DB2 Connect for DBAs

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Baltimore/Washington DB2 Users Group
September 9, 2009

THE FILLMORE GROUP
Relational Database Solutions

Agenda

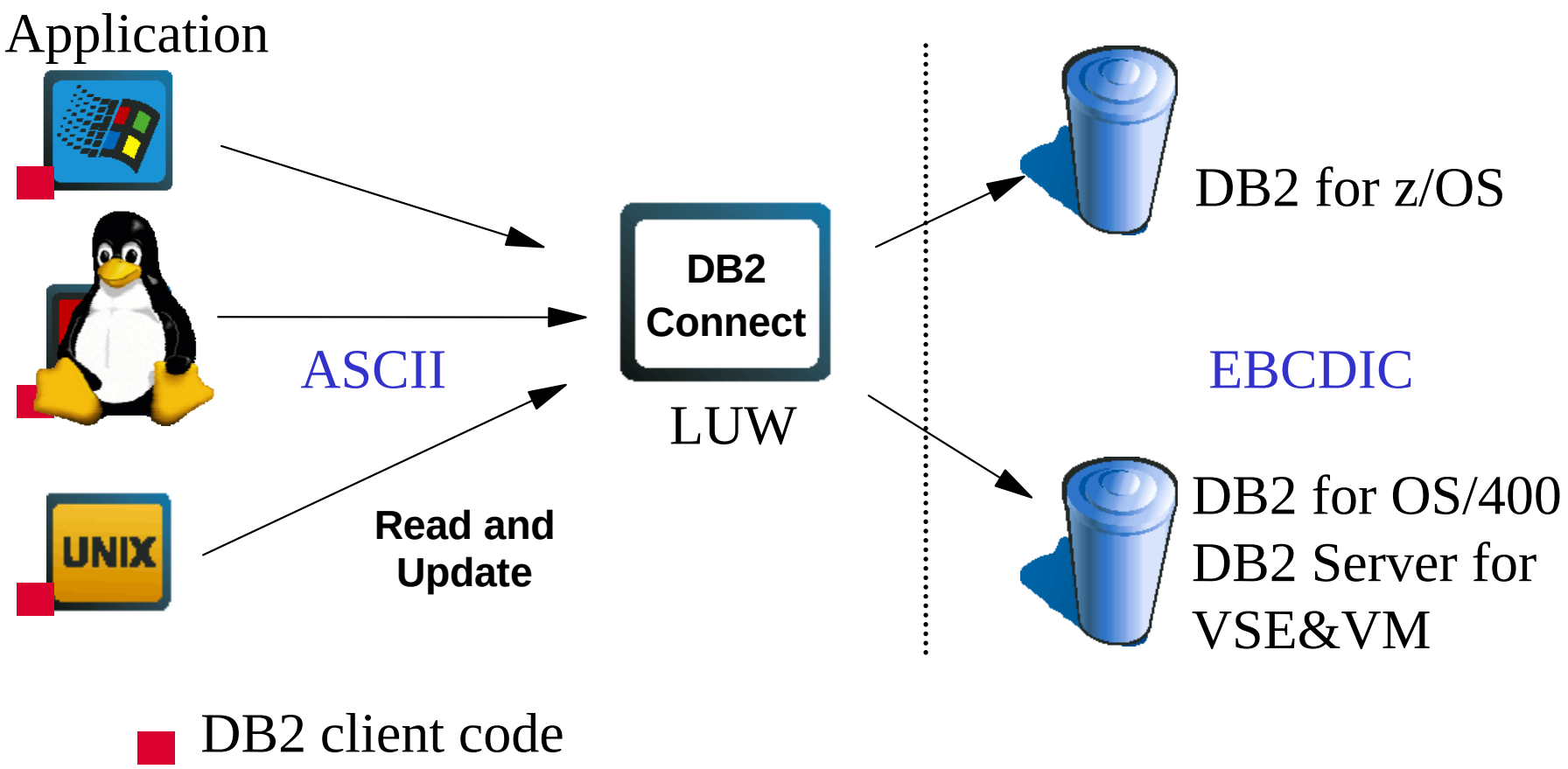
- Architecture
- Configuration
- Performance and Monitoring
- Tooling
- Cool things I didn’t know…
- Case Studies

