Redundancy

Technical Info

Using Redundancy in Plant Control and Monitoring Systems

The sophisticated features provided by the current generation of plant control and monitoring systems have ensured their acceptance in plants and factories throughout the world. All successful systems provide high-level control and monitoring facilities, such as graphic displays, alarm handling, trending, reports, and data exchange. In a well-designed system, these features improve a plant's efficiency and therefore its profitability. However, when implementing a plant control and monitoring system, designers often overlook one important aspect – what happens if the system hardware fails?

The control systems for both a single node or a network application (see Figure 1) have a single point of failure. These systems fail totally if ***one*** piece of hardware (such as the computer connected to the control and monitoring units) fails. Most modern computers are designed for reliability, yet breakdowns can still occur, especially where they are used in harsh environments. If some or all of the plant processes are critical, or if the cost of non-production due to system failure is high, redundancy ***must*** be incorporated into the system. In a system with inbuilt redundancy, interruptions due to equipment failure are eliminated. Citect for Windows incorporates redundancy through a simple yet effective method, unavailable in any other control and monitoring system.

Client-Server Processing

In 1992, Citect for Windows pioneered the use of client-server architecture in plant monitoring and control. By distributing the processes in the control and monitoring application across two or more computers (using a LAN) you can increase the speed and efficiency of the system. In a simple application, the computer connected to the control and monitoring units becomes the server, dedicated to communication with the plant control devices, while the display nodes are clients (see Figure 1). When a client computer requires data for display, it requests the data from the server, and processes that data locally.

Dual Server Redundancy

To provide redundancy, a second (standby) server can be added, also dedicated to communication with the plant control devices (see Figure 2). If the primary server fails, the client's requests for data are channelled to the standby server.

The standby server does not duplicate the primary server's functions, or both servers would have to communicate with the PLCs, doubling the load on the PLC network, and reducing performance. In the Citect client-server system, only the primary server communicates with the PLCs. The primary server also communicates with the standby server, continually updating it with the plant's status. If communication with the primary server is interrupted, the standby server assumes that the pri-

