

Cool new things in MySQL 5.0

Stewart Smith

April 5th, 2005

MySQL AB



5.0 At A Glance

- MySQL 5.0.3 Beta released
- FEDERATED Storage Engine
- Updatable Views
- Stored Procedures
- Cursors
- Rudimentary Triggers
- Explicit RTREE indexes on MyISAM tables
- Dynamic length rows for MEMORY tables
- BIT data type
- INFORMATION_SCHEMA
- True VARCHAR
- Speed improvements (galore!)

MySQL 5.0.3 Beta

- Released 23rd March
- Current Binaries:
 - Linux (x86, IA64, Alpha, PowerPC, AMD64), Windows (x86), Solaris 8/9/10 (SPARC 32/64, x86), FreeBSD 4.x (x86), MacOS X (PowerPC), HPUX (11.00, 11.11, 11.23), AIX 5.2, QNX, SGI IRIX 6.5, DEC OSF 5.1
- More coming
 - apparently the build team requires sleep too.
- All tests pass
- Bugs still exist (varying severity)
- Will not release GA until there are no fatal run-time bugs.
- Please try it and report any bugs!

Storage Engines

- No one way of storing data is ideal for all tables
- Choice between different methods
 - at CREATE TABLE time
 - can ALTER later
 - default: “set storage_engine=ndbcluster;”
- Easy to code your own
- Many to choose from

Storage Engines (cont.)

- **MyISAM**
 - Faster than a speeding bullet!
 - No transactions
 - No foreign keys (yet)
 - Not crash safe (no logging)
 - FULLTEXT indexing
 - Can store indexes away from data (e.g. separate disk)
- **MERGE**
 - Merge two identical MyISAM tables into one
- **MEMORY/HEAP**
 - In-memory
 - **really** fast

Storage Engines (cont.)

- **BDB**
 - Use BDB as a store for your MySQL tables
 - an SQL interface on BDB
 - Just what the storage engine architecture is good for doing!
 - transactions
 - crash recovery
 - page-level locking
- **EXAMPLE**
 - does nothing.
 - good example code
- **ARCHIVE**
 - compressed tables (zlib)
 - no indexes, deletes, replaces or updates

Storage Engines (cont.)

- CSV
 - a CSV text file as a table
 - Good example code for a functional storage engine
 - Import your table directly into Excel!
- InnoDB
 - ACID
 - Foreign Keys
 - Terrabytes of data possible (64 current max)
 - Separate log files (could put on another disk)
 - Multiple storage files (add more disk, add more innodb storage space)
 - Row level locking
- Federated
- Cluster

FEDERATED storage engine

- Added in MySQL 5.0.3
- Accesses data in tables of remote databases rather than in local tables.
- In this first version, only to other MySQL servers

FEDERATED example

- MySQL Server 1

```
CREATE TABLE test_table (  
  id int(20) NOT NULL auto_increment,  
  name varchar(32) NOT NULL default "",  
  other int(20) NOT NULL default '0',  
  PRIMARY KEY (id),  
  KEY name (name),  
  KEY other_key (other)  
)  
ENGINE=MyISAM  
DEFAULT CHARSET=latin1 ;
```

FEDERATED Example (cont)

- MySQL Server 2

```
CREATE TABLE federated_table (
  id int(20) NOT NULL auto_increment,
  name varchar(32) NOT NULL default '',
  other int(20) NOT NULL default '0',
  PRIMARY KEY (id),
  KEY name (name),
  KEY other_key (other)
)
ENGINE=FEDERATED
DEFAULT CHARSET=latin1
COMMENT='mysql://root@remote_host:9306/federated/test_table';
```

Updatable Views

- Views make (some) big queries a lot nicer
- MySQL has been previously criticized for not having views
- Views are updatable
- Real Cool Things(TM) are possible:

```
mysql> CREATE TABLE t (qty INT, price INT);
```

```
mysql> INSERT INTO t VALUES(3, 50);
```

```
mysql> CREATE VIEW v AS SELECT qty, price,
    qty*price AS value FROM t;
```

```
mysql> SELECT * FROM v;
```

qty	price	value
3	50	150

Example real-world view

```
-- current_memberships
-- -----
--
-- current memberships of all members of all orgs,
--   of all types, which provide membership
CREATE or replace view current_memberships AS
select distinct
  members.*,
  orgs.id as org_id,
  orgs.name as org_name,
  member_types.id as member_type_id,
  member_types.type as member_type
from
  members,
  orgs,
  org_members,
  member_types
where
  members.id = org_members.member_id
  AND org_members.org_id = orgs.id
  AND org_members.member_type_id = member_types.id
  AND member_types.org_id = orgs.id
  and (
--
-- you are a current member if your membership:
-- - period started before now, and ends after now
-- - never ends, always existed
-- - started before now, never ends
-- - started at unknown, ends after now
(org_members.start_date < now()
 and org_members.expiry > now())
  or (org_members.start_date is null
 and org_members.expiry is null)
  or (org_members.start_date<now()
 and org_members.expiry is null)
  or (org_members.start_date is null
 and org_members.expiry>now())
  )
  AND member_types.validates_membership = true
  AND not exists (select member_id from org_members,member_types
where org_members.member_type_id = member_types.id
and org_members.member_id = members.id
and member_types.revokes_membership = true
and member_types.validates_membership = false
and (
--
-- you are a current member if your membership:
-- - period started before now, and ends after now
-- - never ends, always existed
-- - started before now, never ends
-- - started at unknown, ends after now
(org_members.start_date < now()
 and org_members.expiry > now())
  or (org_members.start_date is null
 and org_members.expiry is null)
  or (org_members.start_date<now()
 and org_members.expiry is null)
  or (org_members.start_date is null
 and org_members.expiry>now())
  )
  )
);
```

→ select * from current_memberships;

Stored Procedures

- MySQL follows the SQL:2003 syntax for stored procedures, which is also used by IBM's DB2.
- One of the most requested features
- Things you can do
 - SQL queries
 - call SQL functions
 - have IN and OUT parameters
 - local variables
 - Use cursors
- Future enhancements
 - Framework to support external stored procedures (e.g. PHP)
 - Lifting of limitations with CREATE FUNCTION and some references to tables.

