Remote Conformance & Interop Testing

TPAC2016 – Web of Things IG Meeting – Lisbon
22nd September 2016

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F-Interop H2020 Project

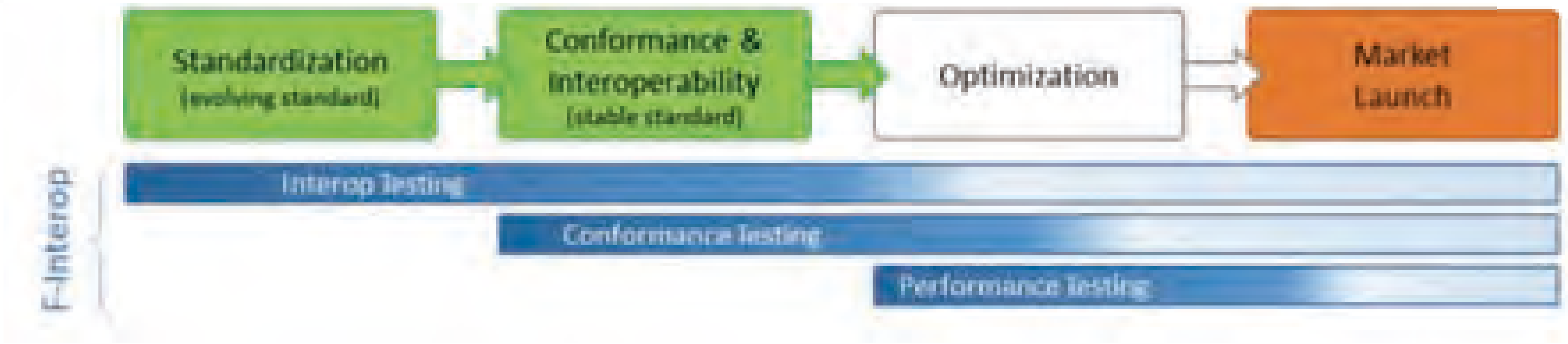
- www.f-interop.eu
- 1 November 2015 – 31 October 2018
- *develop and provide online interoperability and performance test tools to support emerging technologies from research to standardization and market launch*
- 9 partners

ETSI
iMinds CONNECT.INNOVATE.CREATE
EANTC
UPMC PARIS UNIVERSITAS
Inria informatics mathematics
CATAPULT Digital
uni.lu UNIVERSITÉ DU LUXEMBOURG
UDG UNIVERSAL DEVICE GATEWAY
MANDAT INTERNATIONAL

Goals

1. Describe the F-Interop platform
2. Is this useful for the WoT community?
3. How the WoT community can help?
   - Introduce the F-Interop open call

Why remote conformance & interop?

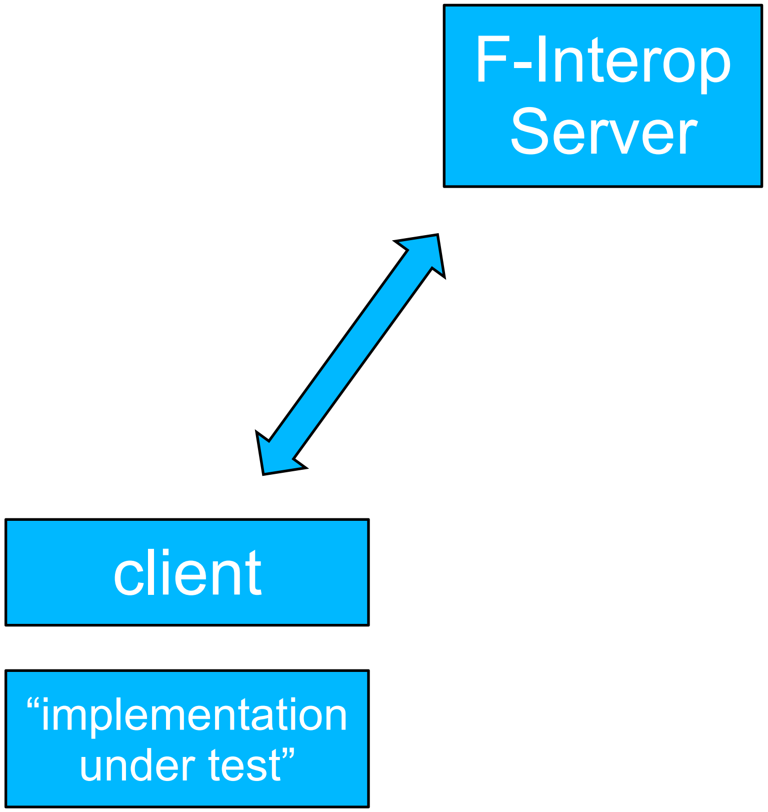


➢ **SDOs**
- save time and resources
- running code early
- accelerate standardization process

➢ **SMEs and companies**
- interop tests without needing to travel
- lower development cost
- faster development of standards-based products

