郑州轻工业学院

本科毕业设计（论文）

——英文翻译

题　　目　RDF 1.1 基础

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完成时间　2014 年 4 月 1 日

英文原文

RDF 1.1 Primer

W3C Working Group Note 25 February 2014

Abstract

This primer is designed to provide the reader with the basic knowledge required to effectively use RDF. It introduces the basic concepts of RDF and shows concrete examples of the use of RDF. Secs. 3-5 can be used as a minimalist introduction into the key elements of RDF. Changes between RDF 1.1 and RDF 1.0 (2004 version) are summarized in a separate document: "What's New in RDF 1.1" [RDF11-NEW].

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This document is part of the RDF 1.1 document suite. It is an informative note on the key concepts of RDF. For a normative specification of RDF 1.1 the reader is referred to the RDF 1.1. Concepts and Abstract Syntax document [RDF11-CONCEPTS].

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This document was produced by a group operating under the 5 February 2004 W3C

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1. Introduction

The Resource Description Framework (RDF) is a framework for expressing information about resources. Resources can be anything, including documents, people, physical objects, and abstract concepts.

RDF is intended for situations in which information on the Web needs to be processed by applications, rather than being only displayed to people. RDF provides a common framework for expressing this information so it can be exchanged between applications without loss of meaning. Since it is a common framework, application designers can leverage the availability of common RDF parsers and processing tools. The ability to exchange information between different applications means that the information may be made available to applications other than those for which it was originally created.

In particular RDF can be used to publish and interlink data on the Web. For example, retrieving http://www.example.org/bob#me could provide data about Bob, including the fact that he knows Alice, as identified by her IRI (an IRI is an "International Resource Identifier"; see Sec. 3.2 for details). Retrieving Alice's IRI could then provide more data about her, including links to other datasets for her friends, interests, etc. A person or an automated process can then follow such links and aggregate data about these various things. Such uses of RDF are often qualified as Linked Data [LINKED-DATA].

This document is not normative and does not give a complete account of RDF 1.1. Normative specifications of RDF can be found in the following documents:

- A document describing the basic concepts underlying RDF, as well as abstract syntax ("RDF Concepts and Abstract Syntax") [RDF11-CONCEPTS]
- A document describing the formal model-theoretic semantics of RDF ("RDF Semantics") [RDF11-MT]

Specifications of serialization formats for RDF:

Turtle [TURTLE] and TriG [TRIG]

JSON-LD [JSON-LD] (JSON based)

RDFa [RDFA-PRIMER] (for HTML embedding)

N-Triples [N-TRIPLES] and N-Quads [N-QUADS] (line-based exchange formats)

RDF/XML [RDF11-XML] (the original 2004 syntax, updated for RDF 1.1)

A document describing RDF Schema [RDF11-SCHEMA], which provides a data-modeling vocabulary for RDF data.

2. Why Use RDF?

The following illustrates various different uses of RDF, aimed at different communities of practice.

- Adding machine-readable information to Web pages using, for example, the popular schema.org vocabulary, enabling them to be displayed in an enhanced format on search engines or to be processed automatically by third-party applications.
- Enriching a dataset by linking it to third-party datasets. For example, a dataset about paintings could be enriched by linking them to the corresponding artists in Wikidata, therefore giving access to a wide range of information about them and related resources.
- Interlinking API feeds, making sure that clients can easily discover how to access more information.
- Using the datasets currently published as Linked Data [LINKED-DATA], for example building aggregations of data around specific topics.
- Building distributed social networks by interlinking RDF descriptions of people across multiple Web sites.
- Providing a standards-compliant way for exchanging data between databases.
- Interlinking various datasets within an organisation, enabling cross-dataset queries to be performed using SPARQL [SPARQL11-OVERVIEW].

3. RDF Data Model

3.1 Triples

RDF allows us to make statements about resources. The format of these statements is simple. A statement always has the following structure:

<subject> <predicate> <object>

An RDF statement expresses a relationship between two resources. The subject and the object represent the two resources being related; the predicaterepresents the nature of their relationship. The relationship is phrased in a directional way (from subject to object) and is called in RDF a property. Because RDF statements consist of three elements they are called triples.

Here are examples of RDF triples (informally expressed in pseudocode):

EXAMPLE 1: Sample triples (informal)

<Bob> <is a> <person>.

<Bob> <is a friend of> <Alice>.

<Bob> <is born on> <the 4th of July 1990>.

<Bob> <is interested in> <the Mona Lisa>.

<the Mona Lisa> <was created by> <Leonardo da Vinci>.

<the video 'La Joconde àWashington'> <is about> <the Mona Lisa>

The same resource is often referenced in multiple triples. In the example above, Bob is the subject of four triples, and the Mona Lisa is the subject of one and the object of two triples. This ability to have the same resource be in the subject position of one triple and the object position of another makes it possible to find connections between triples, which is an important part of RDF's power.

We can visualize triples as a connected graph. Graphs consists of nodes and arcs. The subjects and objects of the triples make up the nodes in the graph; the predicates form the arcs. Fig. 1 shows the graph resulting from the sample triples.

