

LG-Ericsson iPECS ES-3024G/GP Gigabit Managed Switches: Performance, Power Consumption, Features & Interoperability vs Cisco Systems and HP ProCurve

Executive Summary

Today's access switches need to provide low-latency and high performance and do that in a cost-effective and energy-efficient manner. With the rise of VoIP and WLAN, many access switches must also provide power to phone handsets, WLAN access points and other next-generation endpoints. Access switches need to support key features such as quality-of-service, VLANs and link aggregation as well as interoperate with the installed base of LAN switches.

The LG-Ericsson iPECS ES-3000 Gigabit managed switches provide all these capabilities. The LG-Ericsson switches provide wire-speed throughput and match the performance of the Cisco and HP ProCurve switches tested. The LG-Ericsson switches exhibited significantly lower power consumption than the Cisco and HP switches tested.

The LG-Ericsson iPECS ES-3024GP can provide 20W greater power to endpoints than the Cisco PoE switch tested. Where the Cisco and HP switches only supports PoE, the LG-Ericsson iPECS ES-3024GP offers both PoE and PoE Plus support.

Finally, the LG-Ericsson switches can interoperate with Cisco and HP ProCurve switches already deployed.

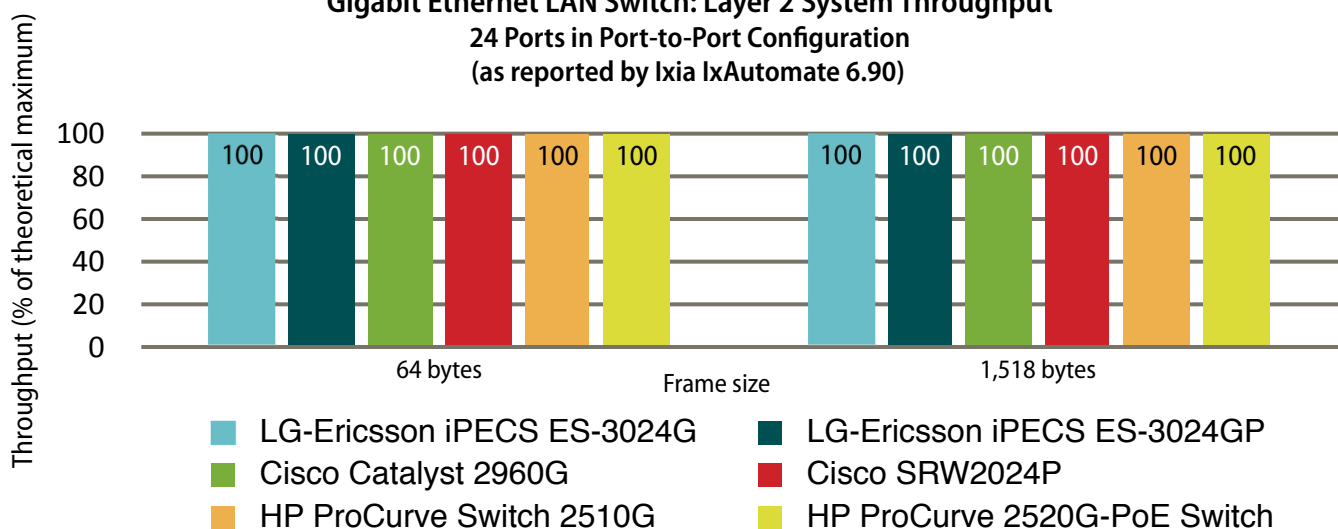
The Bottom Line

The LG-Ericsson iPECS ES-3000 Gigabit Managed Switches:

- 1 Provides wire-speed, layer 2 throughput at all frame sizes tested from 64 to 1,518 bytes
- 2 Offers a comprehensive layer 2 feature-set with enhanced VoIP & UC-friendly features
- 3 Requires less power to operate than the Cisco and HP ProCurve switches tested
- 4 Provides interoperability in key areas such as VLANs, link aggregation, MSTP and auto-negotiation with all Cisco and HP switches tested
- 5 Provides PoE and PoE Plus on its model where Cisco and HP ProCurve models provide only PoE
- 6 Provides unified configuration and monitoring software for voice/data convergence networking in a simpler and smarter way

Gigabit Ethernet LAN Switch: Layer 2 System Throughput

24 Ports in Port-to-Port Configuration
(as reported by Ixia IxAutomate 6.90)



Source: Tolly, April 2010

Figure 1



Introduction

Tolly conducted a comprehensive evaluation of the performance and functionality of the LG-Ericsson ES-3000 family of switches. The test covered both the traditional LAN switch as well as a model capable of delivering power over Ethernet.

