

# SQL1999

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## Issues Discussed Last Term

We briefly covered *Object-Relational Concepts* last term in Database 1.

The following topics were discussed:

- row types
- collections
- reference types
- explicit identity
- inheritance
- user defined complex types

## Issues Mentioned Last Term

There was also brief mention of:

- recursive queries
- triggers
- new types (boolean, CLOBs, and BLOBs)
- user-defined subtypes

We now cover what is in the SQL3 standard.

We shall also mention here, in very brief terms where different vendors stand.

- Informix Universal Server – Datablades
- Oracle - Oracle8 – Cartridges
- IBM - DB2
- Sybase - Adaptive Server
- Open Source - PostgreSQL

## History of SQL

SQL was first specified in the 1970s

SQL-86 (SQL1) was made an ANSI standard

- tables, columns, views, basic relational operations, some integrity constraints, language bindings to COBOL, FORTRAN, C, etc.

SQL-92 (SQL2) was made an official ANSI/ISO standard in 1992 and has enjoyed tremendous success.

- assertions, bit data type, case, character sets, connection management, DATETIME, domains, dynamic SQL, enhanced constraints (referential integrity), get diagnostics, grouped operations, information schema, natural character sets, natural joins (inner and outer), row and table constraints, schema manipulation, sub-queries in check clauses, table constraints, temporary tables, transactions, union and intersect.

If you are not already an SQL2 expert, I refer you to chapter 8 of the textbook.

## History of SQL

SQL3 has had a slow, stormy and confused birth. But it has been born. The problem has been that proprietary approaches abound. Will the Industry converge? - Probably not soon!

The documents cost almost 300\$ :-)

And the new names are SQL1999 and subsequent improvements will be SQL200n (Melton).

SQL1999 is backward-compatible with SQL2. (In other words SQL2 is forward compatible with SQL1999)

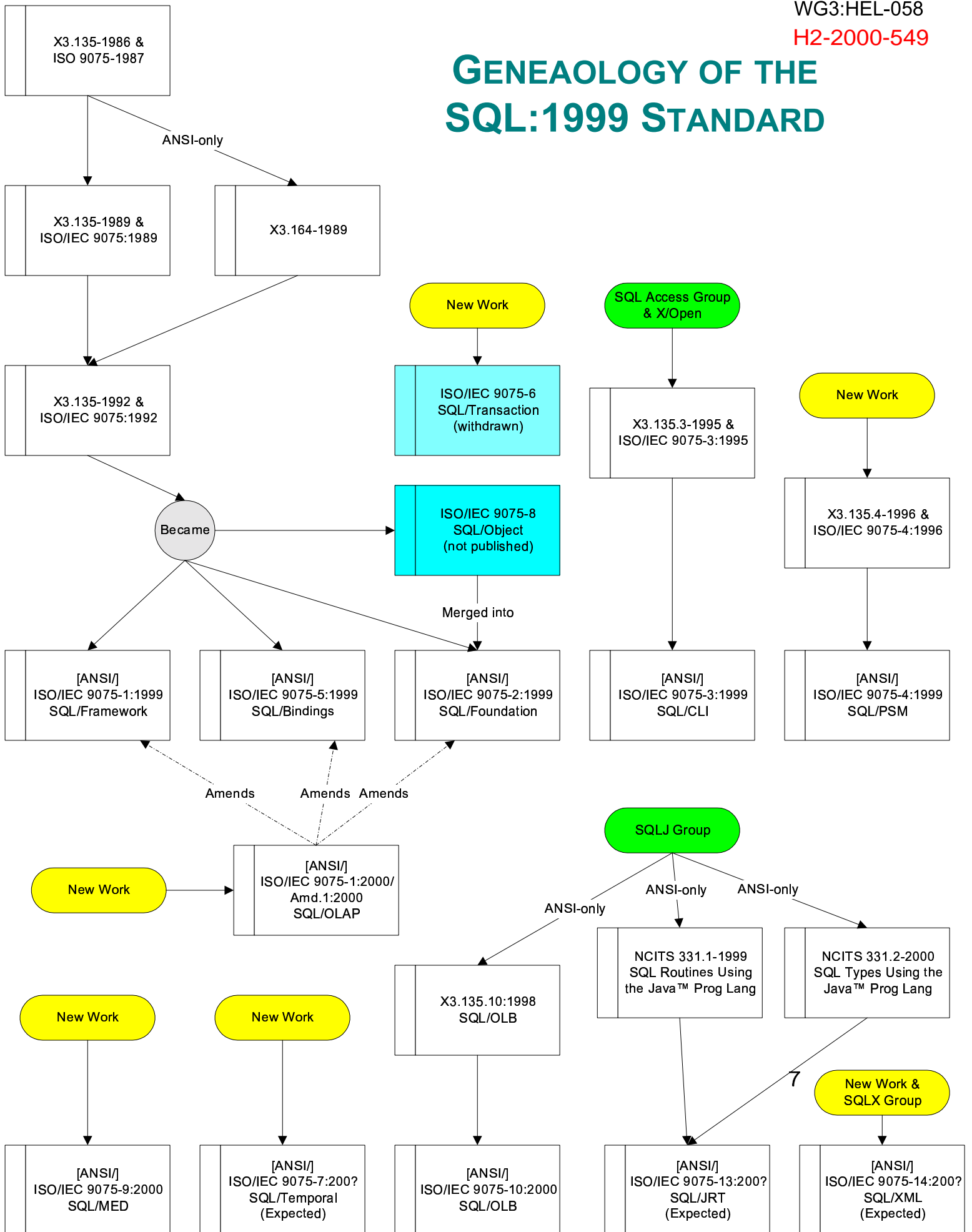
There is open skepticism that the standard is too big and poorly defined, but ANSI/ISO standards have clout!

