

Formatos de Serialização RDF

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Agenda

1. Web Semântica: **Conceitos x Especificações**
2. Web Semântica: **Formatos de Serialização**
3. Serialização RDF **incorporada a Páginas Web**
4. Serialização RDF **para compreensão humana**
5. Serialização RDF **para processamento**

Web Semântica

conceitos x especificação

Conceitos x Especificações

The Semantic Web Technology Stack
(not a piece of cake...)

Most apps use only a subset of the stack

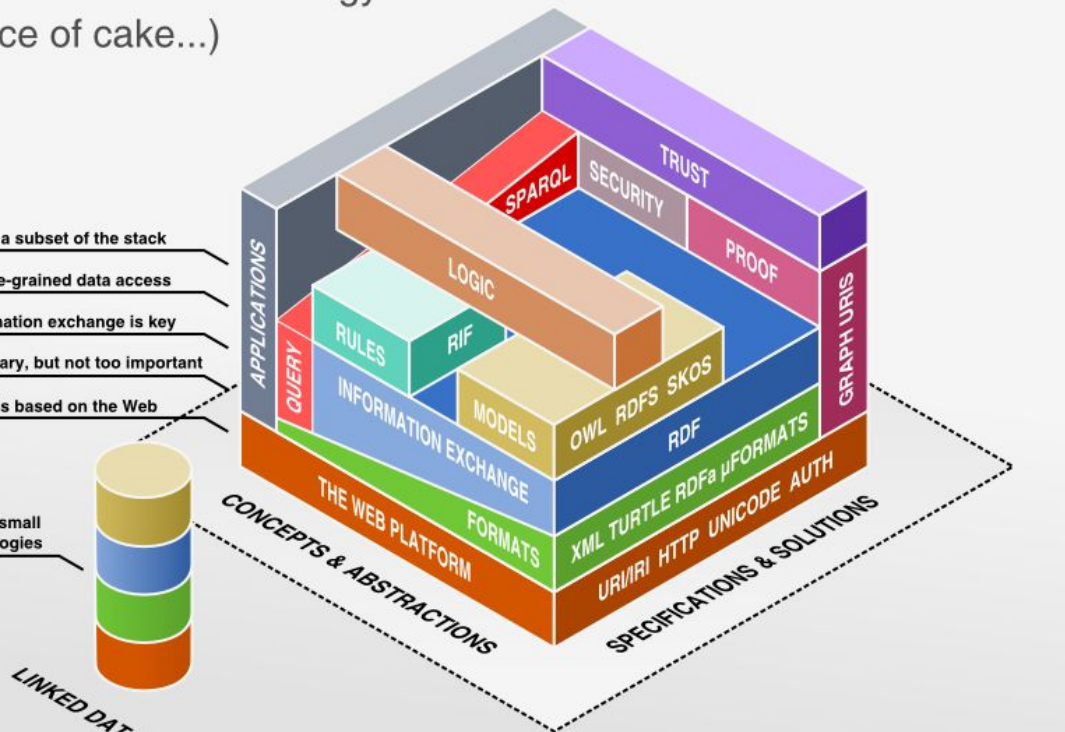
Querying allows fine-grained data access

