Network Working Group INTERNET-DRAFT Expires in: September 2007 Intended Status: Informational

> Scott Poretsky Reef Point Systems

Shankar Rao Qwest Communications

March 2007

Terminology for Accelerated Stress Benchmarking
<draft-ietf-bmwg-acc-bench-term-11.txt>

Intellectual Property Rights (IPR) statement:

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with <u>Section 6 of BCP 79</u>.

Status of this Memo

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/lid-abstracts.txt.

The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html.

Copyright Notice

Copyright (C) The IETF Trust (2007).

ABSTRACT

This document provides the Terminology for performing Accelerated Stress Benchmarking of networking devices. The three phases of the Stress Test: Startup, Instability and Recovery are defined along with the benchmarks and configuration terms associated with the each phase. Also defined are the Benchmark Planes fundamental to stress testing configuration, setup and measurement. The terminology is to be used with the companion framework and methodology documents.

Table of Contents		
<u>1</u> . Introduction	<u>3</u>	
<u>2</u> . Existing definitions	<u>3</u>	
<u>3</u> . Term definitions	<u>4</u>	
Poretsky and Rao	[Page 1]	

3.1 General Terms	1
3.1.1 Benchmark Planes	
3.1.2 Configuration Sets	
<u>3.1.3</u> Startup Conditions	
<u>3.1.4</u> Instability Conditions	
<u>3.1.5</u> Aggregate Forwarding Rate	<u>6</u>
<u>3.1.6</u> Controlled Session Loss	· · · · <u>7</u>
<u>3.1.7</u> Uncontrolled Session Loss	· · · <u>7</u>
3.2 Benchmark Planes	8
<u>3.2.1</u> Control Plane	8
<u>3.2.2</u> Data Plane	
3.2.3 Management Plane	
<u>3.2.4</u> Security Plane	
3.3 Startup	
<u>3.3.1</u> Startup Phase	
3.3.2 Benchmarks	
3.3.2.1 Stable Aggregate Forwarding Rate	
<u>3.3.2.2</u> Stable Latency	
3.3.2.3 Stable Session Count	
<u>3.3.3</u> Control Plane	
<u>3.3.3.1</u> Control Plane Configuration Set	
3.3.3.2 Control Plane Startup Conditions	
<u>3.3.4</u> Data Plane	<u>13</u>
<u>3.3.4.1</u> Data Plane Configuration Set	<u>13</u>
<u>3.3.4.2</u> Traffic Profile	<u>13</u>
<u>3.3.5</u> Management Plane	<u>14</u>
3.3.5.1 Management Plane Configuration Set	
3.3.6 Security Plane	
<u>3.3.6.1</u> Security Plane Configuration Set	15
3.3.6.2 Security Plane Startup Conditions	
3.4 Instability	
3.4.1 Instability Phase	
3.4.2 Benchmarks	
<u>3.4.2.1</u> Unstable Aggregate Forwarding Rate	
3.4.2.2 Aggregate Forwarding Rate Degradation	
<u>3.4.2.3</u> Average Aggregate Forwarding Rate Degradation	
<u>3.4.2.4</u> Unstable Latency	
<u>3.4.2.5</u> Unstable Uncontrolled Sessions Lost	
<u>3.4.3</u> Instability Conditions	
<u>3.4.3.1</u> Control Plane Instability Conditions	
<u>3.4.3.2</u> Data Plane Instability Conditions	
<u>3.4.3.3</u> Management Plane Instability Conditions	<u>20</u>
<u>3.4.3.4</u> Security Plane Instability Conditions	<u>20</u>
<u>3.5</u> Recovery	<u>21</u>
<u>3.5.1</u> Recovery Phase	<u>21</u>
<u>3.5.2</u> Benchmarks	
<u>3.5.2.1</u> Recovered Aggregate Forwarding Rate	
<u>3.5.2.2</u> Recovered Latency	

<u>3.5.2.3</u> Recovery Time <u>22</u>	
<u>3.5.2.4</u> Recovered Uncontrolled Sessions Lost	
<u>3.5.2.5</u> Variability Benchmarks	
<u>4</u> . IANA Considerations <u>24</u>	

Poretsky and Rao

[Page 2]

