



draft-ietf-6tisch-minimal-security

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Status

- Published -07 and -08
 - WGLC resolutions, reviews from:
 - Göran Selander
 - Tero Kivinen
 - Xavier Vilajosana
 - Klaus Hartke
 - Jim Schaad
 - Tengfei Chang
 - William Vignat
 - Thomas Watteyne
- Goal of the presentation
 - Discuss WGLC resolutions



- For a full list of WGLC issues resolved in -07 and -08, see:
<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues?content=%7EWGLC>

WGLC resolutions 1/8

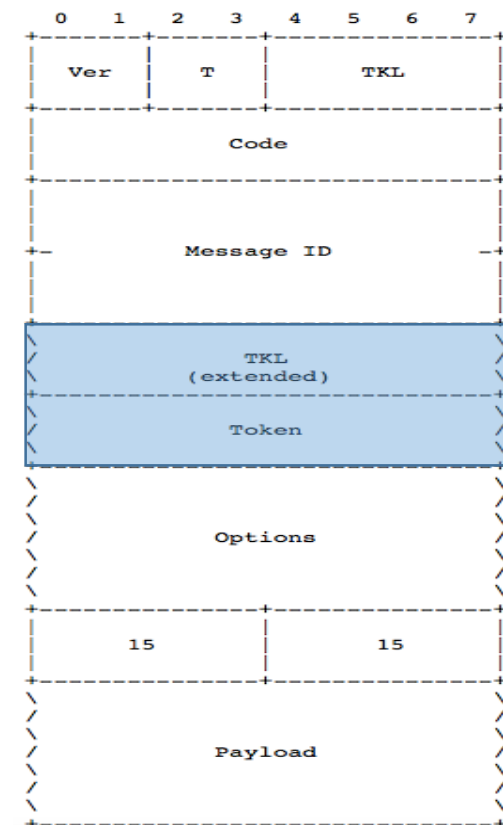
Stateless-Proxy

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/29/stateless-proxy>

- New work in CoRE: [draft-hartke-core-stateless](#)
 - Adopted by CoRE and soon in WGLC. Thanks!
 - Extended the base CoAP token definition to support longer tokens
- Removed the definition of Stateless-Proxy option from minimal-security
- Added Section 8.1 “Statelessness of the JP”
 - RECOMMENDED that the JP operates in a stateless manner
 - Use CoAP token to transport state. If it doesn’t fit => use hartke-core-stateless extended token
 - Informative reference to hartke-core-stateless

New text to accommodate implementations where stateless proxy is not possible:

Note that in some networking stack implementations, a fully (per-pledge) stateless operation of the JP may be challenging from the implementation point of view. In those cases, the JP may operate as a statefull proxy that stores the per-pledge state until the response is received or timed out, but this comes at a price of an additional DoS vector.



CoAP base header
w/ Extended Token

WGLC resolutions 2/8

Use of confirmable CoAP message for Join Request

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/49/use-coap-con-messages-at-pledge>

- When proxy makes a request on behalf of a pledge (client), it does not need to use the same message type
- Pledge MUST send a CON Join Request, proxy MUST forward it as NON to avoid maintaining state
- Removes previous minimal-security-specific retransmission mechanism
- Retransmission now handled exclusively by CoAP, same (old) behavior of pledge retransmitting

Name	Default Value: Pledge	Default Value: JP
ACK_TIMEOUT	10 seconds	(10 seconds)
ACK_RANDOM_FACTOR	1.5	(1.5)
MAX_RETRANSMIT	4	(4)

Default values for CoAP parameters. Values enclosed in () have no effect when JP operates in a stateless manner.

