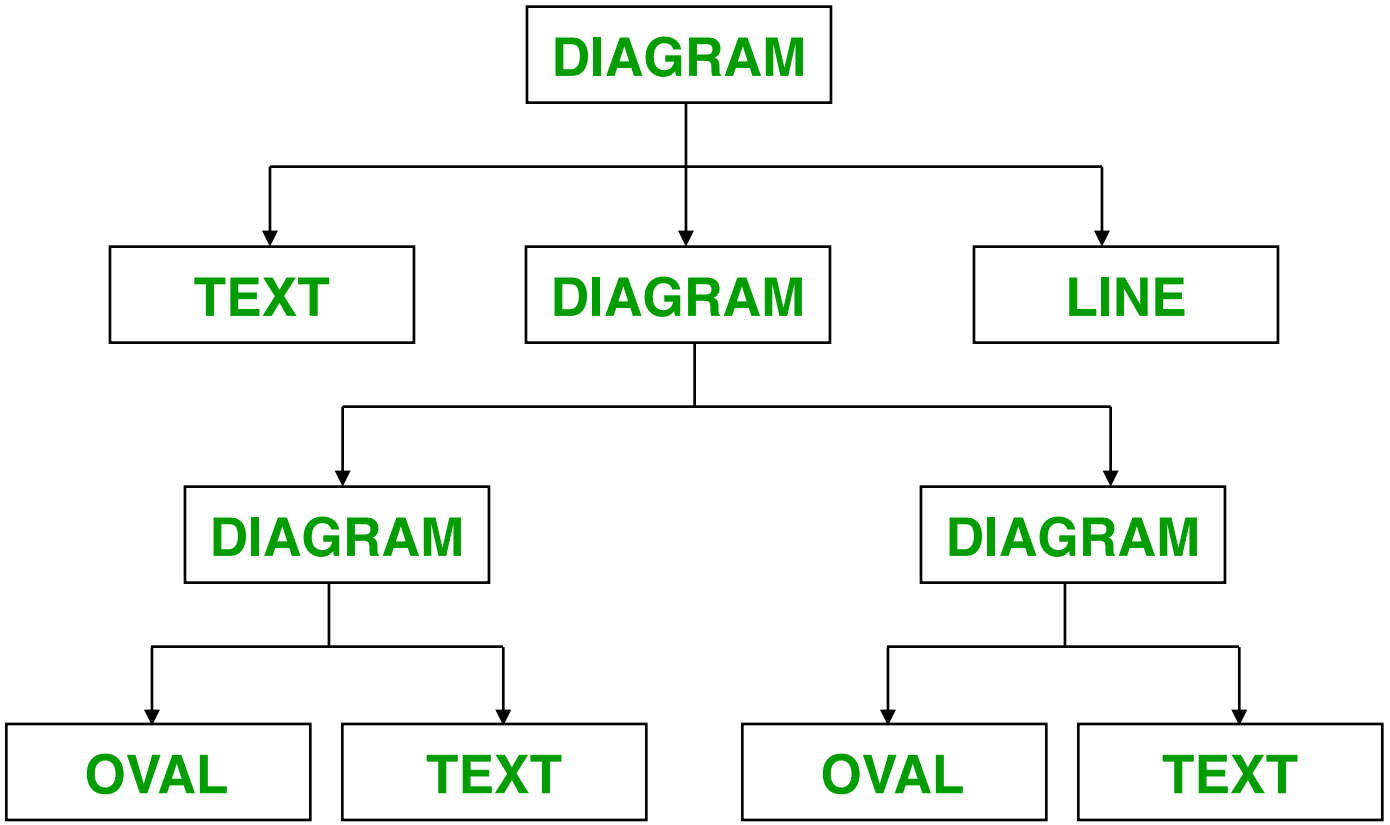
Composite Pattern – Structural

- Intent
  - » **Compose objects into tree structures representing part-whole hierarchies**
  - » **Clients deal uniformly with individual objects and hierarchies of objects**