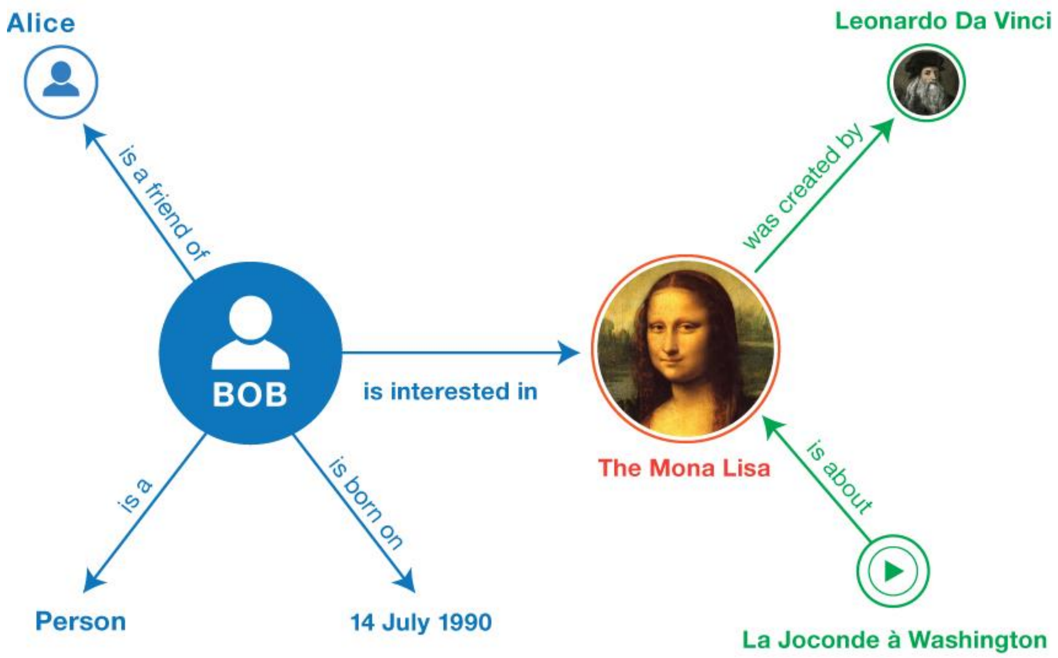

Fig. 1 Informal graph of the sample triples

Once you have a graph like this you can use SPARQL [SPARQL11-OVERVIEW] to query for e.g. people interested in paintings by Leonardo da Vinci.

The RDF Data Model is described in this section in the form of an "abstract syntax", i.e. a data model that is independent of a particular concrete syntax (the syntax used to represent triples stored in text files). Different concrete syntaxes may produce exactly the same graph from the perspective of the abstract syntax. The semantics of RDF graphs [RDF11-MT] are defined in terms of this abstract syntax. Concrete RDF syntax is introduced later in Sec. 5.

In the next three subsections we discuss the three types of RDF data that occur in triples: IRIs, literals and blank nodes.

3.2 IRIs

The abbreviation IRI is short for "International Resource Identifier". An IRI identifies a resource. The URLs (Uniform Resource Locators) that people use as Web addresses are one form of IRI. Other forms of IRI provide an identifier for a resource without implying its location or how to access it. The notion of IRI is a generalization of URI (Uniform Resource Identifier), allowing non-ASCII characters to be used in the IRI character string. IRIs are specified in RFC 3987 [RFC3987].

IRIs can appear in all three positions of a triple.

As mentioned, IRIs are used to identify resources such as documents, people, physical objects, and abstract concepts. For example, the IRI for Leonardo da Vinci in DBpedia is:

http://dbpedia.org/resource/Leonardo_da_Vinci

The IRI for an INA video about the Mona Lisa entitled 'La Joconde à Washington' in Europeana is:

http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619

IRIs are global identifiers, so other people can re-use this IRI to identify the same thing. For example, the following IRI is used by many people as an RDF property to state an acquaintance relationship between people:

http://xmlns.com/foaf/0.1/knows

RDF is agnostic about what the IRI represents. However, IRIs may be given meaning by particular vocabularies or conventions. For example, DBpedia uses IRIs of the form http://dbpedia.org/resource/Name to denote the thing described by the corresponding Wikipedia article.

3.3 Literals

Literals are basic values that are not IRIs. Examples of literals include strings such as "La Joconde", dates such as "the 4th of July, 1990" and numbers such as "3.14159". Literals are associated with a datatype enabling such values to be parsed and interpreted correctly. String literals can optionally be associated with a language tag. For example, "Léonard de Vinci" could be associated with the "fr" language tag and "李奥纳多•达•文西" with the "zh" language tag.

Literals may only appear in the object position of a triple.

The RDF Concepts document provides a (non-exhaustive) list of datatypes. This includes many datatypes defined by XML Schema, such as string, boolean, integer, decimal and date.

3.4 Blank nodes

IRIs and literals together provide the basic material for writing down RDF statements. In addition, it is sometimes handy to be able to talk about resources without bothering to use a global identifier. For example, we might want to state that the Mona Lisa painting has in its background an unidentified tree which we know to be a cypress tree. A resource without a global identifier, such as the painting's cypress tree, can be represented in RDF by a blank nodes. Blank nodes are like simple variables in algebra; they represent some thing without saying what their value is.

Blank nodes can appear in the subject and object position of a triple. They can be used to denote resources without explicitly naming them with an IRI.

