CICS
Introduction and Overview

Larry Trollope

Monday August 8, 2011
9:30 am
Orlando, FL Session 9627

Abstract

This session provides an introduction to CICS and provides an overview of the product. CICS transaction processing and application server capabilities will be highlighted. It provides the attendee with information regarding important functionality such as Application Development, Storage Management, File Control, DB2 and MQ attach, Security, Two-phase commit, and Dispatching. The attendee also will see how resources are defined and will be introduced to the new face of CICS, the IBM CICS Explorer.

CICS: IBM's best kept secret

30 billion transactions/day, >$300B/week

40 years invested in applications

16,000 customers worldwide

30 million users

CICS

950,000 programmers earn their living from CICS

Over *900,000* concurrent users/system

5000 packages from 2000 ISVs

Used by 490 + of IBM"s top 500 customers

50,000 CICS licenses

What is a transaction and what should software to manage transactions provide?

A transaction is the fundamental unit of work for which recovery, consistency and concurrency are managed in online processing environment.

For a transaction manager to pass the ACID test it should provide:

Atomicity, Consistency, Isolation and Durability

What else should transaction management software provide?

- Should support major programming languages
- Should provide tools to assist in development
- Should have an API to shield developers
- Should have tools to assist in operations
- Should support major platforms
- Should support major database systems
- Should support major network protocols

- And it should support Web-based applications

So CICS is a Transaction Manager?

Customer Information Control System

also known as .....

- ➔ a Transaction Server
- ➔ a Transaction Monitor
- ➔ an Application Server

So what does CICS actually do?

CICS provides a concurrent program execution environment for multiple end users, who have access to multiple data types.

CICS will manage the operating environment to provide performance, scalability, security and integrity.

Transaction Processing Requirements

- Large volume of business transactions to be rapidly and accurately processed
- Multiple users, single/sysplex or distributed
- With potentially:
  - A huge number of users
  - Simultaneous access to data
  - A large volume of data residing in multiple database types
  - Intense security and data integrity controls necessary
- The access to the data is such that:
  - Each user has the perception of being the sole user of the system
  - A set of changes is guaranteed to be logically consistent
    If a failure occurs, any intermediate results are undone before the system becomes available again
  - A completed set of changes is immediately visible to other users

CICS Provides .....

- Systems Services
  - ➔ Storage, Program, Task and Time Control
  - ➔ Security, Workload Management
- Communications Services
  - ➔ To other CICS's, end-users, the web and other non-CICS programs
  - ➔ SNA – TCP/IP
- Data Management Services
  - ➔ with Commit
  - ➔ with Logging
  - ➔ with Recovery
- Application Development Services
  - ➔ API
  - ➔ Language Tools
  - ➔ Debug Support

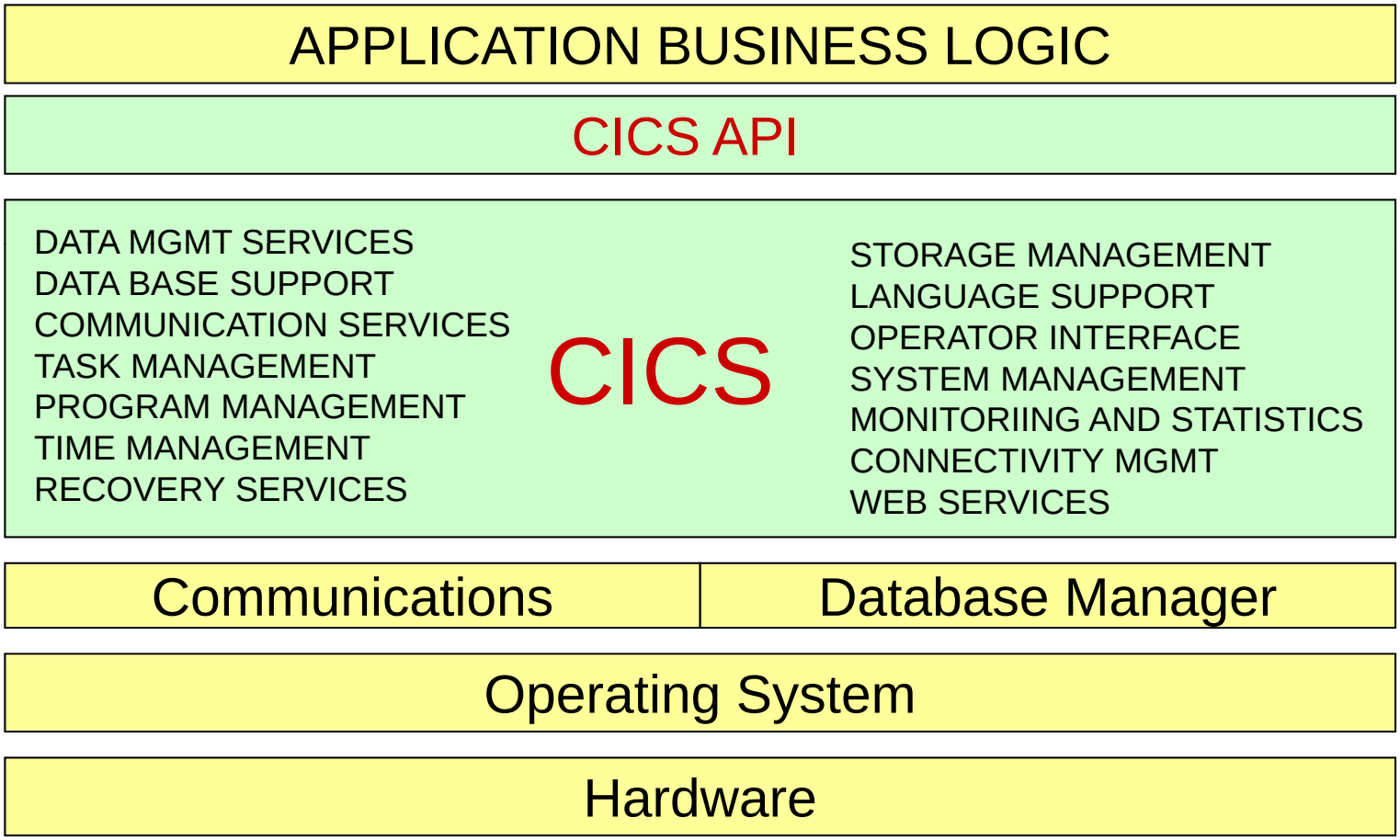
Does CICS Run on a System z?

