

DeSEm

Laboratory - Development of the DeseNet Protocol Stack

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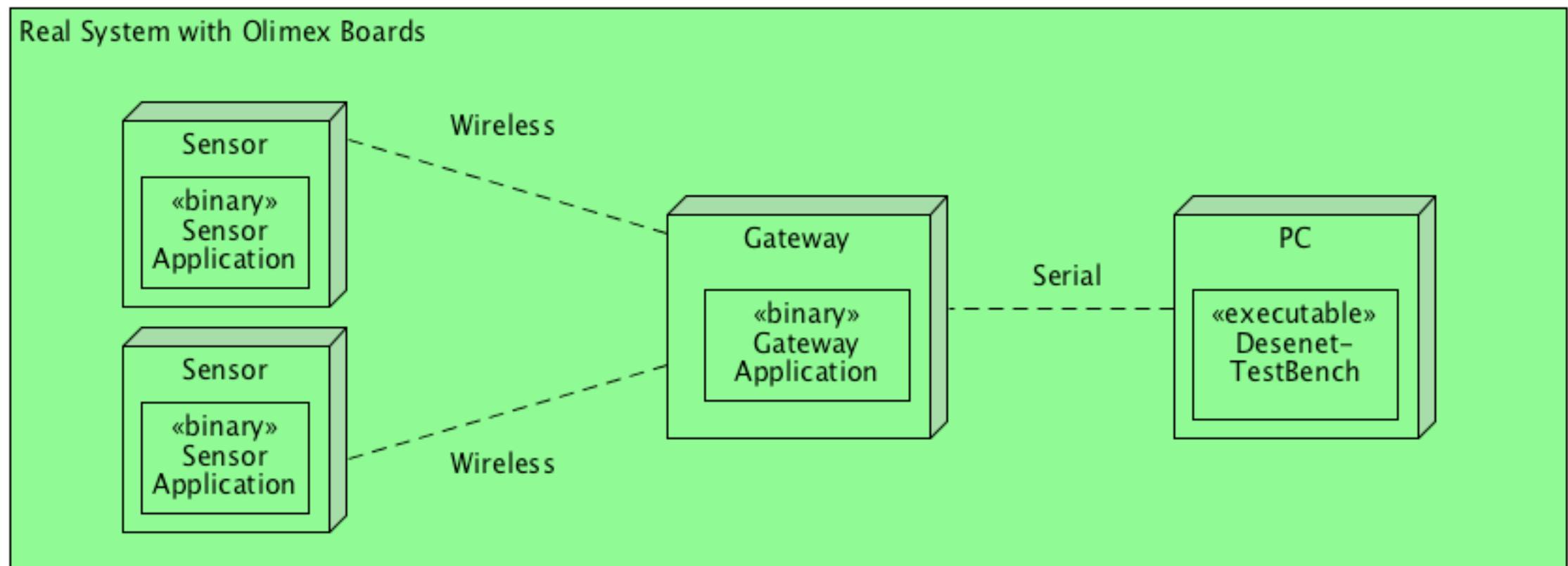
HES-SO 2025/2026

