Marwadi University
Marwadi Chandarana Group

NAAC A+

Subject

Subject Name: Open Source Technologies

Subject Code: 01CE0618

B.Tech. Year – III

Syllabus coverage plan

We will cover below units for mid – 1 Exam:

Sr. No	Unit	Hours
1	Introduction to Open Source	4
2	Open Source Licensing and Legal Aspects	4
3	Open Source Communities and Contribution Models	4
4	Version Control Systems	4
5	Package Managers	4

Total teaching hours = 20 Hours

Below Units will be covered after mid – 1 exam:

Total teaching hours = 24 Hours

Sr. No	Unit	Hours
6	Web App Development using OSS Frameworks	5
7	Deployment Platforms and Web Servers	4
8	Open Source Databases	3
9	Open Source Testing and Automation Tools	5
10	Case Studies and Real-world OSS Applications	5

Tools & Platforms Covered During the Semester

Version Control

- Git

Package Managers

- npm (JavaScript)
- yarn (JavaScript)
- pip (Python)
- composer (PHP)

Deployment Tools / Web Servers

- Nginx
- Apache

Testing Tools

- PyTest – Unit Testing
- Selenium – Web UI Testing
- Postman – API Testing
- OWASP ZAP – Security Testing

Databases

- MySQL
- PostgreSQL
- MongoDB

Internal assessment pattern

Practical:

ESE - 50 Marks – Department End Semester Exam
(Practical)

IA - 30 Marks – Department Mid Semester Exam
(We will conduct two MCQ based exam, each of 30 marks and we will make average of two)

CSE - 20 Marks
Prepare a case study on any Open Source web or desktop application. Your study should briefly cover which open-source tools, licenses, communities, version control workflows, package managers, frameworks, servers, databases, and testing/automation tools are used in that application.

Internal assessment pattern

Practical:

TW - 25 Marks – Lab Manual
For Lab Manual – Each Practical to be assessed out of 10 marks (Total 140 marks) to be converted to 25 at End of Semester

PR - 25 Marks - Viva

SYLLABUS AND TEACHING SCHEME

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SUBJECT NAME: OPEN SOURCE TECHNOLOGIES
SUBJECT CODE: 01CE0618

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Termwork (TW)	
3	0	2	4	50	30	20	25	25	150

