DEVCON '94
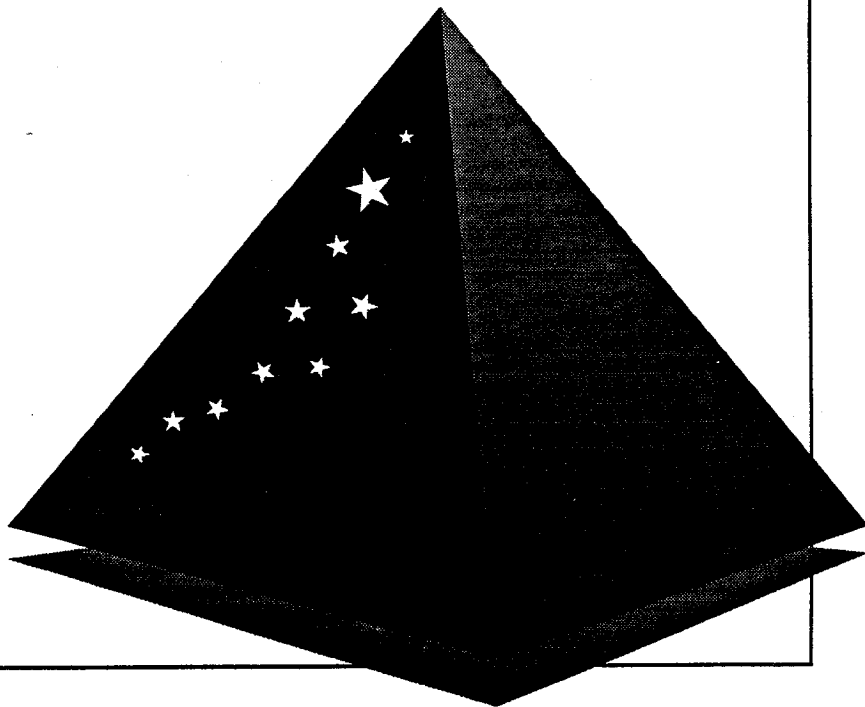
AN OVERVIEW OF THE CLARION AS/400 CONNECT

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Overview

What is AS/400 Connect?

AS/400 Connect is the fastest way to write PC client programs to access data stored on an AS/400.

With this invaluable tool, you can write Clarion programs that run under either DOS or Windows to access data stored on an AS/400. **No AS/400 Host Code is required.** Simply register the file driver in your Clarion environment and you can begin accessing your AS/400 data within minutes. No special code is required. The driver behaves just like all other file drivers available for Clarion Database Developer, Clarion ReportWriter 3 or Clarion for Windows.

In addition, if you have the proper compiler installed, the Clarion Project system supports all TopSpeed programming languages (C/C++, Modula2, and Pascal). This allows you to seamlessly integrate other source code into your program. You can choose the right tool for the job—no matter what the job might be.

What do I need to use AS/400 Connect?

- **Clarion Database Developer 3009** (or later) and the **Clarion DOS Extender**
  or
  Clarion for Windows
  or
  Clarion ReportWriter 3