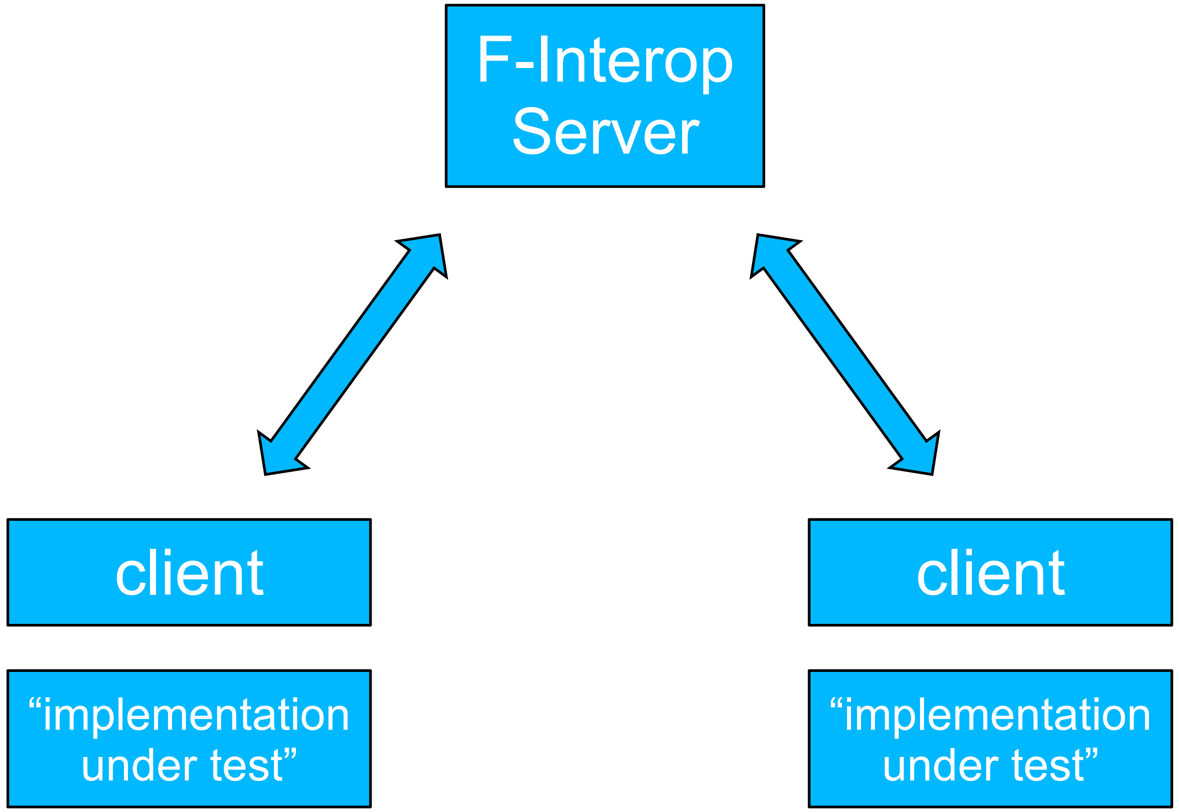
→ more standards-based products

Core Idea



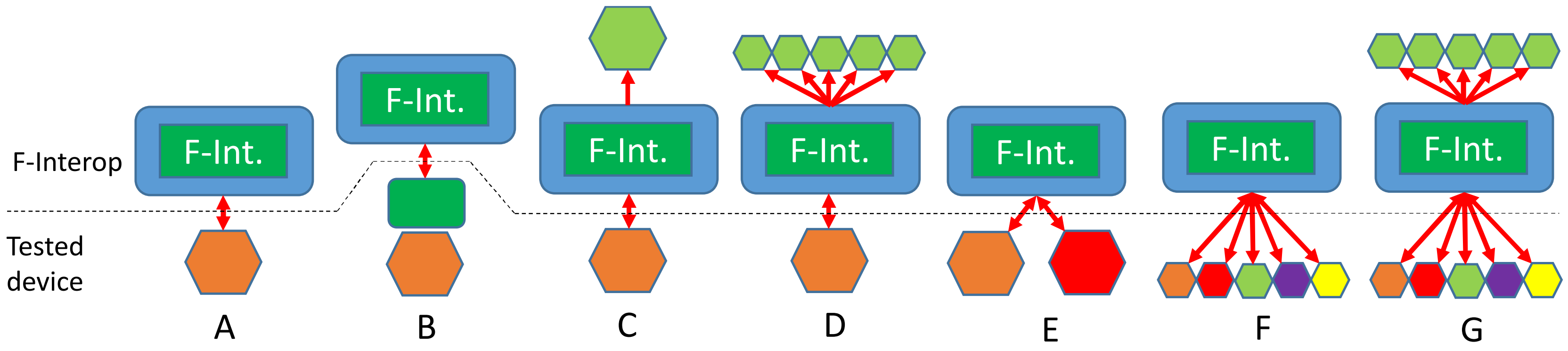
Conformance Testing

Core Idea



Interop Testing

Different Configurations

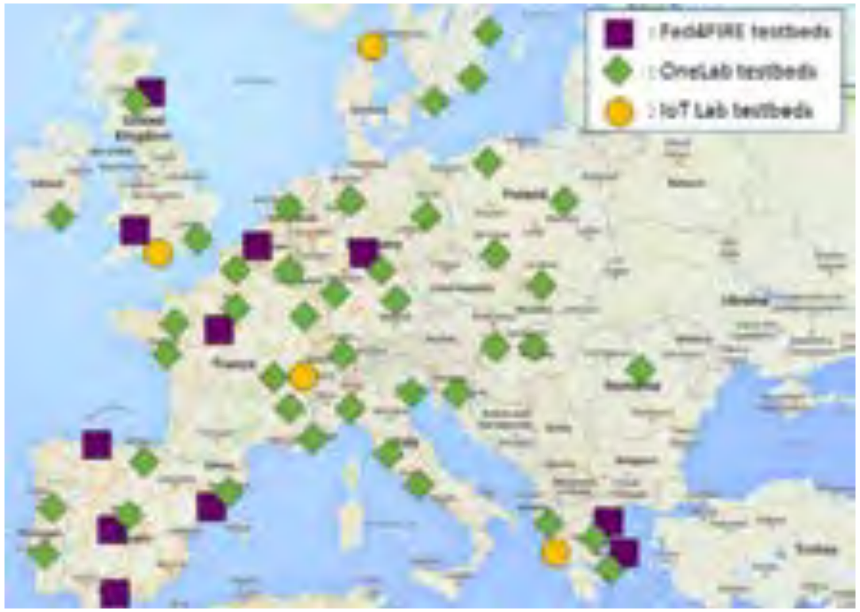


A. Tested Device ←→ F-Interop test server
B. Deported test with downloaded resource
C. Remote interop with 2 participants
D. Interop against testbed
E. Local interop
F. Remote interop with N participants
G. Remote interop with N participants and testbeds

Testbeds

32 testbeds, 4755 nodes

- **Fed4FIRE** (www.fed4fire.eu/testbeds)
  - 24 testbeds
  - ~1000 nodes
- **OneLab** (onelab.eu)
  - Includes 6 IoT-lab deployments (including 2728 IoT nodes)
- **IoT lab** (www.iotlab.eu)



Targeted Standards

- Initially standards of the IoT realm
  - CoAP
  - 6TiSCH
  - 6LoWPAN

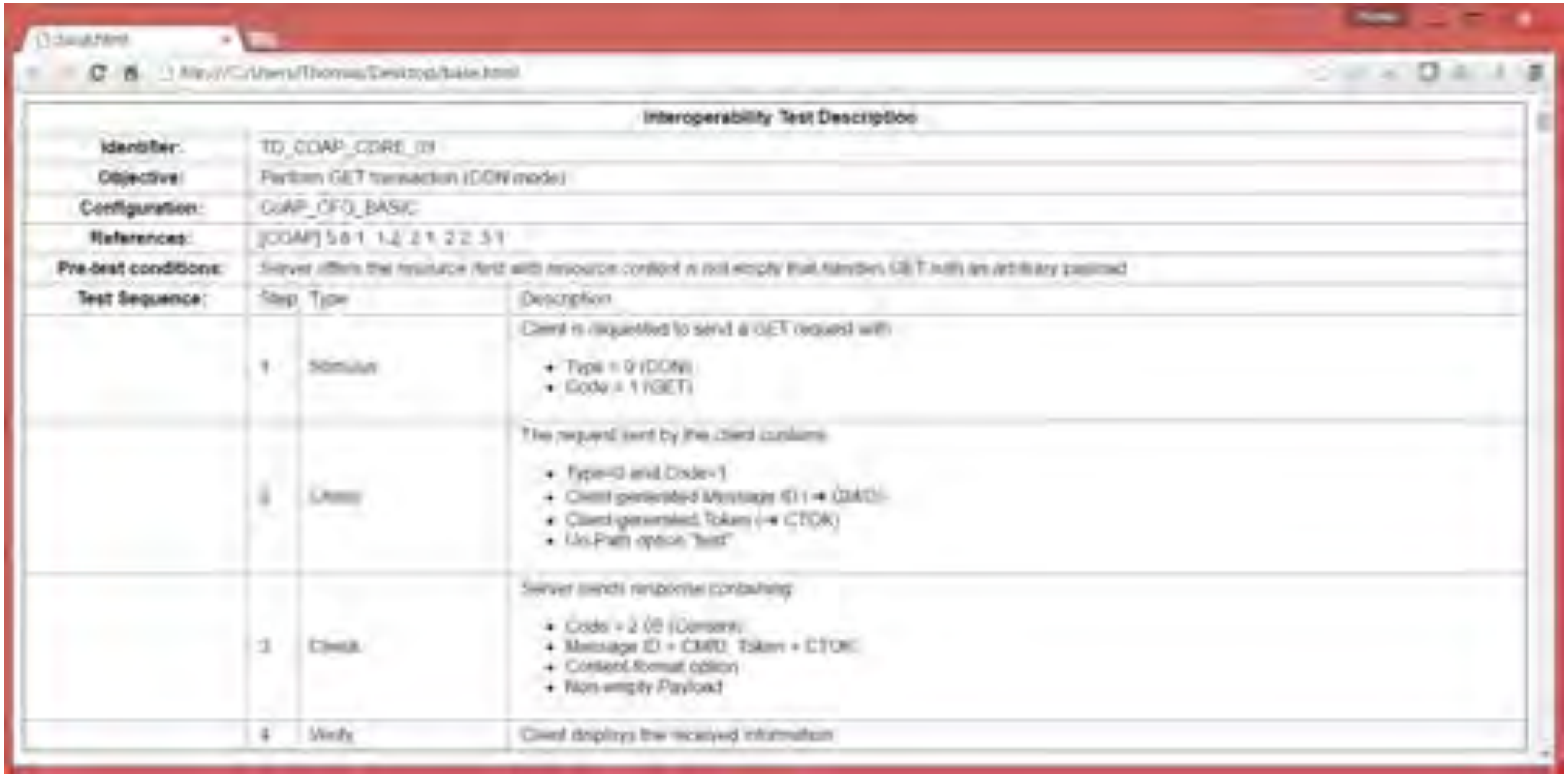
- We take, as a starting point, the ETSI plugtests specifications and build an architecture that allows those to be done remotely

- **Contributions/extensions are expected by design**
  - Including:
    - oneM2M
    - **Web of Things (WoT)**

CoAP remote online interop testing
A proof of concept

Example CoAP Test

- From ETSI plugtest CoAP#4, IETF89 (London)

