



SPIRENT LANDSLIDE

DRA NODAL AND NODE EMULATION

DIAMETER ROUTING AGENT

Diameter Routing Agent (DRA) is a 3GPP standards-based network element that addresses the need for a Diameter domain routing function. In the ePC, Diameter is used extensively in the control plane for Authentication, Authorization and Accounting, Dynamic Policy and Charging Control and other purposes.

Diameter is a peer-to-peer protocol that results in mesh-like network architectures with direct signaling connections between peers. This places the burden of redundant connections, Diameter realm-routing and peer connectivity on key ePC network elements, such as gateways, mobility management entities, home subscriber servers and policy and charging rules functions. The DRA was introduced to the ePC control architecture to alleviate these problems. The DRA is responsible for all Diameter-session related tasks, such as realm-routing, redundancy and failover and traffic management.

The Landslide DRA test solution consists of a DRA emulation that serves the function of a DRA network element and a DRA nodal test application for end-to-end and on-armed testing. DRA nodal emulates the Diameter peers, such as MMEs, gateways and PCRFs communicating through a DRA node. In addition, the DRA nodal test application can be used for one-arm testing of real Diameter network elements connected through a DRA node.

APPLICATIONS

- Validate system scalability and identify capacity limits
- Measure Diameter session capacity
- Determine network element responsiveness
- Perform Diameter relay, proxy and redirect testing
- Characterize system before trial and delivery
- Identify performance ceilings
- Evaluate SCTP multi-home and failover behavior
- Test ePC behavior under dynamic PCC conditions
- Verify call flows and network element behavior

FEATURES & BENEFITS

- Use higher-level test management systems and Tcl to control and monitor Landslide
- Compile combined test reports that include the emulation (Landslide) and the device under test using Landslide's Tcl interface
- Realistic, real-world simulations that allow equipment vendors to accurately specify the performance characteristics of their equipment under real-world conditions
- Simultaneous control and user plane that allow service providers to measure the performance of their network and to validate new features and services in the lab
- Unmatched scalability allows the user to simulate subscriber loads ranging from a small rural town to the largest metropolitan city
- Standard Web browser interface means no need to load software onto user equipment
- Emulate multiple network elements to test a variety of network topologies
- Provides more effective lab equipment utilization
- Emulate key network elements to reduce capital expenditure and ongoing support costs
- Automation control for repeatable, multi-test server complex test scenarios and lab configurations
- Create real-world scenarios for heavy load, BHCA modeling and long duration stability tests
- Test any ePC network element in isolation or end-to-end configuration with realistic UEs
- Core and network element Diameter performance and scalability is easily tested while the effects of dynamic PCC investigated
- Investigate the effects of subscriber roaming on the Diameter control plane and related network elements

SPIRENT LANDSLIDE DIAMETER ROUTING AGENT

The Landslide DRA node emulation feature provides a means to emulate the DRA within a test bed. DRA emulation is useful for testing DRA-related functions of major ePC network elements, such as MME, HSS, PCRF and gateways. In addition, DRA node can be used to provide DRA services for test beds that cannot afford, or do not have, access to a commercial DRA. The Landslide DRA emulation provides Relay, Proxy and Redirect agent functions on a per-interface basis and is scalable to tens of SUTs and millions of Diameter sessions.

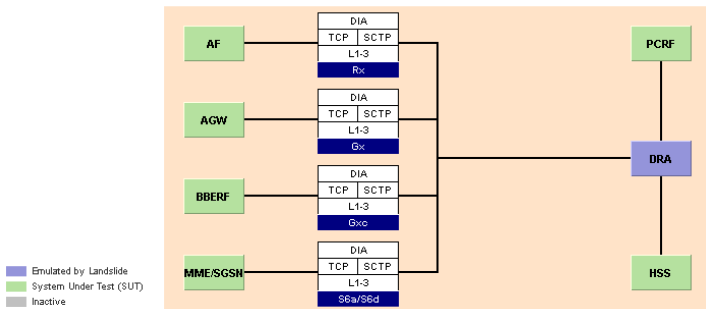


Figure 1 – DRA Node Emulation Test Case Diagram

When the device under test is the DRA itself, Landslide DRA nodal is the test solution of choice. DRA nodal test application is able to emulate both peers for various Diameter applications such as, S6a on the MME/HSS; S13 on the MME/EIR; and, S9, Gx and Rx on PCRF, PGW and P-CSCF. One-armed testing can be accomplished by emulating one peer and connecting through a DRA node to the other peer hosted in a real network element under test. Figure 3 shows a combined end-to-end and one-armed test of a DRA and HSS DUT; Landslide is emulating the AF (P-CSCF), AGW (PGW), MME and PCRF.