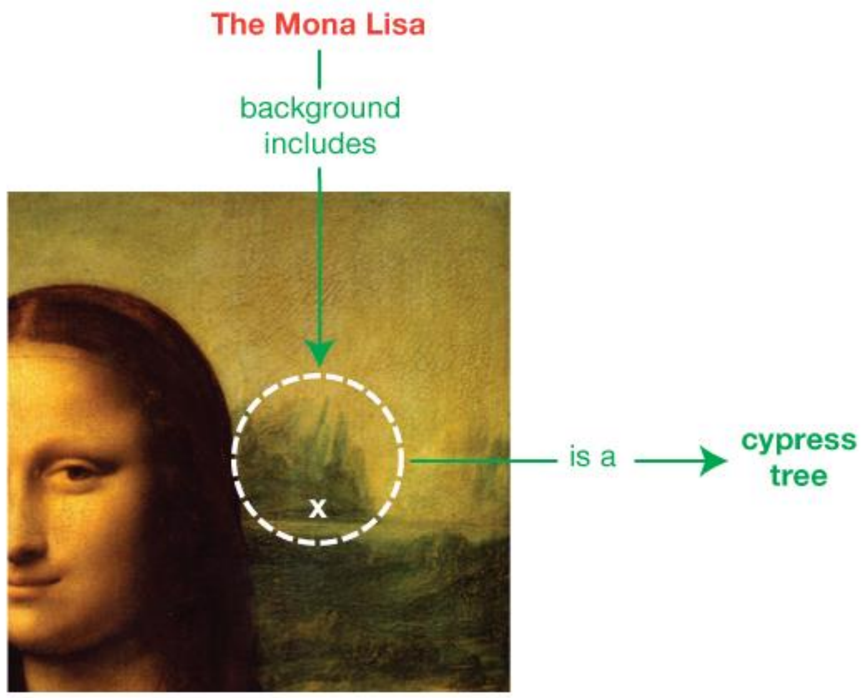

Fig. 2 Informal blank node example: the background of the Mona Lisa depicts an unnamed resource that belongs to the class of cypress trees.

3.5 Multiple graphs

RDF provides a mechanism to group RDF statements in multiple graphs and associate such graphs with an IRI . Multiple graphs are a recent extension of the RDF data model. In practice, RDF tool builders and data managers needed a mechanism to talk about subsets of a collection of triples. Multiple graphs were first introduced in the RDF query language SPARQL. The RDF data model was therefore extended with a notion of multiple graphs that is closely aligned with SPARQL.

Multiple graphs in an RDF document constitute an RDF dataset. An RDF dataset may have multiple named graphs and at most one unnamed ("default") graph.

For example, the statements in Example 1 could be grouped in two named graphs. A first graph could be provided by a social networking site and identified byhttp://example.org/bob:

EXAMPLE 2: First graph in the sample dataset

<Bob> <is a> <person>.

<Bob> <is a friend of> <Alice>.

<Bob> <is born on> <the 4th of July 1990>.

<Bob> <is interested in> <the Mona Lisa>.

The IRI associated with the graph is called the graph name.

A second graph could be provided by Wikidata and identified by https://www.wikidata.org/wiki/Special:EntityData/Q12418:

EXAMPLE 3: Second graph in the sample dataset

<Leonardo da Vinci> <is the creator of> <the Mona Lisa>.

<The video 'La Joconde àWashington'> <is about> <the Mona Lisa>

Below is an example of an unnamed graph. It contains two triples that have the graph name <http://example.org/bob> as subject. The triples associate publisher and license information with this graph IRI:

EXAMPLE 4: Unnamed graph in the sample dataset

<http://example.org/bob> <is published by> <http://example.org>.

<http://example.org/bob> <has license> <http://creativecommons.org/licenses/by/3.0/>.

In this example dataset we assume graph names represent the source of the RDF data held within the corresponding graphs, i.e. by retrieving<http://example.org/bob> we would get access to the four triples in that graph.

NOTE

RDF provides no standard way to convey this semantic assumption (i.e., that graph names represent the source of the RDF data) to other readers of the dataset. Those readers will need to rely on out-of-band knowledge, such as established community practice, to interpret the dataset in the intended way. Possible semantics of datasets are described in a separate note [RDF11-DATASETS].

