

# Xirrus Inc.

## XS-3900-16 Wi-Fi Array

### Evaluation of Wireless Load Balancing of 802.11 a/b/g Stations



## Test Summary

***Premise:** Given the costs associated with procuring and installing wireless access points, solutions that can scale to support large numbers of users while simultaneously providing advanced traffic load balancing for the network can provide significant value for users by improving network performance and decreasing the number of required access points and traffic management equipment in the enterprise.*

Xirrus Inc. commissioned The Tolly Group to evaluate the wireless load-balancing feature of its IEEE 802.11a/b/g XS-3900 family of Wi-Fi Arrays. These devices combine the functionality of a WLAN switch/controller with Integrated Access Points (IAPs) in a single device. The Wi-Fi Array includes 16 high-gain, multi-sector antennas housed in a circular enclosure.

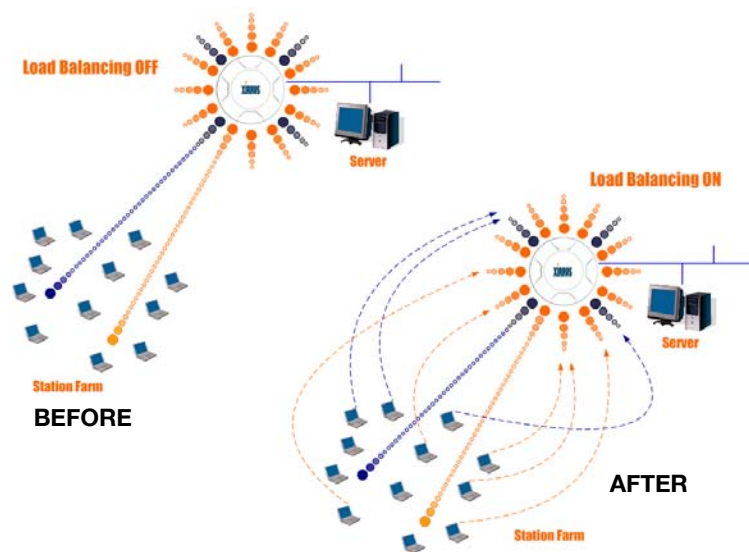
Engineers deployed a single Xirrus XS-3900 Wi-Fi Array to evaluate its advanced wireless load-balancing feature and the benefits provided to a typical wireless corporate network. Moreover, engineers tested the XS-3900 Wi-Fi Array for user scalability. To illustrate the benefits of the Xirrus Wi-Fi offering, some of the tests were conducted inside a specialized cage, called a Faraday Cage, to eliminate possible wireless interference.

Tests were conducted in October 2006.

### Test Highlights

- ▶ Supports wireless load balancing on all 15 802.11a/b/g radios with a single Wi-Fi Array
- ▶ Provides dynamic load balancing for 802.11 clients
- ▶ Supports up to 1,024 simultaneous wireless users with a single XS-3900 Wi-Fi Array
- ▶ Bolsters 802.11b/g capacity by moving 802.11b/g stations to 802.11a when possible
- ▶ Improves performance across the entire wireless network

### Wireless Load Balancing Test Scenario for 802.11a/b/g Radios with Multiple Wireless Stations



Source: The Tolly Group, October 2006

Figure 1

## Executive Summary

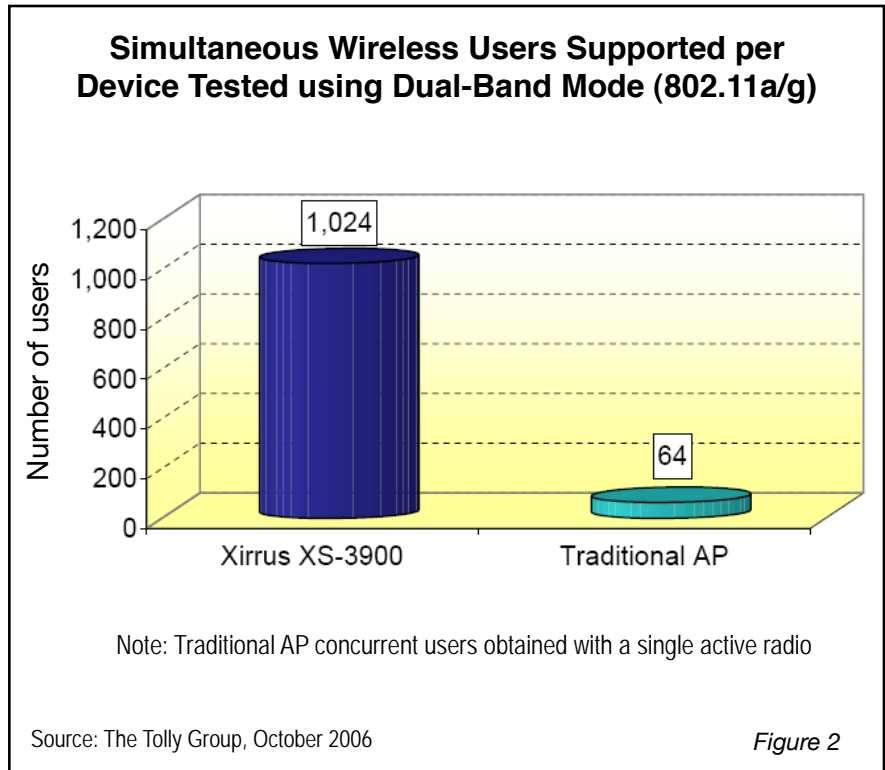
The Xirrus XS-3900 Wi-Fi Array provides advanced real-time wireless load balancing that distributes user loads across a single Array.

