SBOL 2.0: Vision and Structure

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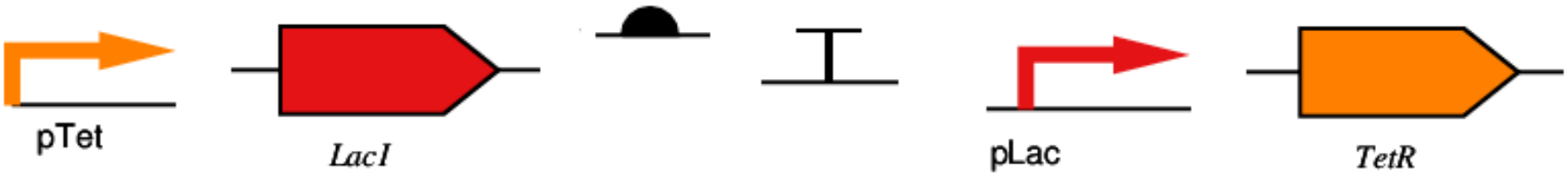
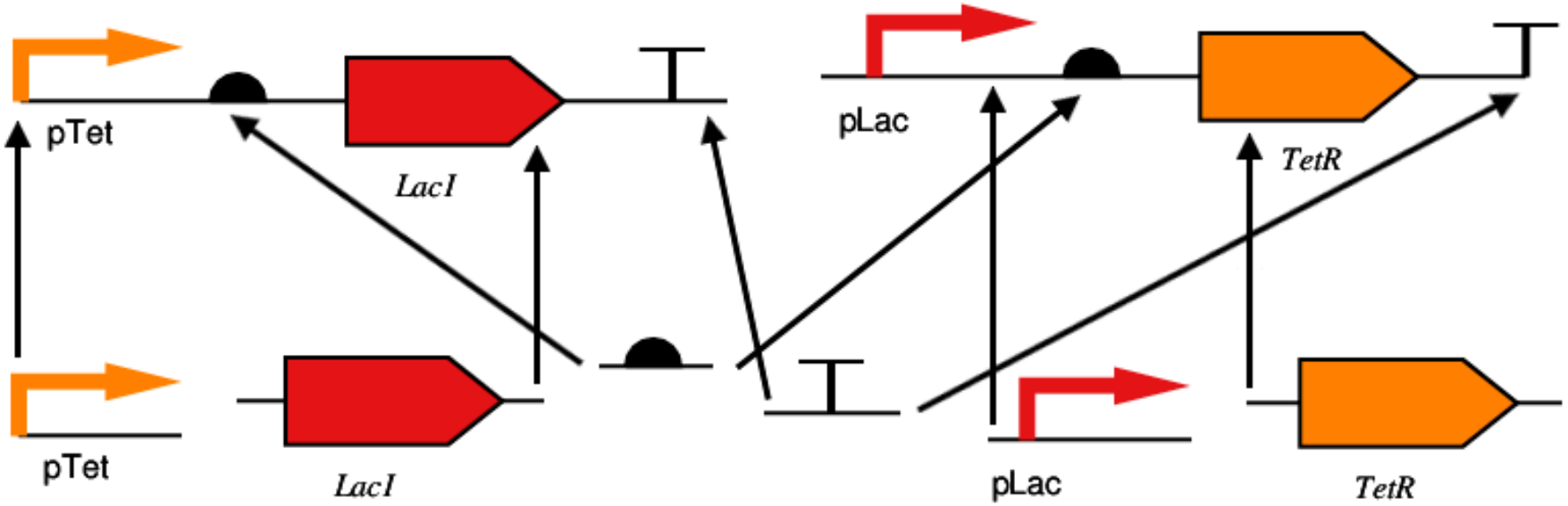
SBOL Workshop 10: UC Berkeley

Current Capabilities of SBOL 1.0



- Specification of DNA components

Current Capabilities of SBOL 1.0

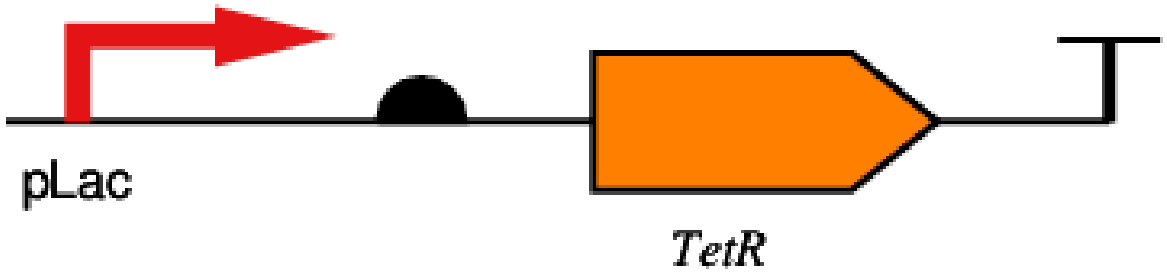


- Specification of DNA components
- Hierarchical composition of DNA components

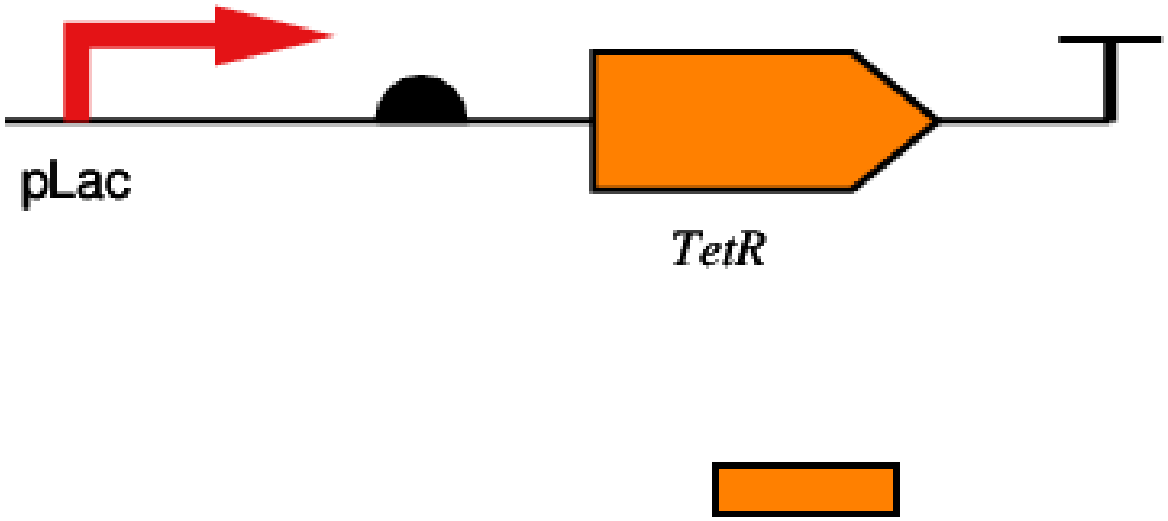
Goals for SBOL 2.0

- Increase the range of biological structure and function that we may specify.
- Provide an extensible basis for composition of function.

Increasing Structural Range

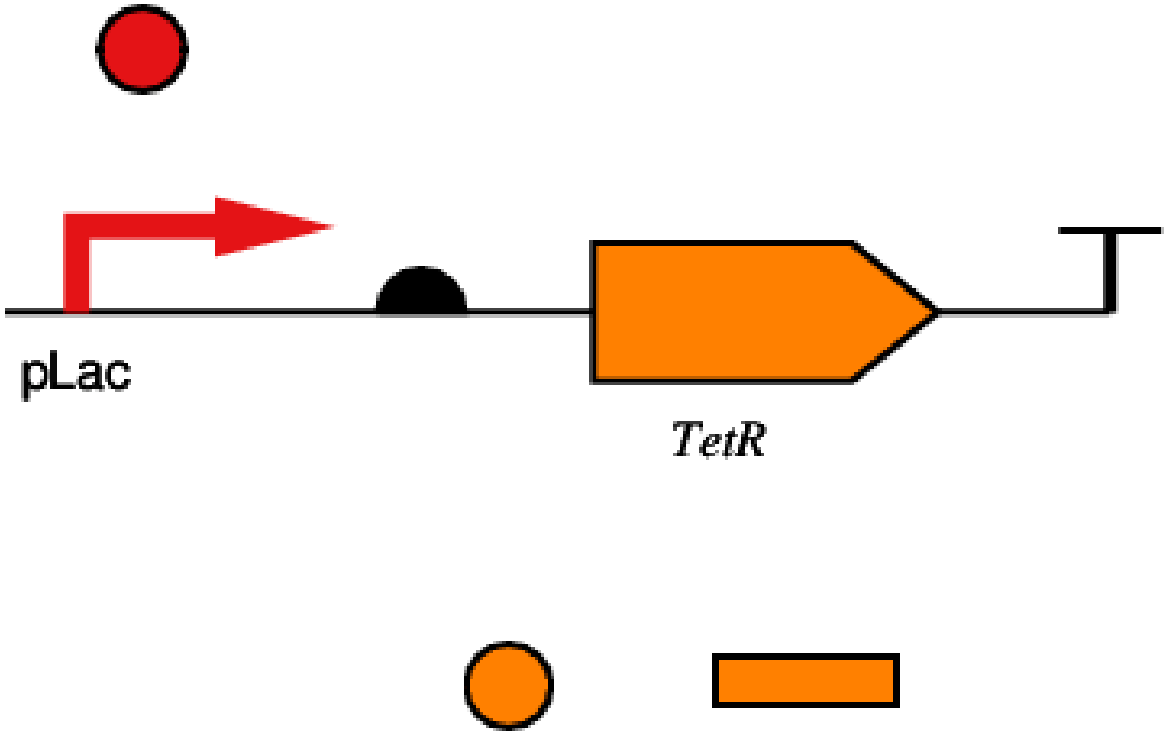


Increasing Structural Range



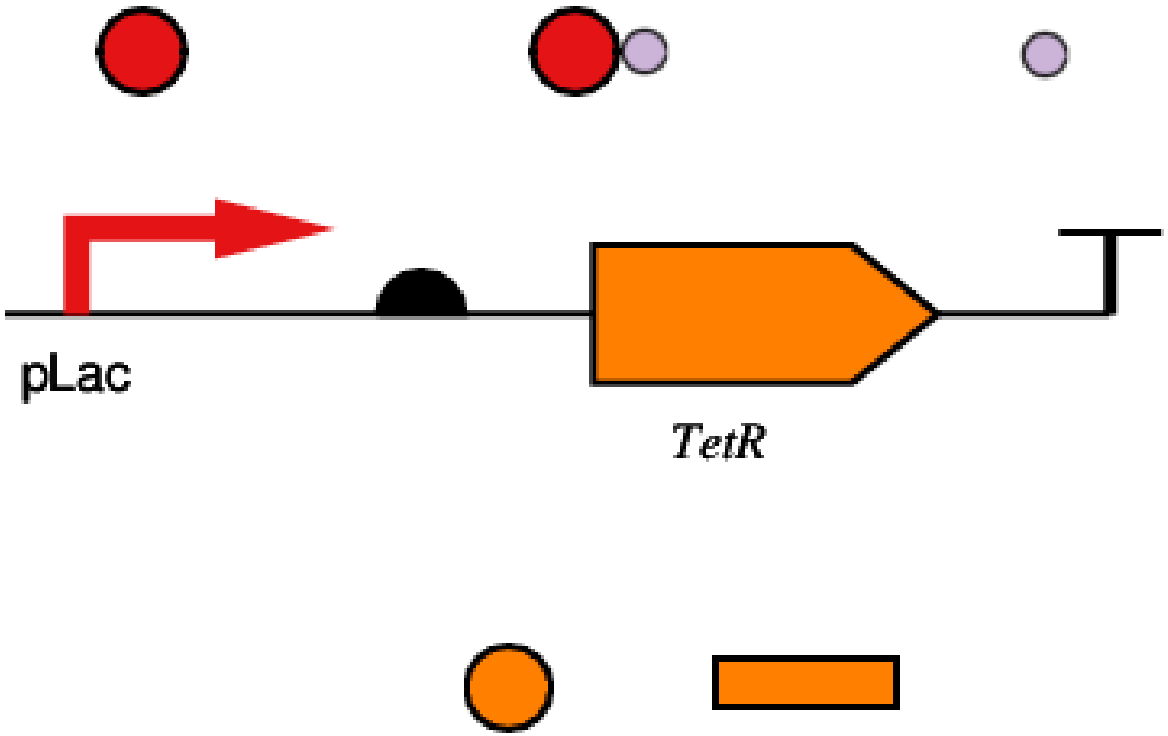
- RNA components (mRNA, tRNA, siRNA)

Increasing Structural Range



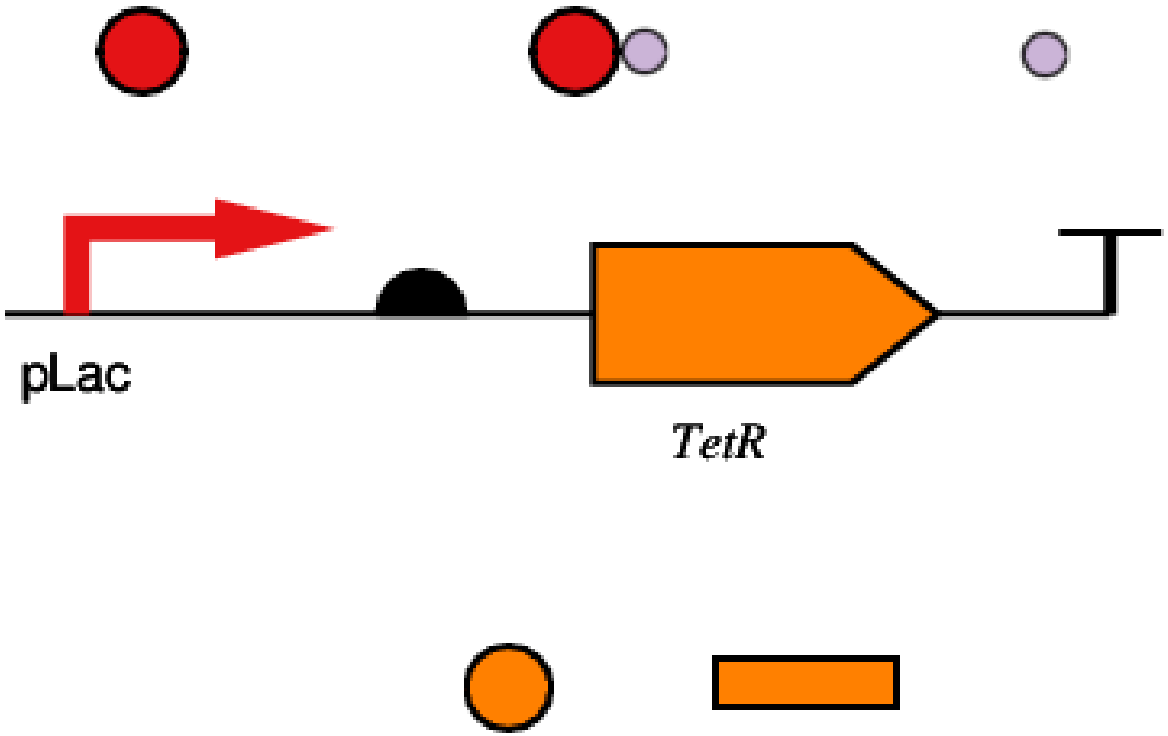
- RNA components
- Protein components (TFs, enzymes)

Increasing Structural Range



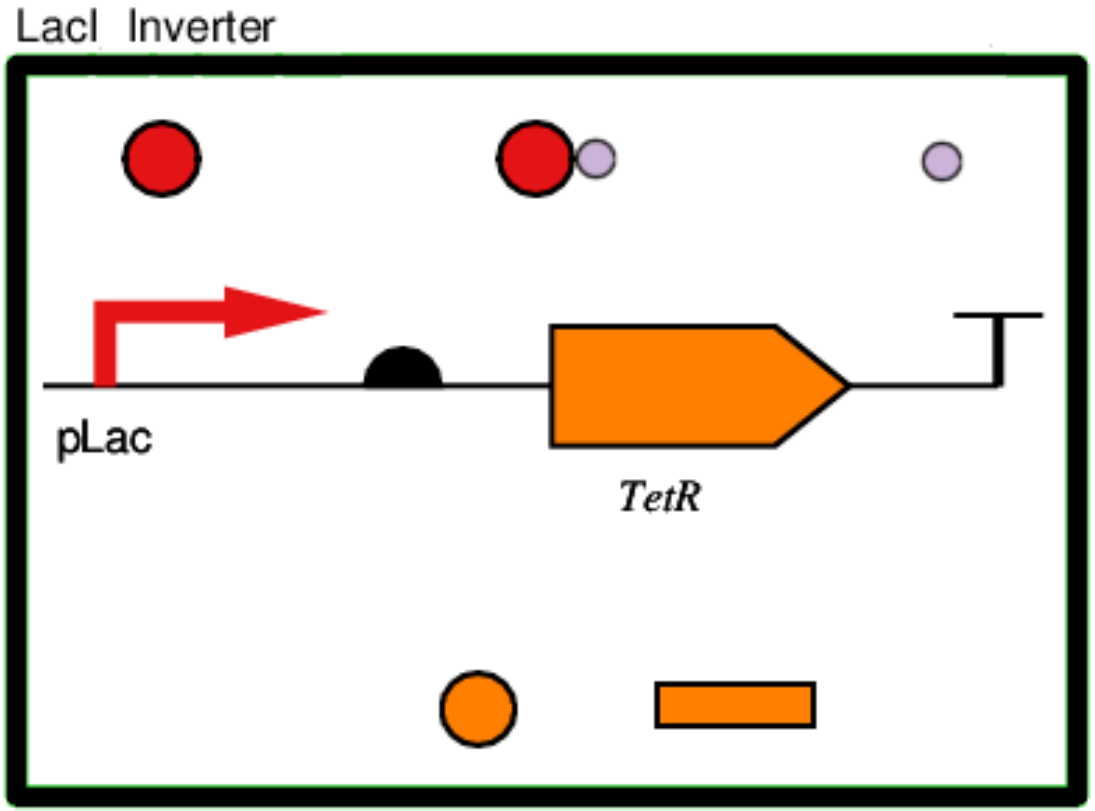
- RNA components
- Protein components
- Small molecules (inducers)

