RFC 7967
About the first indigenous contribution to IETF Standard from India

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Brief background and problem statement

• TCS Research, Kolkata was working on communication protocols for IoT/M2M specific constrained environments
  – Constrained devices
  – Constrained networks
  – Closely following standardization efforts

• Efforts to improve performance under specific scenarios
  – Increase scalability; Reduce communication cost, latency

• Initial problem statement: How to improve the overall system performance for series of independent updates with the information producer acting as a RESTful client
  – Enhance throughput without degrading the application level QoE beyond a desired level
  – Example use case: GPS updates in a vehicle tacking solution
Brief background and problem statement (contd ...)

• Had an existing HTTP based RESTful solution
  – Too much delay
  – System freeze
  – Battery drain out (sensor G/W attached to car battery)
Solution approach: Step by step progress to conceiving RFC 7967

- Packet dissection proved HTTP to be too heavy on resources
  - Note: System operated over just a 2.5G data connection
- **Constrained Application Protocol (CoAP, RFC 7252)** from **Constrained Restful Environment (CoRE) WG** was at a nascent stage of standardization
  - ‘Web-enable’ resource-constrained devices for IoT by allowing exchanges similar to RESTful web-services on LLN and resource constrained nodes
- Tried an open-source implementation of that early version of CoAP from University of Bremen
- System performance improved – but at times (busy hours)
  system still stalls for a while for ACKs – there are retransmissions as well – but actually that is because of delayed arrival of ACK
Solution approache: Step by step progress to conceiving RFC 7967 (contd..)

• Give it a thought – why is it important to receive application responses and server ACKs for a location that you have already passed by?
• Push the GPS update at a higher rate when vehicle moving fast – a sporadic loss can be quickly compensated by a next successful reception at the server
• When vehicle moving slow, push GPS update at a slow rate but ensure server responses
• So, contextually switch the semantics
Solution approach: Step by step progress to conceiving RFC 7967 (contd..)

• CoAP allows both Confirmable (CON) and Non-confirmable (NON) update requests

• But, NON requests are still a closed loop system at the application level
  – Server application will send back the state of execution of the request on the resource
  – That’s not an ACK from the messaging layer - that’s a response from the request/response layer

CoAP

![CoAP Diagram]

Client

CON, Msg ID: 0x7a11
PUT /resource,<value>,
Token: 0x74

ACK, Msg ID: 0x7a11,
Code: 2.04 (Changed),
Token: 0x74

Server

NON, Msg. ID: [0x7a11]
PUT /resource, <value>,Token: 0x74

Token: 0x7a11, 2.04 (Changed)
Field experiment setup (driven across Biswa Bangla Sarani)
RFC 7967 ...Client option to proactively requesting the server to suppress the request execution status

• Allowing response suppression at a more granular level – typically useful in optimizing the response traffic against a multicast request
  – Triggered by requirements from the connected lights industry
Example handshake

Client | Server
------|-------

+-----+ | Header: PUT (T=NON, Code=0.03, MID=0x7d38)
| PUT  | Token: 0x53
    | Uri-Path: "vehicle-stat-00"
    | Content Type: text/plain
    | No-Response: 26
    | Payload:
        | "VehID=00&RouteID=DN47&Lat=22.5658745&Long=88.4107966667&
         | Time=2013-01-13T11:24:31"
[No response from the server. Next update in 20 s.]

+-----+ | Header: PUT (T=NON, Code=0.03, MID=0x7d39)
| PUT  | Token: 0x54
    | Uri-Path: "vehicle-stat-00"
    | Content Type: text/plain
    | No-Response: 26
    | Payload:
        | "VehID=00&RouteID=DN47&Lat=22.5649015&Long=88.4103511667&
         | Time=2013-01-13T11:24:51"
The spec takes care of design guidelines to ...

- Avoid congestion despite being “RESTfully” best-effort. 😊
- Define proxy behaviour between HTTP and CoAP
More Use Cases

• Connected lights
  – RFC 7967 is used in OpenAIS standard for Solid State Lighting System
  – Optimizes traffic for multicast switching
  – Helps system-level debugging

• Higher layer control signaling for Low Power WAN (LPWAN)
RFC 7967 – In short

- Deals with IoT/M2M use case
- Adds an option (#258) as an enhancement to CoAP (Constrained Application Protocol) at the CoAP-client
- Enables an IoT implementations to extremely reduce the server and network load
- Improves trade-off between delay and reliability
- Client initiated suppression of application-level response at the server in a RESTful exchange

- Available implementations – libcoap, aicoap ....
- Use cases so far
  - GPS updates, Connected lights, LPWAN signalling
  - Recently being used in intelligent video streaming solution for remote constrained surveillance bots/ UAVs
    - Video is nothing but a time series information
The journey

- **Vancouver, November, 2013**
  - Got acquainted with the IETF processes

- **Toronto, July, 2014**
  - Submitted a draft on security
  - Strengthened the position of the No-Response option draft
  - Prior this meeting draft on No-Response proposal floated in the WG mailing list
  - House voted in favour of continuing the proposed work

- **Honolulu, November, 2014**
  - WG Chair expressed his keenness to push the No-Response draft for acceptance

- **Prague, July, 2015**
  - Received ISOC fellowship
  - Official commitment from the WG chair to push the draft for No-Response for RFC

- **Buenos Aires, April, 2016**
  - Completed final technical reviews for the No-Response draft

- **Berlin, July, 2016**
  - Took part in Govt. of India’s initiative to represent India in IETF.
  - Received ISOC fellowship

- **Yokohama, November, 2015**
  - Submitted a draft on secure session establishment

- **Aug, 2016**
  - Received ISOC fellowship

- **RFC 7967**
Thank you