

Validation continue des exigences et de l'implémentation

méthode et techniques

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Material

<http://mathieuacher.com/teaching/PDL/>

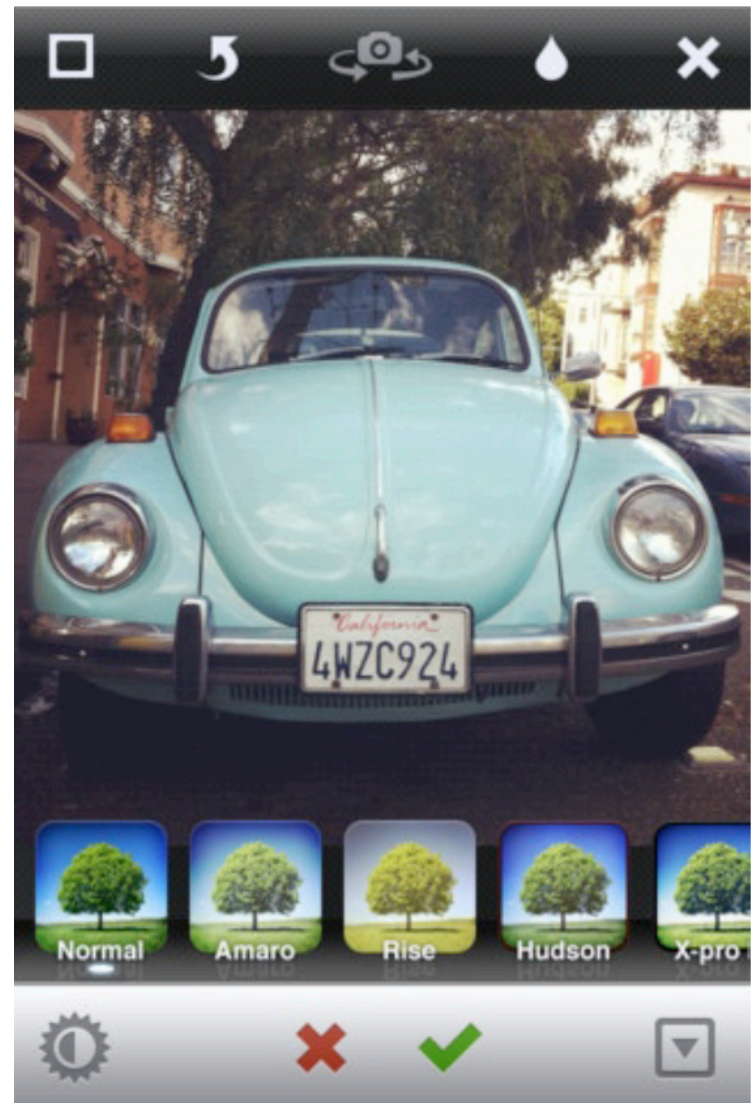
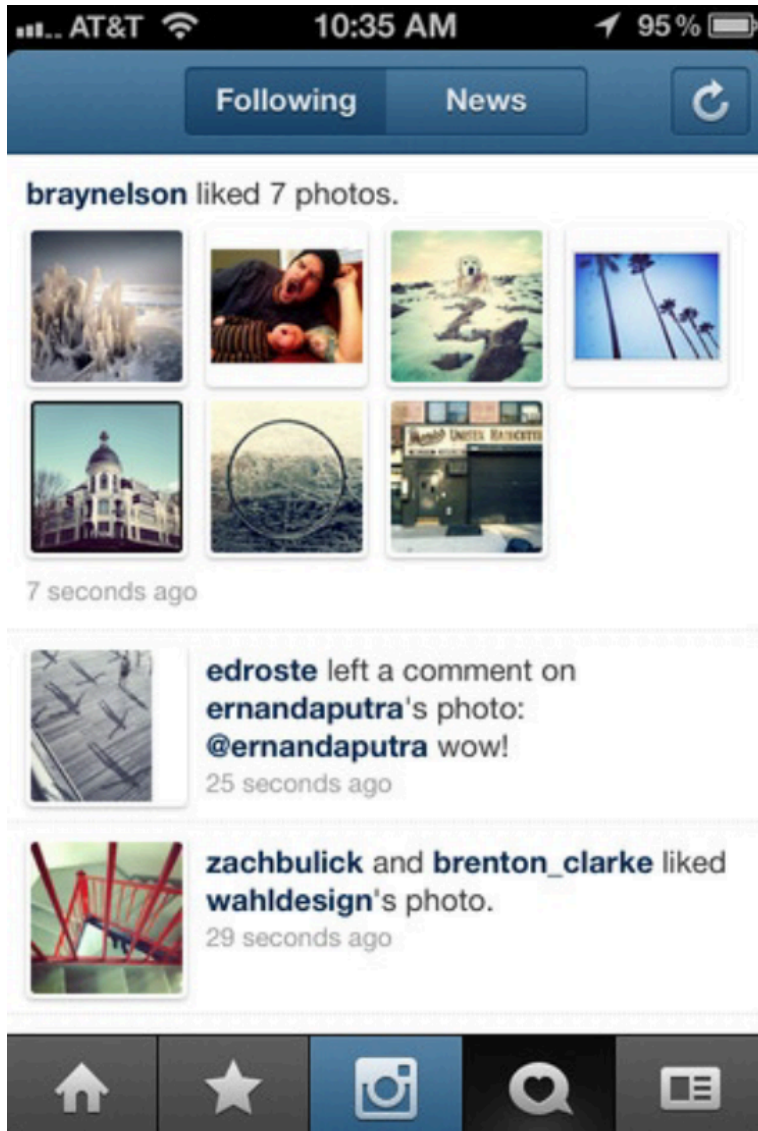
Deux projets:

Un succès

Un échec

Des défis

Instagram Story



Instagram Story

« Instagram is an app that **only took 8 weeks** to build and ship, but was a product of over a year of work. »

Instagram Story

« While I was there working in marketing, I started doing more and more engineering at night on simple ideas that helped me learn how to program (**I don't have any formal CS degree or training**) »

Instagram Story

« We spent 1 week prototyping a version that focused solely on photos.

It was pretty awful. So we went back to creating a native version of Burbn. We actually got an entire version of Burbn done as an iPhone app, but it felt cluttered, and overrun with features. It was really difficult to decide to start from scratch, but we went out on a limb, and basically cut everything in the Burbn app except for its photo, comment, and like capabilities. What remained was Instagram. »

Instagram Story

« So 8 weeks later, we gave it to our friends, beta tested, bug fixed, etc. and this Monday we decided it was ready to ship. »

<http://www.forbes.com/sites/limyunghui/2012/04/09/inspiring-insights-by-instagram-ceo-kevin-systrom-the-man-who-built-a-1-billion-startup/>

Instagram Story

« Who is responsible for Instagram's UI design?

For better or for worse, I've done most of the pixel pushing in our app. ;) »

Instagram Story

- 30+ millions d'utilisateur en 2 ans
- 25k inscriptions le premier jour
 - « best & worst day of our lives so far »
 - « favicon » cause des milliers d'erreurs 404
 - « 404-ing on Django, causing tons of errors »
- Un seul serveur au lancement
 - Moins puissant qu'un MacBook Pro
- La suite: passage à l'échelle, cloud (EC2) et ingénierie du logiciel

<https://speakerdeck.com/mikeyk/scaling-instagram>

<http://zoompf.com/blog/2012/04/instagram-and-optimizing-favicons>

Instagram Story

- Sur la trentaine de composants, 4 seulement ont été écrits à partir de zéro
 - App iOS, App Android, Android Push Notification Service et Redis Query analyzer



node2dm



Fabric

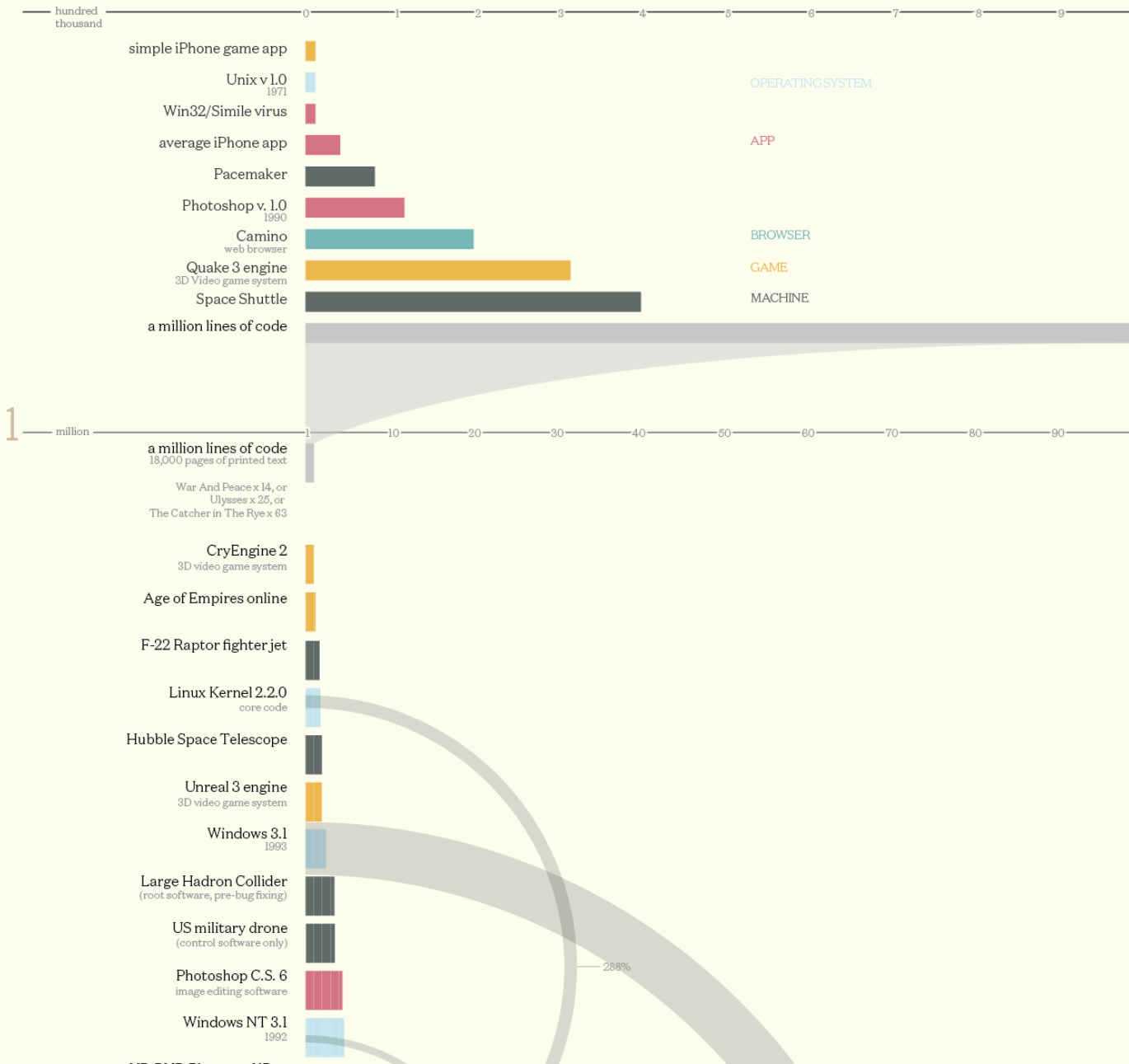


Instagram Story (key lessons)

- Sélection et intégration de multiples bibliothèques
- Open source community
 - Apprendre, partager, demander, répondre, etc.
- Auto-apprentissage
 - « Product guys » sont maintenant à même de rivaliser...
- Agilité, développement incrémental