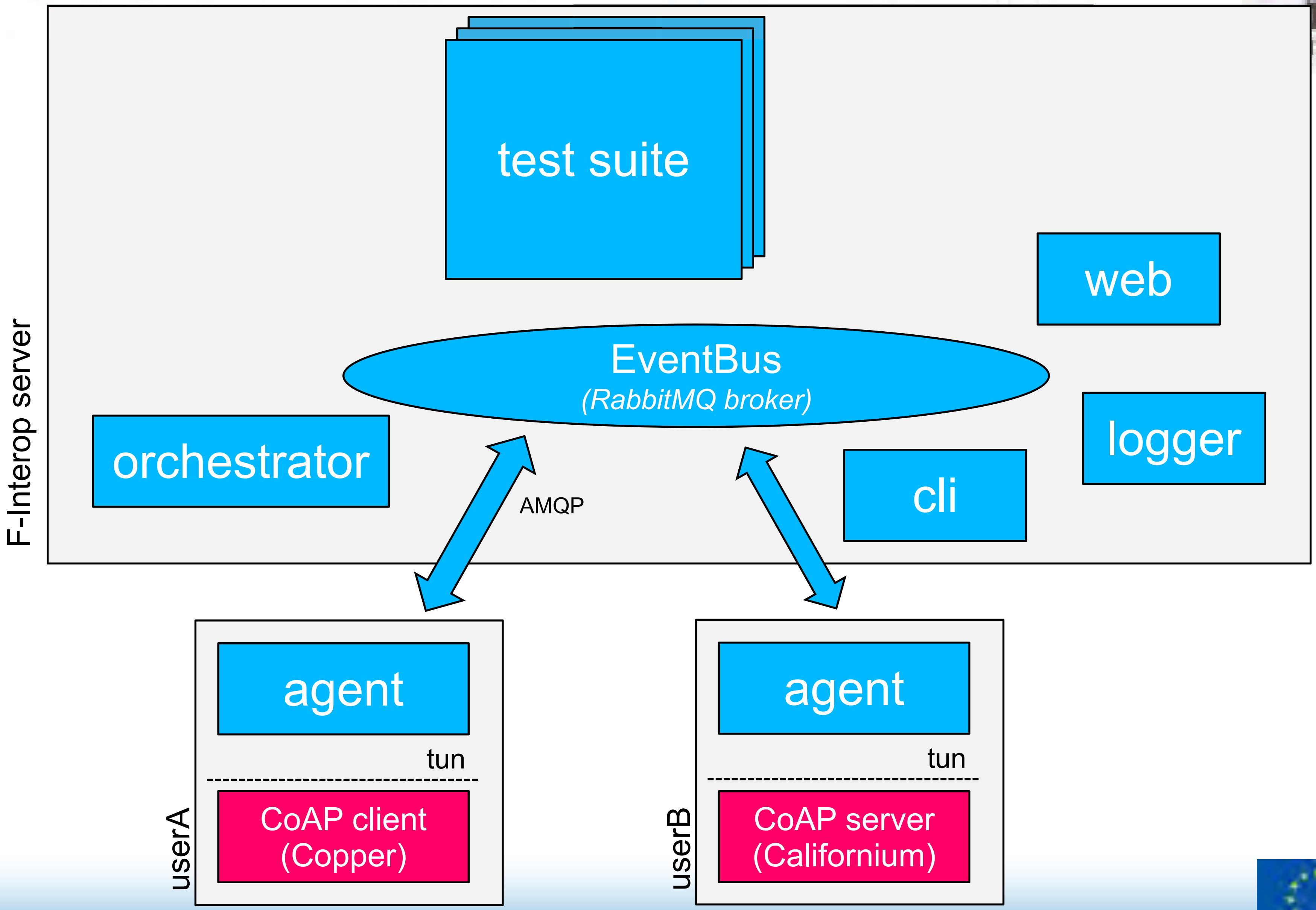


file:///C:/Users/Thomas/Desktop/base.html

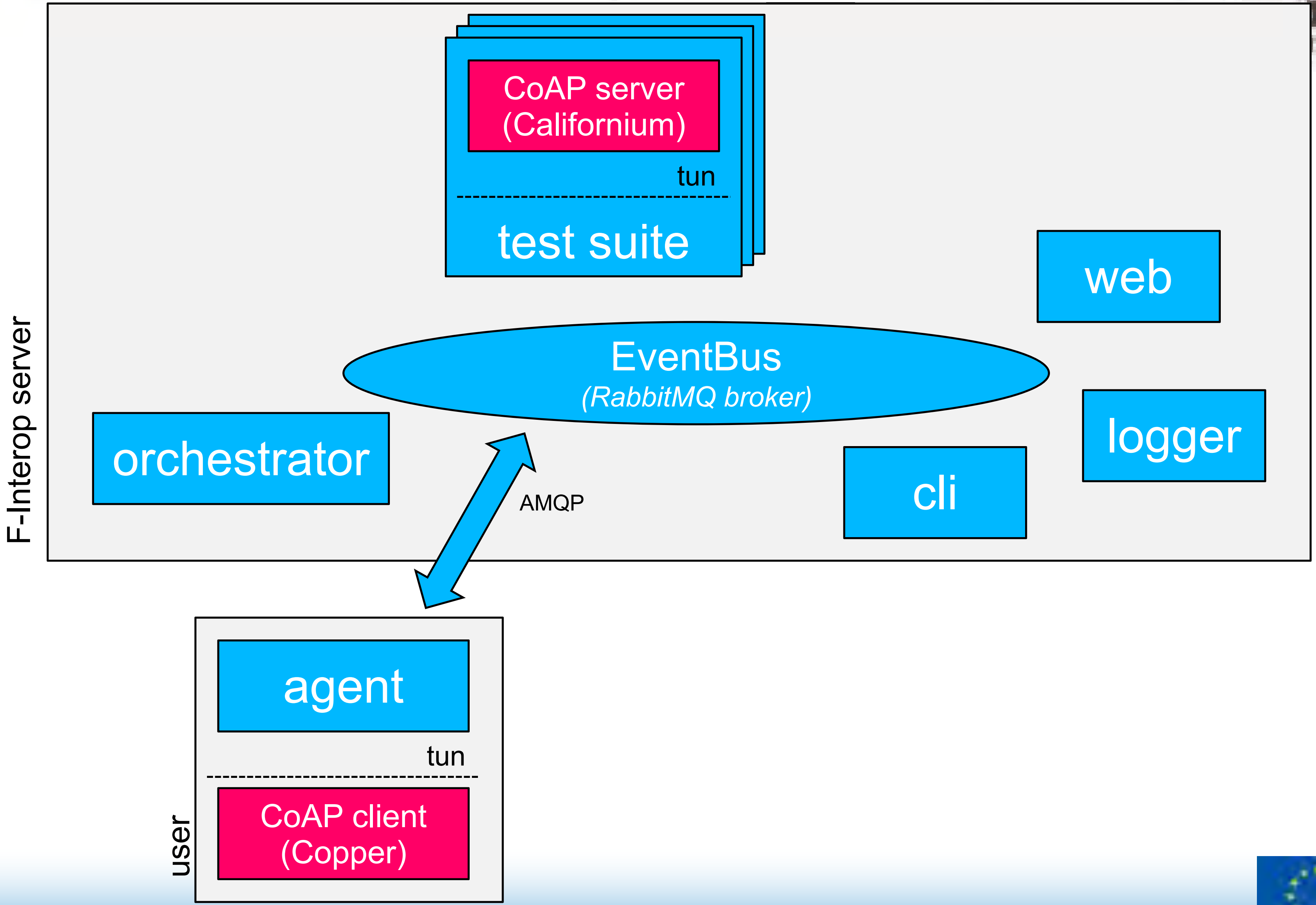
Interoperability Test Description

Identifier:	TD_COAP_CORE_01		
Objective:	Perform GET transaction (CON mode)		
Configuration:	CoAP_CFG_BASIC		
References:	[COAP] 5.8.1, 1.2, 2.1, 2.2, 3.1		
Pre-test conditions:	Server offers the resource /test with resource content is not empty that handles GET with an arbitrary payload		
Test Sequence:	Step	Type	Description
	1	Stimulus	Client is requested to send a GET request with: • Type = 0 (CON) • Code = 1 (GET)
	2	Check	The request sent by the client contains: • Type=0 and Code=1 • Client-generated Message ID (➔ CMID) • Client-generated Token (➔ CTOK) • Uri-Path option "test"
	3	Check	Server sends response containing: • Code = 2.05 (Content) • Message ID = CMID, Token = CTOK • Content-format option • Non-empty Payload
	4	Verify	Client displays the received information