The tests covered the following areas: layer 2 throughput and latency, energy efficiency, delivery of power over Ethernet, advanced layer 2 functions (e.g., VLANs), interoperability and system management. Engineers also used test data to calculate cost per Gigabit of throughput and cost per Watt of power delivered.

Performance

The LG-Ericsson switches delivered wire-speed throughput across the range of frame sizes tested from 64-bytes through 1,518-bytes. matched or exceeded. See Figures 1 and 3.

The latency of the LG-Ericsson switches was on par with the HP ProCurve switches and the Cisco SRW2024P. The LG-Ericsson results were significantly lower than the Cisco Catalyst across all frame sizes tested with the Catalyst with LG-Ericsson often having just half the latency of the Cisco Catalyst. See Figure 3.


Energy Efficiency

While delivering better or comparable performance as the Cisco and HP ProCurve switches tested, the LG-Ericsson switches do so while consuming significantly less power than the competing products.

Engineers benchmarked the switches in three scenarios in order to identify any significant differences in energy consumption under varying conditions: 1) all ports active/idle (no traffic flowing), 2) 100% load of 64-byte frames, and 3) 100% load of 1,518-byte frames.

LG-Ericsson
iPECS ES-3024G/GP

**LAN Switch:
 Performance,
 Power
 Consumption,
 PoE & PoE Plus,
 Interoperability**



*Tested
 April
 2010*

The Cisco Catalyst switch required more than 3X the power of the comparable LG-Ericsson iPECS ES-3024G switch. The ProCurve required 2X the power of the LG-Ericsson iPECS ES-3024G.

