



YAWL Symposium 2013  
St. Augustin, Germany

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# Adapting a Generic Data Synchronization Framework for YAWL to Access Clinical Information Systems at the Task Level

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### Evaluation in Clinical Setting

Krankenhaus Hetzelstift •  
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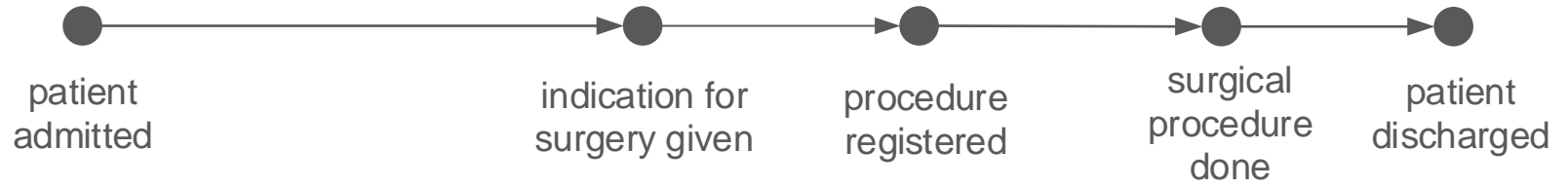


# Test Case: Surgical Procedure



## Procedural events

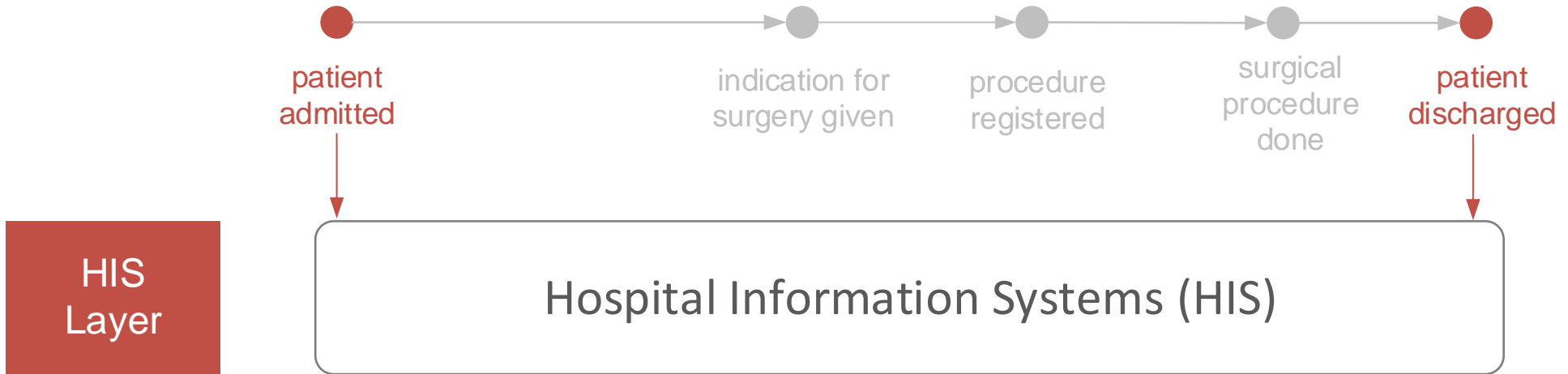
Simplified sequence of key events that each map to business process tasks





## Procedural events

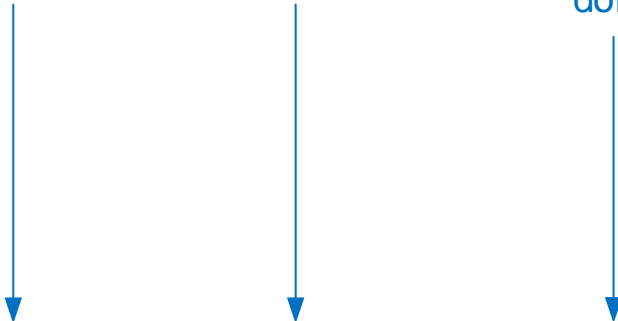
Events that are captured by existing clinical information systems



