SAP HANA Graph Reference 1.0 SPS 12 ▼

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SAP HANA Graph Data Model 8.9

Graphs are a powerful abstraction that can be used to model different kinds of networks and linked data coming from many industries, such as logistics and transportation, utility networks, knowledge representation, text processing, and so on.

In SAP HANA, a graph is a set of vertices and a set of edges. Each edge connects two vertices; one vertex is denoted as the source and the other as the target. Edges are always directed and there can be two or more edges connecting the same two vertices. Vertices and edges can have an arbitrary number of attributes. A vertex attribute consists of a name that is associated with a data type and a value. Edge attributes consist of the same information.

The following image provides an example of a graph in which vertices represent Greek mythology members and edges represent the relationships among them. All vertices have attributes "NAME" (shown in the image) and "TYPE" (shown in the image). "TYPE" takes one of the following values: 'primordial deity', 'god', 'titan'. Some vertices have an attribute "RESIDENCE" (not shown in the image). All edges have attributes "KEY" (not shown in the image) and "TYPE", which takes one of the following values: 'marriedTo', 'hasSon', and 'hasDaugther'.
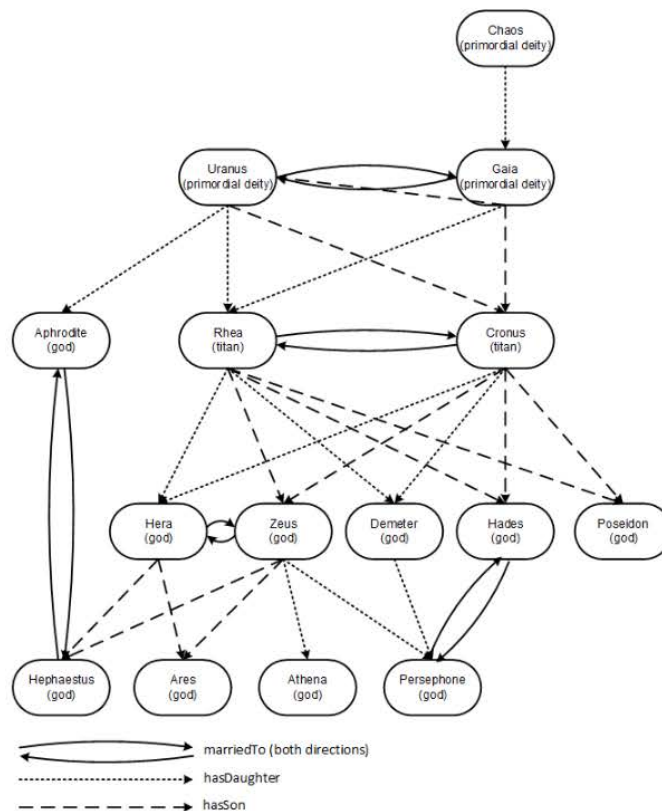
The primary storage of a graph are two relational objects that can be tables or views or table or view synonyms. We will refer to them as vertex table and edge table for the sake of simplicity. The vertex table stores the set of vertices and the edge table stores the set of edges. Vertex attributes match to columns of the vertex table. Edge attributes match to columns of the edge table. The maximum number of attributes is bound by the maximum number of columns for the underlying tables (for more information, see *SAP HANA SQL and System Views Reference*). One of the vertex attributes must uniquely identify vertices. This attribute is also referred to as a vertex key. Similarly, one of the edge attributes must uniquely identify edges and is referred to as edge key. The edge table contains two additional columns referencing the key column of the vertex table. One of them identifies the source vertex and the other identifies the target vertex of an edge.

The following tables show the tabular storage of the Greek mythology graph.

Table 1: "GREEK_MYTHOLOGY"."MEMBERS"

NAME (Unique Key)	TYPE	RESIDENCE
Cronus	titan	Tartarus

Rhea	titan	Tartarus
Zeus	god	Olympus
Hades	god	Underworld
...	...	...

Table 2: "GREEK_MYTHOLOGY"."RELATIONSHIPS"

KEY (Unique Key)	SOURCE	TARGET	TYPE
1	Cronus	Rhea	marriedTo
2	Rhea	Cronus	marriedTo
3	Cronus	Zeus	hasSon
4	Rhea	Zeus	hasSon
...	...	...	...

Relational storage allows all the functions of SAP HANA to be applied to the graph data: access control, backup and recovery, etc. It also allows all SAP HANA Graph functions to be applied to the graph data stored in relational format coming from business applications. SAP HANA Graph provides a dedicated catalog object, which is referred to as a graph workspace, for defining a graph in terms of the existing SAP HANA tables.