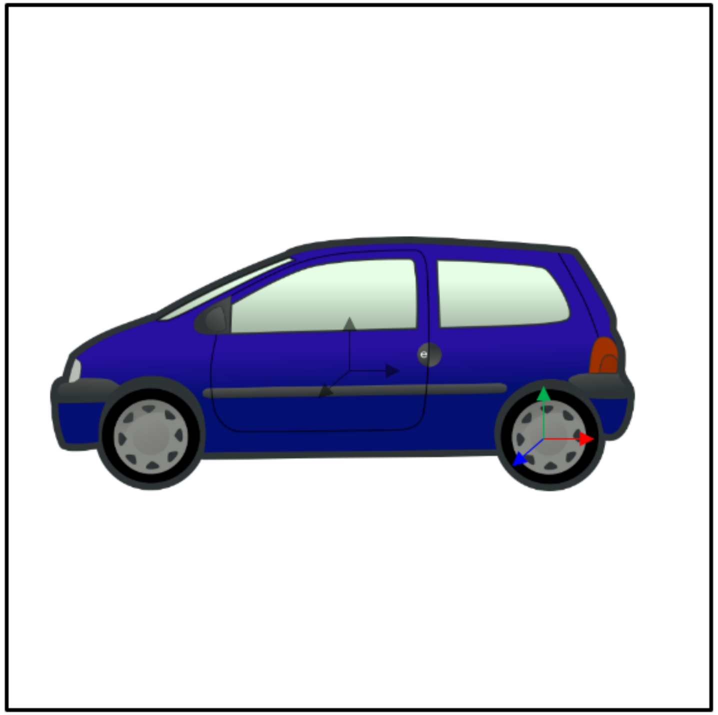
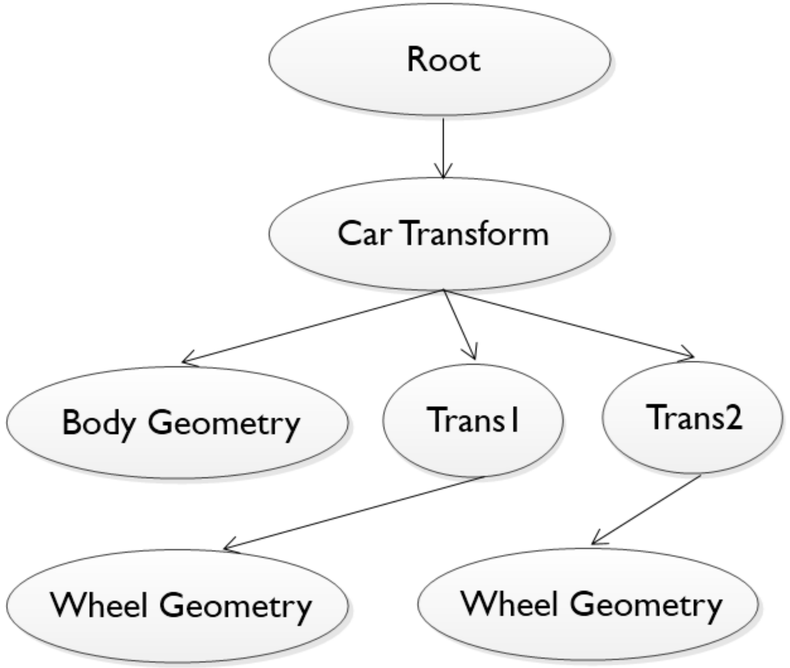
The Field Concept and Dependency Graphs

