- Material and some slide content from:
- Emerson Murphy-Hill
- Software Architecture: Foundations, Theory, and Practice
- Essential Software Architecture



#### Arch Basics & NFPs Reid Holmes

### What is SW architecture?

#### Definition:

#### "The set of principal design decisions about the system"

- Blueprint for construction and evolution.
- Encompasses:
  - Structure
  - Behaviour
  - Interaction
  - Non-functional properties

#### Prescriptive vs descriptive

- Prescriptive architecture dictates how the system will be built a priori.
  - (as-conceived)
- Descriptive architecture captures how the system was actually built after the fact.
  - (as-implemented)

## Architectural degradation

#### Drift

- Introduction of changes that are not captured in the current architecture but do not violate it.
- Erosion
  - Introduction of changes that violate the current architecture.
- How can this happen?



### Architectural recovery

- [ICSE 1999: Bowman, Holt, and Brewster]
- Conceptual architecture
  - How developers think about the system.
  - Focuses on meaningful relationships.
- Concrete architecture
  - How the system was actually built.
  - Necessary: the devil is in the details.



# Components

- Elements that encapsulate processing and data at an architectural level.
- Definition:
  - Architectural entity that:
    - encapsulates a subset of functionality.
    - restricts access via explicit interface.
    - has explicit environmental dependencies.



## Connectors

- Definition:
  - An architectural entity tasked with effecting and regulating interactions between components.
- Connectors are often more challenging than components in large heterogenous systems.
- Often consists of method calls, but be much more.
  - Examples?
- Often provide application-independent interaction mechanisms.



# Configurations

- Bind components and connectors together in a specific way.
- Definition:
  - An architectural configuration, or topology, is a set of specific associations between the components and the connectors of the system's architecture.
- Differentiates a bag of components and connectors from an implementable system.



# Architectural styles

- Some design choices are better than others.
  - Experience can guide us towards beneficial sets of choices (patterns) that have positive properties.
    - Such as?
- An architectural style is a named collection of architectural design decisions that:
  - Are applicable to a given context.
  - Constrain design decisions.
  - Elicit beneficial qualities in resulting systems.



### NFPs

- NFPs are constraints on the manner in which the system implements and delivers its functionality.
  - ► E.g.,
    - Efficiency
    - Complexity
    - Scalability
    - Heterogeneity
    - Adaptability
    - Security
    - Dependability

#### FP vs NFP

- Products are sold based on their FPs.
  - e.g., Cell phone, Car, Tent.
- However, NFPs play a critical role in perception.
  - "This program keeps crashing"
  - "It doesn't work with my [...]"
  - "It's too slow"