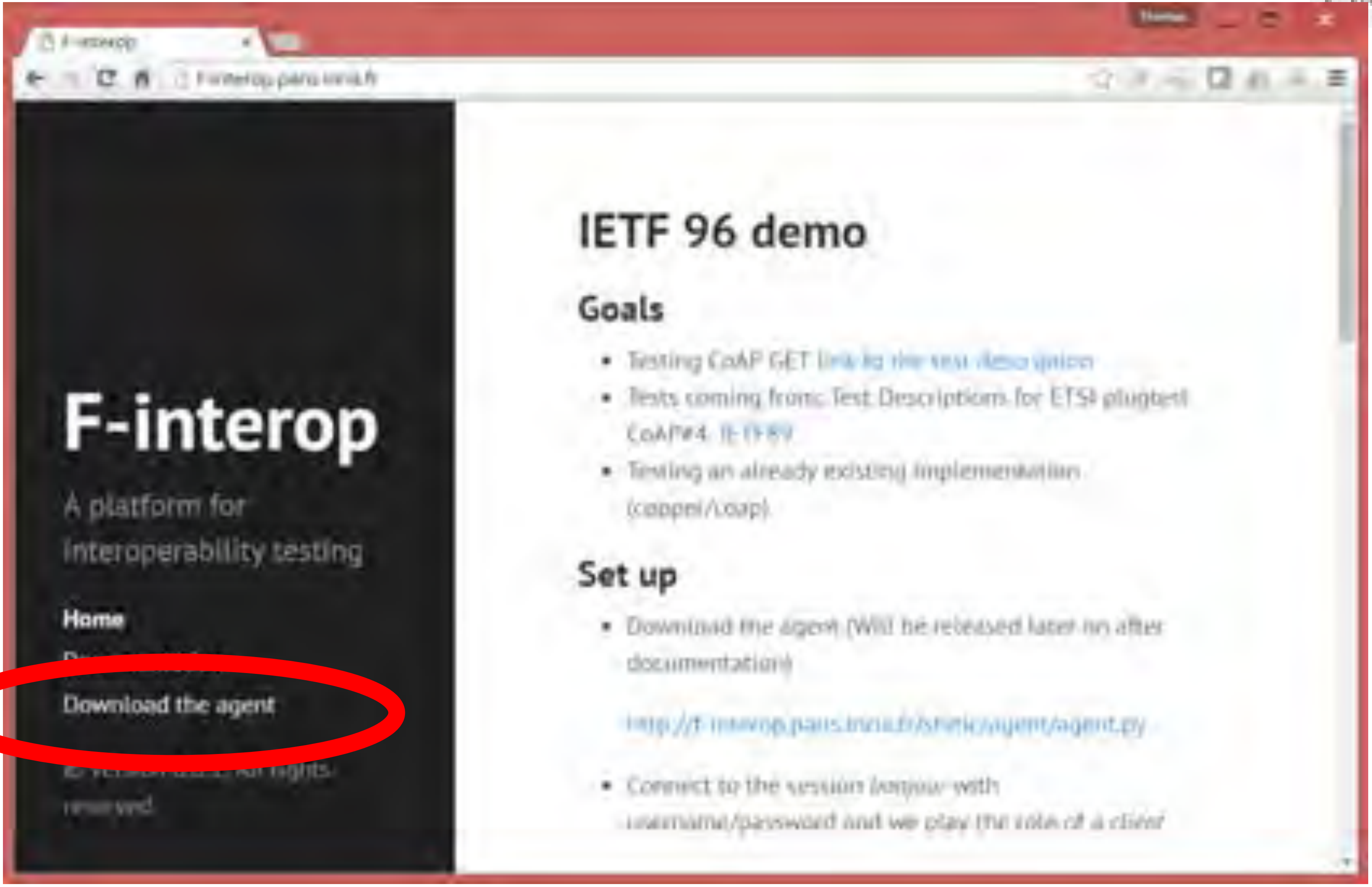
Base Architecture (CoAP interop)



Base Architecture (CoAP interop demo)



Download the Agent



F-interop

A platform for interoperability testing

Home

Download the agent

reserved

IETF 96 demo

Goals

- Testing CoAP GET link to the test description
- Tests coming from: Test Descriptions for ETSI plugtest CoAP#4, IETF89
- Testing an already existing implementation (coppei/coap)

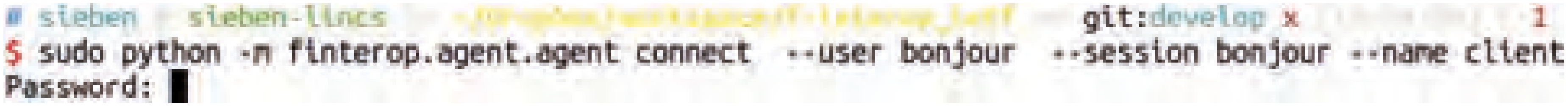
Set up

- Download the agent (Will be released later on after documentation)

  http://f-interop.paris.inria.fr/static/agent/agent.py

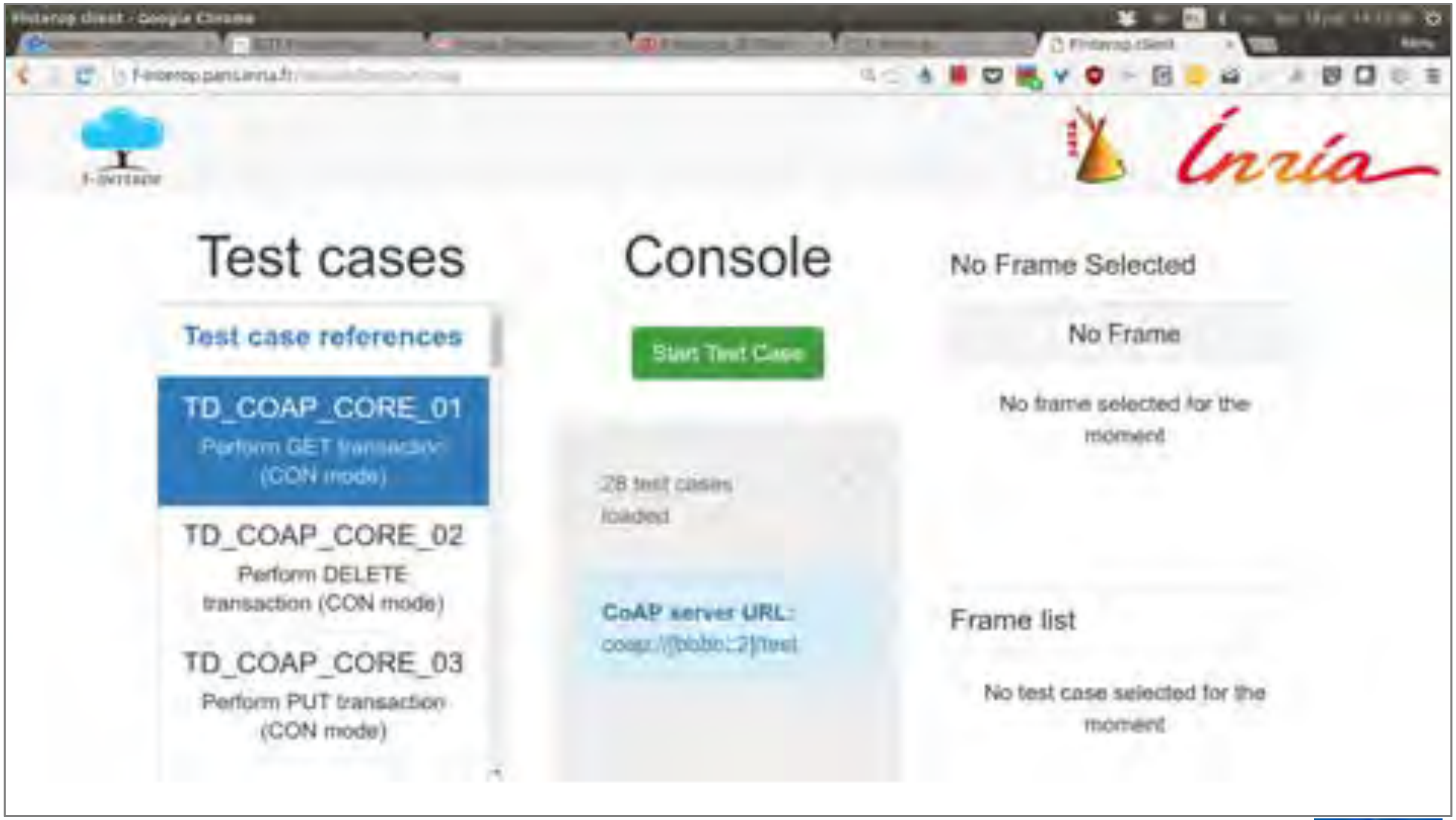
- Connect to the session [illegible] with username/password and we play the role of a client

Connect to the F-Interop Server



```
# sieben   sieben-lincs   ~/Dropbox/workspace/f-interop_ietf   git:develop x   1
$ sudo python -m finterop.agent.agent connect  --user bonjour  --session bonjour --name client
Password: █
```

Select and Start the Test Case



TD_COAP_CORE_01
Perform GET transaction (CON mode)

TD_COAP_CORE_02
Perform DELETE transaction (CON mode)

TD_COAP_CORE_03
Perform PUT transaction (CON mode)