- Well yes it does .....
  - ➔and on the UNIX platforms,
    - AIX, HP-UX, Solaris,
  - ➔and on Windows
  - ➔and VSE
  - ➔and OS/400
  - ➔and Linux (PRPQ 7J0468 on System x)

- TX Series for Multi-platforms

- CICS also has Gateways, Clients, Connectors and Systems Management.....much much more

CICS - Its really Middleware !



CICS Systems Services - Security

- Strong security facilities are available in the CICS to implement identification, authentication and authorization
- Uses SAF calls to access External Security Manager
- Logon/Signon
  - Passwords (8 characters upper/lower/special char)
  - Passphrase (100 character)
- CICS implements techniques to protect
  - Transactions
  - Resources
  - Commands
- Encryption of communication flows

CICS Systems Services - Storage

- Effective use of memory is key to performance
- Supported Virtual Storage, Paging
- Redesigned to .....
  - ➔ Utilize 31-bit addressing
  - ➔ Allow data to be put in memory
  - ➔ Provides storage protection within a region
  - ➔ Exploiting 64-bit addressing
- Storage has been a major evolution allowing for **significant transactional growth**

Other CICS Systems Services

- Abnormal termination and exception handling
- Interval Control for time initiated events
- Multitasking and subtasking
  - ➔ Different TCB's dispatched
  - ➔ Priority scheduling
  - ➔ Open Transaction Environment (OTE)
  - ➔ Threadsafe
  - ➔ JVM Server for threadsafe Java programs
  - ➔ Pooled JVM for non-threadsafe Java programs
    (See CICS TS 4.2 Statement of Direction)

CICS Systems Management

- Operator commands to control the transaction processing environment (e.g. inquire/change trans, trace, purge trans ….)
- CICS Explorer – Web based definition, operation and monitoring
- Resource Definition Online (RDO) provides dynamic definitions
- Dynamic Program Library Management without CICS restart
- Exits and sample code allow for customization
  - TRUES – Task Related User Exits
  - GLUES – Global User Exits
  - URMS – User Replaceable Modules
- Monitoring tools are available to analyze performance and load
  - CICS Statistics Utilities
  - CICS Performance Monitor
  - CICS Performance Analyzer
- CICSPlex SM features provide operational and definitional tools
  - Web based interface (WUI) included with CICS Transaction Server

CICS Communications Services

- SNA - VTAM
  - 3270 Terminals
  - APPC / LU 6.2 sessions
  - CICS or IMS ISC (InterSystem Communication)
  - FEPI – Front End Programming Interface
- MRO – Multiple Region Operation
- XCF / MRO - Cross-system MRO (CTC or Coupling Facility)
- EXCI – External CICS Interface
- TCP/IP
  - TCP/IP Sockets
  - Region to Region IP Connectivity (IPIC)
  - Internet protocols (e.g. HTML, XML, SOAP)
  - Remote Procedure Calls (ONC RPC)
  - IIOP / EJB (Note Statement of Direction TS 4.2)
- WebSphere MQ

CICS Data Services

- Multiple types, multi-access within same transaction
- VSAM (KSDS, ESDS, RRDS)
  and VSAM transparency too….
- Data Base Management Systems (DBMS)
  - DB2
  - IMS DBCTL
  - And many other third party database products
- Transient Data queues (TD queues)
- Temporary Storage (TS)
- Data Tables (> 2GB)
- Data integrity, logging, recovery, backout, restart

CICS Application Development Services

- Command level Application Programming Interface
  XPI, SPI added for Systems Programmers

- Language Support
  (Assembler, COBOL, PL/I, C, C++, Java, REXX)

- Dynamic Scripting with PHP and Groovy support

- Execution Diagnostic Facility (EDF)

- Command Interpreter

- End to end debugger for client and server

- Support for BMS/3270 screens, Web Services, and Atom feeds

But What Does a CICS Command Look Like ?

