

Agilent N2X
**Link Aggregation
Control Protocol (LACP)
Emulation Software**

N5582A
Technical Data Sheet



The most comprehensive tool to verify the operation, performance and scalability of LACP link bundling implementations, assess bandwidth allocation under realistic and abnormal conditions, and measure availability and QoS during link failures.



Agilent Technologies

Key Features

- **LACP emulation with full parameter control and state display**
- **Full support for protocol emulations over LAG for realistic test scenarios**
- **Measure scalability using unlimited LAGs and ports/LAG**
- **Test failover, including standby link mechanisms**
- **Emulate mixed-rate link bundles**
- **Reduce test time using automated QuickTests**

Product Overview

Agilent N2X is the industry's most comprehensive test solution for testing the development and deployment of network services for converging network infrastructures. Service providers, network equipment manufacturers (NEMs), and component manufacturers can verify service attributes of entire networks end-to-end, while also isolating problems down to individual networking devices and subsystems

Agilent N2X delivers unparalleled test realism to verify the ultimate performance, scalability and resilience of carrier grade services and infrastructure.

The N5582A N2X Link Aggregation Control Protocol (LACP) emulation software offers the most comprehensive and scalable solution available for testing link bundling, a technology that aggregates multiple ethernet links into a single logical link to increase bandwidth and availability.

N2X accurately emulates LACP, which is the protocol used by partner systems to form and manage link aggregation groups.

By combining multiple N2X Ethernet interfaces into one or more link bundles, emulating LACP, and generating realistic traffic over each link bundle, N2X can accurately verify the functionality and performance of LACP implementations.

Link bundling introduces proprietary mechanisms for identifying and allocating traffic flows to the links within a bundle. These schemes may impact fairness and QoS – especially during dynamic or oversubscribed network conditions. N2X enables thorough verification of traffic forwarding engines, flow identifiers and QoS mechanisms to validate device and network behavior.

LACP allows links to be added to and removed from in-service link bundles, and includes mechanisms that reduce packet loss by switching traffic from a failed link onto redundant links or onto the remaining links within a bundle. N2X can characterize the impact of these mechanisms on subscriber traffic by measuring failover time and packet loss. LACP PDUs and simulated traffic can be captured, decoded and analyzed to detect and isolate faults and to aid performance tuning.

LACP emulation software now supports full integration with N2X's extensive suite of protocol emulations, allowing users to characterize network performance and stability when deploying LACP.

