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On-line Score Board System Implemented in Inter-plant Game 1997

By

S. A. Chuah / PC Sam
Staff Engineer / Senior Staff Engineer
Test Systems Engineering

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S.A.Chuah / PC Sam

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ABSTRACT

In the pass score board for the inter-plant game are updated using card board. Game results are updated once in every few hours. The organising committee basically have to send someone to the site to update score. Player will always go to the secretariat office to request for games score status. This require a lot of man power to organize the team that take care all the result of the score. This time it was decided to make a change. On-line score board with real time game result is proposed and subsequently implemented. The implementation of the on-line score board system have shown a success in the IPG. Player now will be able to tell how their team member is performing in other game in real time. This paper describe how the system is designed and setup.

INTRODUCTION

In the past IPG score board are done by writing game result in the card board and pasting it to the notice board. Since the slogan for this year IPG game is that “Where everything is possible” we decided to do it different this time. We decided to put the score board on-line and display the result in real time.

OBJECTIVE

The objective of the project is to have an on-line score board. The challenge here is that it have to be low cost and be able to cover a fairly wide area. Besides, the system setup time have to be less than half a day. For setup budget, we are looking at less that RM$500 per unit. For area coverage, we have short distance coverage which has the distance of less than 100 meters and long distance coverage which has 2 - 5 km distance.

METHODOLOGY

Base on the area coverage requirement, we see that a simple *local area network* (LAN) should be able to cover the short distance requirement and for long distance coverage, modem will be a cheaper solution.

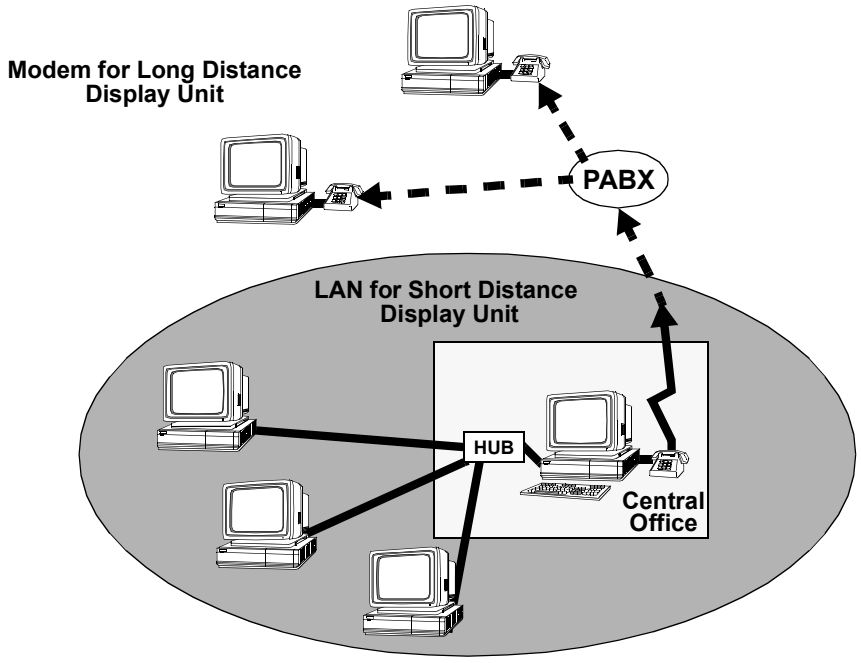

Figure 1: Network Strategic

Due to limited budget, PC's were use as the *on-line display controller* because they can be borrowed from factory office. Unfortunately most of this display are 14 inches and requirement is at lease 19 inches display for the score board, therefore a monitor to TV signal converter is used to display the computer output to bigger screen television

In order to keep the budget within the limit, we manage to source a low cost monitor to TV signal converter card for the display unit. This card basically cost RM$160 compare to a high end unit that cost RM$1,500 to RM$3,000. Unfortunately the converter card only support Windows 3.11 and Windows 95 OS. It does not support NT. Due to this factor we have to set the development platform to Windows 3.11. That basically hold us back from developing more graphical and colourful display system.

The whole system can be divided into 3 parts. Central control unit, Score board display unit and Network / communication infrastructure.

Central Control Unit

Central control unit is a Windows-NT PC with in-house developed software that reads game results into database, and subsequently send the results to the display unit in real time (see figure below). Windows-NT is selected because it provide a multi-tasking environment for running multiple programs in the same computer concurrently.

