

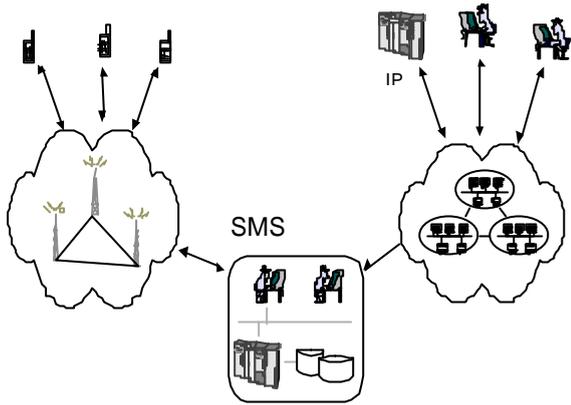
XMAS - M: 가 DBMS

(XMAS - M: An Embedded Main Memory DBMS for Value-added Mobile Telecom Services)

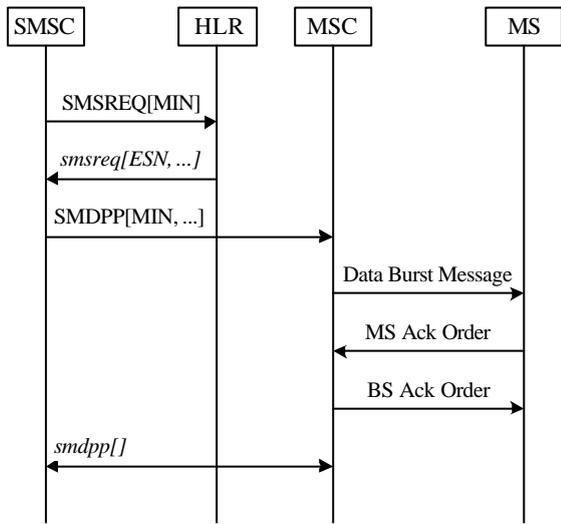
{next, juch, giraffe, chask}@ kdb.snu.ac.kr

가 DBMS XMAS-M SMS(Short Message Service) SMS SMS DBMS 가

1. ms [Ron99]. 가 [Tim98, LK+99, CK+99]. 가 SMS(Short Message Service), 가 , SMS [RK+98]. 가 [SKT00]. 가 , SMS (push) ms



(1) SMS



(2) SMS

XMAS-M
, SMS

167MHz CPU 가

SUN Enterprise 3000
300~700

SMS

200~400
, XMAS-M
가

2. SMS

가 SMS
가
. SMS
1
SMS

2 SMS

SMSC(SMS Center) HLR (Home Location Register)
가 MSC(Mobile Switching Center)
가 MSC

(MS: Mobile Station)

SMS 가 가

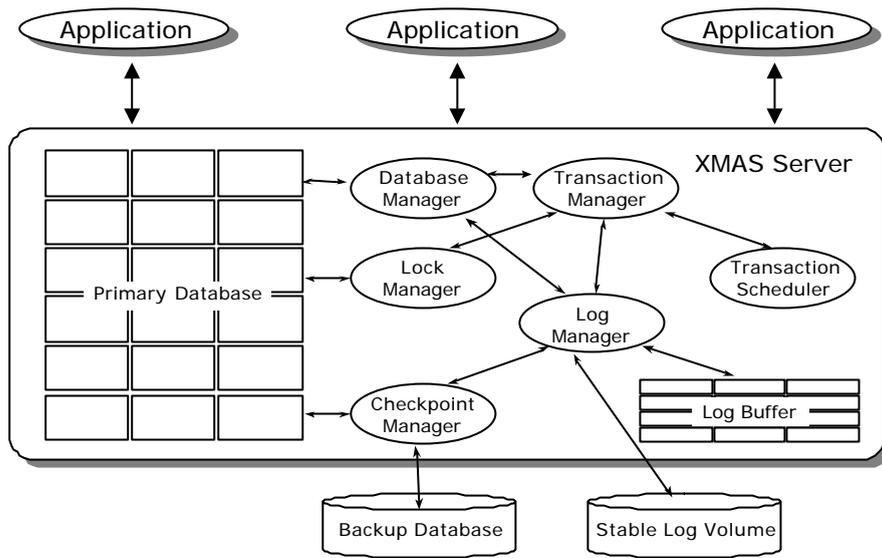
SMS

가

XMAS-M (embedded) DBMS
SMS
. XMAS-M
DBMS XMAS (eXtensible MAin-memory Storage system)[CPP97, PC+98, PK+99]
가