5. Security Considerations2	<u>24</u>
<u>6</u> . References <u>2</u>	<u>24</u>
<u>7</u> . Author's Address2	25
Appendix 1 - White Box Benchmarks2	<u>25</u>

1. Introduction

Routers in an operational network are configured with multiple protocols and security policies while simultaneously forwarding traffic and being managed. To accurately benchmark a router for deployment, it is necessary to test that router under operational conditions by simultaneously configuring and scaling network protocols and security policies, forwarding traffic, and managing the device. It is useful to accelerate these network operational conditions so that the router under test can be benchmarked with a shorter test duration. Testing a router in accelerated network conditions is known as Accelerated Stress Benchmarking.

This document provides the Terminology for performing Stress Benchmarking of networking devices. The three phases of the Stress Test: Startup, Instability and Recovery are defined along with the benchmark and configuration terms associated with the each phase. Benchmarks for stress testing are defined using the Aggregate Forwarding Rate and control plane Session Count during each phase of the test. For each plane, the Configuration Set, Startup Conditions, and Instability Conditions are defined. Also defined are the Benchmark Planes fundamental to stress testing configuration, setup and measurement. These are the Control Plane, Data Plane, Management Plane and Security Plane Multiple benchmarks are measured for each Benchmark Plane during each Phase. Benchmarks can be compared across multiple planes for the same DUT or at the same plane for 2 or more DUTS. Benchmarks of internal DUT characteristics such as memory and CPU utilization (also known as White Box benchmarks) are described in Appendix 1, to allow additional characterization of DUT behavior. The terminology is to be used with the companion methodology document [4]. The sequence of phases, actions, and benchmarks are shown in Table 1.

2. Existing definitions

<u>RFC 1242</u> [1] and <u>RFC 2285</u> [2] should be consulted before attempting to make use of this document. For the sake of clarity and continuity this RFC adopts the template for definitions set out in <u>Section 2 of RFC 1242</u>. Definitions are indexed and grouped together in sections for ease of reference.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in <u>BCP 14</u>, <u>RFC 2119</u>

[5]. RFC 2119 defines the use of these key words to help make the intent of standards track documents as clear as possible. While this document uses these keywords, it is not a standards track document.

Poretsky and Rao

[Page 3]

INTERNET-DRAFT Terminology for Accelerated March 2007 Stress Benchmarking

-	ce and Benchmarks II. Instability Phase -<	-
	Achieve Configuration	
Recovered Aggregate	Benchmark: Unstable Aggregate Forwarding Rate	Benchmark: Stable Aggregate Forwarding Rate
	Degraded Aggregate Forwarding Rate	
	Average Degraded Forwarding Rate	
Recovered Latency	Unstable Latency	Startup Latency
Recovered Uncontrollo Sessions Lost	ed Recovered Uncontrolled Sessions Lost	Stable Session Count

Recovery Time

<u>3</u>. Term definitions

3.1 General Terms

3.1.1 Benchmark Planes

Definition:

The features, conditions, and behavior for the Accelerated Stress Benchmarking.

Discussion:

There are four Benchmark Planes: Control Plane, Data Plane, Management Plane, and Security Plane as shown in Figure 1. Configuration, Startup Conditions, Instability Conditions, and Failure Conditions used for each test are defined for each of these four Benchmark Planes.

Measurement units: N/A Issues: None See Also: Control Plane Data Plane Management Plane Security Plane

Poretsky and Rao

[Page 4]

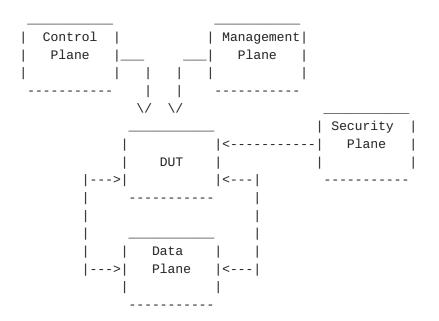


Figure 1. Router Accelerated Stress Benchmarking Planes

3.1.2 Configuration Sets

Definition:

The offered load, features, and scaling limits used during the Accelerated Stress Benchmarking.