Tim Weißker

Last Week: Scenegraphs





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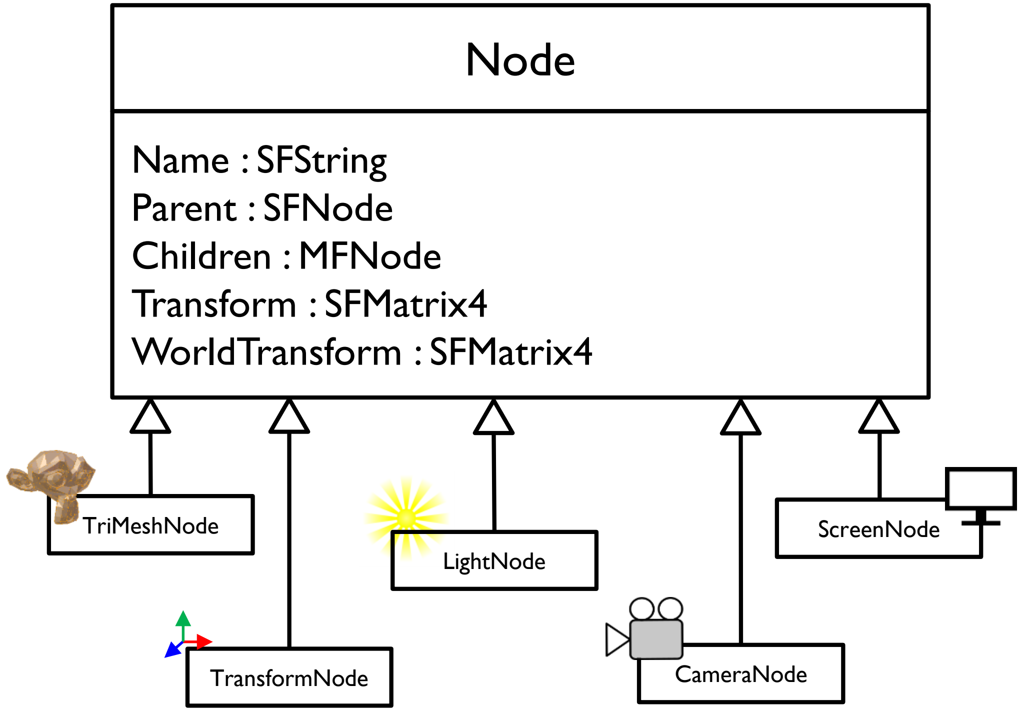
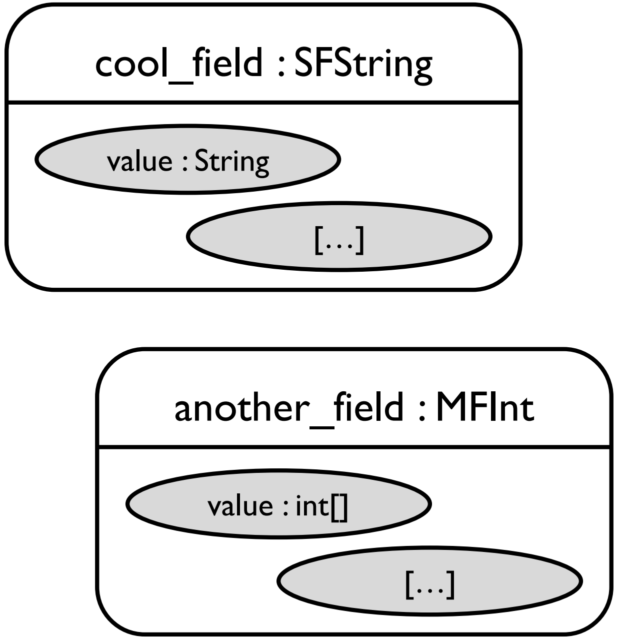


Every node in the scenegraph is a *field container*!

Fields and Field Containers

Field

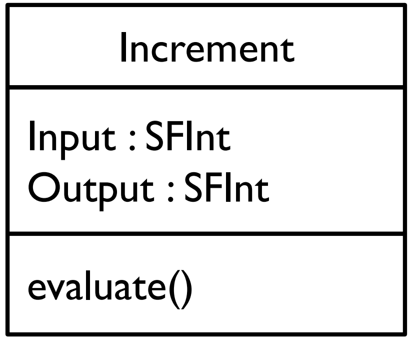
- more complex form of an attribute
- object state information
- single and multi fields
- easy serialization and distribution



