DEFINITIONS OF LONWORKS TERMS (click on a term to go to the page with its definition)

Address: A set of numbers which uniquely identifies a device to the rest of the network. All devices on a Lon network must have a network address. In a Lon network, the devices are addressed in a three-tier hierarchy:

The *Domain* address is the highest level of the hierarchy. Members of one domain may not communicate with members of another domain without the use of a router. Most networks will only have 1 domain.

The *Subnet* address is the middle tier of the addressing scheme. Up to 255 subnets may be defined per domain. Subnets are typically used to segregate data traffic from different control systems. For example, the Lon dimming for ballrooms may be on a separate subnet from the Lon security system, but since they are both on the data network, they could exchange information if set up to.

The *Node ID,* the lowest tier, identifies devices within a subnet. There can be up to 127 devices, each with their own Node ID, per subnet.

In addition to the network addressing assigned to each device, each neuron chip has a unique neuron ID that was assigned at fabrication. No two neurons have the same neuron ID. This neuron ID may be used by network tools to communicate with a device when attempts to contact the device using network addressing fail.

It is the responsibility of a network manager to assign and maintain the network addresses for devices installed on the network. Each device, when installed on the network for the first time, will supply the network manager with a specific program ID and its neuron ID. These IDs are stored in the network manager's database for future reference. The network manager then

sets the subnet/node ID address. This scheme is particularity useful when a device needs to be replaced or upgraded. The actual device is removed from the network, and the network manager is instructed to 'replace' the device. The replacement command would typically assign the new device the same network address of the old device. To the network, it would then be business as usual, with the other devices communicating with the replacement as before.

Binding: The process of linking network variables of different network devices together, enabling those devices to communicate. Only after an output network variable is bound to an input network variable does a receiver device get updates from a sender device. Bindings must be made between input variables and output variables of the same type (see SNVTs). It would make no sense to bind a device transmitting a variable measuring meters per second, for example, to a device expecting a pressure measurement in PSI.

The process of binding devices requires the knowledge of the capabilities of each device (see XIF), their physical locations on the network and the intended operation of the network as a whole. For example, let us consider a simple network of two switch devices and two relay devices: a switch in room A would activate a relay in room A and a switch in room B would activate a relay in room B. To achieve this result, the installer would have to bind the output network variables of each switch device to the input network variables of their relay target.

Browser: A generic device plug-in that allows a user to view and modify network variables and configuration properties for a device. A browser is shipped as a standard plug-in with LonMaker for Windows, the most commonly used LonWorks network manipulation software. This browser presents all network variables and properties in a list view, and includes output monitoring, data formatting and report capabilities.

Channel: The physical medium that devices use to communicate with one another. Typical channels are fiber optics, RF, power line, and twisted pair types. Each channel type has its own specifications as to maximum distances, number of devices (loading), and throughput (maximum number of data packets per second). The most popular channel type for building controls is TP/FT-78, or Twisted Pair, Free Topology, 78K bits per second. Most devices can only exist on 1 channel unless a router is used.

Configuration: Each device on the network has properties that the user may adjust to modify the device's behavior. Setting these properties is called configuration. For example, setting the trip point and deadband of a LON photo control would be part of configuring the device for normal runtime responses. Sets of adjustable properties for standard network devices are known as SCPTs, or Standard Configuration Property Types. Manufacturers may also define their own properties, known as UCPTs, or User defined Configuration Property Types.

Configuration properties are written to the device when it is commissioned in the network by the network manager, and the settings stored in the network database. The stored settings can be recalled and sent to a replacement device, if the original ever failed. The replacement device would then assume the exact operating characteristics of the original device. Configuration properties for a specific device may be quite elaborate. (For example, nearly one third of the memory resources of the WNX-2624 Network Node are reserved for SCPT data, relay data, and group settings.) For devices of this complexity, the setting and modification of configuration properties is usually done within a manufacturer supplied plug-in which provides a user-friendly interface for configuring the device.

Device: Any hardware entity that can communicate LonTalk messages on a Lon network. Also known as a node, a device typically consists of a neuron chip, a standard Lon transceiver, a local power supply and associated input and output hardware to fulfill its intended functionality. A device must conform to the LonTalk protocol and have a physical connection to the network using an appropriate transceiver for the channel type in use.

LonWorks devices are categorized based on their primary function. Measuring devices are referred to as sensors. Devices that implement input to output algorithms are called controllers. Output devices that drive hardware in response to control variables are known as actuators. Additionally, there are special support devices that aid in the structure of a network, such as routers and network interface devices. The functionality of the device is implemented as the device application, which resides on and is executed by the neuron processor. A detailed description of the device's capabilities and settings may also be available in the form of an XIF, or External Interface File.

