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Personal Learning Network on Discovering and Improving User Skills and Interests

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Abstract: *Personal Learning Networks that currently exist have limited opportunities for improvisation and usually cannot convey the genuine interests and talents of their users. We want to design and implement a comprehensive personal learning network by targeting even younger audiences to register and allow them to share all kinds of accomplishments, interests and their ambitions so that we may be able to help them realize their skills and talents and guide them into fields that match their profile. We will build a modern web app to represent the platform covering many of the modern web technologies. This platform will greatly help users discover their talents and improvise and will enable recruiters to find and select passionate workforce.*

Keywords: *PLN, personal learning network, web app, PLE, personal learning environment, machine learning*

I. INTRODUCTION

Personal learning networks (PLNs) are not new. People have long relied on their friends, colleagues, families and acquaintances to add to their knowledge about the world. But the times are changing. Information and communication technologies (ICT), including an ever-growing collection of open source applications, have freed content from the printed page, giving voice to the ideas of people they have never had access to before and enabling them to reshape their information experiences to suit their learning needs. Harnessing these new technologies to create and grow their own PLNs is imperative for educators who want to stay connected to the changing world they are charged with introducing to their students. Personal learning networks are based on the grounds that learning occurs through interaction with multiple people and in multiple, varied contexts through virtual communities. Informal membership in each Web-based community is initiated by the individual learner, who interacts through a variety of communication technologies and digital media.

[1] Networking is an important skill in professional careers, supporting the individual's growth and learning. However, little is known about how professionals intentionally manage the connections in their personal networks and which factors influence their decisions in connecting with others for the purpose of learning. It has also been recognized that ties and networks can be intentionally built, created and managed as resources for learning and working (Burt, 1992). The structure of a personal network can change in ways best benefiting the needs of professional learners throughout different stages of their careers (Margaryan, et al., 2009). By including weak links in their personal networks, learners can create an environment for learning (Kester and Sloep, 2009).

[2] When networks are properly designed, they reliably facilitate learning. This is because, when properly designed, the network will itself learn. Through the process of interaction and communications, the entities that constitute the network will form a mesh of connections. Knowledge is embedded in this mesh of connections, and therefore, through interaction with the network, the learner can acquire the knowledge. Foresters learn about trees by working with foresters; lawyers learn about the law by working with lawyers.

[3] Learning on demand is becoming a type of lifestyle in modern society (Mc Loughlin & Lee, 2007). Learners constantly seek information to address a problem at work, school, or to just satisfy a curiosity. To do so, they take advantage of digital and networked technologies not only to seek information, but also to share information. Thus, learners should not be considered as passive information consumers; rather, they are active co-producers of content. In the physical world, learners usually rely on lunchtime discussions, student organizations, brown bag sessions and study groups for peer support and informal learning networks (Martindale & Dowdy, 2010). [4] Public affairs professionals are on the edge of a revolution in education and knowledge management. The combination of mass syndication of user-created online content coupled with the advent of powerful search engines is a revolution as fundamental as the one created by the invention of the printing press in the 15th century. Professional educators can create learning networks using Web 2.0 technologies that are freely available.

[5] A Personal Learning Network refers to the network of people a self-directed learner connects with for the specific purpose of supporting their learning. An effective use of PLNs as learning resources depends on various networking skills of the learners. These skills include content-related skills such as such as being able to engage in conversations and being able to communicate

ideas, thoughts and opinions to the listener, but also (ii) skills regarding the process of networking itself to continuously build, maintain and activate PLNs, in particular to be able to identify the experience and expertise of the connections in their PLNs. [6] The use of design patterns is now well established as an approach within the field of software systems as well as within the field of architecture. An initial effort was made to harness patterns as a tool for elaborating the design of the elements of personal learning environments as part of the University of Bolton's Personal Learning Environment project; however, this earlier effort had a number of limitations that prompted a revisit to the pattern language documented here. In particular, the initial patterns, while functionally useful, lacked some of the moral and generative qualities that are the essential qualities of an effective pattern language.

[7] The design, evaluation and testing of Personal Learning Environments (PLEs) is a complex and important issue where higher education institutions and learning analytics can play an important role. We analysed a paper which presented a case study that focused on the effect that service multiplicity of institutionally-powered PLEs has on the composition, structure and overall design of students' personal networks. The evaluation of the case was carried out using social network analysis as the particular approach to learning analytics.

[8] Compared with learning in classrooms, classical e-learning systems are less adaptive and once a system that supports a particular strategy has been designed and implemented, it is less likely to change according to student's interactions and preferences. Remote educational systems should be developed to ensure as much as necessary the personalization of learning tasks. New e-learning environments should appear to act as intelligent systems that better fit the needs of their users and especially students according to their interests, preferences, motivations, objectives and knowledge.

