

DB2 Connect for DBAs

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Baltimore/Washington DB2 Users Group
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Agenda

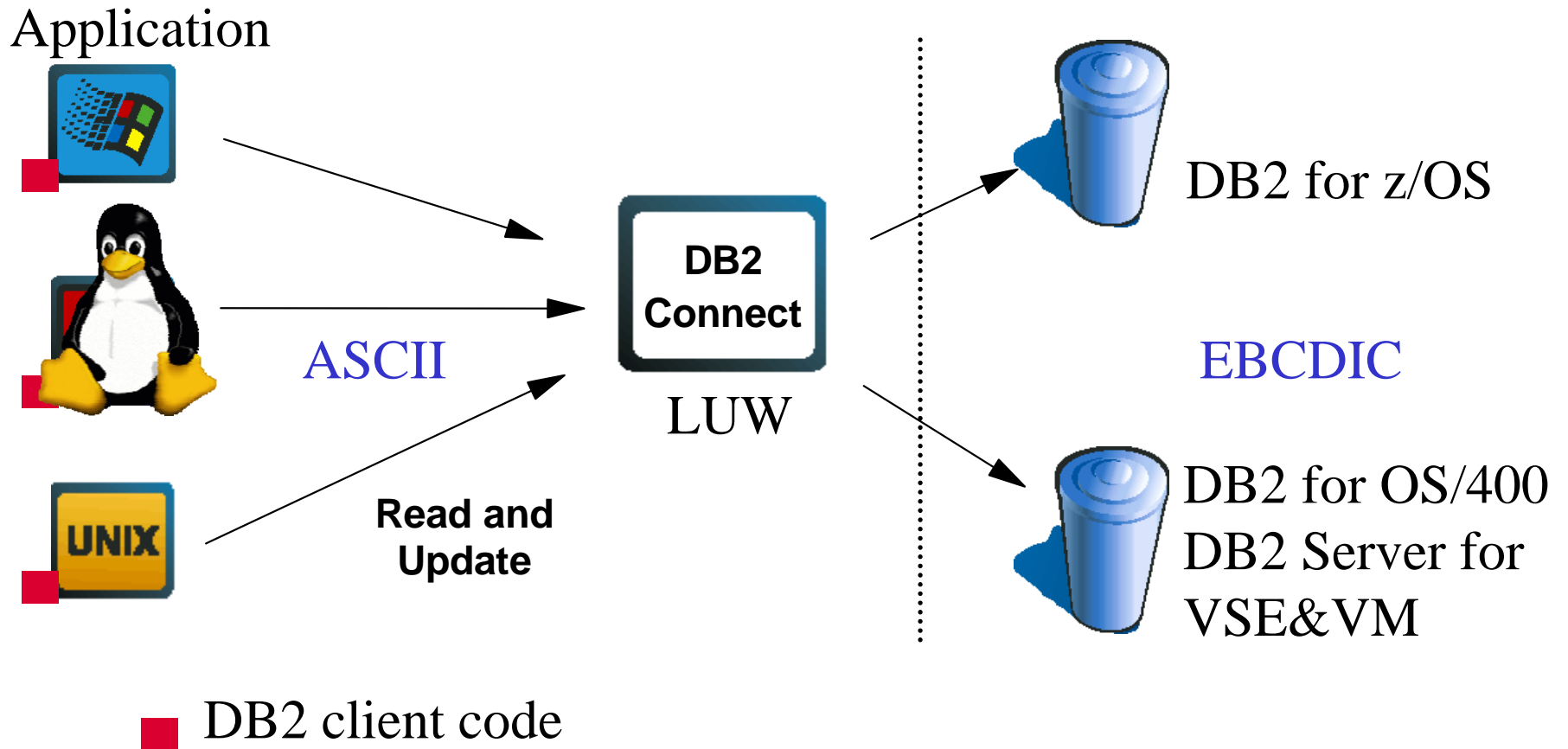
- Architecture
- Configuration
- Performance and Monitoring
- Tooling
- Cool things I didn't know...
- Case Studies