Discussion:

There are four Configuration Sets: Control Plane Configuration Set, Data Plane Configuration Set, Management Plane Configuration Set, and Security Plane Configuration Set. The minimum Configuration Set that MUST be used is discussed in the Methodology document [4].

```
Measurement units:
N/A
```

Issues: None

See Also: Control Plane Configuration Set Data Plane Configuration Set Management Plane Configuration Set Security Plane Configuration Set

3.1.3 Startup Conditions

Definition:

Test conditions that occur at the start of the Accelerated Stress Benchmark to establish conditions for the remainder of the test.

Poretsky and Rao

[Page 5]

Terminology for Accelerated INTERNET-DRAFT March 2007 Stress Benchmarking Discussion: Startup Conditions may cause stress on the DUT and produce failure. Startup Conditions are defined for the Control Plane and Security Plane. Measurement units: N/A Issues: None See Also: Control Plane Startup Conditions Data Plane Startup Conditions Management Plane Startup Conditions Security Plane Startup Conditions 3.1.4 Instability Conditions Definition: Test conditions that occur during the Accelerated Stress Benchmark to produce instability and stress the DUT. Discussion: Instability Conditions are applied to the DUT after the Startup Conditions have completed. Instability Conditions occur for the Control Plane, Data Plane, Management Plane, and Security Plane. Measurement units: N/A Issues: None See Also: Control Plane Instability Conditions Data Plane Instability Conditions Management Plane Instability Conditions Security Plane Instability Conditions 3.1.5 Aggregate Forwarding Rate Definition: Sum of forwarding rates for all interfaces on the DUT during the Startup Phase. Discussion: Each interface of the DUT forwards traffic at some measured rate. The Aggregate Forwarding Rate is the

sum of forwarding rates for all interfaces on the DUT.

Poretsky and Rao

[Page 6]

Measurement units: pps Issues: None See Also: Startup Phase 3.1.6 Controlled Session Loss Definition: Control Plane sessions that are intentionally brought down during the Stress test. Discussion: Controlled Session Loss is performed during the test in order to stress the DUT by forcing it to tear down Control Plane sessions while handling traffic. It is assumed that the test equipment is able to control protocol session state with the DUT and is therefore able to introduce Controlled Session Loss. Measurement units: None Issues: None See Also: Uncontrolled Session Loss 3.1.7 Uncontrolled Session Loss Definition: Control Plane sessions that are in the down state but were not intentionally brought down during the Stress test. Discussion: The test equipment is able to control protocol session state with the DUT. The test equipment is also to monitor for sessions lost with the DUT which the test equipment itself did not intentionally bring down. Measurement units: N/A Issues:

None

See Also: Controlled Session Loss

Poretsky and Rao

[Page 7]

Terminology for Accelerated INTERNET-DRAFT March 2007 Stress Benchmarking 3.2 Benchmark Planes 3.2.1 Control Plane Definition: The Description of the control protocols enabled for the Accelerated Stress Benchmarking. Discussion: The Control Plane defines the Configuration, Startup Conditions, and Instability Conditions of the control protocols. Control Plane protocols MAY include routing protocols, multicast protocols, and MPLS protocols. These can be enabled or disabled for a benchmark test. Measurement units: N/A Issues: None See Also: Benchmark Planes Control Plane Configuration Set Control Plane Startup Conditions Control Plane Instability Conditions 3.2.2 Data Plane Definition: The data traffic profile used for the Accelerated Stress Benchmarking. Discussion: The Data Plane defines the Configuration, Startup Conditions, and Instability Conditions of the data traffic. The Data Plane includes the traffic and interface profile. Measurement Units: N/A See Also: Benchmark Planes Data Plane Configuration Set Data Plane Startup Conditions Data Plane Instability Conditions 3.2.3 Management Plane

Definition:

The Management features and tools used for the Accelerated Stress Benchmarking.