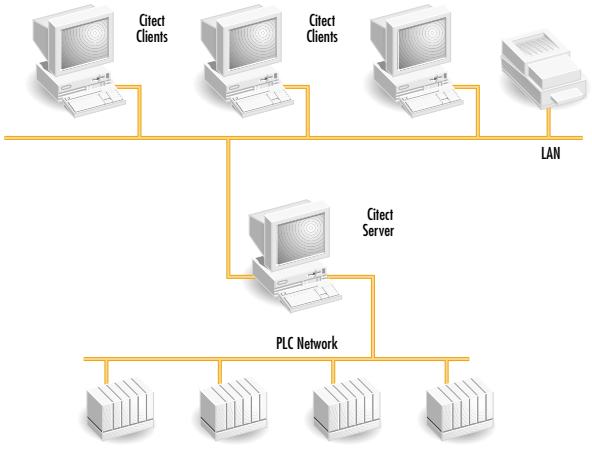

Figure 1 – A Client-Server System

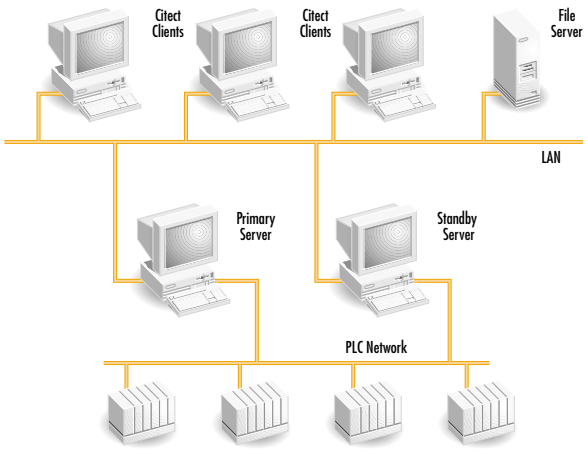

Figure 2 – Dual Server Redundancy

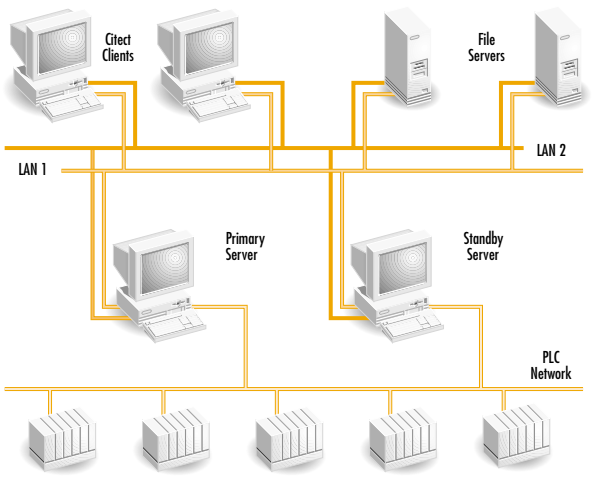

Figure 3 – Dual LANs

mary server has failed, and takes over as the primary server. When the primary server is repaired and returned to service, it reads the plant's status from the standby server and resumes its role as the primary server. The standby server automatically reverts to its former role.

Dedicated File Server

If you also add a dedicated file server, you can centralize the databases and display screens. Continuity is then maintained if the primary server fails. Centralized databases are also easier to manage and maintain. Citect supports dual network paths to the centralized database, allowing dual file servers if required.

Dual Lans

The arrangement in Figure 2 secures the system by removing the single point of failure (the I/O server). However, if the LAN fails, control and monitoring by the display nodes is lost. A second LAN and file server would ensure system stability even in the event of network failure (see Figure 3).

Split-Task Redundancy

Citect allows you to do more than simply maintain continuous communication with plant-floor devices. You can ensure that all alarm and trend data is also maintained in the event of failure. This is achieved by splitting the server's task into four subtasks: I/O (Input/Output); Alarms; Trends and Reports

Each of these tasks manages its own database independently of the other tasks, so you can handle redundancy differently for each task. For example, to maintain integrity of trends, you would parallel the trend task in both servers (unlike the I/O task that uses primary/standby processing). When the primary is returned to service after a failure, it can update its lost trend data from the standby server. Both servers then have continuous, uninterrupted trend data.

This level of redundancy is aimed directly at the centralized part of the processing. Citect ensures the plant's uninterrupted operation by more than simply duplicating hardware – all processing power is utilized.

Parallel Units Redundancy

For maximum system stability, you should connect parallel units (PLCs) to the same field devices as in Figure 4. Any hardware component in this system can fail without disrupting the control and monitoring of the plant.

Citect for Windows offers a capacity to work in an integrated manufacturing environment unequalled in today's market.

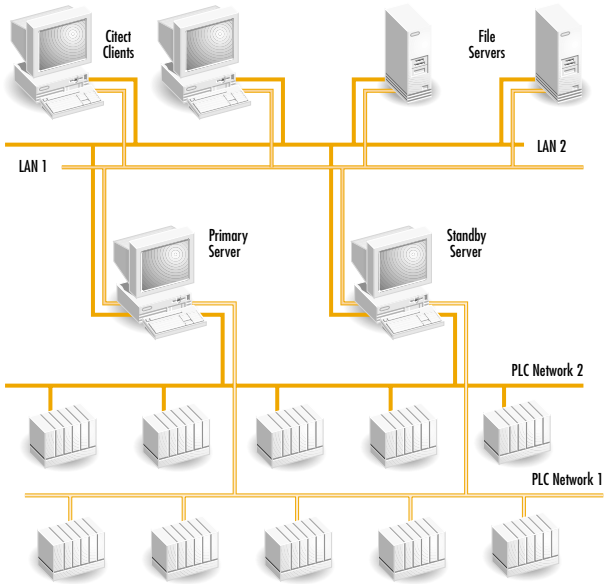

Figure 4 – Units Level Redundancy

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