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Establishing Institutional Repository in IIM Calcutta : A Study of DSpace

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Abstract

This paper deals with the practical experiences of establishing IIM Calcutta Institutional Repository using an open-source software DSpace. It will act as a user manual for professionals who want to develop their repository. From beginning to end, the whole process & steps have been divided into three core units. The 1st unit explains the requirement of hardware & software with their compatible versions & step-by-step commands for installing DSpace. The unit also shows the workflow of user interface customizations with their suitable script both in JSPUI & XMLUI mode. This unit has revealed the script for the complete outgoing email server configuration. In the 2nd unit, the steps of creating & designing the communities, sub-communities, collections & metadata entry with full text comes. The unit also includes the steps of bulk data import & export from the admin site. The configuration of global IP mapping and SSL integration with the Tomcat server has also been shown, and the repository is now globally accessible with a secure connection. The access control policy and specific right to any collection have been discussed in this unit. The 3rd unit mainly focuses on each problem or error practically faced during the development stage & the suitable solutions, which will make the professionals more aware from the beginning so that they will not panic or ignore the errors. This unit also discusses the necessary steps for backup and restoration. However, this paper is a comprehensive guide for all the users who want to develop their repository using DSpace.

Keywords: DSpace, Institutional repository, IR, IR@IIMC, IR IIMCAL, IIM Calcutta, Open Access, Open-source software, Scholarly outputs, User manual.

1. Introduction:

An Institutional repository is a platform to collect, preserve and disseminate the scholarly outputs of an institute in digital form (IR@IIMC: Home, 2021)¹. It helps maintain an institution's academic outcomes in one location for future reference. It promotes the open access movement and helps to reduce the digital divide. With the objectives to collect, preserve and gain broader visibility of the scholarly outputs of IIM Calcutta, the B C Roy Memorial Library took the initiative

¹ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

in developing its Institutional Repository using DSpace (Mitchell, n.d.)². The IR will hold the published materials like Research papers, reviews, book chapters, books, conference papers, edited volumes, editorials, erratum and the unpublished or grey literature like working papers, theses & dissertations, invited lectures, workshops etc.

Many institutions created their IRs using different open-source software like Greenstone, E-prints, Fedora, DSpace etc. However, DSpace is widely used because it has the world's largest community of developers and users. It is user-friendly, flexible in customization, interoperable and supports multiple languages. This effort is to share the technical know-how with the professionals to acquire adequate installation, customization, and administration skills and to handle the project more efficiently and successfully.

2. Literature Review:

B. Sutradhar (2006)³ discussed the design and development of an institutional repository in IIT Kharagpur using DSpace. It mentioned the few details of the Hardware and software requirements and their copyright and policy issues. The article also shows the workflow of submitting content to IR and their plan of sharing resources among all IITs through the OAI harvesting mechanism.

Joanna Barwick (Barwick,2007)⁴ summarized the experiences of developing an institutional repository at Loughborough University. It has mentioned the reasons for selecting the software DSpace, their types of resources, metadata, and licensing issues for collecting content, developing a steering committee, copyright issues from the publishers, etc.

Gayatri Doctor and Smitha Ramachandran (Doctor & Ramachandran, 2008)⁵ conducted a survey to know the different aspects associated with setting up an institutional repository intending to establish IR at the ICFAI Business School. In the installation part, it has mentioned downloading the prerequisites software with their versions for DSpace and shows the hierarchy of collections and sub-collections of communities. **Simon J. Bevan (Bevan, 2007)**⁶ defined IR, aims & missions and the reasons for selecting the DSpace software for content development and advocacy at Cranfield University It has also stated the management of IR and measuring the usage.

² Mitchell, S. (n.d.). DSpace Home. DSpace. Retrieved November 14, 2022, from <https://dspace.lyrasis.org/>

³ Sutradhar, B. (2006). Design and development of an institutional repository at the Indian Institute of Technology Kharagpur. *Program*, 40(3), 244–255. <https://doi.org/10.1108/00330330610681321>

⁴ Barwick, J. (2007). Building an institutional repository at Loughborough University: Some experiences. *Program*, 41(2), 113–123. <https://doi.org/10.1108/00330330710742890>

⁵ Doctor, G., & Ramachandran, S. (2008). DSpace@IBSA: knowledge sharing in a management institute. *VINE*, 38(1), 42–52. <https://doi.org/DOI 10.1108/03055720810870888>