가
. XMAS-M
(logging)

DBMS



(3) XMAS

SMS 가 가 . 가 , SMS 가 . , SMS

DBMS .

30 가

SMS

가 9 .

가 .

DBMS

가 .

가 .

DBMS .

가

가

가 .

가

가

SMS

3. XMAS-M

10

DBMS

10

가

DBMS

[Tim98].

SMS

PC+98, PK+99]

DBMS

XMAS [CPP97,

가

RDBMS

가

60~70

SMS

XMAS-M

200~400

3.1 XMAS

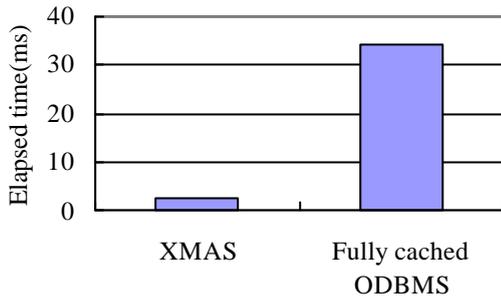
24,000

3

DBMS

XMAS

SMS



(4) XMAS

(10)

.5

C++

200

DBMS

(manager)

가

, Hash, T-tree[LC86], R-

tree[Gut84]

OpenGIS

, R-tree

k-nearest

[RKV95]

가

가

[CK+99].

XMAS

가

[Hag86],

(commit)[GS92]

XMAS

가

, 2

PL(phase locking)

, XMAS composite action

4 XMAS

ODBMS

30 , 가

ODBMS 10

ODBMS

I/O

3.2 XMAS-M

DBMS

10

XMAS 가

XMAS

I/O

가

, XMAS-M

DBMS

3.2.1

DBMS

가

(committed)

[BHG87].

I/O

10ms

I/O

4~10ms

(rotational latency)

I/O

I/O

I/O

, SMS

100~250

I/O

. XMAS-M

(differential)

가

가

가

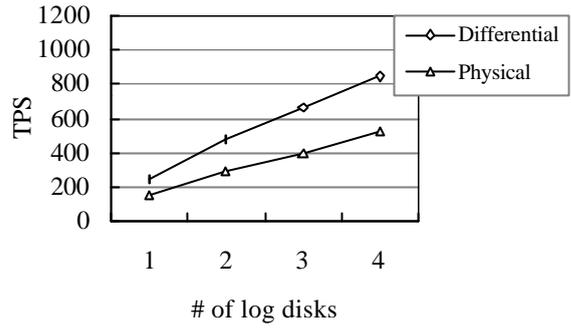
I/O

SMS

4.3
XMAS-M

[LKC00].

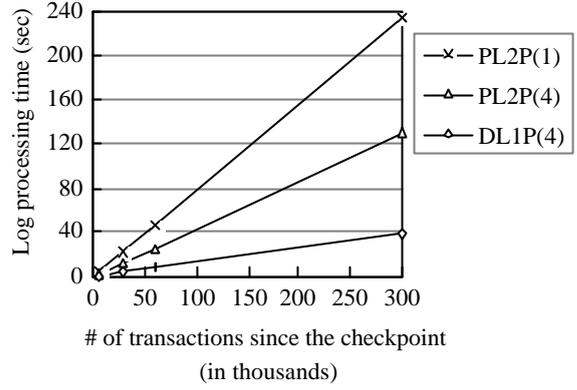
[MH+92].



[PK+99].

100~250

(5)



(6)

[LKC00].

5

, 30

, 300

40

가 TPS(Transactions Per Second)

3.2.2

2

10

128

288

[BHG87].

