

## Access to E-Resources for Indian Higher Education System and the Role of INFED (INFLIBNET Access Management Federation)

Yatrik Patel, Scientist – D (CS) & Raja V, Scientist – B (CS)

Indian Universities and institutions of higher education have witnessed a boost in e-resources accessible to their users through various consortium initiatives. However, at present, mostly the access is restricted to only university/institute campuses within specific IP ranges. There is a need to widen the access of e-resources. Ideally the access to e-resources should be available to users from anywhere i.e. on-campus, off-campus, from home, while travelling and at any given point of time. The purpose of this article to give an overview of the role of INFED (INFLIBNET Access Management Federation) to expand the reach of e-resources and make some suggestions about how effective it is from perspective of practice with a view to justifying its role. This paper attempts to describe the scope of INFED and benefits of inter federation services, beyond the features off-campus access.

**Keywords:** University Libraries, Access Management Federations, INFED, Identity Provider (IdP), Service Provider (SP), Higher Education, Off-campus access, Inter-Federations

### 1. Introduction

Tim Berners-Lee, the computer scientist who invented the World Wide Web (WWW) in 1989, realised that true information can be accessed by anyone, anywhere can use it without paying a fee or seeking permission . But the real scenario is different. The most of publisher who owns the copyright of the material refuse to provide access to their material free of cost to anyone. Institutes are already spending huge amount of money on subscribing to e-resources for their users. But most of the institutions are not paying much attention to ensure consistent and reliable access of those resources an anywhere and anytime basis to their users. There are number of mechanism that exists to provide off-campus access to e-resources such as Proxy Server, Virtual Private Network (VPN), etc. however implementing this mechanism will be the extra burden to the institution, on the other hand the e-resource service provider is demanding the user to access their paid resources only when they are in campus, due to lack of trusted secure attribute exchange from the institution about users and their roles

Now SAML2.0 (Security AssertionMark-up Language) is an XML standard for exchanging authentication and authorization data between security domains. “Authentication” is a kind of confirmation from the identity that he/she is the legitimated or registered user with our organization. Where as “authorization” is a rights or privileges to the certain resource groups. This SAML 2.0 has been agreed by most of the publishers (Service Providers) to exchange user attributes and allow them access to the restricted content anytime and any where. In this context, INFED is a formal federation that act as a trust entity between Institutes and Publishers.

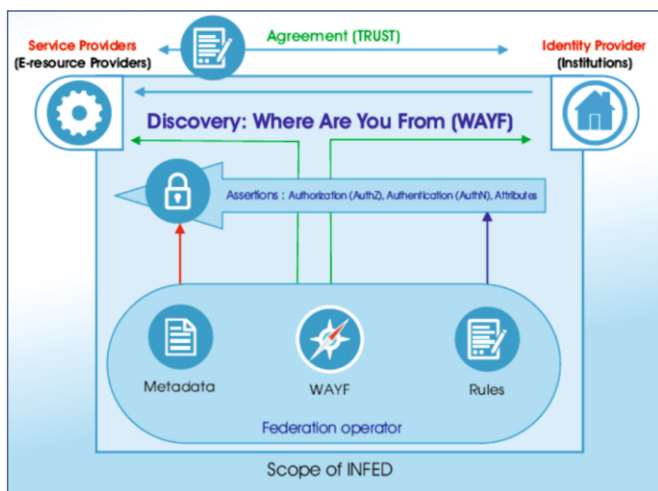
### 2. About INFED

INFLIBNET Access Management Federation (INFED), the first and only Federation in India, that has adopted Shibboleth (a SAML based) open source software, for authenticating authorized users from colleges and universities and provide them seamless access to e-resources from anywhere, anytime. The INFLIBNET Centre, as one of its core mandates, provides access to

scholarly e-resource to universities and colleges in India under e-Shodh Sindhu initiative of the Ministry of Human Resource Development (MHRD). The INFED has been set-up as a centralized entity to coordinate with member institutions in the process of implementation of user authentication and access control mechanism distributed across participating institutions using standardized rules and metadata for exchange of attributes.

