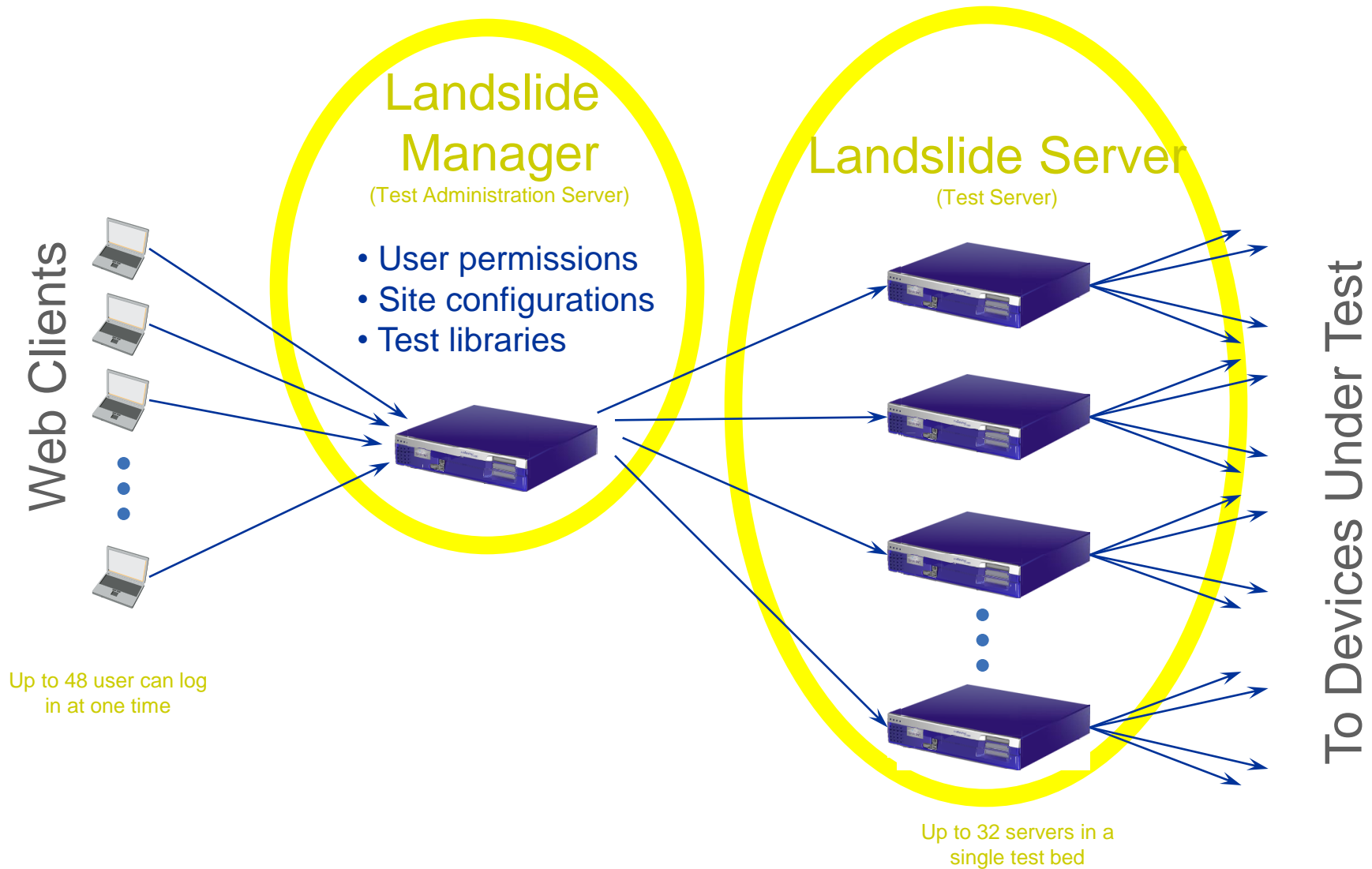


Landslide CDMA 2000 Performance Test System

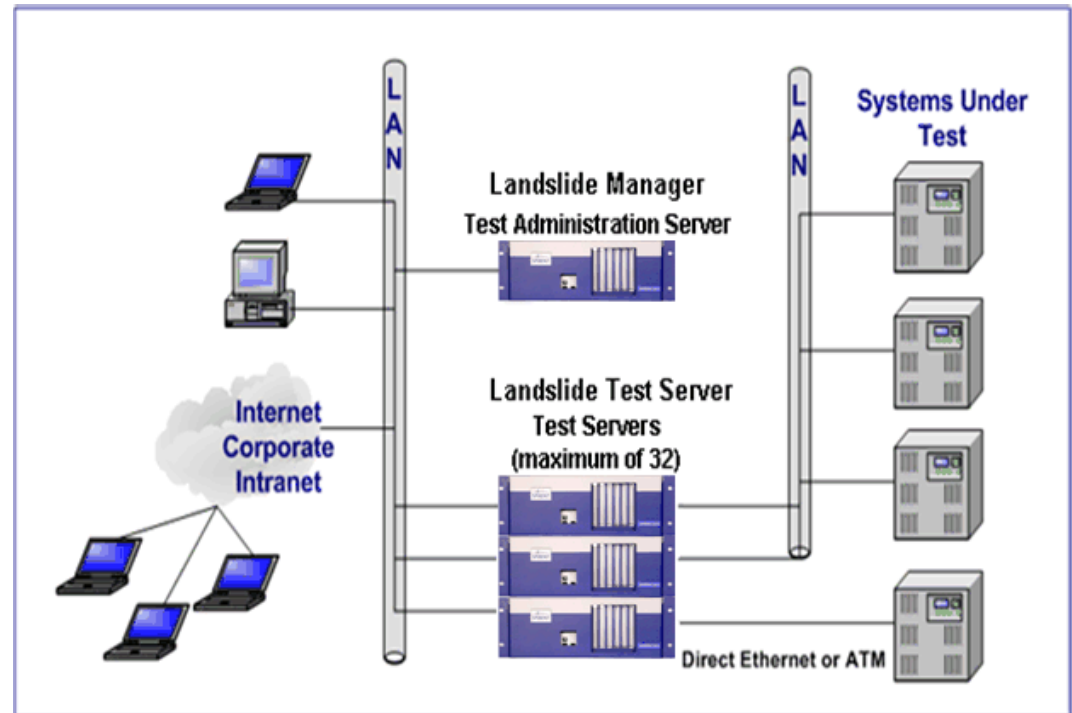


Components of the Landslide System



Landslide Applications/Features

- ❖ LTE™ Performance Testing
- ❖ WiMax Performance Testing
- ❖ UMTS Performance Testing
- ❖ GPRS Performance Testing
- ❖ CDMA Performance Testing
- ❖ Mobility over IPv4/IPv6
- ❖ AAA Performance Testing (RADIUS and Diameter)
- ❖ AAA Server Emulation
- ❖ Advanced Data with IPSec
- ❖ L2TP VPN Gateway
- ❖ Charging Gateway Function Emulator
- ❖ IMS Security and Policy Testing



