2nd International Track on Collaborative Modeling & Simulation

June 27 - June 29, 2011, Paris (France)

Vivid OPM & OPM/ML

OPM Model-Driven Simulation with Computational Interface to Matlab

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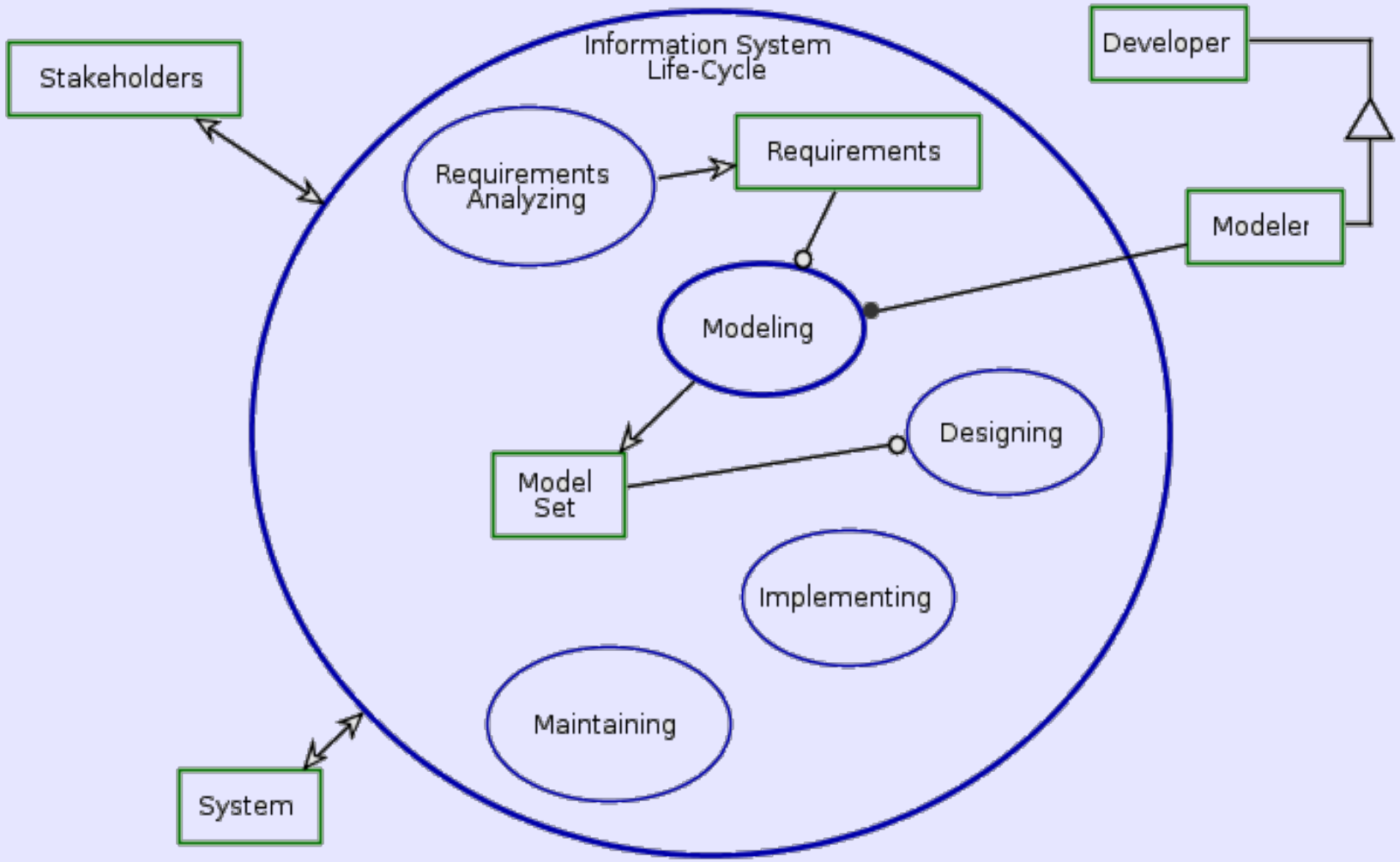
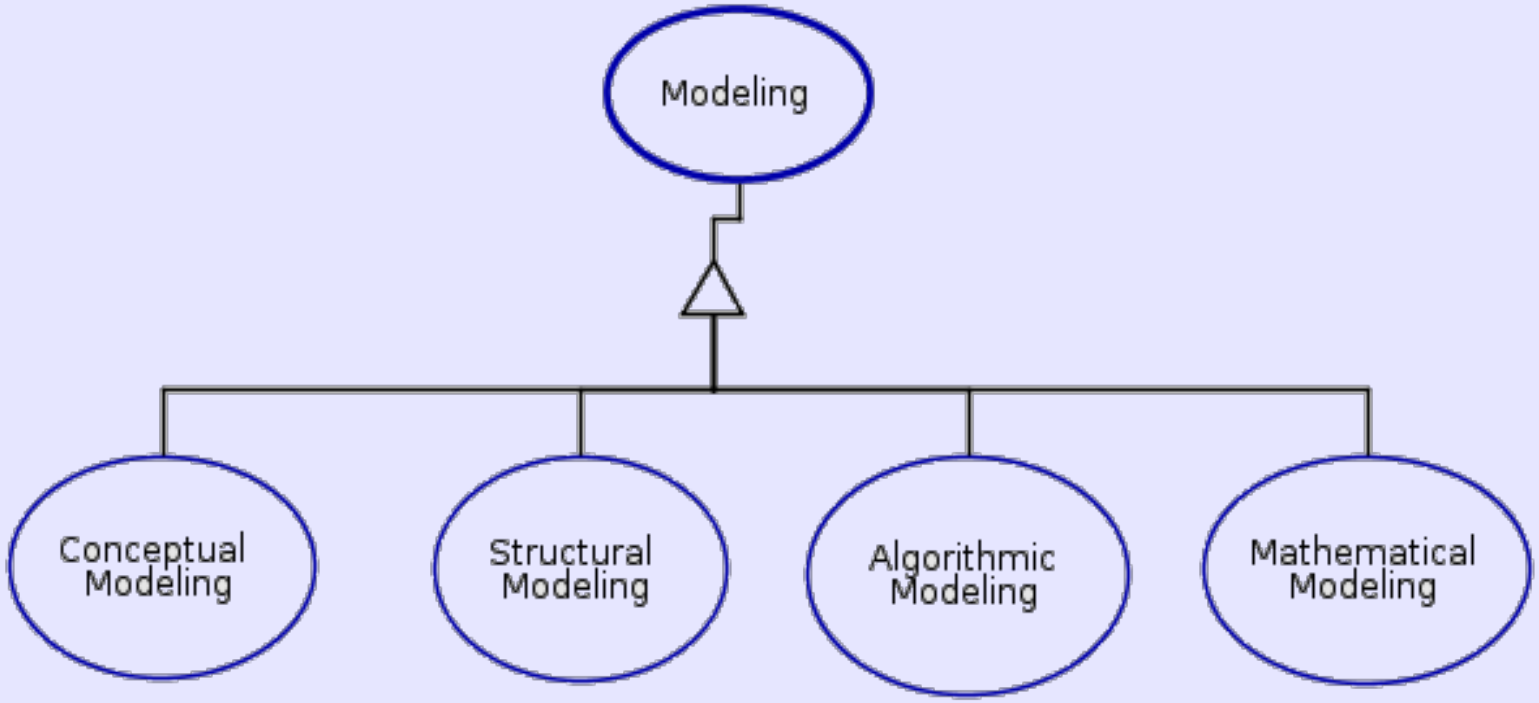
Information System Development Life-Cycle



