

# Consistency Management In Database Systems: Review

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## Abstract

By its definition, a database must serve as a faithful and incorruptible repository of data. Applications that consult the database expect a "warranty" that the database is supplying the correct values. This survey briefly presents the approaches of integrity constraint management in database systems. It reflects the various research activities in this field. We focus on central approaches, concepts, methods, and systems in this area.

## References

- [1] Malcolm Atkinson, François Bancilhon, David DeWitt, Klaus Dittrich, David Maier and Stanley Zdonik, "The Object-Oriented Database System Manifesto", *Proceedings of the First International Conference on Deductive and Object-Oriented Databases*, Kyoto, Japan, pp. 223-240, 1989,  
[citeseer.nj.nec.com/atkinson89objectoriented.html](http://citeseer.nj.nec.com/atkinson89objectoriented.html).
- [2] Rakesh Agrawal, Shaul Dar and Narain H. Gehani, "The O++ Database Programming Language: Implementation and Experience", *ICDE*, pp. 61-70, 1993,  
[citeseer.nj.nec.com/dar93database.html](http://citeseer.nj.nec.com/dar93database.html).
- [3] R. Agrawal and N. H. Gehani, "ODE (Object Database and Environment): the language and the data model", pp. 36-45, 1989,  
[citeseer.nj.nec.com/agrawal89ode.html](http://citeseer.nj.nec.com/agrawal89ode.html).
- [4] Véronique Benzaken and Xavier Schaefer, "Static Integrity Constraint Management in Object-Oriented Database Programming Languages via Predicate Transformers", *Lecture Notes in Computer Science*, vol. 1241, pp. 60-??, 1977,  
[citeseer.nj.nec.com/article/benzaken97static.html](http://citeseer.nj.nec.com/article/benzaken97static.html).
- [5] Stefano Ceri, Piero Fraternali and Stefano Paraboschi, "Constraint Management in Chimera", *IEEE Data Eng. Bull.*, vol. 17, no. 2, pp. 4-8, 1994.
- [6] Stefano Ceri, Piero Fraternali, Stefano Paraboschi and Letizia Tanca, "Automatic generation of production rules for integrity maintenance", *ACM Trans. Database Syst.*, ACM Press, vol 19, no. 3, pp. 367-422, 1994.

