SYBASE
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NEW KERNEL ARCHITECTURE AND NEW FEATURES IN ASE 15.7

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AGENDA

- New Kernel Architecture in ASE 15.7
  - Pre-ASE 15.7 Kernel Architecture
  - ASE 15.7 Kernel Architecture
- New Features in ASE 15.7
  - SFU(SELECT FOR UPDATE)
  - Enhanced LOB support
  - Non-materialized column support for not NULL
  - Fully recoverable DDL
  - UPSERT/MERGE statement
  - Enforce dump transaction sequence
  - Shrink log devices with alter database command
  - Caching CURSOR statement as a LWP

1.똑같은 bcp-in에 대하여 속도 차이가 심하다

2.처리속도가 불규칙하다

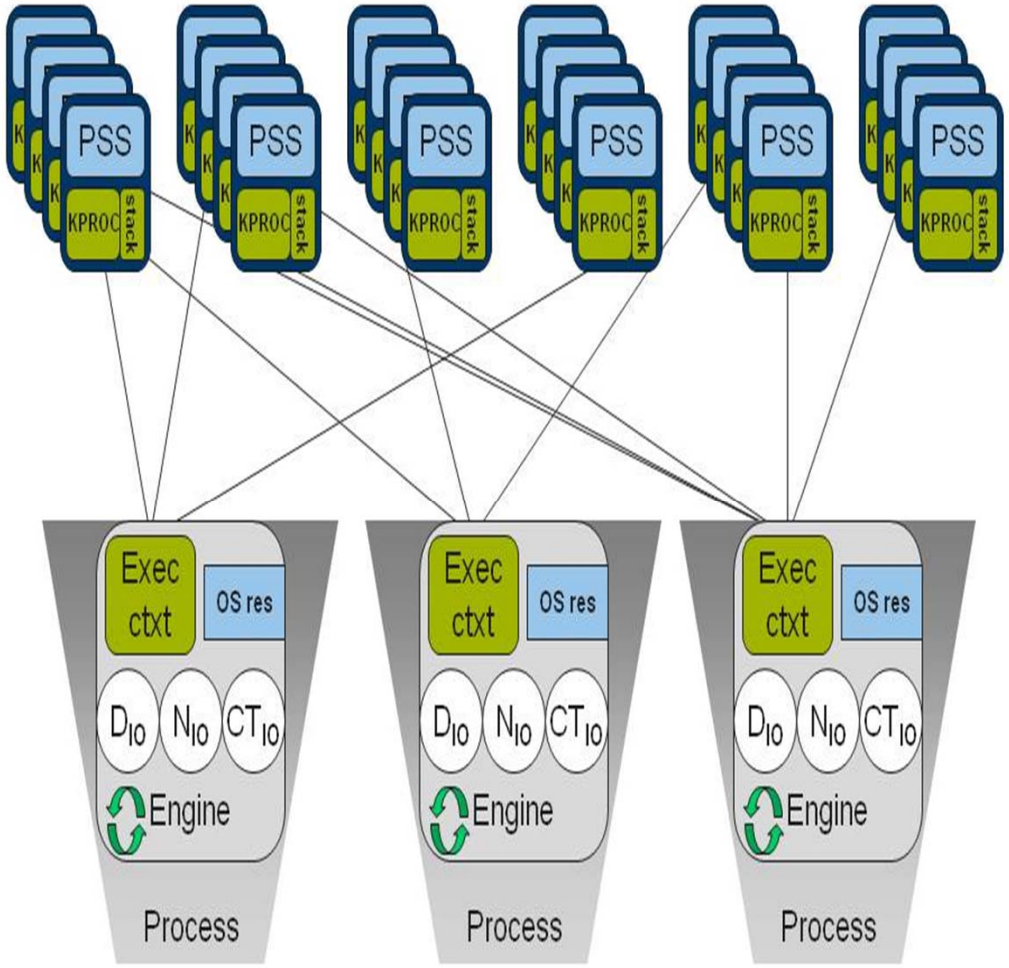
3.특정 sessions의 응답속도가 현저히 느리다

4.Big table에 대한 full scan 시 ASE에 주는 영향은?