⁶ Bevan, S. J. (2007). Developing an institutional repository: Cranfield QUEprints – a case study. *OCLC Systems & Services: International Digital Library Perspectives*, 23(2), 170–182. <https://doi.org/10.1108/10650750710748478>

Laxminarsaiah & Rajgoli (2007)⁷ came out building different communities, and collections and decisions are taken in sharing the responsibility of maintaining various collections. It also described metadata customization, Collaboration with other divisions of ISRO HQ. Muhammad Safdar (Safdar, 2021)⁸ mentioned some reasons for selecting the DSpace software and described the need for Assessment for the Creation of IR. They have found some problems in Implementing DSpace, mentioned the solutions, and also provided some suggestions. Meenal Oak and Suresh Patil (Patil & Oak, 2015)⁹ in their work, discussed the need to make an institutional repository and strategic plan. They mainly focused on collection development, policies, lack of staffing issues, backup and maintenance issues, and lastly, the role of a librarian in developing an IR. S. Ketheeswaren (Ketheeswaren, 2014)¹⁰ mentioned the steps of installing DSpace in the Windows environment. The configuration and customization of the user interface, like the Top bar & Sidebar news. Later the workflow of creating top-level community, sub-community, and collection. Lastly, presented the testing of the IR on the web through searching & browsing the resources.

To our knowledge, there has been no attempt to give specific step-by-step guidance with necessary code & scripts, proper configuration paths, commands, screenshots of the actual outcome, backup & restoration. That is attempted in this study and also explained each problem encountered during the development stage with their solutions to assist others interested in developing IR using DSpace in a Linux platform.

3. Objectives:

- i) To share the experiences gathered during the journey from installation to global access to the IIM Calcutta IR.
- ii) Discuss the problems faced in each step and the required solutions.
- iii) Prepare a step-by-step guide for the professionals interested in establishing an IR using DSpace.

4. UNIT 1 (Installation & development of the Software):

4.1 Hardware Recommendations:

It is the high-end DSpace production system where the number of items in future can be more than 50,000. DSpace can be installed on any modern PC or laptop, but IIM Calcutta has a larger

⁷Laxminarsaiah, A., & Rajgoli, I. U. (2007). Building institutional repository: An overview. *OCLC Systems & Services: International Digital Library Perspectives*, 23(3), 278–286. <https://doi.org/10.1108/10650750710776413>

⁸ Safdar, M. (2021). Creating Institutional Repository in Libraries: The DSpace Experience in Pakistan. *Library Philosophy and Practice (e-Journal)*. <https://digitalcommons.unl.edu/libphilprac/5597>

⁹ Patil, S., & Oak, M. (2015). *Planning and Implementation of Institutional Repository: A case study of IMCC*. 2015 4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services. <https://www.researchgate.net/publication/277559610>

¹⁰ Ketheeswaren, S. (2014). *Building an institutional repository: Dspace@University of Jafna, Srilanka* [University of Jafna]. <https://www.researchgate.net/publication/240163048>

community of users, so we have a high-end hardware system (*DSpace 6.x Documentation - LYRASIS Wiki*, 2018, p. 6)¹¹.

- I. **Processor:** Intel Core i5 5th Generation with 3.10 GHz
- II. **Random Access Memory (RAM):** 16 GB
- III. **Physical Storage:** 1 TB

4.2 Prerequisite Software:

- i) **Unix Like OS:** We have used (*DSpace System Documentation: Installation*, 2008)¹² Ubuntu 18.04 LTS in a VM or Virtual Machine where the base machine is the latest Ubuntu 20.04 LTS OS because of the server issue. As the DSpace is globally accessible 24x7 for a large community of users, we selected this powerful OS system.
- ii) **Java OpenJDK 8:** DSpace is written in Java, so we need this complete JDK development kit with its default Java JRE 8 or Java Runtime Environment.
- iii) **PostgreSQL 10 with pgcrypto installed:** We need a PostgreSQL relational database for storing the metadata of the items imported in DSpace. Pgcrypto extension is essential as it allows DSpace to create UUIDs for all objects.
- iv) **Pgadmin 3:** It is an application for accessing PostgreSQL in GUI mode. We can create databases and also enable pgcrypto by this application.
- v) **Maven 3.6.0:** Apache Maven (Java build tool) is very much important for the first stage installation of the DSpace instance as it provides the flexibility to install and download DSpace from its existing Maven projects, which is found in *[dspace-source]/dspace/modules* directory to build the DSpace installation package. It will also build Mirage 2 theme.
- vi) **Ant 1.10.5:** After Maven, to build the process, Ant is required. Ant will install or deploy the application files constructed or downloaded by.
- vii) **Tomcat 8:** It is a servlet engine or server software which actually runs DSpace globally or in a LAN. But for global accessibility, we need to configure it with SSL HTTPS ports
- viii) **DSpace 6.3 Git code:** For installation, **Source Release (dspace-<version>-src-release.zip)** has been used. Because it contains all the codes for the core dspace-api, supporting servlets etc. of DSpace and other web services or applications. Provides all the functionalities of binary release.

