Cilia Mediation Framework

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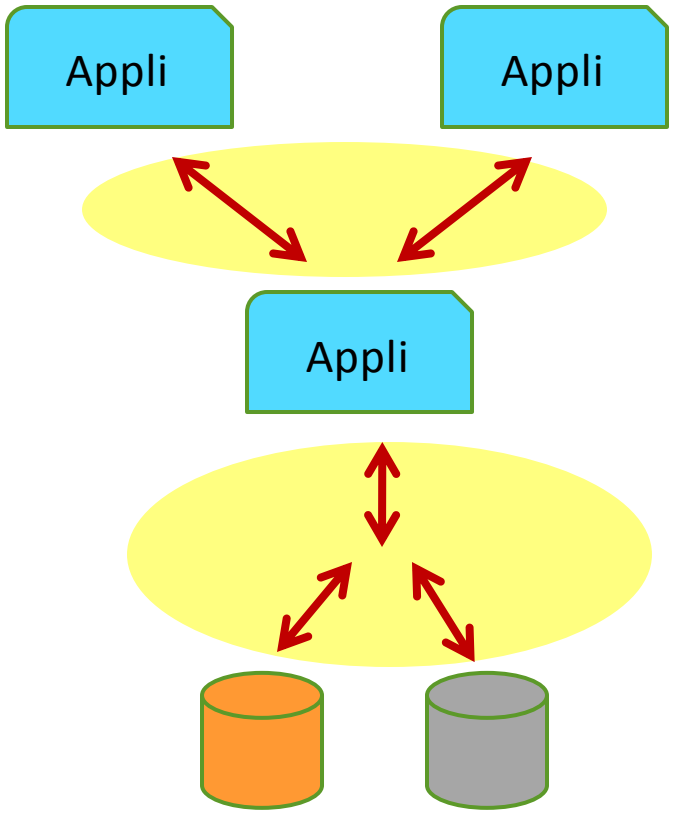
Overview

ADELE TEAM

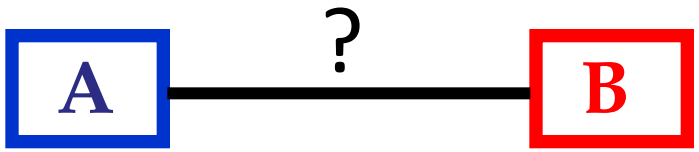
- Introduction to mediation
- Cilia: conceptual model
- Cilia: implementation model
- DSL
- Conclusion

Mediation

- The activity of integrating disparate information sources in a timely fashion
  - G. Wiedelhold and H. Garcia-Molina (Stanford)
  - Integration of heterogeneous data stored in IS
- Mediation operations
  - Transformation, alignment,
  - Filtering, aggregation, …
  - Business functions, …
- Plus thorny technical code
  - Synchronisation, distribution, log, security, …



Very, very, very old issue



Change A

Maintain multiple versions of A

Attach an adaptor to A

Multi-language A

Introduce an intermediary

In the 90's: a well explored domain

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- Data mediation
  - Many commercial frameworks
  - Some are even component-based!
- Interoperability
  - The time of EAI (IBM, BEA, …)
  - Tooling and environment – big and complex
- Not a research topic anymore
  - Except for (very) long-term stuff like ontology, …

The 2000's: mediation, the return

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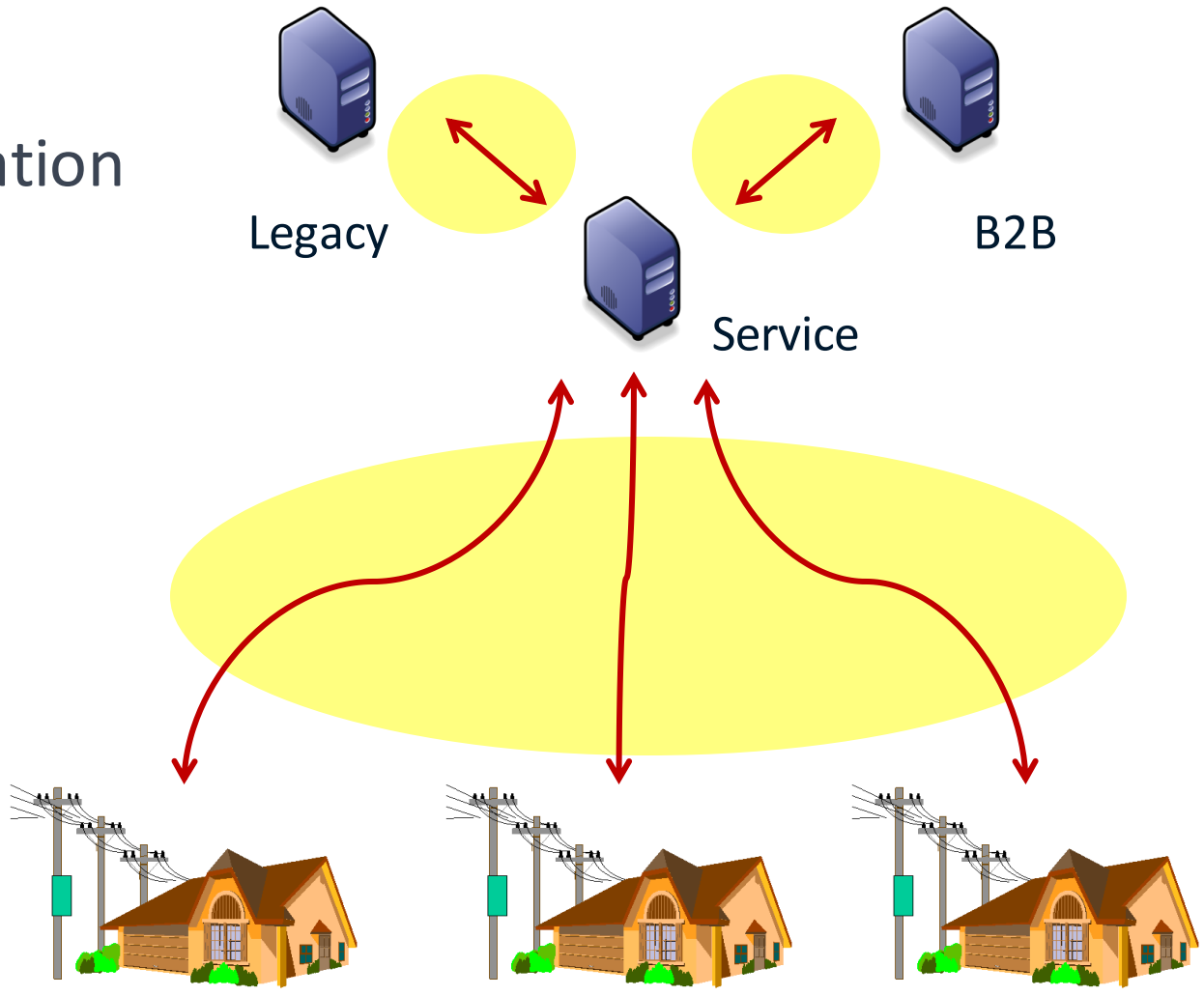
- New exciting domains
  - Service-oriented computing
  - Pervasive computing
  - Transparent manufacturing
  - Cloud computing
- Different contexts and new requirements
  - that changes everything!