Codebases

Millions of lines of code



5

needed to repair HealthCare.gov
apparently

Mars Curiosity Rover
Martian ground vehicle probe

Linux kernel 2.6.0
2003

Google Chrome
latest

World of WarCraft
server only

Boeing 787
avionics & online support systems only

Windows NT 3.5
1993

Firefox
latest version

10

Chevy Volt
electric car

Intuit Quickbooks
accounting software

Windows NT 4.0
1996

Android
mobile device operating system

Mozilla Core
core code at heart of all Mozilla's software

MySQL
database language

Boeing 787
total flight software

Linux 3.1
latest version

Apache Open Office
open-source office software

F-35 Fighter jet
2013

25

Microsoft Office 2001

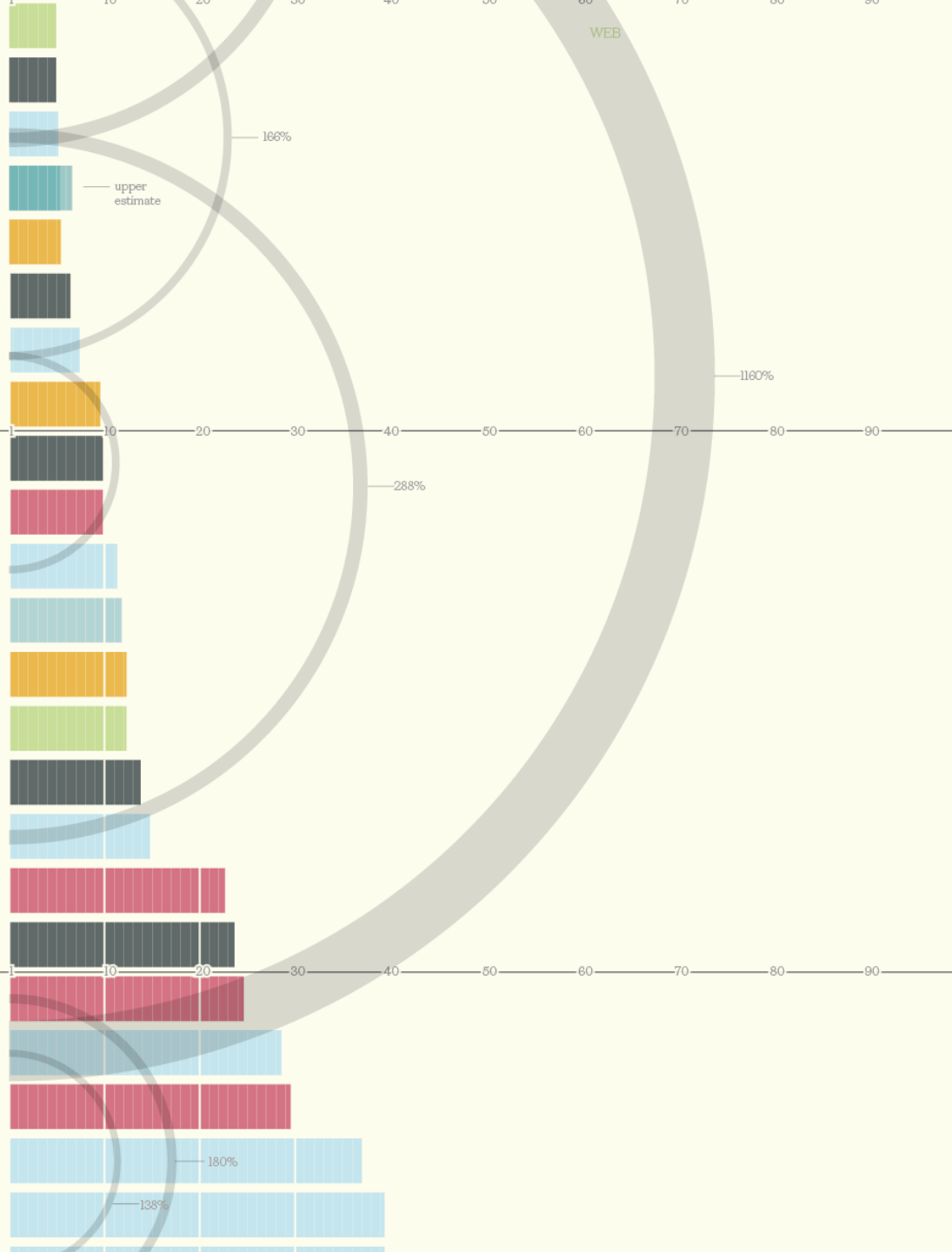
Windows 2000

Microsoft Office for Mac
2006

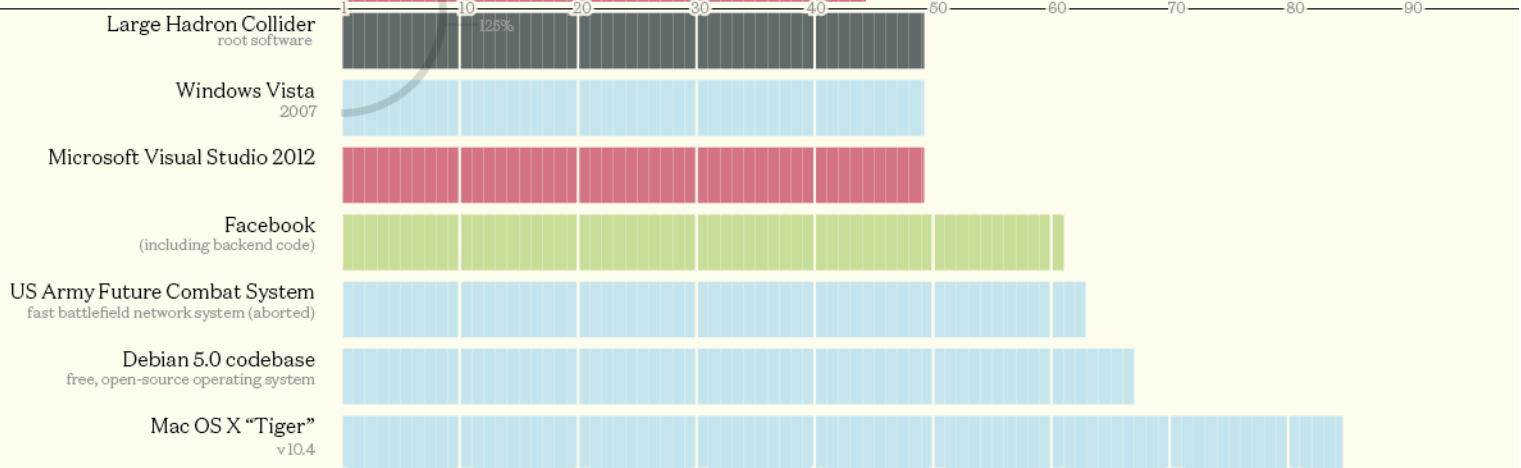
Symbian
mobile operating system

Windows 7
2009

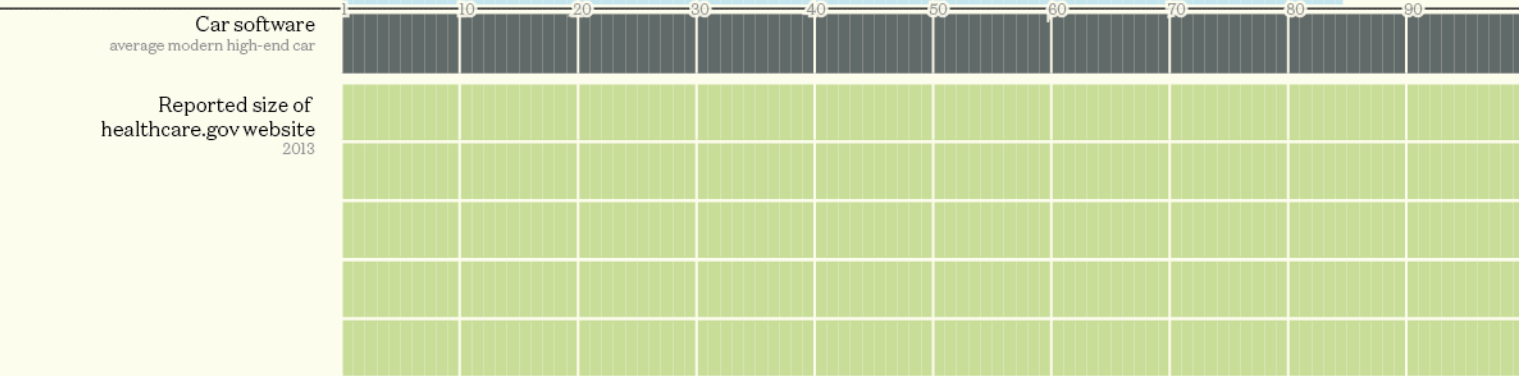
Windows XP



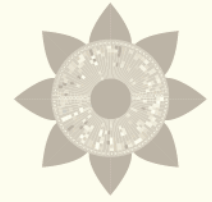
50



100



concept & design: David McCandless
informationisbeautiful.net
 research: Pearl Doughty-White, Miriam Quick



work in progress
 v0.62 // Oct 2013

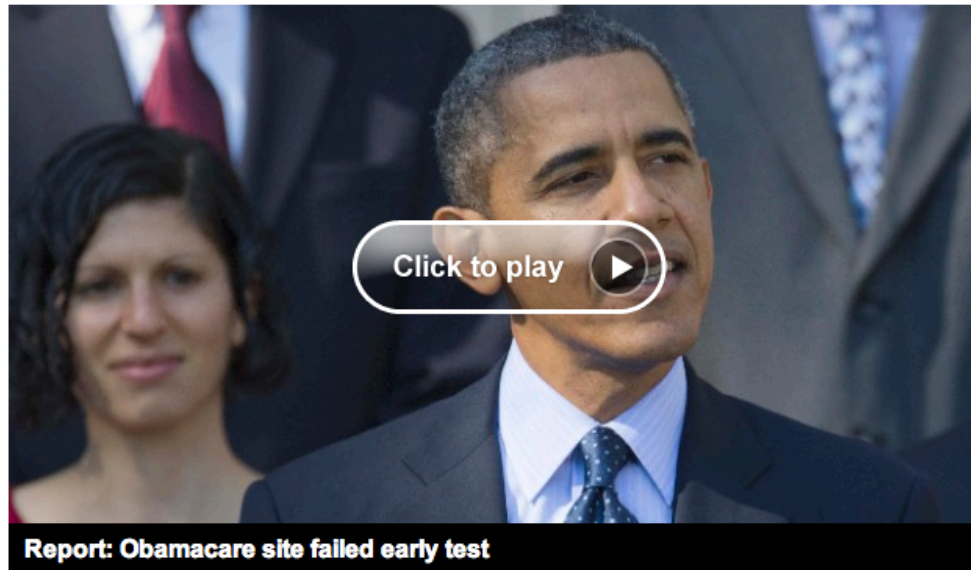
sources NASA, Quora, Ohloh, Wired & press reports
 note some guess work, rumours & estimates
 data bit.ly/KIB_linescode



Report: Healthcare website failed test ahead of rollout

By **Ed Payne**, **Matt Smith** and **Tom Cohen**, CNN

October 23, 2013 -- Updated 0103 GMT (0903 HKT)



Report: Obamacare site failed early test

STORY HIGHLIGHTS

- **NEW:** Top White House official part of "tech surge" on Obamacare
- Obamacare "is not failing" despite website woes, White House spokesman says
- Obama says HealthCare.gov problems are "going to get fixed"
- Secretary Sebelius expected to testify at a congressional hearing next week

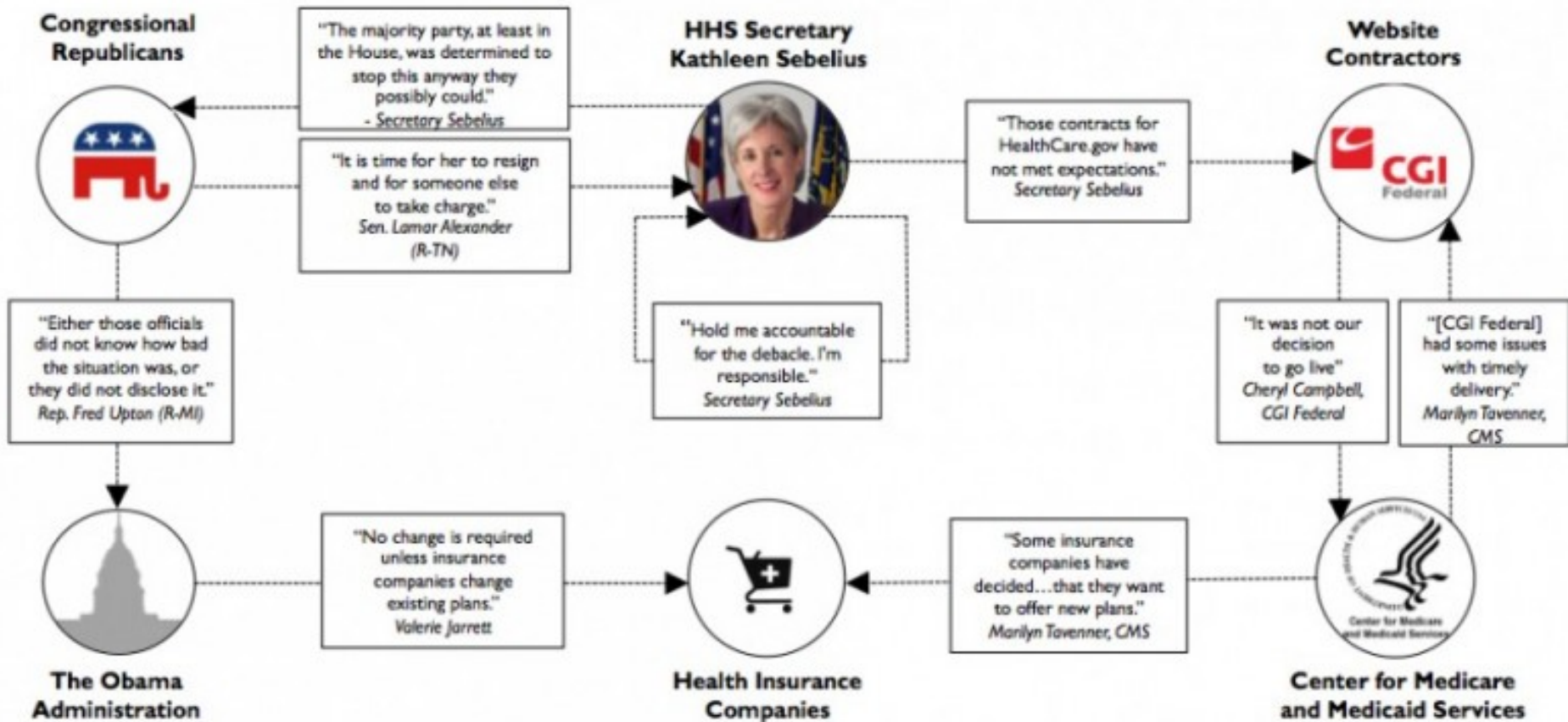
Washington (CNN) -- The President's healthcare sign-up web page was supposed to handle tens of thousands of people at once. But in a trial run days before its launch, just a few hundred users flatlined the site.

Despite the problems, federal health officials pushed aside the crash cart and rolled out [HealthCare.gov](#) on October 1 as planned, [The Washington Post](#) reported.

The result? The website crashed shortly after midnight as a couple thousand people tried to start the process, two people familiar with the project told the Post.

Requirements engineering/ Management problem

ACA Finger-Pointing Flowchart



<http://www.washingtonpost.com/blogs/wonkblog/wp/2013/11/01/thirty-one-things-we-learned-in-healthcare-govs-first-31-days/>

Thirty-one things we learned in HealthCare.gov's first 31 days

Scalability problem

Technical problems (e.g., inaccurate data, cancellation failures)

Testing issues

<http://www.washingtonpost.com/blogs/wonkblog/wp/2013/11/01/thirty-one-things-we-learned-in-healthcare-govs-first-31-days/>

10. HealthCare.gov didn't have enough testing before going live.

This became clear in a series of Congressional hearings, where federal contractors testified that end-to-end testing only began in the final weeks of September, right before the Oct. 1 launch. When pressed on how much time would have been ideal for testing, one contractor told lawmakers that “months would have been nice.”

<http://www.washingtonpost.com/blogs/wonkblog/wp/2013/11/01/thirty-one-things-we-learned-in-healthcare-govs-first-31-days/>

1 succès, 1 échec

- 1 succès:
 - réutilisation: sélection et intégration de multiples bibliothèques
 - agilité, développement incrémental: les exigences ne sont pas fixes; sorties d'un produit qui correspond aux attentes des utilisateurs
- 1 échec:
 - problèmes dans la communication et l'élicitation des exigences
 - pas de test

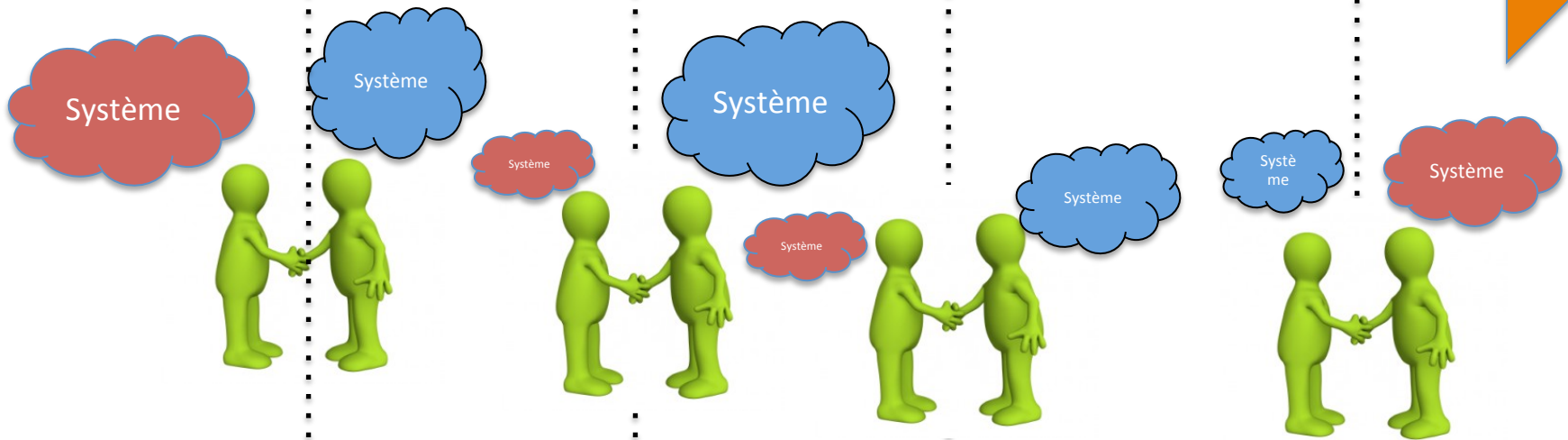
Votre projet = succès + !échec

Votre projet

- Réutilisation: sélection et intégration de multiples bibliothèques
- Agilité, développement incrémental: les exigences ne sont pas fixes; sorties d'un produit qui correspond aux attentes des utilisateurs
- Communication et élicitation des exigences avec le client; modélisation
- Test

EX (exigences; cahier des charges)

SP (sprints; implémentation)



Valider à chaque itération avec le client: montrer les exigences et l'implémentation (le « produit » en action)

Test

A test engineer walks into a bar and



— Bill Sempf (@sempf)