The program flow diagram is shown in figure-2 below:

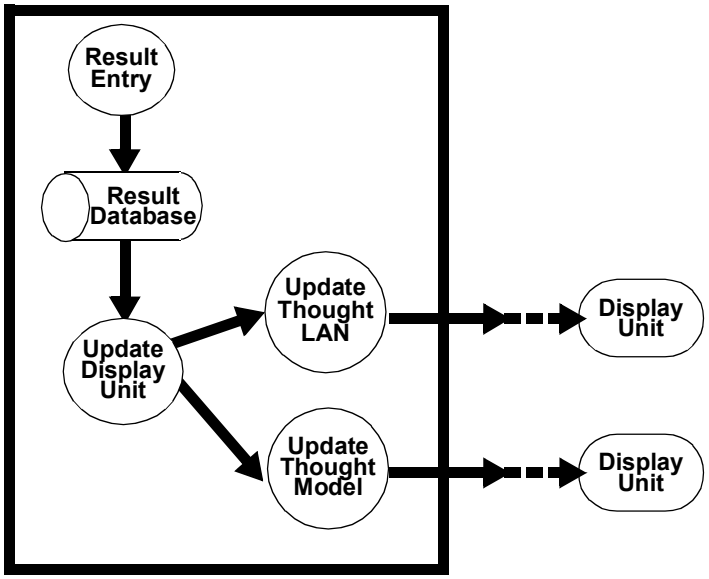

Figure 2: Flow diagram for central control unit

Ethernet card and external modem (or internal modem card) are added to the 'central control unit' for communicating to the display unit electronically. More details on the electronic connectivity are described in the Network/communication Infrastructure section.

Score Board Display Unit

Score display unit is a Windows-3.11 PC which display the game result to the television screen. Besides displaying game result, it has to receive game data from the central control unit' in real time.

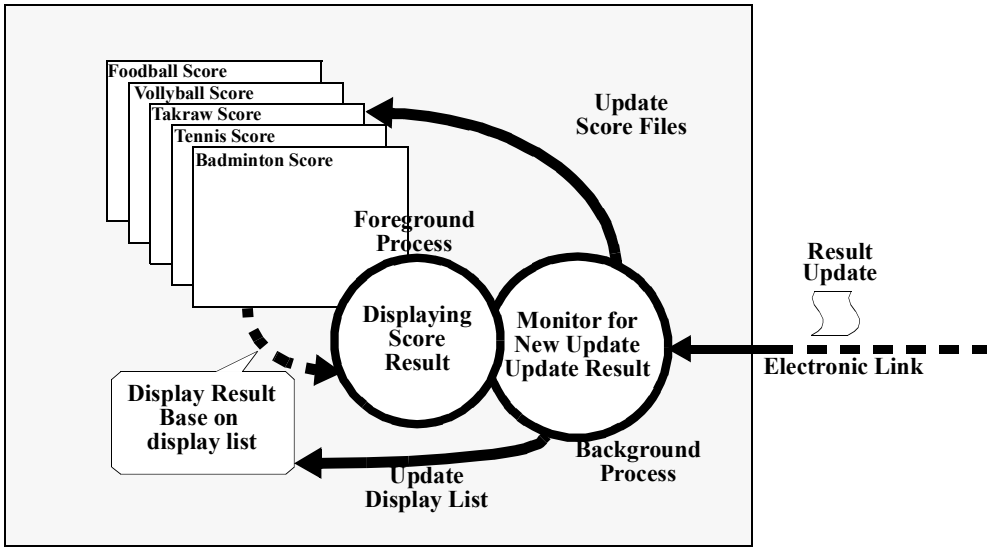

Figure 3: Flow diagram for score board display unit

This can be done by getting the controller to execute two process, one process to display and refresh the score board, another one process to monitor the incoming data and update the score file upon received new result. NT is actually a prefer OS platform for developing the controller program. However, due to the limitation set by the "video convertor card" we have to develop the program in windows 3.11 OS. Since window 3.11 does not do multi-tasking, we need to write the program that execute the two task. The program will display the score on screen. While prompting for the next display, the program will continue monitor the data link, phone line through modem. If the phone line is activated, it will then pick up the phone and monitor for data download. A simple set of protocol are design to handle the data downloading process. Once complete downloading the new data, it will update the result in the score file. This program basically continue for infinite loop.

