Enterprise System Integration

Session 1: Introduction to Practical Sessions

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Agenda

1. Course Organisation
   - Development Environment and Technologies
   - Package Managers
Course Organisation

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Enterprise integration is a discipline and enabling technology that connects and combines people, processes, systems, and technologies to ensure that the right people and the right processes have the right information and the right resources at the right time to perform their duties effectively. [3]
Objective

How to manage enterprise systems integration efficiently?
Motivation

- Enterprise integration is a field of study that has been around since the 1990s [10]
- In large organizations, hundreds, or sometimes even thousands of information systems exist [6]
- Today, almost a third of a company’s IT budget is spent on integrating applications so they can share data [3].
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<th>General Info, Logistics, Technologies, and Setting up Development Environment.</th>
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<td>Session 4</td>
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Session 5  · · · • Integration and Building SOAP APIs.

Session 6  · · · • Integration and Building REST APIs.

Session 7  · · · • Consuming REST APIs.

Session 8  · · · • Assignment: Building and Consuming SOAP APIs.

Session 9  · · · • Building Role-based REST API.
Learning Path (Cont…)

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Learning Path (Cont...)

Session 14

Assessment 3: Project Final Presentation.
2. Enterprise Scale CI/CD and Utilising APIs

Figure: CI/CD Pipeline
2. Enterprise Scale CI/CD and Utilising APIs

Figure: CI/CD Pipeline
3. Enterprise Architecture Modeling

- Most of the challenges and problems in enterprise systems integration are socio-organizational [9].
- Understand the nature, interactions, and operations
- A high-level integration strategy

Create the views with the help of existing EA frameworks

1. Zachman Framework [8]
3. The Department of Defence Architecture Framework [13]
4. The NATO Architecture Framework [12]
4. Integration with Enterprise Networking Hardware

- The term "loosely coupled system" refers to a system in which the components are linked together by a communication network [10].

How?
- Network Environment
  - Cisco Sandbox
- Scripting
  - Python
- API
  - REST

How?
- Data Formats
  - JSON, XML, YAML, INI
- Linux Skills
- Automation
  - Ansible
5. Integration and Building SOAP APIs

- SOAP is an XML-based protocol for sending messages and making remote procedure calls in a distributed environment [4].
- SOAP successfully ensures Web Service extensibility, transparency, and interoperability [14].
- SOAP works well in distributed enterprise environments [5].

![Diagram showing SOAP Server and SOAP Client with Python and PHP implementations, using Spyne and SoapClient](image)
6. Integration and Building **REST** APIs

- Client-Server Architecture
- Lightweight, easy to consume, and supports all data type directly [7]

```
Java
  ▼ Spring Framework
    ▼ Spring Boot
    ▼ JPA
    ▼ H2

Tools
  ▼ JDK 1.8 or later
  ▼ IntelliJ IDEA
  ▼ Gradle
```

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7. Consuming REST APIs

Testing
- Postman API Platform
- SoapUI
- Command Line: cURL

REST Client
- JavaScript
  - Using jQuery
    - Library
    - Ajax
    - VueJS
8. **Assignment 1: Building and Consuming SOAP API**

Performing Operations (Shell Commands) with SOAP Web Services

This assignment's main purpose is to gain a deeper theoretical and practical understanding of Executing Shell Commands and Web Services, particularly SOAP, in Python. In this homework assignment, we ask students to execute Shell commands by writing and calling SOAP Web Services in Python.
9. Building Role-based REST API

Technologies
- Spring Boot
- Spring Security
- OAuth2
- Java Persistent API (JPA)
- H2 Database Engine

OAuth2 Authorisation Server
(Users and Clients Details)

1. Provide Credentials

Client APP

2. Send Token

3. Use Token to Request a Resource

4. Verify Token

5. Provide Resource

REST API
(OAuth2 Secured)
(Resource Server)
• GraphQL is a **query language** for implementing web service architectures
• Clients can define exactly the data they require from service providers.
• It was internally developed at Facebook
• GraphQL requires less effort to implement remote service queries when compared to REST (9 vs 6 minutes, median times) [2].
The X-Road Project

Figure: Source: NIIS
Development Environment and Technologies

Local Environment

- Operating System
  - Linux - Ubuntu
  - macOS

- Programming Language
  - Python
  - Java
  - PHP
  - JavaScript

- Terminal and Shells

- Package Manager
  - apt (Ubuntu), pip (Python), brew (macOS)

- IDE/Editor
  - Visual Studio Code, Intellij IDEA, Atom,
    PyCharm

Auxiliary Tools

- Kite - AI Coding Assistant
- SoapUI - API Testing
Development Environment and Technologies (cont...)

**DevOps**

- Heroku
  - PaaS
- Container Engine
  - Docker
- Automation Server
  - Jenkins
- Subversion Control System
  - git/Github

**Data and Configuration**

- Data Serialization (YAML)
- Markup Language (XML)
- Data Interchange Format (JSON)
**Package Managers**

**Ubuntu Package Managers**

- Advanced Packaging Tool (`apt`)
  - `sudo apt install package name`
  - `sudo apt install Debian Package.deb`
  - `sudo apt remove package name`
  - `sudo apt upgrade`

- Install Debian Packages in Ubuntu (`snap`)
  - `sudo apt install snapd`
  - `sudo snap install atom --classic`

**Python Package Installer**

- Required package: `python3-distutils`
- `pip install package name`
Other Tools

- **URL Manipulation**
  - `sudo apt install curl`
  - `curl -I https://www.ut.ee`

- **Typical developer tools (GNU and C/C++ Compilers)**
  - `sudo apt install build-essential`

- **Source Control Systems**
  - `sudo apt install git`

- **Python virtual environments**
  - `sudo apt install python3-virtualenv`
# Text Editors and IDEs

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<th>Editors/IDEs</th>
<th>VS Code Configuration</th>
</tr>
</thead>
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<tr>
<td><strong>nano</strong></td>
<td>Press <code>ctrl + p</code></td>
</tr>
<tr>
<td>- <code>sudo apt install nano</code></td>
<td>Paste the following command and press Enter</td>
</tr>
<tr>
<td>- <code>nano filename</code></td>
<td>ext install ms-python.python</td>
</tr>
<tr>
<td><strong>Visual Studio Code</strong></td>
<td>Install</td>
</tr>
<tr>
<td>- <code>sudo snap install code --classic</code></td>
<td>Open Command Pallette</td>
</tr>
<tr>
<td><strong>Atom</strong></td>
<td><code>ctrl + shift +p</code></td>
</tr>
<tr>
<td>- <code>sudo snap install atom --classic</code></td>
<td>Type <code>Python:Select Interpreter</code></td>
</tr>
<tr>
<td></td>
<td>Select it</td>
</tr>
</tbody>
</table>
Development Tools and Clients

Postman

- Automation of API Tests
  - `sudo snap install postman`

- Test
  - Enter `https://icanhazdadjoke.com/` into the address bar.
  - Click the Headers tab and add an entry for Accept with a value of `application/json`.
  - Click Send and enjoy your joke.
Thank you!

Questions?

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