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# System Monitoring with Firebird 2.1

Session: B33

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Upscene Productions

Database Tools for Developers

Database Workbench, LogManager Series, Advanced Data Generator,

InterXpress for Firebird

<http://www.upscene.com>



# Overview

- Introduction (which is this)
- The idea behind monitoring
- What is available in Firebird
- What is available in Firebird 2.1
- How it works
- The Structure of the Monitoring Tables
- Future ideas
- Examples

# The idea behind monitoring

- “client” side performance
  - Using prepared queries
  - Testing during development
    - Test data
    - Basically: application testing
- “server” side performance
  - Running in production
    - Real users doing real things
    - User patterns
  - Detect problems during production

# What is available in Firebird

- Database statistics

```
ODS version      10.1
Oldest transaction 26661
Oldest active     26662
Oldest snapshot   26662
Next transaction  26666
```

# What's available in Firebird 2.1

- 7 monitoring tables
  - MON\$DATABASE
  - MON\$ATTACHMENTS
  - MON\$TRANSACTIONS
  - MON\$STATEMENTS
  - MON\$CALL\_STACK
  - MON\$IO\_STATS
  - MON\$RECORD\_STATS



# How it works

- Perform a query involving MON\$---
  - Monitoring connection signals other connections
  - Connections dump their current state
  - Data is parsed and pushed into the MON\$--- layouts
  - Data is per-transaction
- Tables can be used in any SQL query
  - Makes it easy to combine the data
  - Tables are currently read-only
  - All data available to DBO & SYSDBA
  - Your own data available to “yourself”

# The Structure of the Monitoring Tables

- MON\$DATABASE
  - Info about your database
    - MON\$DATABASE
    - MON\$PAGE\_SIZE
    - MON\$ODS\_MAJOR
    - MON\$ODS\_MINOR
    - MON\$OLDEST\_TRANSACTION
    - MON\$OLDEST\_ACTIVE
    - MON\$NEXT\_TRANSACTION
    - MON\$PAGE\_BUFFERS
    - MON\$SQL\_DIALECT
    - MON\$SHUTDOWN\_MODE
    - MON\$SWEEP\_INTERVAL
    - MON\$READ\_ONLY
    - MON\$FORCED\_WRITES
    - MON\$RESERVE\_SPACE
    - MON\$CREATION\_DATE
    - MON\$PAGES
    - MON\$BACKUP\_STATE
    - MON\$STAT\_ID

# The Structure of the Monitoring Tables

- MON\$ATTACHMENTS

- Info about connections

- MON\$ATTACHMENT\_ID
    - MON\$SERVER\_PID
    - MON\$STATE
    - MON\$ATTACHMENT\_NAME
    - MON\$USER
    - MON\$ROLE
    - MON\$REMOTE\_PROTOCOL
    - MON\$REMOTE\_ADDRESS
    - MON\$REMOTE\_PID
    - MON\$REMOTE\_PROCESS
    - MON\$CHARACTER\_SET\_ID
    - MON\$TIMESTAMP
    - MON\$GARBAGE\_COLLECTION
    - MON\$STAT\_ID



# The Structure of the Monitoring Tables

- MON\$TRANSACTIONS

- Info about transactions

- MON\$TRANSACTION\_ID
    - MON\$ATTACHMENT\_ID
    - MON\$STATE
    - MON\$TIMESTAMP
    - MON\$TOP\_TRANSACTION
    - MON\$OLDEST\_TRANSACTION
    - MON\$OLDEST\_ACTIVE
    - MON\$ISOLATION\_MODE
    - MON\$LOCK\_TIMEOUT
    - MON\$READ\_ONLY
    - MON\$AUTO\_COMMIT
    - MON\$AUTO\_UNDO
    - MON\$STAT\_ID

# The Structure of the Monitoring Tables

- MON\$STATEMENTS
  - Info about statements
  - SQL and GDML statements
    - MON\$STATEMENT\_ID
    - MON\$ATTACHMENT\_ID
    - MON\$TRANSACTION\_ID
    - MON\$STATE
    - MON\$TIMESTAMP
    - MON\$SQL\_TEXT
    - MON\$STAT\_ID



# The Structure of the Monitoring Tables

- MON\$CALL\_STACK

- Info about Stored Procedures and Triggers

- MON\$CALL\_ID
    - MON\$STATEMENT\_ID
    - MON\$CALLER\_ID
    - MON\$OBJECT\_NAME
    - MON\$OBJECT\_TYPE
    - MON\$TIMESTAMP
    - MON\$SOURCE\_LINE
    - MON\$SOURCE\_COLUMN
    - MON\$STAT\_ID

