The
University
of Auckland

Privacy Patterns

Presented at PST'2016

Professor Clark Thomborson
Computer Science Department

13 December 2016

How can software offer privacy?

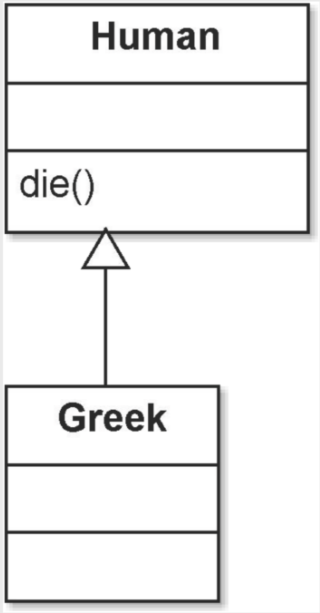
- What is privacy?
  - I offer a constructive definition, based on Westin’s 1967 survey
  - I extend Westin’s taxonomy, to cover the “information privacy” of the EU’s Data Protection Directive
- I’ll teach you a bit about object-oriented design along the way…
- Working manuscript: http://arxiv.org/abs/1612.01553

Our starting point: Aristotle(!)

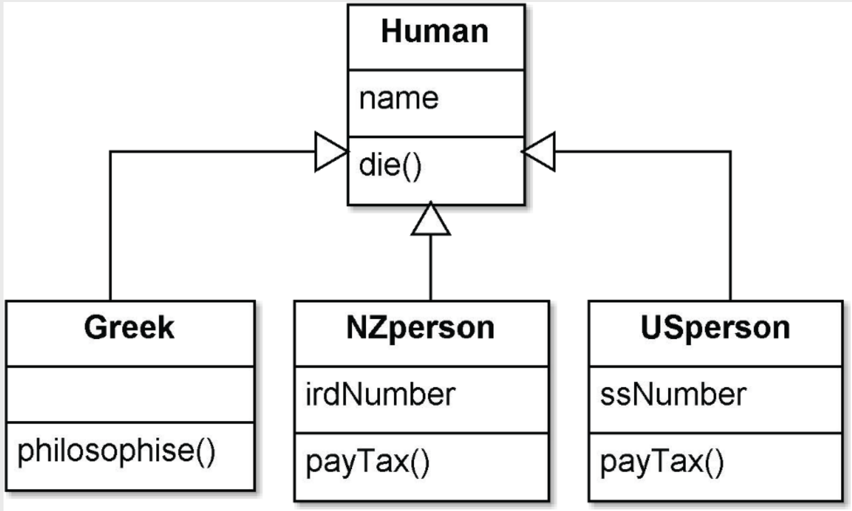
- All humans are mortal
- All Greeks are human
- Therefore: all Greeks are mortal

- In an object-oriented language:
  - `Human` has a `die()` method
  - `Greek` is a subclass of `Human`
  - Therefore: any `Greek` can `die()`

- Not an exact translation
  - Static logic → dynamic system



Extending the design



- Aristotle is-a Greek
  - An "instance" of his class
- I am not representable
  - Clark is-a NZperson
  - Clark2 is-a USperson
  - An instance is a member of *exactly one* class.
- Problem: representing multiple identities