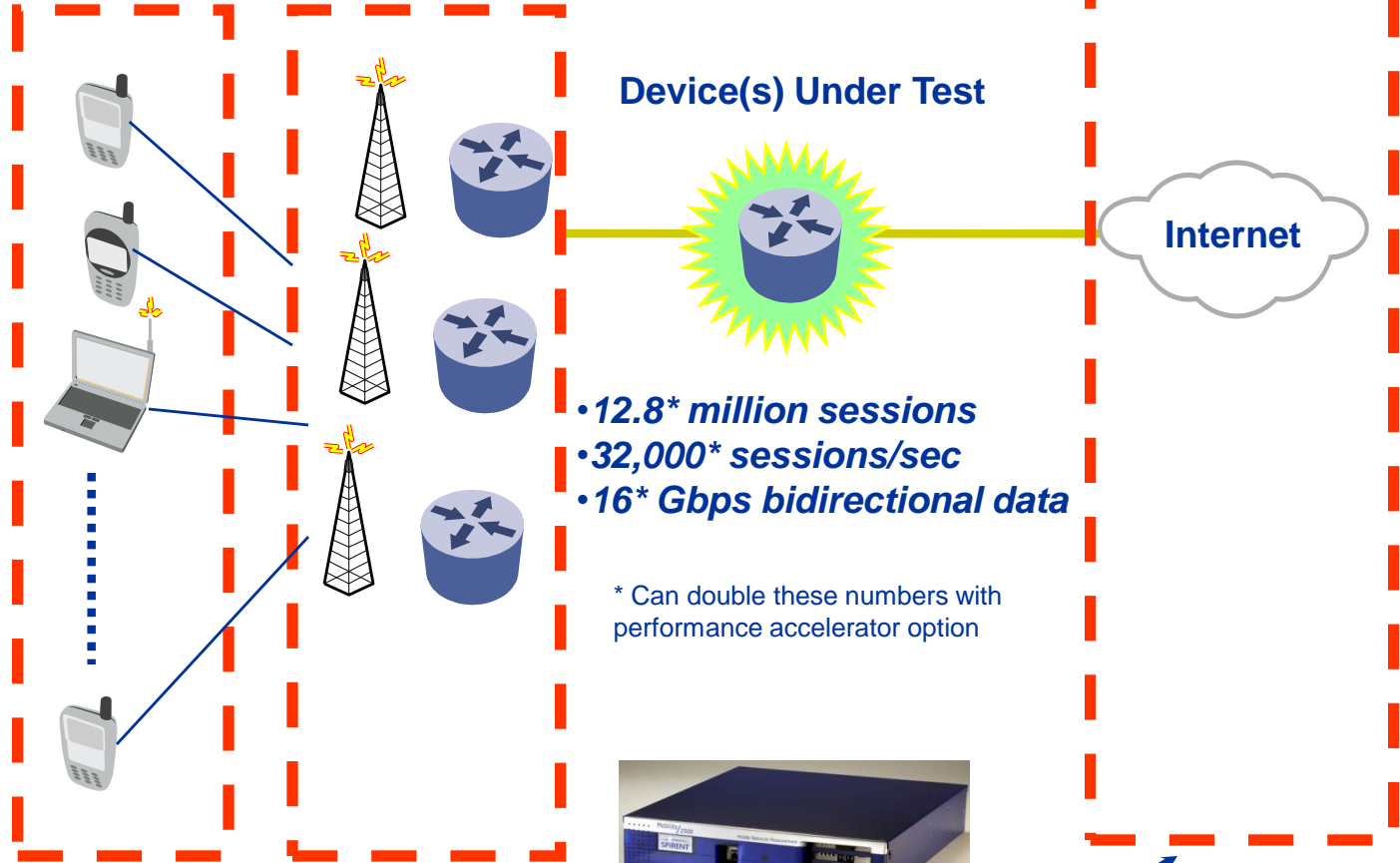
- ❖ CDMA/WI-FI Convergence (PDIF)
- ❖ GPRS/WI-FI Convergence (PDG)
- ❖ DCCA
- ❖ PCRF

Network In a Box

12.8* Million
Mobile Stations

32,000* Base
Stations/RNC

160 Network Hosts



- 12.8* million sessions
- 32,000* sessions/sec
- 16* Gbps bidirectional data

* Can double these numbers with performance accelerator option



Emulated by Spirent

Complete Network Coverage

Emulate

- AAA Diameter Servers
- AAA Radius Servers
- GGSN
- SGSN
- Foreign Agent
- Home Agent
- PDSN
- Base Station Controllers
- LTE_™ Clients
- UMTS Clients
- GPRS Clients
- CDMA Clients
- WiMAX Clients
- WiFi clients
- AAA Clients
- Mobile IP Clients
- Internet/Network Host
- IPSec clients

Test

- Foreign Agent
- Home Agent
- Corresponding Node
- LTE_™ MME
- GGSN
- SGSN
- Security Gateways
- PDIF/PDG
- End-to-end Systems
- AAA Diameter Servers
- AAA Radius Servers
- L2TP VPN Gateway
- Application Servers
- Content Billing systems
- CDR records
- ASN/CSN
- PCRF

Landslide CDMA Testing

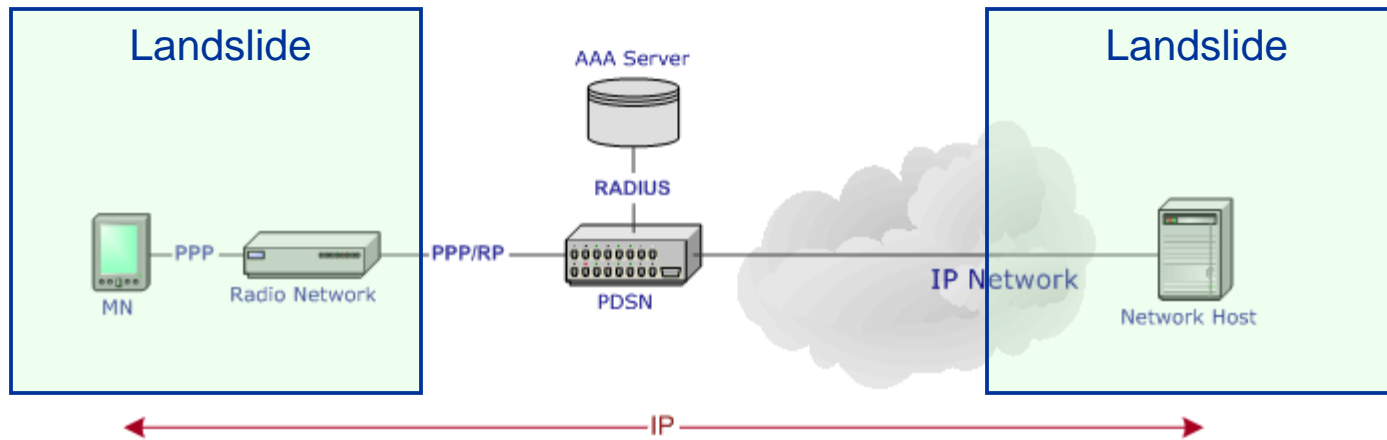


CDMA Testing

- ⊠ Test scalability and performance capabilities of PDSNs, FAs, and HAs
- ⊠ Control Plane and Bearer Plane
- ⊠ Simple IP
- ⊠ Mobile IP
- ⊠ Reverse tunnel
- ⊠ IPv4 and IPv6
- ⊠ Dynamic Mobile IP Key Update (DMU)
- ⊠ Open RP, PPP, L2TP
- ⊠ Emulators:
 - ⊠ Home Agent
 - ⊠ MN
 - ⊠ PCF
 - ⊠ PDSN-FA

CDMA Testing

Simple IP

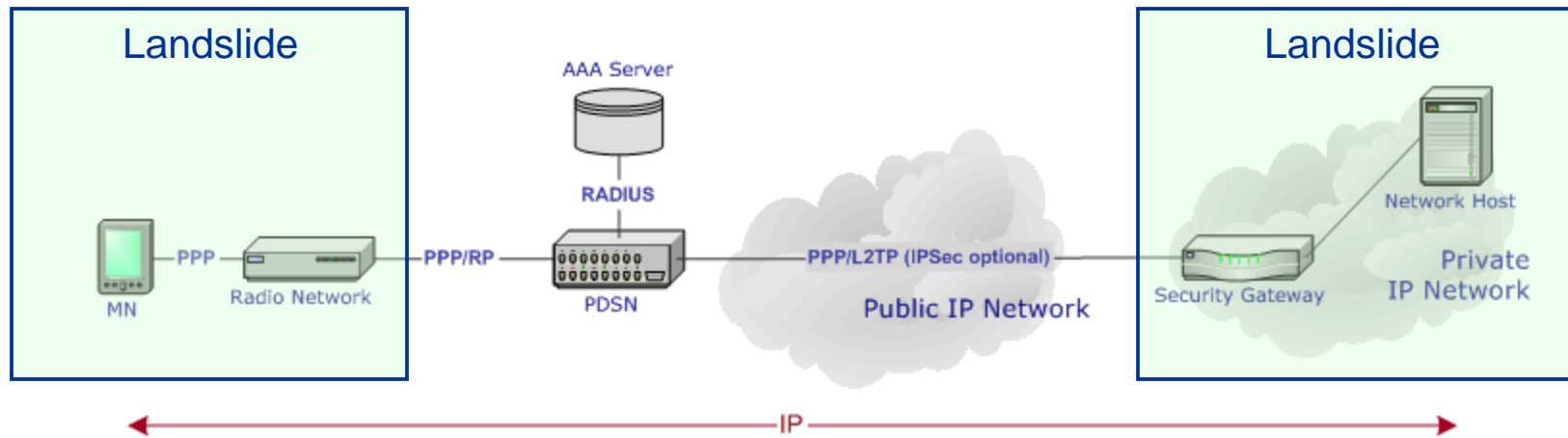


Emulates the MNs and PCFs for control plane testing.

