



Compilers

Self Type

```
class Count {  
  i : int ← 0;  
  inc () : Count {  
    {  
      i ← i + 1;  
      self;  
    }  
  };  
};
```

- Class **Count** incorporates a counter
- The **inc** method works for any subclass

- Consider a subclass **Stock** of **Count**

```
class Stock inherits Count {  
  name : String; -- name of item  
};
```

- And the following use of **Stock**:

```
class Main {  
  Stock a ← (new Stock).inc ();  
  ... a.name ...  
};
```

- `(new Stock).inc()` has dynamic type `Stock`
- So it is legitimate to write
`Stock a ← (new Stock).inc ()`
- But this is not well-typed
 - `(new Stock).inc()` has static type `Count`
- The type checker “loses” type information
 - This makes inheriting `inc` useless
 - So, we must redefine `inc` for each of the subclasses, with a specialized return type

- We will extend the type system
- Insight:
 - `inc` returns “`self`”
 - Therefore the return value has same type as “`self`”
 - Which could be `Count` or any subtype of `Count`!
- Introduce the keyword `SELF_TYPE` to use for the return value of such functions
 - We will also need to modify the typing rules to handle `SELF_TYPE`

- `SELF_TYPE` allows the return type of `inc` to change when `inc` is inherited
- Modify the declaration of `inc` to read
`inc() : SELF_TYPE { ... }`
- The type checker can now prove:
 $O, M, C \vdash (\text{new Count}).\text{inc}() : \text{Count}$
 $O, M, C \vdash (\text{new Stock}).\text{inc}() : \text{Stock}$
- The program from before is now well-typed

- SELF_TYPE is not a dynamic type
 - It is a static type
 - It helps the type checker to keep better track of types
 - It enables the type checker to accept more correct programs
- In short, having SELF_TYPE increases the expressive power of the type system