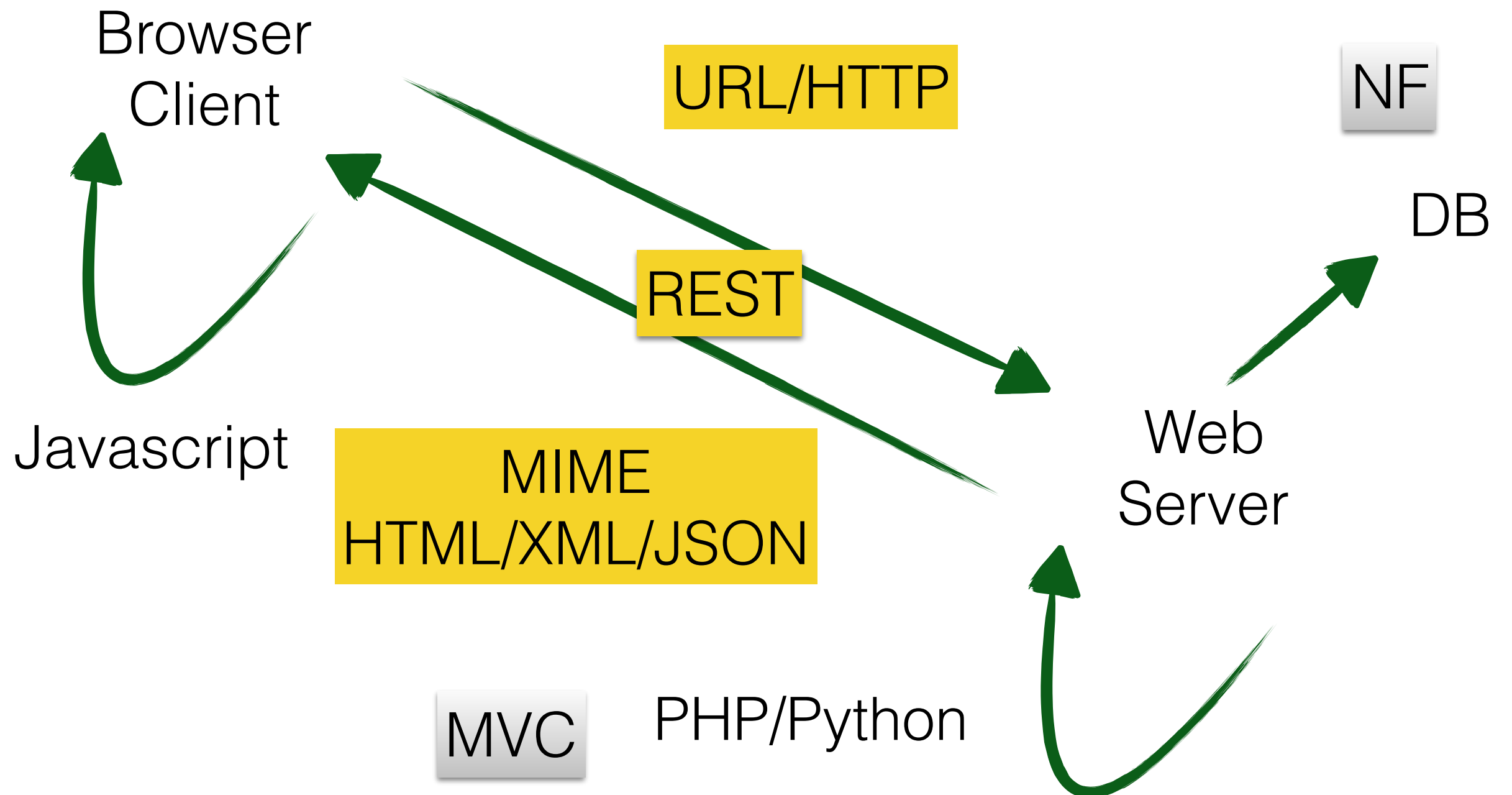


# Web dynamic Protocols & Data Format

Frédéric Le Mouël & Julien Ponge

# The Big Picture



# Standards?

*« The nice thing about standards is that you have so many to choose from »  
Andrew Tanenbaum*

- IETF ([www.ietf.org](http://www.ietf.org))
- W3C ([www.w3.org](http://www.w3.org))
- ISO ([www.iso.org](http://www.iso.org))
- IANA ([www.iana.org](http://www.iana.org))
- ECMA ([www.ecma-international.org](http://www.ecma-international.org))