Fields and Field Containers

Field Container

- collection of fields
- evaluate() method called when one field changes



Fields and Field Containers

Field Container

- collection of fields
- evaluate() method called when one field changes

```
class Increment(avango.script.Script):

  Input = avango.SFInt()
  Output = avango.SFInt()

  def evaluate(self):
    self.Output.value = self.Input.value + 1
```

Evaluation

```
def evaluate(self):
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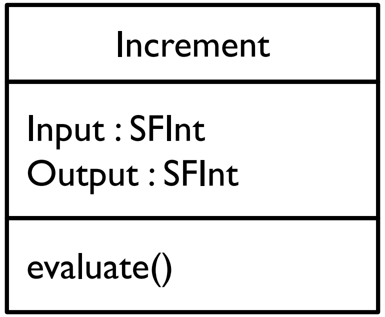
```

- a field container's `evaluate()` method executes three steps in the following order



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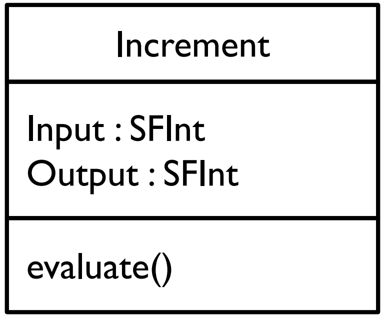

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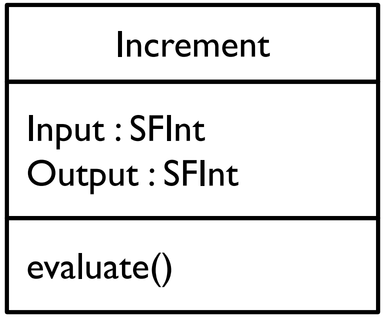

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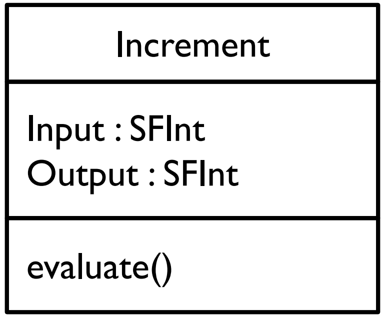

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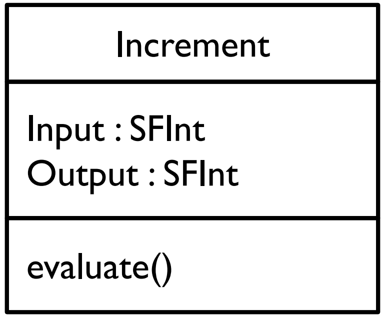

- to increase reuse, no external data should be accessed

Implementing a Field Container

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  sf_mat = avango.gua.SFMatrix4()

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Evaluation policies

- `evaluate()`
  - called when at least one of the field changes
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  def __init__(self):
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  def my_constructor(self, PARAMETER1, PARAMETER2, …):
    #initialize variables, parameters, etc.