They present how the personalization of students' learning process leveraging the use of social semantic web, using resource description framework models, ontologies, social networking and collaborative tagging. Their approach of personalization according to students' preferences, interests and knowledge by defining for them the best learning paths, this means, provide them as recommendations the best collaborators and the relevant resources that better fit their needs. [9] The learning-network perspective rejects both a functionalist tool of management approach and a context-independent organizational learning view. Instead, it demonstrates how learning networks are (re-)produced by interactions among employees, managers, training consultants, and other actors, who each have their own theories and strategies in organizing work-related learning. Learning networks can take various shapes depending both on actor dynamics and on work characteristics.

[10] Social networking has become increasingly popular over the past decade, attracting millions of active users worldwide. These sites offer an opportunity to maintain friendships, create new friendships and even date. As a result, a therapeutic group was formed to address these online experiences and provide practical and emotional support. [11] A real challenge for any learning theory is to stimulate known knowledge at the point of application.

When knowledge, however, is needed, but unknown, the ability to plug into sources to meet the requirements becomes a crucial skill. As knowledge continues to grow, evolve and spread, access to what is needed for the future is more important than what the learner currently possesses. [12] Investment in social networks may benefit individuals through greater access to and use of information, influence, social credentials, and reinforcement of identity and recognition (Lin, 1999, p. 31). Research in education and human development has typically focused on two broad types of social capital among youth and families (rather than among peer networks). [13] Learning Networks are self-organized online communities designed to facilitate lifelong learning. In these communities, learners participate actively creating, sharing and indulging in activities, learning plans, resources, and experiences with peers and institutions (Koper&Sloep, 2002). These networks depend on the active participation of their members and, as a consequence, they need applications that enable and encourage participants' interaction (Koper and Specht, 2007) and, at the same time, guarantee community sustainability.

A Personal Learning Network is a way of defining the group of people that you connect with to learn their ideas, their questions and answers, their reflections, and their references. Your PLN is not limited to just online interactions, but it is that online, global interactive part that really makes it special. It is personal because you decide who is in the group; you choose if you want to lurk—just check out what people are saying—or if you share; because you choose when to do so, and how to do so.

In that way, a Professional Learning Network, then, is a very natural extension of the way people choose to learn—by connecting with others who have shared interests, ideas, or resources.

If the internet was, at one point, one-way—a user “logs on” to search for information or share an opinion, then “logs off” because they're “finished”—a more progressive view could be that connectivity is omni-directional and multi-faceted. We connect with different people with differing levels of expertise using varied tools for authentic and constantly changing purposes.