NEW KERNEL ARCHITECTURE IN ASE 15.7

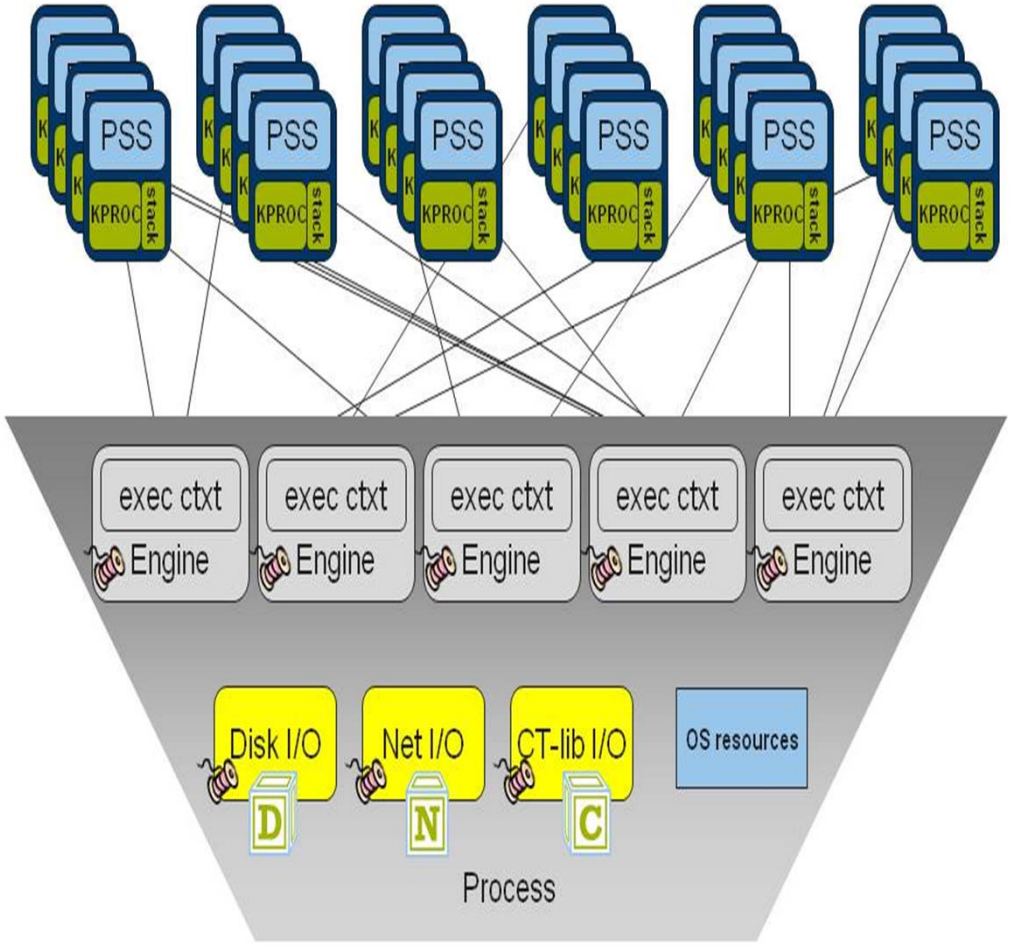
- Pre-ASE 15.7 Kernel
- ASE 15.7 Kernel

PRE-ASE 15.7 KERNEL



- Virtual Server architecture
- Multi-processes engines
- Engine Affinity
  - Query Execution Engine
  - Network Engine
- Engine?
  - scheduler
  - running system and user tasks
  - disk & network i/o
  - Ct-lib service(CIS)
  - clock service