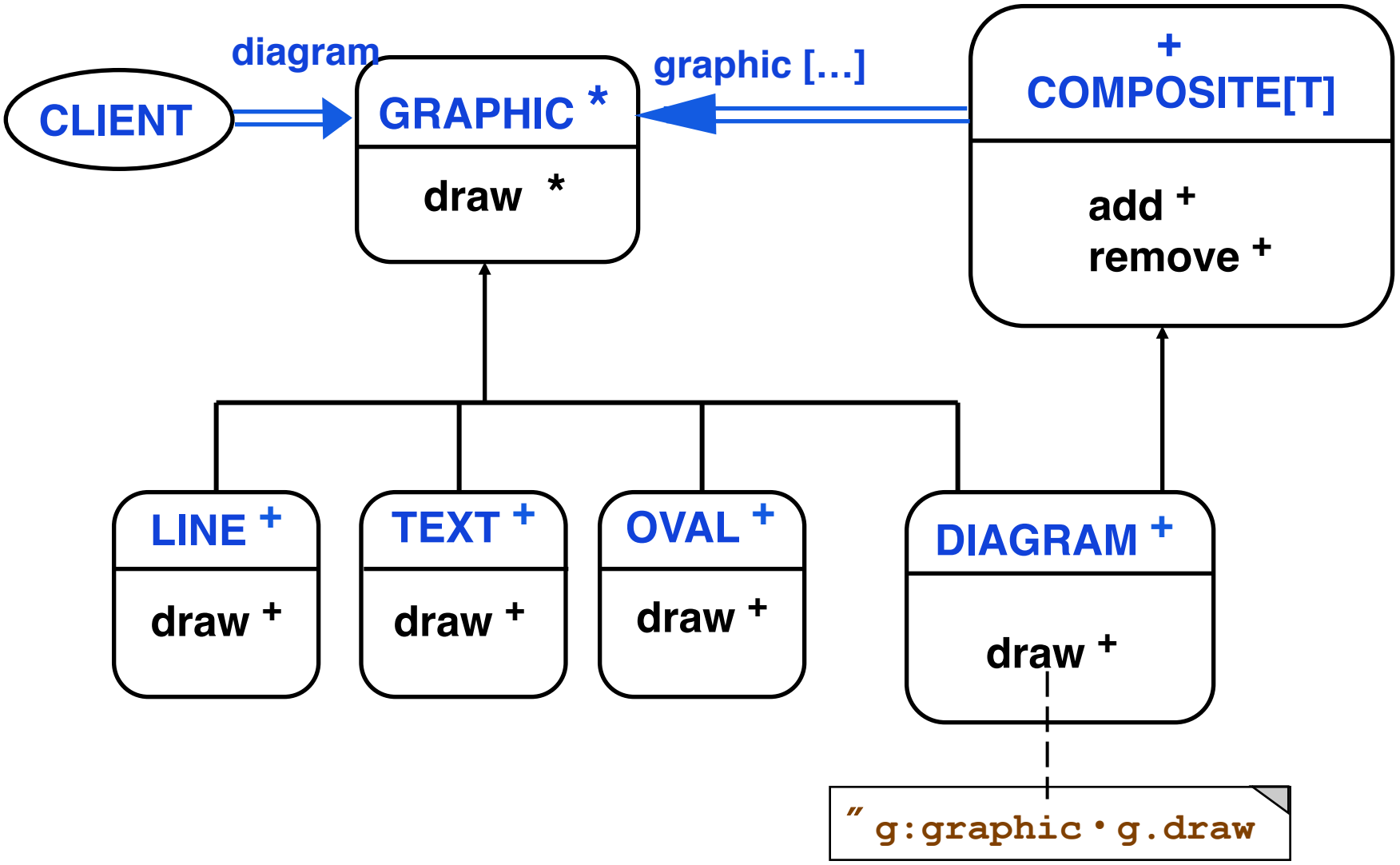
Motivation

- Applications that have recursive groupings of primitives and groups
  - » **Drawing programs**
    - **lines, text, figures and groups**
  - » **Eiffel static structure**
    - **classes and clusters**
- Operations on groups are different than primitives but users treat them in the same way