WGLC resolutions 3/8

Bandwidth cap at JP in -08

https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/40/specify-the-usage-of-coaps-probing_rate-as

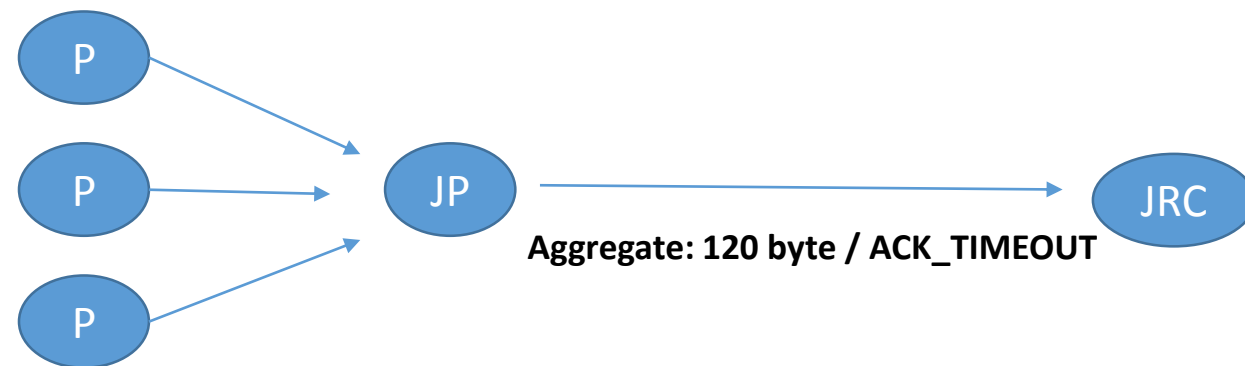
- CoAP already provides a bandwidth cap through its congestion control mechanism
 - **NSTART** in number of requests for Confirmable messages
 - (useful for **statefull** JP)
 - **PROBING_RATE** in bytes/second for non-confirmable
 - (useful for **stateless** JP)
- No need for *any* new code
- Values in -08 (see next).

WGLC resolutions 3/8

Bandwidth cap at JP in -08 (cont)

https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/40/specify-the-usage-of-coaps-probing_rate-as

- Considerations:
 - Stateless proxy limited by upstream bandwidth
 - React *fast* to a potential attack, do not overwhelm the network
 - Statefull proxy limited by RAM
 - NSTART=3 ?
 - 3 pledges concurrently joining
- Some numbers:
 - *Join Request message size ~40 bytes (CoAP + CBOR)*
 - Bandwidth available upstream of JP: at least **~67 bytes/second**
 - ~60 bytes of 802.15.4+6LoWPAN+UDP overhead
 - at minimum 1 cell with preferred parent
 - 101 slots of 10ms in a slotframe



Per request: 40 byte / ACK TIMEOUT

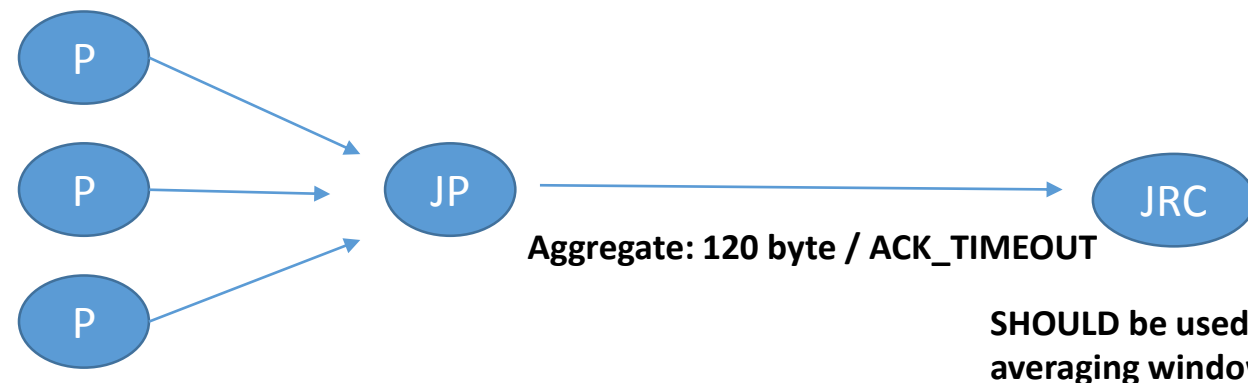
Name	Default Value: Pledge	Default Value: JP
ACK_TIMEOUT	10 seconds	(10 seconds)
NSTART	1	(3)
PROBING_RATE	4 byte/second	12 byte/second