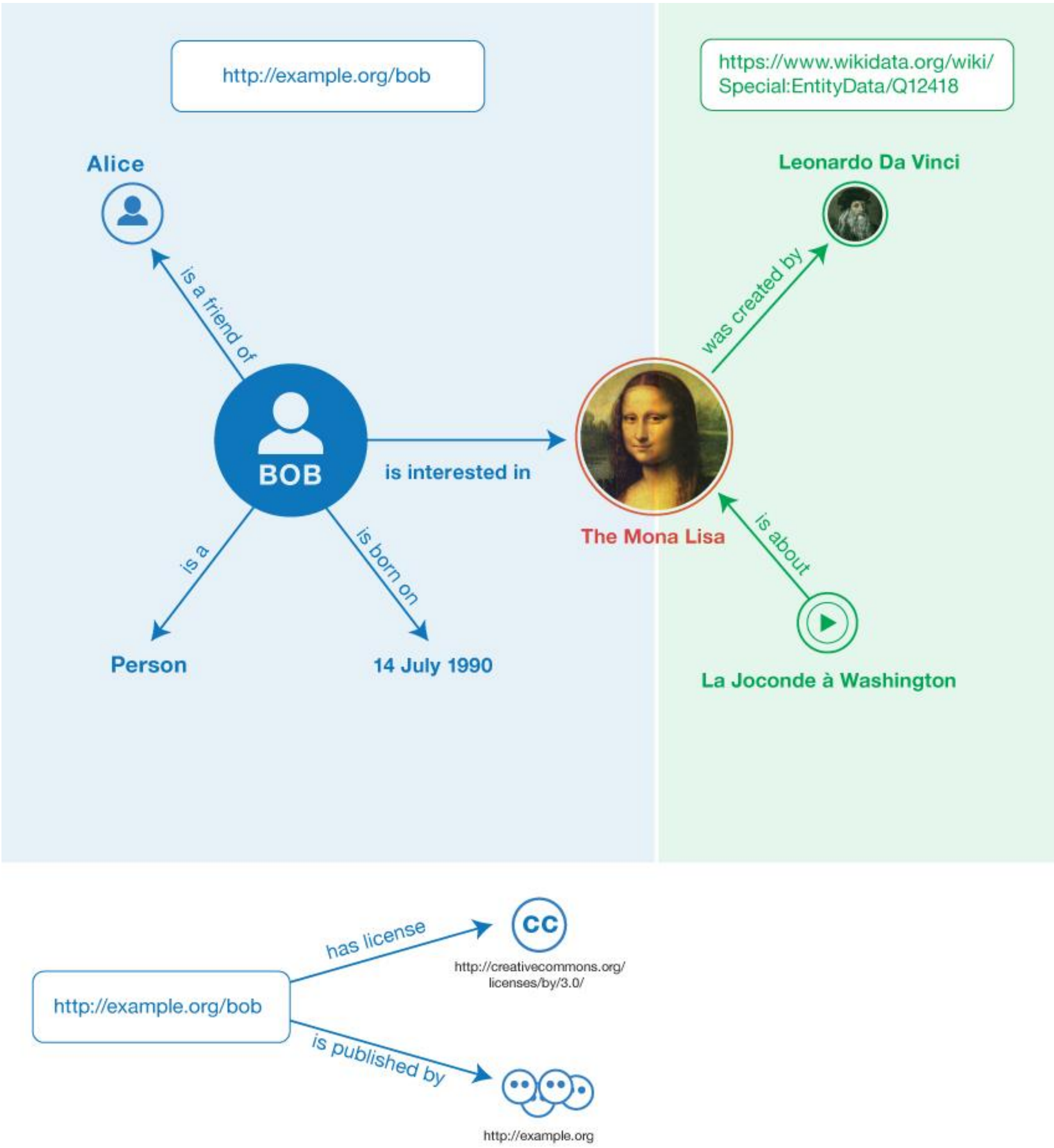

Fig.3 Informal graph of the sample dataset

Sec.5.1.3 provides an example of concrete syntax for this graph.

4. RDF Vocabularies

The RDF data model provides a way to make statements about resources. As we mentioned, this data model does not make any assumptions about what resource IRIs stand for.

In practice, RDF is typically used in combination with vocabularies or other conventions that provide semantic information about these resources.

To support the definition of vocabularies RDF provides the RDF Schema language [RDF11-SCHEMA]. This language allows one to define semantic characteristics of RDF data. For example, one can state that the IRI http://www.example.org/friendOf can be used as a property and that the subjects and objects of http://www.example.org/friendOf triples must be resources of class http://www.example.org/Person.

RDF Schema uses the notion of **class** to specify categories that can be used to classify resources. The relation between an instance and its class is stated through the **type** property. With RDF Schema one can create hierarchies of classes and sub-classes and of properties and sub-properties. Type restrictions on the subjects and objects of particular triples can be defined through **domain** and **range** restrictions. An example of a domain restriction was given above: subjects of "friendOf" triples should be of class "Person".

The main modeling constructs provided by RDF Schema are summarized in the table below:

Table 1: RDF Schema Constructs

Construct	Syntactic form	Description
Class (a class)	C rdf:type rdfs:Class	C (a resource) is an RDF class
Property (a class)	P rdf:type rdf:Property	P (a resource) is an RDF property
type (a property)	I rdf:type C	I (a resource) is an instance of C (a class)
subClassOf (a property)	C1 rdfs:subClassOf C2	C1 (a class) is a subclass of C2 (a class)
subPropertyOf (a property)	P1 rdfs:subPropertyOf P2	P1 (a property) is a sub-property of P2 (a property)
domain (a property)	P rdfs:domain C	domain of P (a property) is C (a class)
range (a property)	P rdfs:range C	range of P (a property) is C (a class)

NOTE

The syntactic form (second column) is in a prefix notation wich is discussed in more detail in Sec.5. The fact that the constructs have two different prefixes (rdf:and rdfs:) is a somewhat annoying historical artefact, which is preserved for backward compatibility.

With the help of RDF Schema one can build a model of RDF data. A simple informal example:

EXAMPLE 5: RDF Schema triples (informal)

<Person> <type> <Class>

<is a friend of> <type> <Property>

<is a friend of> <domain> <Person>

<is a friend of> <range> <Person>

<is a good friend of> <subPropertyOf> <is a friend of>

Note that, while <is a friend of> is a property typically used as the predicate of a triple (as it was in Example 1), properties like this are themselves resources that can be described by triples or provide values in the descriptions of other resources. In this example, <is a friend of> is the subject of triples that assign type, domain, and range values to it, and it is the object of a triple that describes something about the <is a good friend of> property.

One of the first RDF vocabularies used worldwide was the "Friend of a Friend" (FOAF) vocabulary for describing social networks. Other examples of RDF vocabularies are:

Dublin Core

The Dublin Core Metadata Initiative maintains a metadata element set for describing a wide range of resources. The vocabulary provides properties such as "creator", "publisher" and "title".

schema.org

Schema.org is a vocabulary developed by a group of major search providers. The idea is that webmasters can use these terms to mark-up Web pages, so that search engines understand what the pages are about.

SKOS

SKOS is a vocabulary for publishing classification schemes such as terminologies and thesauri on the Web. SKOS is since 2009 a W3C recommendation and is widely used in the library world. The Library of Congress published its Subject Headings as a SKOS vocabulary.

Vocabularies get their value from reuse: the more vocabulary IRIs are reused by others, the more valuable it becomes to use the IRIs (the so-called network effect). This means you should prefer re-using someone else's IRI instead of inventing a new one.

For a formal specification of the semantics of the RDF Schema constructs the reader is referred to the RDF Semantics document [RDF11-MT]. Users interested in more comprehensive semantic modeling of RDF data might consider using OWL [OWL2-OVERVIEW]. OWL is an RDF vocabulary, so it can be used in combination with RDF Schema.