The simplified flow chart for the program is shown below:

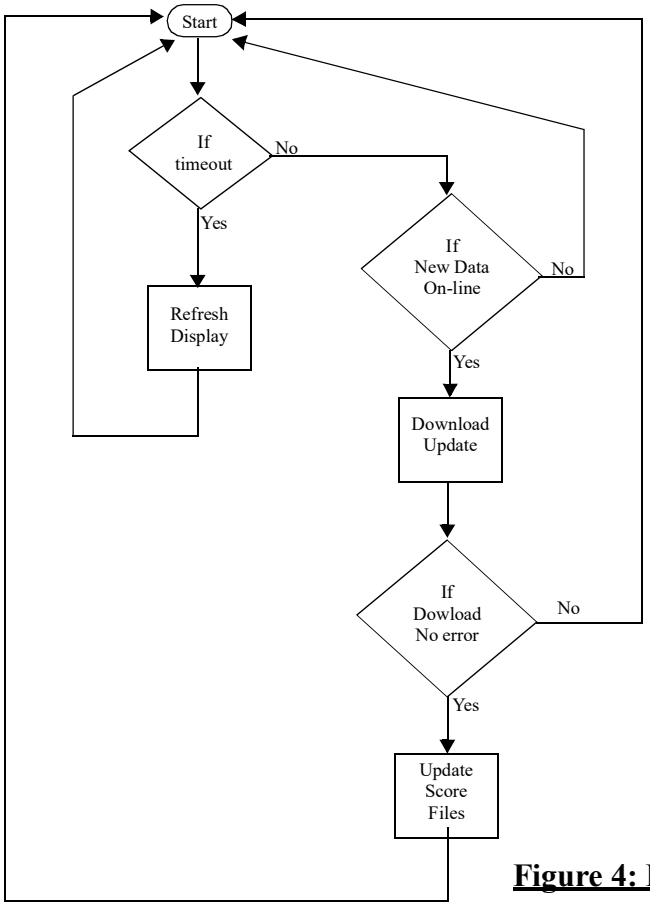

Figure 4: Flow chart for display unit

The hardware setup for the score board display unit are quite simple. The setup is shown in the following diagram.

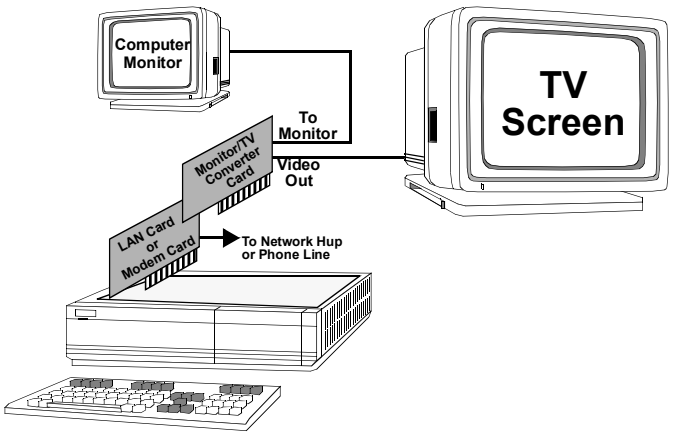

Figure -5: Hardware setup for display unit

If the display unit use modem to link up to the central unit, modem card will be use. If it is link up through local area network, LAN card will be use. The computer monitor is connected to the *monitor output* of the convertor card and the *video in* of the TV is connected to the *video out* of the converter card.

Network /Communication Infrastructure

For *display units* closed to the *central control unit* in the central office (ie. less than 100 meter), 10 Base-T Ethernet Local Area Network (LAN) is used for data transmission because of its stability and ease of implementation. For *display units* which are further away, modems are used for data transmission. The following sub-sections describe the two methods of data transmission in more details.

Data Transmission over Ethernet LAN

A 10 Base-T Ethernet hub is used to connect the nearby *display units* to the *central control unit* in the central office (see figure below). Microsoft networking protocol and services are used so that the *display units* have on-line access to the data in the hard-disk of the *central control unit* (ie. the hard-disk of the *central control unit* is mounted to the *display unit* as 'F:' drive). Once the game results are updated onto the hard-disk of the *central control unit*, the *display unit* will be able to read them from the 'F:' drive and subsequently display them onto the television screen. With this configuration, Inter-plant game web pages are also stored into the *central control unit* and displayed onto the *display unit* for dissemination of IPG information before the game starts (using Net-scape or Internet Explorer web browser).