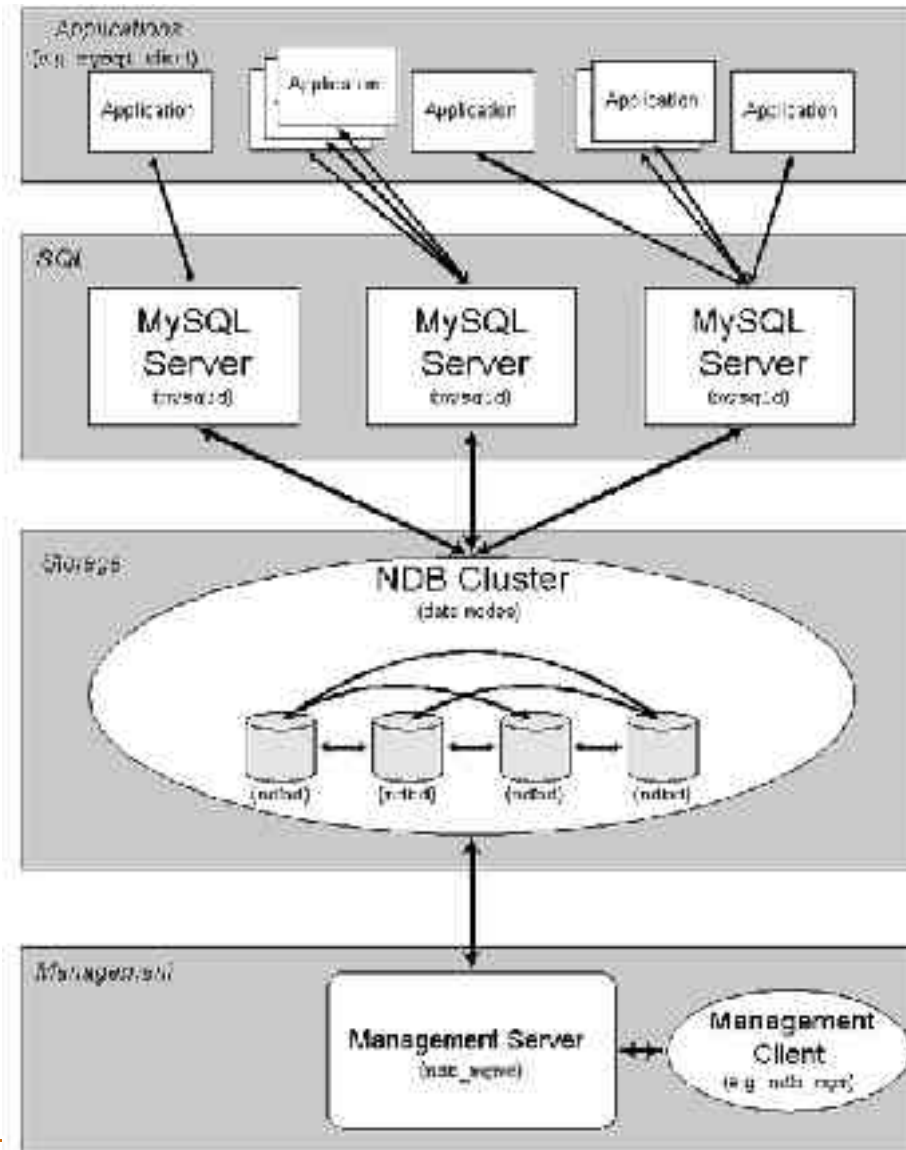
Stored Procedure Example

```
CREATE PROCEDURE curdemo()  
BEGIN  
    DECLARE done INT DEFAULT 0;  
    DECLARE a CHAR(16);  
    DECLARE b,c INT;  
    DECLARE cur1 CURSOR FOR SELECT id,data FROM test.t1;  
    DECLARE cur2 CURSOR FOR SELECT i FROM test.t2;  
    DECLARE CONTINUE HANDLER FOR SQLSTATE '02000' SET done = 1;  
  
    OPEN cur1;  
    OPEN cur2;  
  
    REPEAT  
        FETCH cur1 INTO a, b;  
        FETCH cur2 INTO c;  
        IF NOT done THEN  
            IF b < c THEN  
                INSERT INTO test.t3 VALUES (a,b);  
            ELSE  
                INSERT INTO test.t3 VALUES (a,c);  
            END IF;  
        END IF;  
    UNTIL done END REPEAT;  
  
    CLOSE cur1;  
    CLOSE cur2;  
END
```