SYLLABUS

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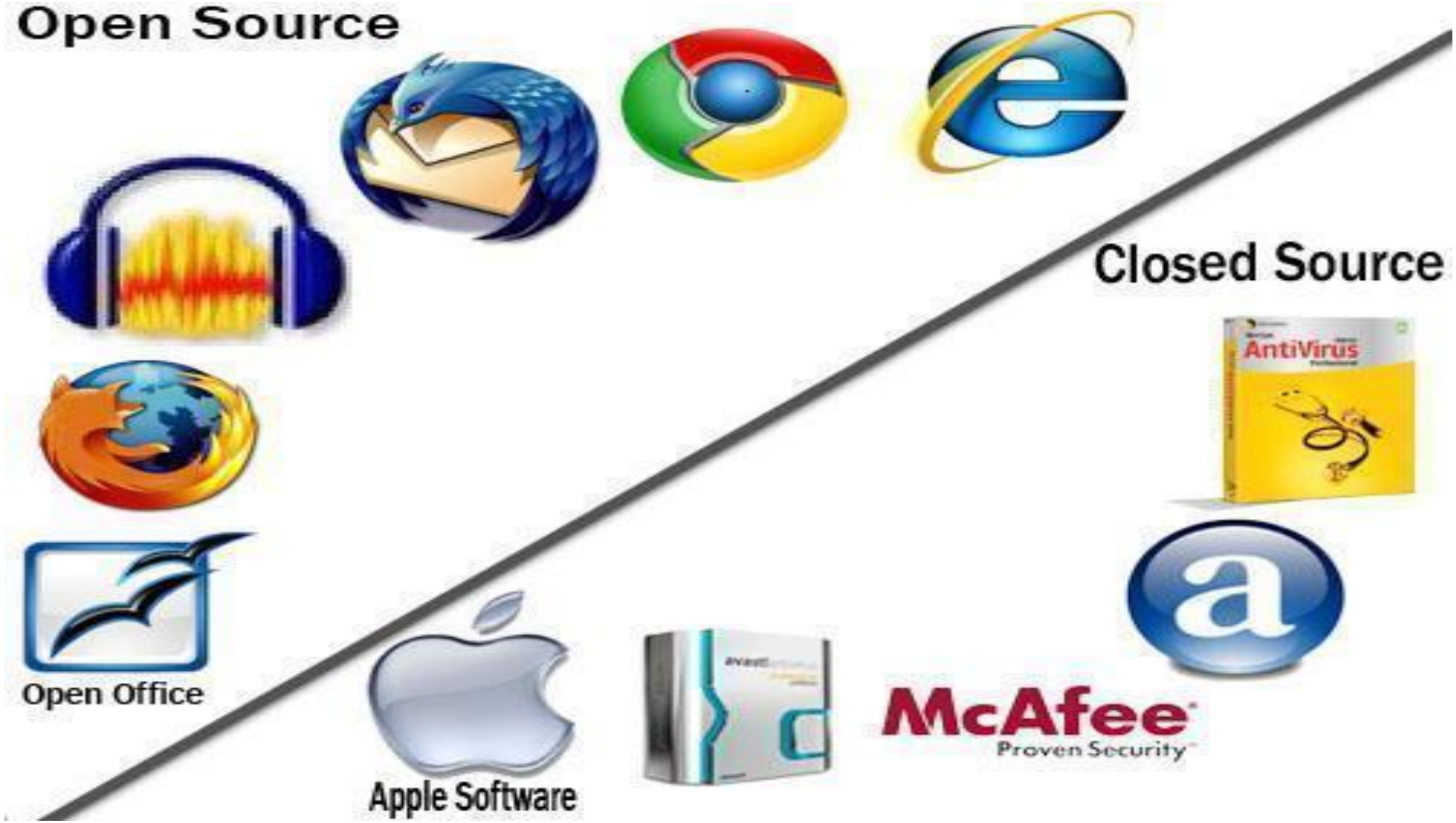
Unit	Topics	Contact Hours
1	**Introduction to Open Source:** Definition, History, OSS vs Proprietary vs Freeware, Characteristics of OSS, Benefits and Challenges	4
2	**Open Source Licensing and Legal Aspects:**	4
	GPL, MIT, BSD, Apache, LGPL Copyleft vs Permissive,Copyright, Patent, Trademark, Compliance Considerations	
3	**Open Source Communities and Contribution Models:** Structure of OSS communities, How to contribute, Communication platforms (IRC, forums), Issue tracking, Pull requests, Code of Conduct	4
4	**Version Control Systems:** Git Basics, Git workflows (feature branches, pull requests), GitHub/GitLab/Bitbucket usage	4
5	**Package Managers :** Introduction to npm, pip, composer, yarn, Semantic versioning, Managing project dependencies	4

SYLLABUS

6	**Web App Development using OSS Frameworks :** Introduction to Laravel, Django, Node.js, MVC architecture overview, Setting up development environments	5
7	**Deployment Platforms and Web Servers :** Web servers (Apache, Nginx), Reverse proxy and load balancing, Introduction to CI/CD in open source deployments	4
8	**Open Source Databases :** Relational - MySQL and PostgreSQL - Basic setup, CRUD operations, common use cases, Non-Relational - MongoDB - Document-based model, CRUD operations, basic comparison with SQL, MySQL workbench and MongoDB compass - GUI for interaction	3
9	**Open Source Testing and Automation Tools :** Unit testing (PyTest, PHPUnit, JUnit), Web testing (Selenium, JMeter), API testing (Postman), Security testing (OWASP ZAP)	5
10	**Case Studies and Real-world OSS Applications :** Desktop (GIMP, LibreOffice, Thunderbird), Web (WordPress, Wikipedia, Odoo), Using and customizing open source projects	5

UNIT 1 : INTRODUCTION TO OPEN SOURCE:

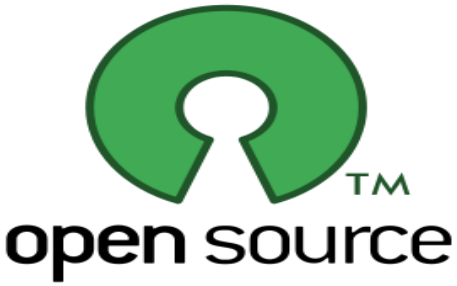
- Definition
- History
- OSS vs Proprietary vs Freeware
- Characteristics of OSS
- Benefits and Challenges