Device Resource File (DRF): A specially coded data file created and provided by a device manufacturer to support their Lon product. There are many SCPTs, SNVTs, and Functional Profiles that are defined by the LonMark standards. If a manufacturer designs devices that use these standards exclusively, and imbeds proper documentation in the device's XIF file, there is no need to provide DRFs. When a manufacturer creates their own definitions, or varies from the defined standards, then they may generate DRFs to describe to PC based tools such as LonMaker the new variables, properties, or profiles implemented in their device. DRFs are intended to aid integrators, and are not required for the installation or operation of any Lon device.

Domain: The top tier of the addressing scheme, with the lower tiers being the subnet and the node address. In order for one Lon device to communicate with another Lon device, they must be members of the same domain. The exception to this rule is when a router is used, each side of a router may be in a different domain. Usually, a Lon device can also be a member of another (but not more than one other) domain.

External Interface File (XIF): A formalized description of the capabilities of a LON device, provided by its manufacturer. This software file describes the manufacturer, make, and model number of the device. The XIF also specifies which functional profiles, SNVTs, and SCPTs are implemented. A properly formatted XIF file will even specify factory default values for all parameters for the device. The primary use of XIF files is to describe a device to a database, or tool (such as LNS) without having the actual device available. This way, an entire network can be designed and configured on a PC without being connected to the target network. This design method, known as an Engineered System, allows most of the integration to occur offsite at an office. The database thus created is then brought to site, where the devices specified in the database are commissioned (associated with real hardware) on the physical network. All addressing, binding, and configurations created at the office are automatically loaded into the target devices in one operation.

Functional Profile (FP): The Industry standard application model of the specific functions for a device. The model describes the types of network variables required to implement a given function, the SCPTs, or properties necessary to tune the function, and a general description of how and when these SNVTs and SCPTs should be applied to events. A typical functional profile would be lamp actuator, which receives activation commands via SNVT_switch, and transmits status out via SNVT_switch. A collection of interconnected functional profiles (connected by binding their input and output network variables) form the basis for a functional network. Functional Profiles allow designers and integrators to all share a standard description of the purpose and capabilities of a given device.

Functional profiles do not specify the exact hardware requirements, nor do they specify the full functionality of a device. They do, however, specify a minimum feature set that must be programmed. They also state the appropriate network variables and configuration properties needed to communicate the FPs functionality and characteristics. Manufacturers are free to add to the base functionality of the defined FPs. This freedom allows additional features to be implemented in the devices to offer greater flexibility and a competitive advantage, while still conforming to the base specifications required by the profile.

There are currently numerous functional profiles, all defined by the LonMark organization, for a wide variety of industries and products. A Lon device may have one or many functional profiles implemented, depending on the device's complexity and attached hardware.

Interoperability: The ability of a defined networked system to function as intended, regardless of the manufacturer of the network devices used. That is to say, if a Lon motion detector was required to activate the lights or HVAC in a room, any LonMark compliant motion detector from any manufacturer could be used, since they should all implement the functional profile *Occupancy Sensor*. Interoperability is the key feature of a LonWorks network.

Local Operating Network (LON): A LON is designed to pass many small bits of control data between its members, primarily for monitoring and control purposes. In contrast, a LAN (Local Area Network) is designed to share large amounts of data files between many PCs for a variety of purposes.

LonMaker: LonMaker is a PC based network tool developed by Echelon, using its LNS database for networks. This tool allows the creation, definition, and maintenance of both small and large LonWorks networks. It supports the deployment of plug-ins,

and self-documents the network with its Visio graphical representation of the network. LonMaker connects to the Lon network using one of several network interface cards available from Echelon or other manufacturers. .

LonMark: The organization that defines standards and procedures for any devices to be used on a LonWorks network. The LonMark organization defines the Standard Network Variable Types (SNVTs), the Standard Configuration Property Types (SCPTs), Functional Profiles (FPs), and specific file formats for support functions, such as device self-documentation, multi language support, and device resource file specifications. Meeting these standards ensures interoperability, that is, the ability of devices from different manufacturers to seamlessly connect and function as a whole on a network.

LonTalk: The protocol which enables neurons to communicate with one another. It includes the specifications for message types, whether those messages are for data exchange via SNVTs, command and control messages from network tools (network commands), or user defined messages (message tags).

LonWorks: The collective technologies, for both hardware and software, that have been developed by Echelon and others to enable the standardized exchange of data on control networks.

LonWorks Network Services (LNS): A database and services-based software product developed by Echelon, for use by tool manufacturers to assist them in creating applications for the PC. LNS provides mechanisms for network creation and maintenance, for control and monitoring (both locally and remotely) and for database backups and archiving. LNS is not a fully operational product, but rather a tool for creating a HMI (Human/Machine Interface) or GUI (Graphical User Interface) system, such as LonMaker for Windows.