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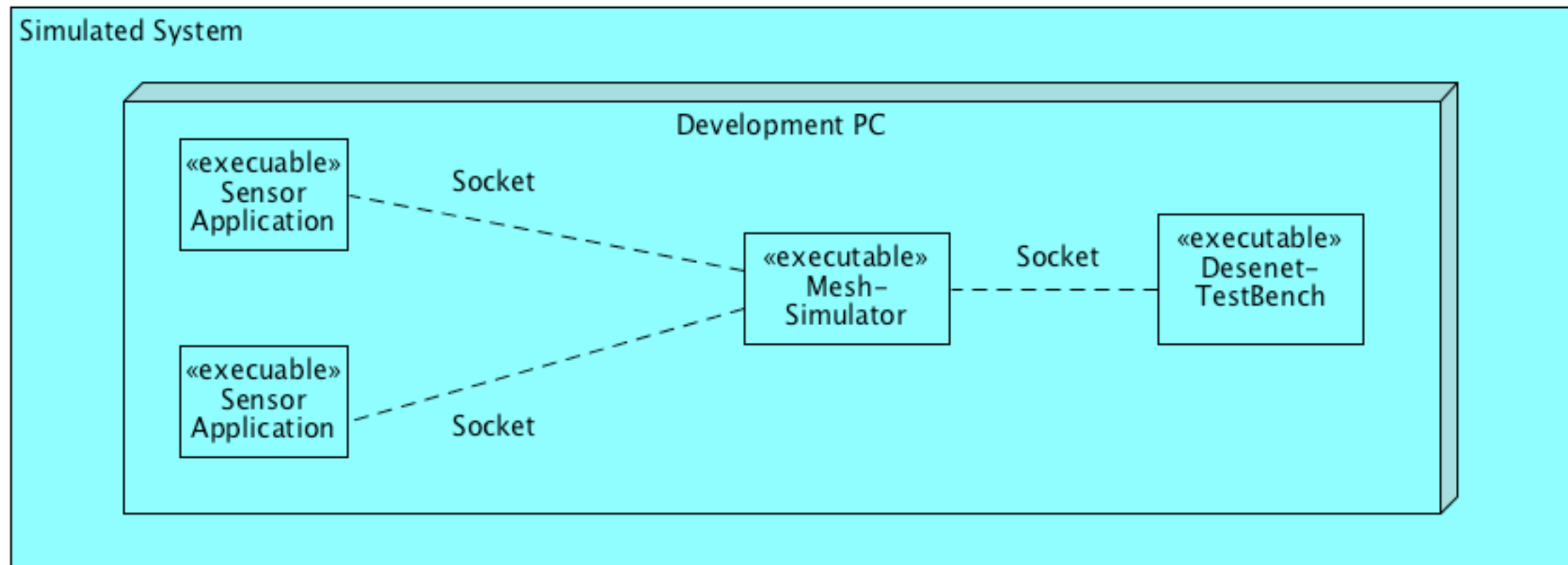
System with real Nodes