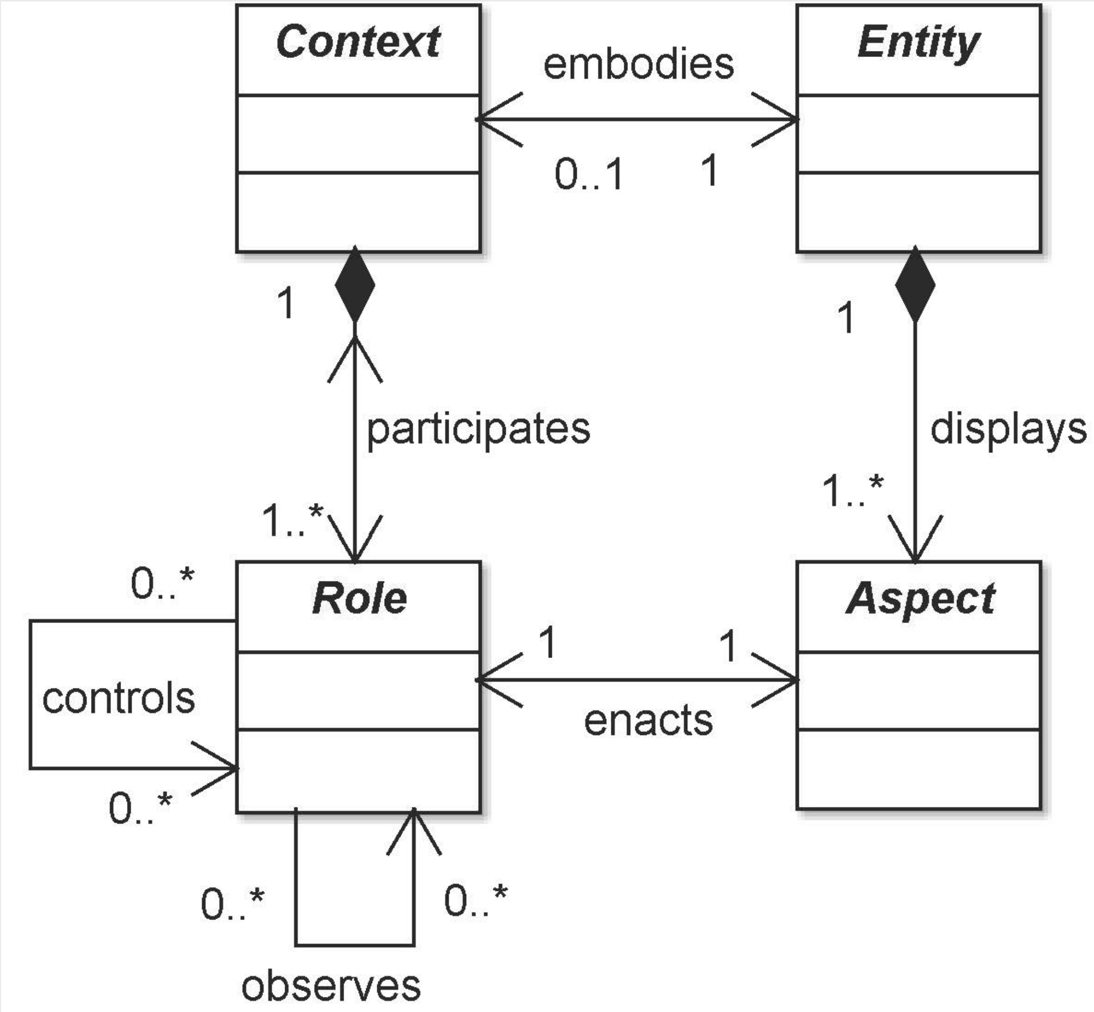
Design Patterns (Gamma,1994)

- “Design patterns capture solutions that have developed and evolved over time.
  - “Hence they aren’t the designs people tend to generate initially.
  - “They reflect untold redesign and recoding as developers have struggled for greater reuse and flexibility in their software.
- “Design patterns capture these solutions in a succinct and easily applied form.”

Privacy Patterns

- A subclass of design patterns
  - Foundational patterns, for private identities
  - Privacy affordances, for
    - Solitude
    - Intimacy
    - Anonymity
    - Reserve
    - Confidence
- Your feedback is welcome, this is a work-in-progress