RDF 1.1 基础

W3C 工作组编译 2014 年 2 月 25 日

摘　要

本文的目的是为读者提供有效地使用 RDF 所需的基本知识。它介绍了 RDF 的基本概念并且列举了使用 RDF 的具体示例。第 3-5 部分使用简单方式引入了 RDF 的关键元素。RDF 1.0（2014 年版本）到 RDF1.1 的变更被总结到单独地文件：“什么是新 RDF 1.1”[RDF11-NEW]。

文档状态

这部分描述了本文档在其发布时所处的状态。其他的相关文档可以取代本文档。当前 W3C 的出版物和最新修订的技术报告可以在 W3C 技术报告指数查询，网址为：http://www.w3.org/TR/。

本文档是 RDF1.1 系列文档的一部分，它使用大量的篇幅介绍 RDF 的关键概念。关于更多 RDF 1.1 的规范，读者可以参照《RDF 1.1. Concepts and Abstract Syntax》[RDF11-CONCEPTS]。

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1. 前言

资源描述框架（Resource Description Framework,RDF）是一个用来描述资源的资源信息的框架。这里的资源可以是任何形式的，包括文档、人物、物体和其他抽象的概念。

RDF 使用的目的是方便 WEB 应用程序处理信息，而不是显示给普通个人。RDF 提供了一个通用信息资源的描述框架，所以资源可以在应用之间相互传递而不改变意义。因为 RDF 是一个常用框架，所以程序员可以利用常用的 RDF 解析器和处理工具处理

RDF 文件。由于资源信息可以在不同的应用之间传递，这就使资源可以在非创建者之外使用成为了可能。

特别指出的是 RDF 可以在互联网上发布和链接数据。例如，检索网址 http://www.example.org/bob#me 可以获取关于 Bob 的信息，包括他认识 Alice 的事实，通过 Alice 的 IRI（IRI 是 International Resource Identifier 的缩写，国际资源标识符。详情参考第 3.2 章。）来断定。检索 Alice 的 IRI 可以获取关于她的更多信息，包括链接到她朋友、爱好等等的数据集。普通个人或自动程序可以跟随这些链接并且收集各种信息。如此使用 RDF 通常被称为数据链接[LINKED-DATA]。

本文档不是一个规范，也不是 RDF1.1 的完整文档。RDF 的规范文档列举如下：

规范 RDF 基本概念和抽象语句的文档《RDF Concepts and Abstract Syntax》[RDF11-CONCEPTS]

规范 RDF 语义模型的文档《RDF Semantics》[RDF11-MT]。

规范 RDF 序列化格式：

Turtle [TURTLE] and TriG [TRIG]

JSON-LD [JSON-LD] (JSON based)

RDFa [RDFA-PRIMER] (for HTML embedding)

N-Triples [N-TRIPLES] and N-Quads [N-QUADS] (line-based exchange formats)

RDF/XML [RDF11-XML] (the original 2004 syntax, updated for RDF 1.1)

规范 RDF 模式的文档[RDF11-SCHEMA]，它提供了 RDF 数据词汇的文档。

2. 应用背景

下面针对 RDF 不同的使用背景，展示 RDF 的不同用途。

向 Web 页面添加机器可读的信息。例如，有著名 schema.org 提供的词汇，能使他们在搜索引擎上以突出的格式显示或被第三方应用层出自动处理。

通过连接到第三方数据库丰富数据集。例如，一个关于绘画的数据集可以通过链接到 Wikidata 丰富相关联的艺术品。

提供互联的 API，确保用户可以更容易地获取更多的信息。

使用 Linked Data [LINKED-DATA]发布的最新数据集。例如，构建指定主题的数据聚合。

跨多个 Web 网站构建分布式社交网络的互连 RDF。

提供符合标准数据库交换的中间数据。

连接同一组织中的不同数据集，让在不同数据集之间使用 SPARQL[SPARQL11-OVERVIEW]检索数据成为可能。

3. RDF 数据模型

3.1 三元组

RDF 允许我们对资源进行声明。该声明的格式十分简单。声明通常具有如下结构：

<主语> <谓词> <宾语>

一个 RDF 的语法表明两个资源之间的关系。主语和宾语代表了两个相关的资源，谓词表示了他们之间关系的性质。该关系被指定的方式表达（从主语到谓词），被称为 RDF 的属性。因此，RDF 语句包含的三个元素被称为三元组。

下面是 RDF 三元组的示例（使用非正式的伪码表示）：

例 1：三元组实例（非正式的）

<Bob> <is a> <person>.

<Bob> <is a friend of> <Alice>.

<Bob> <is born on> <the 4th of July 1990>.

<Bob> <is interested in> <the Mona Lisa>.

<the Mona Lisa> <was created by> <Leonardo da Vinci>.

<the video 'La Joconde à Washington'> <is about> <the Mona Lisa>

相同的资源通常参照多个三元组。在上面的例子中，Bob 是四个三元组的主语，Mona Lisa 是一个三元组的主语和两个三元组的谓词。在一个三元组做主语和在另一个三元组做谓词具有表述相同资源的能力，是我们连接这两个三元组成为可能，这是 RDF 的重要组成部分。

我们可以把三元组想象成一个连通图（connected graph）。该图有节点和弧组成，三元组的主语和宾语组成了图的节点，谓词组成了图的弧。图 1 是由例 1 的三元组产生的连通图。