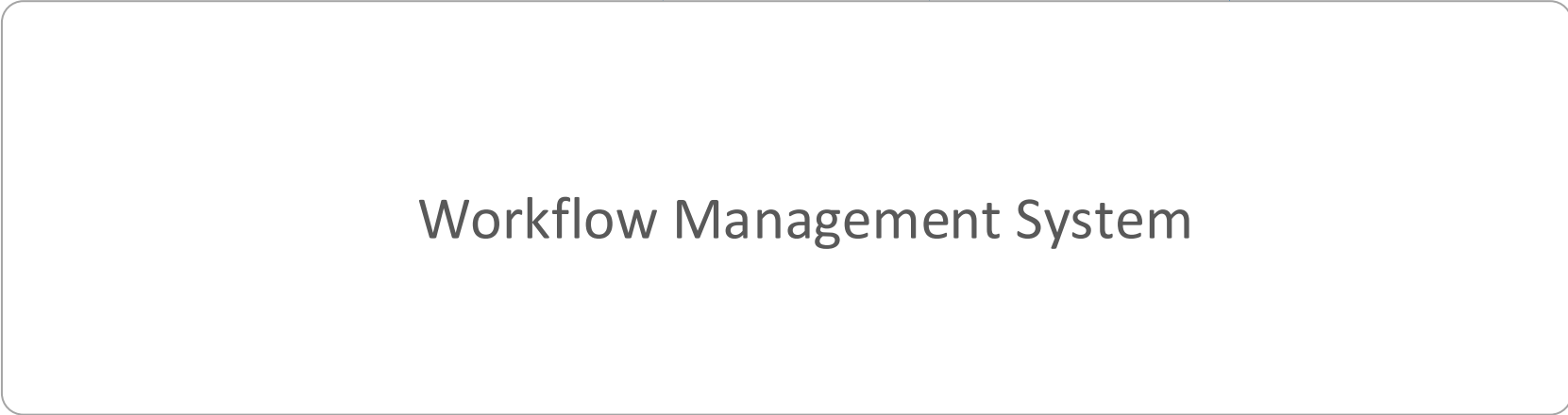


## Procedural events

Events that are captured by YAWL



Process Execution Layer



# Test Case: Surgical Procedure

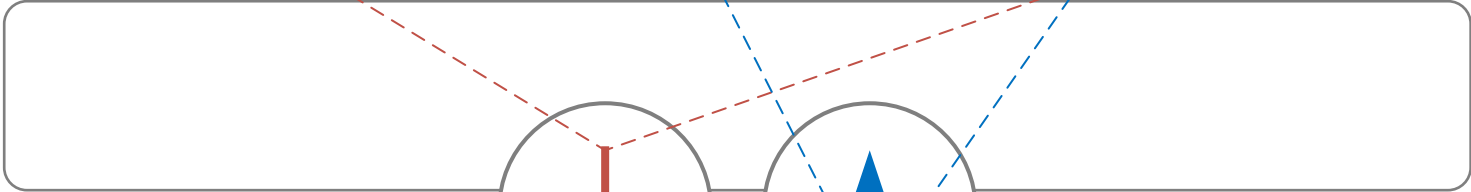


## Data synchronisation

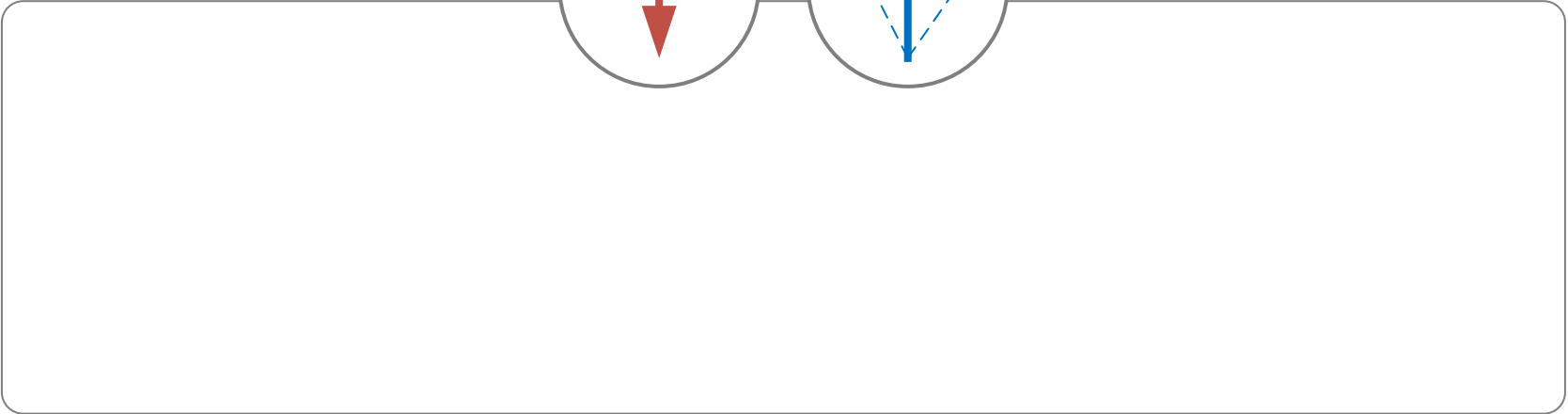
Bidirectional data exchange needed



HIS Layer



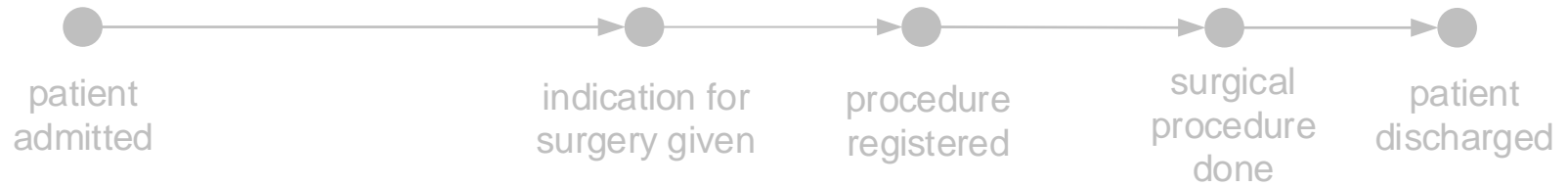
Process Execution Layer



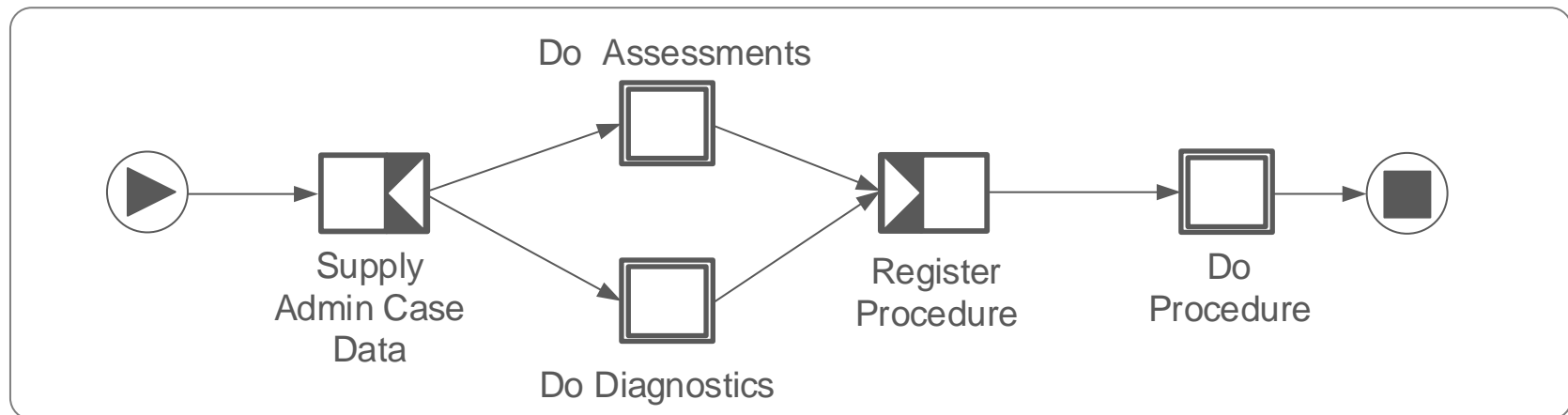


## Business process specification

Enhancement of end-to-end operational process awareness and value-chain control



