Software Quality Attributes

how the customer explained it
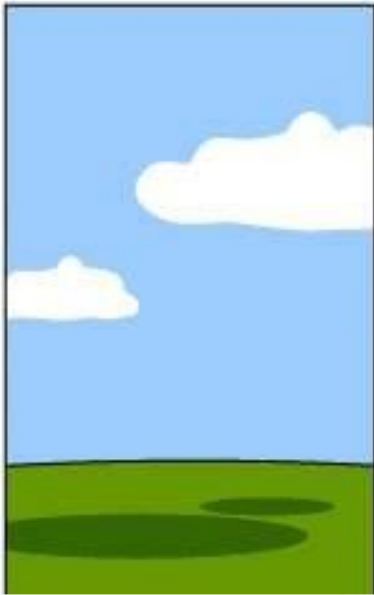
how the project leader understood it

how the analyst designed it

how the programmer wrote it
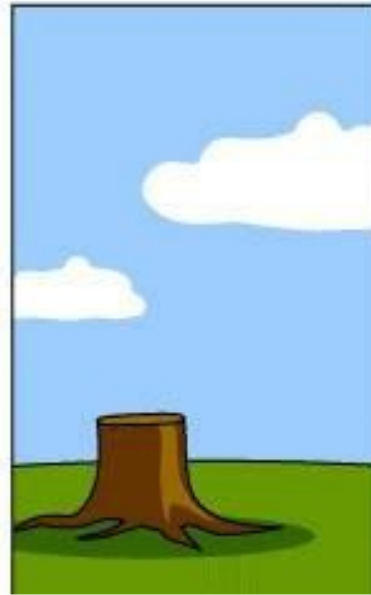
how the business consultant described it

documentation

installation

customer was billed for

post installation support

what the customer really needed

Functional Requirements

First goal is to solve the functional requirements

- meet & exceed the functional requirements
  - "meet" is a must
  - "exceed" is better

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Technology

Match functional requirements to technology

OSS vs Commercial

- what type of support is available

- what type of customization is possible

Performance

What does it mean?

- hand held application performance
- web application performance
  - banking, eBay, Google
- game performance
- real-time applications
  - robotics

Quality

Stability & Bugs

- is there ever a bug free software system?
- what defines a stable system?
  - revision control systems

Fault tolerance

In the case of failure....

Redundancy

- at what level
    - application vs component
    - *batman has many suites but one bat-mobile?*

Graceful exit

- hmmm..... lets see then

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Fault tolerance

A problem has been detected and Windows has been shut down to prevent damage to your computer.

DRIVER_IRQL_NOT_LESS_OR_EQUAL

If this is the first time you've seen this Stop error screen, restart your computer, If this screen appears again, follow these steps:

Check to make sure any new hardware or software is properly installed. If this is a new installation, ask your hardware or software manufacturer for any windows updates you might need.

If problems continue, disable or remove any newly installed hardware or software. Disable BIOS memory options such as caching or shadowing. If you need to use Safe Mode to remove or disable components, restart your computer, press F8 to select Advanced Startup Options, and then select Safe Mode.

Technical information:

*** STOP: 0x000000D1 (0x0000000C,0x00000002,0x00000000,0xF86B5A89)

***   gv3.sys - Address F86B5A89 base at F86B5000, DateStamp 3dd991eb

Beginning dump of physical memory
Physical memory dump complete.
Contact your system administrator or technical support group for further assistance.

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Fault tolerance


```
Terminal — java — 130×26

15:19:05,912 ERROR ~

@5pn2nofg9
Internal Server Error (500) for request GET /posts/1

Template execution error (In /app/views/tags/display.html around line 10)
Execution error occured in template /app/views/tags/display.html. Exception raised was ArithmeticException : / by zero.

play.exceptions.TemplateExecutionException: / by zero
        at play.templates.Template.throwException(Template.java:262)
        at play.templates.Template.render(Template.java:227)
        at play.templates.Template$ExecutableTemplate.invokeTag(Template.java:359)
        at /app/views/Application/show.html.(line:21)
        at play.templates.Template.render(Template.java:207)
        at play.mvc.results.RenderTemplate.<init>(RenderTemplate.java:22)
        at play.mvc.Controller.renderTemplate(Controller.java:367)
        at play.mvc.Controller.render(Controller.java:393)
        at controllers.Application.show(Application.java:26)
        at play.utils.Java.invokeStatic(Java.java:129)
        at play.mvc.ActionInvoker.invoke(ActionInvoker.java:124)
        at Invocation.HTTP Request(Play!)
Caused by: java.lang.ArithmeticException: / by zero
        at java.math.BigDecimal.divide(BigDecimal.java:1327)
        at /app/views/tags/display.html.(line:10)
        at play.templates.Template.render(Template.java:207)
        ... 10 more
```

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Performance

Throughput

- def:
  - calculations per second
  - transactions per second
  - messages per second
- do you see a trend here?
- campus Internet lunch time gremlins

Performance

Throughput

- peak throughput

- average throughput

- should a system be designed for peak or average throughput

Performance

Latency

- latency is in the eye of the observer
- inherently present in everything
  - can not be eliminated
  - reduction & mitigation
- measuring latency is hard

Response time

- combination of computational and communicational latencies

Availability

Has a direct impact on functional requirements

- how?