# Standards?

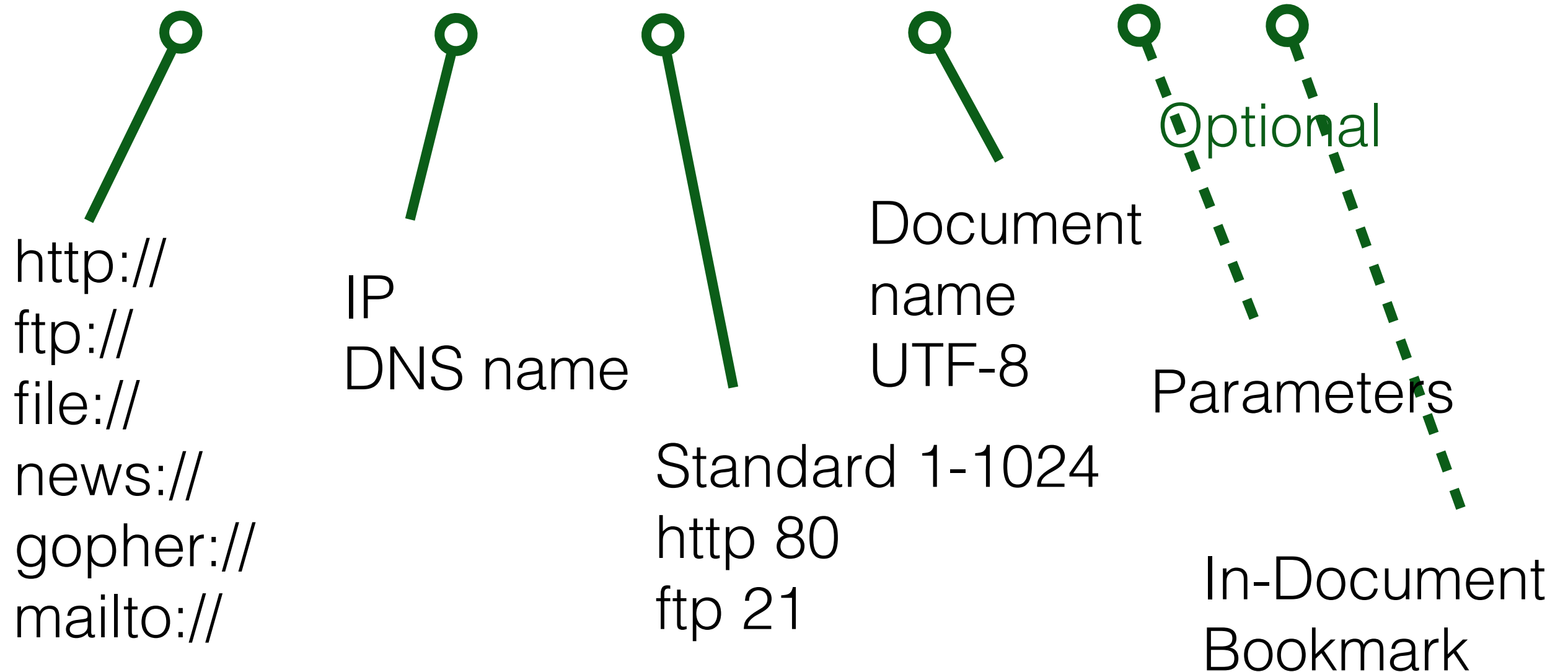
*« The nice thing about standards is that you have so many to choose from »  
Andrew Tanenbaum*

- IETF ([www.ietf.org](http://www.ietf.org)): protocols
- W3C ([www.w3.org](http://www.w3.org)): markup/display languages
- ISO ([www.iso.org](http://www.iso.org)): character encoding
- IANA ([www.iana.org](http://www.iana.org)): domain name, mime format
- ECMA ([www.ecma-international.org](http://www.ecma-international.org)): javascript

# URL

## Uniform Resource Locator

protocol://machine:port/document?param#signet



# URL

Not Valid !

Browser completion !

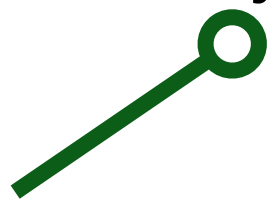

 www.insa-lyon.fr

http://www.insa-lyon.fr/fr/insa-lyon

Document name

≠ File / repository name !

DNS  
result

  
 http://134.214.182.55:80/fr/insa-lyon

UTF-8 !

 https://www.insa-lyon.fr/fr/content/venir-%C3%A0-linsa-lyon-0

# URL

Several parameters

Local  
Routing  
Table

[http://localhost:8080/myagenda/index?  
date=05022016&type=lectures&output=ics](http://localhost:8080/myagenda/index?date=05022016&type=lectures&output=ics)

<http://127.0.0.1:8080/myagenda/add#contact>

- 📷 : Switch between the front and rear cameras.
- 📞 : End the current call.
- 🎤 : Turn off the microphone so that the other party cannot hear you.