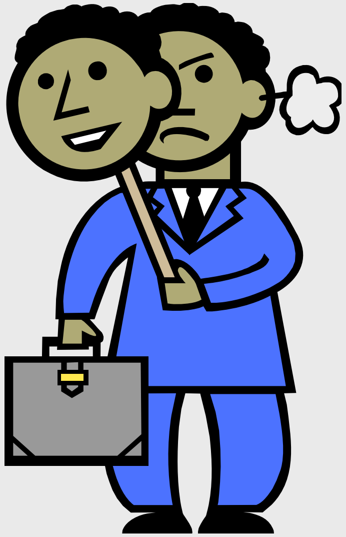
Entity, Aspect, Role, Context



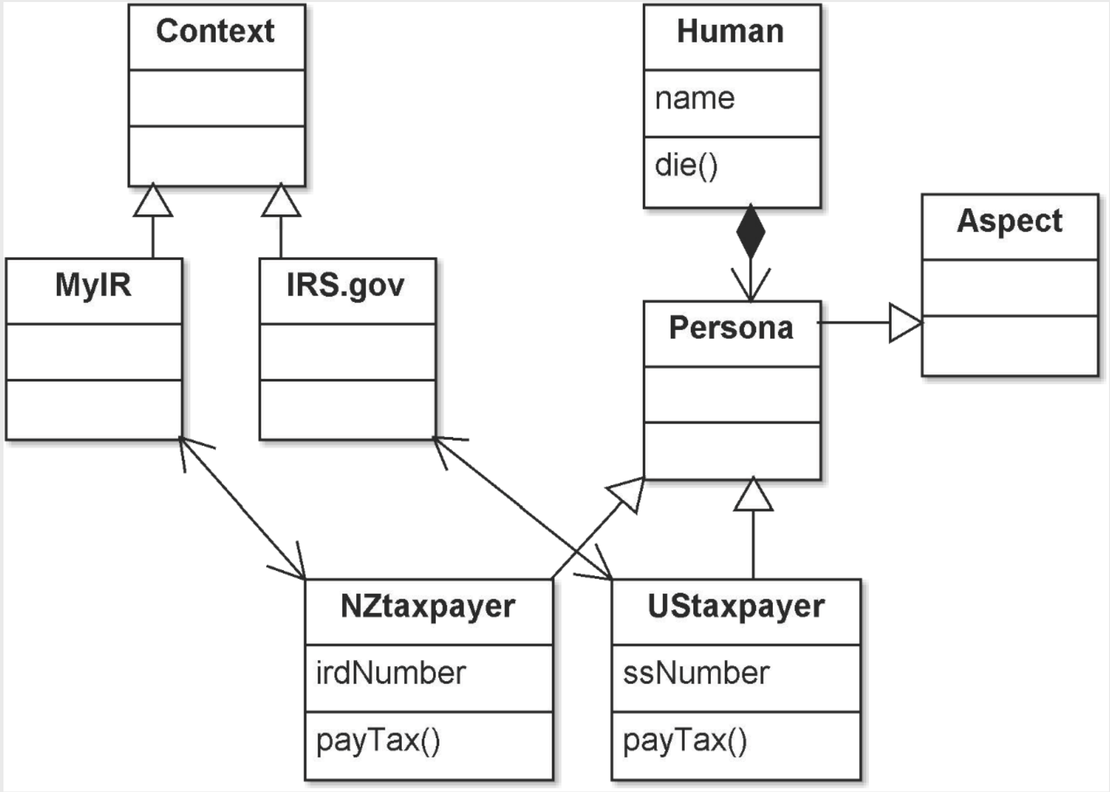
Persona = aspect of a human

- Thousands of years ago, Roman actors wore *personae* (masks) to depict their roles.

- A hundred years ago, Carl Jung asserted that, as social beings, we must hide our true identity:
  - A *persona* is "a compromise between the individual and society as to what a man should appear to be".