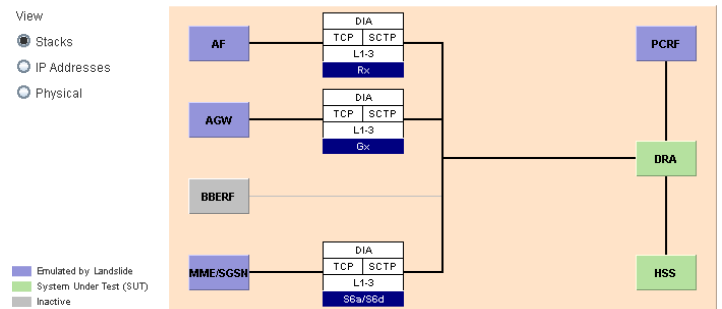


Figure 3 – DRA Nodal with DRA and HSS SUT

DRA node provides simple to define and use Diameter Peer Table and Realm Routing Table so that the user can configure the emulation to accommodate the needs of any test situation, no matter how complex the network design is.

ID	SUT	Host	Realm	Port	Initiator	Policy Sets	Policy
1	10.108.34.2	PCRF-1Gx	Spirent.com	3868	<input type="checkbox"/>	1	
2	10.200.76.1	PCRF-2Ox	Spirent.com	3868	<input type="checkbox"/>	1	
3	10.200.76.2	HSS-A	Spirent.com	3868	<input type="checkbox"/>	2	
4	10.200.76.3	HSS-B	Spirent.com	3868	<input checked="" type="checkbox"/>	2	
5	10.200.77.1	MME-1S6a	Spirent.com	3868	<input type="checkbox"/>	2	
6	10.200.77.2	MME-1S13	Spirent.com	3868	<input type="checkbox"/>	4	
7	10.201.76.1	EIR	Spirent.com	3868	<input checked="" type="checkbox"/>	4	
8	10.201.76.3	pCSCF-1	Spirent.com	3868	<input type="checkbox"/>	5	
9	10.201.77.1	pCSCF-2	Spirent.com	3868	<input type="checkbox"/>	5	
10	10.201.77.2	PCRF-1Rx	Spirent.com	3868	<input type="checkbox"/>	5	
11	10.203.79.5	PCRF3-Rx	Spirent.com	3868	<input type="checkbox"/>	5	
12	10.8.0.1	GMLC	Spirent.com	3868	<input checked="" type="checkbox"/>	6	
13	12.102.14.2	PCRF-1S9	Spirent.com	3868	<input type="checkbox"/>	7	
14	13.101.14.1	PCRF-2S9	Spirent.com	3868	<input type="checkbox"/>	7	

Figure 2 – DRA Node Peer Table

Not only does DRA nodal provide flexibility in choosing the device under test but, it provides a powerful Diameter message flow editor. Using this tool the user is able to define groups of servers and subscribers and script realistic Diameter application-specific message flows. The message flow editor commands available for scripting correspond to the various procedures defined in the 3GPP specifications for different Diameter applications. This makes scripting complex call scenarios involving multiple network elements, such as MME, HSS, P-CSCF, PCRF and PGW, as simple as click and point. It is no longer necessary to build messages from atomic Diameter command codes and AVPs; the application-specific procedures are ready and waiting to be scripted into call flows.

Wait For	Delay (s)	Command	From	To	Response For	Arguments
1	0	SendAuthInfoReq	MME-Node-1	INVALID-1		NumVectors=2
2	2	SendAuthInfoAns	INVALID-1	MME-Node-1		
3	10	SendUpdateLocReq	MME-Node-1	INVALID-1		
4	2	SendUpdateLocAns	INVALID-1	MME-Node-1		
5	15	SendNotifyReq	MME-Node-1	INVALID-1		
6	0	SendNotifyAns	INVALID-1	MME-Node-1		
7	30	SendEstRxSessReq	AF-Node-1	AGW-Node-1		ServiceInfo>Status=1
8	3	SendEstRxSessAnsErr	AGW-Node-1	AF-Node-1		ErrorCode=5143
9	0	SendEstRxSessReq	AF-Node-1	AGW-Node-1		DefaultBearerIndex=2
10	0	SendEstRxSessAns	AGW-Node-1	AF-Node-1		

Figure 4 – DRA Nodal Message Flow Editor

Negative testing is supported by adding a predefined error procedure and assigning a permanent error result code. Default and dedicated bearers can be called out as parameters too. Extreme realism, especially for one-armed tests, is provided by DRA nodal by allowing the user to provision APNs and bearer filters on the Gx; PCC rule sets; and, optional Rx messages and media descriptions including codec data.