## Contacts

### Introduction

Create new contacts or manage contacts on the device.

### Adding contacts

#### Creating contacts manually

- 1 Tap **Contacts** on the Apps screen.
- 2 Tap 📷 and select a storage location.
- 3 Enter contact information.
  - 📷 : Add an image.
  - + / - : Add or delete a contact field.
- 4 Tap **SAVE**.

# MIME

*(‘Multipurpose Internet Mail Extensions’)*

Internet Data Type: RFC 2046 SMTP → HTTP, SIP, etc.

```
MIME-Version: 1.0
```

```
Content-Type: text/plain; charset=utf-8
```

```
Content-Type: text/html
```

```
Content-Type: text/css
```

***In the protocol !***



# MIME

*(‘Multipurpose Internet Mail Extensions’)*

Internet Data Type: RFC 2046 SMTP → HTTP, SIP, etc.

```
Content-Transfer-Encoding: x-gzip
```

```
Content-Type: text/plain; charset=utf-8
```

```
Content-Transfer-Encoding: quoted-printable
```

```
Ceci est un message encod=C3=A9 en UTF-8, puis  
transform=C3=A9 en ASCII par  
la m=C3=A9thode "Quoted-Printable".
```

***In the protocol !***

**UTF-8 !**

# MIME

(*'Multipurpose Internet Mail Extensions'*)

Internet Data Type: RFC 2046 SMTP → HTTP, SIP, etc.

pdf  
PDX  
pgp-encrypted  
pgp-keys  
pgp-signature  
pidf-diff+xml  
pidf+xml  
pkcs10  
pkcs7-mime

*Linked  
to applications*



application/pdf  
application/PDX  
application/pgp-encrypted  
  
application/pgp-signature  
application/pidf-diff+xml  
application/pidf+xml  
application/pkcs10  
application/pkcs7-mime

*In the client  
/ browser!*

*≠ File extension!*



# HTTP/1.0



# GET, POST, HEAD

**/doc.html**

# /cgi-bin/register.pl

# HTTP/1.1



# GET, POST, HEAD

**/doc.html**

```

    /cgi-bin/register.pl

```

# PUT, DELETE, TRACE, OPTIONS, CONNECT, PATCH, + {extensions}

# WebDAV, CalDAV, Subversion, ...

# HTTP/2.0

Binary

Push

Multiplexing



**GET, POST, HEAD**

**/doc.html**

**/cgi-bin/register.pl**

**PUT, DELETE, TRACE,  
OPTIONS, CONNECT,  
PATCH, + {extensions}**

WebDAV, CalDAV, Subversion, ...

Header compression

> GET / HTTP/1.1  
> User-Agent: curl/7.30.0  
> Host: telecom.insa-lyon.fr  
> Accept: \*/\*

< HTTP/1.1 302 Found

< Date: Mon, 15 Nov 2013 20:12:22 GMT

< Server: Apache

< X-Powered-By: PHP/5.3.18-pl0-gentoo

< Set-Cookie:

SESS21667754618b4ba17a8e101c305ce19a=t9vco4t34abvp812478o5im  
fi2; expires=Wed, 29-Nov-2013 23:45:42 GMT; path=/  
domain=.telecom.insa-lyon.fr