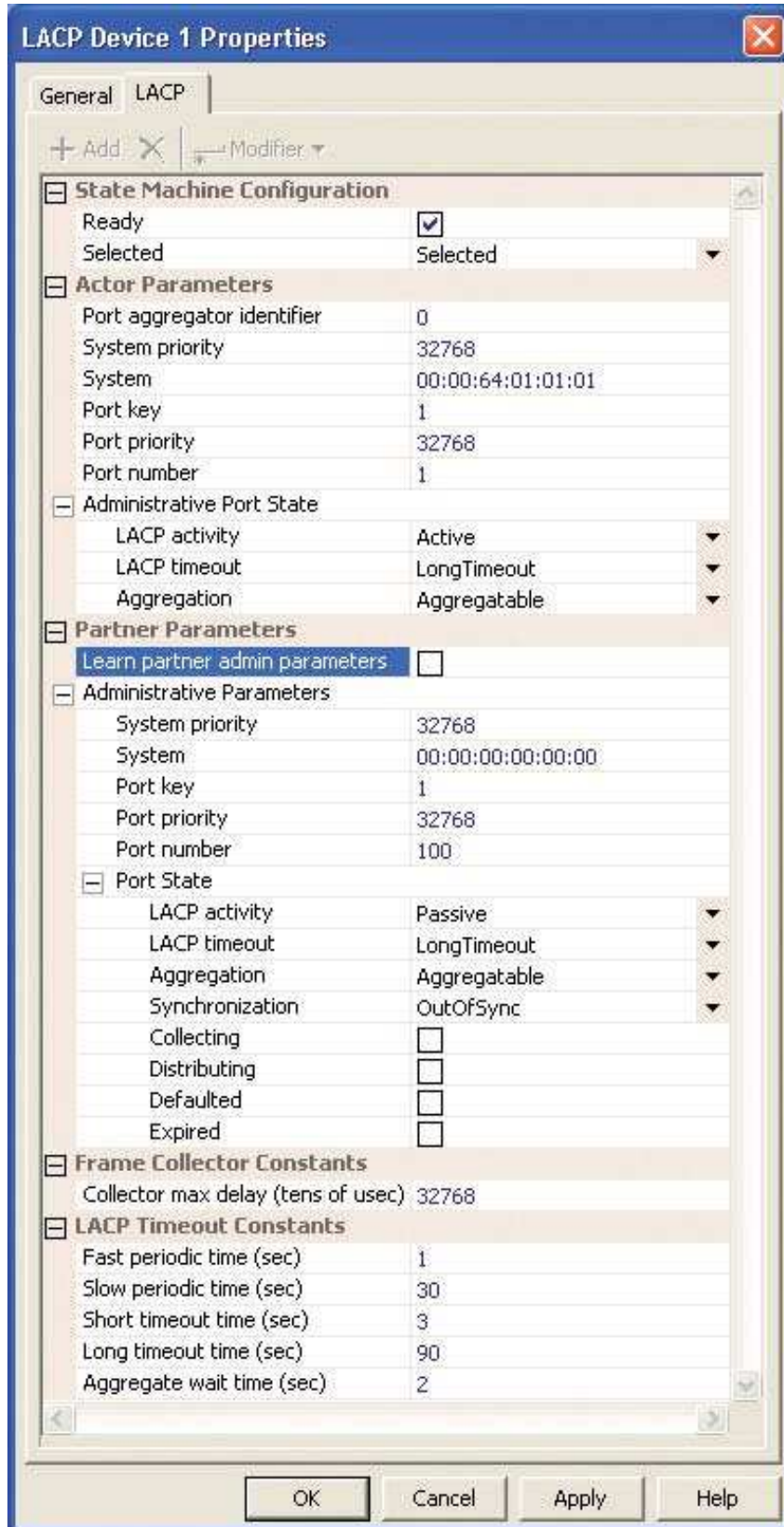


Figure 1: Users can configure any LACP state, actor and partner parameters, and timeouts.

Product Features

LACP emulation with full parameter control and state display

The N5582A software provides a comprehensive, stateful emulation of link bundles, including accurate emulation of the LACP protocol, to validate LACP implementations under realistic, simulated traffic conditions under a wide range of scenarios. LACP configuration and emulation parameters are under full control of the user. Links can be added to or removed from each link bundle interactively while continuing to generate traffic.

N2X also enables ‘negative testing’ of LACP, using extreme or unexpected parameter values, to characterize behaviour under abnormal conditions and verify stability in multi-vendor environments.

LACP emulation states are displayed in real time and system behaviour can be measured during testing, aiding rapid detection of faults and isolation of performance problems.

Full support for protocol emulations over LAG

LACP protocol emulation software supports the addition of control plane protocol emulations for all supported emulations over LAG. This is important for creating realistic test scenarios and therefore validating the effect of any LAG failures on both the data and control planes.

Measure scalability using unlimited LAGs and ports/LAG

N2X can create an unlimited number of Link Aggregation Groups (LAGs) for testing system scalability limits and verifying performance and functionality under both realistic and worst-case network conditions. Users can gauge any control-plane performance degradation while increasing the number of LACP bundles.

Similarly, N2X can create Link Aggregation Groups with any quantity of ports per LAG. Non-standard port counts can be emulated and verified for proprietary applications, or to allow for future requirements.

Test failover, including standby link mechanisms

During a link failure, the LACP protocol should quickly move traffic off the defective link and onto the remaining links of a link bundle with minimal disruption to traffic. With N2X, users can benchmark the performance of this failover mechanism by measuring any packet loss and timing the failover duration. Additionally, any link failures in a LAG should cause minimum disruption on the control plane, which under realistic network scenarios will also be managing any protocol stream exchanges.

N2X also supports LACP ‘Standby’ links, allowing users to compare the speed and operation of different protection mechanisms.