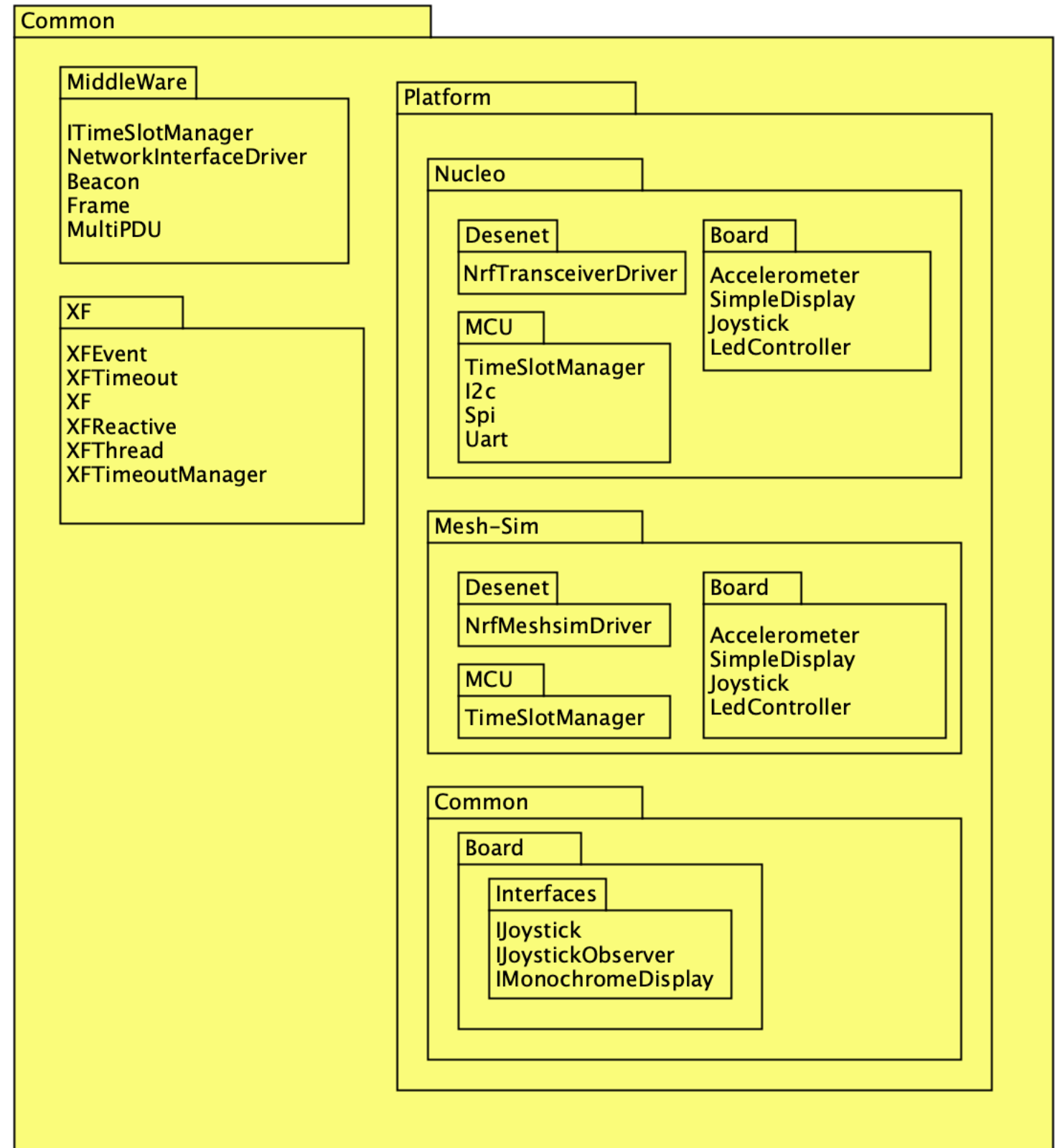
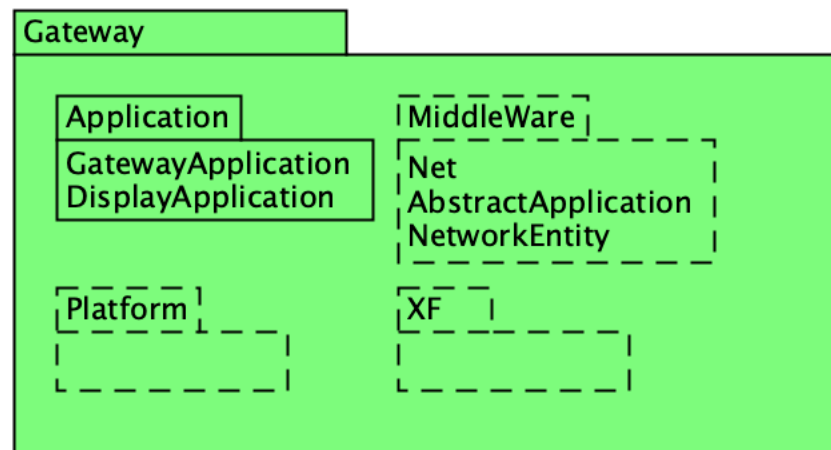
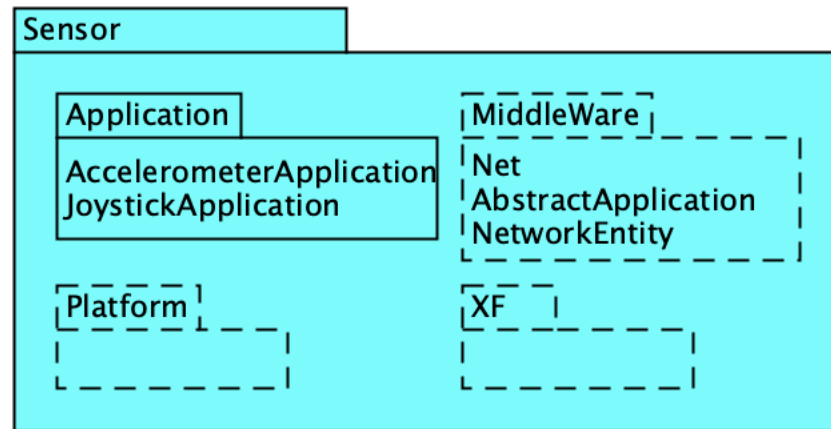
System Overview



