Introduction to **continuous integration**

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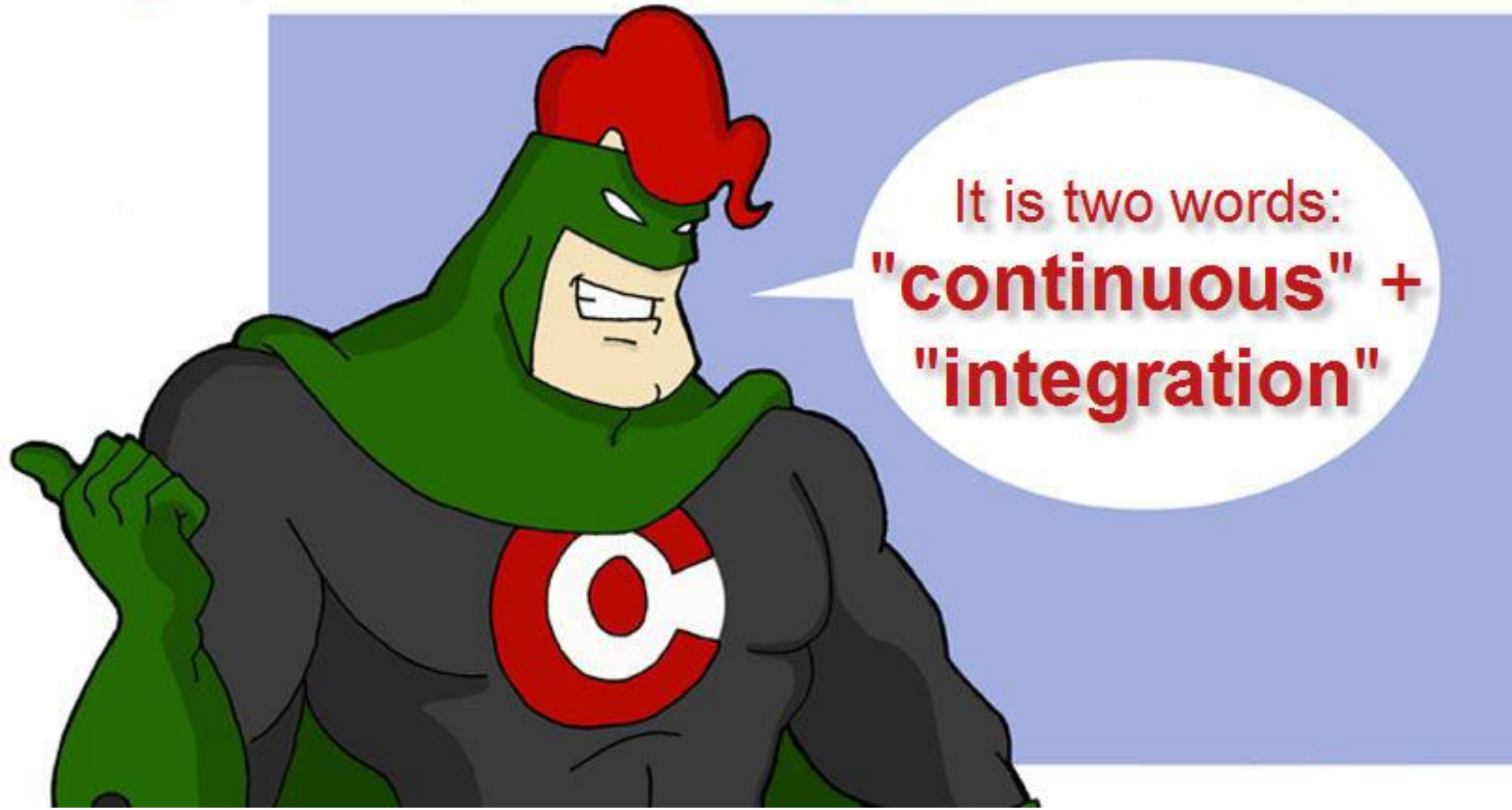
Agenda

- Introduction to continuous integration (CI)
- What is CI?
- What is not **CI**?
- When and how do I build?
- Features of CI
- What is the value of CI?
- CI and You

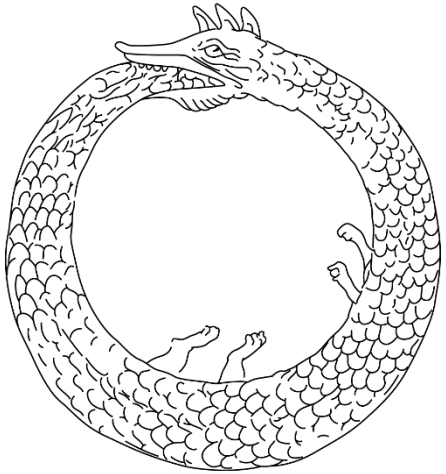
What is **continuous integration**?

http://siriusbuzz.com/what-happens-with-that-sirius-lifetime-subscription.php/big-question-mark

Captain Obvious says



What is **continuous**?

