University of Zurich[UZH]

Department of Informatics

University of Zürich
Department of Informatics
Binzmühlestr. 14
CH-8050 Zürich
Phone. +41 44 635 43 11
Fax +41 44 635 68 09
www.ifi.uzh.ch/dbtg

UZH, Dept. of Informatics, Binzmühlestr. 14, CH-8050 Zürich

Mohit Narang

Prof. Dr. Michael Böhlen
Professor
Phone +41 44 635 43 33
Fax +41 44 635 68 09
boehlen@ifi.uzh.ch

Zürich, 13 February 2015

Master-Basismodul
Topic: Integrating *Now* as Variable With Basic Querying Functionality Into PostgreSQL

Temporal databases allow keeping track of time-varying data. Valid time databases allow storing the information when a tuple is valid in the real world. The valid time interval can either be in the past, present, or future.

Now is a constant whose value evolves over time. When used as lower or upper bound of a tuple's valid time it allows modeling that a tuple's valid time changes over time rather than being bounded by two fixed values. The interpretation of *Now* as upper bound is that a tuple's valid time is open-ended. There exists several real-world applications which require *Now* for properly modeling valid times. One application deals with employment contracts: a permanent employment requires an open-ended valid time and thus *Now* as upper bound.

However, existing database systems (DBS) do not provide any functionality concerning *Now* . Therefore, the main goal of this project is to integrate *Now* as variable in one of the existing DBS – PostgreSQL – and provide some basic querying functionality that can deal with *Now* as upper bound of tuples' valid times.

Tasks:

1. Literature study on *Now* in temporal databases [3, 4]
2. Get familiar with the parts of the PostgreSQL kernel needed for implementing *Now*
   Range (interval) specific type definitions and functions are defined and implemented in the following files:
   - Header file: include/utils/rangetypes.h
   - backend/utils/adt/rangetypes.c
3. Implement the physical representation of *Now* and a limited set of query functionality into

the PostgreSQL kernel

- The physical representation of *Now* is a variable (with additional resolving information if needed) rather than a numerical placeholder
- The range data types *daterange*, *tsrange*, and *tstzrange* [2] need to be capable of handling *Now* as lower and/or upper bound
- All range operators of PostgreSQL [1] are supported (i.e., resolving strategy of *Now* as upper and lower bound needs to be implemented) except:
  union, intersection, difference, is adjacent to, contains element, and element is contained by
- *Now* as keyword is preserved in the intervals of a query result

References

[1] http://www.postgresql.org/docs/9.4/static/functions-range.html.

[2] http://www.postgresql.org/docs/9.4/static/rangetypes.html.

[3] Clifford, James and Dyreson, Curtis and Isakowitz, Tomás and Jensen, Christian S. and Snodgrass, Richard Thomas. On the Semantics of Nowïn Databases. *ACM Trans. Database Syst.*, 1997.

[4] Stantic, B. and Thornton, J. and Sattar, A. A novel approach to model NOW in temporal databases. In *Proceedings. 10th International Symposium on Temporal Representation and Reasoning and Fourth International Conference on Temporal Logic.*, 2003.

Supervisor: Yvonne Mülle (muelle@ifi.uzh.ch)

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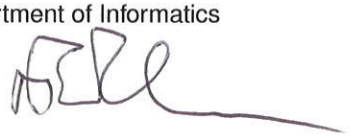

Prof. Dr. Michael Böhlen
Professor