Architecture

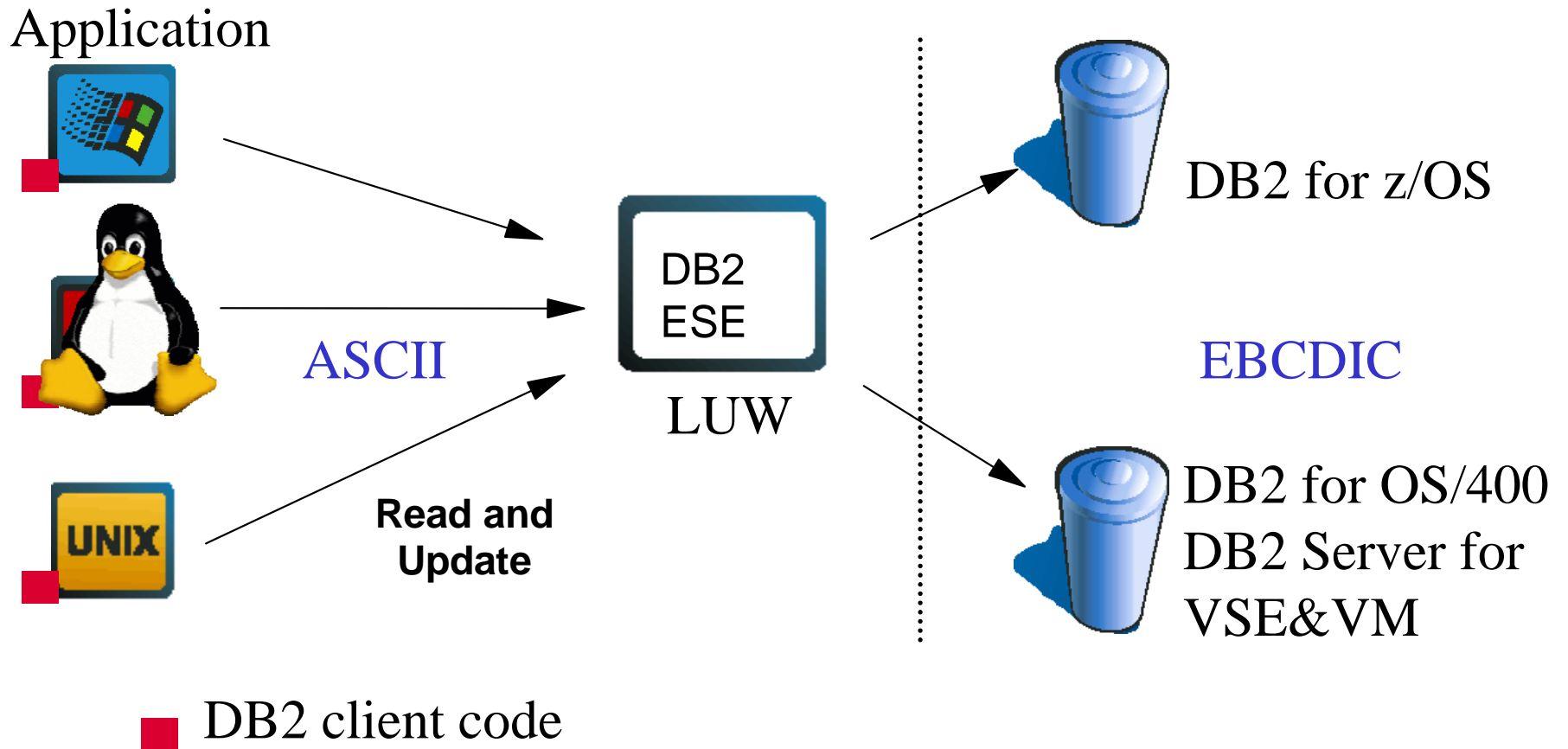
ASCII / EBCDIC gateway

- 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)

