



Axle Counter Monitoring using an IP Based Network with Ring Topology

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Connectivity Solutions for accessing console ports of Axle Counters for Performance Monitoring

Axle counters need to be continuously monitored for their performance. A RS232 console port is provided on Axle Counters through which the device can be monitored using a PC. The monitoring network for tracking the performance of multiple Axle Counters is separate from the network used for interconnection of Axle counters for their main operation.

Axle counters always work in pairs. The challenge in monitoring Axle Counters is their distributed nature. Any centralized monitoring facility has to access multiple Axle Counters periodically, if not continuously. In any case they should be accessed often enough so that data available about their health and performance is real time, and corrective action can be initiated as soon as any performance degradation is observed.

The first task to achieve this is to have a communication path covering all the physical locations where Axle counters are located. Axle Counters are typically located in track-side Goomties, and there may be several Axle Counters in one Goomty. The management network has to therefore span a number of Goomties. The actual management data that needs to be collected from individual Axle Counters may not be voluminous and hence the management network need not be a high bandwidth network. Actual data transfer between the central site PC and Axle counters can be simple command line based.

A TCP/IP based monitoring network based on CYGNUS 1110 Network Access Device (NAX) is a good solution for accessing console ports of Axle Counters from a central site. The scheme is shown in Fig 1 and Fig 2. CYGNUS 1110 NAX is essentially an IP router with serial RS232 and Ethernet ports for connecting user devices. It has two V.35 WAN ports for networking with other CYGNUS 1110 units. One CYGNUS 1110 unit is located at each Goomty housing Axle counters at a site. A NAX unit is also located at the central monitoring location.

WAN ports of the NAX units may be interconnected using 2 Mbps leased channels provisioned from Railway/Railtel optical fiber network. For this, the V.35 WAN ports of CYGNUS 1110 units need to be converted to E1 and connected to E1 ports of STM muxes at cable huts. If a NAX unit is located close to the cable hut a V.35-to-E1 Converter (available from Cygnus) can be used for this purpose. If the distance from NAX to cable hut is large then a pair of G.shdsl modems (on copper) or Fiber modems (on optical fiber) may be used. The modem which connects to the STM mux will have an E1 interface whereas the Modem connecting to the NAX WAN port has V.35 interface. The connectivity may even be in a ring-like fashion, by connecting the last NAX unit back to the first one. This provides a redundant path should a link or a NAX unit in the ring fail.

For increased robustness, the two WAN ports of a NAX unit may be connected to two different cable huts if possible. This would reduce the chance of both links failing simultaneously, since the links from NAX to the two cable huts would most likely be carried in different cables so that they do not fail together and at least one link continues to work. Both WAN ports of the central site NAX unit may however be connected to the same cable hut which provides connectivity in two different directions on the fiber backbone.

Serial RS232 console ports of Axle counters at each Goomty are connected to the RS232 ports of NAX unit located there. Since NAX has four RS232 ports, up to four such connections are possible.

At the central site, CYGNUS 1110 NAX offers two ways of connecting to the management PC. In the first scheme the management PC is connected to NAX using an Ethernet port. In this scheme the PC becomes part of the IP network. The general setup for this application is shown in Fig 1.

The Management PC can send data to various serial ports of NAX units at Goomties using TCP protocol. After setting up a TCP connection with a serial port of CYGNUS 1110 unit at the Goomty it is able to send or receive data to the Console Port of the Axle Counter which is connected to that serial port.

The Management PC may in fact open multiple TCP connections to different serial ports of the same or different NAX unit in the network, and send or receive data to/from the Axle Counter using different terminal emulation “Windows”. It can employ virtual connection software that allows serial data to be sent using Telnet protocol from the “Window” to a remote serial port of NAX to which desired Axle counter’s console port is connected. Communication between the Management PC and the Axle Counter takes place on an error corrected logical channel.

Using TELNET it is even possible to have direct craft terminal access to an Axle Counter from the Management PC.

