Network Working Group
INTERNET-DRAFT
Expires in: April 2004

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October 2003

Framework for Accelerated Stress Benchmarking
<draft-ietf-bmwg-acc-bench-framework-00.txt>

Abstract
This document provides a framework for executing the Accelerated Stress Benchmarking. It is intended that this framework be applied with the Terminology document when using the Methodology document. Discussion to specify and apply Startup Conditions, Configuration Sets, and Instability Conditions is provided with examples. The motivation and benefits of stress testing are also discussed.

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1. Introduction

This document provides the motivation and framework to perform Accelerated Stress Benchmarking. The terminology to be used for Accelerated Stress Benchmarking is defined in [1] and the methodology is provided in [2]. This document discusses how to apply the terminology to the benchmarking for producing effective reproducible tests. Configuration Sets, Startup Conditions, and Instability Conditions are defined [1] and examples are provided in this document.

2. Existing definitions

RFC 1242 "Benchmarking Terminology for Network Interconnect Devices" and RFC 2285 "Benchmarking Terminology for LAN Switching Devices" 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 Section 2 of RFC 1242. 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 RFC 2119.

3. Motivation for Accelerated Stress Benchmarking

Router testing benchmarks have consistently been made in a monolithic fashion in which a single protocol or behavior is measured in an isolated environment. It is important to know the limits for a router/switch's (hereby referred to as Router) behavior for each protocol, however this does not produce a reliable benchmark of the router's behavior in a deployed network. Routers in an operational network are simultaneously configured with multiple protocols and security policies while forwarding traffic and being managed.

To accurately benchmark a router for deployment it is necessary to test that router in operational conditions by simultaneously configuring the network protocols and security policies, sourcing

traffic, and managing the router. The benchmarks are externally

observable as control plane or data plane errors at the DUT. It is helpful to accelerate these network operational conditions so that the DUT can be benchmarked with faster test duration. Accelerated Stress Testing of routers provides the following benefits:

1. Evaluation of multiple protocols enabled simultaneously as configured in deployed networks
2. Evaluation of System and Software Stability
3. Evaluation of Manageability under stressful conditions
4. Identification of Software Coding bugs such as:
    a. Memory Leaks
    b. Suboptimal CPU Utilization
    c. Coding Logic

These benefits produce three advantages for netowrk operations:

1. Increased stability of routers and protocols
2. Hardened routers to DoS attacks
3. Verified manageability under stress

4. Application of Configuration Sets

Configuration Sets are defined in [1] for the Control Plane, Data Plane, Management Plane, and Security Plane. It is intended that the user of these documents specify the specific parameters of the Configuration Set based upon applicability to the device and network. Example Configuration Sets are provided below.

4.1 Control Plane Configuration Sets

Key protocols for the Control Plane are Routing Protocols, MPLS Signaling Protocols, and Multicast Protocols. Examples for these are as follow:

Example Routing Protocol Configuration Set-

PARAMETER	UNITS
BGP	Enabled/Disabled
Number of EBGP Peers	Peers
Number of IBGP Peers	Peers
Number of BGP Route Instances	Routes
Number of BGP Installed Routes	Routes
MBGP	Enabled/Disabled
Number of MBGP Route Instances	Routes
Number of MBGP Installed Routes	Routes
ISIS	Enabled/Disabled
ISIS-TE	Enabled/Disabled
Number of ISIS Adjacencies	Adjacencies
Number of ISIS Routes	Routes
Number of Nodes per Area	Nodes

OSPF	Enabled/Disabled
OSPF-TE	Enabled/Disabled
Number of OSPF Adjacencies	Adjacencies
Number of OSPF Routes	Routes
Number of Nodes per Area	Nodes

Example MPLS Protocol Configuration Set-

PARAMETER	UNITS
MPLS-TE	
Number of Ingress Tunnels	Tunnels
Number of Mid-Point Tunnels	Tunnels
Number of Egress Tunnels	Tunnels
LDP	
Number of Sessions	Sessions
Number of FECs	FECs