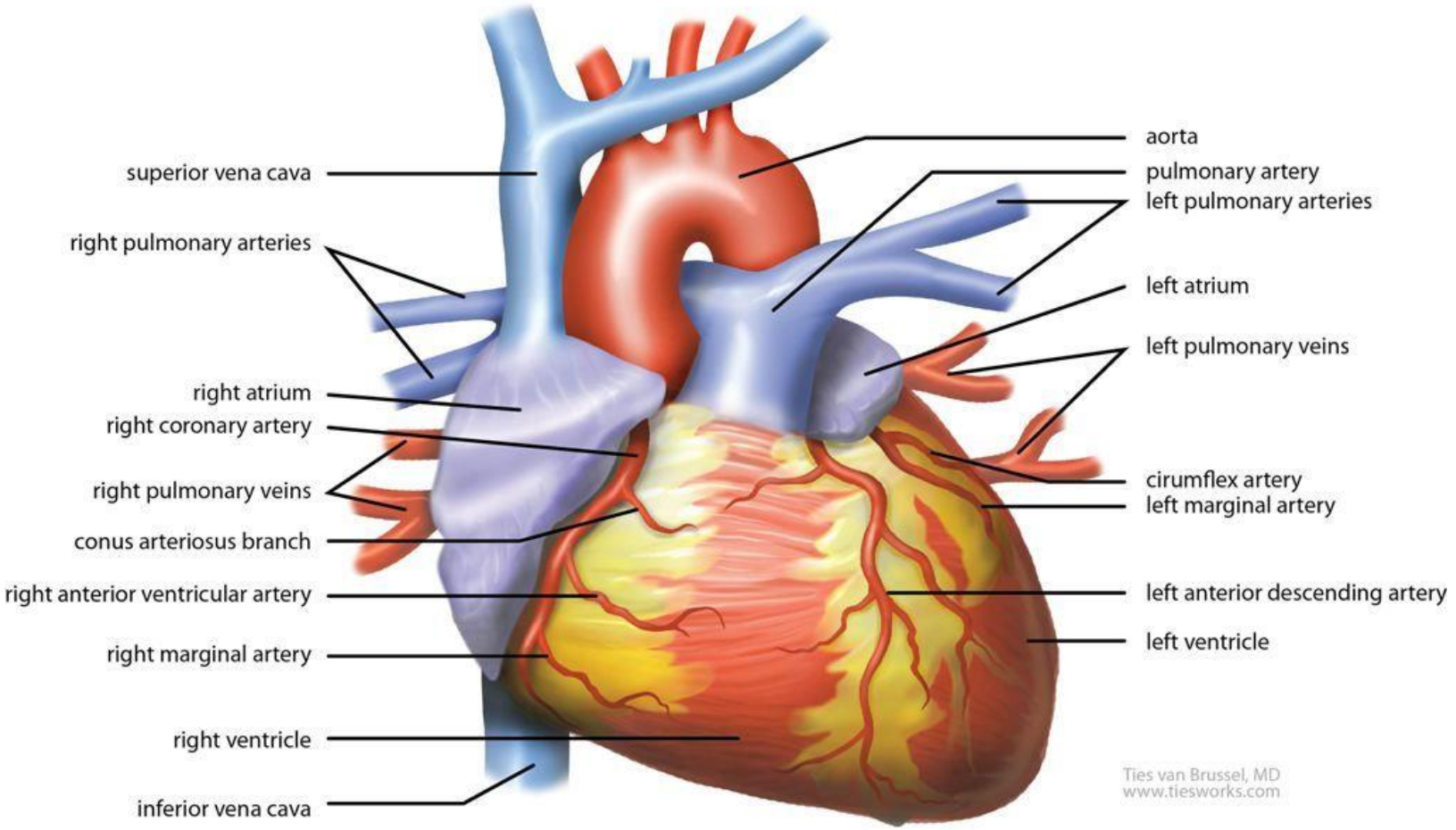


Uninterrupted in time, sequence, substance, or extent.

http://www.thefreedictionary.com/continuous
http://commons.wikimedia.org/wiki/File:Ouroboros1.png

In nature everything is **continuous** and whole!