160

DBMS

I/O 가

sleep

가 signal

가

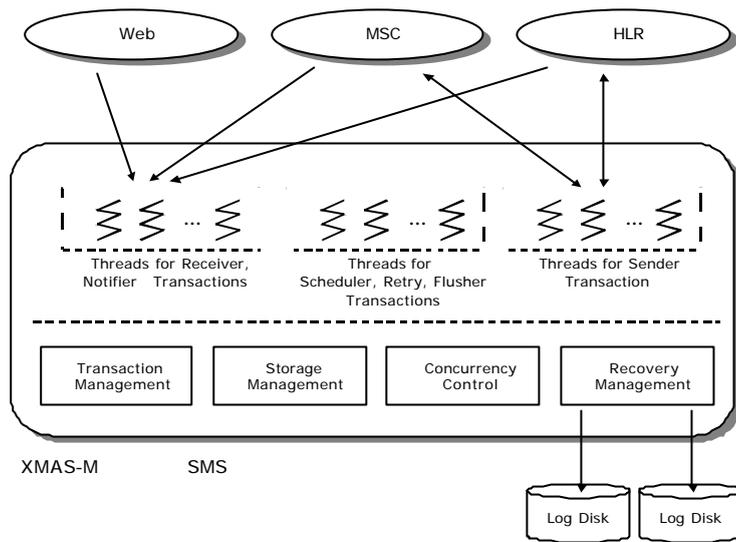
6

DBMS

[GS92]. XMAS-M

가

SMS



(7) XMAS-M SMS

가 4. SMS 가

XMAS-M 가 , XMAS-M (pseudo) . XMAS-M

(serialize)

7 XMAS-M SMS , com-
posite action [CPP97]. 4.2 composite action XMAS-M

4.1

SMS Message, ToDeliver, Scheduled, Sent, ToRetry, MSSState

가

- Message: ID, MIN, MIN, ID

XMAS-M

XMAS 가

가 CPU 가
HLR 1, MSC
Sender 5, 30 가
MSC 가

4.3 가 2%

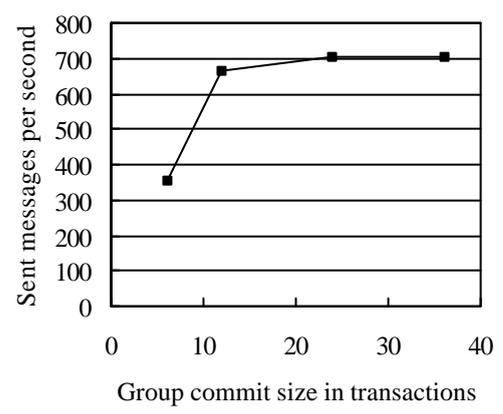
6가 Message Sent 가
Scheduled ToDeliver Message Sent
, ToRetry, MSSState 가
가
가
, MSSState

3.2.2
Message
Receiver
Sender
Flusher

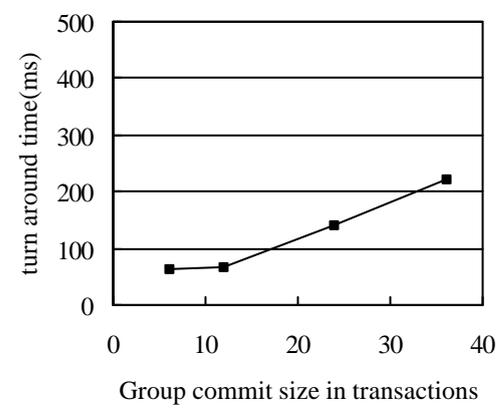
Flusher

4.4 가
SMS
SUN Enterprise 3000
2 167 Mhz CPU 640 MB RAM
가
average seek time 10.5 msec,
average latency 가 5.5 msec, transfer rate 가
5.5 MB/sec XMAS-M

, 3
SMS
700



(8)



(9) turn around

around , turn
I/O 가
8 9
가 가 700
, turn around 80ms 220ms
가 가 6
SMS
가 SMS 2
5.
가
DBMS
XMAS
DBMS SMS
XMAS XMAS-M
. XMAS-M
XMAS-M 300~700
SMS
200~400
XMAS-M
가
DBMS
[]
[BHG87] P. A. Bernstein, V. Hardzilacos, and N. Goodman. *Concurrency Control and Recovery in Database Systems*. Addison Wesley, 1987.
[CK+99] S. K. Cha, K. Kim, J. Lee, S Lee, and J.

