Concern-Sensitive Detection Strategies

Eduardo Figueiredo

http://www.dcc.ufmg.br/~figueiredo

Motivation

- Bad smells are often sensitive to the way concerns are realized in code
  - Concern scattering and tangling may be related to bad smells
- Detection strategies are usually composed of traditional metrics
  - Traditional metrics do not quantify modularity of concerns

Concern-Sensitive Strategies

- They combine information of both traditional metrics and concern metrics
  - Concern metrics make the evaluation process sensitive to concerns
- A detection strategy represents a conditional statement
  - If <*condition*> then <*consequence*>

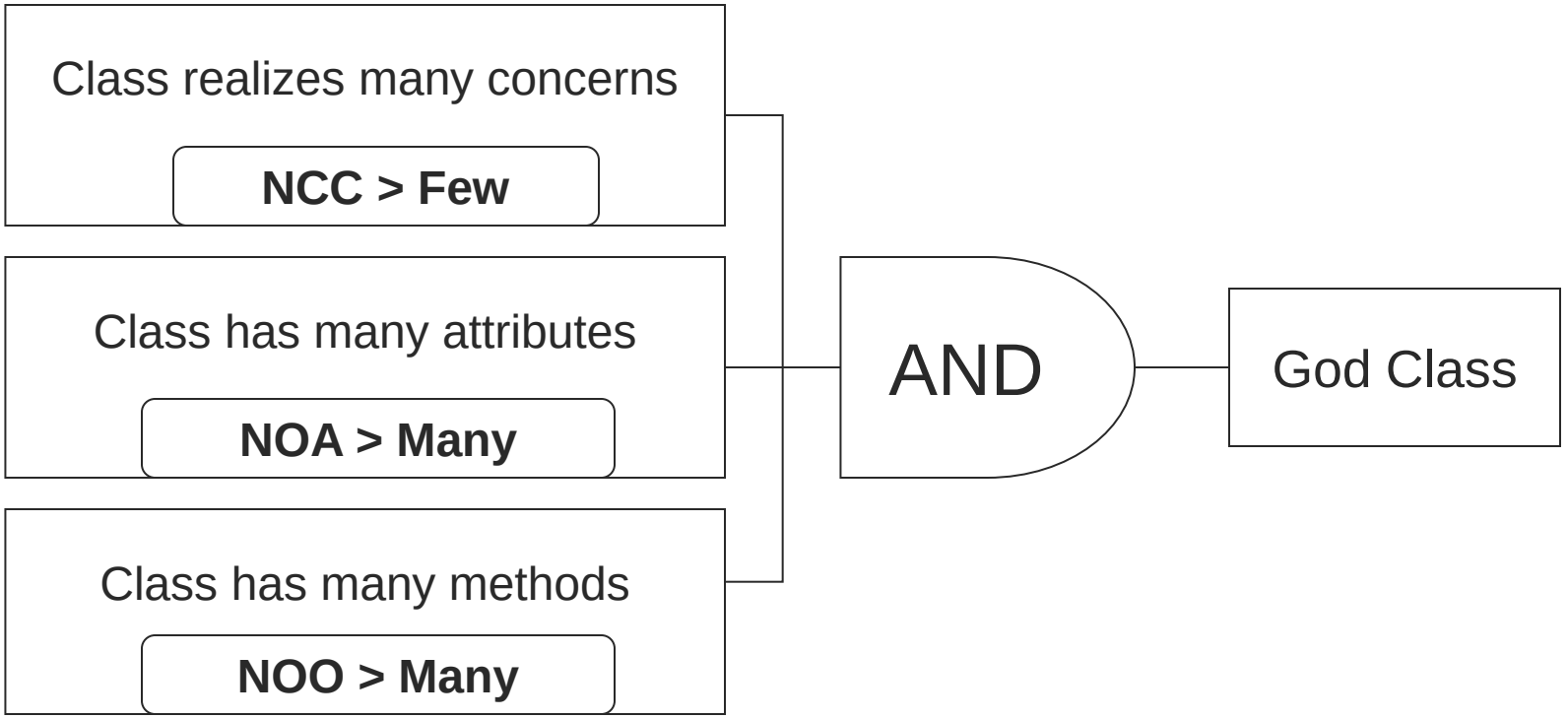
Detecting Bad Smells

- God Class
- God Method
- Divergent Change
- Shotgun Surgery
- Feature Envy

God Class

- It has too many responsibilities
  - Number of Concerns per Component (NCC)
- It knows too much
  - Number of Attributes (NOA)
- It does too much
  - Number of Operations (NOO)

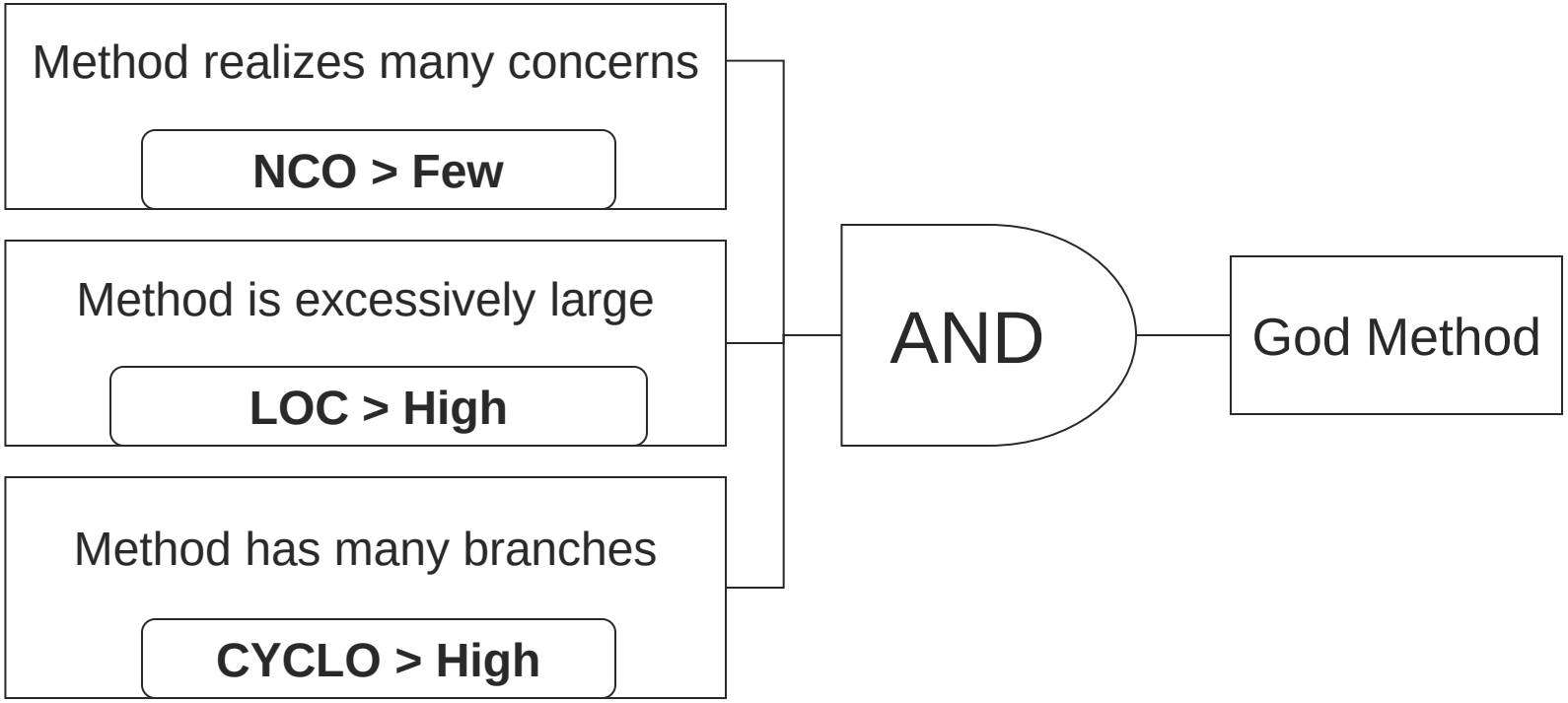
Strategy for God Class



God Method

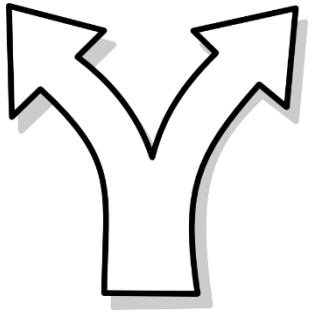
- It centralizes the behavior of a class
  - Number of Concerns per Operation (NCO)
- It is a long method (size)
  - Line of Code (LOC)
- It makes intensive use of branches