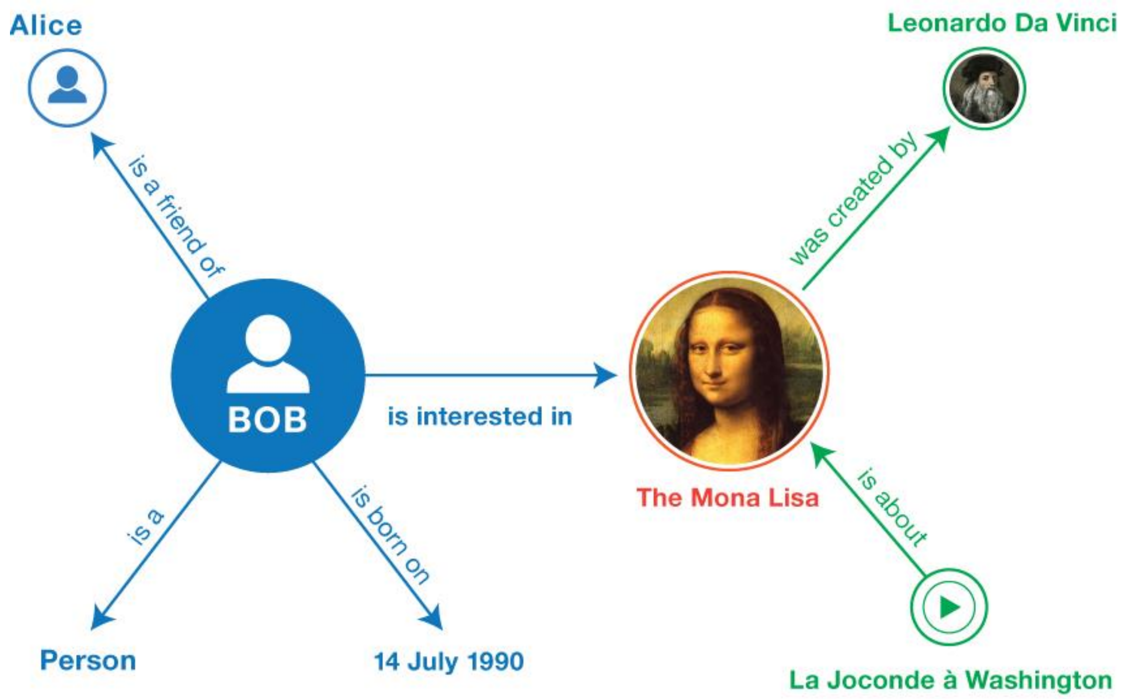

图. 1.　非正式的三元组连通图(例 1)

当你有像这样的连通图后，你就可以使用 SPASQL[SPARQL11-OVERVIEW]来查询，例如谁对达芬奇的绘画感兴趣。

本章介绍 RDF 数据模型的“抽象语法”，即数据模型独立于一个特定的具体的语法（该语法用来表述存储在文件中的三元组）。从语法抽象的角度看，不同的语法可能产生完全相同的连通图。RDF 连通图的语义[RDF11-MT]被定义为这种抽象语法。具体的 RDF 语法将在第五章中介绍。

下面我们分三部分，分别讨论与三元组有关的三种 RDF 数据类型：国际资源标识符(IRIs), literals 和空节点（blank nodes）。

3.2 国际资源标识符(IRIs)

IRI 是“国际资源标识符”的简称。一个 IRI 用来识别资源。人们使用的 URLs（统一资源定位符）作为网络地址，也是 IRI 的一种形式。其他形式的 IRI 为资源提供了一种标识，但并没有包含它们的位置和如何访问。IRI 意图泛化 URL（统一资源标识符），允许 IRI 使用非 ASCII（美国信息交换标准码）的字符串。IRIs 的详情信息请参考 RFC 3987[RFC3987]。

IRIS 可以使用三元组来表示。

综上所述，IRIS 被用来标示资源，如文档，人，物体和抽象的概念等。例如，达芬奇（Leonardo da Vinci）在 DBpedia 中的 IRI 是：

http://dbpedia.org/resource/Leonardo_da_Vinci

一个关于蒙娜丽莎（Mona Lisa）题目为 La Joconde à Washington 在 INA 上的视频，在 Europeana 的 IRI 是：

http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619

IRIs 是一个全局标识符，所以人们可以重用该 IRI 来标识同一个事物。例如，下面的 IRI 被很多人作为一个 RDF 属性来表示两个人之间的属性程度：

http://xmlns.com/foaf/0.1/knows

RDF 并不知道 IRI 代表的意义。然而，IRIs 可以通过特别的词汇或约定表示所代表的意义。例如：DBpedia 使用来自 http://dbpedia.org/resource/Name 的 IRIs 来表示维基百科的文章。

3.3 常量（Literals）

常量是基本数据而不是 IRIs。常量的例子包括形如“La Joconde”的字符串，形如“the 4th of July, 1990”的时间表示，形如“3.14159”的数字。常量被赋予一个数据类型，这样这些数据才能被正确的解析或解释。字符型的常量可以与一个可选地语言标签（language tag）相关联。例如，“Léonard de Vinci”可以与“法语”标签相关联，“李奥纳多·达·文西”可以与“中文”标签相关联。

常量仅在三元组的宾语位置出现。

RDF 的概念文档提供了一系列的数据类型（尚不完整）。它包含了许多已被 XML 模式定义的数据类型，例如，字符型，布尔型，整形，浮点型和日期型。

3.4 空节点（Blank nodes）

IRIs 和常量一起提供了书写 RDF 语句的基本元素。另外，有时候不得不厌烦的使用一个全局标识符来描述简单的资源。例如，我想说蒙娜丽莎背后有个棵不确定的树，我们知道那是一棵柏树（a cypress tree）。如果一个资源没有一个全局标识符，比如画中的柏树，在 RDF 中可以使用另一个空节点（blank nodes）表示。空节点就像代数中的变

