

Increasing Manageability of Your Network Equipment—Including Your Legacy IEDs

IEC 61850 Compliant System Does Not Require Whole New Investment

The most up-to-date smart substations use intelligent electronic devices (IEDs), as defined by IEC 61850, to monitor and control their switchgear and transformers. The monitoring and messaging protocol used for communications in IEC 61850-compliant systems is MMS. As more and more IT equipment in substations now communicate by using MMS, devices such as industrial Ethernet switches and embedded computers can be monitored and controlled by SCADA systems. This eliminates a number of problems for automation engineers when they want to build IEC 61850-compliant systems but also have to maintain Network Management Systems (NMSs) to manage networking devices that use SNMP as communication protocol. A fully integrated management platform using a single communication and networking paradigm definitely simplifies the management of network architecture.

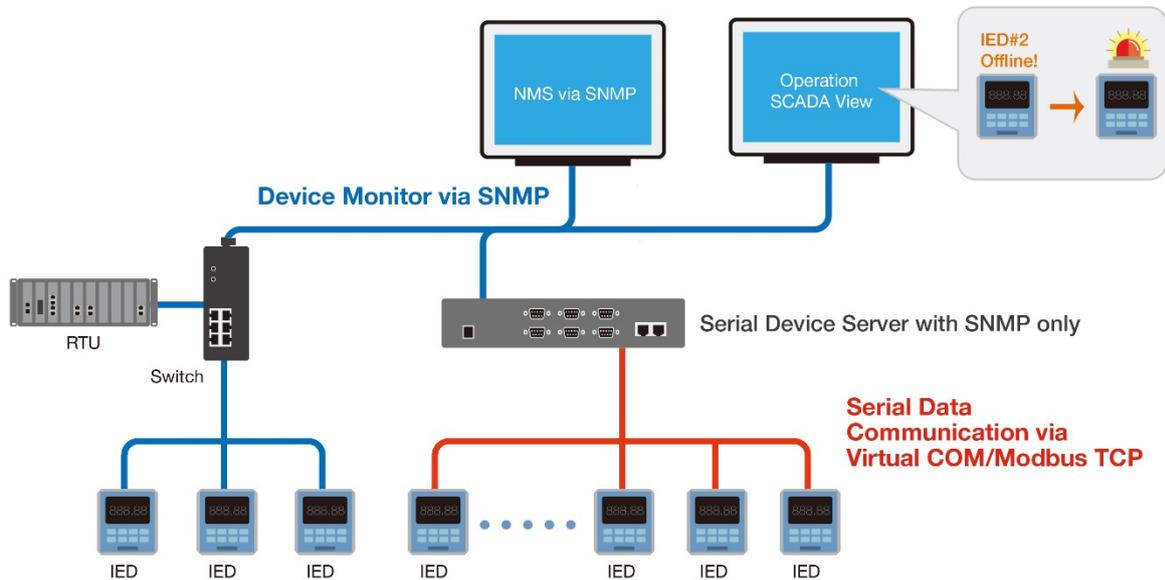
But that doesn't necessarily mean legacy IEDs have to become obsolete in an IEC 61850-compliant system. Serial device servers can bring legacy IEDs to an Ethernet network, therefore extending the lifetime of these devices and ultimately achieving a fully connected substation. However, many serial device servers do not support MMS and thus cannot be readily integrated into an IEC 61850-compliant system. Additional integration efforts are required for a separate SNMP network in order to monitor the status of serial device servers.

MMS Futureproofs Your Equipment and Makes Monitoring and Maintenance More Efficient

Substation engineers stay abreast of the status of IEDs by monitoring the inflow of communication data from these devices on the SCADA system's dashboard. The shortcoming of this method is that once you lose data coming in from an IED, you will not know whether it is the IED itself or the connection that is causing the problem. Both need to be checked to narrow down the possible causes. To make legacy IEDs more visible to SCADA users, a number of options can be considered.

Technical Note

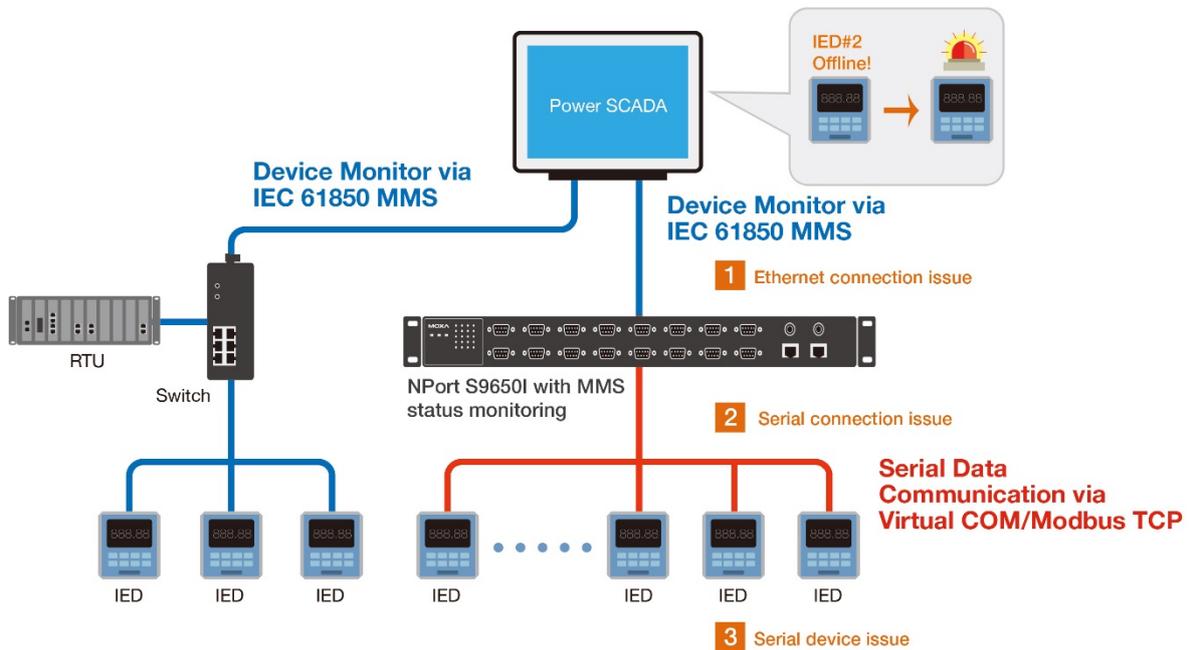
Ethernet Connection to SCADA via Serial Device Server without MMS support