  @field_has_changed(sf_mat)
  def sf_mat_changed(self):
    #perform update when fields change
```

Evaluation policies

- `evaluate()`
  - called when at least one of the field changes
- `self.always_evaluate(True)`
  - forces evaluation every frame regardless of field changes
- `@field_has_changed(SFFoo)`
  - only evaluated when SFFoo changes
  - function name can be arbitrary

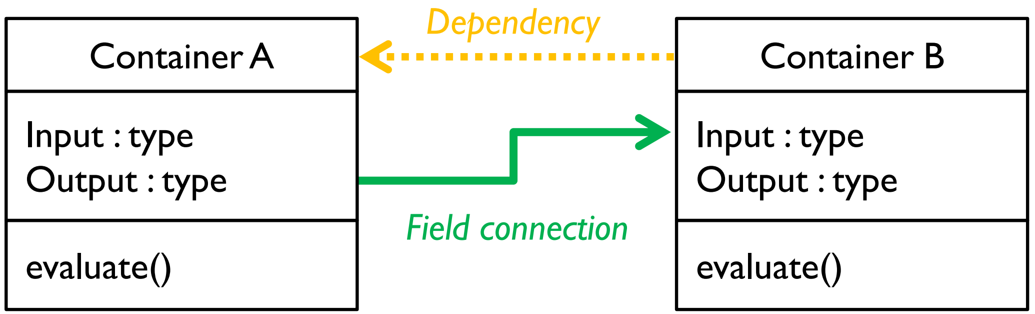
Dependencies

- sometimes it is the case that an output field of one field container forms the input of another one (e.g. sensors)

Container A
Input : type