EXEC CICS LINK
PROGRAM('MyProgram')
COMMAREA(MyData)
LENGTH(LengthofMyData)

EXEC CICS RETURN

EXEC CICS READNEXT
DATASET('MENUFILE')
INTO(MASTER-MENU-RECORD)
RIDFLD(MENU-KEY)
LENGTH(OPTION-LENGTH)
RESP(CICS-RESPONSE)

EXEC CICS WRITEQ TD
QUEUE('CSSL')
FROM(IDMSG)
LENGTH(IDMSGLN)
RESP(RESPVAL)

EXEC CICS DOCUMENT CREATE
DOCTOKEN(Atoken)
TEXT(AppPgmCA)
LENGTH(Input_data_len)
NOHANDLE

EXEC CICS WEB SEND
DOCTOKEN(Atoken)
STATUSCODE(StatusCode)
STATUSTEXT(StatusText)
LENGTH(StatusLen)
CLNTCODEPAGE('819')
NOHANDLE

EXEC CICS GET
CONTAINER(MsgInput)
INTOCCSID(UTF8-CCID)
SET(Msg-Ptr)
FLENGTH(Msg-Length)

CICS Events Processing

- An event is anything of significance to an enterprise
- CICS allows users to capture, format and emit business events from CICS
- Events can be sent via HTTP, MQ queue, TS Queue or Start Transaction for further processing
- Events are bound to a CICS system using an event binding editor built into CICS Explorer and Rational Developer for System z with Java (RDz)
- The bindings are enabled using a BUNDLE resource
  - CICS Explorer or Web User Interface (WUI)
  - RDO or CEMT

CICS – One or Many CICS Regions?

- CICS can run in one single region
- CICS can run as several independent regions on a single system or across multiple systems
- CICS can run as several interconnected regions on multiple images on a single system or across several systems
- Sysplex - z/OS
- CICSplex – a group of CICS regions
- CICSPLEX SM – CICSplex Systems Manager

CICS – What do a call a bunch of regions?

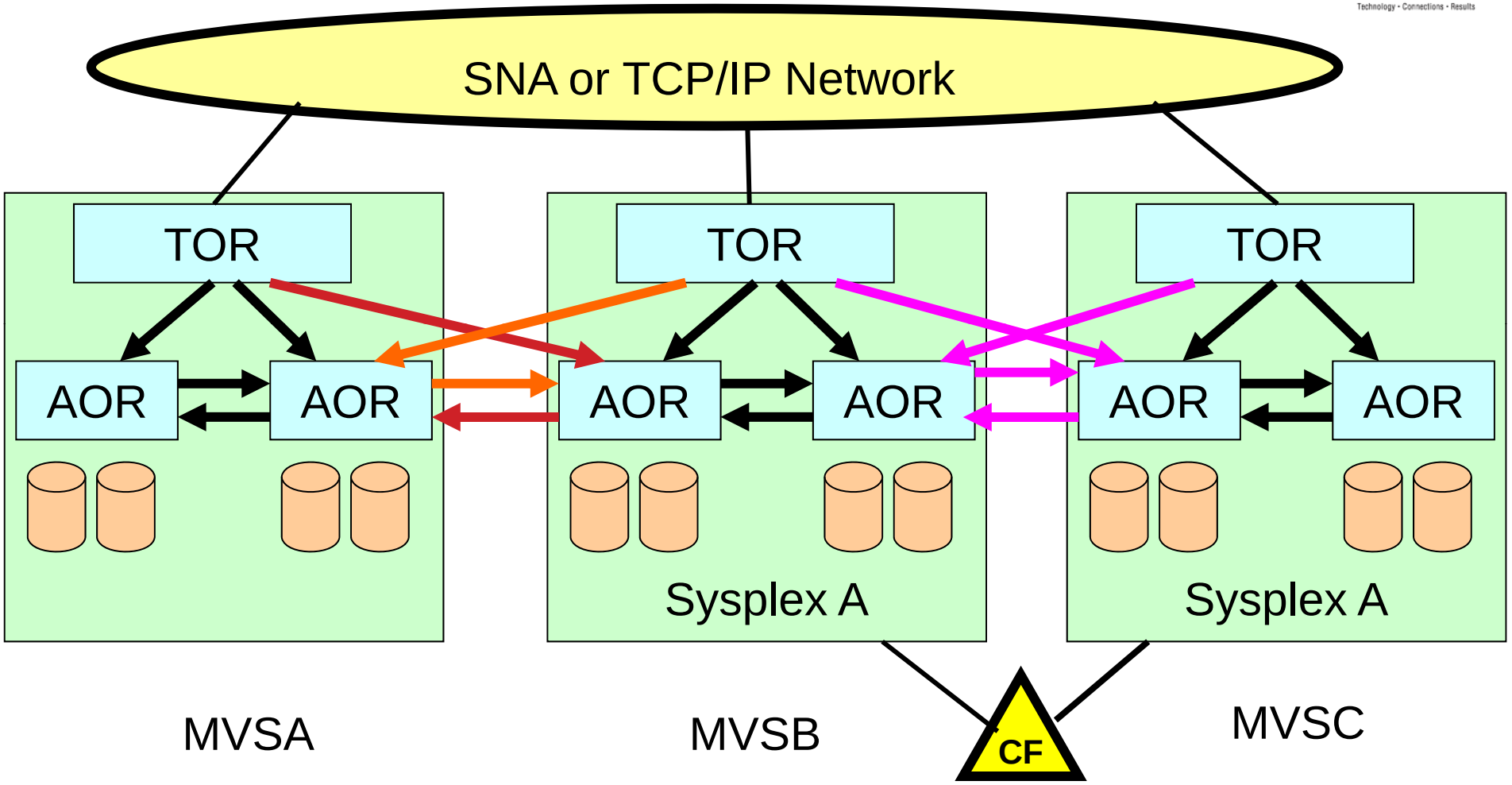
For manageability and recoverability CICS regions in a CICSplex are often segregated by function

