Reading XML

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XML

- Extensible markup language
- Frequently used to store structured data
- Particularly widely used in internet applications
- Extracting XML is the basis for most web scraping
- Components
- Markup - labels that give the text structure
- Content - the actual text of the document

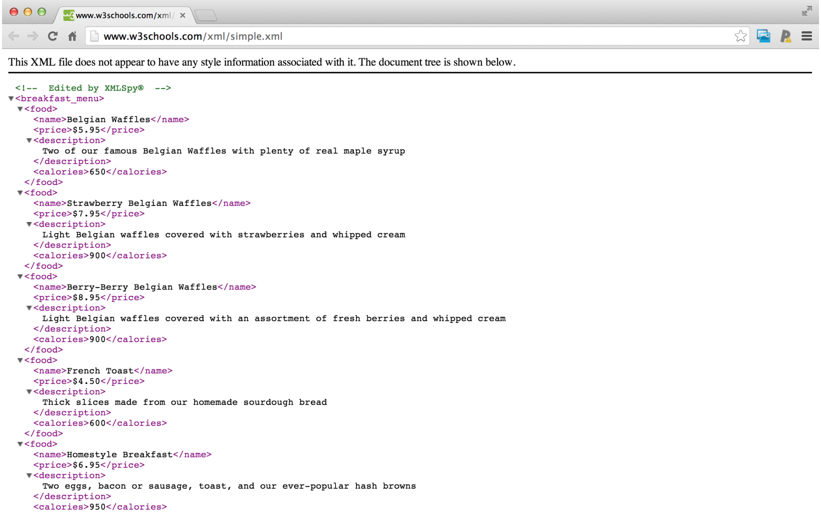
`http://en.wikipedia.org/wiki/XML`

Tags, elements and attributes

- Tags correspond to general labels
- Start tags `<section>`
- End tags `</section>`
- Empty tags `<line-break />`
- Elements are specific examples of tags
- `<Greeting> Hello, world </Greeting>`
- Attributes are components of the label
- `<img src="jeff.jpg" alt="instructor"/>`
- `<step number="3"> Connect A to B. </step>`

http://en.wikipedia.org/wiki/XML

Example XML file



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

```
 <!--  Edited by XMLSpy®  -->
▼<breakfast_menu>
  ▼<food>
     <name>Belgian Waffles</name>
     <price>$5.95</price>
    ▼<description>
       Two of our famous Belgian Waffles with plenty of real maple syrup
     </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>
  ▼<food>
     <name>Berry-Berry Belgian Waffles</name>
     <price>$8.95</price>
    ▼<description>
       Light Belgian waffles covered with an assortment of fresh berries and whipped cream
     </description>
     <calories>900</calories>
   </food>
  ▼<food>
     <name>French Toast</name>
     <price>$4.50</price>
    ▼<description>
       Thick slices made from our homemade sourdough bread
     </description>
     <calories>600</calories>
   </food>
  ▼<food>
     <name>Homestyle Breakfast</name>
     <price>$6.95</price>
    ▼<description>
       Two eggs, bacon or sausage, toast, and our ever-popular hash browns
     </description>
     <calories>950</calories>
```

`http://www.w3schools.com/xml/simple.xml`

Read the file into R

```r
library(XML)
fileUrl <- "http://www.w3schools.com/xml/simple.xml"
doc <- xmlTreeParse(fileUrl,useInternal=TRUE)
rootNode <- xmlRoot(doc)
xmlName(rootNode)
names(rootNode)
```

Directly access parts of the XML document

```
xmlChildren(rootNode)[[1]]

rootNode[[1]]
rootNode[[1]][[1]]
```