### Process Execution Layer

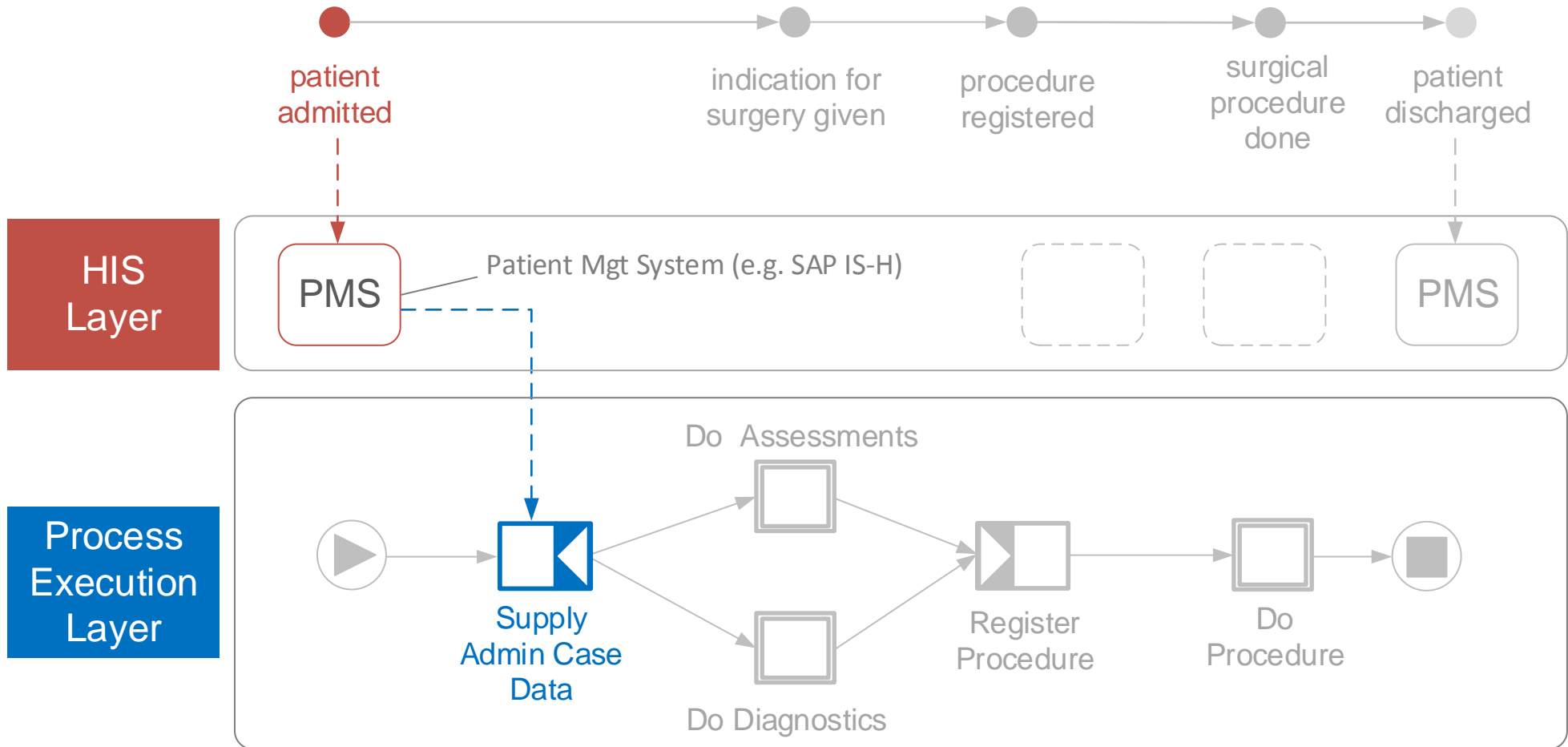


# Enabling Process Execution



## Use case for read-mode synchronisation

Making the patient's admission data available to YAWL







## Clinical data integration technology

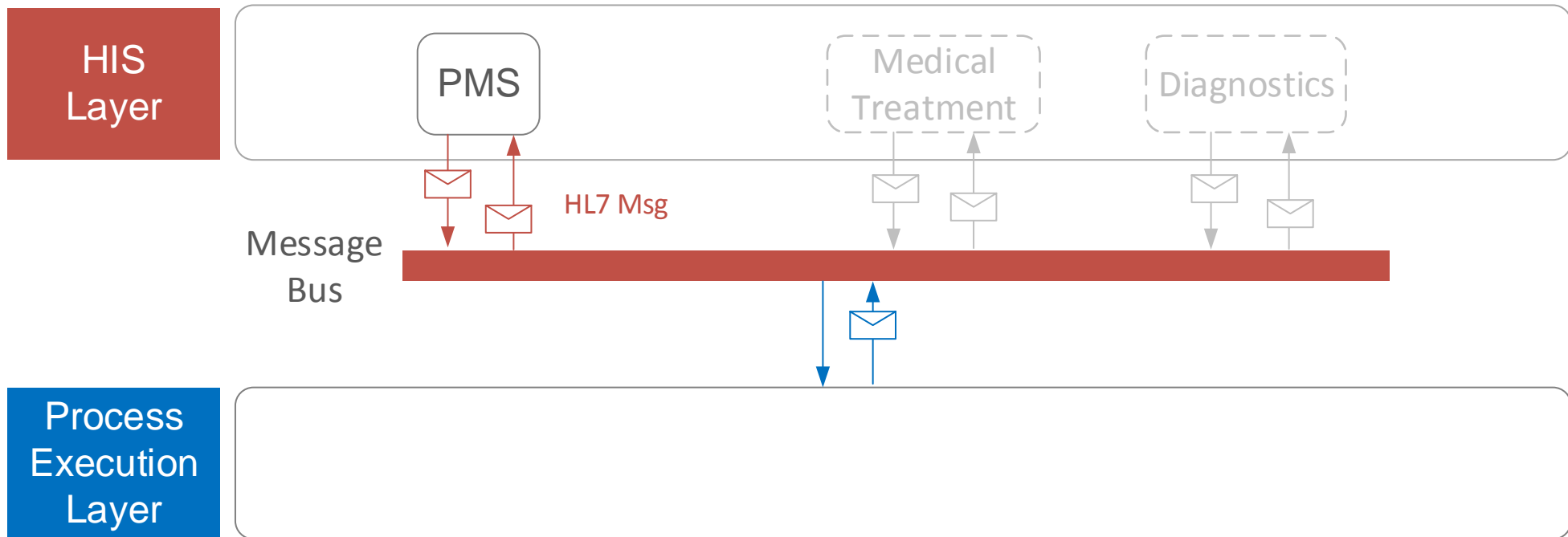
HIS subsystems usually communicate with each other via exchange of HL7 messages that travel along a message bus





### Loose coupling of HIS and YAWL

YAWL can communicate with the HIS layer by reading data from and/or writing data to the message bus, respectively