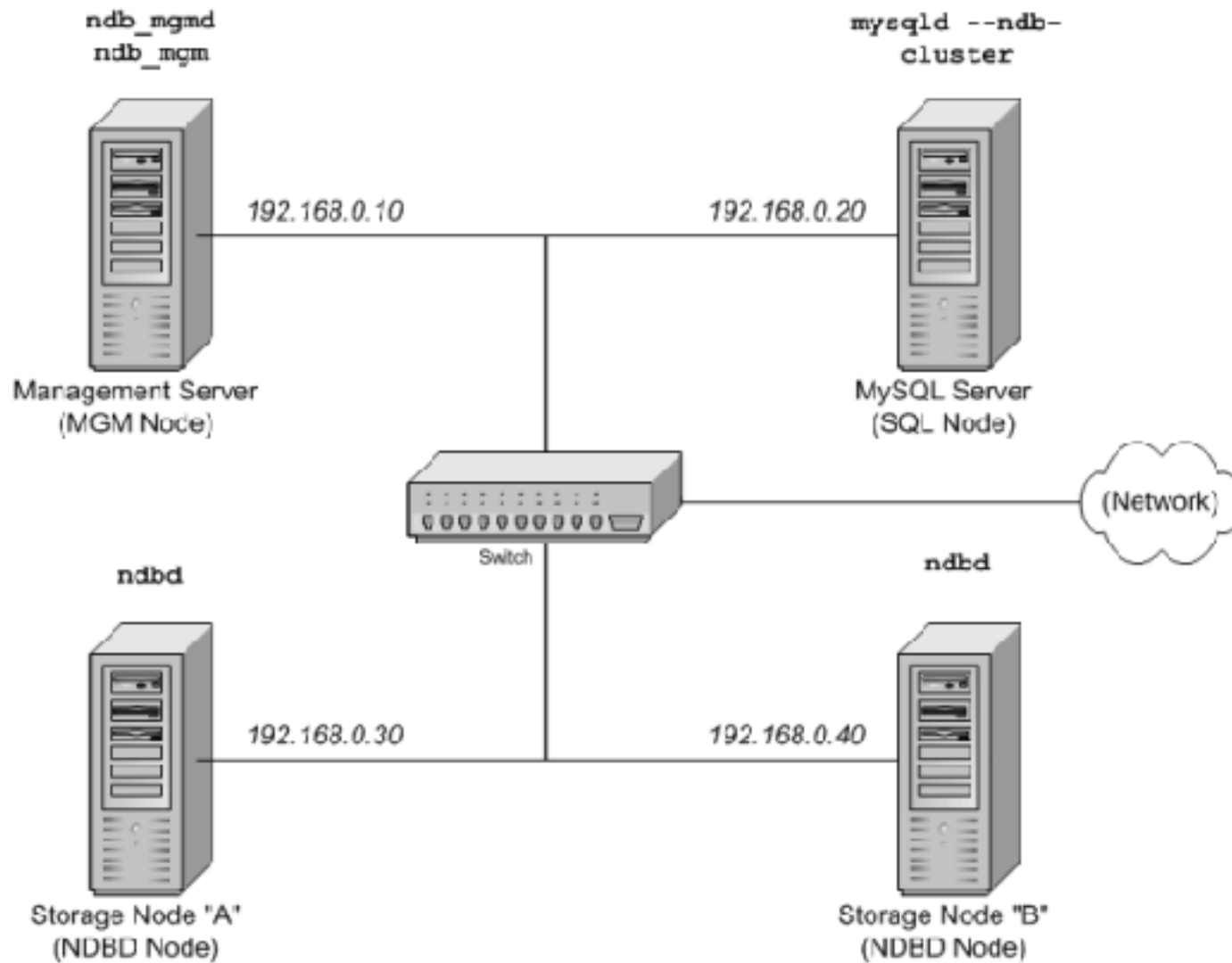
A Quick Introduction to MySQL Cluster

- NDB is a high availability, clustered, in-memory, share-nothing storage engine for MySQL
- Supports transactions
- Designed (and delivers) five 9's uptime
- Multiple MySQL Servers can connect to the one cluster
- Data is checkpointed to disk
- Online backup
- Support of multiple interconnects (TCP/IP, SCI and others)
- Part of the MAX builds (mysql-max, not MaxDB)
 - note that Cluster binaries are in separate RPMs