Architecture

ASCII / EBCDIC gateway

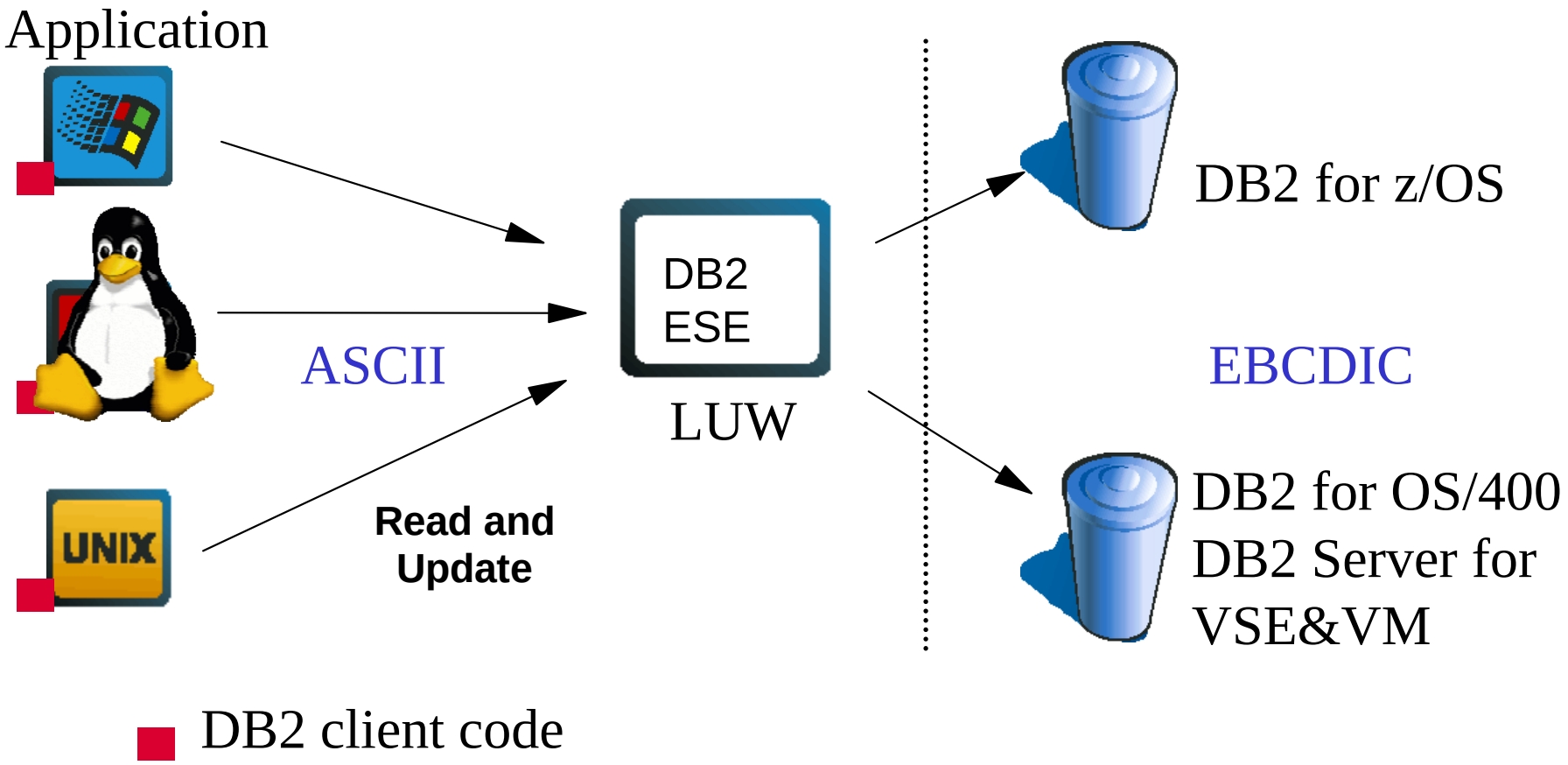
- DB2 Connect enables ASCII based applications to access EBCDIC based data
- DB2 Connect acts as a Distributed Relational Database Architecture (DRDA) Application Requestor (AR)
- DB2 Connect software
  - Enterprise Edition (3 tier)
  - Personal Edition (2 tier)