- TOR – Terminal Owning Region
- WOR – Web Owning Region
- ROR – Remote Owning Region
- AOR – Application Owning Region
- FOR – File Owning Region
- DOR – Data Owning Region
- QOR – Queue Owning Regions

CICS – How Does Your System Grow?

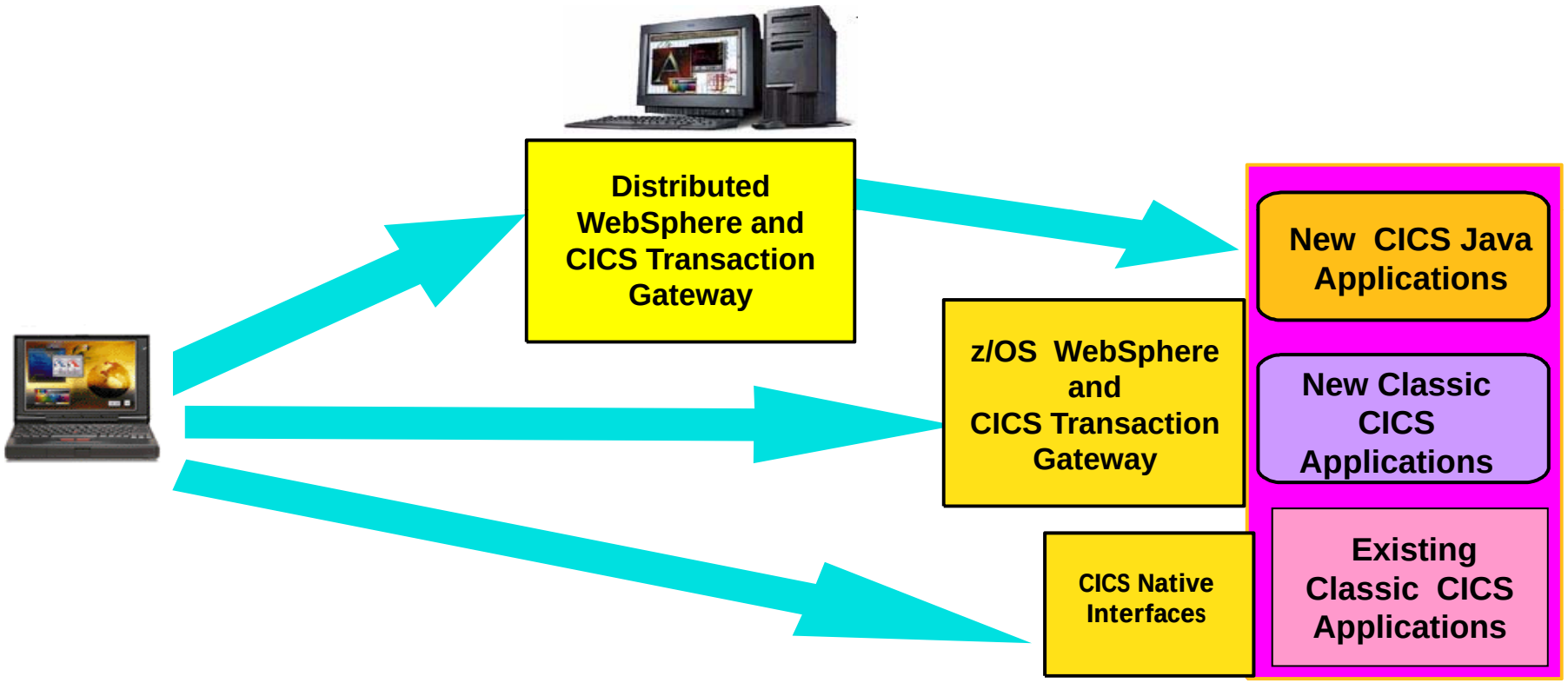
- ISC and MRO
  - ➔InterSystems Communication - system to system
  - ➔Multi-Region Operation - region to region
  - ➔XCF/MRO – Cross System Coupling Facility MRO
  - ➔ IPIC – IP InterCommunications
- Multi-platform
- Clients and Gateways
- No single points of failure
- Systems Management
- Workload Balancing