Download DSpace from the site: <https://github.com/DSpace/DSpace/releases/tag/dspace-6.3>
Version: **dspace-6.3-src-release.tar.gz**

¹¹ *DSpace 6.x Documentation -LYRASIS Wiki.* (2018, June 27). <https://wiki.lyrasis.org/display/DSDOC6x/DSpace+6.x+Documentation>

¹² *DSpace System Documentation: Installation.* (2008). <https://depts.washington.edu/cmditr/dspace/dspace-1.5.1.release/dspace/docs/html.legacy/install.html>

4.3 Command lines:

```
sudo apt-get install openjdk-8-jre
sudo apt-get install openjdk-8-jdk
sudo apt-get install taskel
sudo apt-get install pgadmin3
sudo apt-get install synaptic
sudo -u postgres psql
sudo gedit /etc/postgresql/10/main/postgresql.conf & uncomment listen_addresses
sudo gedit /etc/postgresql/10/main/pg_hba.conf & add host address
sudo useradd -m dspace
sudo mvn -U package
sudo ant fresh_install under dspace/target/dspace-installer
sudo cp -R /dspace/webapps/* /var/lib/tomcat8/webapps/
sudo /dspace/bin/dspace create-administrator
sudo service postgresql restart
sudo service tomcat8 restart
```

4.4 Customization:

i) Jspui header banner change (Palamuttath, 2019)¹³:

Added the below script under `var/lib/tomcat8/webapps/jspui/layout/header-default.jsp` & copied the image in `var/lib/tomcat8/webapps/jspui/image`

```
</header>
<main id="content" role="main">
<p align="middle" topmargin="0">
 </p>
<!-- Location bar -->
```

ii) Navigation bar green colour change (Burde, n.d.)¹⁴:

Edited the file `var/lib/tomcat8/webapps/jspui/static/css/bootstrap/bootstrap-theme.min.css`, searched and replaced the default colour codes `#5cb85c`; `#449d44` ; `#419641` with the chosen code `#18570e`

iii) Navigation bar label change (Patel, n.d.)¹⁵:

¹³ Palamuttath, M. (2019, February 2). Customized header on DSpace JSPUI interface [Blog]. *LIBTECHNOPHILE*. <http://libtechnophile.blogspot.com/2019/02/place-customised-header-on-jspui.html>

¹⁴ Burde, S. (n.d.). *DSpace Customization* [PPT]. Retrieved March 4, 2022, from <http://knowgate.niscair.res.in/documents/10181/19642/8+DSpace+Customization.pdf>

¹⁵ Patel, Y. (n.d.). *DSpace Administration* [PPT]. Retrieved March 4, 2022, from <https://ir.inflibnet.ac.in/bitstream/1944/1659/1/DSpace%20Administration%20and%20Customization.pdf>

Edited the file `/dspace/config/dspace.cfg` and changed the `#Name of the site`

iv) Copyright line added under Jspui footer navbar:

Edited the file `var/lib/tomcat8/webapps/jspui/layout/footer-default.jsp` and added the below script after `<p class="text-muted">`

IIM Calcutta Copyright © 2021-2022 -

v) Label change under Jspui header navigation bar search box:

Edited the file `Var/lib/tomcat8/webapps/jspui/layout/navbar-default.jsp` and replaced the placeholder with the chosen label mentioned below-

```
<input type="text" class="form-control" placeholder="Search&nbsp;IR@IIMC"
name="query" id="tequery" size="25"> == $0
```

Fig 1. Code for JSPUI header navigation search box¹⁶

vi) Jspui jumbotron box margin change:

Edited the file `var/lib/tomcat8/webapps/jspui/static/css/bootstrap/bootstrap.min.css`

left-right spacing: searched by `padding-right:60px` and `padding-left:60px` and replaced with `20px`;