Optionally emulate a network host for testing the bearer plane.

CDMA Testing

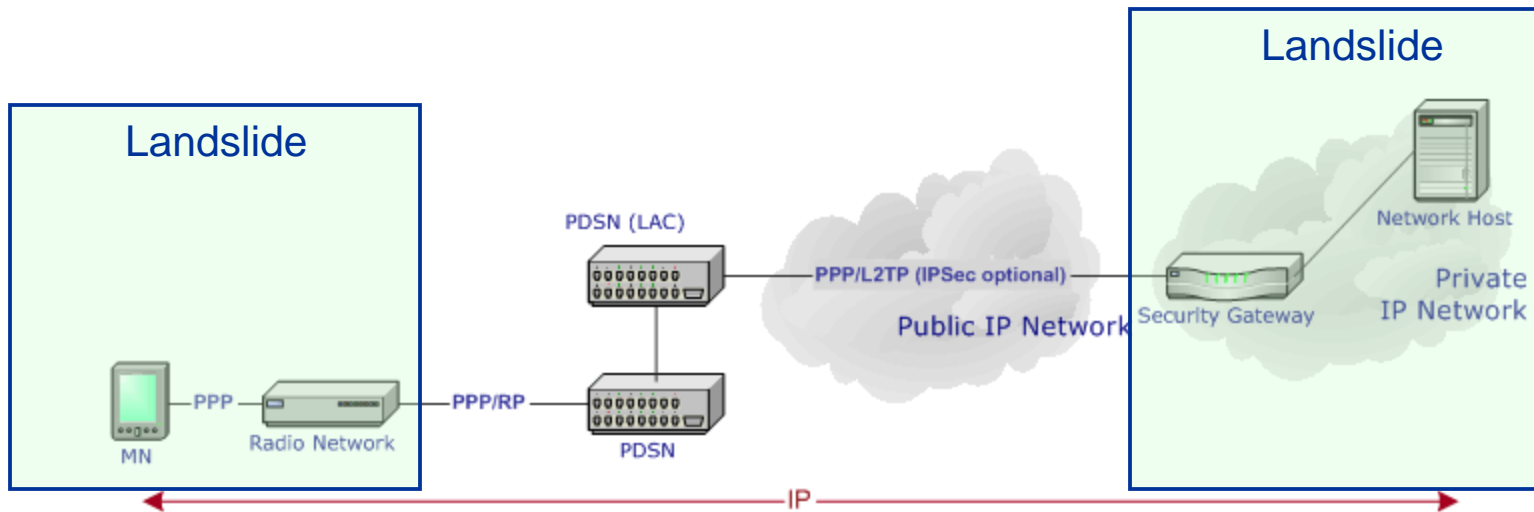
Simple IP - VPN



Emulates the MNs, PCFs, and security gateway for control plane testing.
Optionally emulate a network host for testing the bearer plane.

CDMA Testing

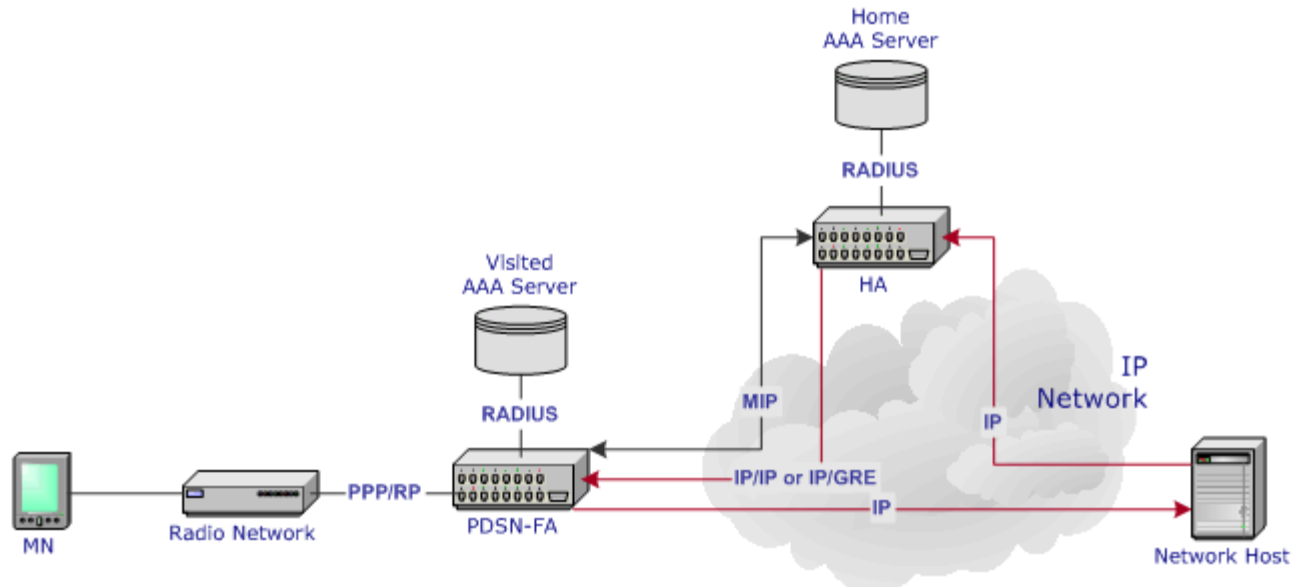
Simple IP - VPRN



Emulates the MNs, PCFs, and security gateway for control plane testing.
Optionally emulate a network host for testing the bearer plane.

CDMA Testing

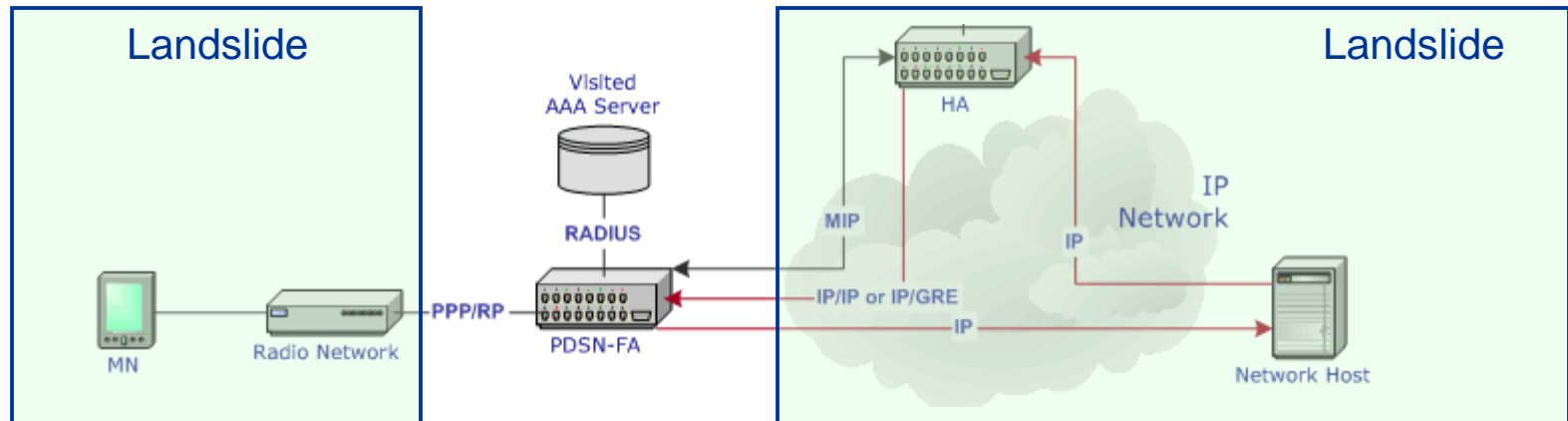
Mobile IP



Only packets from host toward MN are tunneled thru the HA. Packets from MN to host are not tunneled thru HA.