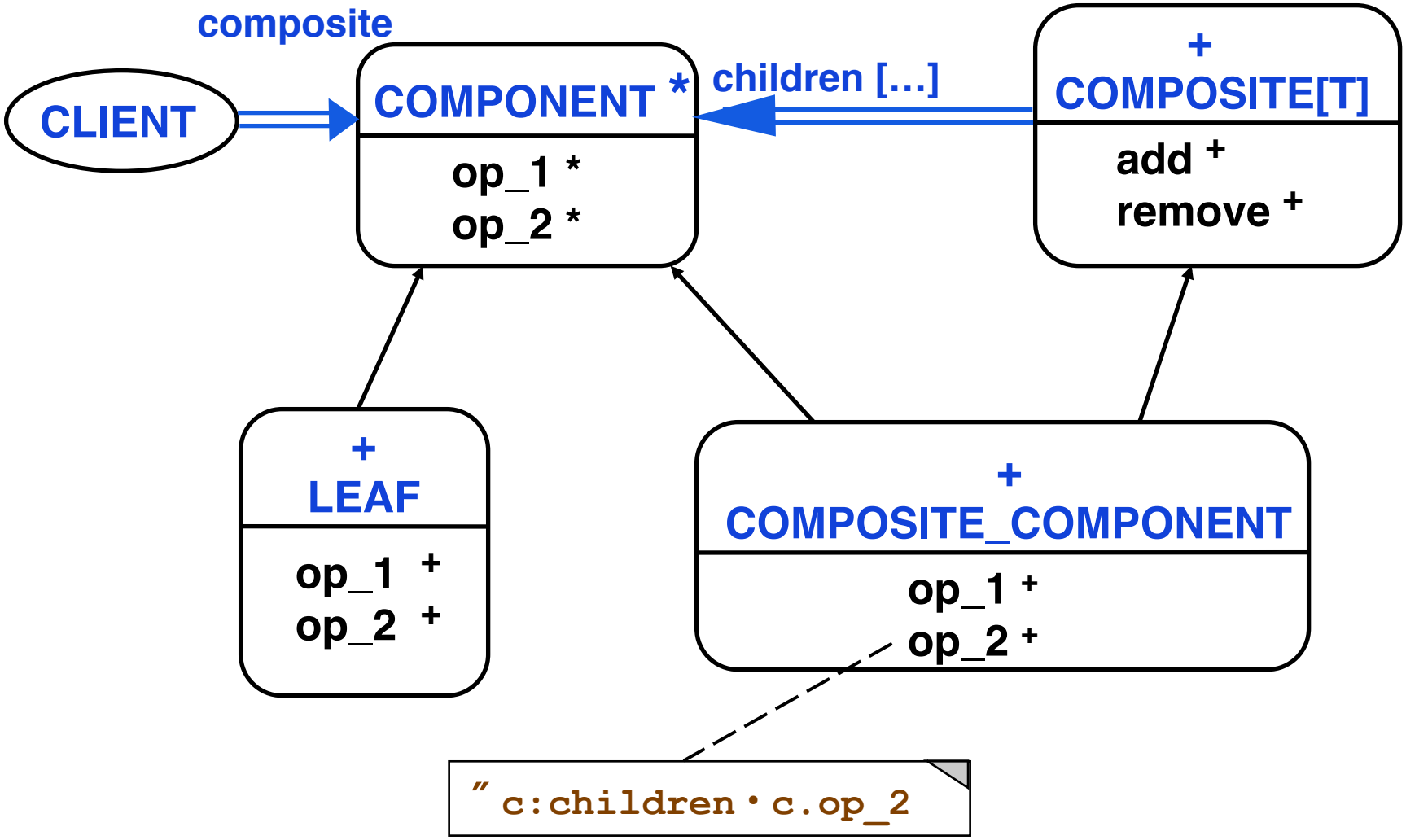
Drawing Example



Example Architecture



Abstract Architecture



Participants

- Component

  Defines properties of an entity

- Leaf

  Defines properties of a primitive entity

- Composite

  Declares properties of a collection of entities

- Composite Component

  Combines properties of a collection of entities and properties of a primitive entity

- Client

  Uses component and composite properties

Applicability

- Represent part-whole hierarchies of objects
- Clients can ignore difference between individual objects and compositions
- Clients deal with all objects in a composition in the same way

Consequences

- Whenever client expects a primitive it can accept a composite
- Client is simplified by removing tag-case statements to identify parts of the composition
- Easy to add new components by sub-classing, client does not change
- If compositions are to have restricted sets of components have to rely on run-time checking

Related Patterns

- Component-parent link is a Chain of Responsibility
- Decorator is used together with composite but then decorators have to support add, remove, iterator
- Flyweight permits sharing components but cannot refer to parents
- Iterator can be used to traverse composites
- Visitor localizes operations that would be distributed across composite and leaf classes

Composite in Java API

- Composites are used in all container like classes
  - **Windows**
  - **Canvases**