- **OS/400 2.x** and the extended DOS version of **PC Support**
  or
  OS/400 3.x and either the extended DOS version of **Client Access** or the Windows version of **Client Access**
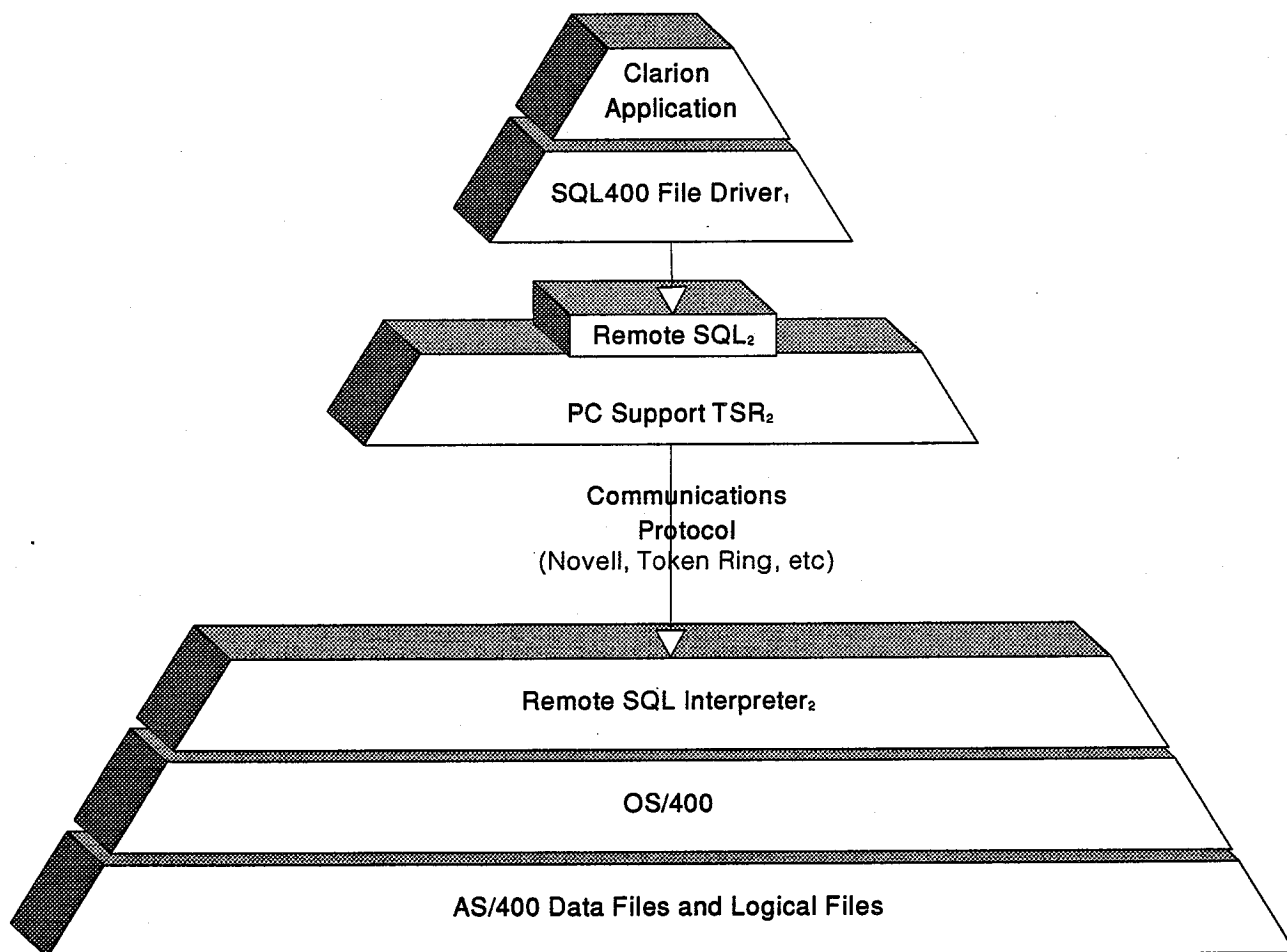
How do I connect to the AS/400?

- Using PC Support (or Client Access) you can connect to the AS/400 via:

    Async
    TwinAx
    Token Ring
    Ethernet
    Novell SAA Gateway

How it all Works

The file driver component of AS/400 Connect handles all the file I/O for you. PC Support (or Client Access) handles all the communication interface for you. This leaves you free to concentrate on the design and presentation of your program.

Clarion
Application

SQL400 File Driver[1]

Remote SQL[2]

PC Support TSR[2]

Communications
Protocol
(Novell, Token Ring, etc)

Remote SQL Interpreter[2]