DB2 Connect Enterprise Edition



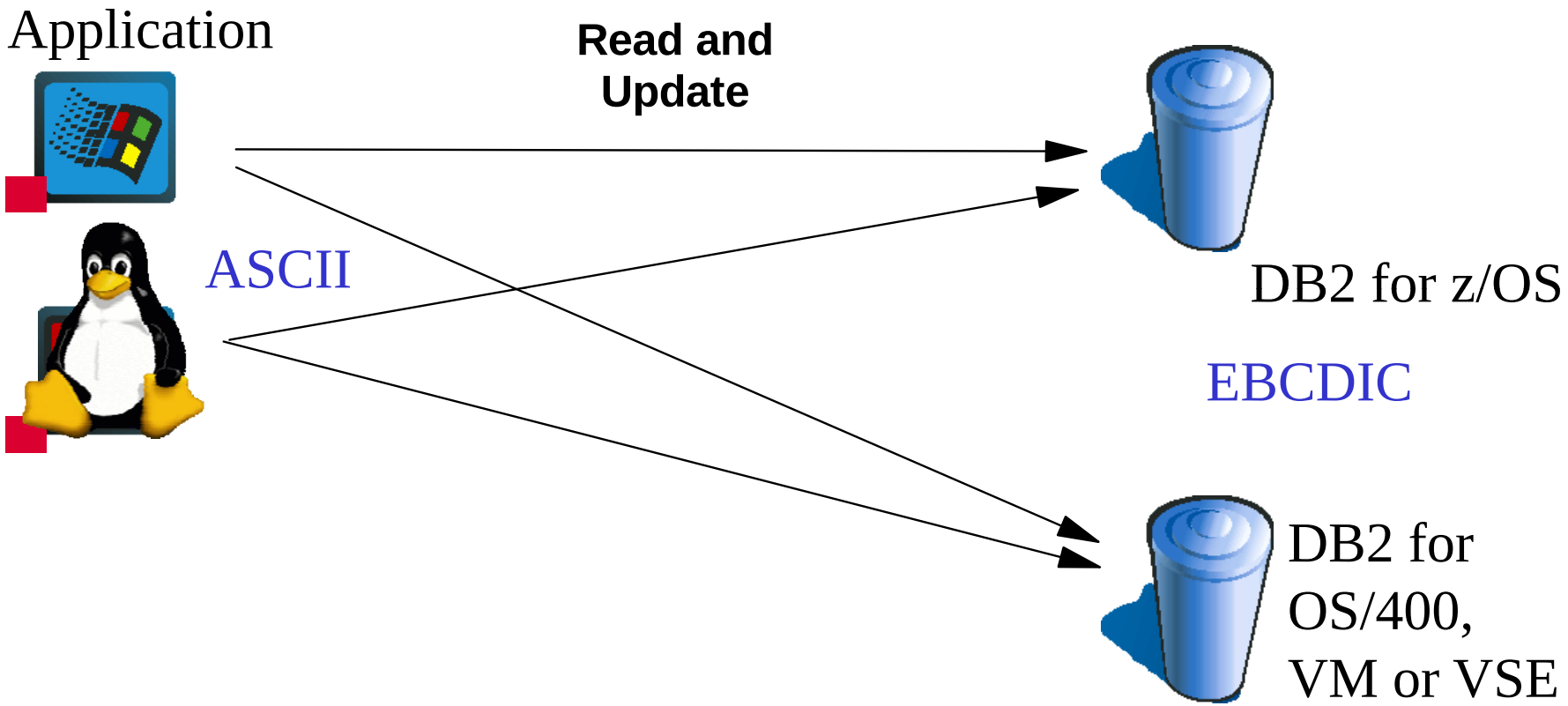
- DB2 client code

DB2 for LUW
Enterprise Server Edition



- DB2 client code

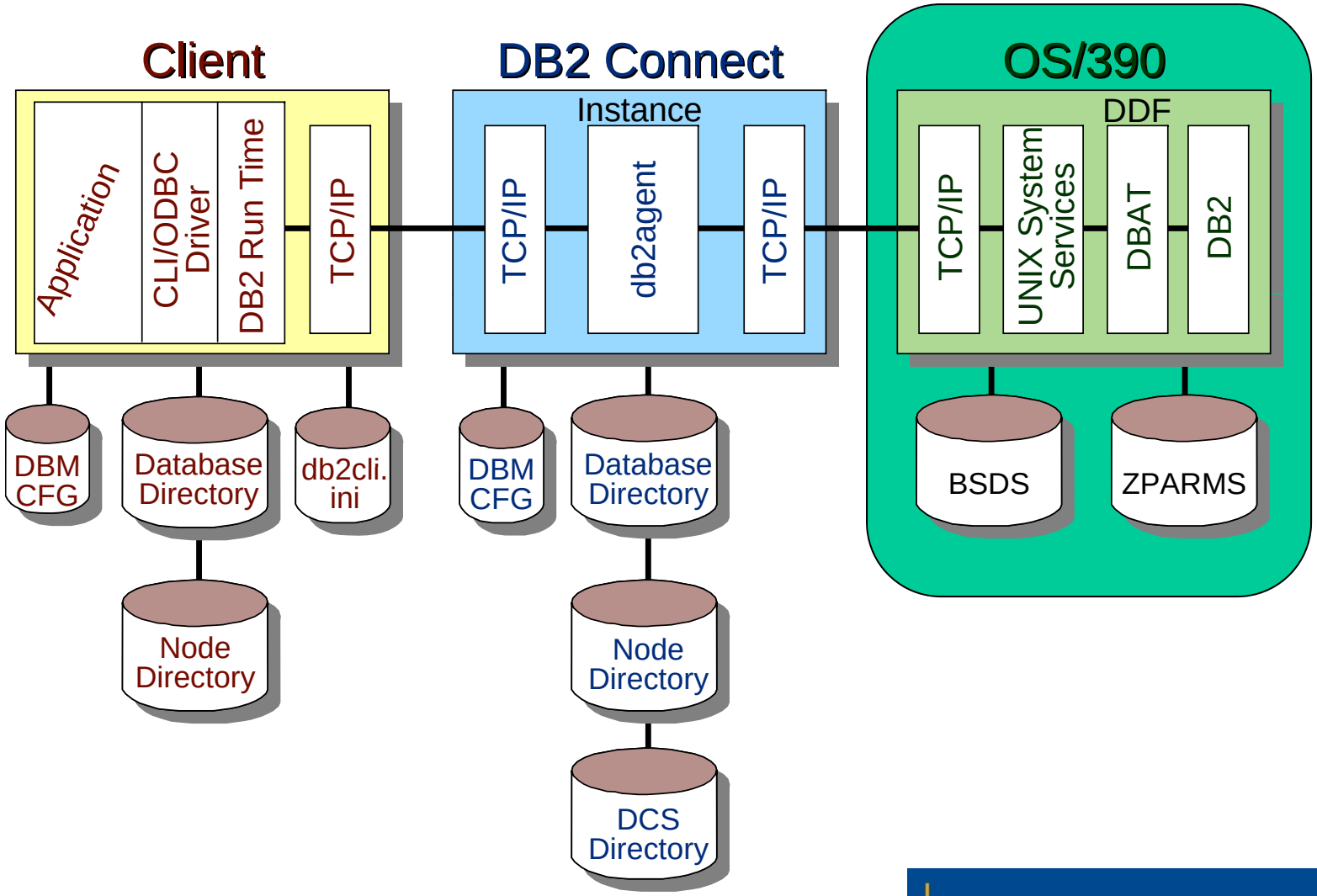
DB2 Connect Personal Edition



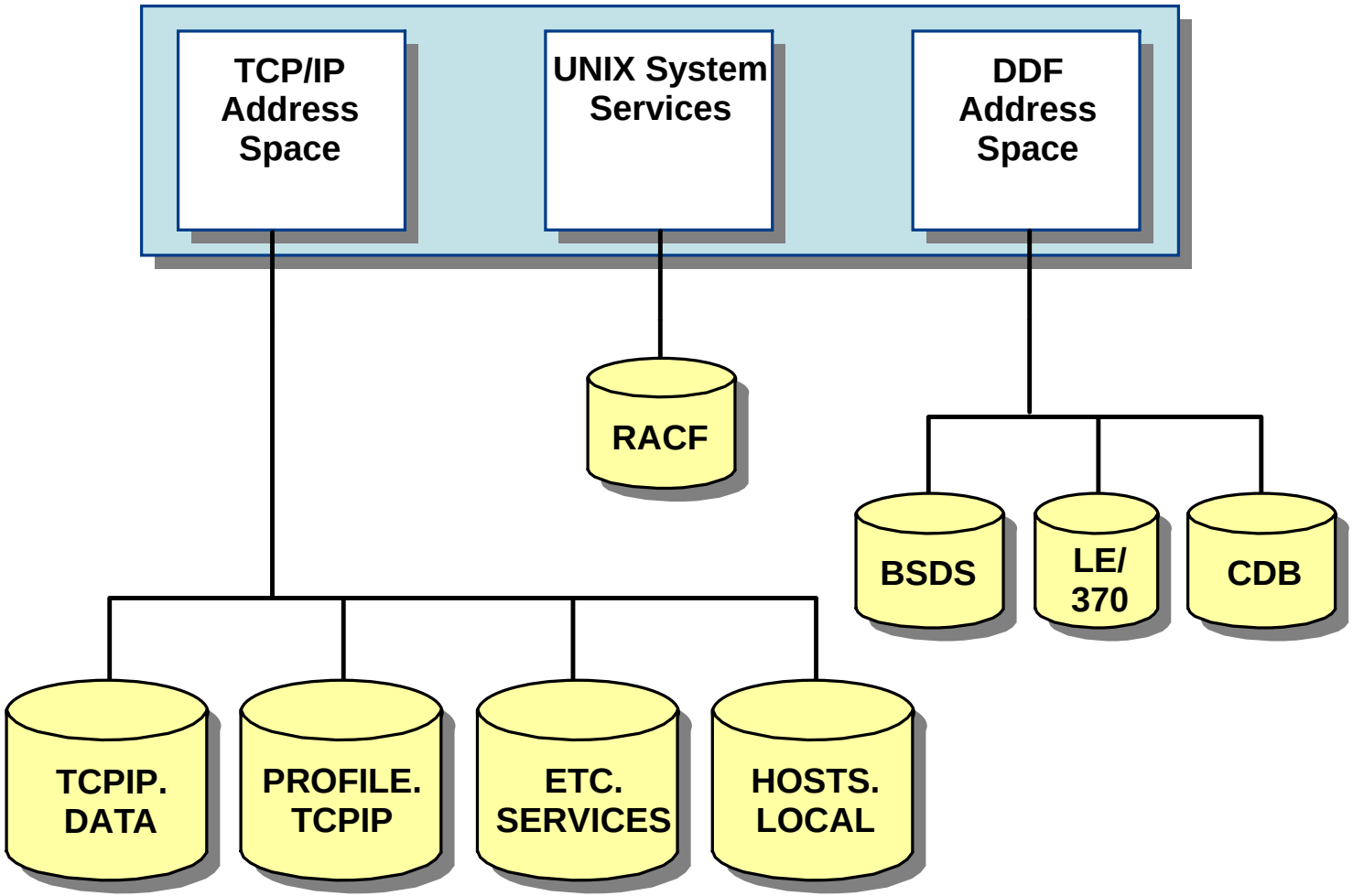
- DB2 Connect Personal Edition

Configuration

z/OS Host



z/OS Configuration



z/OS Configuration

- HOSTS.LOCAL – translates host names to IP addresses
- ETC.SERVICES – translates service names into port numbers