Increasing Structural Range



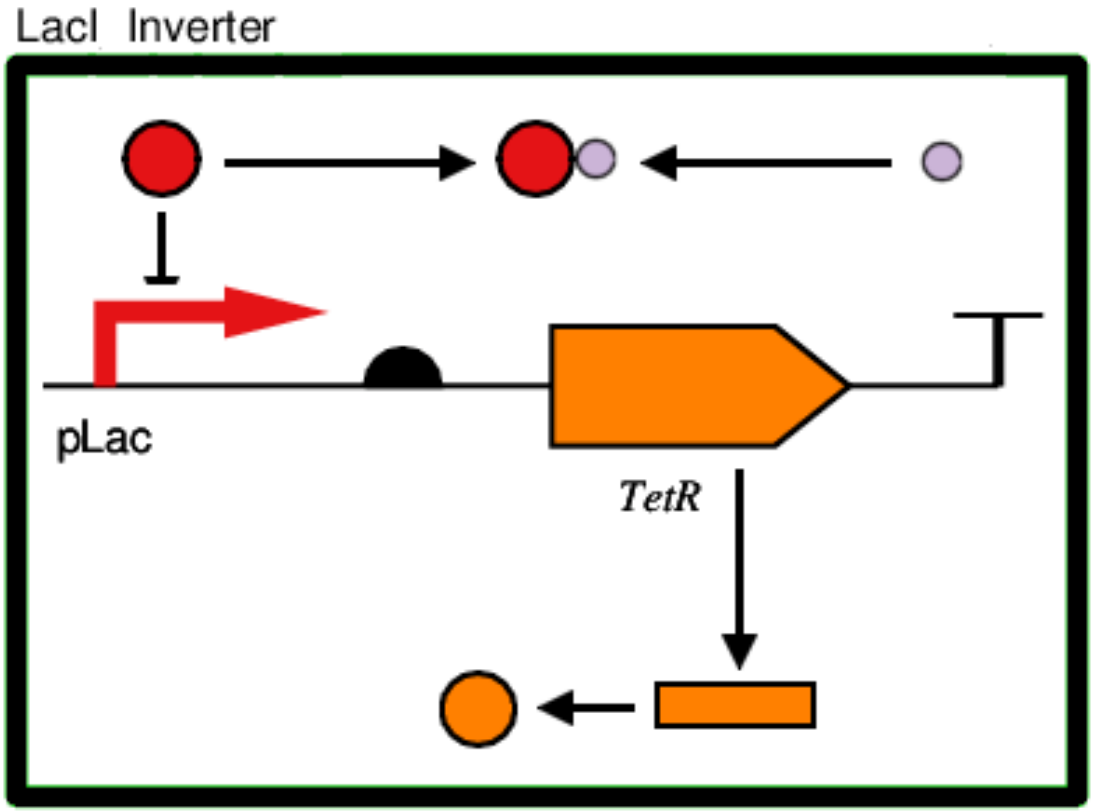
- Physical Entities (all of the above plus complexes, light, pressure, pH, temp)

Increasing Functional Range



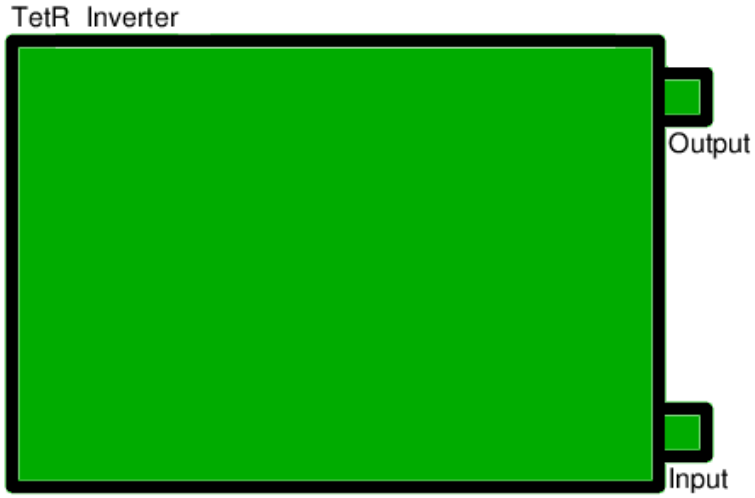
- Devices (logic gates, latches, oscillators, sensors, transducers)

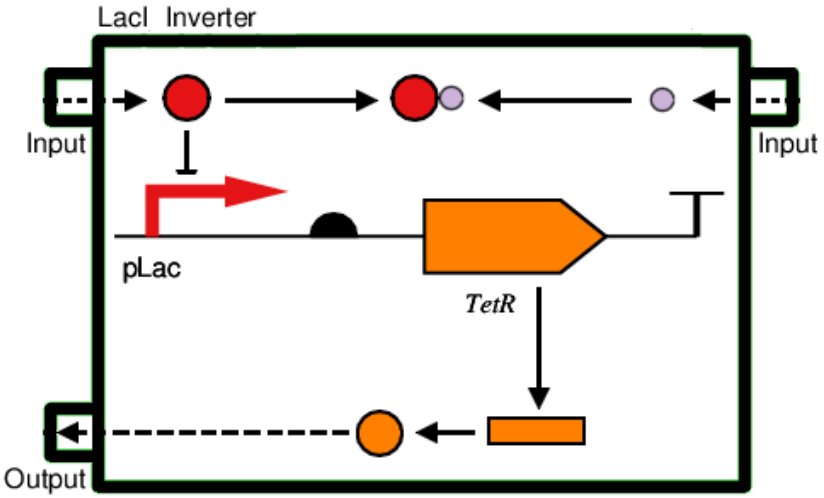
Increasing Functional Range



- Devices
- Interactions (activation, repression, complexation, transcription, translation, phosphorylation)

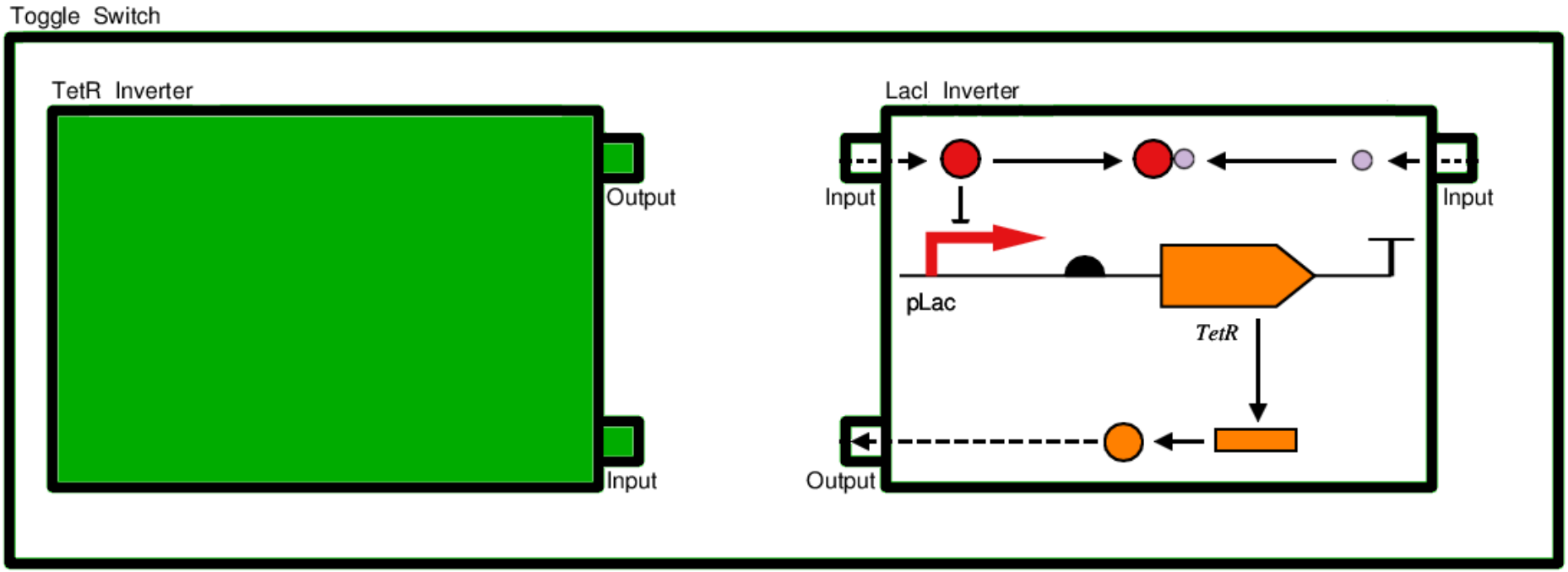
Basis for Functional Composition





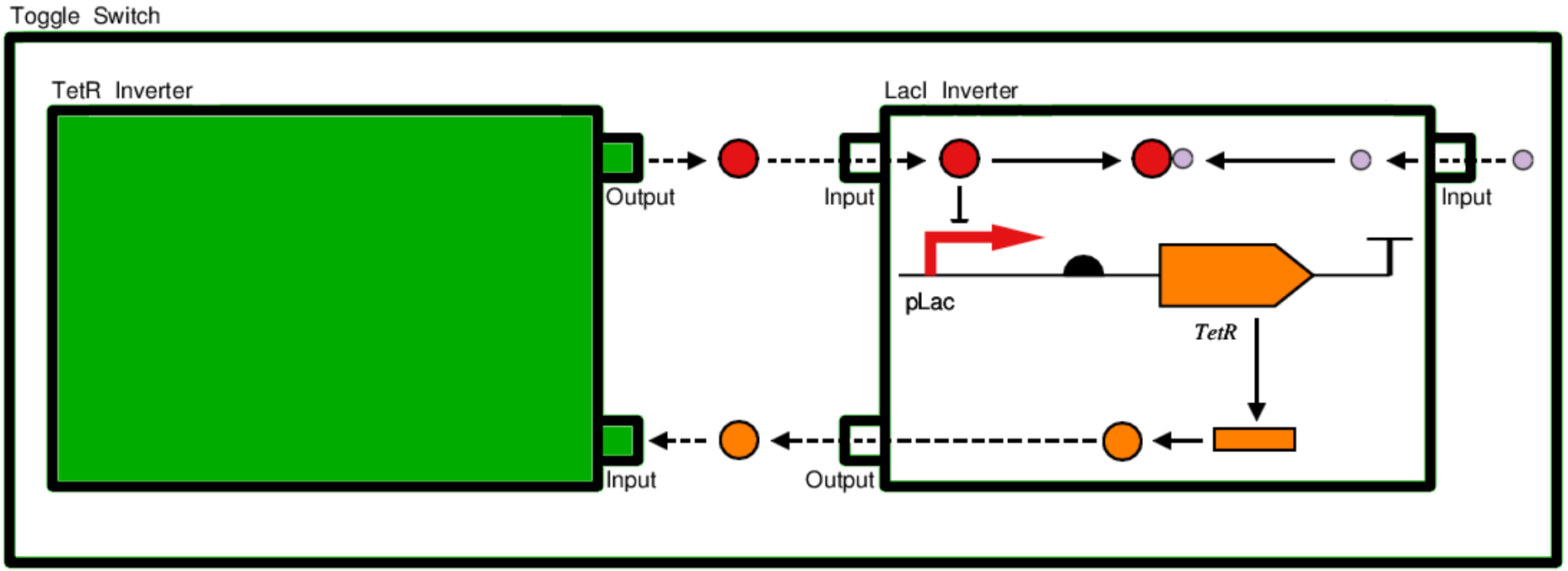
- Ports

Basis for Functional Composition



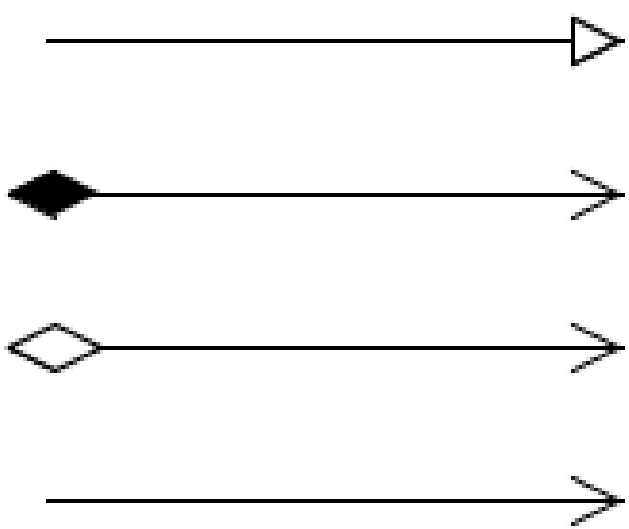
- Ports
- Instantiation

Basis for Functional Composition



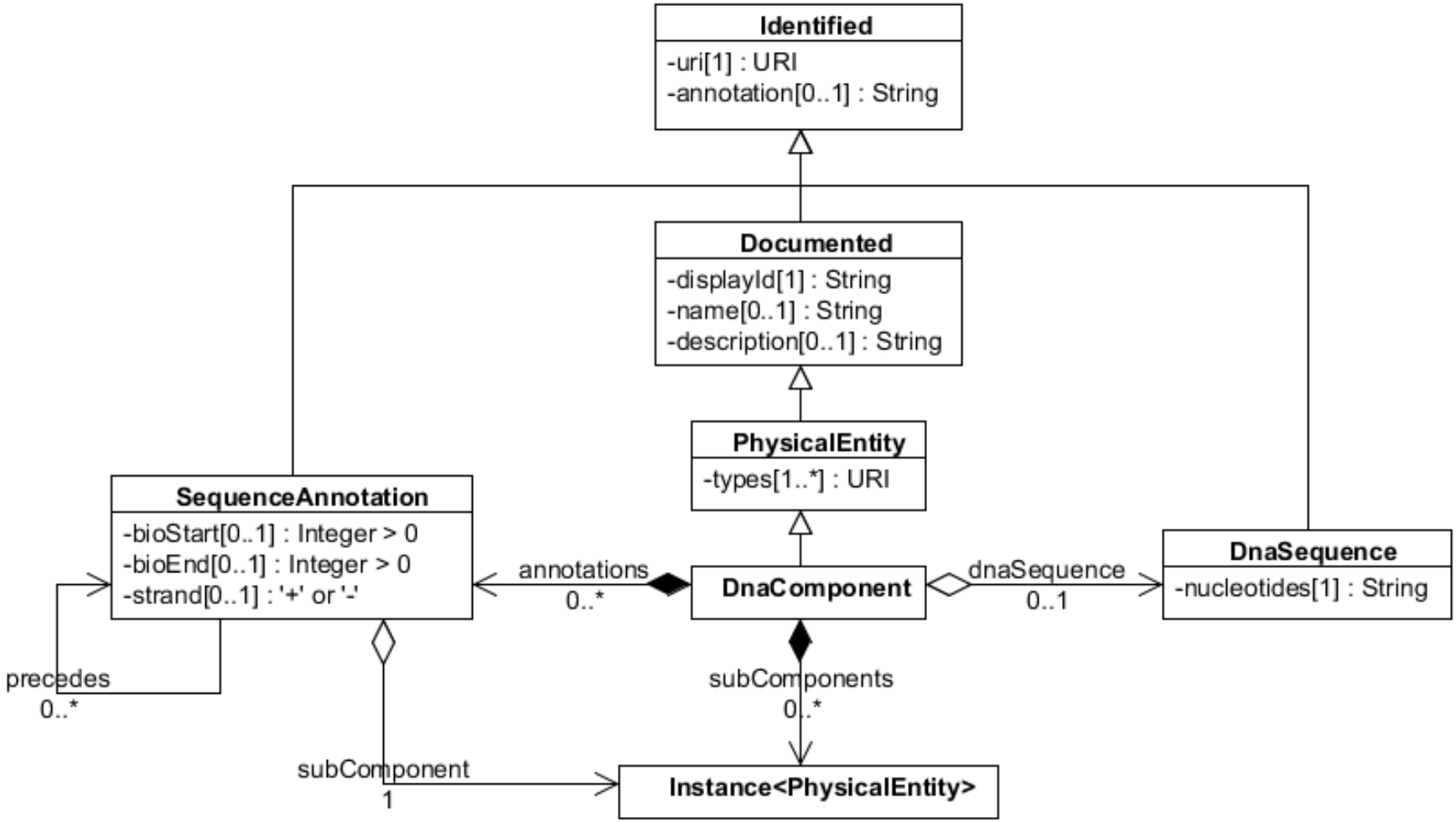
- Ports
- Instantiation
- Port Mapping and Mixed Hierarchy

