LXI Reference Design Updates for LXI Version 1.6

The LXI Reference Design is an open-source implementation of the LXI standard for members of the LXI Consortium. The source code is tested for Windows 7 & 10 and Ubuntu 18.04. Its architectural build with CMake allows many more platforms to be generated or adopted with little to no effort. The source code is built as modules which allow easily adding or removing specific LXI extended features. In addition to the modularity, much of the source code can be modified to meet company requirements such as storing private keys or using a specified web server or database.

The LXI Reference Design implementation was created in 2014 in a collaboration between TSEP and the LXI Consortium. The initial LXI Reference Design supported the LXI Device Specification 2016, LXI IPv6 Extended Function, and LXI HiSLIP Extended Function. The LXI Reference Design was extended to support the LXI Event Messaging, LXI Event Log, and LXI Clock Synchronization Extended Functions.

The LXI Consortium utilizes TSEP to develop and maintain the LXI Reference Design source code. The maintenance includes ongoing platform changes and bug fixes. Whether changing platforms from Windows 7 to Windows 10 or moving from Ubuntu 14.04 to Ubuntu 16.04, then again to Ubuntu 18.04, users have had current and supported tools at their disposal.

TSEP has invested 5 engineering years in the release mentioned above. They have invested another 1.5 engineering years to update the LXI Reference Design to conform to the new LXI Version 1.6. This iteration includes the new LXI Security and LXI API Extended Functions, and updates to the LXI HiSLIP and LXI IPv6 Extended Functions.

Member Benefits

Utilizing the LXI Reference Design allows members to develop new and update existing LXI compliant devices to new versions of the LXI standards in a timely and cost-efficient manner.

For new members, adopting the LXI Reference Design offers a technical blueprint, lowering the barrier of entry for developing an LXI-compliant device. The LXI Reference Design provides a simple introduction to LXI. Leveraging the 6.5 engineering years of development significantly reduces a member's development costs.

In the natively supported platforms (currently Windows 10, Ubuntu 18.04), the technical blueprint includes a virtual instrument to guide the adoption. Other platforms can be adopted as an operating system abstraction class, offering a central location to exchange operating system-specific code and manage device resources in a central resource header.

In the past, LXI members have contracted directly with TSEP to significantly reduce the member's efforts to adopt the LXI Reference Design. For TSEP support contact them directly.

Technical Changes

TSEP has been involved with the development of the LXI Version 1.6. The LXI Reference Design was developed by TSEP in parallel with the development of the LXI Version 1.6 standard. TSEP's parallel development was very valuable in validating the technical aspect of the LXI Version 1.6 standard.

LXI Reference Design supports following aspects of the LXI Standard, Version 1.6:

- ✓ LXI Device Specification 2022
- ✓ LXI IPv6 v2.0
- ✓ LXI HiSLIP v1.3
- ✓ LXI Event Messaging v1.1
- ✓ LXI Event Log v1.0
- ✓ LXI Clock Synchronization v1.1
- ✓ LXI Security v1.0
- ✓ LXI API v1.0

The major changes from LXI Version 1.5 to 1.6 affect the web server, which the standard has now changed from an HTTP server to an HTTPS server. The LXI Reference Design delivers its webpages via HTTPS, however, HTTP is still supported for backward compatibility as permitted by the standard.

Further, the HiSLIP server has been upgraded to a HiSLIP 2.0 server and is also backward compatible. It is not required to use the new security features of the HiSLIP 2.0 server.

Another change from the previous LXI Version 1.5 implementation is the IPv6 module. Like the LXI IPv6 Extended Function, the IPv6 module was updated to include static IPv6 addressing and the capability to toggle DHCPv6, Router Advertisement, and static addressing.

The new LXI Security and LXI API Extended Functions have been added as optional modules to the LXI Reference Design implementation.

As one measure of the complexity of these modules, the LXI Version 1.5 has 150 rules, and the new Extended Functions introduce roughly 250 new rules.

The LXI Reference Design LXI API extended function implementation support includes 11 REST APIs which rely on 8 different XML schemas. The implementation validates and parses the incoming data as defined by the appropriate XML schema.

The LXI Reference Design includes the ability to track the instrument firmware network configuration and API settings configuration to determine if the instrument is in “unsecure mode”.

Summary

In summary, the LXI Reference Design is a technical blueprint that significantly reduces the development cost and lowers the barrier of entry when developing an LXI-compliant device. The LXI Reference Design has been significantly enhanced to support the LXI Version 1.6 including the new LXI Security and LXI API Extended Functions. The modularity of the LXI Reference Design allows members to flexibly and easily utilize or change the components needed for their LXI-compliant device.

David Courtney
Managing Director
TSE Plazotta GmbH
2022