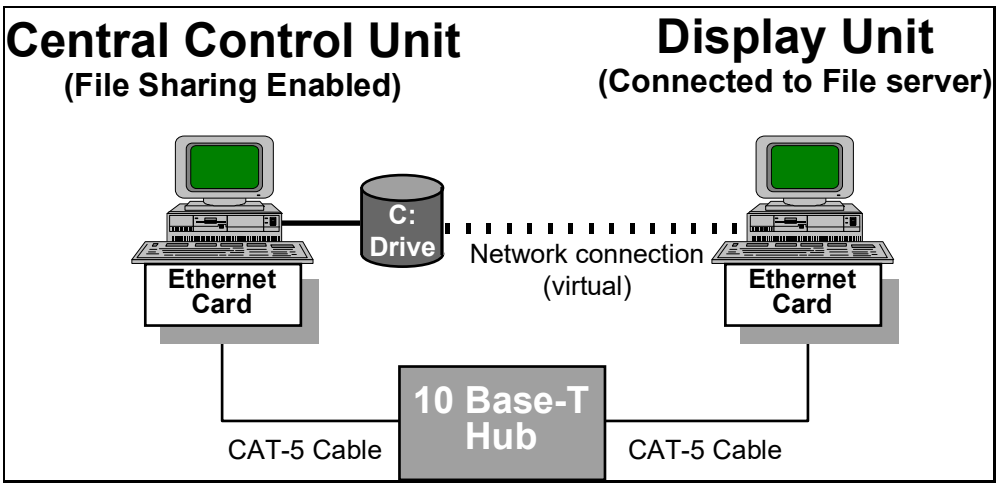

Figure 6 : Local Area Network Setup

Data Transmission over Modem

Modem is the a proven technology for data/network communication over public telephone network or private PABX. Theoretically it can connect two computers anyway in the world as long as telephone network is available. Many commercial software's are available for computer to link to Internet or perform point-to-point data communication (or file transfer) using modem. However most of them do not allow un-attended data transfer and cannot be integrated easily into in-house developed software. As a result, in our Inter-plant game (IPG) on-line score board system, software module using native modem commands and simplified serial handshake protocol was developed for exchanging data between the *central control unit* and the *display units*.

Some of the commands used to control the modem are as follows:
ATZ - Reset modem to default condition.
ATS0=3 - Set modem at receiving side to answer call automatically after 3 rings.
ATS0=0 - Set modem at sending side to disable auto answer.
AT&N6 - Set connect speed to 9600 bps.
ATDT3388- Instruct modem at sending side to dial to extension 3388.
+++ - Instruct modem to escape back to on-line command mode.
ATH0 - Instruct modem to hang up the line (ie. go ON-HOOK).

Figure and table below demonstrate the serial communication via modem used in the IPG on-line score board system.