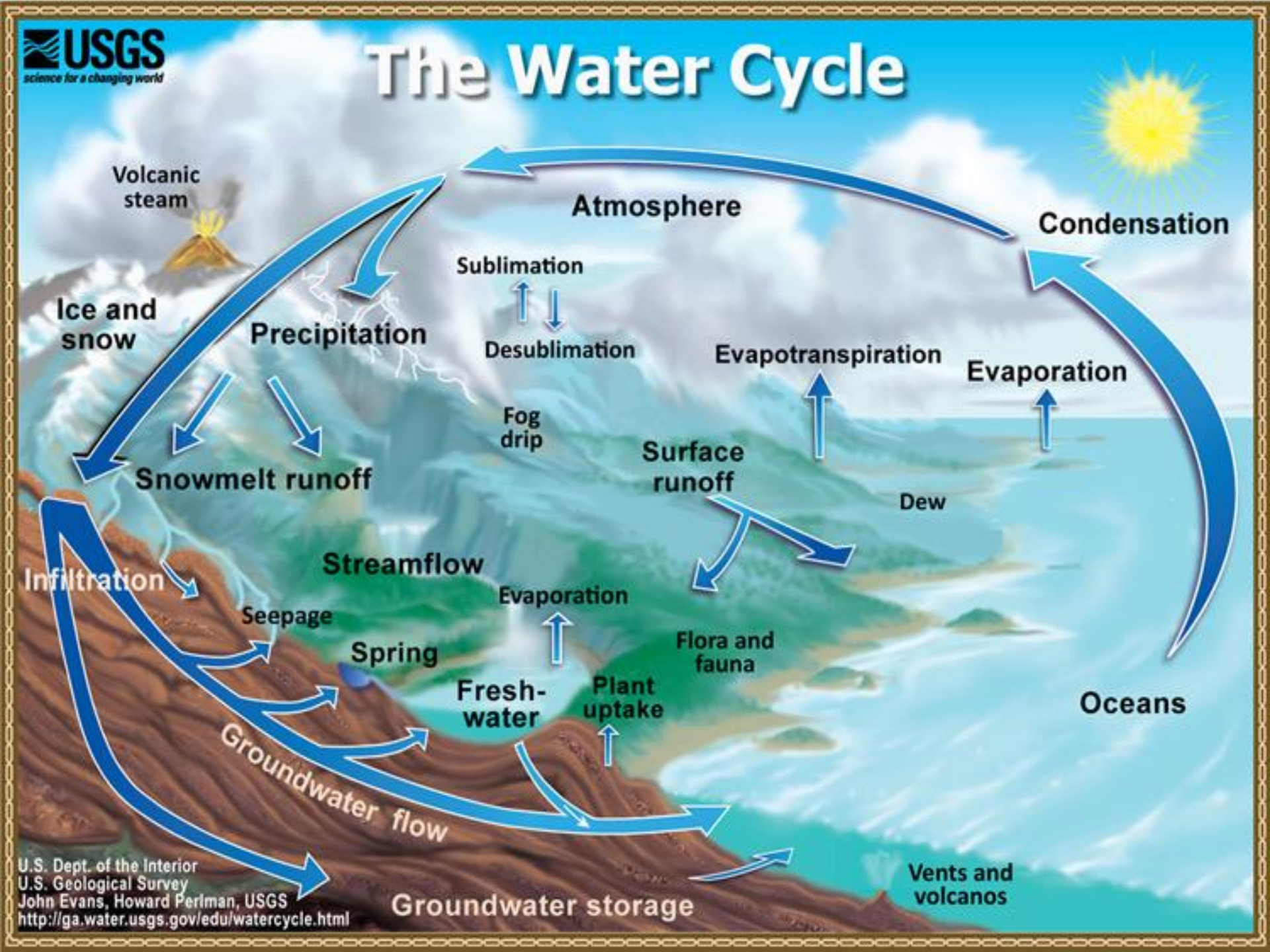
Heart


superior vena cava
right pulmonary arteries
right atrium
right coronary artery
right pulmonary veins
conus arteriosus branch
right anterior ventricular artery
right marginal artery
right ventricle
inferior vena cava
aorta
pulmonary artery
left pulmonary arteries
left atrium
left pulmonary veins
cirumflex artery
left marginal artery
left anterior descending artery
left ventricle
Ties van Brussel, MD
www.tiesworks.com

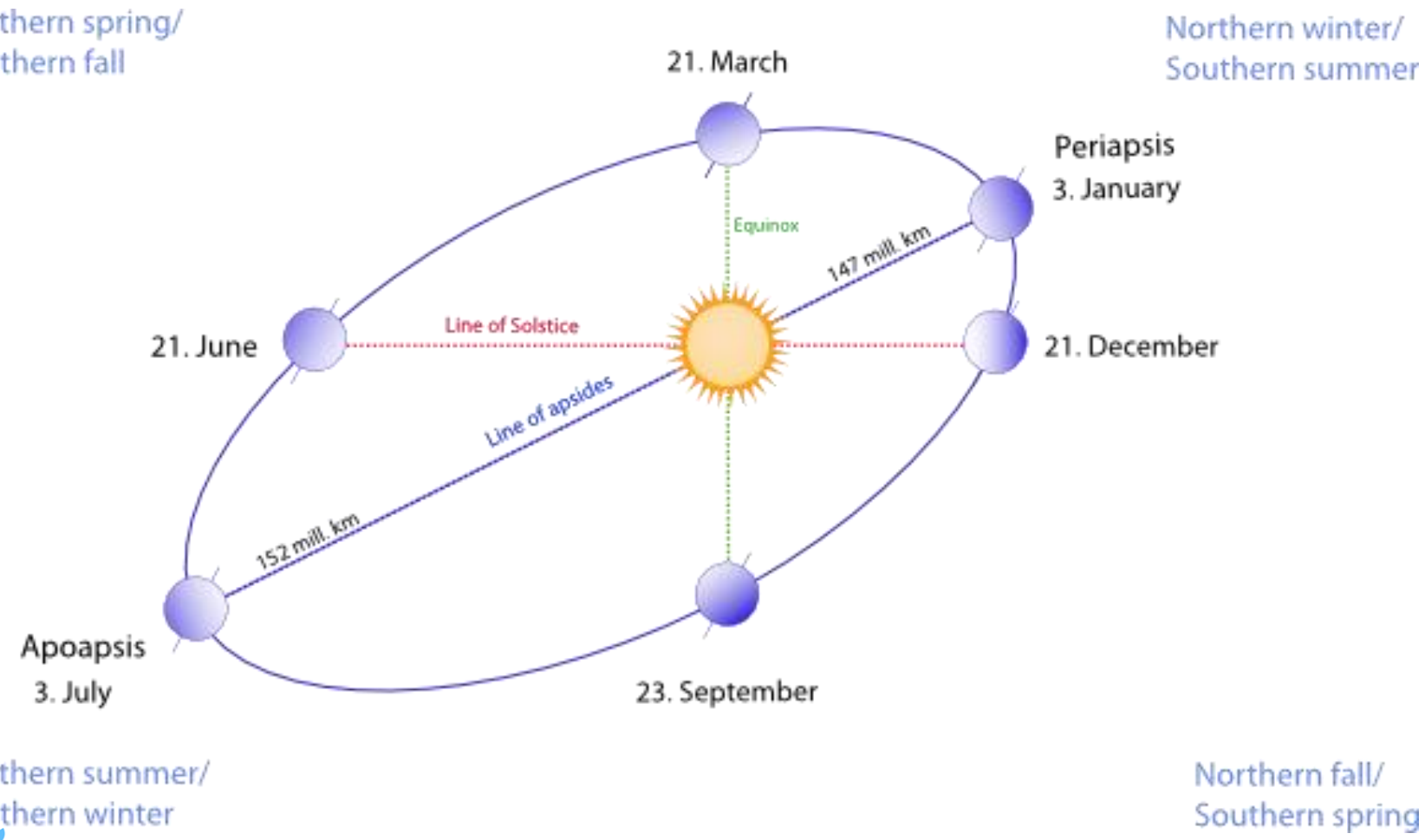
Water cycle

Describes the **continuous** movement of water on, above and below the surface of the Earth.