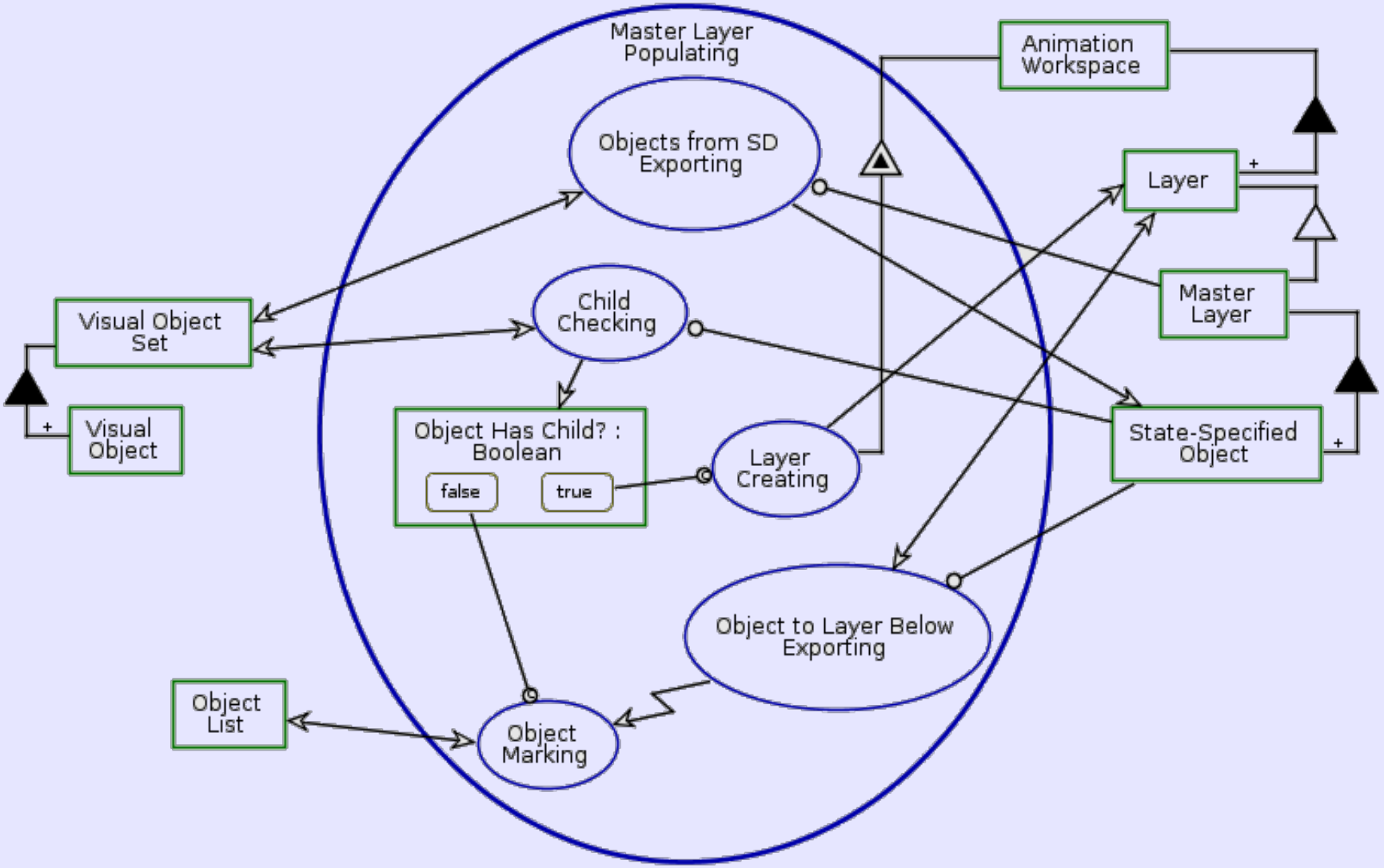
Classification Types of Models



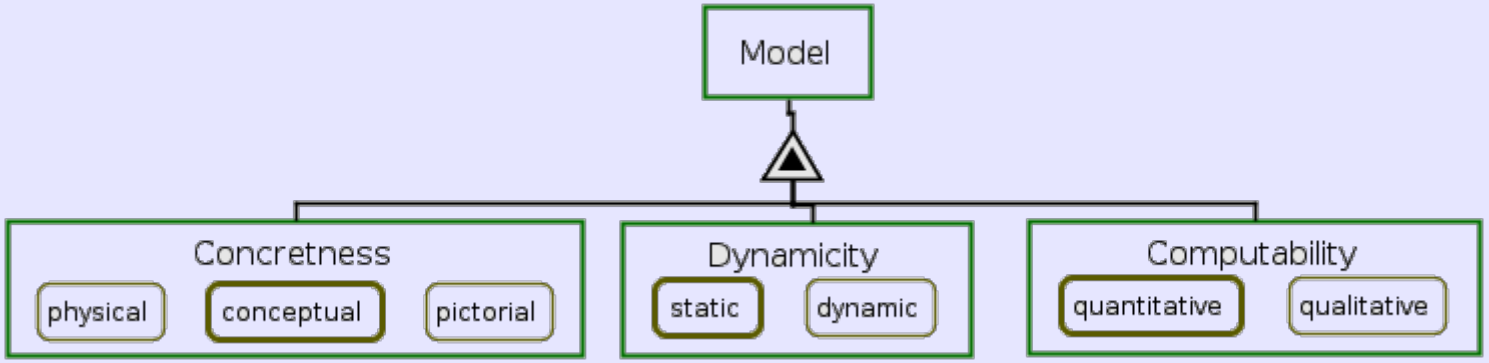
Conceptual Model

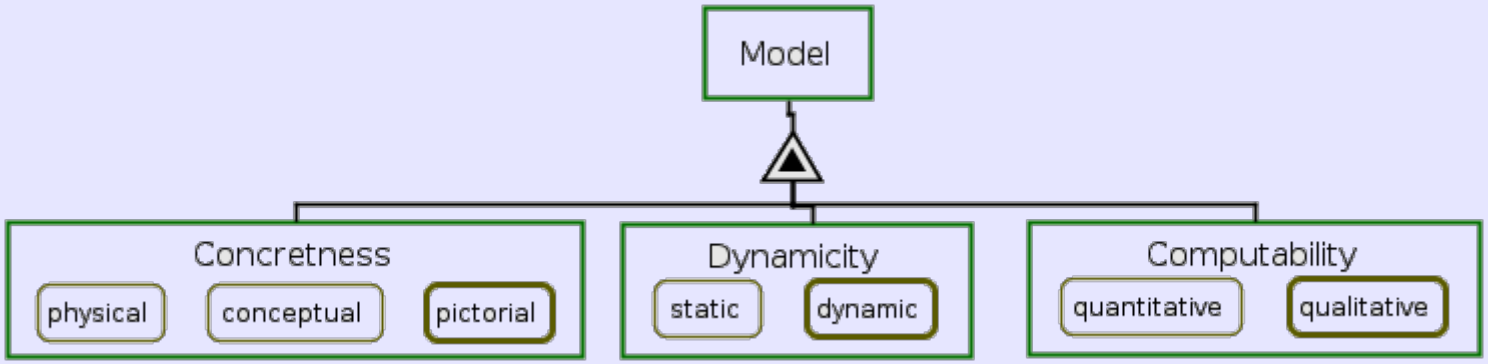
- Holistic framework
- Specification mistakes
- Shortens time-to-market

OPM Example


Master Layer Populating
Animation Workspace
Objects from SD Exporting
Layer
+
Master Layer
Child Checking
Visual Object Set
Visual Object
+
Object Has Child? : Boolean
false
true
Layer Creating
State-Specified Object
+
Object to Layer Below Exporting
Object List
Object Marking

Model Types


Model
Concretness
physical
conceptual
pictorial
Dynamicity
static
dynamic
Computability
quantitative
qualitative