< Expires: Sun, 19 Nov 1978 05:00:00 GMT

< Last-Modified: Mon, 15 Nov 2013 20:12:22 GMT

< Cache-Control: store, no-cache, must-revalidate

< Cache-Control: post-check=0, pre-check=0

< Location: https://telecom.insa-lyon.fr/

< Content-Length: 0

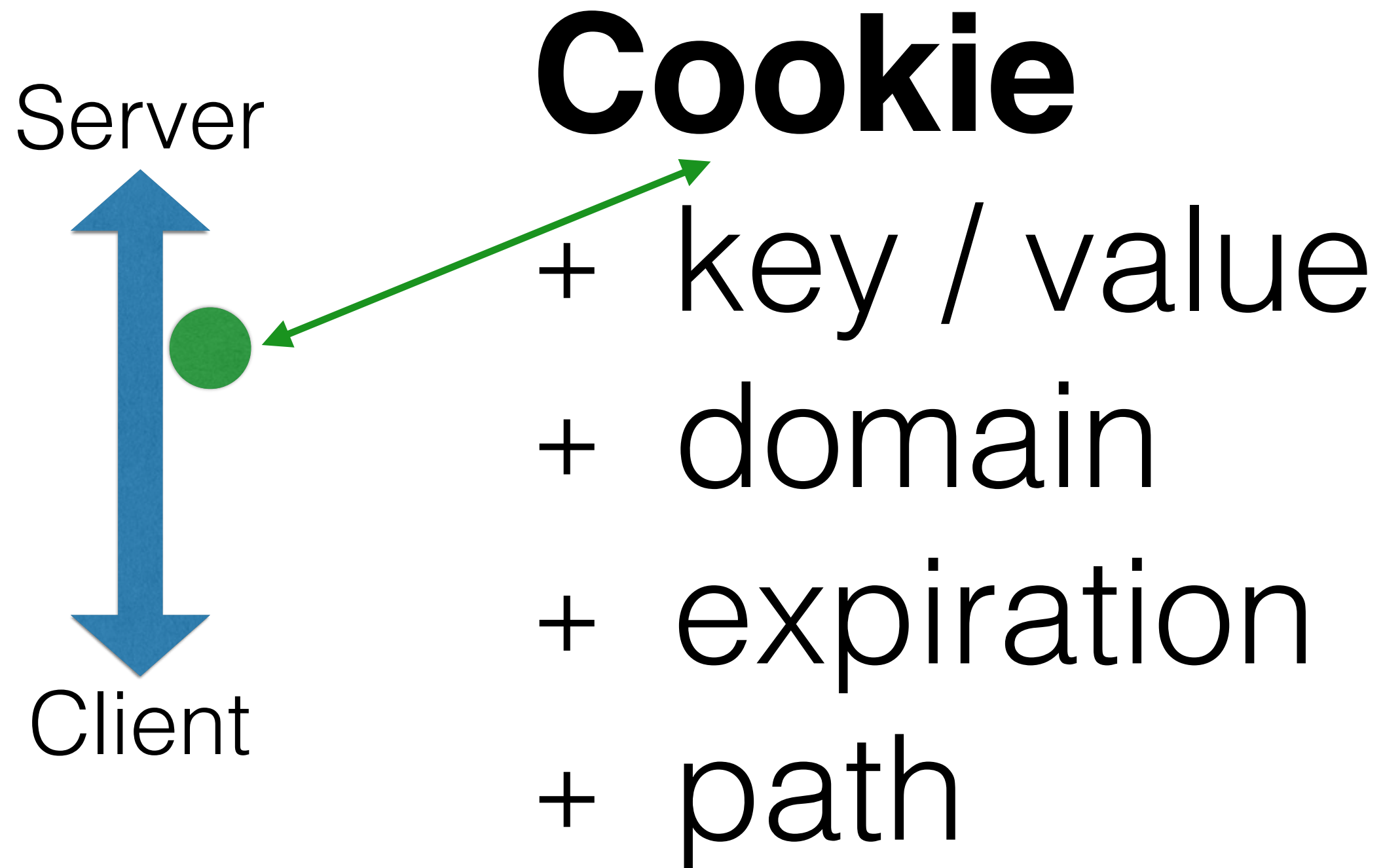
< Content-Type: text/html; charset=utf-8

HTTP stateless ...

... application sessions ?

```
> HEAD / HTTP/1.1
> User-Agent: curl/7.30.0
> Host: www.cnn.com
> Accept: */*
>
< HTTP/1.1 302 Moved Temporarily
< Server: nginx
< Date: Wed, 18 Nov 2013 11:03:42 GMT
< Content-Type: text/html
< Content-Length: 154
< Connection: keep-alive
< Set-Cookie: CG=FR:B9:Tr?voux; path=/
< Cache-Control: private, no-cache
< Vary: *
< Location: http://edition.cnn.com/
```





# Problems ?

**login**=johnb  
**role**=admin

```
md5(value +  
sel_server)
```

*Only on  
the server !*



**login**=johnb

**role**=admin

**hash**=3c734a8be0bcfe85a9e283127  
df12723

*Password  
Storage !*

```
md5(value +  
sel_server)
```

**login**=johnb

**role**=admin

**hash**=3c734a8be0bcfe85a9e283127  
df12723

*Why not a  
shared secret ?*

Secure Channel

HTTPS - certificate trust

PGP - known  
public key

# SGML

(Standard Generalized Markup Language)

Document Type Definition  
(DTD)

```
<!ELEMENT chapter - - (title, section+)>  
<!ELEMENT title o o (#PCDATA)>  
<!ELEMENT section - - (title, subsection+)>
```