- PROFILE.TCPIP – configures TCP/IP communications with this host
- RACF – used for authentication of remote requestors
- BSDS – contains Location name

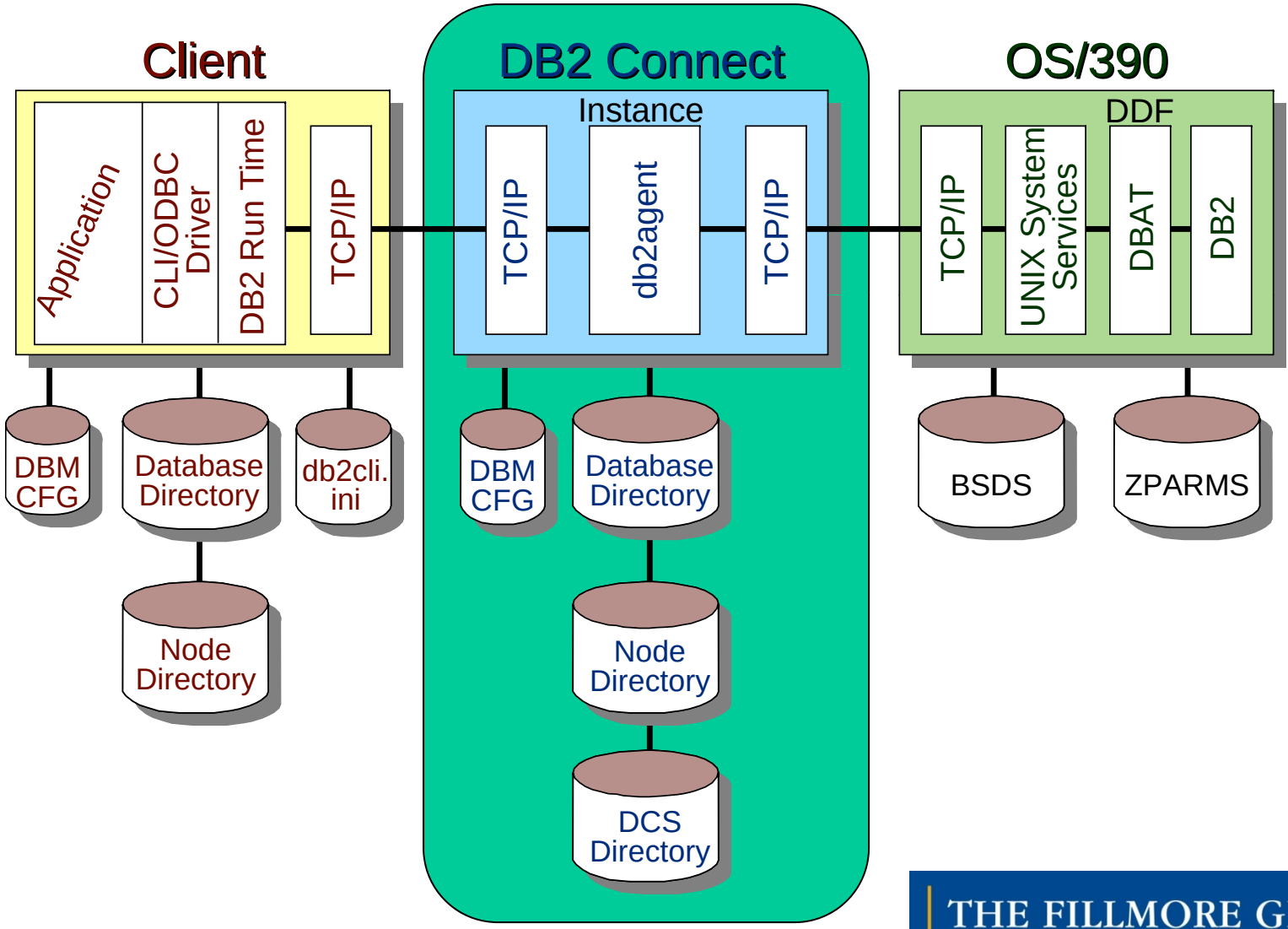
Distributed Data Facility

- Distributed Data Facility (DDF)
  - Optional software DB2 z/OS component
  - Enables all in-bound / out-bound communication to a DB2 subsystem
- One DDF per DB2 subsystem – associated with port number or service