Model
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physical
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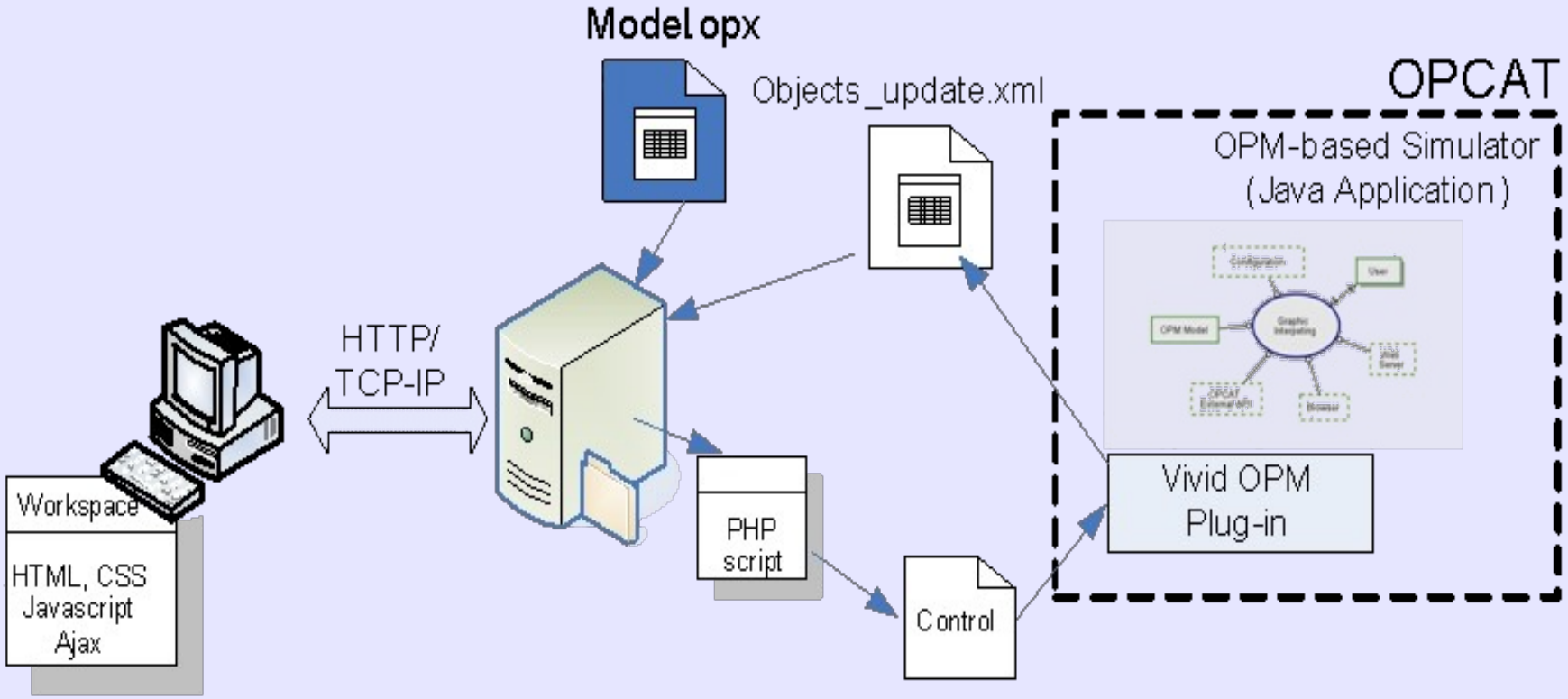
qualitative