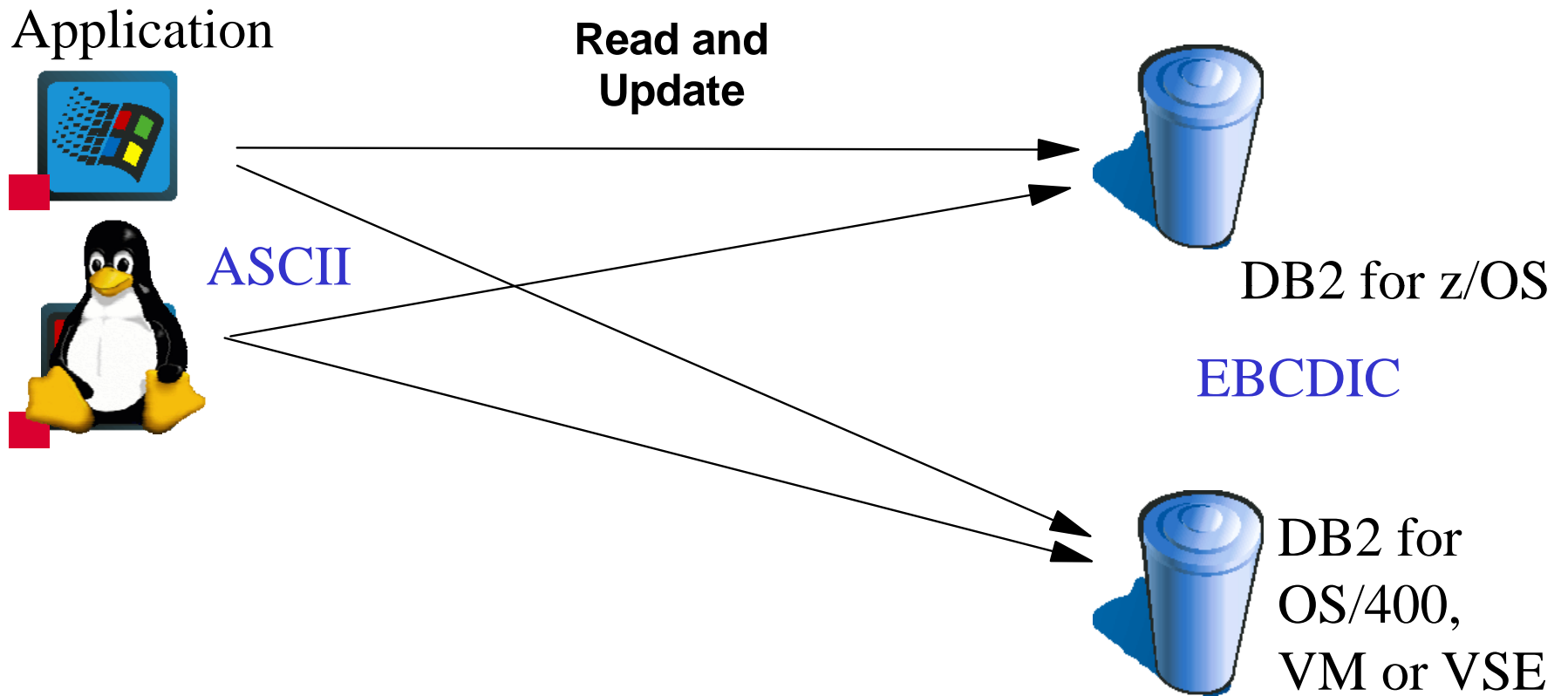
DB2 Connect Enterprise Edition



DB2 for LUW Enterprise Server Edition



DB2 Connect Personal Edition

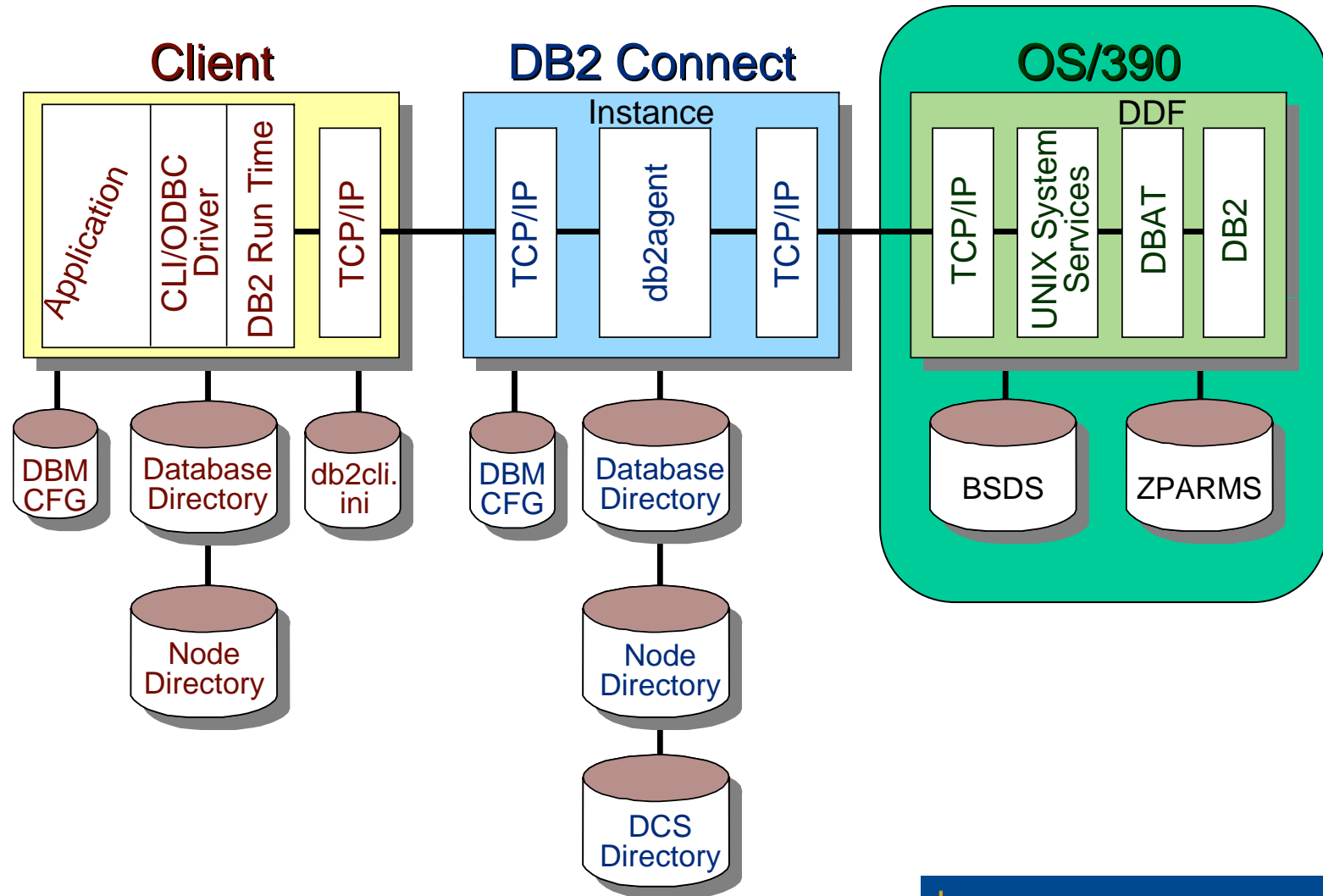


■ DB2 Connect Personal Edition