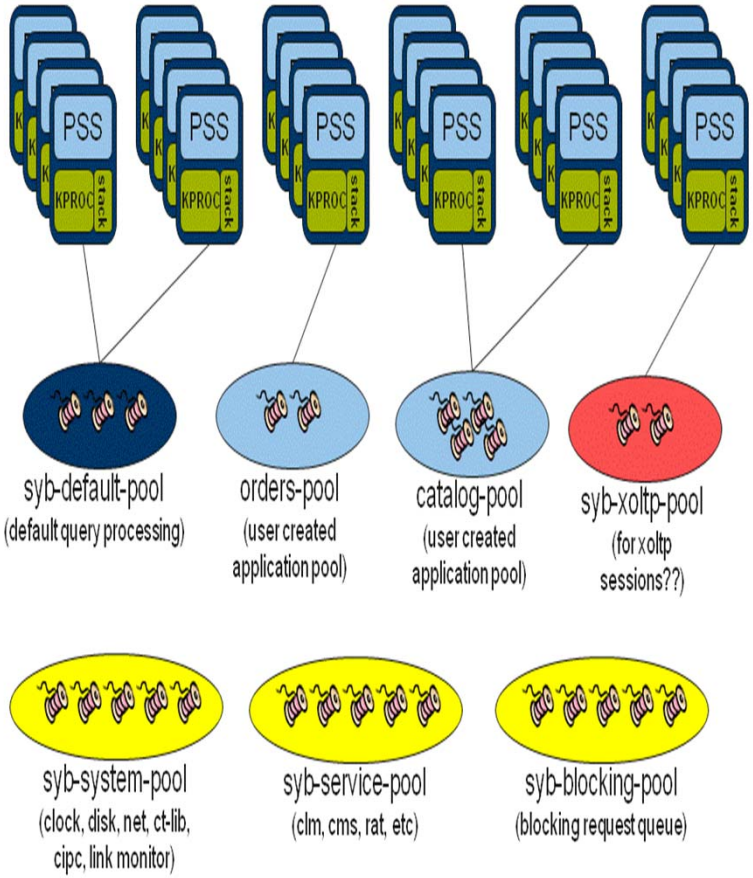
ASE 15.7 KERNEL



- ASE Kernel mode
  - **Threaded**
  - Process
- Background
  - H/W trend
    - CPU clock
    - CPU cores
    - Multi-threading
  - Parallel processing with threads
    - SMT
    - Hyper-Threading(HT),
    - VMT(Virtual Multithread)
- virtualized environment:
  - VMware, IBM PowerVM, ...
  - Dynamically resource managemen t
- Performance
  - TPC-C, Network, CT-LIB I/O
- Scalability(engine#)
  - 128 => 1024

ASE 15.7 KERNEL

Threaded kernel mode



- 1 process with native multiple threads
- Thread pool
  - Engine group
    - LPM(Logical Process Manager)
  - Thread pools
    - syb_default_thread: Default pool to run query sessions
    - syb_system_pool: I/O and system task pool
    - syb_blocking_pool: Dedicated to executing blocking calls
    - *syb_aio_pool: Async file I/O pool on Solaris
    - user-defined pool

ASE 15.7 KERNEL

Threaded kernel mode

```
1> sp_helpthread
2> go
 Name              Type                 Size IdleTimeout Description
 ----------------- -------------------- ---- ----------- -----------------------------------------
 jseo_pool         Engine (Multiplexed)    4          20 Test Thread Pool
 syb_aio_pool      Run To Completion      25           0 The async file I/O pool on Solaris
 syb_blocking_pool Run To Completion      10           0 A pool dedicated to executing blocking calls
 syb_default_pool  Engine (Multiplexed)    4         100 The default pool to run query sessions
 syb_system_pool   Run To Completion      14           0 The I/O and system task pool

(return status = 0)
1> sp_helpthread syb_default_pool
2> go
 Name             Type                 Size IdleTimeout Description
 ---------------- -------------------- ---- ----------- --------------------------------------
 syb_default_pool Engine (Multiplexed)    4         100 The default pool to run query sessions

 thread_id osthread_id state  affinity instance_id
 --------- ----------- ------ -------- -----------
         1          12 IDLE       NULL           0
         2          13 ACTIVE     NULL           0
         3          14 IDLE       NULL           0
         4          15 IDLE       NULL           0
(return status = 0)
```

ASE 15.7 KERNEL

Threaded kernel mode

- No Changes(DBA)
  - ASE Server/Kernel process
  - User connections(PSS)
  - User task scheduling(time slice, CPU grace time)

ASE 15.7 KERNEL

Threaded kernel mode- Advantages

- ❖Engine(scheduler) load 분산
  - lightweight query execution Engine/Scheduler
  - disk i/o, network i/o
  - asynchronous i/o
  - system clock
  - Ct-lib(CIS) tasks
  - ASE CE 관련된 service threads
- ❖Disk/Network I/O performance
  - Adding additional tasks dynamically
- ❖Steady query performance
- ❖Low CPU usage
  - Blocking calls instead of polling

ASE 15.7 KERNEL

Threaded kernel mode- Disadvantages

- Complicated resource management: Tuning
  - number of engines?
  - number of other tasks?
    - Disk, Network, Async. device, ct-lib
  - More memory resources usage
  - More dependency of system resources