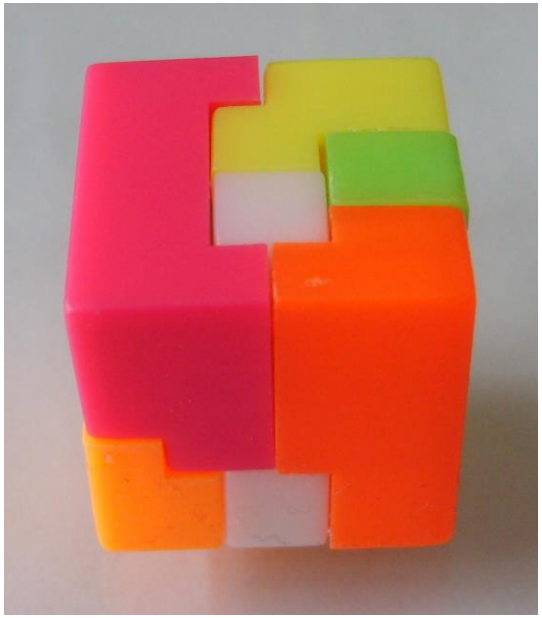
http://en.wikipedia.org/wiki/Water_cycle


USGS
science for a changing world
The Water Cycle
Volcanic steam
Atmosphere
Condensation
Sublimation
Ice and snow
Precipitation
Desublimation
Evapotranspiration
Evaporation
Fog drip
Surface runoff
Snowmelt runoff
Dew
Streamflow
Infiltration
Evaporation
Seepage
Flora and fauna
Spring
Fresh-water
Plant uptake
Oceans
Groundwater flow
Vents and volcanos
Groundwater storage
U.S. Dept. of the Interior
U.S. Geological Survey
John Evans, Howard Perlman, USGS
http://ga.water.usgs.gov/edu/watercycle.html

Season


Northern spring/
Southern fall
21. March
Northern winter/
Southern summer
Periapsis
3. January
Equinox
147 mill. km
Line of Solstice
21. June
21. December
Line of apsides
152 mill. km
Apoapsis
3. July
23. September
Northern summer/
Southern winter
Northern fall/
Southern spring

What is **integration**?



The act of **combining** or **adding** parts to make a unified whole.

Integration

- Social integration, in social sciences, is the movement of minority groups such as ethnic minorities, refugees and underprivileged sections of a society into the mainstream of societies.
- Racial integration, refers to social and cultural behavior.
- Economic integration, refers to trade unification between different states.
- Educational integration of students with disabilities.
- …

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

~~Integrate~~ Build a house

http://www.sadstroi.spb.ru/karkas.php

Lego bricks

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

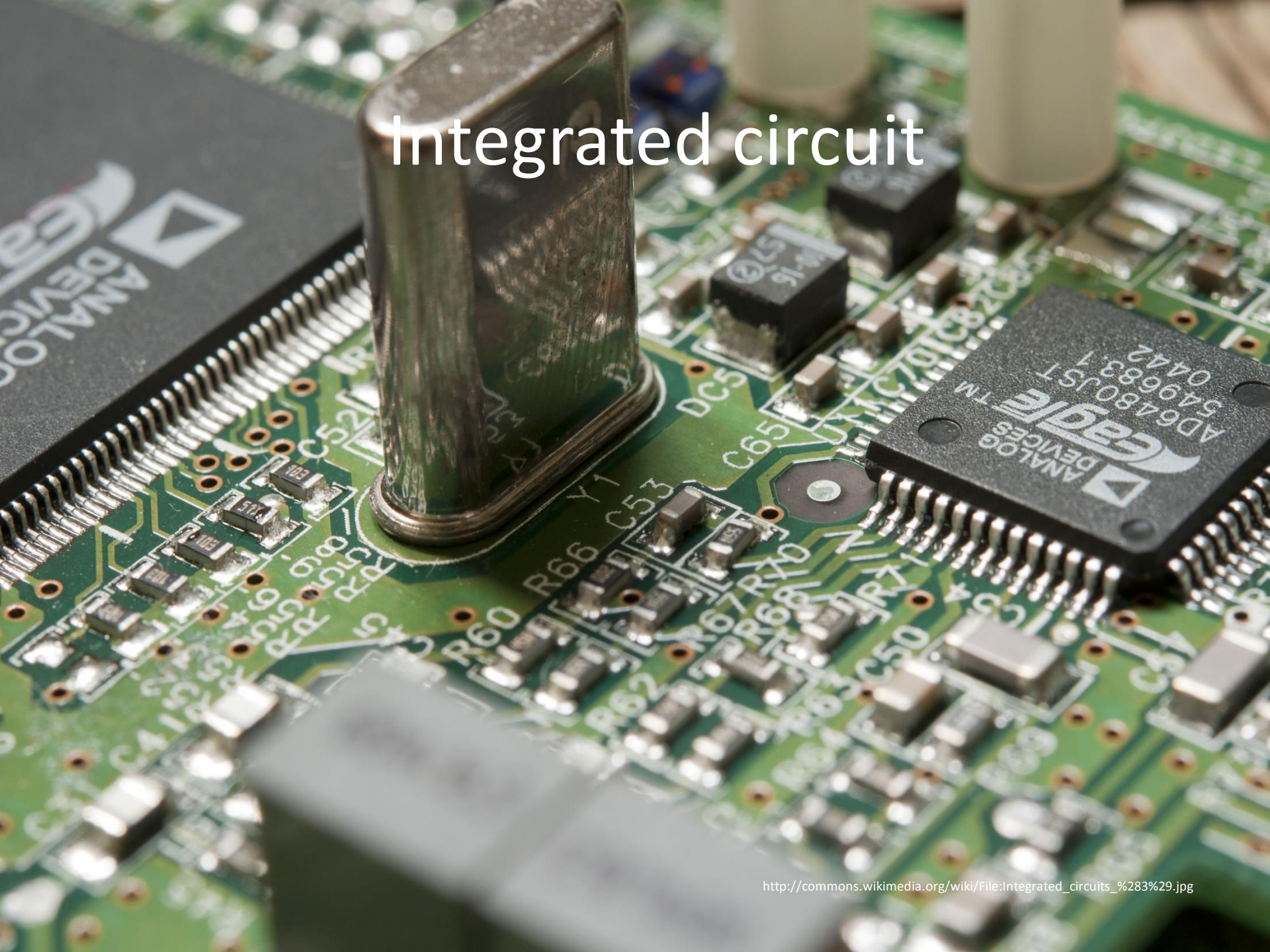
Start (integration)

