Aadhaar Card and xAPI
A national approach on Elearning Transformation

[1]Ashutosh Chaudhary, [2]Shashank
[1]M. Tech Research Scholar, [2,3]Associate Professor
[1,2]Department of Computer Science & Engineering
[1,2]Hindustan Institute of Technology and Management, Agra, Uttar Pradesh, India

Abstract : There has been several advancement in the field of e-learning. Several e-learning platforms has emerged in past decade as a result of pushed efforts for recording learning activities for a student. Nevertheless, it is still a subject of research, for we have still few advancements to make, a specification to prepare, as well as to present this in a framework as a whole. In this paper, I am going to discuss one such framework, called xAPI, which provides a schema to track learning activities on. Furthermore, this paper discusses how Aadhar card can be used as a base for such tracking on a national scale.

IndexTerms **– Aadhar, XAPI, e-learning.**

I. INTRODUCTION

'UIDAI' (Unique Identification Authority of India) introduced the Aadhaar project under UPA (United Progressive Alliance) governance in year 2009. Shri Atal Biharee Vajpayee, Former prime minister of India, had suggested in the year 1999, for the people living in the border area to have biometric identities. Over 99% of Indians aged 18 and above now have **Aadhaar** cards as more than 111 crore residents have enrolled themselves for the unique identification number. Aadhaar card contains the demographic features such as name of the citizen, Father/Mother's name, Date of Birth, Sex, address of the citizen, and biometric features such as photograph, fingerprints and iris (eye) details. Nandan Nilekani, co-founder of Infosys has been looking over the project as the chairman of Aadhar project. Aadhar card has been since integrated with Quick Response (QR) code along with 12 digits unique identity number for every individual as a digital identity.

II. XAPI

Experience API (abbreviated as xAPI) is a collaborative effort of US government for a unique specification scheme for elearning standards. It widely contributes to elearning data by collecting range of experiences of a user performing learning activities, online or offline. It is integrated with API which subsequently captures the data in form of XML tokens, grouped as activities, to communicate the user device with cloud technology. Different systems can communicate securely by capturing and sharing activities of user by using xAPI standardised vocabulary.
Started as a collaborative effect from president Clinton, it emerged as a worldwide standard to record elearning activities. This soon was adopted as a result of supportive APIs with many existing products.

III. SOFTWARE SPECIFICATIONS

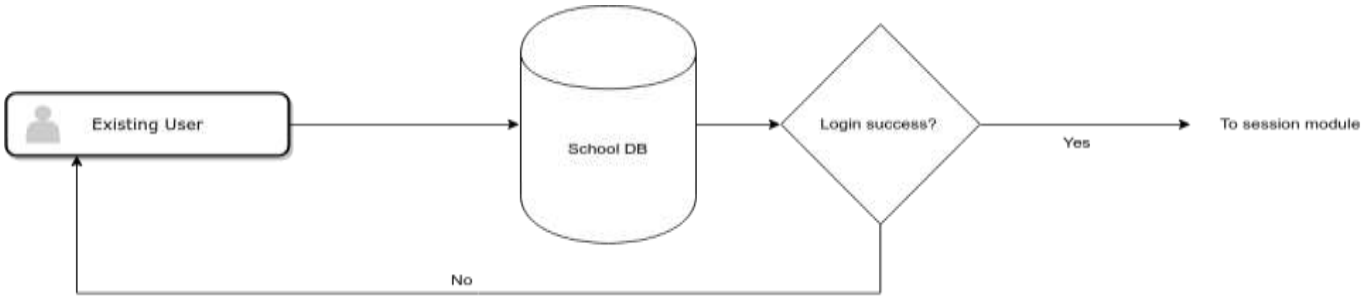
In terms of Functional requirement, a base level requirement of our framework will be tracking user learning activities based on start and end session, in accordance to the amount of data consumed. Tracking should be confined within a virtual session provider, that will allow to track number of applications launched, read the timeout for each applications and getting metadata. Another base level requirement is to isolate the content of entities, encrypting with high entropy algorithms.
The last base level requirement will be granting an authenticated user with a session provided token so that each tracking request does not need to necessarily authenticate against AUA. We record the authentication data first time user is authenticated until user completes the learning activity.
Aside from base level requirements, the framework1 will require fingerprint generator so it can be derived who is the provider and who the consumer is. Both should be authable with Aadhar. Also, this will prevent any identity spoofing or tampering in future. Any tracked data should be prepended with fingerprint in order to identify the owners of data collection.
As a secondary level requirement, we need a sync service which will sync the collection for a user or collection of users, to our RESTful API servers, in order to map the service provided, to the clouds, along with aadhaar numbers.