Output : type
evaluate()
Container B
Input : type
Output : type
evaluate()

Dependencies

- sometimes it is the case that an output field of one field container forms the input of another one (e.g. sensors)
- field connections: the value of a field is copied into another one after evaluation



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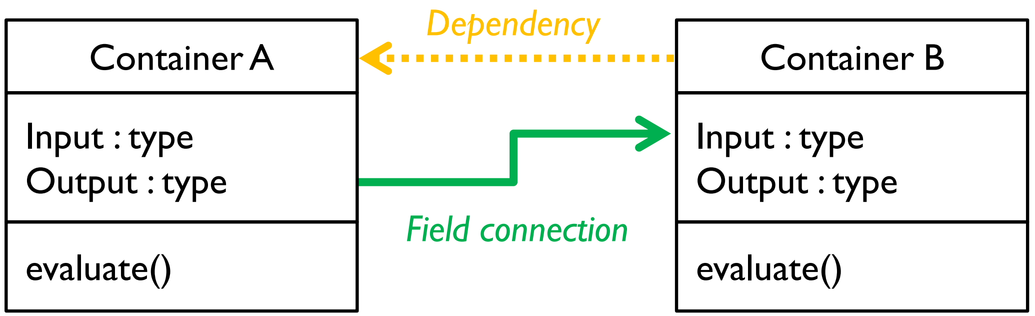
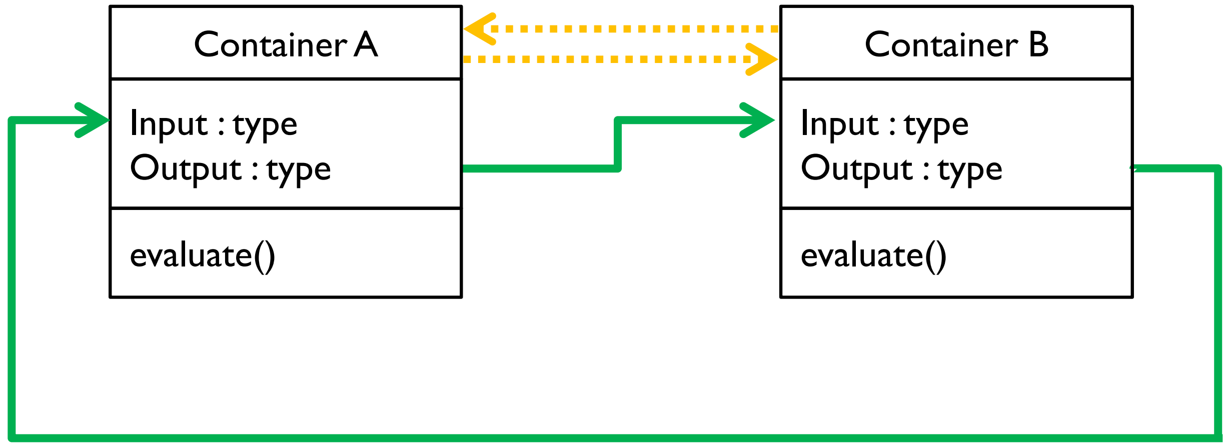


- `b.Input.connect_from(a.Output)` (no .value needed)

Cyclic dependencies



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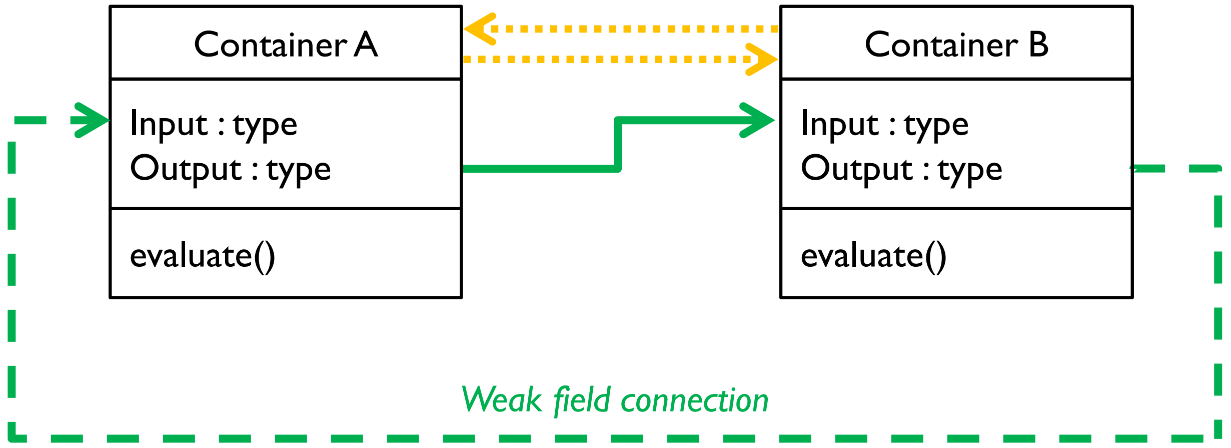