http://365thingsaustin.com/event/lego-kidsfest-texas

Finish (integration)

http://365thingsaustin.com/event/lego-kidsfest-texas

Integrated circuit



http://commons.wikimedia.org/wiki/File:Integrated_circuits_%283%29.jpg

Smoke testing

The phrase smoke test comes from **electronic** hardware testing.

You plug in a new board and turn on the power. If you **see smoke** coming from the board, **turn off** the **power**.

You don't have to do any more testing.

After the integration we have **feedback**: everything is okay or not.

A power

„**continuous**” + „some **action**”

= it's power

Little strokes fell great oaks

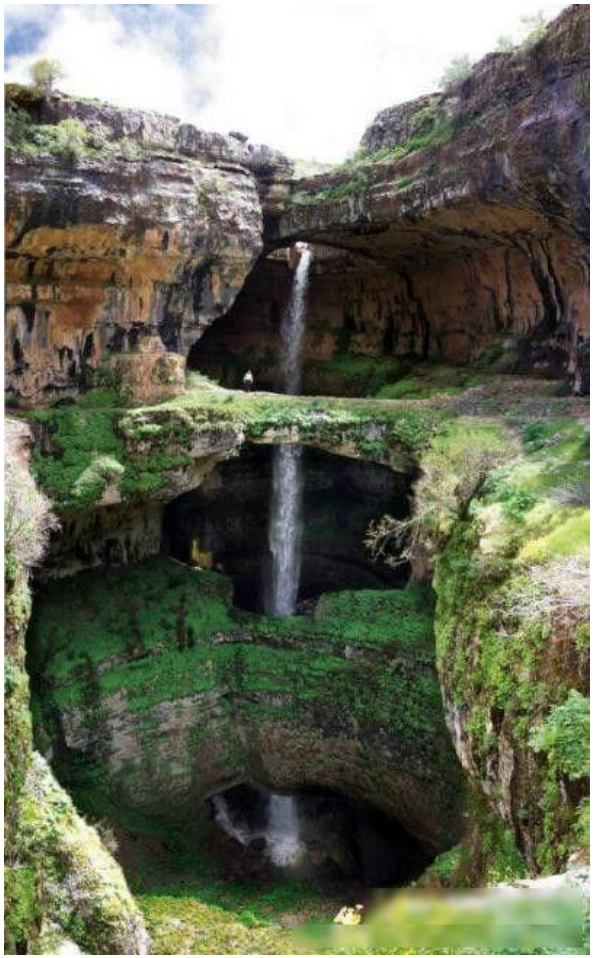
http://www.clipartpal.com/clipart_pd/education/proverb_11066.html

