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SysML 2 API

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Contents

- What is an API?
- Why does SysML 2 need an API?
- What would a SysML 2 API look like?
- Can I see a Hello World example?

What is an API?

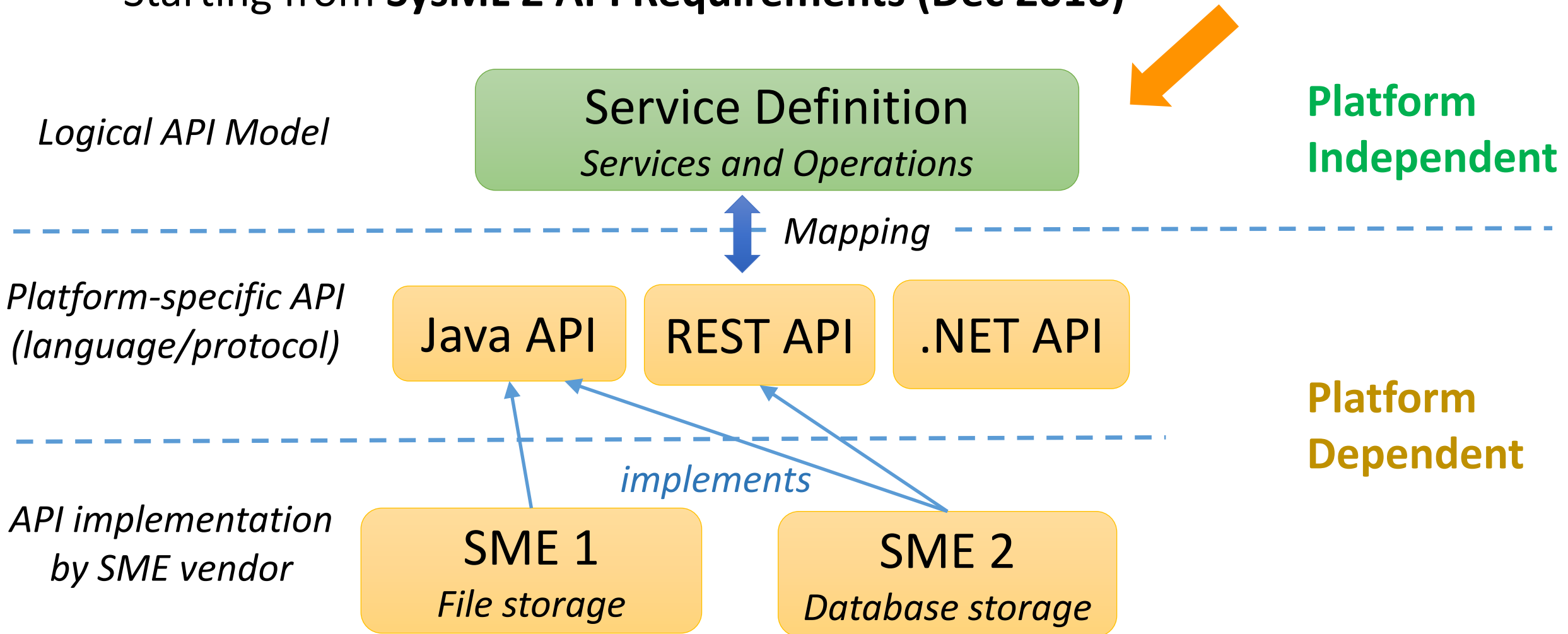
- API = Application Programming Interface
- API = Interface for software to communicate with each other
- For any software, we will typically have
 - Graphical Interface = Interface for human users
 - Application Programming Interface = Interface for other software
- What is an API useful for?
 - If a software (X) provides an API, you can write your own software (Y) to communicate with that software (X)

Why does SysML 2 need an API?

- We have always needed to access system model and automate
 - Document generation
 - Model validation
 - Model generation/transformations
 - Analysis and reasoning
- Today
 - We write plugins / scripts for a specific SysML tool
 - Application logic subject to tool-specific implementation of SysML
- SysML 2 API will make it possible to
 - Write core application (business logic) using SysML 2 services, independent of a specific tool
 - Deploy the core application for each SME
 - No need to rewrite the whole application for each SME

What would SysML 2 API look like?