Government and big business want their software to meet published specs (why?).

## The ANSI/ISO documents...

- SQL/Framework (ISO 9075-1)
- SQL/Foundation (ISO 9075-2)
- SQL/CLI (Call level interface) (ISO 9075-3)
- SQL/PSM (Persistent Storage Modules) (ISO 9075-4)
- SQL/Bindings (ISO 9075-5)
- SQL/Transaction (ISO 9075-6) (withdrawn)
- SQL/Temporal (ISO 9075-7) (expected)
- SQL/Object (ISO 9075-8) (not published)
- SQL/MED (Management of External Data)(ISO 9075-9) (expected)
- SQL/OLB (ISO 9075-10) (Object Language Bindings)
- SQL/SCEMATA (ISO 9075-11) (expected)
- SQL/OLAP (ISO 9075-??)
- SQL/JRT (ISO 9075-13) (expected)
- SQL/XML (ISO 9075-14) (expected)

# GENEALOGY OF THE SQL:1999 STANDARD





- **SQL/Framework (ISO 9075-1) 75 pages**  
common definitions and concepts, structure of multi-part standard. (have copy)
- **SQL/Foundation (ISO 9075-2) 1100 pages**  
This is the most important part of the standard. This has the new data types, predicates, relational operators, cursors, rules and triggers, user-defined types, transaction capabilities, and stored routines. Plus it has old SQL92 (have copy)
- **SQL/CLI (Call level interface) (ISO 9075-3) 400 pages** Execution of binary source codes. Like Dynamic SQL in SQL92 Based on ODBC 3.0 and SQL Access Group. 50 Routines for tasks like connection to server, allocating deallocating resources, diagnostics and implementation information, controlling termination of transactions. (have copy)

- SQL/PSM (Persistent Storage Modules) (ISO 9075-4) 160 pages partitions application between server and client. (have copy)
- SQL/Bindings (ISO 9075-5) 250 pages Embedded SQL and Direct Invocation as in SQL-92. Exception declarations are now included in Embedded SQL. (have copy)
- SQL/Transaction (ISO 9075-6) (withdrawn)  
This was withdrawn and parts were folded into foundation.
- SQL/Temporal (ISO 9075-7) (expected)  
Deals with time series, historical, and other temporal extensions.
- SQL/Object (ISO 9075-8) (not published)  
This too (it appears) has fallen back into foundation.

- SQL/SCEMATA (ISO 9075-11) (expected) (have copy)
- SQL/MED (Management of External Data) (ISO 9075-9) (expected) Seen as way to give SQL access to non-SQL data. (For example flat files, or sensors, etc.)
- SQL/OLB (ISO 9075-10) Based on JDBC. Uses strongly types iterators instead of cursors. (have copy)
- SQL/OLAP (ISO 9075-??)
- SQL/JRT (ISO 9075-13) (expected)
- SQL/XML (ISO 9075-14) (expected)

## LINEAR RECURSION

PART\_TABLE(Part1, Part2)

Part1 contains Part2 as a component. For example “Volvo-121” contains “XY-Motor”.

Bill of Materials query: “give all the parts in a Volvo-121”

```
WITH RECURSIVE
BILL_MATERIAL (Part1, Part2) AS
  (SELECT Part1,Part2
   FROM PART_TABLE
   WHERE Part1 = 'Volvo-121'
   UNION ALL
   SELECT PART_TABLE(Part1), PART_TABLE(Part2)
   FROM BILL_MATERIAL, PART_TABLE
   WHERE PART_TABLE.Part1 = BILL_MATERIAL(Part2))
SELECT * FROM BILL_MATERIAL
ORDER BY Part1, Part2;
```

Horrible syntax! We will treat this more elegantly in the deductive DB section.

# Triggers

Triggers as active rules.

Triggering EVENTS include INSERT, DELETE and UPDATE actions. (May also trigger on temporal conditions or other external events)

Trigger granularity

- row level
- statement level

## Conclusion

- We covered a brief history of the evolving SQL1999 standard.
- Gave a road map of the documents that comprise the standard.
- Covered some additional constructs within SQL1999.