OS/400

AS/400 Data Files and Logical Files

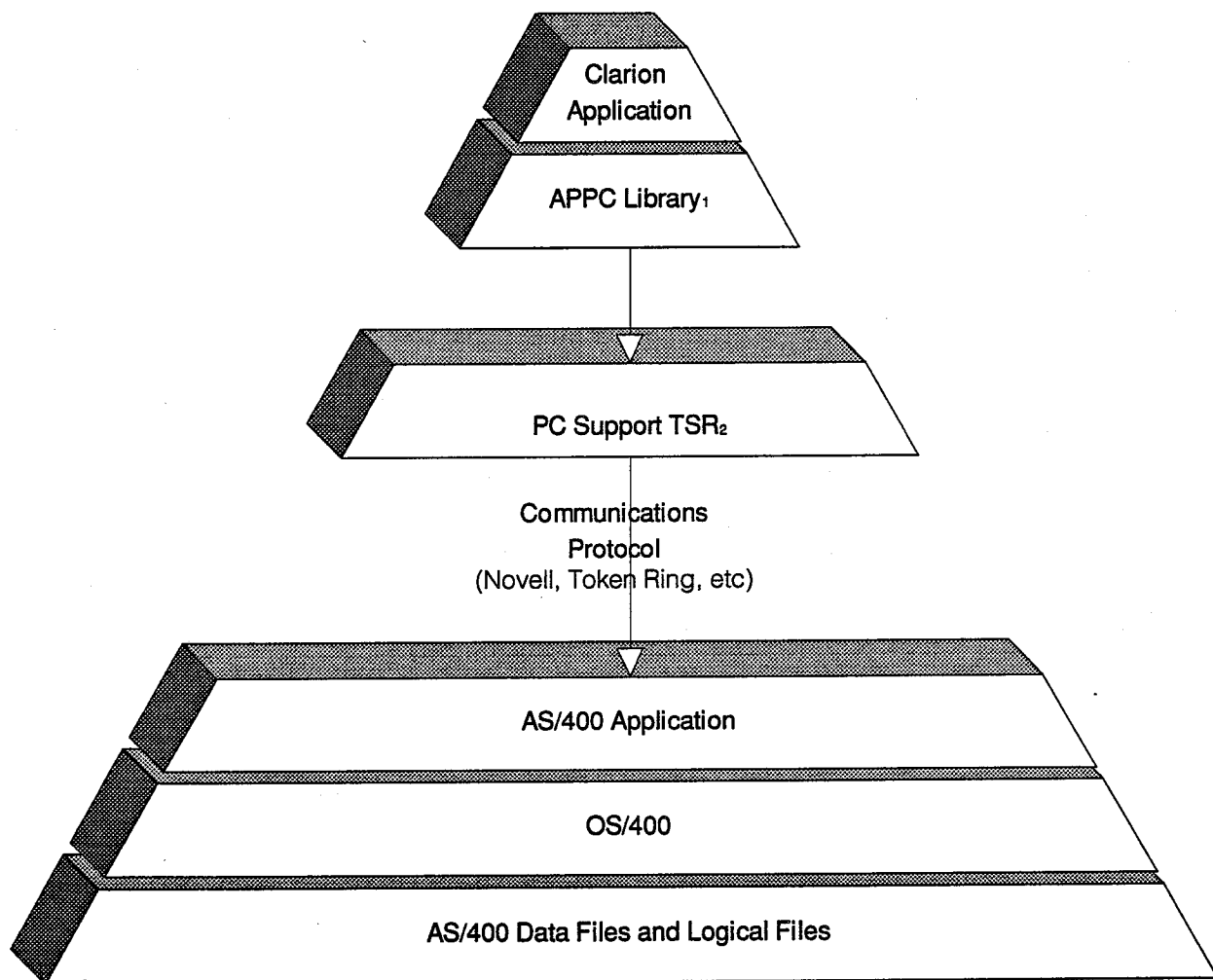*Application accessing AS/400 Data Files*

[1]Part of AS/400 Connect.

[2]Part of PC Support. Equivalent components exist for Client Access.

Application Program-to-Program Communications

The APPC Library in AS/400 Connect provides functions and direct access calls to the PCS Router. This enables you to communicate with APPC programs running on the AS/400.

You can use both the SQL400 Driver and the APPC library in the same program.

Clarion
Application

APPC Library[1]

PC Support TSR[2]

Communications
Protocol
(Novell, Token Ring, etc)

AS/400 Application

OS/400

AS/400 Data Files and Logical Files

Application communicating with an AS/400 Program

[1] Part of AS/400 Connect.

[2] Part of PC Support. Equivalent components exist for Client Access.

What is AS/400 Connect?

AS/400 Connect consists of two components; the SQL400 file driver and an APPC library.

SQL400 FILE DRIVER

The SQL400 file driver allows you to access data on any AS/400 using the plug-in driver technology of Clarion Database Developer v3 (CDD) and Clarion for Windows (CW). The driver can be used with CDD, Clarion ReportWriter 3 and Clarion for Windows.