- Starting from **SysML 2 API Requirements (Dec 2016)**



SysML 2 Services – Client & Provider (SME)

SysML 2 Services



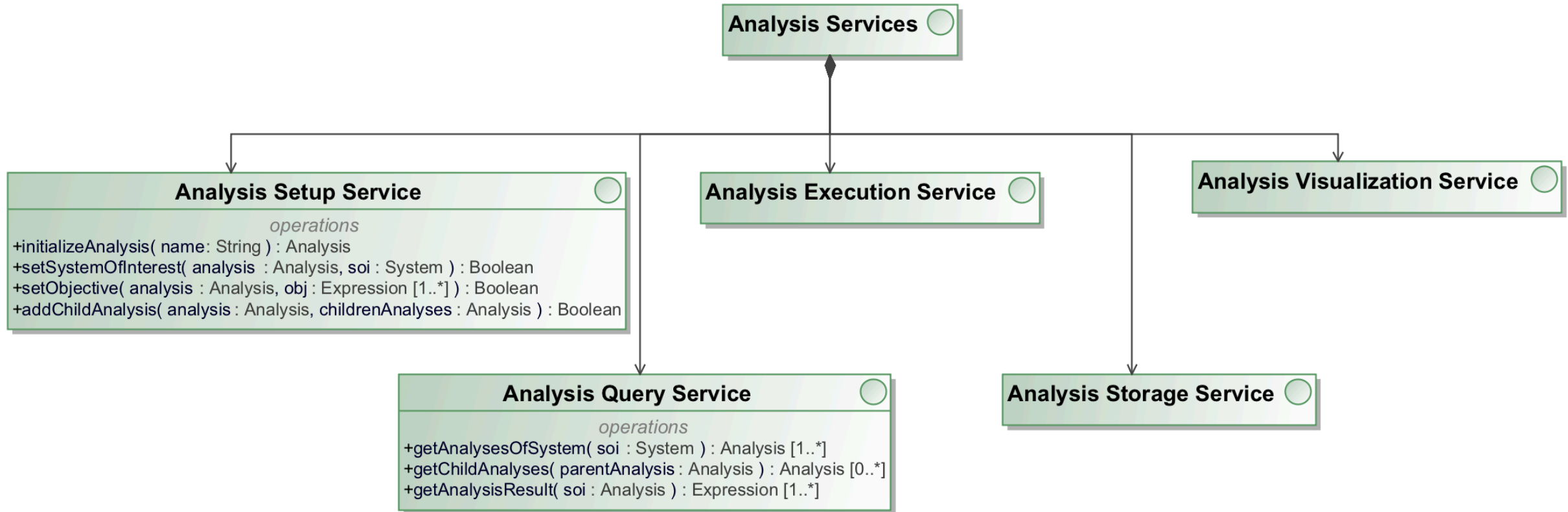
User of SysML 2 Services

SME = Provider of SysML 2 Services

SysML 2 Service Definitions

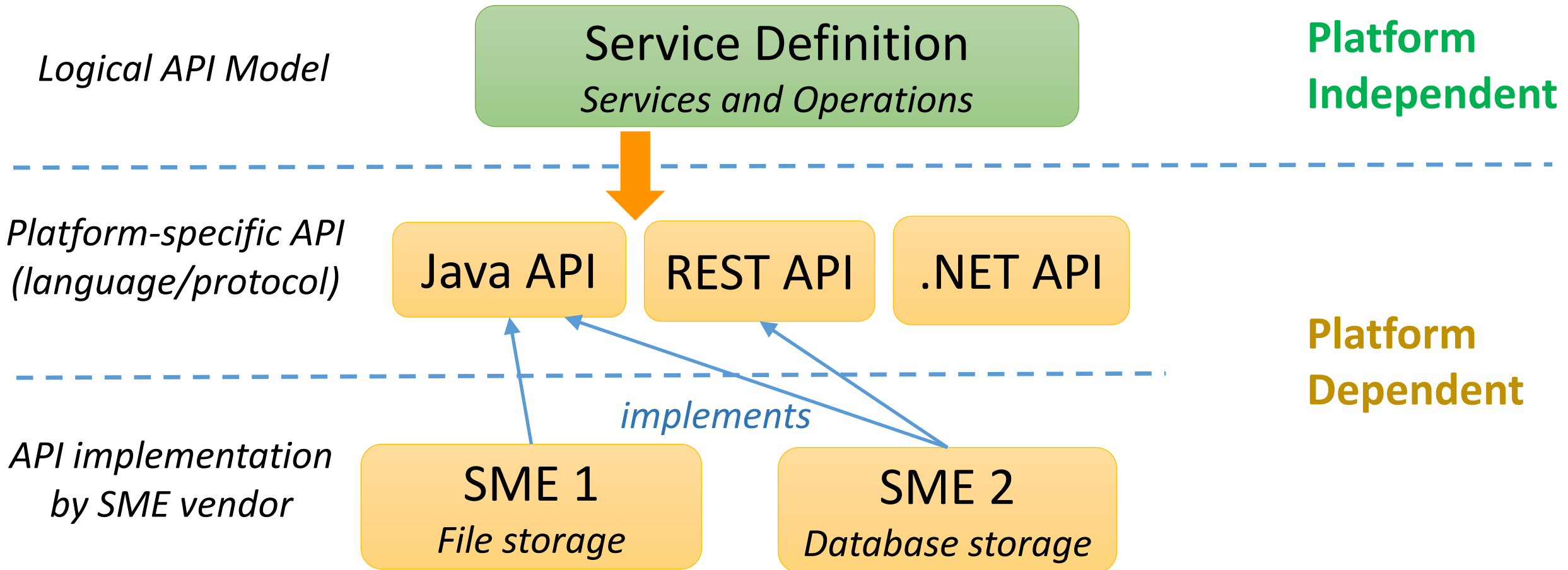
Analysis Services Example

bdd [Package] Services [Analysis Services]



What would SysML 2 API look like?

- Starting from **SysML 2 API Requirements (Dec 2016)**



Java API for Services

Java interface for each service

Service Definition
Services and Operations

Java API

Analysis Query Service

operations

```
+getAnalyses() : Analysis [1..*]  
+getAnalysesOfSystem( soi : System ) : Analysis [1..*]  
+getChildAnalyses( parentAnalysis : Analysis ) : Analysis [0..*]  
+getAnalysisResult( soi : Analysis ) : Expression [1..*]
```

```
package services;  
  
import java.util.Collection;  
  
import domain.Analysis;  
import domain.Expression;  
import domain.System;  
  
public interface AnalysisQueryService {  
  
    public Collection<Analysis> getAnalyses();  
  
    public Collection<Analysis> getAnalysesOfSystem(System soi);  
  
    public Collection<Analysis> getChildAnalyses(Analysis analysis);  
  
    public Collection<Expression> getAnalysisResult(Analysis analysis);  
  
}
```

REST API for Services

Java interface for each service

Service Definition
Services and Operations

REST API

Analysis Query Service
<i>operations</i>
+getAnalyses() : Analysis [1..*]
+getAnalysesOfSystem(soi : System) : Analysis [1..*]
+getChildAnalyses(parentAnalysis : Analysis) : Analysis [0..*]
+getAnalysisResult(soi : Analysis) : Expression [1..*]