Вода камень точит

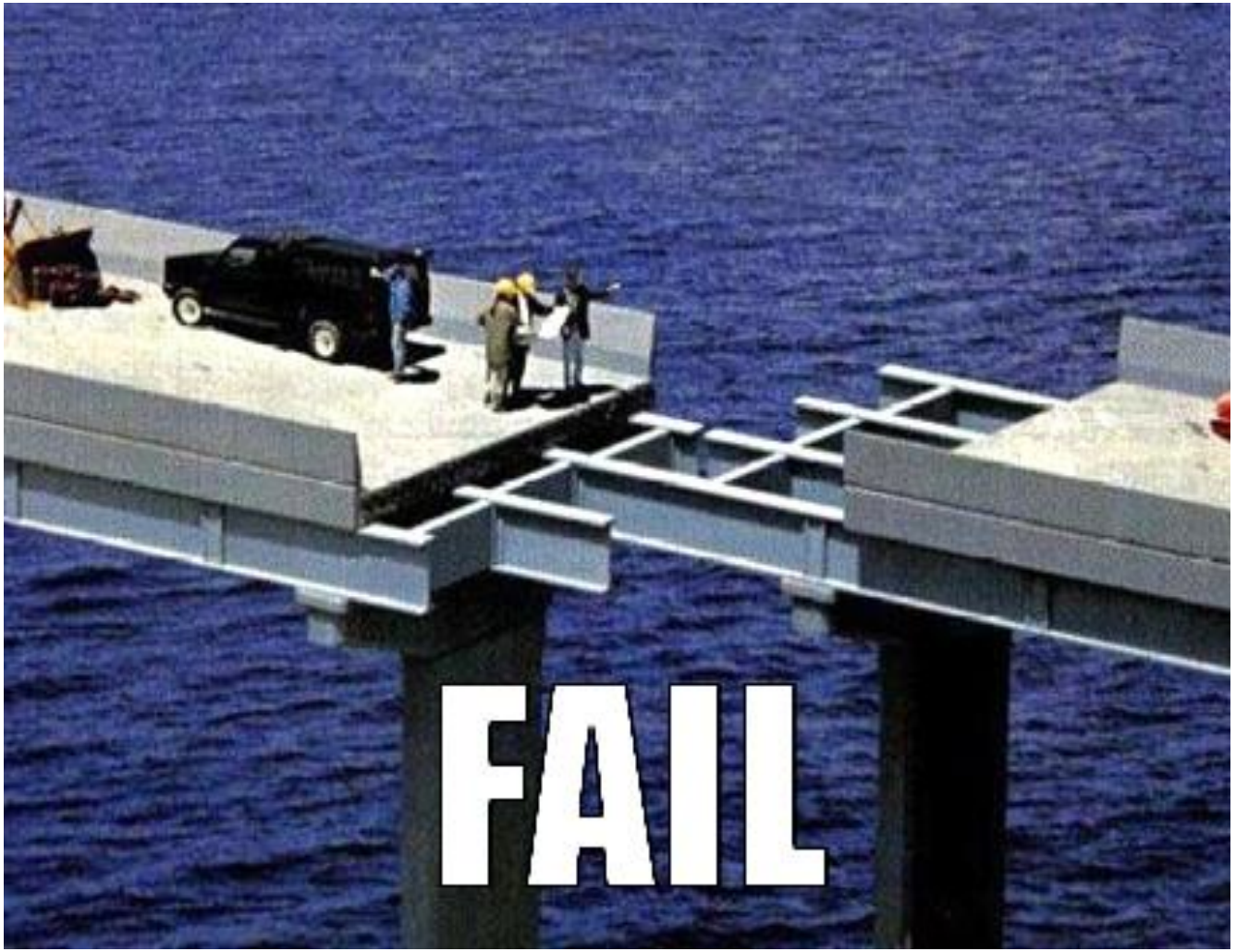
Water cuts through stone

水滴石穿 (Shuǐdīshíchuān)

Water cuts through stone



Integration fail (1)



http://www.threadbombing.com/details.php?image_id=2518

Integration fail (2)

http://deartheonion.wordpress.com/2011/03/01/engineers-fail-to-bridge-gap-between-rich-and-poor/

And how does it look in the **software**?

Principles behind the Agile Manifesto

Our highest priority is to satisfy the customer

through **early** and **continuous** delivery of valuable software.

http://agilemanifesto.org/principles.html

XP rules and concepts

- **Integrate often**
- Project velocity
- Pair programming
- User story

Integrate often

Development teams must integrate changes into the development baseline at least once a day.

This concept is also called **continuous integration**.

Joel Spolsky

http://www.geecon.org/speakers/joel-spolsky.html

The Joel Test

1. Do you use source control?
2. Can you make a build in one step?
3. Do you make daily builds?
4. Do you have a bug database?
5. …

http://www.joelonsoftware.com/articles/fog0000000043.html

What is CI?

It is the practice, of **merging** all developer **working copies** with a shared mainline **several times a day**.

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

What is CI?

- A development methodology
- Of daily developer integration
- Verified by automated builds

What is **not** CI?

- Nightly builds
- Developer branches

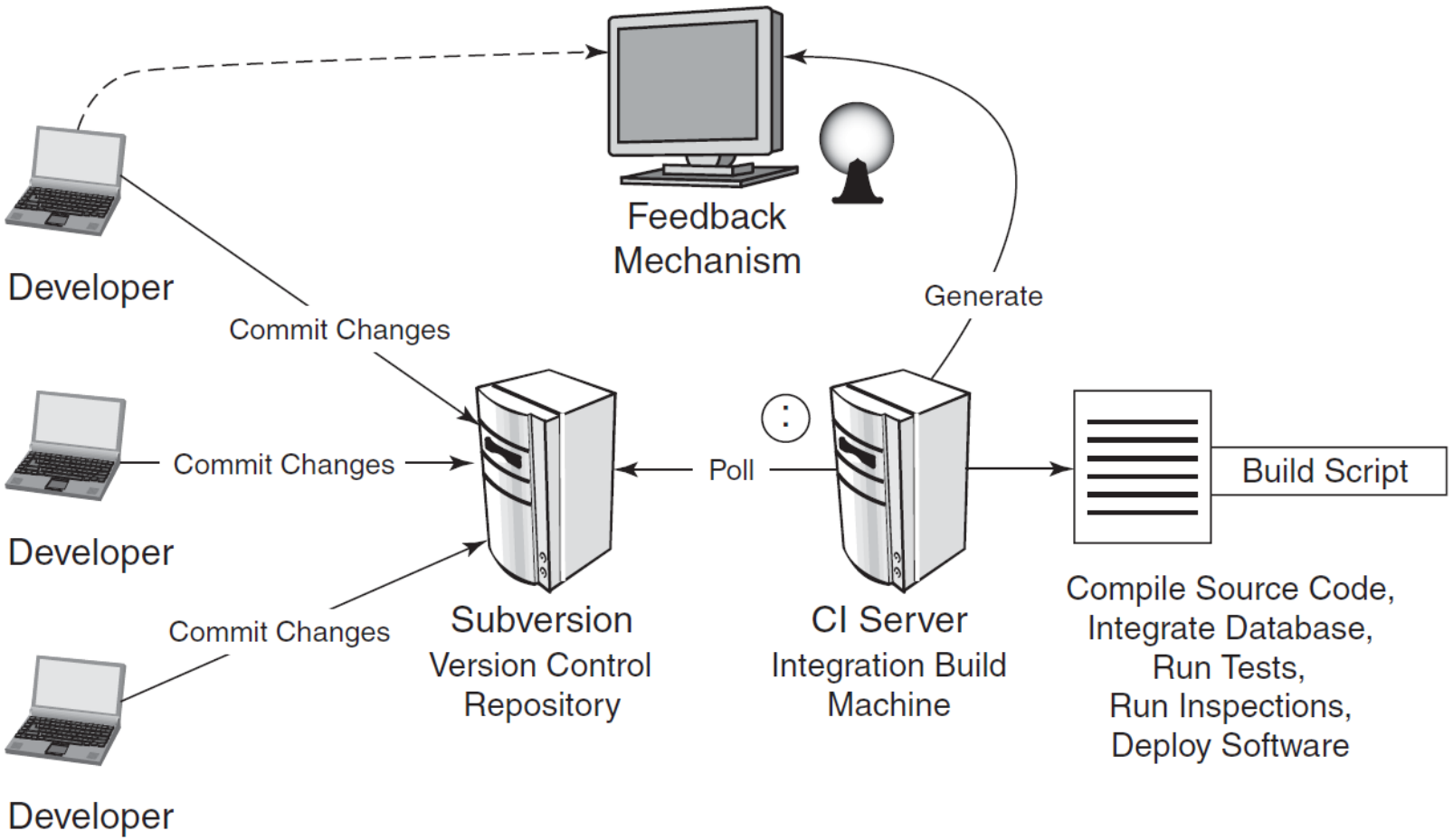
When do I build?