DSNZPARMs

- Max Remote Connected (CONDBAT) – no connections above this limit
- Max Remote Active (MAXDBAT) – this plus CTHREAD = total number of threads accessing data
- DDF Threads (CMTSTAT) – typically set to ACTIVE: best performance, but consumes resources
- Idle Thread Timeout (IDTHTOIN) – time is seconds that active threads can remain idle
- TCP/IP Keep Alive (TCPPALV) – overrides TCP/IP

Mid-tier Platform



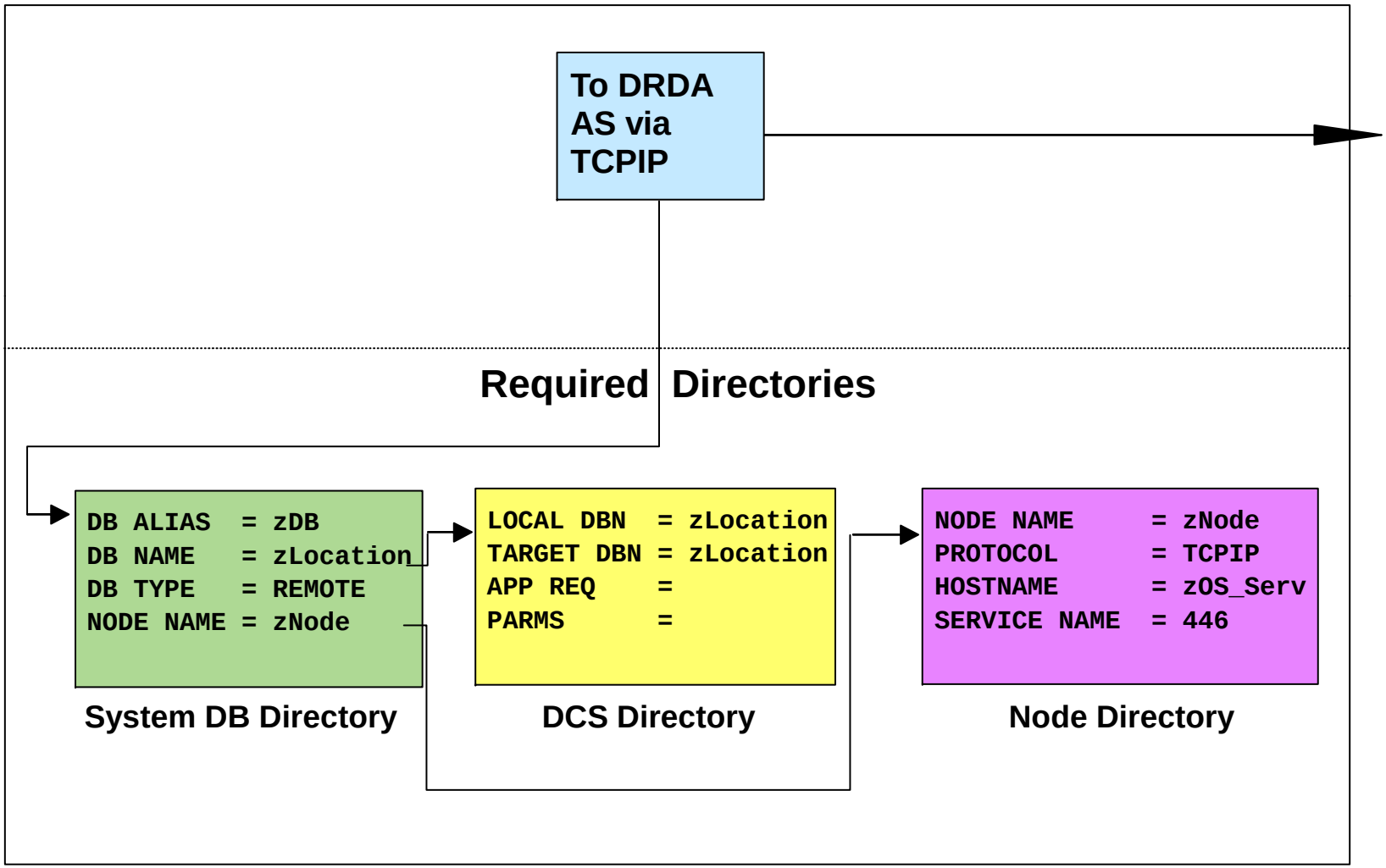
Mid-tier Platform

- Windows
- Unix (Solaris, AIX)
- Linux, including z/Linux

DB2 Connect Configuration

- Node Directory
  - TCP/IP address or hostname of z/OS server
  - Port number or service name of DDF
- Database Directory
  - Location name of DB2 subsystem