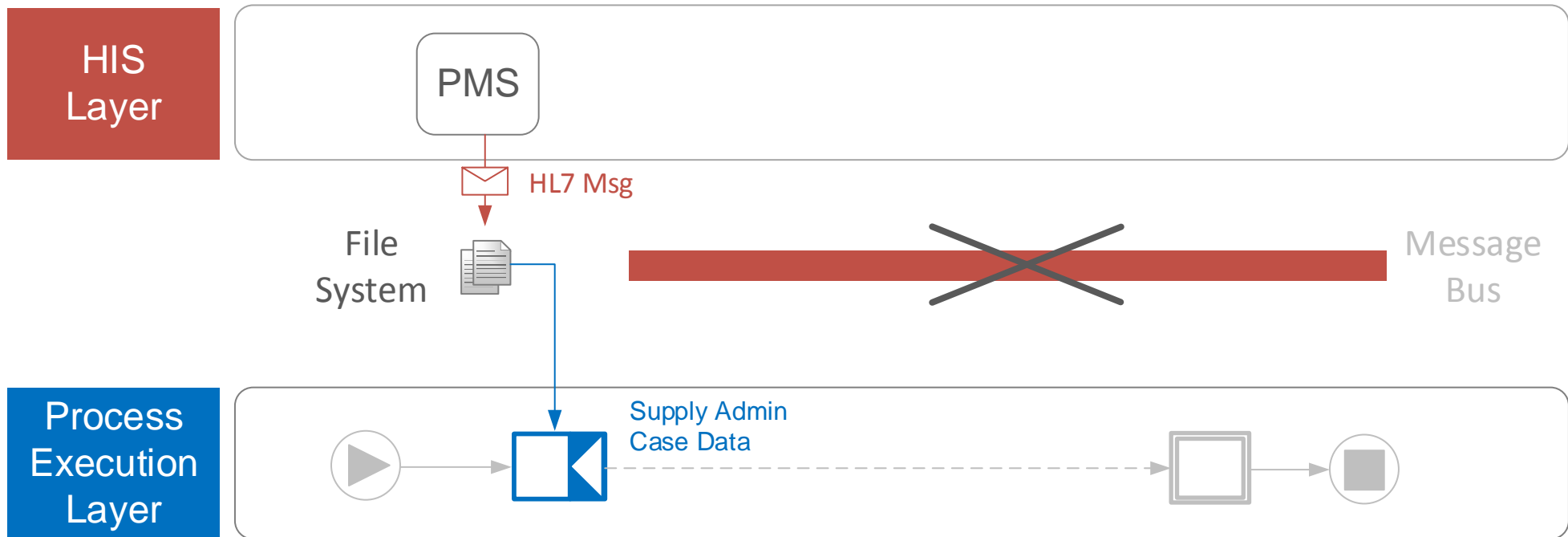




## Data synchronisation scenario

To avoid interferences with the live HIS, the clinical test has been

- ✓ read only
- ✓ via the file system



# Anatomy of HL7 Messages



## Sample admission message

The event type ADT^A01 carries information about the patient's master data as well as visit-related case data

HL7

XML

```

MSH|^~\&|SAP-ISH|020^111|ITB111||
20110415185632|NP11I0|ADT^A01|0003807782
|P|2.1

EVN|A01|20110415183500

PID|||0111140419|0111266201|Doe^John||19
700119|M|||Sample Street
123^^Sampletown^^12345^UK||35784||D|M|02

PV1|00001|I|1115.1^^^111CU|NO|||||1A||
|97^07|||||NO|||||S|111194
2111|||||20110415183500
    
```

**Event Type**

**Master Data**

**Case Data**

| masterData      |        |                     |
|-----------------|--------|---------------------|
| e formOfAddress | [0..1] | (formOfAddressType) |
| e firstName     | [0..1] | string              |
| e middleName    | [0..1] | string              |
| e lastName      | [1..1] | string              |
| e maidenName    | [0..1] | string              |
| ...             |        |                     |
| e residence     | [0..1] | string              |
| e zipCode       | [0..1] | string              |
| e sex           | [0..1] | (sexType)           |
| e age           | [0..1] | (ageType)           |
| e nationality   | [0..1] | string              |

| caseData          |        |                     |
|-------------------|--------|---------------------|
| e admissionType   | [1..1] | (admissionTypeType) |
| e patientId       | [0..1] | (patientIdType)     |
| e caseNo          | [0..1] | (caseNoType)        |
| e insurance       | [0..1] | string              |
| e familyDoctor    | [0..1] | string              |
| e referringDoctor | [0..1] | string              |

# Anatomy of HL7 Messages



## Extracting data from HL7 messages

Some clinical data (HL7) may be mapped to the business process level (XML)