Poretsky and Rao

[Page 8]

Discussion: A key component of the Accelerated Stress Benchmarking is the Management Plane to assess manageability of the router under stress. The Management Plane defines the Configuration, Startup Conditions, and Instability Conditions of the management protocols and features. The Management Plane includes SNMP, Logging/Debug, Statistics Collection, and management configuration sessions such as telnet, SSH, and serial console. Measurement units: N/A Issues: None See Also: Benchmark Planes Management Plane Configuration Set Management Plane Startup Conditions Management Plane Instability Conditions 3.2.4 Security Plane Definition: The Security features used during the Accelerated Stress Benchmarking. Discussion: The Security Plane defines the Configuration, Startup Conditions, and Instability Conditions of the security features and protocols. The Security Plane includes the ACLs, Firewall, Secure Protocols, and User Login. Measurement units: N/A Issues: None See Also: Benchmark Planes Security Plane Configuration Set Security Plane Startup Conditions Security Plane Instability Conditions

Poretsky and Rao

[Page 9]

3.3 Startup

3.3.1 Startup Phase

Definition

The portion of the benchmarking test in which the Startup Conditions are generated with the DUT. This begins with the attempt to establish the first session and ends when the last Control Plane session is established.

Discussion:

The Startup Phase is the first Phase of the benchmarking test preceding the Instability Phase and Recovery Phase. It is specified by the Configuration Sets and Startup Conditions for each Benchmark Plane. The Startup Phase ends and Instability Phase MUST begin when the Configuration Sets are achieved with the DUT.

Measurement Units:

None

Issues:

The 'last control plane session is established' may not be a sufficient indicator that steady-state is achieved and Instability Conditions can be applied to begin the Instability Phase.

See Also:

Benchmark Plane Configuration Sets Startup Conditions Instability Phase Recovery Phase

3.3.2 Benchmarks

3.3.2.1 Stable Aggregate Forwarding Rate

Definition:

Average rate of traffic forwarded by the DUT during the Startup Phase.

Discussion:

Stable Aggregate Forwarding Rate is the calculated average of the Aggregate Forwarding Rates measured during the Startup Phase.

Measurement units:

pps

Poretsky and Rao

[Page 10]

Issues:

The act of the DUT establishing the Startup Conditions could influence the forwarding rate in certain implementations so that this "baseline" for the remainder of the test is lowered. The alternative is to change the definition of Stable Aggregate Forwarding Rate so that it is measured during the Startup Phase, but after Startup Conditions are achieved. The disadvantage of this definition would be that it loses measurement of any impact that establishing Startup Conditions would have on forwarding rate. When comparing the Startup Aggregate Forwarding Rate benchmark of two devices it is preferred to know the impact establishing Startup Conditions has on Forwarding Rate. The definition was therefore selected so that Stable Aggregate Forwarding Rate is calculated from measurement samples throughout the entire Startup Phase.

See Also:

Startup Phase Aggregate Forwarding Rate

3.3.2.2 Stable Latency

Definition:

Average measured latency of traffic forwarded by the DUT during the Startup Phase.

Discussion:

Stable Latency is the calculated average Latency during the Startup Phase.

Measurement units: seconds

Issues:

None

See Also: Startup Phase Stable Aggregate Forwarding Rate

3.3.2.3 Stable Session Count

Definition:

Total number of control plane sessions/adjacencies established and maintained by the DUT during the Startup Phase and prior to Instability Conditions being initiated. Discussion:

This measurement SHOULD be made after the Control Plane Startup Conditions are applied to the DUT.

Poretsky and Rao

[Page 11]

Measurement units: sessions Issues: None See Also: Startup Phase 3.3.3 Control Plane 3.3.3.1 Control Plane Configuration Set Definition: The routing protocols and scaling values used for the Accelerated Stress Benchmarking. Discussion: Control Plane Configuration Set is shown in Figure 2 and specifies the Routing Protocols, Multicast, and MPLS configuration. Specific protocols can be enabled or disabled for a benchmark test. Measurement units: N/A Issues: None See Also: Data Plane Configuration Set Management Configuration Set Security Configuration Set | MPLS Routing | | Multicast | _| Protocols | | Protocols |_ | Protocols | L 1 - - - - - - - - -_ _ _ _ _ _ _ _ _ _ _ _ _ 1 $\backslash /$ DUT |<----|

Figure 2. Control Plane Configuration Module

Poretsky and Rao

[Page 12]