ASE 15.7 KERNEL

Threaded kernel mode- sp_sysmon

-kernel utilization
-Task Management

Engine Utilization (Tick %)		User Busy	System Busy	I/O Busy	Idle
ThreadPool : jseo_pool					
Engine 4		0.0 %	0.0 %	0.3 %	99.7 %
Engine 5		0.0 %	0.0 %	0.3 %	99.7 %
Engine 6		0.0 %	0.0 %	0.3 %	99.7 %
Engine 7		0.0 %	0.0 %	0.3 %	99.7 %
Pool Summary	Total	0.0 %	0.0 %	1.3 %	398.7 %
	Average	0.0 %	0.0 %	0.3 %	99.7 %
ThreadPool : syb_default_pool					
Engine 0		1.3 %	0.0 %	0.3 %	98.4 %
Engine 1		0.0 %	0.0 %	0.3 %	99.7 %
Engine 2		0.0 %	0.0 %	0.3 %	99.7 %
Engine 3		0.0 %	0.0 %	0.3 %	99.7 %
Pool Summary	Total	1.3 %	0.0 %	1.3 %	397.4 %
	Average	0.3 %	0.0 %	0.3 %	99.3 %
Server Summary	Total	1.3 %	0.0 %	2.6 %	796.1 %
	Average	0.2 %	0.0 %	0.3 %	99.5 %

Average Runnable Tasks		1 min	5 min	15 min	% of total
ThreadPool : jseo_pool					
Engine 4		0.0	0.0	0.0	0.0 %
Engine 5		0.0	0.0	0.0	99.4 %
Engine 6		0.0	0.0	0.0	0.6 %
Engine 7		0.0	0.0	0.0	0.0 %
Pool Summary	Total	0.0	0.0	0.0	
	Average	0.0	0.0	0.0	

ThreadPool : syb_default_pool					
Global Queue		0.0	0.0	0.0	0.0 %
Engine 0		0.0	0.0	0.0	27.3 %
Engine 1		0.0	0.0	0.0	0.0 %
Engine 2		0.0	0.0	0.0	1.5 %
Engine 3		0.0	0.0	0.0	71.2 %
Pool Summary	Total	0.0	0.0	0.0	
	Average	0.0	0.0	0.0	
Server Summary	Total	0.1	0.1	0.0	
	Average	0.0	0.0	0.0	

CPU Yields by Engine	per sec	per xact	count	% of total
ThreadPool : jseo_pool				
Engine 4				
Full Sleeps	21.3	58.2	640	23.9 %
Interrupted Sleeps	0.0	0.0	0	0.0 %
Engine 5				
Full Sleeps	21.9	59.6	656	24.5 %
Interrupted Sleeps	0.0	0.0	0	0.0 %
Engine 6				
Full Sleeps	22.0	59.9	659	24.6 %
Interrupted Sleeps	0.0	0.0	0	0.0 %
Engine 7				
Full Sleeps	23.6	64.3	707	26.4 %
Interrupted Sleeps	0.4	1.1	12	0.4 %
Pool Summary	89.1	243.1	2674	