A test engineer walks into a bar and

- orders a beer

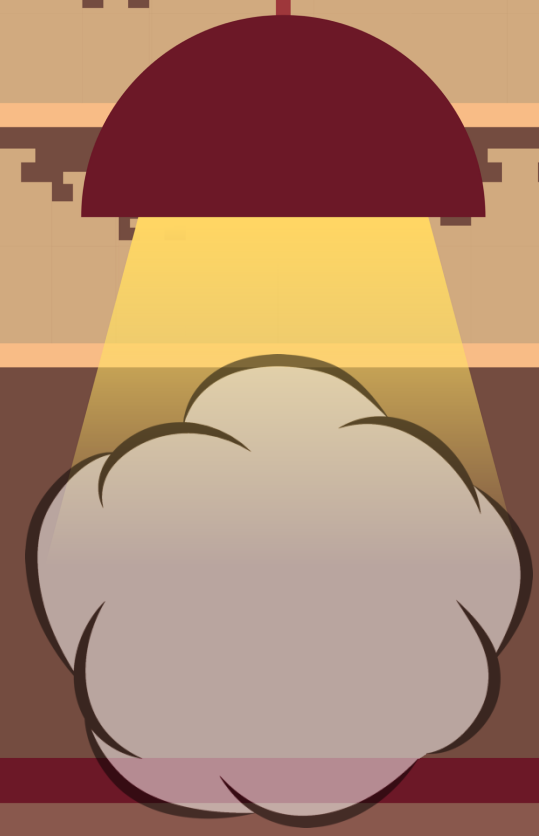


— Bill Sempf (@sempf)

A test engineer walks into a bar and

- orders a beer
- orders 0 beers

— Bill Sempf (@sempf)



A test engineer walks into a bar and

- orders a beer
- orders 0 beers
- orders 9999999 beers

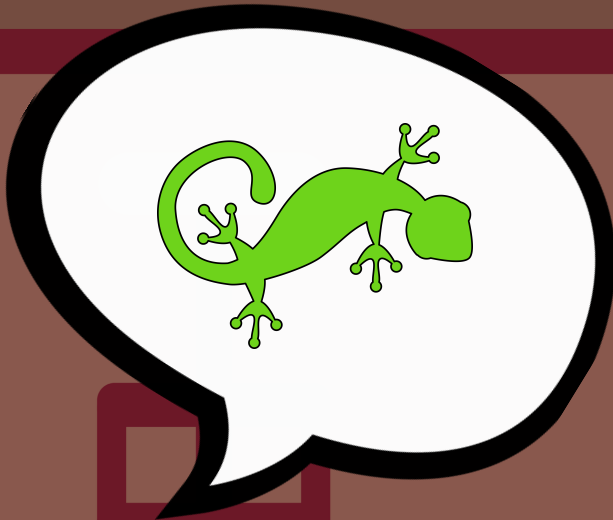
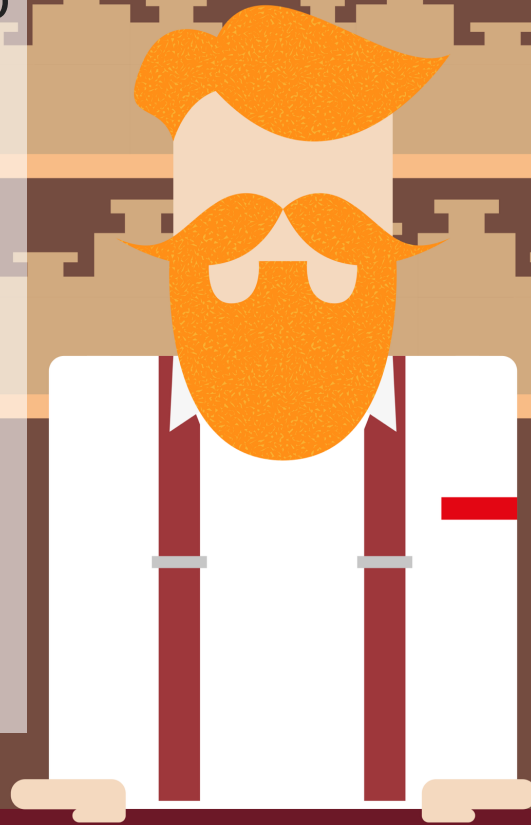
— Bill Sempf (@sempf)



A test engineer walks into a bar and

- orders a beer
- orders 0 beers
- orders 99999999 beers
- orders a lizard

— Bill Sempf (@sempf)



A test engineer walks into a bar and

- orders a beer
- orders 0 beers
- orders 99999999 beers
- orders a lizard
- orders -1 beers

— Bill Sempf (@sempf)

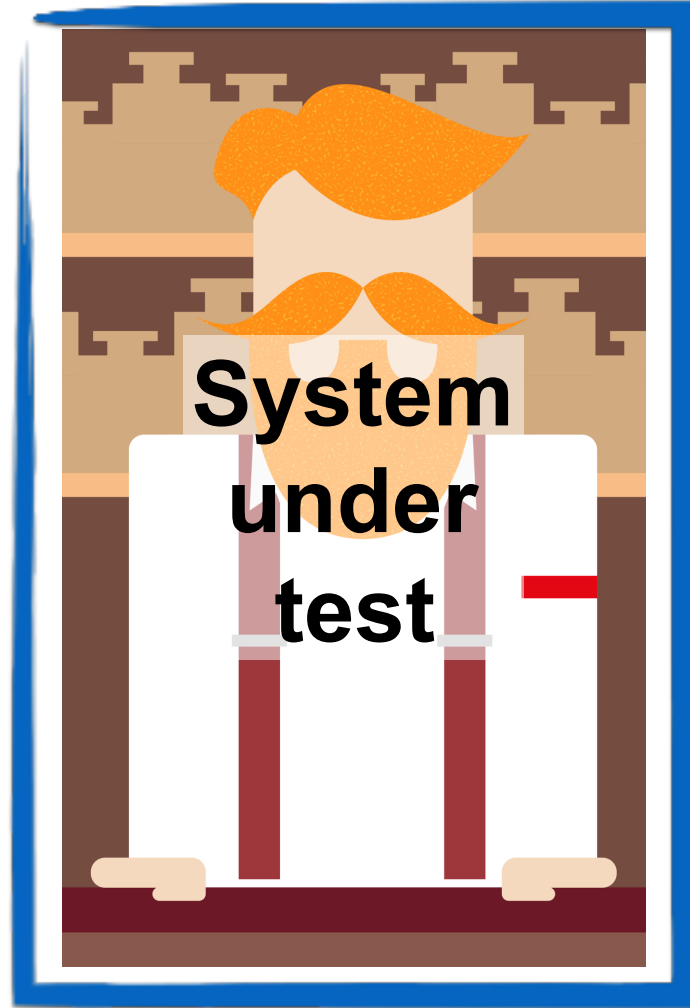


A test engineer walks into a bar and

- orders a beer
- orders 0 beers
- orders 99999999 beers
- orders a lizard
- orders -1 beers
- orders a "sfdeljknesv"

— Bill Sempf (@sempf)

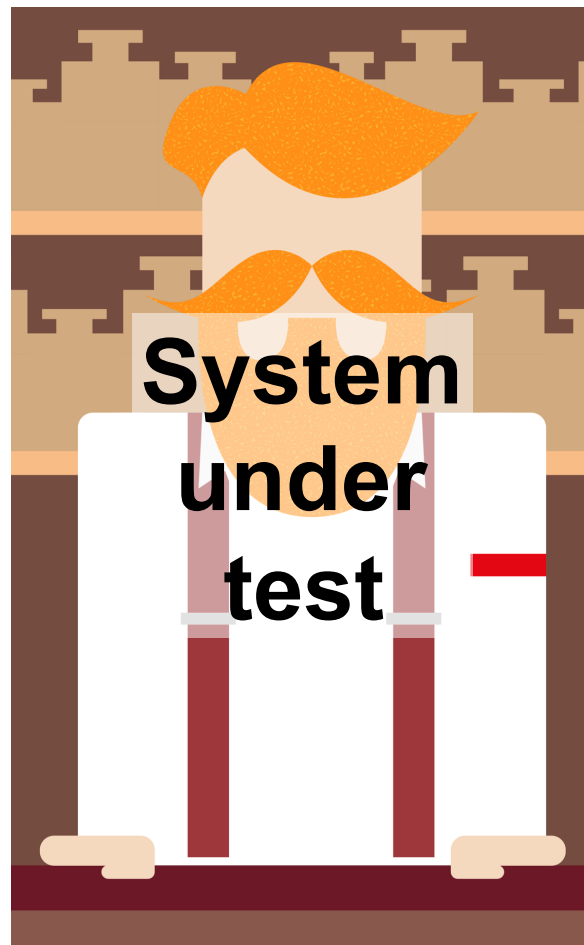


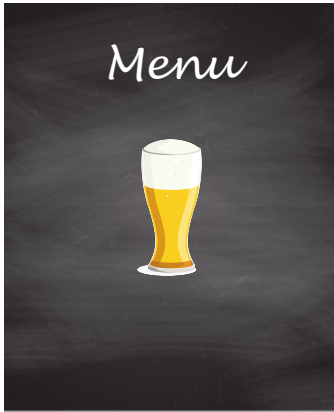


**System
under
test**

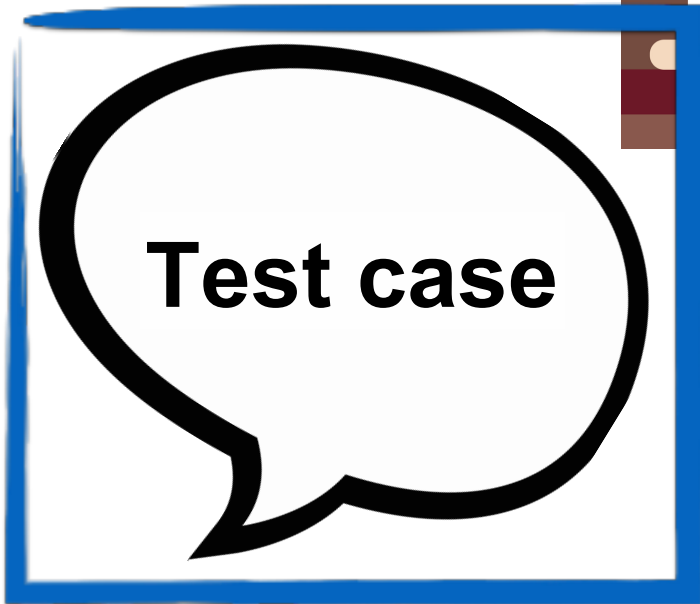
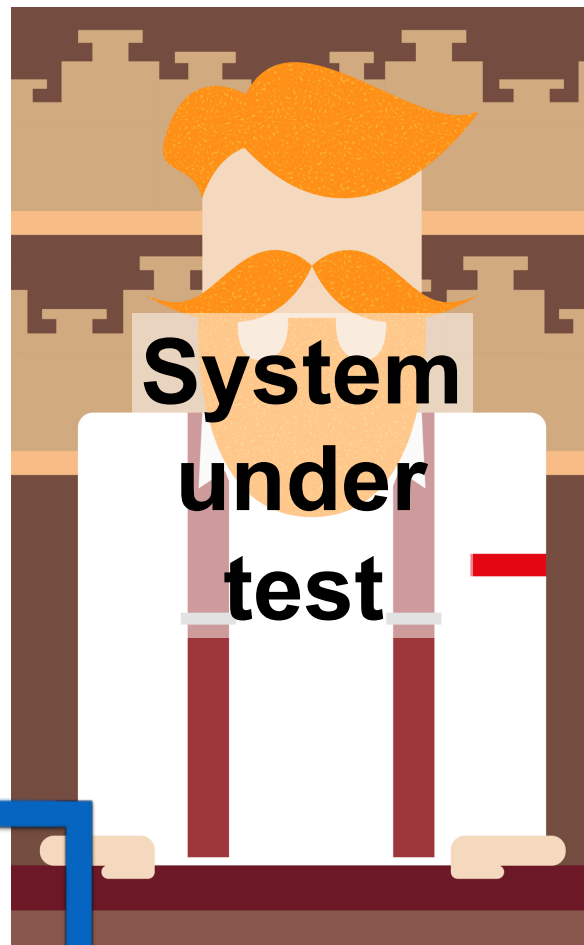


Specification



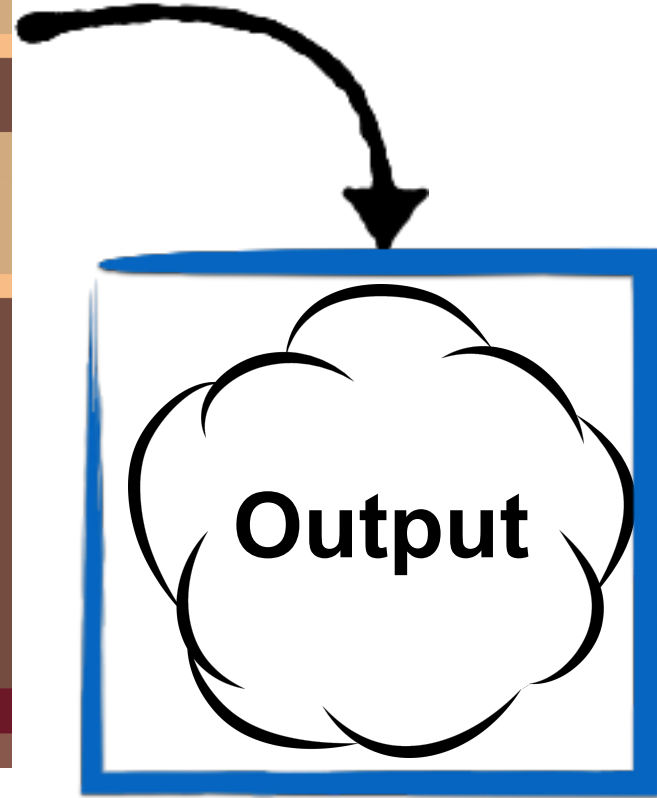
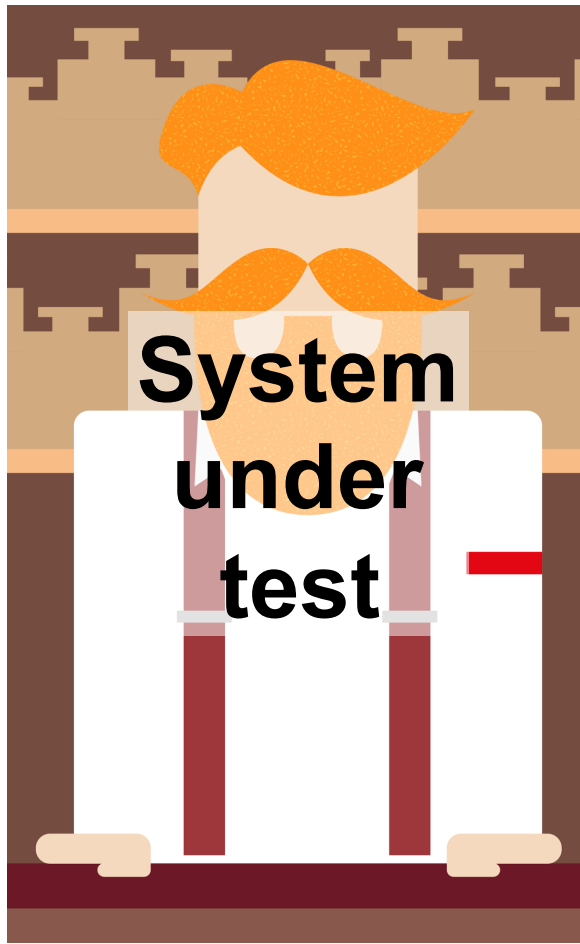