  - McCabe's Cyclomatic Complexity (CYCLO)

Strategy for God Method



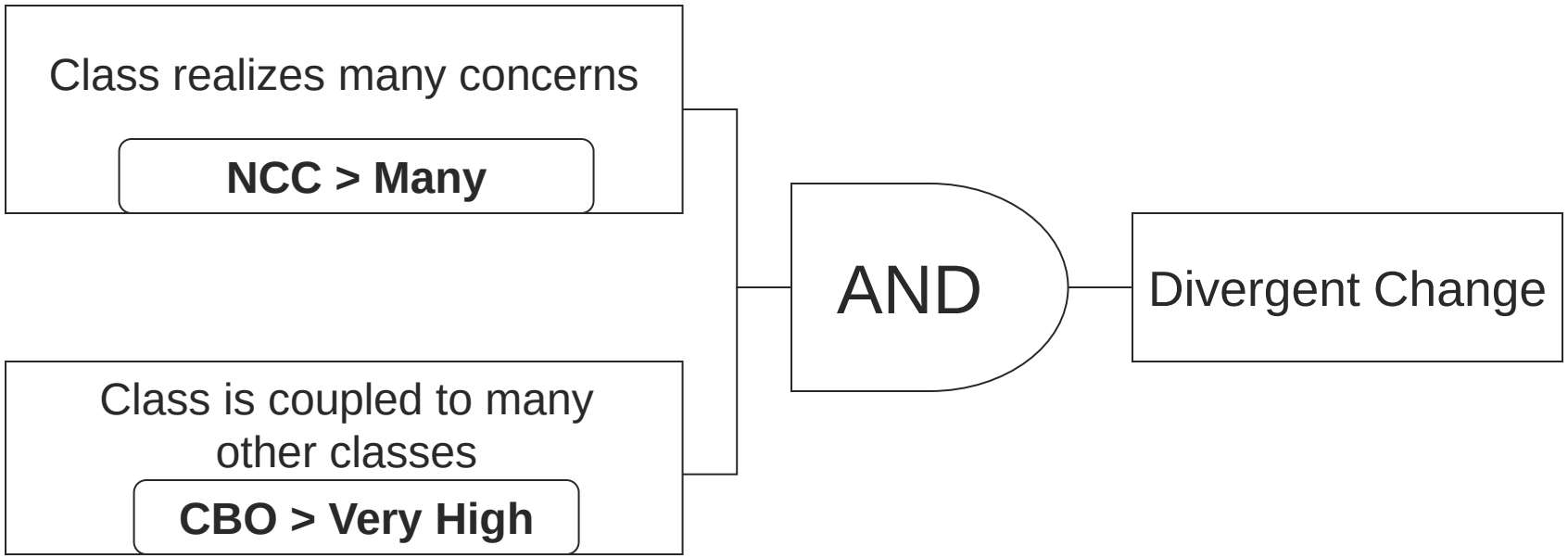
Divergent Change

- A class tangles many concerns in its source code
  - Number of Concerns per Component (NCC)



- A class is coupled to a lot of different classes
  - Coupling between Object Classes (CBO)