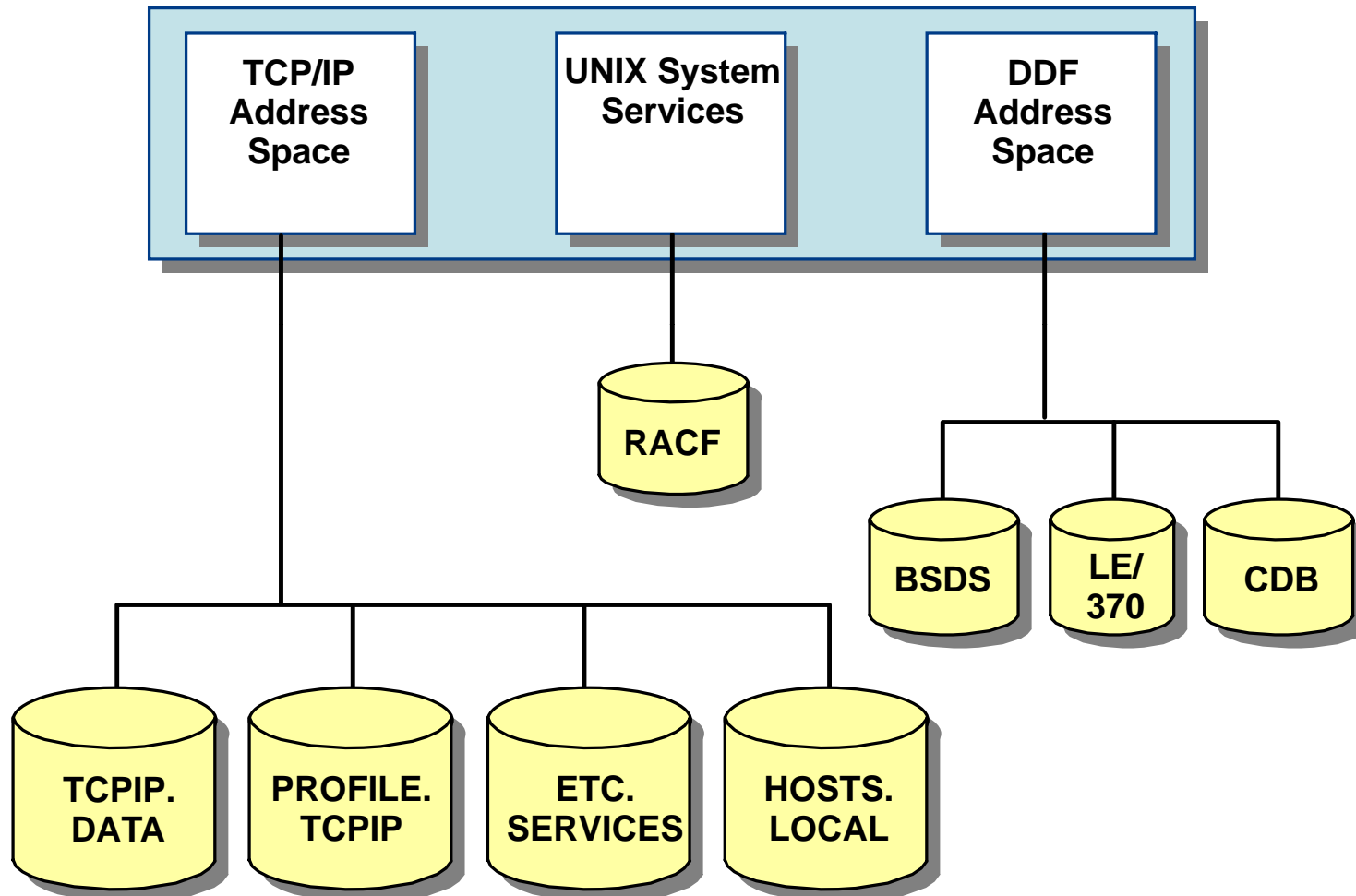
Configuration

DB2 Connect

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

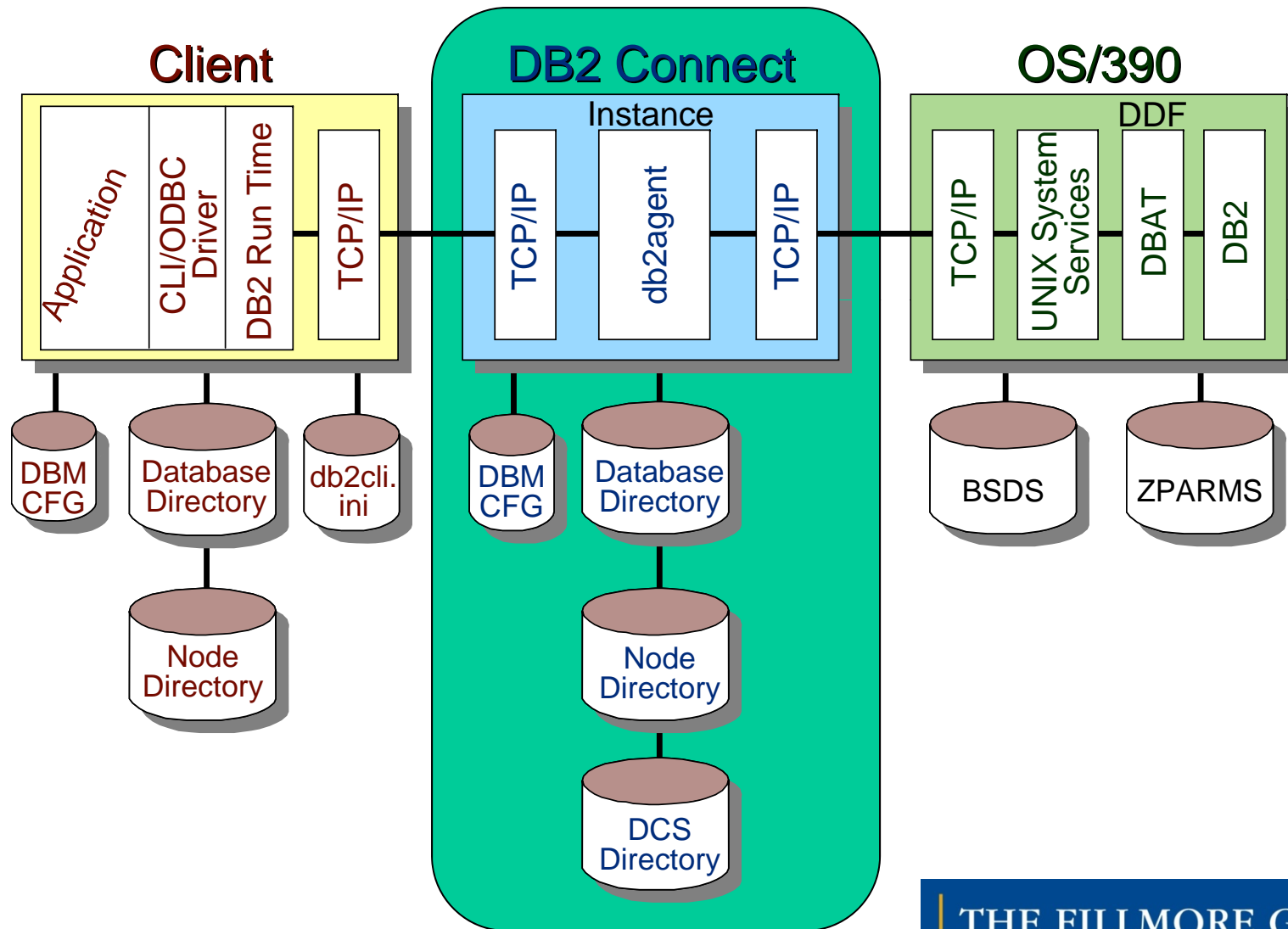
Distributed Data Facility

- 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 in