- [7] Stefano Ceri and Rainer Manthey, "Chimera: A Model and Language for Active DOOD Systems", *East/West Database Workshop*, pp. 3-16, 1994, [citeseer.nj.nec.com/ceri94chimera.html](http://citeseer.nj.nec.com/ceri94chimera.html).
- [8] S. Ceri and J. Widom, "Deriving Production Rules for Constraint Maintenance", *Proceedings of the 16th VLDB Conference*, Brisbane, Australia, D. McLeod and R. Sacks-Davis and H. Schek, pp. 566-577, 1990, [citeseer.nj.nec.com/ceri90deriving.html](http://citeseer.nj.nec.com/ceri90deriving.html).
- [9] S. Ceri and J. Widom, "Deriving Production Rules for Incremental View Maintenance", *Proceedings of the 17th Conference on Very Large Databases*, (Los Altos CA), Barcelona, Morgan Kaufman, 1991, [citeseer.nj.nec.com/ceri91deriving.html](http://citeseer.nj.nec.com/ceri91deriving.html).
- [10] C. J. Date, "Database Systems", Addison-Wesley, 2000.
- [11] Umeshwar Dayal, Eric N. Hanson and Jennifer Widom, "Active Database Systems", *Modern Database Systems*, pp. 434-456, 1995, [citeseer.nj.nec.com/dayal94active.html](http://citeseer.nj.nec.com/dayal94active.html).
- [12] K. R. Dittrich and S. Gatzui and A. Geppert, "The Active Database Management System Manifesto: A Rulebase of a ADBMS Features", *Proceedings of the 2nd International Workshop on Rules in Database Systems*, Springer, vol. 985, pp. 3-20, 1995, [citeseer.nj.nec.com/dittrich95active.html](http://citeseer.nj.nec.com/dittrich95active.html).
- [13] M. Fitting, "First-Order Logic and Automated Theorem Proving", SpringerVerlag, 1990.
- [14] Piero Fraternali and Letizia Tanca, "A structured approach for the definition of the semantics of active databases", *ACM Trans. Database Syst.*, ACM Press, vol. 20, no. 4, pp. 414-471, 1995, <http://doi.acm.org/10.1145/219035.219042>.
- [15] Andreas Geppert and Klaus R. Dittrich, "Specification and Implementation of Consistency Constraints in Object-Oriented Database Systems: Applying Programming-by-Contract", *Datenbanksysteme in Buro, Technik und Wissenschaft*, pp. 322-337, 1995, [citeseer.nj.nec.com/geppert95specification.html](http://citeseer.nj.nec.com/geppert95specification.html).
- [16] Stella Gatzui and Andreas Geppert and Klaus R. Dittrich, "The SAMOS active DBMS prototype", pp. 480-480, 1995, [citeseer.nj.nec.com/gatzui94samo.html](http://citeseer.nj.nec.com/gatzui94samo.html).
- [17] N. H. Gehani and H. V. Jagadish, "Ode as an Active Database: Constraints and Triggers", *Proceedings of the 17th Conference on Very Large Databases*, (Los Altos CA), Barcelona, Morgan Kaufman, 1991, [citeseer.nj.nec.com/gehani91ode.html](http://citeseer.nj.nec.com/gehani91ode.html).
- [18] Theodore Hong, "A Survey of Active Database Systems", 1997, [citeseer.nj.nec.com/hong97survey.html](http://citeseer.nj.nec.com/hong97survey.html).
- [19] Ulrike Jaeger and Johann Christoph Freytag, "An Annotated Bibliography on Active Databases", *SIGMOD Record*, vol. 24, no. 1, pp. 58-69, 1995, [citeseer.nj.nec.com/article/jaeger95annotated.html](http://citeseer.nj.nec.com/article/jaeger95annotated.html).
- [20] H. V. Jagadish and X. Qian, "Integrity Maintenance in Object-Oriented Databases", *Proceedings of the 18th Conference on Very Large Databases*, Los Altos CA), Vancouver, Morgan Kaufman, 1992, [citeseer.nj.nec.com/jagadish92integrity.html](http://citeseer.nj.nec.com/jagadish92integrity.html).