UML Conventions

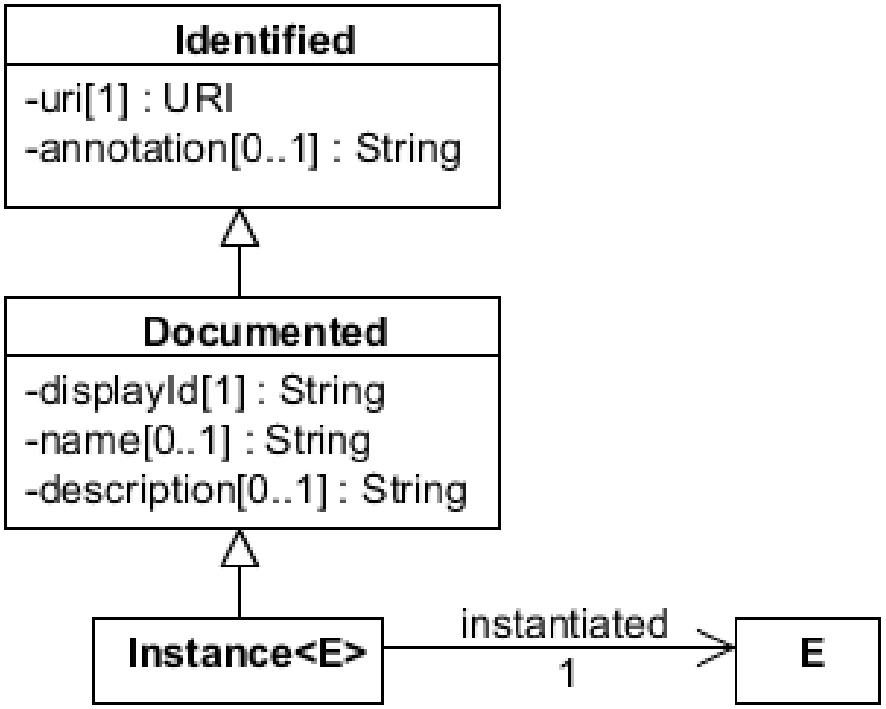


- Inheritance
- Composition
- Aggregation
- Association
- Class

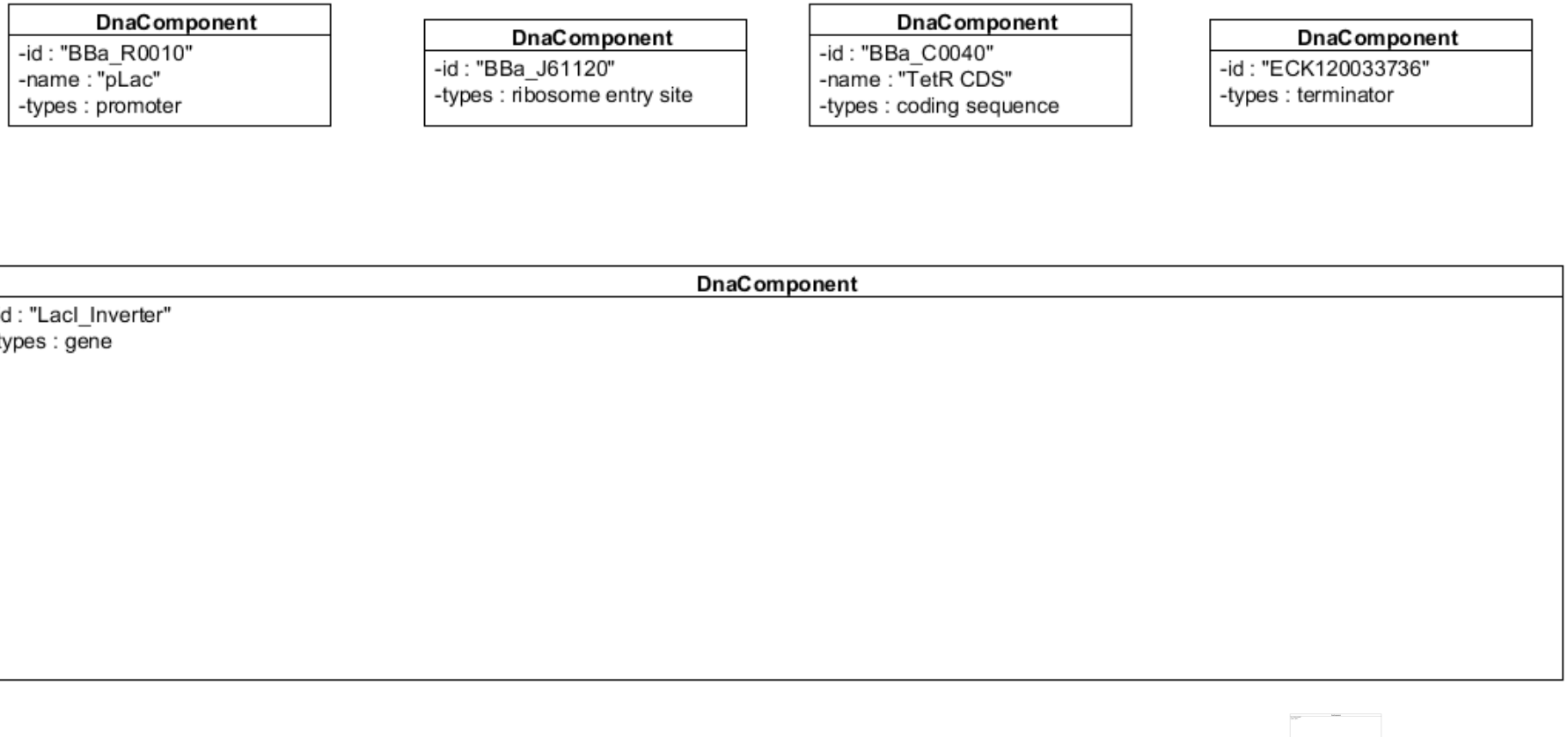
Data Model: DNA Component



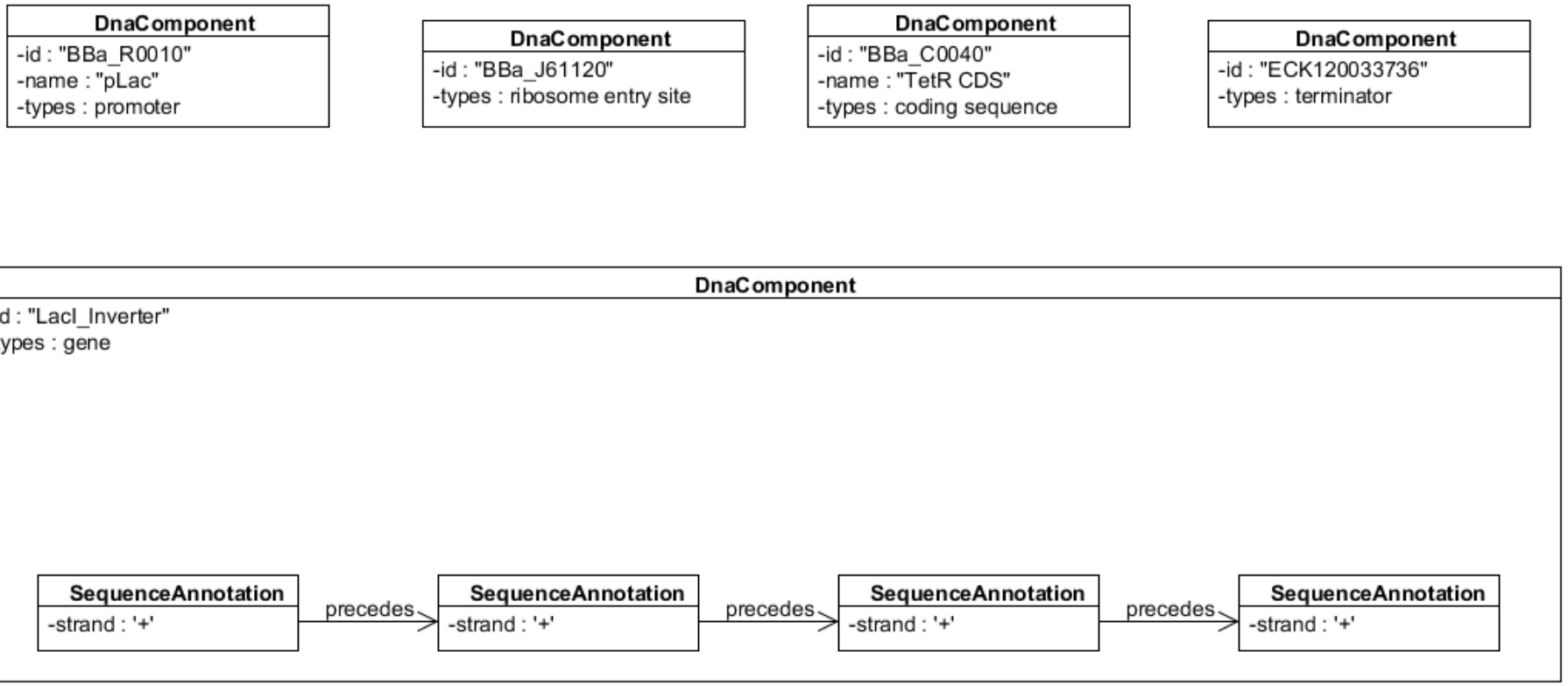
Data Model: Instance



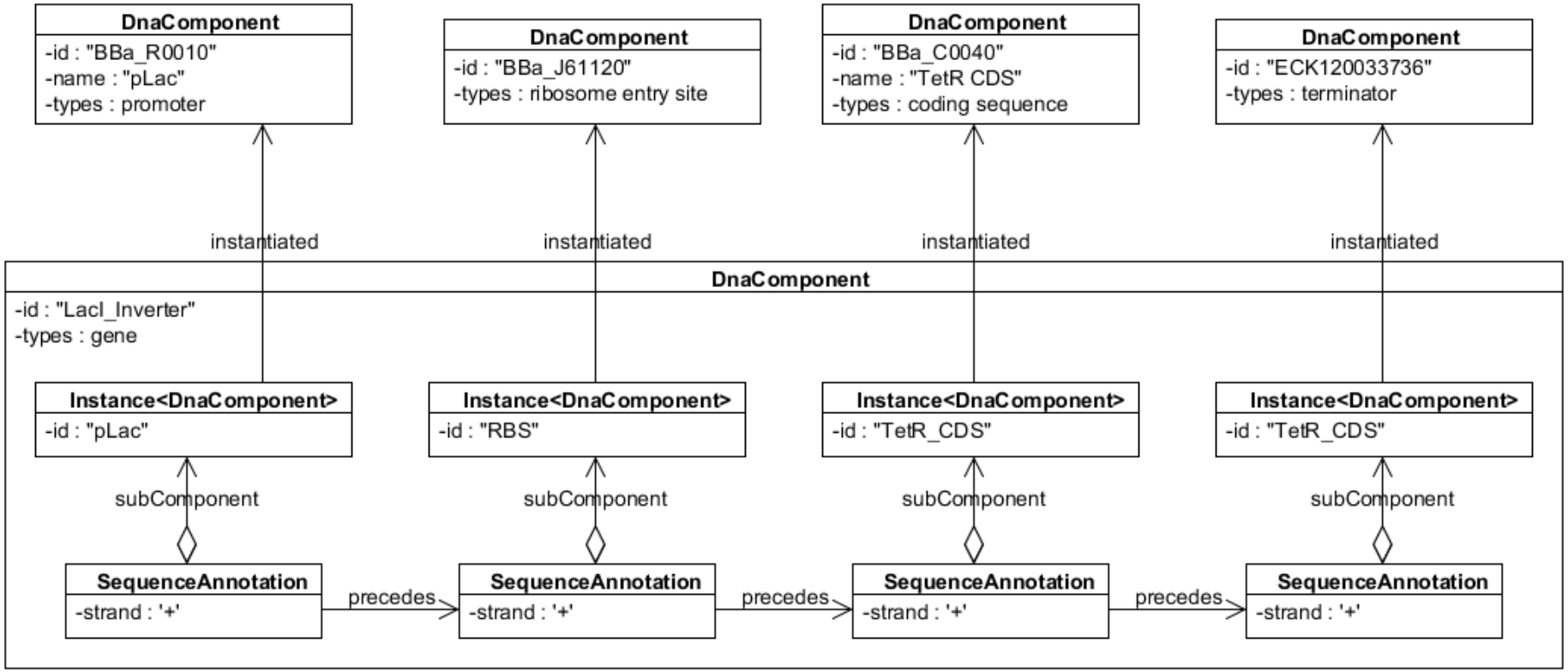
Example: DNA Components



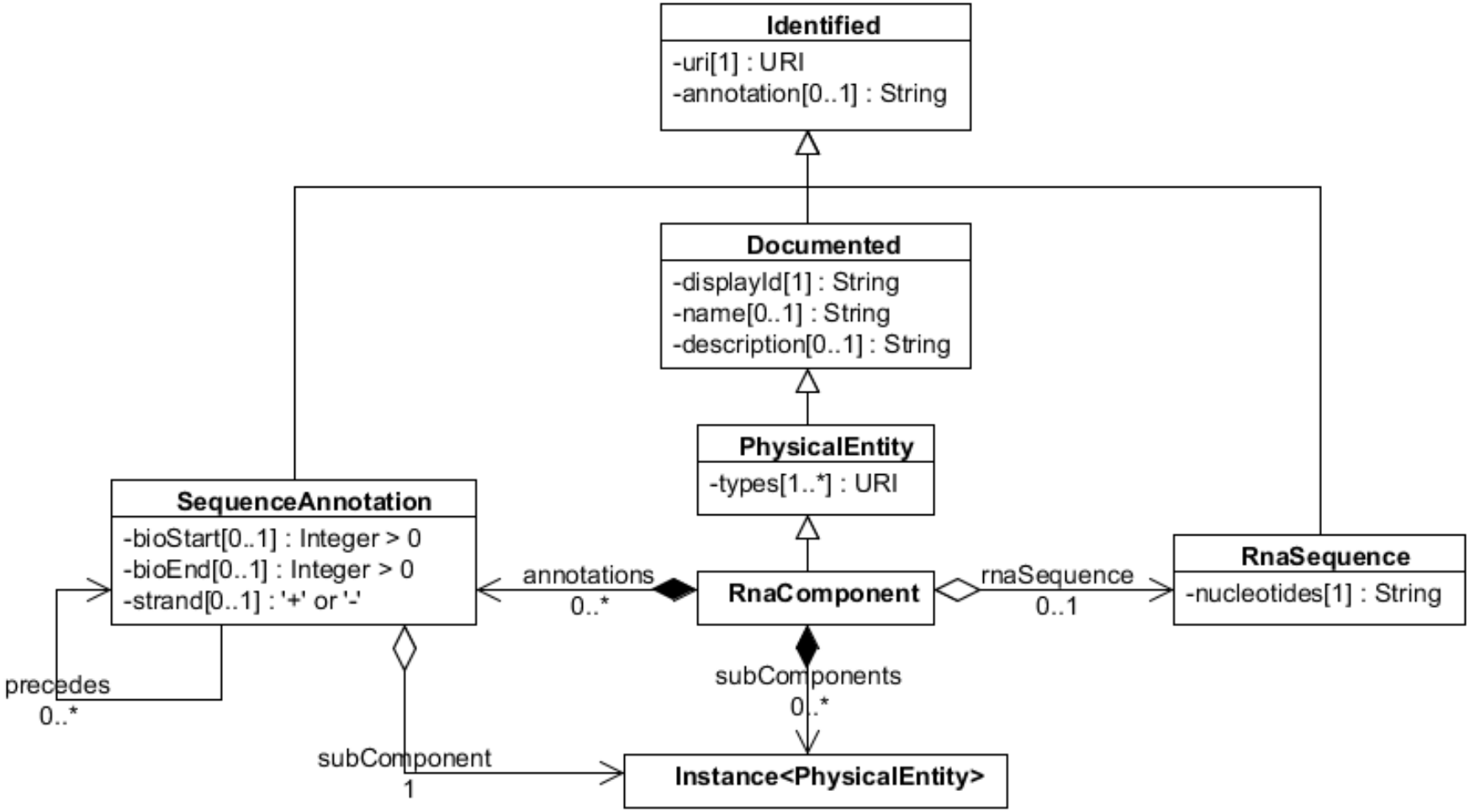
Example: Sequence Annotations



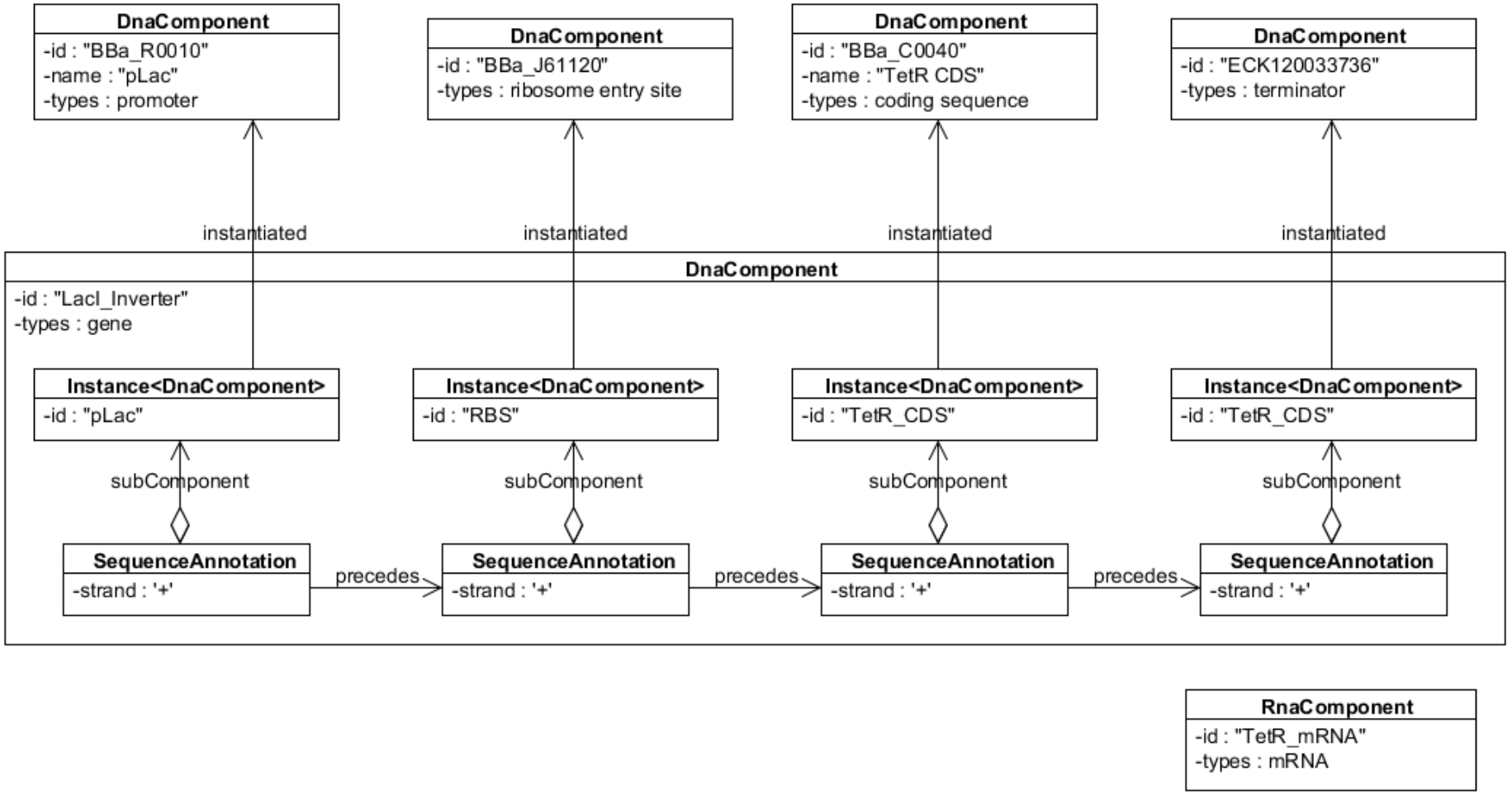
Example: Instantiation



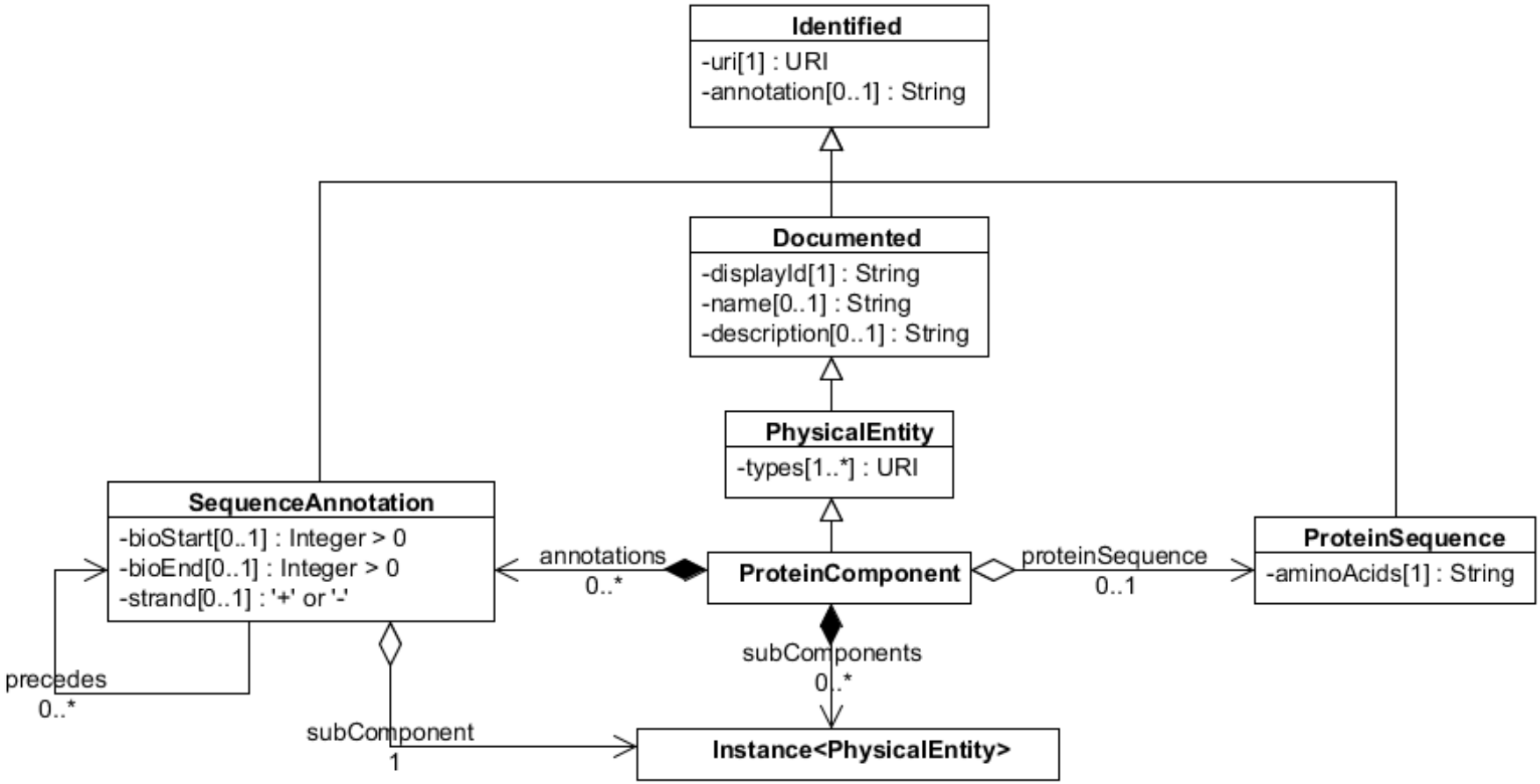
Data Model: RNA Component



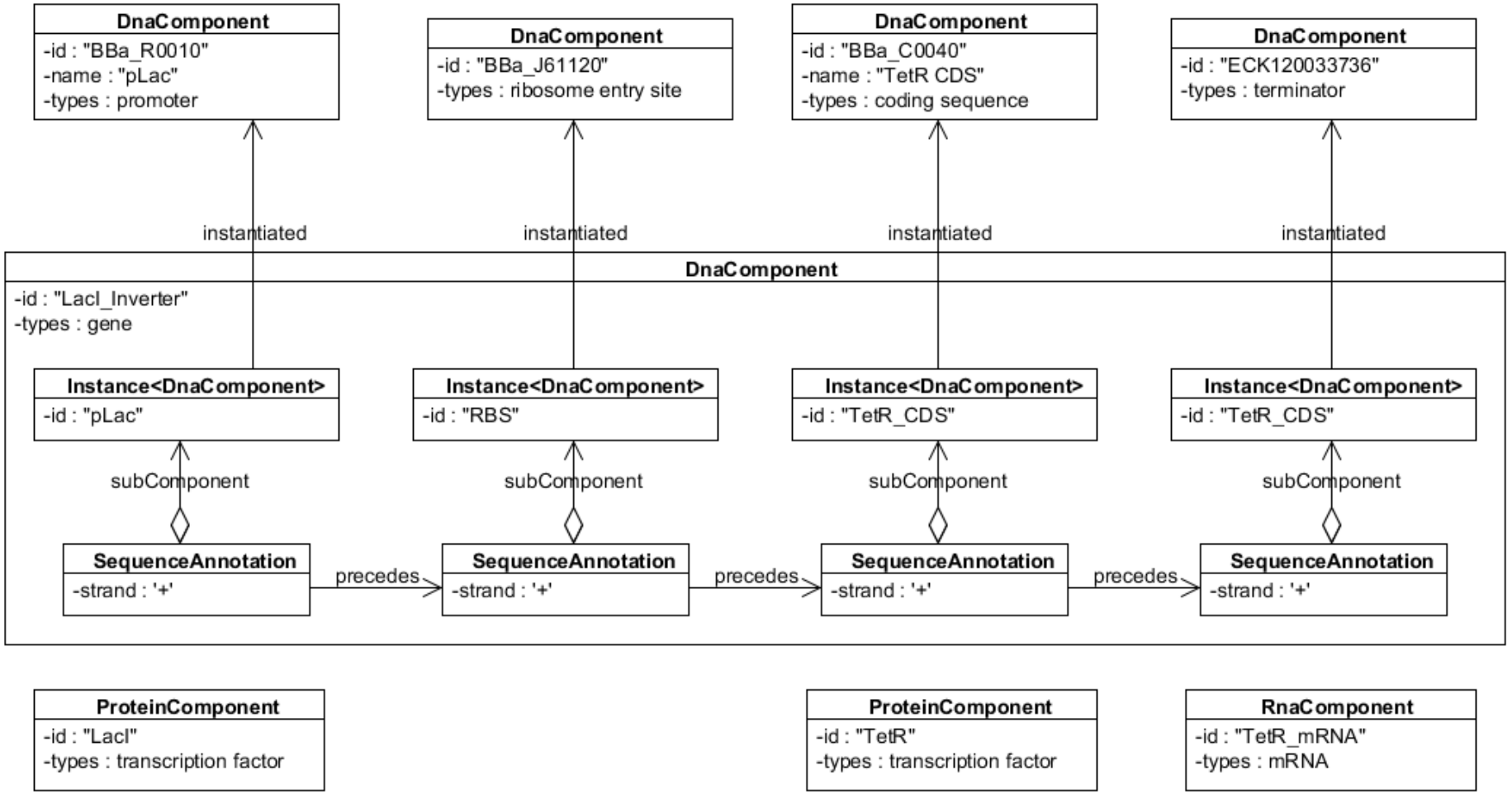
Example: RNA Component