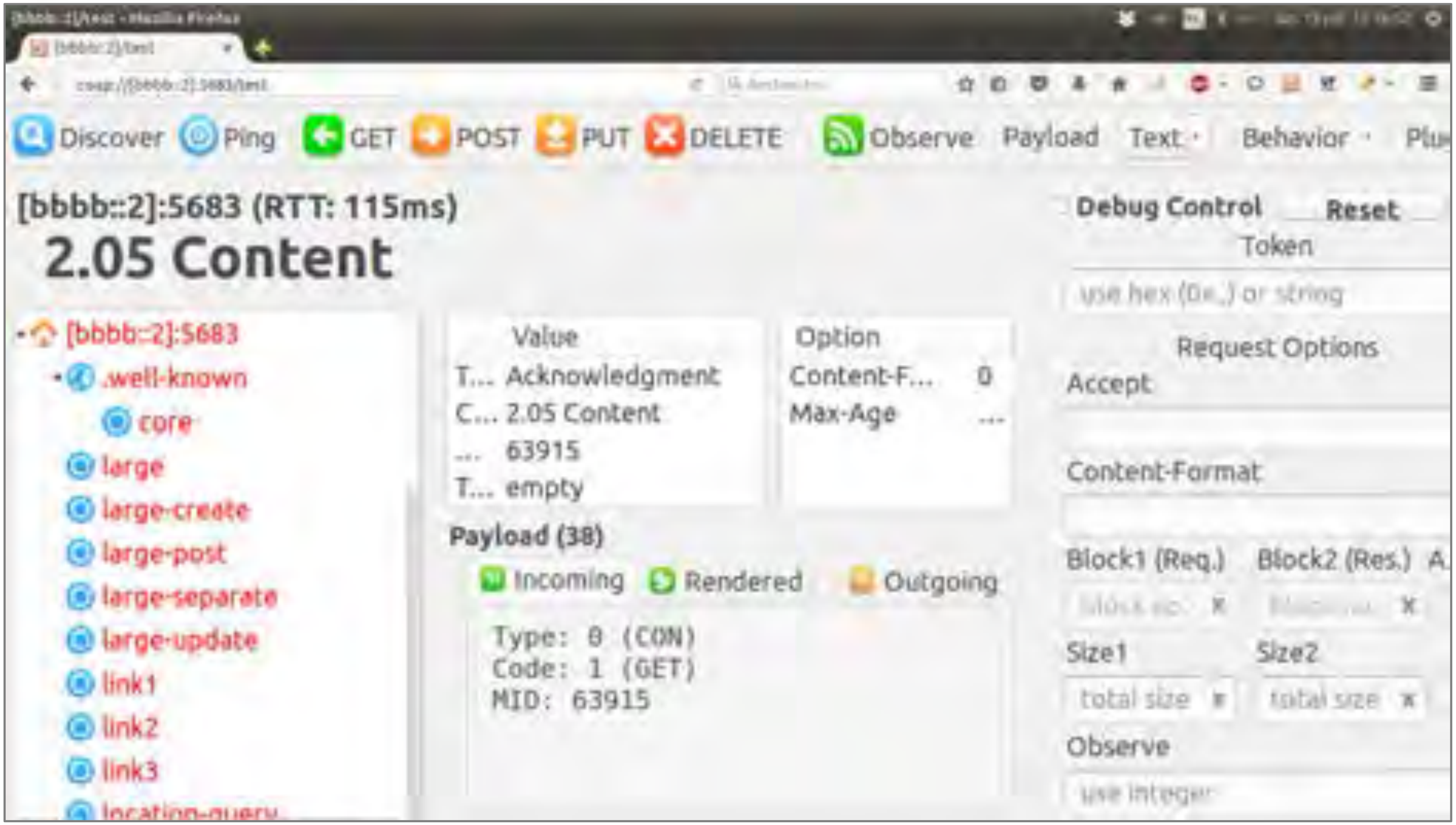
28 test cases loaded

CoAP server URL: coap://[bbbb::2]/test

No frame selected for the moment

No test case selected for the moment

Send CoAP Packets



[bbbb::2]:5683 (RTT: 115ms)

2.05 Content

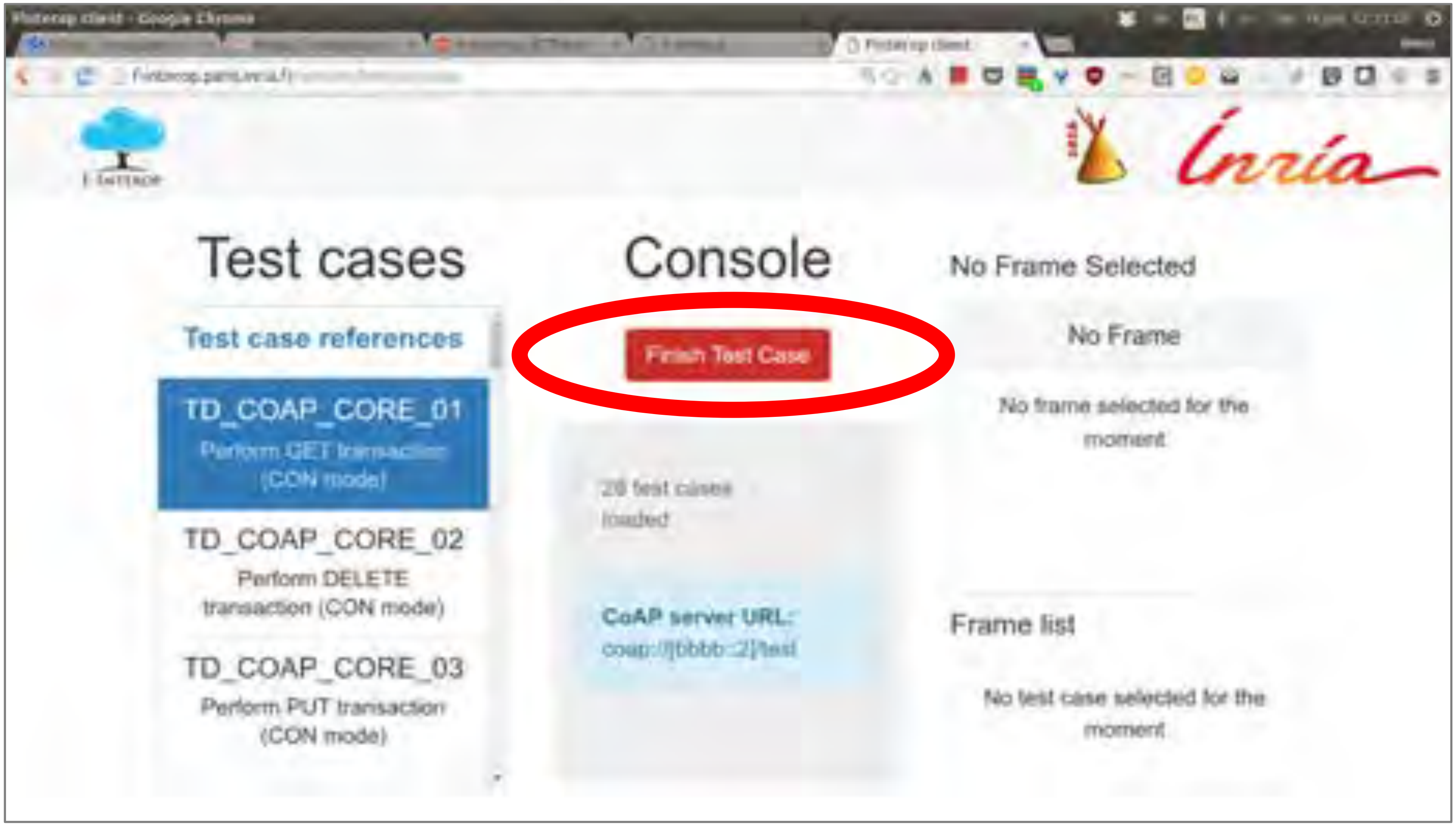
	Value
T...	Acknowledgment
C...	2.05 Content
...	63915
T...	empty

Option	
Content-F...	0
Max-Age	...