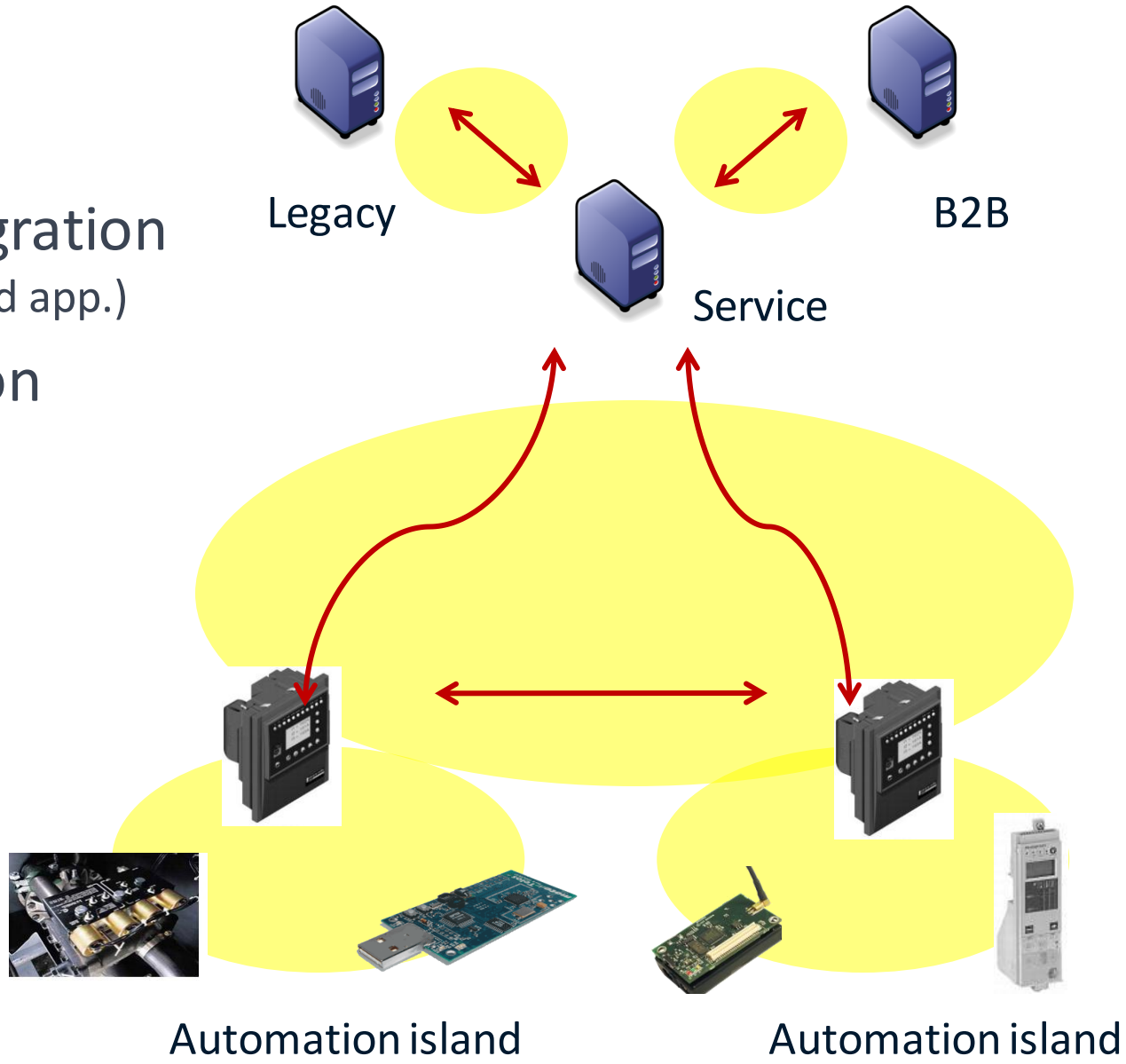
Power management

- Data mediation
  (PLC, GSM, Internet)
- Application integration
  (legacy and B2B)



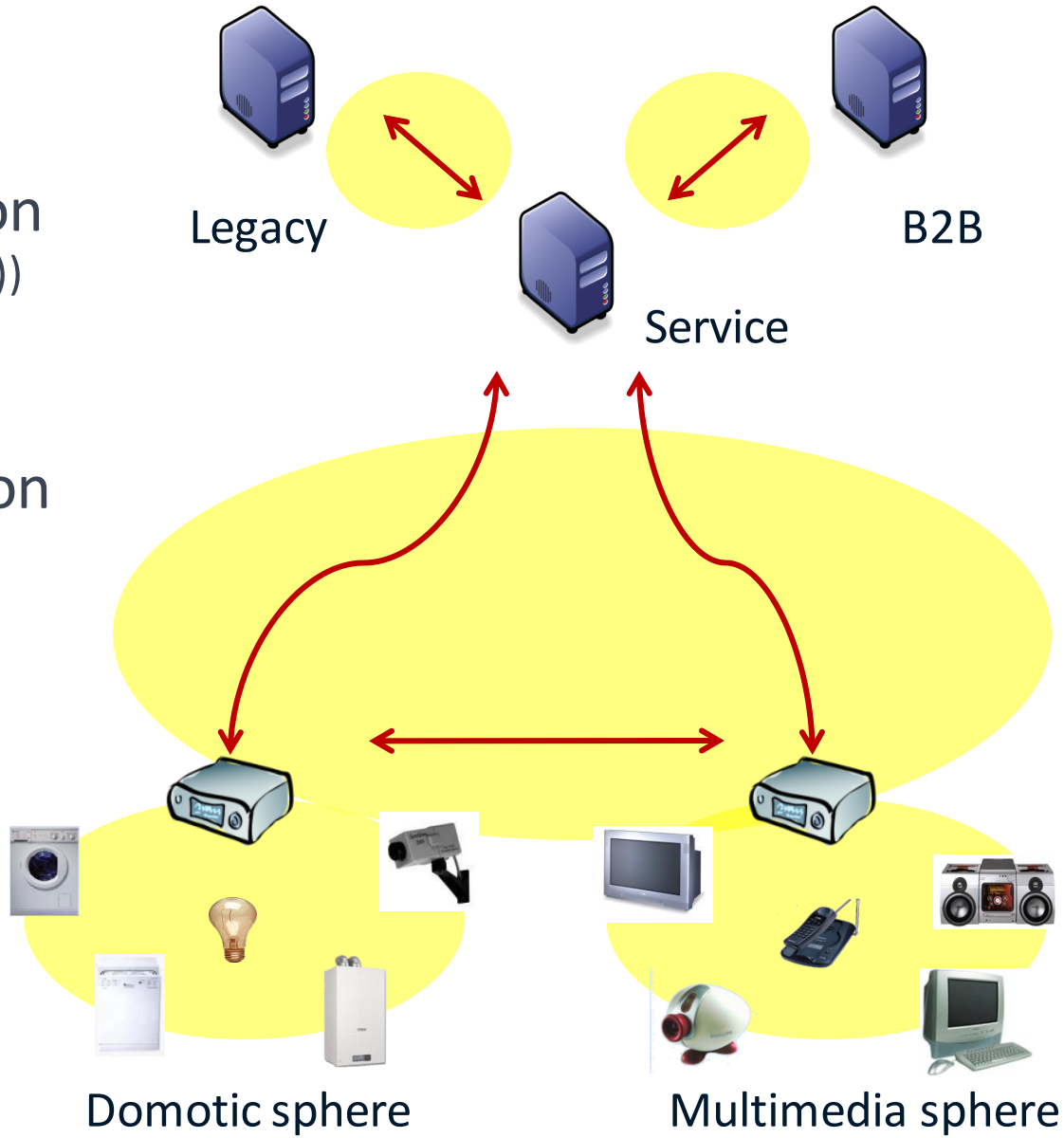
Manufacturing

- Data mediation
  (Internet)
- Application integration
  (legacy, B2B, embedded app.)
- Device integration
  (DPWS, UPnP)



Homes and buildings

- Data mediation
  (Internet)
- Application integration
  (legacy, B2B, embedded app.))
- Device integration
  (home buses)
- Multimodal interaction



New requirements

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- Very heterogeneous
  - Different forms of mediation in a single application (service)
- Very technical
  - Various media, protocols, time constraints
- Various hardware constraints
  - IT servers, field gateways
- New elements are regularly created
  - Fast growing applications
- Running applications can not be stopped
  - Service continuity
- Management is complex
  - Shortage in skills, no administrator on place

State-of-the-art

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- Old technology do not meet new requirements
  - EAI, data mediation frameworks
- New technology neither!
  - Often too big
  - Often too complex
  - Lack of dynamicity (or with a high complexity price!)
  - Lack of autonomy (because too complex)

Cilia: yet another mediation framework!

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- Domain-specific
  - Manipulation of mediation concepts
- Abstract
  - Encapsulation of mediation concepts

Conceptual model

- Dynamic
  - Hot updates properties
- Autonomic
  - Self-management capabilities
- Embedded
  - Lightweight

Implementation model

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Cilia concepts

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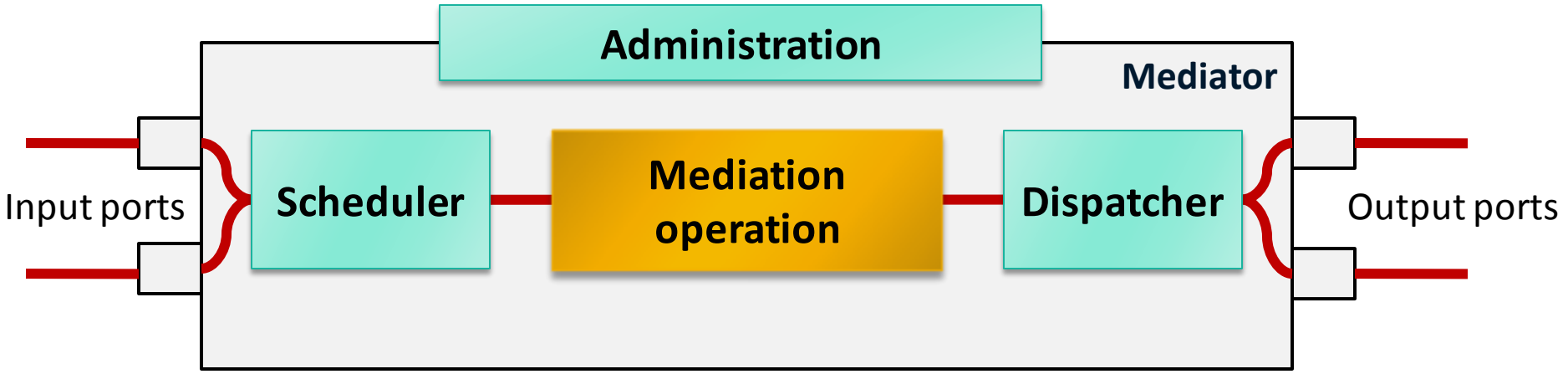
- Cilia is based on three first-order concepts
  - Cilia mediator
  - Cilia link
  - Cilia mediation chain
- A mediator realizes an elementary mediation task
  - A filter, an aggregator, a transformation, …
- A link relates two mediators
  - MOM, direct call, non functional properties
- A mediation chain is a directed graph of mediators linked with connectors
  - A sequence, an EIP, …

Cilia mediator

- A set of concepts characterizing an elementary mediation task
- Separation of concerns (a concept = a concern)
  - Communication
  - Activation
  - Function
  - Rendering
  - Administration