A common monitoring protocol used for IT networking devices is SNMP. However, in an IEC 61850-compliant system, adopting a serial device server without IEC 61850 MMS support means a user will need a SCADA system, which covers operation-related monitoring, and a NMS, which monitors networking equipment using SNMP. With regard to serial communication, telling whether the IED fault on the SCADA system is coming from the IED itself or the serial connection, the serial device server manufacturer must provide SNMP private MIBs that include serial status, so that more detailed information can be obtained to determine the fault. More effort is needed for troubleshooting, and more money is needed for setting up the management architecture.

Technical Note

Ethernet Connection to SCADA via Serial Device Server with MMS support



Serial device servers with MMS, on the other hand, allow substation engineers to manage all networking devices under one software view. They do not only provide the status of networking equipment but also update the status of serial communication. This is beneficial because before sending any field engineer to a distant location, one can determine where the fault might be by clarifying whether it is a:

- 1) network connection issue, or
- 2) serial connection issue, or
- 3) serial device issue

With the probable cause in mind, field engineers will be able to gather the necessary resources to resolve the issue on-site in a more efficient way.

What Exactly Can Be Monitored and Managed?

The NPort S9000 serial device server comes with an ICD file that includes the full list of items that can be monitored via MMS-compliant PSCADA systems. Users will be able to import the file and select items that need to be integrated from the list. The following figure is an example of ICD file for NPort S9650I, where you can find the status of both the Ethernet and serial ports.

Technical Note

```
<?xml version="1.0" encoding="UTF-8"?>
<SCL xmlns="http://www.iec.ch/61850/2003/SCL" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
SCL.xsd">
  <Header id="SCL Example T1-1" nameStructure="IEDName"/>
  <Communication>
    <SubNetwork name="W01" type="8-MMS">
      <Text>Station bus</Text>
      <BitRate unit="b/s">100</BitRate>
      <AccessPoint name="S1">
        <Server>
          <Authentication/>
          <LDevice desc="description" inst="C1">
            <LN0 desc="description" lnType="Switch_LLNO" lnClass="LLNO" inst="">
              <DataSet name="dsLnkSt" desc="Port link status">
                <FCDA ldInst="C1" prefix="" lnInst="1" lnClass="LCCH" doName="ChLiv" fc="ST"/>
                <FCDA ldInst="C1" prefix="" lnInst="2" lnClass="LCCH" doName="ChLiv" fc="ST"/>
                <FCDA ldInst="C1" prefix="" lnInst="3" lnClass="LCCH" doName="ChLiv" fc="ST"/>
                <FCDA ldInst="C1" prefix="" lnInst="4" lnClass="LCCH" doName="ChLiv" fc="ST"/>
              </DataSet>
            </LN0>
          </LDevice>
          <LNNodeType id="Serial_LPCP" lnClass="LPSP">
            <DO name="PortNum" type="Switch_INS_90-4"/>
            <DO name="Status" type="Switch_SPS_90-4"/>
            <DO name="RxCnt" type="BCR"/>
            <DO name="TxCnt" type="BCR"/>
            <DO name="RxTotalCnt" type="BCR"/>
            <DO name="TxTotalCnt" type="BCR"/>
            <DO name="FrameErrCnt" type="BCR"/>
            <DO name="ParityErrCnt" type="BCR"/>
          </LNNodeType>
        </Server>
      </AccessPoint>
    </SubNetwork>
  </Communication>
</SCL>
```

Ethernet port status

Serial port status

Three major items can be monitored:

- 1) **Network Status:** The NPort S9000 has built-in switch ports and every Ethernet port can be monitored for
 - Link up status
 - Link down status
- 2) **Serial Communication Status:** By knowing the transmission status of serial devices via the NPort S9000, users also have a better understanding of the communication status of the connected IEDs
 - Tx/Rx Count – This indicates to users whether the serial data transmission is at a normal state or troubleshooting is needed.
 - Modem signal status – If serial devices use modem signals to indicate the readiness of a device, the NPort S9000 will be able to provide the status via MMS to the PSCADA.
- 3) **Power Status:** The NPort S9000 comes with dual power inputs, so the status of each power input can be monitored.
 - On/Off

For IEC 61850, there is a clear drive towards getting every device to communicate through MMS. This will allow substation engineers to include networking switches and device servers within the same SCADA/HMI overview, right alongside the substation's IEDs. This will improve communications, reduce deployment costs, and eliminate huge portions of maintenance issues and efforts. Furthermore, because substation engineers will only need to focus on a single set of tools and skills, operations efficiency and maintenance execution (and the associated costs) will improve as well.