Specification





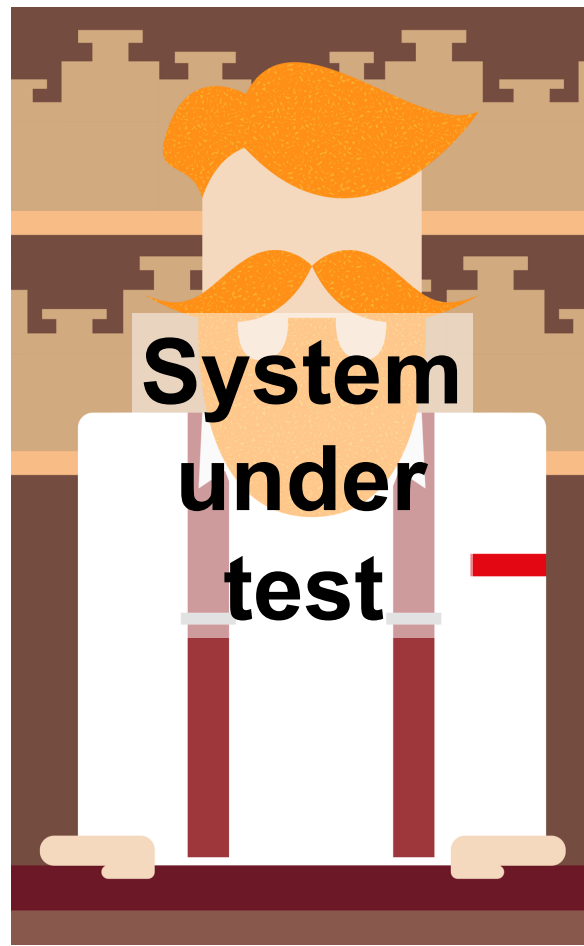
Specification



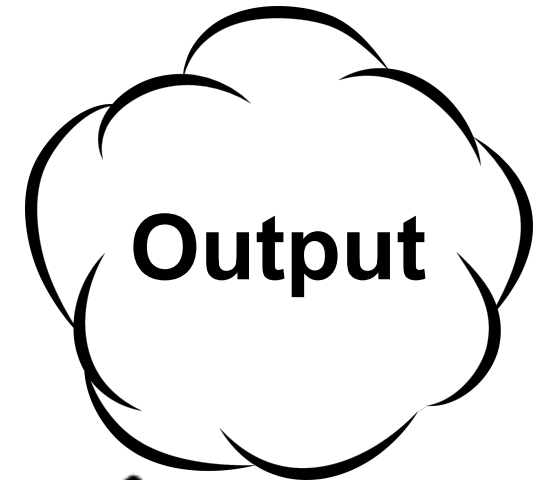
Output



Specification



**System
under
test**



Output



Test case

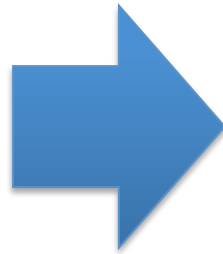
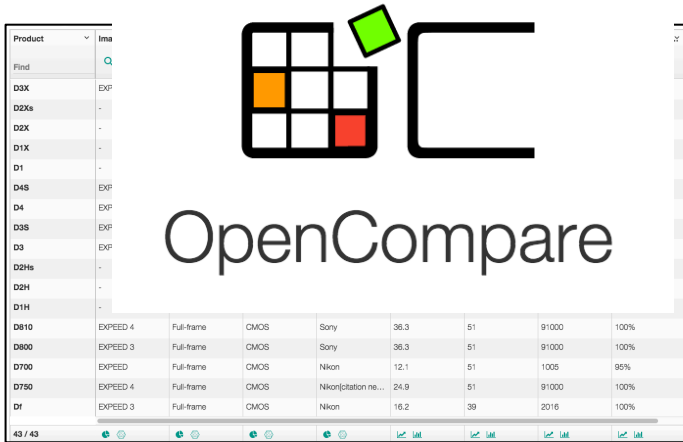


Pass or fail?

Tests et projets

Projet #1

OpenCompareReverseJSON



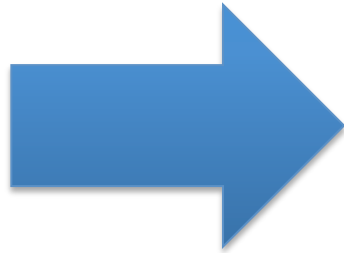
Java API (incl. JSON parsing)
JSON Schema
UML Class diagram



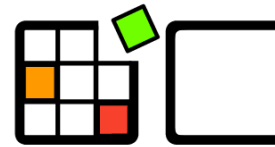
Projet #2

OpenFoodFacts2CSV

CSV
(Comma Separated
Values)



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPEED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D3Xa	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D3X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%
D1	-	APS-C	CCD	Sony	2.66	5	1005	96%
D4S	EXPEED 4	Full-frame	CMOS	Nikon	16.2	51	9100	100%
D4	EXPEED 3	Full-frame	CMOS	Nikon	16.2	51	9100	100%
D3S	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D3	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D2Hs	-	APS-C	JFET-LIBCAST	Nikon	4.1	11	1005	100%
D2H	-	APS-C	JFET-LIBCAST	Nikon	4.1	11	1005	100%
D1H	-	APS-C	CCD	Sony	2.7	5	1005	96%
D810	EXPEED 4	Full-frame	CMOS	Sony	36.3	51	9100	100%
D800	EXPEED 3	Full-frame	CMOS	Sony	36.3	51	9100	100%
D700	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	96%
D700	EXPEED 4	Full-frame	CMOS	Nikon (station re...	24.9	51	9100	100%
Df	EXPEED 3	Full-frame	CMOS	Nikon	16.2	39	2016	100%



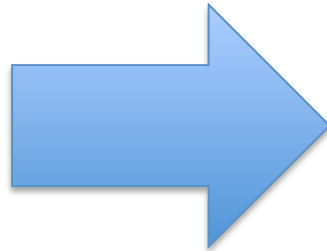
OpenCompare

Projet #3

MatrixSynthesizerWikipedia

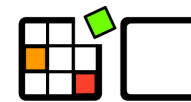


WIKIPEDIA
The Free Encyclopedia



CSV
(Comma Separated
Values)

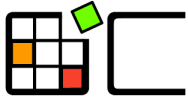
Product	Image process.?	Sensor format	Sensor type	Sensor manufa.?	Megapixels	Focus points	Metering pixels	Viewfinder cov.?
D3X	EXPEED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D200	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%
D1	-	APS-C	CCD	Sony	2.86	5	1005	96%
D4S	EXPEED 4	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D4	EXPEED 3	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D3S	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D3	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D2Hs	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D2H	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D1H	-	APS-C	CCD	Sony	2.7	5	1005	96%
D810	EXPEED 4	Full-frame	CMOS	Sony	36.3	51	91000	100%
D800	EXPEED 3	Full-frame	CMOS	Sony	36.3	51	91000	100%
D700	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	96%
D780	EXPEED 4	Full-frame	CMOS	Nikonipartson ne...	24.9	51	91000	100%
Df	EXPEED 3	Full-frame	CMOS	Nikon	16.2	39	2016	100%



OpenCompare

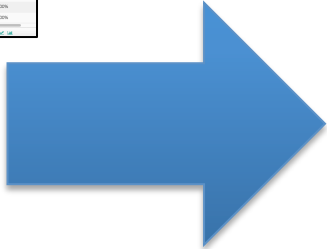
Projet #4

WikipediaMatrixAnalysis



OpenCompare

Product	Image processor	Sensor format	Sensor type	Sensor resolution	Megapixels	Pixel pitch	Shooting speed	Video frame rate
D3X	EXPEED 4	Full-frame	CMOS	Sony	24.5	51	1000	100%
D3Xs	EXPEED 4	Full-frame	CMOS	Sony	24.4	11	1000	100%
D2X	EXPEED 3	Full-frame	CMOS	Sony	12.4	11	1000	100%
D2Xs	EXPEED 3	Full-frame	CMOS	Sony	12.4	5	1000	98%
D1X	EXPEED 3	Full-frame	CMOS	Sony	12.4	5	1000	98%
D1	EXPEED 3	Full-frame	CMOS	Sony	12.4	5	1000	100%
D4	EXPEED 4	Full-frame	CMOS	Sony	16.2	51	91000	100%
D4s	EXPEED 4	Full-frame	CMOS	Sony	16.2	51	91000	100%
D3S	EXPEED 3	Full-frame	CMOS	Sony	12.4	51	1000	100%
D3	EXPEED 3	Full-frame	CMOS	Sony	12.4	51	1000	100%
D2Hs	EXPEED 3	Full-frame	CMOS	Sony	12.4	11	1000	100%
D2H	EXPEED 3	Full-frame	CMOS	Sony	12.4	11	1000	100%
D1H	EXPEED 3	Full-frame	CMOS	Sony	12.4	11	1000	98%
D610	EXPEED 4	Full-frame	CMOS	Sony	24.5	51	91000	100%
D600	EXPEED 3	Full-frame	CMOS	Sony	12.4	51	91000	100%
D700	EXPEED 3	Full-frame	CMOS	Sony	12.4	51	1000	95%
D750	EXPEED 4	Full-frame	CMOS	Sony	24.5	51	91000	100%
Df	EXPEED 3	Full-frame	CMOS	Sony	12.4	28	2016	100%



Automated Analysis

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4 Projets et des risques

- Activités similaires:
 1. Eliciter et valider des exigences
 2. Développement Java pour traiter des données
 3. Travail collaboratif
- **Risques** similaires. Exemples:
 1. Implémenter des fonctionnalités inutiles ou qui ne correspondent pas aux besoins du client
 2. Le programme Java est incapable de traiter certains types de données
 3. La sortie générée (e.g., CSV) n'est pas "correcte"
 4. Une modification dans 1, 2, et 3 ne permet pas à un membre du groupe de correctement contribuer

Comment fait-on ?

Product	Image process.™	Sensor format	Sensor type	Sensor manufa.™	Megapixels	Focus points	Metering pixels	Viewfinder cov.™
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%

Product	Image process.™	Sensor format	Sensor type	Sensor manufa.™	Megapixels	Focus points	Metering pixels	Viewfinder cov.™	
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%	
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%	
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%	
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%	
D1	-	APS-C	CCD	Sony	2.66	5	1005	96%	
D2Xs	D4S	EXPED 4	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D2X	D4	EXPED 3	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D1X	D3S	EXPED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D1	D3	EXPED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D4S	D99s	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D4	D9H	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D3S	D1H	-	APS-C	CCD	Sony	2.7	5	1005	96%
D3	D610	EXPED 4	Full-frame	CMOS	Sony	36.3	51	91000	100%
D29s	D600	EXPED 3	Full-frame	CMOS	Sony	36.3	51	91000	100%
D29H	D700	EXPED	Full-frame	CMOS	Nikon	12.1	51	1005	96%
D21H	D750	EXPED 4	Full-frame	CMOS	Nikon(Station ne...	24.9	51	91000	100%
D610	Df	EXPED 3	Full-frame	CMOS	Nikon	16.2	39	2016	100%
D600									



Réponses

- Valider l'implémentation (tester)
- Valider les exigences et l'implémentation à chaque itération
 - Sortie de “release” avec procédure de tests automatisée (git + Jenkins + Junit + PhantomJS)
 - Validation de chaque release avec le client
- Eliciter et modéliser les exigences/besoins avec le client

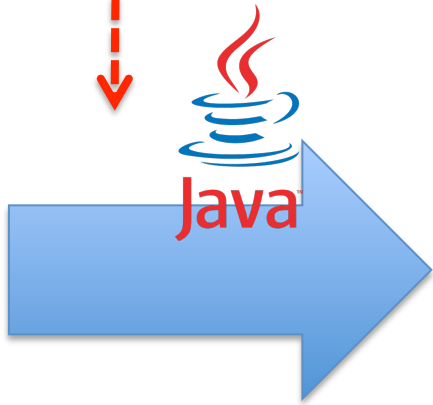
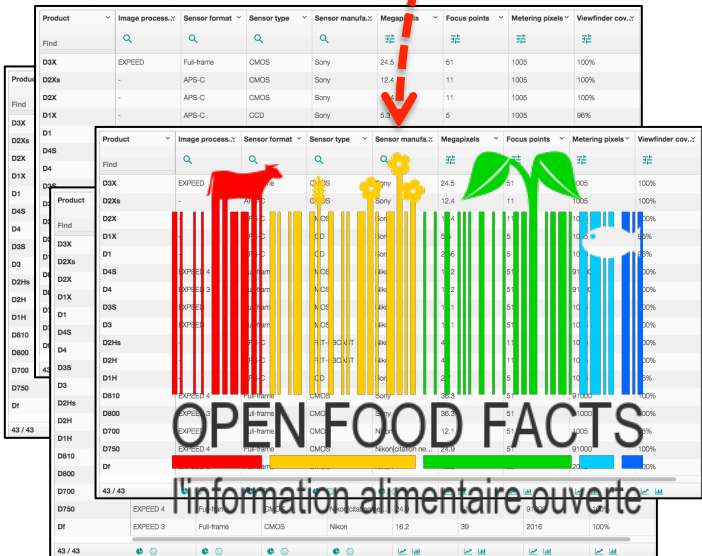
Valider l'implémentation
(tests automatisés)

Tests

(sur les entrées)

(sur la transformation)

(sur la sortie)

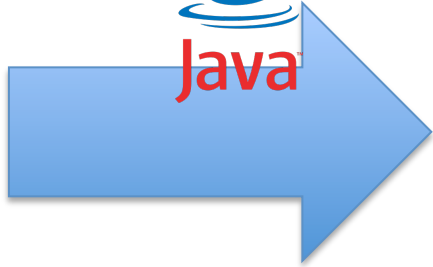
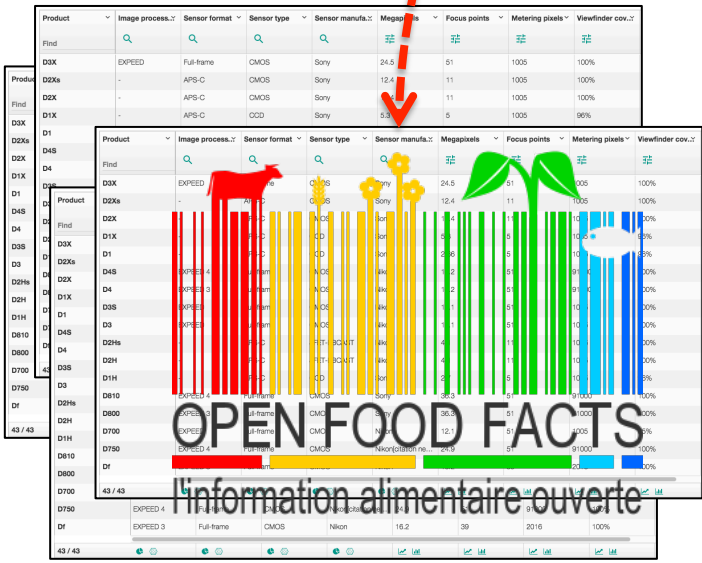


exemple
CSV

Tests



(sur les entrées)



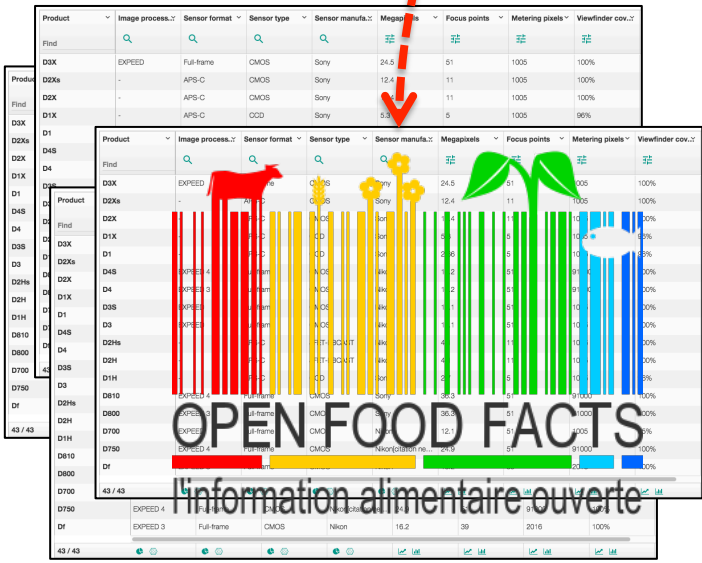
exemple

CSV

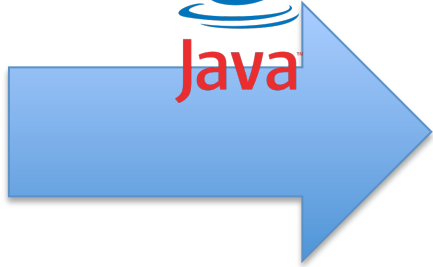
Tests



(sur les entrées)



RuntimeException....