Failover tests are easily scaled up, using multiple links and multiple LAGs, to gauge recovery performance under worst-case conditions and measure the impact of faults on subscriber traffic, as well as control plane traffic.

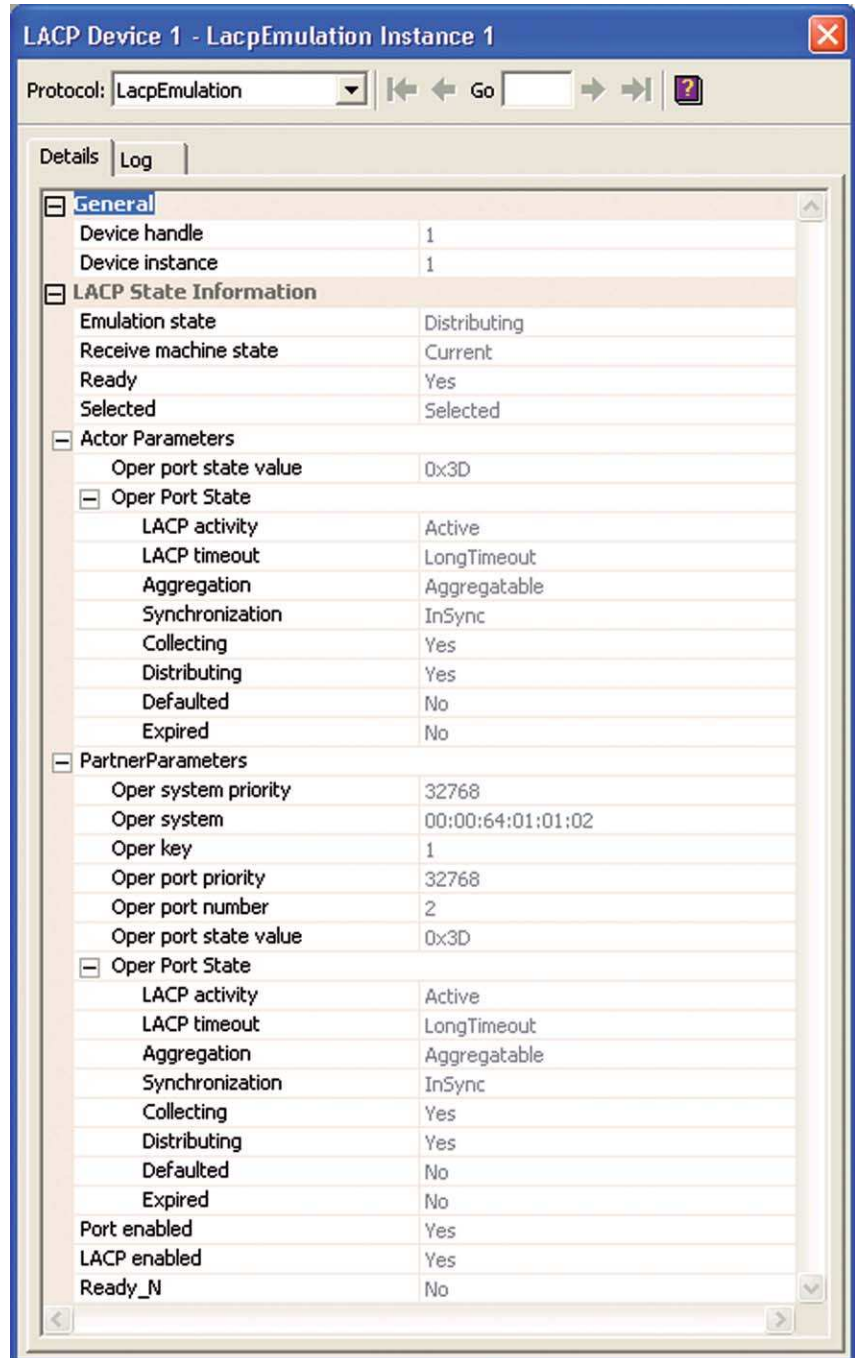


Figure 2: Real-time view of LACP emulation state and parameter values.

