

Inter-Process Communication Using Clarion

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What is IPC & why am I here?

- IPC = Inter-Process Communications
- "Talking" between programs
- Same Machine
- Different Machines

Different Methods of IPC

- Database Oriented
 - Shared files or database queues
- Asynchronous (Delayed) Messaging
 - MAPI
- Synchronous (Live) Messaging
 - Pipes
 - Mailslots — NT/95
 - Sockets
- Remote Procedures
 - RPC - Remote procedure Calls
 - OLE - COM

IPC Mechanism Issues

- Connectionless vs. Connection-Oriented
- Stream vs. Message-Oriented
- Blocking vs. Non-Blocking
- One-to-One or One-to-Many applications

Transport Protocol vs. Messaging Protocol

- Transport Protocol
 - Gets the packets of information from here to there
 - Usually OSI levels 1 through 6
 - TCP/IP, IPX/SPX, NetBEUI
- Messaging Protocol
 - Mechanisms for locating machines
 - Mechanisms for sending/receiving application-defined messages to other processes
 - Pipes, RPC, Sockets

Live IPC Mechanisms

- Pipes — NT
- Mailslots — NT/95
- NetBIOS
- NetDDE
- Sockets

Live IPC Mechanisms

- Pipes
 - Named, Anonymous
 - File System Paradigm: Act like file system
 - Allow "Impersonation" – alias as attached client
 - Use more memory than Sockets
 - Generally, poorer performance than Sockets

Live IPC Mechanisms

- Pipes
- Mailslots
 - Variety of Pipes – use same file system paradigm
 - Used for Broadcast (or for multiple receipts)
 - Creator is only reader

Live IPC Mechanisms

- Pipes
- Mailslots
- NetBIOS
 - NETAPI32.DLL
 - Runs over:
 - NetBeui
 - NWLink NetBIOS (NWNBLink)
 - NetBIOS over TCP/IP (NetBT)

Live IPC Mechanisms

- Pipes
- Mailslots
- NetBIOS
- NetDDE
 - NDDENB32.DLL
 - NetDDE resource must be “shared”
 - Runs over NetBIOS-compatible protocols

Live IPC Mechanisms

- Pipes
- Mailslots
- NetBIOS
- NetDDE
- Sockets
 - Transport Independent
 - WSOCK32.DLL
 - Runs over TCP/IP, IPX/SPX (NWLink)

Difficulties in IPC

- Finding one another
- Passing Information
- Synchronizing Conversation

Sockets Types

- Connectionless
 - UDP = User Datagram Protocol
 - Identify two machines, then stream the data between
 - Data can be coalesced between read/write
 - Nagling: performance drop due to coalescing of small packets. Based upon buffer sizes of `recv()` and `send()` calls
- Connection-Oriented (TCP)
 - TCP = Transmission Control Protocol
 - Identify target port and machine for each transmission
 - Data is transmitted as single blocks, not coalesced

Sockets Process Flow - Streamed

- | | |
|-------------------|-------------------|
| • Server Side | • Client Side |
| - Socket() | - Socket() |
| - Bind() | - Bind() |
| - Listen() | - Connect() |
| - Accept() | - Send() / Recv() |
| - Send() / Recv() | - CloseSocket() |
| - CloseSocket() | |

Sockets Process Flow - Datagram

- | | |
|-------------------------|--------------------------------|
| • Server Side | • Client Side |
| - Socket() | - Socket() |
| - Bind() | - Bind() - optional |
| - SendTo() / RecvFrom() | • SendTo() / RecvFrom() |
| - CloseSocket() | - or - |
| | • Connect(), Send(),
Recv() |
| | - CloseSocket() |

Sockets in Clarion

- Uses WSOCK32.DLL
- Include function prototypes in Global MAP embed
 - *Include(Wsock.clw, 'Prototypes')*
- Include equates in Globals embed
 - *Include(Wsock.clw, 'Equates')*
- Include Files and Sample APP available at WWW.CWSUPERPAGE.COM
- Note that these are 32-bit (Win95, NT)

Pipes

- Anonymous
 - Same Machine
 - Uses [Pipe] File Handle, and
 - File Handles [Pointers] only valid in Process Context
 - Must be duplicated in process or passed to child through inheritance
- Named
 - Same Machine, or
 - Available across network
 - Identified by Server Name and Unique Pipe Name
 - Can have multiple instances, limited by initial call
 - Can only connect with one client at a time

Named Pipes

- Several Options
 - Message size vs. Byte-Sized
 - Blocking vs. Non-Blocking
 - Write-through vs. Buffering
 - Overlapped vs. Non-Overlapped
- Three General Types
 - Synchronous Blocking Pipes (Simplest)
 - Asynchronous Non-Blocking Pipes (Polling)
 - Asynchronous Overlapped Pipes (Windows NT only)

Named Pipes Flow

- Server Side
 - CreateNamedPipe()
 - SetNamedPipeHandleState()
 - ConnectNamedPipe()
 - ReadFile() / WriteFile() [Byte Pipes] or
 - TransactNamedPipe() [Message Pipes]
 - PeekNamedPipe()
 - DisconnectNamedPipe()
 - CloseHandle()

Named Pipes Flow

- Client Side
 - CreateFile(), or CallNamedPipe()
 - WaitNamedPipe()
 - ReadFile() / WriteFile() [Byte Pipes] or
 - TransactNamedPipe() [Message Pipes]
 - PeekNamedPipe()
 - CloseHandle()

Named Pipes in Clarion

- Functions in Windows API
- Can build prototypes and equates from Clarion API Viewer
- Include function prototypes in Global MAP embed
 - *Include(PipeAPIs.clw, 'Prototypes')*
- Include equates in Globals embed
 - *Include(PipeAPIs.clw, 'Equate')*
- Include Files and Sample APP available at WWW.CWSUPERPAGE.COM
- Note that these are 32-bit (Win95, NT)

Mailslots

- Messages must be less than 64K
- Broadcasts to domain should be less than 400 bytes
- Naming (like Pipes):
 - '\\.\mailslot\myslothere'
 - local slot, or server naming convention
 - '\\mymachine\mailslot\myslothere'
 - contacts mailslot on named machine
 - '\\mydomain\mailslot\myslothere'
 - contacts all mailslots in 'mydomain'
 - '*\mailslot\myslothere'
 - contacts all mailslots in primary domain

Mailslot Flow

- | | |
|---------------------|-----------------|
| • Server Side | • Client Side |
| – CreateMailSlotA() | – CreateFileA() |
| – GetMailslotInfo() | – WriteFile() |
| – SetMailSlotInfo() | – CloseHandle() |
| – ReadFileA() | |
| – CloseHandle() | |

Mailslots in Clarion

- Functions in Windows API
- Can build prototypes and equates from Clarion API Viewer
- Include function prototypes in Global MAP embed
 - *Include(SlotAPIs.clw, 'Prototypes')*
- Include equates in Globals embed
 - *Include(SlotAPIs.clw, 'Equate')*
- Include Files and Sample APP available at WWW.CWSUPERPAGE.COM
- Note that these are 32-bit (Win95, NT)

END
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Using Clarion

Samples:
Includes, APPS
available at
www.cwsuperpage.com

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