Top and bottom: searched by `padding-top:48px` and `padding-bottom:48px` and replaced with `1px, 0px`

vii) Jspui Top News script by HTML: (Text Marquee, PDF & Image Marquee, Font colour, Size, Hyperlink)

```
<marquee width="100%" behavior="alternate" direction="right" height="60px"></marquee>
```

```
<a href="https://library.iimcal.ac.in/" target="_blank"><font style="font-size:15px"><font
color="Blue">B.C. Roy Memorial Library</font></a>
```

```
<a href="https://ir.iimcal.ac.in:8443/jspui/image/user_manual.pdf" target="_blank"><font
color="#99158c"></font>
```

viii) Jspui Sidebar News by HTML: (Font colour, Size)

```
<B><h2><font color="666600"><p style="font-size:20px"><b>Any assistance
contact</p></b><font color="#7B241C"><B><p style="font-size:16px">Jhantu Mazumder
(Admin) | jhantum@iimcal.ac.in</h2></B></p></font>
```

ix) Xmlui header label change:

¹⁶ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

Edited (*IDR Home, 2016*)¹⁷ the file `var/lib/tomcat8/webapps/xmlui/i18n/messages.xml`, searched the below script & replaced with the chosen label `<message key="xmlui.dri2xhtml.structural.head-subtitle">IR@IIMC</message>`

x) Xmlui News add:

Edited (*Eprints@IIT Delhi, n.d.*)¹⁸ the file `dspace/config/news-xmlui.xml` and added the details about IIMC Repository.

xi) Xmlui Header logo change:

Copy the image (*DSpaceDirect Demo Repository, 2020*)¹⁹ to `var/lib/tomcat8/webapps/xmlui/themes/mirage/images` then copy the name of the image and pixel size to the file `var/lib/tomcat8/webapps/xmlui/themes/mirage/lib/css/style.css`

xii) Xmlui Header colour change (*IIT Delhi Institutional Repository, 2018*)²⁰:

```
Path: webapps/xmlui/themes/Mirage/lib/css/style.css

to change background color of header->

#ds-header-wrapper {
  background-color: #1F3F5E;
  color: white;
  min-width: 950px;
```

Fig 2. Code for XMLUI header colour change²¹

4.5 Email set up in DSpace 6.3 by TLS mode in 587:

Then config the file `dspace/config/dspace.cfg` according to the below script -

The mail server password must be the email login password.

SMTP mail server (Mukhopadhyay, 2021)²² (allows DSpace to send email notifications)

smtp.gmail.com

Email - ir@iimcal.ac.in

Pass-IR@123

Port = 587

**Extraproperties = mail.smtp.socketFactory.port=587, **

**Starttls.enable=true, **

**Starttls.required=true, **

SSL.protocols=TLSv1.2

¹⁷ IDR Home. (2016). <http://www.idr.iitkgp.ac.in/xmlui/>

¹⁸ Eprints@IIT Delhi. (n.d.). Retrieved February 27, 2022, from <http://eprint.iitd.ac.in/>

¹⁹ DSpaceDirect Demo Repository. (2020). <https://demo.dspace.org/>

²⁰ IIT Delhi Institutional repository. (2018). <https://repository.iitd.edu.in/jspui/>

²¹ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

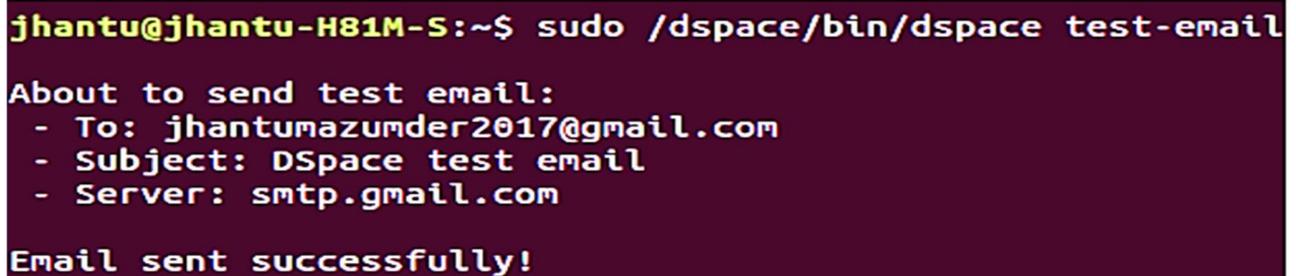
²² Mukhopadhyay, P. (2021). Mail configuration in DSpace by using App password: DSpace 6.3, Tomcat 9 and Gmail SMTP. *How-to Series of PSM.*

https://www.academia.edu/44949352/Mail_configuration_in_DSpace_by_using_App_password_DSpace_6_3_Tomcat_9_and_Gmail_SMTP