CDMA Testing

Mobile IP – FA Nodal

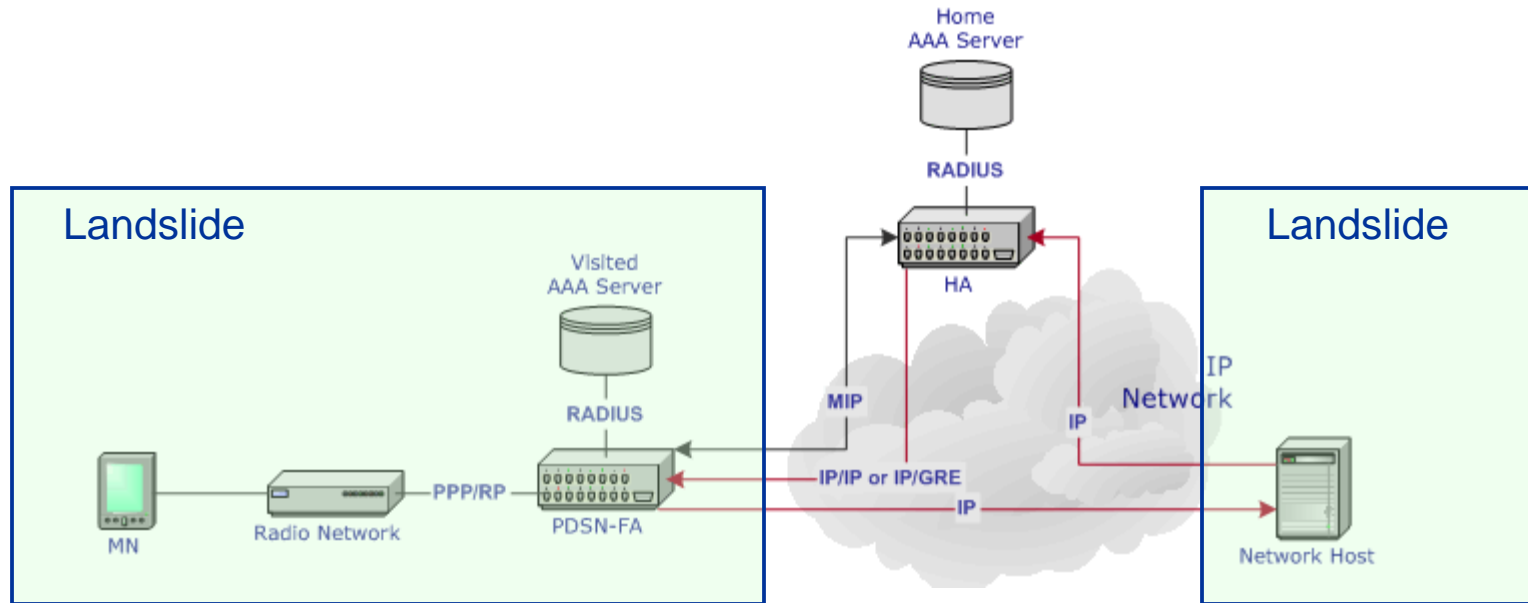


Emulates the MNs, PCFs, and HA for control plane testing.

Optionally emulate a network host for testing the bearer plane.

CDMA Testing

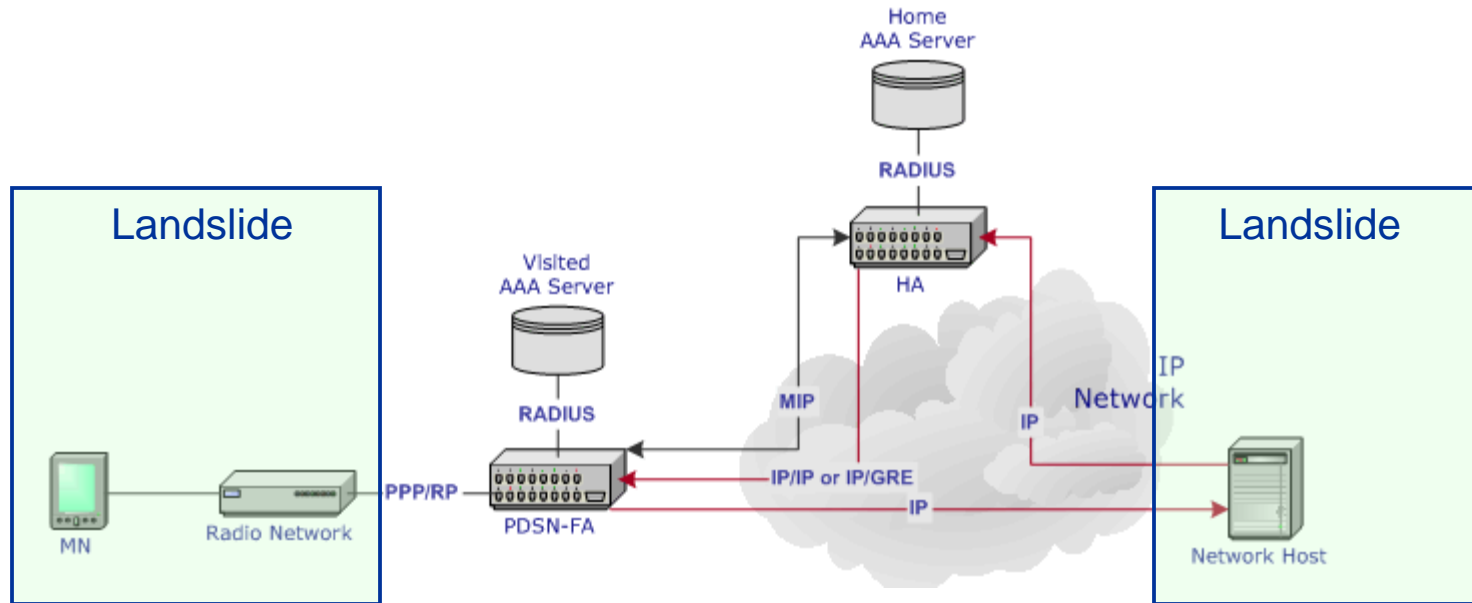
Mobile IP – HA Nodal



Emulates the MNs, PCFs, and PDSN for control plane testing.
Optionally emulate a network host for testing the bearer plane.