IV. SOFTWARE DESIGN

The design of our framework contains 4 major modules: entity recognition, session manager, content pool and LRS. The modules are placed such that each next module will required authenticated data from previous module, else will halt data processing.
The modules are form of services that requires data from dependent module to retrieve and present information.
These monolithic modules communicates directly, using a secured encrypted tunneled line. AES is preferred encryption of tunnel for industrial standards reasons.

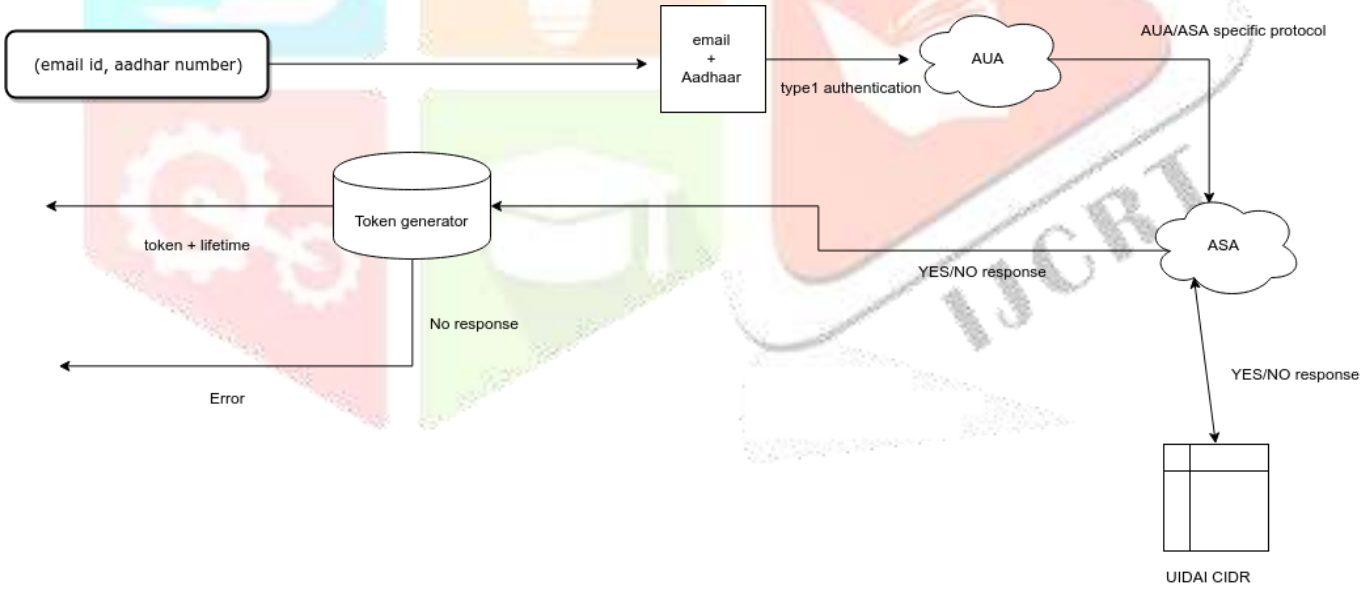
The entity recognition module is the essential module in whole application as it provides the basis of user data for every other modules. The data formed here is locally known to user and does not contains any sensitive information such as passwords, fingerprints etc.

Only Aadhar number and email id of user is known. One can easily attach any additional data to this module so it can be carried to LRS for general purposes. The basic structure of this modules looks like this:



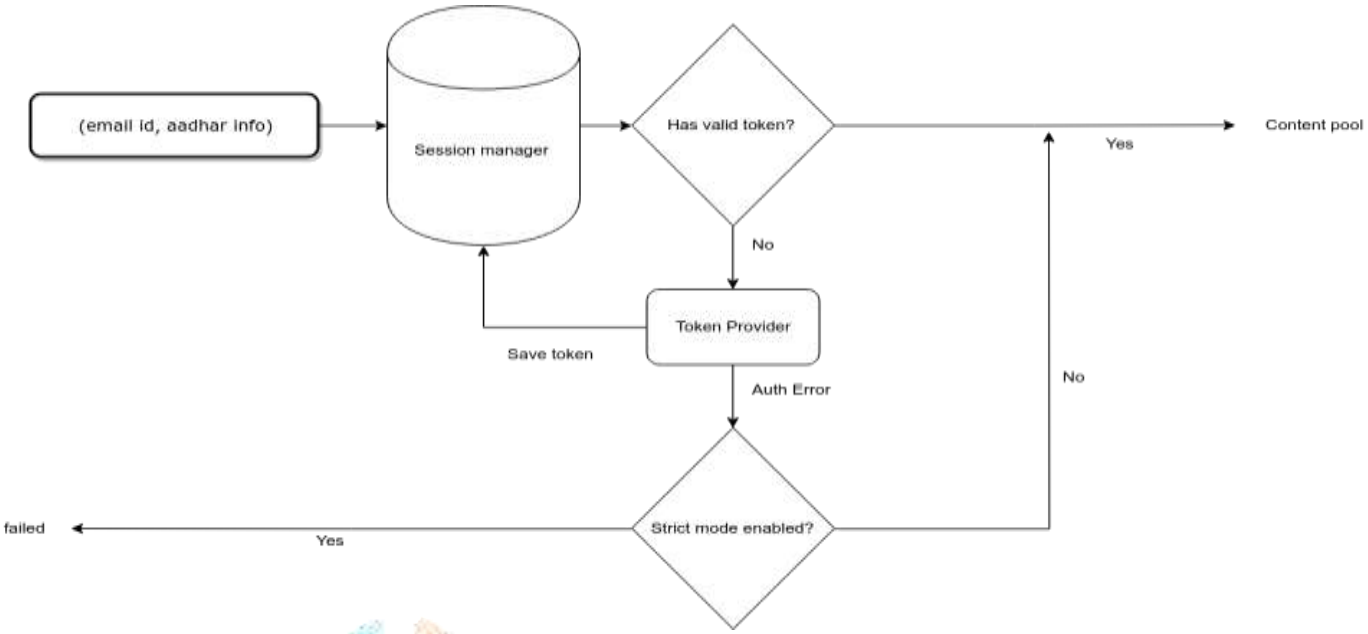
Any existing student from an institute can login to institute database using provided credentials. The institute must be able to provide necessary student info- email id and aadhaar number. It forms the basis of any next module attached. Once obtained, student proceeds to the next module, which is session manager module.

The most crucial module of all is the token provider which validate aadhar data of user, along with email, against the AUA auth provided by aadhaar center. It contains YES/NO response based on which it is determined if user is validated with aadhaar or not. We present type 1 authentication which allows us to authenticated based on user aadhaar number and one demographic information, which in our case is email id of user. The token provider then constructs the token if user response is YES. The lifetime of token is set to anytime, in our case 2 hours. Once token is created, another token is also created, which can be used to refresh the existing token, ensuring the availability. The basic flow diagram of token provider is as follows:



Session manager module is an optional module which receives basic user credentials of any aadhaar recognised user, and creates a session based on token obtained from token generator service, after authenticating user against aadhaar database, following Aadhar authentication type 1 [3]. Once token is obtained, it is saved in session along with lifetime provided with token. Thus session also validates invalid tokens based on lifetimes of each token. It does not block user from going to next module since user should not be blocked from any learning activity regardless of whether it can be tracked or not.

An strict mode may be enabled by any school which can mandate if session manager should allow user to proceed or not. The basic flow can be summarized in below flow chart:



Considering optionality of session manager, it may or may not provide token to next module. However, if token if present, it is ensured it is valid and user is authenticated with aadhar.

The content pool is responsible for showing learning content to user. It can support any kind of documents, for instance PDFs, Latex documents, lecture videos, lecture documents, web pages etc. Some of these documents provides an API for better interactivity. It provides a meaningful information how interaction is being done with the object. For instance, video provides an API to know when video was started, resumed or stopped. Web pages can be programmed to know when and how user interacted with the page. Any interactive activity that can be obtained from the object can be recorded with tincan api (xAPI). This document does not cover the operations necessary for interaction with the document but provides a higher visibility on how to act on information obtained from interaction.

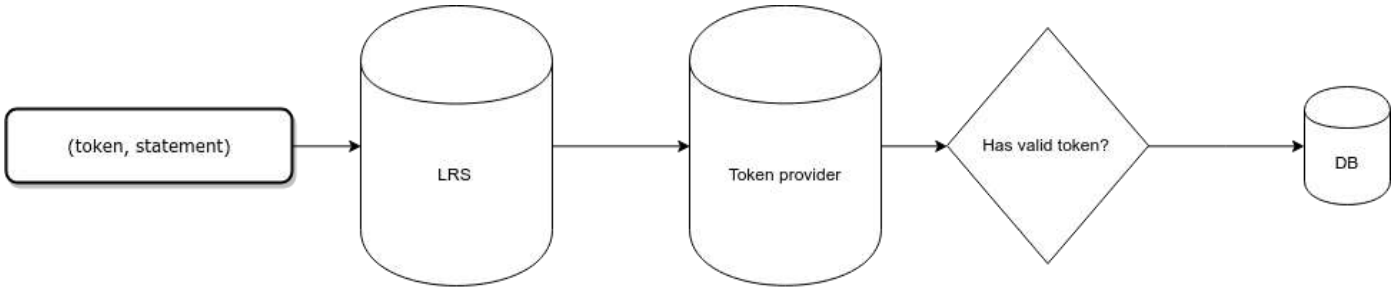
We begin the interaction with LRS only when a token is present in content pool. Once we've obtained user interaction information using the API, statements can be constructed, passing in token in following form:

```
{
  Token: <token-obtained>
  Statement: {
        Activity: "video-started",
        Timestamp: ISO-standard-time
        }
}
```

We then pass this statement in our LRS request, which we are sending anytime new interaction is happening. This information is then sent to last module LRS.