seconds that active threads can remain idle
- TCP/IP Keep Alive (TCPPALV) – overrides TCP/IP

Mid-tier Platform



Mid-tier Platform

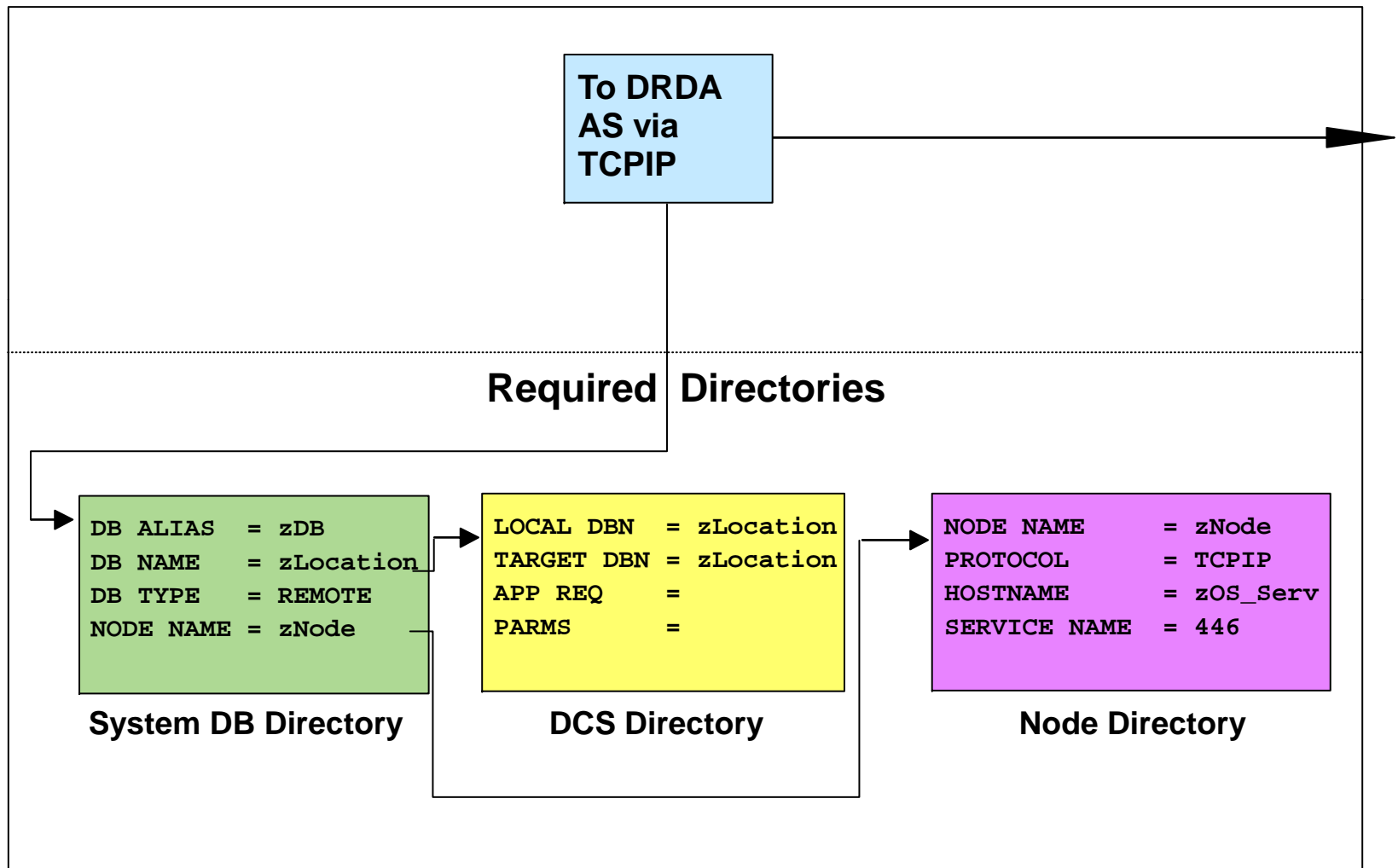
- Windows
- Unix (Solaris, AIX)
- Linux, including z/Linux