- At every check-in
- Every time a dependency changes
- Every X minutes

How do I build?

- Use a single build script
- That can run from cmdline
- Do not depend on an IDE

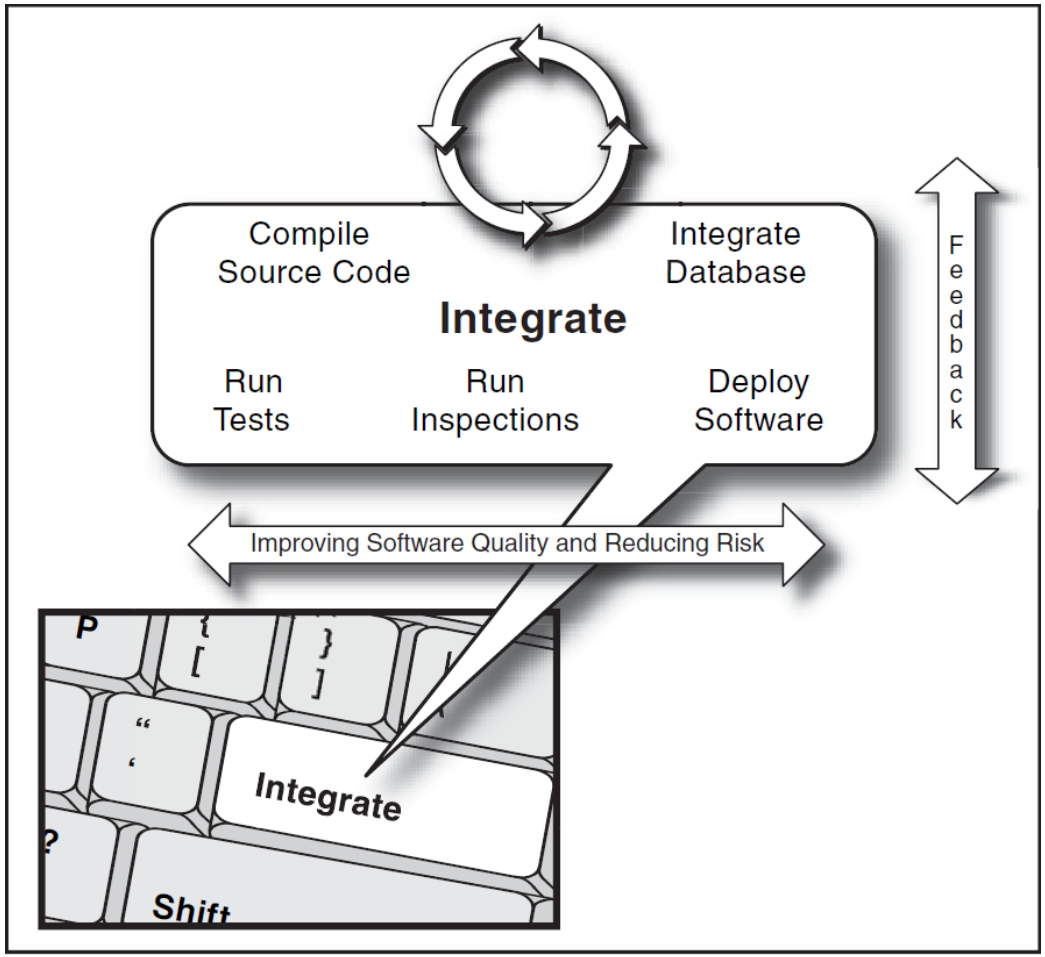
The components of a CI system



Features of CI

- Source code compilation
- Database integration
- Testing
- Inspection
- Deployment
- Documentation and feedback

The Integrate button



What is the value of CI?

- Reduce risks
- Reduce repetitive processes
- Generate deployable software
- Enable better project visibility
- Establish greater product confidence

What is the value of CI?

Reduce risks

- Defects are detected and fixed sooner
- Health of software is measurable
- Reduce assumptions

Reducing risks using CI

- Lack of deployable software
- Late discovery of defects
- Lack of project visibility
- Low-quality software

What is the value of CI?

Reduce repetitive processes

It saves **time**, **costs**, and **effort**.

- The process runs the same way every time.
- An ordered process is followed.
- The processes will run every time a commit occurs in the version control repository.

What is the value of CI?

Generate deployable software

CI can enable you to release deployable software at any point in time.

What is the value of CI?

Enable better project visibility

- Effective decisions
- Noticing trends

What is the value of CI?

Establish greater product confidence

Effective application of CI practices

can provide **greater confidence** in producing a software product.

What prevents teams from using CI?

- Increased overhead in maintaining the CI system
- Too much change
- Too many failed builds
- Additional hardware/software costs
- Developers should be performing these activities

How do I get to „Continuous Integration”?

I build so consistently.