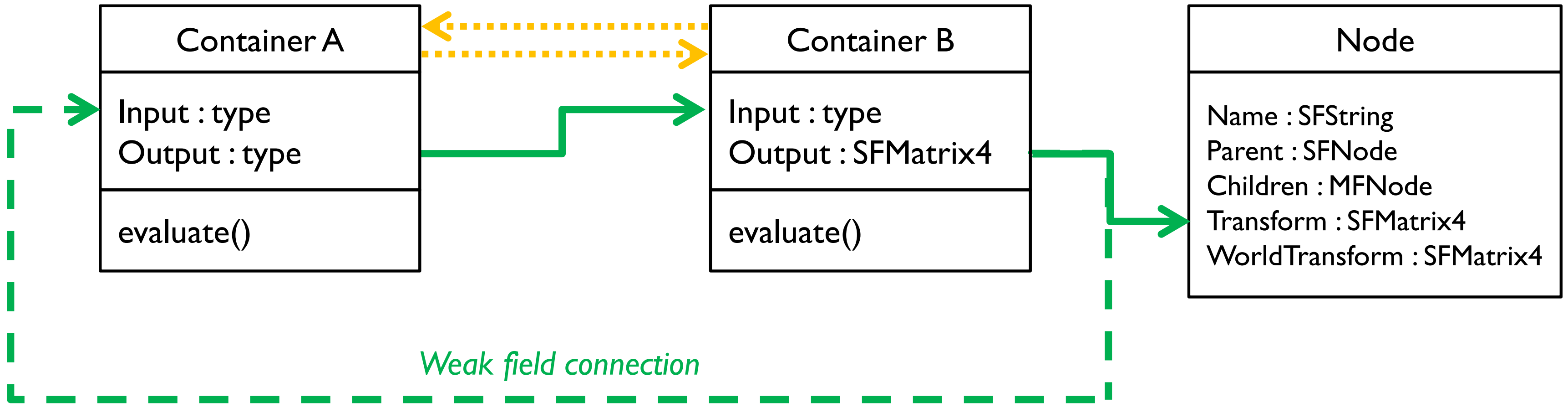


- `a.Input.connect_weak_from(b.Output)`

Orthogonality



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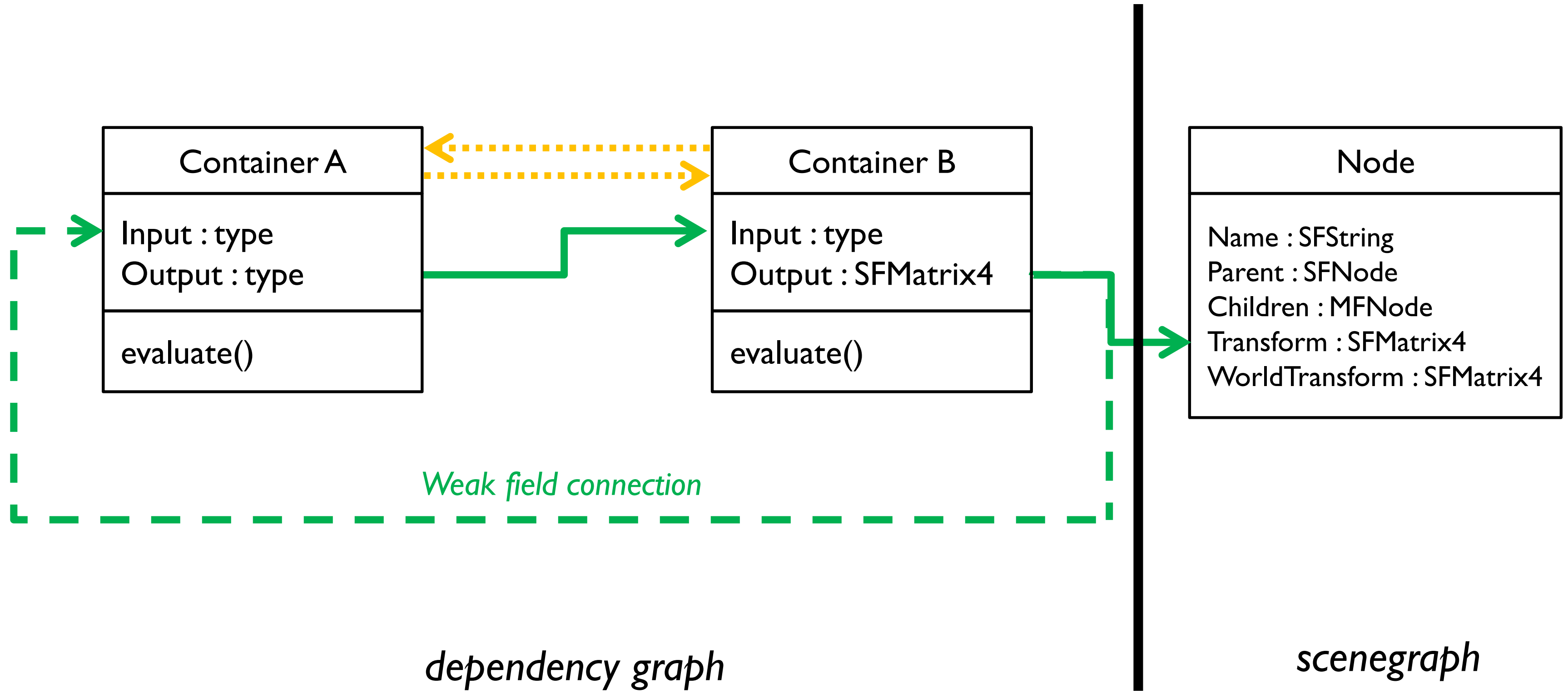

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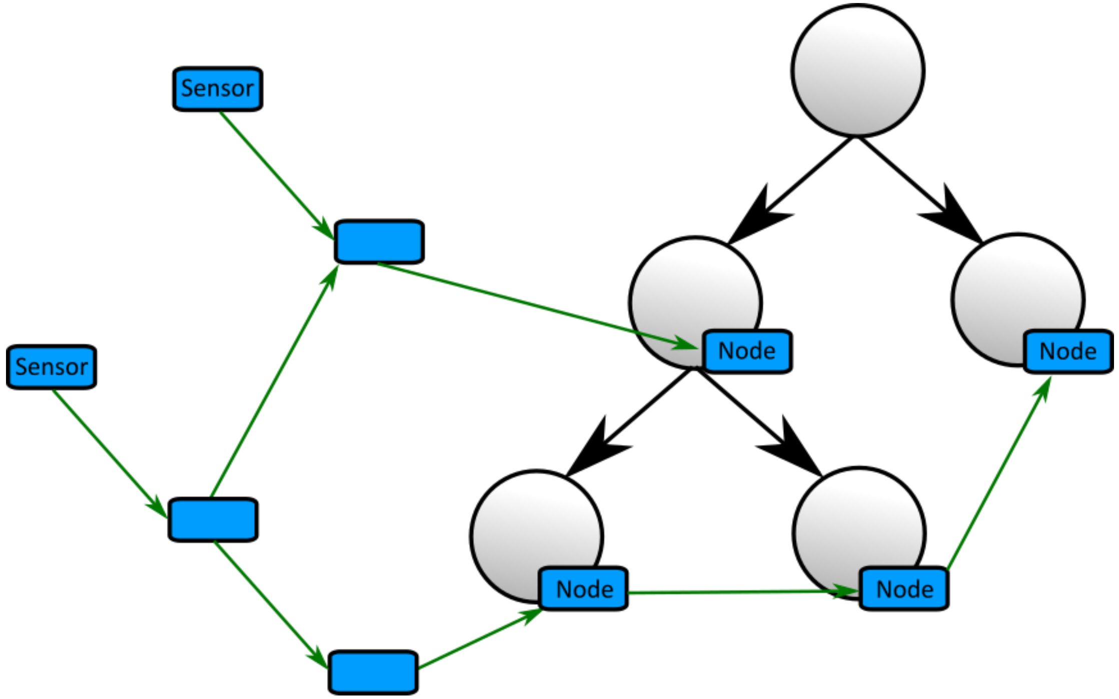

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  - realize dependencies with field connections
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  - easy network distribution
- within a field container, no external data should be accessed