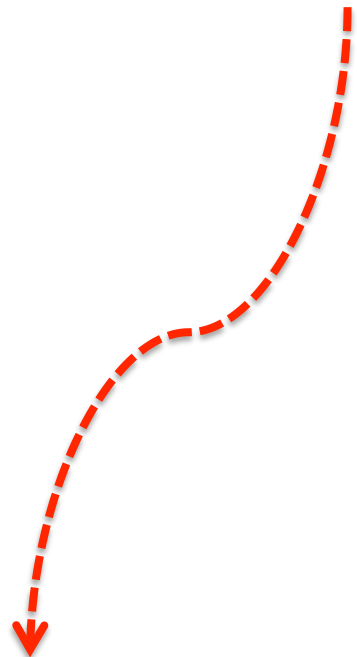
example

CSV

Tests

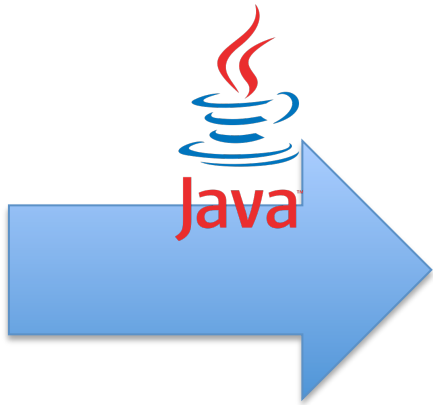


(sur les entrées)



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPED	Full-frame	CMOS	Sony	24.6	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11		
D1X	-	APS-C	CMOS	Sony	5.3	5		
D1	-	APS-C	CMOS	Sony	2.6	5	1005	100%
D4S	EXPED 4	Full-frame	CMOS	Nikon	16.1	51	1000	100%
D4	EXPED 3	Full-frame	CMOS	Nik	16.1	51	1000	100%
D3S	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D3	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D2Hs	-	APS-C	CMOS	Nik	11	51	1000	100%
D2H	-	APS-C	CMOS	Nik	11	51	1000	100%
D1H	-	APS-C	CMOS	Nik	5.3	51	1000	100%
D610	EXPED 4	Full-frame	CMOS	Nik	16.1	51	1000	100%
D600	EXPED 3	Full-frame	CMOS	Nik	16.1	51	1000	100%
D700	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D750	EXPED 4	Full-frame	CMOS	Nik	16.1	51	1000	100%
D7	EXPED 3	Full-frame	CMOS	Nik	16.1	51	1000	100%

OPEN FOOD FACTS
l'information alimentaire ouverte

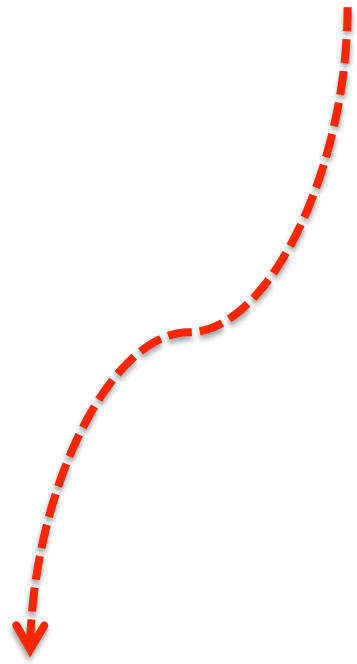


F1;f2; , ;
“”.””.
, , ,

Tests



(sur les entrées)



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11		
D1X	-	APS-C	CMOS	Sony	5.3	5		
D1	-	APS-C	CMOS	Sony	2.6	5	1005	100%
D4S	EXPED 4	Full-frame	CMOS	Nikon	16.5	51	1000	100%
D4	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1000	100%
D3S	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D3	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D2Hs	-	APS-C	CMOS	Nik	11	51	1000	100%
D2H	-	APS-C	CMOS	Nik	11	51	1000	100%
D1H	-	APS-C	CMOS	Nik	11	51	1000	100%
D610	EXPED 4	Full-frame	CMOS	Nik	16.5	51	1000	100%
D600	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1000	100%
D700	EXPED	Full-frame	CMOS	Nik	12.4	51	1000	100%
D750	EXPED 4	Full-frame	CMOS	Nik	16.5	51	1000	100%
D7	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1000	100%

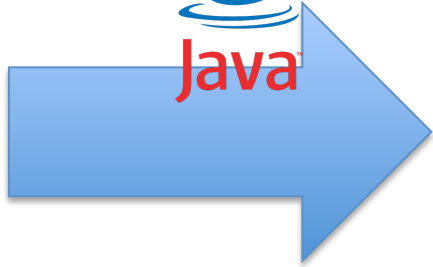
OPEN FOOD FACTS
l'information alimentaire ouverte



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

example

CSV



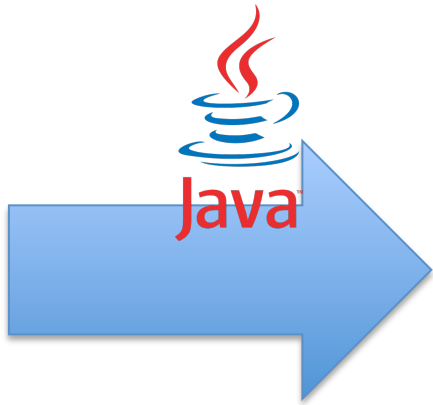
Manual testing is a terrible idea

non reproducible; error-prone; time-consuming



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	-	-
D1X	-	APS-C	CMOS	Sony	5.3	5	-	-
D1	-	APS-C	CMOS	Sony	2.6	5	1005	100%
D4S	EXPED 4	Full-frame	CMOS	Nikon	16.5	51	1000	100%
D4	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1100	100%
D3S	EXPED	Full-frame	CMOS	Nik	12.4	51	1005	100%
D3	EXPED	Full-frame	CMOS	Nik	12.4	51	1005	100%
D2Hs	-	APS-C	CMOS	Nik	11	11	1005	100%
D2H	-	APS-C	CMOS	Nik	11	11	1005	100%
D1H	-	APS-C	CMOS	Nik	5.3	5	1005	100%
D610	EXPED 4	Full-frame	CMOS	Nik	16.5	51	1100	100%
D600	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1100	100%
D700	EXPED	Full-frame	CMOS	Nik	12.4	51	1005	100%
D750	EXPED 4	Full-frame	CMOS	Nik	16.5	51	1100	100%
D7	EXPED 3	Full-frame	CMOS	Nik	16.5	51	1100	100%

OPEN FOOD FACTS
l'information alimentaire ouverte



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

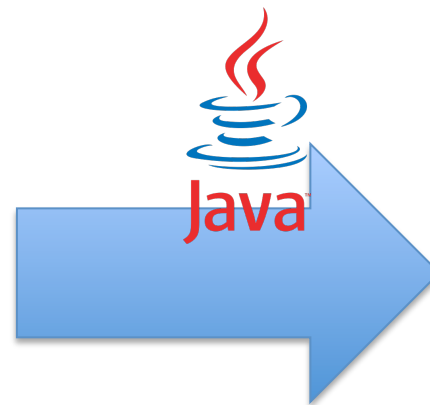
example
CSV

You can start with some values/ inputs and then (manually) observe



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	-	-
D1X	-	APS-C	CMOS	Sony	5.3	5	-	-
D1	-	APS-C	CMOS	Sony	2.6	5	1005	100%
D4S	EXPED 4	Full-frame	CMOS	Nikon	16.5	51	1000	100%
D4	EXPED 3	Full-frame	CMOS	NK	16.5	51	1000	100%
D3S	EXPED	Full-frame	CMOS	NK	16.5	51	1000	100%
D3	EXPED	Full-frame	CMOS	NK	16.5	51	1000	100%
D2Hs	-	APS-C	CMOS	NK	11	11	1000	100%
D2H	-	APS-C	CMOS	NK	11	11	1000	100%
D1H	-	APS-C	CMOS	NK	11	11	1000	100%
D610	EXPED 4	Full-frame	CMOS	NK	16.5	51	1000	100%
D600	EXPED 3	Full-frame	CMOS	NK	16.5	51	1000	100%
D700	EXPED	Full-frame	CMOS	NK	16.5	51	1000	100%
D750	EXPED 4	Full-frame	CMOS	NK	16.5	51	1000	100%
D7	EXPED 3	Full-frame	CMOS	NK	16.5	51	1000	100%

OPEN FOOD FACTS
l'information alimentaire ouverte



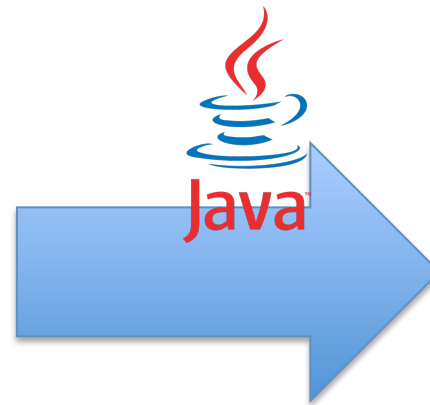
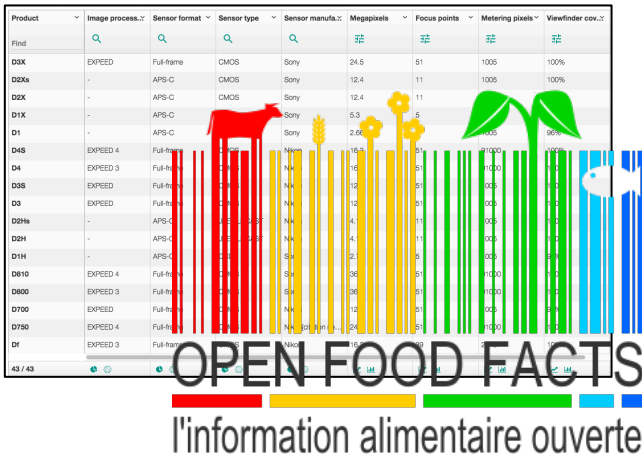
```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

example

CSV

But manual testing is a terrible idea

non reproducible; error-prone; time-consuming



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

example

CSV

Whenever you are tempted to type something into a print statement or a debugger expression, **write it as a test instead.**



Tests

(sur les entrées)



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megap...	Focus points	Metering pixels	Viewfinder cov...
Find	🔍	🔍	🔍	🔍	🔍	🔍	🔍	🔍
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xa	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	11	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%

Observer par des assertions
(vérification de propriétés) 

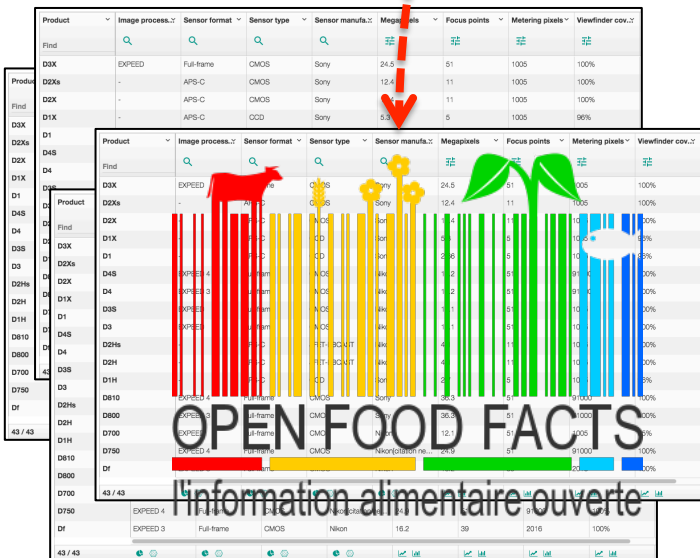


```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

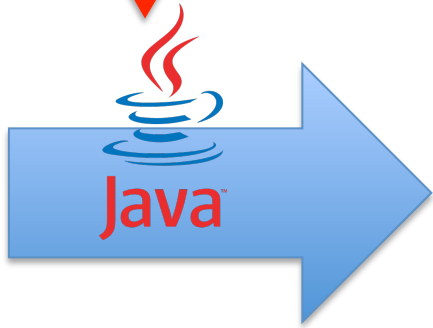
example
CSV

Tests automatisés

(sur les entrées)



(sur la transformation)



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

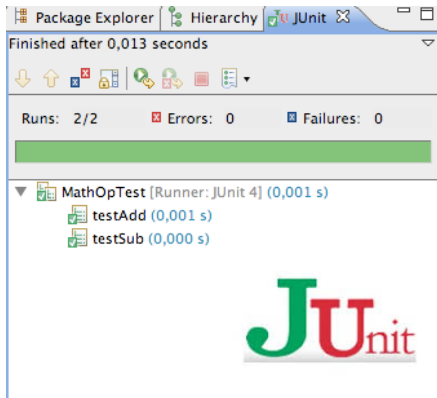
exemple
CSV



(sur la sortie)



Tests automatisés



```
// Tests adding a product to the cart.
public void testProductAdd() {
    Product book = new Product("Refactoring", 53.95);
    _bookCart.addItem(book);

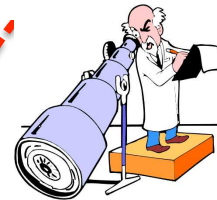
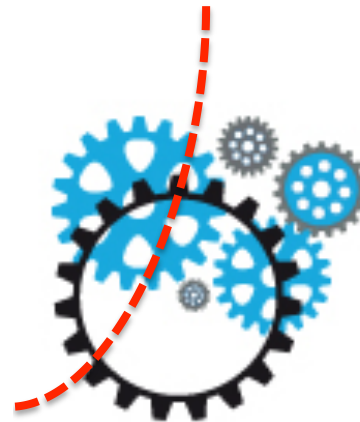
    assertTrue(_bookCart.contains(book));

    double expected = 23.95 + book.getPrice();
    double current = _bookCart.getBalance();

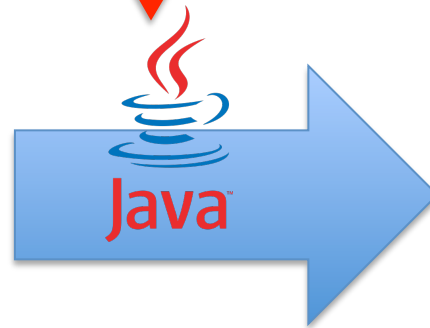
    assertEquals(expected, current, 0.0);

    int expectedCount = 2;
    int currentCount = _bookCart.getItemCount();

    assertEquals(expectedCount, currentCount);
}
```



(sur la transformation)



