DNP3 Overview
Communication protocol

Schneider Electric
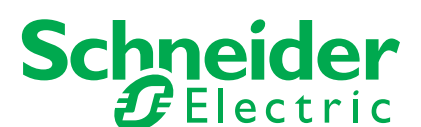
DNP3 Protocol
Features

Overview

Schneider Electric's complete family of SCADAPack Smart RTUs and gas flow computers are available with DNP3 Protocol. Today's increasingly complex SCADA networks demand that data-transfer protocols be sufficiently flexible to meet communication challenges while remaining easy-to-configure. Our intelligent implementation of the DNP3 protocol succeeds on both counts.

PRODUCT AT A GLANCE

- Logic programming not required for most DNP applications

- Easily configured using TelePACE, ISaGRAF and Realflo environments

- DNP Master and Slave modes supported

- Unsolicited messaging supported

- Change-of-State and Log-All event types supported

- Available through Ethernet and serial communication ports

Enhanced Interoperability

DNP3 or Distributed Network Protocol is a standards-based communication protocol developed to enhance interoperability among systems in the electric utility, oil & gas, water/waste water and security industries. It is a flexible and efficient, non-proprietary, layered protocol that offers higher data-transfer integrity than most conventional communication protocols.

It is suitable for implementation anywhere within a SCADA environment, including PLC to IED, master-to-remote, peer-to-peer and network communication applications.

The DNP3 User Group, (www.dnp.org), ensures continuous improvement of the protocol in the ever-changing technological climate of industrial control.

Easily Configured

DNP3 is configured in TelePACE, ISaGRAF and Realflo programming environments with an easy-to-use dialog. Application and data layers, master poll and mimic mode, address mapping, message routing and IO points are all configured on the same dialog. The majority of DNP3 applications can be configured using this dialog, thereby eliminating the need for additional logic programming.

TelePACE, ISaGRAF, Realflo and Firmware Loader applications also support DNP connections to Smart RTUs. Firmware and application programs can be downloaded to the Smart RTU and logic execution monitored on-line using a DNP connection.

Additional DNP Functions

Custom logic functions are available when additional DNP functionality is required. These functions allow the PLC logic application to trigger various DNP events, including class polls, clock synchronisation and unsolicited response messages.

Another set of dedicated function blocks allows the PLC logic to access DNP diagnostic information including DNP connection status, event-count by point type and class, port communication statistics and station message statistics.

DNP3 enables tight integration between SCADAPack E RTUs and ClearSCADA enterprise software with features that include automatic/manual downloading of firmware, configuration and application from ClearSCADA to the RTU, trend reading, alarm time profile and security configuration downloading.

DNP3 Protocol Features

Master Mode

SCADAPack 32 and SCADAPack 300 Smart RTUs support DNP3 master functionality. A DNP master can initiate polls for static data (Class 0) and event data (Class 1, 2, 3) and accept unsolicited event data from slave PLCs.

A typical DNP application consists of a DNP master Smart RTU, routinely polling a number of DNP slave Smart RTUs as shown below.
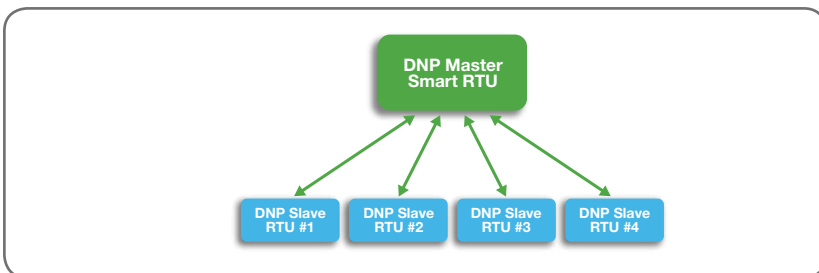

In many applications the DNP master PLC or DNP slave PLC is simply required to route messages to/from a SCADA host as shown below.
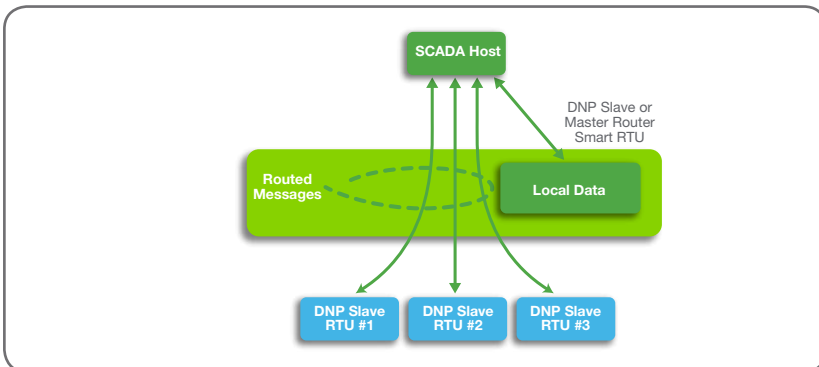
In addition to message routing, master functionality also includes data concentration, using mimic and mapping modes.