Check by command whether the mail is outgoing or not:

```
sudo service tomcat8 restart
```

```
sudo service postgresql restart
```



```
jhantu@jhantu-H81M-S:~$ sudo /dSPACE/bin/dSPACE test-email
About to send test email:
- To: jhantumazumder2017@gmail.com
- Subject: DSpace test email
- Server: smtp.gmail.com
Email sent successfully!
```

Fig 3. DSpace test mail status check by command²³

4.6 Compose the outgoing email Body:

After setting up the mail, we have to write the body of the mail with a different purpose-

Path- `dSPACE/config/emails`

edit the text file and save ex. `Register, forget password, feedback, submit_archive, registration_notify`

5. UNIT 2 (New Item Creation):

5.1 Submission of new item:

- i) After login, create a top-level community from 'Browse.'
- ii) Within the top-level community, a sub-community can be created, or directly a collection can be created according to the purpose
- iii) Without creating a collection, no item can be submitted.
- iv) within the collection, click on 'submit to this collection' for item entry

5.2 Batch data import in DSpace by SAFBuilder:

SAFBuilder:

It is an excellent tool for converting a metadata spreadsheet (*SAFBuilder - Item Packager from CSV, 2019*)²⁴ and a content file into a **Simple Archive Format** package. DSpace supports this particular format for Batch data import. The spreadsheet will mainly be in CSV format.

Prerequisite software- Maven, Java JDK 8

i) Installation -

```
sudo apt-get update
```

```
git clone https://github.com/DSpace-Labs/SAFBuilder.git
```

```
sudo apt-get update
```

²³ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

²⁴ *SAFBuilder—Item Packager from CSV*. (2019). DSpace Repository Labs. <https://github.com/DSpace-Labs/SAFBuilder>

The installation has been completed & SAFBuilder will be in /home folder

For full-text, the CSV file looks like this -

A	B	C	D	E	F
filename	dc.title	dc.contributor	dc.date.issued	dc.description	dc.format.extent
Alabama.pdf	Alabama	robert r. riley	12/14/1819	yellowhammer state	4447100
Alaska.pdf	Alaska	Sean Parnell	12/3/59	the last frontier	626932
American Samoa.pdf	American Samoa	Togiola Tulafono	11/13/20	alaska last	1545125
Arizona.pdf	Arizona	Jan Brewer	2/14/12	grand canyon state	5130632

The filename is the names of the pdfs of that particular item -

Fig 6. Bulk upload excels data sheet format²⁵

ii) After making the CSV file go to the path `home/SAFBuilder/src`

Create a folder and save the CSV file into that folder and copy all the full text pdfs on that folder in case of full-text import-

Give full `chmod 777 -R` permission to SAFBuilder folder in /home

iii) Now go to the `/home/SAFBuilder` folder and open the terminal from this place

iv) Give the command below-

`./safbuilder.sh -c src/foldername/filename.csv -z`

It will show the result as the figure and a folder and .zip file will be made automatically.

```

jhantu@jhantu-HP-250-G7-Notebook-PC:~/SAFBuilder$ ./safbuilder.sh -c src/IITKGP/
iit.csv -z
Recompiling SAFBuilder, just a moment...
Didn't properly detect the charset of file. Setting to UTF-8 as a fallback
Detected input CSV as:UTF-8
Opened CSV File:src/IITKGP/iit.csv
Output directory is: /home/jhantu/SAFBuilder/src/IITKGP/SimpleArchiveFormat
ZIP file located at: /home/jhantu/SAFBuilder/src/IITKGP/SimpleArchiveFormat.zip
File: iit.csv has been used 0 times.

```

Fig 8. Bulk data upload status²⁶

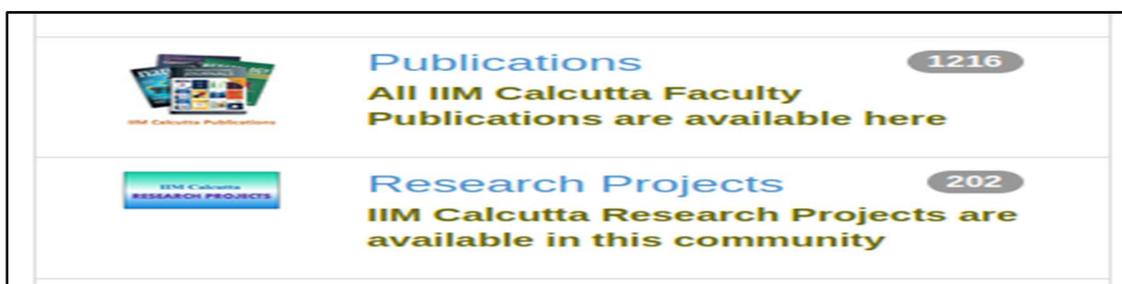
v) **Batch upload** - Open DSpace web page & enter into any of the collections. Then click on the Batch Import (ZIP) option. Select the .zip file from `home/SAFBuilder/src/foldername/` then click on upload. It will take some time and will show the successfully submitted window.