# The Structure of the Monitoring Tables

- MON\$IO\_STATS

- Info about reading & writing data pages

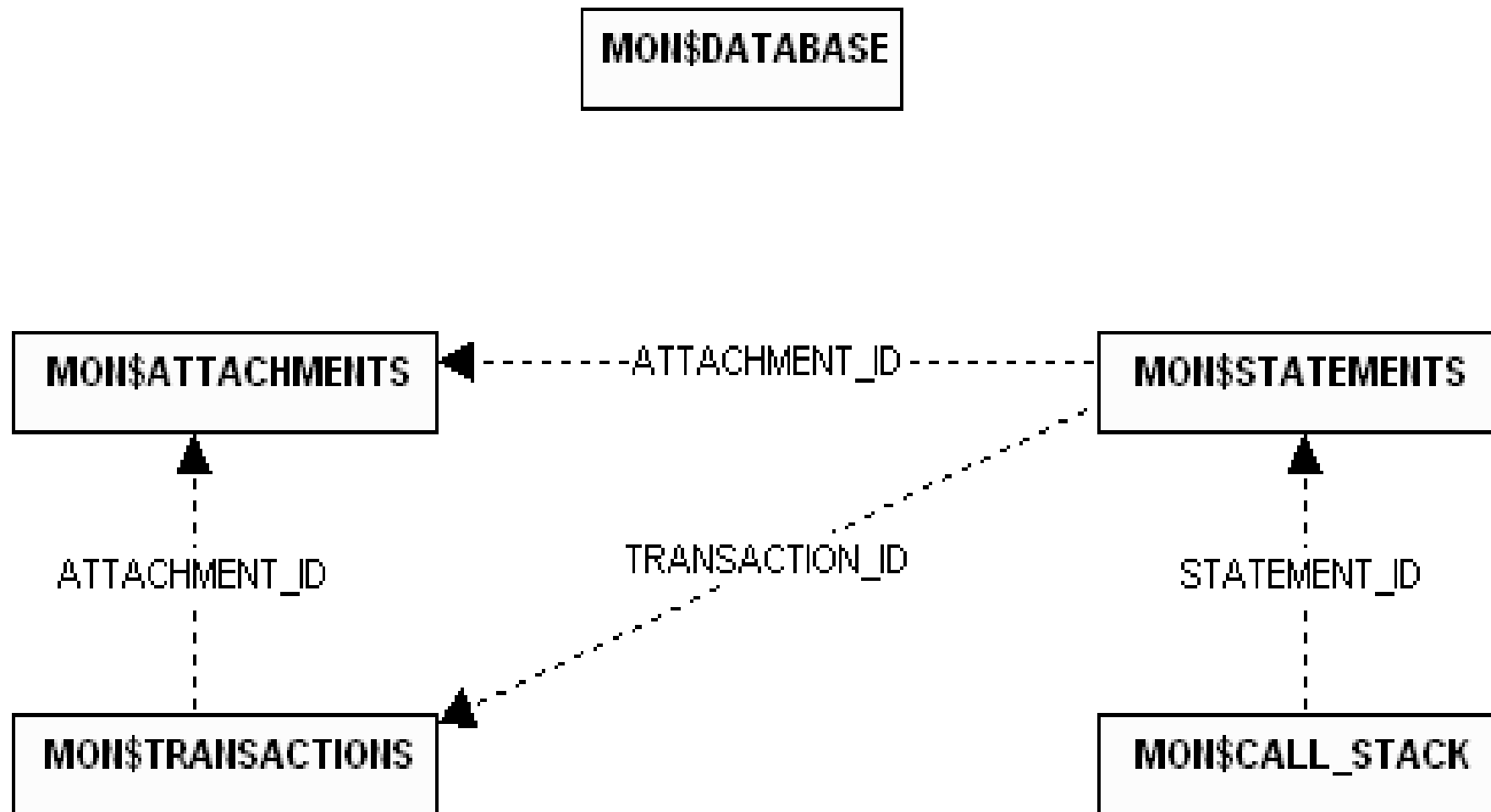
- MON\$STAT\_ID
    - MON\$PAGE\_READS
    - MON\$PAGE\_WRITES
    - MON\$PAGE\_FETCHES
    - MON\$PAGE\_MARKS