WGLC resolutions 3/8

Bandwidth cap at JP in -08 (cont)

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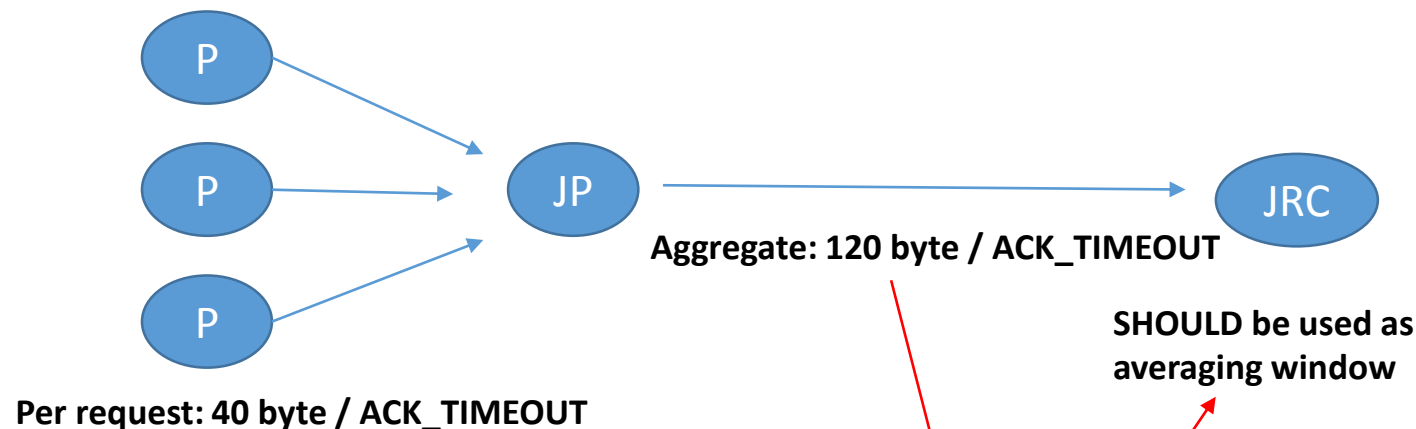
SHOULD be used as averaging window

WGLC resolutions 3/8

Bandwidth cap at JP in -08 (cont)

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17.9% of minimal upstream available bandwidth can and should be higher, but decided by JRC

WGLC resolutions 4/8

CoJP Error Handling

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/41/error-handling-for-cojp-parameters>

New CBOR structure “Error”: transported over OSCORE secure channel

```
Error = [
  error_code      : int,
  error_addinfo   : int / bstr / tstr / nil,
  ? error_description : tstr,
]
```

Description	Value	Additional info	Additional info type	Reference
Invalid Join_Request object	0	None	nil	[[this document]]
Invalid Configuration object	1	None	nil	[[this document]]
Invalid parameter	2	Label of the invalid parameter	int	[[this document]]
Invalid link-layer key	3	Index of the invalid key	uint	[[this document]]
Significant OSCORE partial IV mismatch	4	Next acceptable OSCORE partial IV	bstr	[[this document]]

Table 4: CoJP error codes.

- Errors can occur when processing CBOR objects both part of CoAP requests and **responses**
- For requests, transport Error object as part of 4.00 Bad Request response
- For responses, add Error object to the next Join_Request:

```
Join_Request = {
  ? 1 : uint,           ; role
  ? 5 : bstr,           ; network identifier
  ? 7 : Error,          ; response processing error
}
```

WGLC resolutions 5/8

AEAD Nonce Reuse on JRC failure

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/44/nonce-reuse-when-jrc-looses-mutable>

```
Error = [
  error_code      : int,
  error_addinfo   : int / bstr / tstr / nil,
  ? error_description : tstr,
]
```

Description	Value	Additional info	Additional info type	Reference
Invalid Join_Request object	0	None	nil	[[this document]]
Invalid Configuration object	1	None	nil	[[this document]]
Invalid parameter	2	Label of the invalid parameter	int	[[this document]]
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Table 4: CoJP error codes.