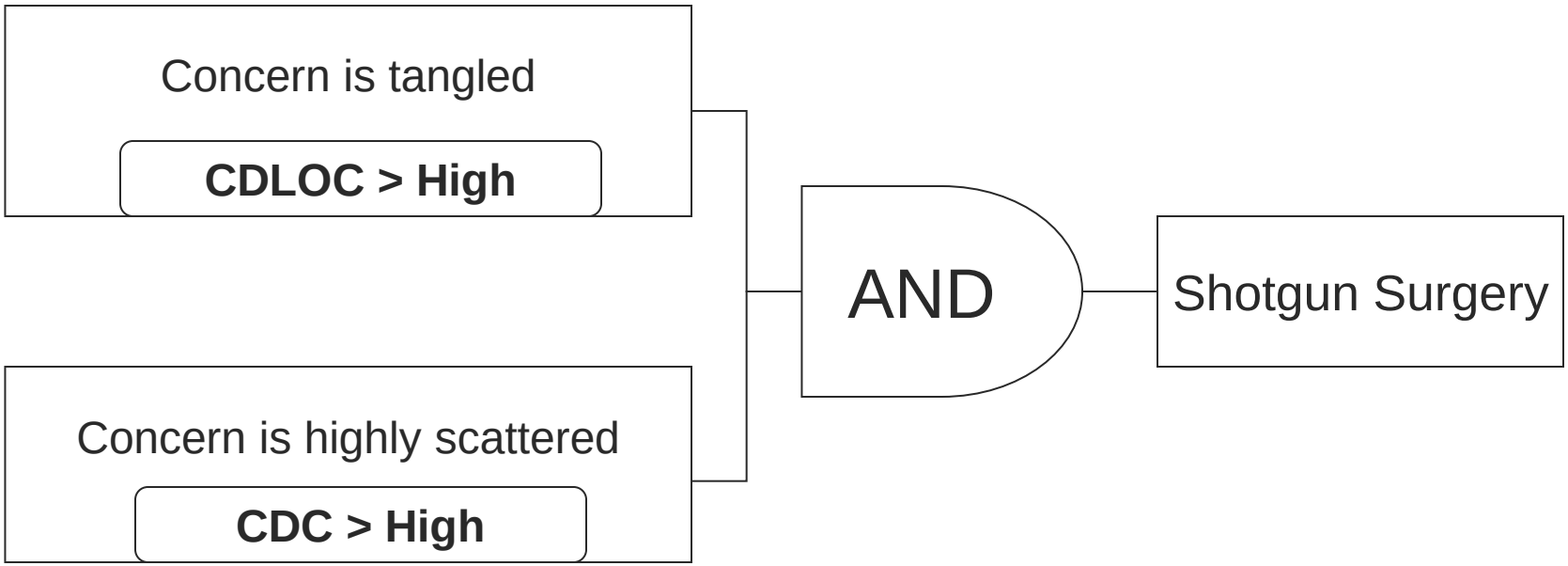
Strategy for Divergent Change



Shotgun Surgery

- We can consider a concern suffering from this bad smell - instead of a class
- A concern is highly scattered
  - Concern Diffusion over Components (CDC)
- A concern is tangled with other concerns
  - Concern Diffusion over Lines of Code (CDLOC)