Payload (38)

```
Type: 0 (CON)
Code: 1 (GET)
MID: 63915
```

Finish Test Case



Test cases

Test case references

TD_COAP_CORE_01
Perform GET transaction (CON mode)

TD_COAP_CORE_02
Perform DELETE transaction (CON mode)

TD_COAP_CORE_03
Perform PUT transaction (CON mode)

Console

28 test cases loaded

CoAP server URL: coap://[bbbb::2]/test

No Frame Selected

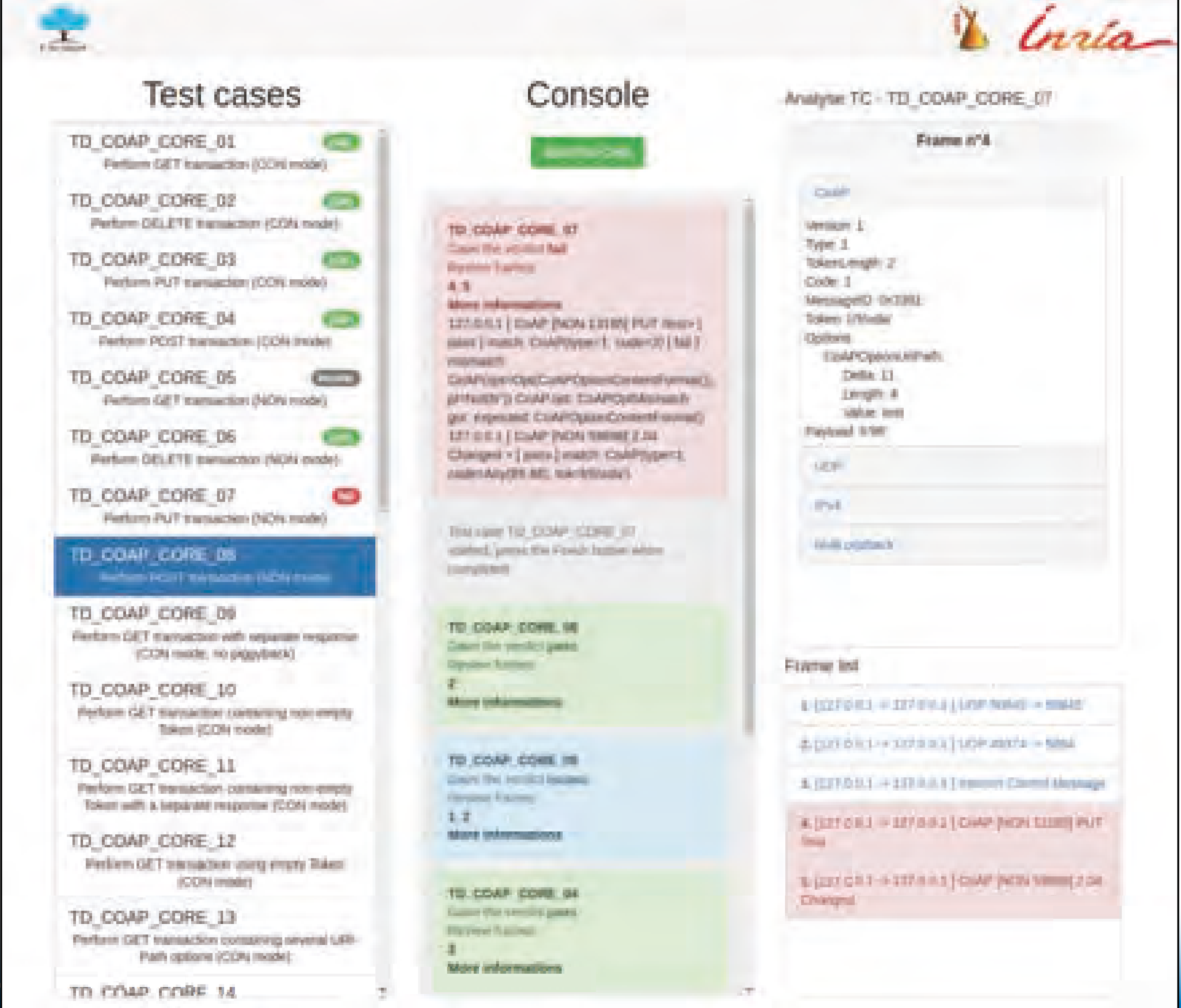
No Frame

No frame selected for the moment

Frame list

No test case selected for the moment

Verdict!



Test cases

TD_COAP_CORE_01
Perform GET transaction (CON mode)

TD_COAP_CORE_02
Perform DELETE transaction (CON mode)

TD_COAP_CORE_03
Perform PUT transaction (CON mode)

TD_COAP_CORE_04
Perform POST transaction (CON mode)

TD_COAP_CORE_05
Perform GET transaction (NON mode)

TD_COAP_CORE_06
Perform DELETE transaction (NON mode)

TD_COAP_CORE_07
Perform PUT transaction (NON mode)

TD_COAP_CORE_08
Perform POST transaction (NON mode)

TD_COAP_CORE_09
Perform GET transaction with separate response (CON mode, no piggyback)

TD_COAP_CORE_10
Perform GET transaction containing non-empty Token (CON mode)

TD_COAP_CORE_11
Perform GET transaction containing non-empty Token with a separate response (CON mode)

TD_COAP_CORE_12
Perform GET transaction using empty Token (CON mode)

TD_COAP_CORE_13
Perform GET transaction containing several URI-Path options (CON mode)

TD_COAP_CORE_14

Console

TD_COAP_CORE_07
Case the verdict fail
Frames:
4 5
More informations
127.0.0.1 | CoAP [NON 13193] PUT /test | [illegible] | match: CoAP(type=1, code=3) | fail | mismatch: CoAP(opt=Opt(CoAPOptionContentFormat), [illegible]) CoAP(opt: CoAPOptMismatch, got: expected CoAPOptionContentFormat) 127.0.0.1 | CoAP [NON 59898] 2.04 Changed - | pass | match: CoAP(type=1, code=Any(65, 68), tok=[illegible])

This case TD_COAP_CORE_07 started, press the Finish button when completed

TD_COAP_CORE_08
Case the verdict pass
Frames:
2
More informations

TD_COAP_CORE_05
Case the verdict [illegible]
Frames:
1 2
More informations

TD_COAP_CORE_04
Case the verdict pass
Frames:
3
More informations

Analyse TC - TD_COAP_CORE_07

Frame n°4

CoAP
Version: 1
Type: 1
TokenLength: 2
Code: 3
MessageID: 0x3391
Token: [illegible]
Options:
    CoAPOptionUriPath:
        Delta: 11
        Length: 4
        Value: test
Payload: [illegible]