Park, "Main-Memory Database for Location Management in Telecommunication", in *Proceedings of Workshop on Databases in Telecommunications*, Sept. 1999.
[CPP97] S. K. Cha, J. H. Park, and B. D. Park, "Xmas: An Extensible Main-Memory Storage System", in *Proceedings of the 6th ACM International Conference on Information and Knowledge Management*, pages 356-362, 1997.
[GS92] H. Garcia-Molina and K. Salem, "Main Memory Database Systems: An Overview," *IEEE Transactions on Knowledge and Data Engineering*, 4(6): 509-516, December 1992.
[Gut84] A. Guttman, "R-Trees: A Dynamic Index Structure for Spatial Searching", In *Proceedings of ACM SIGMOD International Conference on Management of Data*, pages 47-57, 1984.
[Hag86] R. B. Hagmann, "A Crash Recovery Scheme for a Memory-Resident Database Systems," *IEEE Transactions on Computers*, C-35(9): 839-843, Sep. 1986.
[LC86] T. J. Lehman and M. J. Carey, "A Study of Index Structures for Main Memory Database Management Systems", in *Proceedings of VLDB Conference*, pages 294-303, 1986.
[LK+99] J. Lindstrom, T. Niklander, P Porkka, K. Raatikainen, "A Distributed Real-Time Main-Memory Database for Telecommunication", in *Proceedings of Workshop on Databases in Telecommunications*, Sept. 1999.
[LKC00] J. Lee, K. Kim, and S. K. Cha, "Differential Logging: A commutative and associative logging scheme for highly parallel main memory databases," submitted to VLDB 2000.
[MH+92] C. Mohan, D. Haderle, B. Lindsay, H. Pirahesh, and P. Schwarz. ARIES: A Transaction Recovery Method Supporting Fine-Granularity Locking and Partial Rollback Using Write-Ahead Logging. *ACM Transactions on Database Systems*, 17(1), March, 1992.
[PK+98] J. H. Park, Y. S. Kwon, K. Kim, S. Lee, B. D. Park, and S. K. Cha, "Xmas: An Extensible Main-Memory Storage System for High-Performance Applications," in *Proceedings*

of ACM SIGMOD Conference, pages 578-580, 1998.

- [PKV99] J. H. Park, K. Kim, S. K. Cha, M. S. Song, S. Lee, and J. Lee, "A High-performance Spatial Storage System Based on Main-Memory Database Architecture," in *Proceedings of DEXA Conference*, pages 1066-1075, 1999.



1993.2
1995.2
1995 -

- [RKV95] N. Roussopoulos, S. Kelly, and F. Vincent, "Nearest Neighbor Queries", In *Proceedings of ACM SIGMOD International Conference on Management of Data*, 1995.

: DB, DB,
DB

- [RK+98] J. J. Reed, K. J. Krizman, B. D. Woerner, and T. S. Rappaport, "An Overview of the Challenges and Progress in Meeting the E-911 Requirement for Location Service", *IEEE Communications Magazine*, pages 30-37, April 1998.



1999.2

- [Ron99] M. Ronstrom, "Database Requirement Analysis for a Third Generation Mobile Telecom System", in *Proceedings of Workshop on Databases in Telecommunications*, Sept. 1999.

: DB, DB

- [SKT00] SK Telecom 가 Main Memory DB , 2000 3 .



2000.2
2000 -

: DB

- [Tim98] TimesTen Performance Software, In Memory Data Management, Technical White Paper, 1998, <http://www.timesten.com>.



1980
1982
1991 Stanford
1992 -

: DB, DB
, DB