CDMA Testing

Mobile IP – end to end

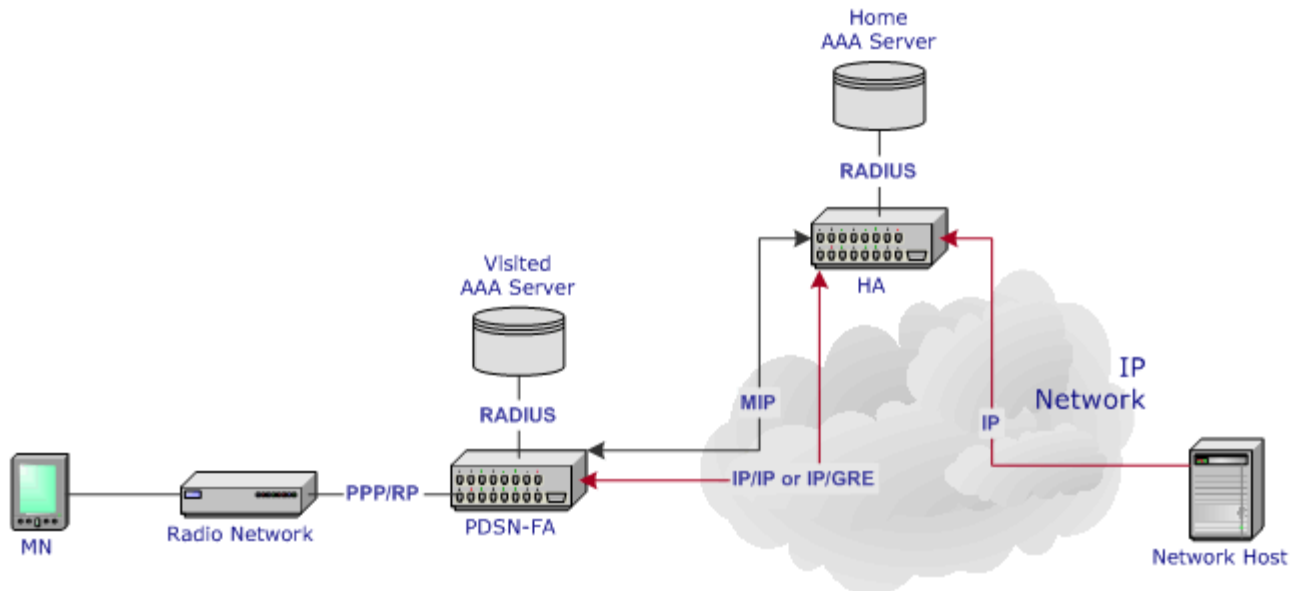


Emulates the MNs and PCFs for control plane testing.

Optionally emulate a network host for testing the bearer plane.

CDMA Testing

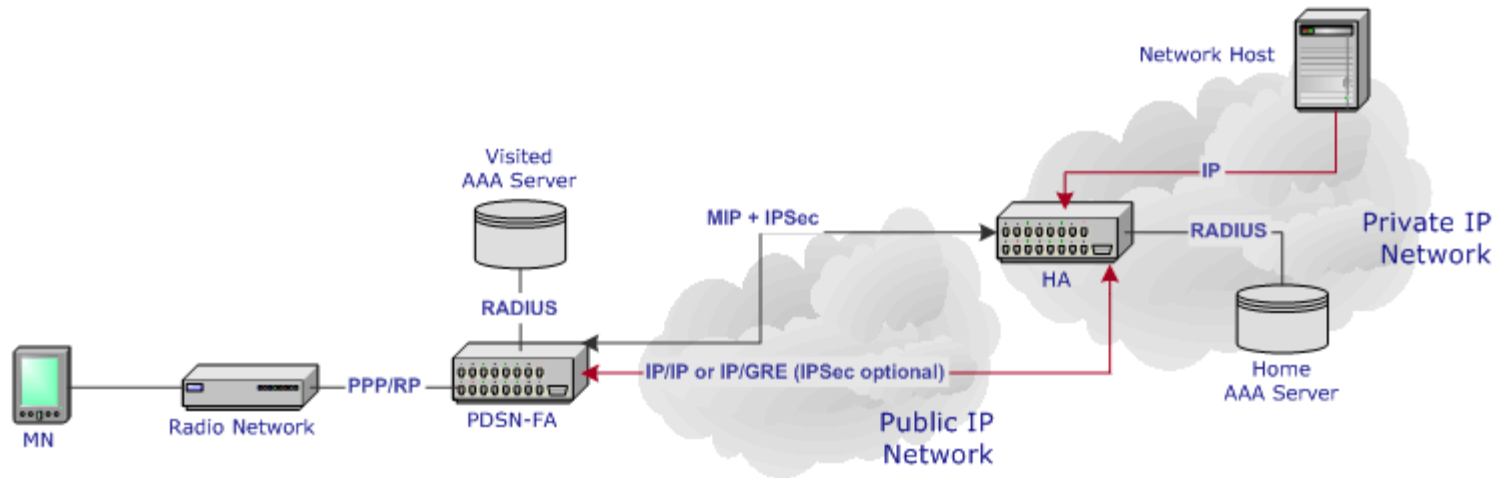
Mobile IP – Reverse Tunnel



For all previous test scenario's (FA Nodal, HA Nodal, End-to-End) all packets between MN and host are tunneled thru the HA.

CDMA Testing

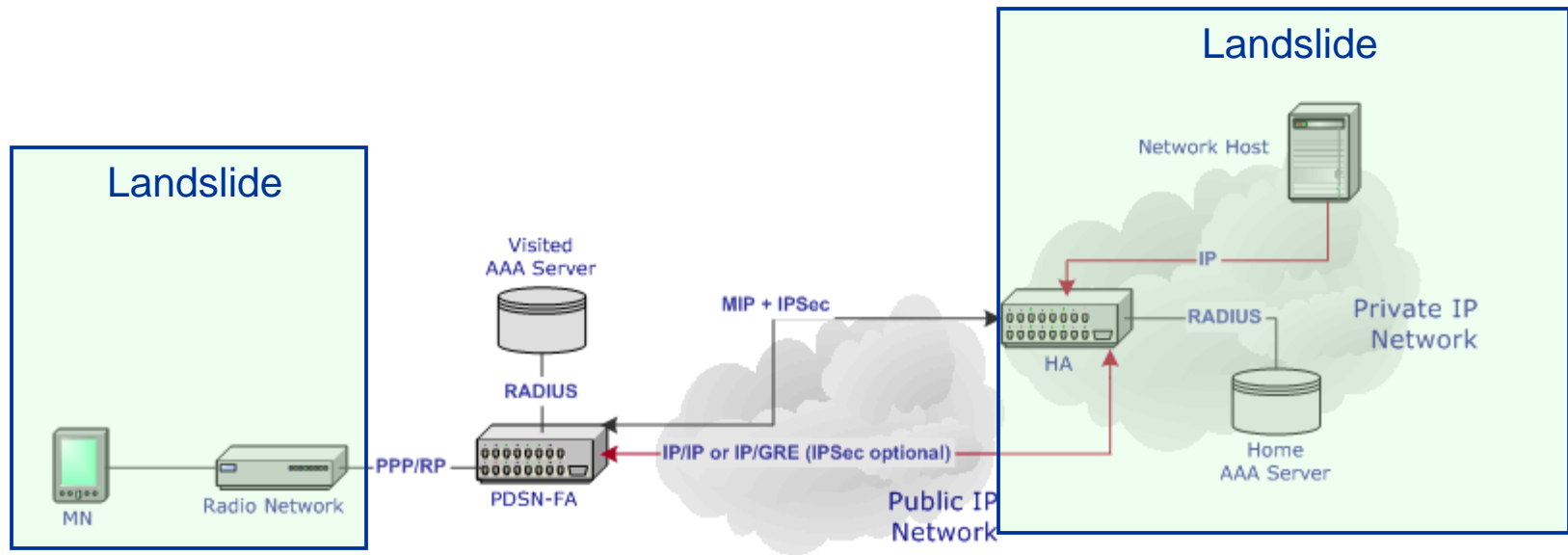
Mobile IP – VPN



The Mobile IP Virtual Private Network (VPN) model allows MN access to a private network. In the VPN model, the HA belongs to the private network and can also act as a Security Gateway. IPsec is used to encrypt control plane packets between the PDSN-FA and the HA.

