VALID8.com

Flexible. Affordable. **That's Different.**

Conformance

Protocol Conformance Test Suites for 4G Interfaces

OVERVIEW

The Valid8 4G Conformance Test Suites are available for many protocols and interfaces including S1, Diameter, GTP, SIP, H.323 and many others.

WHAT IT CAN DO FOR YOU

The 4G Conformance solution is capable of simulating and testing several devices individually or in parallel:

It can simulate

- Signaling gateway (SG)
- IP signaling point (IPSP)
- eNodeB
- MME
- UA
- Proxy
- Redirect Server
- B2BUA

It can test

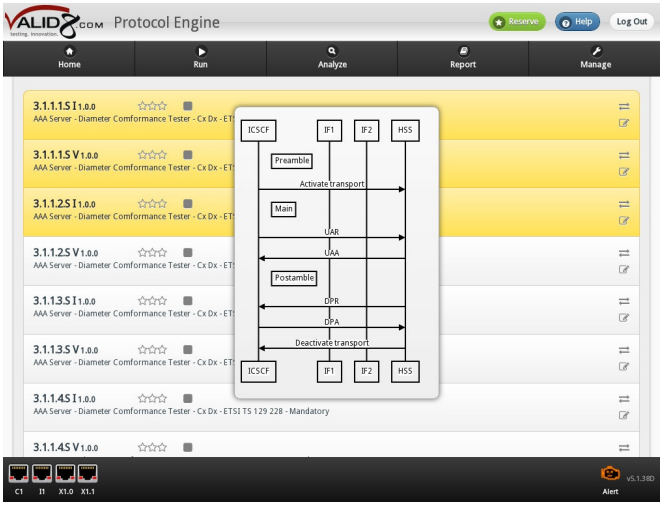
- Diameter: AF, AS, DRA, DEA, HSS, OCS, OFCS, PCEF, PCRF, SPDF
- GTP: SGSN, GGSN SGW, PGW
- SCTP: signaling gateway (SG), IP signaling point (IPSP), eNodeB, MME
- SIP: UA, Proxy, Redirect Server, B2BUA

WHY IT'S DIFFERENT

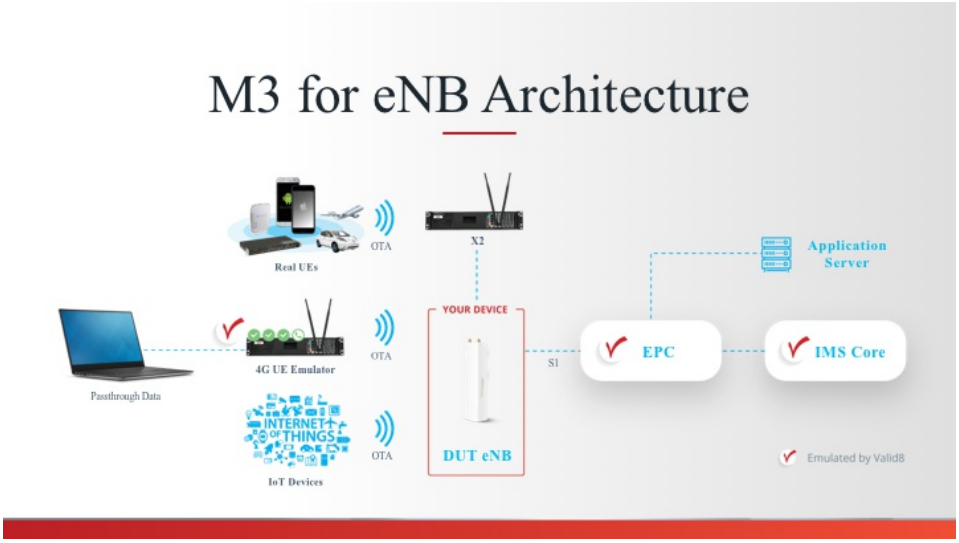
- Software based solution can be run on high-end customer hardware/VM to achieve better performance, or in the Cloud (e.g. Amazon AWS) for maximum versatility
- Web-based Graphical User Interface provides customer with intuitive, easy access via browser
- API's used (REST, HTTP) enable automated testing using test tools.
- Emulated nodes behave exactly as true real nodes, due to Finite State Machine architecture
- Testing is scalable across multiple cores and multiple systems

FEATURES

- Pre-made test scenarios and procedures
- PASS / FAIL analysis, including plain English diagnostic reason
- Valid / Invalid testing
- Customizable source-code
- User-configurable proprietary messages, IEs, headers
- Animated test results action-replay
- Easy to configure
- Automatic execution of test batches
- UDP, TCP, SCTP transport layer IPv4/IPv6 support
- Suitable for Development and QA test lab environments, verifying protocol compliance, negative and robustness testing, Regression testing and Reproducing customer issues in the field