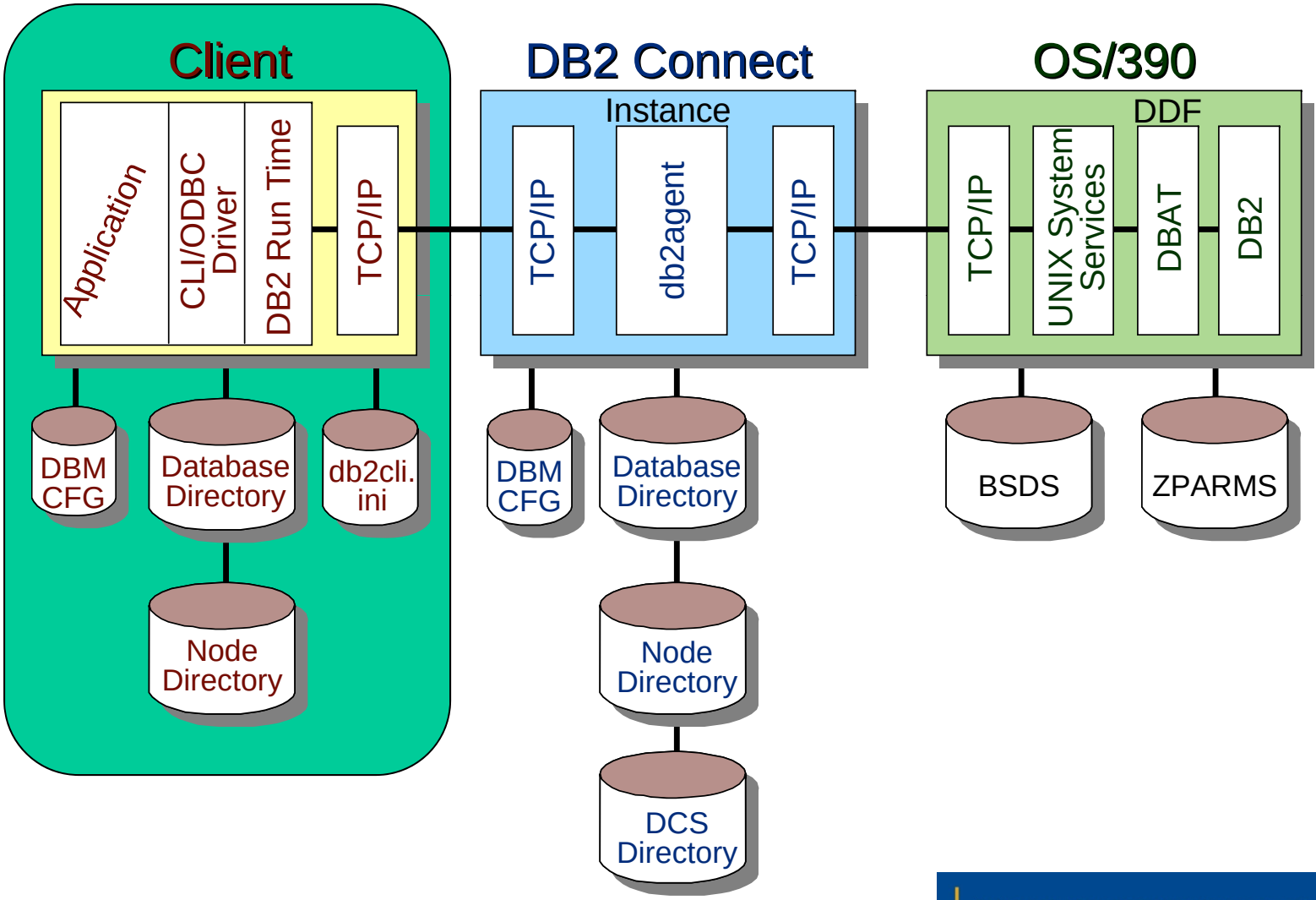
Directory Entries



DB2 Connect Configuration

- Configuration of Node and Database Directories
  - GUI – Configuration Assistant
  - Profile
  - Command line script
- Considerations
  - Authentication – typically SERVER (RACF, et al)

Client Workstation



Client Configuration

- Node Directory
  - TCP/IP address or hostname of Mid-tier
  - Port number or service name of DB2 Connect or DB2 ESE Instance
- Database Directory
  - Database alias name on DB2 Connect or DB2 ESE server

Client Configuration

- Configuration of Node and Database Directories
  - GUI – Configuration Assistant
  - Profile
  - Command line script

Performance and Monitoring

Objectify Results

- Understand what is great / normal / bad response for your environment
  - Set up a meaningful script - document its run time at various times
- Understand the true cost of the DB2 Connect component

Remember the Basics

- Application
  - DB2 for z/OS doesn't care where the bad SQL comes from
  - Techniques can minimize traffic
    - Stored Procedures / Compound SQL
- DB2 for z/OS database tuning 101
  - Avoid locking
  - Encourage Caching / Buffering
  - Encourage I/O parallelism
- Beware of the impact of monitoring

DB2 Connect Performance

- Agents
  - Number of idle and total agents available
  - Connection Pooling
  - Connection Concentration
- Memory
  - Per agents for data in transition
- Parallel Sysplex
  - Exploit Data Sharing environment

Agents

- Set the number of available DB2 agents & idle is sufficient
  - unless you have limited resources
  - *MAX_COORDAGENTS* - maximum number of active coordinator agents
  - *MAXAGENTS* - maximum number of worker agents
  - *NUM_POOLAGENTS* - agent pool size
  - *NUM_INITAGENTS* - initial number of worker agents in the pool

Agents

- Connection Pooling
  - Maintain open connections to the database in a readily accessible pool
    - After a disconnection from database by application
    - It is maintained for a future connection request
  - Automatic feature and transparent to application
- Connection Pooling might be available from application server (e.g. WAS), but not as flexible

Agents

- Connection Concentrator
  - More efficient use of z/OS resources
  - Similar pooling at a more granular level
    - While still connected but not active, the “connection resources” are passed to the pool after COMMIT or ROLLBACK
    - Alternate application can then use this connection
  - Implemented by setting Database Manager (DBM or Instance) Configuration
    - *max_connections* > *max_coordagents*

Memory

- Each connection / agent consumes one block of memory 300K to 500K
- Great numbers of agents can represent substantial amounts of memory
- If insufficient memory is available
  - DB2 Connect will borrow from other agents
  - Sub-optimal performance for all
  - Consider limiting the number of agents

    maxagents, max_coordagents

Memory

- *ASLHEAPSZ*
  - With QueryHeap only used for local clients
  - Not used with DB2CONNECT_IN_APP = NO
- *QUERY_HEAP_SZ*
  - Five times the size of *aslheapsz*
- *RQRIOBLK*
  - Can set to 64k depending on types of requests

Parallel Sysplex

- Support and exploitation of data sharing
- Configure connectivity to DB2 subsystem
- After each connection
  - Information describing activity and availability of each member
  - Directs traffic to optimal member

Parallel Sysplex Configuration

- DB2 Registry variable (db2set)
  - DB2SYSPLEX_SERVER
    - 0 disables Parallel Sysplex… so don't set it to 0
  - DB2CONNECT_IN_APP_PROCESS
    - NO, required if local application
- CATALOG DCS DATABASE ... PARMS ",,,,,SYSPLEX"
  - The sixth parameter in PARMS field

Client Application Tuning

- db2cli.ini
  - SysSchema=SYSIBM
  - SchemaList="'SYSIBM','PAYROLL','FINANCE'"
  - DeferredPrepare=1
  - ConnectTimeout=10
  - ReceiveTimeout=120
  - LockTimeout=60
  - AppendForFetchOnly=1
  - AutoCommit=1
  - ConnectType=1
  - CursorHold=0
  - TxnIsolation=1
- http://www.thefillmoregroup.com/blog/?p=80