CDMA Testing

Mobile IP – VPN – FA Nodal

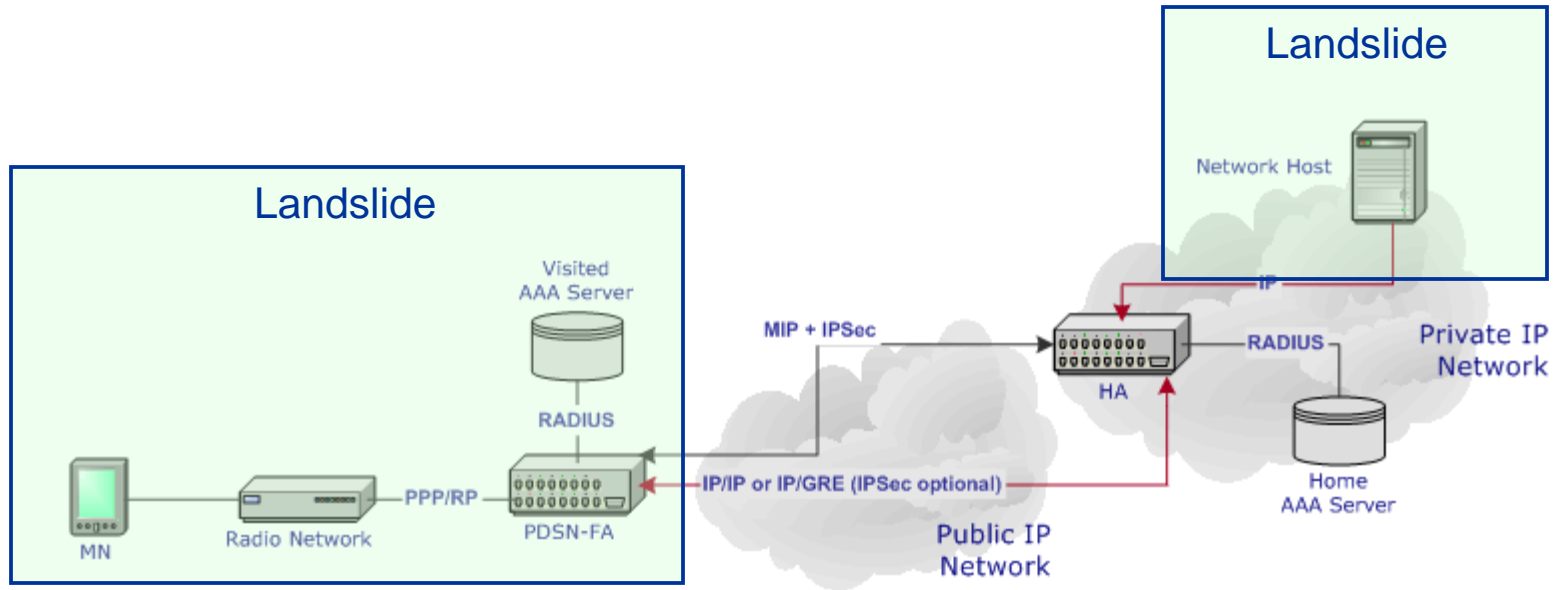


Emulates the MNs, PCFs, and HA for control plane testing.

Optionally emulate a network host for testing the bearer plane.

CDMA Testing

Mobile IP – VPN – HA Nodal

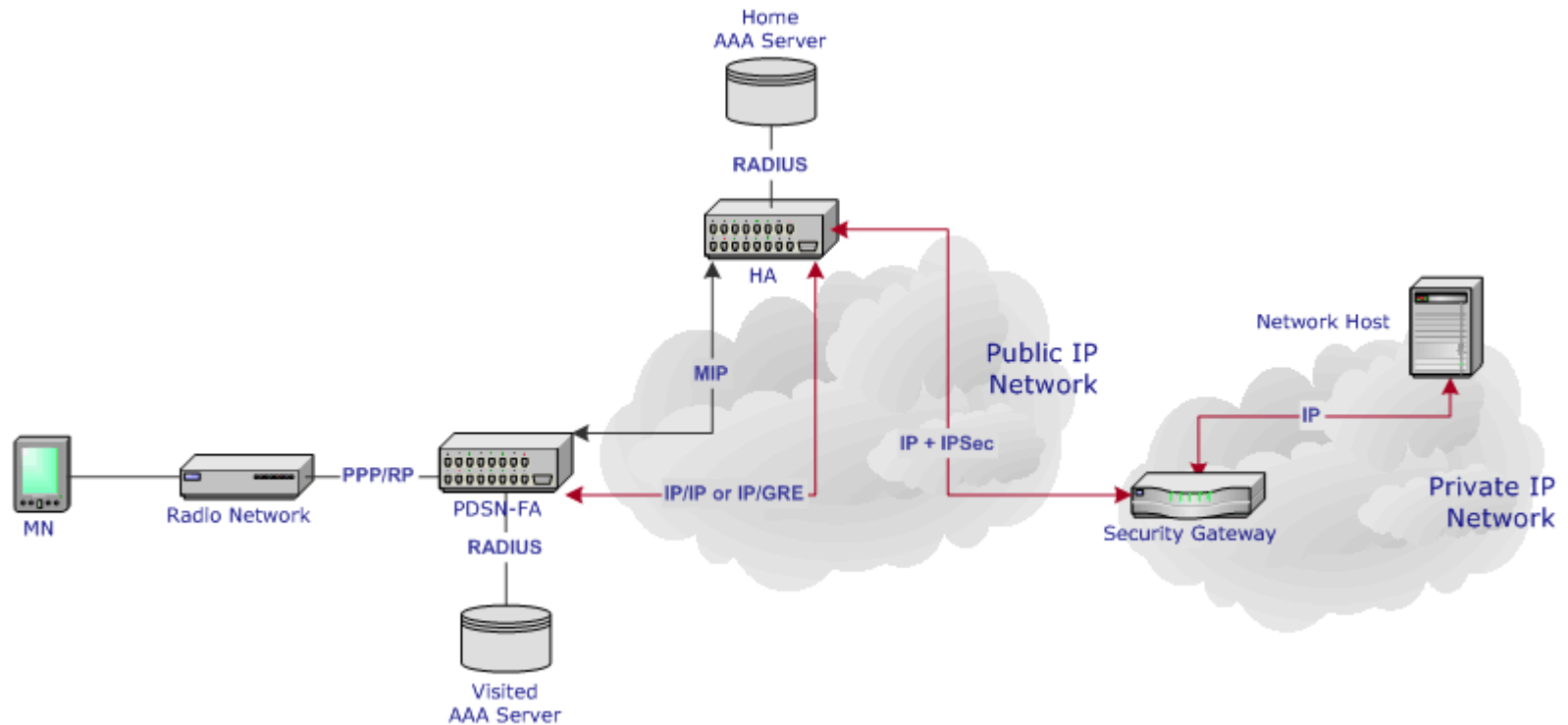


Emulates the MNs, PCFs, and PDSN-FA for control plane testing.

Optionally emulate a network host for testing the bearer plane.