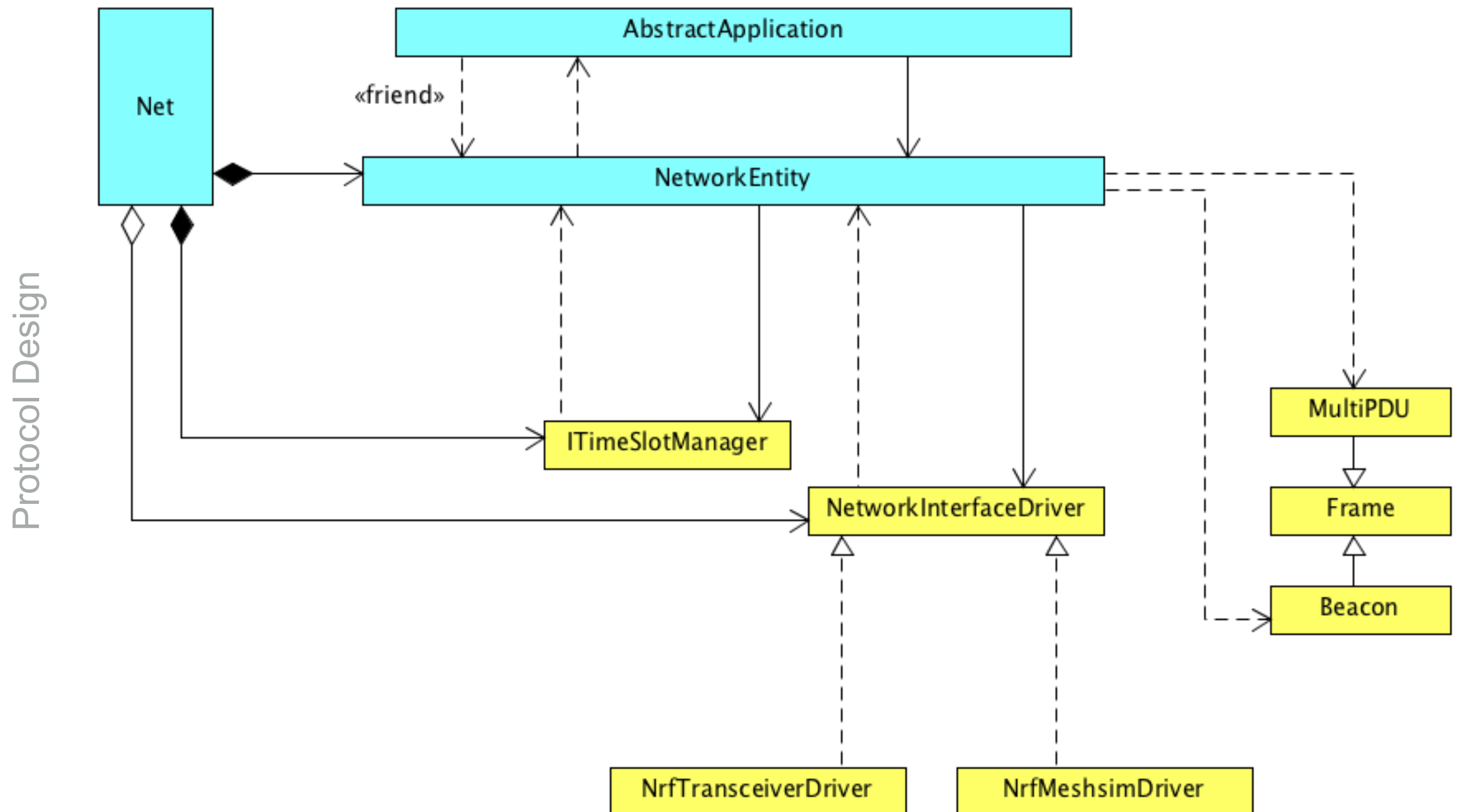
System with virtual Nodes

System Overview



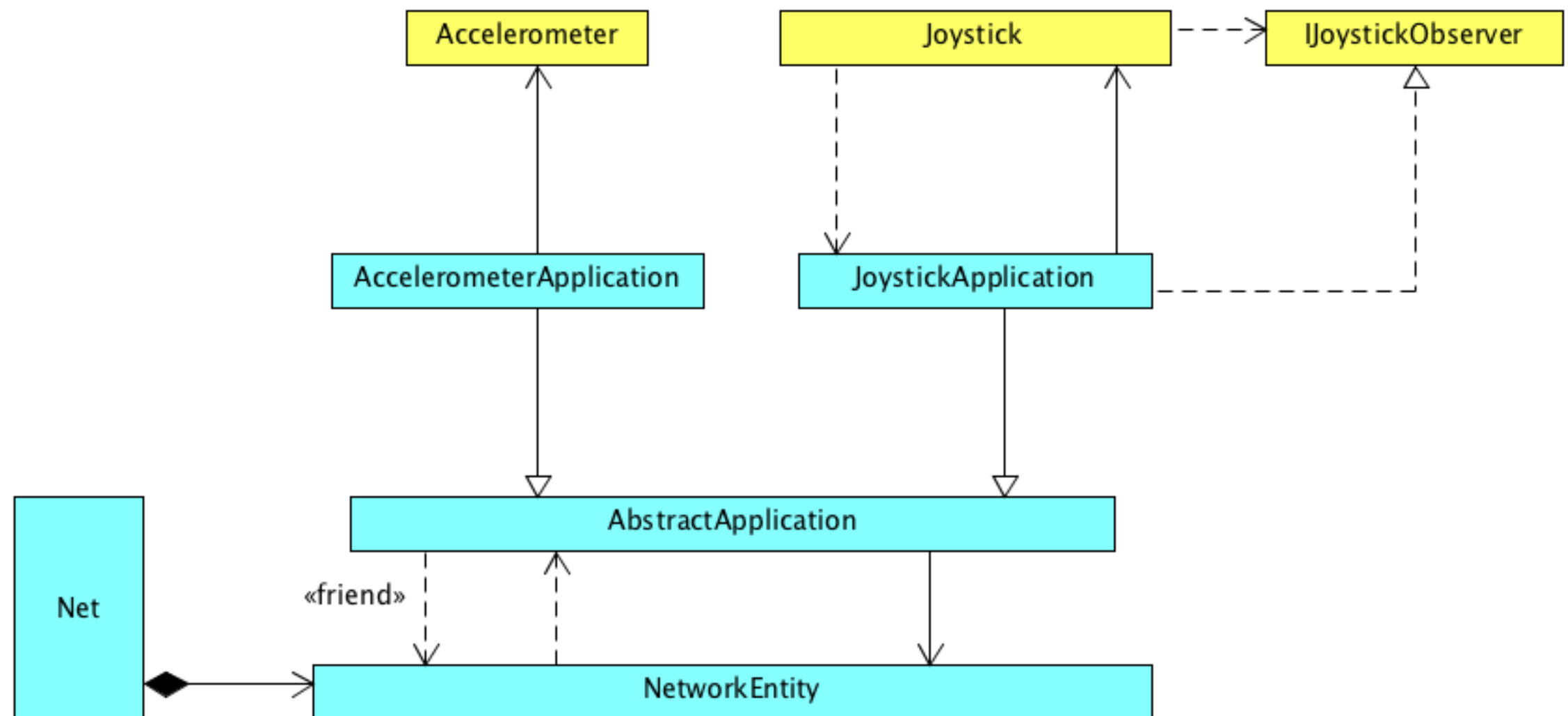


Protocol Elements



Application Elements

Protocol Design



SAP

Protocol Design

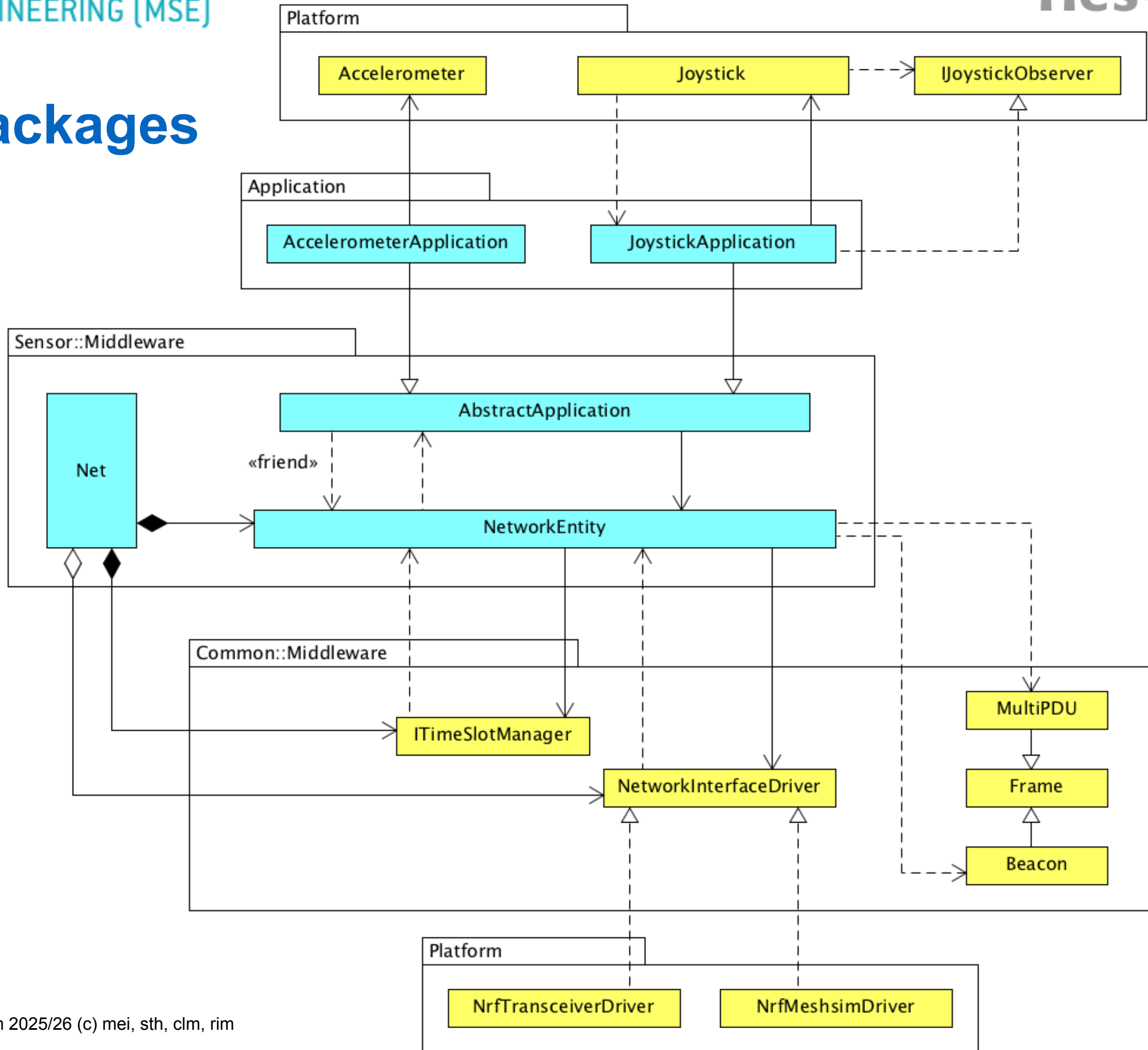
AbstractApplication

```
# svSyncRequest():void
# svPublishRequest(group:SvGroup):bool
# evPublishRequest(id:EvId, evData:SharedByteBuffer):void

- svSyncIndication(time:NetworkTime):void
- svPublishIndication(group:SvGroup, svData:SharedByteBuffer):SharedByteBuffer::sizeType
```