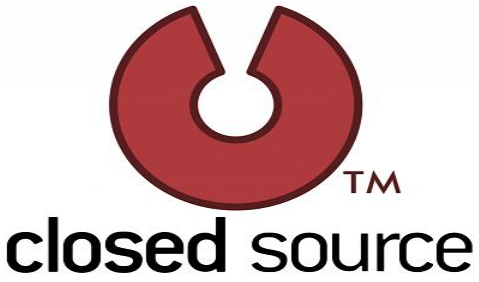

Open Source
Closed Source
AntiVirus
Open Office
Apple Software
McAfee
Proven Security

OPEN SOURCE VS. CLOSED SOURCE

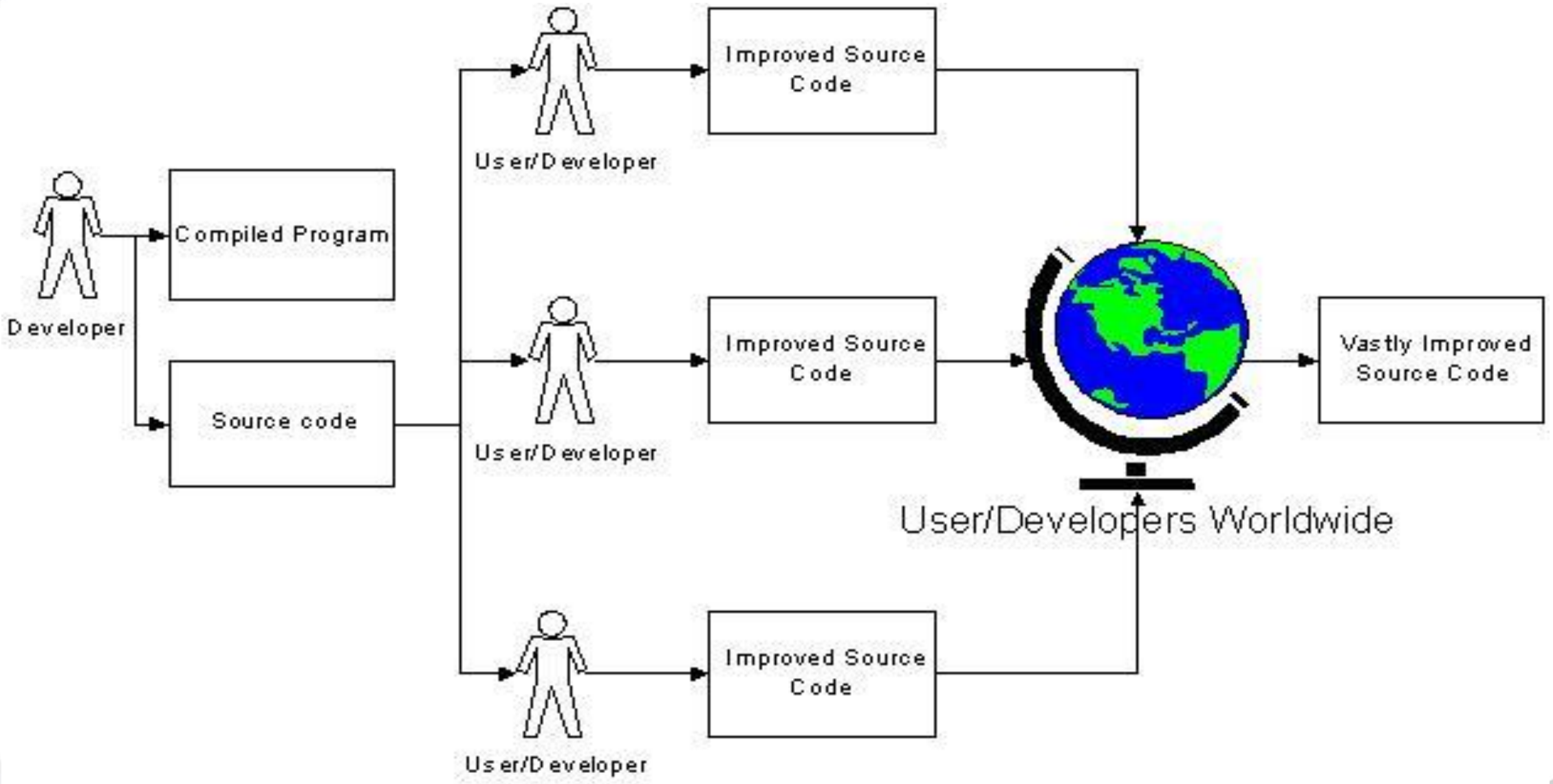
- **Open-source software is based on the idea that the user cannot only view but also can change the source code of the existing application.**

- **Closed-source software is hidden to prevent the user either viewing or changing the code.**