II. SSTEM DESIGN

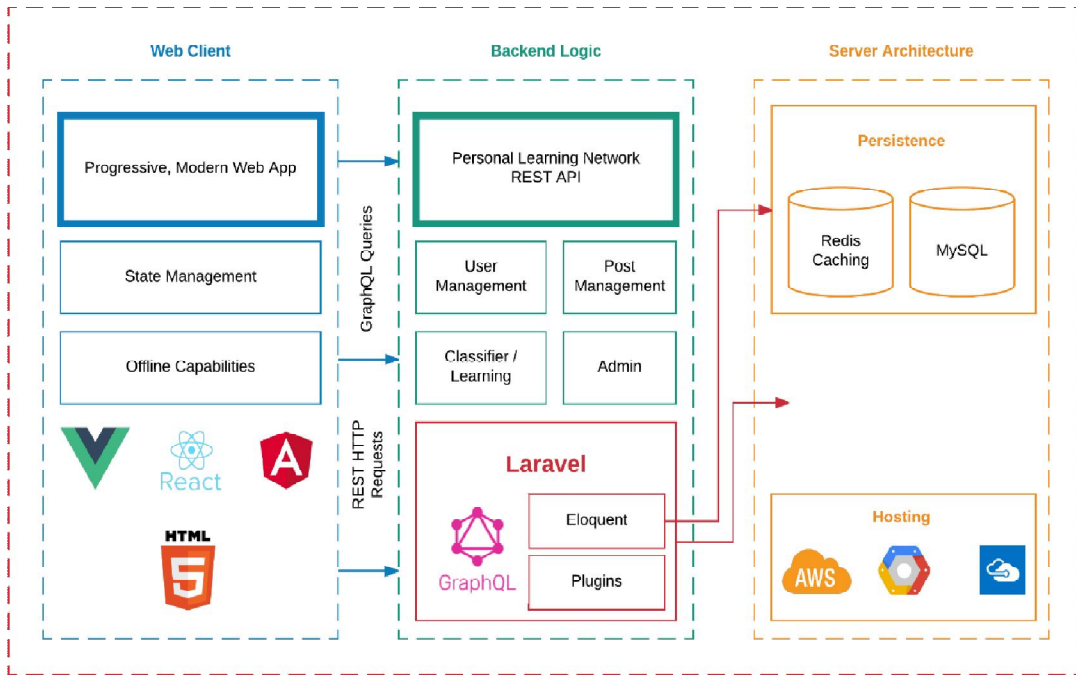


FIGURE 1 TIERED ARCHITECTURE DIAGRAM

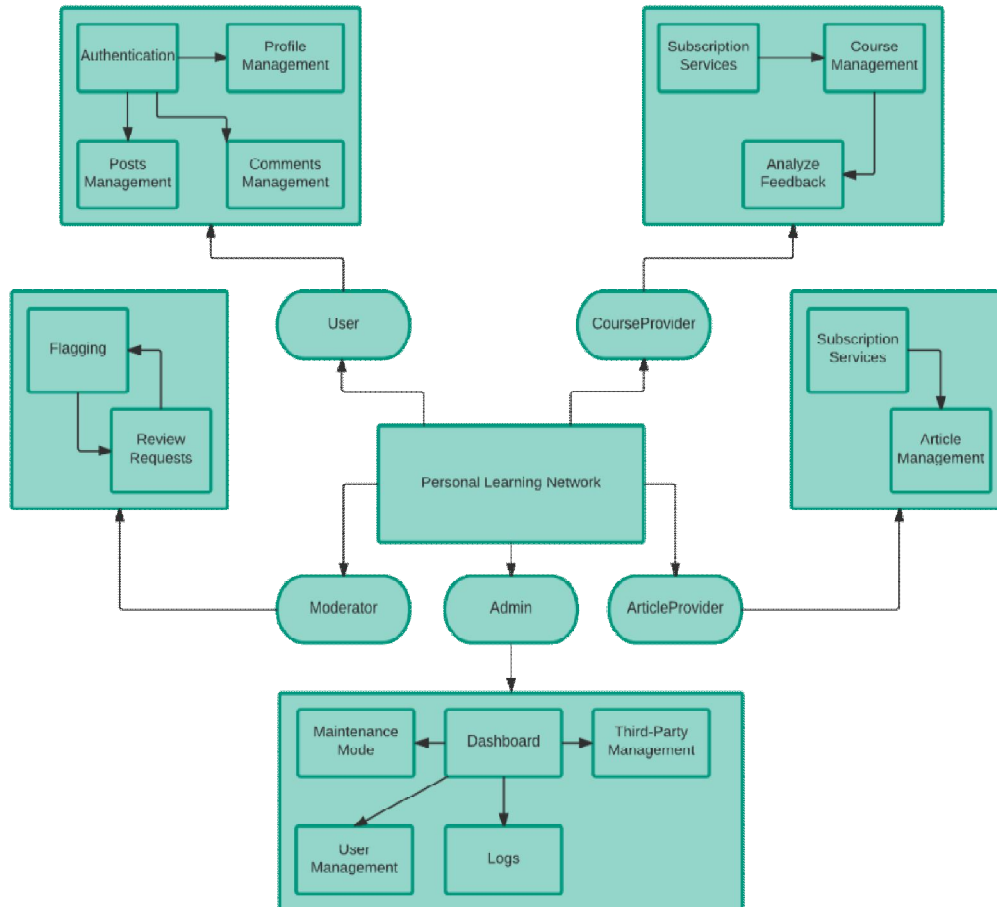


Figure 2 Overview Architecture Diagram

III. MODULE DESCRIPTION

The system consists the following main modules

A. Registration

This deals with the registration of users to access the various features of the network. This module will handle manual registration as well as registration using modern techniques such as OAuth. This module also takes care of post-signup activities such as verifying the user and subscribing to email updates. The module will also keep track of % completion of the profile by the user.

