Examples of Detection Strategies

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Detection Strategies

- God Class

- God Method

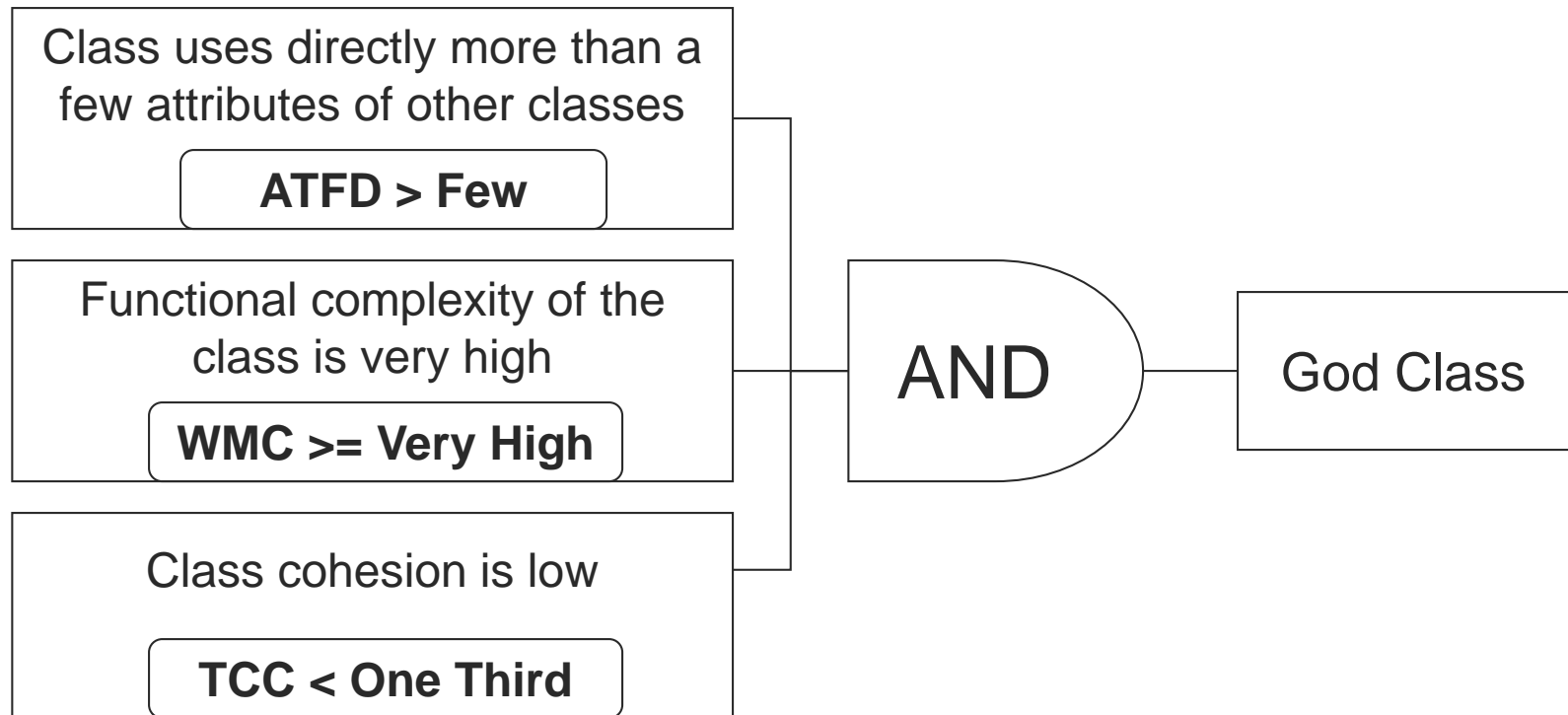- Feature Envy

- Shotgun Surgery

- Refused Bequest

Work Definition of God Class

- God Class …
  - performs too much work
  - lacks internal relationships between its methods
  - accesses a lot of data from other classes
- In other words, God Class has
  - High complexity
  - Low cohesion
  - Access foreign data