Tooling

Tools for Managing z/OS Host

- Resource Measurement Facility (RMF) or equivalent tool
- DB2 –DISPLAY commands
- DB2 accounting, statistics, and performance traces
- Access to tcpip.profile
- Ability to modify DSNZPARMs
- DB2 Performance Monitor (DB2PM) or equivalent tool

Tools for Managing Mid-tier

- db2diag
- db2pd

  http://www-128.ibm.com/developerworks/db2/library/techarticle/dm-0504poon2
- db2 GET SNAPSHOT FOR DCS APPLICATION
  - Turn on monitor switches (DBM CFG)
    - *DFT_MON_UOW* ON
    - *DFT_MON_STMT* ON
- db2trc
- db2drdat

GET SNAPSHOT FOR DCS APPLICATION

snapdcsappmod.txt - Notepad

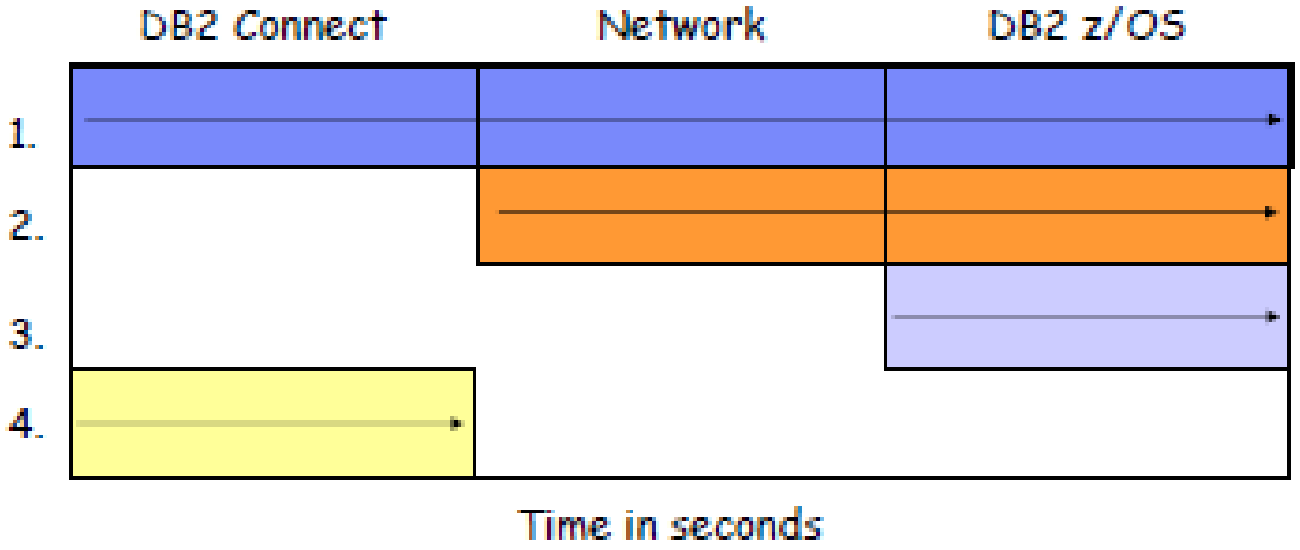
File Edit Format Help

```
UOW completion status                          =
Previous UOW completion timestamp              =
UOW start timestamp                            = 03/23/2006 14:53:32.002521
UOW stop timestamp                             =
Elapsed time of last completed uow (sec.ms)= 0.000000

Host execution elapsed time                    = 0.865403


Statement                                      = Execute Immediate
Section number                                 = 203
Application creator                            = NULLID
Package name                                   = SQLC2E06
SQL compiler cost estimate in timerons         = 0
SQL compiler cardinality estimate              = 1
Statement start timestamp                      = 03/23/2006 14:53:32.002521
Statement stop timestamp                       = 03/23/2006 14:53:32.959621
Host response time (sec.ms)                    = 0.956138
Elapsed time of last completed stmt(sec.ms)= 0.957100
Physical fetches for statement                 = 0
Time spent on gateway processing               = 0.000977
Inbound bytes received for statement           = 145
Outbound bytes sent for statement              = 153
Outbound bytes received for statement          = 426
Inbound bytes sent for statement               = 127
Blocking cursor                                = NO
Outbound blocking cursor                       = NO
Host execution elapsed time                    = 0.865403
SQL statement text:
update acct2 set balance=15000 where acct_id=5
```

Interpreting SNAPSHOT



Element name in output	Element name/identifier in manual
1. Elapsed time of last completed stmt	Most recent statement elapsed time/stmt_elapsed_time
2. Host response time	Host response time/host_response_time
3. Host execution elapsed time	Statement execution elapsed time/elapsed_exec_time
4. Time spent on gateway processing	Elapsed time spent on DB2 Connect gateway/gw_exec_time

Tools for Managing Client

- CLI Trace
- CLI Trace Parser

  ftp://ftp.software.ibm.com/ps/products/db2/tools
- db2trc
- db2ping
- Visual Explain/Optimization Service Center (OSC)

