Library Design
Influenza Model

Spreading of Influenza Epidemic

- Four state variables.
- Initial population of 10 000 non-infected individuals.
- Stem of influenza is introduced into the system.
- Infections occur spontaneously
- Virus spread in infected individuals and after some time, the individuals fall sick.

Spreading of Influenza Epidemic

- Contagious people = sick + infected, spread the disease further
- The sick people eventually get cured, immune people
- Immune period is temporary due to mutation of virus.
- Immune people turn into non-infected people again who are again susceptible to infection.

Influenza Model Parameters

- Time to breakdown, 4 weeks
- Actual sickness period, 2 weeks
- Immune period, 26 weeks

$$Incubation = floor\left(\frac{Infected\ population}{Time\ to\ break\ down}\right)$$

$$Activation = floor\left(\frac{Immune\ population}{Immune\ period}\right)$$

$$Cure\_Rate = floor\left(\frac{Sick\ population}{Sickness\ duration}\right)$$

Influenza Model Parameters

- Average weekly contacts of a person with others, C_{Wk}=15
- Contraction rate per contact, $Rate_C$=0.25

$$Infection\_rate = min(floor(Non\_infected\_population * C_{Wk} * Perc\_infected * Rate_C + Initial), Non\_infected\_population)$$

$$Perc\_infected = \frac{contagious}{total}$$

Governing Equations

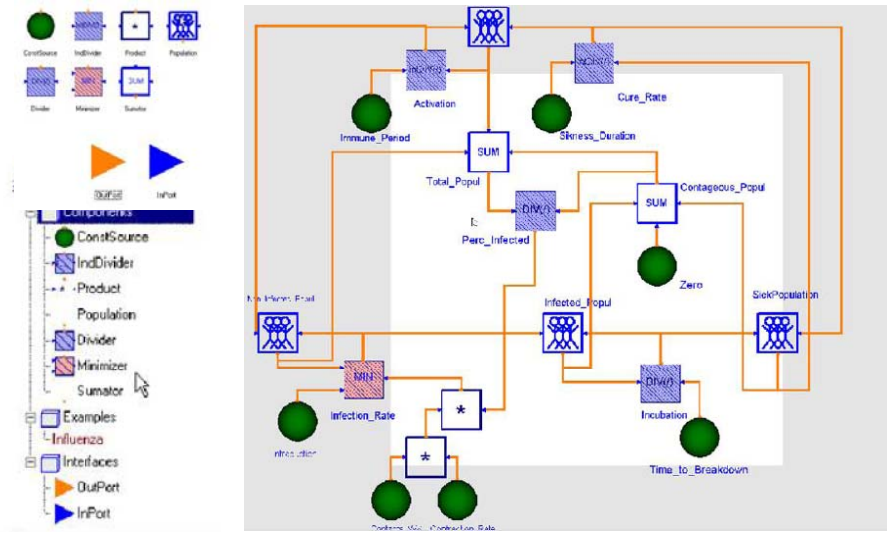
$$\frac{d(Non\_Infected\_population)}{dt} = Activation - Infection\_Rate$$

$$\frac{d(Infected\_population)}{dt} = Infection\_Rate - Incubation$$

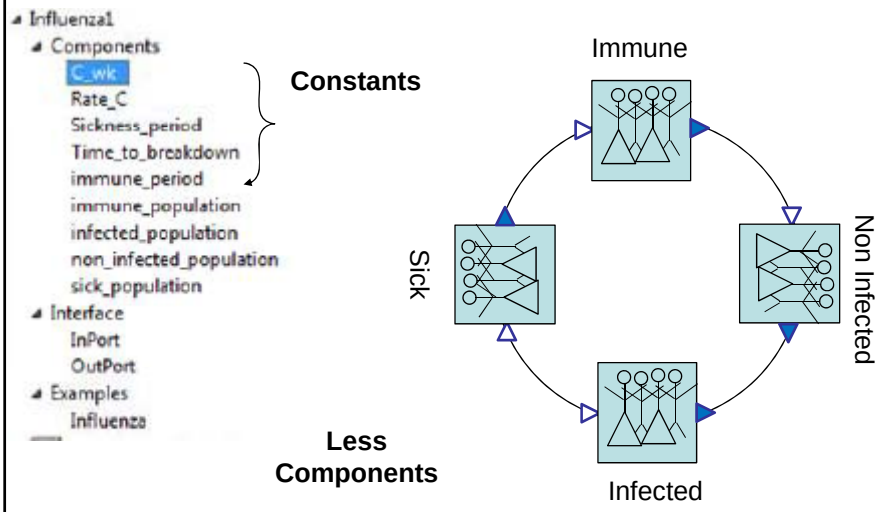
$$\frac{d(Immune\_population)}{dt} = Cure\_Rate - Activation$$

