

ENERGY STAR®

Large Network Equipment: Draft 1 Specification and Draft 2 Test Method Webinar

August 13, 2013

U.S. Environmental Protection Agency
U.S. Department of Energy

Agenda



- 1 Introduction
- 2 Draft 1 Specification Overview
- 3 Draft 2 Test Method Overview
- 4 Timeline and Open Comments

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- 1** Introduction
- 2 Draft 1 Specification Overview
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Meeting Introduction



- EPA and DOE encourage all stakeholders to continue to participate in the development of the ENERGY STAR specification for Large Network Equipment
 - Stakeholder participation is critical to the specification development.
 - EPA and DOE look forward to continuing the development of the specification and test method based on stakeholder feedback.
- Note: All slides will be posted to the ENERGY STAR Large Network Equipment website

Webinar Details



- Webinar slides and related materials will be available on the Large Network Equipment Web page:
 - www.energystar.gov/newspecs
 - Follow link to “Version 1.0 is in Development” under “Large Network Equipment”
- Audio provided via teleconference:
 - Call in:** +1 (877) 423-6338 (U.S.)
+1 (571) 281-2578 (International)
 - Code:** 436598#
 - Phone lines will remain open during discussion
 - Please mute line unless speaking
 - Press *6 to mute and *6 to un-mute your line

Webinar Goals



Cover topics in the Draft 1 Specification related to:

1. Definitions and Scope
2. Energy Efficiency Criteria
3. Information Management and Reporting Requirements

Cover topics in the Draft 2 Test Method related to:

1. Power over Ethernet (PoE)
2. High- and Low-utilization Tests
3. Ambient Temperature Requirement
4. Pluggable and Interchangeable Modules
5. Test Data Format and Idle-link Period Distribution
6. Mesh and Half-port Configurations
7. UUT Reconfiguration and handling of UUTs with multiple PSUs

Written Comments



- In addition to making verbal comments during the meeting, stakeholders are strongly encouraged to submit written comments and helpful information.
- Please send all comments to:

largenetwork@energystar.gov

Comment Deadline

Friday, August 29

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Summary of Specification



- Fills in as much as possible
 - New definitions
 - Updated scope
 - Proposals for efficiency requirements
- Still much TBD
 - Will fill in, edit based on feedback
 - Continue conversation from Framework Document
 - Will have a Draft 2, possibly Draft 3 to complete

Definitions



- LNE vs. SNE: EPA welcomes stakeholder feedback on alternative means to delineate between SNE and LNE, for potential implementation in both specifications if warranted.
- Fixed vs. Modular: Proposing to separate fixed and modular LNE products by whichever port type is more prevalent in the product.

Definitions



- Switches: Revised the Switch definition to clarify that devices which perform native data link layer switching and also encapsulate data frames in network packets for intra/extra network routing at multiple link layers (e.g. 2,3) are considered switches for ENERGY STAR.
- VPN: Clarified that VPN servers are included within the security appliance definition.

Definitions



- Processor vs. Network Managed: Revised the product management definitions to separate products by whether they are managed by a co-processor in the product itself, or by a separate product within the network.
- Core vs. Edge Products: Proposing to separate products which are often not fully loaded or connected from products which face routinely higher loads and are typically fully loaded.

Definitions



- Primary Components: Developed new definitions for the following primary LNE components:
 - PSU and associated PSU sub-definitions
 - Standard Equipment Rack
 - Modular Chassis
 - Backplane
 - Line Card
 - Processor

Definitions



- Other Enterprise/Data Center IT Equip: Developed the following definitions to provide additional clarity for LNE scope exclusions:
 - Existing ENERGY STAR definitions:
 - SNE
 - Computer Server
 - Storage Product
 - UPS
 - New proposed definitions:
 - Storage Networking Product
 - DSLAM and CMTS
 - Network Caching Device
 - Load Balancing Device

Definitions



- Operational States: Simplified this section to include only active and idle states
 - EPA welcomes feedback on how prevalent other low power states are in the market, knowing there are some LNE products with these optional states
- Additional Terms:
 - Clarified that fiber-optic connections are not considered Physical Network Ports
 - Proposing definitions for uplink and downlink ports
 - Updated IEEE references to EEE and PoE definitions

Definitions



- Product Family: EPA will further develop this definition once sufficient product data is gathered to determine the most logical groupings of configurations in order to accurately and fairly represent LNE product families
- Potential configuration types under consideration:
 - Maximum Configuration
 - Minimum Configuration
 - Typical Configuration