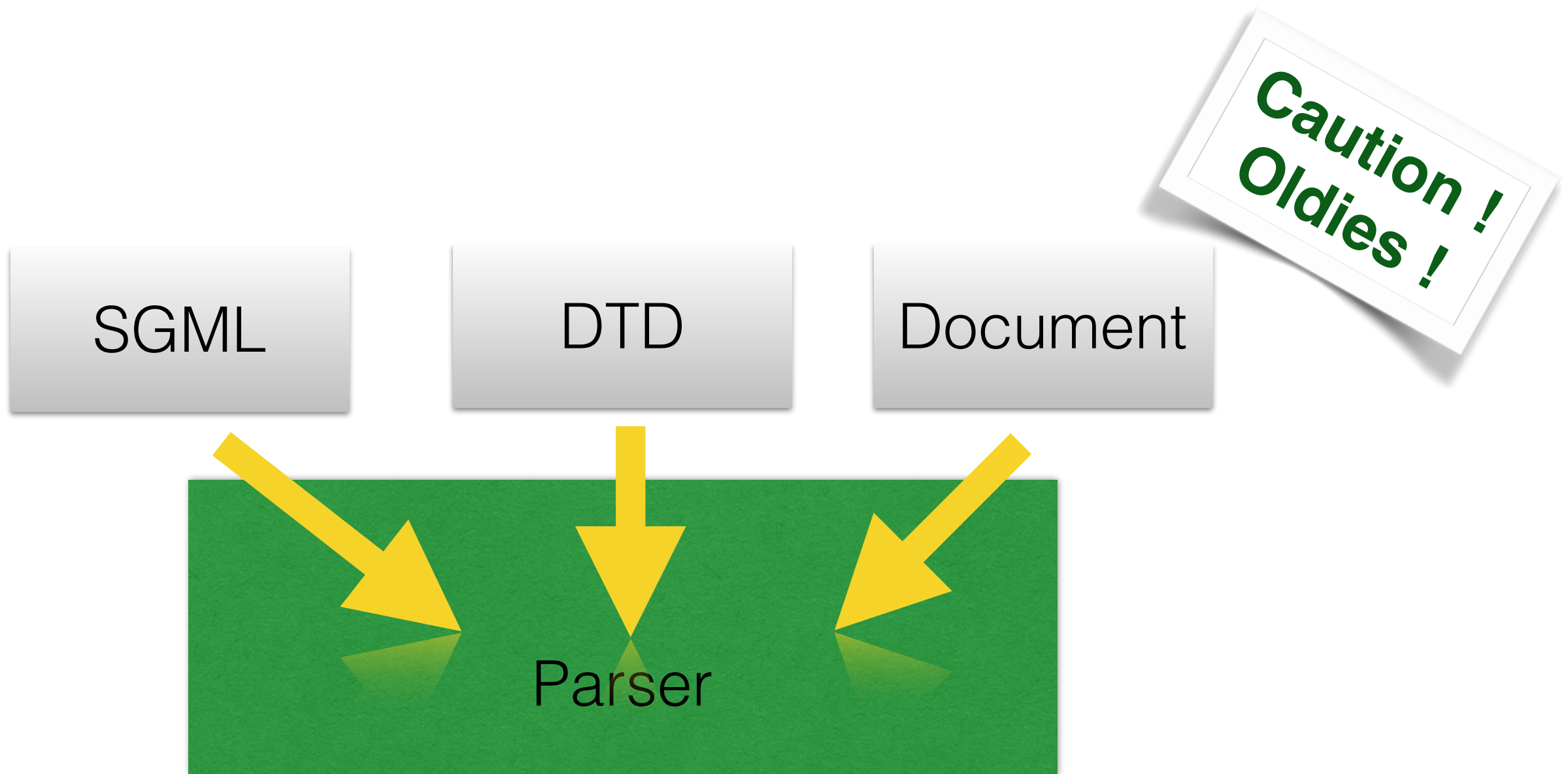
Caution !  
Oldies !

Document

```
<chapter>Introduction to SGML  
<section>The SGML Declaration  
<subsection>  
...
```

# SGML

(Standard Generalized Markup Language)