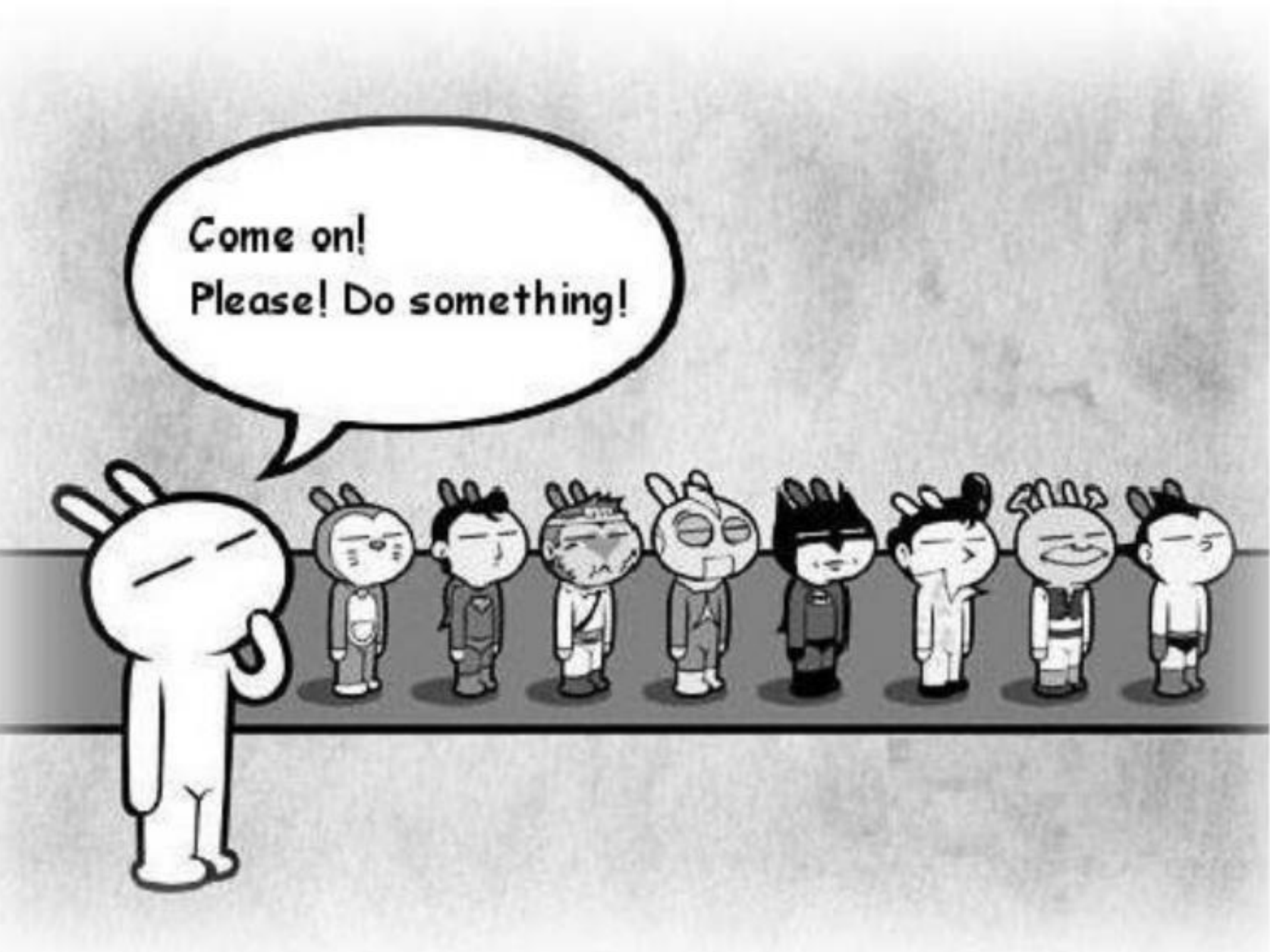
- Identify
- Build
- Share
- Make it continuous

When and how should a project implement CI?

It is best to implement CI early in the project.

CI is not just a technical implementation;

it is also an organizational and cultural implementation


Come on!
Please! Do something!

How long does CI take to set up?

It depends.

- For a new project may take you a few hours to set up and configure.
- For a project already in progress, it can take days, weeks, or even months to set up a CI system.

CI and You

- Commit code frequently
- Don’t commit broken code
- Fix broken builds immediately
- Write automated developer tests
- All tests and inspections must pass
- Run private builds
- Avoid getting broken code

CI and You (1)

Commit code frequently

Commit code to your version control repository **at least once a day**.

- Make small changes
- Commit after each task

CI and You (2)

Don’t commit broken code

Don’t commit code that does **not compile** with other code or **fails a test**.

CI and You (3)

Fix broken builds immediately

Although it's the team's responsibility,

the developer who recently committed code must be involved in **fixing the failed build**.

CI and You (4)

Write automated developer tests

Verify that your software works using automated developer tests.

Run these tests with your automated build and run them often with CI.

CI and You (5)

All tests and inspections must pass

Not 90% or 95% of tests,

but **all tests** must **pass** prior to committing code to the version control repository.

CI and You (6)

Run private builds

To prevent integration failures, get changes from other developers by

getting the latest changes from the repository and run a full integration build locally,

known as a private system build.

CI and You (7)

Avoid getting broken code

If the build has failed, you will lose time if you get code from the repository.

Wait for the change or **help** the developer(s) **fix** the **build failure** and then get the latest code.

In summary

CI can help you build better, quality software faster, with more confidence.

Resource

- **Continuous Integration: Improving Software Quality and Reducing Risk** by *Paul M. Duvall, Steve Matyas, Andrew Glover.*
- **Continuous Integration in .Net** by *Marcin Kawalerowicz, Craig Berntson.*
- **Software Configuration Management Patterns: Effective Teamwork, Practical Integration** by *Stephen P. Berczuk.*
- **Configuration Management Best Practices: Practical Methods that Work in the Real World** by *Robert Aiello, Leslie Sachs*