Emulate mixed-rate link bundles

The N2X LACP test solution supports LACP link bundles with Ethernet interface rates from 10 Mb/s to 10 Gb/s. In addition, N2X supports mixed-rate bundles – for example, a bundle containing a mixture of both Gigabit Ethernet and 10 Gigabit Ethernet links. Although mixed-rate bundles are non-standard, this capability enables users to understand how the SUT handles interfaces of different rates

Reduce test time using automated QuickTests

N2X QuickTests are automated applications that simplify and reduce test time for common but complex scenarios. The N2X LACP Link Bundling QuickTest suite is a group of three QuickTests that is included with the LACP emulation software. These QuickTests integrate LACP emulation with capabilities such as traffic generation and analysis, providing the user with a powerful set of tests to verify LACP inter-working, packet forwarding over LACP link bundles, and failover performance.

- Ethernet Link Bundle Functional Inter-working QuickTest
- Link Bundling Traffic Management QuickTest
- Link Failover Performance QuickTest

Additionally, there is a tool that provides quick configuration of protocol emulations over a LAG.

Aggregate links across multiple test cards

Ports on multiple N2X test cards can be aggregated into a single link bundle – there is no requirement for all of the interfaces in a link bundle to reside on the same N2X test card. This enables greater flexibility within multi-user test environments and permits the verification of much larger link bundles.

IEEE 802.3ad standard compliance

The N2X LACP software emulation, used in conjunction with N2X test cards, has been implemented as per the IEEE 802.3ad standard. This offers users a reference against which to test, thereby providing confidence that their network equipment complies with industry standards and should interoperate with equipment from other vendors.

Generate traffic over link bundles

The powerful and flexible N2X traffic engine supports the LACP software application, allowing users to create and send many thousands of traffic streams with realistic traffic distributions and a variety of PDUs over multiple link bundles. Traffic and protocol statistics can be viewed and graphed in real time and logged to a file for later analysis. Per-stream, per-port and per-field measurements permit service delivery to be measured for each individual simulated subscriber and summarized over aggregate flows containing many thousands of streams.

Users can easily simulate voice, video and data traffic with multiple priority levels, and measure the ability of the system-under-test to prioritize different types of traffic. This allows users to characterize system performance and determine whether Service Level Agreements can be met under congestion conditions.

LACP Protocol Capture and Decode

LACP Protocol Data Units (PDUs) can be captured and decoded to closely examine the LACP message exchange and to find problems in protocol operation and interoperability. In addition, the N2X capture engine extends across link bundles, enabling users to capture, decode and analyze traffic over entire link bundles as well as over individual links within a link group. Together, these capabilities provide a rapid and complete solution for finding and diagnosing all types of system faults and performance limitations.

LACP Technical Specifications

LACP Configurable Parameters

State Machine Parameters	<ul style="list-style-type: none"> • Ready • Selected
Actor Parameters	<ul style="list-style-type: none"> • Port aggregator identifier • System priority • System MAC • Port key • Port priority • Port number • Active or Passive mode • Short or Long timeouts • Aggregatable or Individual
Partner Parameters	<ul style="list-style-type: none"> • Partner parameter autodiscovery or • System priority • System MAC • Port key • Port priority • Port number • Active or Passive mode • Short or Long timeouts • Aggregatable or Individual • Out of synchronization or In synchronization • Collecting, Distributing, Defaulted and Expired flags
Frame Collector Constants	<ul style="list-style-type: none"> • Frame collector maximum delay (tens of microseconds)
Timers	<ul style="list-style-type: none"> • Fast periodic time (seconds) • Slow periodic time (seconds) • Short timeout time (seconds) • Long timeout time (seconds) • Aggregate wait time (seconds)