ASE 15.7 KERNEL

Threaded kernel mode- sp_sysmon

```
ThreadPool : syb_default_pool
  Engine 0
     Full Sleeps                  22.4          61.2           673        25.0 %
     Interrupted Sleeps            0.5           1.3            14         0.5 %
  Engine 1
     Full Sleeps                  22.3          60.9           670        24.9 %
     Interrupted Sleeps            0.1           0.3             3         0.1 %
  Engine 2
     Full Sleeps                  22.5          61.4           675        25.1 %
     Interrupted Sleeps            0.0           0.0             0         0.0 %
  Engine 3
     Full Sleeps                  21.7          59.2           651        24.2 %
     Interrupted Sleeps            0.2           0.5             6         0.2 %
  -------------------------  ------------  ------------  ----------
  Pool Summary                    89.7         244.7          2692

  -------------------------  ------------  ------------  ----------
  Total CPU Yields               178.9         487.8          5366


  Thread Utilization (OS %)    User Busy   System Busy        Idle
  -------------------------  ------------  ------------  ----------
  ThreadPool : jseo_pool
   Thread 15   (Engine 4)          0.1 %         0.1 %      99.9 %
   Thread 16   (Engine 5)          0.1 %         0.1 %      99.9 %
   Thread 17   (Engine 6)          0.0 %         0.1 %      99.9 %
   Thread 18   (Engine 7)          0.1 %         0.1 %      99.9 %
  -------------------------  ------------  ------------  ----------
  Pool Summary      Total          0.2 %         0.3 %     399.5 %
                  Average          0.1 %         0.1 %      99.9 %
  ThreadPool : syb_aio_pool
   Thread 33   (AIO Worker)        0.0 %         0.0 %     100.0 %
   ...
   Thread 105  (AIO Worker)        0.0 %         0.0 %     100.0 %
  -------------------------  ------------  ------------  ----------
  Pool Summary      Total          0.0 %         0.2 %    9699.8 %
                  Average          0.0 %         0.0 %     100.0 %
```

```
ThreadPool : syb_blocking_pool
 Thread 5    (Work Queue Task)     0.0 %         0.0 %     100.0 %
 ...
 Thread 14   (Work Queue Task)     0.0 %         0.0 %     100.0 %
-------------------------  ------------  ------------  ----------
Pool Summary      Total           0.0 %         0.0 %    1000.0 %
                Average           0.0 %         0.0 %     100.0 %

ThreadPool : syb_default_pool
 Thread 1    (Engine 0)           0.8 %         0.1 %      99.1 %
 Thread 2    (Engine 1)           0.1 %         0.1 %      99.9 %
 Thread 3    (Engine 2)           0.1 %         0.1 %      99.9 %
 Thread 4    (Engine 3)           0.1 %         0.1 %      99.9 %
-------------------------  ------------  ------------  ----------
Pool Summary      Total           1.0 %         0.3 %     398.8 %
                Average           0.2 %         0.1 %      99.7 %

ThreadPool : syb_system_pool
 Thread 19   (Signal Handler)      0.1 %         0.0 %      99.9 %
 Thread 20   (CtlibController)     0.0 %         0.0 %     100.0 %
 ...
 Thread 27   (NetController)       0.0 %         0.0 %      99.9 %
 ...
 Thread 32   (DiskController)      0.0 %         0.0 %     100.0 %
-------------------------  ------------  ------------  ----------
Pool Summary      Total           0.2 %         0.2 %    1399.6 %
                Average           0.0 %         0.0 %     100.0 %

-------------------------  ------------  ------------  ----------
Server Summary    Total           1.4 %         0.9 %   12897.7 %
                Average           0.0 %         0.0 %     100.0 %

Adaptive Server threads are consuming 0.0 CPU units.
Throughput is 15.8 commited xacts per CPU unit.
```

ASE 15.7 KERNEL

Threaded kernel mode- sp_sysmon

Context Switches at OS	per sec	per xact	count	% of total
Voluntary	258.9	706.0	7766	98.0 %
Non-Voluntary	5.4	14.6	161	2.0 %
Total Context Switches	264.2	720.6	7927	100.0 %

CtlibController Activity	per sec	per xact	count	% of total
Polls	3.0	8.3	91	n/a
Polls Returning Events	0.0	0.0	0	0.0 %

DiskController Activity	per sec	per xact	count	% of total
Polls	1101.2	3003.3	33036	n/a
Polls Returning Events	11.2	30.5	335	1.0 %
Polls Returning Max Events	0.0	0.0	0	0.0 %
Total Events	11.2	30.5	335	n/a
Events Per Poll	n/a	n/a	0.010	n/a

NetController Activity	per sec	per xact	count	% of total
Polls	5.2	14.1	155	n/a
Polls Returning Events	0.0	0.0	0	0.0 %

Blocking Call Activity	per sec	per xact	count	% of total
Total Requests	0.0	0.0	0	n/a

ASE 15.7 KERNEL

Threaded kernel mode- configuration parameters

kernel mode
kernel resource memory
max online engines: total threads to run query sessions
number of ctlib tasks
number of disk tasks
number of network tasks

*number of engines at startup
* runnable process search count

Application Functionality Group: SAP porting

- enable functionality group
- enable inline default sharing
- enable permissive unicode
- quoted identifier enhancements
- select for update
- streamlined dynamic SQL

NEW FEATURES IN ASE 15.7

- SFU(SELECT FOR UPDATE)
- Enhanced LOB support
- Non-materialized column support for not NULL
- Fully recoverable DDL
- MERGE statement
- Enforce dump transaction sequence
- Shrink log devices with alter database command
- Caching CURSOR statement as a LWP

NEW FEATURES IN ASE 15.7

SFU(SELECT FOR UPDATE)

- ❖SELECT 문의 result set에 대하여 Exclusive lock
- ❖Transaction 내에서만 동작함
- ❖SFU를 사용하지 않는 sessions은 SFU result set에 대하여 READ 가능함

```
create table jseo(a int, b varchar(100) null)
go
insert jseo values(1, 'test1')
insert jseo values(2, 'test2')
insert jseo values(3, 'test3')
go
```