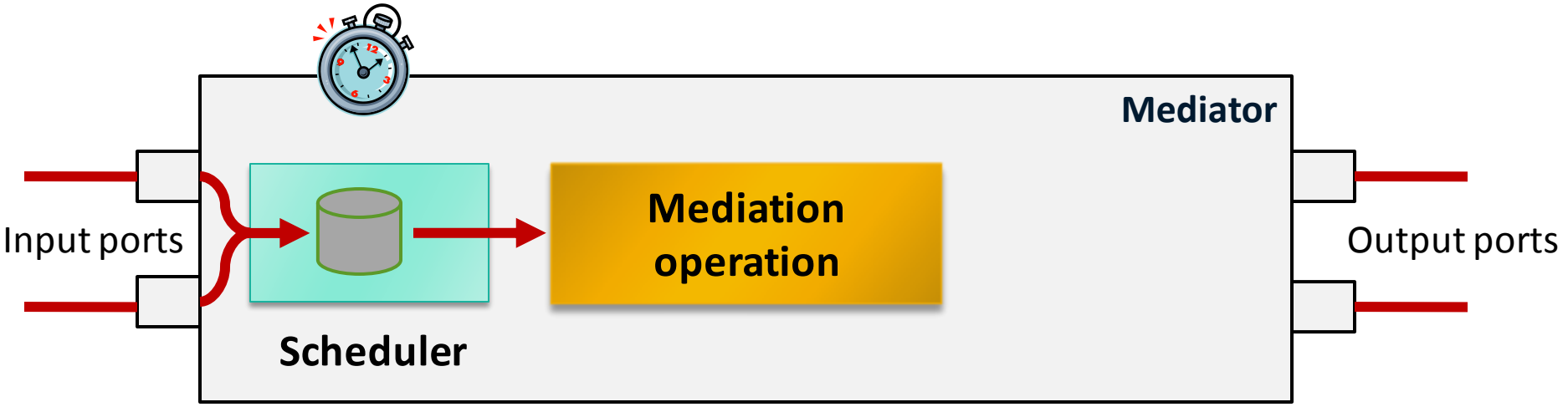


Input and output ports

- Collect and produce data
  - Ports are typed
  - External view of a mediator

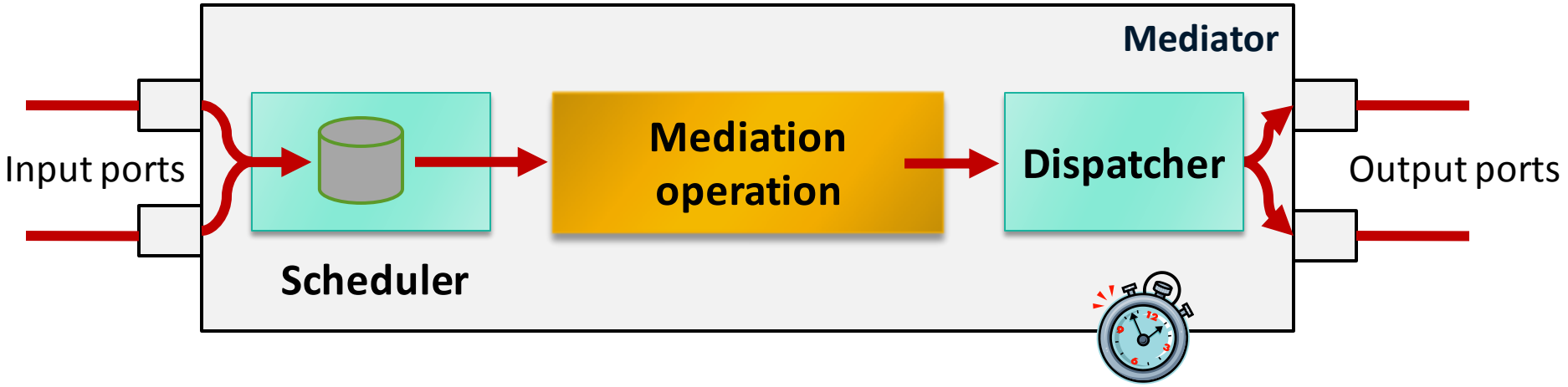
Scheduler

- Triggering conditions depend on context
  - Nature/quantity/values of collected data
  - Time interval/certain date/last activation



Dispatcher

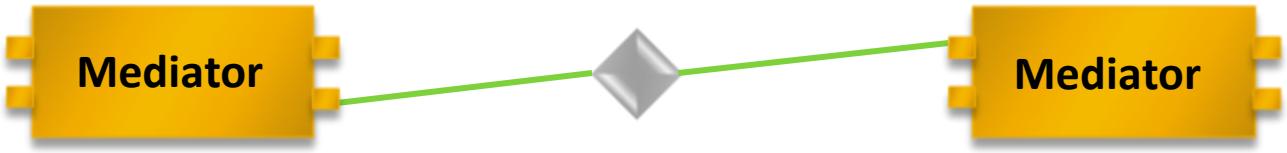
- Distribute results in the output ports
  - Nature/quantity/values of processed data



Cilia link

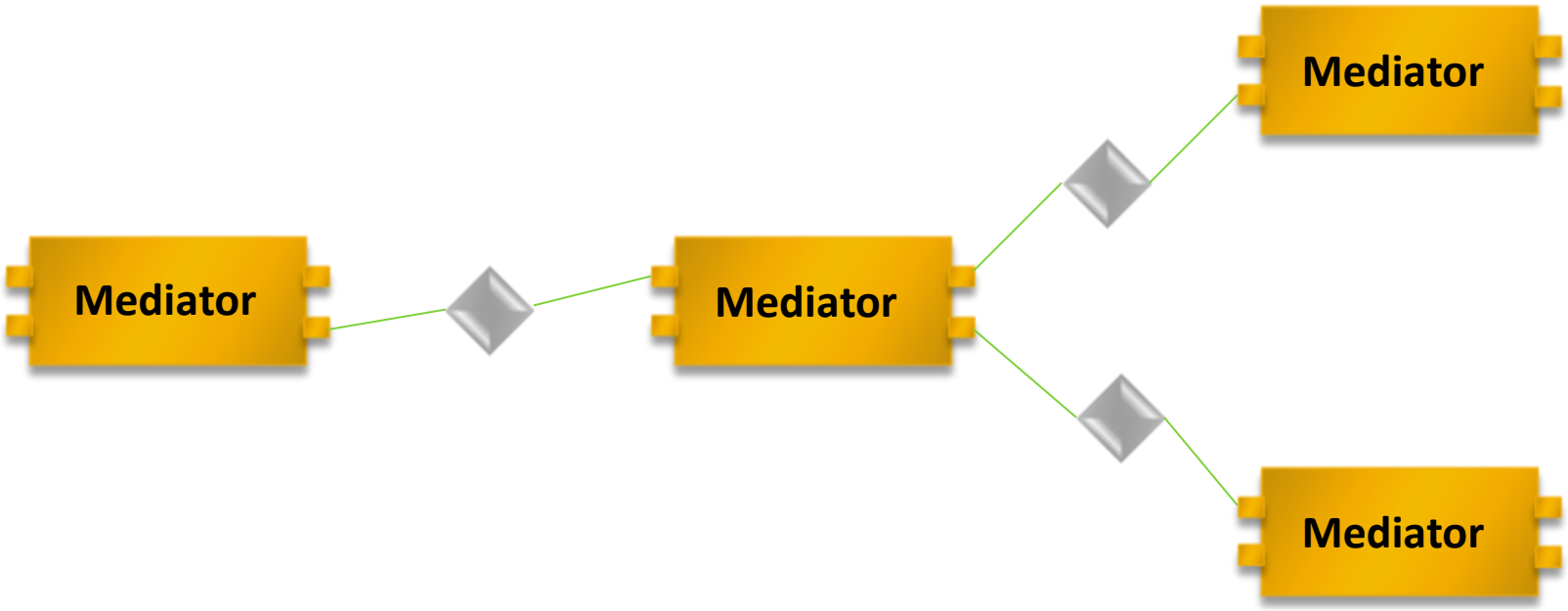
- A communication link between two mediators through compatible ports