Network Variable (NV): The standard method used to exchange data between Lon devices. It may be defined as an *output NV* that a device transmits to other devices, or as an *input NV* that a device receives from other devices on the network. A network device may implement up to 62 network variables. Network variables may be simple raw data types, such as unsigned or signed quantities, or they may be more complex and standardized. Standardized network variables, or SNVTs, are used to convey predefined data information, such as time weight, speed or position. There are currently hundreds of SNVTs in common use. Typically, connections (known as bindings) are only made between network variables of identical types. For instance, an output network variable of *SNVT_switch* from a pushbutton device would typically be bound to an input network variable also of *SNVT_switch* on, for example, a relay.

Neuron: The marketing name given to a class of computer chips manufactured by Toshiba and others. This chip has the LonTalk communications protocol embedded in one of its three control processors, and also has memory resources for device specific applications. These applications are the routines created by manufacturers to give their particular device functionality. All Lon devices, generally, include a neuron.

Node: A specific piece of hardware on a Lon network (also called a *device*).

Object: A defined set of one or more specific input and/or network variables, along with a set of configuration properties to allow performance of a certain function. An object is a software entity, burned into the device's chip. A device may contain any number of objects. Each LonWorks object is assigned an Object Number.

Plug-In: A mini software application, supplied by the device manufacturer, that generally assists the operator in configuring and using the device on a LonWork network. Not all LonWorks software programs support plug-ins, and not all devices have plug-ins written for them. A device will operate properly without the use of a plug-in; it is only intended as an aid to the user.

Protocol: An agreed-to set of rules, forms and conventions for the common exchange of information. A protocol may or may not be an open (published and publicly documented and maintained) standard. The *LonTalk* protocol (EIA 709.1 Control Networking Standard) is an open, official standard.

Router: A special class of Lon device that allows communication between different channels on a LON network. A typical router has two neurons connected back to back, each with its own transceiver. This allows the router to pass data between two different types of media, or channels. Routers also can selectively pass or block data from either side, lowering data traffic. Routers also electrically isolate the two channels, so a network fault on one side does not affect the operation on the second side.

Service Pin: A push-button switch on a Lon Device that is used to identify the device to others when first introduced onto a network. All Lon devices are required to have a service pin, as well as an accompanying service LED. When pressed, the service pin directs the device's neuron to transmit its unique 6-byte ID, plus the program ID that identifies the application running on the neuron. The service LED, normally not lit, has several defined flash characteristics that aid in diagnosing the health of a neuron.

Standard Configuration Property Type (SCTP): A set of object properties, standard for the type of object, which is assigned at the time of installation and remains static for the life of the device which contains the object. SCPTs are defined and maintained by the LonMark organization and are to be used wherever applicable. Typical SCPTs include device location labels, setpoints, heartbeat rates for outputs, etc. SCPTs are either assigned by a standard data browser (shipped with LonMaker) or by a device plug-in. An object can have more than one SCPT.

Standard Network Variable Type (SNVT): A pre-defined format for data exchange between Lon devices. Not only do SNVTs convey data, but they also imply measurement quantity, such as percent, volume, light level, or distance. Typically, a sender device would transmit an output network variable of SNVT_xxx, which could be received by a listener device with an input network variable of the same type SNVT_xxx. Currently there are several hundred SNVT data types defined.

Subnet: The middle tier of the Lon Network addressing hierarchy. A network *domain* (highest address level) can contain up to 255 subnets. Generally, subnet designations are used to segregate the network in some logical manner. For instance, the HVAC network may be set to one subnet, and the access control to a second. Though there may be some data exchange between subnets, the main data flow tends to be among devices within a subnet. This architecture helps to segregate bandwidth if routers are used.

Transceiver: An electronic component that connects a neuron to a channel and serves as the physical connection between devices. A transceiver is specific to the channel type it connects to; there are RS-485, power line, RF, fiber optic, twisted pair, and coax transceivers to name a few. The most popular transceiver is the FTT-10A, which connects neurons to a TP/FT-78 data line.

User-Defined Configuration Property Type (UCPT): A set of object properties, defined by the manufacturer of the device that contains the object. It is assigned at the time of installation and remains static for the life of the device. UCPTs are used to give a device properties not covered by any SCPTs (Standard Configuration Property Types). Like SCPTs, UCPTs are either assigned by a standard data browser (shipped with LonMaker) or by a device plug-in. An object can have more than one UCPT.

Wink: A visible component, usually a flashing LED, that is used to physically identify the device within the network. It is activated by a network command (usually from a network tool). An installer can then search the devices and look for the unit that is winking (flashing LED or other signal).