UDP

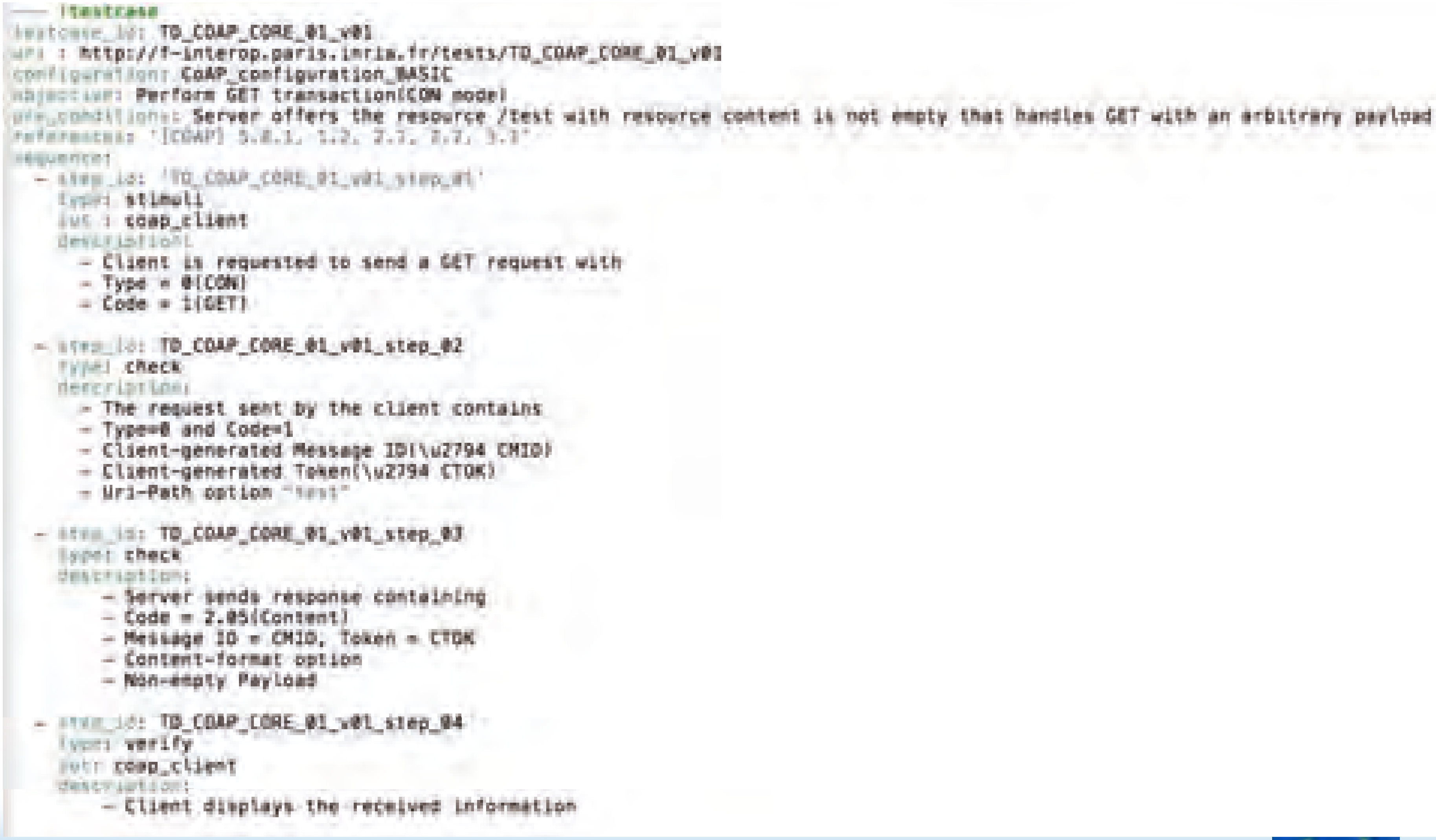
IPv4

Null loopback

Frame list

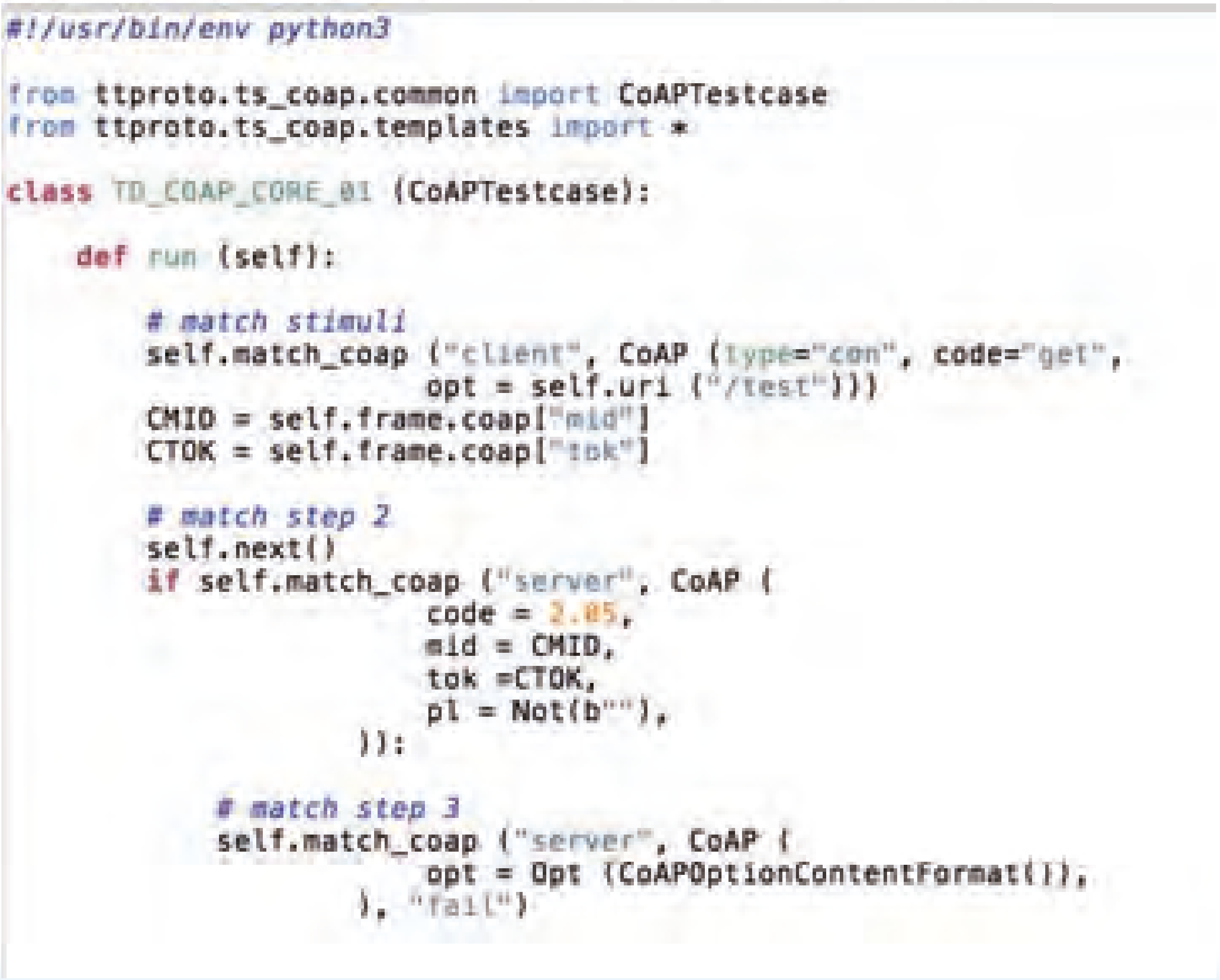
1. [127.0.0.1 -> 127.0.0.1 | UDP [illegible] -> [illegible]
2. [127.0.0.1 -> 127.0.0.1 | UDP [illegible] -> [illegible]
3. [127.0.0.1 -> 127.0.0.1 | Internet Control Message
4. [127.0.0.1 -> 127.0.0.1 | CoAP [NON 13193] PUT /test
5. [127.0.0.1 -> 127.0.0.1 | CoAP [NON 59898] 2.04 Changed

Under the Hood: What’s a test?



```
--- !testcase
testcase_id: TD_COAP_CORE_01_v01
uri : http://f-interop.paris.inria.fr/tests/TD_COAP_CORE_01_v01
configuration: CoAP_configuration_BASIC
objective: Perform GET transaction(CON mode)
pre_conditions: Server offers the resource /test with resource content is not empty that handles GET with an arbitrary payload
references: '[COAP] 5.8.1, 1.2, 2.1, 2.2, 3.1'
sequence:
  - step_id: 'TD_COAP_CORE_01_v01_step_01'
    type: stimuli
    iut : coap_client
    description:
      - Client is requested to send a GET request with
      - Type = 0(CON)
      - Code = 1(GET)

  - step_id: TD_COAP_CORE_01_v01_step_02
    type: check
    description:
      - The request sent by the client contains
      - Type=0 and Code=1
      - Client-generated Message ID(\u2794 CMID)
      - Client-generated Token(\u2794 CTOK)
      - Uri-Path option "test"

  - step_id: TD_COAP_CORE_01_v01_step_03
    type: check
    description:
        - Server sends response containing
        - Code = 2.05(Content)
        - Message ID = CMID, Token = CTOK
        - Content-format option
        - Non-empty Payload

  - step_id: TD_COAP_CORE_01_v01_step_04
    type: verify
    iut: coap_client
    description:
        - Client displays the received information
```

Under the Hood: What's a test?