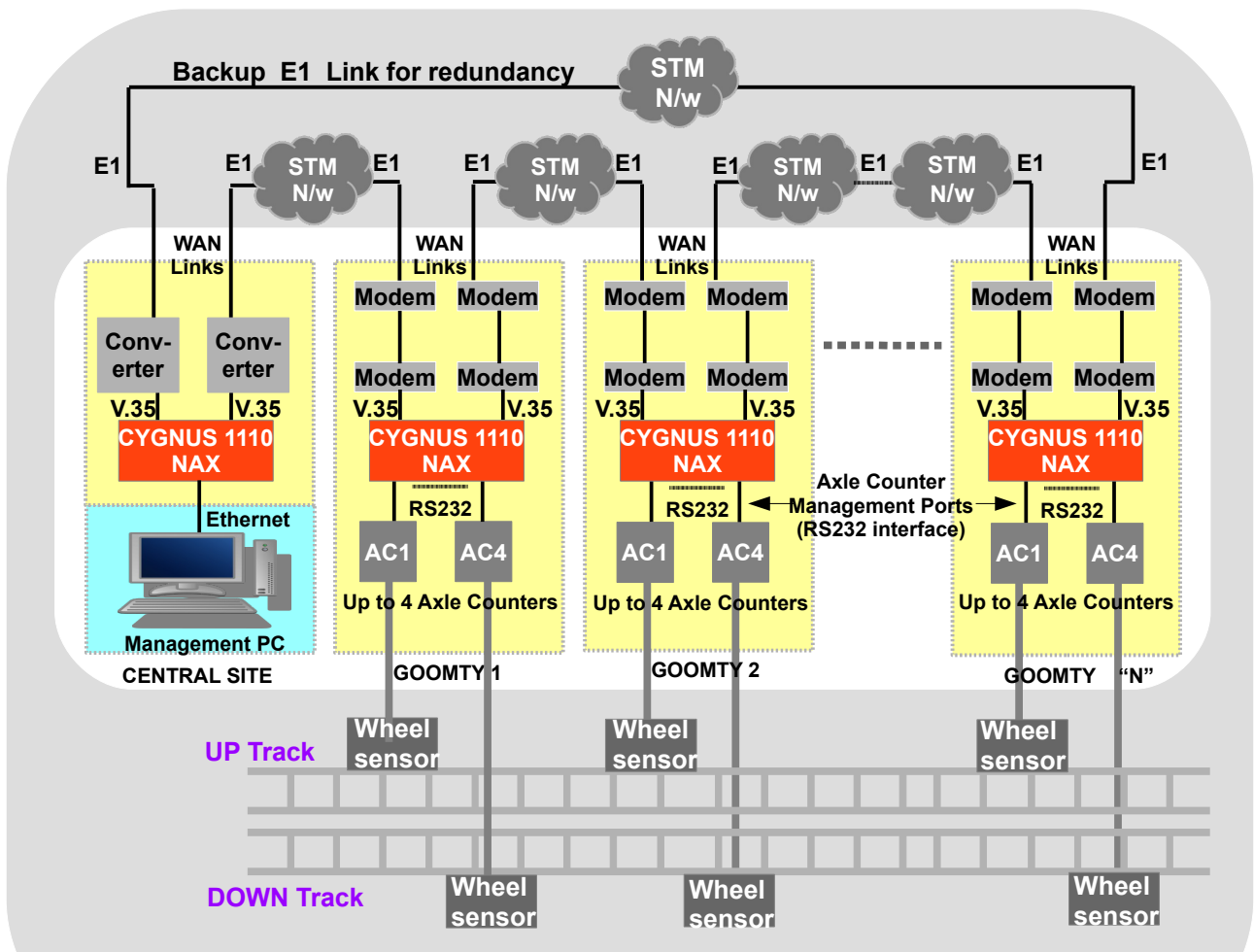


Fig. 1 Providing supervisory access to RS232 Supervisory Ports of Axle Counters at Goomties from a Management PC with Ethernet interface over an IP Network formed using CYGNUS 1110 Network Access Device (NAX)

The second approach at the central site is by using a PC with multiple RS232 COM ports as the Management PC. This is shown in Fig 2. The NAX network may be used to establish one logical connection between each RS232 port of the Management PC and the console port of an Axle Counter (A higher version of CYGNUS 1110 NAX - the CYGNUS 1121 NeTS - can also be used at the central site if more RS 232 ports are desired. NeTS provides up to 16 RS232 as against the 4 ports provided by NAX. The NeTS is shown at the central site in Fig 2). In this case the Management PC is not part of the IP network as the connection with the Axle Counter between them is only through serial ports. This arrangement may simplify the matters if users are more familiar with RS232 port handling at the central site. Other than RS232 ports being used to establish connections from central site to each Axle Counter, the network in Fig 2 is similar to Fig 1.