Shibboleth access management model is essentially designed to run in a federated mode wherein individual participating institutions are required to run their own Identity Provider Services for users in their respective institutions. Alternatively, members can use identity provider services offered by the INFLIBNET Centre through INFED. A formal federation is required as trusted interface between the institutions as Identity provider (IdP) and publishers as Service Providers (SP) to ensure use of uniform standards and protocols while transmitting attributes of authorized users to publishers.

INFLIBNET Centre is operating the Federation for Indian Higher Education Institutions. The INFED website give a broad outline of goals and purpose. At the outset, In the broader context, INFED offers the off-campus access facility to librarians. The scope of INFED is depicted in figure given below.



Scope of INFED

## 2.1 Identity Provider

Identity Provider software is run by the institutions having database of users entitled to access subscription based e-resources or services. Shibboleth leverages the organization's identity and access management system, so that the individual's relationship with the institution can be used to determine access rights to subscription based e-resources or services. In other words, different categories of users in an institution may have access to different sets of resources based on attributes assigned to them. In case of Shibboleth implementation at INFED, participating universities and colleges would register themselves for creation of an identity management system using college administrative interface. A trusted officer (Administrative or Technical Contact) nominated by the college/university authorities, is made responsible for maintaining identity management system for a given college on the INFED Server.

## 2.2 Service Provider

Service Provider software is run by the publisher of a subscription-based e-resource or service. The Service Provider receives a set of pre-defined attributes from the Identity Provider and provides access to subscribed e-resources or services to the user depending upon the attributes received.

## 2.3 Federation Metadata

It provides the basis for trust between Institute and Publishers. Normally, owners of the federation keep track of the metadata of the Institutes and Publishers. When an Institution or Publisher receives a request from another provider, it needs to be able to verify that the remote provider is who it claims to be. When institute claims to access the content from the publisher, the service provider could identify the details of their institute by using their supplied metadata. If it has been positively identified, Institute and Publisher can

communicate. If there is no match, or the credentials presented are wrong, no attributes will be sent.

It should be signed by the federation operator and hosted using https://, and should be accessible to anyone by all providers in the federation.

## 2.4 Discovery Services (WAYF-Where Are You From)

As a user who is willing to use the federated services he/she has to locate his home organisation. It's quite difficult to locate from the large number of list. In order to overcome this issue Discovery Services (DS) can be setup based upon the federation metadata. The essential goal is to redirect the user to their SSO endpoint by selecting their home organization. This Discovery Services can setup by the publishers or by the country federation itself .

## 2.5 Rules

The framework is created by each Member agreeing to be bound by these Rules which set out an agreed set of rules for exchanging information about End Users and resources so as to enable access and use of resources and services. Responsibility for the provision of the Federation is shared amongst the INFLIBNET Centre, member universities and colleges. The Access Management Committee is ultimately responsible for maintaining effective governance of the Federation. It discharges this responsibility by defining the policies governing membership of the federation and for the responsibilities that federation membership entails.

## 2.6 Eligibility to become a member of INFED

The INFED currently has the following four classes of participants who are eligible to join the federation. All institutions have to apply for the membership of INFED on prescribed application form:

**i. Universities & CFTIs:** All Govt. / Govt.-aided universities covered under Section 12(B) and 2 (F)

Section of the UGC Act, 1956 and all Inter-University Centre (IUCs) of the UGC that are eligible to get access to e-resources through the e-Shodh Sindhu Consortium are eligible to participate of the INFED.

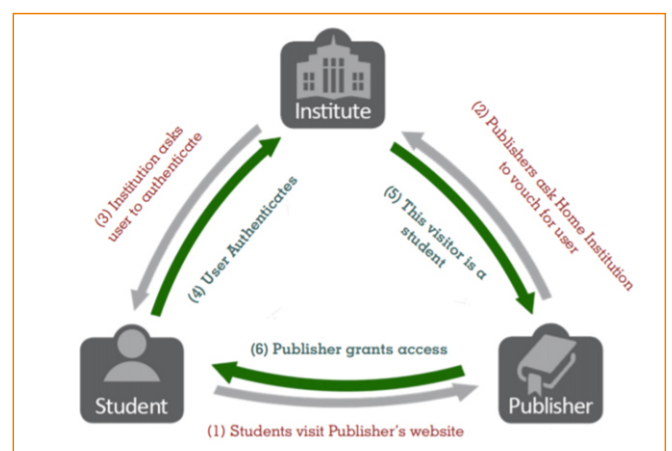
**ii. Colleges:** All Govt. / Govt.-aided colleges covered under 12(B) and 2(f) Section of the UGC Act, 1956 that are eligible to get access to e-resources through the National Library and Information Infrastructure for Scholarly Content (N-LIST) are eligible to participate in INFED.