Cluster Architecture



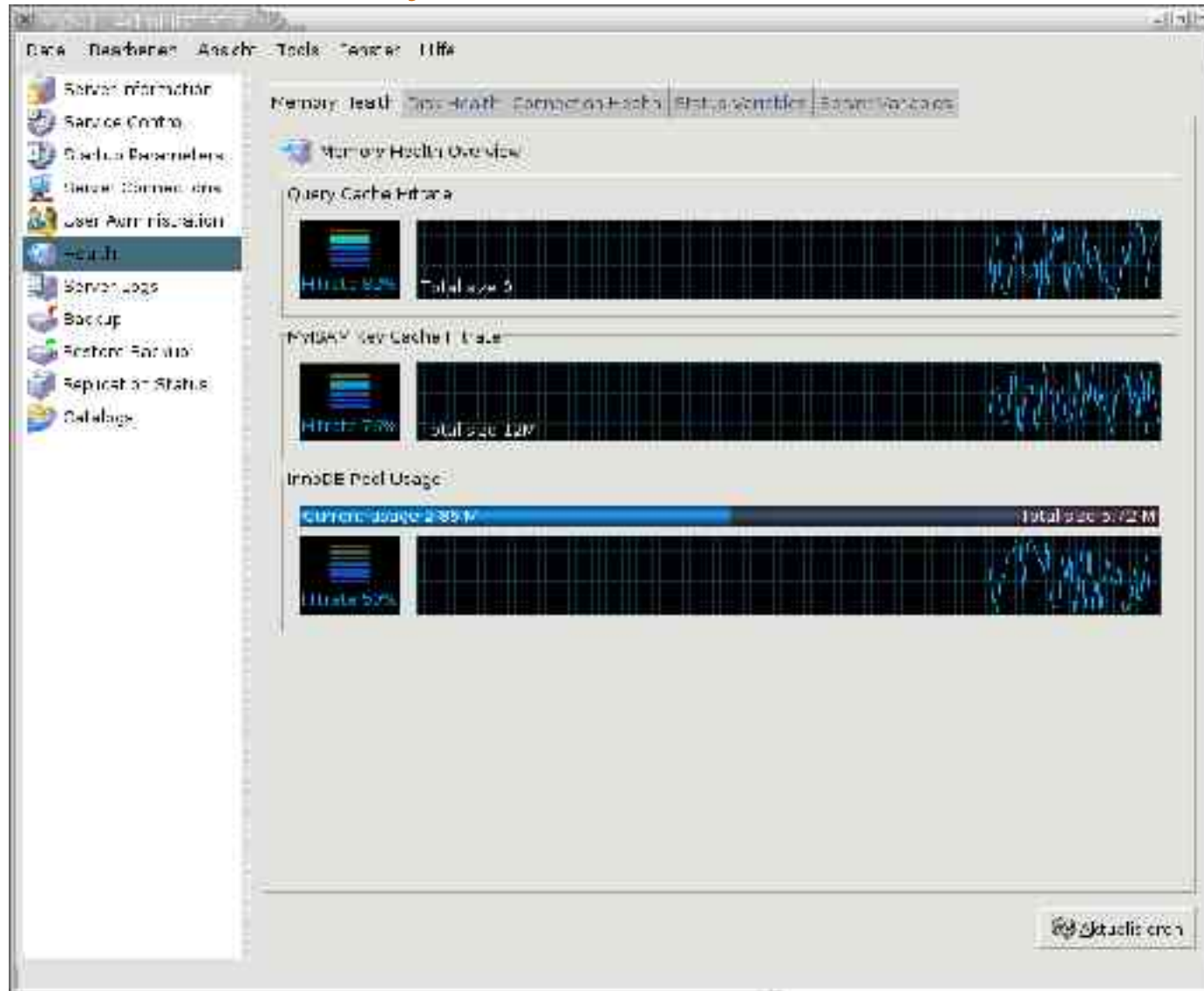
Example Cluster



MySQL GUI Tools

- MySQL Administrator
 - Linux, Windows, MacOS X binaries available
- MySQL Query Browser
 - Linux and Windows binaries available
- MySQL Migration Tool
 - Java based migration tool
 - Windows Binaries available (1.0.1-alpha)