Terminology for Accelerated INTERNET-DRAFT March 2007 Stress Benchmarking 3.3.3.2 Control Plane Startup Conditions Definition: Control Plane conditions that occur at the start of the Accelerated Stress Benchmarking to establish conditions for the remainder of the test. Discussion: Startup Conditions may cause stress on the DUT and produce failure. Startup Conditions for the Control Plane include session establishment rate, number of sessions established and number of routes learned. Measurement units: N/A Issues: None See Also: Startup Conditions Security Plane Startup Conditions Control Plane Configuration Set 3.3.4 Data Plane 3.3.4.1 Data Plane Configuration Set Definition: The data traffic profile enabled for the Accelerated Stress Benchmarking. Discussion: Data Plane Configuration Set includes the Traffic Profile and interfaces used for the Accelerated Stress Benchmarking. Measurement Units: N/A Issues: None See Also: Traffic Profile 3.3.4.2 Traffic Profile Definition The characteristics of the Offered Load to the DUT used for the Accelerated Stress Benchmarking. Discussion

The Traffic Profile specifies the number of packet size(s), packet rate per interface, number of flows, and encapsulation used for the offered load to the DUT.

Poretsky and Rao

[Page 13]

```
INTERNET-DRAFT
                      Terminology for Accelerated
                                                           March 2007
                         Stress Benchmarking
      Measurement Units:
      Traffic Profile is reported as follows:
        Parameter
                                        Units
        _ _ _ _ _ _ _ _ _ _ _
                                         - - - - - -
        Packet Size(s)
                                         bytes
        Packet Rate(interface)
                                         array of packets per second
        Number of Flows
                                         number
        Encapsulation(flow)
                                         array of encapsulation type
      Issues:
        None
      See Also:
        Data Plane Configuration Set
  3.3.5 Management Plane
  3.3.5.1 Management Plane Configuration Set
      Definition:
        The router management features enabled for the
        Accelerated Stress Benchmark.
      Discussion:
        A key component of the Accelerated Stress Benchmark is the
        Management Configuration Set to assess manageability of the
        router under stress. The Management Configuration Set defines
        the management configuration of the DUT. Features that are
        part of the Management Configuration Set include access, SNMP,
        Logging/Debug, and Statistics Collection, and services such as
        FTP, as shown in Figure 3. These features SHOULD be enabled
        throughout the Stress test.
      Measurement units:
      N/A
      Issues:
        None
      See Also:
        Control Plane Configuration Set
        Data Plane Configuration Set
      Security Plane Configuration Set
```

Poretsky and Rao

Terminology for Accelerated March 2007 Stress Benchmarking

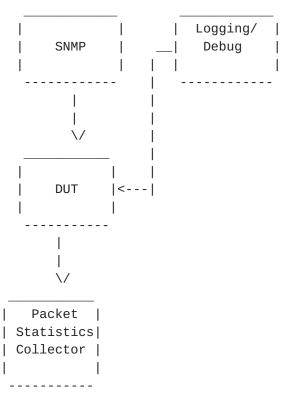


Figure 3. Management Plane Configuration Set

3.3.6 Security Plane

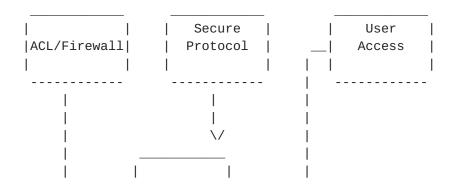
3.3.6.1 Security Plane Configuration Set

Definition:

Security features and scaling enabled for the Accelerated Stress Test.

Discussion:

The Security Plane Configuration Set includes the configuration and scaling of ACLs, Firewall, IPsec, and User Access, as shown in Figure 4. Tunnels SHOULD be established and policies configured. Instability is introduced by flapping tunnels and configuring and removing policies.



|----->| DUT |<-----| | | Figure 4. Security Configuration Module

Poretsky and Rao

[Page 15]

Measurement units: N/A Issues: None See Also: ACL Configuration Set Secure Protocol Configuration Set Password Login Configuration Set 3.3.6.2 Security Plane Startup Conditions Definition: Security Plane conditions that occur at the start of the Accelerated Stress Benchmarking to establish conditions for the remainder of the test. Discussion: Startup Conditions may cause stress on the DUT and produce failure. Startup Conditions for the Security Plane include session establishment rate, number of sessions established and number of policies learned, and number of user access sessions opened. Measurement units: N/A Issues: None See Also: Startup Conditions Data Plane Startup Conditions Management Plane Startup Conditions Security Plane Startup Conditions 3.4 Instability 3.4.1 Instability Phase Definition: The portion of the benchmarking test in which the Instability Conditions are offered to the DUT. Discussion: The Instability Phase is the middle Phase of of the benchmarking test following the Startup Phase and preceding the Recovery Phase.