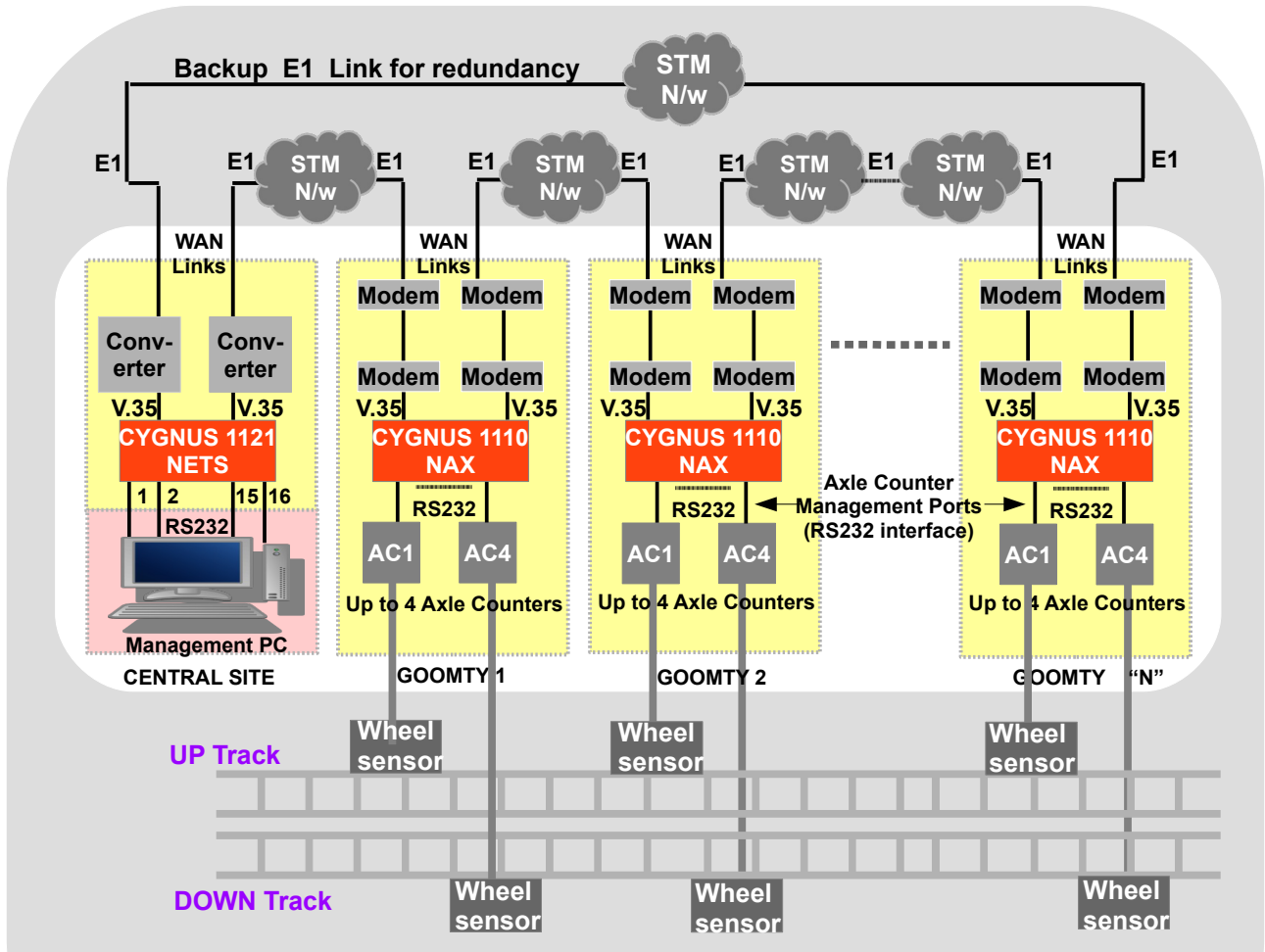


Fig. 2 Providing supervisory access to RS232 Supervisory Ports of Axle Counters at Goomty's from a Management PC with serial ports over an IP Network formed using CYGNUS 1110 Network Access Device (NAX)

Note: A Networking Terminal Server CYGNUS 1121 is used at central site to provide a number of serial ports to a PC

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