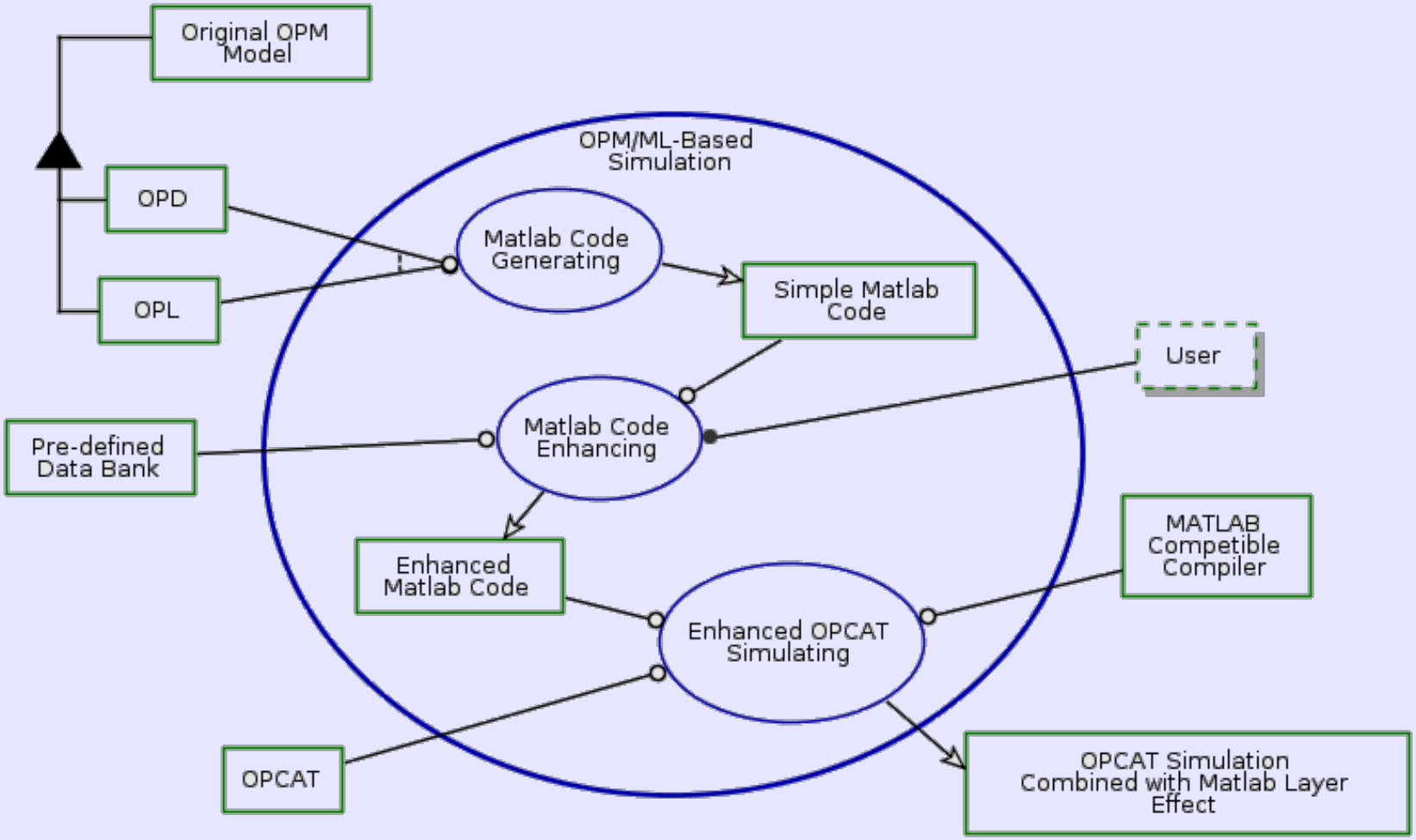
Two complementary concepts

- Vivid OPM: dynamic display
- OPM Matlab Layer: qualitative aspect

Vivid OPM Architecture

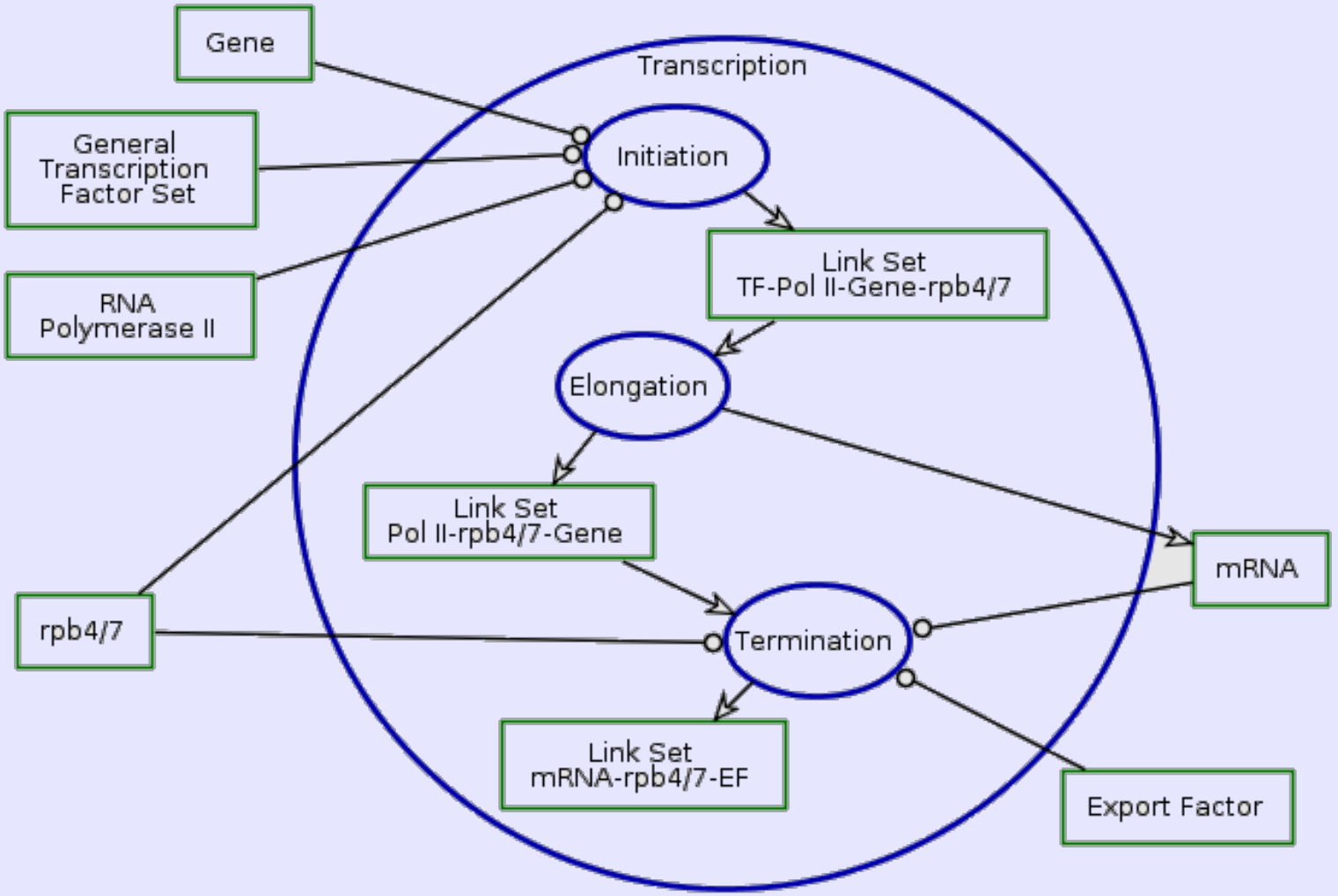


OPM/ML Architecture

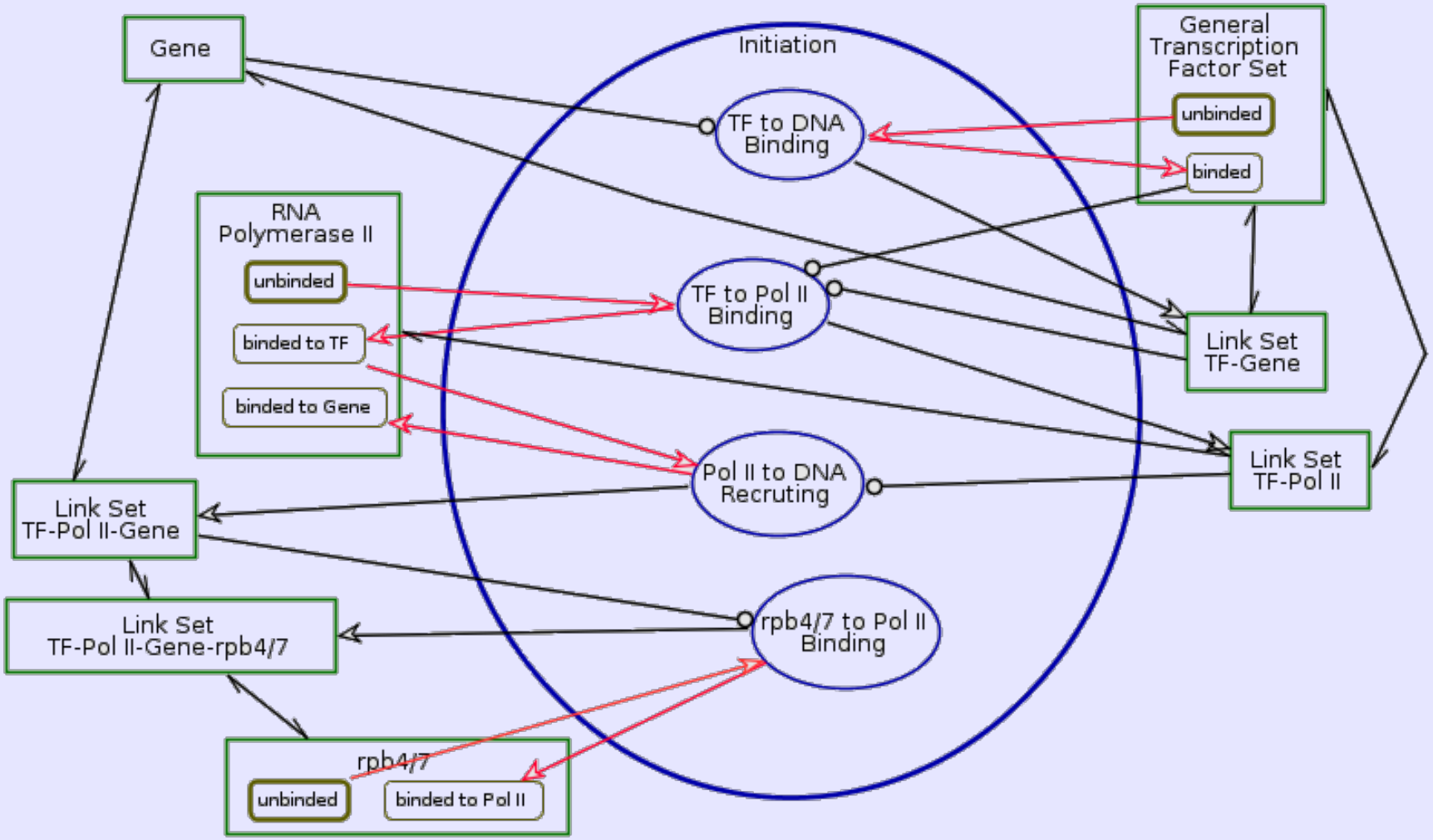


Proof of Concept

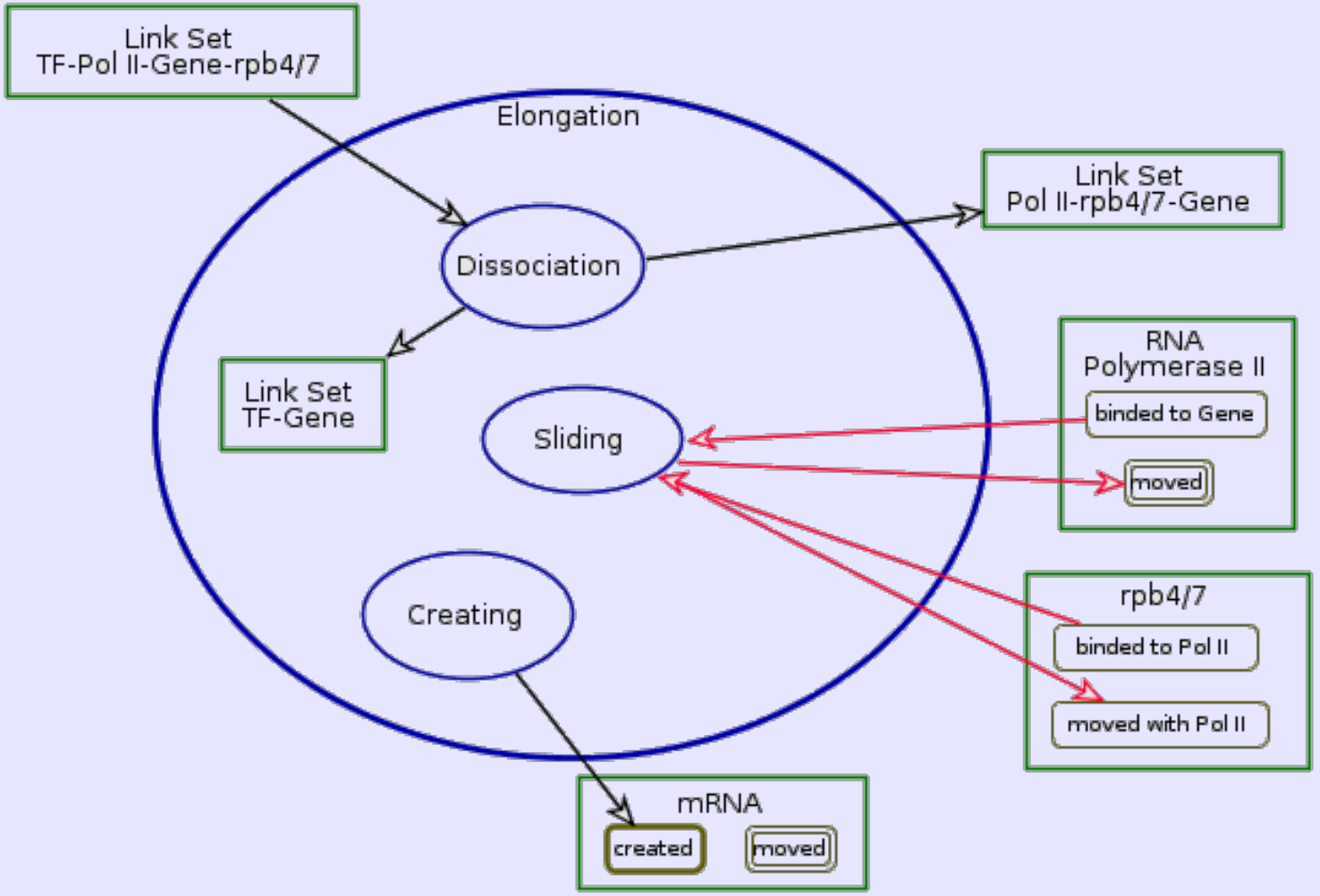
Transcription Process



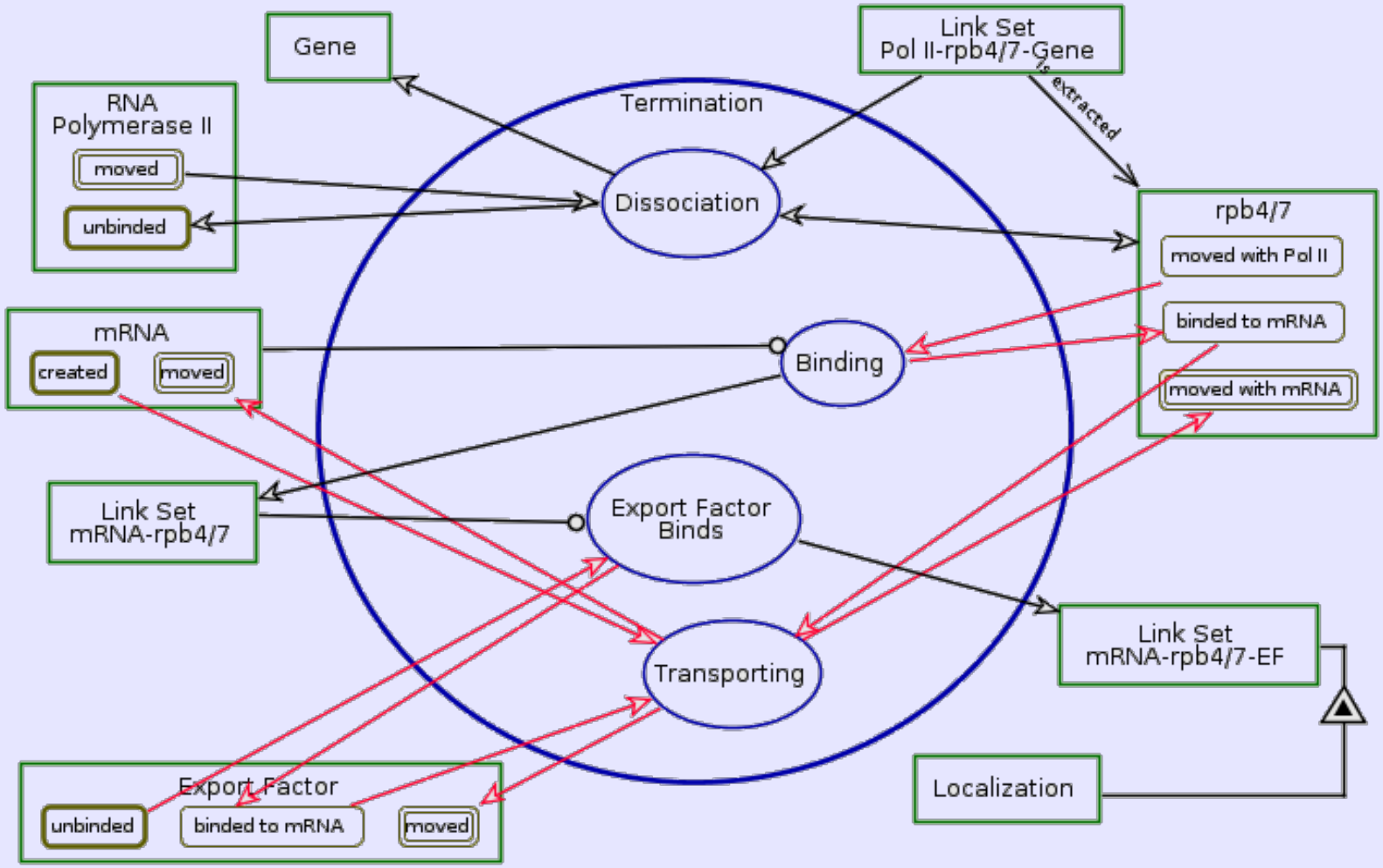