- Separation of concerns
  - Communication means
  - Communication properties



Cilia mediation chain

- A directed graph of mediators connected through links
  - {mediators, links}
  - Topology constraints



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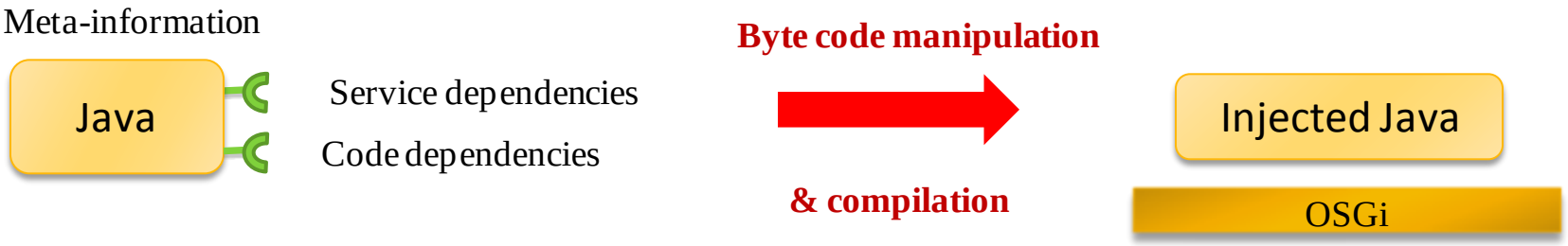
Implementation model