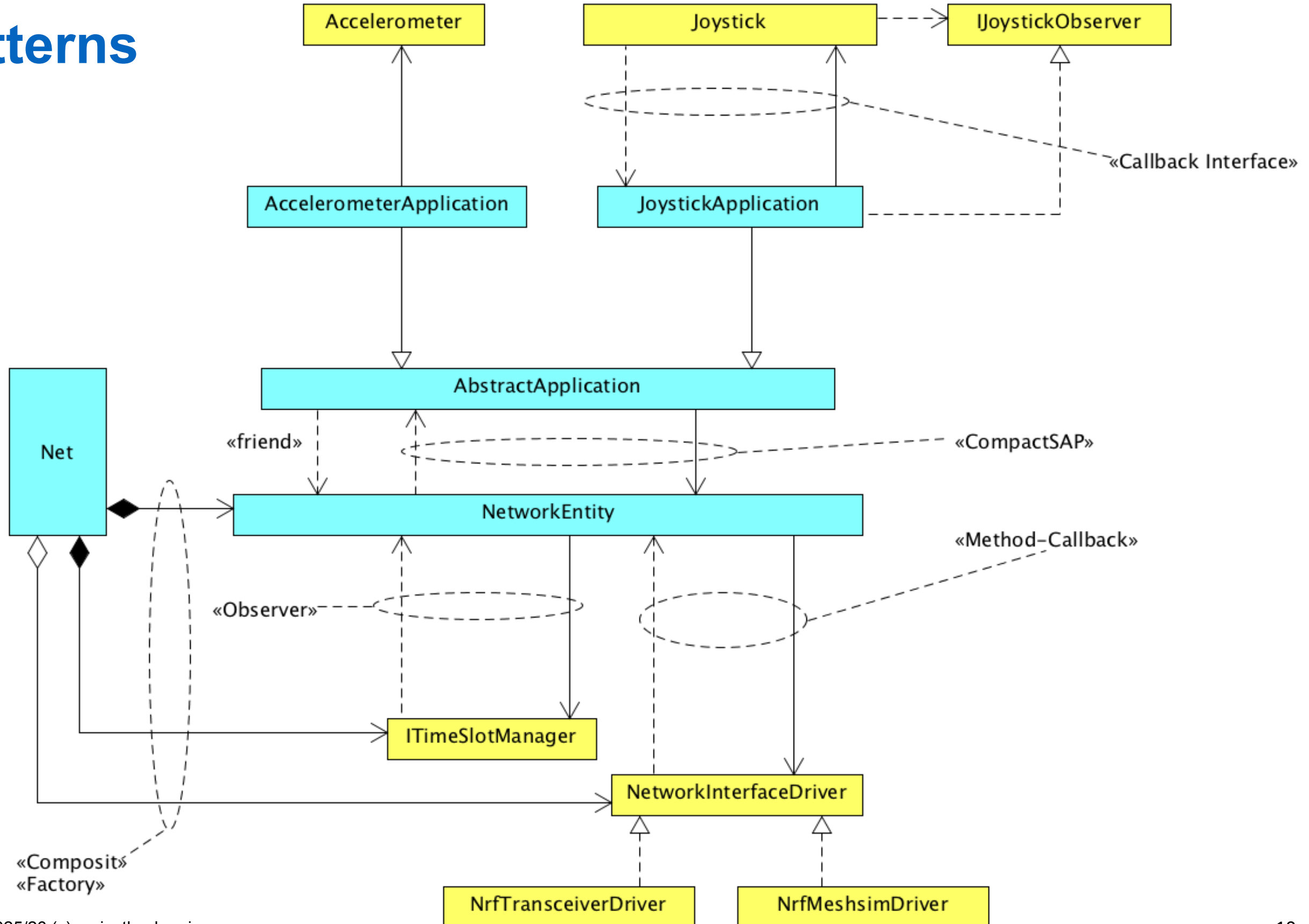

Packages

Protocol Design



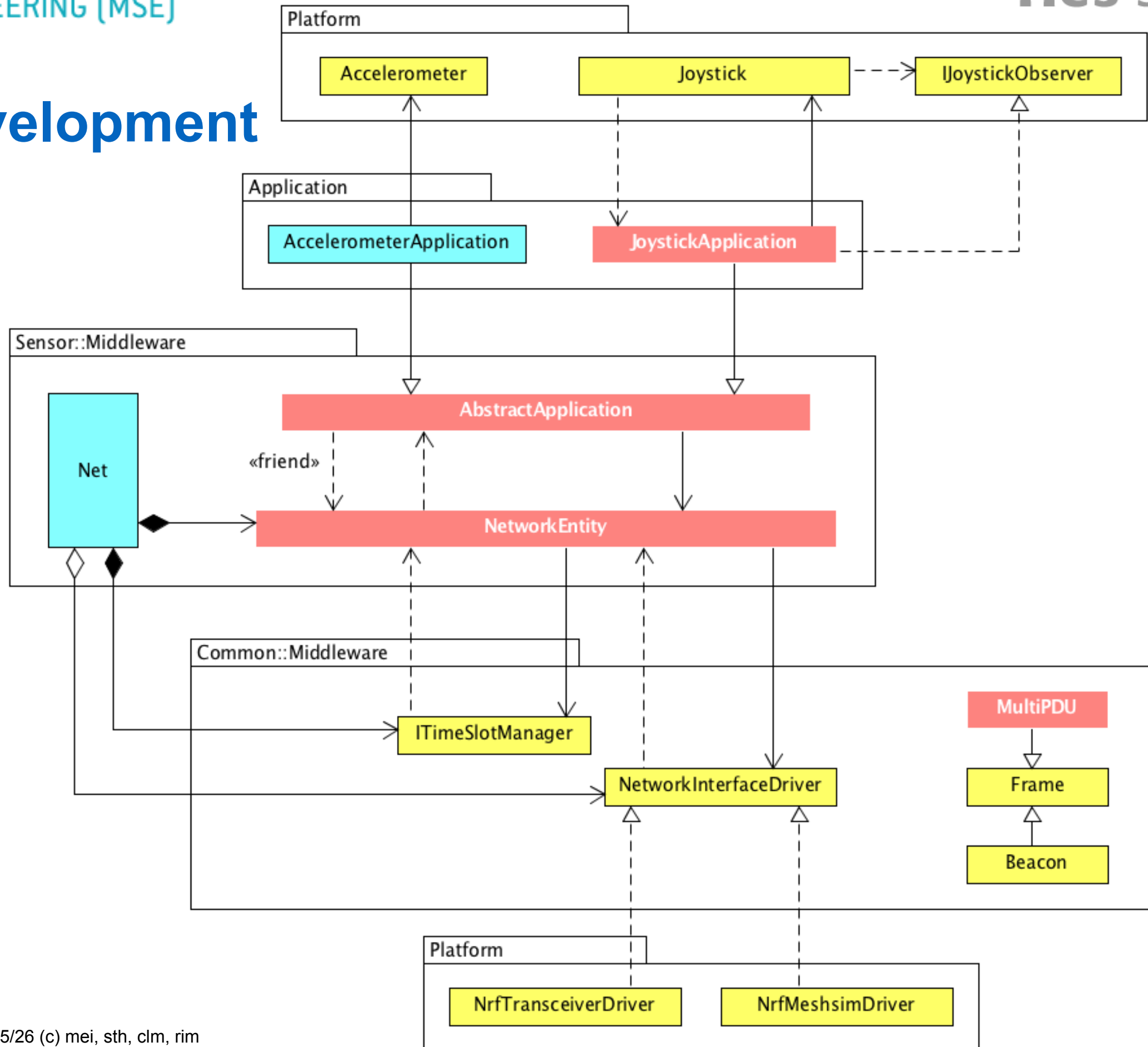
Patterns

Protocol Design



Development

Task Setting



Development Process

- Study the preset project and the structure of it
- Understand classes, their relations and patterns used (using these slides)
- Develop the simulated solution using the Mesh-Sim environment
 - Step 1: Receive beacons
 - Step 2: Implement notification of the applications on reception of the beacon
 - Step 3: Implement MultiPDU class
 - Step 4: Collect sampled values, put them into MultiPDU and send it a the right slot
 - Step 5: Implement the Joystick application
- Test the simulated solution using the Mesh-Sim environment
 - Define and describe test cases
 - Test and document each test case
 - Generate an error / a todo list

Task Setting

Development Process continued

Task Setting

- „Port“ your simulated solution to the Nucleo target
 - Step 1: Rebuild for Nucleo target
 - Step 2: Flash run and debug it
- Test your Nucleo solution against the Gateway that will be present in class room
 - Define and describe test cases
 - Test and document each test case
 - Generate an error / a todo list
- Documentation
 - During all the development, create UML diagrams as possible or necessary. Use class and sequence diagrams as well as state charts.
 - Comment well your code !!!
- Delivery
 - Eclipse project without compiled code. UML diagrams in PDF format. Pack everything into a ZIP archive with the name „FirstnameLastname.zip“