**iii. Private Universities / Colleges and Other Institutions:** The Federation may allow private universities, private colleges and other organizations to participate after obtaining approval from competent authority.

**iv. Publishers:** All publishers providing access to e-resources under the e-Shodh Sindhu Consortium or NLIST Programme are can be member of the INFED.

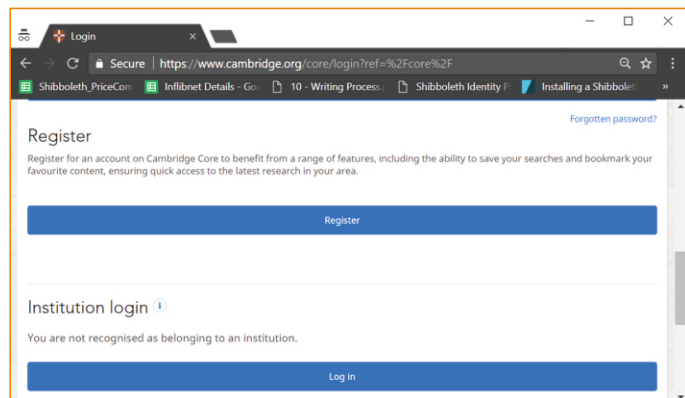
## 2.7 How INFED Works?

INFED creates a trust relationship, facilitating federated, single sign-on access and offers improved data security and convenience for end-users. As such, Shibboleth implementation at INFED @INFLIBNET Centre would work as follows:



How INFED Works

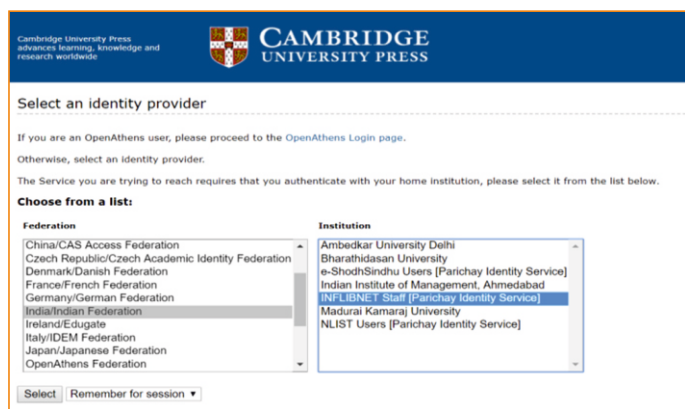
User has to opt the institutional/shibboleth based login from the publisher.



### Login via Institution Account

If the institute has setup and configured their Identity Provider and mutually exchanged their metadata with publisher, then user can find the home organization in publisher list.

The service providers (publishers) will recognize INFED @ INFLIBNET Centre as a trusted organization for authenticating user and would give an option on their website to select WAYF as INFED federation in turn, will have list of all members IDPs for user to choose from.



### Federation and Home organization selection

When a user select his/her home organization, he / she may be re-directed to respective identity provides login page.