Using the dictionary import feature of ReportWriter 3, you can import the file definition from the AS/400 directly into your Clarion dictionary.

To access the AS/400 files you use the same Clarion database functions that are used to access any database file. These are conceptually very similar to RPG, so existing AS/400 RPG programmers will find it very easy to pick up Clarion.

Here is a complete example program that connects to an AS/400 and reads all Customers whose last name is Johns.

```
    PROGRAM
Customer      FILE,DRIVER('SQL400'),PRE(Cus),NAME('AS400:Library/Customer')  ! File Definiton
NameKey       KEY(+Cus:LastName),DUP,NAME('Library/NameOrder')    ! Logical File Definition
Record        RECORD                                              ! Record Layout
FirstName       STRING(20),NAME('FRSTNAME')
LastName        STRING(30),NAME('LASTNAME')
AccountNumber   DECIMAL(6,0),NAME('CUSACNUM')
                . .
    CODE
    OPEN(CustomerFile)                                            ! Open File
    Cus:LastName = 'Johns'
    SET(Cus:NameKey,Cus:NameKey)                                  ! Prepare to read using
                                                                  ! Logical file

      LOOP

        NEXT(Customer)                                            ! Read next record
        IF ERRORCODE() THEN BREAK.                                ! Stop if at EOF
        IF Cus:LastName ~= 'Johns' THEN BREAK.                    ! Stop if different name
        TYPE(Cus:FirstName&' '&Cus:LastName&' acc num = '&Cus:AccountNumber)
                                                                  ! Display record
      END                                                         ! End Loop
```

Supported Data Types

The table below shows the large range of data types supported by the SQL400 File Driver. Beyond the normal AS/400 data types, the driver also includes support for special DATE and TIME data types to handle all the common methods used for storing date and time on the AS/400.

Clarion Data Type	AS/400 Data Type	Notes
STRING	CHAR	
DECIMAL	DECIMAL	
PDECIMAL	PACKED DECIMAL	
DATE	DATE, DECIMAL, or PDECIMAL	[1]
TIME	TIME, DECIMAL, or PDECIMAL	[2]
CSTRING	VAR CHAR	
SREAL	REAL	
REAL	DOUBLE	
LONG	INTEGER	
SHORT	SMALLINT	
STRING(26)	TIMESTAMP	

Table 1- Supported Data Types

[1]   DATE can access DATE fields or PDECIMAL or DECIMAL fields, where the date is stored as yyyymmdd, yymmdd, mmddyyyy, mmddyy, ddmmyyyy, or ddmmyy.

[2]   TIME can access TIME fields or PDECIMAL or DECIMAL fields, where the time is stored as hhmmss or hhmm.

APPC LIBRARY

The APPC library allows you to write Clarion programs that do more than just access data on the AS/400. It allows you to communicate with other programs that are running on the AS/400. Table 2 lists all the functions in the APPC library.

Function	Description
Allocate	Start conversation with another program
Deallocate	Stop Conversation
Confirm	Ask for confirmation that data has been received
Confirmed	Confirm that all data has been received
GetAttributes	Get information about current conversation
GetLocationList	Get a list of all AS/400's the PC is connected to
PrepareToReceive	Wait until there is data to receive
ReceiveAndWait	Retrieve data. Wait if none to retrieve.
ReceiveImmediate	Retrieve waiting data
RqsToSend	Tell partner program that you want to send data
SendData	Send data to partner
SendError	Send an error state to partner
ConvertToASCII	Converts EBCDIC to ASCII
ConvertToEBCDIC	Converts ASCII to EBCDIC
GetLastOperation	Returns string of last APPC call made

Table 2 - APPC Functions

Why is the driver called SQL400 and not AS400?

To the developer, the file driver appears to be making direct file access via Clarion file I/O statements (NEXT, PUT, GET, etc). Actually it is building up SQL statements to send to the SQL interpreter on the AS/400.

Although the driver uses SQL to retrieve the data, you are not restricted to SQL tables stored on the AS/400. The driver allows you to access all data files you have on the AS/400.