GET /sysml2/api/analyses

GET /sysml2/api/analyses/:soi

GET /sysml2/api/analyses/children/:id

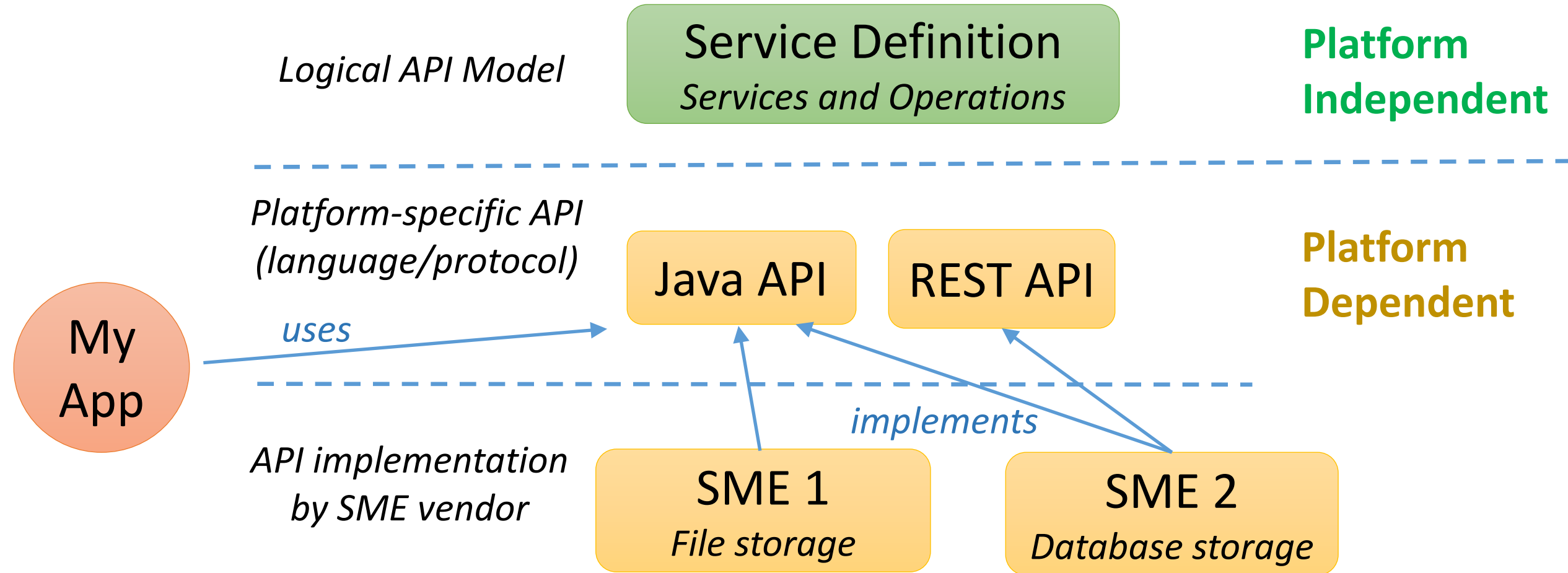
GET /sysml2/api/analyses/result/:id

Can I see some Hello World examples?

- Example 1 – SME-independent application using SysML 2 API
 - SysML 2 Analysis Service as Java API
 - Two SMEs implement this Java API
 - Write a *simple app* using SysML 2 API and run with both SMEs
- Example 2 – REST API
 - SysML 2 Analysis Service as REST API

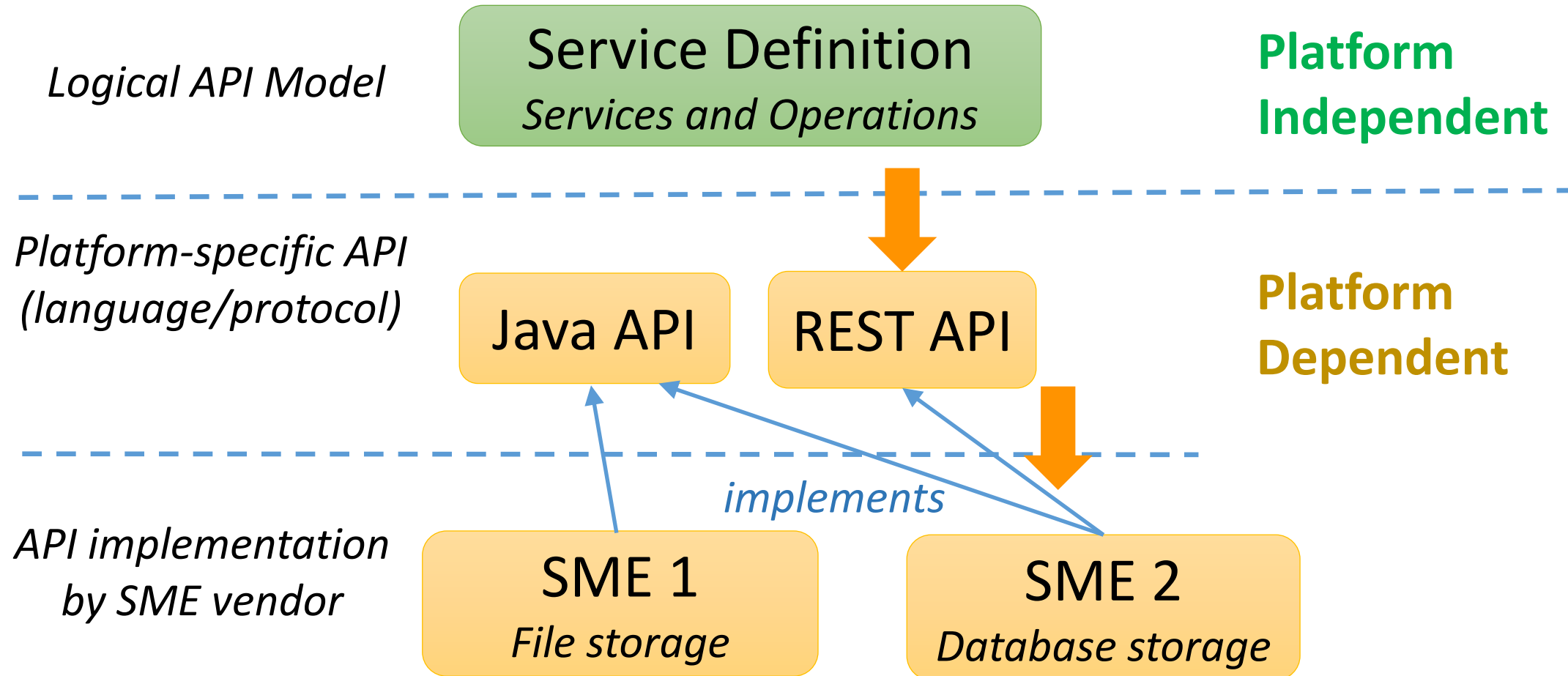
Example 1 – MyApp using SysML 2 Java API