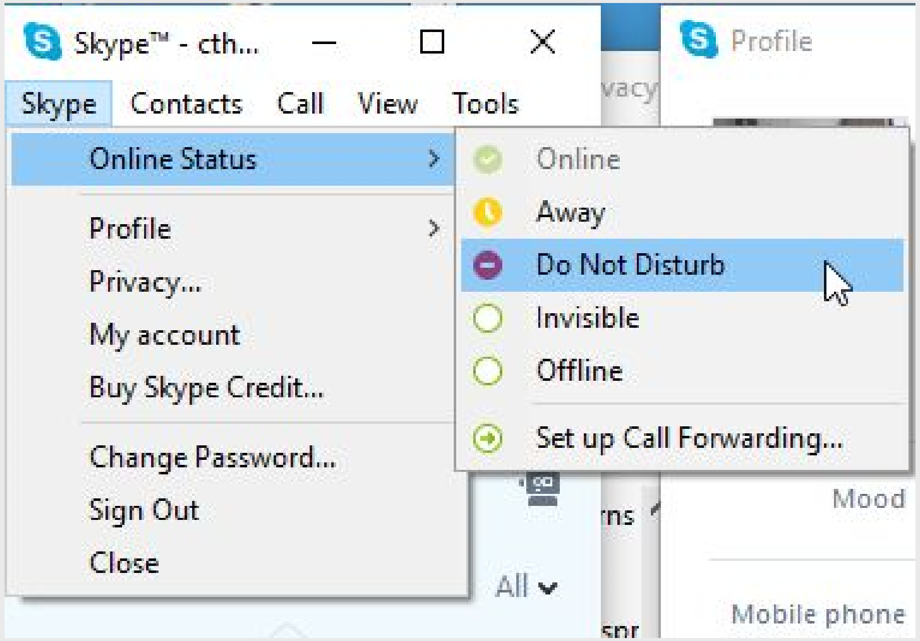
A taxpayer is a persona

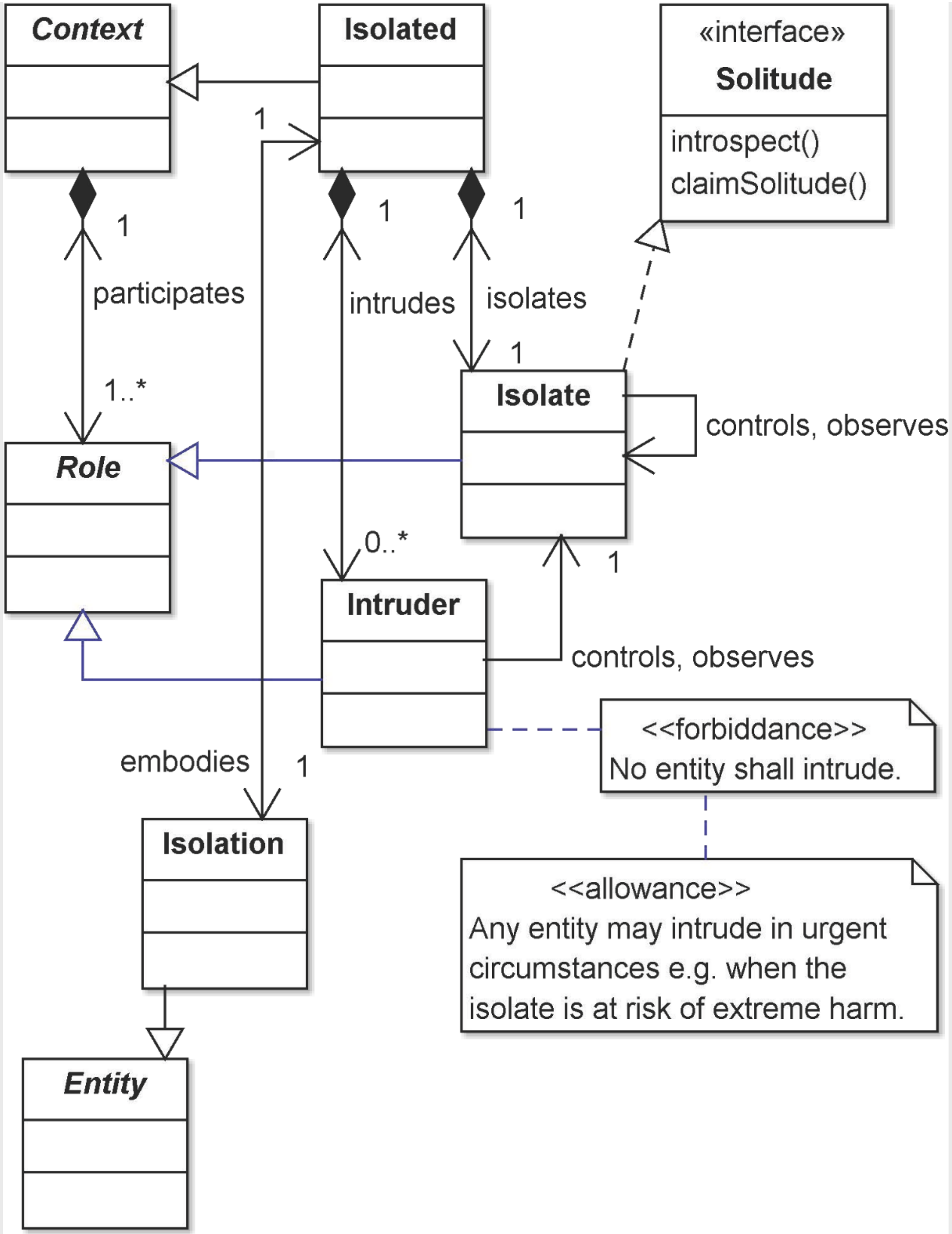


- One-way navigability from Human to Persona
  - ssNumber doesn’t reveal irdNumber
  - irdNumber doesn’t reveal ssNumber