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

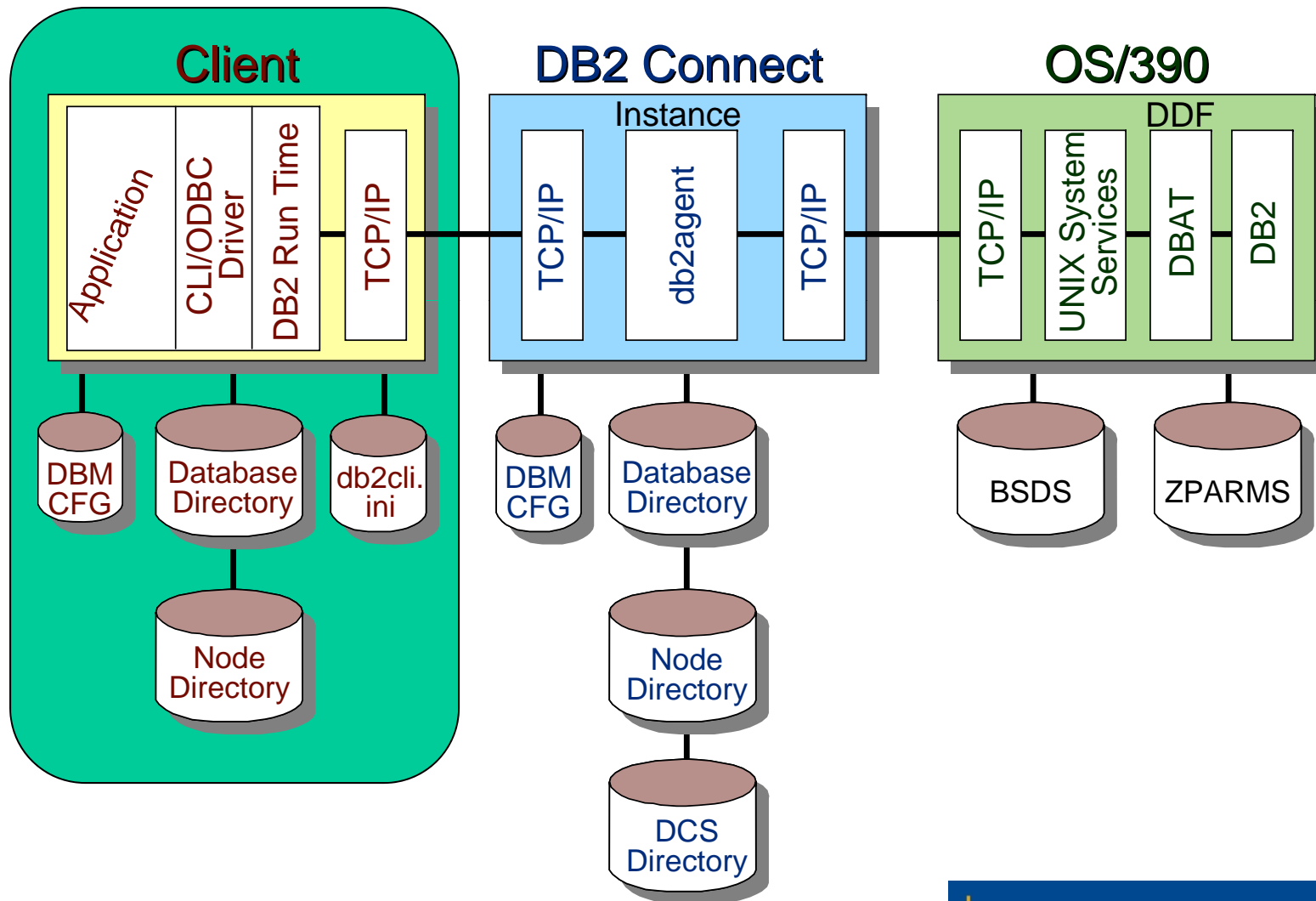
Directory Entries



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

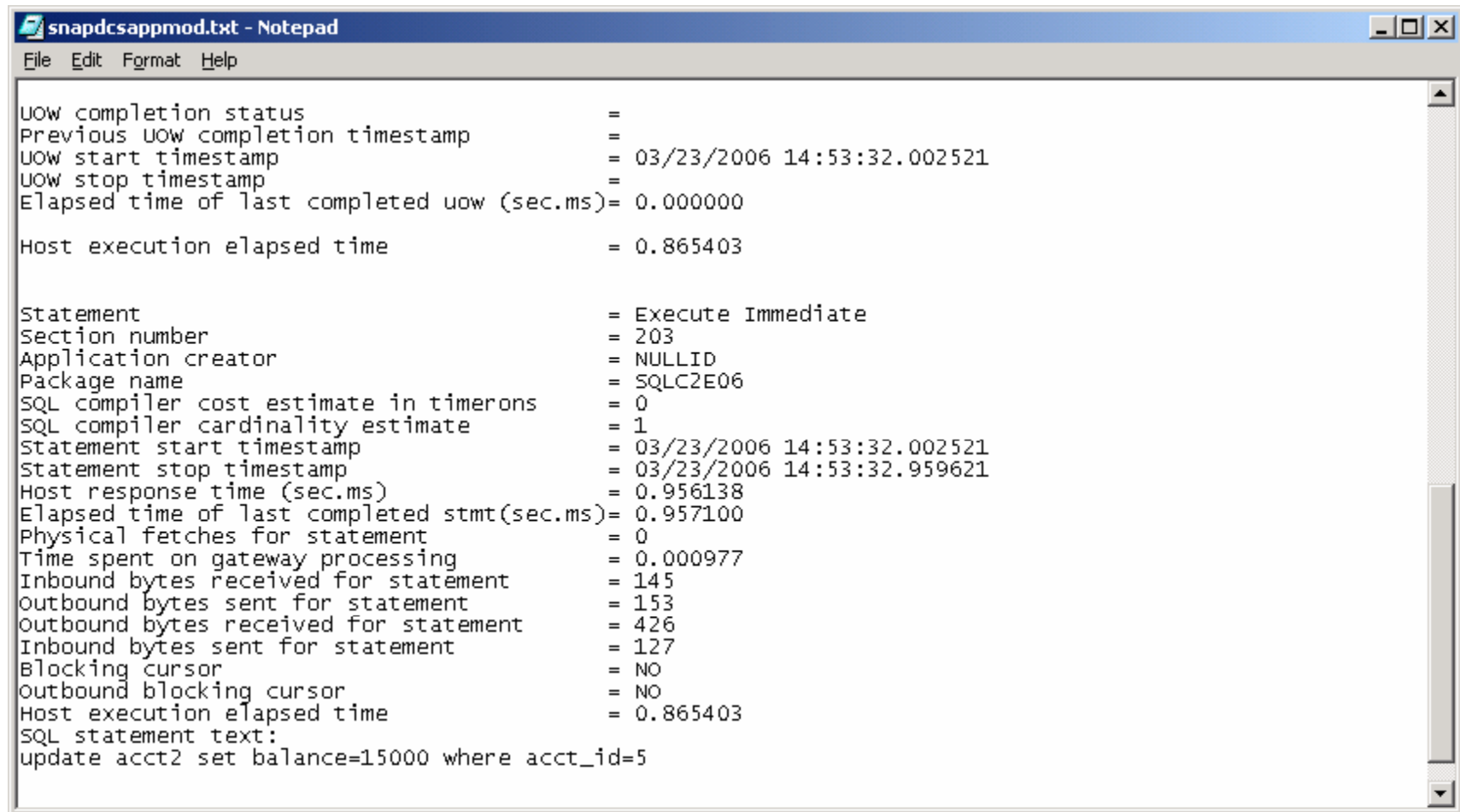
Tools for Managing Mid-tier

- 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

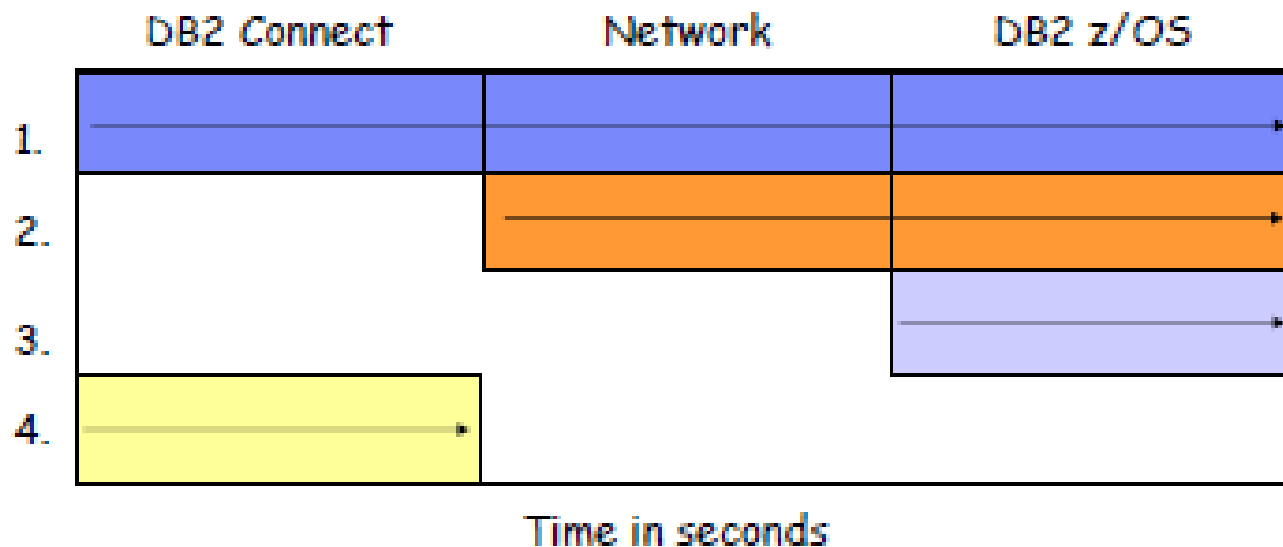


```
File Edit Format Help
snapdcsappmod.txt - Notepad
Uow completion status =
Previous Uow completion timestamp =
UOW start timestamp = 03/23/2006 14:53:32.002521