CDMA Testing

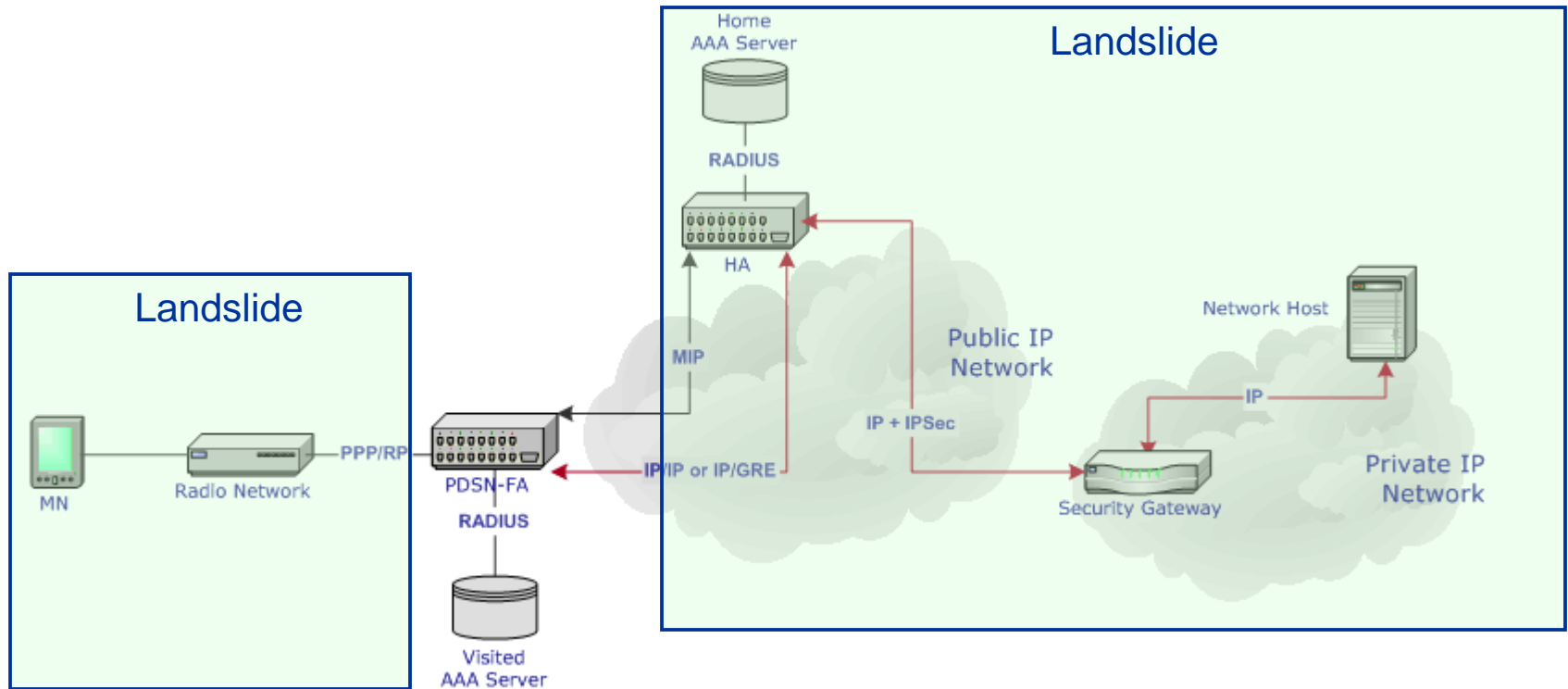
Mobile IP – VPRN



The Mobile IP Network Based VPN model allows MN access to a private network. In contrast with the [Mobile IP VPN model](#), the HA is in the service provider's network, and connects to a Security Gateway on the perimeter of the private network.

CDMA Testing

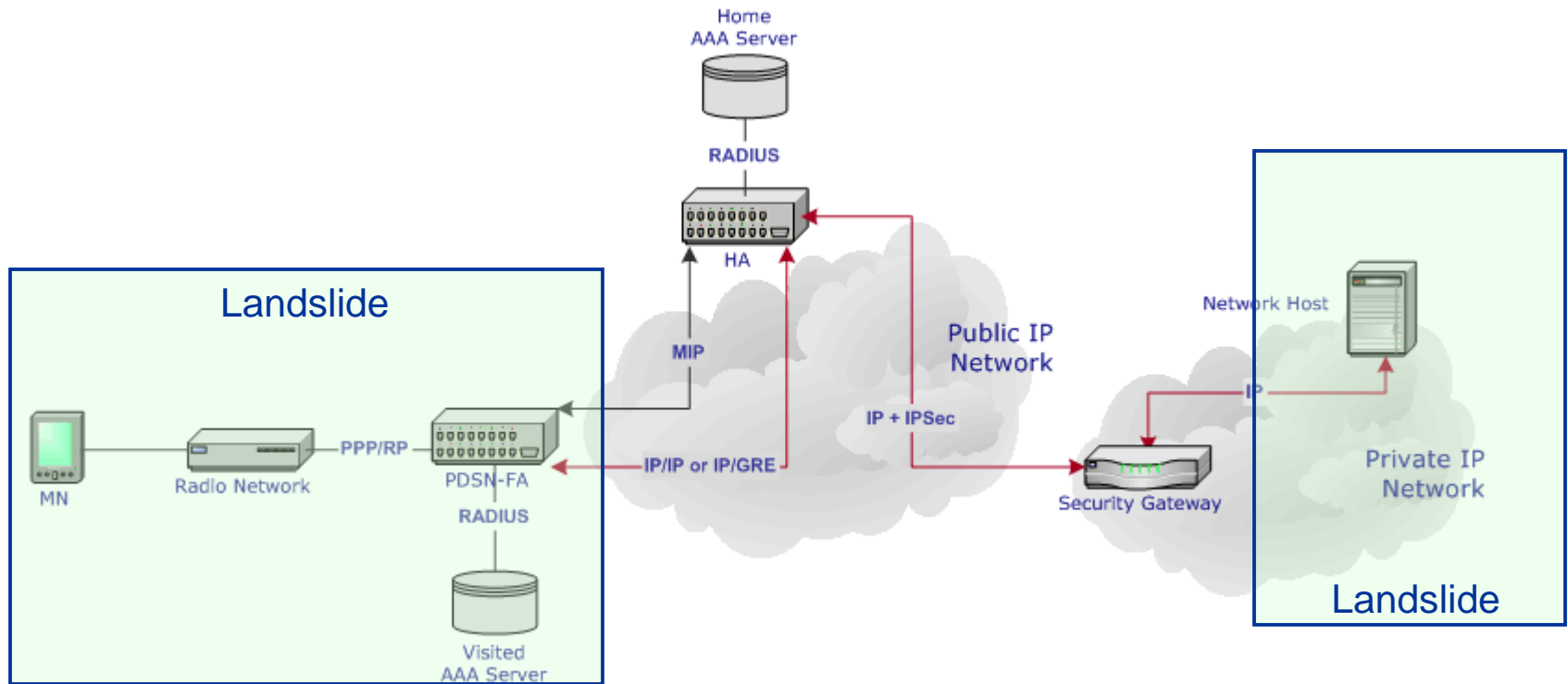
Mobile IP – VPRN – FA Nodal



Emulates the MNs, PCFs, HA, and security gateway for control plane testing.
Optionally emulate a network host for testing the bearer plane.

CDMA Testing

Mobile IP – VPRN – HA Nodal



Emulates the MNs, PCFs, and PDSN for control plane testing.

Optionally emulate a network host for testing the bearer plane.

Landslide CDMA Performance Capabilities

- ❖ Up to 1000 activations per second for PDSN testing
- ❖ Up to 4000 activations per second for HA testing
- ❖ Up to 1,000 emulated PCFs
- ❖ Up to 200,000 emulated MNs
- ❖ Multiple emulated PDSN-FAs
- ❖ Multiple emulated HAs
- ❖ Numbers can be doubled with performance accelerator feature

Performance based on a single
Landslide server

Test Methodology



Performance Testing

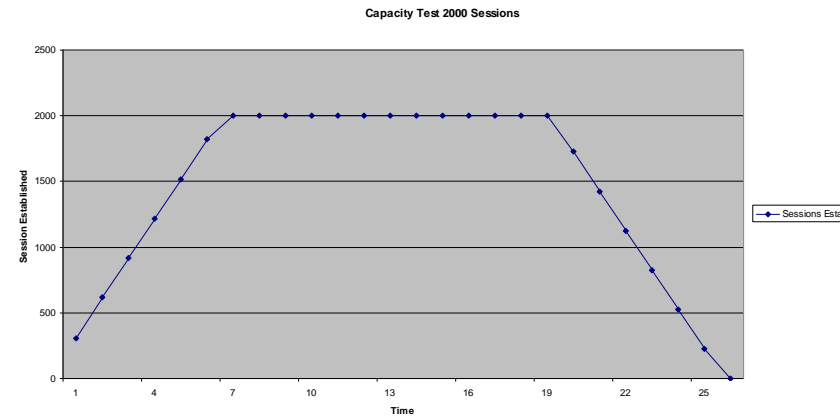
❖ Key Test Types

- ❖ Capacity Test
- ❖ Mobility Tests
- ❖ Session Loading
- ❖ Session Loading with Mobility