HL7

XML

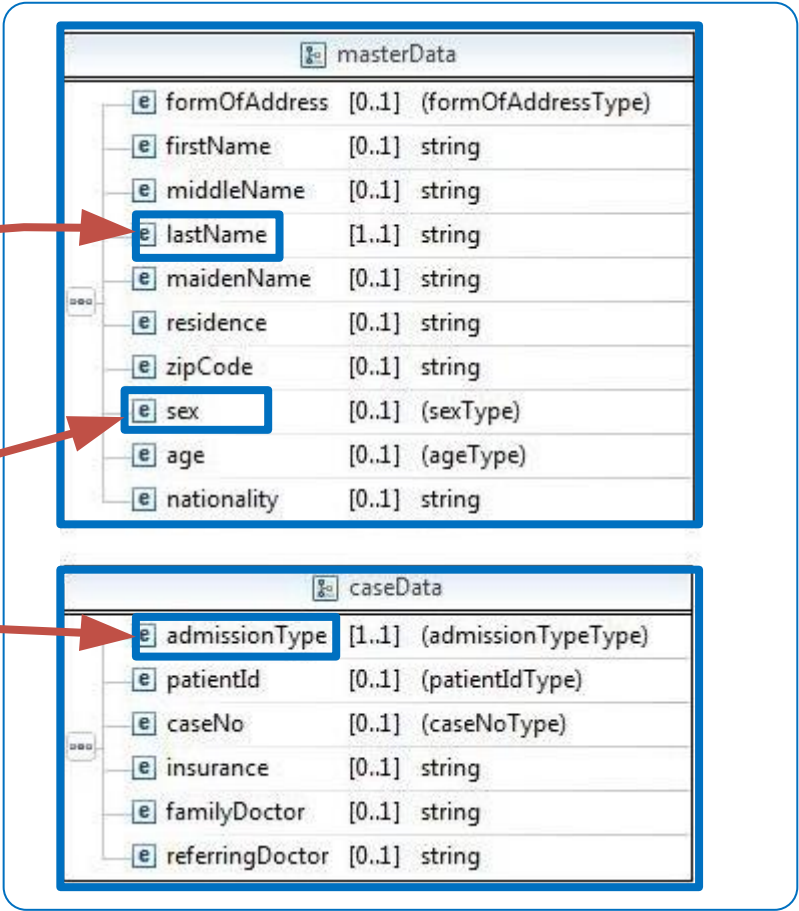
```

MSH|^~\&|SAP-ISH|020^111|ITB111||
20110415185632|NP11I0|ADT^A01|0003807782
|P|2.1

EVN|A01|20110415183500

PID|||0111140419|0111266201|Doe^John||19
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```

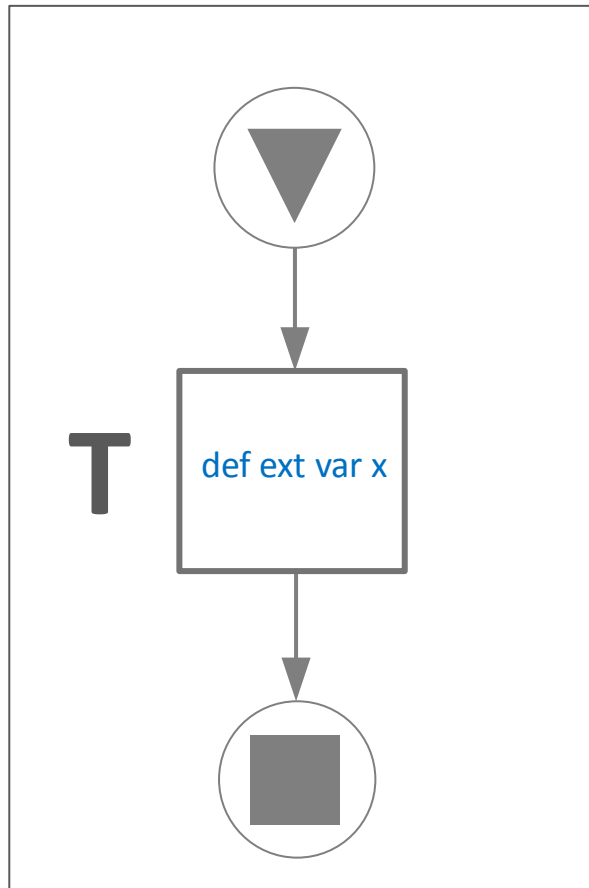




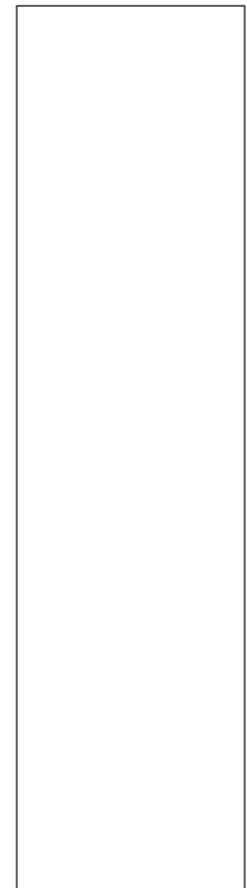
## Task variables

Definition of an external task variable that is bound to HIS data

YAWL Engine



HIS

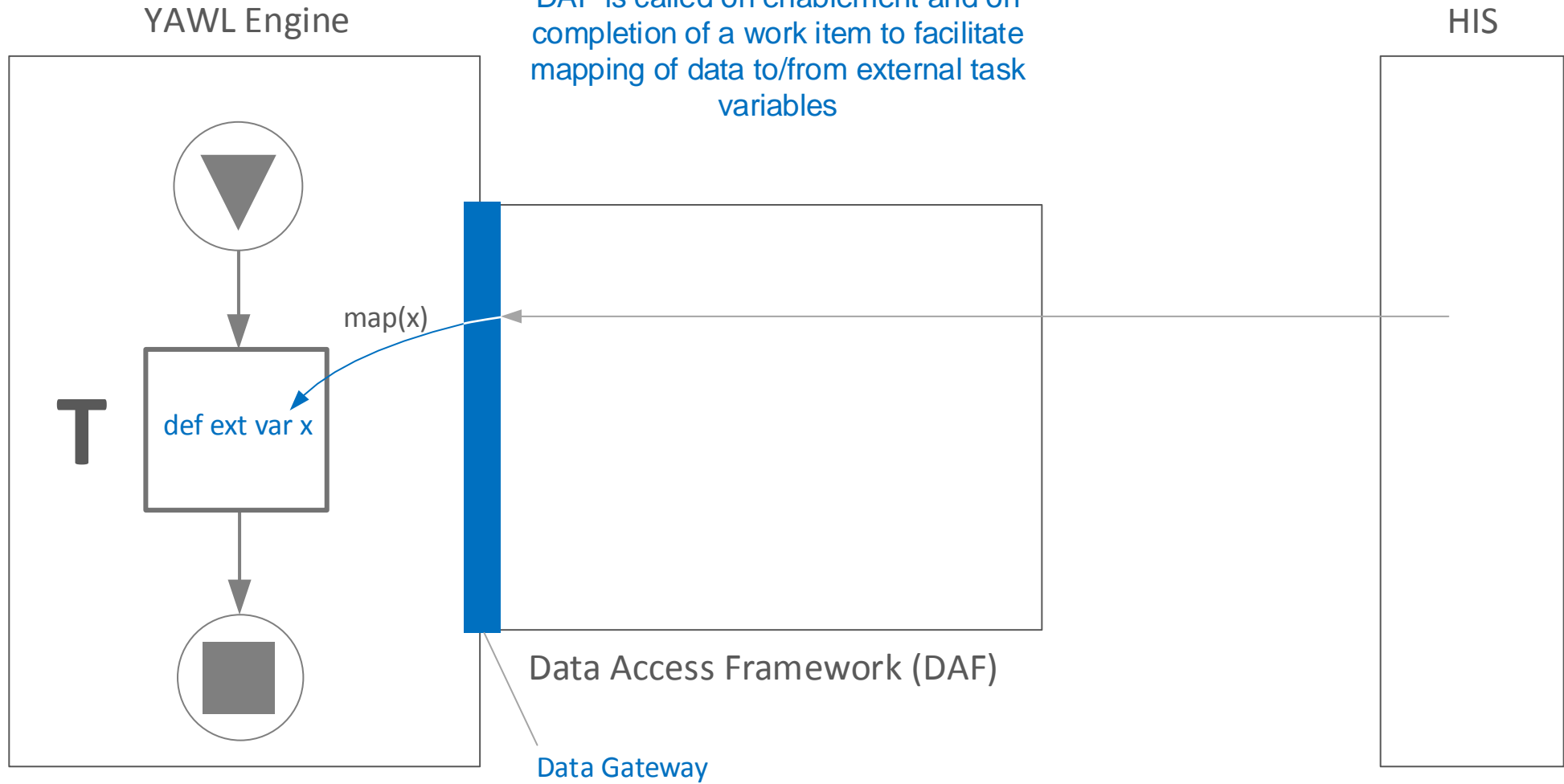