### Redirecting to Login page of Institute (Identity Provider)

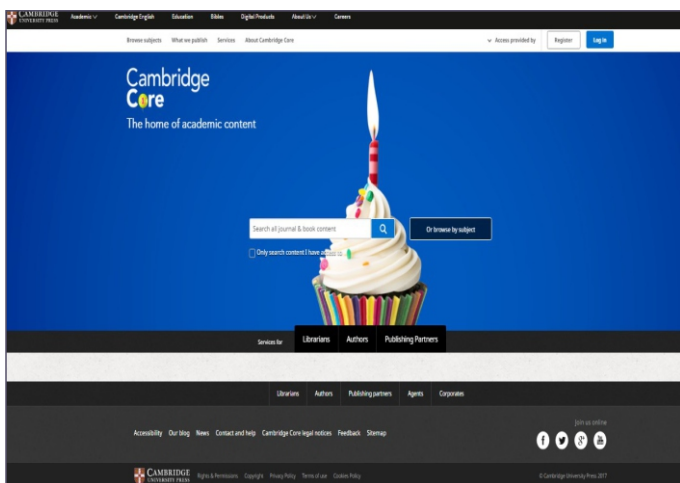
#### 2.7.1 User Consent

After verifying user's credentials, Identity Provider of the user home organization will pass "user attributes" which may also contain his / her institute, department, role (member/faculty/ student/researcher), and if agreed, whether he / she is having access to certain e-resource or not and / or any other attributes which are mutually agreed with the service provider and;

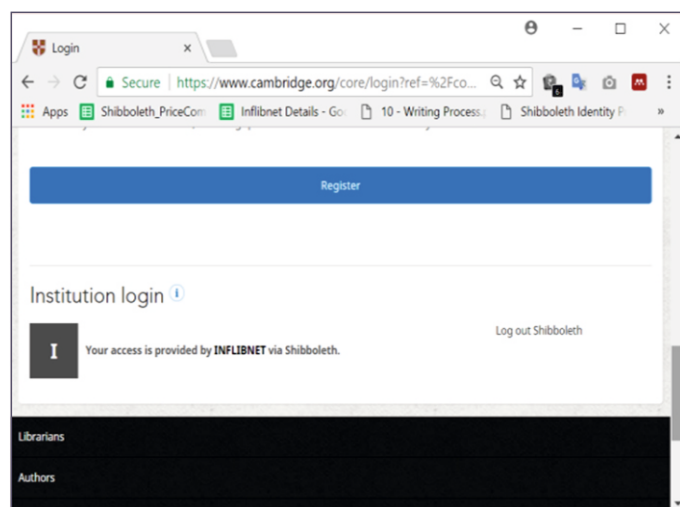


### User Consent for releasing attributes to Publisher

Based on attributes passed by the IdP for a user, he / she will be allowed access to e-resource, if entitled.



**Success Authentication to publisher site**



**Successful Logged in via shibboleth**

### 3. Single Sign-On (SSO)

“One Login, Many Services”- users can access number of services by authenticating themselves only once. Features of SSO are as follows, (i) Mitigate risk for access to 3rd-party sites (user passwords not stored or managed externally), (ii) Minimal Disclosure of Identity, (iii) Time saving for entering passwords different service providers, (iv) Cost saving for managing IT helpdesk for password issues

It shares centralized authentication servers such as LDAP, Kerberos, Active Directory, etc. It will ensure that users do not have to actively enter their credentials more than once else explicitly specified at time of first login.

For example, Google Apps, Facebook Login, Linked In and Microsoft Live ID provide centralized authentication for third-party web applications where users can log in using their existing identities.

### 4. Inter-Federation

INFED is part of an inter-federation. Inter-federation is a means for getting access of the other federations resources (If they allowed any restricted content to only, simplifying access to content, services and resources for the global research and education community. eduGAIN, a non-profit entity, is playing a major role to connect all the federation around the world. It helps the researchers and faculty to access online services and manages all the service providers metadata in common place. It is also giving service providers access to a larger pool of users globally, and allows users to access resources of collaborative research institutions.

#### 4.1 Benefits of Inter-Federation

Today, online services are crucial to research and higher education. Majority of the academic activities such as mail, teaching and conferencing, Massive Online Open Courses (MOOCs), Data analysis, e-Journals are made accessible over Internet, directly to users including students, teachers and researchers. Normally, for each services / application they have separate user account. But with just a single trusted identity, provided by their institution which is part of country-wide identity federation can serve the purpose of using same trusted identity via single sign-on (SSO) across the applications/services, this feature can be extended by participating to inter-federations such as eduGAIN (a service developed within the GÉANT Project - a major collaboration between European national research and education network (NREN) organisations and the European Union), so that users can access services from other participating federations using same single sign-on (SSO).

