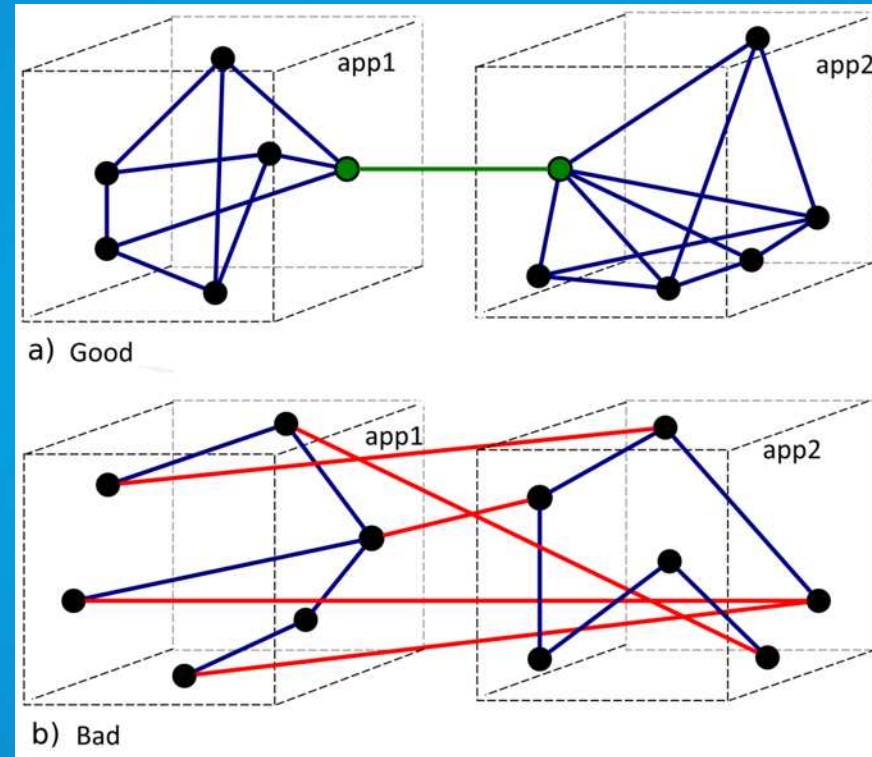


# Measuring cohesion & coupling



Mike Mugglin

# Content

- Motivation
- Theory
- Indexes
- Examples
- Conclusion

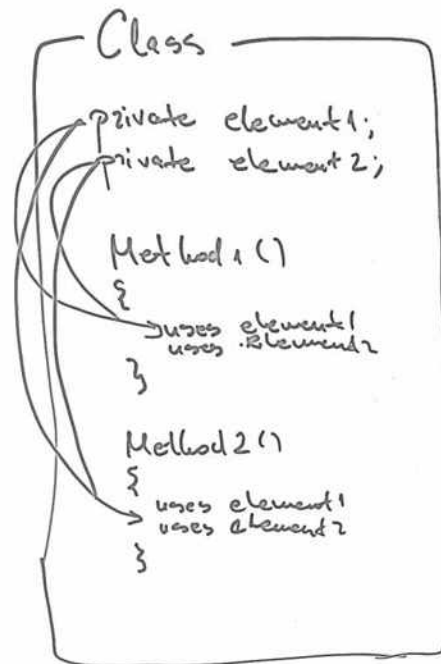
# Motivation

- Do the cohesion-/coupling-indexes really work ?
- Do they really work for real world software code (not only school examples) ?

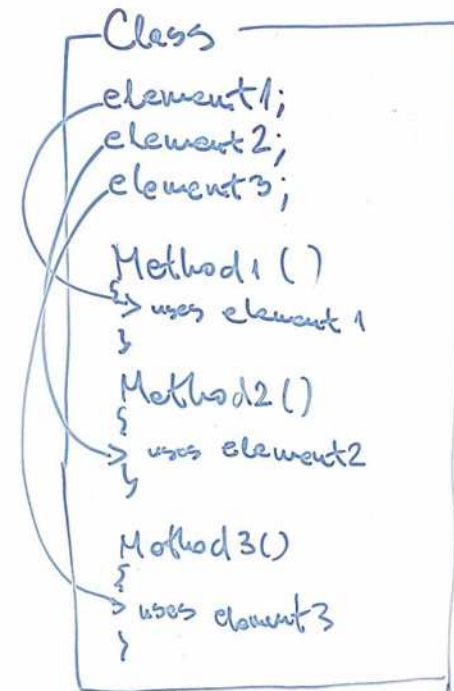


# Cohesion

HIGH COHESION



LOW COHESION

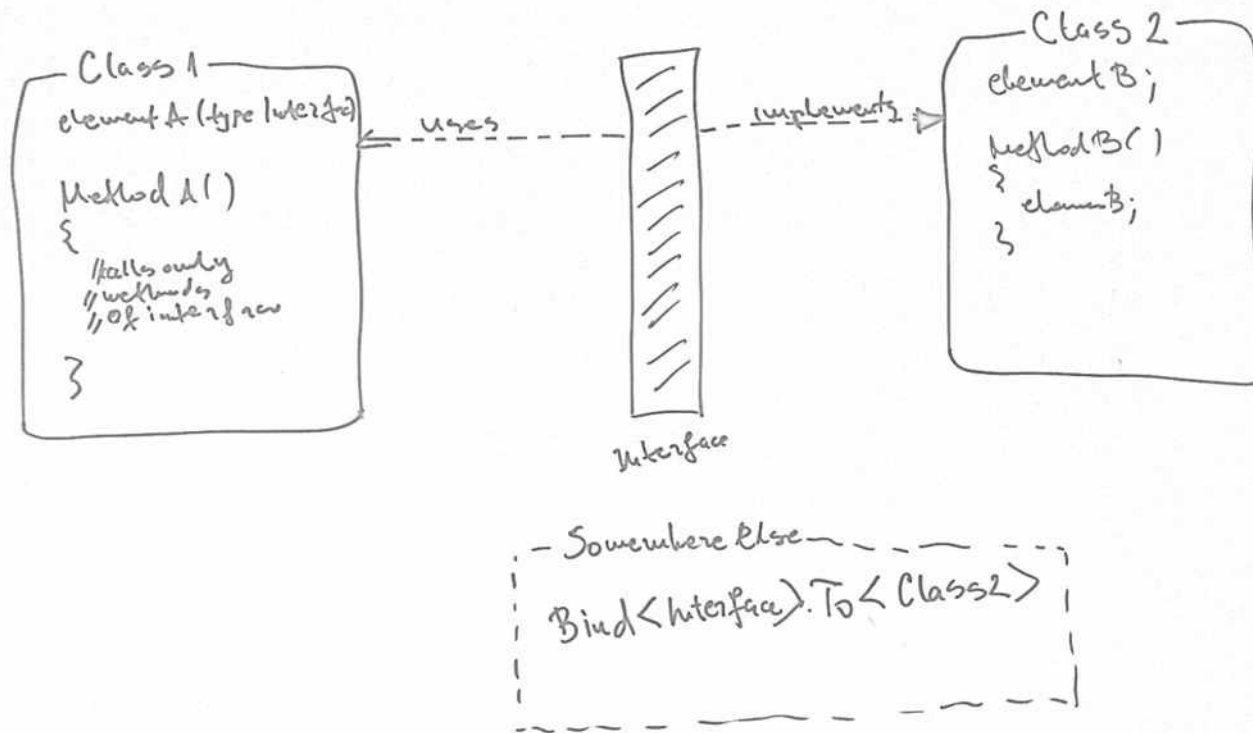


# Cohesion

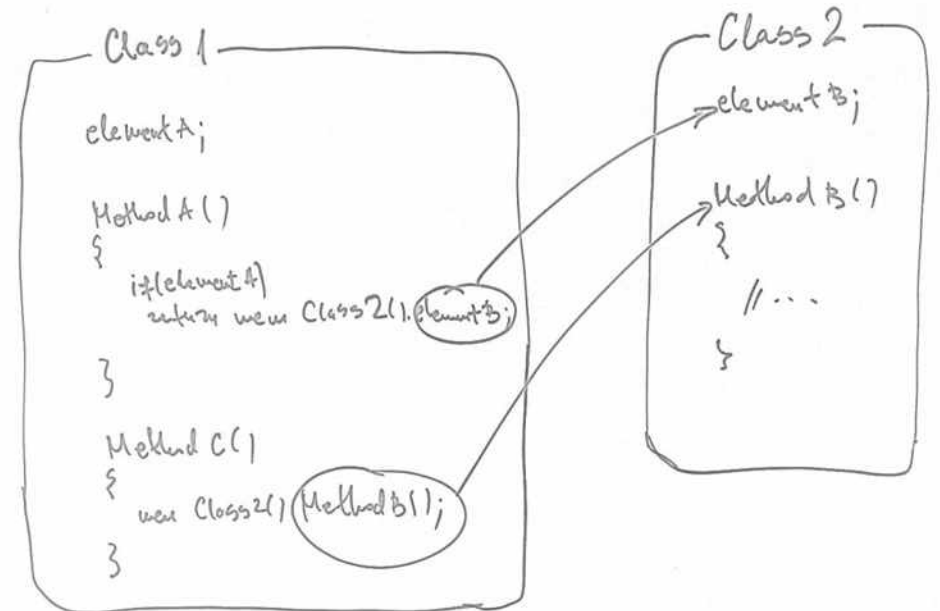
- Cohesion tells us how strongly modules and classes are internally related to one another
- A module or class with a high level of cohesion will have elements that all share a common purpose, while one with lower cohesion will be more of a loosely organized collection of odds and ends
- ‘Do one thing and do it well’
- *Single Responsibility Principle* (**SOLID**) is a way to increase cohesion by just ‘do one thing’

# Coupling

## LOOSE COUPLING



## TIGHT COUPLING



# Coupling

- Coupling tells us how strongly modules and classes are connected to one another
- Coupling measures how much two modules "know" about each other
- It's just the inverse concept of cohesion
  
- *Liskov Substitution* is a pretty straightforward example of reducing coupling

# Cohesion-Index

## Formula of *class cohesion*

$n_F$   $\Rightarrow$  number of fields

$n_M$   $\Rightarrow$  number of methods

$n_{MF}$   $\Rightarrow$  number of methods accessing the field F

$$\text{Cohesion} = \frac{\sum_0^F n_{MF}}{n_M n_F}$$

$$[0 < \text{Cohesion} < 1]$$



# Coupling-Index

## Formula of *class coupling*

$d_I \Rightarrow$  data in input

$cd_I \Rightarrow$  control data input

$g \Rightarrow$  global data

$m_I \Rightarrow$  fan in (modules call in)

$k \Rightarrow$  control data crappiness constant

$d_O \Rightarrow$  data in output

$cd_O \Rightarrow$  control data output

$cg \Rightarrow$  control global data

$m_O \Rightarrow$  fan out (modules call out)

$$\text{Coupling} = 1 - \frac{1}{d_I + d_O + g + k(cd_I + cd_O + cg) + m_I + m_O}$$