CICS MRO, ISC, IPIC and XCF



Communicating among CICSs can be using memory, SNA or TCP/IP

CICS e-business options



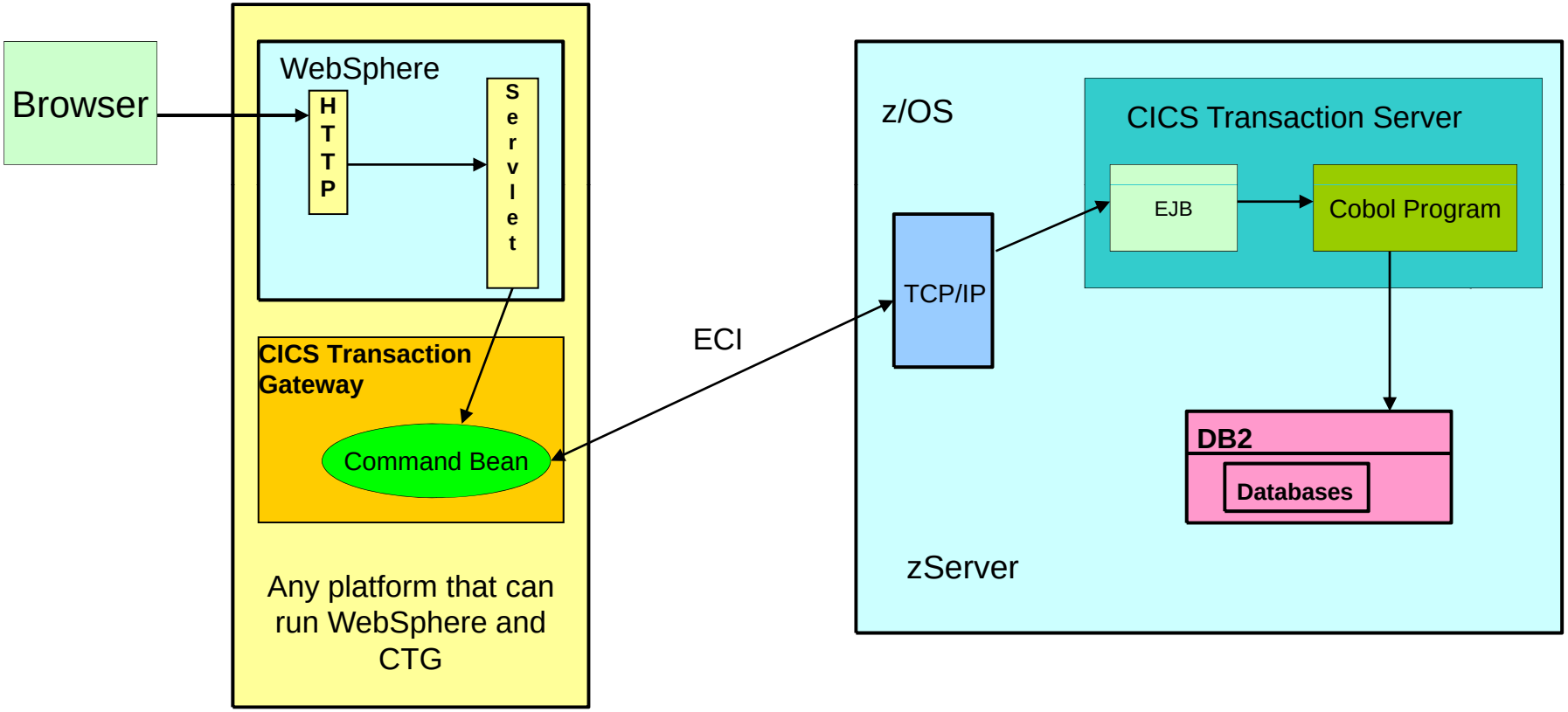
A **pragmatic approach** to implementing e-business solutions

CICS Transaction Gateway (TG) and the Universal Client (UC)