The Cisco SRW2024P, Power over Ethernet, switch required 2X the power of the LG-

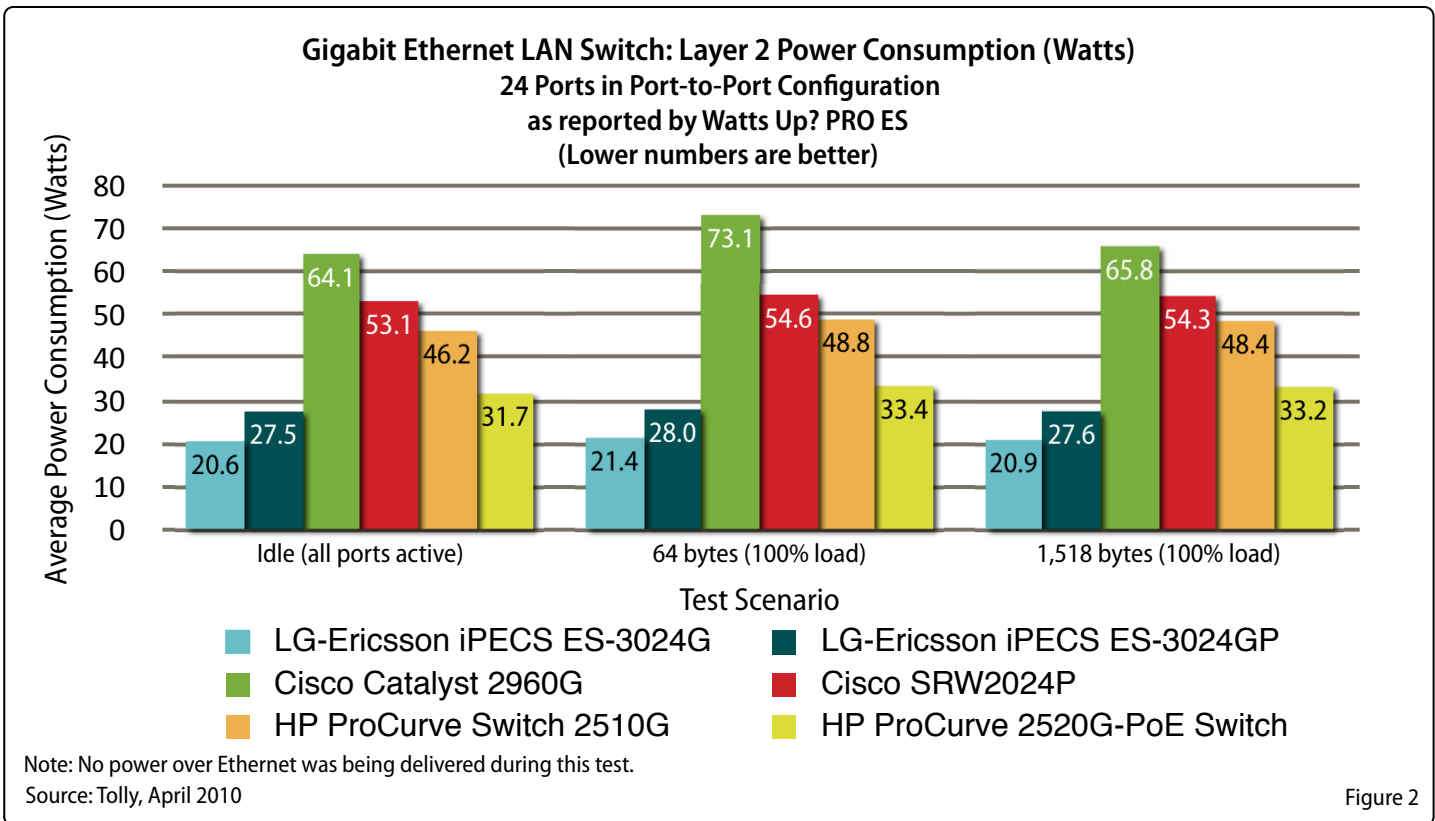


Figure 2



Ericsson iPECS ES-3024GP, Power over Ethernet switch. See Figure 2.

Power over Ethernet

Engineers evaluated the LG-Ericsson iPECS ES-3024GP power over Ethernet switch and compared it with the Cisco SRW2024P and HP ProCurve 2520G power over Ethernet switches.

While all three switches offer support for the original PoE standard, IEEE 802.3.af, only the LG-Ericsson switch offers support for the new IEEE 802.3at standard. This standard ratified in 2009, is known as "PoE Plus".

The LG-Ericsson switch can deliver a total of 191.5W across all ports compared with 171.4W for Cisco and 194.8W for the HP

iPECS ES-3024G/GP Key Benefits

Fully Managed Gigabit Switches with Advanced L2 Switching Features

STP/RSTP/MSTP, Static/Dynamic VLANs, IGMP Snooping/Querier, Link Aggregation (LACP), LLDP, Storm Control, Jumbo Frames

VoIP & UC Friendly Features

Advanced L2/L3 QoS, Economical & Flexible PoE via 802.3af and 802.3at
Smarter configuration of LG-Ericsson data switches and IP-PBXs via UDM

Simpler to Install and Smarter to Manage

Auto negotiation, auto-MDI/MDIX, easy to read LEDs
Smarter configuration from a single intuitive GUI via Unified device manager

Green Ethernet and ECO-Friendly Design

Power savings by link status and cable length
Compliant with environmental regulations such as RoHS, WEEE and PFOS

Advanced Built-in Security

RADIUS/TACACS+ Authentication/Authorization/Accounting
DHCP Snooping, Dynamic ARP Inspection, IP Source Guard

Source: LG-Ericsson, April 2010

Gigabit Ethernet LAN Switch: Layer 2 System Throughput & Latency
24 Ports in Port-to-Port Configuration
(as reported by Ixia IxAutomate 6.90)

System Under Test	LG- Ericsson iPECS ES-3024G		LG-Ericsson iPECS ES-3024GP		Cisco Catalyst 2960G		Cisco SRW2024P		HP ProCurve Switch 2510G		HP ProCurve 2520G-PoE Switch	
	Frame size (bytes)	Throughput (%)	Latency (ms)	Throughput (%)	Latency (ms)	Throughput (%)	Latency (ms)	Throughput (%)	Latency (ms)	Throughput (%)	Latency (ms)	Throughput (%)
64	100	3.31	100	3.45	100	8.80	100	2.22	100	4.08	100	3.84
128	100	3.87	100	3.92	100	9.21	100	2.80	100	4.58	100	4.34
256	100	5.03	100	5.23	100	10.12	100	3.84	100	5.60	100	5.27
512	100	7.35	100	7.45	100	12.69	100	5.88	100	7.63	100	7.25
1,024	100	11.48	100	11.39	100	19.47	100	9.97	100	11.72	100	11.36
1,280	100	13.49	100	13.59	100	22.69	100	12.01	100	13.76	100	13.42
1,518	100	15.40	100	15.48	100	25.67	100	13.79	100	15.67	100	15.33

Note: Throughput results are listed as the percentage of maximum theoretical throughput of 24 Gigabit Ethernet ports. Throughput is zero-loss. For latency tests, Cisco Catalyst tests were run at 95% load.