LRS or Learning record store, is our last module in recording learning activity. It receives information from anywhere in a prescribed format. Since we have our own LRS, we are adding user authentication with aadhaar, in form of token, so it can validate and save only aadhar recognisable users.

Once information is received, LRS communicates with Token provider for the validity of token. If token is valid, it saves the user information in database. This allows any information in LRS confined to aadhar searchable. A basic flow diagram for LRS is shown below:



IV. RESULTS AND DISCUSSION

To examine the benefits of framework ready tracking, one must first understand elearning tracking. Many activities that a user participates in, are composed of learning curve. For example, a youtube video might be a tutorial garnering interest of students. An Online quiz or forum may also provide a questionnaire which can improve the learning track record of a student. Classroom, as such can act as a learning record provider, if viewed in context of student centred learning approach [6]. Whilst classroom program can be considered as a monolithic way of teaching, a student centered learning approach works, as it can be viewed as a personalized feed for learning tracking. Our frameworks eases this approach and provides a mean to use existing authenticator for every tracking activity.

Reporting is a very crucial dimension for overall development of student. As a seeker, a student may want to know what other co-curricular activities he had performed so as to contribute to overall development. Existing learning records only are able to provide reports in context of classroom, but can not outside. Our framework seeks to alleviate these problems and provides a scalable, flexible and micro-structure that is easy to implement, scale and distribute. It can easily be extended by API standards using any other languages, in-order to incorporate any new services, provided that it conforms with elearning standards.

Learning has always been changing and there had been lot of research on the methodologies. While e-learning is still blooming, it can be extended to evolve in many ways. Most importantly, it should not be dependent on specific classroom, but should be adoptable per person, tailored, based on personality of user. Hence, a flexible, scalable solution is necessary, as a mediator, which can record the activities and present the output in a tailored way.

V. ACONCLUSION AND FUTURE DEVELOPMENTS

This paper has presented a new framework for Aadhar to incorporate with the existing xAPI standards within the existing education system of india to combat various challenges faced. The key components of the proposed new architecture has been described via various flow charts, schema representations and prototype details. I believe this framework will bring several significant benefit to digitization of education system in india. Not only students, but guardians as well as teachers can come on common grounds for betterment of coming future of india.

Future development of Aadhar includes developing more flexible framework, which operates on a cloud based system, embedded in several aadhar card readers. This will contextualise user interaction based on activity or location and can be generalised later on. This allows for more rapid aggregation of user activities, not limited to elearning, but to banking, stakes as well as public participations. This further allows government to keep tap of user in case of misuse of services.

In the near future, I imagine Aadhar to be a centralised POS for a user to authenticate various digital services for himself. Attaching frameworks will bring in another dimension for aadhar, to act as data collector. This will accompany the need for big data solutions in order to make the data readily available. The Aadhar could eventually implement big data solution in a multiple data-centralised repository, such as Hadoop [5]

REFERENCES

[1] Ahemant R., Rajiv et.al. 2014.E-learning: Issues and Challenges, International Journal of Computer Applications (0975 – 8887).

[2] Unique Identification Authority of India, Planning Commission, Govt. of India (GoI), http://stateofaadhaar.in.

[3] Shyam Singh A. 2015. AADHAAR – Possibilities with 1 to n authentication.International Journal of Scientific and Research Publications, Volume 5, Issue 9, September 2015.

[4] Raja Siddharth R.,Sukhdev S.,Kiran Khatter. 2015. Aadhar card: Challenges and impact on digital transformation.

[5] Sun Shengtao, Wu Aizhi et.al: The Study of a Hierarchical Hadoop Architecture in Multiple Data Centers Environment. The Open Cybernetics & Systemics Journal, 2015. 131-137.

[6] Shyam Singh A. 2015. AADHAAR – Possibilities with 1 to n authentication.International Journal of Scientific and Research Publications, Volume 5, Issue 9, September 2015.

[7] Gabriel Reif et.al: A Qualitative Study of Student-Centered Learning Practices in New England High Schools.