  http://www-01.ibm.com/software/data/db2/zos/downloads/osc.html

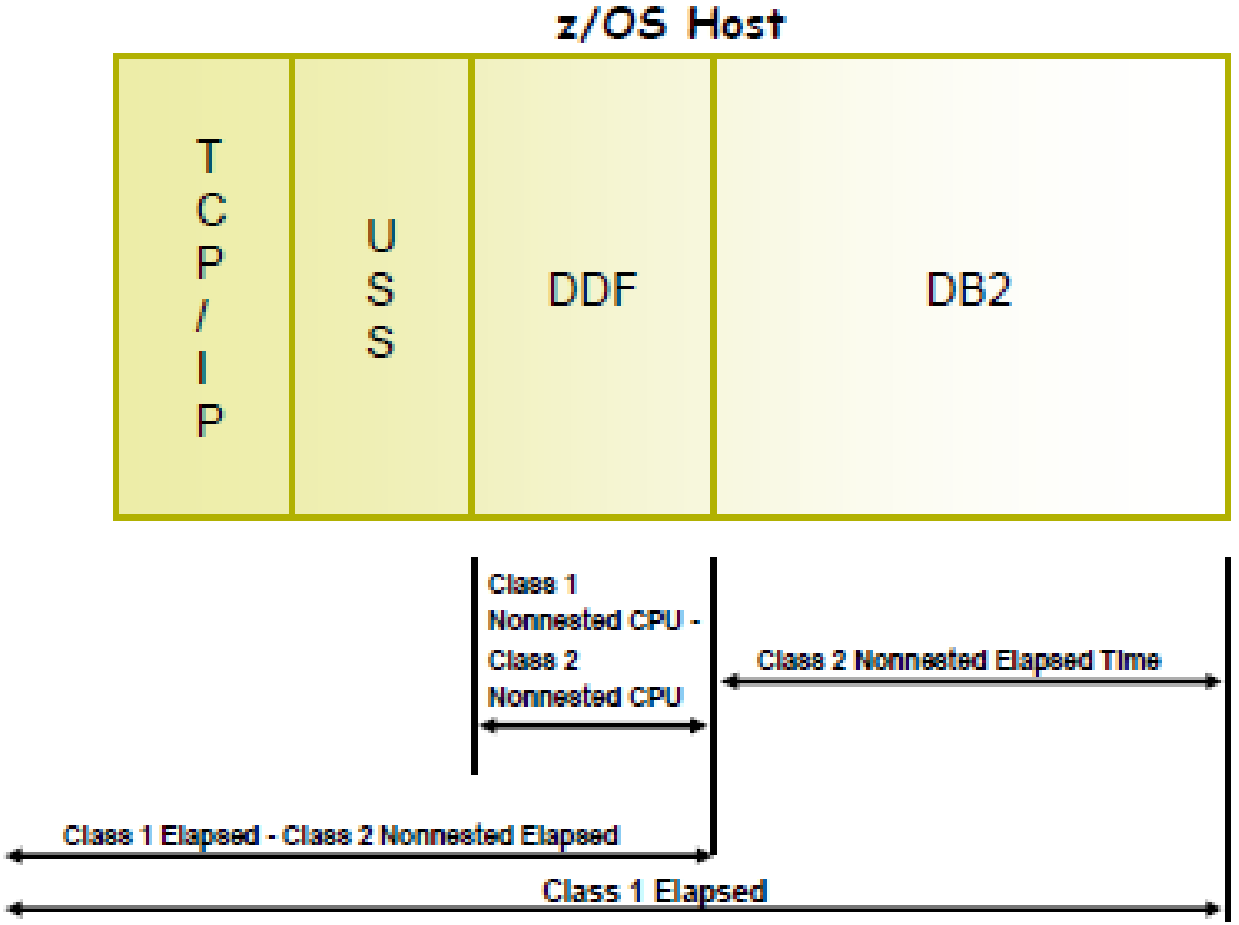
Tools for Managing Network

- ping
- traceroute
- netstat
- “Rules of thumb”
  - Network delays < 5 ms
  - Limit routers / hops
  - Place DB2 Connect server geographically near DB2 for z/OS

z/OS Troubleshooting

- DDF address space must be
  - Configured
  - Started
  - Varied on in VTAM

Accounting Trace Class Times



Cool things I didn't know…

Convert Dynamic SQL to Static

- "Static SQL Profiling"
- Edit db2cli.ini
  - STATICMODE=CAPTURE
  - STATICCAPFILE=Myfile
  - STATICPACKAGE=Colla.Mypack
- Execute the application
- db2cap bind…
- Edit db2cli.ini
  - STATICMODE=MATCH

Identify Who Is Accessing DB2

- db2cli.ini – identify remote users
  - ClientAcctStr
  - ClientApplName
  - ClientUserId
  - ClientWrkStnName

Registry Variable Table Function

```
db2 connect to feddb
db2 select substr (reg_var_name,1,30) as reg_var_name, substr(reg_var_value,1,30) as reg_var_value
from table (reg_list_variables()) as t
```

REG_VAR_NAME	REG_VAR_VALUE
DB2ADMINSERVER	DB2DAS00
DB2COMM	TCPIP
DB2INSTDEF	DB2
DB2INSTPROF	C:\PROGRA~1\IBM\SQLLIB
DB2PATH	C:\Program Files\IBM\SQLLIB
DB2SYSTEM	CF6000
DB2_GRP_LOOKUP	LOCAL
DB2TEMPDIR	C:\PROGRA~1\IBM\SQLLIB\
DB2PORTRANGE	60000:60003
DB2INSTOWNER	CF6000
DB2ACCOUNTNAME	C:\Program Files\IBM\SQLLIB\
DB2_EXTSECURITY	YES

In memory/current values

On disk/delayed values

```
db2set -all
[e] DB2PATH=C:\Program Files\IBM\SQLLIB
[i] DB2CONNECT_IN_APP_PROCESS=NO
[i] DB2ACCOUNTNAME=CF6000\db2admin
[i] DB2INSTOWNER=CF6000
[i] DB2PORTRANGE=60000:60003
[i] DB2_GRP_LOOKUP=LOCAL
[i] DB2INSTPROF=C:\PROGRA~1\IBM\SQLLIB
[i] DB2COMM=TCPIP
[g] DB2_EXTSECURITY=YES
[g] DB2_DOCCDPATH=C:\Program Files\IBM\SQLLIB\
[g] DB2SYSTEM=CF6000
[g] DB2PATH=C:\Program Files\IBM\SQLLIB
[g] DB2INSTDEF=DB2
[g] DB2COMM=TCPIP
[g] DB2ADMINSERVER=DB2DAS00
```

Case Studies

“DB2 for z/OS Stinks”

- Municipal Government
- Web application developed using Microsoft tools
- “This runs much faster against SQL Server”
  - Never tuned the queries on DB2 for z/OS
- Used Visual Explain
- Created new Indexes
- Achieved equivalent performance

"DB2 Connect Stinks"

- State Government
- VisualBasic application
- High CPU utilization, slow response times
  - Didn't complete month-end reorgs
- Changed key table to VOLATILE
- Completed month-end processing
- Tuned dynamic application SQL
- Found that application issued database connect for each SQL statement

DB2 Connect for DBAs

Questions ?

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410-465-6335

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