Extensible Prioritization Scheme for HTTP

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draft-ietf-httpbis-priority
New in -02: H3 PRIORITY_UPDATE breaking change

-01

- Type 0xF
- T bit - Element ID is Request or Push
- Priority Field Value is ASCII encoded

Structured Headers

0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|T|    Empty    |   Prioritized Element ID (i)                ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Priority Field Value (*)                  ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

-02

- Replace bitfield with frame type
- 0xF0700 applies to Request
- 0xF0701 applies to Push

HTTP/3 PRIORITY_UPDATE Frame {
    Type (i) = 0xF0700..0xF0701,
    Length (i),
    Prioritized Element ID (i),
    Priority Field Value (...),
}
New in -02

1. Add consideration for server scheduling (Section 9)
2. Remove specific instruction about intermediary fairness (Section 10.2)
3. Describe considerations when clients use PRIORITY_UPDATE (Section 6)

Problem: Race condition where frame arrives before request

Solution: Servers SHOULD buffer most recent frame and apply it once steam is opened.

Need to add some further text on how servers can limit the state commitment.
Open issues

- "Within the stream limit" in HTTP/2? #1261
- The default priority of a pushed request #1056
For HTTP/2 PRIORITY_UPDATE frame we say:

“The Prioritized Stream ID MUST be within the stream limit.”

Mike Bishop points out that

“HTTP/2 specifies a maximum number of concurrently active streams, with streams which are either "open" or "half-open" counting toward the limit regardless of the ID”

Are we attempting to redefine HTTP/2? No (if we can avoid it).
Kazuho suggests we rephrase the requirement to concurrency window size.

And while we’re fixing this we can probably add more text about buffering and limits in Section 6.

Implementation experience can help make this better.
Default priority of a push #1056 (1)

Server Push: the request and response headers are created by the server (or in an intermediary case, the origin). If either of the two contains a priority signal, resolve the merge as normal.

The question is what to do when there is no priority signal.
Default priority of a push #1056 (2)

Omitting priority signal in normal request/response: urgency=3, incremental=false

RFC 7540, Section 5.3.5 “pushes initially depend on their associated stream … default weight of 16”

Extensible priorities has no dependency, so what are a push’s default urgency and incremental?
Default priority of a push #1056 (3)

Possible push defaults:

1) Same as the associated stream (aka “request that triggered the push”).
2) “An urgency one less than the associated stream”.
3) No default.

Considerations for picking:

- No single best value.
- Server cannot use PRIORITY_UPDATE to signal push priority
- Performance benefits are hard to measure.
- Performance degradation is very possible if wrong value is picked
  - Especially if pushed resources priority cause bad scheduling of other resources
Questions?