Source: Tolly, April 2010

Figure 3



Gigabit Ethernet LAN Switch Interoperability
LG-Ericsson Switches to Cisco and HP ProCurve Switches
 (as reported by Ixia IxAutomate 6.90)

System Under Test	Cisco Catalyst 2960G				Cisco SRW2024P				HP ProCurve Switch 2510G				HP ProCurve 2520G-PoE Switch			
	Auto-Negotiation	Link Aggregation	802.1 Q/p	MSTP	Auto-Negotiation	Link Aggregation	802.1 Q/p	MSTP	Auto-Negotiation	Link Aggregation	802.1 Q/p	MSTP	Auto-Negotiation	Link Aggregation	802.1 Q/p	MSTP
LG-Ericsson iPECS ES-3024G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
LG-Ericsson iPECS ES-3024GP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: Tolly, April 2010

ProCurve. The LG-Ericsson can provide 7.6W to all 24 ports simultaneously or the maximum 15.4W defined by the PoE standard to 12 ports.

PoE Plus provides for, currently, up to 30W of power across a given port. This, in turn, allows for new classes of devices to be powered directly across the Ethernet connection. These devices can include: PoS terminals, RFID terminals, pan-tilt-zoom

(PTZ) video cameras and even notebook computers.

Tests show that the LG-Ericsson switch can deliver a full 30W to six ports (port 1-6) simultaneously. See Figure 5.

Price/Performance

Engineers calculated the cost per Gigabit per second of switch throughput. These calculations were based on U.S. MSRP as of

April, 2010. For the non-PoE switch, the LG-Ericsson cost is about 12% lower than the ProCurve 2510G with the LG-Ericsson ES-3024G having a cost per Gigabit of throughput of \$29.34 and the HP ProCurve Switch 2510G having a cost of \$33.77. This compares with \$84 for the Cisco Catalyst which is 2.8X higher than the LG-Ericsson iPECS ES-3024G.

For PoE, the LG-Ericsson has a cost per W delivered via PoE of \$5.90 compared to

LAN Switch: Power over Ethernet (PoE) Support
 as reported by Sifos PSA-3000 PowerSync Analyzer

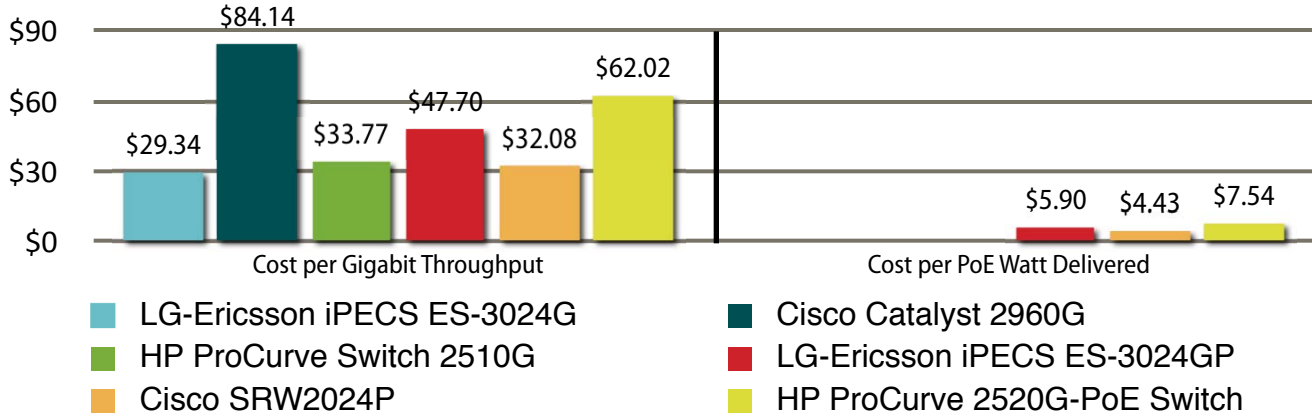
Vendor	Product	Power Budget (W)	Power over Ethernet (IEEE 802.3af-2003) (up to 15.4W)	Power over Ethernet Plus (IEEE 802.3at-2009) (Up to 30W)
LG-Ericsson	iPECS ES-3024GP	191.5	Yes. Available on all ports. All 24 ports active with 7.6W per port, 12 ports can be powered at a full 15.4W	Yes. Available on port 1 to 6 which can be powered at a full 30W
Cisco Systems	Cisco SRW2024P	171.4	Yes. Available on 24 ports. 11 ports powered simultaneously at full power	Not supported
HP ProCurve	HP ProCurve 2520G-PoE Switch	194.8	Yes. Available on 24 ports. 12 ports powered simultaneously at full power	Not supported

Note: The Power Budget is the total amount of power that the switch can make available to PoE ports, thus, a higher number is better. Power Budget is typically shared among all PoE ports. Virtually every VoIP phone tested by Tolly has required less than 7.6W.