Programatically extract parts of the file

```r
xmlSApply(rootNode,xmlValue)
```

XPath

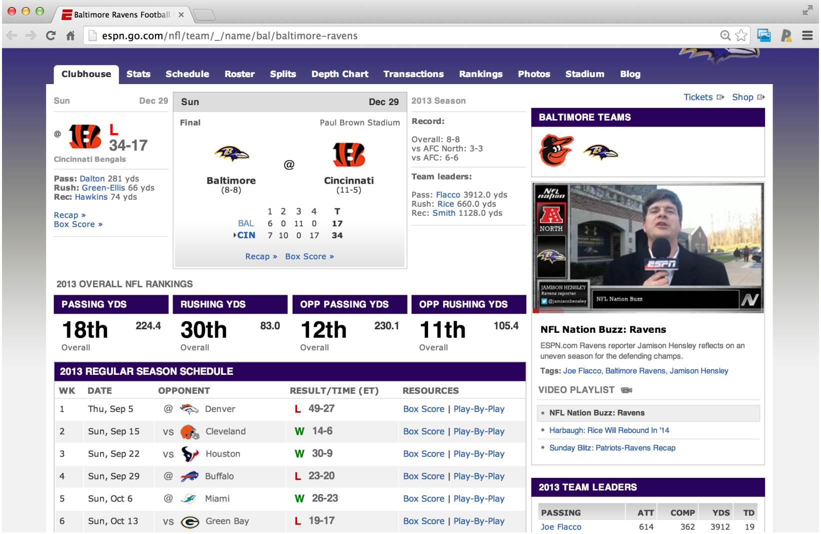
- */node* Top level node
- *//node* Node at any level
- *node[@attr-name]* Node with an attribute name
- *node[@attr-name='bob']* Node with attribute name attr-name='bob'

Information from: `http://www.stat.berkeley.edu/~statcur/Workshop2/Presentations/XML.pdf`

Get the items on the menu and prices

```
xpathSApply(rootNode,"//name",xmlValue)
xpathSApply(rootNode,"//price",xmlValue)
```

Another example



Sun Dec 29

@ L 34-17

Cincinnati Bengals

Pass: Dalton 281 yds
Rush: Green-Ellis 66 yds
Rec: Hawkins 74 yds

Recap »
Box Score »

Sun Dec 29

Final Paul Brown Stadium

Baltimore (8-8) @ Cincinnati (11-5)

	1	2	3	4	T
BAL	6	0	11	0	**17**
‣**CIN**	7	10	0	17	**34**

Recap » Box Score »

2013 Season

Record:

Overall: 8-8
vs AFC North: 3-3
vs AFC: 6-6

Team leaders:

Pass: Flacco 3912.0 yds
Rush: Rice 660.0 yds
Rec: Smith 1128.0 yds

BALTIMORE TEAMS

NFL Nation Buzz: Ravens

ESPN.com Ravens reporter Jamison Hensley reflects on an uneven season for the defending champs.

Tags: Joe Flacco, Baltimore Ravens, Jamison Hensley

VIDEO PLAYLIST

- **NFL Nation Buzz: Ravens**
- Harbaugh: Rice Will Rebound In '14
- Sunday Blitz: Patriots-Ravens Recap

2013 OVERALL NFL RANKINGS

PASSING YDS	RUSHING YDS	OPP PASSING YDS	OPP RUSHING YDS
18th Overall 224.4	30th Overall 83.0	12th Overall 230.1	11th Overall 105.4