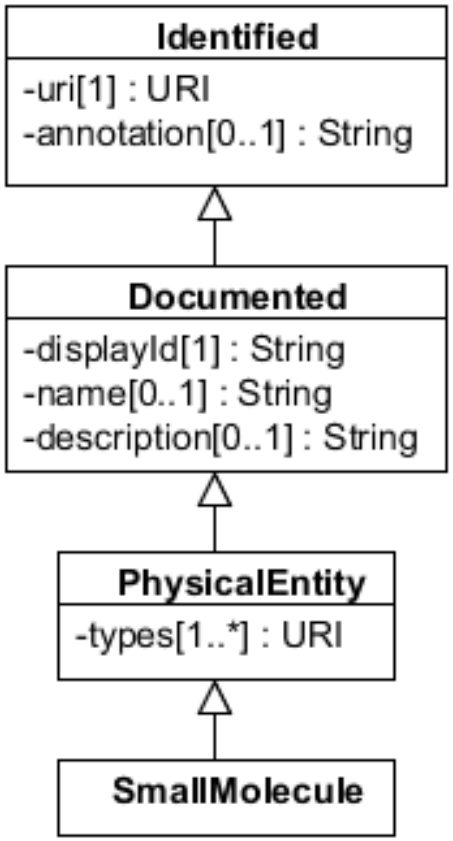
Data Model: Protein Component



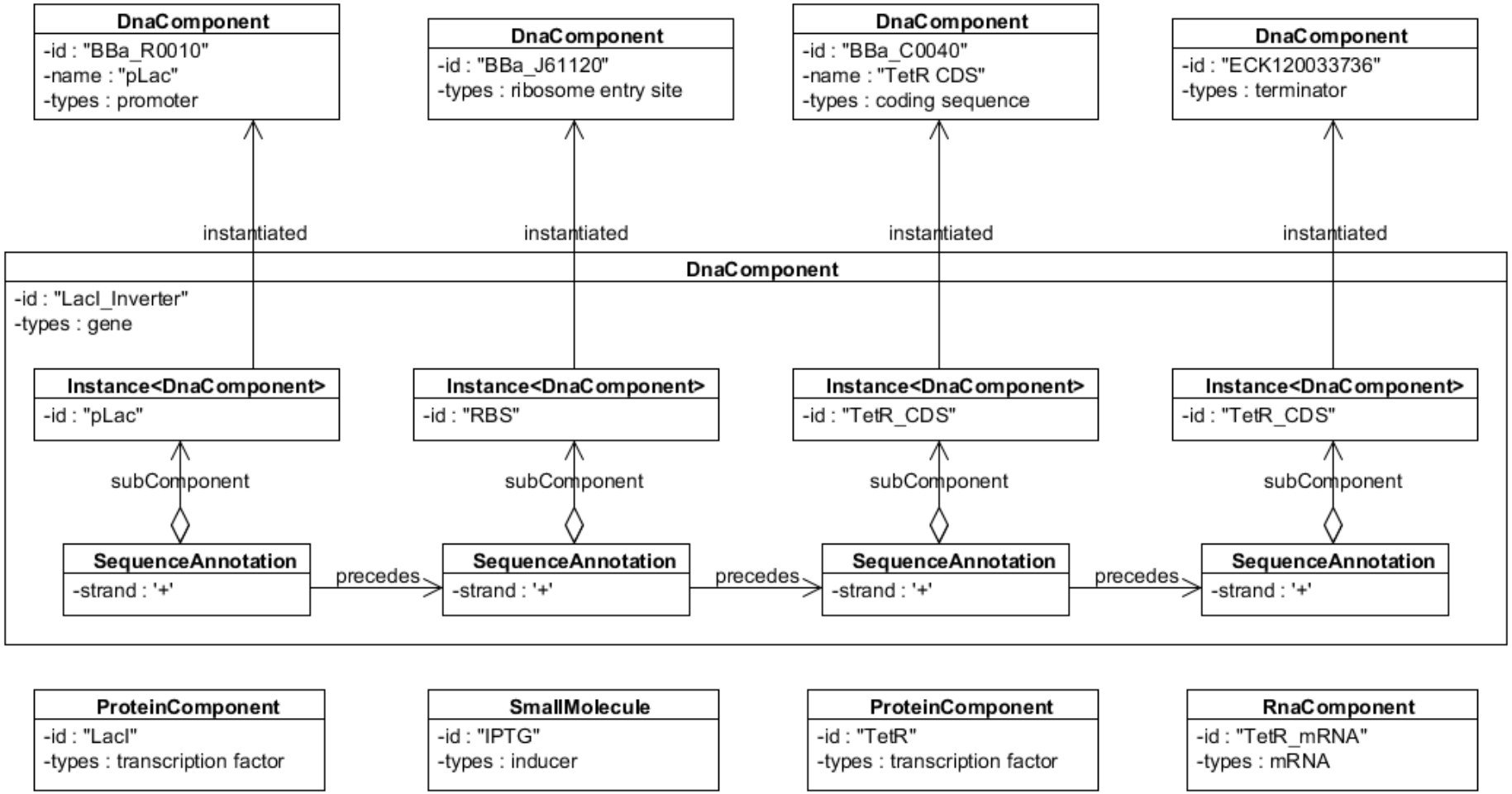
Example: Protein Components



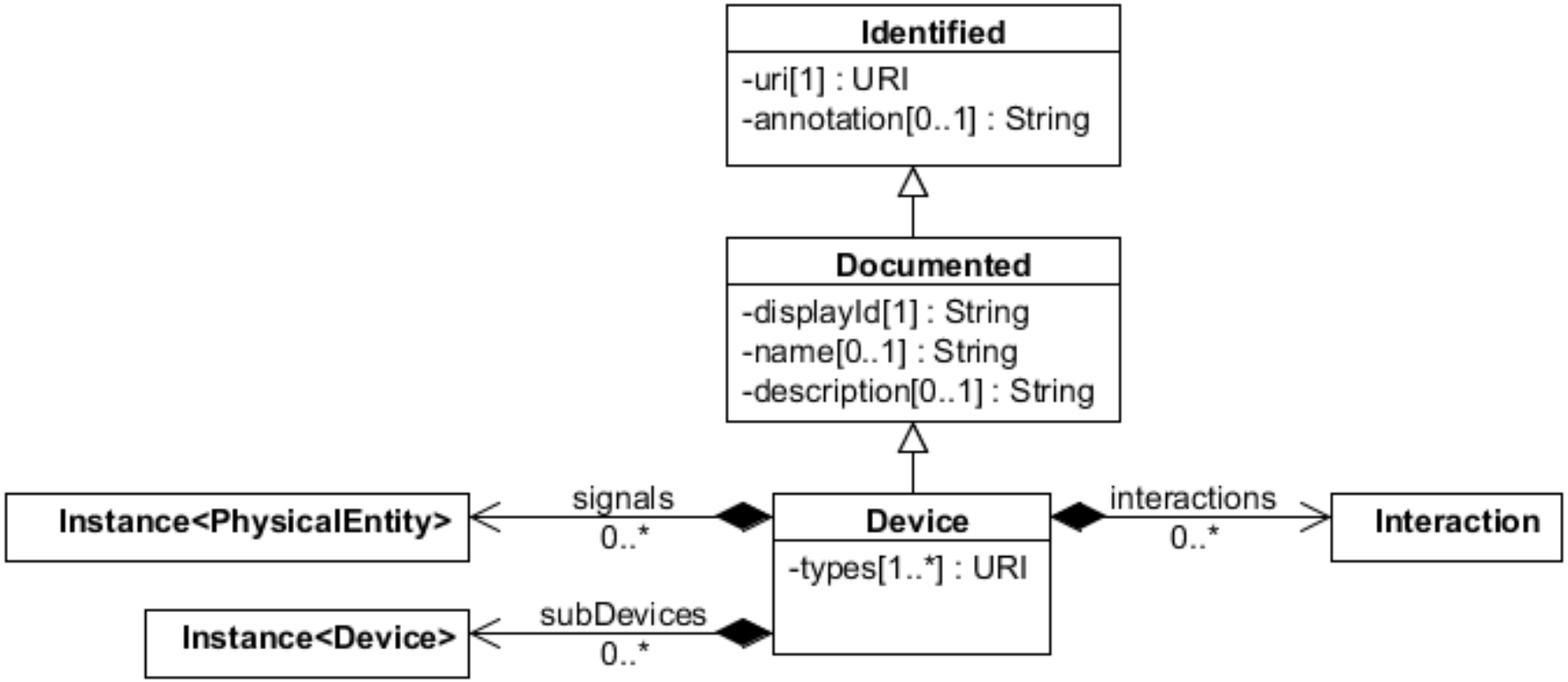
Data Model: Small Molecule



Example: Small Molecule



Data Model: Device



Example: Device

PhysicalEntity
-id : "IPTG_LacI_Complex" -types : complex

ProteinComponent
-id : "TetR" -types : transcription factor

RnaComponent
-id : "TetR_mRNA" -types : mRNA

Device
-id : "LacI_Inverter" -types : inverter

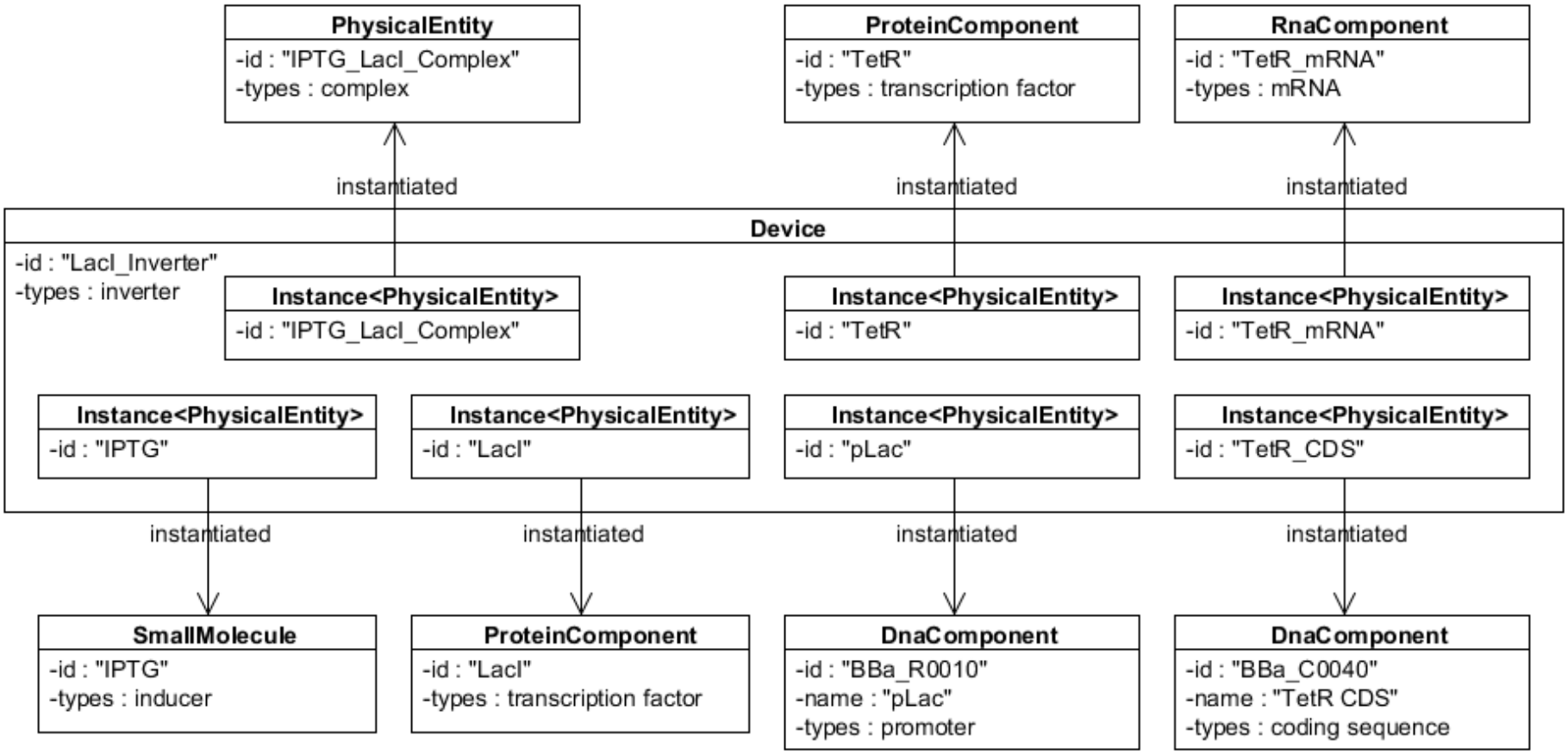
SmallMolecule
-id : "IPTG" -types : inducer