This gives you the best of both worlds—easy file access using the clean Clarion file I/O syntax, and fast batch processing and server-based filtering using embedded SQL.

For example, to give all programmers a 20% pay raise all you need to do is:

```
Res" - SEND(SalaryFile, 'UPDATE SalaryFile ' & |
                        'SET Salary - 1.2 * Salary ' & |
                        'WHERE Position - ''P''')
```

If you do not know SQL, you can use standard Clarion code to achieve the same results.

Here is a modification of the first example taking advantage of SQL to do record filtering on the server to find all Johns who's account number is greater than 500000.

```
  PROGRAM
Customer    FILE,DRIVER('SQL400'),PRE(Cus),NAME('AS400:Library/Customer') ! File Definiton
NameKey        KEY(+Cus:LastName),DUP,NAME('Library/NameOrder')    ! Logical File Definition
Record         RECORD                                              ! Record Layout
FirstName        STRING(20),NAME('FRSTNAME')
LastName         STRING(30),NAME('LASTNAME')
AccountNumber  DECIMAL(6,0),NAME('CUSACNUM')

  CODE
  OPEN(CustomerFile)                                       ! Open File
  Cus:LastName - 'Johns'
  SET(Cus:NameKey,Cus:NameKey)                             ! Prepare to read using
                                                           ! Logical file
  Res" - SEND(CustomerFile,'/WHERE CUSACNUM > 500000')       ! Tell AS/400 filter
                                                           ! Condition
  LOOP
    NEXT(Customer)                                         ! Read next record
    IF ERRORCODE() THEN BREAK.                             ! Stop if at EOF
    IF Cus:LastName ~- 'Johns' THEN BREAK.                 ! Stop if different name
    TYPE(Cus:FirstName&' '&Cus:LastName&' acc num - '&Cus:AccountNumber)
                                                           ! Display record
  END                                                      ! End Loop
```

What is Performance Like?

Users of the SQL400 driver have reported performance comparable to programs running on the AS/400 and comparable to LAN-based systems. IBM has indicated that SQL is the preferred method to perform large database access on the AS/400.

With OS/400 v3 and Client Access, using SQL as the database access method yields even faster performance than is currently achieved with OS/400 v2 and PC Support.

The primary factors affecting performance are:

- **The type of AS/400**
- **How many users are using the AS/400**
- **The PC you are using**
- **The communication protocol in place.**

You will get the best performance with a large, unloaded, AS/400 directly connected via token ring or TwinAx, with the Clarion program running on a 486 PC with eight megabytes memory.

The communication protocol can have significant impact. Using a gateway between your PC network and your AS/400 may slow down data transfer. Using Async over modems will significantly affect performance. However, all PC-based applications are slow in these cases.

Using the embedded SQL features of the SQL400 driver to retrieve only the records you need can significantly improve the performance of your application in comparison to a non-client/server based application in these situations.

Real World Results

One of our users, Joe Hilton of Unitil Services Corporation, tells us, "I've been working with AS/400 Connect. The bottom line is the driver works extremely well." Mr. Hilton participated in the AS/400 Connect Beta test program.

"Response times are very good. Of course, using AS/400 native tools you get quicker response times," Mr. Hilton reports. "But, you don't get Client/Server." He runs a Novell Network using Ethernet and TokenRing connecting to an E50 AS/400 running OS400 v2 and PC Support. His data files contain as many as 50,000 records, each approximately 800 bytes long.

Mr. Hilton says using Clarion has increased his productivity. "I can put something together in Clarion to do sub-file processing [an SQL browse procedure] in a half hour. Using AS/400 tools, it would take a whole day."

"With the new operating system [OS400 v3] and Client Access," he predicts, "this driver will absolutely scream!"

Rapid Development for Client/Server

Clarion's AS/400 Connect is the fastest way to develop Client/Server applications for the AS/400. Our Application Prototyping technology makes developing business applications easy, while our true Database Independence allows you to manage data in its native format.

Most 4GL application development systems exchange performance for ease of use. But not Clarion's TopSpeed Optimizing Compiler! Clarion elminates the performance penalties, and, with the best business application development environment in the world, allows you to create professional applications in a fraction of the time.

No other PC-based application development system provides the flexibility and power of Clarion!

With Clarion you have it all: Productivity, Connectivity, and Performance.