# Microkernel Architecture

CSSE6400

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So far…

Simplicity – Monolith, Pipeline

Modularlity – Layered, Pipeline

### Definition 1. Extensibility

Features or extensions can be easily added to the software over its lifespan.

Question

How easy is it to extend *Monolith*, *Layered* or *Pipeline*?

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Answer

Monolith – Everything in one container

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Answer

Monolith – Everything in one container

Layered – Typically all layers

Pipeline – Create a new filter

### Definition 2. Interoperability

Software can easily share information and exchange data with internal components and other systems.

Question

# What about interoperability?

Question

# What about interoperability?

Answer

## Monolith – Everything in one container

- Internal 
- External 

Question

# What about interoperability?

Answer

## Monolith – Everything in one container

- Internal  External 

## Layered – Nearest Neighbour

- Internal  External 

Question

# What about interoperability?

Answer

## Monolith – Everything in one container

- Internal  External 

## Layered – Nearest Neighbour

- Internal  External 

## Pipeline – Standard Interface

- Internal  External 

Question

# What if I want simplicity, extensibility and interoperability?

Question

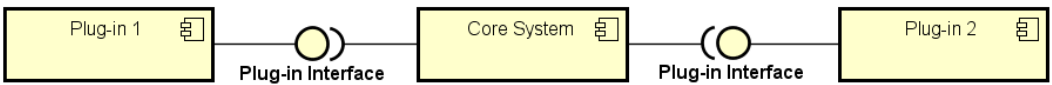
# What if I want simplicity, extensibility and interoperability?

Answer

# Consider *Microkernel Architecture*

### Definition 3. Microkernel Architecture

Core system providing interfaces that allow plug-ins to extend its functionality.



### Definition 4. Registry

Tracks which plug-ins are available to the core system and how to access them.

# Loading Plug-ins

Static Loading when application starts

Dynamic Loading as needed at run-time

Registry designed for the selected strategy

Question

# Can you think of a *microkernel archiecture*?

Question

## Can you think of a *microkernel archiecture*?

Answer

## Web Browser?

### Definition 5. Independent Plug-in Principle

Plug-ins should be independent, with no dependencies on other plug-ins. The only dependency on the core system is through the plug-in interface.

### Definition 6. Standard Interface Principle

There should be a single interface that defines how the core system uses plug-ins.

Question

# Does a plug-in architecture equate to a microkernel archiecture?

Question

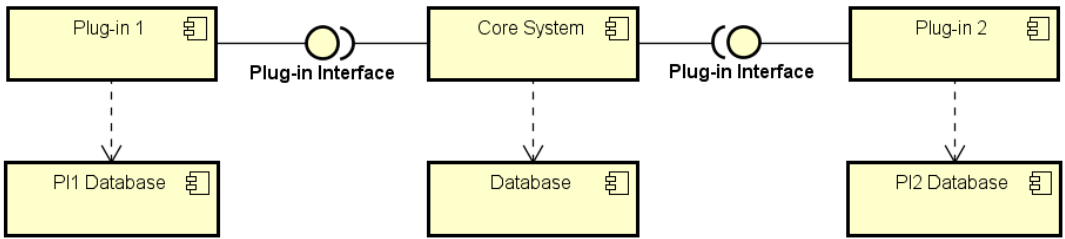
# Does a plug-in architecture equate to a microkernel archiecture?

Answer

# What about *IntelliJ*?

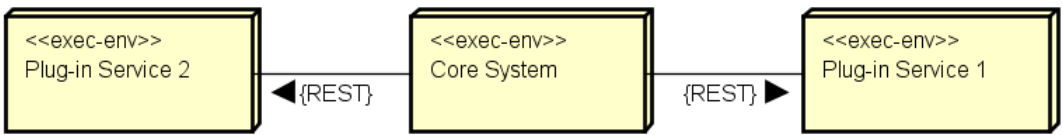
# Plug-ins with Separate Databases

- Plug-ins cannot access core system data
  - Core system may pass data to the plug-in
- Plug-ins may have their own persistent data

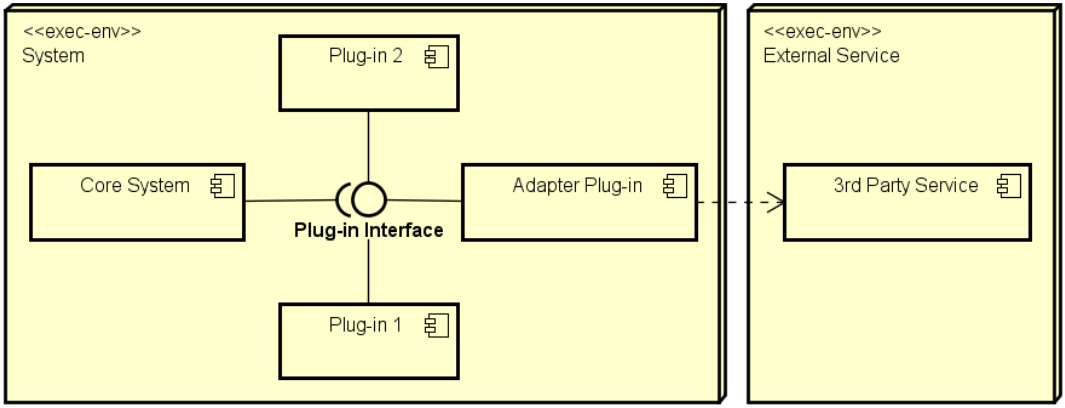


# Plug-ins as External Services

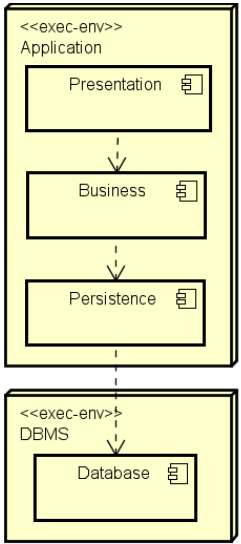
- Need communication protocol
- Registry records communication contract
  - e.g. URL of the REST endpoint & data passed to it