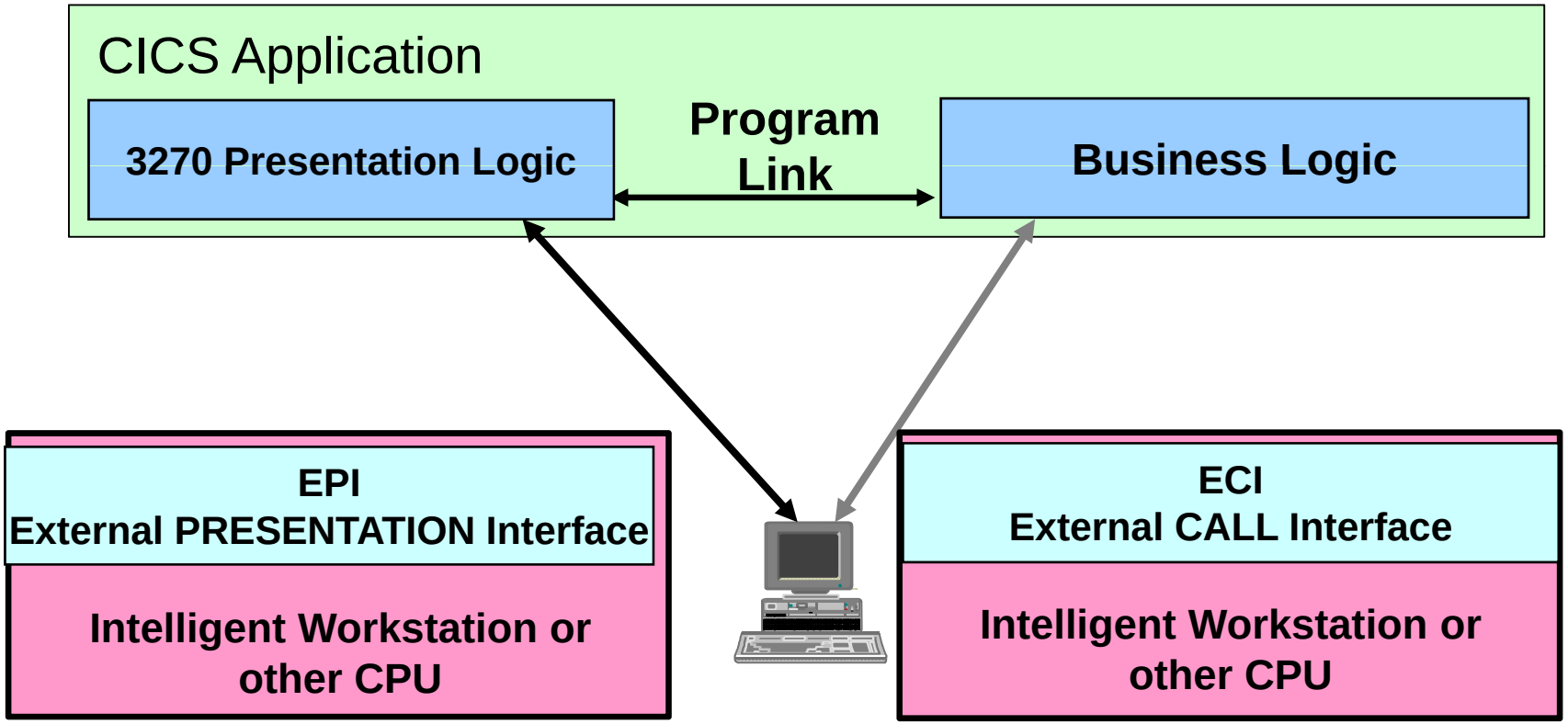
- Enables client applications to invoke services in CICS
- Gives users at Web browsers access to business critical applications running on CICS servers
- Supported on multiple platforms:
  - ➔**Windows (XP, Vista, Windows 7)**
  - ➔**Linux**
  - ➔**HP-UX**
  - ➔**z/OS**
  - ➔**AIX**
  - ➔**Sun Solaris**
- Client Interfaces
  - ➔**MQ client - WebSphere MQ queues**
  - ➔**External Presentation Interface (EPI) – "3270 Screen Based"**
  - ➔**External Call Interface (ECI) - "Call and Return with Data" "Remote Procedure Call"**

CICS Transaction Gateway

Support for IBM JEE and JCA connectors



CICS Client Interfaces



CICS access with Java

CICS Client and Gateway classes

- Used by Java program to run a CICS transaction
- ECI, EPI calls available

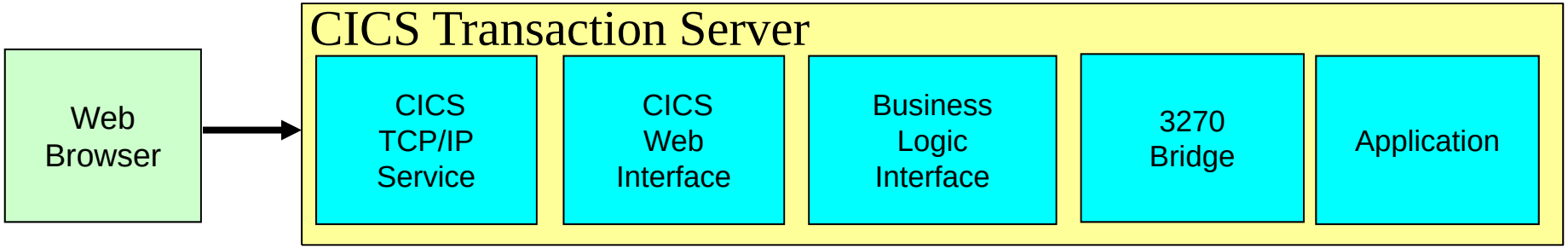
JCICS Classes

- Allow CICS function execution for Java programs

Connection to CICS can be by

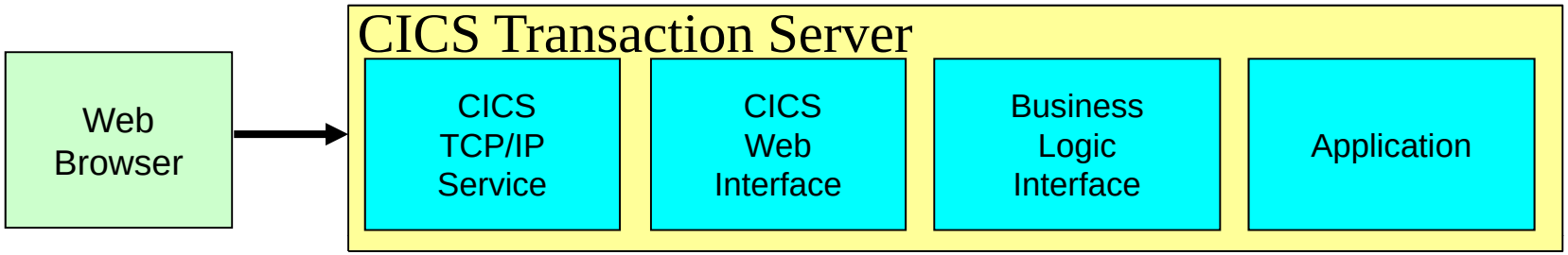
- CTG, WebSphere AS, either or both
- Program calls can be created by program development workbenches