量一样，它们代表着那些没有被指出的事物。

空节点可以出现在三元组的主语和宾语的位置。它们可以用来表示没有被明确的 IRI 代表的资源。

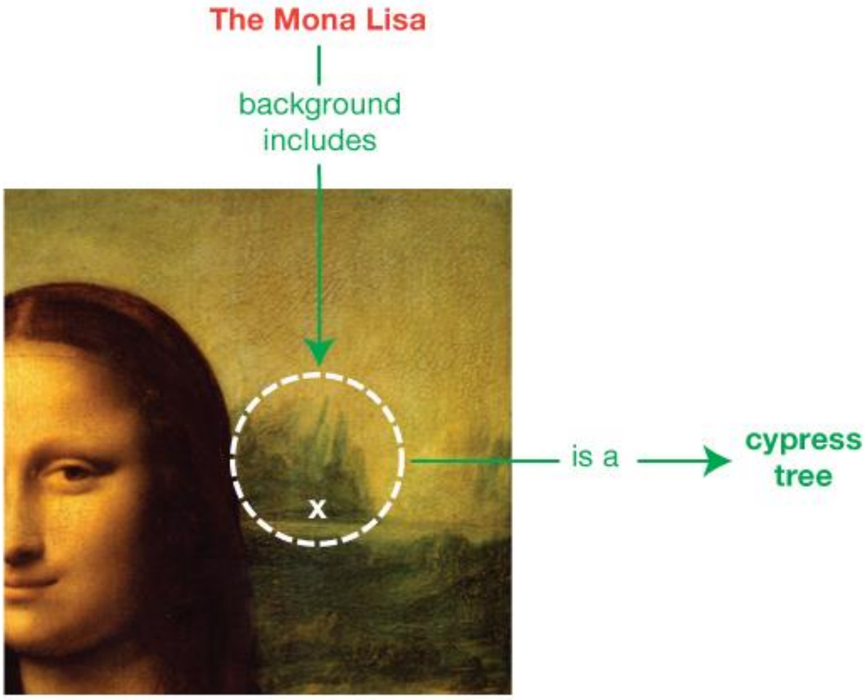

图. 2.　空节点实例：《蒙娜丽莎》描绘了一个未知的背景资源, 属于柏树类

3.5 复合图（Multiple graphs）

RDF 提供了一个在复合图（multiple graphs）中组织 RDF 语句的机制，并且将此复合图与 IRI 向结合。复合图是最近的扩展地 RDF 数据模型。实际上，RDF 工具开发者和数据管理员需要一个机制来表述一个三元组集合的子集。复合图在 RDF 中首次引入了 SPARQL 查询语言。因此，扩展的 RDF 数据模型和复合图与 SPARSQL 有着紧密的结合。

复合图在 RDF 文档中组成了一个 RDF 数据集。一个 RDF 数据集可能有多个命名图,一个未命名的“默认”图。例如，例 1 中的语句可以分为两个命名图。

第一个图可以由一个社交网络所提供，标识为 http://example.org/bob:

例 2：在样本数据集的第一个图

<Bob> <is a> <person>.

<Bob> <is a friend of> <Alice>.

<Bob> <is born on> <the 4th of July 1990>.

<Bob> <is interested in> <the Mona Lisa>.

该 IRI 与图相结合，被称为图名称（graph name）。

第二个图可以由 Wikidata 提供，标识为 https://www.wikidata.org/wiki/Special:EntityData/Q12418:

例 3：在样本数据集中的第二个图

<Leonardo da Vinci> <is the creator of> <the Mona Lisa>.

<The video 'La Joconde à Washington'> <is about> <the Mona Lisa>

下面是一个未命名的图。它包含两个三元组，主语均以<http://example.org/bob>作为图名，该三元组通过 IRI 表示出版商和许可证信息：

例 4：样本数据集中的未命名图

<http://example.org/bob> <is published by> <http://example.org>.

<http://example.org/bob> <has license> <http://creativecommons.org/licenses/by/3.0/>.

在示例数据集中，我们假设图名称代表 RDF 数据的来源在相应的图。例如，通过检索<http://example.org/bob>，我们将访问那个图中的四个三元组。

注释：RDF 并没有给其他读取数据集的用户提供标准的预定语义（例如：图名称代表 RDF 数据的来源），这些读者需要依赖其他的外部信息来解释数据集的意义，比如通过建立社区实践等。语义描述在数据集中可能被描述为一个单独的记录 [RDF11-DATASETS]。