### WIRELESS LOAD BALANCING

The testing evaluated the ability of the Xirrus XS-3900 Wi-Fi Array by evenly distributing 15 wireless stations among its 15 Integrated Access Points (IAPs), while all stations attempted to associate simultaneously to the closest IAP.

The Xirrus solution demonstrated to Tolly Group engineers that the Xirrus Wi-Fi Array was capable of not only associating all 15 wireless stations among different IAPs, but also, thanks to the new advanced load-balancing feature, the Wi-Fi Array was intelligent enough to evenly migrate each wireless user to a different IAP within the same XS-3900 Array. This is done automatically, without user intervention. (Please see Figure 1.)

For network administrators, this feature requires less hands-on administration to the network, since the feature does not require the installation of client-side software. Therefore, it is compatible with any Wi-



Fi client device.

### MAXIMUM USER SUPPORT

The benefit of supporting a large number of wireless users via a single wireless access point (AP) array is that enterprises with large user populations or sizable campuses, such as universities, can save money on equipment needed to provide all users with ample wireless bandwidth.

The Xirrus XS-3900 Wi-Fi Array, with its high-gain antennas, and 16 independent IAPs, is capable of supporting up to 1,024 simultaneous wireless users. (See Figure 2.) This positions the device well in terms of more cost-effective deployments and easier management for administrators.

Supporting large numbers of associated users is one thing, but also, it is imperative that any wireless AP can support large

number of actively associated stations.

Tests verified that the Xirrus XS-3900 Wi-Fi Array was able to support 1,024 users and maintain each user associated by sending/receiving ICMP traffic from an external traffic generator.

### TEST METHODOLOGY & CONFIGURATION

The Xirrus Wi-Fi Arrays utilized in all test scenarios had installed the same firmware: version 2.1 (October 9, 2006), Build: 371.

The wireless stations utilized for all tests were identical. Testers used 15 IBM/Lenovo ThinkPad laptops Model R51e equipped with a 1.5-GHz Intel Celeron M processor, 512-MB RAM, a Linksys Dual-Band Wireless A+G Notebook Adapter version 1.3 (Driver version 4.1.2.38 - 4/1/2005) and Windows XP Professional SP2.

To monitor the wireless signaling and traffic, engineers utilized WildPackets, Inc. AiroPeek NX Expert Wireless LAN Analyzer for windows.

## WIRELESS LOAD BALANCING

In order to test the wireless load-balancing feature, engineers configured 15 identical wireless stations to connect to an SSID in the Xirrus Wi-Fi Array.

Because the 802.11a radios have association priority over the 802.11b/g radios, engineers divided this test case into two subtests: (1) 802.11a radios enabled only, and (2) 802.11b/g radios enabled on the XS-3900 Wi-Fi Array.

Engineers started by turning on all 802.11a radios from the XS-3900 Wi-Fi Array first with load balancing disabled. From the console window, engineers were able to verify that, in effect, almost all 15 wireless stations were associated to a couple of 802.11a radios only. Next, engineers disassociated all wireless stations from the Wi-Fi Array. Then, they enabled the load-balancing feature, and turned on all the 802.11a radios and re-associated all wireless users to the same SSID configured earlier. Engineers verified that all wireless users were distributed appropriately across all 802.11a radios in the Wi-Fi Array.

The same procedure was repeated for the 802.11b/g radios on the Xirrus XS-3900 Wi-Fi Array.

## MAXIMUM USER SUPPORT

To determine the maximum number of simultaneous users supported, Tolly Group engineers set and deployed a Xirrus XS-3900 Wi-Fi Array inside a Faraday Cage (an interference-free environment) to avoid possible interference from the surrounding area.