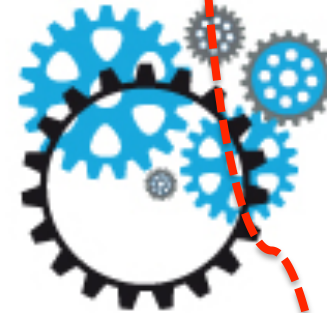
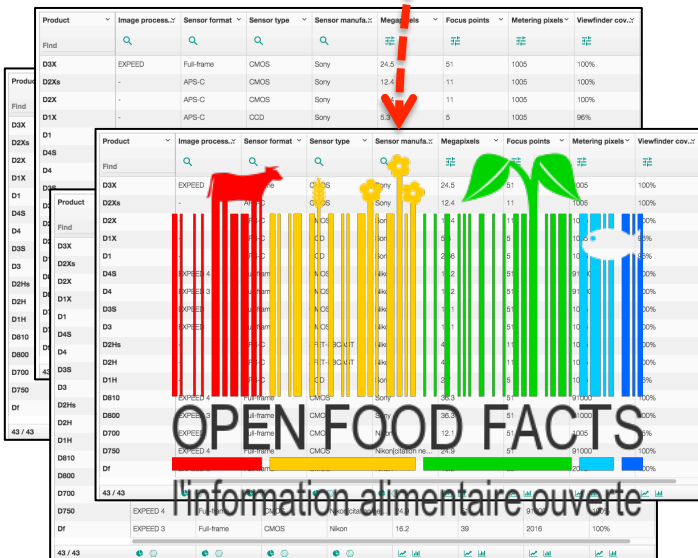
```
f1,f2,f3
v11,v12,v13
v21,v22,v23
```

example

CSV

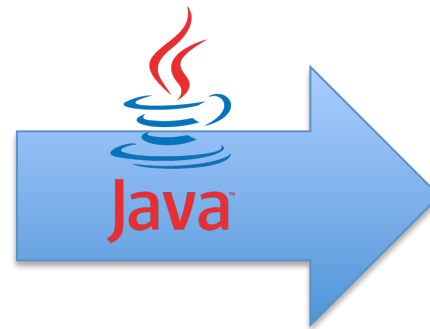
Tests automatisés

(sur les entrées)



(sur la sortie)

```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```



exemple

CSV

Tests automatisés

(concevoir un ensemble de données en “input” pertinent pour le test et couvrant un maximum de cas)

(vérifier des assertions « génériques » ou bien produire la sortie attendue puis comparaison aka « diff »)

Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
Find	🔍	🔍	🔍	🔍	🔍	🔍	🔍	🔍
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xa	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

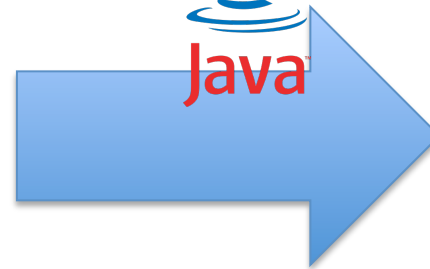
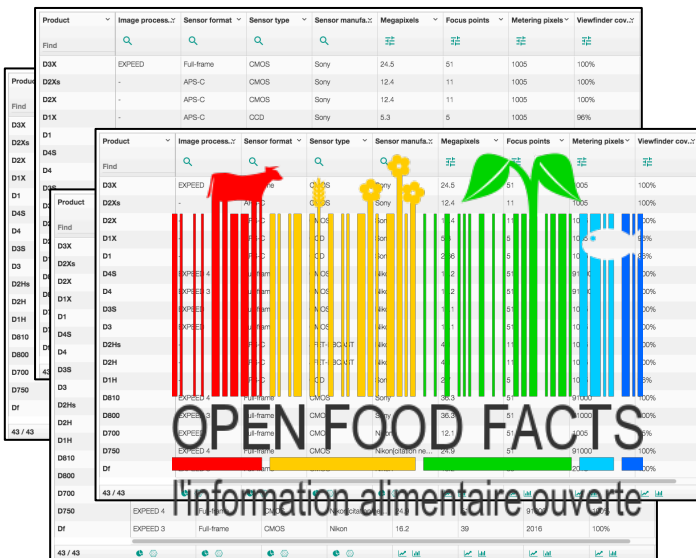
exemple

CSV

Tests automatisés

NE PAS TESTER VOTRE
SOLUTION SUR UNE
SEULE MATRICE!

(vérifier des assertions
« génériques » ou bien
produire la sortie attendue
puis comparaison aka « diff »)

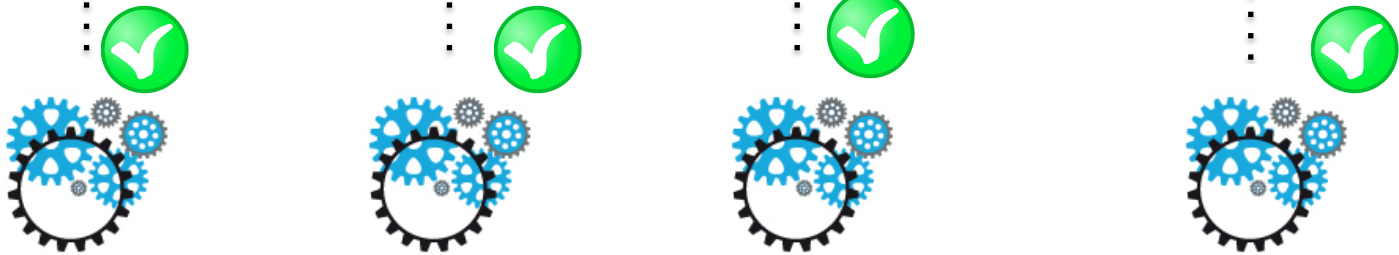


```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

exemple

CSV

SP (sprints; implémentation)

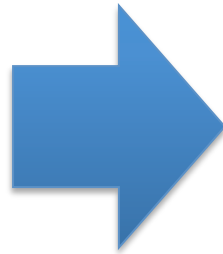
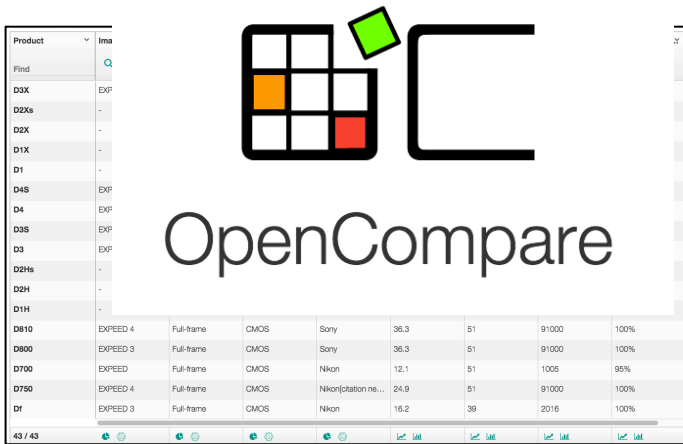


Execute the tests before/after each commit
Don't break (no regression)
Continuous validation

Tests et projets
(bis, discussions)

Projet #1

OpenCompareReverseJSON



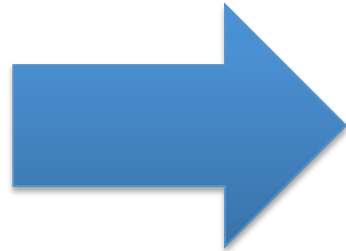
Java API (incl. JSON parsing)
JSON Schema
UML Class diagram



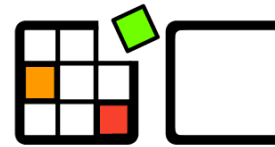
Projet #2

OpenFoodFacts2CSV

CSV
(Comma Separated
Values)



Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPEED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D3Xa	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D3X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%
D1	-	APS-C	CCD	Sony	2.66	5	1005	96%
D4S	EXPEED 4	Full-frame	CMOS	Nikon	16.2	51	9100	100%
D4	EXPEED 3	Full-frame	CMOS	Nikon	16.2	51	9100	100%
D3S	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D3	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D2Hs	-	APS-C	JFET-LIBCAST	Nikon	4.1	11	1005	100%
D2H	-	APS-C	JFET-LIBCAST	Nikon	4.1	11	1005	100%
D1H	-	APS-C	CCD	Sony	2.7	5	1005	96%
D810	EXPEED 4	Full-frame	CMOS	Sony	36.3	51	9100	100%
D800	EXPEED 3	Full-frame	CMOS	Sony	36.3	51	9100	100%
D700	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	96%
D700	EXPEED 4	Full-frame	CMOS	Nikon/Station ne...	24.9	51	9100	100%
Df	EXPEED 3	Full-frame	CMOS	Nikon	16.2	39	2016	100%



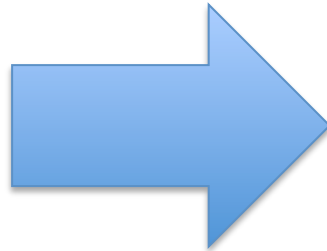
OpenCompare

Projet #3

MatrixSynthesizerWikipedia

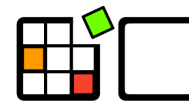


WIKIPEDIA
The Free Encyclopedia



CSV
(Comma Separated
Values)

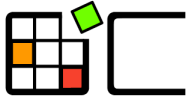
Product	Image process.?	Sensor format	Sensor type	Sensor manufa.?	Megapixels	Focus points	Metering pixels	Viewfinder cov.?
D3X	EXPEED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%
D1	-	APS-C	CCD	Sony	2.86	5	1005	96%
D4s	EXPEED 4	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D4	EXPEED 3	Full-frame	CMOS	Nikon	16.2	51	91000	100%
D3S	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D3	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	100%
D2Hs	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D2H	-	APS-C	JFET-LBCAST	Nikon	4.1	11	1005	100%
D1H	-	APS-C	CCD	Sony	2.7	5	1005	96%
D810	EXPEED 4	Full-frame	CMOS	Sony	36.3	51	91000	100%
D800	EXPEED 3	Full-frame	CMOS	Sony	36.3	51	91000	100%
D700	EXPEED	Full-frame	CMOS	Nikon	12.1	51	1005	96%
D780	EXPEED 4	Full-frame	CMOS	Nikonipartson re...	24.9	51	91000	100%
Df	EXPEED 3	Full-frame	CMOS	Nikon	16.2	39	2016	100%



OpenCompare

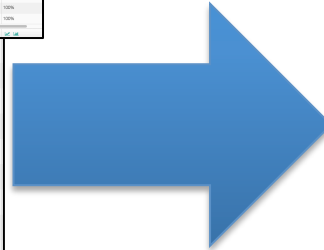
Projet #4

WikipediaMatrixAnalysis



OpenCompare

Product	Image processor	Sensor format	Sensor type	Sensor resolution	Megapixels	Pixel pitch	Weighting pixels	Viewfinder resolution
D3X	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D3S	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D3H	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D3Xs	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D2X	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D2Xs	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D1X	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D1	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D4	EXPEED 4	Full-frame	CMOS	Sony	18.2	51	91000	100%
D4S	EXPEED 4	Full-frame	CMOS	Sony	18.2	51	91000	100%
D4H	EXPEED 4	Full-frame	CMOS	Sony	18.2	51	91000	100%
D3S	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D3	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	100%	100%
D2Hs	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D2H	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D1H	EXPEED 2	Full-frame	CMOS	Sony	12.4	11	100%	100%
D610	EXPEED 4	Full-frame	CMOS	Sony	24.5	51	91000	100%
D600	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	91000	100%
D700	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	91000	100%
D750	EXPEED 4	Full-frame	CMOS	Sony	24.5	51	91000	100%
Df	EXPEED 3	Full-frame	CMOS	Sony	24.5	51	91000	100%

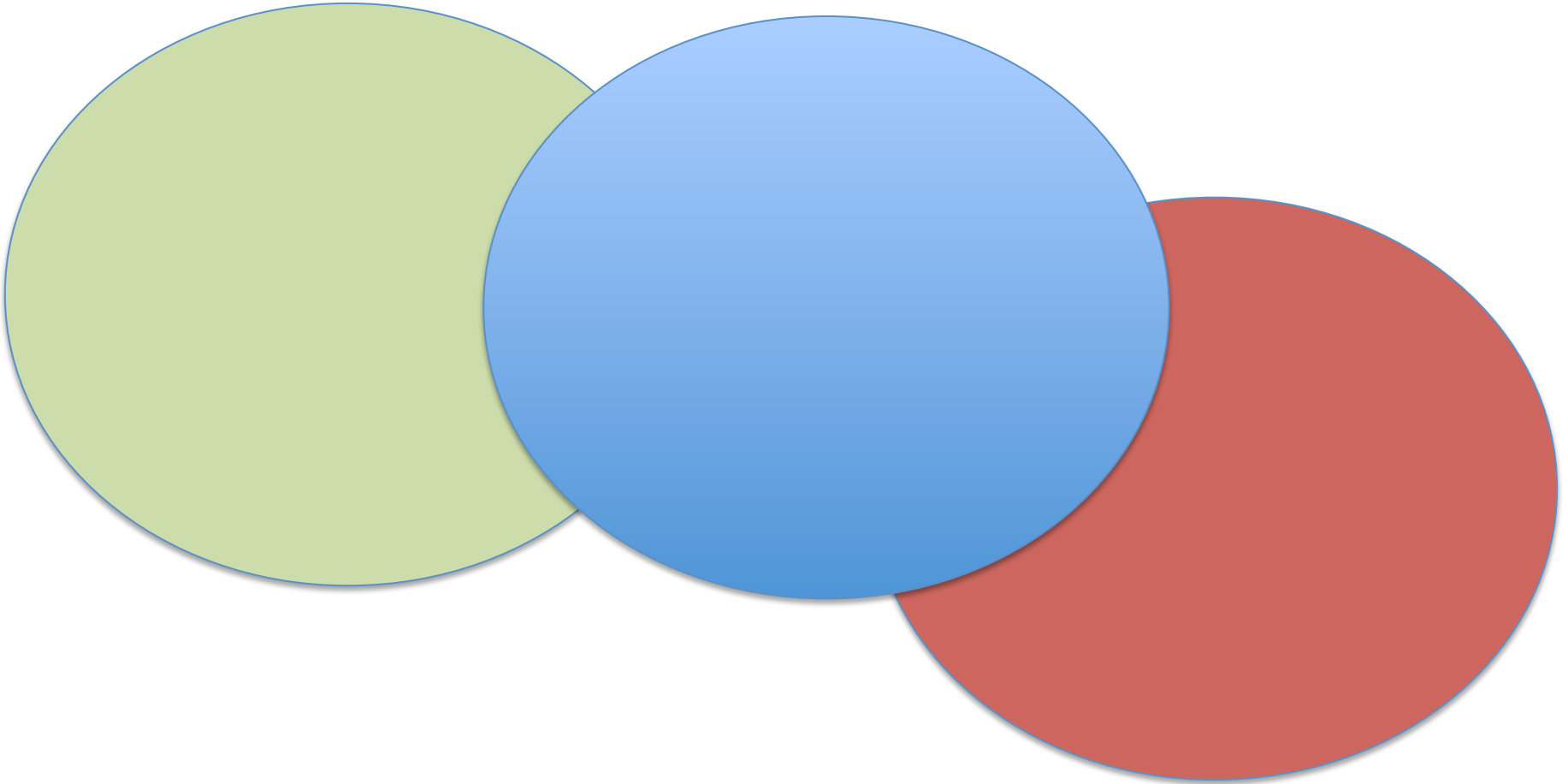


Automated
Analysis

WIKIPEDIA
The Free Encyclopedia

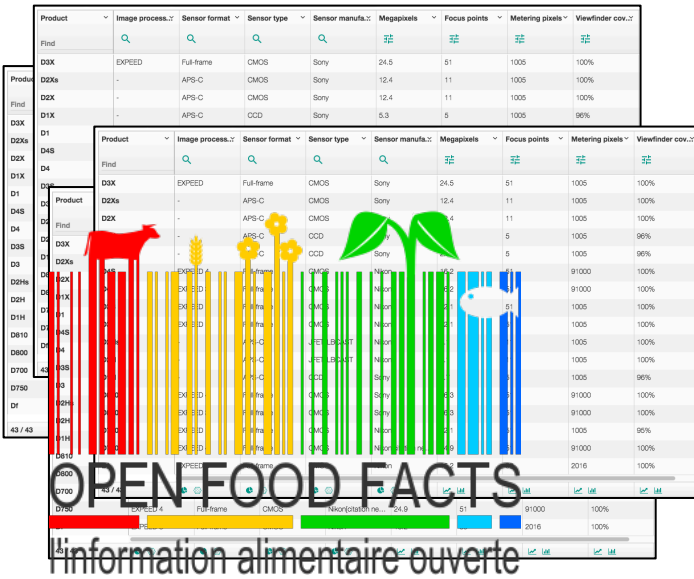
Modéliser les exigences

Implémenter des fonctionnalités inutiles ou qui ne correspondent pas aux besoins du client => **Modéliser les exigences**



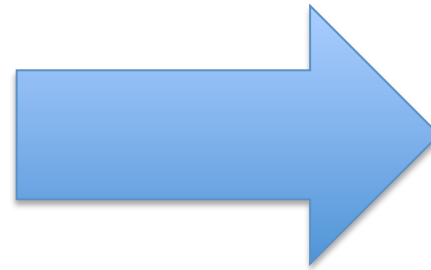
(à côté de la plaque?)