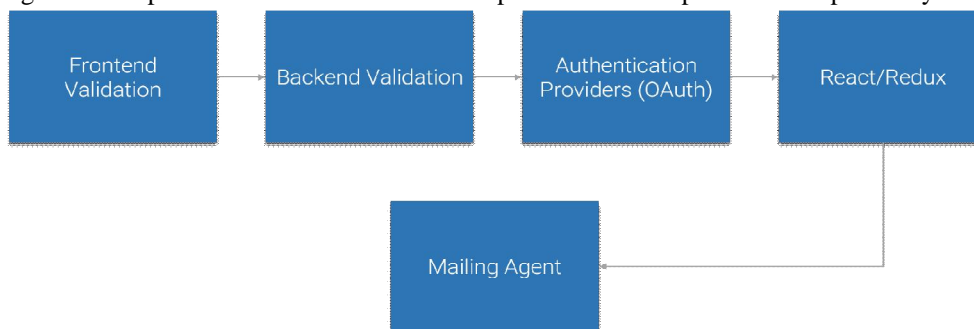


Figure 3 Registration Module Block Diagram

B. Profile

The profile of the user contains various fields pertaining to personal, education as well as work aspects. This profile is a dynamic entity in that it will grow with the system to have more options for the user to add to. The profile will be viewable by anyone if the user permits the system to do so and can be shared to peers and potential recruiters. The user will also choose a category of users he/she belongs to — Primary School, High School, College, Postgraduate, and Professional.



Figure 4 Profile Module Block Diagram

C. Post

Users can post what we call a “post”. The post is a block of text with Markdown support for expressing detailed content. Post can also contain images and other media as attachments. Posts could also be tagged to a particular location. Other profiles can be mentioned in the post. Every post will have a reactions panel for other users to react to. Every post will also have a comments section with support for multiple levels of comments. Posts will also have decoration options to tell apart the kind of post — whether it is about an accomplishment or a discussion etc. Posts can be marked as public/private and can be shared by other users.

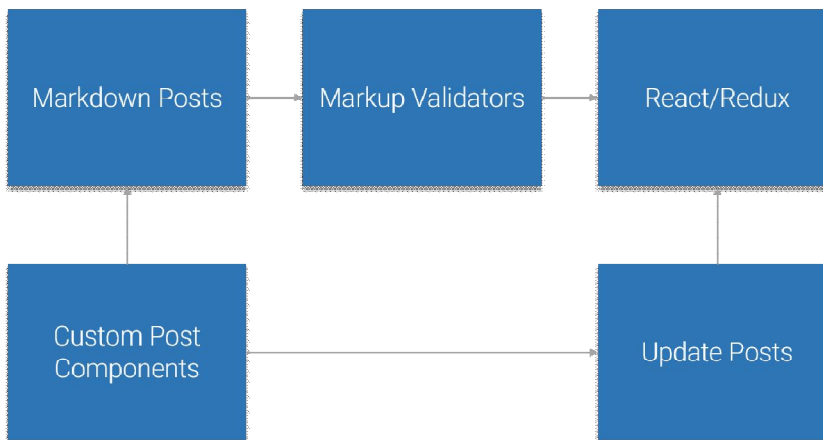


Figure 5 Posts Module Block Diagram

D. Discover

The Discover tab makes use of the information generated by the learning systems to display content from the network that might be of interest to the user. The Discover section will also contain information from external sources which matches the interests of the user. The Discover differs from the feed in that it will focus exclusively on interests while the feed can show content from people the user follows.

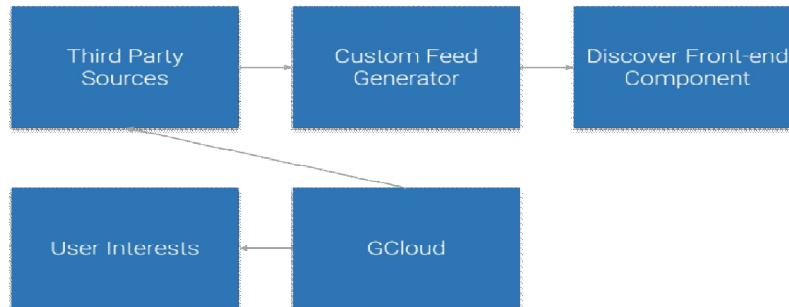


Figure 6 Discover Module Block Diagram

E. Suggestions

The network has a learning system which could be Clustering-based/Neural network based to learn about individual users and their interests. This will enable the system to extract keywords that pertain to user interests and these keywords will be used to identify content within the network and outside the network that could be of relevance to the user.

