SEMAPHORE
a CSE-Global Group Company

APPLICATION BRIEF

Kingfisher Networking Master and Sub Master Capabilities and Benefits

INTRODUCTION

In SCADA systems, use of an RTU device in a role, which has gone by various designations such as master terminal unit (MTU), data concentrator, and communications front-end, has been a long-standing tradition.

More recently, however, the tide has turned toward use of SCADA servers communicating directly to the RTUs. Today, SCADA server platforms are practically always capable of interfacing with the data communication devices that are used in modern SCADA systems. With cost always an issue in SCADA systems, eliminating the RTU device in this role would appear to be an effective measure.

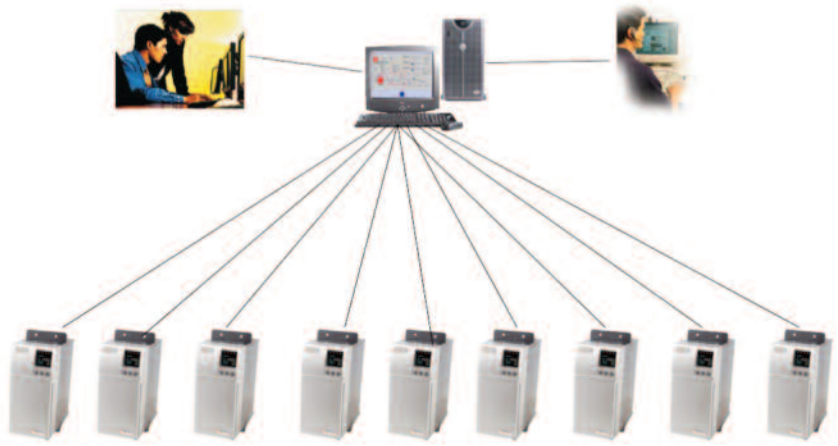
This is particularly true in a "flat network," in which there is no hierarchical or tree structuring in the SCADA system. An example of a system used in a plant environment is an Ethernet. Today, SCADA server platforms are always Ethernet-capable, as are most RTU and PLC products. It is very easy to implement a flat network that is based on Ethernet.

This structure is complicated only mildly by the broad, geographical coverage that is characteristic of most SCADA systems. In "wide area" systems, wireless Ethernet communications can provide operation that is similar to hard-wired Ethernet. The Ethernet interfaces on the SCADA server and RTU devices are simply connected to Ethernet radios. Fundamentally, the flat-network architecture is unchanged. Baud rates are lower than those in hard-wired networks but features and operations are, otherwise, similar.

In a "flat" network, the SCADA server directly connects to all RTU "end nodes" without any RTUs acting as intermediate, "masters" or "sub-masters." It should be noted that, while this diagram implies multi-drop wiring, most SCADA networks cover such broad areas that the wiring cannot be literally shown at this detail level. In addition, the features of communication protocols and contention schemes, e.g. peer-to-peer communication or management of PSTN connections, should not be assumed from this type of diagram.

Even in the modern, point-to-multipoint radio networks that are now often used instead of traditional, leased telephone line networks, the SCADA server can connect directly to the communications hardware. Depending on the master radio product, the interface is via Ethernet or an RS-232 serial port.

Since no master or sub-master nodes are included, this alternative representation also fits the description of a flat network. The "wiring" scheme is representative of leased telephone line networks with individual connections (via individual modems) between the SCADA server and RTU nodes. This scheme is also representative of point-to-multi-point radio networks, which are alternatives to leased telephone line networks.



SCADA SYSTEMS – FEATURES vs. STRUCTURE

In spite of the progress, which has been made in modern SCADA systems, issues that remain include the facts that not all SCADA servers are the same—and that applies to RTU devices, communications hardware and communications protocols, as well. Today's products continue to be distinguished by capabilities such as support of peer-to-peer communications, security features, report-by-exception and unsolicited messaging.

In the Kingfisher product line, support of DNP3 as a master and support of DNP3 Secure Authentication are distinguishing features. Master operations are keys to hierarchical networks, in which the geographical lay-out is conducive to use of RTUs in the role of sub-masters. This can substantially reduce costs in purchase and operation of communications networks.

Particularly when it relates to a wireless network or connection via the Internet, the "cloud" representation of a flat network avoids wiring implications but protocol features must still be clarified. For instance, can the RTU initiate an unsolicited message to the server?