Solitude

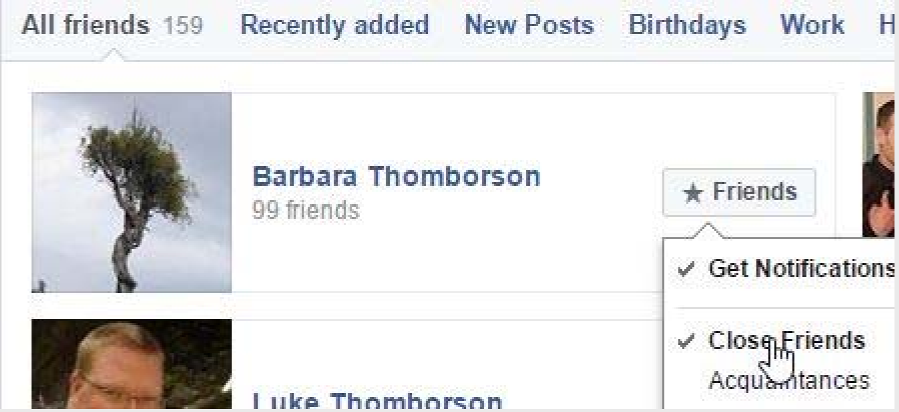
- “The first state of privacy is solitude;
  - here the individual is separated from the group and freed from the observation of other persons.” (Westin, 1967)