Standardized information exchange is key

Formats are necessary, but not too important

The Semantic Web is based on the Web

Linked Data uses a small
selection of technologies

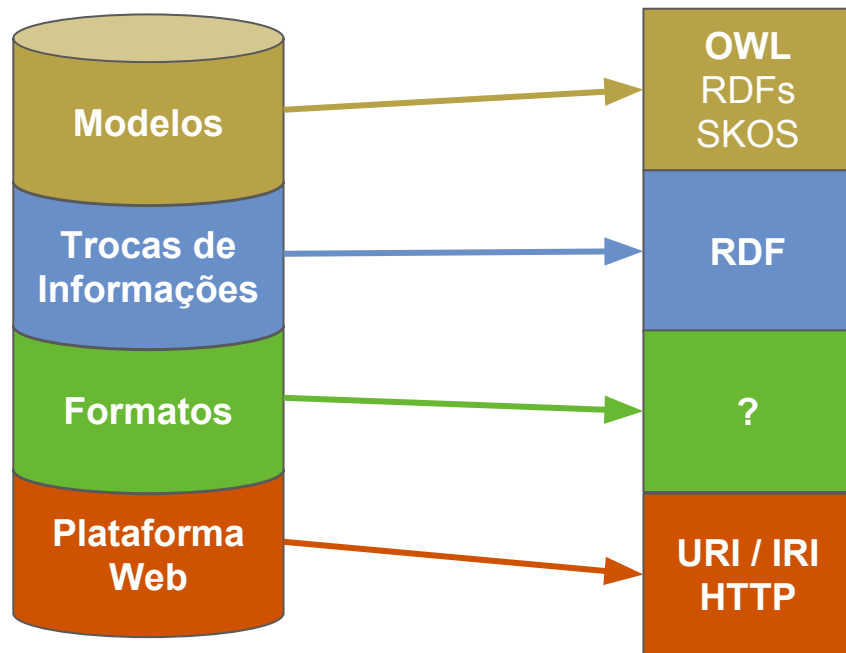


Tecnologias da Web
Semantica [1]

Conceitos x Especificações

- A maioria das aplicações utilizam um subconjunto dos modelos e tecnologias da Web Semântica
- Troca padronizada de informação é uma prioridade para a Web Semântica
- Formatos de serialização são necessários, mas não são prioridade

Conceitos x Especificações

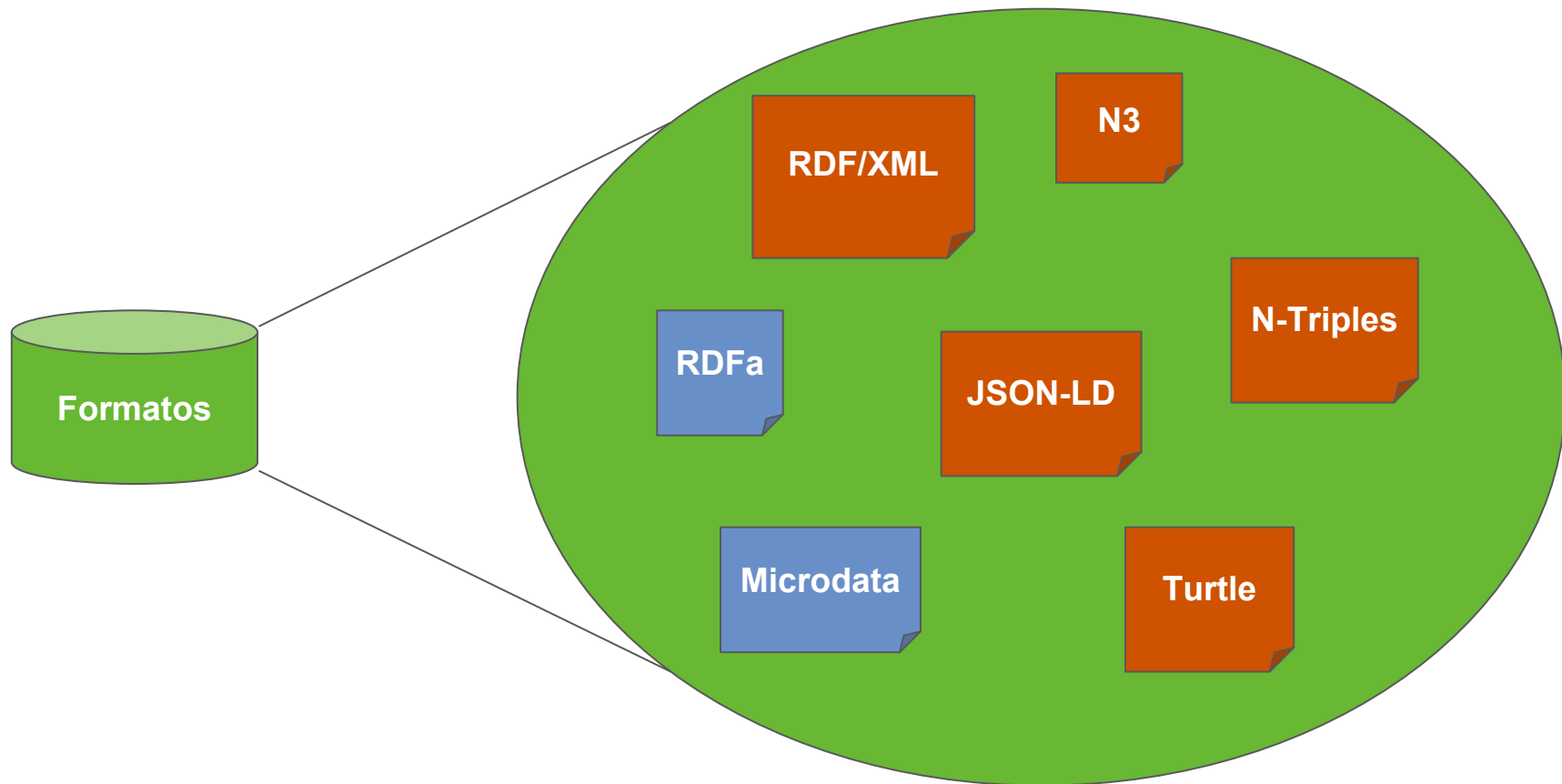


Web Semântica

formatos de serialização RDF



Formatos de serialização RDF



Formatos de serialização RDF

Processamento

N3

Turtle

N-Triples

JSON-LD

RDF/XML

Páginas Web

RDFa

Microdata

Serialização RDF

incorporada a páginas web

Páginas Web

Processamento

RDFa

- Objetivo de ser incorporado ao HTML
- Pode ser usado em XHTML, HTML e XML
- Possibilidade de misturar vocabulários

RDFa

```
<div
    xmlns="http://www.w3.org/1999/xhtml"
    prefix="
        rdf: http://www.w3.org/1999/02/22-rdf-syntax-ns#
        gr: http://purl.org/goodrelations/v1#
        rdfs: http://www.w3.org/2000/01/rdf-schema#"
>
    <div
        typeof="gr:Location"
        about="http://www.acme.com/#store">
        <div
            rel="gr:hasOpeningHoursSpecification">
            <div
                typeof="gr:OpeningHoursSpecification">
                <div
                    rel="gr:hasOpeningHoursDayOfWeek"
                    resource="http://purl.org/goodrelations/v1#Wednesday">
                    <div
                        property="gr:opens"
                        content="08:00:00">
                    <div
                        rel="gr:hasOpeningHoursDayOfWeek"
                        resource="http://purl.org/goodrelations/v1#Monday">
                        <div
                            property="gr:closes"
                            content="20:00:00">
                        <div
                            rel="gr:hasOpeningHoursDayOfWeek"
                            resource="http://purl.org/goodrelations/v1#Friday">
                        <div
                            rel="gr:hasOpeningHoursDayOfWeek"
                            resource="http://purl.org/goodrelations/v1#Thursday">
                        <div
                            rel="gr:hasOpeningHoursDayOfWeek"
                            resource="http://purl.org/goodrelations/v1#Tuesday">
                        </div>
                    </div>
                </div>
            </div>
        <div
            property="gr:name"
            content="Hepp's Happy Burger Restaurant">
        </div>
    </div>

```

Microdata

- Especificação HTML5
- Simples
- É compatível somente com documentos HTML
- Há dificuldade em misturar vocabulários
- É comparável ao RDFa Lite

Microdata

```
<div>
  <div
    itemtype="http://purl.org/goodrelations/v1#Location"
    itemid="http://www.acme.com/#store"
    itemscope

      <meta      itemprop="name"      content="Hepp's      Happy      Burger      Restaurant"

    <div
      itemprop="hasOpeningHoursSpecification"
      itemtype="http://purl.org/goodrelations/v1#OpeningHoursSpecification"
      itemscope

        <link      itemprop="hasOpeningHoursDayOfWeek"      href="http://purl.org/goodrelations/v1#Monday"
          <meta      itemprop="closes"      content="20:00:00"
          <meta      itemprop="opens"      content="08:00:00"
        <link      itemprop="hasOpeningHoursDayOfWeek"      href="http://purl.org/goodrelations/v1#Tuesday"
        <link      itemprop="hasOpeningHoursDayOfWeek"      href="http://purl.org/goodrelations/v1#Thursday"
        <link      itemprop="hasOpeningHoursDayOfWeek"      href="http://purl.org/goodrelations/v1#Friday"
        <link      itemprop="hasOpeningHoursDayOfWeek"      href="http://purl.org/goodrelations/v1#Wednesday"
      </div>
    </div>
  </div>
```

Serialização RDF para processamento

Compreensão
Humana

Páginas Web

Processamento

RDF/XML

- Um dos primeiros padrões a se consolidar
- Difícil de ser lido
- Listas não são cidadãos de primeira classe

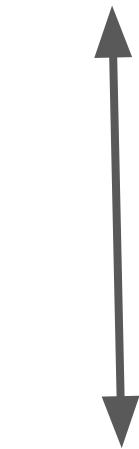
RDF/XML

```
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF
  xmlns:gr="http://purl.org/goodrelations/v1#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
>
  <rdf:Description rdf:nodeID="Nb5bba391025d4cf99d0d0b058e927016" >
    <gr:hasOpeningHoursDayOfWeek rdf:resource="http://purl.org/goodrelations/v1#Monday" />
    <gr:hasOpeningHoursDayOfWeek rdf:resource="http://purl.org/goodrelations/v1#Tuesday" />
    <gr:hasOpeningHoursDayOfWeek rdf:resource="http://purl.org/goodrelations/v1#Wednesday" />
    <gr:hasOpeningHoursDayOfWeek rdf:resource="http://purl.org/goodrelations/v1#Friday" />
    <gr:opens>08:00:00</gr:opens>
    <gr:hasOpeningHoursDayOfWeek rdf:resource="http://purl.org/goodrelations/v1#Thursday" />
    <gr:closes>20:00:00</gr:closes>
    <rdf:type rdf:resource="http://purl.org/goodrelations/v1#OpeningHoursSpecification" />
  </rdf:Description>
  <rdf:Description rdf:about="http://www.acme.com/#store" >
    <gr:hasOpeningHoursSpecification rdf:nodeID="Nb5bba391025d4cf99d0d0b058e927016" />
    <gr:name>Hepp's Happy Burger Restaurant </gr:name>
    <rdf:type rdf:resource="http://purl.org/goodrelations/v1#Location" />
  </rdf:Description>
</rdf:RDF>
```

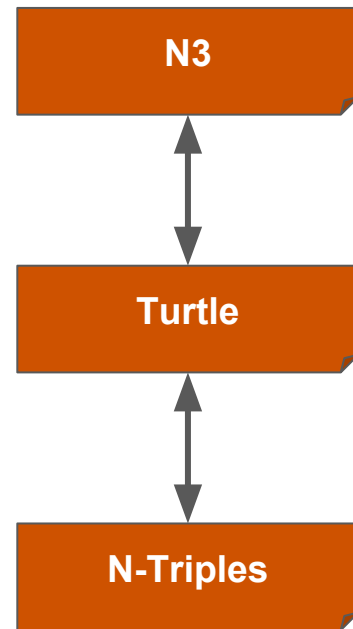
N3 (Notation 3) ^[4]

- Desenvolvido por Tim Berners-Lee
- Pensado para ser fácil de ler
- Possui problemas com internacionalização
- Possui muitas funcionalidades incompatíveis com RDF/XML