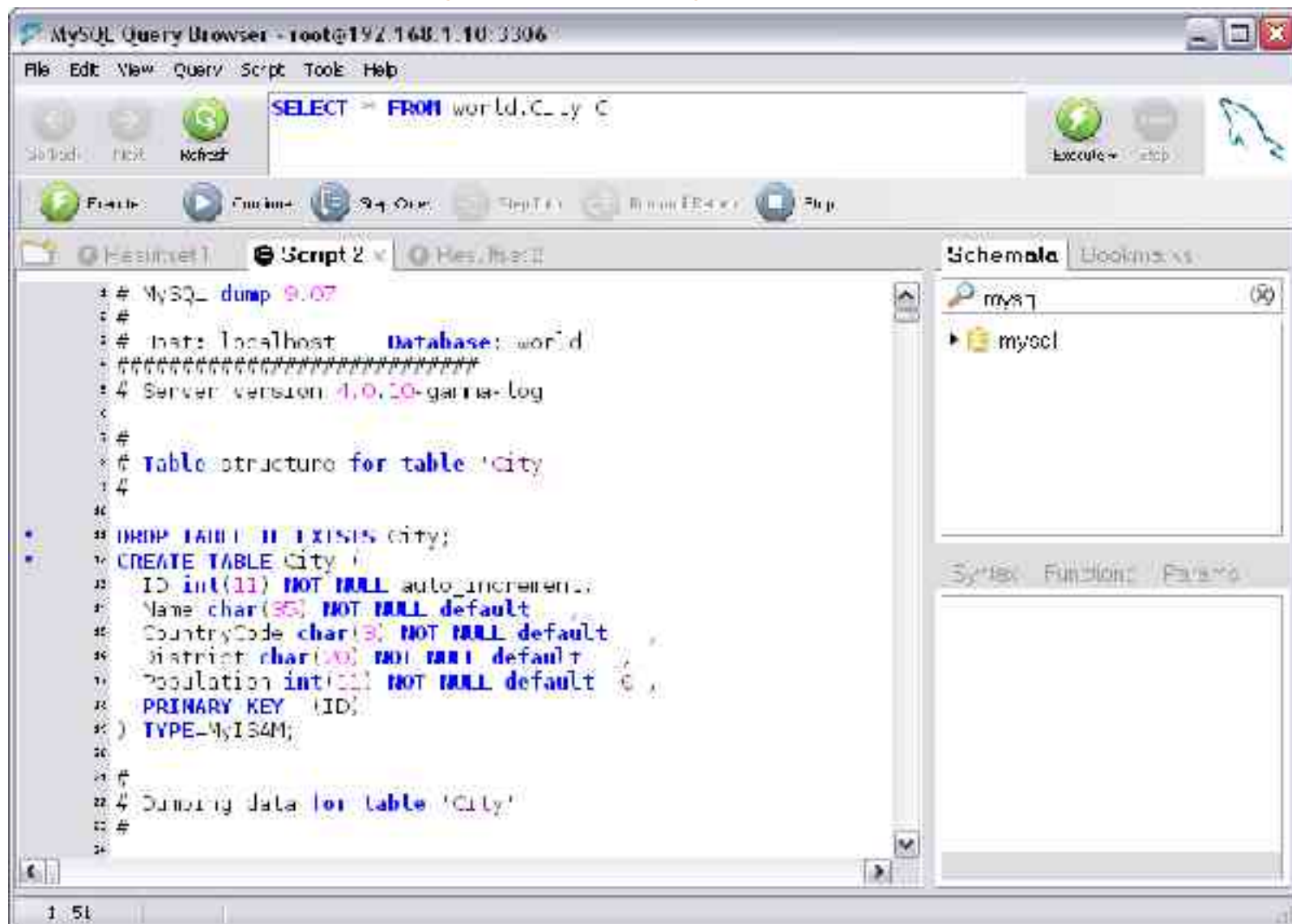
MySQL Administrator



The screenshot shows the MySQL Administrator interface with the following components:

- Navigation Panel (Left):**
 - Server Information
 - Service Control
 - Global Privileges
 - Server Connections
 - User Administration
 - Health** (Selected)
 - Server Logs
 - Backup
 - Restore Backup
 - Replication Status
 - Galaxy
- Memory Health Overview:**
 - Memory Health: [View Health](#) | [Connection Health](#) | [Status Variables](#) | [Server Variables](#)
 - Memory Health Overview
- Query Cache Hit Rate:**
 - Hit rate: 80% | Total size: 0
- MYISAM Key Cache Hit Rate:**
 - Hit rate: 70% | Total size: 12M
- InnoDB Pool Usage:**
 - Current usage: 2.85 M | Total size: 5.72 M
 - Hit rate: 50%
- Bottom Right:**
 - MySQL.com

MySQL Query Browser



The screenshot shows the MySQL Query Browser window. The title bar reads "MySQL Query Browser - root@192.168.1.10:3306". The menu bar includes "File", "Edit", "View", "Query", "Script", "Tools", and "Help". The toolbar contains buttons for "Stop", "Next", "Refresh", "Execute", and "Stop". The main text area displays a SQL script:

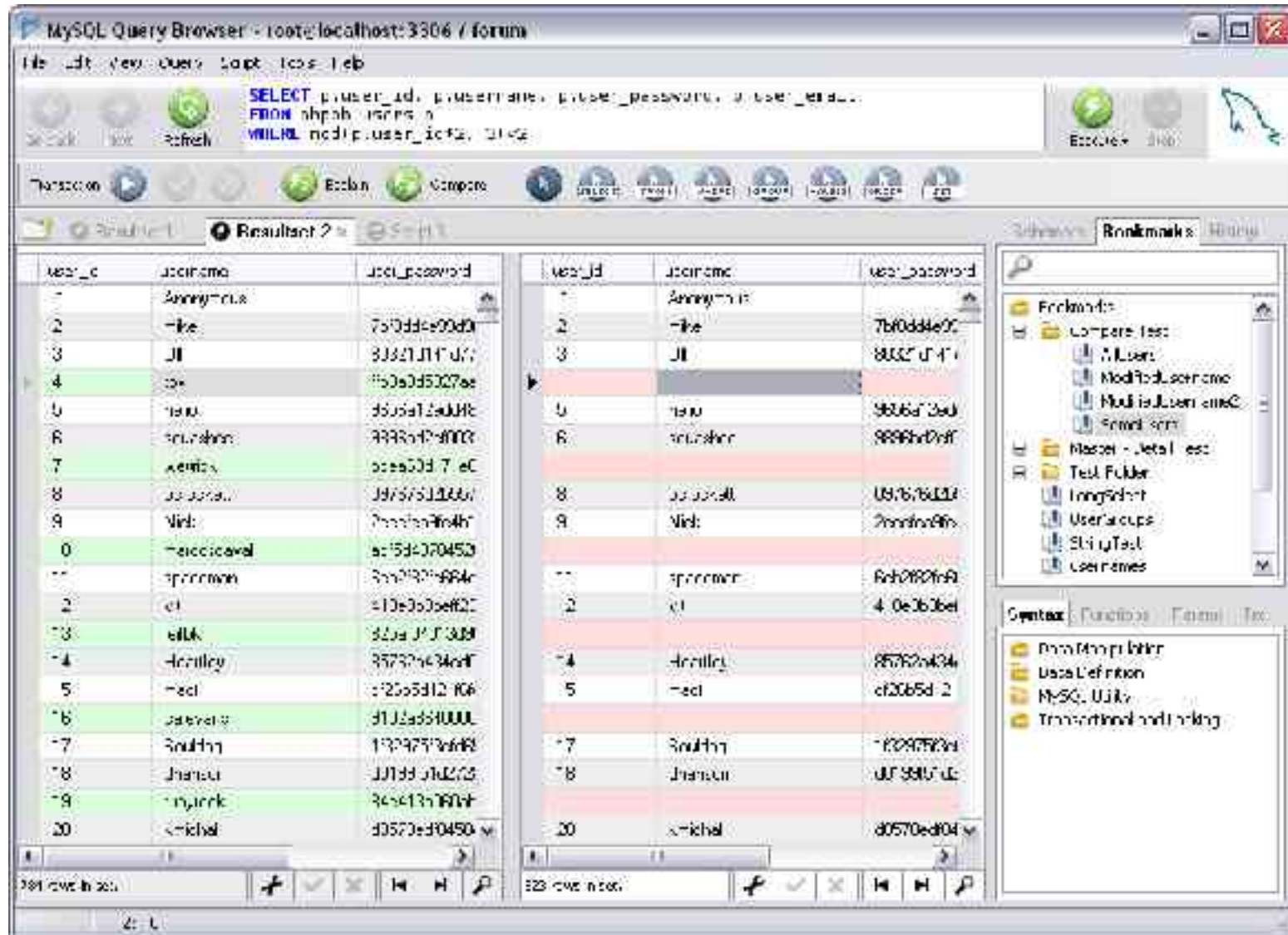
```

1 # MySQL dump 9.07
2 #
3 # host: localhost  Database: world
4 # Server version: 4.0.10-gamma-log
5 #
6 # Table structure for table 'City'
7 #
8 #
9 #
10 #
11 #
12 #
13 #
14 #
15 #
16 #
17 #
18 #
19 #
20 #
21 #
22 #
23 #
24 #
25 #
26 #
27 #
28 #
29 #
30 #
31 #
32 #
33 #
34 #
35 #
36 #
37 #
38 #
39 #
40 #
41 #
42 #
43 #
44 #
45 #
46 #
47 #
48 #
49 #
50 #
51 #
52 #
53 #
54 #
55 #
56 #
57 #
58 #
59 #
60 #
61 #
62 #
63 #
64 #
65 #
66 #
67 #
68 #
69 #
70 #
71 #
72 #
73 #
74 #
75 #
76 #
77 #
78 #
79 #
80 #
81 #
82 #
83 #
84 #
85 #
86 #
87 #
88 #
89 #
90 #
91 #
92 #
93 #
94 #
95 #
96 #
97 #
98 #
99 #
100 #
101 #
102 #
103 #
104 #
105 #
106 #
107 #
108 #
109 #
110 #
111 #
112 #
113 #
114 #
115 #
116 #
117 #
118 #
119 #
120 #
121 #
122 #
123 #
124 #
125 #
126 #
127 #
128 #
129 #
130 #
131 #
132 #
133 #
134 #
135 #
136 #
137 #
138 #
139 #
140 #
141 #
142 #
143 #
144 #
145 #
146 #
147 #
148 #
149 #
150 #
151 #
152 #
153 #
154 #
155 #
156 #
157 #
158 #
159 #
160 #
161 #
162 #
163 #
164 #
165 #
166 #
167 #
168 #
169 #
170 #
171 #
172 #
173 #
174 #
175 #
176 #
177 #
178 #
179 #
180 #
181 #
182 #
183 #
184 #
185 #
186 #
187 #
188 #
189 #
190 #
191 #
192 #
193 #
194 #
195 #
196 #
197 #
198 #
199 #
200 #
201 #
202 #
203 #
204 #
205 #
206 #
207 #
208 #
209 #
210 #
211 #
212 #
213 #
214 #
215 #
216 #
217 #
218 #
219 #
220 #
221 #
222 #
223 #
224 #
225 #
226 #
227 #
228 #
229 #
230 #
231 #
232 #
233 #
234 #
235 #
236 #
237 #
238 #
239 #
240 #
241 #
242 #
243 #
244 #
245 #
246 #
247 #
248 #
249 #
250 #
251 #
252 #
253 #
254 #
255 #
256 #
257 #
258 #
259 #
260 #
261 #
262 #
263 #
264 #
265 #
266 #
267 #
268 #
269 #
270 #
271 #
272 #
273 #
274 #
275 #
276 #
277 #
278 #
279 #
280 #
281 #
282 #
283 #
284 #
285 #
286 #
287 #
288 #
289 #
290 #
291 #
292 #
293 #
294 #
295 #
296 #
297 #
298 #
299 #
300 #
301 #
302 #
303 #
304 #
305 #
306 #
307 #
308 #
309 #
310 #
311 #
312 #
313 #
314 #
315 #
316 #
317 #
318 #
319 #
320 #
321 #
322 #
323 #
324 #
325 #
326 #
327 #
328 #
329 #
330 #
331 #
332 #
333 #
334 #
335 #
336 #
337 #
338 #
339 #
340 #
341 #
342 #
343 #
344 #
345 #
346 #
347 #
348 #
349 #
350 #
351 #
352 #
353 #
354 #
355 #
356 #
357 #
358 #
359 #
360 #
361 #
362 #
363 #
364 #
365 #
366 #
367 #
368 #
369 #
370 #
371 #
372 #
373 #
374 #
375 #
376 #
377 #
378 #
379 #
380 #
381 #
382 #
383 #
384 #
385 #
386 #
387 #
388 #
389 #
390 #
391 #
392 #
393 #
394 #
395 #
396 #
397 #
398 #
399 #
400 #
401 #
402 #
403 #
404 #
405 #
406 #
407 #
408 #
409 #
410 #
411 #
412 #
413 #
414 #
415 #
416 #
417 #
418 #
419 #
420 #
421 #
422 #
423 #
424 #
425 #
426 #
427 #
428 #
429 #
430 #
431 #
432 #
433 #
434 #
435 #
436 #
437 #
438 #
439 #
440 #
441 #
442 #
443 #
444 #
445 #
446 #
447 #
448 #
449 #
450 #
451 #
452 #
453 #
454 #
455 #
456 #
457 #
458 #
459 #
460 #
461 #
462 #
463 #
464 #
465 #
466 #
467 #
468 #
469 #
470 #
471 #
472 #
473 #
474 #
475 #
476 #
477 #
478 #
479 #
480 #
481 #
482 #
483 #
484 #
485 #
486 #
487 #
488 #
489 #
490 #
491 #
492 #
493 #
494 #
495 #
496 #