# The Structure of the Monitoring Tables

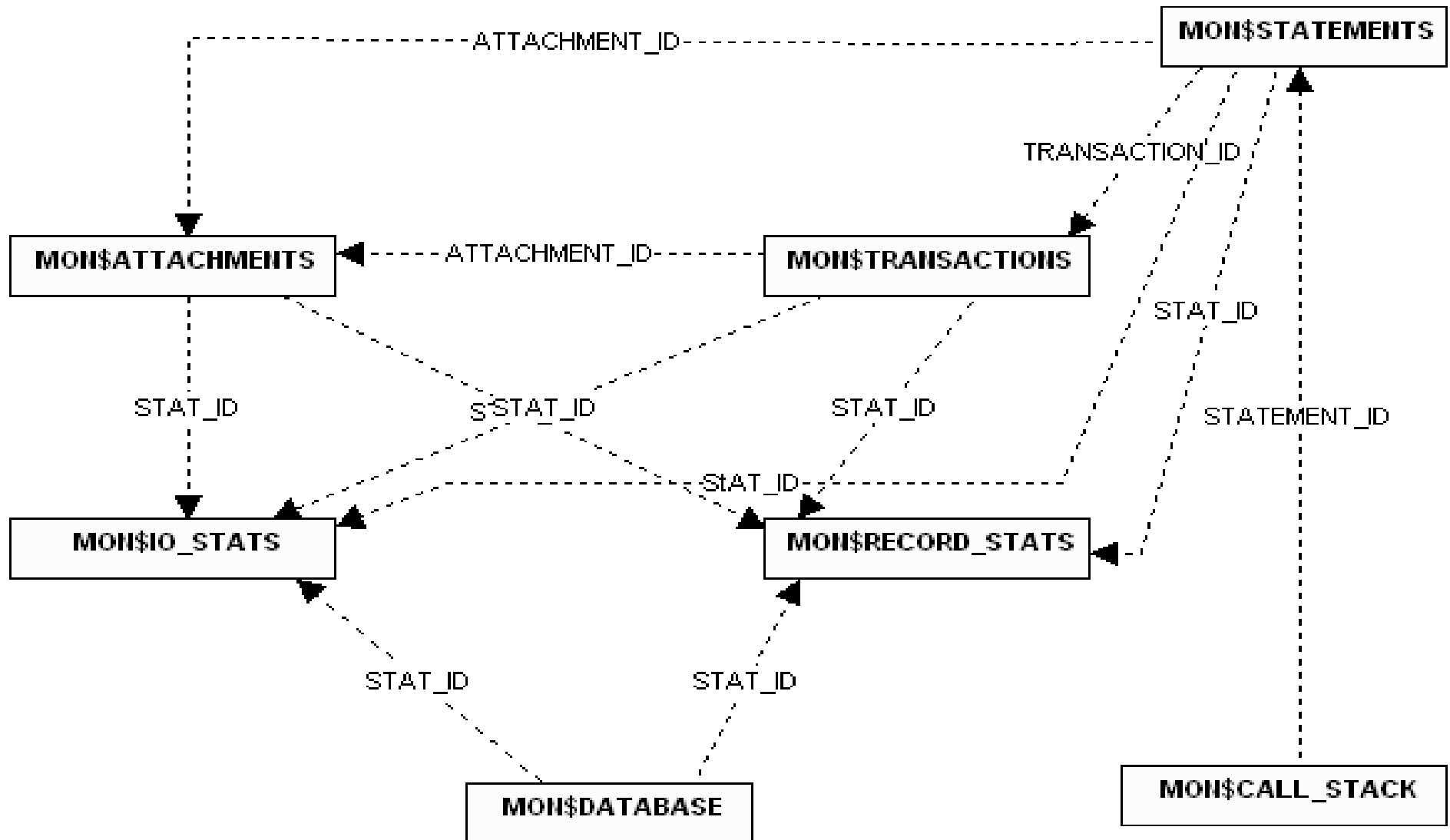
- MON\$RECORD\_STATS
  - Info about record level statistics
    - MON\$STAT\_ID
    - MON\$RECORD\_SEQ\_READS
    - MON\$RECORD\_IDX\_READS
    - MON\$RECORD\_INSERTS
    - MON\$RECORD\_UPDATES
    - MON\$RECORD\_DELETES
    - MON\$RECORD\_BACKOUTS
    - MON\$RECORD\_PURGES
    - MON\$RECORD\_EXPUNGES



# The Structure of the Monitoring Tables



# The Structure of the Monitoring Tables



# Future ideas

- More tables & more info
  - Server based monitoring instead of database based?
  - Server memory usage, per database?
  - Server threads?
  - Query memory usage?
  - Query plan available?
  - Query “heaviness” measurement?



# Future ideas

- Trace API
  - As per Nickolay, not yet in Firebird tree
  - Compare tracing to monitoring

# Examples



# Questions?

- Feel free to ask!