Modéliser les exigences



The image shows a screenshot of a data management interface. At the top, there are several filter menus: 'Product', 'Image process...', 'Sensor format', 'Sensor type', 'Sensor manufa...', 'Megapixels', 'Focus points', 'Metering pixels', and 'Viewfinder cov...'. Below these is a table with columns corresponding to these filters. A large blue arrow points from the table towards the right. In the foreground, there is a bar chart with vertical bars of various colors (red, yellow, green, blue) and icons (a cow, a plant, a person) overlaid on it. At the bottom of the screenshot, the text 'OPEN FOOD FACTS' and 'l'information alimentaire ouverte' is visible.

Product	Image process...	Sensor format	Sensor type	Sensor manufa...	Megapixels	Focus points	Metering pixels	Viewfinder cov...
D3X	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xs	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%



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f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

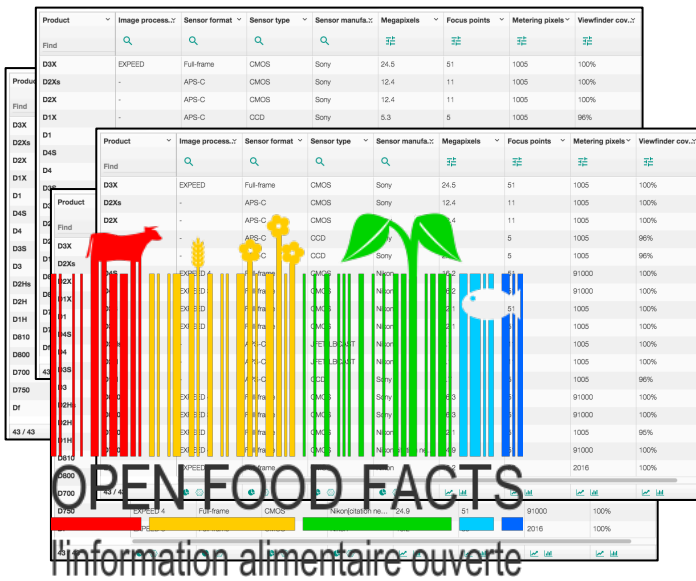
example

CSV

Expliciter
Documenter

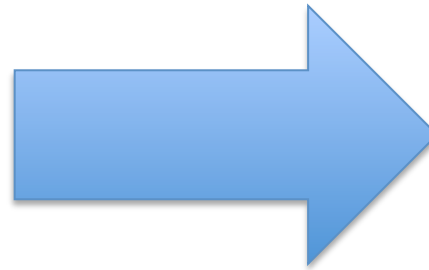
Communiquer avec le client

Modéliser les exigences



The image shows a screenshot of a data table with several columns: Product, Image process., Sensor format, Sensor type, Sensor manufa., Megapixels, Focus points, Metering pixels, and Viewfinder cov. The table is filtered to show rows for products like DDX, D2Xa, D2X, D1X, and D1Xs. A large blue arrow points from the table towards the right. In the foreground, there is a bar chart with various colored bars (red, yellow, green, blue) and icons (a cow, a plant, a person) overlaid on it. The text 'OPEN FOOD FACTS' and 'l'information alimentaire ouverte' is visible at the bottom of the chart area.

Product	Image process.	Sensor format	Sensor type	Sensor manufa.	Megapixels	Focus points	Metering pixels	Viewfinder cov.
DDX	EXPED	Full-frame	CMOS	Sony	24.5	51	1005	100%
D2Xa	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D2X	-	APS-C	CMOS	Sony	12.4	11	1005	100%
D1X	-	APS-C	CCD	Sony	5.3	5	1005	96%



f1,f2,f3
v11,v12,v13
v21,v22,v23

example

CSV

Délimiter
Approche défensive
“Contrat”

Valider les exigences et
l'implémentation
à chaque itération
avec le client

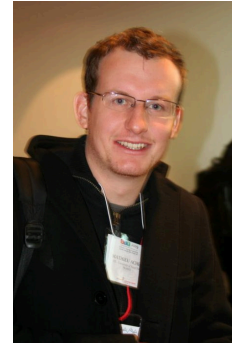
Systeme

Systeme



Validation par le client et/ou des utilisateurs

NE PAS TESTER VOTRE SOLUTION SUR UNE SEULE MATRICE!

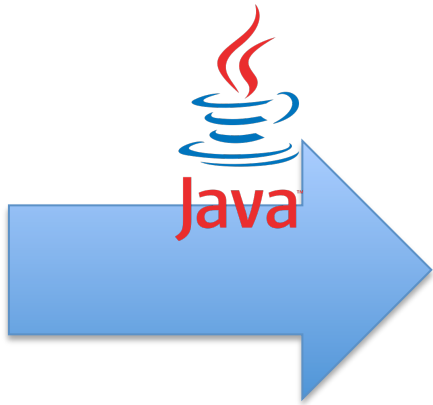


“la stratégie de filtrage sur OFF n’est pas correcte”
“la librairie XYZ n’est pas adaptée”

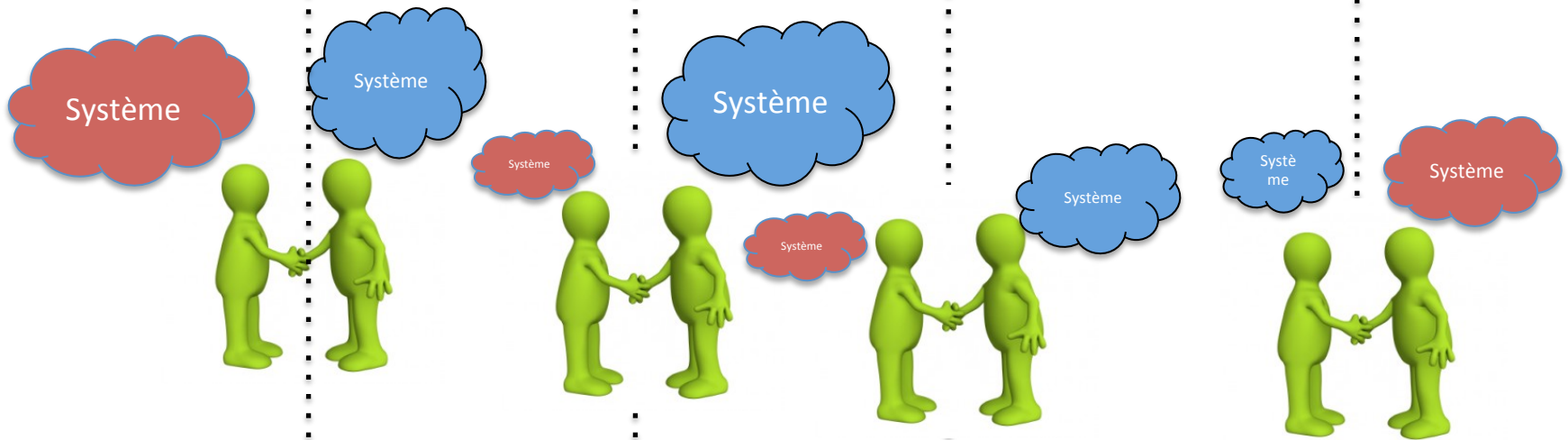
Product Image process. Sensor format Sensor type Sensor manufa... Metering pixels Viewfinder cov...

Product	Image process.	Sensor format	Sensor type	Sensor manufa...	Metering pixels	Viewfinder cov...
D3X		Full-frame	CMOS	1005	100%	
D2Xs		Full-frame	CMOS	1005	100%	
D2X		Full-frame	CMOS	1005	100%	
D1X		Full-frame	CMOS	1005	96%	
D2Xs		Full-frame	CMOS	1005	100%	
D4s		Full-frame	CMOS	1005	100%	
D4		Full-frame	CMOS	1005	100%	
D1X		Full-frame	CMOS	1005	96%	
D4s		Full-frame	CMOS	1005	100%	
D4		Full-frame	CMOS	1005	100%	
D3		Full-frame	CMOS	1005	100%	
D2Hs		Full-frame	CMOS	1005	100%	
D2H		Full-frame	CMOS	1005	100%	
D1H		Full-frame	CMOS	1005	100%	
D810		Full-frame	CMOS	1005	100%	
D4		Full-frame	CMOS	1005	100%	
D600		Full-frame	CMOS	1005	100%	
D700		Full-frame	CMOS	1005	96%	
D790		Full-frame	CMOS	1005	100%	
D2Hs		Full-frame	CMOS	1005	100%	
D2H		Full-frame	CMOS	1005	100%	
D1H		Full-frame	CMOS	1005	100%	
D810		Full-frame	CMOS	1005	100%	
D600		Full-frame	CMOS	1005	100%	
D700		Full-frame	CMOS	1005	96%	
D790		Full-frame	CMOS	1005	100%	
Df		Full-frame	CMOS	1005	100%	

OPEN FOOD FACTS
l'information alimentaire ouverte



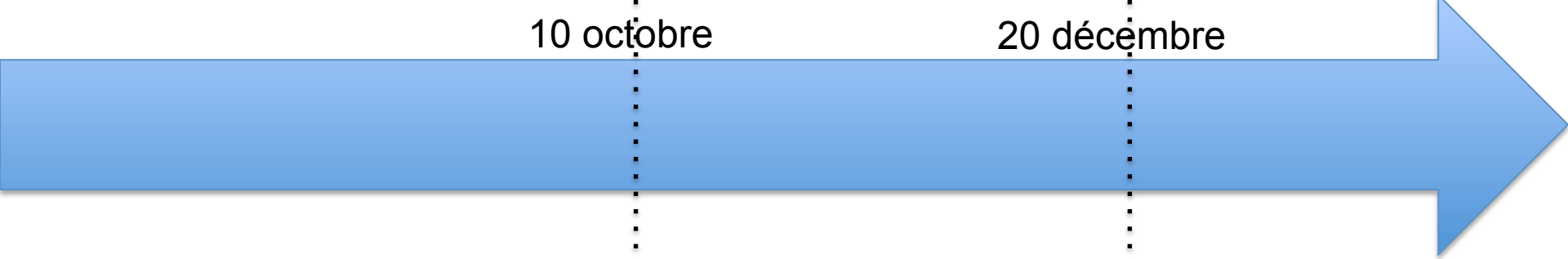
EX (exigences; cahier des charges)



Valider à chaque itération avec le client: montrer les modèles, expliquer les choix technologiques, etc.

10 octobre

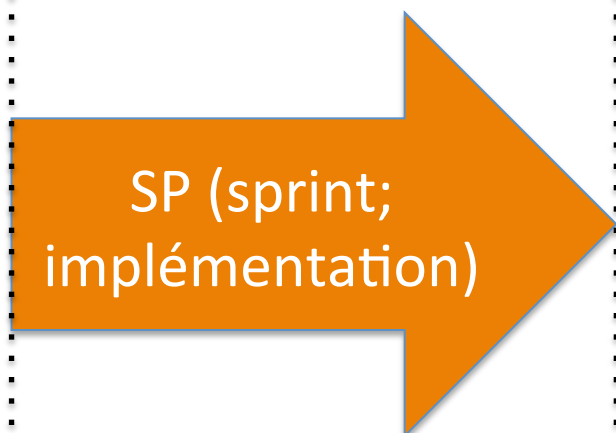
20 décembre



EX (exigences; cahier des charges)



SP (sprint; implémentation)

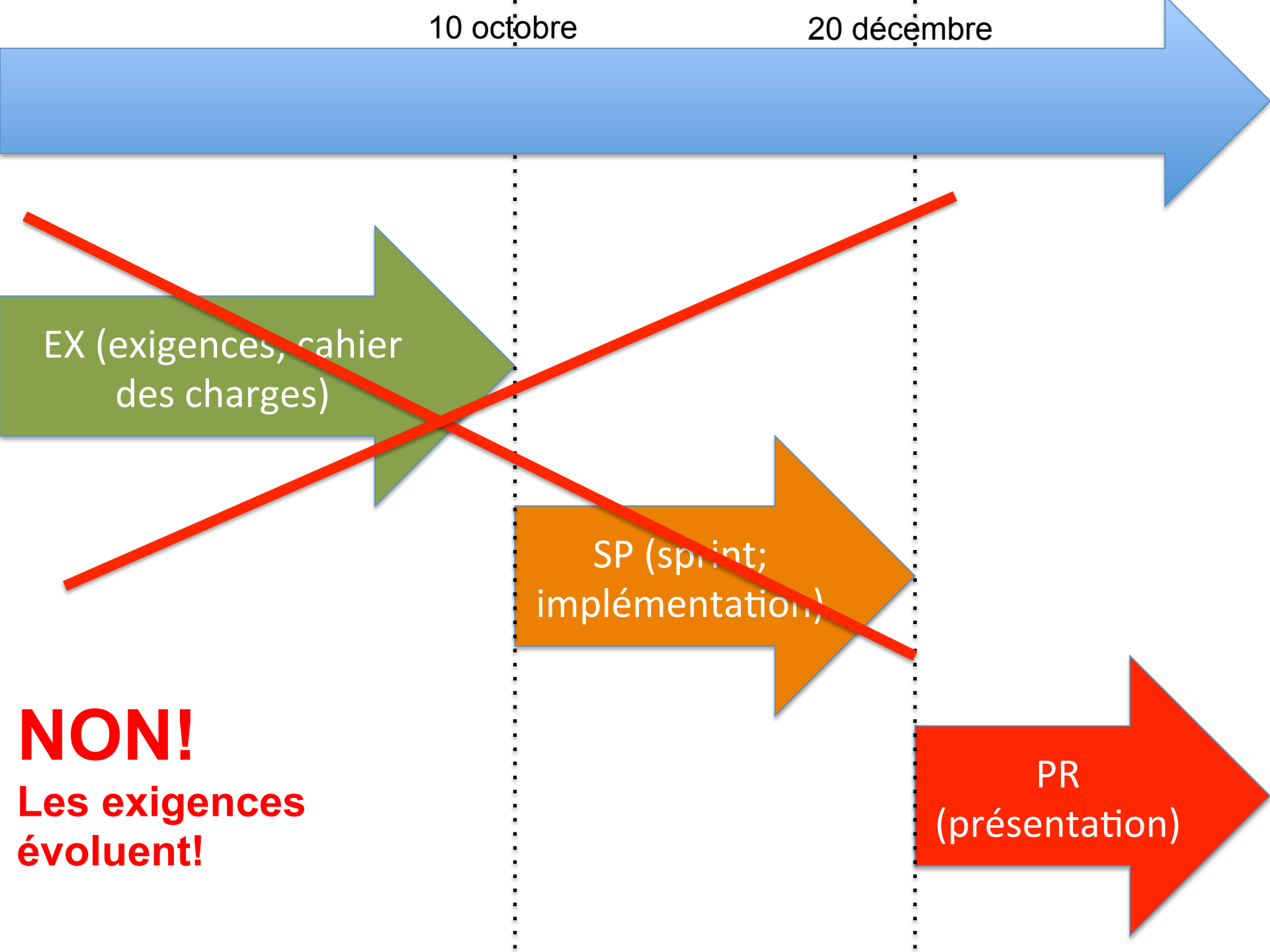


PR (présentation)



10 octobre

20 décembre



EX (exigences, cahier des charges)

SP (sprint; implémentation)

PR (présentation)

NON!
Les exigences évoluent!