ProteinComponent
-id : "LacI" -types : transcription factor

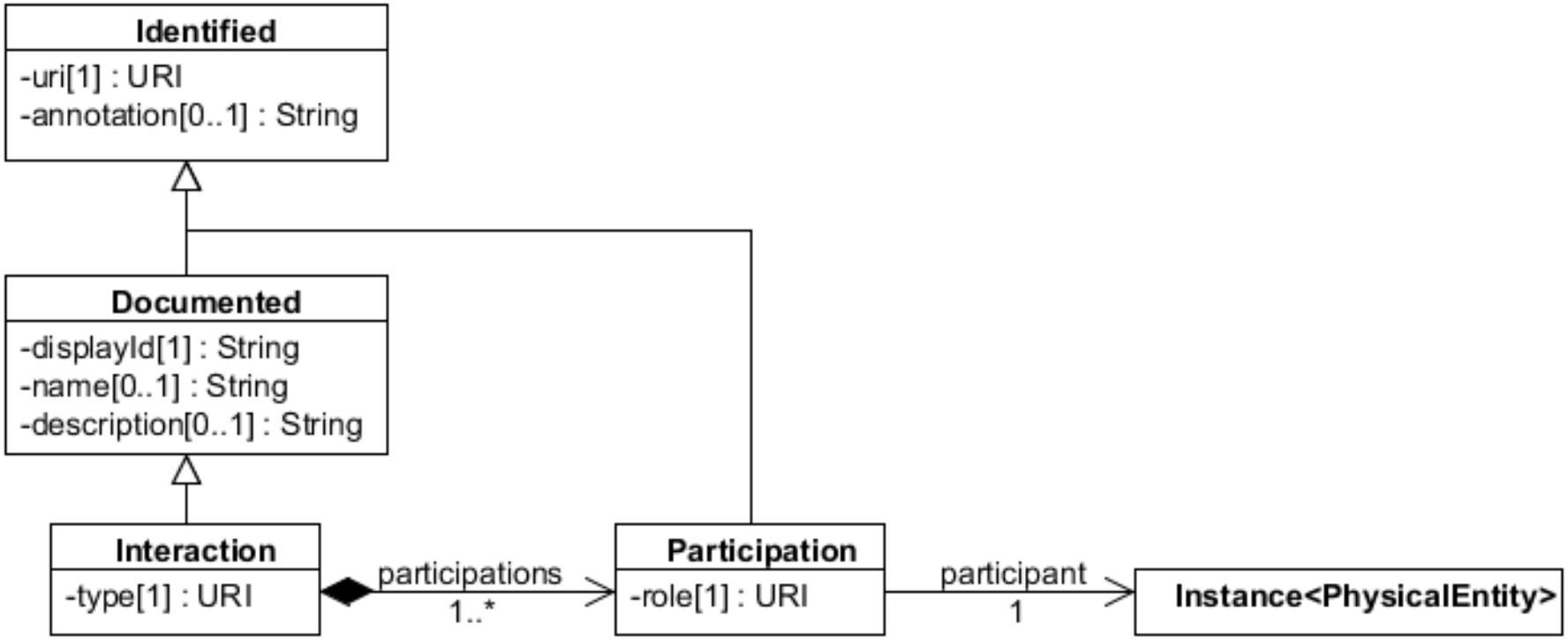
DnaComponent
-id : "BBa_R0010" -name : "pLac" -types : promoter