- [21] C. Medeiros and M. Andrade, "Implementing Integrity Control in Active Databases", *Implementing Integrity Control in Active Databases . The Journal of Systems and Software*, december, pp. 171-181, 1994,  
[citeseer.nj.nec.com/medeiros94implementing.html](http://citeseer.nj.nec.com/medeiros94implementing.html).
- [22] C. Medeiros and P. Pfeffer, "Object Integrity Using Rules", *n Proceedings European Conference on Object-Oriented Programming*, pp. 219-230, 1991.
- [23] H. Oakasha and S. Conrad and G. Saake, "Consistency management in object-oriented databases", *Concurrency and Computation: Practice and Experience*, vol. 13, no. 11, pp. 955-985, 2001,  
[citeseer.nj.nec.com/296653.html](http://citeseer.nj.nec.com/296653.html).
- [24] Oakasha, H. and Saake, G., " Integrity Independence in Object-Oriented Database Systems ", *Kurzfassungen — 10. Workshop "Grundlagen von Datenbanken", Konstanz (02.06.–05.06.98)*, Universität Konstanz, Fachbereich Informatik, M. H. Scholl and H. Riedel and T. Grust and D. Gluche, no. 63, pp. 94-98, 1998,  
[citeseer.nj.nec.com/oakasha98integrity.html](http://citeseer.nj.nec.com/oakasha98integrity.html).
- [25] N.W. Paton and O. Diaz, " Active Database Systems ", *ACM Computing Surveys*, vol. 1, no. 3, pp. 63-103, 1999,  
[citeseer.nj.nec.com/paton99active.html](http://citeseer.nj.nec.com/paton99active.html).
- [26] K.-D. Schewe, and B. Thalheim, and J.W. Schmidt, and I. Wetzl, "Integrity Enforcement in Object-Oriented Databases", *Proc. 4th Int. Workshop on Foundations of Models and Languages for Data and Objects* , Volkse, Germany, October, pp. 19-22, 1992.
- [27] Susan D. Urban and Lois M. L. Delcambre, "Constraint Analysis: A Design Process for Specifying Operations on Objects", *IEEE Trans. Knowl. Data Eng.*, vol. 2, no. 4, pp. 391-400, 1990.
- [28] Susan D. Urban, Anton P. Karadimce and Ravi B. Nannapaneni, "The Implementation and Evaluation of Integrity Maintenance Rules in an Object-Oriented Database", *Proceedings of the Eighth International Conference on Data Engineering* , Tempe, Arizona, IEEE Computer Society, Forouzan Golshani, pp. 565-572, 1992.
- [29] Susan D. Urban and Mario Desiderio, "CONTEXT: a CONstrainT EXplanation Tool", *Data Knowl. Eng.*, Elsevier Science Publishers B. V., vol. 8, no. 2, pp. 153-183, 1992,  
[http://dx.doi.org/10.1016/0169-023X\(92\)90035-A](http://dx.doi.org/10.1016/0169-023X(92)90035-A) .
- [30] Susan D. Urban and Billy B. L. Lim, "An intelligent framework for active support of database semantics", *nt. J. Expert Syst.*, JAI Press, Inc., vol. 6, no. 1, pp. 1-37, 1993.
- [31] Ullman J. D., Widom J., Garcia-Molina H., "Database Systems: The Complete Book", Prentice Hall, 2001.
- [32] J. Widom, " The Starburst Rule System: Language Design, Implementation, and Applications ", *IEEE Quarterly Bulletin on Data Engineering, Special Issue on Active Databases*, vol. 15, no. 1-4, pp. 15-18, 1992,  
[citeseer.nj.nec.com/widom92starburst.html](http://citeseer.nj.nec.com/widom92starburst.html).
- [33] Jennifer Widom, "The Starburst Active Database Rule System", *Knowledge and Data Engineering*, vol. 8, no. 4, pp. 583-595, 1996,  
[citeseer.nj.nec.com/widom96starburst.html](http://citeseer.nj.nec.com/widom96starburst.html).
- [34] J. Widom and R. Cochrane and B. Lindsay, "Implementing Set-Oriented Production Rules as an Extension to Starburst", *Proceedings of the 17th Conference on Very Large*

*Databases*, (Los Altos CA), Barcelona, Morgan Kaufman, 1991,  
*citeseer.ist.psu.edu/widom91implementing.html*.

- [35] J. Widom and S. J. Finkelstein, "Set-oriented production rules in relational database systems", pp. 259-270, 1990,  
*citeseer.nj.nec.com/widom90setoriented.html*.

## Ամբողջականության ապահովումը տվյալների հենքերում. ակնարկ

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### Անփոփում

Ըստ իր սահմանման տվյալների հենքը պետք է ծառայի որպես տվյալների «վստահելի» եվ «անխոցելի» շտեմարան եվ պետք է ապահովի տվյալների կոռեկտությունը՝ հենքի հետ աշխատող կիրառական ծրագրերի համար: Սույն ակնարկում ներկայացվում են տվյալների հենքերում ամբողջականության սահմանափակումների մշակման մի շարք մոտեցումներ: Այն արտացոլում է այս բնագավառում ներկայումս կատարվող հետազոտական ուղղությունները: