Web Services

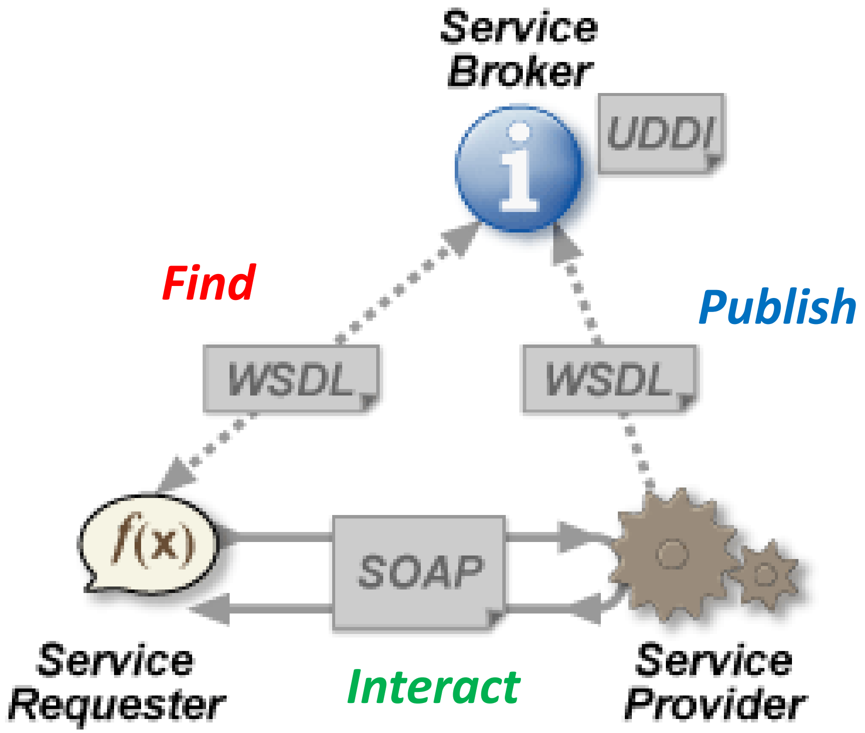
(XML applications)

Web Engineering

UNIVERSIDADE
DE TRÁS-OS-MONTES
E ALTO DOURO

Web Services

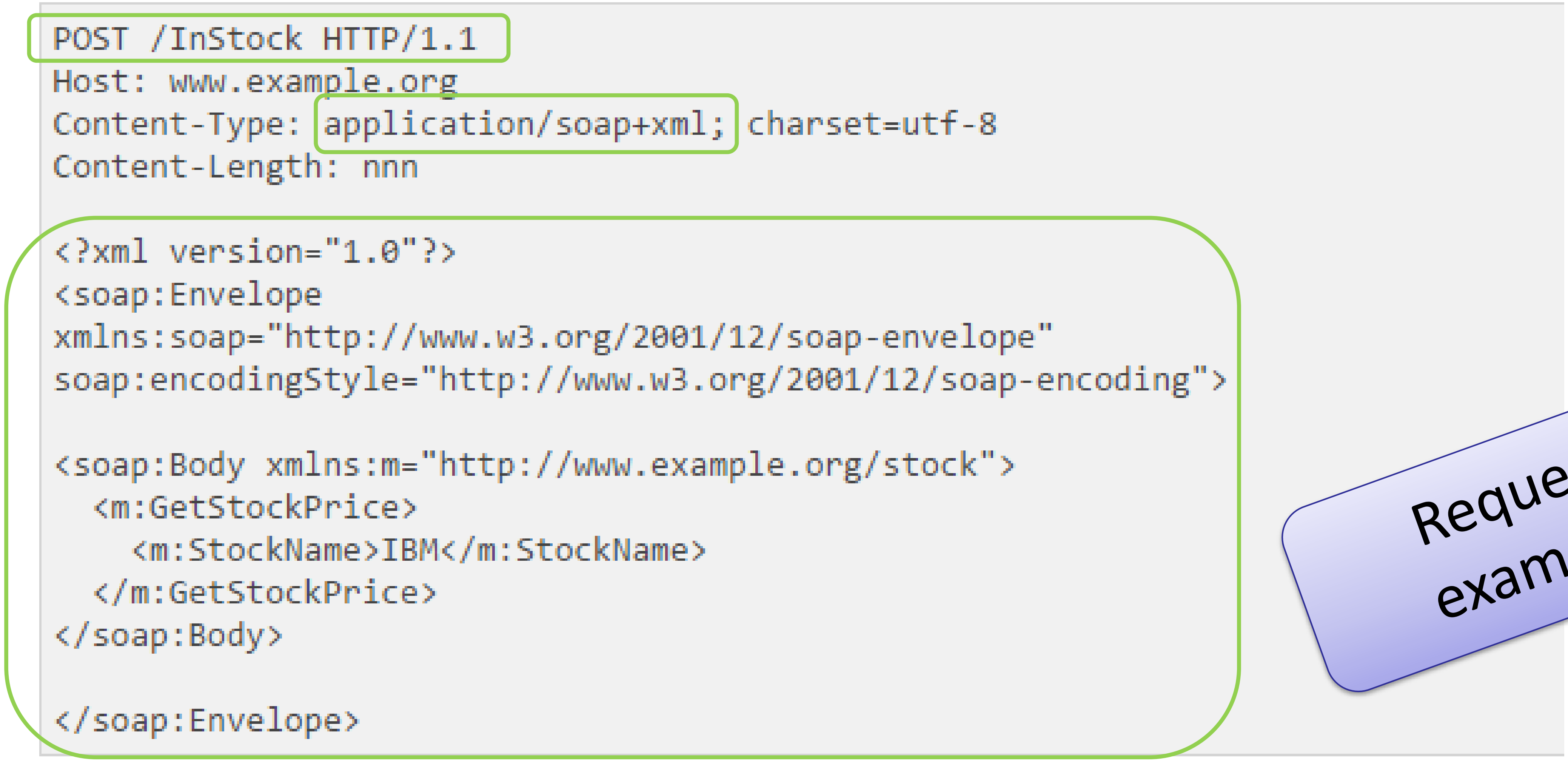
application communication
over the Internet



identified by a Uniform Resource Identifier (URI), described and defined using XML

used to deliver
interactive web services

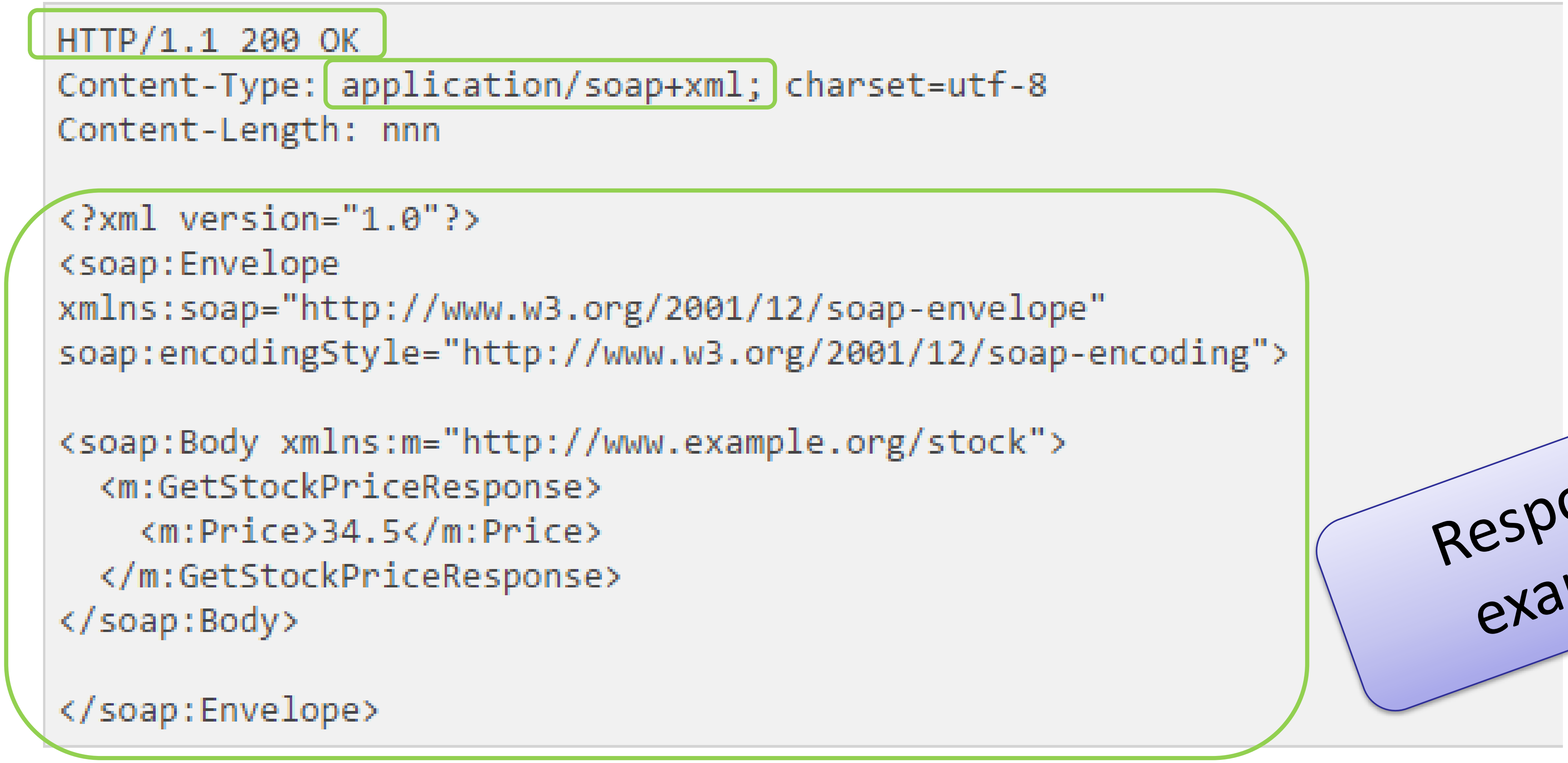
SOAP : Simple Object Access Protocol



```
POST /InStock HTTP/1.1
Host: www.example.org
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPrice>
    <m:StockName>IBM</m:StockName>
  </m:GetStockPrice>
</soap:Body>

</soap:Envelope>
```

Request example

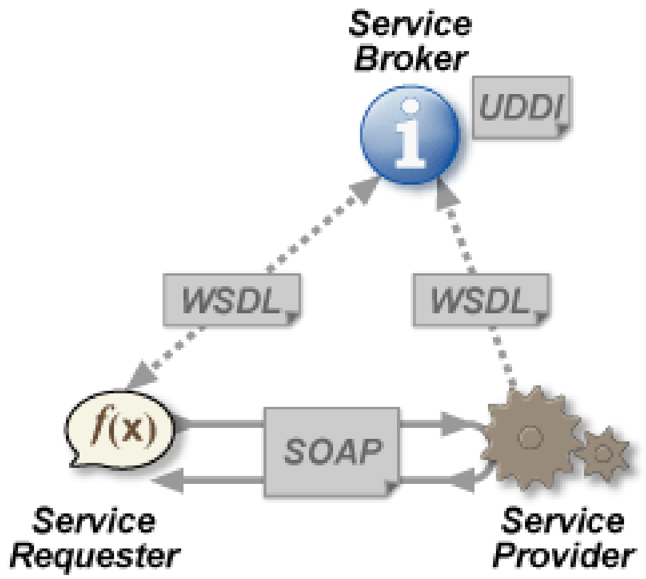
SOAP : Simple Object Access Protocol



```
HTTP/1.1 200 OK
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPriceResponse>
    <m:Price>34.5</m:Price>
  </m:GetStockPriceResponse>
</soap:Body>

</soap:Envelope>
```

Response example

SOAP : Simple Object Access Protocol



- Web Services Definition Language (WSDL)
  Is a XML document that describes a Web service. It specifies the location of the service and the operations (methods) the service exposes

- Universal Description, Discovery and Integration (UDDI)
  is a directory service where businesses can register and search for Web services.

WSDL Document:

In addition to describing each service, it also describes how they can be found. Its major elements are:

```
<types>: Defines the (XML Schema) data types used by the web service.

<message>: Defines the data elements for each operation.

<portType>: Describes the operations that can be performed and the messages involved.

<binding>: Defines the protocol and data format for each port type.
```

WSDL Document (example):

The following code is where the services are defined:

```
<wsdl:portType name="ICalculator">
  <wsdl:operation name="Add">
     <wsdl:input wsaw:Action="http://Example.org/ICalculator/Add"
                                    message="tns:ICalculator_Add_InputMessage" />
     <wsdl:output wsaw:Action="http://Example.org/ICalculator/AddResponse"
                                    message="tns:ICalculator_Add_OutputMessage" />
  </wsdl:operation>

  <wsdl:operation name="Subtract">
     <wsdl:input wsaw:Action="http://Example.org/ICalculator/Subtract"
                                    message="tns:ICalculator_Subtract_InputMessage" />
     <wsdl:output wsaw:Action="http://Example.org/ICalculator/SubtractResponse"
                                    message="tns:ICalculator_Subtract_OutputMessage" />
  </wsdl:operation>
</wsdl:portType>
```

WSDL Document (example):

The following code describes how each service should be called:

```xml
<wsdl:binding name="DefaultBinding_ICalculator" type="tns:ICalculator">
   <soap:binding transport="http://schemas.xmlsoap.org/soap/http" />7

   <wsdl:operation name="Add">
      <soap:operation soapAction="http://Example.org/ICalculator/Add" style="document" />
      <wsdl:input>
         <soap:body use="literal" />
      </wsdl:input>
      <wsdl:output>
         <soap:body use="literal" />
      </wsdl:output>
   </wsdl:operation>

   <wsdl:operation name="Subtract">
      <soap:operation soapAction="http://Example.org/ICalculator/Subtract" style="document" />
      <wsdl:input>
         <soap:body use="literal" />
      </wsdl:input>
      <wsdl:output>
         <soap:body use="literal" />
      </wsdl:output>
   </wsdl:operation>

</wsdl:binding>
```

WSDL Document (example):

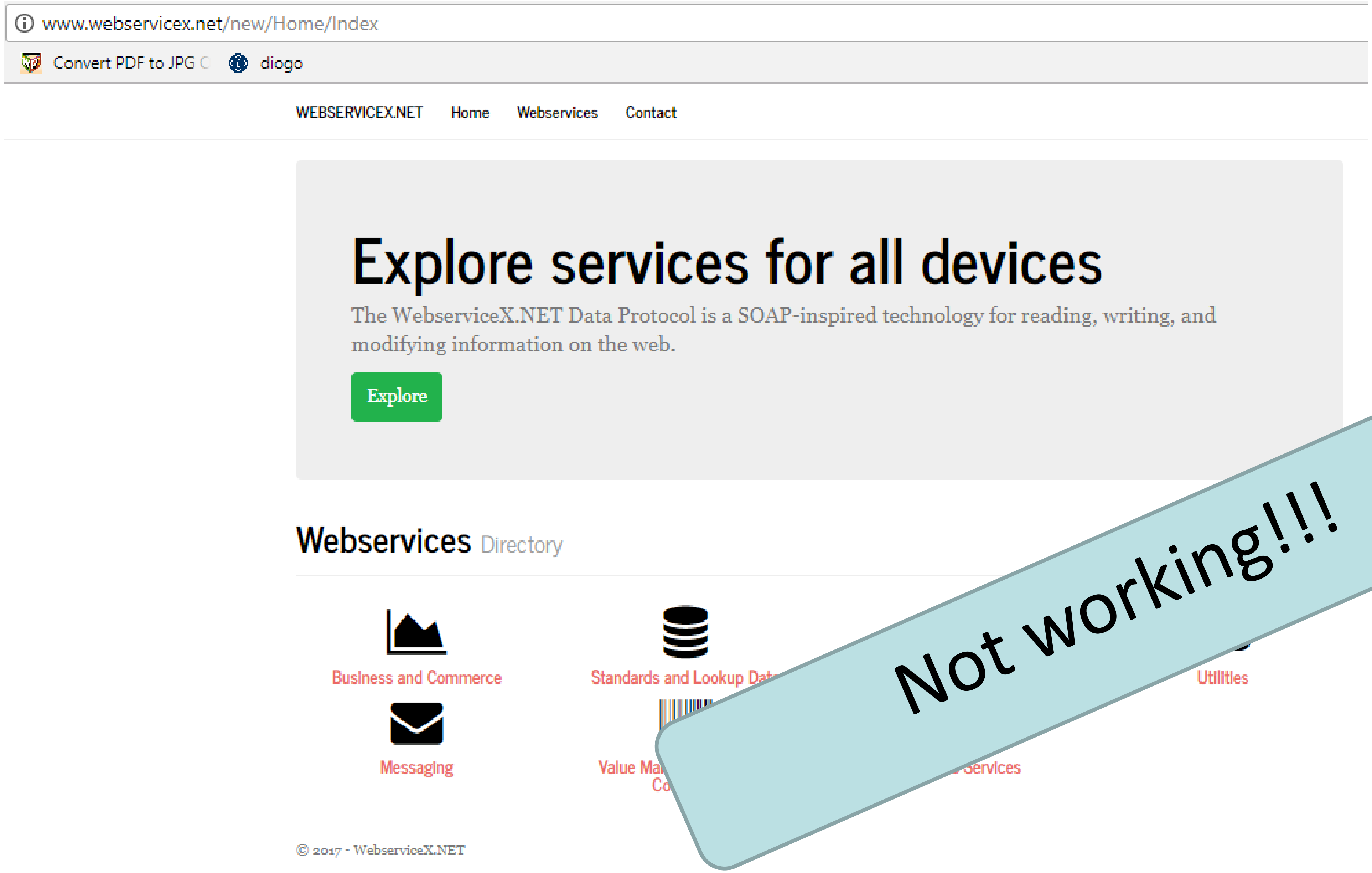
The following code defines the location of the *CalculatorService* service:

```
<wsdl:service name="CalculatorService">
   <wsdl:port name="ICalculator" binding="tns:DefaultBinding_ICalculator">
      <soap:address location="http://Example.org/ICalculator" />
   </wsdl:port>
</wsdl:service>
```

Another WSDL Document (example):

https://www.tutorialspoint.com/wsdl/wsdl_example.htm

Directory of public SOAP Web Services



www.webservicex.net/new/Home/Index

WEBSERVICEX.NET Home Webservices Contact

Explore services for all devices

The WebserviceX.NET Data Protocol is a SOAP-inspired technology for reading, writing, and modifying information on the web.

Explore

Webservices Directory

Business and Commerce

Standards and Lookup Dat

Utilities

Messaging

Value Ma Co

Services

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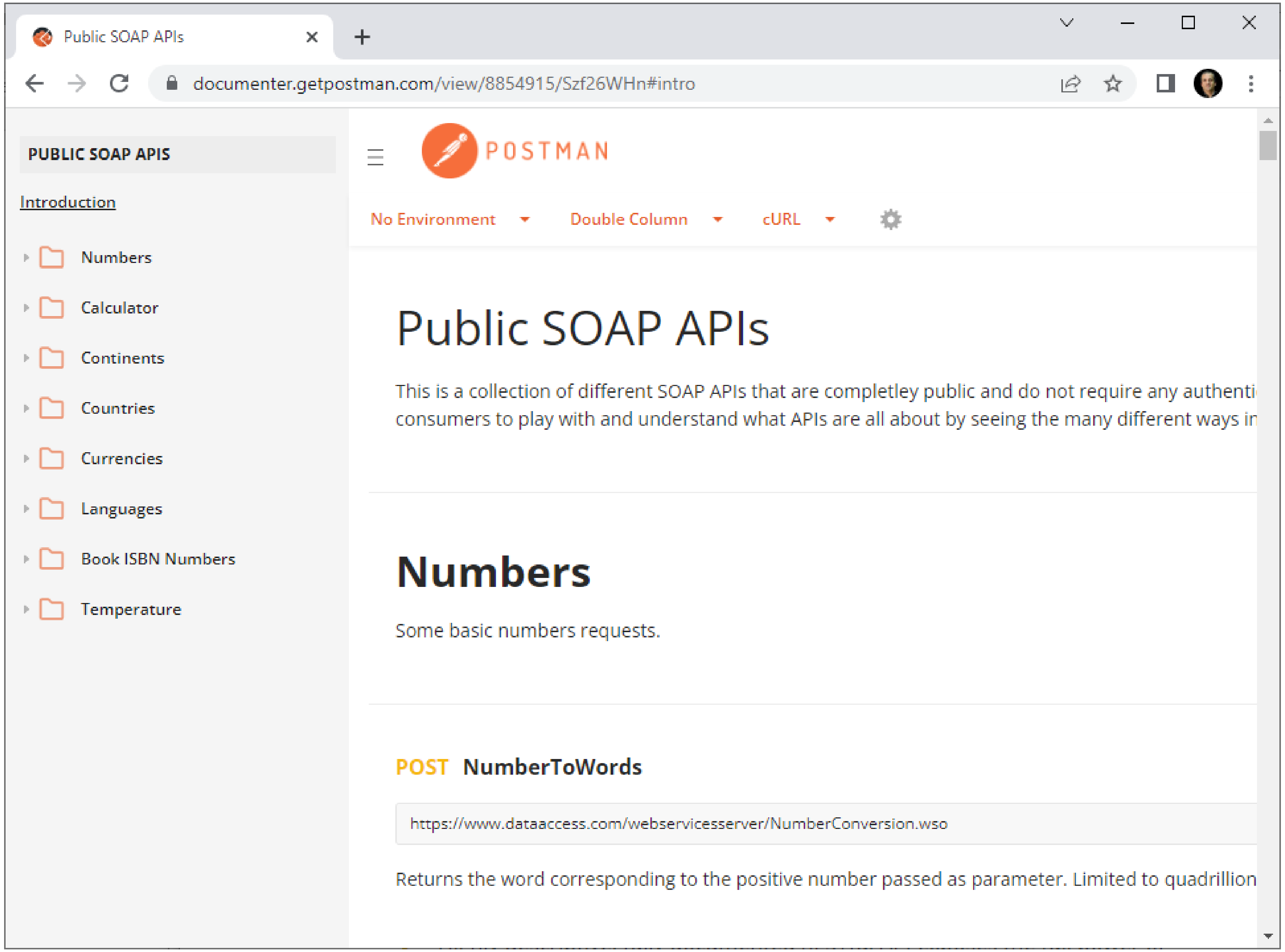
Not working!!!

Example of public SOAP Web Service



Public SOAP APIs

documenter.getpostman.com/view/8854915/Szf26WHn#intro

PUBLIC SOAP APIS

Introduction

- Numbers
- Calculator
- Continents
- Countries
- Currencies
- Languages
- Book ISBN Numbers
- Temperature

POSTMAN

No Environment Double Column cURL

Public SOAP APIs

This is a collection of different SOAP APIs that are completley public and do not require any authenti
consumers to play with and understand what APIs are all about by seeing the many different ways ir

Numbers

Some basic numbers requests.

POST NumberToWords

https://www.dataaccess.com/webservicesserver/NumberConversion.wso

Returns the word corresponding to the positive number passed as parameter. Limited to quadrillion

Webservices : RESTful Systems

REST : Representational State Transfer

SOAP vs REST
(example)

SOAP

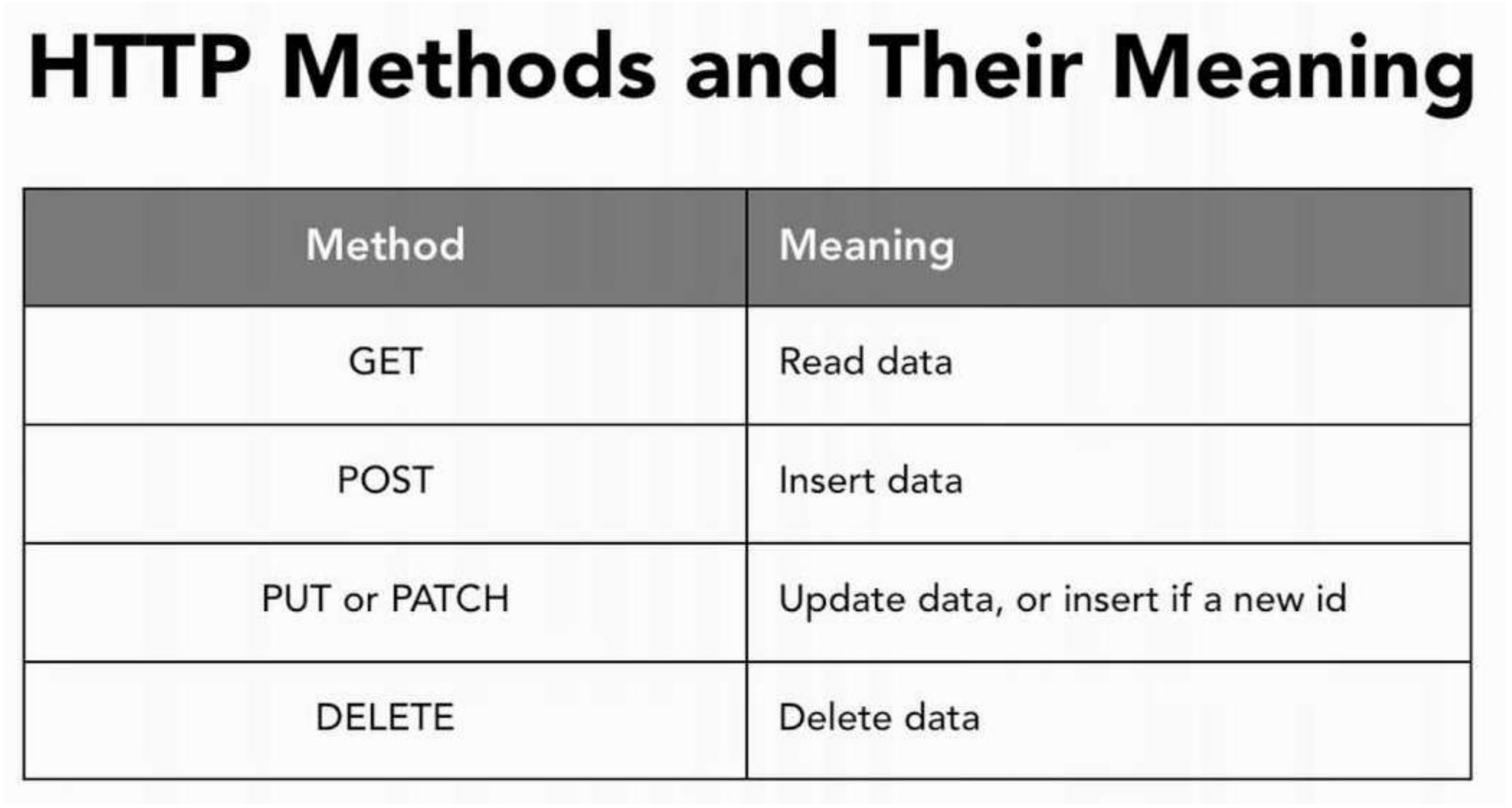
```
POST / HTTP/1.1
Host: www.acme.com

<?xml version="1.0"?>
<soap:Envelope xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
                   soap-encodingStyle="http://www.w3.org/2001/12/soap-encoding">
  <soap:body pb="http://www.acme.com/phonebook">
    <pb:GetUserDetails>
           <pb:UserId>12345</pb:UserId>
    </pb:GetUserDetails>
  </soap:body>
</soap:Envelope>
```

REST

```
GET /phonebook/UserDetails/12345 HTTP/1.1
Host: www.acme.com
```

Webservices : RESTful Systems

REST : Representational State Transfer



HTTP Methods and Their Meaning

Method	Meaning
GET	Read data
POST	Insert data
PUT or PATCH	Update data, or insert if a new id
DELETE	Delete data

REST vs SOAP

REST

RESTs sweet spot is when you are exposing a public API over the internet to handle CRUD operations on data. REST is focused on accessing named resources through a single consistent interface.

SOAP

SOAP brings it’s own protocol and focuses on exposing pieces of application logic (not data) as services. SOAP exposes operations. SOAP is focused on accessing named operations, each implement some business logic through different interfaces.

REST vs SOAP

REST

Areas that REST works really well for are:

- **Limited bandwidth and resources**; remember the return structure is really in any format (developer defined). Plus, any browser can be used because the REST approach uses the standard GET, PUT, POST, and DELETE verbs. Again, remember that REST can also use the XMLHttpRequest object that almost modern browsers support today, which adds an extra bonus of AJAX.
- **Totally stateless operations**; if an operation needs to be continued, then REST is not the best approach and SOAP may fit it better. However, if you need stateless CRUD (Create, Read, Update, and Delete) operations, then REST is it.
- **Caching situations**; if the information can be cached because of the totally stateless operation of the REST approach, this is perfect.

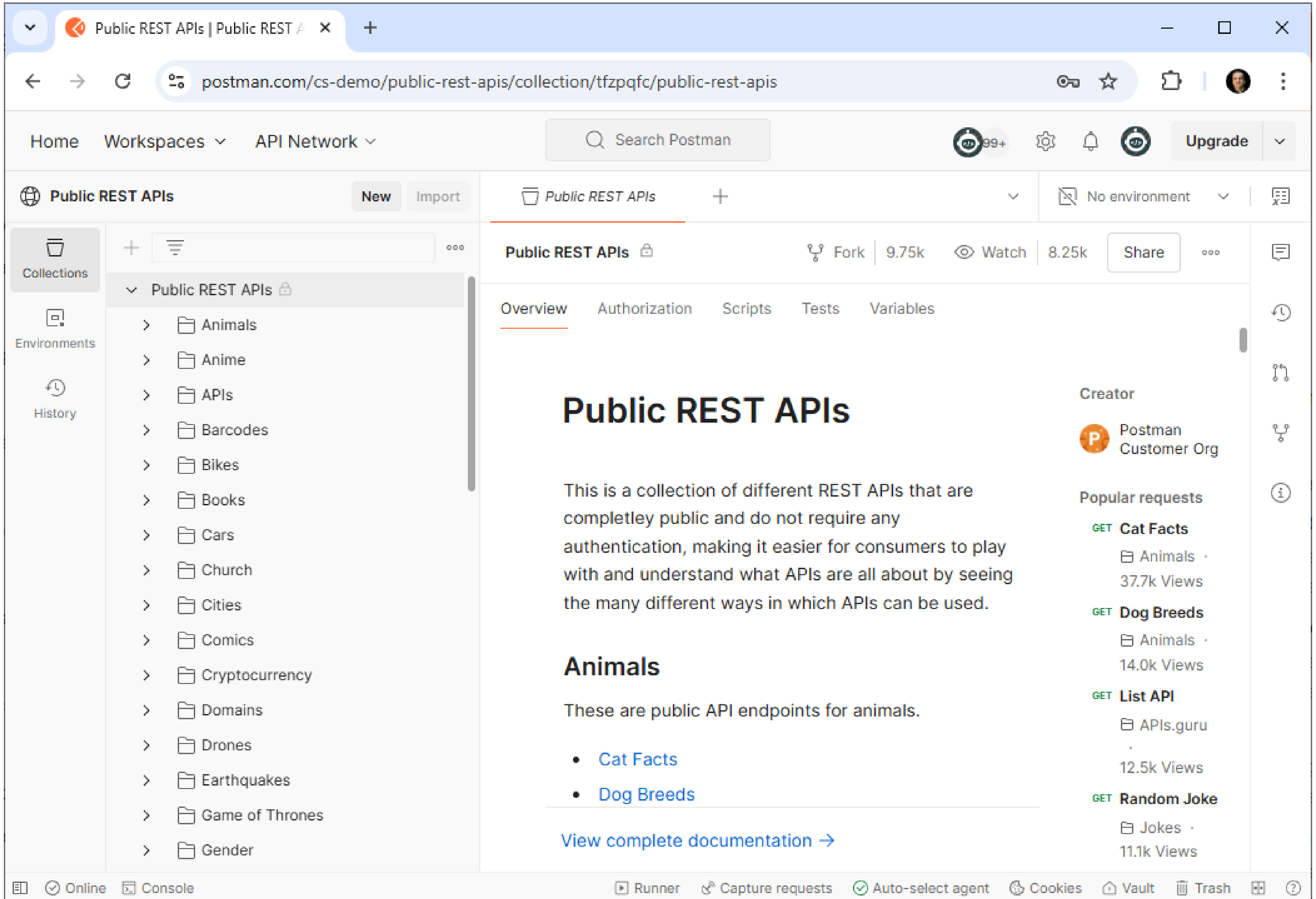
REST vs SOAP

SOAP

Areas that SOAP is a great solution:

- **Asynchronous processing and invocation**; if your application needs a guaranteed level of reliability and security then SOAP 1.2 offers additional standards to ensure this type of operation. Things like WSRM – WS-Reliable Messaging.
- **Formal contracts**; if both sides (provider and consumer) have to agree on the exchange format then SOAP 1.2 gives the rigid specifications for this type of interaction.
- **Stateful operations**; if the application needs contextual information and conversational state management then SOAP 1.2 has the additional specification in the WS structure to support those things (Security, Transactions, Coordination, etc).

Example of public REST APIs



Public REST APIs

This is a collection of different REST APIs that are completley public and do not require any authentication, making it easier for consumers to play with and understand what APIs are all about by seeing the many different ways in which APIs can be used.

Animals

These are public API endpoints for animals.

- Cat Facts
- Dog Breeds

View complete documentation →

Creator

Postman Customer Org

Popular requests

GET Cat Facts
Animals · 37.7k Views

GET Dog Breeds
Animals · 14.0k Views

GET List API
APIs.guru · 12.5k Views

GET Random Joke
Jokes · 11.1k Views

Really Simple Syndication: RSS

Rich Site Summary

(XML applications)

Web Engineering

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Feeds RSS

is a web feed that allows users and applications to access updates to websites in a standardized, computer-readable format.

Websites usually use RSS feeds to publish frequently updated information, such as blog entries, news headlines, episodes of audio and video series, or for distributing podcasts.

Feeds RSS

An RSS document (called "feed", "web feed", or "channel") includes full or summarized text, and metadata, like publishing date and author's name.

RSS formats are specified using an XML file.

Feeds RSS

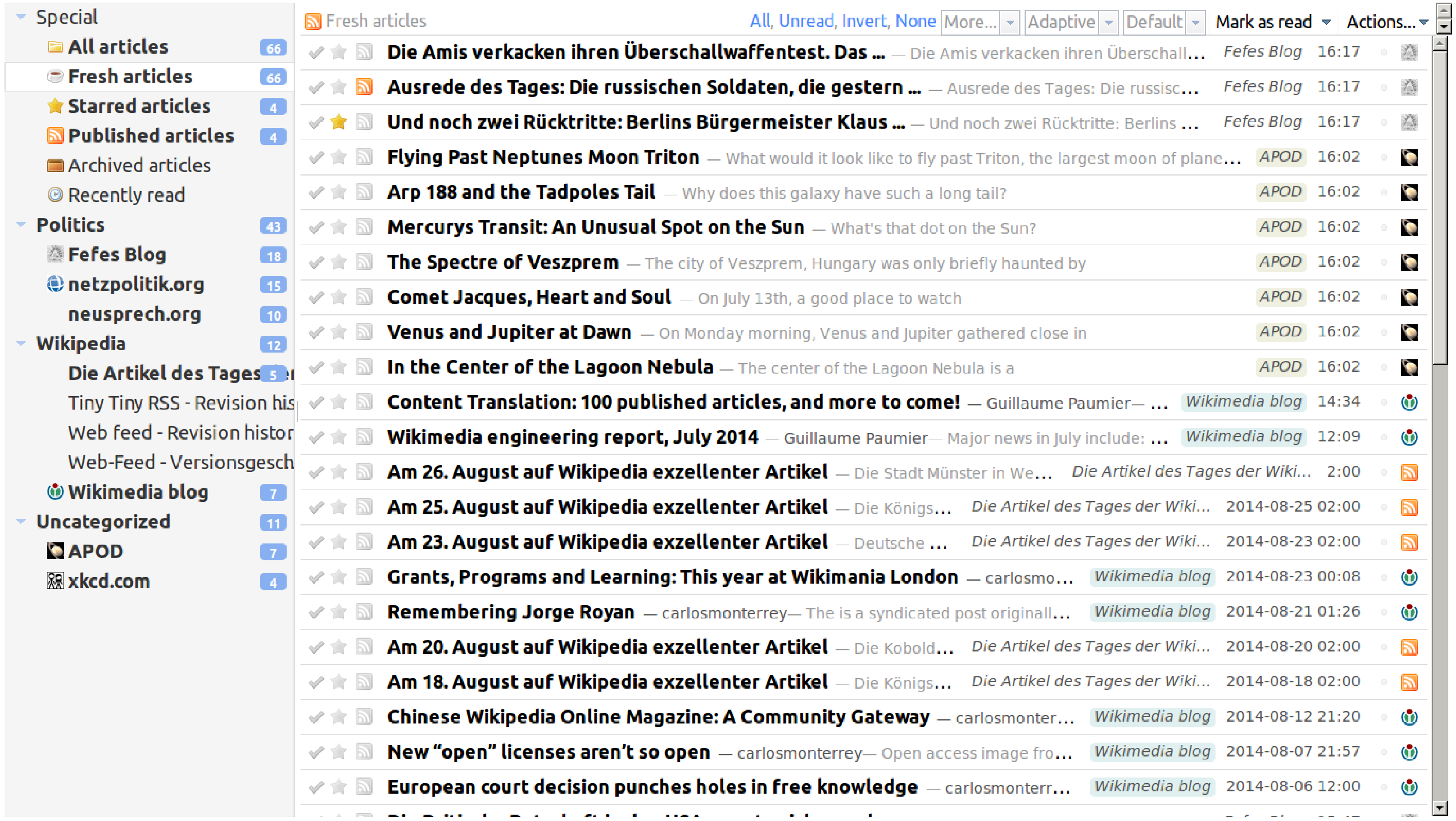
```xml
<?xml version="1.0" encoding="UTF-8" ?>
<rss version="2.0">
<channel>
 <title>RSS Title</title>
 <description>This is an example of an RSS feed</description>
 <link>http://www.example.com/main.html</link>
 <copyright>2020 Example.com All rights reserved</copyright>
 <lastBuildDate>Mon, 6 Sep 2010 00:01:00 +0000</lastBuildDate>
 <pubDate>Sun, 6 Sep 2009 16:20:00 +0000</pubDate>
 <ttl>1800</ttl>

 <item>
  <title>Example entry</title>
  <description>Here is some text containing an interesting description.</description>
  <link>http://www.example.com/blog/post/1</link>
  <guid isPermaLink="false">7bd204c6-1655-4c27-aeee-53f933c5395f</guid>
  <pubDate>Sun, 6 Sep 2009 16:20:00 +0000</pubDate>
 </item>

</channel>
</rss>
```

Feeds RSS

Aggregators

RSS reading software use the XML structure to present a neat display to the end users. There are various news aggregator software for desktop and mobile devices, but RSS can also be built-in inside several web browsers or email clients.

Feeds RSS

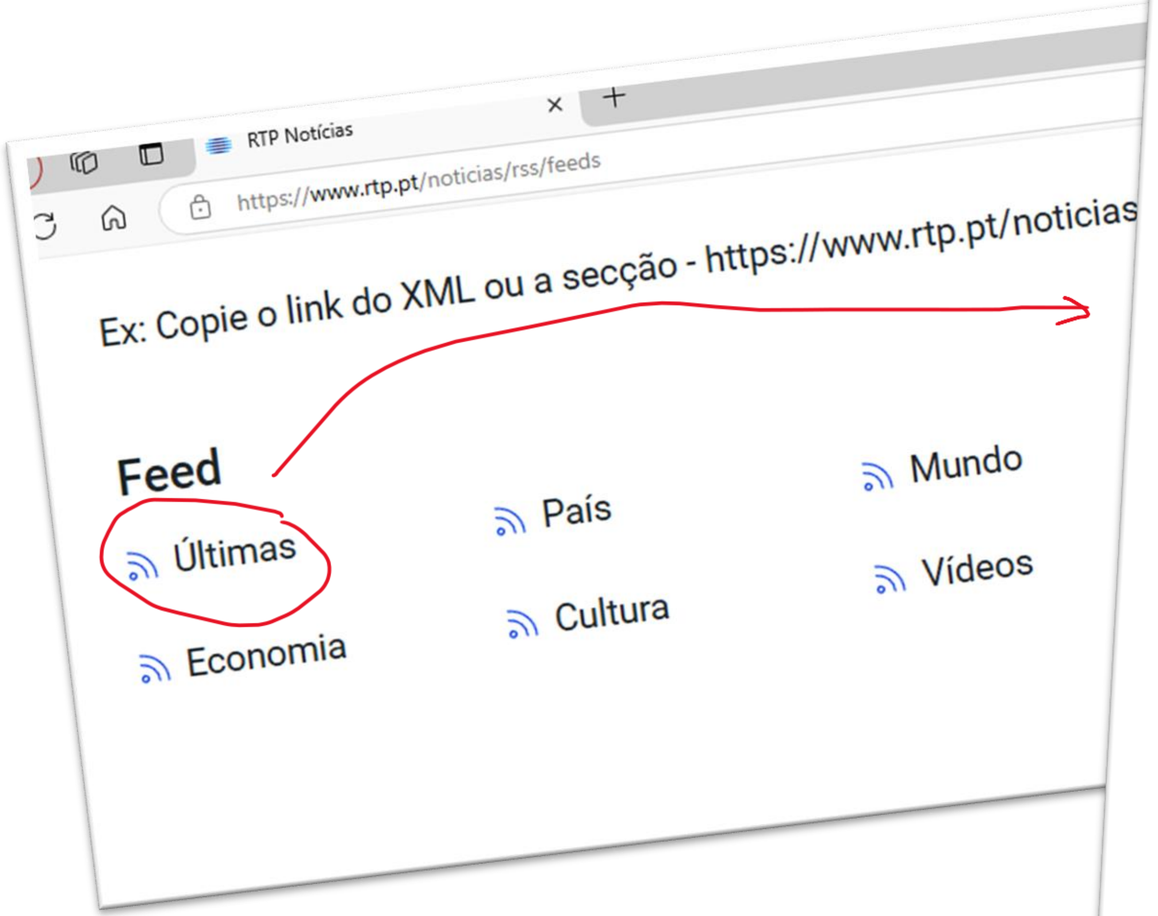


- Special
  - All articles 66
  - Fresh articles 66
  - Starred articles 4
  - Published articles 4
  - Archived articles
  - Recently read
- Politics 43
  - Fefes Blog 18
  - netzpolitik.org 15
  - neusprech.org 10
- Wikipedia 12
  - Die Artikel des Tages 5
  - Tiny Tiny RSS - Revision his
  - Web feed - Revision histor
  - Web-Feed - Versionsgesch
  - Wikimedia blog 7
- Uncategorized 11
  - APOD 7
  - xkcd.com 4

Fresh articles — All, Unread, Invert, None — More... — Adaptive — Default — Mark as read — Actions...

Die Amis verkacken ihren Überschallwaffentest. Das ... — Die Amis verkacken ihren Überschall...	Fefes Blog	16:17
Ausrede des Tages: Die russischen Soldaten, die gestern ... — Ausrede des Tages: Die russisc...	Fefes Blog	16:17
Und noch zwei Rücktritte: Berlins Bürgermeister Klaus ... — Und noch zwei Rücktritte: Berlins ...	Fefes Blog	16:17
Flying Past Neptunes Moon Triton — What would it look like to fly past Triton, the largest moon of plane...	APOD	16:02
Arp 188 and the Tadpoles Tail — Why does this galaxy have such a long tail?	APOD	16:02
Mercurys Transit: An Unusual Spot on the Sun — What's that dot on the Sun?	APOD	16:02
The Spectre of Veszprem — The city of Veszprem, Hungary was only briefly haunted by	APOD	16:02
Comet Jacques, Heart and Soul — On July 13th, a good place to watch	APOD	16:02
Venus and Jupiter at Dawn — On Monday morning, Venus and Jupiter gathered close in	APOD	16:02
In the Center of the Lagoon Nebula — The center of the Lagoon Nebula is a	APOD	16:02
Content Translation: 100 published articles, and more to come! — Guillaume Paumier— ...	Wikimedia blog	14:34
Wikimedia engineering report, July 2014 — Guillaume Paumier— Major news in July include: ...	Wikimedia blog	12:09
Am 26. August auf Wikipedia exzellenter Artikel — Die Stadt Münster in We...	Die Artikel des Tages der Wiki...	2:00
Am 25. August auf Wikipedia exzellenter Artikel — Die Königs...	Die Artikel des Tages der Wiki...	2014-08-25 02:00
Am 23. August auf Wikipedia exzellenter Artikel — Deutsche ...	Die Artikel des Tages der Wiki...	2014-08-23 02:00
Grants, Programs and Learning: This year at Wikimania London — carlosmo...	Wikimedia blog	2014-08-23 00:08
Remembering Jorge Royan — carlosmonterrey— The is a syndicated post originall...	Wikimedia blog	2014-08-21 01:26
Am 20. August auf Wikipedia exzellenter Artikel — Die Kobold...	Die Artikel des Tages der Wiki...	2014-08-20 02:00
Am 18. August auf Wikipedia exzellenter Artikel — Die Königs...	Die Artikel des Tages der Wiki...	2014-08-18 02:00
Chinese Wikipedia Online Magazine: A Community Gateway — carlosmonter...	Wikimedia blog	2014-08-12 21:20
New "open" licenses aren't so open — carlosmonterrey— Open access image fro...	Wikimedia blog	2014-08-07 21:57
European court decision punches holes in free knowledge — carlosmonterr...	Wikimedia blog	2014-08-06 12:00

Feeds RSS – Example 1



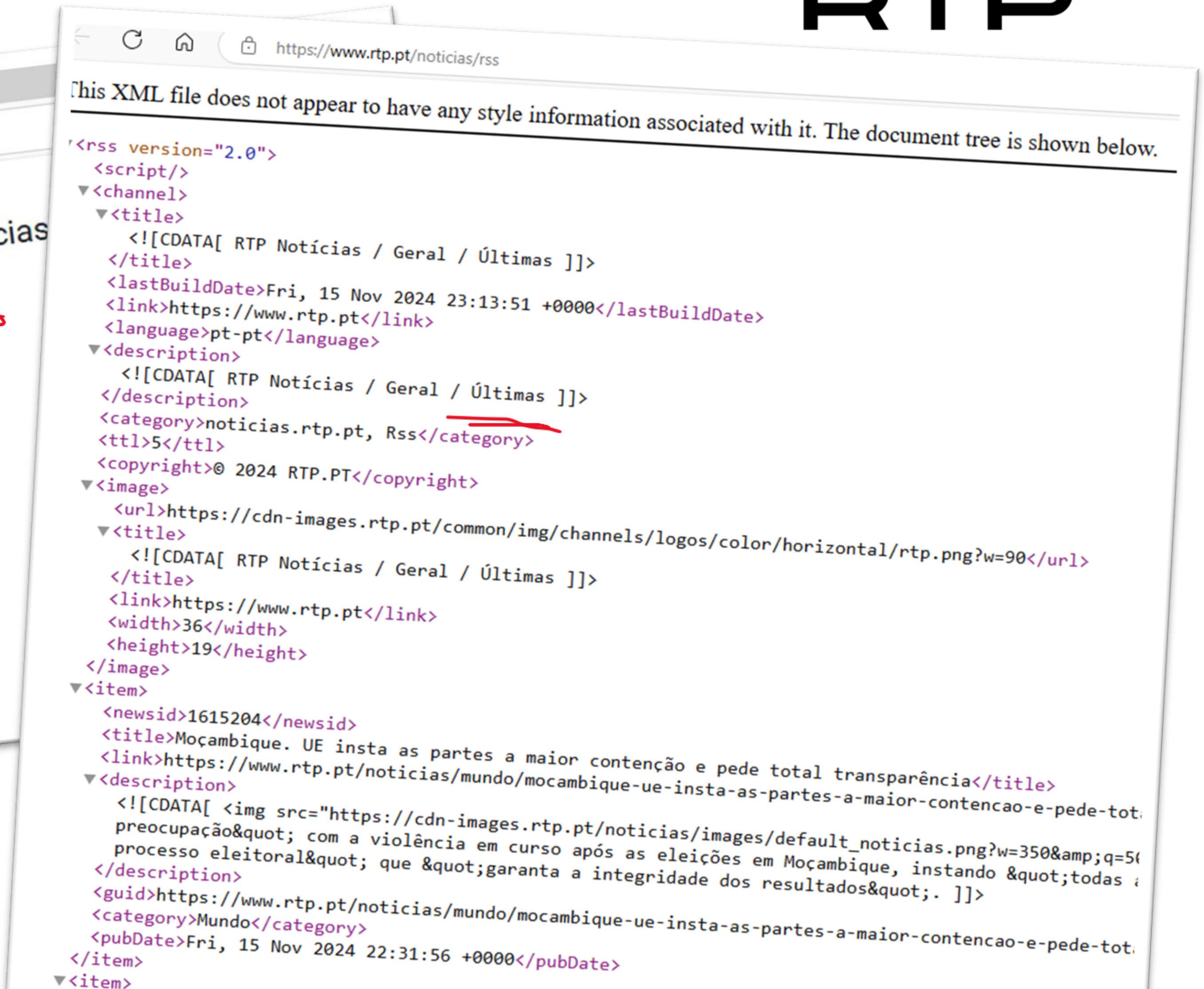
RTP Notícias

https://www.rtp.pt/noticias/rss/feeds

Ex: Copie o link do XML ou a secção - https://www.rtp.pt/noticias

Feed

- Últimas
- País
- Mundo
- Economia
- Cultura
- Vídeos

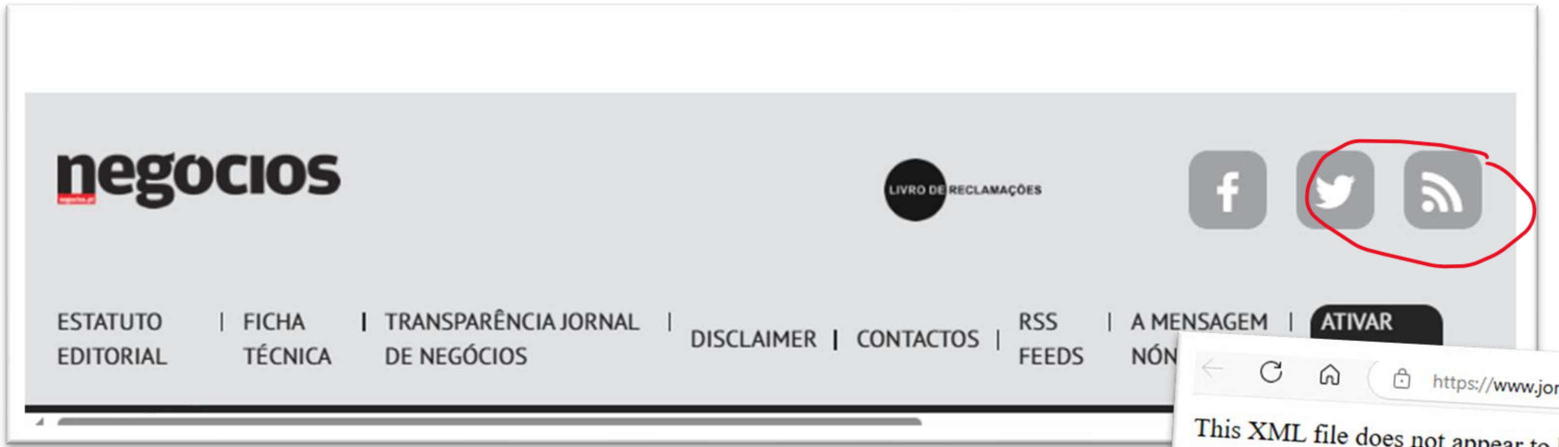


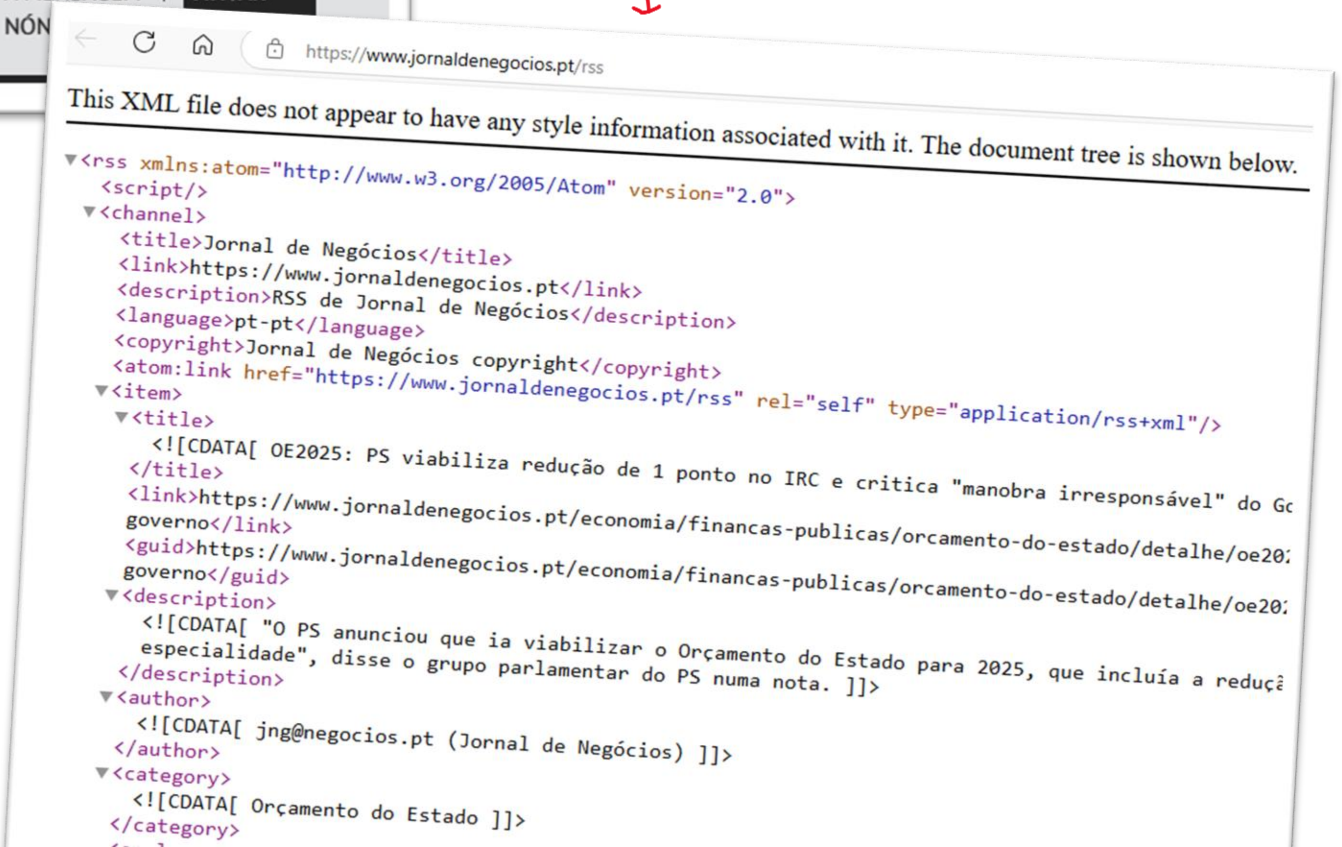
https://www.rtp.pt/noticias/rss

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<rss version="2.0">
  <script/>
▼<channel>
  ▼<title>
      <![CDATA[ RTP Notícias / Geral / Últimas ]]>
    </title>
    <lastBuildDate>Fri, 15 Nov 2024 23:13:51 +0000</lastBuildDate>
    <link>https://www.rtp.pt</link>
    <language>pt-pt</language>
  ▼<description>
      <![CDATA[ RTP Notícias / Geral / Últimas ]]>
    </description>
    <category>noticias.rtp.pt, Rss</category>
    <ttl>5</ttl>
    <copyright>© 2024 RTP.PT</copyright>
  ▼<image>
      <url>https://cdn-images.rtp.pt/common/img/channels/logos/color/horizontal/rtp.png?w=90</url>
    ▼<title>
        <![CDATA[ RTP Notícias / Geral / Últimas ]]>
      </title>
      <link>https://www.rtp.pt</link>
      <width>36</width>
      <height>19</height>
    </image>
  ▼<item>
      <newsid>1615204</newsid>
      <title>Moçambique. UE insta as partes a maior contenção e pede total transparência</title>
      <link>https://www.rtp.pt/noticias/mundo/mocambique-ue-insta-as-partes-a-maior-contencao-e-pede-tot
    ▼<description>
        <![CDATA[ <img src="https://cdn-images.rtp.pt/noticias/images/default_noticias.png?w=350&amp;q=5
        preocupação&quot; com a violência em curso após as eleições em Moçambique, instando &quot;todas
        processo eleitoral&quot; que &quot;garanta a integridade dos resultados&quot;. ]]>
      </description>
      <guid>https://www.rtp.pt/noticias/mundo/mocambique-ue-insta-as-partes-a-maior-contencao-e-pede-tot
      <category>Mundo</category>
      <pubDate>Fri, 15 Nov 2024 22:31:56 +0000</pubDate>
    </item>
  ▼<item>
```

Feeds RSS – Example 2

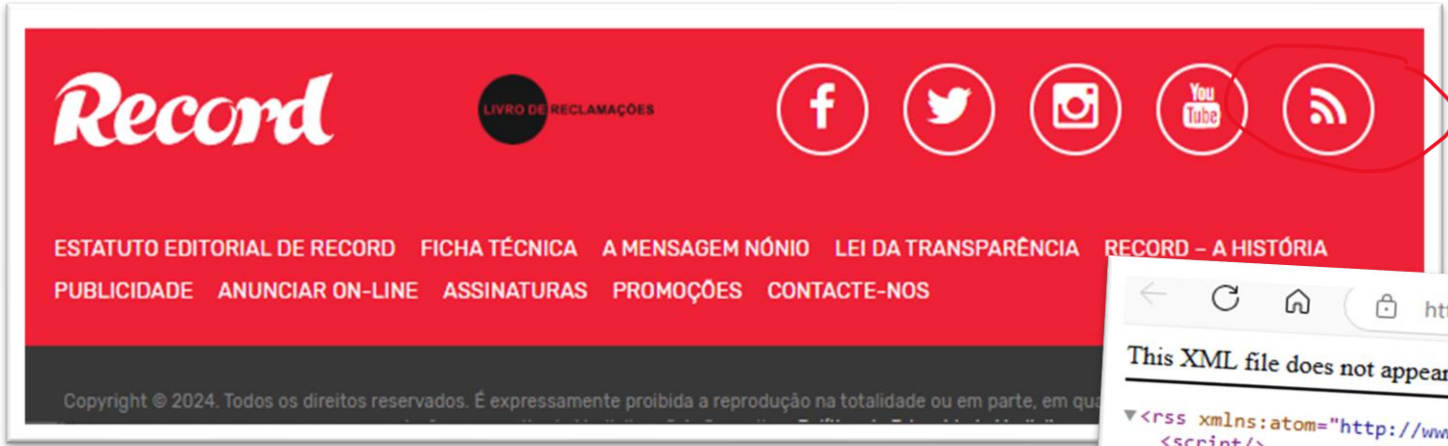

negocios
LIVRO DE RECLAMAÇÕES
ESTATUTO EDITORIAL | FICHA TÉCNICA | TRANSPARÊNCIA JORNAL DE NEGÓCIOS | DISCLAIMER | CONTACTOS | RSS FEEDS | A MENSAGEM NÓN | ATIVAR



This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
▼<rss xmlns:atom="http://www.w3.org/2005/Atom" version="2.0">
  <script/>
 ▼<channel>
   <title>Jornal de Negócios</title>
   <link>https://www.jornaldenegocios.pt</link>
   <description>RSS de Jornal de Negócios</description>
   <language>pt-pt</language>
   <copyright>Jornal de Negócios copyright</copyright>
   <atom:link href="https://www.jornaldenegocios.pt/rss" rel="self" type="application/rss+xml"/>
  ▼<item>
   ▼<title>
      <![CDATA[ OE2025: PS viabiliza redução de 1 ponto no IRC e critica "manobra irresponsável" do Gc
    </title>
    <link>https://www.jornaldenegocios.pt/economia/financas-publicas/orcamento-do-estado/detalhe/oe20:
    governo</link>
    <guid>https://www.jornaldenegocios.pt/economia/financas-publicas/orcamento-do-estado/detalhe/oe20:
    governo</guid>
   ▼<description>
      <![CDATA[ "O PS anunciou que ia viabilizar o Orçamento do Estado para 2025, que incluía a reduçã
      especialidade", disse o grupo parlamentar do PS numa nota. ]]>
    </description>
   ▼<author>
      <![CDATA[ jng@negocios.pt (Jornal de Negócios) ]]>
    </author>
   ▼<category>
      <![CDATA[ Orçamento do Estado ]]>
    </category>
```

Feeds RSS – Example 3



Record

LIVRO DE RECLAMAÇÕES

ESTATUTO EDITORIAL DE RECORD   FICHA TÉCNICA   A MENSAGEM NÓNIO   LEI DA TRANSPARÊNCIA   RECORD – A HISTÓRIA

PUBLICIDADE   ANUNCIAR ON-LINE   ASSINATURAS   PROMOÇÕES   CONTACTE-NOS

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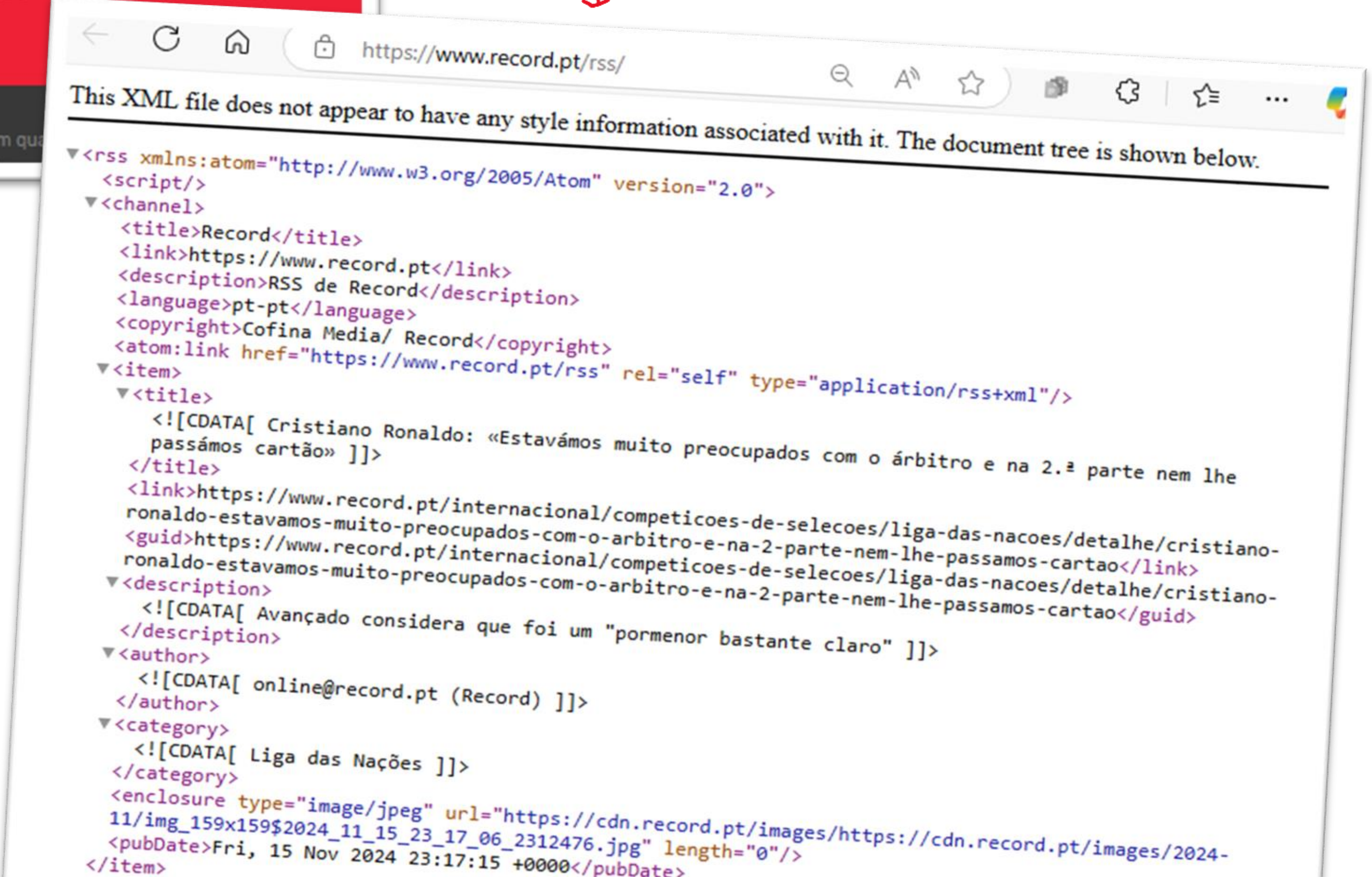


https://www.record.pt/rss/

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
▼<rss xmlns:atom="http://www.w3.org/2005/Atom" version="2.0">
  <script/>
 ▼<channel>
    <title>Record</title>
    <link>https://www.record.pt</link>
    <description>RSS de Record</description>
    <language>pt-pt</language>
    <copyright>Cofina Media/ Record</copyright>
    <atom:link href="https://www.record.pt/rss" rel="self" type="application/rss+xml"/>
   ▼<item>
     ▼<title>
        <![CDATA[ Cristiano Ronaldo: «Estavámos muito preocupados com o árbitro e na 2.ª parte nem lhe
        passámos cartão» ]]>
      </title>
      <link>https://www.record.pt/internacional/competicoes-de-selecoes/liga-das-nacoes/detalhe/cristiano-
      ronaldo-estavamos-muito-preocupados-com-o-arbitro-e-na-2-parte-nem-lhe-passamos-cartao</link>
      <guid>https://www.record.pt/internacional/competicoes-de-selecoes/liga-das-nacoes/detalhe/cristiano-
      ronaldo-estavamos-muito-preocupados-com-o-arbitro-e-na-2-parte-nem-lhe-passamos-cartao</guid>
     ▼<description>
        <![CDATA[ Avançado considera que foi um "pormenor bastante claro" ]]>
      </description>
     ▼<author>
        <![CDATA[ online@record.pt (Record) ]]>
      </author>
     ▼<category>
        <![CDATA[ Liga das Nações ]]>
      </category>
      <enclosure type="image/jpeg" url="https://cdn.record.pt/images/https://cdn.record.pt/images/2024-
      11/img_159x159$2024_11_15_23_17_06_2312476.jpg" length="0"/>
      <pubDate>Fri, 15 Nov 2024 23:17:15 +0000</pubDate>
    </item>
```

Styles and transformations: XSL and XSLT

(XML applications)

Web Engineering

utad UNIVERSIDADE DE TRÁS-OS-MONTES E ALTO DOURO

Consider the following XML document…

```xml
<?xml version="1.0" encoding="ISO-8859-1"?>
<?xml-stylesheet type="text/xsl" href="simple.xsl"?>
<breakfast_menu>
  <food>
    <name>Belgian Waffles</name>
    <price>$5.95</price>
    <description>
       two of our famous Belgian Waffles
    </description>
    <calories>650</calories>
  </food>
  <food>
    <name>Strawberry Belgian Waffles</name>
    <price>$7.95</price>
    <description>
       Light Belgian waffles covered with strawberries and whipped cream
    </description>
    <calories>900</calories>
  </food>
</breakfast_menu>
```

…and the next XSL

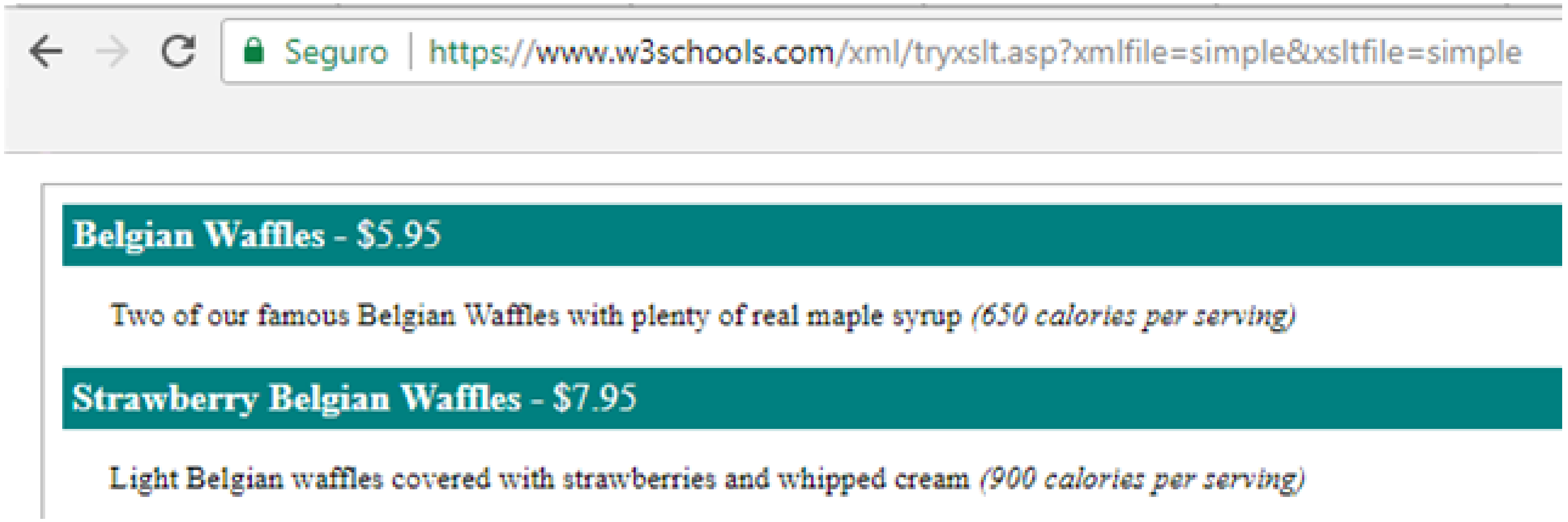
```
<?xml version="1.0" encoding="ISO-8859-1"?>
<html xsl:version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
xmlns="http://www.w3.org/1999/xhtml">
  <body style="font-family:Arial;font-size:12pt;background-color:#EEEEEE">
    <xsl:for-each select="breakfast_menu/food">
      <div style="background-color:teal;color:white;padding:4px">
        <span style="font-weight:bold"><xsl:value-of select="name"/></span>
        - <xsl:value-of select="price"/>
      </div>
      <div style="margin-left:20px;margin-bottom:1em;font-size:10pt">
        <xsl:value-of select="description"/>
        <span style="font-style:italic">
          <xsl:value-of select="calories"/> (calories per serving)
        </span>
      </div>
    </xsl:for-each>
  </body>
</html>
```

XSLT : XSL Transformations

XSL : eXtensible Stylesheet Language

What is the result of the XSLT (transformation)?

https://www.w3schools.com/xml/tryxslt.asp?xmlfile=simple&xsltfile=simple


Seguro
https://www.w3schools.com/xml/tryxslt.asp?xmlfile=simple&xsltfile=simple

Belgian Waffles - $5.95

Two of our famous Belgian Waffles with plenty of real maple syrup *(650 calories per serving)*

Strawberry Belgian Waffles - $7.95

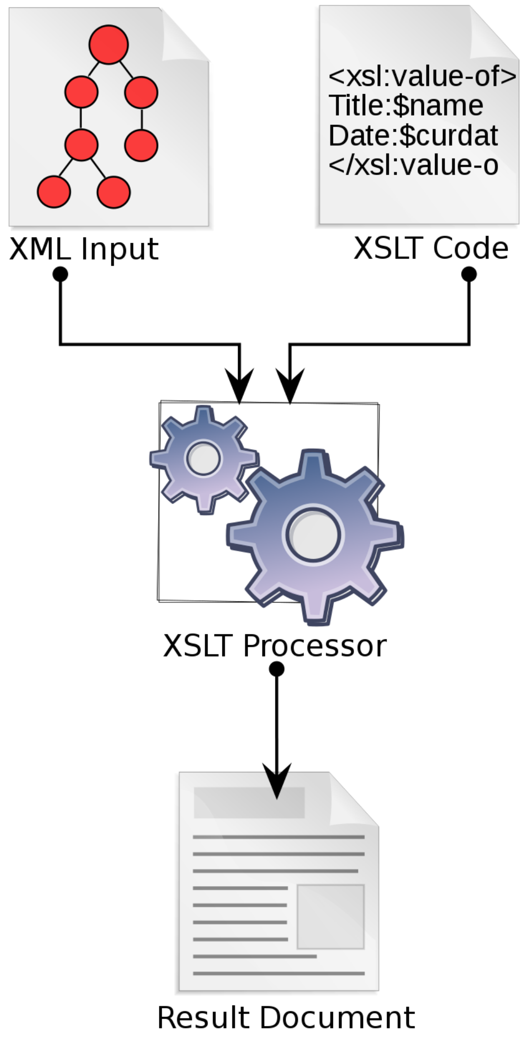
Light Belgian waffles covered with strawberries and whipped cream *(900 calories per serving)*

eXtensible Stylesheet Language (XSL)

serves the dual purpose of transforming XML documents and of exhibiting control over document rendering

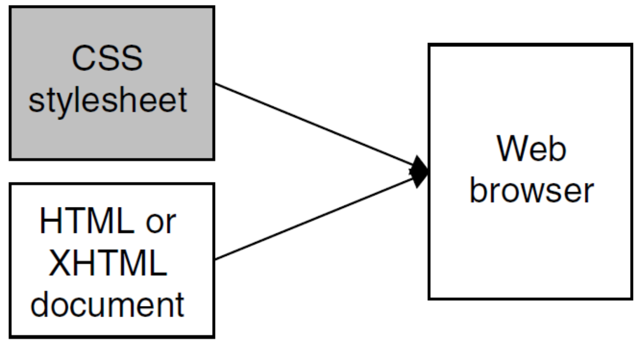
Transformation component of XSL (XSLT)

makes it possible to select fragments of XML documents, based on path patterns in the element hierarchy, and to apply transformation operations to these fragments

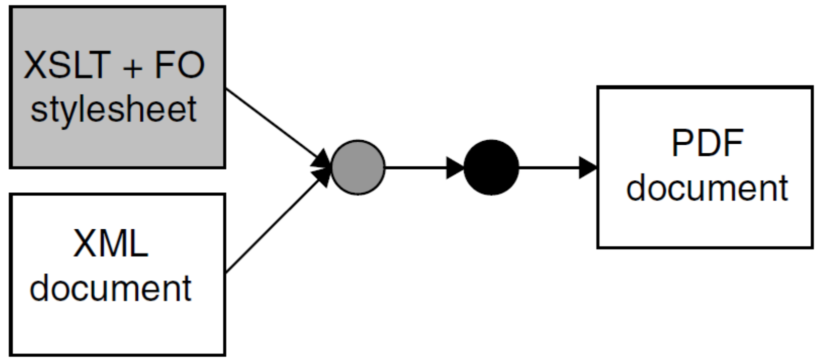


XSL Formating Objects (XSLT-FO)

markup language that describes the rendering vocabular designed to support pagination



Using CSS stylesheets to render HTML and XHTML documents



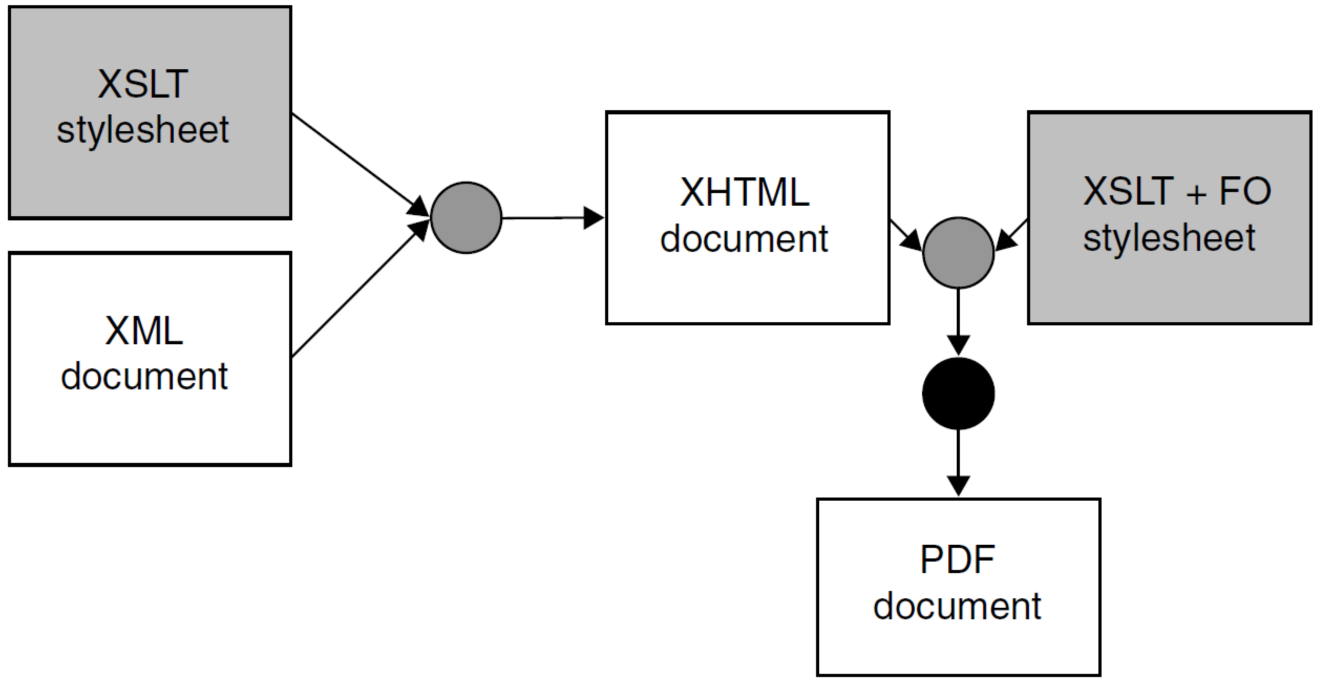
Using XSL stylesheets to print XML documents

XSL Formating Objects (XSLT-FO)

```
P { font: italic bold 12pt/14pt Times, serif; color: #0000F0  }
```

```
<fo:block font-size="12pt" font-weight="bold">content</fo:block>
```

XSL Formating Objects (XSLT-FO)



Alternate pattern for using XSL stylesheets to print XML documents

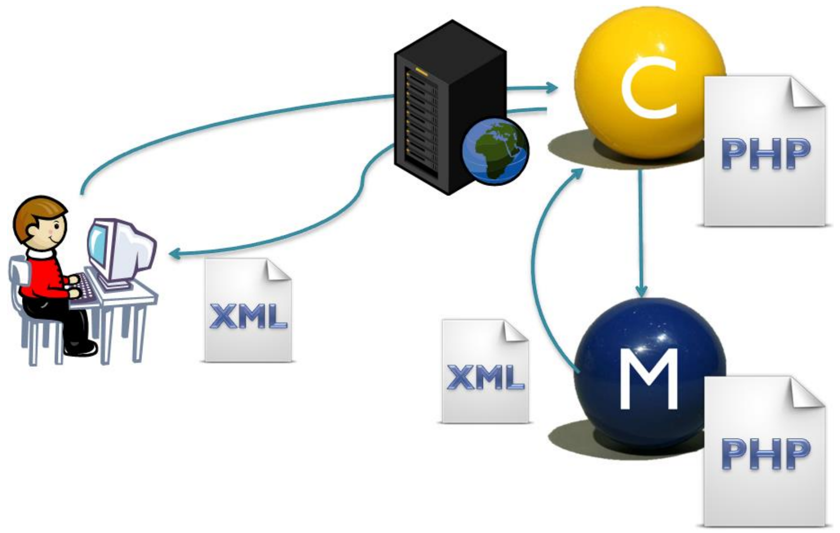
XPath - XML Path Language

query language for selecting nodes from an XML document

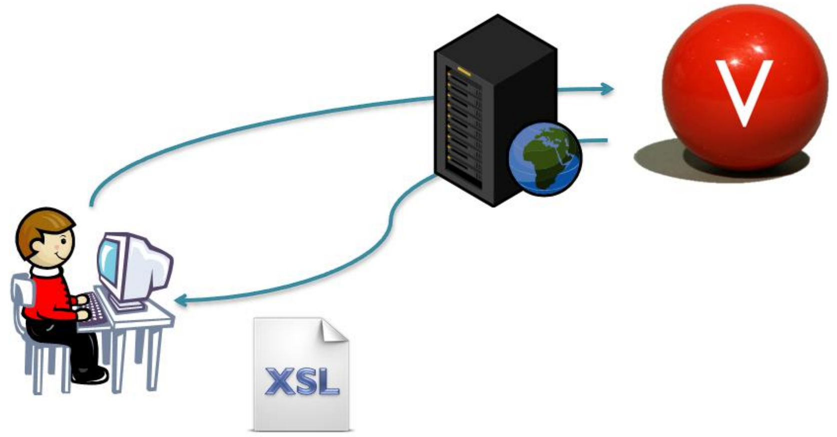
XSLT uses XPath to identify subsets of the source document tree and perform calculations

How important is it to use XSL to define the visual aspect of data?

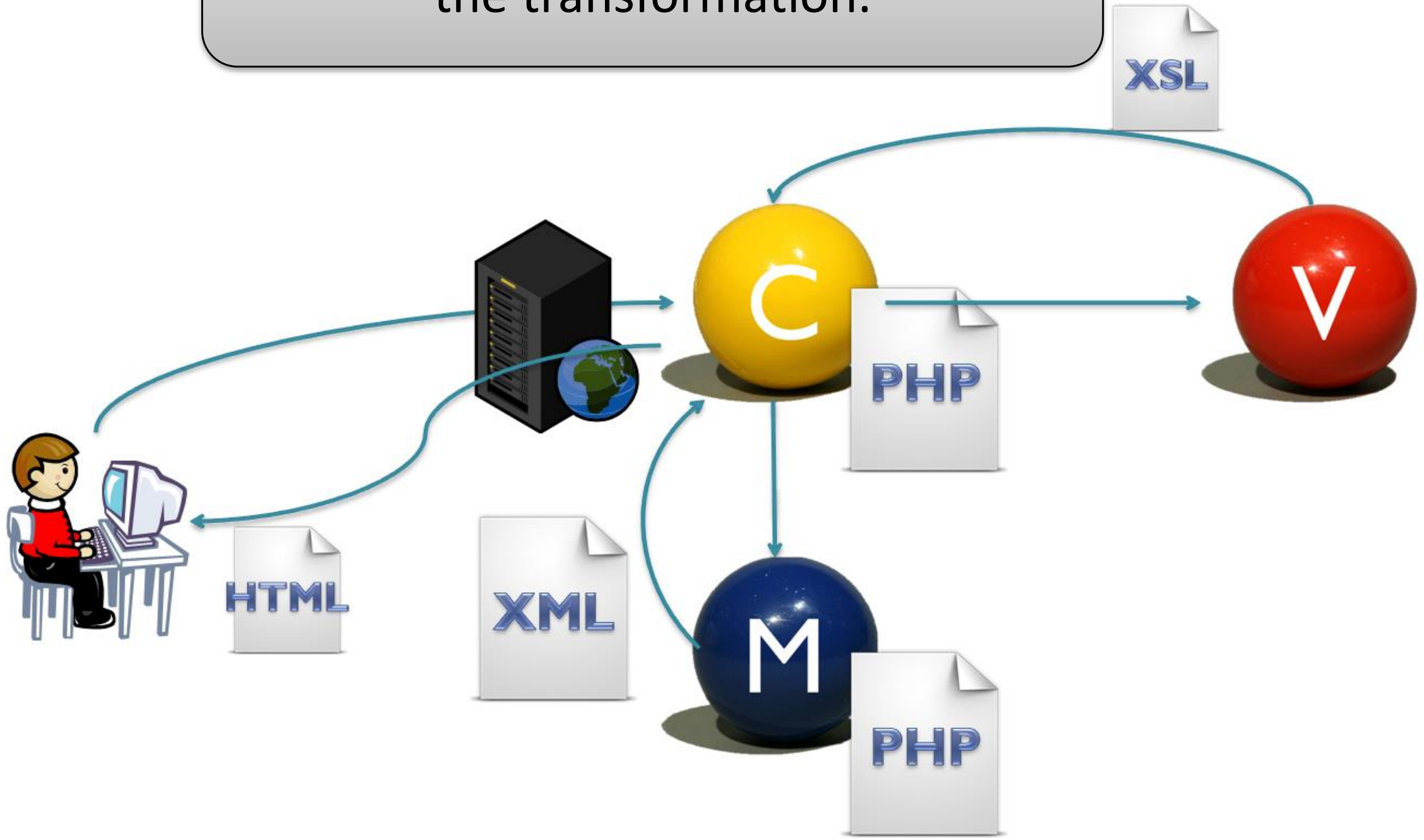
Step 1: User interacts with browser, sending request to Controller



Step 2: Browser automatically prompts for the View XSL

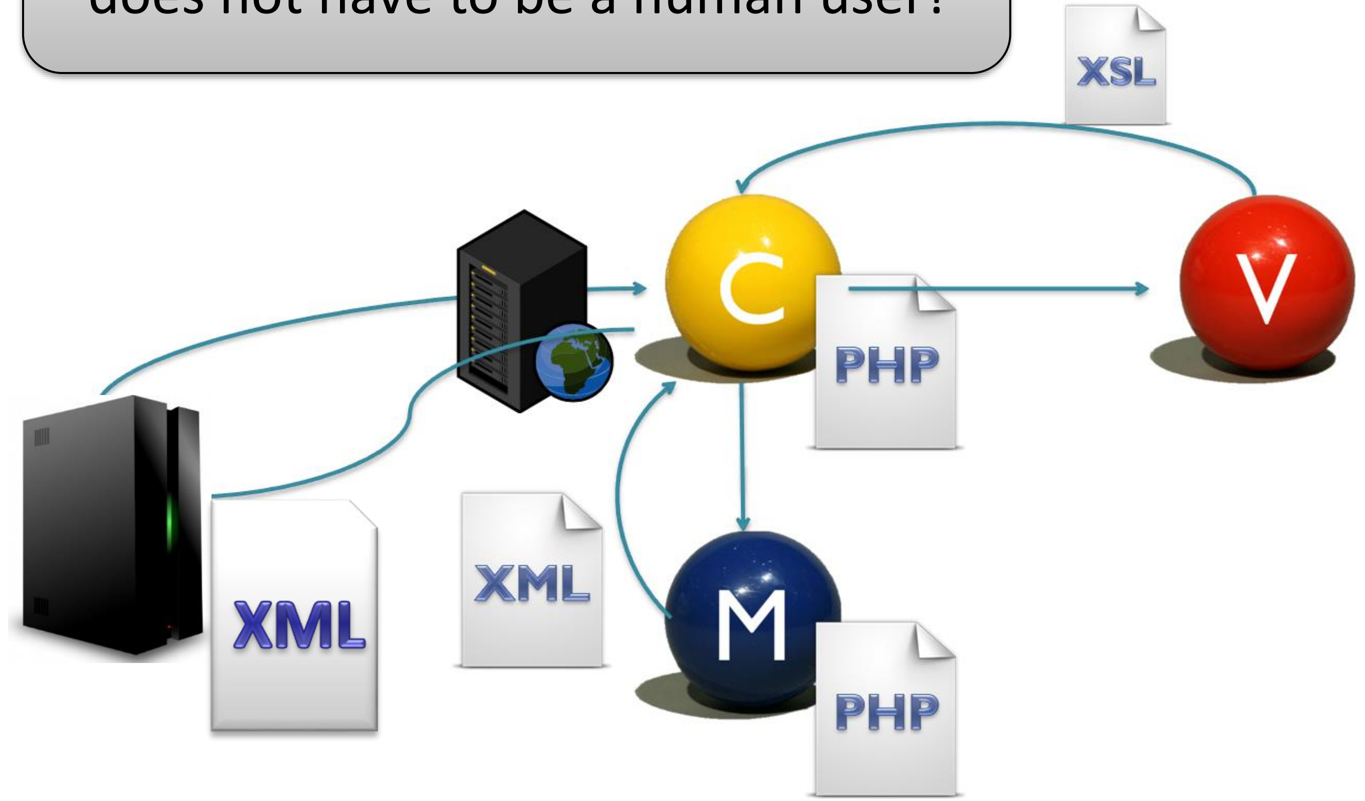


... or Controller uses View XSL to do the transformation.

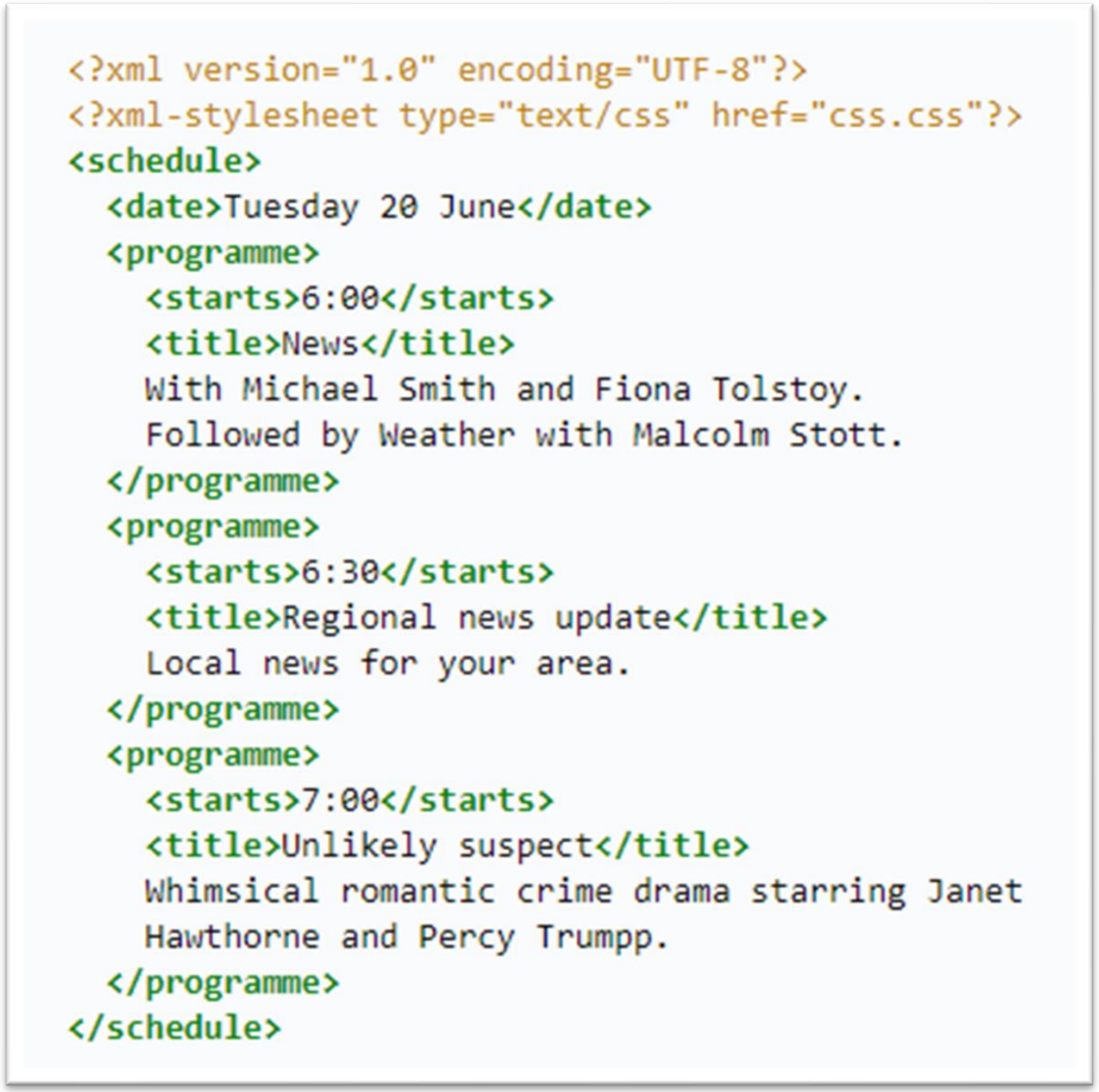


Why is it important that we can use XSL to convert files without visuals?

Let us remember that the destination does not have to be a human user!

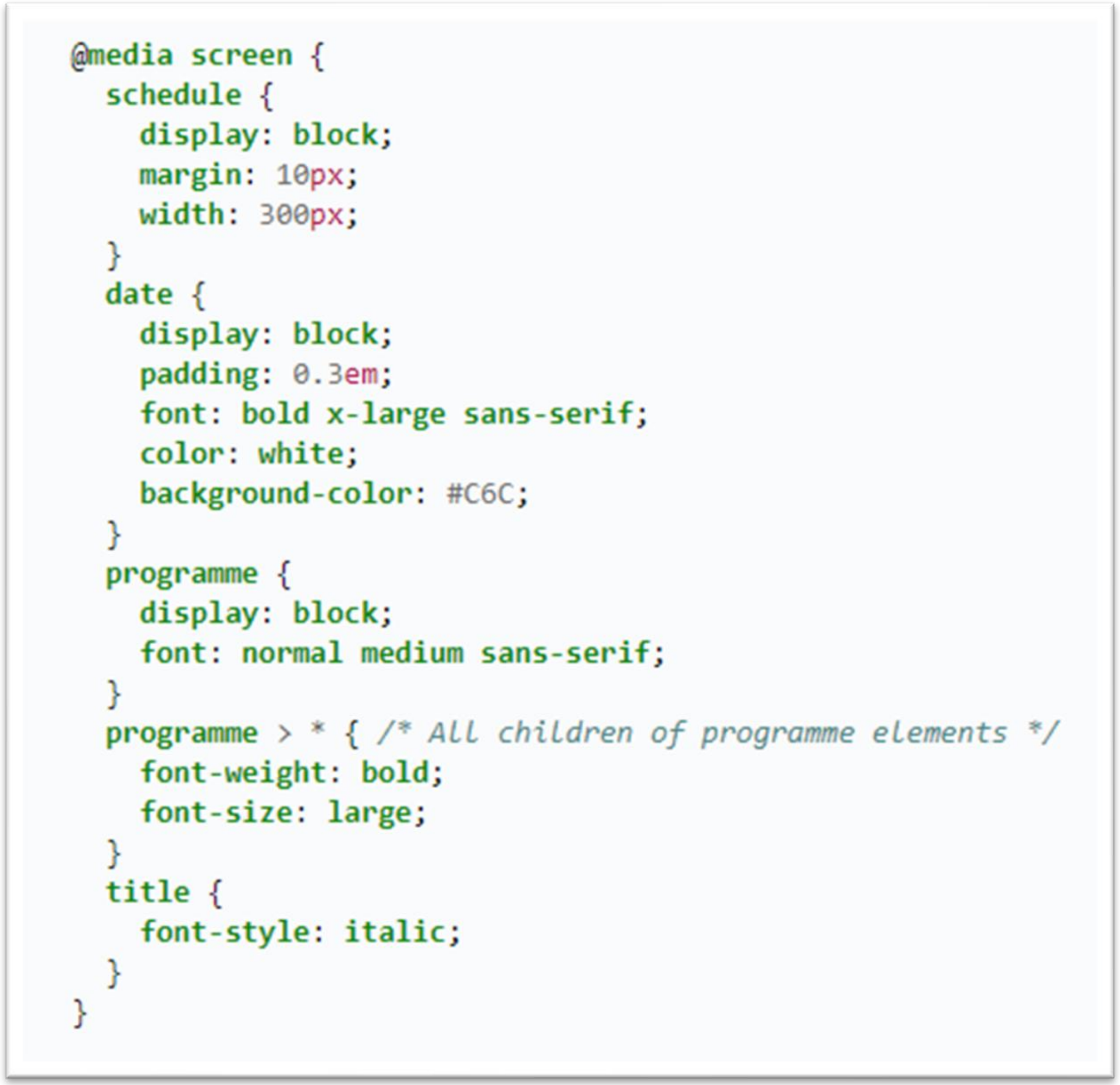


Alternatives to XSL? …CSS



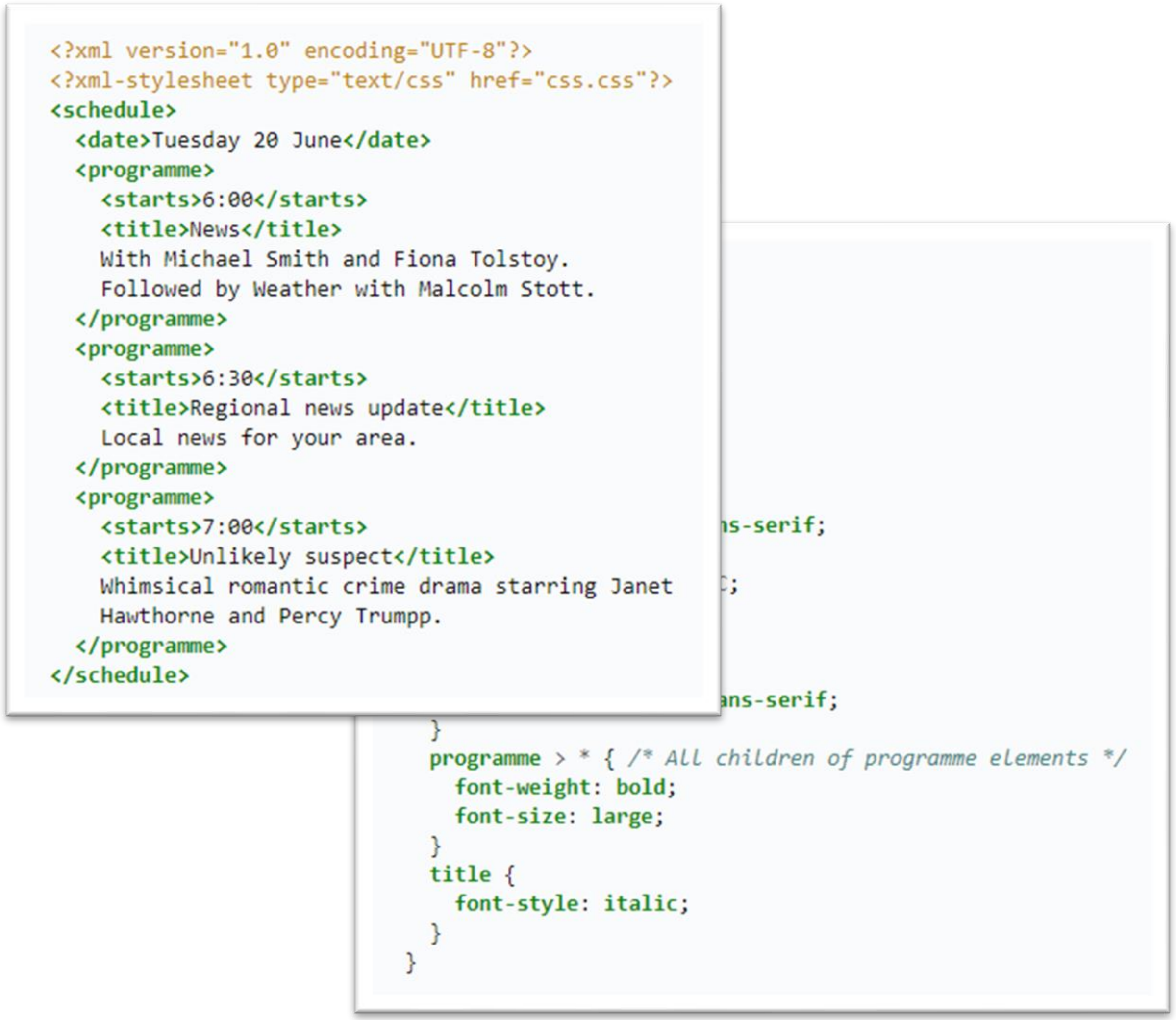
```xml
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/css" href="css.css"?>
<schedule>
  <date>Tuesday 20 June</date>
  <programme>
    <starts>6:00</starts>
    <title>News</title>
    With Michael Smith and Fiona Tolstoy.
    Followed by Weather with Malcolm Stott.
  </programme>
  <programme>
    <starts>6:30</starts>
    <title>Regional news update</title>
    Local news for your area.
  </programme>
  <programme>
    <starts>7:00</starts>
    <title>Unlikely suspect</title>
    Whimsical romantic crime drama starring Janet
    Hawthorne and Percy Trumpp.
  </programme>
</schedule>
```

+



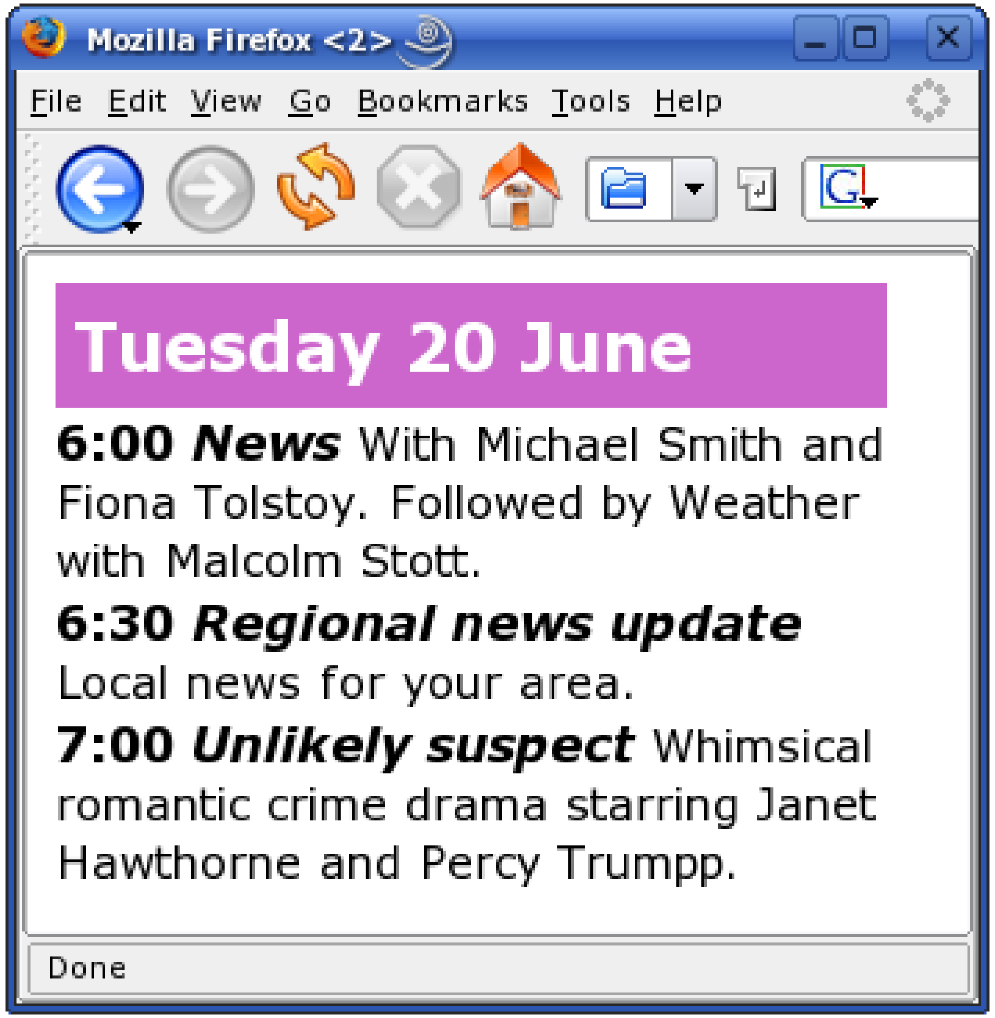
```css
@media screen {
  schedule {
    display: block;
    margin: 10px;
    width: 300px;
  }
  date {
    display: block;
    padding: 0.3em;
    font: bold x-large sans-serif;
    color: white;
    background-color: #C6C;
  }
  programme {
    display: block;
    font: normal medium sans-serif;
  }
  programme > * { /* All children of programme elements */
    font-weight: bold;
    font-size: large;
  }
  title {
    font-style: italic;
  }
}
```

Alternatives to XSL? …CSS



```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/css" href="css.css"?>
<schedule>
  <date>Tuesday 20 June</date>
  <programme>
    <starts>6:00</starts>
    <title>News</title>
    With Michael Smith and Fiona Tolstoy.
    Followed by Weather with Malcolm Stott.
  </programme>
  <programme>
    <starts>6:30</starts>
    <title>Regional news update</title>
    Local news for your area.
  </programme>
  <programme>
    <starts>7:00</starts>
    <title>Unlikely suspect</title>
    Whimsical romantic crime drama starring Janet
    Hawthorne and Percy Trumpp.
  </programme>
</schedule>
```

```
ns-serif;
C;
ans-serif;
  }
  programme > * { /* All children of programme elements */
    font-weight: bold;
    font-size: large;
  }
  title {
    font-style: italic;
  }
}
```



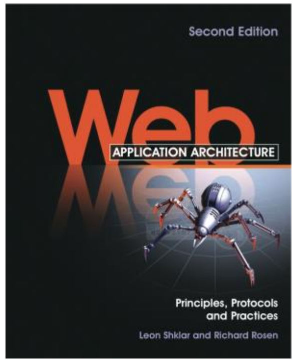
Tuesday 20 June

6:00 *News* With Michael Smith and Fiona Tolstoy. Followed by Weather with Malcolm Stott.

6:30 *Regional news update*
Local news for your area.

7:00 *Unlikely suspect* Whimsical romantic crime drama starring Janet Hawthorne and Percy Trumpp.

Bibliography


Second Edition
Web
APPLICATION ARCHITECTURE
Principles, Protocols and Practices
Leon Shklar and Richard Rosen

Shklar, Leon & Rosen, Rich (2009). Web Application Architecture: Principles, Protocols and Pratices. Chichester, Reino Unido: John Wiley & Sons.

Pages: 100 to 119

Chapter 5

5.3 Web Services
5.4 XSL