Selecting Metrics for God Class

- ## High complexity
  - Weighted Method per Class (WMC)

- ## Low cohesion
  - Tight Class Cohesion (TCC)

- ## Access foreign data
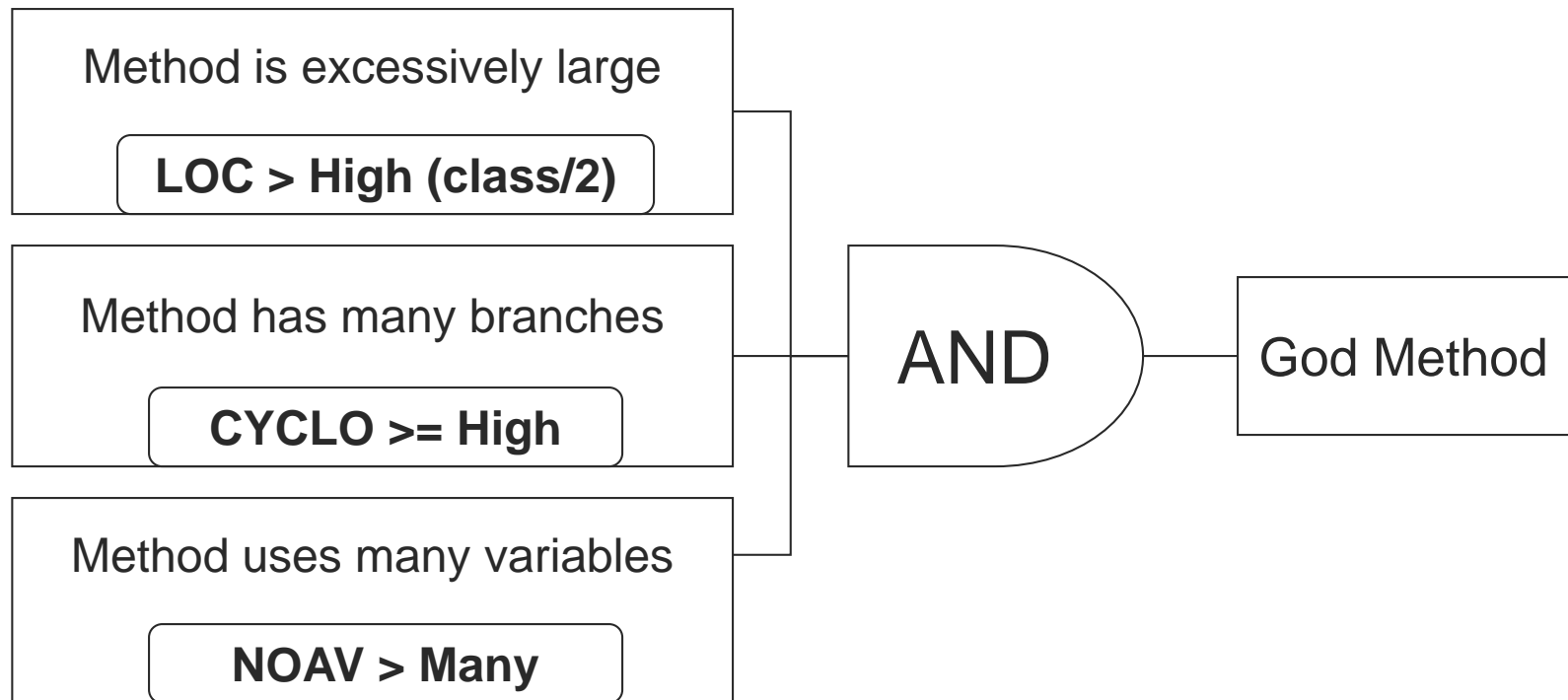 - Access to Foreign Data (ATFD)

Strategy for God Class

Class uses directly more than a few attributes of other classes

ATFD > Few

Functional complexity of the class is very high

WMC >= Very High

Class cohesion is low

TCC < One Third

AND

God Class

God Method

- It is a long method (size)
  - Line of Code (LOC)
- It makes intensive use of branches
  - McCabe's Cyclomatic Complexity (CYCLO)
- It defines many local variables and uses many instances variables
  - Number of Accessed Variables (NOAV) (counts attributes, local variables and parameters)
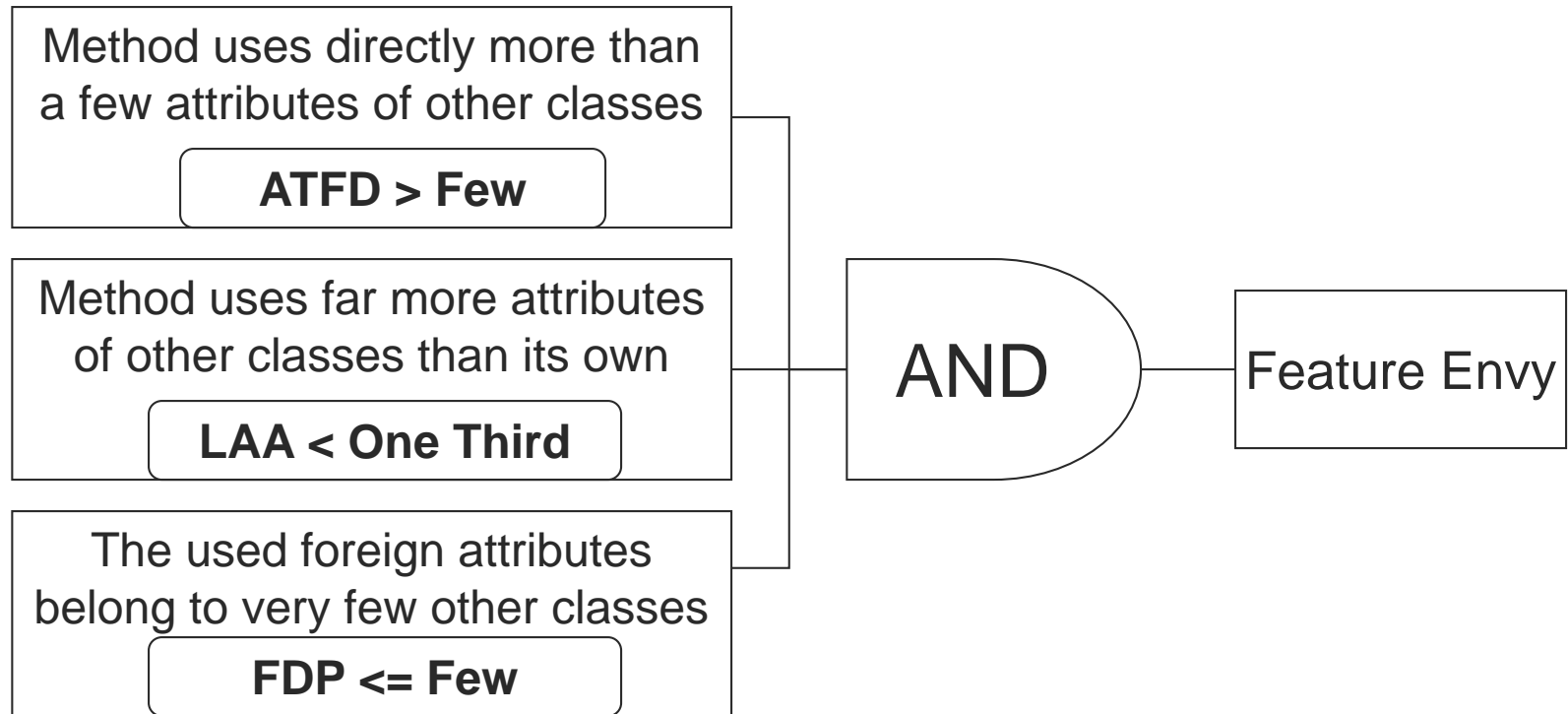
Strategy for God Method

Method is excessively large
LOC > High (class/2)

Method has many branches
CYCLO >= High

Method uses many variables
NOAV > Many

AND

God Method

Feature Envy

- Method uses directly more than a few attributes of other classes
  - Access to Foreign Data (ATFD)
- Method uses far more attributes from other classes than from its own class
  - Locality of Attribute Accesses (LAA)
- The used foreign attributes belong to very few other classes
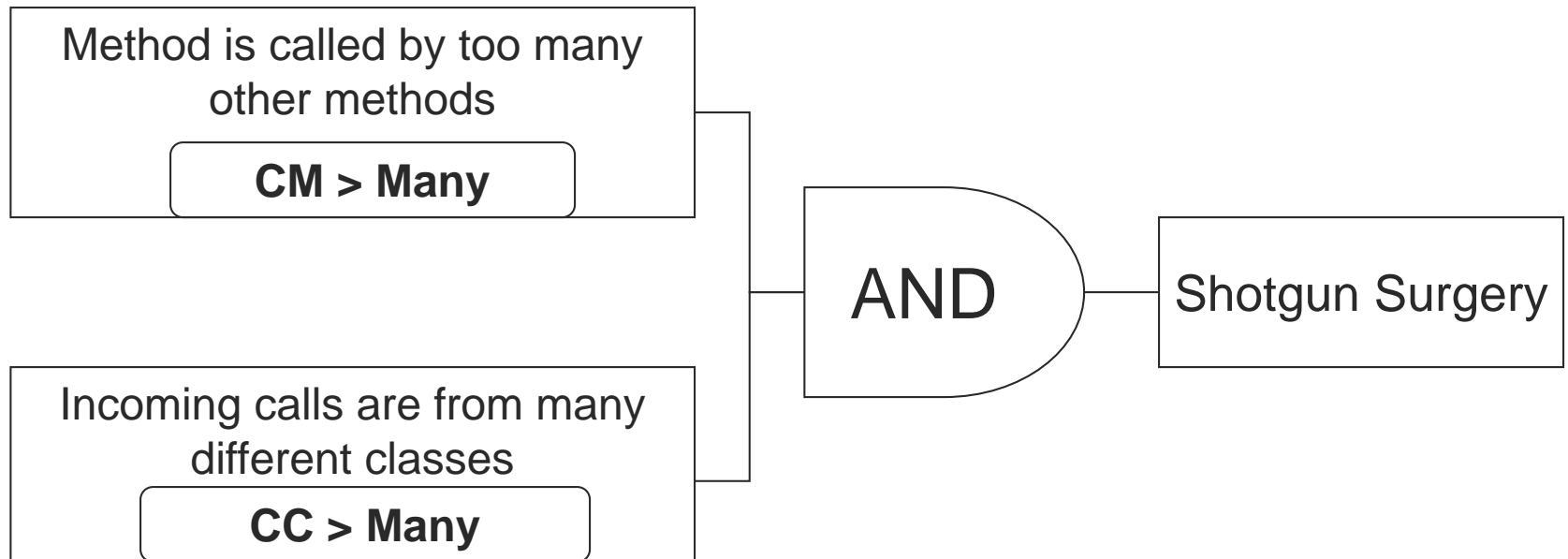 - Foreign Data Providers (FDP)

Strategy for Feature Envy

Method uses directly more than a few attributes of other classes

ATFD > Few

Method uses far more attributes of other classes than its own

LAA < One Third

The used foreign attributes belong to very few other classes

FDP <= Few

AND

Feature Envy

Shotgun Surgery

- Operation is called by
too many other operations
  - Changing Methods (CM)
- Incoming calls are from many classes
  - Changing Classes (CC)

- CC and CM count coupling
connections from other classes
outside the inheritance tree

Strategy for Shotgun Surgery

Method is called by too many other methods

CM > Many

Incoming calls are from many different classes
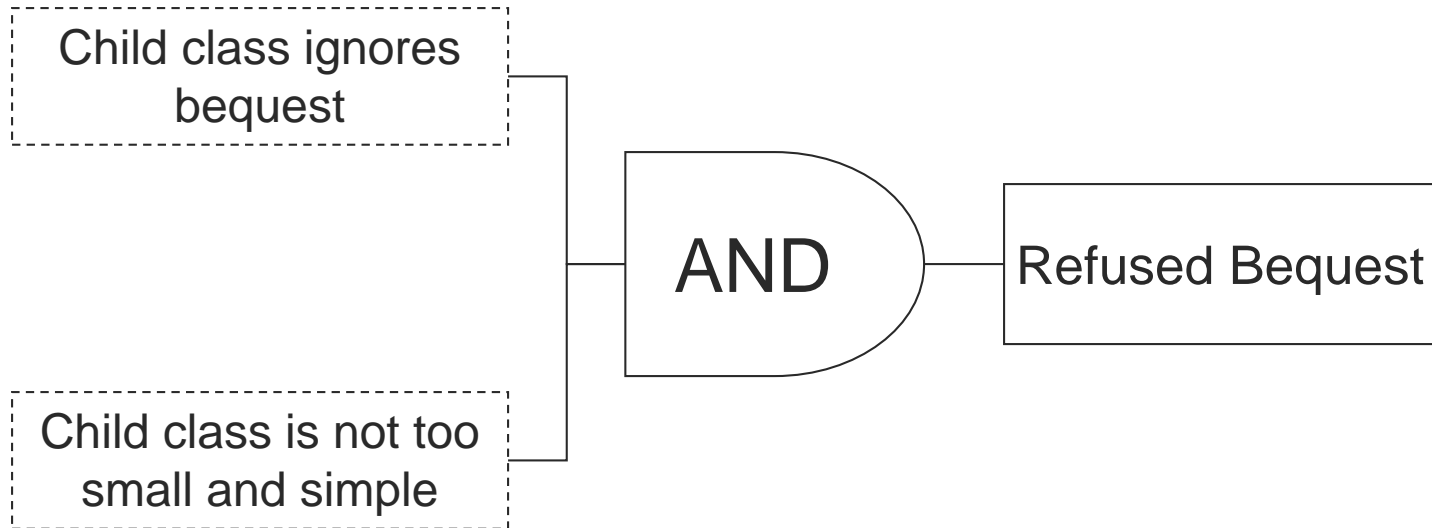
CC > Many