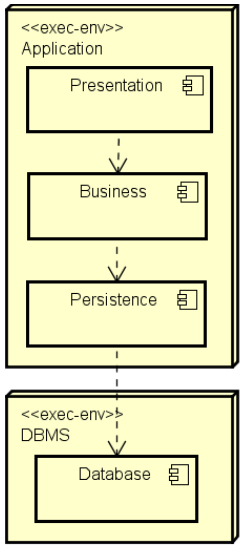
# Adapting Non-Conforming Interfaces



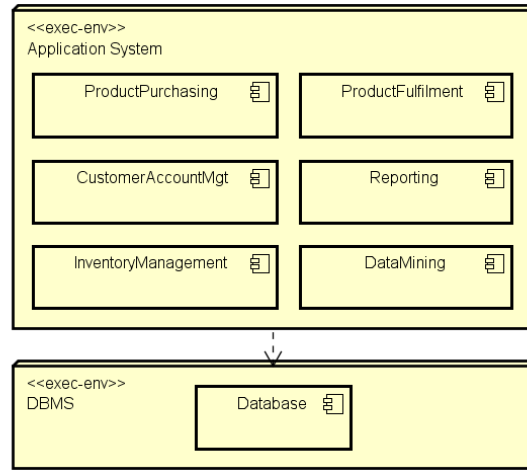
# Technical Partitioning



# Technical Partitioning




# Domain Partitioning



Question

# Is the microkernel architecture suited to *technical* or *domain* partitioning?

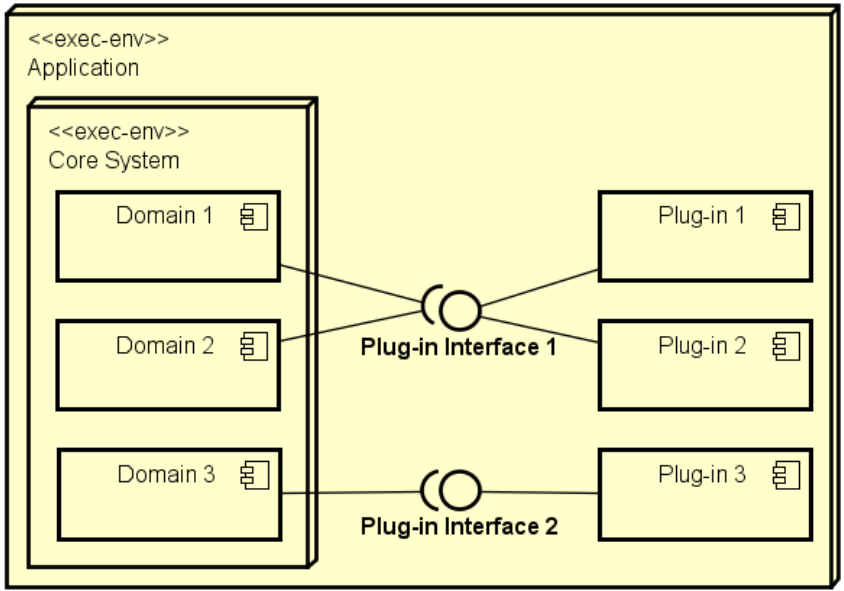
Question

Is the microkernel architecture suited to *technical* or *domain* partitioning?

Answer

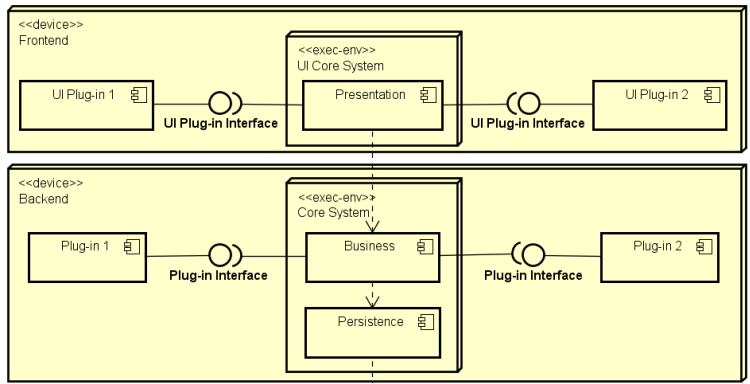
Core system can be partitioned either way.

# Domain Standard Interfaces



# Distributed Microkernel

- Partitions in the core system can be distributed
  - Technical or domain partitions
  - Plug-ins could also be distributed



# Pros & Cons

Simplicity Core system & Plug-in interface 

Extensibility Plug-ins 

Interoperability Plug-ins 

Scalability 

Reliability