Numbered HTTP Datagrams

Marcus Ihlar
Magnus Westerlund

Adding Numbers to Datagrams

DG-Sequence: ?1

Indicate support

```
REGISTER_SEQUENCE_CONTEXT Capsule {
  Type (i) = REGISTER_SEQUENCE_CONTEXT,
  Length (i),
  Context ID (i),
  Payload Context ID (i),
  [Representation (8)]
}
```

Register the use of sequence numbers.

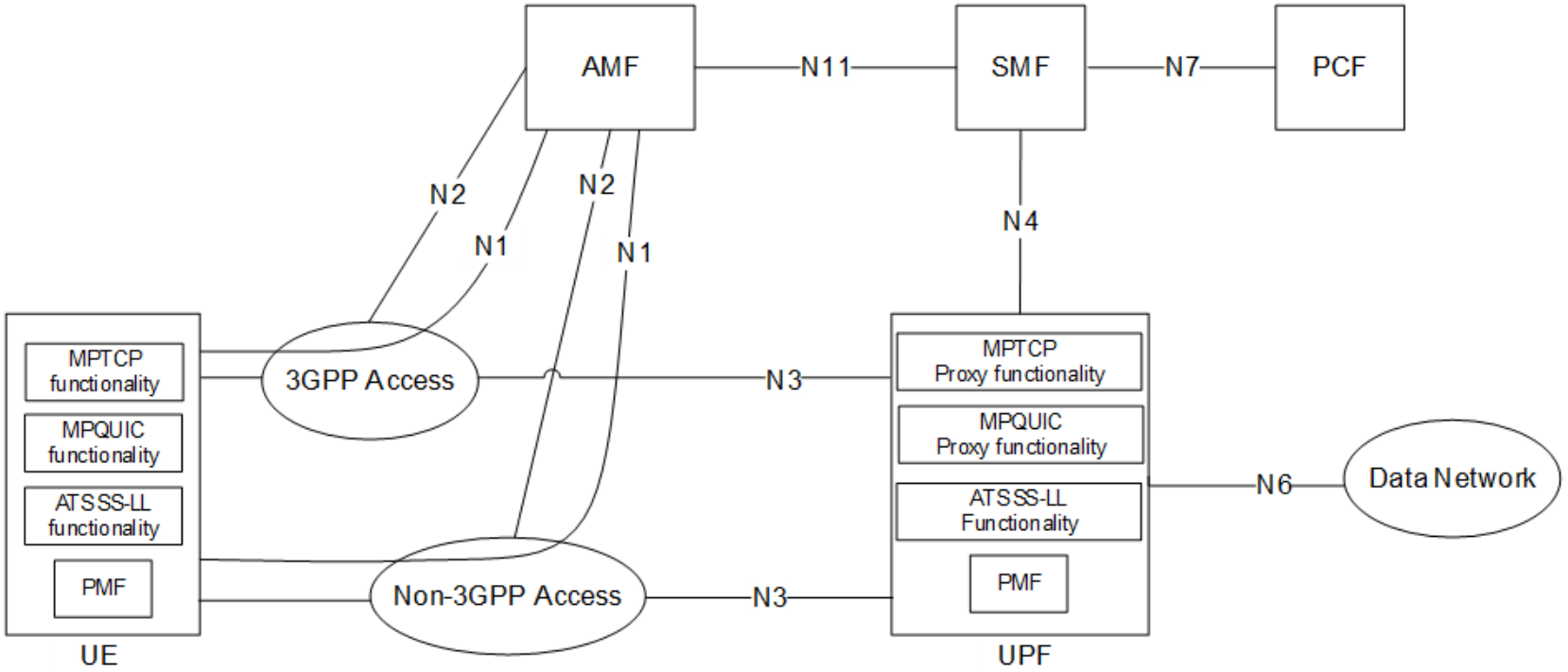
```
Sequence Number Datagram {
  Context ID (i),
  Sequence Number (8..64),
  Payload (..)
}
```

Datagram format.

Why?

ATSSS

TS 23.501 Version 18.1.0



3GPP TS 23.501 Clause 5.32.6.2.2.1

Datagram mode 2: This transport mode is the mode defined in RFC 9298
...
and provides unreliable transport with no sequence numbering and no packet reordering / deduplication.

Default Mode

Datagram mode 1: This transport mode is an extension of the mode defined in RFC 9298
…
but with sequence numbering and with packet reordering / deduplication.
…
The details of the datagram mode 1, including the potential use of a Context ID (…), are considered in stage-3 specifications.

Optional Mode

Reordering

- With the ATSSS “Load Balancing Steering Mode” traffic is simultaneously transmitted over 3GPP and non-3GPP paths.
- Default transport mode (Datagram mode 2): use plain HTTP Datagrams, let endpoints deal with out-of-sequence data.
- Optional transport mode, use HTTP datagrams with sequence numbers.
  - Alternative to encode datagrams over capsules streams.
  - Delay incoming out-of-sequence datagrams by some time e.g., estimated path delay difference.
  - Reduced packet delay variation and out-of-sequence data at the expense of increased minimum delays.

Deduplication

- ATSSS Redundant Steering Mode
  - Duplicate data over multiple accesses.
  - Various triggers and strategies for packet duplication, such as network quality estimates.
  - Receiver must be able to identify and discard duplicates.
  - Sequence numbers allow for simple duplicate packet detection.

Use Cases

- Campus where existing Wi-Fi coverage is augmented with 5G radio.
  - Single management plane for subscribers.
  - Steering modes depends on application.
    - Traffic aggregation and redundancy useful for e.g., remote controlled devices.

- Emergency response teams, simultaneously connected over multiple accesses.

- …

Exercise in Extensibility

- Should this type of extension be able to work with multiple payload formats?
- What is the best way of realizing layered contexts?

```
REGISTER_SEQUENCE_CONTEXT Capsule {
  Type (i) = REGISTER_SEQUENCE_CONTEXT,
  Length (i),
  Context ID (i),
  Payload Context ID (i),
  [Representation (8)]
}
```