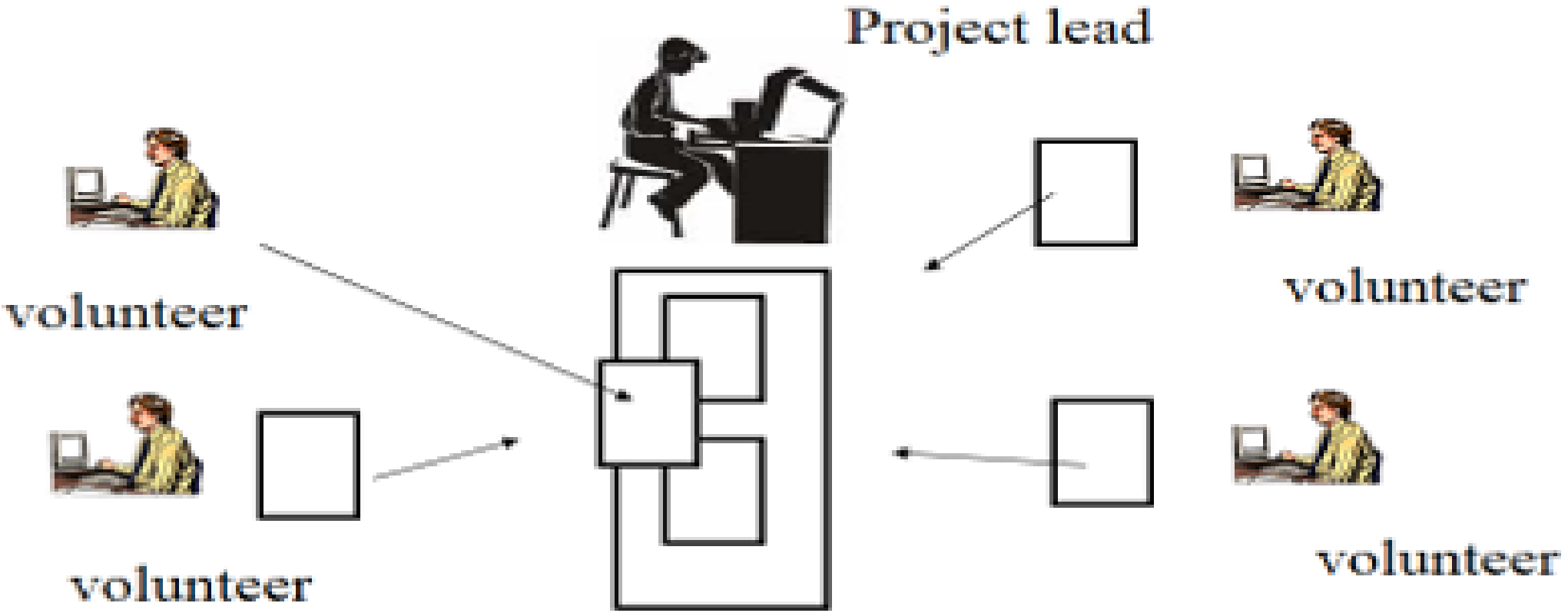




HOW OPEN SOURCE WORKS ?