# Synchronisation Principle

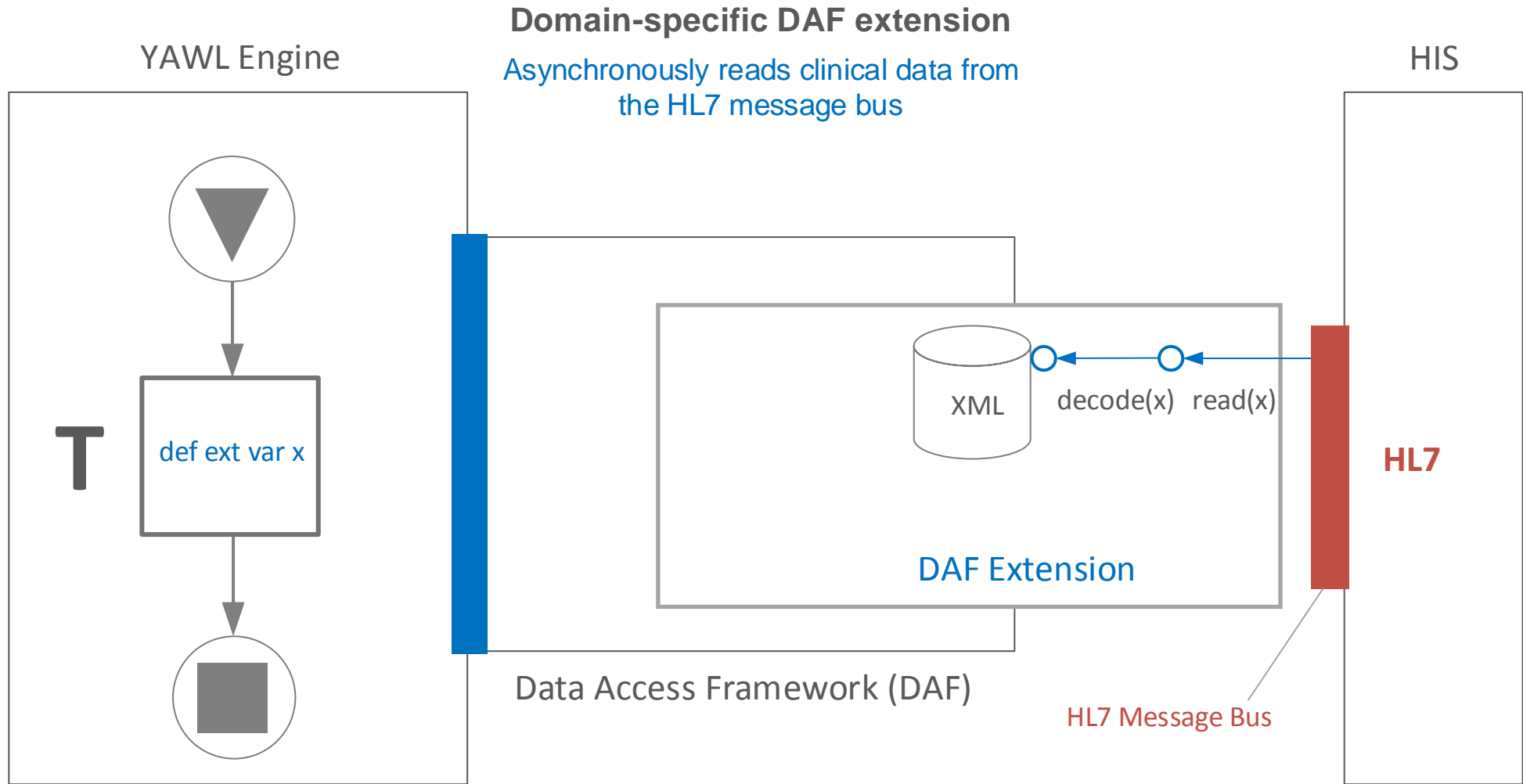


## Mapping

DAF is called on enablement and on completion of a work item to facilitate mapping of data to/from external task variables

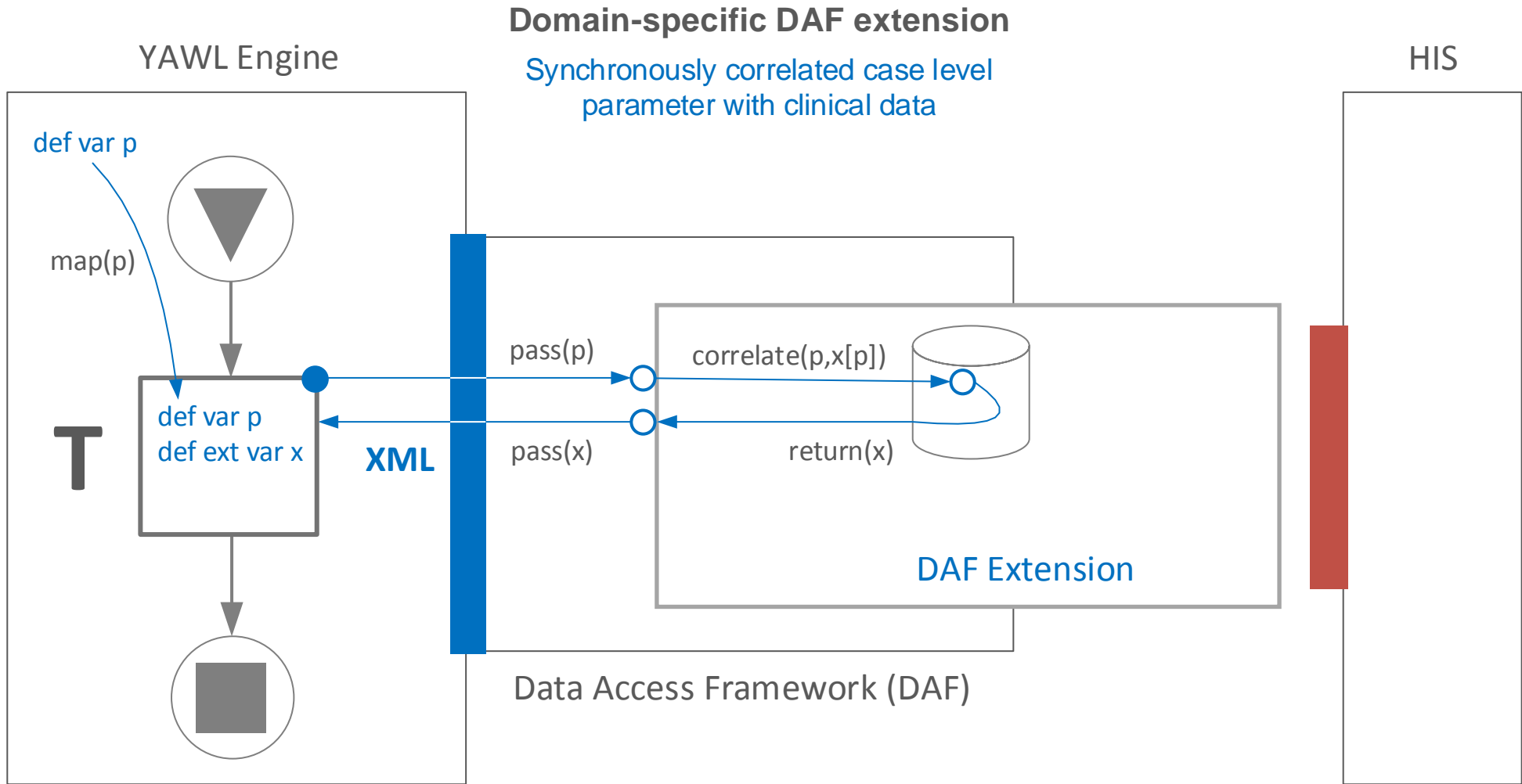


# Synchronisation Principle





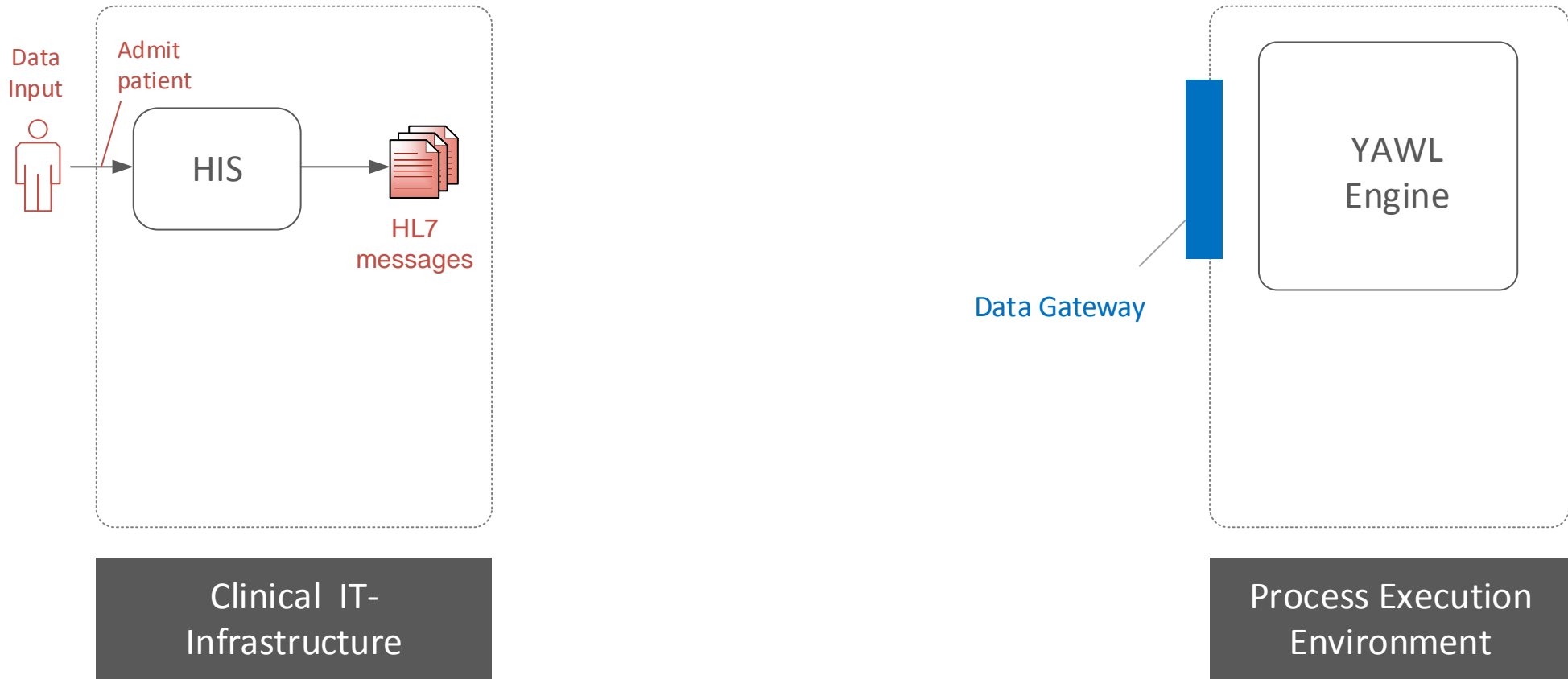
# Synchronisation Principle





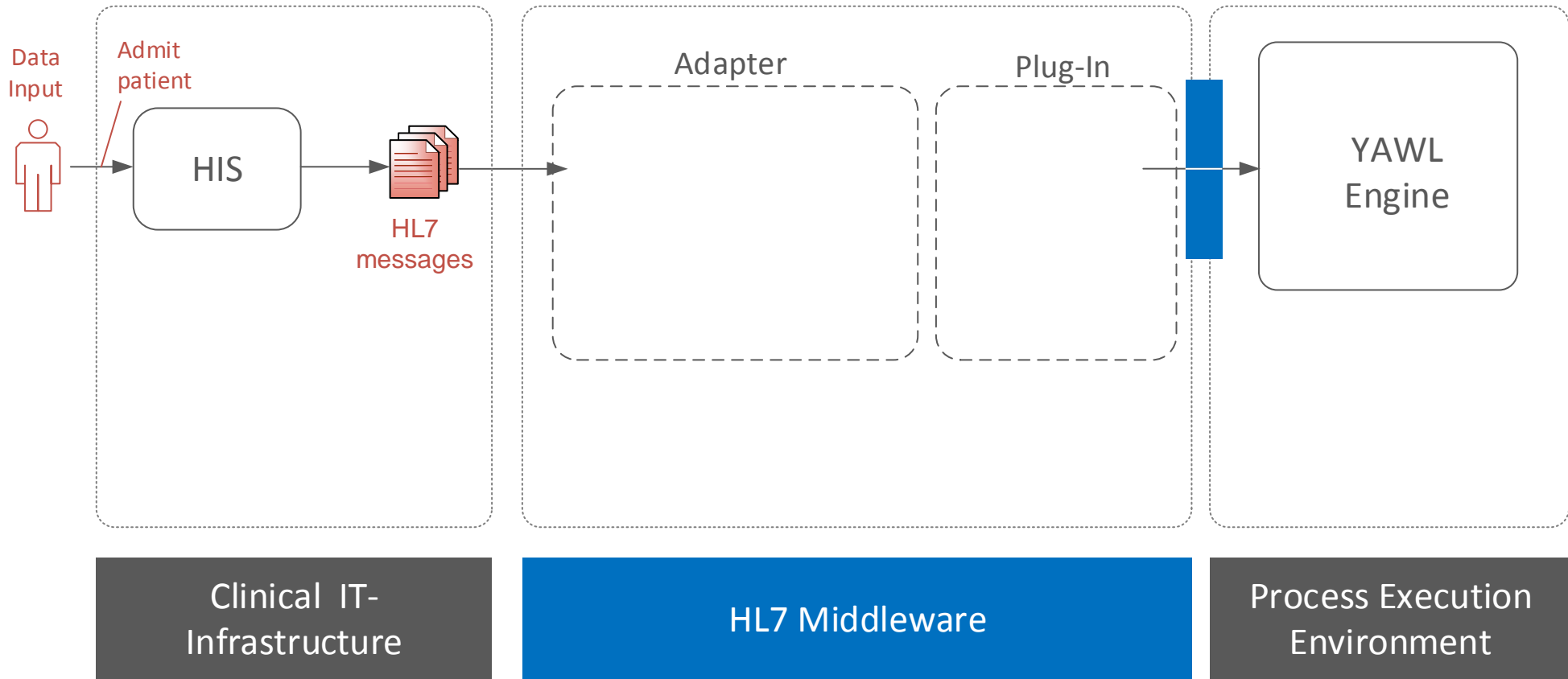
## Bridging the gap between the HIS layer and YAWL

In case of the task „Admit patient“, data are generally entered into the system via the HIS.