Measurement Units: None

Poretsky and Rao

[Page 16]

Issues: None See Also: Instability Conditions Startup Phase **Recovery Phase** 3.4.2 Benchmarks 3.4.2.1 Unstable Aggregate Forwarding Rate Definition: Rate of traffic forwarded by the DUT during the Instability Phase. Discussion: Unstable Aggregated Forwarding Rate is an instantaneous measurement of the Aggregate Forwarding Rate during the Instability Phase. Measurement units: pps Issues: None See Also: Instability Conditions Aggregate Forwarding Rate 3.4.2.2 Aggregate Forwarding Rate Degradation Definition: The reduction in Aggregate Forwarding Rate during the Instability Phase. Discussion: The Aggregate Forwarding Rate Degradation is calculated for each measurement of the Unstable Aggregate Forwarding Rate. The Aggregate Forwarding Rate Degradation is calculated by subtracting each measurement of the Unstable Aggregate Forwarding Rate from the Stable Aggregate Forwarding Rate, such that Aggregate Forwarding Rate Degradation= Stable Aggregate Forwarding Rate -Unstable Aggregate Forwarding Rate Ideally, the Aggregate Forwarding Rate Degradation is zero. Measurement Units: pps

Poretsky and Rao

[Page 17]

```
INTERNET-DRAFT
                      Terminology for Accelerated
                                                          March 2007
                         Stress Benchmarking
      Issues:
        None
     See Also:
        Instability Phase
        Unstable Aggregate Forwarding Rate
   3.4.2.3 Average Aggregate Forwarding Rate Degradation
     Definition
        DUT Benchmark that is the calculated average of the
        obtained Degraded Forwarding Rates.
     Discussion:
        Average Aggregate Forwarding Rate Degradation=
        (Sum (Stable Aggregate Forwarding Rate) -
        Sum (Unstable Aggregate Forwarding Rate)) / Number of Samples
     Measurement Units:
        pps
     Issues:
        None
     See Also:
        Aggregate Forwarding Rate Degradation
   3.4.2.4 Unstable Latency
     Definition:
        The average increase in measured packet latency during
        the Instability Phase compared to the Startup Phase.
     Discussion:
        Latency SHOULD be measured at a fixed interval during the
        Instability Phase. Unstable Latency is the difference
        between Stable Latency and the average Latency measured
        during the Instability Phase. It is expected that there
        be an increase in average latency from the Startup Phase
        to the Instability phase, but it is possible that the
        difference be zero. The Unstable Latency cannot be a
        negative number.
     Measurement units:
        seconds
     Issues:
        None
```

See Also: Instability Phase Stable Latency

Poretsky and Rao

[Page 18]

```
Terminology for Accelerated
INTERNET-DRAFT
                                                          March 2007
                         Stress Benchmarking
  3.4.2.5 Unstable Uncontrolled Sessions Lost
     Definition:
       Control Plane sessions that are in the down state
       but were not intentionally brought down during the
       Instability Phase.
     Discussion:
       The test equipment is able to control protocol
       session state with the DUT. The test equipment
       is also to monitor for sessions lost with the
       DUT which the test equipment itself did not
       intentionally bring down.
     Measurement units:
       sessions
     Issues:
       None
     See Also:
       Controlled Session Loss
       Uncontrolled Session Loss
  3.4.3 Instability Conditions
  3.4.3.1 Control Plane Instability Conditions
     Definition:
       Control Plane conditions that occur during the Accelerated Stress
       Benchmark to produce instability and stress the DUT.
     Discussion:
       Control Plane Instability Conditions are experienced by the DUT
       after the Startup Conditions have completed. Control Plane
       Instability Conditions experienced by the DUT include session
       loss, route withdrawal, and route cost changes.
     Measurement units:
       N/A
     Issues:
       None
     See Also:
       Instability Conditions
       Data Plane Instability Conditions
       Management Plane Instability Conditions
       Security Plane Instability Conditions
```