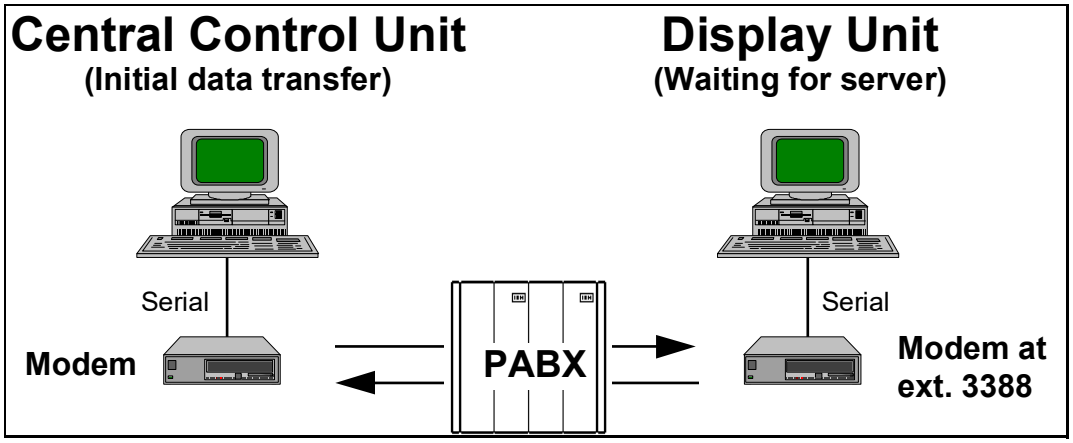

Figure 7: Model Network Setup

Step	Master computer serial communication	Remarks		Slave computer serial communication	Remarks
1	send ATZ	Reset modem		send ATZ	Reset modem
2	send ATS0=0	Disable auto answer		send ATS0=3	Set auto answer
3	send AT&N6	Set speed to 9600		send AT&N6	Set speed to 9600
4	send ATDT3388	Dial ext.3388			Modem auto answer
5	read CONNECT 9600			read CONNECT 9600	
6	send data			read data	
7	send end-of-data			read end-of-data	
8	send +++	Escape to modem command mode		send +++	Escape to modem command mode
9	send ATH0	Hang-up phone line		send ATH0	Hang-up phone line

Once the modem establish the link as in step 5, a simple serial handshake protocol is used to transfer data through the phone line. Figure below show the serial protocol used in step 6.

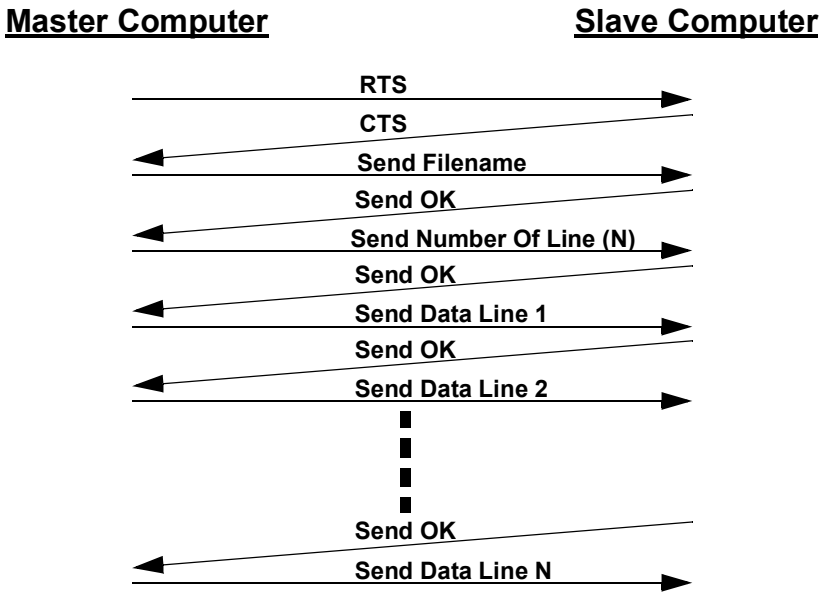

Figure 8: Serial Handshake Protocol

Each package that send through the line should have the format as shown in figure below:

1 byte	1 byte	1 byte	Maximum 256 bytes
01 (Hex)	01 (Hex)	Data Length (Hex)	Data (ASCII)

Figure 9: Protocol Package Format

Some of the standard commands used in Visual C++ to handle the protocol are as follow:

OpenComm : This function opens a communication device
BuildCommDCB : This function define the baud rate and other property of the communication device
SetCommState : This function setup the define parameter define by BuildCommDCB.
CloseComm : This function close a specified communication device.
WriteComm : This function writes data to the communication device.
ReadComm : This function read data from the communication device.

FUTURE PLANS & RECOMMENDATION

The implementation for the on-line score board system can be expended to *on-line information display system*. Rather than display the game results, we can use it to display factory news, DPKU or DBS information. Other implementation like *smart advertisement display* where colourful advertisement and day to day variable on *sales price* and offer can be change on-line through phone line or RF network setup.

CONCLUSION

The on-line game result display system has become a success story in the Inter-plant game. While accurate game results are delivered to Motorolans real time in many locations, the organizing committee members did not need to run around to update display stations. Even through many information technologies (varies from Visual C++ programming, networking, modem/serial communication to web page development) were used in this on-line display system, the implementation cost is relatively low. Besides, the experience learnt can be applied to other IT projects that can make Motorola more competitive.