²⁵SAFBuilder—Item Packager from CSV. (2019). DSpace Repository Labs. <https://github.com/DSpace-Labs/SAFBuilder>

²⁶ Ibid, Footnote-25

Fig 10. Zip file import process²⁷

5.3 Dspace Item Counter Set up -

Fig 11. DSpace item counter beside each community & collection²⁸

Go to the (*Welcome to IR @ NIT Rourkela: Home, 2013*)²⁹ path `dspace>config>` edit the file `dspace.cfg`

Replace the false tag (*Helix, 2013*)³⁰ with true same as the lines given below -

`webui.strengths.show = true`

`webui.strengths.cache = true`

Save the file and restart the tomcat server & the Item counter would come in both XMLUI and JSPUI mode

5.4 Global IP mapping:

i) We need a dedicated global IP registering with a domain name

ii) IIM Calcutta DSpace runs SSL through Tomcat using port 8443

SSL Steps for Creating CSR file ("*CSR SSL, 2022*")³¹ and Installing CRT created by CA in Tomcat Apache in Ubuntu. (.jks >csr file> 3 crt files merged to .p7b file by purchase authority> single .jks including all those previous three files)

²⁷ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

²⁸ Ibid; 28

²⁹ *Welcome to IR @ NIT Rourkela: Home*. (2013). <http://dspace.nitrkl.ac.in/dspace/>

³⁰ Helix. (2013). [*Dspace-tech*] *how to show total item on a community/collection [Help me please]* [Blog]. Narkive Newsgroup Archive. <https://dspace-tech.narkive.com/rCvOvVI6/how-to-show-total-item-on-a-community-collection-help-me-please>

³¹ How to Generate CSR for SSL, SSL CSR Generator. (2022, September 11). [Website]. *Knowledge Base*. <https://www.thesslstore.com/knowledgebase/ssl-generate/>

iii) Generate a **keystore** and **private key** by running the following command:

```
keytool -genkey -alias tomcat -keyalg RSA -keysize 2048 -keystore /etc/keys/iimcal.ac.in.jks
```

iv) From the newly created keystore, generate your **CSR** by running the following **keytool** command:

```
keytool -certreq -alias tomcat -file iimcal.csr -keystore /etc/keys/iimcal.ac.in.jks
```

.p7b file generated by CA against csr file

```
keytool -import -trustcacerts -alias tomcat -file star_iimcal_ac_in.p7b -keystore /etc/keys/iimcal.ac.in.jks
```

v) Enter keystore password.

vi) **sudo service tomcat8 restart**

vii) Modify and link (SSL/TLS, 2022)³² the certificate with the [tomcat]/config/server.xml file by the following lines –

```
<Connector port="8080" redirectPort="8443" connectionTimeout="20000"
protocol="HTTP/1.1"/><Connector port="8443" sslprotocol="TLS" keyAlias="tomcat"
clientAuth="false" keystorePass="redhat"keystoreFile="/etc/keys/repository.iimcal.ac.in.jks"
SSLEnabled="true" secure="true" scheme="https" maxThreads="150"/><Host name="localhost"
autoDeploy="true" unpackWARs="true" appBase="webapps">
```

5.5 Access control: Sometimes, the users require access privilege to any specific community or collection for data entry; the users are called ‘E-people’ in DSpace.

i) After login, click on ‘Administer’, then ‘access control.’

ii) Any e-people can be added to a group like metadata editor, approver etc. from ‘Group.’

iii) Different access policies of the collections, communities and items can be changed from ‘Authorizations.’

iv) Another way of accessing privilege to any collection is going to that collection page, then clicking on ‘edit’; the e-people can be selected for submitters.

³² How to Install an SSL/TLS Certificate In Tomcat—The SSL Store. (2022, September 11). [Website]. <https://www.thesslstore.com/resources/tomcat-ssl-installation/>



Fig 12. Access privilege of a collection to any e-people³³

6 UNIT 3 (Problems and Solutions):

6.1 Software compatibility:

Make sure that the accompanying software components like JDK, Ant, Maven, Tomcat server, and PostgreSQL all are installed according to their compatible versions depending on the Operating system and Dspace source code version (Ex.6.3 or 7) you are using.