4G Conformance



SUBSYSTEMS

Load Application

```
PUT /api/1/application/{PRODUCT}/{APPLICATION}/{CONFIGURATION}
```

Start

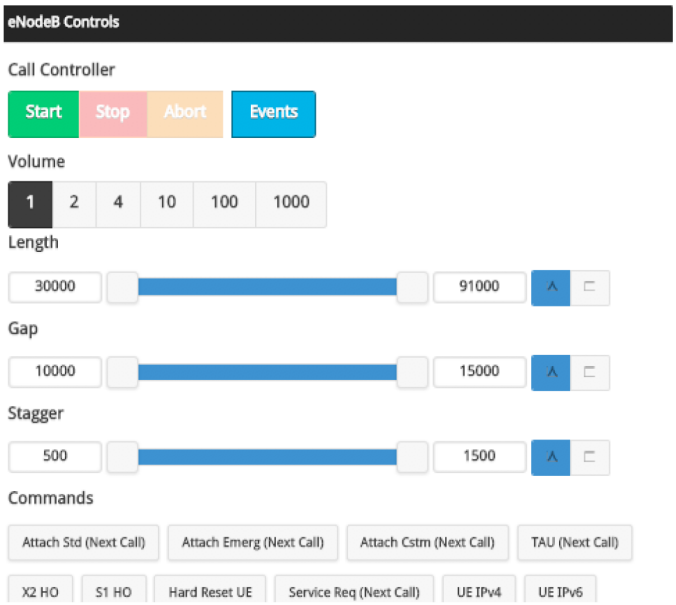
```
PUT /api/1/control/{ELEMENT}/start
```

Reset Report

```
DELETE /api/1/report
```

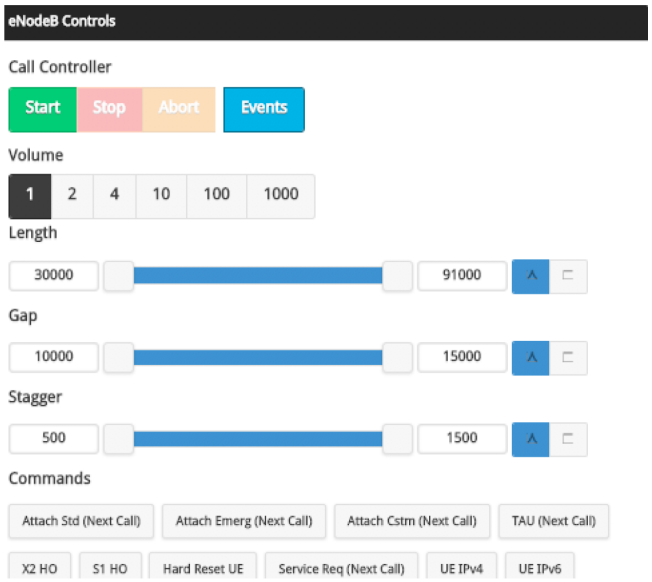
Get Events

```
GET /api/1/events
```



KPIs

- S1 Attach Requests/Successes/Fails
- S1 Detach Requests/Successes/Fails
- S1 Dedicated Bearer Requests/Successes/Fails
- Current Active Sessions/ Bearers
- Number of Sessions/ Bearers Created
- S1 Attach Request Response Time
- S1 Dedicated Bearer Setup Request Response Time
- S1 Detach Request Response Time
- S1 Authentication Request Response Time
- S6a Authentication Request Response Time
- S1 Tracking Area Update Request Response Time
- Verdict Pass/Fail/Inconclusive
- Reason information



Configurable Parameters

- Mobile Country Code
- Mobile Network Code
- eNodeB Type
- IP Addres S1 Interface
- IP Address eNodeB
- Primary DNS Address
- Secondary DNS Adress
- MAC Address Public Gateway
- GTP Tunnel IP Address and Port
- GTP Tunnel eNodeB IP Address
- Integrity Algorithm
- IP Address to assign UEs on LAN

Load Application

```
PUT /api/1/application/{PRODUCT}/{APPLICATION}/{CONFIGURATION}
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Start

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PUT /api/1/control/{ELEMENT}/start
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Reset Report

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DELETE /api/1/report
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Get Events

```
GET /api/1/events
```

AUTOMATION API

User commands can be fully automated using REST API. This includes performing all test control functions as well as collecting results and metrics.

Load Application