Poretsky and Rao

[Page 19]

Terminology for Accelerated INTERNET-DRAFT March 2007 Stress Benchmarking 3.4.3.2 Data Plane Instability Conditions Definition: Data Plane conditions that occur during the Accelerated Stress Benchmark to produce instability and stress the DUT. Discussion: Data Plane Instability Conditions are experienced by the DUT after the Startup Conditions have completed. Data Plane Instability Conditions experienced by the DUT include interface shutdown, link loss, and overloaded links. Measurement units: N/A Tssues: None See Also: Instability Conditions Control Plane Instability Conditions Management Plane Instability Conditions Security Plane Instability Conditions 3.4.3.3 Management Plane Instability Conditions Definition: Management Plane conditions that occur during the Accelerated Stress Benchmark to produce instability and stress the DUT. Discussion: Management Plane Instability Conditions are experienced by the DUT after the Startup Conditions have completed. Management Plane Instability Conditions experienced by the DUT include repeated FTP of large files. Measurement units: N/A Issues: None See Also: Instability Conditions Control Plane Instability Conditions Data Plane Instability Conditions Security Plane Instability Conditions 3.4.3.4 Security Plane Instability Conditions

Definition:

Security Plane conditions that occur during the Accelerated Stress Benchmark to produce instability and stress the DUT.

Poretsky and Rao

[Page 20]

Stress Benchmarking Discussion: Security Plane Instability Conditions are experienced by the DUT after the Startup Conditions have completed. Security Plane Instability Conditions experienced by the DUT include session loss and uninitiated policy changes.

Measurement units:

N/A

INTERNET-DRAFT

Issues: None

See Also: Instability Conditions Control Plane Instability Conditions Data Plane Instability Conditions Management Plane Instability Conditions

- 3.5 Recovery
- 3.5.1 Recovery Phase
 - Definition:

The portion of the benchmarking test in which the Startup Conditions are generated with the DUT, but the Instability Conditions are no longer offered to the DUT.

Terminology for Accelerated

Discussion:

The Recovery Phase is the final Phase of the benchmarking test following the Startup Phase and Instability Phase. Startup Conditions MUST NOT be Restarted.

Measurement Units: None

Issues:

None

See Also: Startup Conditions Startup Phase Instability Conditions Instability Phase

3.5.2 Benchmarks 3.5.2.1 Recovered Aggregate Forwarding Rate Definition Rate of traffic forwarded by the DUT during the Recovery Phase.

Poretsky and Rao

[Page 21]

Discussion: Recovered Aggregate Forwarding Rate is an instantaneous measurement of the Aggregate Forwarding Rate during the Recovery Phase. Ideally, each measurement of the Recovered Aggregate Forwarding Rate equals the Stable Aggregate Forwarding Rate because the Instability Conditions do not exist in both the Startup and Recovery Phases. Measurement Units: pps Issues: None See Also: Aggregate Forwarding Rate **Recovery Phase** Recovered Aggregate Forwarding Rate Startup Phase Stable Aggregate Forwarding Rate 3.5.2.2 Recovered Latency Definition: The average increase in measured packet latency during the Recovery Phase compared to the Startup Phase. Discussion: Latency SHOULD be measured at a fixed interval during the Recovery Phase. Unstable Latency is the difference between Stable Latency and the average Latency measured during the Recovery Phase. It is expected that there be no increase in average latency from the Startup Phase to the Recovery Phase. The Recovered Latency cannot be a negative number. Measurement units: seconds

Issues: None

See Also: Recovery Phase Stable Latency

3.5.2.3 Recovery Time

Definition The amount of time for the Recovered Aggregate Forwarding Rate to become equal to the Stable Aggregate Forwarding Rate.

