Analysis Patterns

- First introduced by Fowler in 1997.

- “Analysis patterns are groups of concepts that represent a common construction in business modeling.“
  - An analysis pattern may be relevant to only one domain, or it may span many domains.
Analysis Patterns: Categories

- **Accountability**: Patterns for describing relationships that define responsibilities between parties.
- **Observations and Measurements**: Patterns for recording facts.
- **Referring to Objects**: Patterns of indexing to refer exactly to objects.
- **Inventory and Accounting**: Basic patterns for accounting, describing how a network of accounts can form an active accounting system.
- **Planning**: Patterns depicting the relationship between standard plans and one-off plans, and how to plan and record the use of resources.
- **Trading**: Patterns focusing on trading in situations where prices are fluid and we need to understand how these price changes affect the profits.
Fowler also provides several supporting patterns, which describe how to take analysis patterns and apply them:

- **Layered Architecture for Information Systems**
- **Patterns for Type Model Design Templates**
- **Association Patterns**
Analysis Patterns: Accountability - Party

- **Problem:** People and organizational units have similar responsibilities.

- **Solution:** Create a type party as a supertype of person and organization.
Analysis Patterns: Accountability - Party
Analysis Patterns: Accountability - Accountability

- **Problem:** Representing organization structures, employment, management, professional registration, and contracts with a similar structure.

- **Solution:** Create accountability as a directed relationship between two parties.
  - Give it an accountability type to represent the kind of relationship.
Analysis Patterns: Accountability - Accountability

Diagram:

- **Accountability Type**
  - 1
  - *

- **Accountability**
  - Time Period

- **Party**
  - * commissioner 1
  - * responsible 1

- **Person**

- **Organization**
Analysis Patterns: Observations and Measurements - Quantity

- **Problem:** Representing a value such as 6 feet or $5.

- **Solution:** Use a quantity type that includes both the amount and the unit.
  - Currencies are a kind of unit.
Analysis Patterns: Observations and Measurements - Quantity

Person

- height : Number
- weight : Number
- blood glucose level : Number

Person

- height : Quantity
- weight : Quantity
- blood glucose level : Quantity

Quantity

- amount : Number
- units : Unit
- +, -, *, /, =, >, <
Analysis Patterns: Observations and Measurements - Measurement

- **Problem:**
  - An object has a large number of quantity attributes.
  - Recording information about an individual measurement of an attribute.
  - Tracking changes in a value to an attribute over time.

- **Solution:** Create an object to represent the individual measurement.
  - This is linked to the object being measured and to a phenomenon type that describes the kind of measurement being made.
Analysis Patterns: Observations and Measurements - Measurement

```
knowledge

operational

Person

Phenomenon Type

1

Measurement

quantity : Quantity
```

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Analysis Patterns: Observations and Measurements - Observation

- **Problem**: Attributes are qualitative and thus cannot be measured with numbers.

- **Solution**: Create an observation type that links the object to a phenomenon.
  - Each phenomenon is a value for some phenomenon type.
Analysis Patterns: Observations and Measurements - Observation
Analysis Patterns: Referring to Objects - *Identification Scheme*

- **Problem:** Ensuring an identification refers to only one object but different parties can refer to the object differently.

- **Solution:** Create identification schemes that contain identifiers, where each identifier refers to only one unit.
  - A party can use any identification scheme.
Analysis Patterns: Referring to Objects - *Identification Scheme*

```
Object       Identifier       Identification Scheme
1 -> *        * -> 1        1

String
1
```
Analysis Patterns: Inventory and Accounting - *Account*

- **Problem:** Recording a history of changes to some quantity.

- **Solution:** Create an account. Each change is recorded as an entry against the account.
  - The balance of the account gives its current value.
Analysis Patterns: Inventory and Accounting - *Account*

\[
\begin{align*}
\{ \text{Constraint:} \\
\{ \text{balance} = \text{sum(entries.amount)} \} \\
\end{align*}
\]

- **Account**
  - balance: **Quantity**
- **Entry**
  - amount: **Quantity**
  - whenCharged: **Timepoint**
  - whenBooked: **Timepoint**
Analysis Patterns: Inventory and Accounting - *Transaction*

- **Problem:** Ensuring that nothing gets lost from an account.

- **Solution:** Use transactions to transfer items between accounts.
Analysis Patterns: Inventory and Accounting - *Transaction*

```
Account       Entry       Transaction
1             *            2
|               amount: Quantity              1
|                                              
|                                              |
|                                              |
|                                              |
{Constraint: Sum(entries.amount) = 0}
```
Analysis Patterns: Planning - *Proposed and Implemented Action*

- **Problem**: Representing both what you intended to do and what you did.

- **Solution**: Use separate objects for the proposed and implemented actions.
Analysis Patterns: Planning - *Proposed and Implemented Action*
Analysis Patterns: Planning - *Plan*

- **Problem:**
  - Recording a group of proposed actions that you intend to perform together.
  - Representing the dependencies among actions.
  - Allowing different people to coordinate each other's plans.

- **Solution:** A plan is a collection of proposed actions linked by dependencies.
  - Several parties can have different plans that refer to the same proposed action.
  - Use separate objects for the proposed and implemented actions.
Analysis Patterns: Planning - Plan

Constraint: the combinaison of plan and proposed action is unique

Plan 1 0..* Action Reference 0..* 1 Proposed Action

dependent 1 consequent 1

Plan Dependency 0..* 0..*
Analysis Patterns: Trading - *Contract*

- **Problem:** Recording deals from the perspective of both the buyer and the seller.

- **Solution:** Use a contractor with both buying and selling parties.
Analysis Patterns: Trading - *Contract*
Reference