6.2 Installation directory:

Sometimes, we install the right software components with their exact versions but in the wrong directory. As we know, Ubuntu has applications like **Taskel and Synaptic** to download & install the software components automatically from the source in their default path.

6.3 Java error:

When IIM Calcutta DSpace was being installed with Java JDK 8, at last, the jspui or xmlui interface was not opening. The page was showing an error. It was found that when the Solr server is opening by `http://localhost:8080/solr/` it is showing java properties 11 (JDK & JRE).

So, the steps to replace Java 11 mentioned below-

Java 11 automatically install during tomcat8 installation (*Linux - Update-Alternatives*, 2020)³⁴ so

delete java 11 all files from **usr/lib/jvm (default path)** and use the commands

```
sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib/jvm/java-8-openjdk-  
amd64/jre/bin/java" 1
```

```
sudo update-alternatives --set java /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java
```

```
sudo update-alternatives --config java
```

³³ Ibid; 27

³⁴ linux - update-alternatives: Warning: /etc/alternatives/java is dangling. (2020, April 1). <https://stackoverflow.com/questions/17609083/update-alternatives-warning-etc-alternatives-java-is-dangling>

6.4 Access permission by chmod:

Giving access permissions to file systems is a common issue, but sometimes we cannot identify the right files to give access which makes the error.

In every step of the installation, there has a permission issue. If we miss them, we have to repeat the installation process.

- i) **Parent directory:** We have to give chmod 777 permissions to the parent directory named DSpace in our system, where all the installation files will be stored and can be accessed by the server.
- ii) **Dspace source code:** When the **dspace-6.3-src-release.tar.gz** DSpace source code file had been downloaded from Github it was not given any access permission and then at the time of package installation by the command **sudo mvn -U package** it was showing error that the root has no permission to overwrite the source code file.
- iii) **Solr:** Dspace depends on Apache Solr search engine for its searching, real-time indexing database integration, and document handling works. So giving access permission to solr is the most important task. But during installation, that step was missed. As a result, the items were imported but were not indexed or searched.

Commands:

```
sudo chmod 777 /dspace/webapps/solr -R
sudo chmod 766 /dspace/var/oai -R
sudo chmod 777 /dspace/solr -R
```

6.5 Postgresql database:

In the uploading steps of selecting bitstream, it shows an error. The bitstream is not being uploaded. Simply one access permission given to **PostgreSQL & PostgreSQL-common** under **etc.**, and it works well now.

6.6 Package installation error:

During the DSpace package installation from source code by the help of Maven, it shows Build failure after around 1 hour of downloading.

Then the below commands were used to resolve-

```
sudo apt-get install git
mvn dependency:tree
mvn enforcer:display-info
sudo mvn -U package
```

Use **mvn clean install** if the error is coming again

6.7 Ant dspace-installer error:

After using the command `sudo ant fresh_install` under `dspace/target/dspace-installer` one error was showing. It was occurring due to the wrong database creation. Ant was unable to connect with PostgreSQL. So again, the database was removed, and fresh database was created.

6.8 Outgoing email setting:

DSpace use Gmail with SMTP mail server protocol by TLS mode for outgoing mail service. Previously the SMTP port was 465, but at present, port 587 is used. But not only port 587, but the DSpace also used a more secure technique called 'App password' after two-step verification from your Gmail account.

- i) If you are launching Dspace in an institute where they have its own network policy, please consult with the IT team. In IIM Calcutta, port 587 was not allowed into their institutional network system as IIM Calcutta has its own network policy and security. So the port was allowed, and the mail server could send mail, and users could send feedback or register.
- ii) The emails in the IIM Calcutta domain (`xxxxx@iimcal.ac.in`) has no settings for two-step verification and generating app password. So an account under the domain of Gmail (`xxxxx@gmail.com`) has been used for outgoing mail service.

6.9 SSL and Public IP Mapping Error:

Security errors after opening the site through different browsers. This problem only arises when your SSL certificate is not properly created and authenticated by the providing company or the SSL certificate is not correctly linked with the Tomcat server.