- easy to measure
    - uptime

- easy to specify

Data Specific Qualities

Size

Interoperability

Changes to schema

Replication

Consistency

Non-Runtime Qualities

Evolution

- code size

- coupling / dependencies
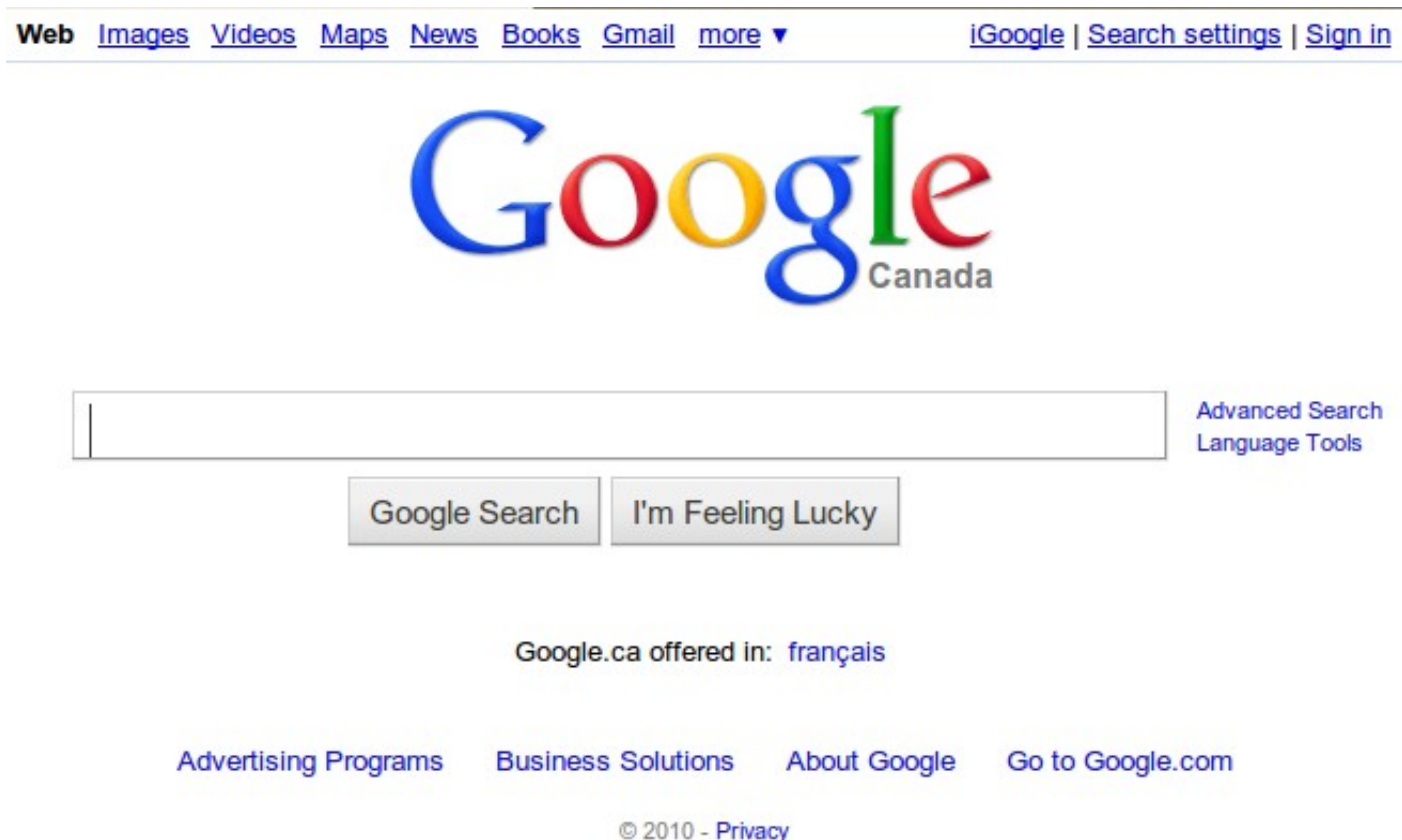
Portability

Reusability

Non-Runtime Qualities

Interoperability

- at what level?
  - system / components
  - data
  - *which one is better?*
- interoperability via standardization
  - communication protocols
  - schema
    - XML

Non-Runtime Qualities

Ease of use

- user interface is the face of the software
- logic is the back end

Operational Qualities

Cost

- what are some of the things that cost money

Supportability

- user support

- technical support

Configuration & Distribution

Release management

- backwards compatibility