10 octobre

20 décembre

EX (exigences, cahier des charges)

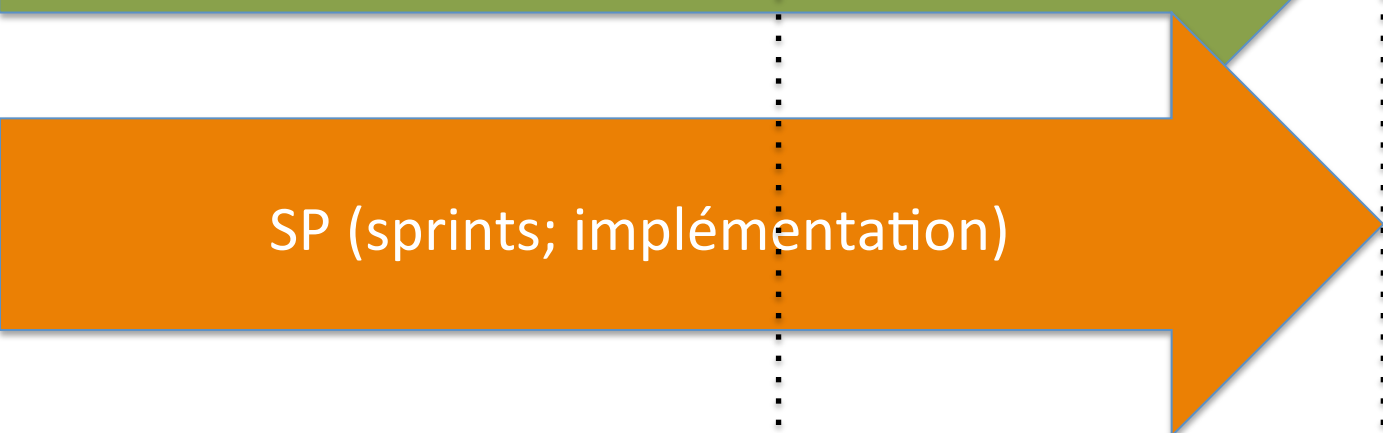
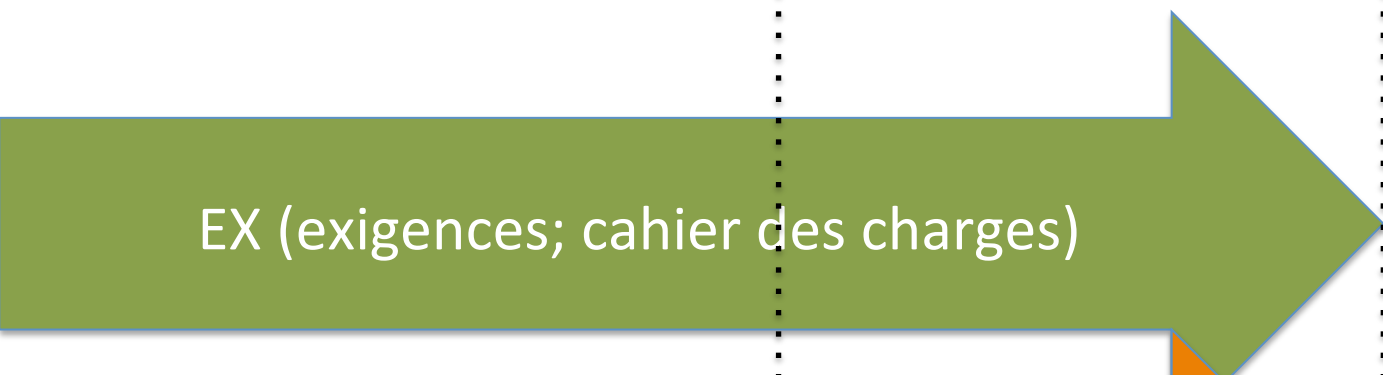
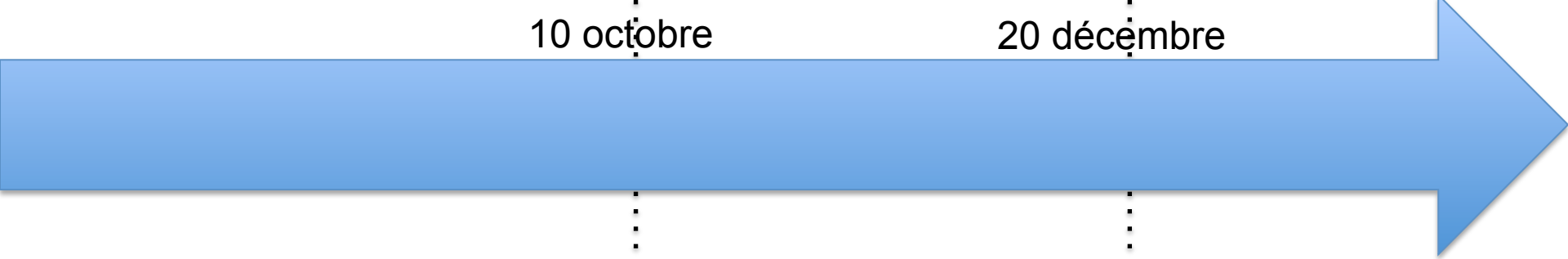
SP (sprint; implémentation)

PR (présentation)

**On ne fixe pas les exigences (même après le 1er livrable)
Remettre en cause certains éléments du cahier des charges ne serait pas surprenant**

10 octobre

20 décembre



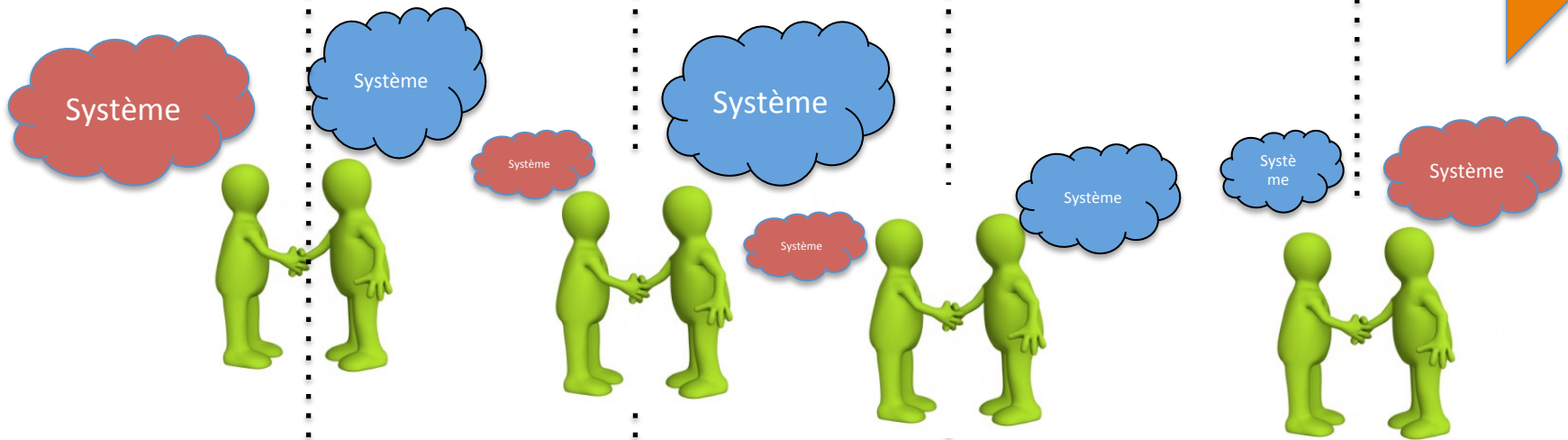
EX (exigences; cahier des charges)

SP (sprints; implémentation)

PR
(présentation)

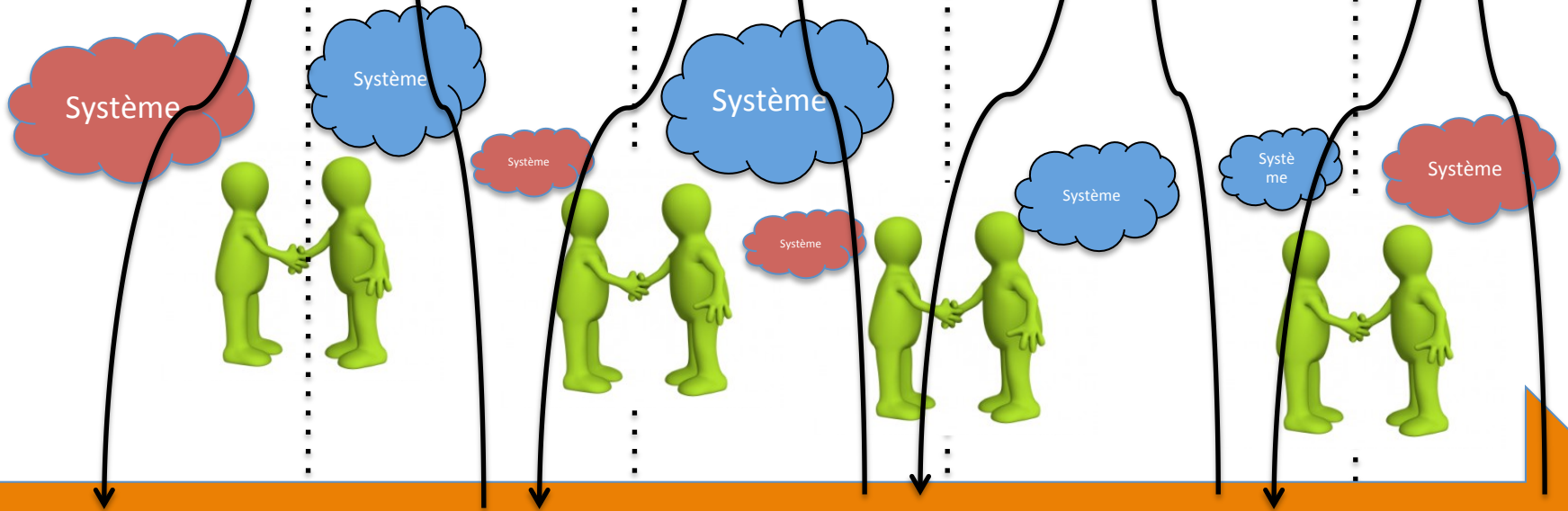
EX (exigences; cahier des charges)

SP (sprints; implémentation)



Valider à chaque itération avec le client: montrer les exigences et l'implémentation (le « produit » en action)

EX (exigences; cahier des charges)



SP (sprints; implémentation)

Conclusion

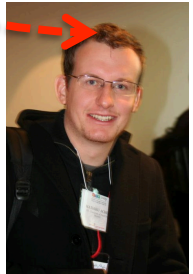
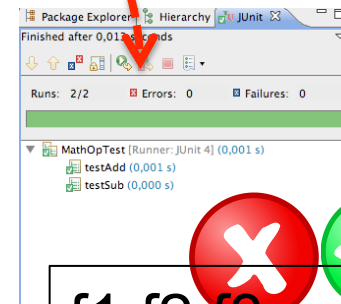
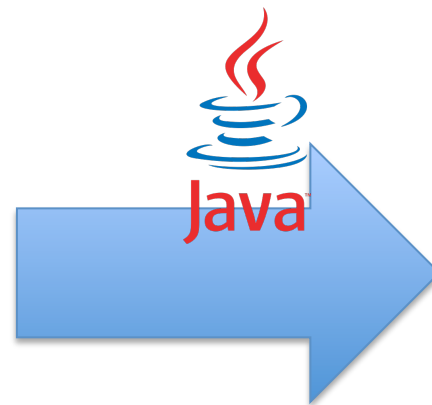
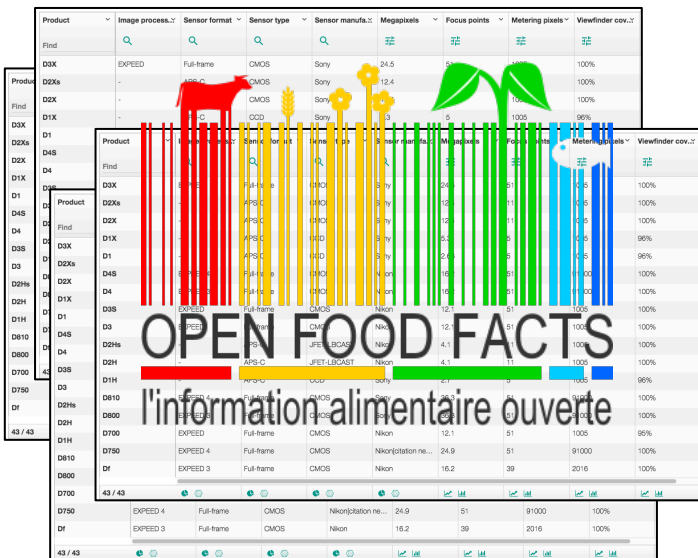
En résumé

- Modéliser les exigences/besoins avec le client de manière continue (EX)
- Valider l'implémentation par le test (SP)
- Valider les exigences et l'implémentation à chaque itération avec le client ou des utilisateurs
 - Montrer le “produit” en action permet de raffiner les exigences
- Conséquence: sorties fréquentes de “release”
 - Solution: procédure de tests automatisée (git + CI + Junit)

#1 tests automatiques (exhaustif)

#2 validation par le client/des utilisateurs (sampling)

NE PAS TESTER VOTRE
SOLUTION SUR UNE
SEULE MATRICE!

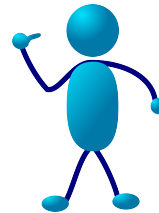
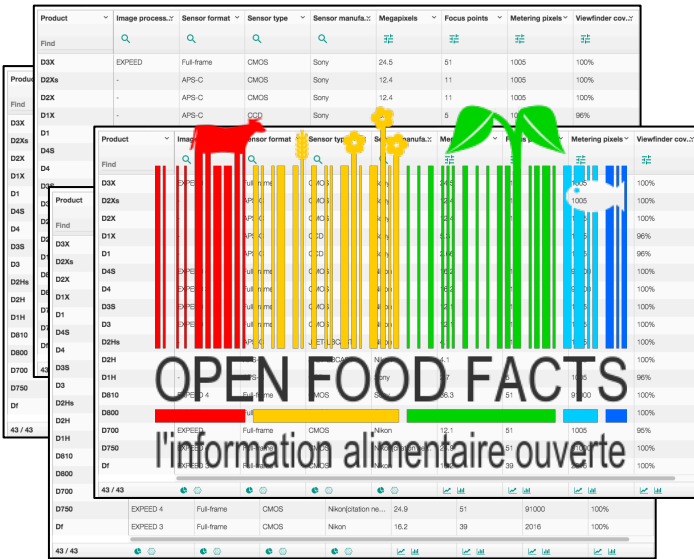


f1,f2,f3
v11,v12,v13
v21,v22,v23

example

CSV

Travail collaboratif et itératif (multi-persons, multi-versions)



```
f1,f2,f3  
v11,v12,v13  
v21,v22,v23
```

example

CSV



Multi-Tools and Languages



Visual Basic



Code::Blocks Studio



eclipse



Microsoft Visual Studio



play



maven



mongoDB



HTML5 CSS3 JS



Java



SUBVERSION



CVS



git



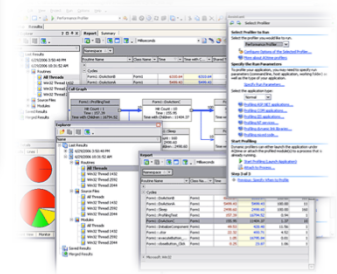
node.js

[http://logging.apache.org/](http://logging.apache.org/log4j/)

Logging Service



LOG4J



<APACHE ANT>



JUnit.org