Around the world there are currently more than 48 federations participating in or in the process of joining eduGAIN, with approximately 1,500 identity providers and 500 service providers. Inter-federation facility enabled institutions to access the services and resources for the global research and research and education

community. Publishers (SP) offer their services to users in different federations, though they can create their target market and users also get seamless benefit from the wide range of service providers. Federation and members can get the following benefits:

<b>Federations</b>	<ul style="list-style-type: none"> <li>• Maximum services for your institutions – enables them to access services from different federations.</li> <li>• Lower administration costs</li> <li>• Saves time - no need to make bilateral agreements with other federations.</li> <li>• Trustworthy - secure collaboration and exchange of information.</li> </ul>
<b>Service providers</b>	<ul style="list-style-type: none"> <li>• More users and more business</li> <li>• Minimal cost and support is needed to maintain user identities</li> </ul>
<b>Identity providers</b>	<ul style="list-style-type: none"> <li>• Ashome federation is interconnected with other federations, hence wide range of services to your users</li> <li>• Less administrative work.</li> </ul>
<b>User Community (students, researchers, network and proxy administrators)</b>	<ul style="list-style-type: none"> <li>• Wider range of services than are available nationally or locally.</li> </ul>

## 4.2 An overview of Other Country federation and IdP Details

Inter-federation Status of Federations IdP's(\*)

<b>Federation</b>	<b>URL</b>	<b>No. of IdP</b>
United Kingdom - UK federation	<a href="http://ukfederation.org.uk/">http://ukfederation.org.uk/</a>	734
U.S. - InCommon	<a href="https://incommon.org">https://incommon.org</a>	450
France - Fédération Éducation-Recherche	<a href="https://services.renater.fr/federation/en/index">https://services.renater.fr/federation/en/index</a>	291
Brazil -café	<a href="https://www.rnp.br/en/services/cafe.html">https://www.rnp.br/en/services/cafe.html</a>	194
The Netherlands - SURFconext	<a href="http://www.surfconext.nl/">http://www.surfconext.nl/</a>	108
Czech Republic - eduID.cz	<a href="http://www.eduid.cz/wiki/en/">http://www.eduid.cz/wiki/en/</a>	80
Italy - IDEM	<a href="https://www.idem.garr.it/index.php/en">https://www.idem.garr.it/index.php/en</a>	77
Germany - DFN AAI	<a href="https://www.aai.dfn.de/">https://www.aai.dfn.de/</a>	75
Denmark - WAYF	<a href="http://wayf.dk/en">http://wayf.dk/en</a>	62
Sweden - SWAMID	<a href="https://www.sunet.se/swamid/">https://www.sunet.se/swamid/</a>	48
Switzerland - SWITCHaai	<a href="https://www.switch.ch/aaai">https://www.switch.ch/aaai</a>	48
Canadian Access Federation	<a href="https://www.canarie.ca">https://www.canarie.ca</a>	46