NEW FEATURES IN ASE 15.7

SFU(SELECT FOR UPDATE)

*session#1

```
1> begin tran
2> go
1> select * from jseo where a=1 for update
2> go
 a           b
 ----------- ----------------------------------------------------------------------------------------------------
           1 test1


(1 row affected)
1> sp_lock
2> go
```

The class column will display the cursor name for locks associated with a cursor for the current user and the cursor id for other users.

```
 fid    spid  loid      locktype             table_id    page      row   dbname       class       context
 ------ ----- ----------- ---------------------------- ----------- ----------- ------ --------------- ---------------
     0    17        34 Sh_intent            1163148158           0     0 master       Non Cursor Lock
     0    17        34 Ex_intent             576002052           0     0 mydb         Non Cursor Lock
     0    17        34 Ex_row                576002052         841     0 mydb         Non Cursor Lock
(3 rows affected)
(return status = 0)
1>
```

*session#2

```
<case#1>
1> select * from jseo where a=1
2> go
 a           b
 ----------- ----------------------------
           1 test1
(1 row affected)

<case#2>
1> begin tran
2> go
1> select * from jseo where a=1
2> go
 a           b
 ----------- ----------------------------
           1 test1
(1 row affected)

<case#3>
1> begin tran
2> go
1> select * from jseo where a=1 for update
2> go
```

<========== blocking

NEW FEATURES IN ASE 15.7

Enhanced LOB support

- In-row/off-row data
  - Database, table level

```
create table textimage(a text in row (1000), b image in row(2000) , c text off row)
go
```

- Compression
  - Set enable compression to 1
  - Level: 0 ~ 9, data compression: page, row

```
create table xb(a int, b varchar(100), c text in row (100))
with compression=page, lob_compression= 9
go
insert xb values(1,  'Compression support', 'text data')
go
```

- LOB Locator
  - text_locator, image_locator, unitext_locator
  - As input parameter of stored procedure
- As input parameter of stored procedure
  - Declare LOB data type: text, image, unitext
- Isnull(), Substring(), datalength()

NEW FEATURES IN ASE 15.7

Non-materialized column support for not NULL

- ❖Alter table을 수행할 때 Not NULL column에 대한 non-materialization
- ❖즉, Table schema만 변경하고 실제 데이터 변경이 발생하지 않음
  - ▪Default 값을 추가된 column에 넣지 않음
  - ▪해당 칼럼을 SELECT 할 때 default value를 return함

```
1> alter table jseo add c decimal(12,5) default -1
2> go
(3 rows affected)

1> alter table jseo drop c
2> go
(3 rows affected)
1> alter table jseo add c decimal(12,5) default -1 not null not materialized
2> go
```

```
1> select * from jseo
2> go
 a           b          c
 ----------- ---------- ---------------
           1 test1          -1.00000
           2 test2          -1.00000
           3 test3          -1.00000

(3 rows affected)
```

NEW FEATURES IN ASE 15.7

Fully recoverable DDL

- ❖다음의 commands에 대하여 Minimal logging을 수행하지 않음
  - ▪SELECT INTO
  - ▪ALTER TABLE
  - ▪REORG REBUILD
  - ▪PARALLEL CREATE INDEX
- ❖Dump tran 가능
- ❖Database option으로 제공함

```
1> sp_dboption
2> go
Settable database options.
 database_options
 ----------------------------
 abort tran on log full
…
unique auto_identity index
(19 rows affected)
 full logging for options
 -----------------------------
 select into
 pll create index
 alter table
 reorg rebuild
```

```
1> sp_dboption mydb, 'full logging for select into', true
2> go
Database option 'full logging for select into' turned ON for database 'mydb'.
Running CHECKPOINT on database 'mydb' for option 'full logging for select into' to take effect.
(return status = 0)
1> sp_dboption mydb, 'full logging for alter table', true
2> go
Database option 'full logging for alter table' turned ON for database 'mydb'.
Running CHECKPOINT on database 'mydb' for option 'full logging for alter table' to take effect.
(return status = 0)
1> sp_helpdb mydb
2> go
 name db_size      owner dbid created      durability status
 ---- ------------ ----- ---- ------------ ---------- ----------------------------------------
 mydb      15.0 MB sa      4 Apr 08, 2011 full       full logging for select into/alter table
(1 row affected)
 device_fragments           size        usage           created             free kbytes
 -------------------------- ------------ ------------------ ------------------------ ----------------
 mydb_dev                    10.0 MB data only         Apr  8 2011  6:46PM              6824
 mydb_log2                    5.0 MB log only          Apr  8 2011  6:48PM      not applicable
 ------------------------------------------------------------------------------
 log only free kbytes = 5064, log only unavailable kbytes = 5120
 (return status = 0)
```