Eligible Product Categories



- Proposed in scope:
 - Fixed Routers
 - Fixed Switches
 - Modular Switches
 - Modular Routers

Eligible Product Categories



- Proposed out of scope:
 - Small Network Equipment
 - Computer Servers, including blade switches sold within a Blade Server configuration
 - Storage Products, including Blade Storage
 - Storage Networking Products
 - Security Appliances
 - Access Point Controllers
 - DSLAM/CMTS equipment
 - Network Caching Devices
 - Load Balancing Devices

Energy Efficiency Criteria - PSUs



- PSU Efficiency Requirements:
 - 80Plus Gold
 - Additional 80% efficiency requirement at 10% load
 - 10% load requirement is vital to assess performance of PSU in products that supply PoE power which may be bought and/or tested with an overcapacity PSU
 - Requirements (including 10% load point) match those found in the Version 2.0 Computer Servers Eligibility Criteria, which share many internal components
- PSU power factor requirements match those used in Version 2.0 Computer Servers and Version 1.0 Data Center Storage Eligibility Criteria

Energy Efficiency Criteria - PSUs



Table 2: Efficiency Requirements for PSUs

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
Multi-output	All Output Levels	N/A	85%	88%	85%
Single-output	All Output Levels	80%	88%	92%	88%

Table 3: Power Factor Requirements for PSUs

Power Supply Type	Rated Output Power	10% Load	20% Load	50% Load	100% Load
Multi-output	All Output Ratings	N/A	0.80	0.90	0.95
Single-output	Output Rating \leq 500 W	N/A	0.80	0.90	0.95
	Output Rating > 500 W and Output Rating \leq 1,000 W	0.65	0.80	0.90	0.95
	Output Rating > 1,000 watts	0.80	0.90	0.90	0.95

Energy Efficiency Criteria – Energy Efficiency Features



- Four required features in Draft 1:
 - Port Power Down
 - Remote Port Administration
 - Adaptive Active Cooling
 - Energy Efficient Ethernet
- EPA would like to further discuss how to incentivize and accelerate the adoption of:
 - Scaling power dynamically with level of product utilization
 - Operating at higher ambient temperature and humidity

Energy Efficiency Criteria – Active State for Fixed Products



- Active state efficiency requirements
 - Developed in more detail in subsequent drafts
 - Require gathering additional data to support level setting.
 - EPA intends to publish active state test data for fixed products on the ENERGY STAR website as part of the certification process
- Goal: Develop a simple, easy-to-understand energy performance calculation to allow apples to apples comparison of similar LNE products.

Energy Efficiency Criteria – Active State for Modular Products



- Active state power and performance data
 - Reported for all modular products as a requirement to gain ENERGY STAR certification.
- No additional active state efficiency criteria or level setting will be proposed in Version 1.0.
- EPA welcomes stakeholder feedback on:
 - Appropriate boundaries and configuration guidance for standardized testing
 - Creating a representative product family.

Standard Information Reporting Requirements



- Terms:
 - Qualified Product Exchange (QPX): The submission form used by certification bodies to provide product data to EPA.
 - Qualified Product List (QPL): The ENERGY STAR online database that lists product information. A subset of the QPX.
- All data fields in the ENERGY STAR Version 1.0 LNE QPX form must be submitted for certification.
- A subset of these fields will be displayed on the ENERGY STAR website. A list of the proposed fields for publication can be found in Section 4.1.2 of the Draft 1 Specification
- EPA welcomes feedback on additional information that should be displayed
- More detailed review of particular data to submit, display will occur during Draft 3/Final Draft stages next year.

Standard Performance Data Measurement and Output Reqs.



- Proposing that all core products, more likely to be found in data center like environments, must meet the following requirements:
 - Reporting of input power in watts
 - Reporting of air inlet temperature
 - Reporting implementation requirements
 - Sampling and/or timestamping requirements on reported data
 - Documentation requirements
- More detail on these requirements can be found in Section 5.1 of the Draft 1 Specification

Standard Performance Data Measurement and Output Reqs.



- EPA received feedback that many LNE products are able to collect additional information in real or near-real time including:
 - Throughput
 - Latency
 - Utilization
- EPA welcomes stakeholder feedback on whether these additional variables should also be required to be reported by core products

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Review of Draft 2 Test Method



The Draft 2 Test Method includes modifications regarding:

1. Power over Ethernet (PoE)
2. High- and Low-utilization Tests
3. Ambient Temperature Requirement
4. Pluggable Modules
5. Interchangeable Modules
6. Test Data Format
7. Idle-link Period Distribution
8. Mesh Configuration
9. Half-port Test Configuration
10. UUT Reconfiguration
11. UUTs with Multiple PSUs

Test Method Revision #1: PoE Load Testing



Draft 1 Test Method

PoE load test included



Draft 2 Test Method

PoE load testing not included.