$$\frac{d(Sick\_population)}{dt} = Incubation - Cure\_Rate$$

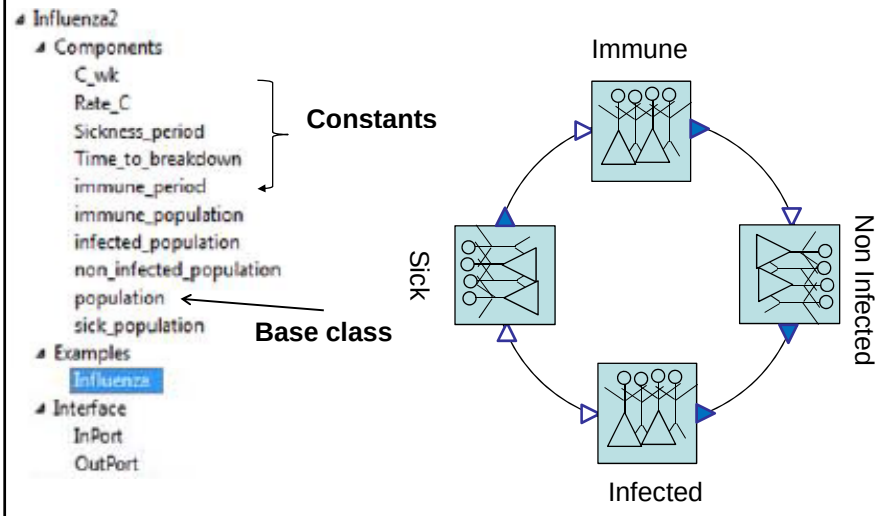
Block Oriented Approach



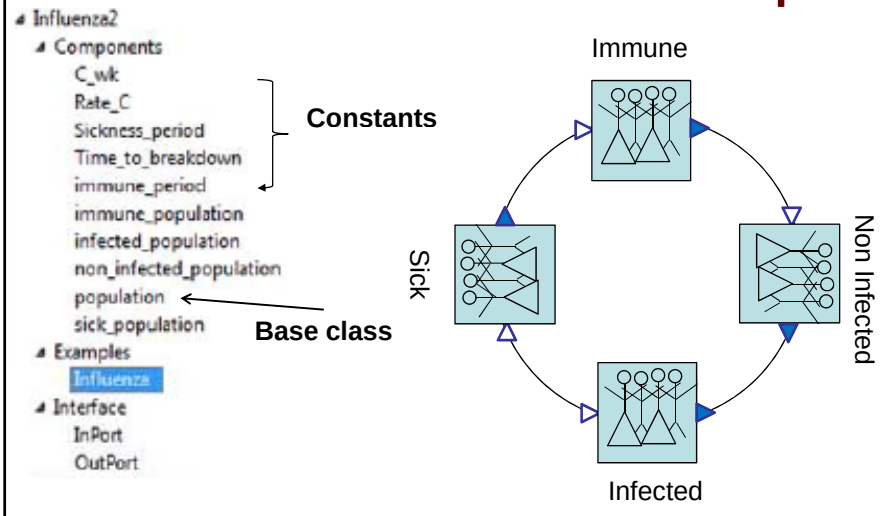
Object Oriented Approach #1



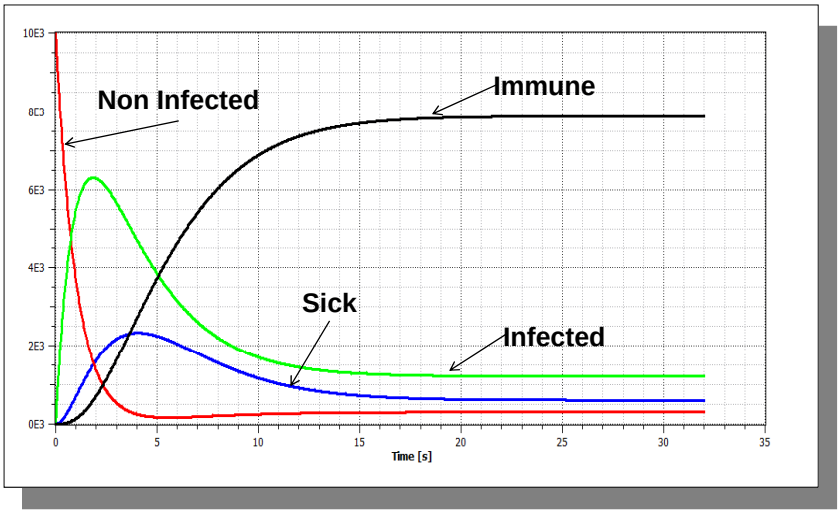
Object Oriented Approach #2



Object Oriented Approach #3, multiple conncectors or connect several comp.



Simulation



Coclusions

- The influenza epidemic spreads rapidly
- Within 4 weeks, the percentage of sick people reaches its maximum of roughly 25%
- A steady state is reached about 20 weeks
- The disease does not die out naturally.
- A certain percentage loses immunity sufficiently fast to get infected before the virus stem has disappeared.

Excersize

- Make the influenza library with the suggested packages, components, interface, and example
- Tip: The inner and outer operators can be useful (what happens with the encapsulation rule?)
  Define the constants in the package level