Poretsky and Rao

[Page 22]

Discussion Recovery Time is measured beginning at the instant the Instability Phase ends until the Recovered Aggregate Forwarding Rate equals the Stable Aggregate Forwarding Rate for a minimum duration of 180 consecutive seconds. Measurement Units: milliseconds Issues: None See Also: Recovered Aggregate Forwarding Rate Stable Aggregate Forwarding Rate 3.5.2.4 Recovered Uncontrolled Control Plane Sessions Lost Definition: Control Plane sessions that are in the down state but were not intentionally brought down during the Recovery Phase. Discussion: The test equipment is able to control protocol session state with the DUT. The test equipment is also to monitor for sessions lost with the DUT which the test equipment itself did not intentionally bring down. Measurement units: sessions Tssues: None See Also: Controlled Session Loss Uncontrolled Session Loss 3.5.2.5 Variability Benchmarks Definition: The difference between the measured Benchmarks of the same DUT over multiple iterations. Discussion: Ideally, the measured benchmarks should be the same for multiple iterations with the same DUT. Configuration Sets and

Instability Conditions MUST be held constant for this benchmark. Whether the DUT can exhibit such predictable and repeatable behavior is an important benchmark in itself.

Poretsky and Rao

[Page 23]

Terminology for Accelerated Stress Benchmarking

Measurement units: As applicable to each Benchmark. The results are to be presented in a table format for successive Iterations. Ideally, the differences should be zero.

```
Issues:
```

```
None
```

See Also: Startup Period Instability Period Recovery Period

4. IANA Considerations

This document requires no IANA considerations.

<u>5</u>. Security Considerations

Documents of this type do not directly affect the security of the Internet or of corporate networks as long as benchmarking is not performed on devices or systems connected to operating networks.

6. References

6.1 Normative References

- [1] Bradner, S., Editor, "Benchmarking Terminology for Network Interconnection Devices", <u>RFC 1242</u>, March 1991.
- [2] Mandeville, R., "Benchmarking Terminology for LAN Switching Devices", <u>RFC 2285</u>, June 1998.
- [3] Bradner, S. and McQuaid, J., "Benchmarking Methodology for Network Interconnect Devices", <u>RFC 2544</u>, March 1999.
- [4] Poretsky, S. and Rao, S., "Methodology Guidelines for Accelerated Stress Benchmarking", <u>draft-ietf-bmwg-acc-bench-meth-07</u>, work in progress, March 2007.
- [5] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", <u>RFC 2119</u>, March 1997.

6.2 Informative References

- [RFC3871] Jones, G., "Operational Security Requirements for Large Internet Service Provider (ISP) IP Network Infrastructure.", IETF <u>RFC 3871</u>, September 2004.
- [NANOG25] Poretsky, S., "Core Router Evaluation for Higher Availability", NANOG 25, June 8, 2002, Toronto, CA.

[IEEECQR] Poretsky, S., "Router Stress Testing to Validate Readiness for Network Deployment", IEEE CQR 2003.

Poretsky and Rao

[Page 24]

7. Author's Address

Scott Poretsky Reef Point Systems 8 New England Executive Park Burlington, MA 01803 USA Phone: + 1 781 395 5090 EMail: sporetsky@reefpoint.com Shankar Rao 1801 California Street 8th Floor **Owest Communications** Denver, CO 80202 USA Phone: + 1 303 437 6643 Email: shankar.rao@qwest.com Appendix 1. White Box Benchmarking Terminology Minimum Available Memory Definition: Minimum DUT Available Memory during the duration of the Accelerated Stress Benchmark. Discussion: This benchmark enables the assessment of resources in the DUT. It is necessary to monitor DUT memory to measure this benchmark. Measurement units: bytes Issues: None See Also: Maximum CPU Utilization Maximum CPU Utilization Definition: Maximum DUT CPU utilization during the duration of the Accelerated Stress Benchmark. Discussion:

This benchmark enables the assessment of resources in the DUT. It is necessary to monitor DUT CPU Utilization to measure this benchmark.

Measurement units: %

Issues: None

See Also: Minimum Available Memory

Poretsky and Rao

[Page 25]

Full Copyright Statement

Copyright (C) The IETF Trust (2007).

This document is subject to the rights, licenses and restrictions contained in $\underline{BCP 78}$, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in <u>BCP 78</u> and <u>BCP 79</u>.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at http://www.ietf.org/ipr.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

Poretsky and Rao

[Page 26]