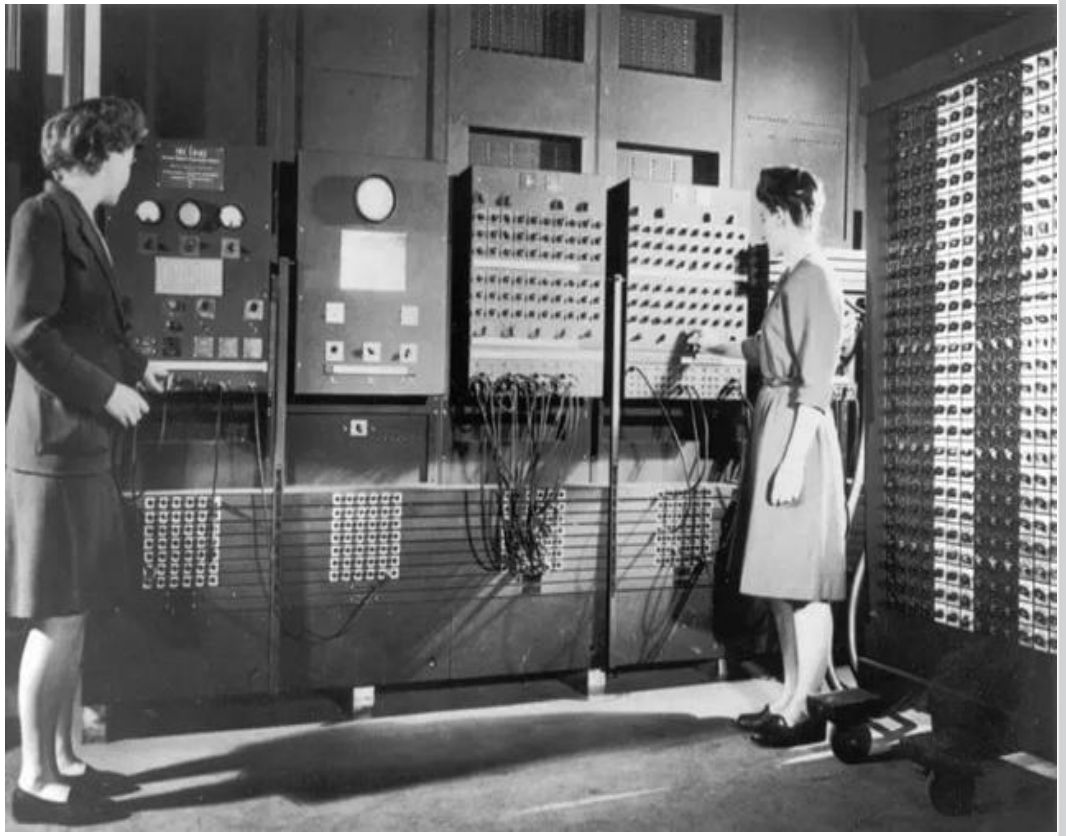
OPEN SOURCE DEVELOPMENT MODEL



HISTORY OF OPEN SOURCE SOFTWARE

Early Software Development Era (1950s–1970s)

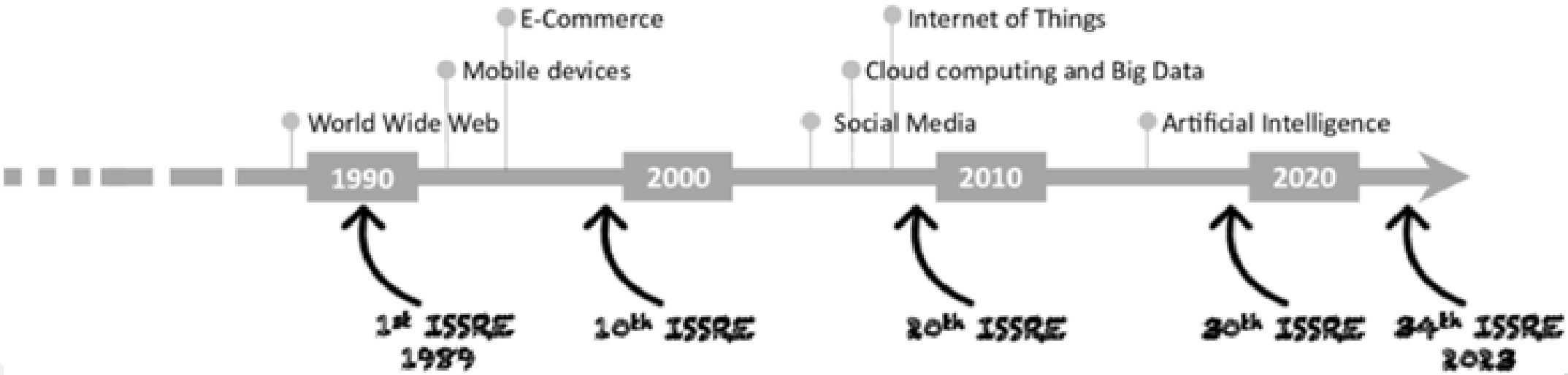
- Software was freely shared among researchers
- Universities and research labs collaborated openly
- Software bundled with hardware
- No concept of software ownership or licenses



HISTORY OF OPEN SOURCE SOFTWARE

Emergence of Proprietary Software (1980s)

- Software became a commercial product
- Companies started closing source code
- License agreements restricted usage
- Collaboration reduced significantly
- Triggered resistance from developer communities



HISTORY OF OPEN SOURCE SOFTWARE

Birth of Free & Open Source Movement

- Free Software Movement began in the 1980s
- Linux kernel released in 1991
- Term “Open Source” coined in 1998
- OSS gained global recognition and adoption

SOFTWARE CLASSIFICATION OVERVIEW

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Software can be classified based on **user rights and restrictions**