CICS 3270 Bridge



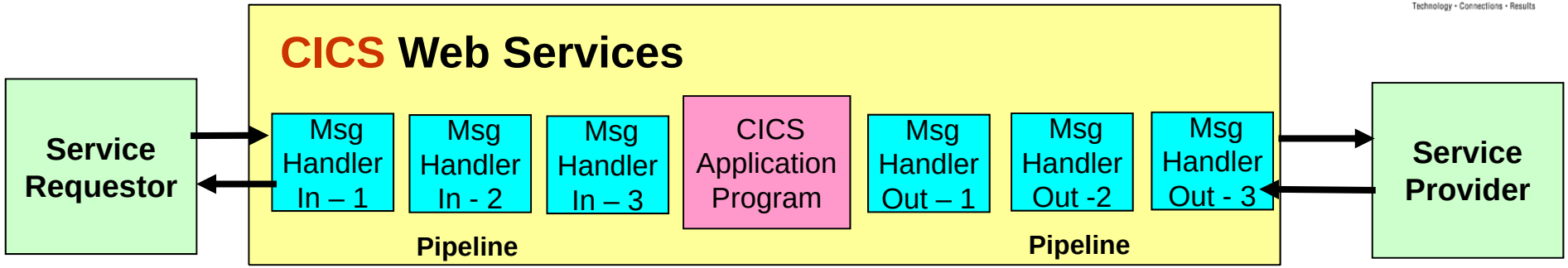
- Rapid enablement of 3270 Terminal Transactions
- Allows 3270 terminal based transactions to run with map recompile
- Utilities provided to recover old maps
- CICS interprets HTML/XML flows, formats as if it came from 3270
- Allows new web applications to be written using CICS skills
- Linkable bridge allows EXCI invocation of 3270 terminal based trans
- Can be sysplex enabled

CICS Web Support



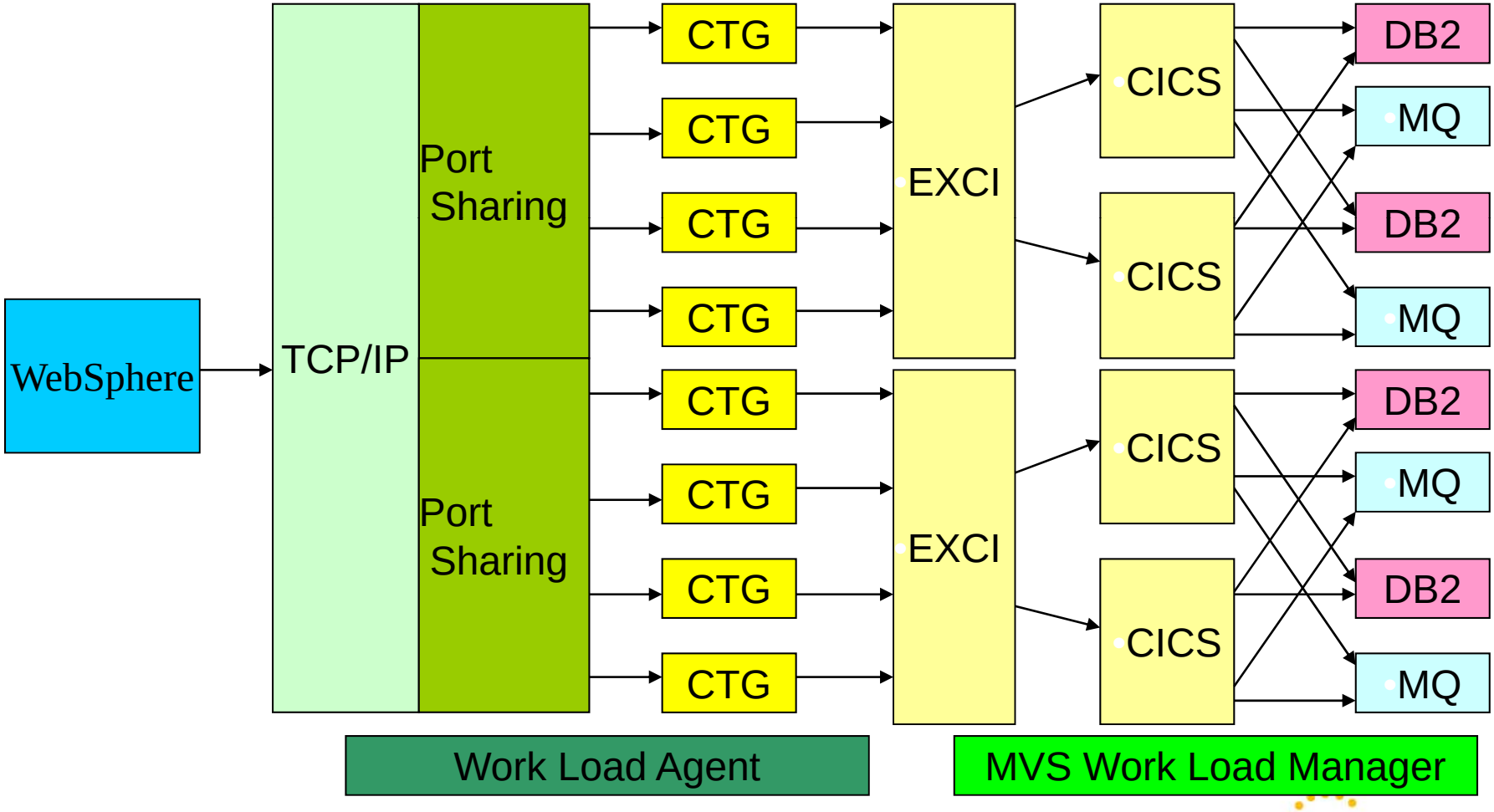
- Gives CICS applications direct access to web browser
- CICS interprets HTTP flows and executes transactions
- Allows new web applications to be written using CICS skills
- Secure Socket Layer (SSL) support using up to 256 bit encryption
- Certificates mapped to MVS USERID
- Mixed case password and passphrase support
- Can be sysplex enabled