The call flow editor and Landslide's ease of configuration allow you to quickly build test sessions to confirm and verify call flows and node responses. Once the node behavior is verified, it only takes a few minutes to reconfigure Landslide to perform high-capacity, scale and performance tests.

When all things are considered, Landslide's scale, performance, ease of use and degree of control coupled with DRA test application's flexibility, high fidelity and configuration options provide all the tools and power necessary to test the highly-scalable and complex Diameter control planes required by the LTE ePC.

TECHNICAL SPECIFICATIONS

- Test Activities
 - Capacity Test
 - Session Loading
 - DRA and network element emulation
 - Command Mode/Command Sequencer
 - Scriptable Diameter Application message flows
- Landslide Manager
 - Up to 125 user accounts
 - Up to 48 simultaneous users
 - Up to 32 Landslide Test Servers
- Landslide Test Server
 - Up to 1 million subscribers
 - Up to 16 Diameter sessions per subscriber
 - More than 100K Diameter TPS
 - Up to 3 simultaneous users per Test Server
 - Up to 40 Gbps data plane traffic per Test Server
- Landslide Test Server Ethernet Ports
 - Quad-port, 10/100/1000Base-T NIC
 - Quad-port, 10/100/1000Base-SX multi-mode NIC
 - Dual-port, 10G Base-SR, 850 nm multi-mode AONIC NIC

REFERENCED STANDARDS (PARTIAL LIST)

- 3GPP TS 23.203 Policy and Charging Control (PCC) architecture
- 3GPP TS23.401 General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
- 3GPP TS 29.212 Technical Specification Group Core Network and Terminals; Policy and Charging Control (PCC) over Gx/Sd reference point
- 3GPP TS 29.214 Policy and Charging Control over Rx reference point
- 3GPP TS 29.272 Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol
- IETF RFC-2960/4960 Stream Control Transmission Protocol

ORDERING INFORMATION	
DESCRIPTION	PART NUMBER
Landslide DRA Test Application Adds DRA Test Application to a Landslide system. Includes Diameter message flow editor and Diameter message library for S6a/S6d, Gx/Gxx, Rx, S9 interfaces.	L-APP-039
Landslide DRA Node Emulation Provides relay/redirect/proxy functions for Diameter messages, supports S6a/S6d, Gx/Gxx, Rx, S9 and other Diameter Application interfaces. Add-on to an existing Landslide system.	L-FT-056
Landslide LTE Gateway Test System Landslide Manager, Test Server and LTE Gateway Test Application. Allows testing of LTE Serving Gateway, PDN Gateway and combined S/P gateways.	L-KIT-5020
Landslide LTE MME Test System Landslide Manager, Test Server and LTE MME Test Application. Allows testing of Mobility Management Entity.	L-KIT-5021
Landslide GPRS Test Application Adds GPRS Test Application to an existing Landslide Test System	L-APP-001
Landslide UMTS Test Application Adds UMTS Test Application to an existing Landslide Test System	L-APP-005
Landslide IP Data Test Application Adds IP Data Test Application to an existing Landslide Test System	L-APP-007
Landslide PCRF Test Application Adds PCRF Test Application to an existing Landslide Test System	L-APP-012
Landslide eHRPD Test Application Adds eHRPD Test Application to an existing Landslide Test System	L-APP-025
Landslide HNB-GW Test Application Adds HNB-GW Test Application to an existing Landslide Test System	L-APP-037
Landslide WiFi Offload GW Test Application Adds WiFi Offload GW Test Application to an existing Landslide Test System	L-APP-038
Landslide Performance Accelerator License Doubles Test Server data throughput and control plane performance for mobility test applications	L-FT-532-B
Landslide Extreme Capacity Accelerator License Increases control plane capacity to the maximum available for mobility test applications	L-FT-532-C

SPIRENT SERVICES

Spirent Global Services provides a variety of professional services, support services and education services—all focused on helping customers meet their complex testing and service assurance requirements. For more information, visit the Global Services website at www.spirent.com or contact your Spirent sales representative.

AMERICAS 1-800-SPIRENT • +1-818-676-2683 • sales@spirent.com

EUROPE AND THE MIDDLE EAST +44 (0) 1293 767979 • emeainfo@spirent.com

ASIA AND THE PACIFIC +86-10-8518-2539 • salesasia@spirent.com