Source: Tolly, April 2010

Figure 5

Gigabit Ethernet LAN Switch: Price/Performance
Cost per Gigabit Throughput & Cost per PoE Watt Delivered
 (Calculations based on US MSRP April 2010)



Note: The cost per Gigabit was calculated using the aggregate bidirectional throughput of each switch when transmitting 1,518-byte frames at the switch's maximum rate. (When taking into account the 20-byte inter-frame gap, the total throughput becomes 23.68 Gbps.) The MSRP is divided by the throughput. The cost per PoE Watt was calculated by dividing the MSRP by the measured power budget.

Source: Tolly, April 2010

Figure 6

Cisco's \$4.43 and HP ProCurve's \$7.54. See Figure 6.

Features & Interoperability

Engineers verified the presence of key L2 switch features. This feature set included:

auto-negotiation of link speed, IGMP Snooping, VLANs, Multiple Spanning Tree (IEEE 802.1Q), quality-of-service (IEEE 802.1p) and link aggregation (IEEE 802.3ad).

System Details & Cost Elements
 (All Systems Configured with 24 Copper Gigabit Ethernet Ports)

Vendor	Product	Software/Hardware Version	Power over Ethernet	MSRP (USD)
LG-Ericsson	iPECS ES-3024G	SW: 1.0.1.5 HW: R01	Not supported	\$694.99
	iPECS ES-3024GP	SW: 1.0.1.5 HW: R01	PoE and/or PoE+	\$1,129.99
Cisco Systems	Cisco Catalyst 2960G-24TC-L	SW: IOS 12.2(53)SE6	Not supported	\$1,992.99
	Cisco SRW2024P	SW: 1.2.9 HW: R01	PoE only	\$759.99
HP ProCurve	HP ProCurve Switch 2510G-24 (J9279A)	SW: Y.11.16	Not supported	\$799.99
	HP ProCurve 2520G-24 PoE Switch (J9299A)	SW: J.14.01	PoE only	\$1,539.99

Note: Cisco and HP list prices obtained from CDW.com, April 2010. LG-Ericsson list prices provided by LG-Ericsson as switch was unreleased at time of test. All products include standard vendor warranty and maintenance which may vary across vendors. The LG-Ericsson, HP ProCurve and Cisco Catalyst switches include 4 dual-personality ports. The Cisco SRW2024P includes 2 dual-personality ports.

For more information about the LG-Ericsson solutions, please visit: <http://www.lgericsson.com>

Source: Tolly, April 2010

Figure 7



Engineers confirmed that these features were implemented in the LG-Ericsson switches and, furthermore, that the applicable features interoperate with the Cisco and HP ProCurve switches tested. See Figure 4.

Management

Engineers also evaluated LG-Ericsson's iPECS-UDM (Unified Device Manager) program. This program is bundled with the LG-Ericsson switch and IP-PBX product lines to provide an easy, single-screen access to all LG-Ericsson switches and LG-Ericsson IP-PBX products deployed on the network.

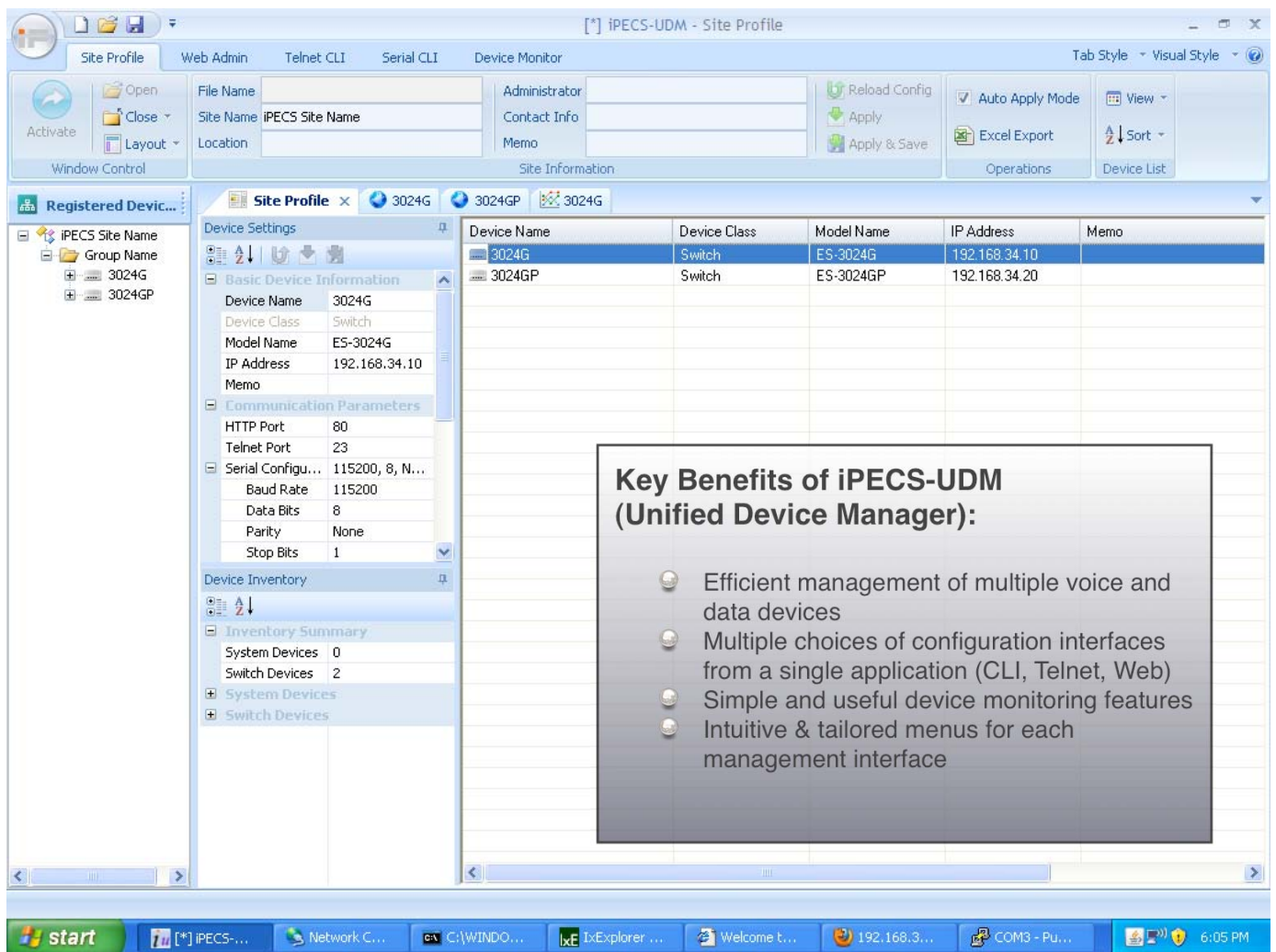
Figure 6 shows a screen from this application.

Test Methodology

Devices Under Test

The test compared 24-port Gigabit Ethernet, Layer 2 LAN switches with and without Power over Ethernet capabilities.

LG-Ericsson iPECS-UDM (Unified Device Manager) Interface



Source: Tolly, April 2010

Figure 8

Figure 7 provides details of the systems tested and the software versions used.

Test Tools

The test traffic was generated using an Ixia 1600T outfitted with 24 Gigabit Ethernet 1000Base-T ports. The Power over Ethernet tests were run using the Sifos PSA-3000 PowerSync analyzer.

Energy consumption was measured using the Watts up? PRO ES power meter. This device recorded power consumption in one-second intervals to provide granular power consumption data.

Throughput and Latency

For this test, engineers connected all ports on the DUT to Ixia 1600T test ports, keeping the switch in its default configuration. Engineers then ran the RFC 2544 throughput test included as a standard test in the Ixia platform, varying the frame size and using a binary search to determine the maximum throughput. Latency metrics



The test methodology used for this report relies upon test procedures, metrics and documentation practices as defined in various Tolly Common Test Plan.

To learn more about Tolly Common Test Plans, go to:

<http://www.CommonTestPlan.org>

Competitive Interaction

Tolly acquired the HP ProCurve and Cisco Catalyst switches via normal product distribution channels. The Tolly Group invited representatives from Cisco and HP to participate in the testing as per The Tolly Group's Fair Testing Charter (See <http://www.tolly.com/FTC.aspx>). Both Cisco and HP participated.



Cisco recommended testing the Cisco SRW2024P in place of the Cisco SGE-2000P that was originally planned for the test. Cisco provided the SRW2024P for the test. Cisco also recommended that the Cisco Catalyst 2960S be tested rather than the Cisco Catalyst 2960G that was tested but the recommended switch was not available in the timeframe available for this test.

Cisco reviewed the test results and stated that the results were as expected.

HP ProCurve also reviewed their results and verified their accuracy.

For more information on the Tolly Fair Testing Charter, visit:

<http://www.tolly.com/FTC.aspx>

LG-Ericsson iPECS ES-3024G



LG-Ericsson iPECS ES-3024GP





Gigabit Managed Switches: Datasheet Comparison*

	LG- Ericsson iPECS ES-3024G	LG-Ericsson iPECS ES-3024GP	Cisco Catalyst 2960G	Cisco SRW2024P	HP ProCurve Switch 2510G	HP ProCurve 2520G-PoE Switch
Hardware Specifications						
Switching Fabric	48Gbps	48Gbps	32Gbps	48Gbps	48Gbps	48Gbps
MAC Address Table Size	8,000	8,000	8,000	8,000	8,000	8,000
10/100/1000Base-T port	24	24	20	24	20	20
SFP	4	4	4	2	4	4
Layer 2 Support						
STP	Yes	Yes	Yes	Yes	Yes	Yes
RSTP	Yes	Yes	Yes	Yes	Yes	Yes
MSTP	Yes	Yes	Yes	Yes	Yes	Yes
VLAN	Yes	Yes	Yes	Yes	Yes	Yes
LACP	Yes	Yes	Yes	Yes	Yes	Yes
LLDP	Yes	Yes	Yes	No	Yes	Yes
IGMP Snooping	Yes	Yes	Yes	Yes	Yes	Yes
IGMP Querier	Yes	Yes	No	Yes	No	No
Quality-of-Service						
DSCP	Yes	Yes	Yes	Yes	No	No
802.1p	Yes	Yes	Yes	Yes	Yes	Yes
Mark/Remark	Yes	Yes	Yes	Yes	Yes	Yes
PoE/PoE+						
802.3af (PoE)	N/A	Yes	N/A	Yes	N/A	Yes
802.3at (PoE+)	N/A	Yes	N/A	No	N/A	No
Power budget	N/A	191.5W	N/A	171.4W	N/A	194.8W
Security						
ACL	Yes (512)	Yes (512)	No	Yes	Yes	Yes
DHCP Snooping	Yes	Yes	No	Yes	No	No
IP Source Guard	Yes	Yes	No	No	No	No
ARP Spoofing Prevention	Yes	Yes	No	No	No	No
Management						
UDM (Windows Application)	Yes	Yes	N/A	N/A	N/A	N/A
Command Line Interface (CLI)	Yes	Yes	Yes	Yes	Yes	Yes
Telnet/SSH	Yes	Yes	Yes	Yes	Yes	Yes
Web (HTTP/HTTPS)	Yes	Yes	Yes	Yes	Yes	Yes
SNMP v1/2c/3	Yes	Yes	Yes	Yes	Yes	Yes

* Not all listed features verified by Tolly. See other figures for specific features tested. UDM is a proprietary LG-Ericsson management application.

Source: LG-Ericsson, April 2010

Figure 9

were taken using the RFC 2544 latency test, built in to IxAutomate, using the First Out - First In metric at 100% line rate on all ports. In cases where the standard deviation across the port pairs was greater than 5%, additional tests were run and averaged.

Power Consumption

To measure the power consumption of the switches under load, Engineers modified the RFC 2544 template in IxAutomate to yield a test which varied the load at 25% line rate increments over both 64 and 1518 byte frames, which was run with 6, 12, 18 and 24 links active on the DUT. Measurements were recorded using a Watts Up? PRO ES power meter. Each metric is the result of 30 individual data points, and in no scenario was the percent error greater than 0.5% of the mean. Testing was conducted as described in Tolly Common Test Plan #1080: LAN Switch Power Consumption.

Devices were tested in default configurations. Testers noted that HP ProCurve offers an option that turns off the LEDs on the switch. Informal tests show that enabling this feature reduces switch power consumption by 1W.

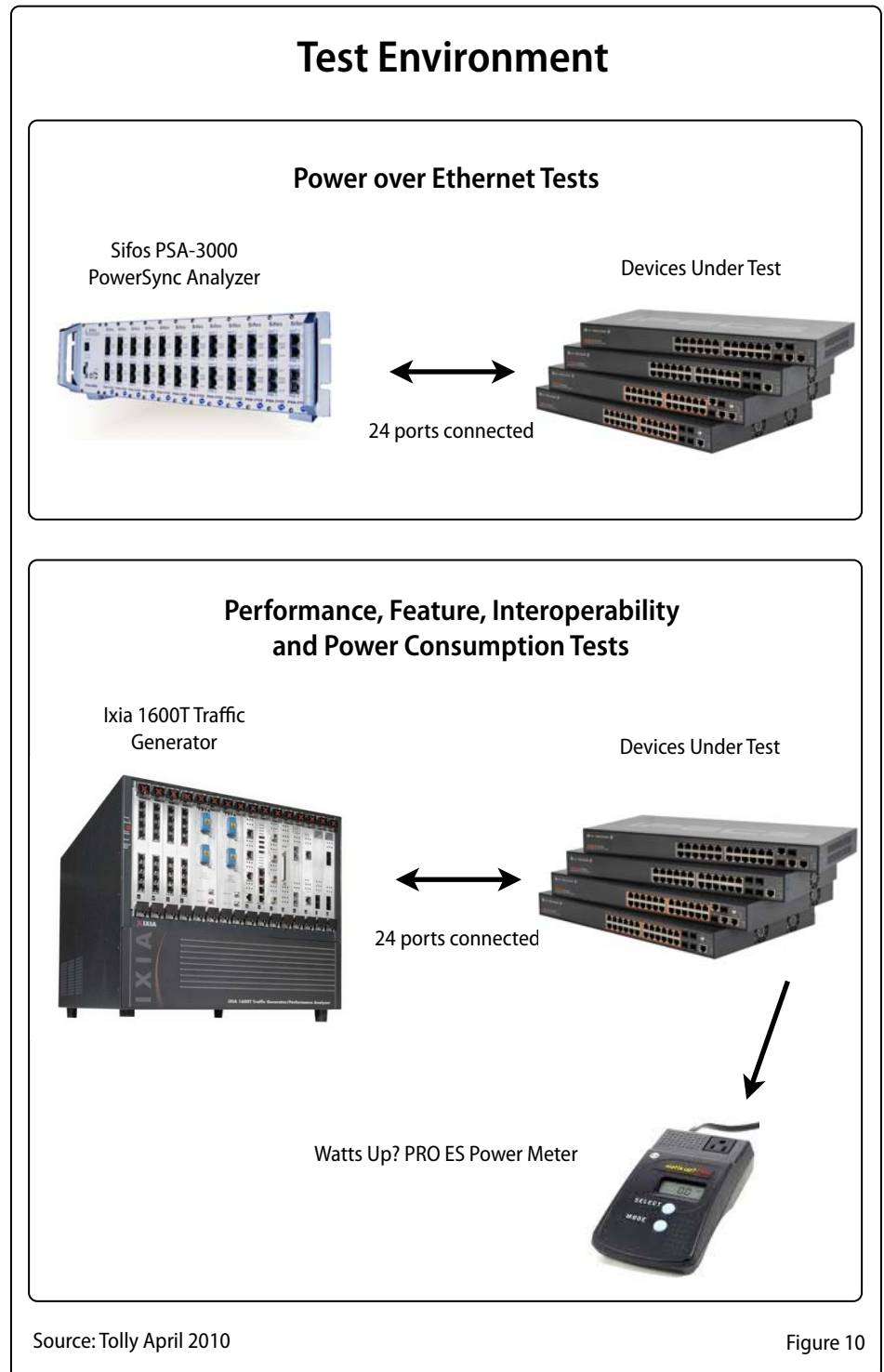
Power over Ethernet

To measure PoE capabilities, engineers enabled PoE on each of the switches supporting that feature. Then, they connected all 24 ports to the Sifos PSA-3000 PowerSync Analyzer. Engineers used the integrated mp_power_cap test. This test requests a minimal amount of power draw from the switch on all ports, then gradually increases the request on each port, terminating when the switch drops power from one port in order to make that power available for other ports. The maximum supplied power was recorded, and tests were run a total of three times to accurately measure the power budget of the DUT.

Interoperability

For the Interoperability and feature verification tests, Engineers configured each switch to support LACP, MSTP, RSTP, VLAN

Tagging, and IGMP Snooping. Testing was conducted as described in Tolly Common Test Plan #1088: LAN Switch Interoperability, verifying the configurations using various scripts built in to IxAutomate.



Source: Tolly April 2010

Figure 10





About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 20 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services. You can reach the company by e-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at: <http://www.tolly.com>

Test Equipment Summary

The Tolly Group gratefully acknowledges the providers of test equipment/software used in this project.

Vendor	Product	Web
	Chassis Type: 1600T Interfaces: 24x 1Gbps Card Type: 5x LM1000STXS4, 1x LM1000SFPS4-256 Software: IxAutomate 6.90.90.9 GA	http://www.ixiacom.com
	PSA-3000 PowerSync Analyzer	http://www.sifos.com

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