Initiation In-zooming



Elongation In-zooming



Termination In-zooming



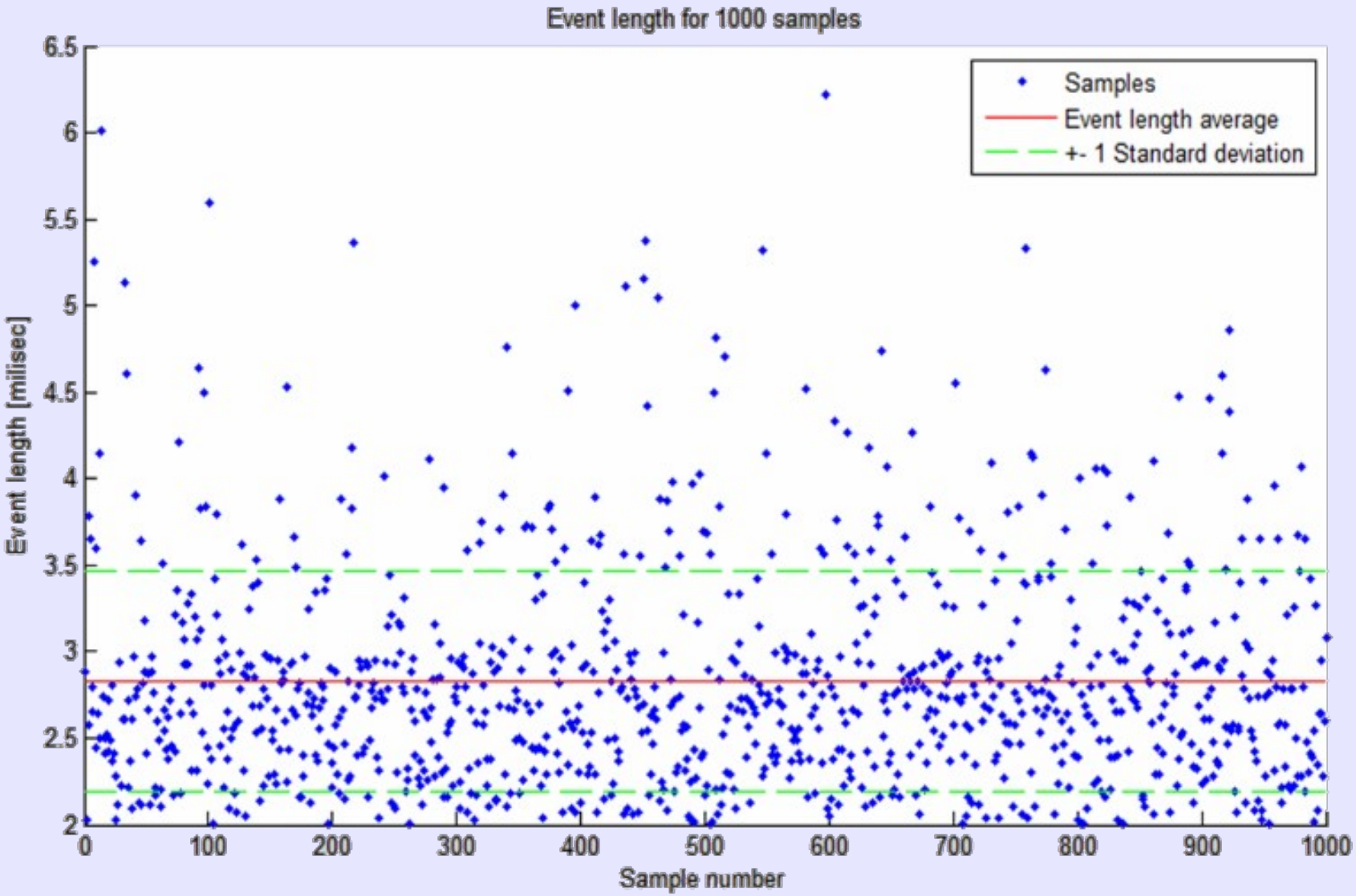
Demo

```
function [mRNA] = Transcription(Pol_II,DNA,Transcription_Factors,rpb4_7,Export_Factor)
global processleangth% user input

%Transcription zooms into Initiation, Elongation, and Termination, as well as  > mRNA-rpb4/7-E