- Classification helps in:
  - Legal compliance
  - Cost planning
  - Software selection
- The main **classification criteria** are:
  - Source code availability
  - Licensing terms
  - Cost

CLASSIFICATION BASED ON SOURCE CODE AVAILABILITY

- Source code refers to the human-readable program instructions

- Availability of source code decides:
  - Transparency
  - Customization
  - Security auditing

Types:

- Open Source Software (OSS)
  - Source code is publicly accessible
  - Users can modify and redistribute

- Closed Source Software
  - Source code is hidden
  - Users cannot modify

CLASSIFICATION BASED ON LICENSING TERMS

- License defines **legal rights and limitations**
- Specifies:
  - How software can be used
  - Whether modification is allowed
  - Redistribution rules

Types:

- **Open Source Licenses**
  - GPL, MIT, Apache
  - Allow modification and redistribution
- **Proprietary Licenses**
  - Restrict copying, modification, sharing
- **Freeware Licenses**
  - Allow free usage
  - Restrict modification and redistribution

Classification Based on Cost

- Cost refers to **monetary payment for usage**

- Cost does not always define user freedom

Types:

- **Free Software**
  - No payment required
- **Paid Software**
  - Requires purchase or subscription
- **Freemium Software**
  - Basic version free, advanced features paid

OPEN SOURCE SOFTWARE(OSS)

- Source code is openly available
- Users can modify and redistribute
- Community-driven development
- Transparent and secure
- Examples:
  - Linux
  - Apache
  - Firefox

PROPRIETARY SOFTWARE

- Source code is closed
- Owned by a company or individual
- Requires paid license
- No modification or redistribution allowed
- Examples:
  - Microsoft Windows
  - MS Office
  - Adobe Photoshop

FREEWARE

- Software is free to use
- Source code not available
- Limited user rights
- Often includes ads or limited features
- Examples:
  - Google Chrome
  - Skype
  - Adobe Acrobat Reader

OSS VS PROPRIETARY VS FREEWARE

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Feature	OSS	Proprietary	Freeware
Cost	Free / Paid Code = FREE Value-added services = PAID	Paid	Free
Source Code	Available	Not Available	Not Available
Modification	Allowed	Not Allowed	Not Allowed
Redistribution	Allowed	Restricted	Restricted
Control	Community	Company	Company

OSS VS PROPRIETARY

Key Differences

VS

Open-Source Software		Proprietary Software
Full access to source code	**Access**	Restricted access
Free or low-cost	**Cost**	License fees or subscriptions
High customization	**Customization**	Limited customization
Community/third-party	**Support**	The vendor
Transparent	**Security**	Vendor-managed updates
Longer	**Time to Market**	Faster
No vendor lock-in	**Vendor Lock-In**	Dependent on vendor
Flexible	**Integration**	Limited
Long-term availability	**Longevity**	Vendor-dependent lifecycle
Steeper	**Learning Curve**	Easier

CRITERIA FOR OPEN SOURCE

- Source Code
- Derived Works
- Free Redistribution
- Distribution of License
- Integrity of The Author's Source Code
- License Must Not Restrict Other Software
- No Discrimination Against Persons or Groups
- No Discrimination Against Fields of Endeavor

ADVANTAGES OF OPEN SOURCE

- Availability of source code
  - Source code to understand and learn from
  - Do not have to re-invent the wheel
  - Free as in “freedom”
- Does not depend on vendor
  - Can choose additional support
  - Can fix bugs and adapt to change in requirements as well as technology
- Quality and Customizability in open source is better.
- Costs much less than proprietary counterparts.

DISADVANTAGES OF OPEN SOURCE

- Not generally straightforward to use and requires a certain learning curve to use and get accustomed.
- Incompatibility issue with software and hardware. (3rd party drivers)
- Bad Codes, and some unqualified people who uses it.
- Software quality assurance process is widely not transparent
- No financial incentive.