NEW FEATURES IN ASE 15.7

UPSERT/MERGE statement

- Transferring rows from source to target table

```
create table A(a int, b varchar(100) null)
go
create table B(a int, b varchar(100) null)
go

insert A values(1, 'test1')
insert A values(2, 'test1')
insert A values(3, 'test1')

insert B values(1, 'test2')
go
```

```
1> MERGE INTO B USING A ON A.a=B.a
2> WHEN NOT MATCHED THEN insert (a, b) values(A.a, A.b)
3> WHEN MATCHED THEN update set B.b=A.b
4> go
(3 rows affected)
1> select * from B
2> go
 a           b
 ----------- ----------------------------------------------
           1 test1
           2 test1
           3 test1

(3 rows affected)
1>
```

NEW FEATURES IN ASE 15.7

Enforce dump transaction sequence

- Before setting it, run dump database.
- Set db option

```
1> sp_dboption mydb,'enforce dump tran sequence',true
2> go
Msg 17957, Level 16, State 1:
Server 'jseo_ase157', Procedure 'sp_dboption', Line 842:
You cannot set the 'enforce dump tran sequence' database option because the database 'mydb' is either marked as needing a database dump, an unlogged
operation was performed or the transaction log was truncated. Dump the database, then retry setting the option.
(return status = 1)
```

```
dump database mydb to '/tmp/mydb.dump'
go

1> sp_dboption mydb,'enforce dump tran sequence',true
2> go
Database option 'enforce dump tran sequence' turned ON for database 'mydb'.
Running CHECKPOINT on database 'mydb' for option 'enforce dump tran sequence' to take effect.
(return status = 0)
```

```
1> dump tran mydb with truncate_only
2> go
Msg 4243, Level 16, State 1:
Server 'jseo_ase157', Line 1:
DUMP TRANSACTION WITH NO_LOG or DUMP TRANSACTION WITH TRUNCATE_ONLY is not allowed in database 'mydb' while the 'enforce dump tran sequence' database
option is enabled. Disable the option with sp_dboption to truncate the log.
1>
```

NEW FEATURES IN ASE 15.7

Shrink log devices with alter database command

```
create database mydb on mydb_dev=10 log on mydb_log1=5
alter database mydb log on mydb_log2=5
go
select * from sysusages where dbid=4
dbid  segmap  lstart  size  vstart  location unreservedpgs  crdate  vdevno
------ ----------- ----------- --------- --------- -------- ------------- ------------------------- -----------
    4       3       0    2560       0       0       1714    Apr  8 2011  6:46PM     4
    4       4    2560    1280       0       0       1275    Apr  8 2011  6:46PM     5
    4       4    3840    1280       0       0       1275    Apr  8 2011  6:48PM     6
1> alter database mydb log off mydb_log2
2> go
Removing 1280 pages (5.0 MB) from disk 'mydb_log2' in database 'mydb'.
1> sp_helpdb mydb
2> go
 name db_size      owner dbid created     durability status
 ---- ------------- ----- ---- ------------ ---------- --------------
 mydb      15.0 MB sa      4 Apr 08, 2011 full       no options set
device_fragments       size        usage          created              free kbytes
 ------------------------ ------------- ---------------- ------------------------
mydb_dev             10.0 MB data only      Apr  8 2011  6:46PM             6856
mydb_log1             5.0 MB log only       Apr  8 2011  6:46PM    not applicable
 ------------------------------------------------------------------------------
log only free kbytes = 5068
```

```
1> alter database mydb log off mydb_log1
2> go
Msg 5053, Level 16, State 1:
Server 'jseo_ase157', Line 1:
You cannot shrink the log in database 'mydb' because there is at least one page to be removed (2568) that is part of the log. Dump the transaction log
and retry the ALTER DATABASE command.

1> dump tran mydb with truncate_only
2> go

1> alter database mydb log off mydb_log1
2> go
Removing 1280 pages (5.0 MB) from disk 'mydb_log1' in database 'mydb'.
1> select * from sysusages where dbid=4
2> go
 dbid  segmap     lstart     size       vstart     location unreservedpgs crdate          vdevno
 ------ ----------- ----------- ----------- ----------- -------- ------------- ------------------------------ -----------
    4       3       0    2560       0       0       1714          Apr  8 2011  6:46PM         4
    4       0    2560    1280    2560       4       1275          Apr  8 2011  6:46PM        -4
    4       4    3840    1280       0       0       1275          Apr  8 2011  6:48PM         6
```