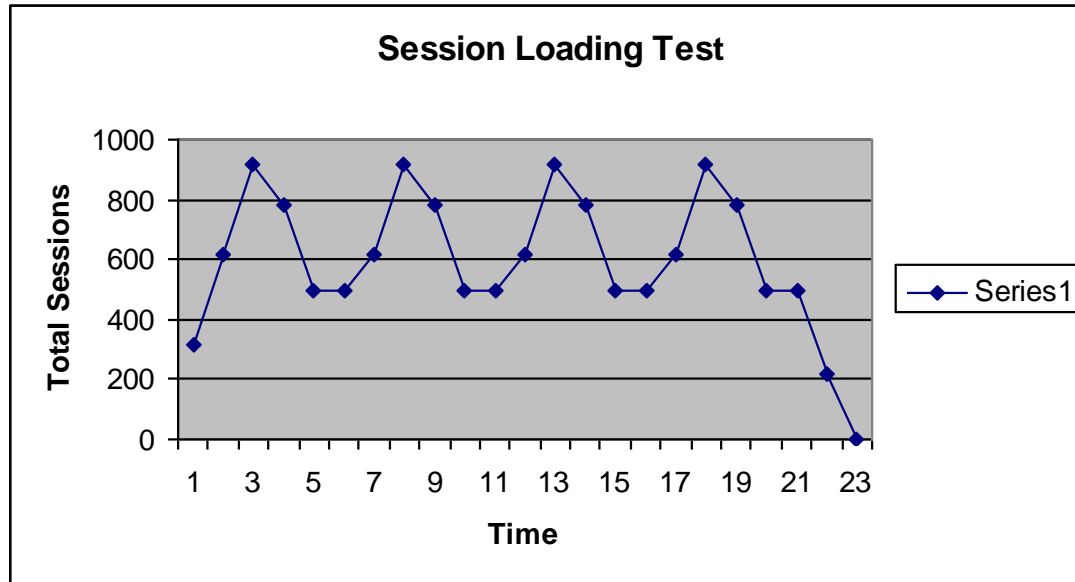
- ⊞ Data flows can be included in all test types.
- ⊞ Test types can be combined and complex traffic patterns can be simulated using automation control.

Test Methodology - Capacity Test

- ❖ A key measurement of a DUT is its capacity for simultaneous sessions
- ❖ The Landslide begins establishing sessions at a specified rate
- ❖ When the maximum is reached all subsequent sessions fail
- ❖ Established sessions are kept active for the specified period or until stopped
- ❖ Finally sessions are deactivated at a specified rate
- ❖ Help->Test Activities->Capacity Test
->About the Capacity Test



Test Methodology - Session Loading Test



- ❖ A key measurement of a DUT is its ability to process real world activity for a long period of time
- ❖ Session loading emulates multiple simultaneous real world events
 - ❖ Session activations
 - ❖ Session deactivations
 - ❖ Data transactions of various types
 - ❖ Handovers
- ❖ Help->Test Activities->Session Loading->About the Session Loading Test

Test Methodology -Continuous Data

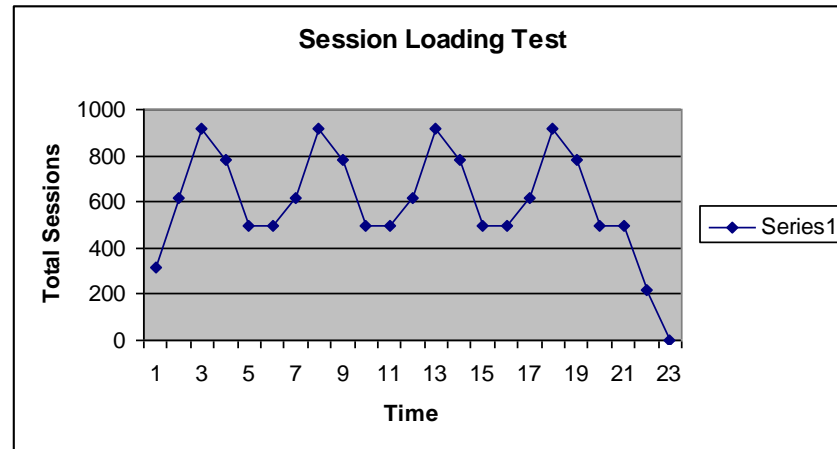
- ❖ Data packets of a user defined flow(s) are transported over the sessions.
- ❖ User may select pre-configured data flows from the basic library or build custom flows using the powerful data flow editor.
- ❖ Capacity - transmission can begin as each session is established or after all sessions are successfully established.
- ❖ Session Loading - transmission begins as each session is established.
- ❖ Protocols flows currently supported include: Ping (ICMP), RAW, SCTP, UDP, TCP, HTTP, FTP, WAP 1.X, WAP 2.0, SMTP, POP3, IMAP, RSTP, RTP, SIP, Wireless Village and Custom built or imported

Combined Complex Test Cases

**Capacity
Mobility**

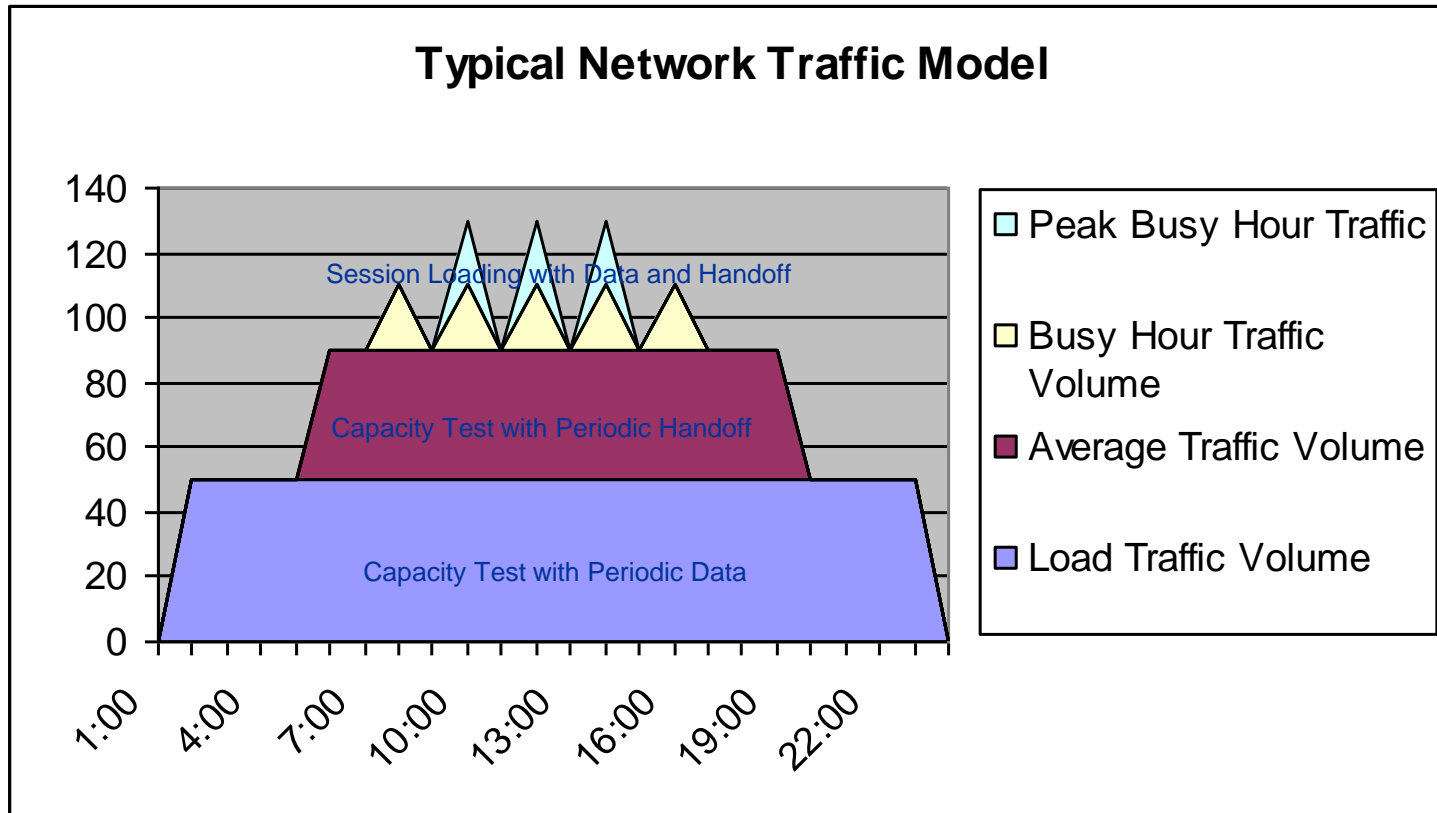


Session Loading



**+ Data Traffic
Generation**

Real World Network Modeling



- ❖ Create real-world traffic patterns in lab
- ❖ Need wide range of control plane and data plane profiles
- ❖ Test with expect and worst-case use scenarios

Thank You!