Strategy for Shotgun Surgery



Feature Envy

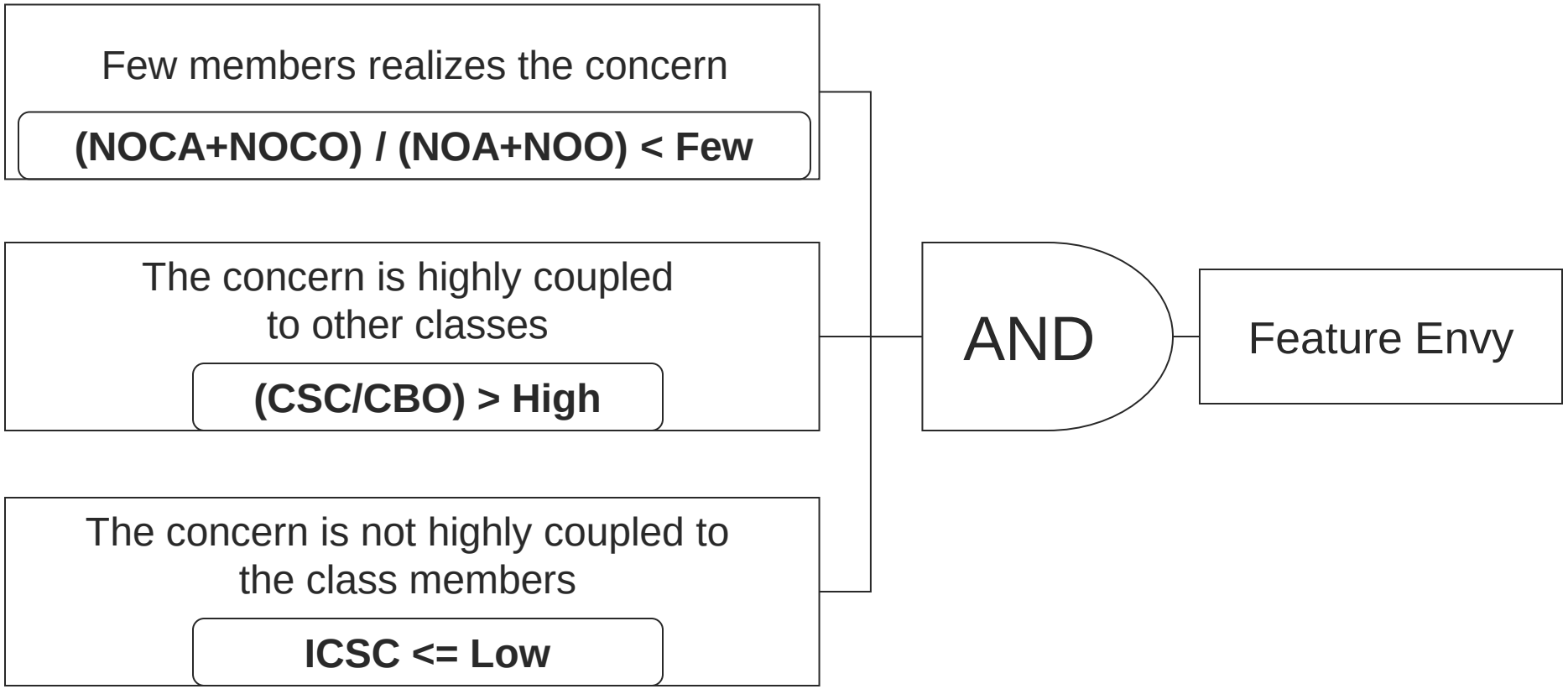
- Few members realize the concern
- The concern is highly coupled to other classes
  - High inter-component coupling
- The concern is not highly coupled to member of its class
  - Low intra-component coupling

Used Metrics

- Intra-Component Concern Sensitive Coupling (ICSC)
- Concern Sensitive Coupling (CSC)
- Coupling between Object Classes (CBO)
- Number of Concern Attributes (NOCA)
- Number of Attributes (NOA)
- Number of Concern Operations (NOCO)
- Number of Operations (NOO)

E. Figueiredo et al. **Applying and Evaluating Concern-Sensitive Design Heuristics.** Journal of Systems and Software, pp. 227 - 243, 2012.

Strategy for Feature Envy



Bibliography

- E. Figueiredo *et al*. **Applying and Evaluating Concern-Sensitive Design Heuristics**. Journal of Systems and Software, pp. 227 - 243, 2012.
- J. Padilha *et al*. **On the Effectiveness of Concern Metrics to Detect Code Smells: An Empirical Study**. Int'l Conf. on Advanced Information Systems Engineering (CAiSE), 2014.