DnaComponent
-id : "BBa_C0040" -name : "TetR CDS" -types : coding sequence

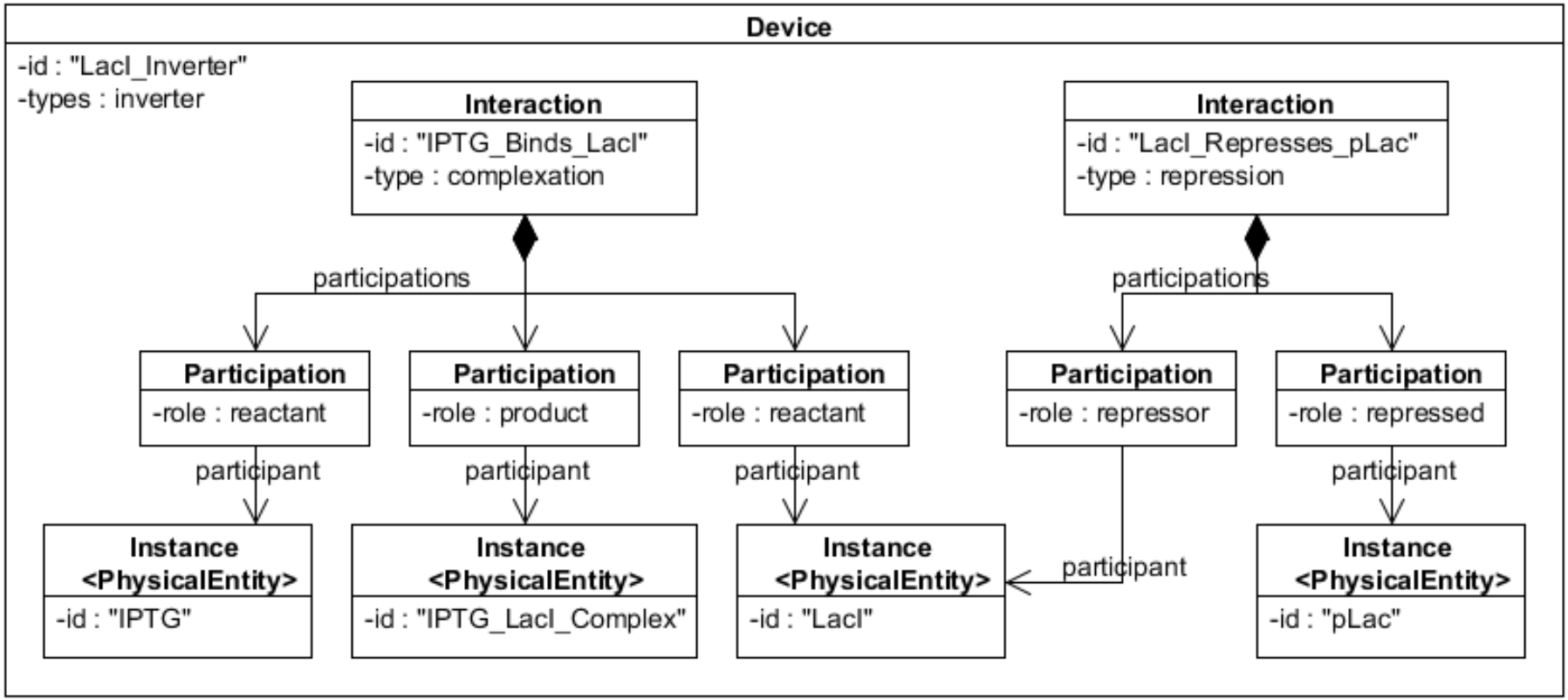
Example: Instantiation



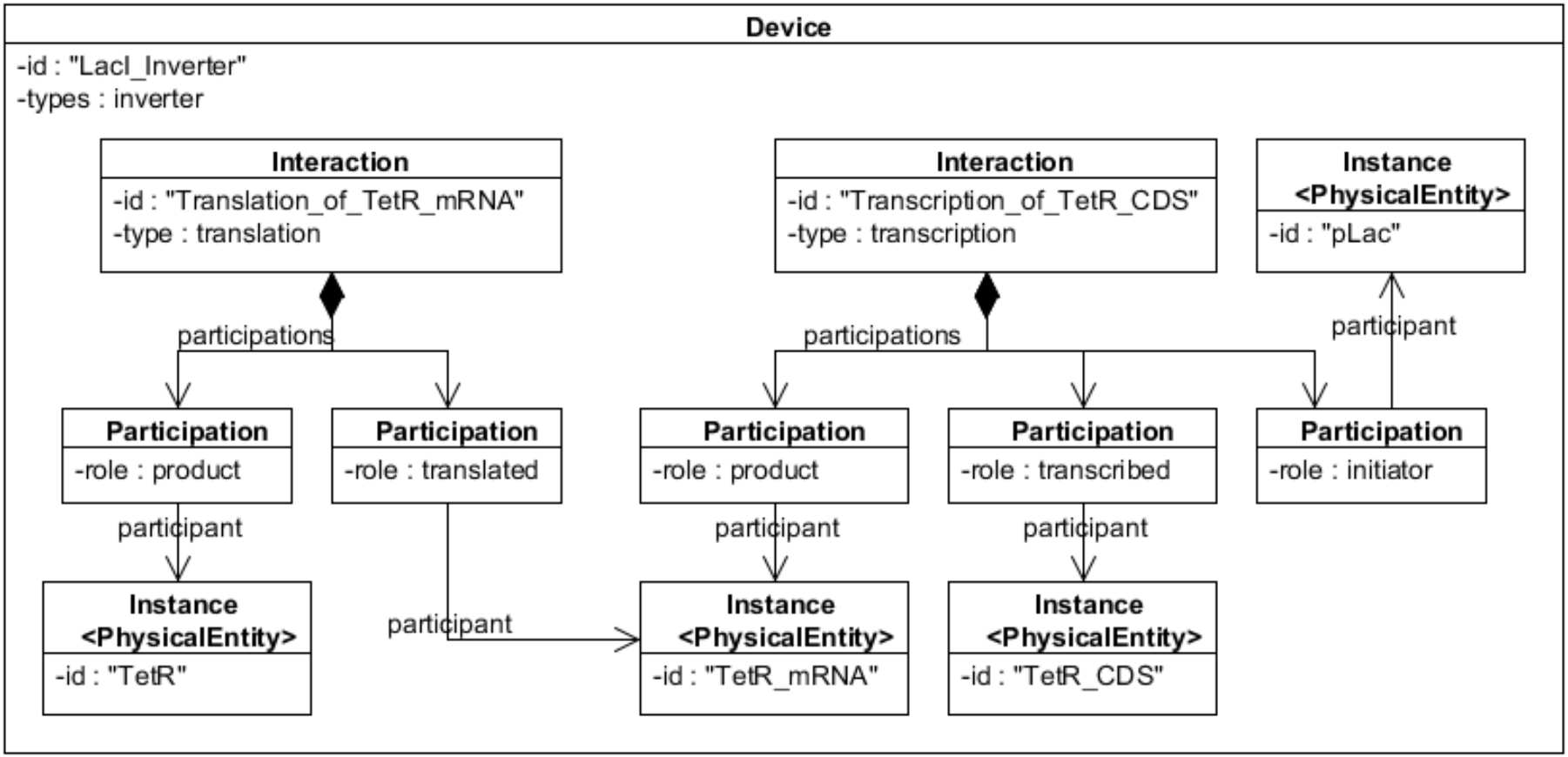
Data Model: Interactions



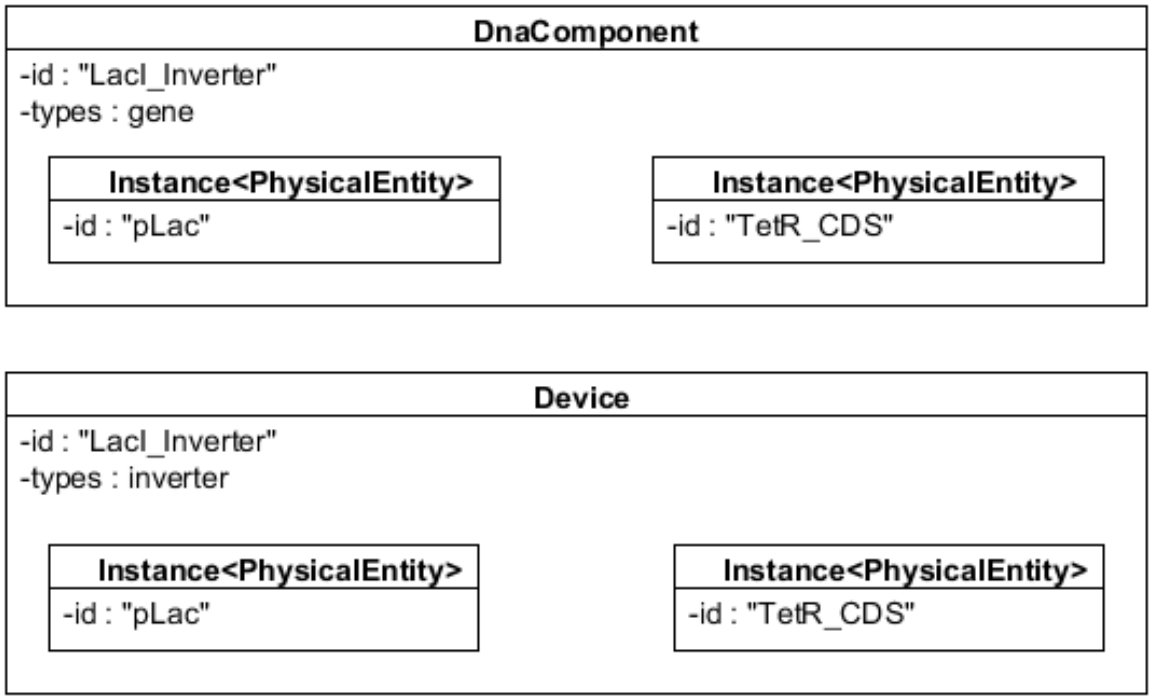
Example: Interactions



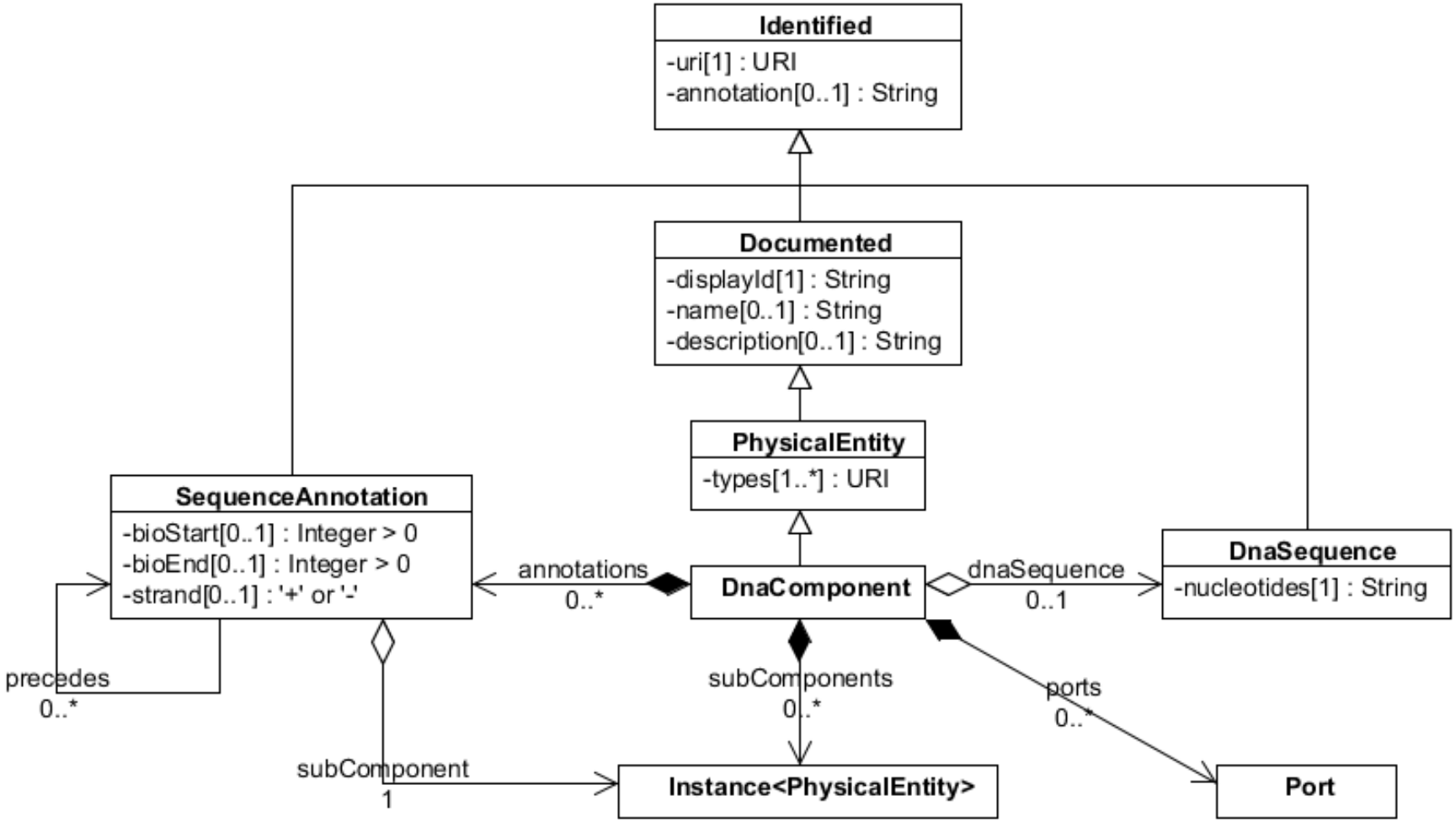
Example: Interactions



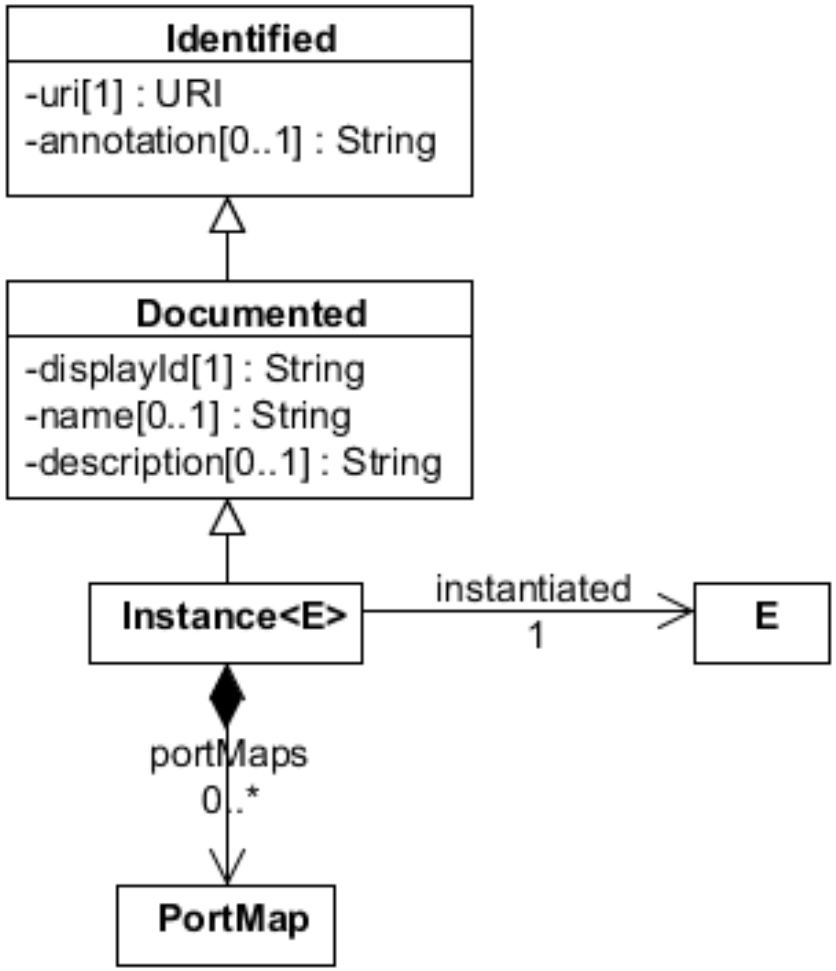
Functional Composition Pt. 1



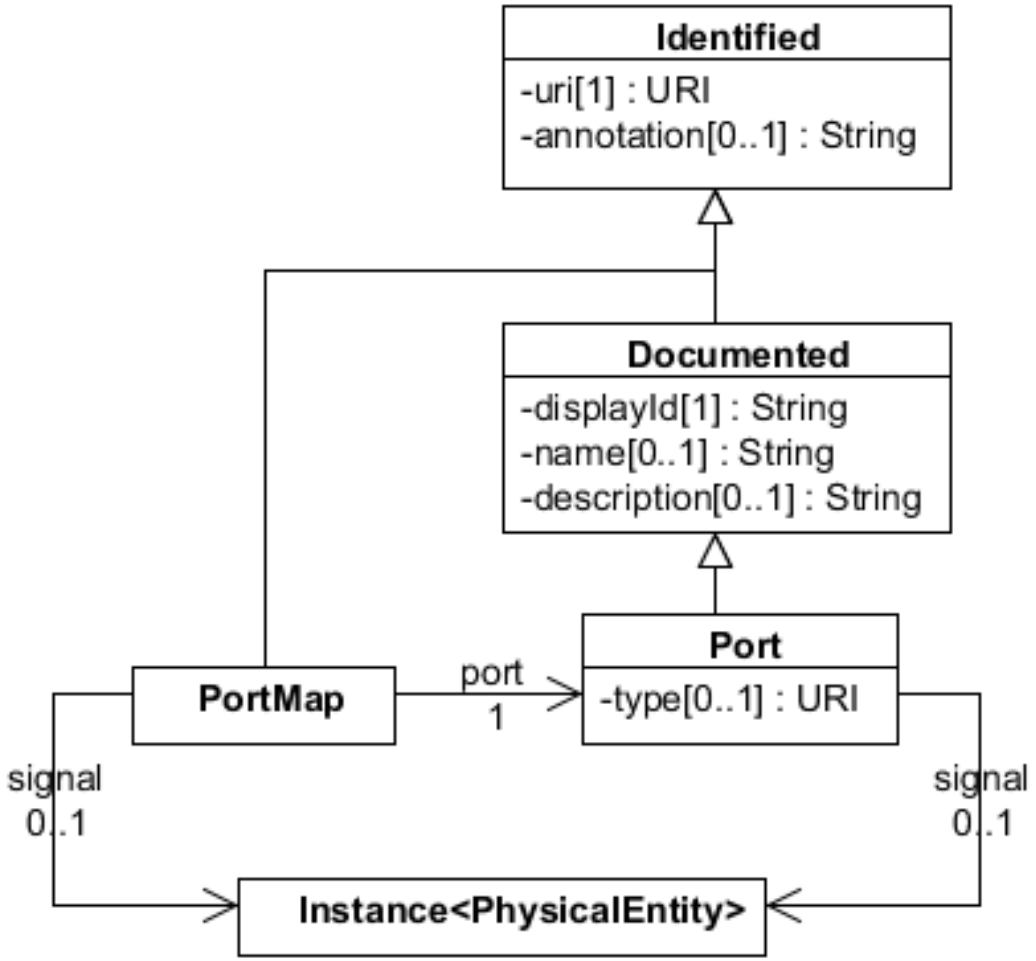
Data Model Revisited: DNA Component



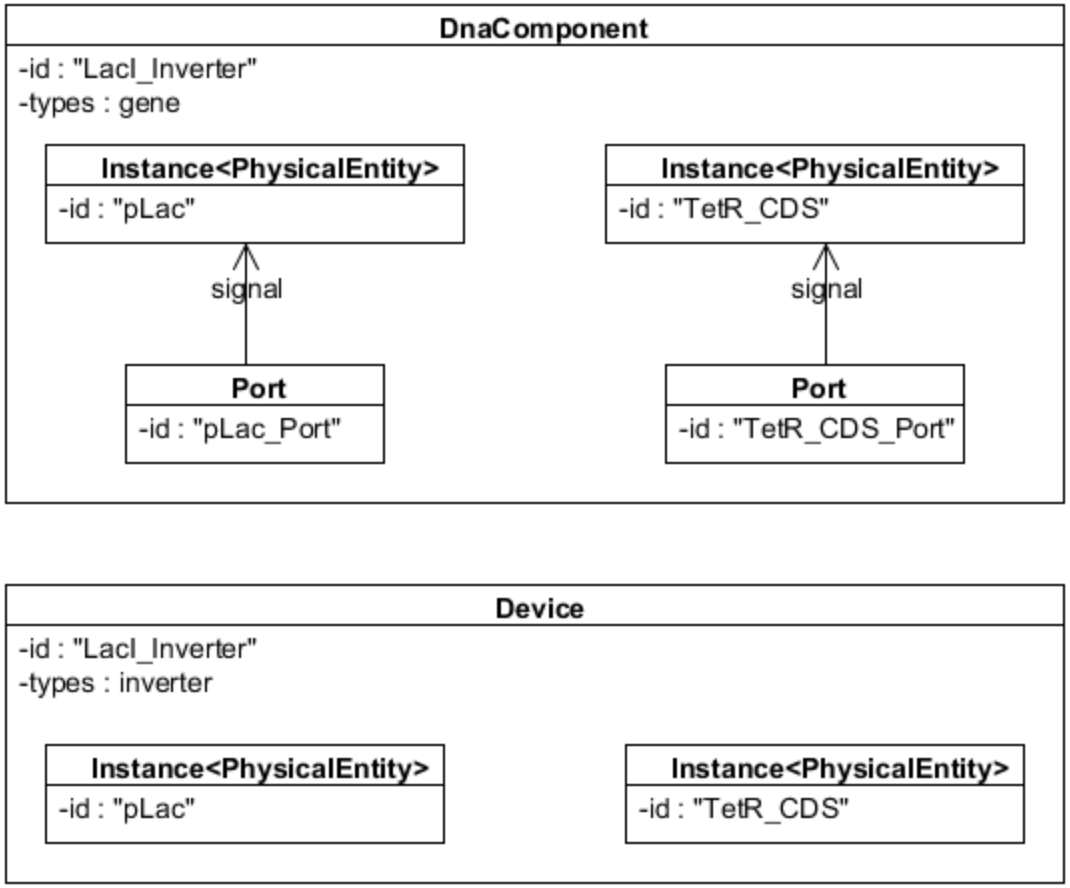
Data Model Revisited: DNA Component



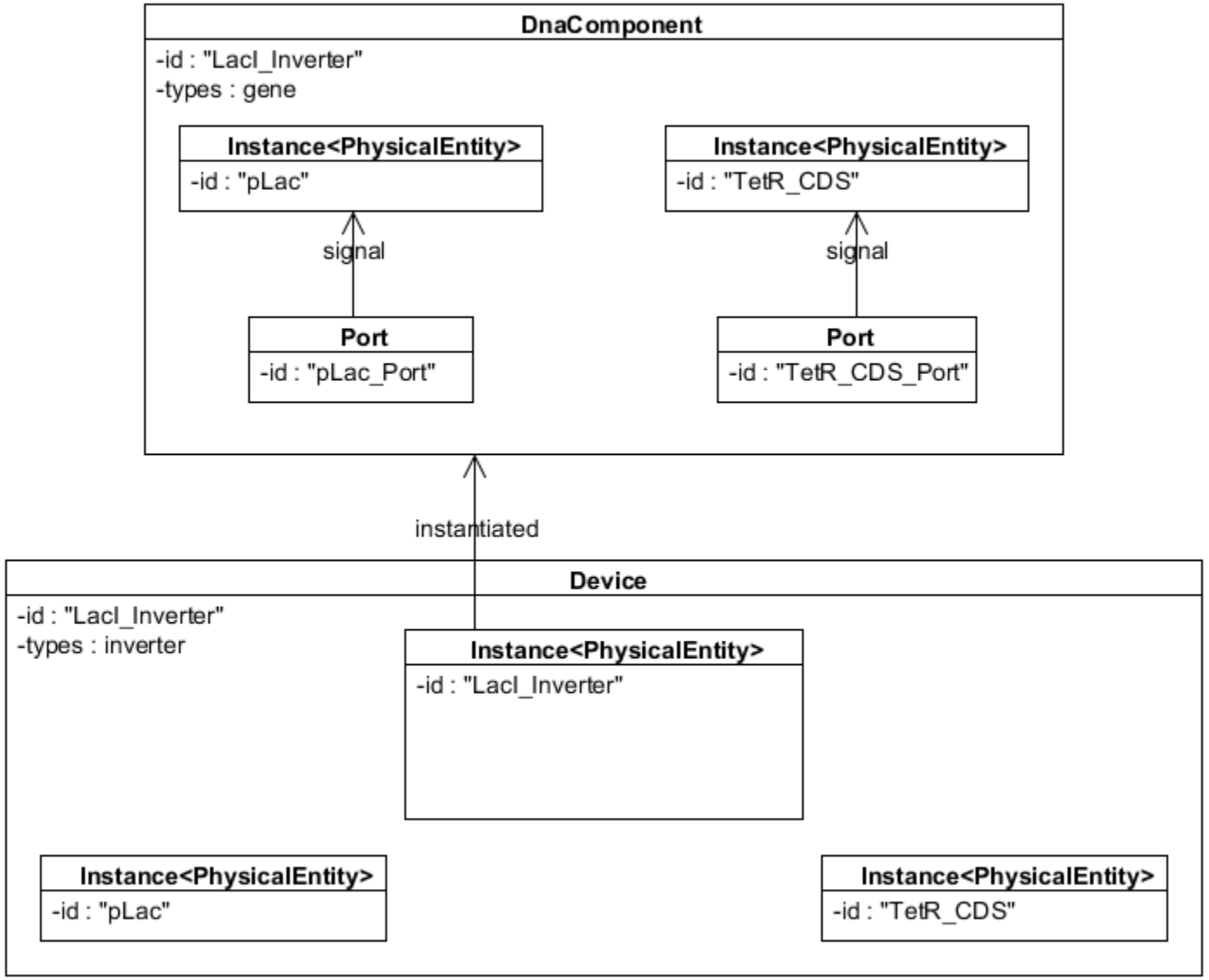