497 #
498 #
499 #
500 #
501 #
502 #
503 #
504 #
505 #
506 #
507 #
508 #
509 #
510 #
511 #
512 #
513 #
514 #
515 #
516 #
517 #
518 #
519 #
520 #
521 #
522 #
523 #
524 #
525 #
526 #
527 #
528 #
529 #
530 #
531 #
532 #
533 #
534 #
535 #
536 #
537 #
538 #
539 #
540 #
541 #
542 #
543 #
544 #
545 #
546 #
547 #
548 #
549 #
550 #
551 #
552 #
553 #
554 #
555 #
556 #
557 #
558 #
559 #
560 #
561 #
562 #
563 #
564 #
565 #
566 #
567 #
568 #
569 #
570 #
571 #
572 #
573 #
574 #
575 #
576 #
577 #
578 #
579 #
580 #
581 #
582 #
583 #
584 #
585 #
586 #
587 #
588 #
589 #
590 #
591 #
592 #
593 #
594 #
595 #
596 #
597 #
598 #
599 #
600 #
601 #
602 #
603 #
604 #
605 #
606 #
607 #
608 #
609 #
610 #
611 #
612 #
613 #
614 #
615 #
616 #
617 #
618 #
619 #
620 #
621 #
622 #
623 #
624 #
625 #
626 #
627 #
628 #
629 #
630 #
631 #
632 #
633 #
634 #
635 #
636 #
637 #
638 #
639 #
640 #
641 #
642 #
643 #
644 #
645 #
646 #
647 #
648 #
649 #
650 #
651 #
652 #
653 #
654 #
655 #
656 #
657 #
658 #
659 #
660 #
661 #
662 #
663 #
664 #
665 #
666 #
667 #
668 #
669 #
670 #
671 #
672 #
673 #
674 #
675 #
676 #
677 #
678 #
679 #
680 #
681 #
682 #
683 #
684 #
685 #
686 #
687 #
688 #
689 #
690 #
691 #
692 #
693 #
694 #
695 #
696 #
697 #
698 #
699 #
700 #
701 #
702 #
703 #
704 #
705 #
706 #
707 #
708 #
709 #
710 #
711 #
712 #
713 #
714 #
715 #
716 #
717 #
718 #
719 #
720 #
721 #
722 #
723 #
724 #
725 #
726 #
727 #
728 #
729 #
730 #
731 #
732 #
733 #
734 #
735 #
736 #
737 #
738 #
739 #
740 #
741 #
742 #
743 #
744 #
745 #
746 #
747 #
748 #
749 #
750 #
751 #
752 #
753 #
754 #
755 #
756 #
757 #
758 #
759 #
760 #
761 #
762 #
763 #
764 #
765 #
766 #
767 #
768 #
769 #
770 #
771 #
772 #
773 #
774 #
775 #
776 #
777 #
778 #
779 #
780 #
781 #
782 #
783 #
784 #
785 #
786 #
787 #
788 #
789 #
790 #
791 #
792 #
793 #
794 #
795 #
796 #
797 #
798 #
799 #
800 #
801 #
802 #
803 #
804 #
805 #
806 #
807 #
808 #
809 #
810 #
811 #
812 #
813 #
814 #
815 #
816 #
817 #
818 #
819 #
820 #
821 #
822 #
823 #
824 #
825 #
826 #
827 #
828 #
829 #
830 #
831 #
832 #
833 #
834 #
835 #
836 #
837 #
838 #
839 #
840 #
841 #
842 #
843 #
844 #
845 #
846 #
847 #
848 #
849 #
850 #
851 #
852 #
853 #
854 #
855 #
856 #
857 #
858 #
859 #
860 #
861 #
862 #
863 #
864 #
865 #
866 #
867 #
868 #
869 #
870 #
871 #
872 #
873 #
874 #
875 #
876 #
877 #
878 #
879 #
880 #
881 #
882 #
883 #
884 #
885 #
886 #
887 #
888 #
889 #
890 #
891 #
892 #
893 #
894 #
895 #
896 #
897 #
898 #
899 #
900 #
901 #
902 #
903 #
904 #
905 #
906 #
907 #
908 #
909 #
910 #
911 #
912 #
913 #
914 #
915 #
916 #
917 #
918 #
919 #
920 #
921 #
922 #
923 #
924 #
925 #
926 #
927 #
928 #
929 #
930 #
931 #
932 #
933 #
934 #
935 #
936 #
937 #
938 #
939 #
940 #
941 #
942 #
943 #
944 #
945 #
946 #
947 #
948 #
949 #
950 #
951 #
952 #
953 #
954 #
955 #
956 #
957 #
958 #
959 #
960 #
961 #
962 #
963 #
964 #
965 #
966 #
967 #
968 #
969 #
970 #
971 #
972 #
973 #
974 #
975 #
976 #
977 #
978 #
979 #
980 #
981 #
982 #
983 #
984 #
985 #
986 #
987 #
988 #
989 #
990 #
991 #
992 #
993 #
994 #
995 #
996 #
997 #
998 #
999 #
1000 #