How we will grade you

Task Setting

- This is how we will generate marks:
- No delivery at all : 1.0
- DeseNET protocol not working: 2.5
- DeseNET protocol and joystick application working on simulator (4.0)
- DeseNET protocol and joystick application tested on simulator and tests documented 5.0
- DeseNET protocol and joystick application working on target: 5.5
- DeseNET protocol and joystick application tested on target and tests documented 6.0
- No code documentation (-1.0)
- Bad or insufficient code documentation (-0.5)
- No model documentation (-1.0)
- Bad or insufficient model documentation (-0.5)
- No test documentation (-1.0)
- Bad or insufficient test documentation (-0.5)
- No pattern usage (-0.5)
- Copy from other : For involved persons maximum mark is 3.0

Plan Your Time well

Task Setting

Week	Date	Period 1	Period 2	Period 3
2	15.09.2025	Introduction to Desem	Layered communication model	Comm exercise
3	29.09.2025	Introduction to protocol development	Introduction to protocol development	Comm exercise
4	06.10.2025	Object Oriented Paradigms	UML Notation	C++ & UML exercises
5	13.10.2025	Embedded software engineering patterns		Pattern exercises
6	20.10.2025			
7	27.10.2025			
8	03.11.2025			
9	10.11.2025	HAL strategies	HAL exercise	HAL exercise
10	17.11.2025	Desem protocol	Desem protocol	Comm. Exercise
11	24.11.2025			
12	01.12.2025			
13	08.12.2025			
14	15.12.2025			
15	05.01.2026			
	12.01.2026	Prepare Exams		
16	19.01.2026	Exams		
17	26.01.2026			