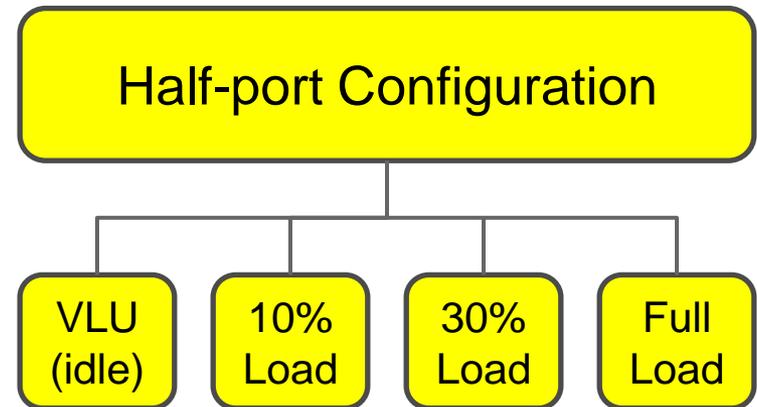
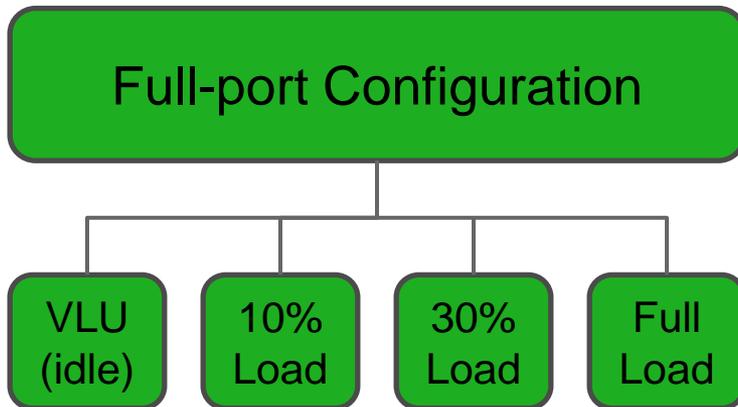
- PoE testing can be complex and burdensome.
- PoE delivery efficiency is closely tied to PSU efficiency.
- The ability to provide PoE can affect a product's energy consumption; this may be addressed at a later date.

Test Method Revision #2: High- and Low-utilization Tests



Draft 1 Test Method

Full-port with 4 load levels and half-port with 4 load levels

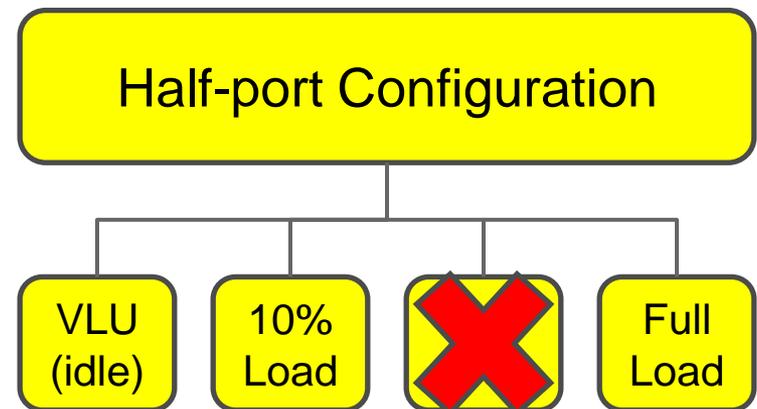
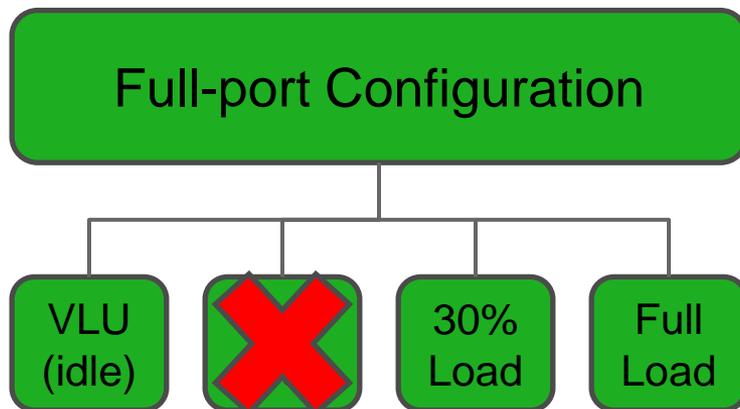