AND

Shotgun Surgery

Refused Bequest

- Child class ignores bequest
  - Parent provides more than a few protected methods
  - Child uses only little of parent's bequest
  - Overriding methods are rare in child
- Child class is not too small and simple
  - Functional complexity above average
  - Class complexity not lower than average
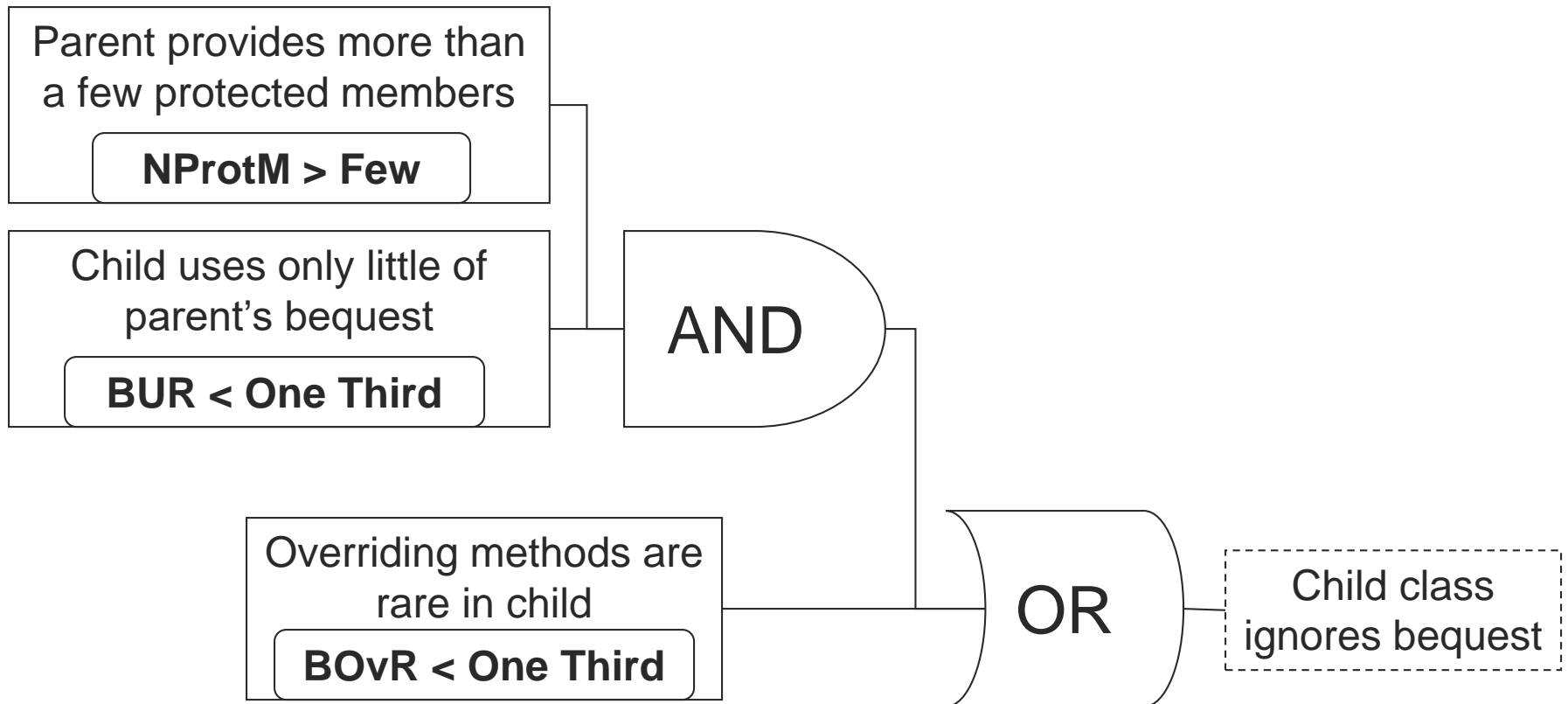 - Class size is above average