# XML

## (Extensible Markup Language)

```
<?xml version="1.0" encoding="UTF-8"?>
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

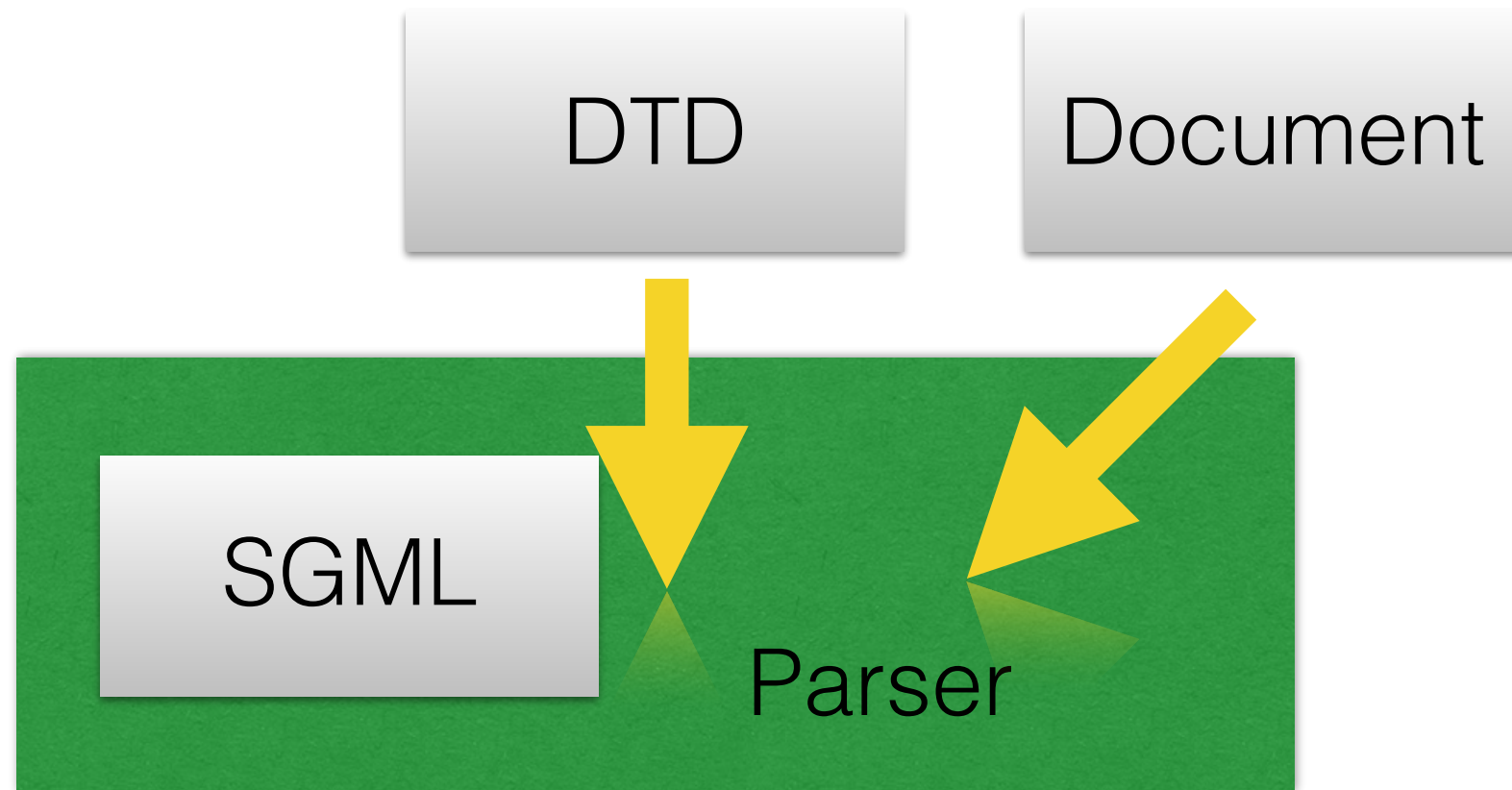


No non-closing tag

*Easier to parse !*

# XML

(Extensible Markup Language)