NEW FEATURES IN ASE 15.7

Caching CURSOR statement as a LWP

- ❖Caching in Statement cache as a LWP
- ❖Performance improvement
- ❖Monitoring at monCachedStatement

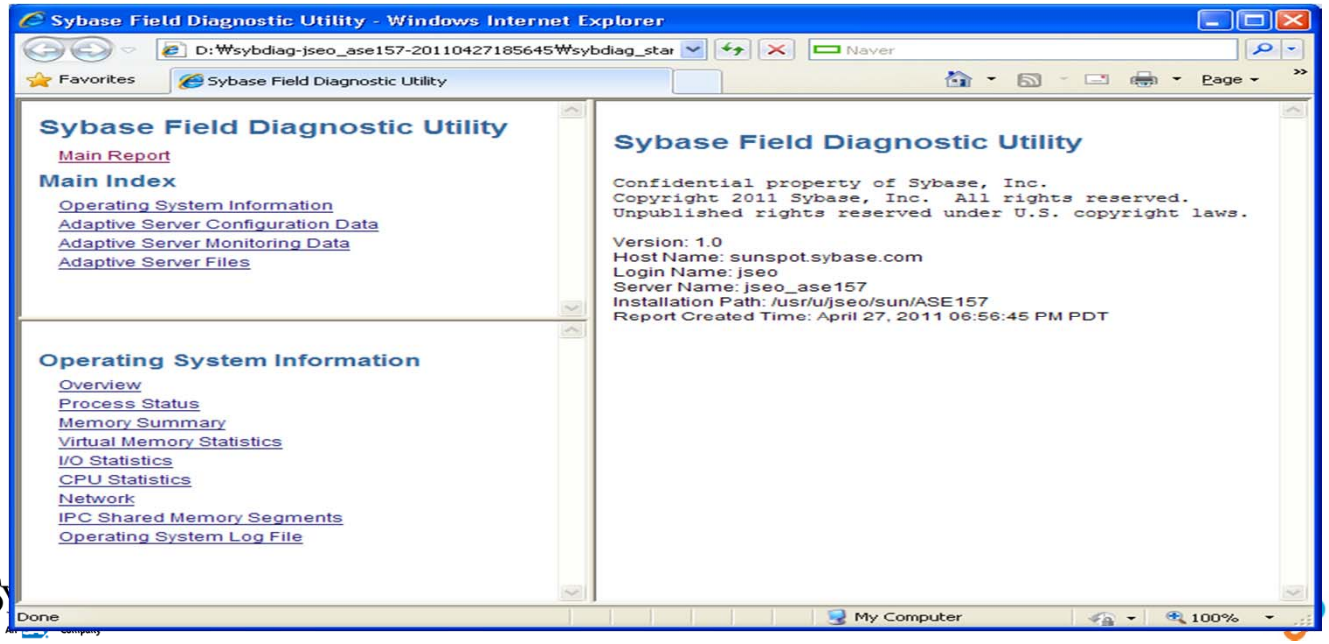
```
1> declare cur_A cursor for select * from A for read only
2> go
1> sp_cursorinfo
2> go
Cursor name 'cur_A' is declared on procedure '*sq1531522171_0269623816ss*'.
The cursor is declared as NON-SCROLLABLE cursor.
The cursor id is 1114121.
The cursor has been successfully opened 0 times.
The cursor will remain open when a transaction is committed or rolled back.
The number of rows returned for each FETCH is 1.
The cursor is read only.
This cursor is declared on a stored procedure. It is presently using '1000' bytes. However,
the memory usage will increase when the cursor is opened
because the query plan will be associated with the cursor at that time.


(return status = 0)
1>
```

NEW FEATURES IN ASE 15.7

Etc.

- ❖Online reorg rebuild
- ❖Transfer database object ownership: alter … modify owner
- ❖Str() extention: select STR(123, 10, '*')
- ❖Enable/Disable truncating trailing zeros for varbinary type
- ❖sybdiag : Sybase Field Diagnostic Utility
  - ▪asecore - Adaptive Server configuration data
  - ▪osdata - Operating System data
  - ▪keyfile - Adaptive Server files
  - ▪aseadd - Adaptive Server monitoring data.

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