

NMRAnet Goals and Measures of Success

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Goals for NMRAnet

5 Goals are meant to provide a shared vision of what we're trying to achieve. As such, they describe what we want to support without necessarily restricting other approaches. Well-written goals help make decisions. When you have a problem you're trying to solve and you have multiple solutions you could choose from, goals help point the way to solutions that further the shared vision. As such, goals do not use strong words like shall and should with a "legal" intent, which often dictate solutions too early in the process. Rather, these words carry no special meaning. (Note, I'm carefully avoiding defining what words we should use because these goals are not meant to be a rigid framework—just aspirations).

10 Additionally, these goals are intentionally brief. They're designed to be easy to read and re-read as a guide to our work. Clarification is in the Measures of Success section, which has much longer descriptions.

15	Interoperable	Products from one company can work with products from any other company, and with legacy systems.
	No Central Control	Products can interact with other products without the need for a central processor.
	Optional PC Control	A PC can provide higher-level functionality, such as a CTC Interlocking, and system functions such as monitoring, testing, and debugging.
20	Simple	Make it easy for a novice customers to install and configure without technical knowledge (should be easier than DCC systems).
	Expandable	Allow very large layouts (a higher-level of technical knowledge required is OK for large layouts).
	Flexible	Customers can easily connect many-to-many devices, and connect to legacy systems.
25	Extensible	Allow additional functionality to be added easily, whether by the NMRA, or manufacturers.
	Easy to Implement	Easy and inexpensive to implement products that are reliable and compatible for vendors wishing to create products.
30	Bi-directional	Support bi-directional exchange of information.
	Free IP	The Standards and/or RPs should be free from intellectual-property restrictions from parties other than the NMRA.
	Transport Agnostic	Allow different transport mechanisms for messages.
35	Train Agnostic	Support controlling trains when the network is connected to a train-control system.
	Discoverable	Allow a user to find out what devices are connected and how they're configured on a layout.
	Self Describing	Devices should describe themselves.
	Testable	Allow components to be easily tested for compliance.
40	Compliance	A name protected by a trademark that NMRA can use to help ensure compliance.
	First-Time Use	A new user can buy a device and have it work.

Measures of Success

45 Goals by their nature tend to be broad and open to interpretation. They are kept short and simple to help
understanding of the broad vision. However, we also need a way to determine if we have met a goal—this
is the purpose of Measures of Success. A well-written measure of success helps determine if a solution
does in fact meet a goal, which means that Measures of Success provide a clearer, more grounded
50 interpretation of a goal. These measures should not impose technical solutions, but rather describe
scenarios that we want to support. The measures below are my first take on defining these in more detail.
You can see that they're not of consistent quality and detail—they're a work in progress.

- **Interoperability:** Manufacturers can easily test their nodes for interoperability using standard tests. Any device passing these tests should be able to work with other devices passing these tests. Likewise, it should be easy for manufacturers to build bridges to systems like DCC or Loconet that
55 allows NMRAnet turnouts to be controlled from DCC throttles, and DCC engines/accessories to be controlled from NMRAnet.
- **No Central Control:** Once a layout is set up, it should run perfectly and completely without a central processing system for basic and advanced functionality.
- **Optional PC Control:** A computer attached to the bus can provide more advanced functionality, such as CTC, and system-control functions such as: monitoring, testing and debugging
- **Simple:** A customer can change the configuration of any device at any time with a simple interface that includes text descriptions of settings, thus greatly reducing the need for a manual and required level of learned expertise. This mechanism should also reduce the support burden to the manufacturer. In addition:
 - You can disconnect a node, reconnect it somewhere else on the same net and have it still work
65 without having to make any configuration changes.
- **Expandable:** A very large museum layout might be divided into distinct segments that work together as a single network. You can use a device, such as a hub, repeater, or switch, to connect multiple segments to form a single network.
- **Flexible:** You can buy devices from any manufacturer that were designed without knowledge of the other devices and make them work together.
- **Extensible:** The NMRA can add Standards and/or RPs on top of the bus to define new capabilities. Additionally, manufacturers can add their own proprietary functionality between their own devices.
- **Easy to Implement:** A manufacturer should be able to get a simple node up and running correctly with much less effort than building a DCC stationary decoder. A manufacturer should be able to
75 use inexpensive test tools and test suites, while they are building their product, which make it easier to ensure their product is implemented correctly and will work with other devices.
- **Testable:** Components can be easily tested for compliance using available tools and standard test suite.
- **Bi-Directional:** All products should be able to transmit and receive information to/from the bus. Feedback of information such as Block Occupancy Detection should be fundamental to the bus. As such, success here would be that a more sophisticated BOD could report not only occupancy, but optional additional information, such as the locomotive or rolling stock unique number, as well as yet-to-be determined information.
- **Free IP:** There should be no legal limitations on the usage of software or hardware designs specifically addressing these Standards and/or RPs in creating products (whether free or commercial)—no royalties, no licensing, no distribution limitations. In other words, anyone should be able to create a product without fear of violating patents or copyrights that are connected with the Standards and RPs created by this working group.
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- **Transport Agnostic:** If a company has another method for connecting devices, such as wireless or another wired method, they can substitute their own transport mechanism and still use all the other standards/RPs and automated test suites.
 - **Train Agnostic:** The NMRANet should be able to connect, via bridge products, to any train control system, such as DCC, DC, or PWM, to allow interaction with each other. A hand-held throttle on NMRANet can control a locomotive on DCC, DC, or PWM. Similarly, you can have a
95 bridge between a DCC command station and the NMRANet that will allow the DCC hand controller, for example, to throw a turnout motor attached to NMRANet.
 - **Discoverable:** You can connect a laptop to a layout it has never seen before. The configuration software can query the layout, provide a list of all the nodes attached to the layout, display how each node is configured, and show how nodes are interconnected and interact with each other. In
100 addition, you can save the configuration of an entire layout and later restore it (in case you want to make some changes, and then decide to go back to what you had).
 - **Self Describing:** You can connect a computer to a type of node that it has never seen before. The computer can display the manufacturer of the node, the number of devices inside the node, the configuration variables, actions, reaction, etc. All of this information can be used to generate a
105 user-friendly interface on the fly that allows configuring a node with text prompts.
 - **Compliance:** A manufacturer should be able to obtain a license to use the NMRANet name and logo when their product successfully passes a test suite. To comply with these standards a product should be capable of being connected to a real layout or a “white-box” simulation of a layout and pass all designed tests. These tests would examine the products ability to keep up with bandwidth requirements as well as make 100% compatible protocol exchange. Using standardized busses such as CAN, USB, Ethernet, ZigBee or 802.11 wireless would negate the need for a low level
110 compliance test.
 - **First-Time User:** A user new to NRMANet can buy a single device, take it home and have it do something useful and interesting without having to buy any other special hardware, or another
115 device.