Data Model: Ports



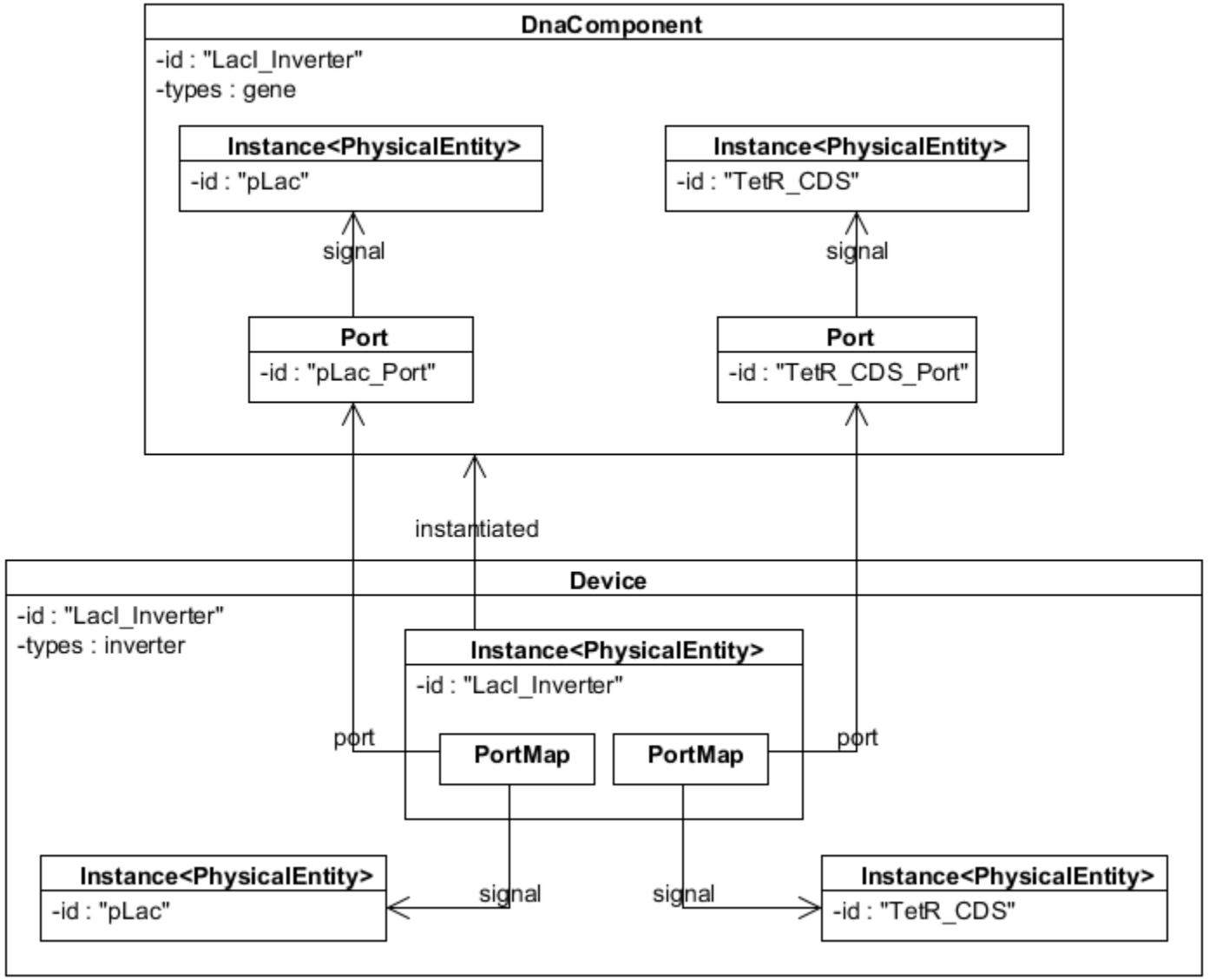
Example: Ports



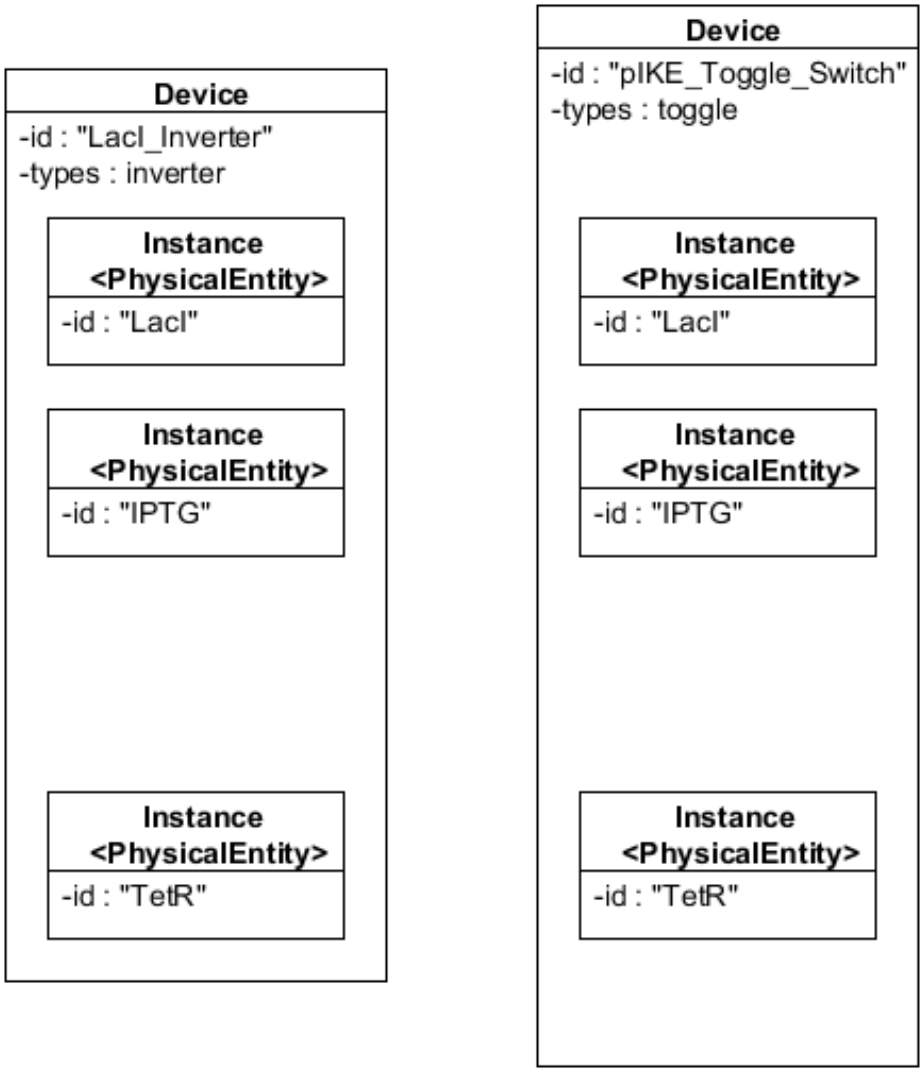
Example: Instantiation



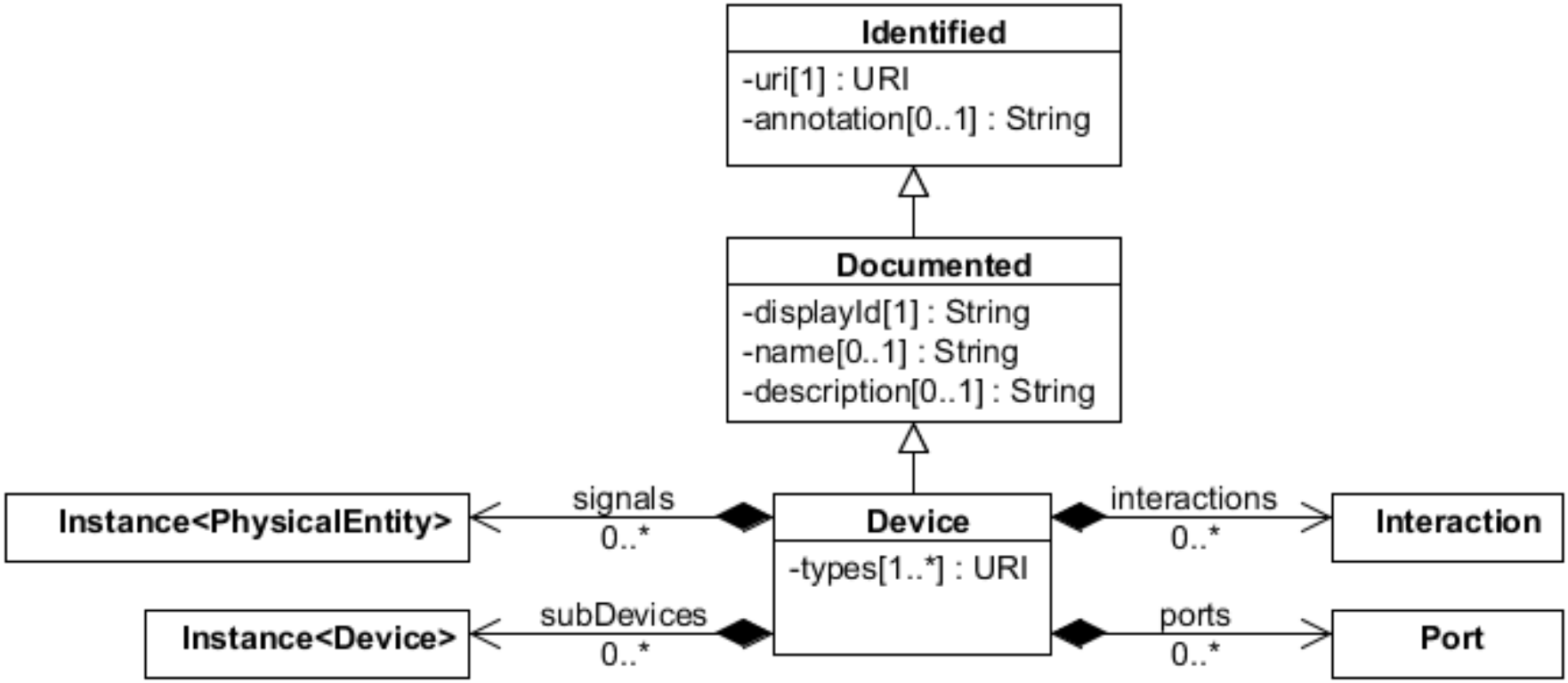
Example: Port Mapping



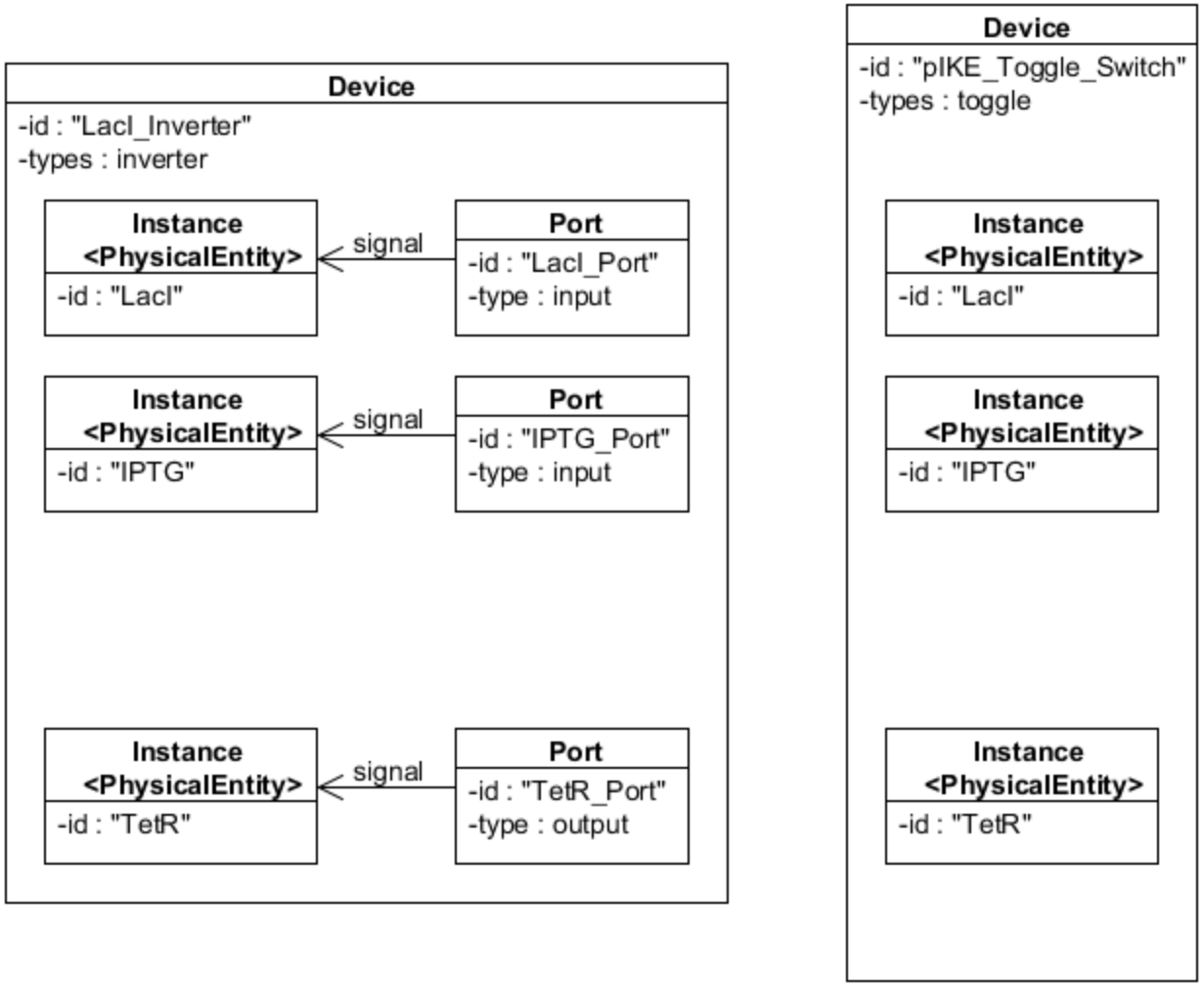
Functional Composition Pt. 2



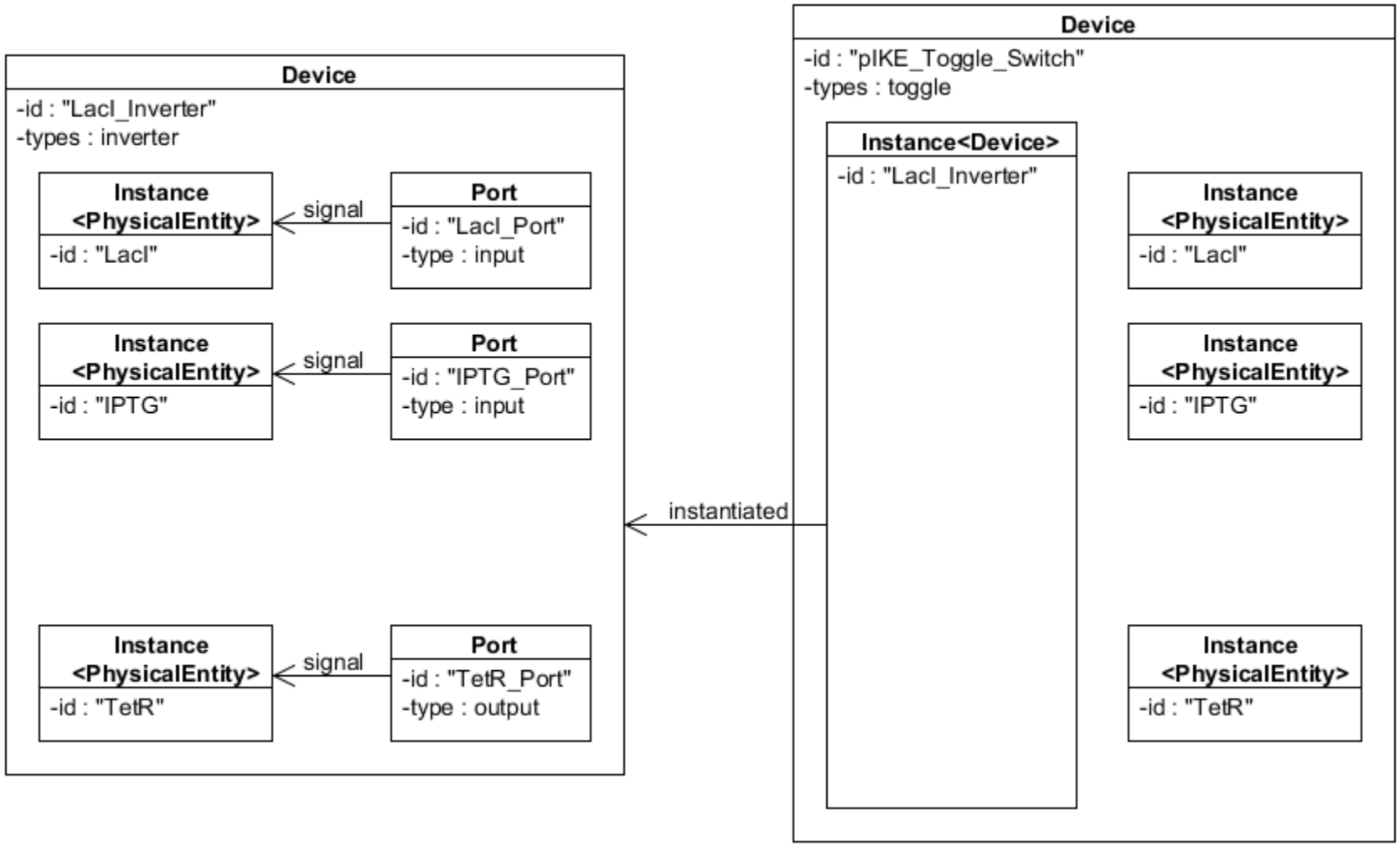
Data Model Revisited: Device



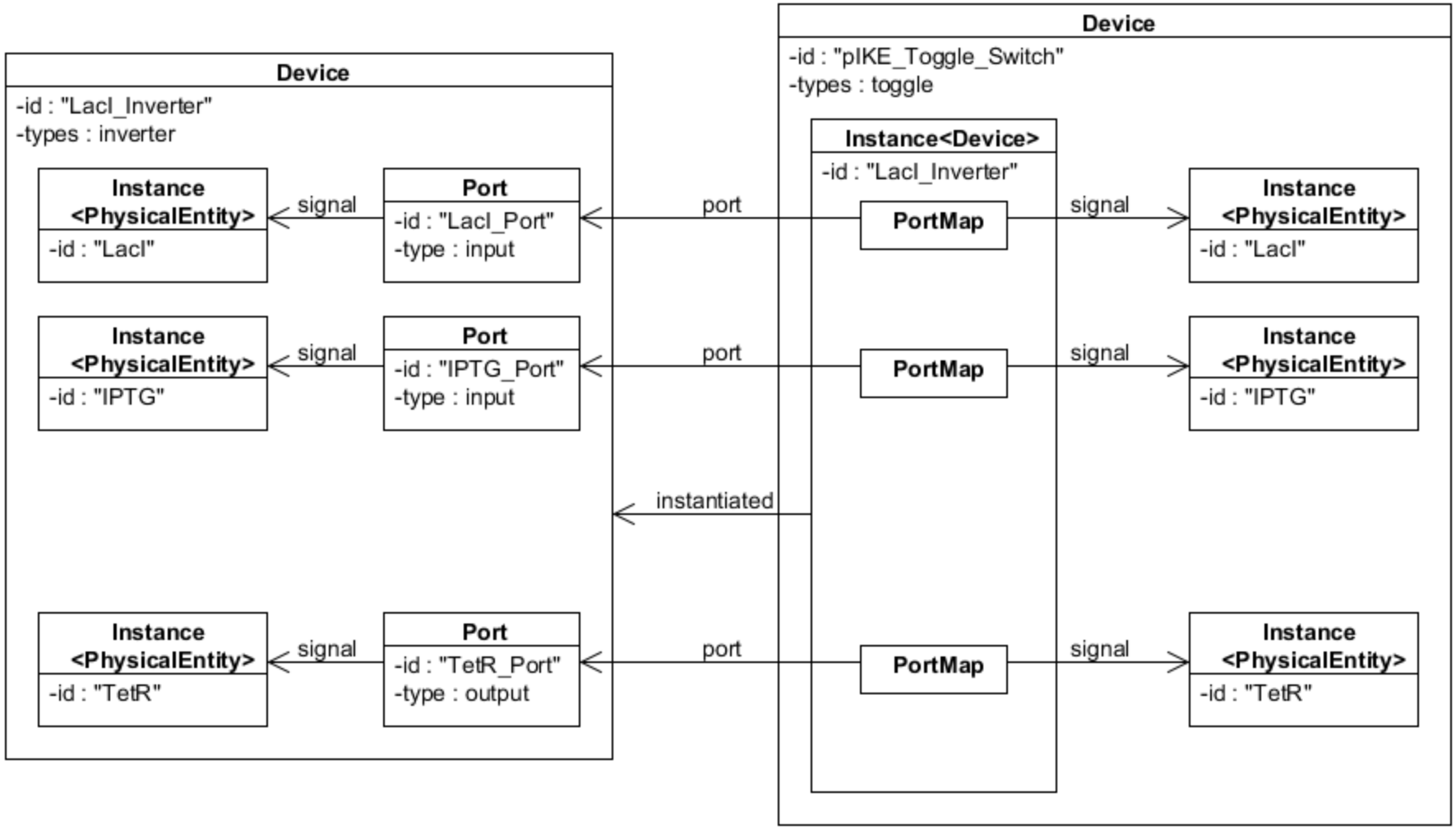
Example: Ports



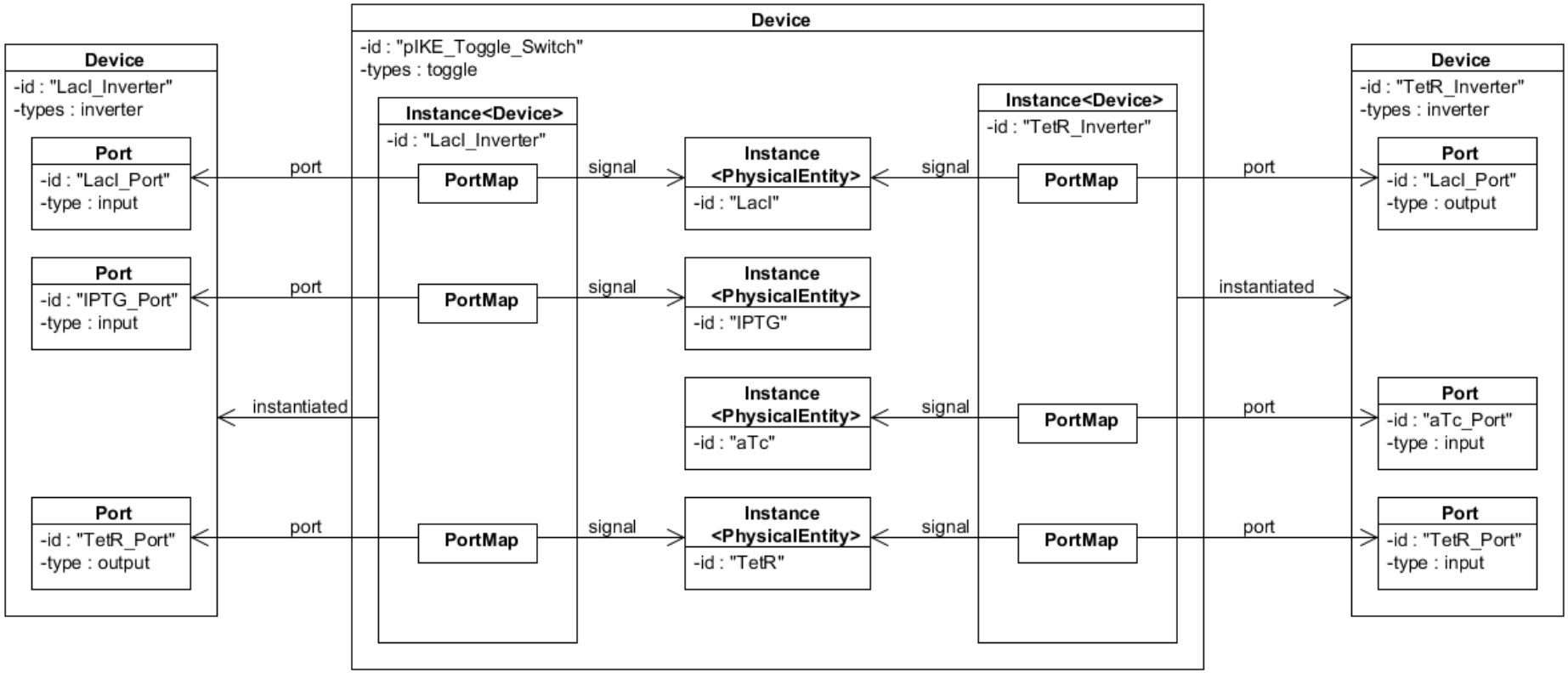
Example: Instantiation



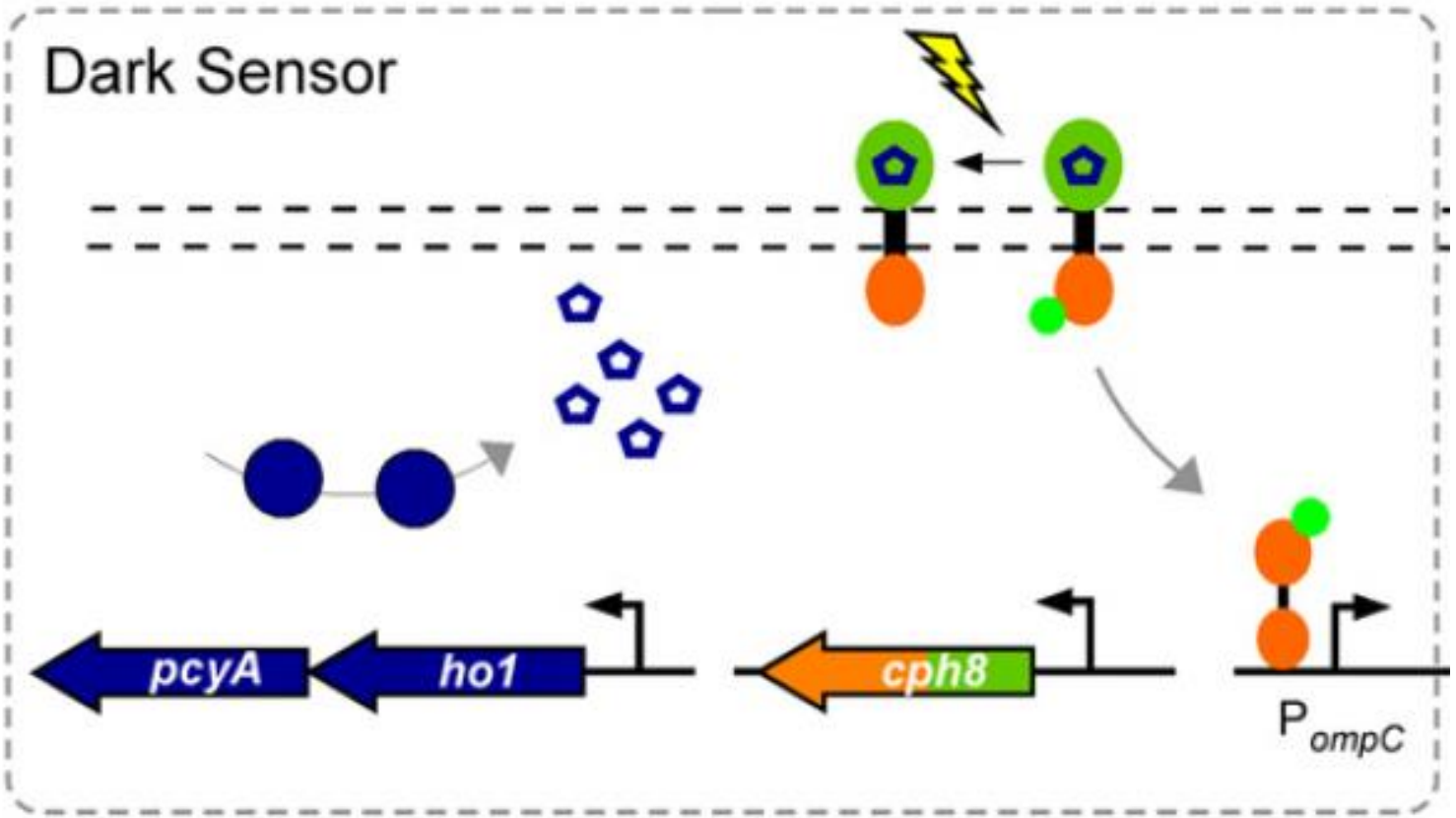
Example: Port Mapping



Toggle Switch Composed



Dark Sensor (Tabor et al. 2009)