- Based on Java/OSGi/iPOJO



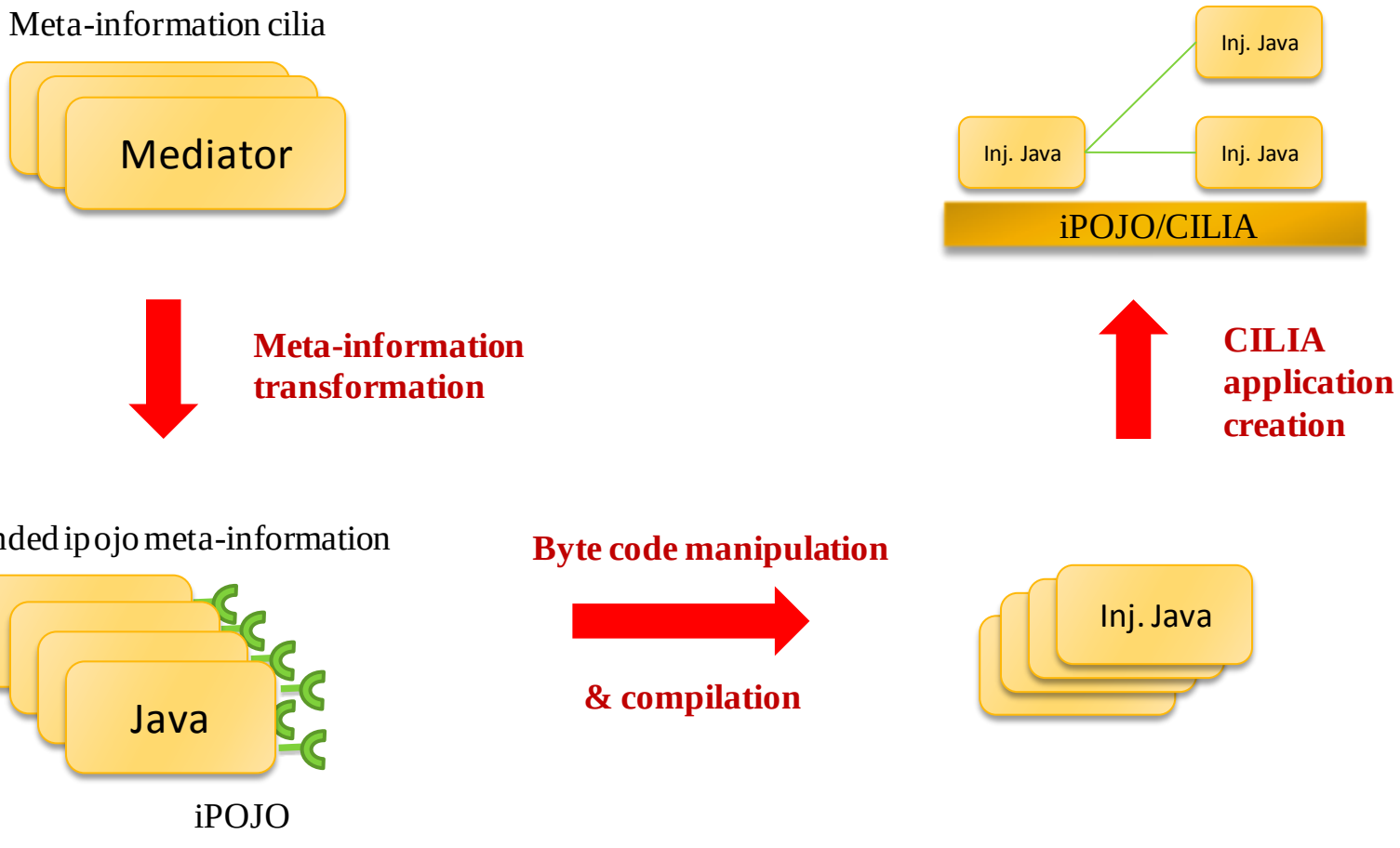
Domain component model

Dependencies management

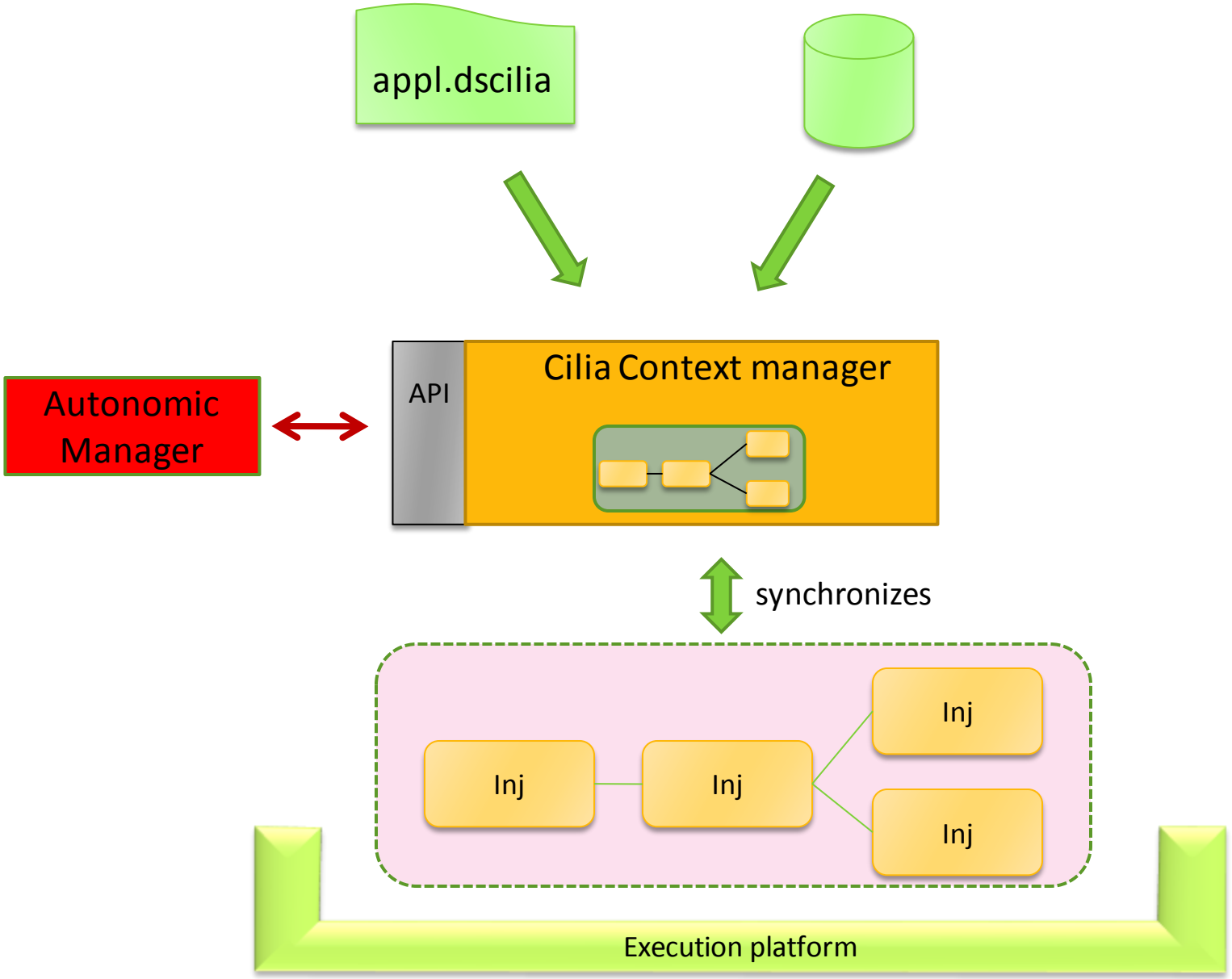
Service architecture

Multithreading management

Cilia: a domain-specific component model



Architecture



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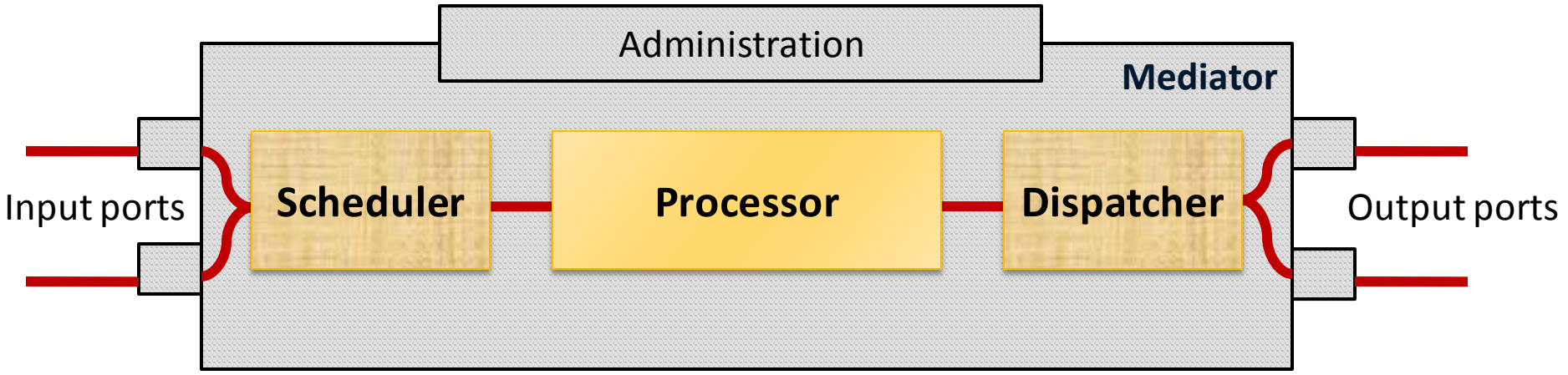
Specifying a mediator

- A mediator includes three classes (developed or reuse)
  - Processor
  - Scheduler
  - Dispatcher
- Plus some meta-information



Cilia DSL – Type definition

- Free of implementation model syntax

DSL XML

```
<processor name="SplitterProcessor" namespace="example"
classname="example.Splitter">
 <properties>
   <property name="separator" field="separator"/>
</properties>
</processor>


<mediator-component name="MySplitter"
category="Splitter" namespace="example">
    <processor name="SplitterProcessor" namespace="example"/>
    <scheduler name="periodic-scheduler"/>
    <dispatcher name="multicast-dispatcher"/>
</mediator-component>
```