**Bridging the gap between the HIS layer and YAWL**  
 Adapter and plug-in make up the domain-specific HL7 middleware

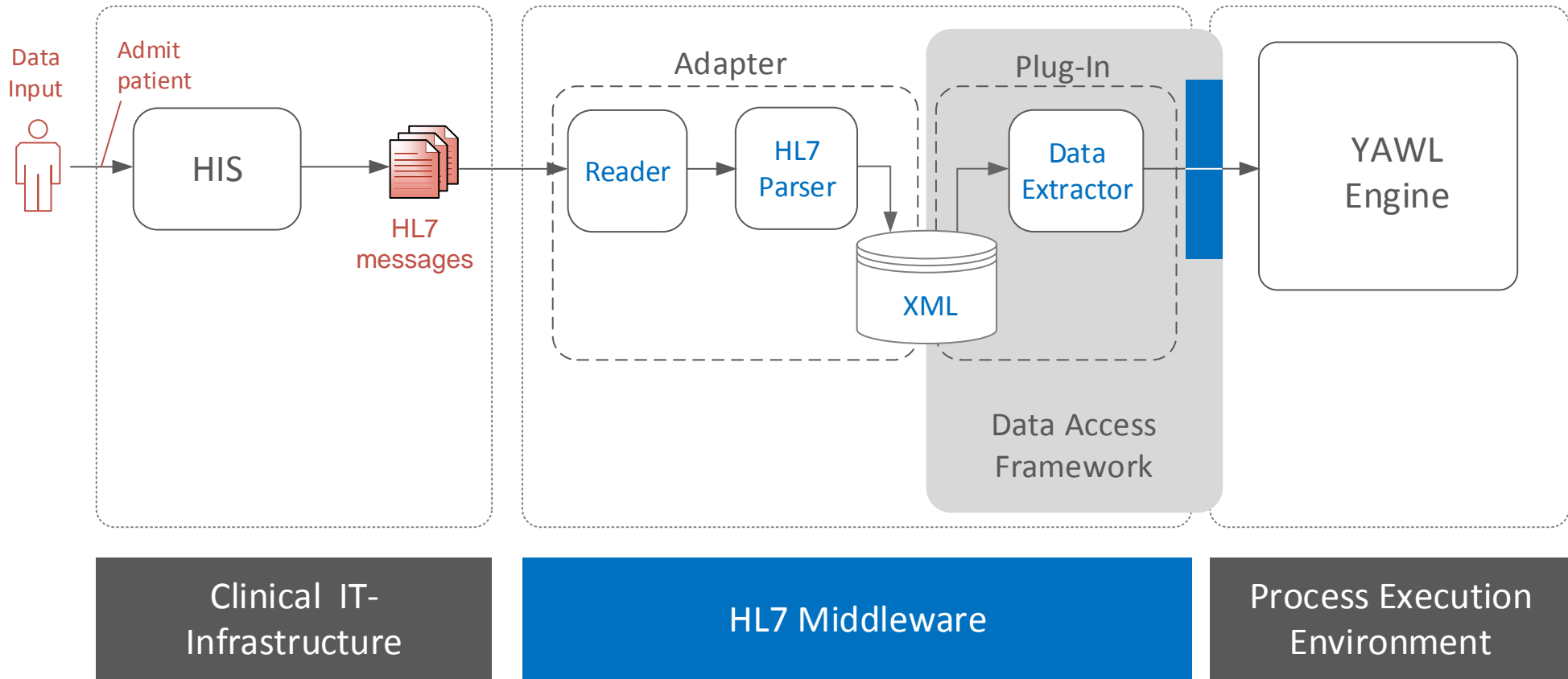


**Introduction of a domain-specific middleware**



## Functional building blocks

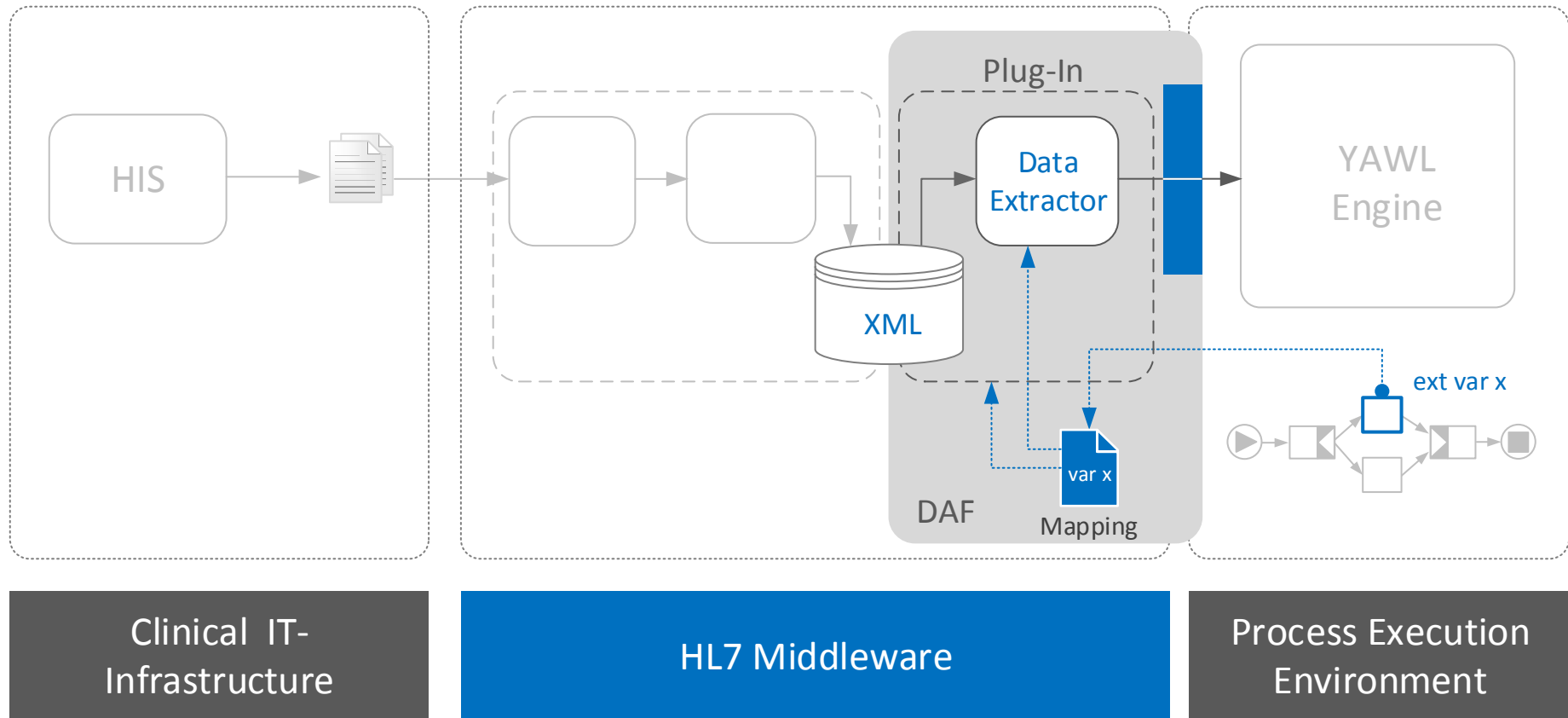
The component „Data Extractor“ executes an XPath query to select business process relevant data from the XML representation of the HL7 message





## Separation of concerns

Domain-specific metadata are decoupled from the business process specification





- ✓ Process automation allows for an **end-to-end operational control** of patient cases associated with surgical procedures
- ✓ The process execution engine should be **interoperable** with the hospital's IT infrastructure
- ✓ Interoperability should be **bidirectional**
- ✓ Depending on the individual task, **either** HIS **or** WfMS can be the principal data-capturing system



# Thank you!

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## People involved

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