2013 REGULAR SEASON SCHEDULE

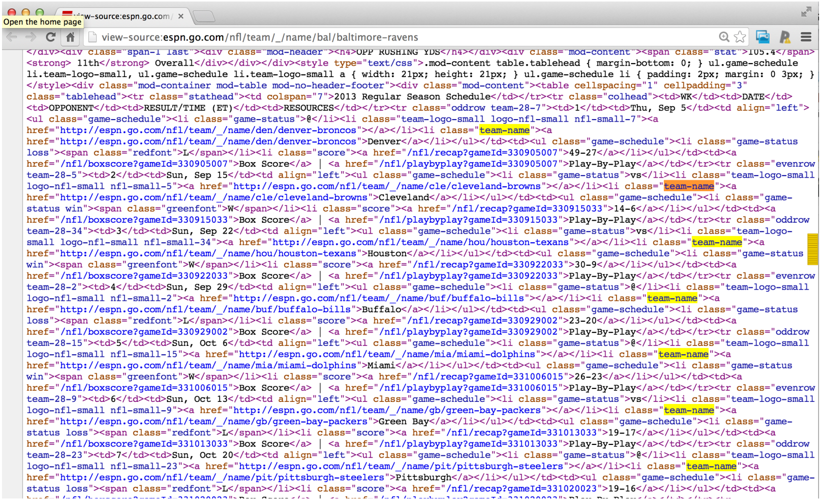
WK	DATE	OPPONENT	RESULT/TIME (ET)	RESOURCES
1	Thu, Sep 5	@ Denver	L 49-27	Box Score | Play-By-Play
2	Sun, Sep 15	vs Cleveland	W 14-6	Box Score | Play-By-Play
3	Sun, Sep 22	vs Houston	W 30-9	Box Score | Play-By-Play
4	Sun, Sep 29	@ Buffalo	L 23-20	Box Score | Play-By-Play
5	Sun, Oct 6	@ Miami	W 26-23	Box Score | Play-By-Play
6	Sun, Oct 13	vs Green Bay	L 19-17	Box Score | Play-By-Play

2013 TEAM LEADERS

PASSING	ATT	COMP	YDS	TD
Joe Flacco	614	362	3912	19

```
http:
//espn.go.com/nfl/team/_/name/bal/baltimore-ravens
```