- New JRC knows that there has been a failure of the old JRC
- When first Parameter Update is sent by new JRC, AEAD nonce reuse occurs
 - New JRC MUST include dummy payload: at least 40 byte long randomly generated string
- Pledge detects significant mismatch in the received sequence number
 - e.g. Sequence number is 1.

WGLC resolutions 6/8

Add blacklist

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/39/specify-blacklist-parameter-for-parameter>

```
Configuration = {  
  ? 2 : [ +Link_Layer_Key ], ; link-layer key set  
  ? 3 : Short_Identifier, ; short identifier  
  ? 4 : bstr, ; JRC address  
  ? 5 : bstr, ; network identifier  
  ? 6 : bstr, ; network prefix  
  ? 8 : [ +bstr ], ; blacklist  
}
```

When the joined node receives this parameter, it MUST silently drop any link-layer frames originating from the indicated pledge identifiers.

- JRC can include a “blacklist” parameter at any time
 - Parameter Update to JP
 - Join Response to pledge
- Contains a list of pledge identifiers
- Useful in case of misconfiguration, can help in case of a DoS attack

Link_Layer_Key that supports all modes of 802.15.4

https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues/43/extend-link_layer_key-cbor-struct-to

New definition:

```
Link_Layer_Key = (  
    key_id          : uint,  
    ? key_usage     : int,  
    key_value       : bstr,  
    ? key_addinfo   : bstr,  
)
```

- o Key ID Mode 0x00 (Implicit, pairwise): key_id parameter MUST be set to 0. key_addinfo parameter MUST be present. key_addinfo parameter MUST be set to the link-layer address(es) of a single peer with whom the key should be used. Depending on the configuration of the network, key_addinfo may carry the peer's long link-layer address (i.e. pledge identifier), short link-layer address, or their concatenation with the long address being encoded first. Which address is carried is determined from the length of the byte string.
- o Key ID Mode 0x01 (Key Index): key_id parameter MUST be set to a value different than 0. key_addinfo parameter MUST NOT be present.
- o Key ID Mode 0x02 (4-byte Explicit Key Source): key_id parameter MUST be set to a value different than 0. key_addinfo parameter MUST be present. key_addinfo parameter MUST be set to a byte string, exactly 4 bytes long. key_addinfo parameter carries the Key Source parameter used to configure [IEEE802.15.4].
- o Key ID Mode 0x03 (8-byte Explicit Key Source): key_id parameter MUST be set to a value different than 0. key_addinfo parameter MUST be present. key_addinfo parameter MUST be set to a byte string, exactly 8 bytes long. key_addinfo parameter carries the Key Source parameter used to configure [IEEE802.15.4].

WGGLC resolutions 8/8

Misc

- Update of Security Considerations, uniqueness requirements
- Update of Privacy Considerations
- Encode short address lease time in hours instead of seconds
- PAN ID clarifications
- Mandate unique PSKs
- New appendix on “Lightweight implementation option” that does not require implementations of HKDF and SHA in firmware
- Remove “network prefix” parameter in order not to go into 6LBR management
- ...

Please see the full list of resolved/open issues:

<https://bitbucket.org/6tisch/draft-ietf-6tisch-minimal-security/issues?content=%7EWGLC>

Next steps

- Latest IETF103 discussions and proposals for -09.
 - Add "bandwidth cap" parameter that JRC can use to configure JP
 - When not present, stateless JP uses all the available bandwidth
 - In case of an attack, JRC can use the recommended values to limit the affect on the network
 - Can also be useful to switch on/off the join process
 - At IETF102 we agreed on not provisioning the full configuration to 6LBR
 - A remnant in -08: "network identifier" parameter => Remove it.
 - 6LBR joins as any other pledge, *but* how it gets all other parameters is out of scope
- Publish -09
- Wait one week for additional comments?
 - Ship
- OSCORE is *still* blocked with one DISCUSS
- EDHOC to key OSCORE for zero-touch ?