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- the dependency graph is orthogonal to the scenegraph

The Field Concept

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class Container(avango.script.Script):

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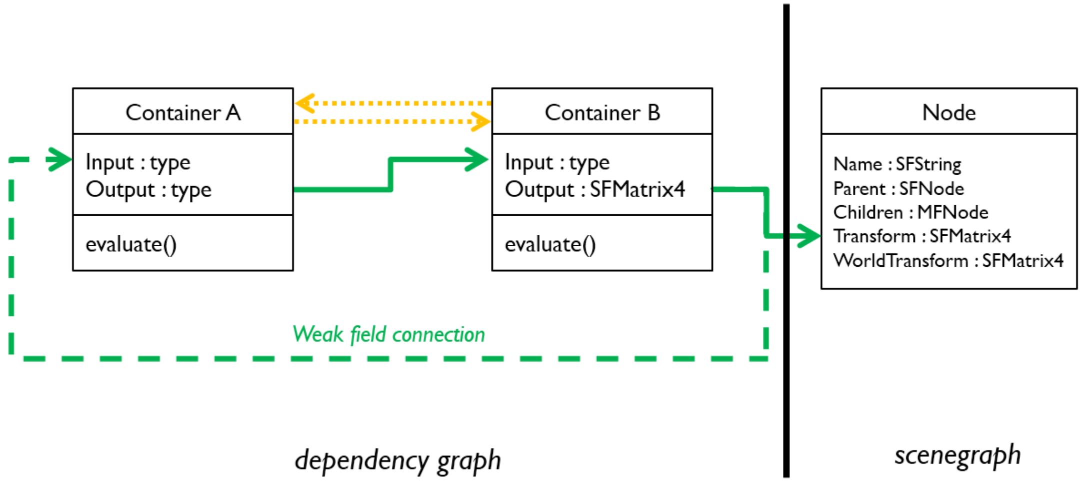
Questions?


Container A
Input : type
Output : type
evaluate()
Container B
Input : type
Output : SFMatrix4
evaluate()
Node
Name : SFString
Parent : SFNode
Children : MFNode
Transform : SFMatrix4
WorldTransform : SFMatrix4
Weak field connection
dependency graph
scenegraph