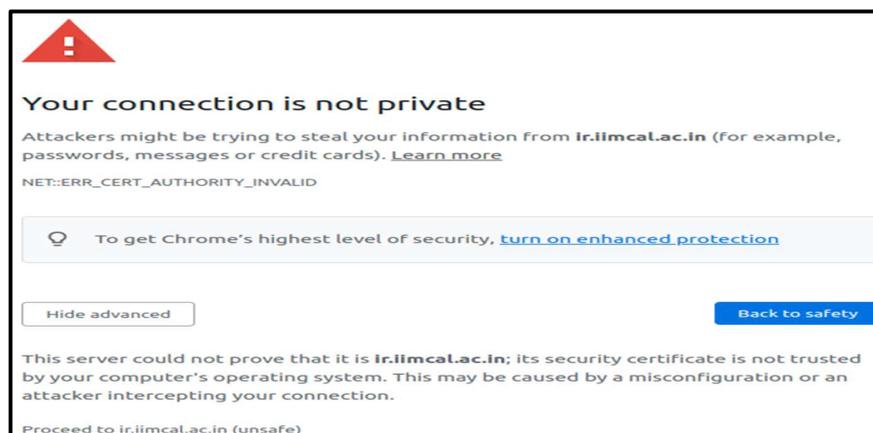


Fig 13. Chrome security error³⁵

6.10 Slow internet connectivity:

Slow internet connectivity is a hindrance to installing DSpace; the bandwidth must be above 1 or 2MB/Second. Otherwise, the downloaded packages will be incomplete.

³⁵ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

6.11 Clear browser history, cookies and cached:

Sometimes browser makes us confused or irritated. When you have made some changes to your DSpace site, the browsing history or cached files must be cleared. Otherwise, it would not reflect the same you customized.

6.12 Batch import and export problem:

DSpace metadata and bitstreams can be exported from the admin site, but there is a tendency to import those raw .zip files in DSpace without deleting the handles attached to each item which occurs error for duplication of the handle id.

7 Backup and restore:

7.1 DSpace data export & import from admin site:

Export and import deal only with bitstreams, metadata, license, and handles backup –

- i) Login to DSpace as an admin
- ii) Enter into the specific collection or community and click on export collection or export community



Fig 15. Bulk data export³⁶

- iii) Go to My DSpace from the top right pop-up menu, and the exported Zip file can be downloaded.

- iv) After uploading each item in DSpace, it has been automatically assigned with a unique handle number.

- v) Extract the zip file and search in the folder by the term 'handle', delete all the handles and again compress it into the zip

Click on 'Batch import' from the 'Content' menu, choose the zip file, and it will take some time to be successfully uploaded

³⁶ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

Fig 17. Bulk data import³⁷

7.2 DSpace complete server backup:

The following folders must be copied from the server (NDLI Presents, 2012)³⁸

/dspace/assetstore (minimum backup)

/dspace (entire directory)

DSpace PostgreSQL database (Metadata, Communities, sub-communities' details, e-groups, E-persons with their passwords, Host of other information) [pgadmin3>Tools>Backup]

Webapps folder under var/lib/tomcat8 (Customization backup)

- i) Install a fresh DSpace system
- ii) Remove the blank database created during installation
- iii) Create a blank database by the previous database name with pgcrypto extension
- iv) Restore the postgres backup database from pgadmin3>Tools>Restore
- v) Restore the old folders like assetstore, DSpace, webapps, bin etc.
- vi) Use the commands-
 - /dspace/bin/dspace database migrate
 - /dspace/bin/dspace index-discovery -b
 - /dspace/bin/dspace filter-media
 - /dspace/bin/dspace index-discovery
 - /dspace/bin/dspace index-discovery -o
- vii) Restart Tomcat8, Postgresql server

8. Conclusion:

So far, library professionals are enthusiastically maintaining institutional repositories using DSpace in their respective institutions. Several experts conducted many workshops and training programs to teach the technical know-how involved in the installation, customization and

³⁷ IR@IIMC: Home. (2021, August 1). https://ir.iimcal.ac.in:8443/jspui/?author_page=1

³⁸ NDLI Presents: DSpace Backup Restore. (2012, February 15). <https://ndl.iitkgp.ac.in/document/Zk1IM2RkTkZSdDdJWkU1N1hnSSsydUVTWjNUMkVRck5YVGU5TGZtbUZZQT0>

uploading of documents in various file formats. Still, none have so far communicated the codes, scripts, and solutions for a specific problem encountered during the process in one place. We have systematically recorded the steps undertaken by us in developing the institutional repository at IIM Calcutta (<https://ir.iimcal.ac.in:8443/jspui/>), which will act as a complete guide. We are confident that our efforts will benefit the professionals in efficiently and effectively handling institutional repositories.

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