```
PUT /api/1/application/{PRODUCT}/{APPLICATION}/{CONFIGURATION}
```

Start

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PUT /api/1/control/{ELEMENT}/start
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Reset Report

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DELETE /api/1/report
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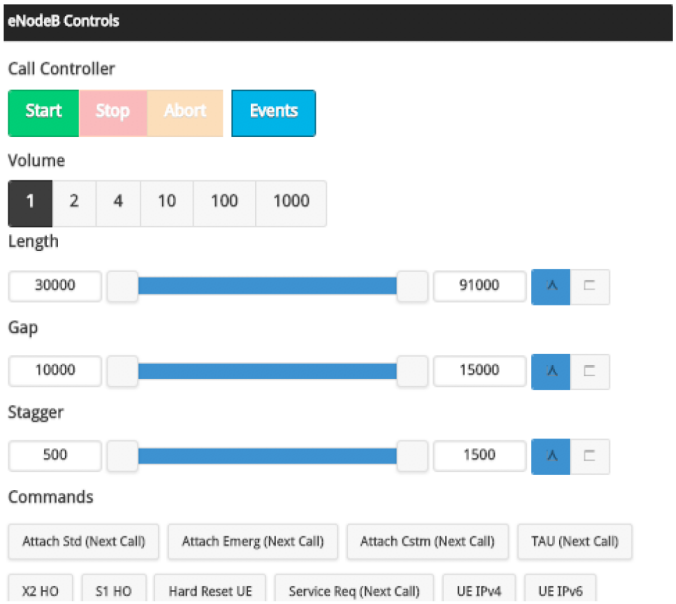
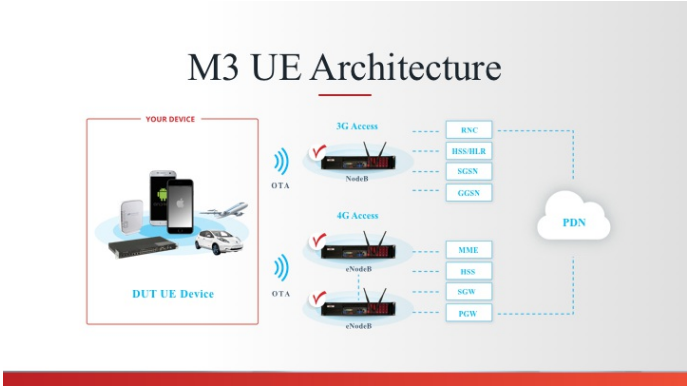
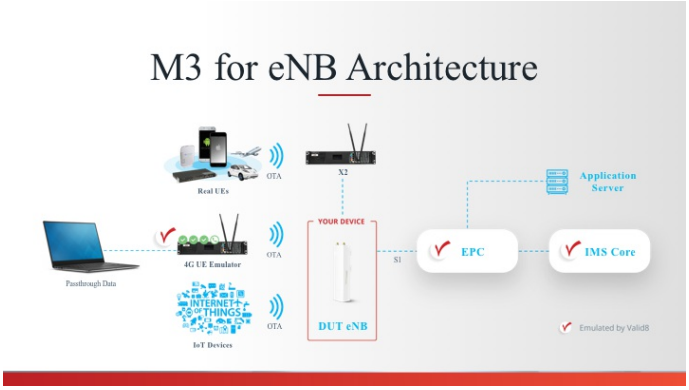


SCRIPTING

The application's subsystems can be edited directly in the browser using Javascript or by using the graphical tools seen below. The Message Workshop allows for creating of test scenarios directly from the hex stream of a remote capture, while the Graphical Editor allows for creating customized call scenarios by dragging and dropping the call flow to meet your test needs.





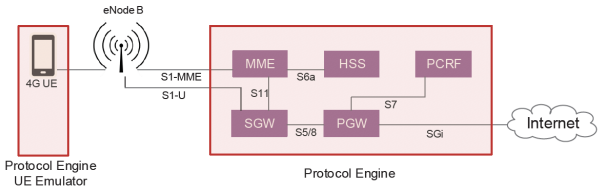
USE CASES

ENODEB UNDER TEST

In the scenario where the eNodeB is to be tested, it can be tested by the Valid8 4G Network Emulator emulating the core network. Additionally, load and conformance tests are available for interfaces S1-MME and S1-U. In the case where the eNodeB needs to be tested on the RF side, it can be tested by the Valid8 4G UE Emulator.

Supported Scenarios:

- Power on / Start up
- 4 Attach
- 4 TAU
- 4 Attach
- 4 eRAB Setup
- 4 Detach
- **UE Under**



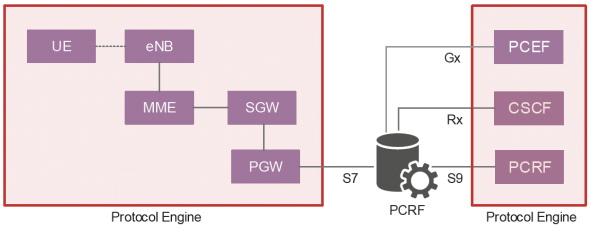
- Emulates MME (for S1-MME) and SGW (for S1-U) along with all other needed core network elements, exposing all internal interfaces
- Conformance tests available for S1-MME, S1-U, and X2

PCRF UNDER TEST

For testing the PCRF, the 4G Network Emulator can wrap around the PCRF with the core network and IMS.

Supported Scenarios:

- CC-Request / Answer (CCR / CCA)
- 4 Re-Auth-Request / Answer (RAR / RAA)
- 4 Capability-Exchange-Request / Answer (CER / CEA)
- 4 Session-Termination-Request / Answer (STR / STA)
- 4 Abort-Termination-Request / Answer (ASR / ASA)
- 4 Device-Watchdog-Request / Answer (DWR / DWA)
- 4 Disconnect-Peer-Request / Answer (DPR / DPA)



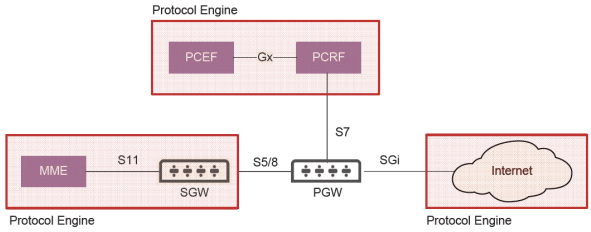
- Emulates core network, Diameter, and IMS nodes as needed for testing the PCRF, exposing all internal interfaces
- Conformance tests available for each interface (S7, S9, Rx, Gx)

PGW UNDER TEST

For testing the PGW, the 4G Network Emulator can wrap around the node using the S5/8, S7, and SGi interfaces. Traffic can be originated from real or emulated UE and IoT devices.

Supported Scenarios:

- Create Session
- 4 Delete Session
- 4 Create Bearer
- 4 Modify Bearer
- 4 Delete Bearer
- 4 Echo



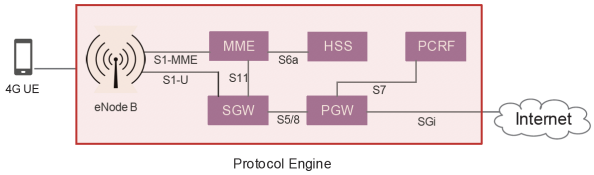