LACP Statistics

PDU Statistics	<ul style="list-style-type: none"> • Received LACPDUs • Received malformed LACPDUs • Transmit LACPDUs • Received marker PDUs • Received malformed marker PDUs • Transmitted marker response PDUs
Mux Machine Measurements	<ul style="list-style-type: none"> • Number of transitions from Detached to Waiting state • Number of transitions from Waiting to Detached state • Number of transitions from Waiting to Attached state • Number of transitions from Attached to Detached state • Number of transitions from Attached to Collecting state • Number of transitions from Collecting to Attached state • Number of transitions from Collecting to Distributing state • Number of transitions from Distributing to Collecting state
Convergence Times	<ul style="list-style-type: none"> • Minimum convergence time • Maximum convergence time • Average convergence time
Receive Machine Measurements	<ul style="list-style-type: none"> • Number of transitions into Disabled state • Number of transitions into Expired state • Number of transitions into LacpDisabled state • Number of transitions into Defaulted state • Number of transitions into Current state • Number of transitions from Current to Expired state
Periodic Transmit Machine Measurements	<ul style="list-style-type: none"> • Number of transitions into NoPeriodic state • Number of transitions from FastPeriodic to PeriodicTx state • Number of transitions from FastPeriodic to SlowPeriodic state • Number of transitions from SlowPeriodic to PeriodicTx state • Number of transitions from PeriodicTx to FastPeriodic state • Number of transitions from PeriodicTx to SlowPeriodic state

Protocol Emulations over LACP support

- All supported N2X protocols. See the N2X E7881B N2X Packets and Protocols application data sheet for more information on supported protocol emulations.
- <http://advanced.comms.agilent.com/n2x/products/sw/routing/E7881B.htm>

Applicable Standards

- IEEE Standard 802.3ad-2000

Configuration and Ordering Details

To use the N5582A Link Aggregation Control Protocol (LACP) Emulation software, the following Agilent N2X hardware and software are required.

Hardware

A N2X system is required with:

- System controller
- Chassis
- Interface cards

N5582A Link Aggregation Control Protocol (LACP) Emulation software is supported on all N2X XR, XR-2, XS and XS-2 Ethernet test cards.

N5582A Link Aggregation Control Protocol (LACP) Emulation software is NOT supported on N2X XP test cards.

Protocol emulations over LACP capability is not supported on the E7906A 16-port 10/100 Ethernet XR test card. LACP emulation (without the addition of protocol emulations over LAG) is supported on this test card.

Software

Required software packages:

- E7881B Packets and Protocols Application Software

Optional software packages:

- N5715A LACP Conformance Test Software

Your local Agilent field engineer can provide more details on how to order and configure a test system.

Online Help

An extensive online help system provides complete descriptions and detailed usage instructions for every component of N2X. Dialog-level, context-sensitive help provides rapid access to the relevant sections of the online help

Related Products

The Agilent Network Tester is a highly scalable and flexible solution for performance testing of Layer 4-7 devices. As a companion to N2X, the NetworkTester provides real-world, stateful application layer traffic generation over PPP sessions, enabling developers to verify the end-user experience and performance of applications running over a broadband network. It also supports 802.1x, IPsec and IPsecv6 access protocols.



Agilent Network Tester

Agilent N2X

Agilent's N2X multi-service tester combines leading-edge services with carrier grade infrastructure testing and emulation. The N2X solution set allows network equipment manufacturers and service providers to more comprehensively test new services end-to-end, resulting in higher quality of service and lower network operating costs.

Warranty and Support

Hardware Warranty

All N2X hardware is warranted against defects in materials and workmanship for a period of 1 year from the date of shipment.

Software Warranty

All N2X software is warranted for a period of 90 days. The applications are warranted to execute and install properly from the media provided. This warranty only covers physical defects in the media, whereby the media is replaced at no charge during the warranty period.

Software Updates

With the purchase of any new system controller, Agilent will provide 1 year of complimentary software updates. At the end of the first year, you can enroll into the Software and Support Agreement (SSA) contract for continuing software product enhancements.

Support

Technical support is available throughout the support life of the product. Support is available to verify that the equipment works properly, to help with product operation, and to provide basic measurement assistance for the use of the specified capabilities, at no extra cost, upon request.

Ordering Information

To order and configure the test system consult your local Agilent field engineer.

Sales, Service and Support

United States:

Agilent Technologies
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
1-800-452-4844

Canada:

Agilent Technologies Canada Inc.
2660 Matheson Blvd. E
Mississauga, Ontario
L4W 5M2
1-877-894-4414

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