Viewing the source


Open the home page
view-source:espn.go.com/
view-source:espn.go.com/nfl/team/_/name/bal/baltimore-ravens

```
</div><div class="span-1 last"><div class="mod-header"><h4>OPP RUSHING YDS</h4></div><div class="mod-content"><span class="stat">105.4</span>
<strong> 11th</strong> Overall</div></div></div><style type="text/css">.mod-content table.tablehead { margin-bottom: 0; } ul.game-schedule
li.team-logo-small, ul.game-schedule li.team-logo-small a { width: 21px; height: 21px; } ul.game-schedule li { padding: 2px; margin: 0 3px; }
</style><div class="mod-container mod-table mod-no-header-footer"><div class="mod-content"><table cellspacing="1" cellpadding="3"
class="tablehead"><tr class="stathead"><td colspan="7">2013 Regular Season Schedule</td></tr><tr class="colhead"><td>WK</td><td>DATE</td>
<td>OPPONENT</td><td>RESULT/TIME (ET)</td><td>RESOURCES</td></tr><tr class="oddrow team-28-7"><td>1</td><td>Thu, Sep 5</td><td align="left">
<ul class="game-schedule"><li class="game-status">@</li><li class="team-logo-small logo-nfl-small nfl-small-7"><a
href="http://espn.go.com/nfl/team/_/name/den/denver-broncos"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/den/denver-broncos">Denver</a></li></ul></td><td><ul class="game-schedule"><li class="game-status
loss"><span class="redfont">L</span></li><li class="score"><a href="/nfl/recap?gameId=330905007">49-27</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=330905007">Box Score</a> | <a href="/nfl/playbyplay?gameId=330905007">Play-By-Play</a></td></tr><tr class="evenrow
team-28-5"><td>2</td><td>Sun, Sep 15</td><td align="left"><ul class="game-schedule"><li class="game-status">vs</li><li class="team-logo-small
logo-nfl-small nfl-small-5"><a href="http://espn.go.com/nfl/team/_/name/cle/cleveland-browns"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/cle/cleveland-browns">Cleveland</a></li></ul></td><td><ul class="game-schedule"><li class="game-
status win"><span class="greenfont">W</span></li><li class="score"><a href="/nfl/recap?gameId=330915033">14-6</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=330915033">Box Score</a> | <a href="/nfl/playbyplay?gameId=330915033">Play-By-Play</a></td></tr><tr class="oddrow
team-28-34"><td>3</td><td>Sun, Sep 22</td><td align="left"><ul class="game-schedule"><li class="game-status">vs</li><li class="team-logo-
small logo-nfl-small nfl-small-34"><a href="http://espn.go.com/nfl/team/_/name/hou/houston-texans"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/hou/houston-texans">Houston</a></li></ul></td><td><ul class="game-schedule"><li class="game-status
win"><span class="greenfont">W</span></li><li class="score"><a href="/nfl/recap?gameId=330922033">30-9</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=330922033">Box Score</a> | <a href="/nfl/playbyplay?gameId=330922033">Play-By-Play</a></td></tr><tr class="evenrow
team-28-2"><td>4</td><td>Sun, Sep 29</td><td align="left"><ul class="game-schedule"><li class="game-status">@</li><li class="team-logo-small
logo-nfl-small nfl-small-2"><a href="http://espn.go.com/nfl/team/_/name/buf/buffalo-bills"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/buf/buffalo-bills">Buffalo</a></li></ul></td><td><ul class="game-schedule"><li class="game-status
loss"><span class="redfont">L</span></li><li class="score"><a href="/nfl/recap?gameId=330929002">23-20</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=330929002">Box Score</a> | <a href="/nfl/playbyplay?gameId=330929002">Play-By-Play</a></td></tr><tr class="oddrow
team-28-15"><td>5</td><td>Sun, Oct 6</td><td align="left"><ul class="game-schedule"><li class="game-status">@</li><li class="team-logo-small
logo-nfl-small nfl-small-15"><a href="http://espn.go.com/nfl/team/_/name/mia/miami-dolphins"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/mia/miami-dolphins">Miami</a></li></ul></td><td><ul class="game-schedule"><li class="game-status
win"><span class="greenfont">W</span></li><li class="score"><a href="/nfl/recap?gameId=331006015">26-23</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=331006015">Box Score</a> | <a href="/nfl/playbyplay?gameId=331006015">Play-By-Play</a></td></tr><tr class="evenrow
team-28-9"><td>6</td><td>Sun, Oct 13</td><td align="left"><ul class="game-schedule"><li class="game-status">vs</li><li class="team-logo-small
logo-nfl-small nfl-small-9"><a href="http://espn.go.com/nfl/team/_/name/gb/green-bay-packers"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/gb/green-bay-packers">Green Bay</a></li></ul></td><td><ul class="game-schedule"><li class="game-
status loss"><span class="redfont">L</span></li><li class="score"><a href="/nfl/recap?gameId=331013033">19-17</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=331013033">Box Score</a> | <a href="/nfl/playbyplay?gameId=331013033">Play-By-Play</a></td></tr><tr class="oddrow
team-28-23"><td>7</td><td>Sun, Oct 20</td><td align="left"><ul class="game-schedule"><li class="game-status">@</li><li class="team-logo-small
logo-nfl-small nfl-small-23"><a href="http://espn.go.com/nfl/team/_/name/pit/pittsburgh-steelers"></a></li><li class="team-name"><a
href="http://espn.go.com/nfl/team/_/name/pit/pittsburgh-steelers">Pittsburgh</a></li></ul></td><td><ul class="game-schedule"><li class="game-
status loss"><span class="redfont">L</span></li><li class="score"><a href="/nfl/recap?gameId=331020023">19-16</a></li></ul></td><td><a
href="/nfl/boxscore?gameId=331020023">Box Score</a> | <a href="/nfl/playbyplay?gameId=331020023">Play-By-Play</a></td></tr><tr
```

http://espn.go.com/nfl/team/_/name/bal/baltimore-ravens

Extract content by attributes

```
fileUrl <- "http://espn.go.com/nfl/team/_/name/bal/baltimor
doc <- htmlTreeParse(fileUrl,useInternal=TRUE)
scores <- xpathSApply(doc,"//li[@class='score']",xmlValue)
teams <- xpathSApply(doc,"//li[@class='team-name']",xmlValu
scores
teams
```

Notes and further resources

- Official XML tutorials short, long
- An outstanding guide to the XML package