Application Note AN2009-24

Archive Wide-Area Information With Synchrophasors

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INTRODUCTION

Synchrophasors provide a unique opportunity to archive and subsequently view data across a wide geographic area. This is because time stamps provide a means to align the data for analysis.

The archived synchrophasor data enable offline analysis of system-wide events and validation of power system models. NERC (North American Electric Reliability Corporation) Standard PRC-002 requires the recording of wide-area power system information.

PROBLEM

Many existing communications links cannot support the bandwidth required for synchrophasor data rates. For example, sending all possible voltage and current measurements available from a single SEL-421 Protection, Automation, and Control System at 60 messages per second requires a data rate of approximately 75 Kbps. Even if the channel can support such a data rate, communications links are not perfect. Data are lost if the link is disrupted. Therefore, a method to archive data without communications channel constraints is needed.

SEL SOLUTION

Use SYNCHROWAVE® Software to store a high data rate locally in the substation and optionally send a lower data rate out of the substation. The result is a high-resolution synchrophasor archive without communications channel limitations. This solution works for applications when data from the substation are for visualization or state estimation enhancement purposes. Visualization displays update, at most, a few times every second. You can view streaming synchrophasor data with the SEL-5078 SYNCHROWAVE Console Software. State estimators typically update at multiples of seconds. Meanwhile, the high-rate data remain local to the substation. The archive stores all data in case the substation connection is lost.

Nearly all SEL relays and meters include synchrophasor measurement as a standard feature. The synchrophasor data stream over a serial connection or Ethernet, depending on the IED (intelligent electronic device), with the IEEE C37.118-2005 protocol. Depending on the local power system, the highest streaming data rate is either 60 or 50 samples per second.

Within the substation, archive data with the SEL-5076 SYNCHROWAVE Archiver Software. This software application stores data locally, optionally using a circular overwrite method. Select an appropriate overwrite interval, such as every 30 days. For time intervals without a disturbance, it is acceptable to allow the data to overwrite. In the event of a disturbance, SYNCHROWAVE Archiver collects data for analysis. Another approach is to periodically collect data, even in the absence of a disturbance.

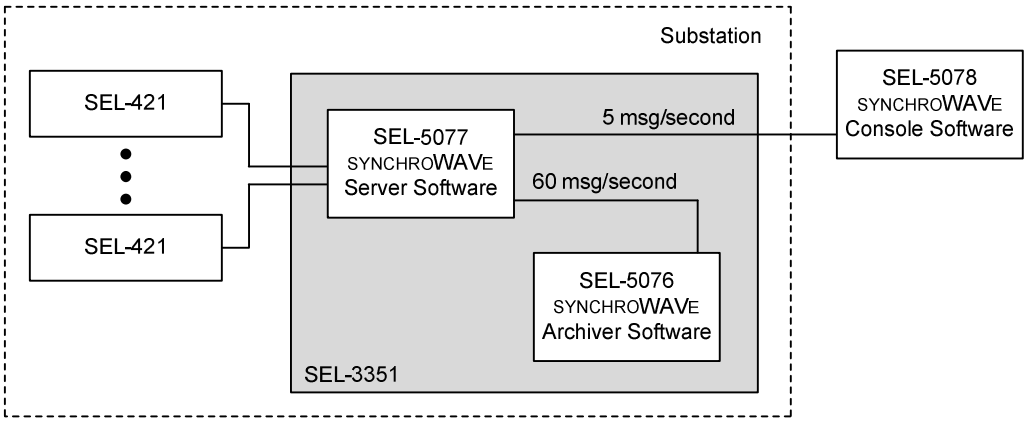

Figure 1 Archiving system architecture

The settings display for SYNCHROWAVE Archiver automatically shows all data available for archiving. The **Stations** folder displays individual available PMUs (phasor measurement units). The PMUs can be expanded to find the specific data available for each. To record each value, click on the value to turn the "flag" from red to green. For this example, the **CSV** and **Zipped** setting boxes are checked. The software stores the data in CSV format, and once the file is complete, compresses the file. In the example above, a new file is generated every 12 hours.

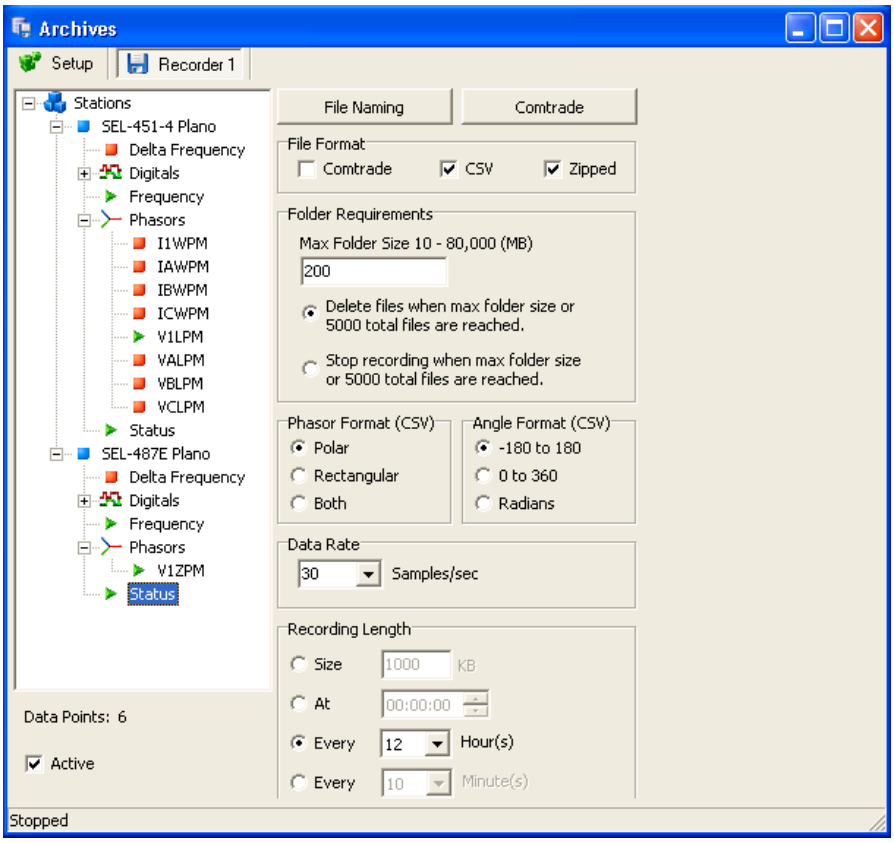

Figure 2 Example settings display

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