Example Multicast Protocol Configuration Set-

PARAMETER	UNITS
PIM-SM	Enabled/Disabled
RP	Enabled/Disabled
Number of Multicast Groups	Groups
MSDP	Enabled/Disabled

4.2 Data Plane Configuration Set

The Data Plane Configuration Set includes the Traffic Profile as defined in [1]. The example configuration set is as follows:

Example Data Plane Configuration Set-

PARAMETER	UNITS
Traffic Forwarding	Enabled/Disabled
Aggregate Offered Load	bps (or pps)
Number of Ingress Interfaces	number
Number of Ingress Interfaces	number
TRAFFIC PROFILE	
Packet Size(s)	bytes
Packet Rate(interface)	array of packets per second
Number of Flows	number
Encapsulation(flow)	array of encapsulation type

4.3 Management Configuration Set

The Management Configuration Set can include SNMP, Logging, Debug, Telnet, FTP, SSH, and RADIUS parameters. An example is as follows:

Example Management Configuration Set-

PARAMETER	UNITS
SNMP GET Rate	SNMP Gets/minute
Logging	Enabled/Disabled
Protocol Debug	Enabled/Disabled
Telnet Rate	Sessions/Hour
FTP Rate	Sessions/Hour
Concurrent Telnet Sessions	Sessions
Concurrent FTP Session	Sessions
Packet Statistics Collector	Enabled/Disabled
Statistics Sampling Rate	X:1 packets

4.4 Security Configuration Set

The Security Configuration Set can include Packet Filters and Access session restrictions. An example is as follows:

Example Security Configuration Set -

PARAMETER	UNITS
Packet Filters	Enabled/Disabled
Number of Filters For-Me	number
Number of Filter Rules For-Me	number
Number of Traffic Filters	number
Number of Traffic Filter Rules	number
SSH	Enabled/Disabled
Number of simultaneous SSH sessions	number
RADIUS	Enabled/Disabled
TACACS	Enabled/Disabled

5. Application of Startup Conditions

Startup conditions are the conditions that must be met in order for Accelerated Stress benchmarking to begin. Startup Conditions specify how a particular Configuration Set should be obtained. Example Startup Conditions include:

PARAMETER	UNITS
Routing Session Establishment Rate	sessions per minute
User Config Session Establishment Rate	number per minute
Security Session Establishment Rate	number per

minute

Routes Learned Rate routes per minute

MPLS LSPs Establishment Rate number per minute

6. Application of Instability Conditions

Test conditions that occur during the Accelerated Stress Test should simulate instability in an operational network. Repeating these conditions should stress the SUT. Example Instability Conditions are provided below:

PARAMETER	UNITS
Interface Shutdown Cycling Rate	interfaces per minute
BGP Session Loss Rate	sessions per minute
BGP Route Flap Rate	routes per minutes
IGP Route Flap Rate	routes per minutes
Route Convergence from Better Next-Hop	routes per minutes
LSP Reroute Rate	LSP per minute
Overloaded Links	number
Amount Links Overloaded	% of bandwidth
FTP Rate	Mb/ minute
IPsec Session Loss	sessions per minute
Filter Policy Changes	policies per minute
SSH Session Re-Start	SSH sessions per minute

7. Accelerated Stress Benchmarking Application

The Accelerated Stress Benchmarking test can be applied in service provider test environments to benchmark DUTs under stress in an environment that is reflective of an operational network. A particular Configuration Set is defined and the DUT is benchmarked using this and the Instability Conditions. Varying ConfigurationSets and/or Instability Conditions for repeated iterations can provide a characterization of the DUT to help determine future network deployments.

8. Security Considerations

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

9. References

[1] Poretsky, Scott, Rao, Shankar, and Piatt, Ray, "Terminology for Accelerated Stress Benchmarking, draft-ietf-bmwg-acc-bench-term-01, work in progress, October 2003.

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