- Starting from **SysML 2 API Requirements (Dec 2016)**



Example 2 – SysML 2 REST API

- Starting from **SysML 2 API Requirements (Dec 2016)**



```
[
  {
    "name": "Car Max Speed Analysis",
    "id": "f01bae55-b1ff-42d6-b9d2-5ff6910a8cda",
    "systemOfInterest": "Car",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  },
  {
    "name": "Sat Mass Analysis",
    "id": "d5e73ad3-1ffe-4eec-aef1-e49b9159879d",
    "systemOfInterest": "Satellite",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  },
  {
    "name": "Car Min Speed Analysis",
    "id": "844d110c-6b56-4e19-af1d-24d449d1905f",
    "systemOfInterest": "Car",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  },
  {
    "name": "Sat Power Analysis",
    "id": "e2b4c686-fb5e-4470-82ec-2e09b3b94b9c",
    "systemOfInterest": "Satellite",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  }
]
```

SysML 2 REST API

- Get all analyses
- **GET** <host>/api/sysml2/analyses

SysML 2 REST API (cont.)

- Get analysis by id
- **GET** <host>/api/sysml2/analyses/:id

```
localhost:9999/api/sysml2/analyses/f01bae55-b1ff-42d6-b9d2-5ff6910a8cda
{
  "name": "Car Max Speed Analysis",
  "id": "f01bae55-b1ff-42d6-b9d2-5ff6910a8cda",
  "systemOfInterest": "Car",
  "objective": null,
  "childrenAnalyses": [
    ""
  ],
  "result": null
}
```

```
localhost:9999/api/sysml2/analyses/system/Car
[
  {
    "name": "Car Max Speed Analysis",
    "id": "f01bae55-b1ff-42d6-b9d2-5ff6910a8cda",
    "systemOfInterest": "Car",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  },
  {
    "name": "Car Min Speed Analysis",
    "id": "844d110c-6b56-4e19-af1d-24d449d1905f",
    "systemOfInterest": "Car",
    "objective": null,
    "childrenAnalyses": [
      ""
    ],
    "result": null
  },
  {
    "name": "Car Speed Analysis",
    "id": "c4bf0dae-58bf-4655-b591-7ea740c3bdf9",
    "systemOfInterest": "Car",
    "objective": null,
    "childrenAnalyses": [
      "Car Min Speed Analysis",
      "Car Max Speed Analysis"
    ],
    "result": null
  }
]
```

SysML 2 REST API (cont.)

- Get analysis by system

- **GET**

<host>/api/sysml2/analyses/system/:id

Questions / Comments

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