to define global priority

• Relay don’t know when to give up ‘over-queued’ object
  • How large should the cache or the jitter buffer be?

• So, We need some indicators of timeliness
Timeliness parameter

• Indicate the application's requirement and intention
  • “Deadline”, “time-to-live”, “maxacceptabledelay”

• Relays should be aware of it to make better decision
  • Especially in real-time transmission
Timeliness parameter in moqt

- An optional field in the object header
  - Deadline: Unix-timestamp (currently)
  - Or other?
- Some new functions of flags
- Other extensions are similar

```plaintext
object_header {
  ... 
  id(i),
  message_type(i),
  object_id(i),

  [nb_objects_previous_group(i), ]

  flags[8],
  object_length(i),
  [deadline(i)]
}
```
Deadline-aware MoQ Relay Components

• Data Unit: Block(Object)
  • basic data unit, containing single frame

• Metadata: Deadline

• Actions
  • Scheduling
  • Dropping
  • Redundancy coding
Deadline-aware MoQ Relay Demo

• Publishers emit objects with deadline
  • Showing the expiration time and expect latency
  • Deadline is given in Unix timestamp

Expect latency: <1000 ms

Expect latency: <100 ms

https://github.com/STAR-Tsinghua/draft-moq-for-deadline
Deadline-aware MoQ Relay Demo

• Schedule with priority, deadline and other parameters

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<th>Payload (e)</th>
<th>DDL: T+1000 ms</th>
<th>Priority: Low</th>
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https://github.com/STAR-Tsinghua/draft-moq-for-deadline
Deadline-aware MoQ Relay Demo

- Relay drops overdue objects (no longer useful)
  - Dropping logic may relate with priority setting
  - Immediate drop or Lazy drop depends on other designs

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Priority: High

DDL: T+1000 ms
Priority: Low

https://github.com/STAR-Tsinghua/draft-moq-for-deadline
Deadline-aware Optional Functions

• [Optional] Add FEC if needed
  • When the network is bad and both ends of a hop have codec

https://github.com/STAR-Tsinghua/draft-moq-for-deadline
## Deadline-aware Optional Functions

- [Optional] Drop notification and Subscribers request
  - Relay notify the subscriber about the drop (control message)
  - Subscribers request with Tolerance (update DDL)

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Drop Notification: \( C = T+100\text{ms} \)

Tolerance: \( C-200\text{ms} \)
The potential benefits of Deadline-aware

• Lower latency, Save bandwidth
• Increase real-time performance of MoQ
• Help the relay make smart decisions

p.s. still need measurement and confirmation
Conclusions

• Timeliness Header Parameter
  • Some parameters like deadline which shows the freshness or validity of data should be added to object header

• Deadline-aware MoQ Relay
  • Relays get better knowledge of app’s timeliness requirement

• Future Work
  • The detailed implementation of deadline-aware relay still needs further discussion, test and measurement
  • Update the draft
Thanks

Q&A