In mimic mode the master maintains 'images' of remote site data for upload by the SCADA host (or other master). This is recommended in applications where the slave PLCs are on low speed or non-continuous links (eg. Dial-up).
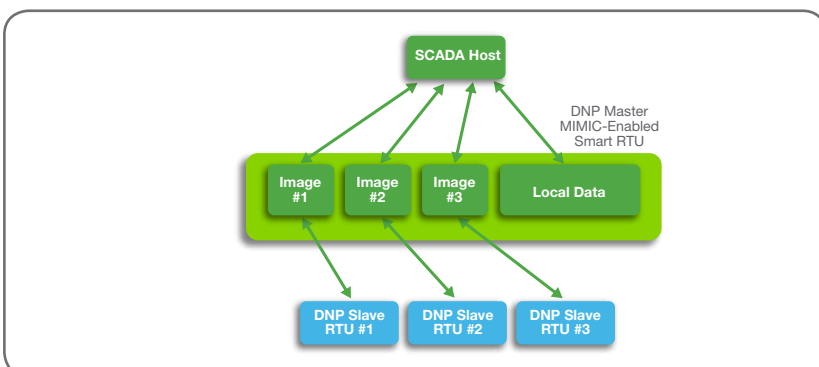
This allows the master to respond to SCADA host requests for remote slave data from its buffered images as shown above.

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In applications where data concentration is required, the master is able to map remote data to its own local registers. This is accomplished using the master-mapping mode as shown below.
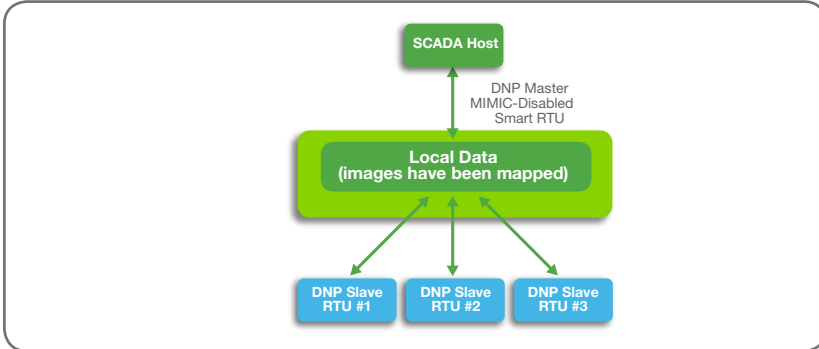
Slave Mode

All SCADAPack Smart RTUs and gas flow computers support DNP3 slave functionality. When configured as a DNP3 slave, the PLC can be polled for static data (Class 0), or event data (Class 1, 2, 3) by a DNP master. The PLC is also able to send unsolicited messages containing event data to a DNP master and route messages to/from other DNP PLCs and DNP devices.

Unsolicited Messages

An important feature of DNP3 is the ability for the PLC to generate unsolicited messages sent to the master PLC/host based upon a local PLC event. An application layer menu allows event-reporting rules for each object class (1-3) to be defined.

Reporting Rules – These are defined for each object class and include:

- Enable/Disable – Turns unsolicited reporting On/Off
- Hold Time – period seconds
- Hold Count – number of unread events in the PLC history

Object Classes

Data object classes allow for the management of message content and message triggering based upon userdetermined priority of the data. The data classes are assigned independently of the data priority.

Supported DNP object classes could be configured with the following priority structure:

- Class 1 – highest priority
- Class 2 – medium priority
- Class 3 – lowest priority

Class 0 is always a reference used by a master to read all DNP data objects. These are instantaneous/last-read values. The master/host polls for Class 0 data objects, on an infrequent basis and after each restart of the master or slave.

Ethernet and Serial Communication

DNP3 is fully supported on all Smart RTU controller communication ports, including the serial RS-232 and RS-485 ports as well as the Ethernet TCP/IP port of the SCADAPack 32 and SCADAPack 300 Smart RTUs.