CICS Service Oriented Architecture (SOA)



- Integrated into most current release
- Defined by Web Service Description Language (WSDL)
- CICS role in SOA can be service requestor, service provider or both
- CICS Web Services utility programs
  - Assist in converting existing application into a Web Service
  - Use a Web Service provided by an external provider
- Support for web services standards and technologies
  - WSDL 2.0
  - WS-I Basic Profile 1.1
  - WS-Security
  - WS-Trust
  - WS-Addressing
  - Message Transmission Optimization Mechanism / XML – Binary Optimized Packaging (MTOM/XOP)

High Volume and High Availability CICS Configuration



CICS Tools

- If ***CICS*** does not provide the needed functionality there are many tools available from IBM and other vendors to assist in creating and managing an online transaction processing system

- For example IBM provides the following:
  - CICS Batch Application Control
  - CICS Configuration Manager for z/OS
  - CICS Interdependency Analyzer
  - CICS Online Transmission Time Optimizer for z/OS
  - CICS VSAM Recovery for z/OS
  - CICS Performance Analyzer
  - CICS Business Events Publisher
  - CICS VSAM Transparency
  - CICS Deployment Assistant for z/OS
  - CICS Service Flow Runtime
  - IBM Tivoli OMEGAMON XE for CICS on z/OS
  - REXX for CICS Transaction Server for VSE/ESA
  - Extensions to the CICS Information Center

CICS - Summary

- ***CICS*** is ideal for existing transactional environments and your new ones too….. It provides:
- Availability, Maintainability, and Scalability
- Tools for Development, Support and Operation
- Continues exploitation of new hardware and software technology
- Plenty of education is available

Some Useful CICS Information

http://www.SHARE.org

SHARE Website – Volunteer Center > Projects/Programs

then select Data Program – CICS Project

You'll find information on:

- **CICS** Announcements
- **CICS** Tools
- **CICS** User Groups
- **CICS-L** Discussion group (listserv)
- **CICS** Presentations made at Share

Some useful IBM Websites

http://www.ibm.com/software/htp/cics/
CICS Product Information

http://publib.boulder.ibm.com/infocenter/cicsts/v4r2/index.jsp
CICS Information Center for CICS Transaction Server

http://www.redbooks.ibm.com/
Download Redbooks

http://www.ibm.com/cics/soap/
SOAP for CICS Information

http://www.ibm.com/software/ts/cics/education/
Lists available training courses and certifications

http://www.ibm.com/support/docview.wss?uid=swg27007241
CICS SupportPacs

CICS Redbooks
www.redbooks.IBM.com

Introduction to CICS Dynamic Scripting — **SG24-7924-00**
Redbook, published March 28, 2011

Threadsafe Considerations for CICS — **SG24-6351-03**
Redbook, published March 14, 2011

Extend The CICS Explorer: A Better Way to Manage Your CICS — **SG24-7819-00**
Redbook, published February 23, 2010

Java Application Development for CICS — **SG24-5275-03**
Redbook, published February 24, 2009

Implementing CICS Web Services — **SG24-7657-00**
Redbook, published November 12, 2008

Exploring Systems Monitoring for CICS Trans Gateway — **SG24-7562-00**
Redbook, published April 3, 2008

CICS Web Services Workload Management and Availability — **SG24-7141-01**
Redbook published March 31, 2008

CICS Systems Manager in the WUI as the Principle Management Interface — **SG24-6793-01**
Redbook, published November 16 2007

CICS

QUESTIONS

“I never said most of the things I said.”

“If you ask me anything I don't know, I'm not going to answer. “

-- Yogi Berra