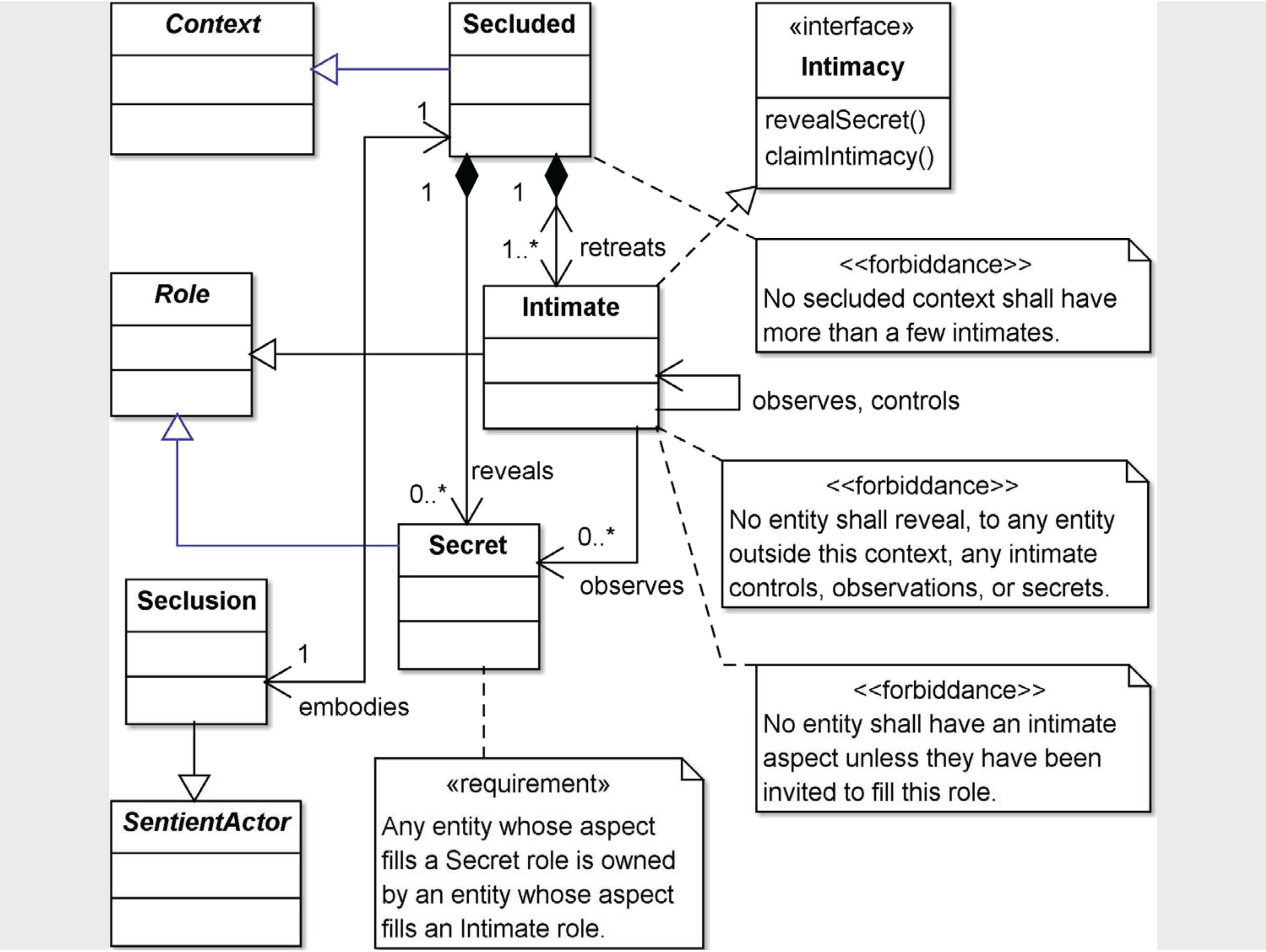



Context
Isolated
«interface»
Solitude
introspect()
claimSolitude()
1
1
1
1
participates
intrudes
isolates
1..*
1
Isolate
controls, observes
Role
0..*
1
Intruder
controls, observes
<<forbiddance>>
No entity shall intrude.
embodies
1
Isolation
<<allowance>>
Any entity may intrude in urgent circumstances e.g. when the isolate is at risk of extreme harm.