EXAMPLES OF OPEN SOURCE APP

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1. **Mozilla Firefox**

2. **Open Office**

3. **Mozilla Firefox**

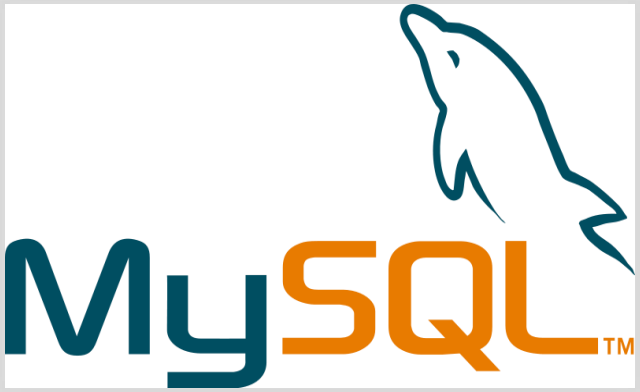
4. **VLC Media Player**

5.Joomla Server

6. WAMP

7. Blender

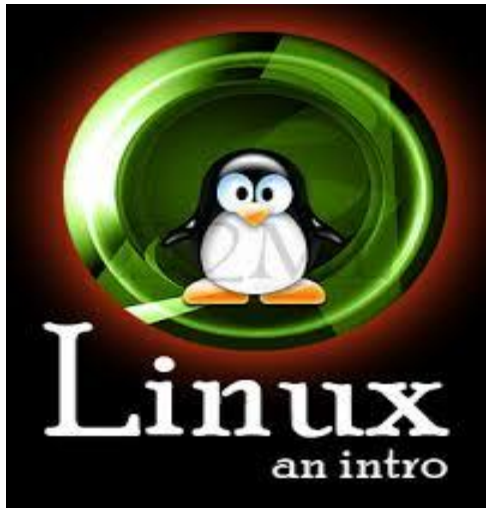
8. MySQL



EXAMPLES OF OPEN SOURCE PROGRAMMING LANGUAGE

EXAMPLES OF OPEN SOURCE O.S.

- 1. Linux
- 2. Google Chrome
- 3. Android

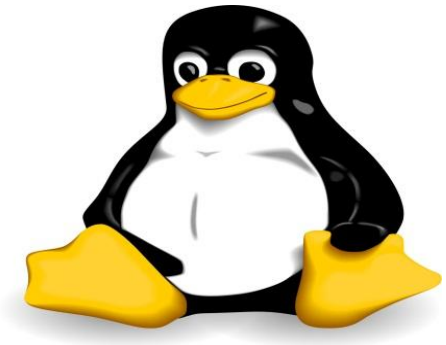


ANDROID

- Linux-based operating system designed primarily for touchscreen mobile devices such as smartphones and tablet computers.
- Android is open source and Google releases the code under the Apache License after acquiring it from Android Incorporation.
- Most widely used mobile platform with over 7,00,000 apps in Google play store, over 25 billion app downloads with 750 million devices running on Android.
- Android Source Code Available at : http://source.android.com/

LINUX

- A very popular open source operating system that runs on a variety of hardware platforms . Linux is widely deployed as a server OS .
- Linux is a multi-tasking, multiuser operating system. Although modified by numerous people.



Values of Open Source

- - Freedom
- - Transparency
- - Extensibility
- - Collaboration
- - Innovation

Strength in numbers!

Viability of Open Source for Libraries

What are ‘hidden’ costs and considerations?

- Infrastructure
- Development
- Support

The Lehigh Experience with Open Source: A Pragmatic Approach

Lehigh Libraries has taken a pragmatic path of considering, on a case-by-case basis, feature-laden OSS for various needs:

- **Discovery**: VuFind
- **Connectivity**: The eXtensible Catalog (XC) NCIP toolkit
- **Web Presence**: Drupal CMS

Open Source Discovery: VuFind

- Very active user community
- Proven Technology - Examples of implementation abound
- Level of Maturity
  (code & the project mgt)
- SirsiDynix Development Community

NEO OFFICE

Most popular open source office application for Mac OS X.

- Word Processing
- Spreadsheet
- Presentation
- Drawing
- Database

Based on the OpenOffice.org office suite, NeoOffice has integrated dozens of native Mac features and can import, edit, and exchange files with other popular office programs such as Microsoft Office.

OPEN SOURCE INTEGRATED LIBRARY SYSTEMS

- Evergreen
- Koha
- Open Biblio
- OPALS

EVERGREEN

- Evergreen is an enterprise-class library automation system that helps library patrons find library materials, and helps libraries manage, catalog, and circulate those materials, no matter how large or complex the libraries.

- Evergreen is open source software, freely licensed under the GNU GPL.

EVERGREEN SUPPORT AND HOSTING

- **NELINET – Spruce Project**

  Spruce Open Source Collaborative to encourage the adoption of open source library software in our region.

- **Equinox Software**

  Evergreen Installation, support and remote hosting service.

- **Progressive Technology Federal Systems, Inc. (PTFS)**

  PTFS supports both Evergreen and KOHA. PTFS provides hosting services for the software system and library data is in a secure data facility.