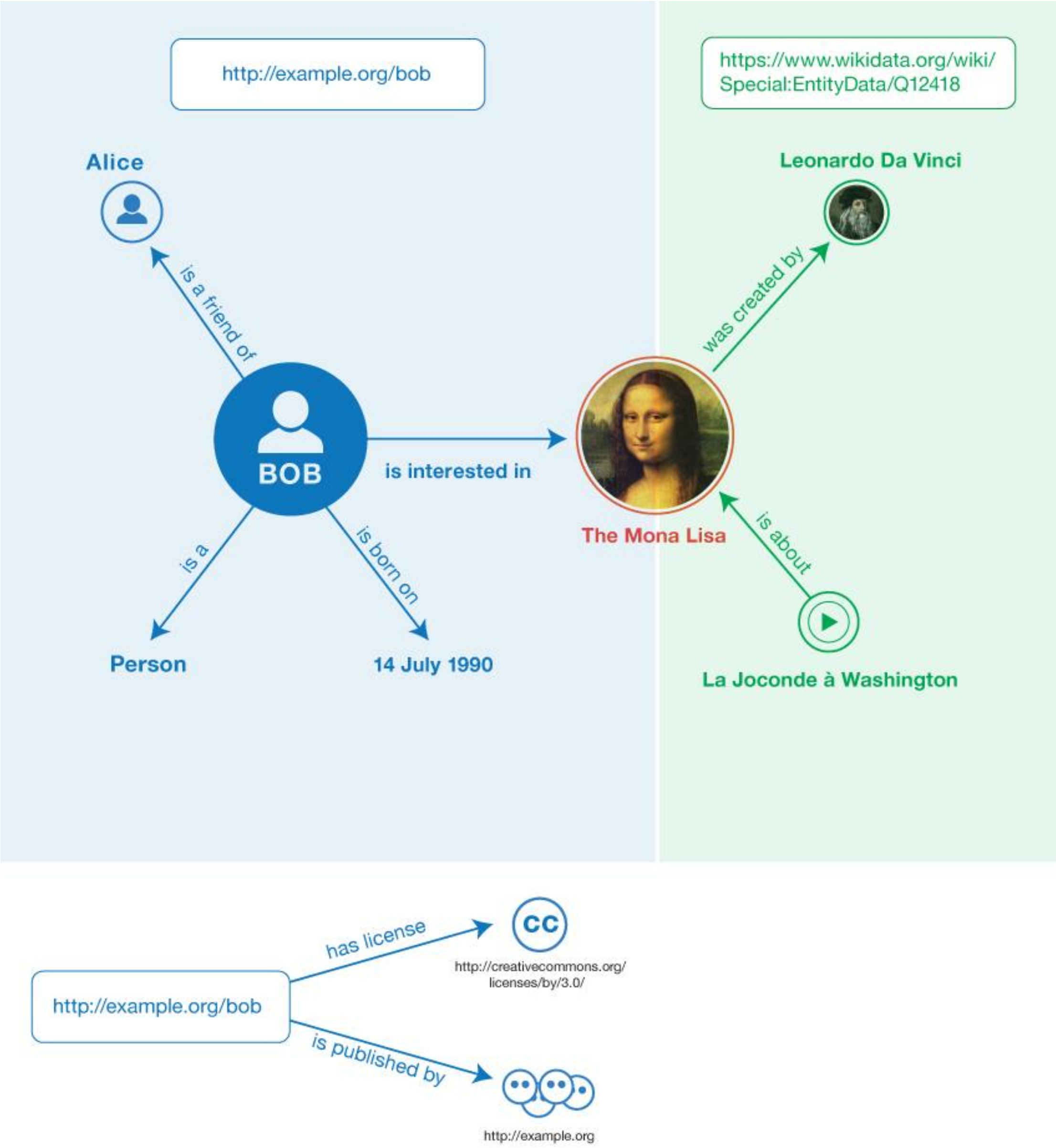

图. 3.　示例数据集中的非正式图

5.1.3 节提供了该示例图的具体语法。

4. RDF 词汇（RDF Vocabularies）

RDF 数据模型提供了一种表述资源的方法，正如我们所提到的，这个数据模型并不对 IRIS 资源代表的意义做任何假设。实际上，通常使用 RDF 结合词汇表和其他约定，而这些提供了有关资源的语义信息。

RDF 模式语言[RDF11-SCHEMA]为 RDF 词汇表提供了定义。这种语言允许个人定义 RDF 数据的语义特征。例如，人们可以声明 IRIhttp://www.example.org/friendOf 作为一个属性，http://www.example.org/friendOf 三元组的主语和宾语必定是表示

http://www.example.org/Person 的资源类。

RDF 模式使用类的概念来表示特殊的类别，可用于分类资源。类和它的一个实例之间的关系是通过类型属性来表示的。使用 RDF 模式，人们可以创建父类和之类，属性和子属性。主语的类型限定和指定三元组的宾语可以定义为域（domain）和范围限制（range restrictions）。上面给出了域限制的例子：”人“类应该是三元组“friendOf”的主语。

下表总结的是 RDF 模型模式的构造：

表.1.　　RDF 模式设计

概念	语法形式	描述
Class (类)	C rdf:type rdfs:Class	C (资源) 是一个 RDF 的类
Property (类)	P rdf:type rdf:Property	P (资源) 是一个 RDF 属性
type (属性)	I rdf:type C	I (资源) is an instance of C (类)
subClassOf (属性)	C1 rdfs:subClassOf C2	C1 (类) is a subclass of C2 (类)
subPropertyOf (属性)	P1 rdfs:subPropertyOf P2	P1 (属性) is a sub-property of P2 (属性)
domain (属性)	P rdfs:domain C	domain of P (属性) is C (类)
range (属性)	P rdfs:range C	range of P (属性) is C (类)

注释：

语法形式（第二列）的前缀表示法将在第 5 章中详细讨论。实际上前缀方法有两种不同的前缀（rdf:和 rdfs），给表示方法是有点烦人的历史产物,它保证了 RDF 的向后兼容性。

在 RDF 模式的帮助下我们可以建立一个 RDF 数据模型。一个简单的非正式例子如下：

例 5：rdf 模式三元组（非正式）

<Person> <type> <Class>

<is a friend of> <type> <Property>

<is a friend of> <domain> <Person>

<is a friend of> <range> <Person>

<is a good friend of> <subPropertyOf> <is a friend of>

请注意，<is a friend of>是三元组的属性，被作为谓词属性使用（如例 1），这样的属性本身就是他们自身的资源,可以通过三元组描述或提供值描述的其他资源。在这个例子中，<is a friend of>是三元组的谓词，用来限定类型、域和数值范围，它是描述关于<is a good friend of>属性三元组的宾语。

全球第一个使用 RDF 词汇表的是使用“朋友的朋友”(FOAF)这个词汇来描述社交网络。其他的 RDF 词汇如下：

Dublin 核心

Dublin 核心元数据倡议使用元数据元素集来描述各种各样的资源。该词汇提供的属性有“creator”,“publisher”和“title”。

schema.org

Schema.org 是一个提供主要搜索程序的词汇开发商，主要思想是，网站管理员可以使用这些术语来标记网页，那么，搜索引擎就可以知道这些网页的主要内容。

SKOS

SKOS(Simple Knowledge Organization System)，简单知识组织系统是一个互联网中名词、词汇的分布发布模式。SKOS 自从 2009 年开始成被 W3C 推荐，是最广泛使用的词库。该词库联合发布的词库被称为 SKOS vocabulary。

词汇在重复使用中获取价值：越多的 IRIs 词汇被其它应用，该 IRIs 词汇就越有价值（这就是所谓的互联网效应）。这就意味着，你应该更倾向于使用已经存在的 IRI，而不是新建一个。

构造 RDF 模式的正式规范请读者参照 RDF 语义文档[RDF11-MT]。如果用户对更全面的 RDF 数据感兴趣，可以考虑使用 OWL[OWL2-OVERVIEW]语义建模。OWL 是 RDF 词汇，所以它可以用来组成 RDF 模式。