Test Method Revision #2: High- and Low-utilization Tests



Draft 2 Test Method

Full-port with 3 load levels and half-port with 3 load levels



Test Method Revision #3: Ambient Temperature Requirement



Draft 1 Test Method

Ambient temperature
requirement:
 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$



Draft 2 Test Method

Ambient temperature
requirement:
 $27^{\circ}\text{C} \pm 1^{\circ}\text{C}$

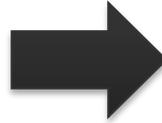
- A stakeholder commented that a range of 10°C may introduce repeatability issues.
- Draft 2 also requires that the temperature sensor is placed within 50mm of the UUT's main airflow inlet.

Test Method Revision #4: Pluggable Modules



Draft 1 Test Method

Highest throughput copper-based pluggable module



Draft 2 Test Method

Any pluggable module supported by the UUT

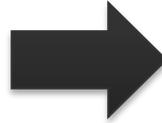
- Copper-based pluggable modules may not always be appropriate, or even supported.
- Pluggable module selection affects power draw and may be addressed at a later date.

Test Method Revision #5: Interchangeable Modules



Draft 1 Test Method

No requirements given



Draft 2 Test Method

All ports must be of the
same type and speed
(or per uplink & downlink
group)

- Port uniformity avoids potential complications that might arise from using “mixed” port-types, improving repeatability.

Test Method Revision #6: Test Data Format



Draft 1 Test Method

No requirements given



Draft 2 Test Method

IPv4 & Ethernet

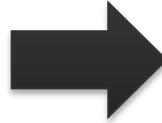
- Specifying traffic formatting improves repeatability and harmonizes with the ATIS-0600015.03.2013.

Test Method Revision #7: Idle-link Period Distribution



Draft 1 Test Method

No requirements given



Draft 2 Test Method

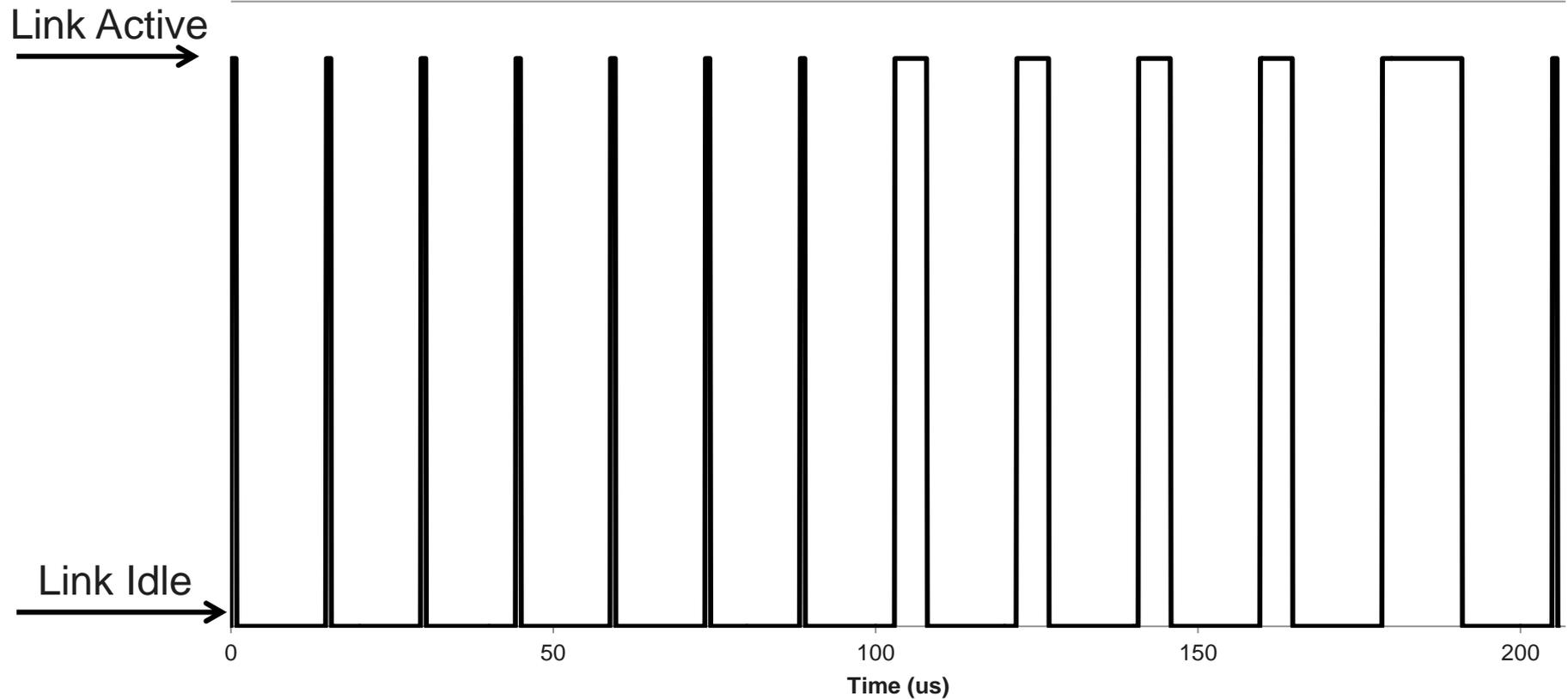
Uniform distribution

- Idle-link period distribution affects the energy consumption of products with EEE.
- Uniform idle-link period distribution is commonly supported by test equipment.

Test Method Revision #7: Idle-link Period Distribution



Example of Uniformly Distributed Idle-link Period



Test Method Revision #8: Mesh Configuration



Dual-group partial mesh shall be used if...

Draft 1 Test Method

...ports can be partitioned into two distinct groups



Draft 2 Test Method

...“uplink” and “downlink” ports are clearly labeled on the product

- Some products have ports that can be arbitrarily partitioned into an arbitrary number of groups.

Test Method Revision #9: Half-port Test Configuration



When dual-group partial mesh is used...

Draft 1 Test Method

Ports connected:
Uplink: half
Downlink: half



Draft 2 Test Method

Ports connected:
Uplink: all
Downlink: half

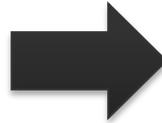
- A stakeholder commented that it is uncommon for only half of the uplink ports to be connected.

Test Method Revision #10: UUT Reconfiguration



Draft 1 Test Method

No requirements given



Draft 2 Test Method

All configuration must occur
before testing begins

- Reconfiguration after testing begins may produce results that are unrepresentative of a product's expected operation.

Test Method Revision #11: UUTs with Multiple PSUs



If a UUT has multiple PSUs, then...

Draft 1 Test Method

Connect each PSU to a single power meter using a PDU



Draft 2 Test Method

- Connect each PSU to:
1. a separate power meter; or
 2. a separate input channel on a single power meter.

- A stakeholder commented that some PDUs consume energy, which could affect repeatability.

Summary of Proposed Changes



Topic	Draft 1 Test Method	Draft 2 Test Method
Power over Ethernet (PoE)	PoE test included	No PoE test
High- and Low-utilization Tests	Full-port: VLU, 10%, 30%, 100%; Half-port: VLU, 10% 30%, 100%	Full-port: VLU, 30%, 100% Half-port: VLU, 10%, 100%
Ambient Temperature	25° C +/- 5° C	27° C +/- 1° C

Summary of Proposed Changes



Topic	Draft 1 Test Method	Draft 2 Test Method
Pluggable Modules	Highest throughput copper-based must be used	Any supported may be used
Interchangeable Modules	No requirements given	All ports same type and speed
Test Data Format	No requirements given	IPv4 & Ethernet

Summary of Proposed Changes



Topic	Draft 1 Test Method	Draft 2 Test Method
Idle-link Period Distribution	No requirements given	Uniform distribution
Mesh Configuration	Dual-group partial mesh if ports can be partitioned	Dual-group partial mesh if “uplink” and “downlink” are labeled
Half-port Test Configuration	For dual-group partial mesh, half of the uplink ports connected.	For dual-group partial mesh, all of the uplink ports connected

Summary of Proposed Changes



Topic	Draft 1 Test Method	Draft 2 Test Method
UUT Reconfiguration	No requirements given	All UUT configuration must occur before testing begins
UUTs with Multiple PSUs	Multiple PSUs requires a PDU	Multiple PSUs requires multiple meters or multiple channels

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Timeline



- Rough timing of future document releases
 - Dependent on comments received and decisions made during development
- July 2014
 - Draft 1 specification and Draft 2 test method released
- November 2014
 - Draft 2 specification, Final Draft Test Method
- March 2015
 - Draft 3 specification, Final Test Method
- May 2015
 - Final Draft spec
- July 2015
 - Final specification released, effective

Open Comment



- EPA and DOE would now like to open the line for any additional comments or questions.

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