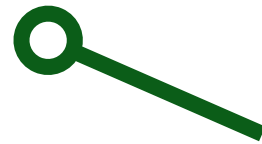




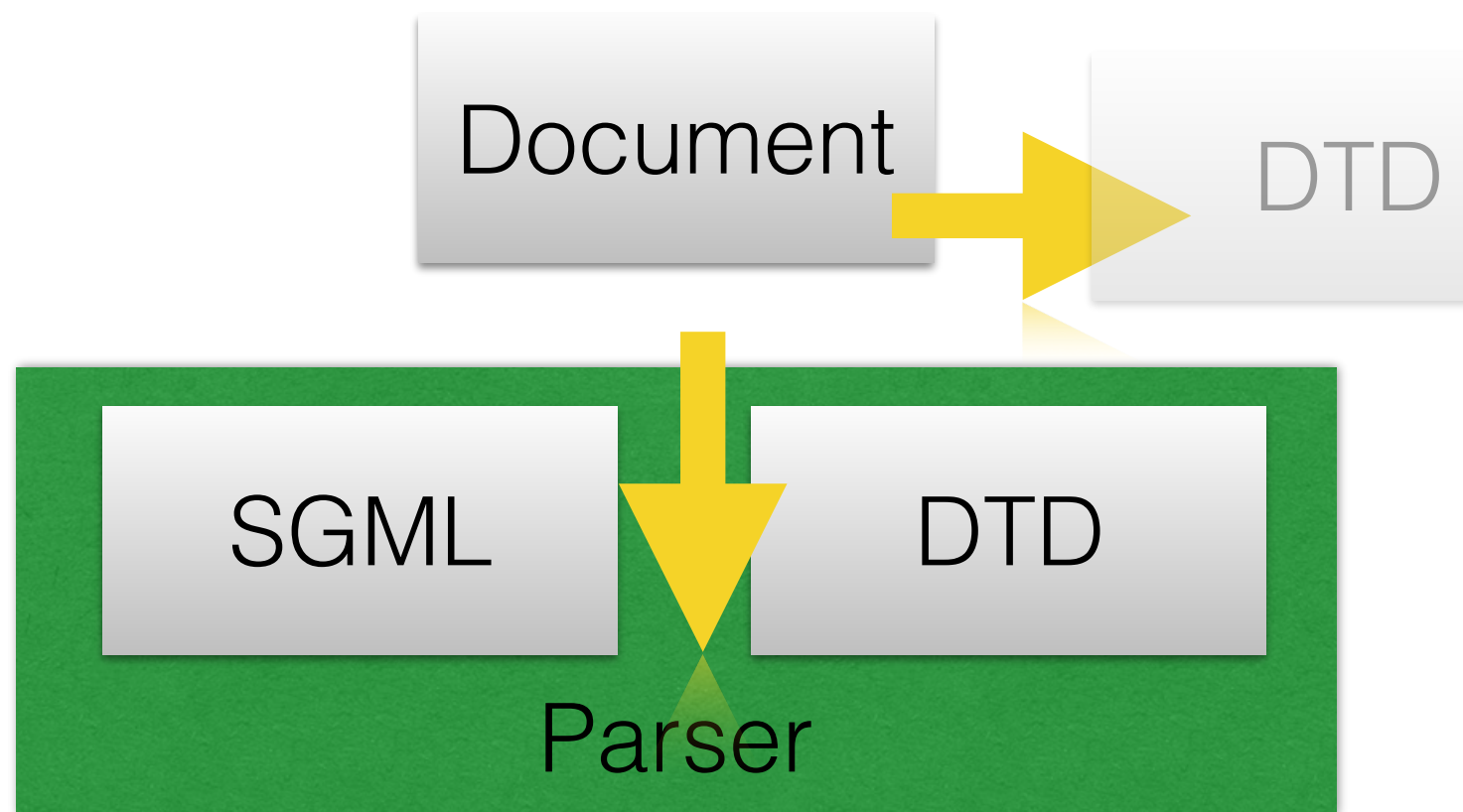
# HTML

## (Hypertext Markup Language)

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html>
  <head>
    <title>This is a title</title>
  </head>
  <body>
    <p>Hello world!</p>
  </body>
</html>
```