[0 < Coupling < 1] should stay  $\leq 0.75$

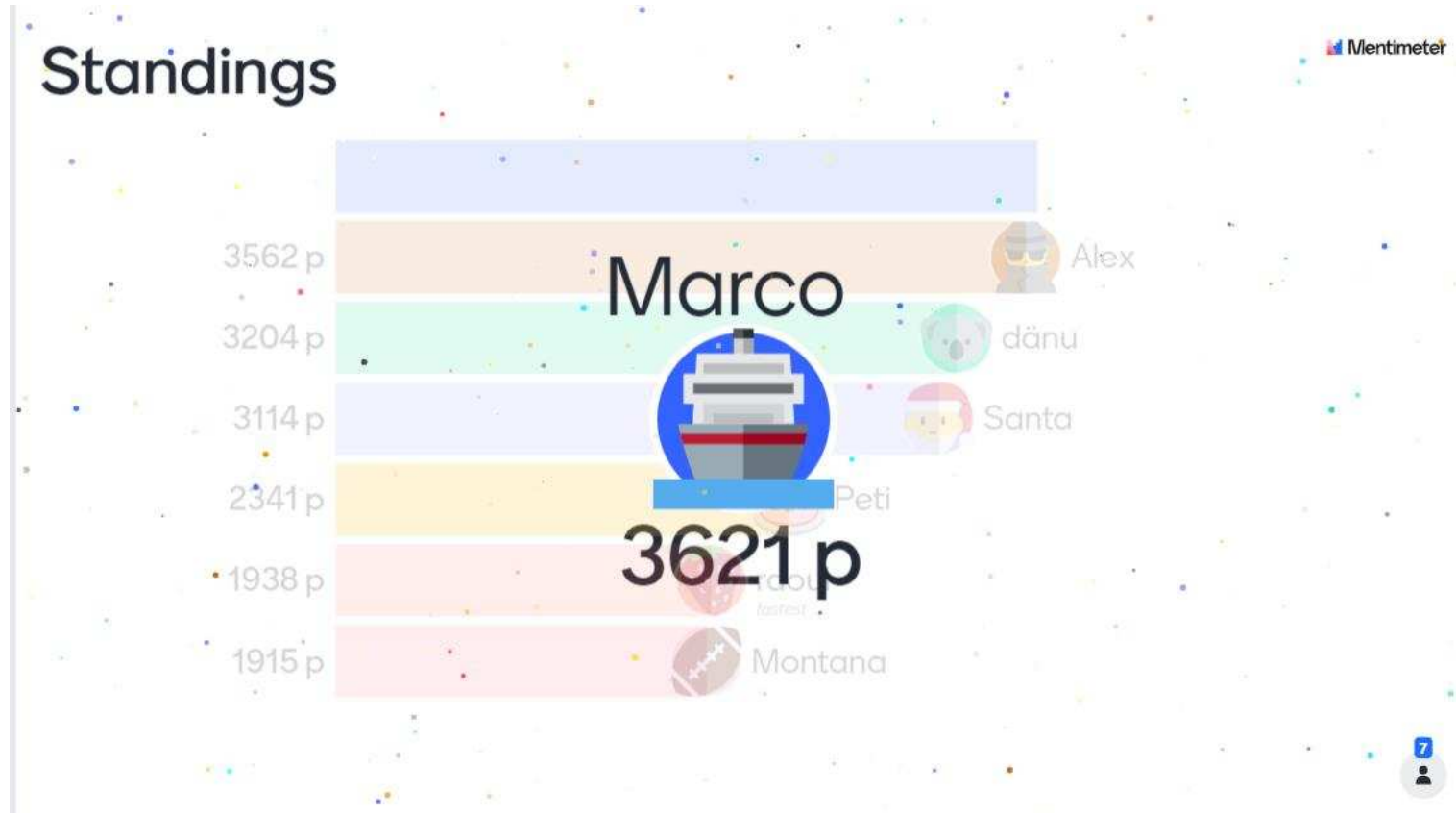
# Examples

[www.menitmeter.com](http://www.menitmeter.com)

Code: 72 26 72 7



# Congratulations !



# Are we improving ?

- Classes of lesson 2:

	Cohesion	Coupling
Board.java	0.2	0.97
Position.java	1	0.93
Tile.java	0.46	0.88
Game.java	0.6	0.95

- Classes of lesson 4:

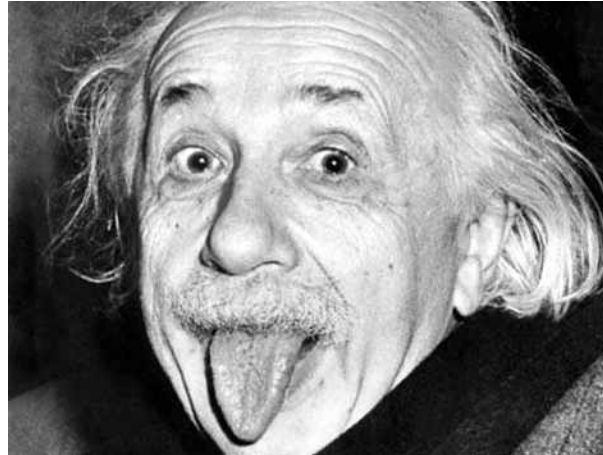
	Cohesion	Coupling
MarsRover.java	1	0
Position.java	0.58	0.93
Coordinate.java	1	0.75

- <https://github.com/Alcor-Academy/css-ch-cohort-3/tree/master/Running>

# Conclusion

- *“Not everything that counts can be counted, and not everything that can be counted counts.”*

Albert Einstein



- **The indexes are good indicator for good or bad cohesion/coupling.  
But the indexes aren't always right about a good or bad design !**

# Questions ?



<https://www.amspirit.com/blog/281-questions-to-ignite-small-talk>