Used Metrics

- Child class ignores bequest
  - Number of Protected Members (NProtM)
  - Base-class Usage Ratio (BUR)
  - Base-class Overriding Ratio (BOvR)
- Child class is not too small and simple
  - Average Method Weight (AMW)
  - Weighted Methods per Class (WMC)
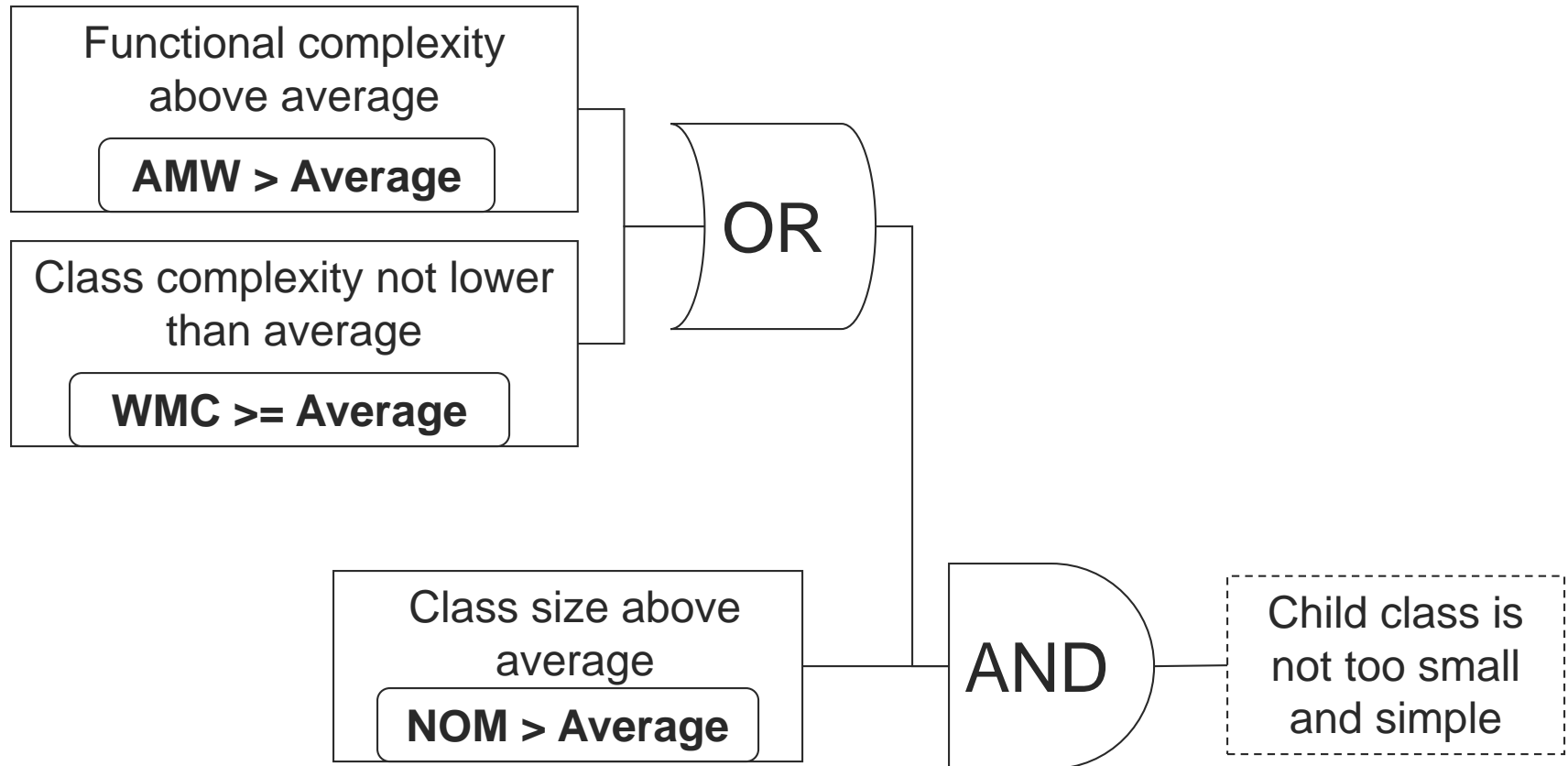 - Number of Methods (NOM)

Strategy for Refused Bequest

Child Class Ignores Bequest

Parent provides more than a few protected members

NProtM > Few

Child uses only little of parent's bequest

BUR < One Third

Overriding methods are rare in child

BOvR < One Third

AND

OR

Child class ignores bequest

Child Class is not Too Small

Functional complexity above average

AMW > Average

Class complexity not lower than average

WMC >= Average

OR

Class size above average

NOM > Average

AND

Child class is not too small and simple

Bibliography

- M. Lanza e R. Marinescu. **Object-Oriented Metrics in Practice**. Springer, 2006.
  - Section 5.3 God Class
  - Section 5.4 Feature Envy
  - Section 5.6 Brain Method
  - Section 6.5 Shotgun Surgery
  - Section 7.3 Refused Parent Bequest