Predefined grammar !



# HTML5

Improved Element Semantics  
(CSS split)

Consistency in Handling Malformed Documents

```
<!DOCTYPE HTML>
<html>
  <head>
    <title>This is a title</title>
  </head>
  <body>
    <strong>Good</strong>
    <canvas id="myCanvas" width="200" height="100" style="border:1px solid #000000;">
    </canvas>
  </body>
</html>
```

Document

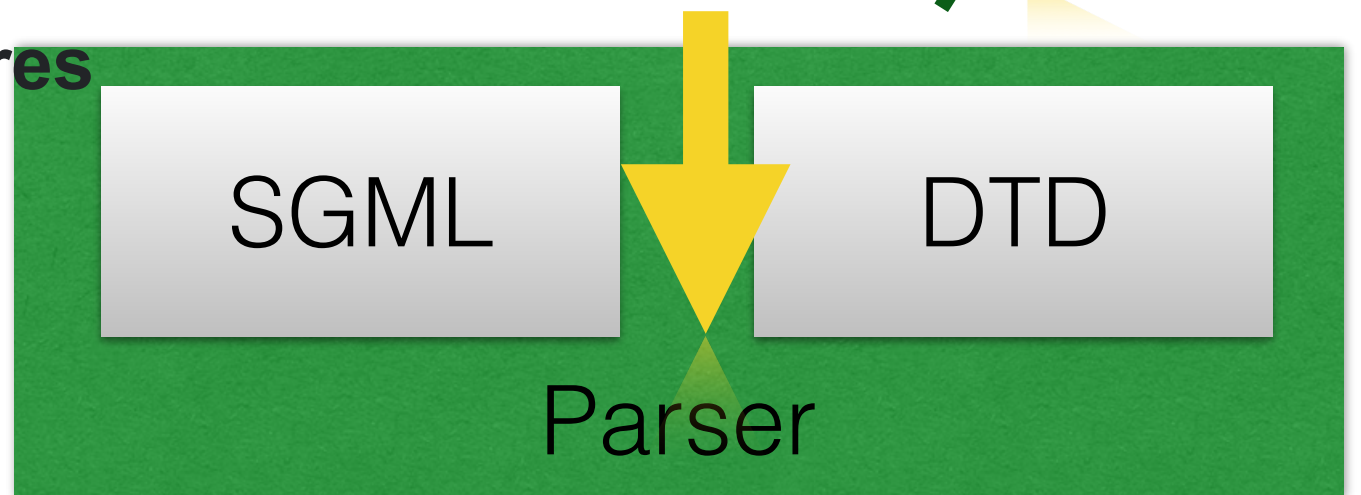
DTD

Better Web Application Features

SGML

DTD

Parser



```
{  
  'contact': {  
    'name': 'Mr Bean',  
    'email': 'mrbean@bean.com',  
    'friends': [  
      'Mary', 'John'  
    ]  
  }  
}
```

# JavaScript Object Notation (JSON)

```
{  
  'contact': {  
    'name': 'Mr Bean',  
    'email': 'mrbean@bean.com',  
    'friends': [  
      'Mary', 'John'  
    ]  
  }  
}
```

JSON.stringify(obj)      → string  
JSON.parse(string)      → obj

# REST

(REpresentational State Transfer)

Methodology !

Resource-based:

- Document
- Things
- User

# REST

- 6 criteria:
  - **Client-Server**
  - **Uniform interface**
  - **Stateless**
  - *Cacheable*
  - *Layered System*
  - *Code on Demand (optional)*

# REST

- Data Model: XML / JSON
- Example:
  - Resource: an person:  
Fred
  - Service: contact  
information: GET
  - Results:

```
{  
  'contact': {  
    'name': 'Le Mouël',  
    'surname': 'Frédéric',  
    'email': 'fred@le-mouel.net',  
    'friends': [  
      'Julien', 'Arnaud'  
    ]  
  }  
}
```

# REST

- URL as Resource Identifier
- Examples

## **List of INSA Lyon's Departments**

<http://www.insa-lyon.fr/departments>

## **List of sorted IT's Departments**

<http://www.insa-lyon.fr/departments?filter=IT&sort=asc>



# REST

- URL as Resource Identifier
- Examples

## **Telecommunication Department**

<http://www.insa-lyon.fr/departments/tc>

## **Students of Telecommunication Department**

<http://www.insa-lyon.fr/departments/tc/students>

## **A student of Telecommunication Department**

<http://www.insa-lyon.fr/departments/tc/students/bob>

# REST

- HTTP actions as 'action verbs'
  - Create → POST
  - Read → GET
  - Update → PUT
  - Delete → DELETE

# REST

- HTTP actions as 'action verbs'
- Examples

## **New Student of Telecommunication Department**

POST <http://www.insa-lyon.fr/departments/tc/students>

## **A student of Telecommunication Department**

GET <http://www.insa-lyon.fr/departments/tc/students/bob>

## **Bob has a new address !**

PUT <http://www.insa-lyon.fr/departments/tc/students/bob>

# REST

- The client ask for the Data Format
- Example

```
GET /departments/tc/students/bob  
Host: www.insa-lyon.fr  
Accept: application/xml
```

```
Accept: text/html
```

# REST

- Authentication Token as Parameter
- Example

```
GET /departments/tc/students/bob?auth&pass=x
```

```
<xml>  
  <user>bob</user>  
  <token>sgrsdr344545</token>  
</xml>
```

# REST

- Authentication Token as Parameter
- Example

```
hash    = SHA1 ( sgrsdr344545 +  
                  GET  ("/departments/tc/notes") )  
        = js7EYHsd33
```

```
GET /departments/tc/notes?  
user=bob&hash=js7EYHsd33
```

# REST

- Authentication Token as Parameter
- Example

```
hash    = SHA1( sgrsdr344545 +  
                GET ("/departments/tc/notes") )  
        = js7EYHsd33
```

```
GET /departments/tc/notes  
Host: www.insa-lyon.fr  
User: bob  
Hash: js7EYHsd33
```

# The Big Picture