Superconjunto



Subconjunto



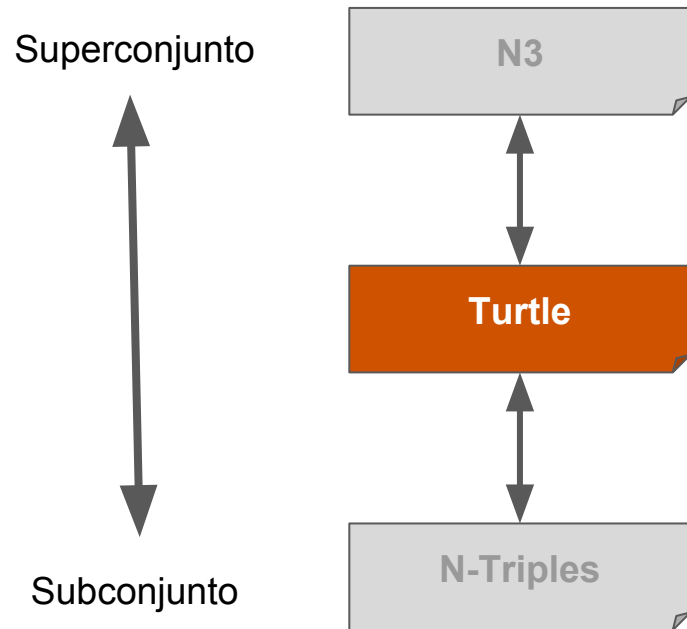
N3 (Notation 3) [3]

```
@prefix      gr:          <http://purl.org/goodrelations/v1#>      .
@prefix      rdf:         <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix      rdfs:        <http://www.w3.org/2000/01/rdf-schema#>   .
@prefix      xml:         <http://www.w3.org/XML/1998/namespace>    .
@prefix      xsd:         <http://www.w3.org/2001/XMLSchema#>      .
```

```
<http://www.acme.com/#store>          a          gr:Location          ;
    gr:hasOpeningHoursSpecification    [  a  gr:OpeningHoursSpecification ;
                                           gr:closes      "20:00:00"      ;
                                           gr:hasOpeningHoursDayOfWeek  gr:Friday ,
                                                                           gr:Monday ,
                                                                           gr:Thursday ,
                                                                           gr:Tuesday ,
                                                                           gr:Wednesday ;
                                           gr:opens      "08:00:00"      ] ;
    gr:name "Hepp's Happy Burger Restaurant" .
```

Turtle [4]

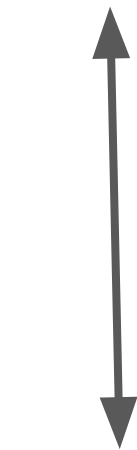
- Não possui alguns elementos sintáticos presentes em N3
 - { }
 - => (implica)
 - = (equivalência)
 - @forAll (para todo)
 - @forSome (para algum)
 - dentre outros
- Adiciona
 - Literal booleano
 - Literal de double de tamanho arbitrário



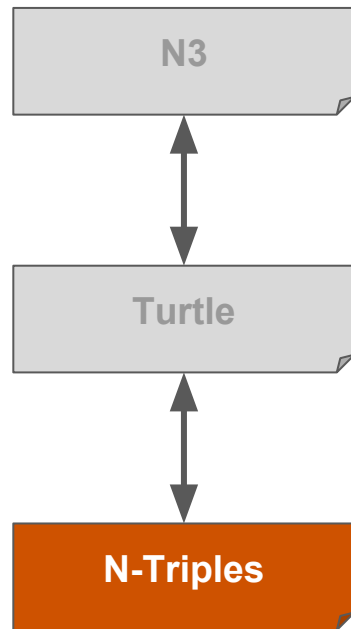
N-Triples [4]

- Não possui alguns elementos sintáticos presentes em Turtle
 - @prefix
 - @name
 - []
 - ()
 - dentre outros
- Cada linha possui uma e somente uma declaração e uma declaração está em uma e somente uma linha