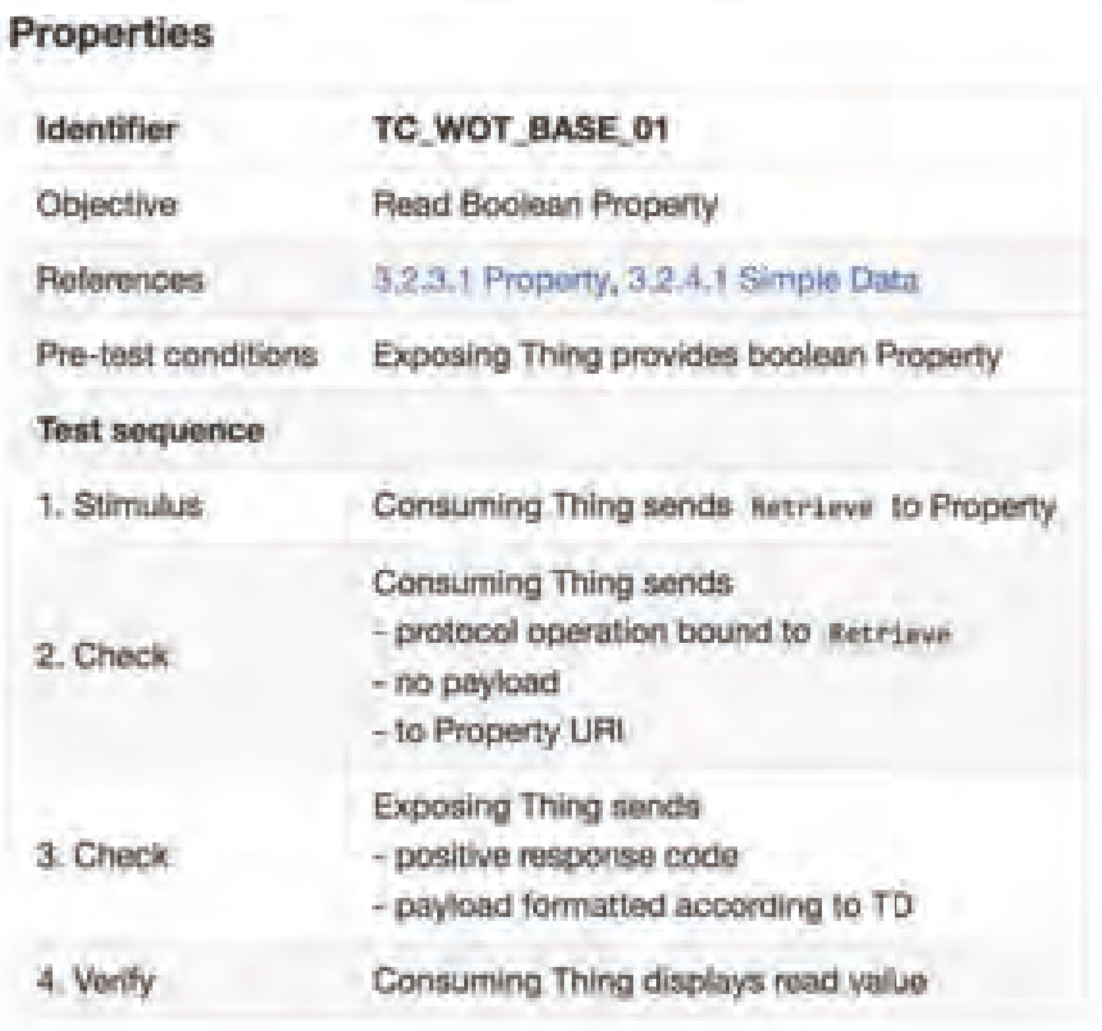


```
#!/usr/bin/env python3

from ttproto.ts_coap.common import CoAPTestcase
from ttproto.ts_coap.templates import *

class TD_COAP_CORE_01 (CoAPTestcase):

    def run (self):

        # match stimuli
        self.match_coap ("client", CoAP (type="con", code="get",
                                opt = self.uri ("/test")))
        CMID = self.frame.coap["mid"]
        CTOK = self.frame.coap["tok"]

        # match step 2
        self.next()
        if self.match_coap ("server", CoAP (
                                code = 2.05,
                                mid = CMID,
                                tok =CTOK,
                                pl = Not(b""),
                            )):

            # match step 3
            self.match_coap ("server", CoAP (
                                opt = Opt (CoAPOptionContentFormat()),
                            ), "fail")
```

Next Milestones

- July 2016
  - minimal CoAP interop testing (done) -> see demo
- November 2016
  - Functional platform available
  - CoAP CORE interop tests
- March 2017
  - 6TiSCH support, update at IETF98
  - CoAP interop test (advanced version)
- July 2017
  - Use at 6TiSCH/6lo plugtests
  - **minimal WoT interop testing**

WoT interop test case example



Properties

Identifier	**TC_WOT_BASE_01**
Objective	Read Boolean Property
References	3.2.3.1 Property, 3.2.4.1 Simple Data
Pre-test conditions	Exposing Thing provides boolean Property
Test sequence	
1. Stimulus	Consuming Thing sends `Retrieve` to Property
2. Check	Consuming Thing sends - protocol operation bound to `Retrieve` - no payload - to Property URI
3. Check	Exposing Thing sends - positive response code - payload formatted according to TD
4. Verify	Consuming Thing displays read value

Source: https://github.com/w3c/wot/blob/master/plugfest/2016-beijing/plugfest-test-cases-beijing-2016.md

How the WoT community can help?

- **Contributors:**
  - Help us extending F-Interop for interop in WoT context
  - List requirements, identify key priority WoT standards
  - Develop test suites for (new) standards
  - Provide feedback on architecture and choices
- **Users:**
  - Use F-Interop for remote interop events/plugtests

Open Call

Open Call Categories

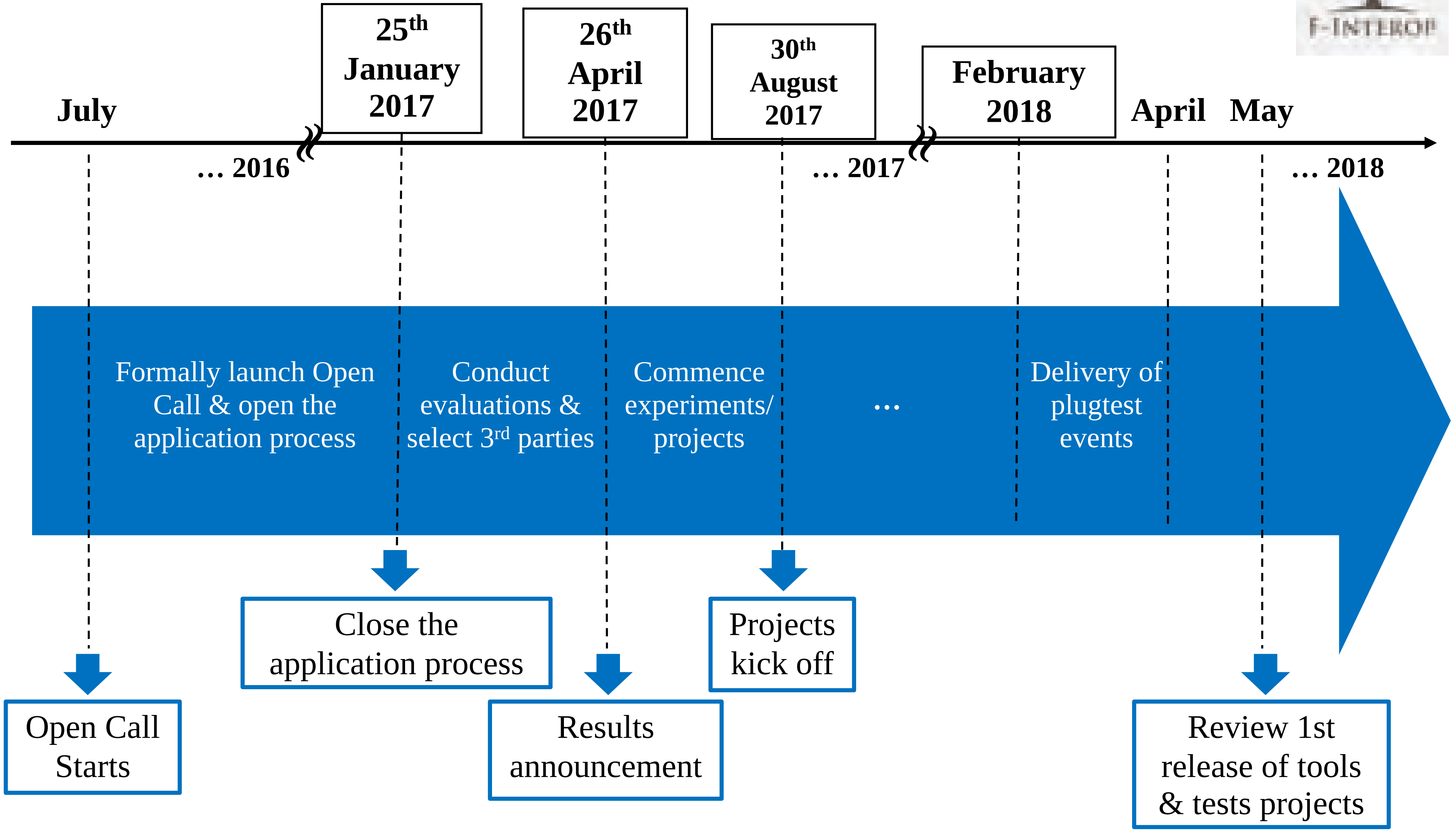
- **New testing tools** to extend capabilities of F-Interop
- **New test descriptions** to test conformance and interoperability of other standards
- **SME F-Interop assessment reports:** SME device Interop tests to test F-Interop platform
- **Plugtest Events:** Third parties selected to conduct 3 remote online plugtest events

Supported Activities & Budget

610k for 19 projects

List of Categories	**Grants**	**Award**
New F-Interop tools extensions	3	100 000
New interop test descriptions	3	60 000
SME devices F-Interop tests and report	10	10 000
Plugtest Events	**3**	**10 000**

Important Dates


July
… 2016
25th January 2017
26th April 2017
30th August 2017
… 2017
February 2018
April
May
… 2018
Formally launch Open Call & open the application process
Conduct evaluations & select 3rd parties
Commence experiments/ projects
…
Delivery of plugtest events
Open Call Starts
Close the application process
Results announcement
Projects kick off
Review 1st release of tools & tests projects

How to apply?

- Template for the proposal
- Guide for Applicants
- Standard Industrial Experiment Contract
- Open Call Terms and Conditions
- **Submission Portal**

http://www.f-interop.eu/index.php/open-call

Thank you for your attention

Open-call: http://www.f-interop.eu/index.php/open-call

Please, feel free to contact us directly or later via:
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