```

The right sidebar shows the "Schema" view with a tree structure containing "mysql". Below the sidebar are tabs for "Syntax", "Functions", and "Errors". The status bar at the bottom left shows "1 51".

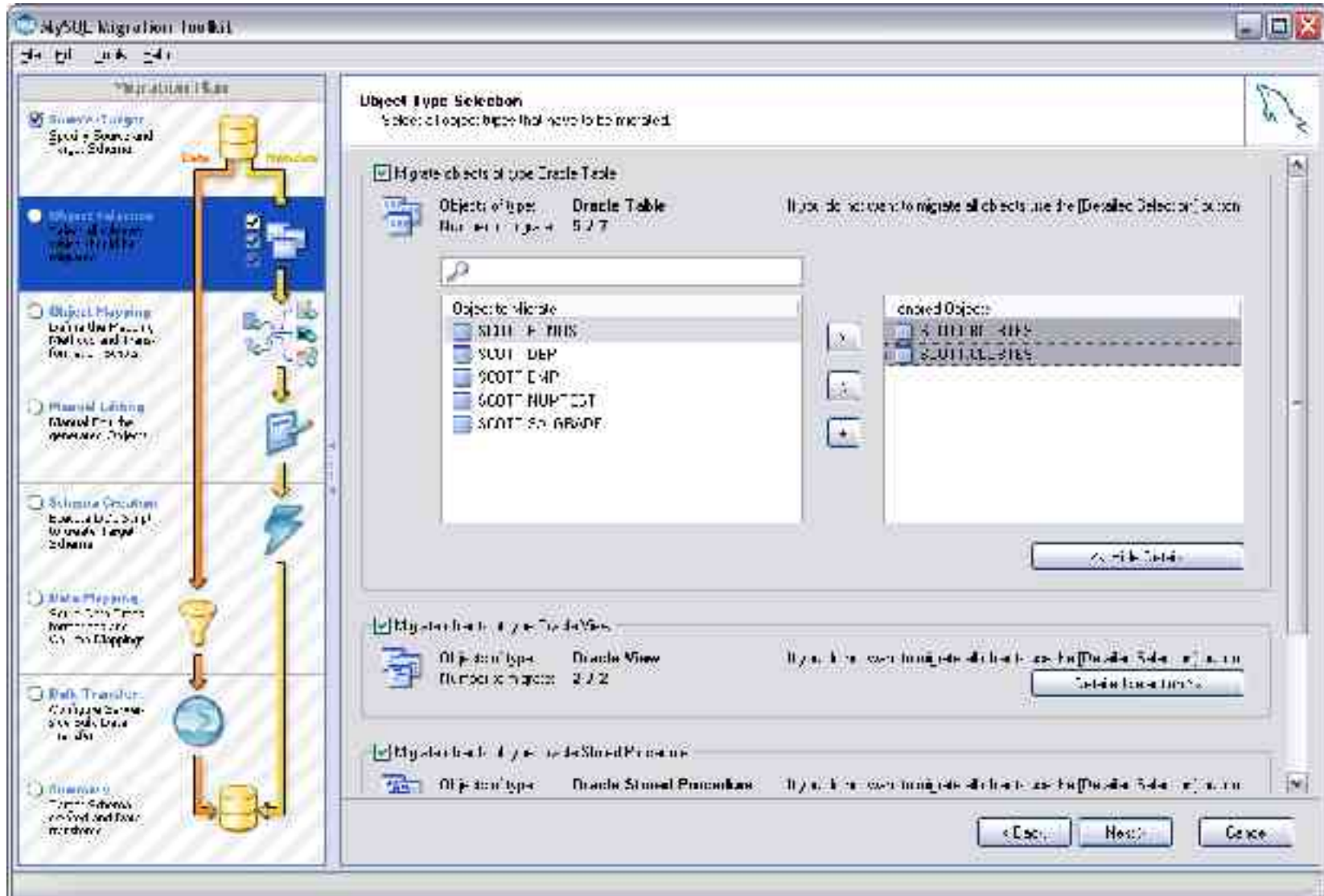
MySQL Query Browser



The screenshot shows the MySQL Query Browser interface. The main window displays a query result set for the 'users' table. The query is: `SELECT user_id, username, user_password FROM users WHERE NOT user_id=2, 1142`. The result set contains 20 rows of user data. The interface includes a toolbar with various icons for navigation and execution, and a sidebar on the right showing a tree view of the database structure.

user_id	username	user_password
1	Anonymous	
2	Mike	7b0ddde00d0
3	Jill	80327d471
4	Joe	ff0a0d5027ae
5	John	5b06af2ed0
6	Jonathan	9996hd0df
7	Kent	0ce00d7e0
8	Joseph	05767603d
9	Mike	200000000
10	Michael	a15d4070450
11	spammer	6d0000000
12	cl	40e000000
13	Bill	500000000
14	Arnold	95762e434
5	mecl	cf2065d12
16	James	100000000
17	Smith	100000000
18	James	00f000000
19	Frank	000000000
20	Michael	00570ed04

MySQL Migration Suite



The future

- We aim toward full compliance with ANSI/ISO SQL. There are no features we plan not to implement.
- Note: If you are an enterprise-level user with an urgent need for a particular feature, please contact [<sales@mysql.com>](mailto:sales@mysql.com) to discuss sponsoring options. Targeted financing by sponsor companies allows us to allocate additional resources for specific purposes. One example of a feature sponsored in the past is replication.

Contact

Stewart Smith

Software Engineer, MySQL Cluster

MySQL AB

stewart@mysql.com

<http://www.mysql.com/>