Entity

Intimacy

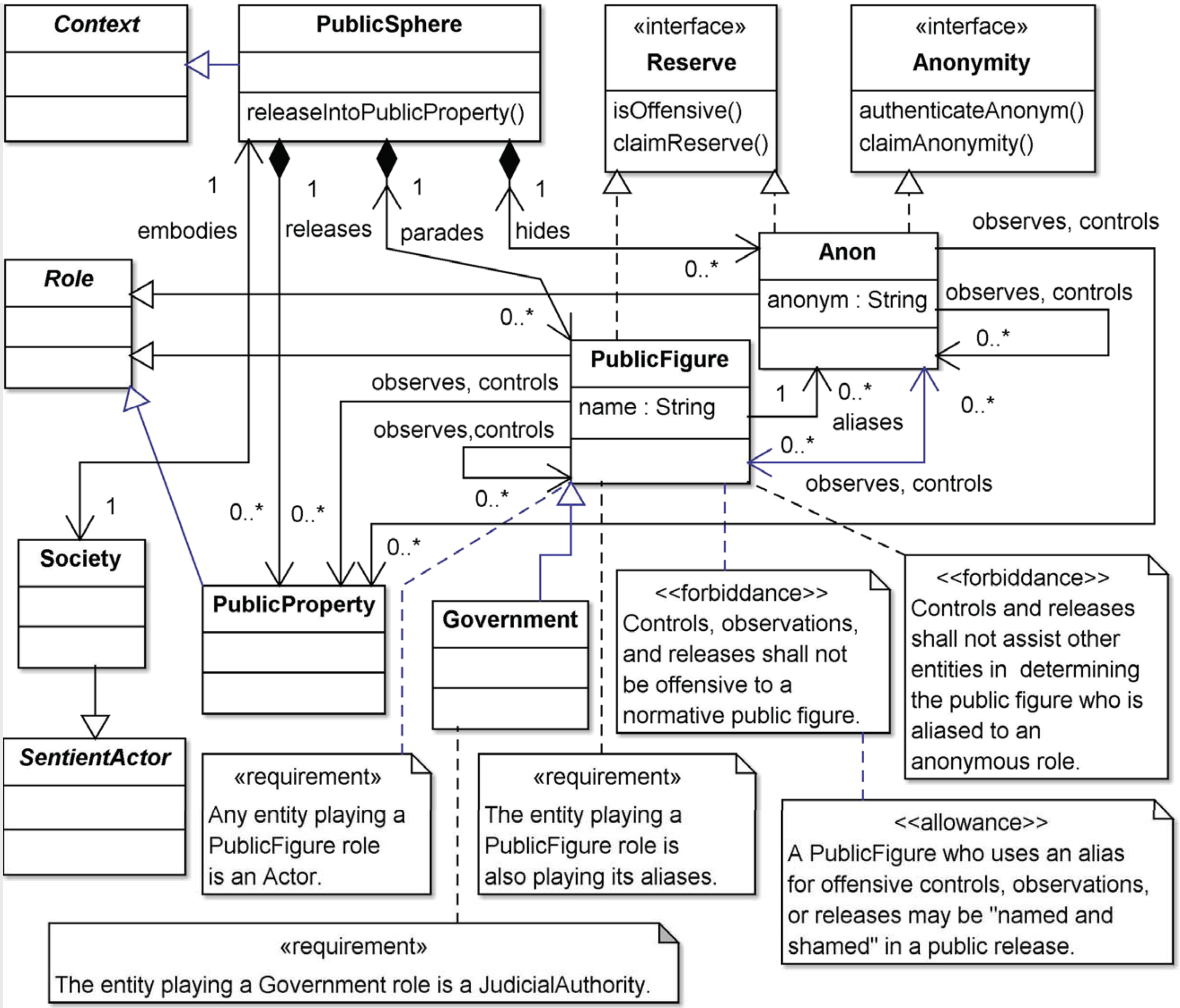
- “In the second state of privacy, intimacy,
  - the individual is acting as part of a small unit that claims and is allowed to exercise corporate seclusion so that it may achieve a close, relaxed, and frank relationship between two or more individuals.” (Westin, 1967)