- Emulates all required nodes for wrapping around, including MME and PCRF for testing over interfaces S5/8, S7, and SGi
- Exposes all internal interfaces
- Conformance tests available for each interface (S5/8, S7, SGi)

UE UNDER TEST

For testing UE or IoT devices, the 4G Network Emulator can provide the entire 4G core network as well as an emulated or real eNodeB depending on your test needs.

Supported Scenarios:

- Power on
- 4 Attach
- 4 Detach
- 4 TAU
- 4 Data Connection
- 4 VoLTE Call



- End to end VoLTE test capability
- Includes real femto, pico, or microcell eNodeB
- Emulates all core network nodes and allows for data connection to external networks

SIP CLIENT UNDER TEST

For testing the SIP Client, the Valid8 Tester can generate SIP calls to test performance and stability.

Supported Scenarios:

- REGISTER
- INVITE Audio/Video calls
- MESSAGE
- UPDATE
- PRACK

SIP SERVER UNDER TEST

For testing the SIP Server, the Valid8 Tester can generate SIP calls to test performance and stability.

Supported Scenarios:

- REGISTER
- INVITE Audio/Video calls
- MESSAGE
- UPDATE
- PRACK

HSS UNDER TEST

For testing the HSS Server, the Valid8 Tester can generate S6a traffic to test performance and stability.

Supported Scenarios:

- AIR/A
- ULR/A
- CLR/A
- NOR/A
- PUR/A
- RSR/A
- ISR/A

SUMMARY OF SPECIFICATIONS

SPECIFICATIONS

Diameter Base Conformance	Test Specification: V. Fajardo et al., Diameter Base Protocol Interoperability Test Suite, IETF Work in progress, 2009 Number of tests included: 46 IETF RFC 6733: Diameter Base Protocol
Diameter Cx/Dx Conformance	Test Specification: ETSI TS 129 228 Number of tests included: 14 IETF RFC 6733: Diameter Base Protocol
Diameter Rf Conformance	IETF RFC 4006, 3GPP TS 32.225, TS 32.299 Available 2Q 2016
Diameter Rx Conformance	3GPP TS 23.203, TS 29.214 Available 2Q 2016
Diameter Rq Conformance	ES 283-026 Available 2Q 2016
Diameter S6a Conformance	Test Specification: 3GPP TS 29.272 Number of tests included: 115 Includes tests from the following areas: Notification-Request / Answer (NOR / NOA) Reset-Request / Answer (RSR / RSA) Purge-UE-Request / Answer (PUR / PUA) Delete-Subscriber-Data Request / Answer (DSR / DSA) Insert-Subscriber-Data Request / Answer (IDR / IDA) Cancel-Location-Request / Answer (CLR / CLA) Capability-Exchange-Request / Answer (CER / CEA) Session-Termination-Request / Answer (STR / STA) Abort-Termination-Request / Answer (ASR / ASA) Device-Watchdog-Request / Answer (DWR / DWA) Disconnect-Peer-Request / Answer (DPR / DPA) Authentication-Information-Request / Answer (AIR / AIA) Update-Location-Request / Answer (ULR / ULA)