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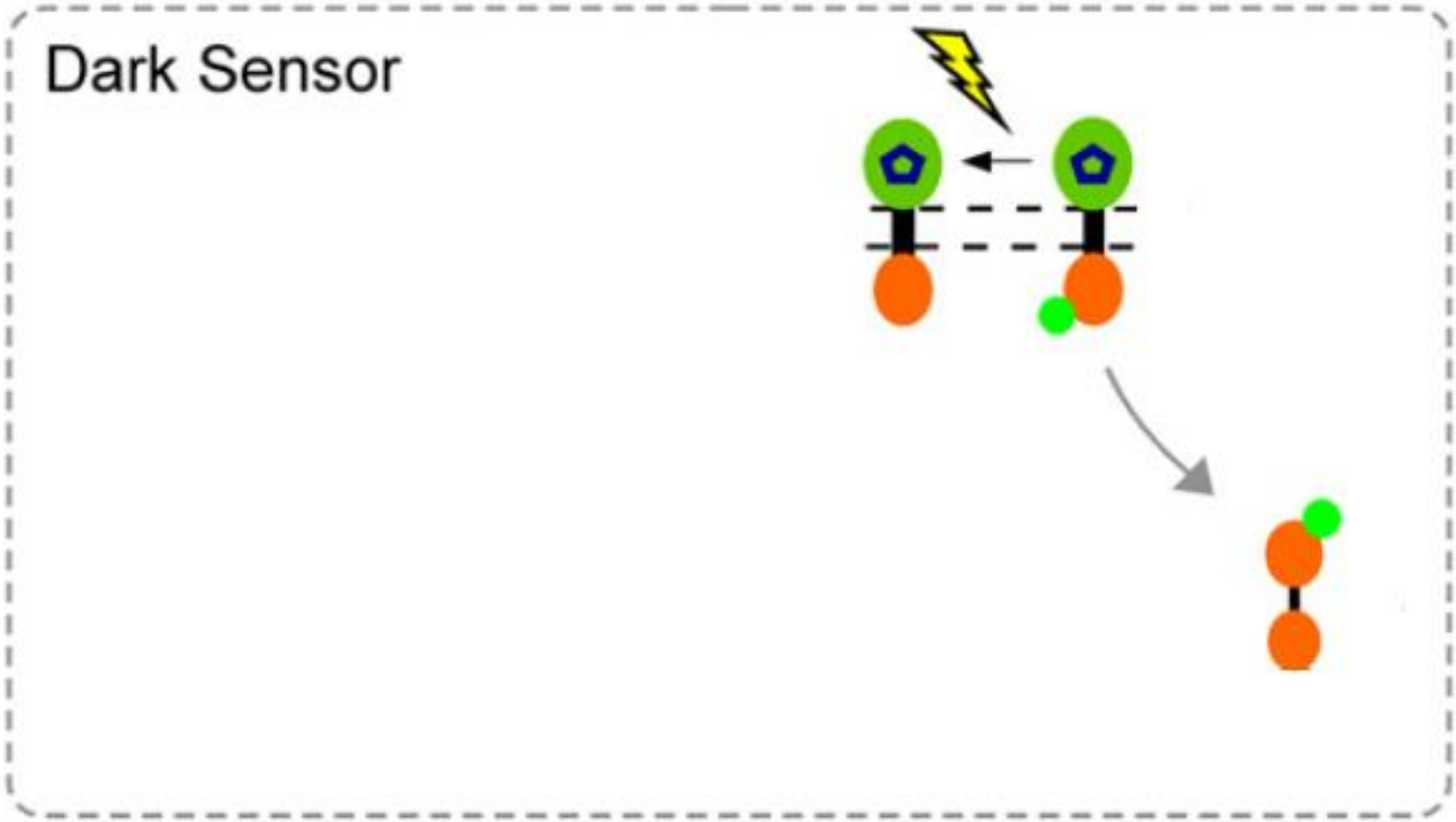
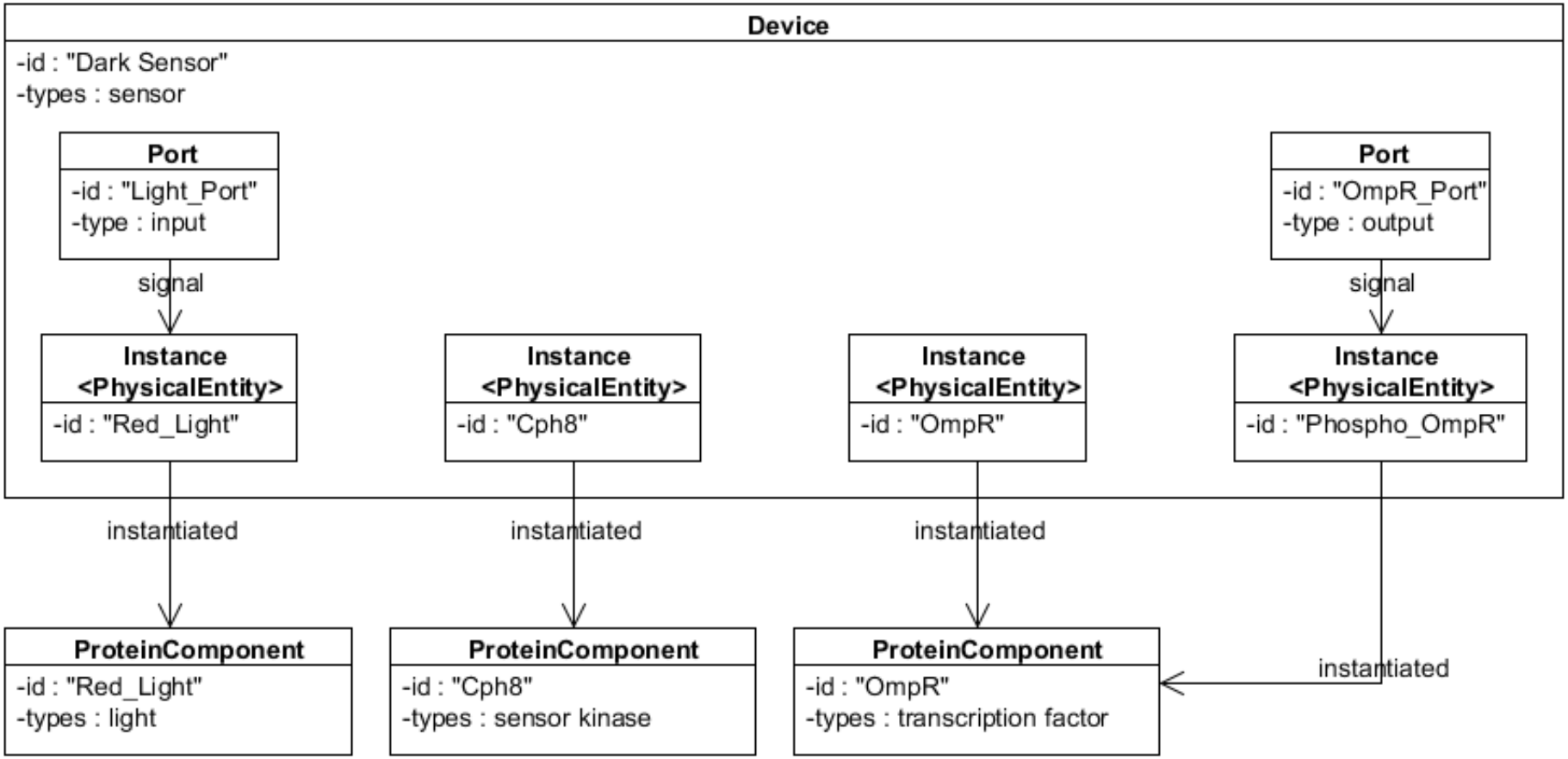
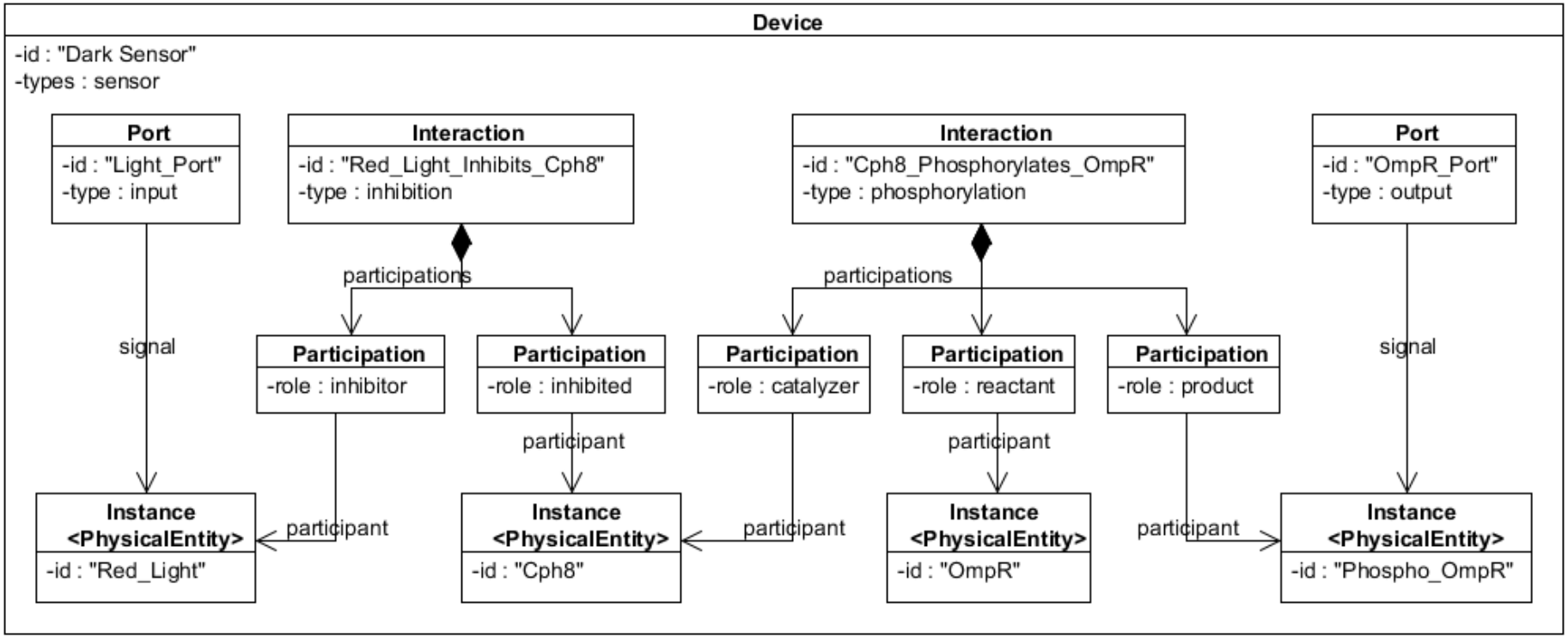


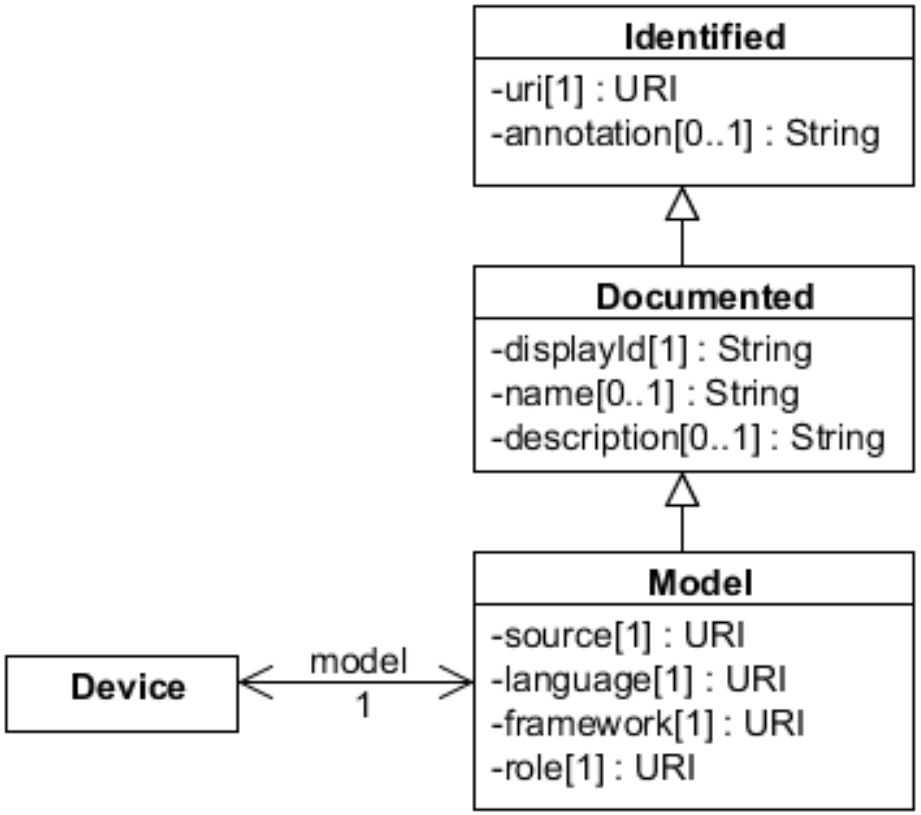
Dark Sensor: Instantiation



Dark Sensor: Interactions



Extensions Update: Modeling

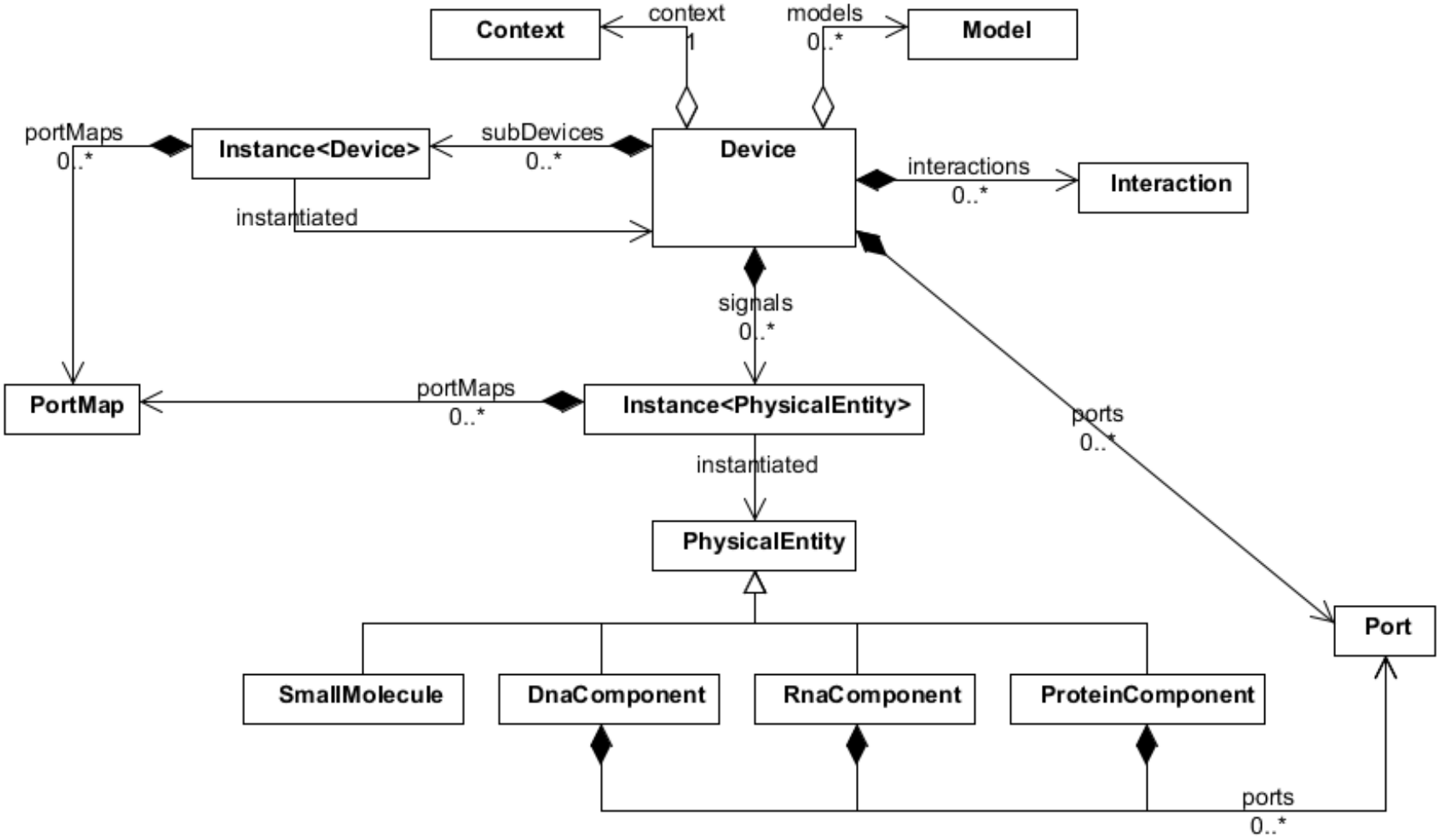


Extensions Update: Context

Canonical EX: *Repressilator*

Measurement Device	Zeiss Axiovert 135TV microscope
Environment	The temperature of the samples was maintained at 30–32 °C by using Peltier devices (Melcor)
Container	coverslip and microscope slide
Medium	minimal media 1 ml of liquid 2% SeaPlaque low-melt agarose (FMC) in media 100 uM IPTG inducer antibiotic 20 g ml-1 kanamycin or 20 g ml -1 ampicillin) minimum initial cell density OD = 0.1
Host	*E. coli* lac- strain MC4100
Composition	Genome, Repressilator and Reporter plasmids

Summary UML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