MAINE LIBRARIES AND EVERGREEN

- Tri-County Consortium is creating a 9 library system using Evergreen
- MSAD 40
- Great interest growing

OPEN SOURCE CONNECTIVITY: THE EXTENSIBLE CATALOG (XC) NCIP TOOLKIT

- Lookup User
- Check In Item
- Check Out Item
- Accept Item

OPALS
(OPEN-SOURCE AUTOMATED LIBRARY SYSTEM)

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A cooperatively developed, Web-based, open source program providing Internet access to information databases and library collections. There is no need to install software or purchase expensive computer hardware for this powerful Internet accessed system.

SOME OF THE OPEN SOURCE TOOLS FOR WEB DESIGNERS

- ***KompoZer :*** **KompoZer is a complete web authoring system that combines web file management and easy-to-use WYSIWYG(What You See Is What You Get) web page editing.**
- ***Notepad++ :*** **Notepad++ is a source code editor and Notepad replacement that supports several languages. It runs on Windows and is governed by a GPL License.**
- ***Firebug :*** **Firebug is a plugin for Firefox that allows you to edit, debug, and monitor CSS, HTML, and JavaScript live in any web page.**
- ***Quanta Plus :*** **Quanta Plus is a highly stable and feature rich web development environment.**

10 Reasons Open Source is Good for Business

- Security

- Quality
- Customizability
- Freedom
- Flexibility

- Interoperability
- Audit ability
- Support Options
- Cost
- Try Before You Buy

PRACTICAL EXAMPLES OF OPEN SOURCE TECHNOLOGY:

The Apache Web Server :

- It is the most widely used web server on the Internet.
- The Apache Software Foundation was formed to provide support Apache an related software.

MYTHS ABOUT OPEN SOURCE

1. **It's all about Linux versus Windows, with Red Hat as yet another challenger to Microsoft.**
2. **Open-source Software Isn't Reliable or Supported.**
3. **Big companies don't use open source software.**
4. **There's no money to be made on free software.**
5. **Open Source is playing catch up to Microsoft and the commercial world.**

Conclusions about OSS:

- **Landscape** of OSS is rich, diverse and maturing
- **Philosophically** a good fit for libraries
- **Key Benefit:** Community, Collaboration!
- **Offsetting costs** in terms of infrastructure, development, support
- **Pragmatic approach** may be best

MCQS

1. What is the primary characteristic of Open Source Software (OSS)?

A. It is free of cost
B. Its source code is publicly accessible
C. It cannot be modified
D. It is owned by a single company

2. Which of the following best describes freeware?

A. Software with freely available source code
B. Software that is free to use but source code is not available
C. Software requiring paid licensing
D. Software created only by volunteers

3. Which event is commonly associated with the beginning of the modern OSS movement?

A. Launch of Windows 95
B. Formation of the GNU Project in 1983
C. Release of Android OS
D. Creation of GitHub

MCQS

4. Which of the following is an example of proprietary software?
A. Linux
B. LibreOffice
C. Microsoft Office
D. MySQL

5. Which of the following is NOT a characteristic of OSS?
A. Community-driven development
B. Ability to modify and redistribute
C. No license required
D. Transparency of code

6. Which of the following is a key benefit of OSS?
A. Vendor lock-in
B. Limited customization
C. High flexibility and freedom to modify
D. High purchasing cost

MCQS

7. What is a major challenge associated with OSS?
A. Lack of source code access
B. Limited community support in some projects
C. Mandatory licensing fees
D. No ability to customize

8. OSS differs from proprietary software mainly in terms of:
A. Security features
B. Availability of source code
C. Programming language used
D. Platform compatibility

9. Which term refers to the risk of relying too much on community-based support in OSS?
A. Flexibility risk
B. Community dependency
C. Vendor lock-in
D. Scalability challenge

MCQS

10. A major benefit of OSS for educational institutions is:

A. High cost of licenses
B. Limited learning opportunities
C. Freedom to study and modify the code
D. No access to documentation

CONCLUSION OF UNIT – 1
INTRODUCTION TO OPEN SOURCE

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- Definition of OSS
- History of OSS
- OSS vs Proprietary vs Freeware
- Characteristics of OSS
- Benefits and Challenges

We Will Study
Open Source Licensing and Legal Aspects

- GPL – GNU General Public License
- MIT – Massachusetts Institute of Technology License
- BSD – Berkeley Software Distribution License
- Apache,
- LGPL Copyleft vs Permissive,
- Copyright,
- Patent,
- Trademark,
- Compliance Considerations

THANK YOU