International Standard

ISO/IEC 39075

Information technology — Database languages — GQL

Technologies de l'information — Langages de base de données — GQL

First edition
2024-04

Reference number
ISO/IEC 39075:2024(en)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Tables

Table

Page

Figures

Figure

Page

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see https://www.iso.org/directives or https://www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see https://www.iso.org/iso/foreword.html. In the IEC, see https://www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

Any feedback or questions on this document should be directed to the user's national standards body. https://www.iso.org/members.html and https://www.iec.ch/national-committees.

Introduction

This document defines GQL, a database language for modeling structured data as a graph, and for storing, querying, and modifying that data in a graph database or other graph store. There are two major graph data models in current use: the Resource Description Framework (RDF) model and the Property Graph model. The RDF model has been standardized by W3C in a number of specifications. GQL addresses the Property Graph model.

Property graphs organize data as entities called nodes (or, alternatively, vertices) and edges (or, alternatively, relationships). Each graph element (a node or an edge) can have associated labels and properties. The flexibility and intuitiveness of the data model and its emphasis on interconnections between graph elements make property graphs suitable for storing complex knowledge and for analytical tasks such as entity resolution, fraud detection, cyber security, and forecasting.

GQL is declarative and transactional, taking inspiration from SQL and from leading independently-developed property graph languages. Property graphs select data primarily through path pattern matching. Defining path pattern searches in a graph is often simpler or more flexible than defining the equivalent joins in SQL. The flexible data model, the availability of path pattern matching, and the efficiency of traversing edges compared to joining tables have led to increasing interest in property graph databases.

Various graph data models have been around for many decades, but it is only since the early 21st century that the demand has driven the rise of commercial graph database and graph analytical systems for property graphs.

GQL provides a standard yet flexible common language for this growing market. GQL supports the same graph pattern matching syntax as SQL Property Graph Queries, ISO/IEC 9075-16, Information technology — Database languages SQL— Part 16: Property Graph Queries (SQL/PGQ). While SQL/PGQ provides the property graph data model and graph pattern matching on top of a relational SQL database, GQL is intended for pure property graphs that provide graph data management independent from SQL.

Information technology — Database languages — GQL

1 Scope

This document defines data structures and basic operations on property graphs. It provides capabilities for creating, accessing, querying, maintaining, and controlling property graphs and the data they comprise.

This document specifies the syntax and semantics of a data management language for specifying and modifying the structure of property graphs and collections thereof. This document provides a vehicle for portability of data definitions and manipulation among GQL-implementations.

Implementations of this document can exist in environments that also support application programming languages, end-user query facilities, and various tools for database design, data administration, and performance optimization.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601-1:2019, *Date and time — Representations for information interchange — Part 1: Basic rules*

ISO 8601-2:2019, *Date and time — Representations for information interchange — Part 2: Extensions*

ISO/IEC 9075-2:2023, *Information technology — Database languages — SQL — Part 2: Foundation (SQL/Foundation)*

ISO/IEC 14651:2020, *Information technology — International string ordering and comparison — Method for comparing character strings and description of the common template tailorable ordering*

IEEE Std 754:2019, *IEEE Standard for Floating-Point Arithmetic*

Internet Engineering Task Force (IETF) RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*. Edited by: Berners-Lee, T., Fielding, R., Masinter, L. January 2005
Available at: `https://www.ietf.org/rfc/rfc3986.txt`

Kuhn, Markus. *Coordinated Universal Time with Smoothed Leap Seconds (UTC-SLS)* [online]. University of Cambridge: IETF, January 2006 . Available at `https://tools.ietf.org/html/-draft-kuhn-leapsecond-00`

The Unicode Consortium. *The Unicode Standard (Information about the latest version of the Unicode standard can be found by using the "Latest Version" link on the "Enumerated Versions of The Unicode Standard" page.)* [online]. Mountain View, California, USA: The Unicode Consortium, Available at `https://www.unicode.org/versions/enumeratedversions.html`

The Unicode Consortium. *Unicode Collation Algorithm* [online]. Mountain View, California, USA: The Unicode Consortium, Available at `https://www.unicode.org/reports/tr10/`

The Unicode Consortium. *Unicode Normalization Forms* [online]. Mountain View, California, USA: The Unicode Consortium, Available at `https://www.unicode.org/reports/tr15/`

The Unicode Consortium. *Unicode Identifier and Pattern Syntax* [online]. Mountain View, California, USA: The Unicode Consortium, Available at `https://www.unicode.org/reports/tr31/`

van Kesteren, A. *URL Living Standard* [online]. [Place of publication unknown]: WHATWG, Available at `https://url.spec.whatwg.org`