To emulate a large volume of wireless users, engineers utilized 16 IXIA IxWLAN Wi-Fi Client Emulators (Ver. 6.10). The total number of simulated wireless users was 1,024 which were distributed as follows: 13 IXIA IxWLAN Wi-Fi Client Emulators emulated 64 wireless users using 802.11a radios, and three IXIA IxWLAN Wi-Fi Client Emulators emulated 64 wireless users using 802.11b/g radios. (See Figure 3.)

To transmit traffic to and from all 1,024 simulated wireless users, engineers utilized an IXIA 400T chassis with a four-port Gigabit Ethernet (GbE) line card connected on the GbE interface of the Xirrus XS-3900 Wi-Fi Array. IXIA's traffic generator IxExplorer (version 3.70.24 Build 46) was used to transmit ICMP packets to all 1,024 simulated users to verify that users were sending/receiving data.

For this scenario, note that the monitor radio from the Xirrus XS-3900 Wi-Fi Array was utilized as an available 802.11a/b/g radio. By default, the monitor radio in the Wi-Fi Array is not available for wireless connectivity.

Xirrus  
Inc.

XS-3900-16  
Wi-Fi Array



Wireless Load Balancing  
Evaluation

## Product Specifications

*Vendor-supplied information not necessarily verified by The Tolly Group*

Xirrus Inc.  
XS-3900-16 Wi-Fi Array

### Radios

4 802.11a/b/g + 12 802.11a

### Wireless Switching

Integrated 2.1-Gigabit wireless switch

### Uplink Ethernet Ports

2 Gigabit, 1 Fast Ethernet

### Wi-Fi Bandwidth

864 Mbps

### Security Monitor

Dedicated RF Monitor

### Users per Radio/per Array

64 /1024

### Voice Calls/Video Streams

180 / 45

### Wireless Standards

802.11a,b,e,h,i

### Antenna

Integrated 6dBi (5GHz), 3dBi (2.4GHz) and 3 External RP-TNC connectors

### Security

WPA TKIP, WPA2 AES, WEP 40/64 104/128 Pre-Shared Key, 802.1X EAP PEAP, EAP-TLS, EAP-TTLS MAC ACL, Integrated RADIUS Server, Integrated Rogue AP detection and rule-based Packet filtering.

### QoS

802.11e, 802.1Q VLANs + 802.1p Priority and SpectraLink SVP support

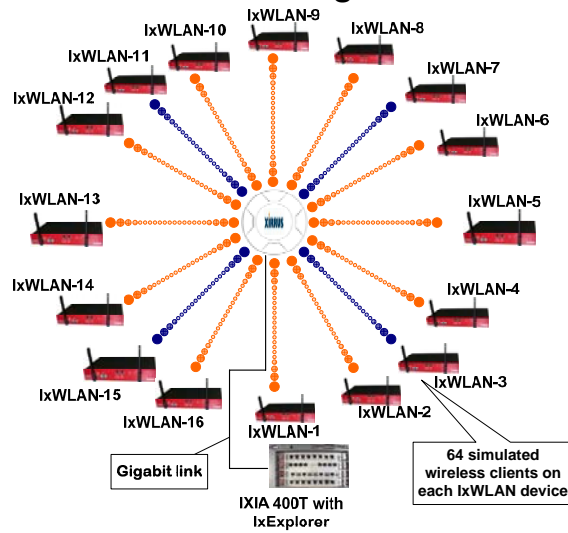
### Other Features

16 SSIDs, DHCP, DNS, WDS, and STP.

### For more information contact:

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URL: <http://www.xirrus.com>

### Maximum Number of Simultaneous Users Test Bed Diagram



Source: The Tolly Group, October 2006

Figure 3

The Tolly Group is a leading global provider of third-party validation services for vendors of IT products, components and services.



The company is based in Boca Raton, FL and can be reached by phone at (561) 391-5610, or via the Internet at <http://www.tolly.com>, [sales@tolly.com](mailto:sales@tolly.com)

### Test Equipment Summary

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

Vendor	Product	Web
IXIA	<ul style="list-style-type: none"> <li>☺ IXWLAN Client Emulator Ver. 6.10</li> <li>☺ IXIA 400T Chassis</li> <li>☺ IxExplorer Ver. 3.70.24 Build 46</li> </ul>	<a href="http://www.ixiacom.com">http://www.ixiacom.com</a>
WildPackets, Inc.	☺ AiroPeek NX for Windows Ver. 3.1	<a href="http://www.wildpackets.com">http://www.wildpackets.com</a>

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