Federation	URL	No. of IdP
Greece - GRNET	<a href="http://aai.grnet.gr/">http://aai.grnet.gr/</a>	42
Spain - SIR	<a href="http://www.rediris.es/sir/">http://www.rediris.es/sir/</a>	36
Austrian Academic Computer Network	<a href="https://www.aco.net/?L=1">https://www.aco.net/?L=1</a>	24
Belgium - Belnet Federation	<a href="http://federation.belnet.be/">http://federation.belnet.be/</a>	20
Finland - HAKA	<a href="http://www.csc.fi/english/institutions/haka">http://www.csc.fi/english/institutions/haka</a>	20
Latvia - LAIFE	<a href="https://laife.lanet.lv/">https://laife.lanet.lv/</a>	18
Slovenia - ArnesAAI Slovenska izobraževalno raziskovalna federacija	<a href="http://www.arnes.si/en/services/arnesaai.html">http://www.arnes.si/en/services/arnesaai.html</a>	13
Hungary - eduld.hu	<a href="http://eduid.hu/">http://eduid.hu/</a>	12
Lithuania - LITNET FEDI	<a href="http://fedi.litnet.lt/">http://fedi.litnet.lt/</a>	11
Poland - PIONIER.Id	<a href="https://aai.pionier.net.pl">https://aai.pionier.net.pl</a>	11
South Africa - SAFIRE	<a href="http://www.safire.ac.za/">http://www.safire.ac.za/</a>	9
Japan - GakuNin	<a href="https://www.gakunin.jp/en-fed/">https://www.gakunin.jp/en-fed/</a>	4
Luxembourg - eduID Luxembourg	<a href="https://www.eduid.lu/">https://www.eduid.lu/</a>	4
Estonia - TAAT	<a href="http://taat.edu.ee/">http://taat.edu.ee/</a>	4
Korea - KAFE	<a href="https://coreen.kreonet.net/">https://coreen.kreonet.net/</a>	3
Australian Access Federation (AAF)	<a href="https://aaf.edu.au/">https://aaf.edu.au/</a>	2
Georgia - Grena Identity Federation	<a href="http://gif.grena.ge/">http://gif.grena.ge/</a>	2
Macedonia - AAIeduMk	<a href="http://aaiedu.mk/">http://aaiedu.mk/</a>	2
Moldova - LEAF	<a href="http://federations.renam.md/">http://federations.renam.md/</a>	2
Portugal - RCTSaai	<a href="http://rctsfederation.fccn.pt">http://rctsfederation.fccn.pt</a>	2
Ukraine - PEANO	<a href="http://www.peano.uran.ua/">http://www.peano.uran.ua/</a>	2
Chile - COFRE	<a href="http://cofre.reuna.cl/">http://cofre.reuna.cl/</a>	2
Ecuador - MINGA	<a href="http://www.cedia.org.ec/minga">http://www.cedia.org.ec/minga</a>	2
Israel - IUCC Identity Federation	<a href="https://iif.iucc.ac.il/home/">https://iif.iucc.ac.il/home/</a>	1
Norway - FEIDE	<a href="https://www.feide.no/introducing-feide">https://www.feide.no/introducing-feide</a>	1
Armenia - AFIRE	<a href="http://afire.asnet.am">http://afire.asnet.am</a>	1
Belarus - FEBAS	<a href="http://febas.basnet.by/">http://febas.basnet.by/</a>	1
Croatia - AAI@EduHr	<a href="http://www.aaiedu.hr/">http://www.aaiedu.hr/</a>	1
Colombia - COLFIRE	<a href="http://colfire.co">http://colfire.co</a>	

\*As on 20th August, 2017

## 5. Concrete Examples from Practice

INFLIBNET Centre is always keen to implement any new technology and makes it available to all universities and member institutions in India. INFED is one of such examples of Identity federated Access Management.

Shibboleth is developed based on Security Assertion Mark-up Language. It is very secure and especially used for exchanging user attributes in a secure manner. Any “SAML-compliant” handling of network user identities seemed and still seem rather hard to grasp. The main benefit with the introduction of Shibboleth and the INFLIBNET Access Management Federation (INFED) for institutions is a move towards a single password system (the local institutional login working on Shibboleth systems).

Most of the academic libraries are maintaining their own username and password mechanism and it is very inefficient to exchange their attributes. Whereas, single sign-on via LDAP, Active Directory or any other standard based protocol is a trustworthy system for universities and publisher to adopt, INFED is giving almost all type of assistance to Universities/Institutions.

At present, INFED is extending all help to the institutions to setting up their IdP, installation and configuration of LDAP and other tools.

### Conclusion

Indian higher education system encompasses more than 50000 institutions in India. INFED can play a major role in increasing research output for our country by providing access to scholarly e-resources to potential researchers at anytime, anywhere. Majority of the research institutions are not offering off-campus access to their subscribed resources because of multiple hindrances like lack of funding and as well as limited technical expertise. By joining INFED, Institutions may get most of the e-resources beyond the boundary of institutions anywhere, anytime. The concept and design

of federated access with world-wide deployment is in progress.

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