Cilia DSL – instance definition

- Gives values to properties

DSL XML

```
<mediator-instance id="ms1" type="MySplitter"
  namespace="example">
   <processor >
       <property name="separator" value=","/>
    </processor>
    <scheduler >
       <property name="delay" value="10000"/>
       <property name="period" value="50000"/>
    </scheduler>
</mediator-instance>
```

Cilia DSL – binding definition

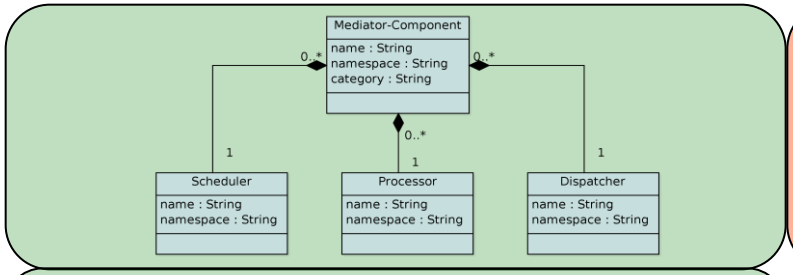
- Instantiates the links

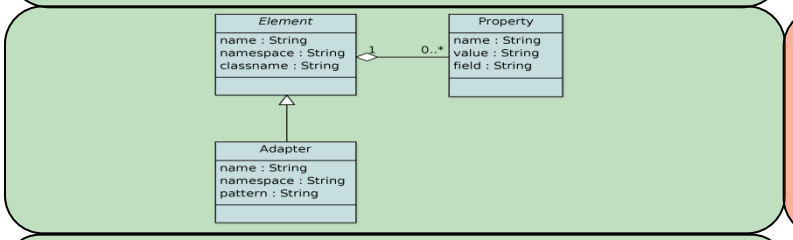
DSL XML

```
<binding from="ms1:port1A" to="ms2:port2A" />
<binding from="ms1:port1B" to="ms3:port3A" />
```

