Imtech Marine & Industry adds host application to CHARON-11 to implement KMC-11 support.

Imtech Marine & Industry of the Netherlands serves the industrial and maritime markets as a system integrator, both domestically and internationally. Especially strong in Marine Systems like Autopilots and DP systems, Alarm, monitoring and control systems and Integrated Bridge systems, these systems are provided to both military and civil customers.

Imtech Marine & Industry applied the CHARON-11 PDP-11 emulator for the replacement of PDP/11 44 systems the company delivered in former times. These PDP-11/44's, running RSX11M+ V4.3, perform the core of an extensive monitoring and control system. The PDP-11/44 processes incoming platform data in a special database while controlling custom designed peripheral devices.

In addition to the standard peripherals supported by CHARON-11, the original PDP-11/44 configuration contained the KMC-11 auxiliary processor on the UNIBUS. The KMC-11 software, which is downloaded by the RSX11M+ operating system, processes the data-flow through the attached DZ-11 serial line cards. The KMC-11 offloads the PDP-11/44 by directly processing the Xon/Xoff and DDCMP-protocols. The length of data-messages in DDCMP is variable and operates without any termination character. With the KMC-11 functionality, only a complete DDCMP-message causes the completion of an outstanding QIO-read of the PDP-11/44. Without the KMC-11, the PDP-11/44 would not have had enough capacity to support the DDCMP protocol on all lines.

Imtech replicated this solution with CHARON-11, which is designed to easily add a Windows/NT application for new functionality like a KMC-11. CHARON-11 uses the so-called "named pipe" mechanism in Windows/NT for serial line emulation. A "named pipe" is a one-way or duplex channel between the pipe server and one or more pipe clients. Typically, such pipes are connected to the serial interface ports of the host system, but an additional application can connect to these pipes equally well.

Implementation details

Imtech Marine & Industry wrote a small application in C, which handles the KMC-11 protocols within the Windows/NT system and passes the data to CHARON-11. The application is declared in the CHARON-11 configuration file and is automatically started like standard serial line:

```
# Load DZ-11 device
load DZ11 YZA
set YZA register=17776500
set YZA vector=300
set YZA line[0]="run DdcmpApplication"
set YZA line[1]="COM2:"     (a standard serial line)
```

In CHARON-11, the links to the Windows/NT application are processed by the standard read and write functions (QIO's) of the assigned DZ11 line. The Windows/NT application must perform the following functions:

- Parsing of the command-line parameters. The first parameter is the PDP-11 device port "YZA/0:". The second parameter is the name of the opened named pipe, e.g. "\.\pipe\charonterm0000001".
- Open the existing named pipe to start the communication. For example in Microsoft Visual C^{++} version 6.0:

```
// Open Pipe communication  m_PipeStr is the name of the NamedPipe
hPipe  = CreateFile(    m_PipeStr,
                        GENERIC_READ | GENERIC_WRITE, 0, NULL,
                        OPEN_EXISTING, NULL, NULL);
```

- Perform the read and write operations through the standard ReadFile en WriteFile mechanism:

```
// Read incomming data from Pipe
bRet = ReadFile( hPipe,           // pipe to read from
                        RxData,          // address of input buffer
                        LenRead,         // number of bytes to read
                        &LenRx,          // number of bytes read
                        NULL);           // overlapped stuff, not needed;
```

```
// Write data to Pipe
if (hPipe != INVALID_HANDLE_VALUE) {
   Status = WriteFile ( hPipe,     // pipe to write to
                        TxData,    // address of output buffer
                        LenWrite,  // number of bytes to write
                        &LenTx,    // number of bytes written
                        NULL);     // overlapped stuff, not needed;
}
```

– Close the application when the link with the named pipe is lost.

```
// Test Pipe
if (PeekNamedPipe(hPipe, NULL, NULL, NULL, &dwAvailable, NULL) == 0) {
  if (GetLastError() == ERROR_BROKEN_PIPE) exit(1);
}
```

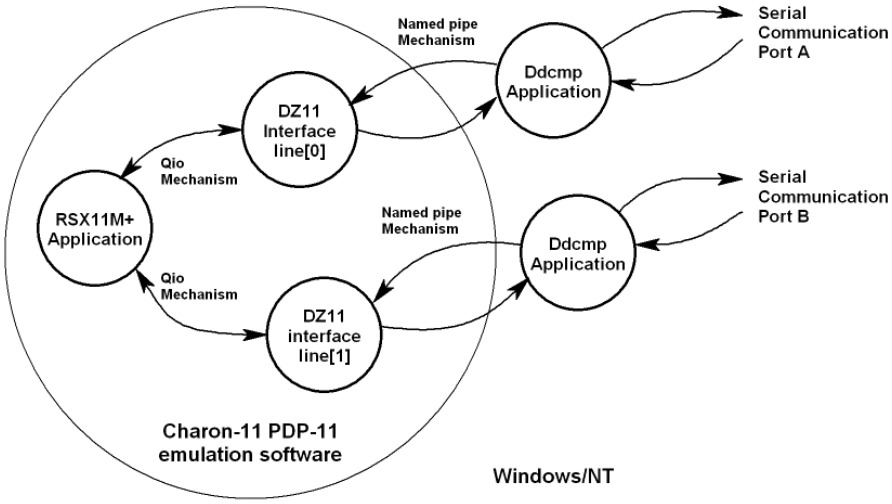
The advantage of using named pipes between a Windows/NT application and the CHARON-11 is that:

- A dedicated Windows/NT application enables you to realise the functionality of a device, which is not emulated by CHARON-11;
- Communication between the emulated PDP-11 and a Windows/NT application is possible without the use of external communication ports (The QQ-11, a pseudo device provided in CHARON-11 is an alternative, but requires coding at the PDP-11 side).

The limitations of this solution through the named pipe mechanism are:

- The Charon-11 device driver (DZ-11), which launched the Windows/NT application, is not attached to a serial communication port. Because of that, all the original PDP-11 functions concerning the serial port settings of the host system, such as terminal settings (SET TERM, etc.) which are normally handled by CHARON-11, are not emulated;
- The Windows/NT application must protect against overrunning the data-flow through the pipe mechanism to the DZ-11 port of the emulated PDP-11.

A schematic view of one of the special Windows/NT applications, which perform the DDCMP-protocols to the peripheral equipment:



Results

With the use of the additional Windows/NT applications, the CHARON-11 emulator provided a good platform to migrate a complex PDP-11/44 system to an Intel Windows/NT system.