Diameter S7 Conformance	Test Specification: 3GPP TS 23.402 Number of tests included: 30 Includes tests from the following areas: Update-VCSG-Location Request / Answer (UVR / UVA) Cancel-VCSG Location Request / Answer (CVR / CVA) Insert-Subscription-Data Request / Answer (IDR / IDA) Delete-Subscriber-Data Request / Answer (DSR / DSA) Reset Request / Answer (RSR / RSA)
Diameter S13 Conformance	Test Specification: 3GPP TS 29.274, TS 129 274 Number of tests included: 6 Includes tests from the following areas: ME-Identity-Check Request / Answer (ECR / ECA)
Diameter Sd Conformance	Test Specification: 3GPP TS 29.212 version 12 release 12, 3GPP TS 29.213 version 11.6.0 release 11 Number of tests included: 21 IETF RFC 5516 Diameter Command Code Registration for the 3GPP EPS
Diameter Sh Conformance	

Diameter Si Conformance

Test Specification: 910-6856-001_rev_b
Number of tests included: 46
IETF RFC 6733: Diameter Base Protocol

GTP S3 Conformance

Test Specification: 3GPP TS 23.228
Number of tests included: 20
IETF RFC 6733: Diameter Base Protocol

S1 Conformance

Test Specification: 3GPP TS 29.328, 3GPP TS 29.329
Number of tests included: 42
Includes tests from the following areas:
CC-Request / Answer (CCR / CCA)
Re-Auth-Request / Answer (RAR / RAA)
Capability-Exchange-Request / Answer (CER / CEA)
Session-Termination-Request / Answer (STR / STA)
Abort-Termination-Request / Answer (ASR / ASA)
Device-Watchdog-Request / Answer (DWR / DWA)
Disconnect-Peer-Request / Answer (DPR / DPA)

S2b Conformance

Test Specification: 3GPP TS 36.413 & 24.301
Number of tests included: 57
Includes tests from the following areas:
NAS
SAE Bearer Management
UE Location, Subscriber Data Handling
Authentication
Fault Recovery
Notification

GTP S3 Conformance

Test Specification: 3GPP TS 23.834
Number of tests included: 20
Includes tests from the following areas:
Create Session
Delete Session
Create Bearer
Modify Bearer
Delete Bearer
Echo

Test Specification: 3GPP TS 29.274, TS 129 274
Number of tests included: 26
Includes tests from the following areas:
Create Session
Delete Session
Create Bearer
Modify Bearer
Delete Bearer
Echo

PRODUCT DETAILS

Hardware	Intel-based; scalable to meet performance needs
Options	P5088/01 includes base kit (simulated eNB) P5089/01 includes LTE pico eNB (single band) P8110/02 includes LTE femto eNB (multi band) Conformance tests available for each interface (S1, S5, S6a, S7, S11, Rx, Gx, Gy, Ro)
Operating System	Protocol Engine (Linux-based)
User Interface	Browser-based, touch-optimized graphical user interface
Automation	HTTP API
Max output power	31 mW (femto RF module option) 1000 mW per Tx (exernal picocell option)
Connector types	Femtocell: SMA female Picocell: N-type female
Hardware dimensions	M1: 4.5" x 4.5" x 1.75" M3: 19" x 15.75" x 3.5"; appx. 16.7lb
Power supply	M3: 520W AC to DC, 100 - 240v