Superconjunto



Subconjunto



N-Triples

```
<http://www.acme.com/#store> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>    ↵
<http://purl.org/goodrelations/v1#Location>
_:N2d527bb35f494f53b47234b7cf21bd65 <http://purl.org/goodrelations/v1#hasOpeningHoursDayOfWeek>    ↵
<http://purl.org/goodrelations/v1#Wednesday>
:N2d527bb35f494f53b47234b7cf21bd65 <http://purl.org/goodrelations/v1#hasOpeningHoursDayOfWeek>    ↵
<http://purl.org/goodrelations/v1#Thursday>
<http://www.acme.com/#store> <http://purl.org/goodrelations/v1#name>    "Hepp's Happy Burger Restaurant"
_:N2d527bb35f494f53b47234b7cf21bd65 <http://www.w3.org/1999/02/22-rdf-syntax-ns#type>    ↵
<http://purl.org/goodrelations/v1#OpeningHoursSpecification>
_:N2d527bb35f494f53b47234b7cf21bd65 <http://purl.org/goodrelations/v1#hasOpeningHoursDayOfWeek>    ↵
<http://purl.org/goodrelations/v1#Tuesday>
_:N2d527bb35f494f53b47234b7cf21bd65    <http://purl.org/goodrelations/v1#closes>    "20:00:00"
<http://www.acme.com/#store> <http://purl.org/goodrelations/v1#hasOpeningHoursSpecification>    ↵
_:N2d527bb35f494f53b47234b7cf21bd65
_:N2d527bb35f494f53b47234b7cf21bd65    <http://purl.org/goodrelations/v1#opens>    "08:00:00"
_:N2d527bb35f494f53b47234b7cf21bd65 <http://purl.org/goodrelations/v1#hasOpeningHoursDayOfWeek>    ↵
<http://purl.org/goodrelations/v1#Friday>
:N2d527bb35f494f53b47234b7cf21bd65 <http://purl.org/goodrelations/v1#hasOpeningHoursDayOfWeek>    ↵
<http://purl.org/goodrelations/v1#Monday>    .
```

JSON-LD

- 100% compatível com JSON
- Fácil de ler e fácil de processar
- Arquivos grandes

```
{
  "@context": {
    "gr": "http://purl.org/goodrelations/v1#",
    "rdf": "http://www.w3.org/1999/02/22-rdf-syntax-ns#",
    "rdfs": "http://www.w3.org/2000/01/rdf-schema#",
    "xsd": "http://www.w3.org/2001/XMLSchema#"
  },
  "@graph": [
    {
      "@id": "http://www.acme.com/#store",
      "@type": "gr:Location",
      "gr:hasOpeningHoursSpecification": {
        "@id": "_:N5c9c2ddc80284490b16a499c8b3b2841",
        "gr:name": "Hepp's Happy Burger Restaurant",
        "@id": "_:N5c9c2ddc80284490b16a499c8b3b2841",
        "@type": "gr:OpeningHoursSpecification",
        "gr:closes": "20:00:00",
        "gr:hasOpeningHoursDayOfWeek": [
          {"@id": "gr:Friday"},
          {"@id": "gr:Thursday"},
          {"@id": "gr:Wednesday"},
          {"@id": "gr:Monday"},
          {"@id": "gr:Tuesday"}
        ],
        "gr:opens": "08:00:00"
      }
    }
  ]
}
```

Conclusões

Conclusões

- Formatos são necessários, mas não são importantes
- É relativamente fácil migrar entre formatos de serialização
- Há contextos em que um formato tem vantagem em relação a outro

Referências Bibliográficas

1. HOPPE, Thomas. **REST APIs Today and Tomorrow - an Essa**, 2015.
<http://vanthome.github.io/rest-api-essay-presentation/rest_apis.html>
2. PALMER B., Sean, **A Rough Guide to Notation3**, 2002.
<<http://infomesh.net/2002/notation3/>>
3. BERNERS-LEE, Tim. **Examples - Getting into RDF & Semantic Web using N3**, 2002. <<http://infomesh.net/2002/notation3/>>
4. BECKETT, David et al. **RDF 1.1 Turtle**. World Wide Web Consortium, 2014.