%Initiation requires DNA, Transcription Factors, Pol II, and rpb4/7.
%Initiation yields  > TF-Pol II-DNA-rpb4/7.
% User input:
Initiated = 0;
while ~Initiated
    p = rand;
    if p<0.7
        %
        [TF_Pol_II_DNA_rpb4_7] = Initiation(DNA,Transcription_Factors,Pol_II,rpb4_7);
        %
        Initiated = 1;
        processleangth = processleangth + 2 + rand*(3-2);
    else
        processleangth = processleangth + 0.5 + rand*(1-0.5);
    end
end
%Elongation consumes  > TF-Pol II-DNA-rpb4/7.
%Elongation yields 1 mRNA and  > Pol II-rpb4/7-DNA.
[mRNA,Pol_II_rpb4_7_DNA] = Elongation(TF_Pol_II_DNA_rpb4_7);
TF_Pol_II_DNA_rpb4_7 = [];

%Termination requires rpb4/7, Export Factor, and mRNA.
%Termination consumes  > Pol II-rpb4/7-DNA.
%Termination yields  > mRNA-rpb4/7-EF.
[mRNA_rpb4_7_EF] = Termination(rpb4_7,Export_Factor,mRNA,Pol_II_rpb4_7_DNA);
Pol_II_rpb4_7_DNA = [];
```


Event length for 1000 samples
Samples
Event length average
+- 1 Standard deviation
Event length [milisec]
Sample number
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
0
100
200
300
400
500
600
700
800
900
1000

Conclusion

- Scientists
- System Architects

Thank you