UOW stop timestamp =
Elapsed time of last completed uow (sec.ms)= 0.000000

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

1. Elapsed time of last completed stmt
2. Host response time
3. Host execution elapsed time
4. Time spent on gateway processing

Element name/identifier in manual

- Most recent statement elapsed time/stmt_elapsed_time
- Host response time/host_response_time
- Statement execution elapsed time/elapsed_exec_time
- 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>

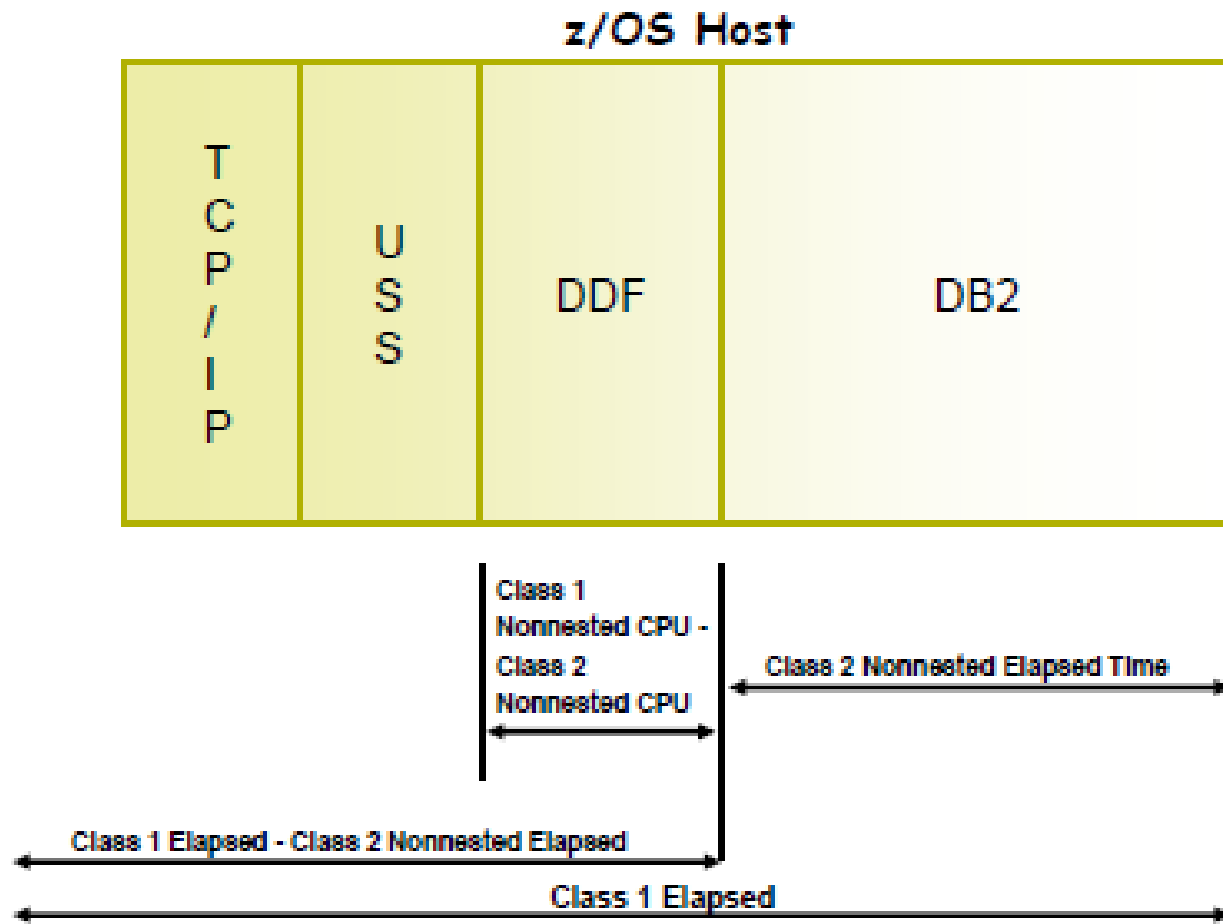
Tools for Managing Network

- 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

```
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_DOCDDPATH=C:\Program Files\IBM\SQLLIB\
[g] DB2SYSTEM=CF6000
[g] DB2PATH=C:\Program Files\IBM\SQLLIB
[g] DB2INSTDEF=DB2
[g] DB2COMM=TCPIP
[g] DB2ADMINSERVER=DB2DAS00
```

On disk/delayed values

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 ?

www.TheFillmoreGroup.com

410-465-6335