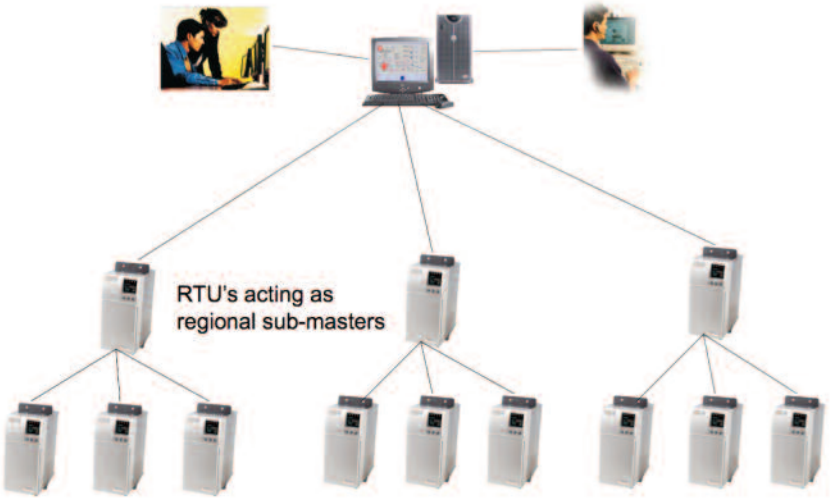
As shown in the case study that follows, SCADA server characteristics, which are very inconspicuous at specification time, could make a significant difference when it comes to operating the network in a manner that meets the needs of the end-user.

CASE STUDY – RTU Master vs. SCADA Server Management of PSTN Connections

In this application, there was a requirement for the SCADA system to communicate with a number of separate branch master, or sub-master, RTUs via a public, switched telephone network (PSTN) and through to outstation RTUs. From a network hierarchy point-of-view, the outstation RTU's are located below the sub-master RTUs.

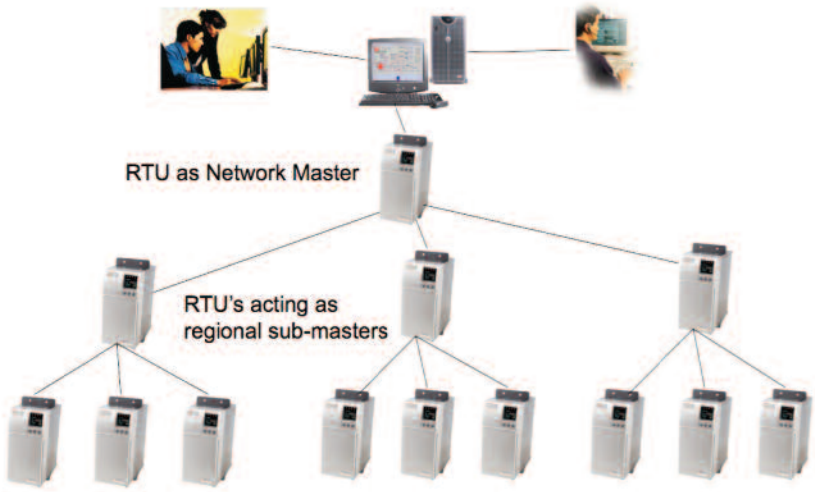
Once the system was up and running, the end user realized that the SCADA system would disconnect and re-dial the PSTN line each time it sought to communicate with an outstation RTU below a given sub-master RTU. That is, it would not maintain the connection to the sub-master RTU when communicating to multiple outstation RTUs located below this given branch sub-master RTU.

Often, a hierarchical network, which uses RTU's acting as regional branch masters, or sub-masters, best suits the geographical lay-out of a SCADA system. While lack of an RTU as a master node appears to be cost-effective, functionality issues could end up costing much more in operation.



The solution in this instance was to incorporate a Kingfisher CP-30 processor as a master RTU that was responsible for the initiation of communication with each of the sub-master RTU's. There was additionally a requirement for whole-range DNP3 addressing, which precluded the use of a Kingfisher CP-11/21 processor module.

Depending on the features or limitations of the SCADA "top end" system, use of an RTU as a master node for the entire network could provide many advantages — despite the added cost in hardware and installation.



CONCLUSION

With this configuration, the SCADA system would direct DNP3 traffic for the sub-master RTU and outstation RTUs to the local Kingfisher CP-30 processor, which would then determine the PSTN connection to be employed and, if this hadn't already been established, perform the dial-out and relay of the DNP3 message between the SCADA system and the destination RTU. Moreover, the Kingfisher CP-30 processor is able to determine if it already has a connection established to the sub-master RTU through which communications to an outstation RTU should be relayed and as such, resolved the problem of PSTN disconnection and re-dial which the SCADA system presented.

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