Context
Secluded
«interface»
Intimacy
revealSecret()
claimIntimacy()
1
1
1
1..*
retreats
Role
Intimate
observes, controls
reveals
0..*
Secret
0..*
observes
Seclusion
1
embodies
SentientActor
<<forbiddance>>
No secluded context shall have more than a few intimates.
<<forbiddance>>
No entity shall reveal, to any entity outside this context, any intimate controls, observations, or secrets.
<<forbiddance>>
No entity shall have an intimate aspect unless they have been invited to fill this role.
«requirement»
Any entity whose aspect fills a Secret role is owned by an entity whose aspect fills an Intimate role.

Anonymity, Reserve

- “The third state of privacy, anonymity,
  - occurs when the individual is in public places or performing public acts but still seeks, and finds, freedom from identification and surveillance.
- “Reserve, the fourth and most subtle state of privacy,
  - is the creation of a psychological barrier against unwanted intrusion; this occurs when the individual’s need to limit communication about himself is protected by the willing discretion of those surrounding him.” (Westin,1967)



«requirement»
Any entity playing a PublicFigure role is an Actor.

«requirement»
The entity playing a PublicFigure role is also playing its aliases.

<<forbiddance>>
Controls, observations, and releases shall not be offensive to a normative public figure.

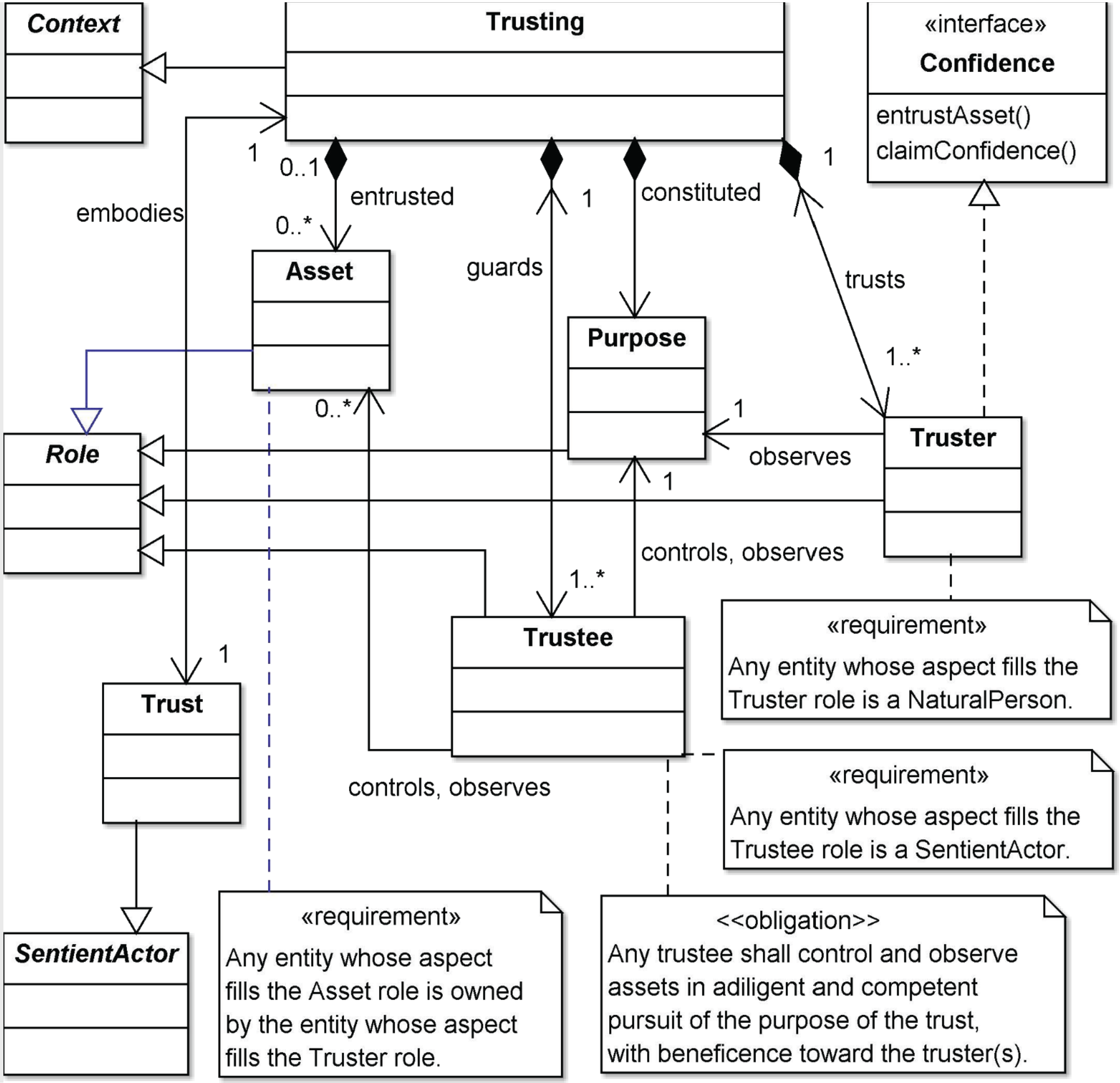
<<forbiddance>>
Controls and releases shall not assist other entities in determining the public figure who is aliased to an anonymous role.

<<allowance>>
A PublicFigure who uses an alias for offensive controls, observations, or releases may be "named and shamed" in a public release.

«requirement»
The entity playing a Government role is a JudicialAuthority.

Confidence

- I added a fifth state of privacy to Westin’s taxonomy, to handle “information privacy”
    - Formally: this is a subclass of Intimacy
- A private individual enters the state of confidence when they release their personal information to a Trustee e.g.
    - Doctor, lawyer, social network provider.



«requirement»
Any entity whose aspect fills the Truster role is a NaturalPerson.

«requirement»
Any entity whose aspect fills the Trustee role is a SentientActor.

«requirement»
Any entity whose aspect fills the Asset role is owned by the entity whose aspect fills the Truster role.

<<obligation>>
Any trustee shall control and observe assets in adiligent and competent pursuit of the purpose of the trust, with beneficence toward the truster(s).

Review

- What is privacy?
  - I offered a constructive definition, based on Westin’s 1967 survey
  - I extended Westin’s taxonomy, to cover the “information privacy” of the EU’s Data Protection Directive
- I taught you a bit about object-oriented design along the way…
- Working manuscript: http://arxiv.org/abs/1612.01553