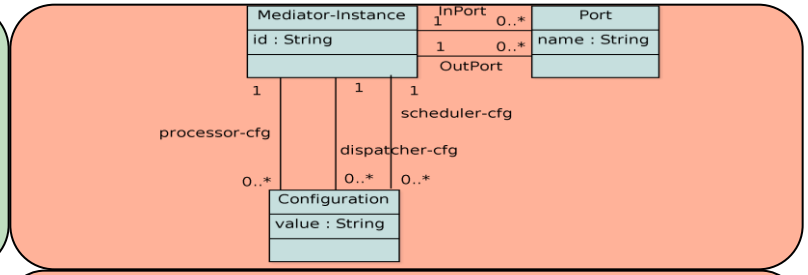
Metamodels

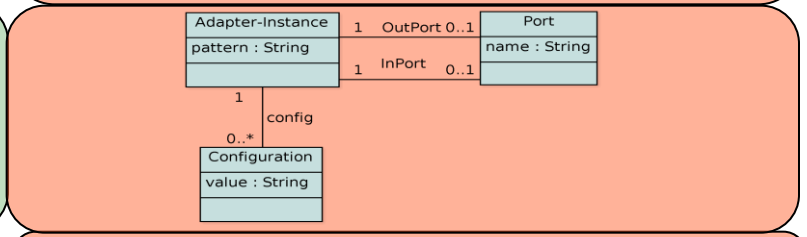
Types

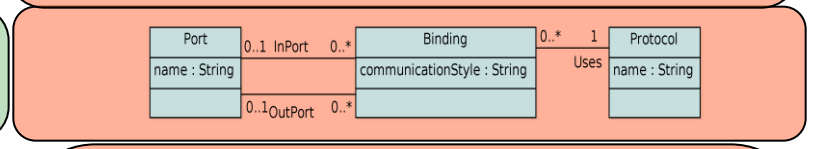


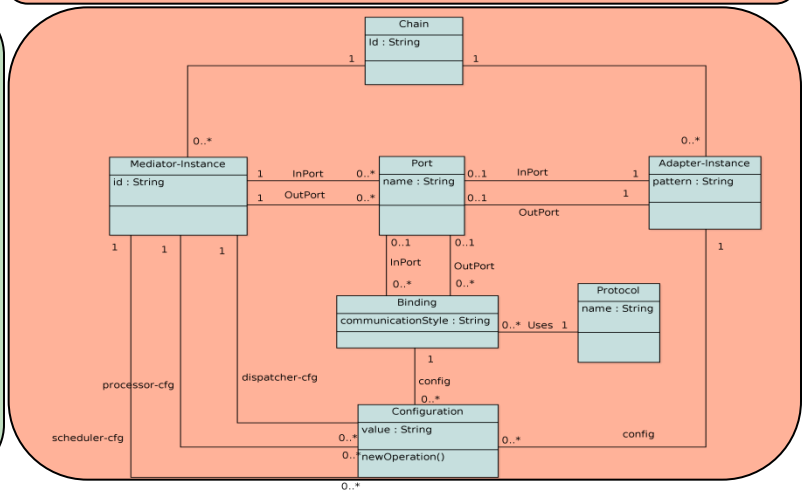


Instances









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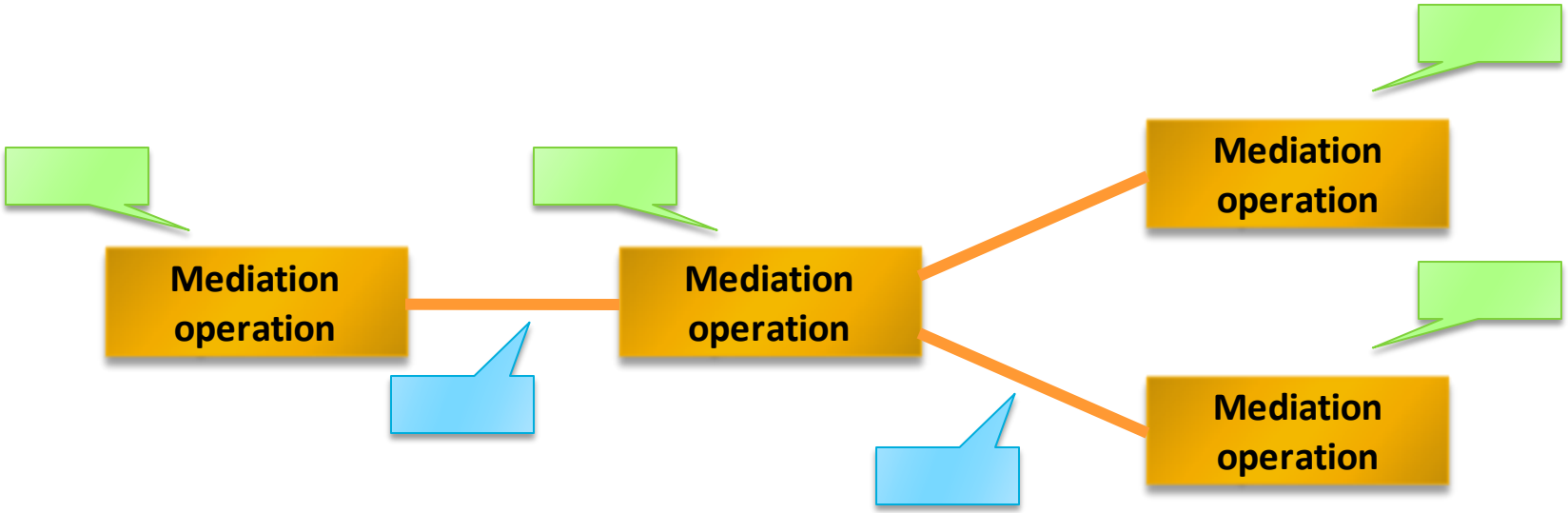
User involvement

- Concerns
  - Communication — hidden or configured
  - Activation — hidden or configured
  - Function — coded or configured
  - Rendering — hidden or configured
  - Administration — hidden or configured



Several (test) applications

- FT workshop (IT integration)
- Schneider POC
- LIG multimodal interaction
- OSAMI European project
- ATOS – to come
- EDF

To be done

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- Ports
- Types
- DSL to be improved
- Extended library
- Definition of domain-specific versions
- Advanced execution machine
- Better integration with Joram
- Autonomic

Cilia history

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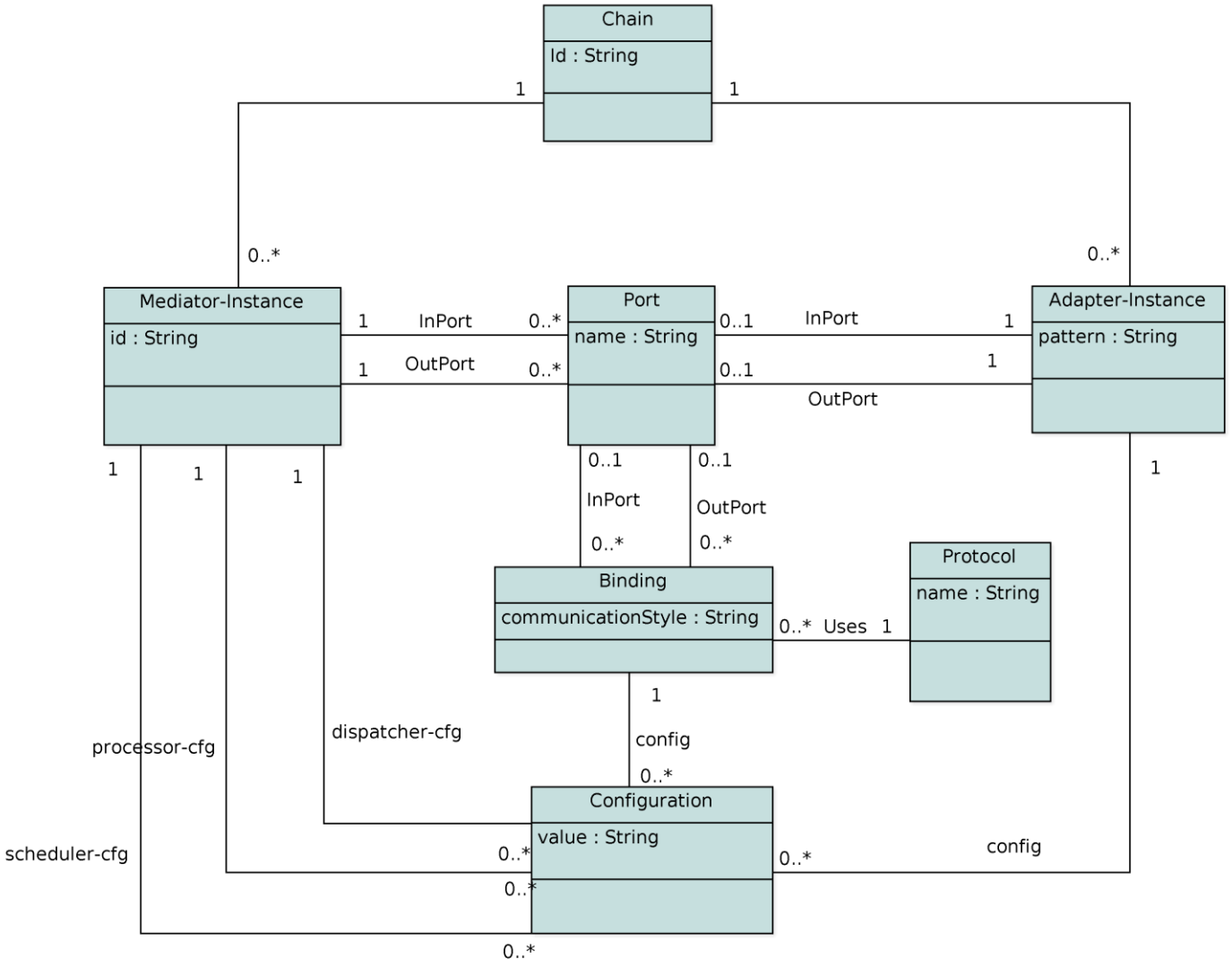
- A collaborative work
  - Catherine Hamon, FT
  - Philippe Lalanda, Adele
  - Ada Diaconescu, Adele
  - Clément Escoffier, Adele
  - Bassem Debbabi, Adele
  - Issac Noe Garcia, Adele
  - Elmehdi Damou, FT, Adele
  - Elias Ricken, FT
  - Anthony Bozon, FT
  - Jerome Bodineau, FT
  - Gabriel Pedraza, Adele
  - Denis Morand, Adele

Annex

Annex: Cilia mediation chain meta-model



Annex: Component types meta-model