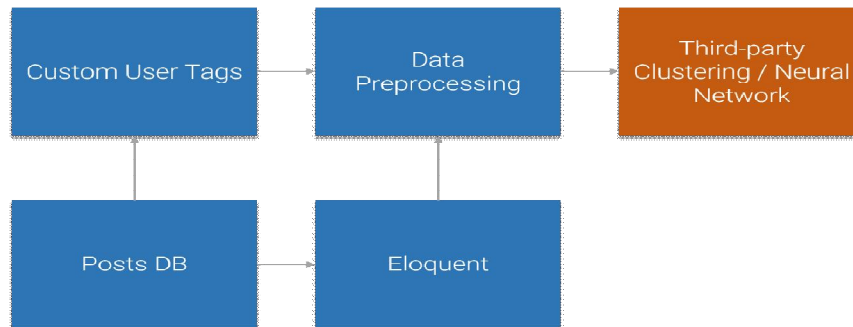


Figure 7 Suggestions Module

IV. SYSTEM SPECIFICATION

PLNs can be understood as learning systems built upon an architecture of participation that can come to exist with or without specific objectives. In such systems “learning is understood in terms of ongoing, recursively elaborate adaptations through which systems maintain their coherences within dynamic circumstances” Individual agents engage in these systems through various forms of participation - from committed engagement to more peripheral lurking - that are generally transactional in nature. In other words, as people participate in a system, they change it, and the system changes them. The responsive nature of PLNs might offer teachers access to interactions and resources necessary to grow professionally.

A. Software Requirements

- 1) Apache/Nginx
- 2) Node.js
- 3) MongoDB Server
- 4) React/Redux Toolkit
- 5) Development requirements are as follows:
- 6) Visual Studio Code
- 7) JetBrains® WebStor
- 8) Google Chrome (for dev/testing)

B. Hardware Requirements

The server hardware will be provided by the SaaS/IaaS provider we will be hosting the application on. These services provide scalability and 24x7 availability without having to interfere with the infrastructure. In theory, the web application will work well in a VM configured with the following specs:

- 1) Processor — 4 x 1.6 GHz CPU
- 2) RAM — 8 GB
- 3) HDD — 20 GB (minimum)

V. IMPLEMENTATION

Our goal was to build the entire application using the cutting-edge web development technologies and to an extent, we were able to achieve this goal. The application uses the popular and efficient React library developed by the engineers at Facebook for powering up the front-end. With React, we were able to make performant UI with minimal code and better maintainability. React makes use of a VDOM in order to keep track of changes in the UI. It doesn't directly interact with the DOM elements and instead, keeps track of state changes through a VDOM object. Whenever the application state changes, React updates the VDOM and does a very efficient comparison of VDOM to the DOM. It then updates the actual DOM wherever necessary without having to re-render the entire document. This avoids flashes of dynamic content that is very frequent in older, conventional websites. React itself is very minimal and contains just the UI part of the application. We use Flux/Redux libraries to manage application state and build the entire system along with React.

React/Redux workflow is battle-tested workflow we implement in our application. It is overwhelming to understand for newcomers but this architecture makes the data-flow more deterministic and errors easy to debug.

The user interface was built on top of material-ui — a well-built component library that provides off-the-shelf components to build our app. The server-side of the application is very minimal since React and its companion technologies help bring the core interface to the client-side. To get performant persistence, we used the Google Firebase services. Firebase provides a very highly performant Real-time Database that scales well and performs really fast. Firebase also provides Storage services which we use to store images.

VI. TECHNOLOGIES LEARNT

A. JavaScript

JavaScript is the web's programming language. It has skyrocketed in popularity ever since its inception in 1995. It's popularity has exponentially increased in the past years due to the rapid development of new libraries and frameworks as well as the presence of isomorphic technologies that make use of JavaScript. JavaScript can now be used to build not only web apps but program server-side, build mobile applications and desktop applications and has even presence in the data science/ML territory. The ES2015/ES6 standard introduced a plethora of new features to the language which has greatly increased its flexibility. Even now, JavaScript is being actively developed and more features are being added to make it even easier to code. The active development has led to the development of a lot of technologies built on top of JavaScript.

B. React

React (sometimes styled React.js or ReactJS) is a JavaScript library for building user interfaces. It is maintained by Facebook, Instagram and a community of individual developers and corporations. React allows developers to create large web-applications that use data and can change over time without reloading the page. It aims primarily to provide speed, simplicity, and scalability. React processes only user interfaces in applications. This corresponds to View in the Model-View-Controller (MVC) pattern, and can be used in combination with other JavaScript libraries or frameworks in MVC, such as AngularJS. For brevity, we will only be detailing the source code of some of the modules we use in the application.

C. Redux

Redux is an open-source JavaScript library designed for managing application state. It is primarily (but not mandatorily) used together with React for building user interfaces. Through the use of Redux in React, it is easy to maintain a global application state and have components communicate with each other without resulting in messy logic. States are immutable and hence, it is easy to go back to a previous state without resulting in additional logic or complexity.

D. NodeJs

Node.js is an open-source, cross-platform JavaScript run-time environment for executing JavaScript code server-side. Historically, JavaScript was used primarily for client-side scripting, in which scripts written in JavaScript are embedded in a webpage's HTML,

to be run client-side by a JavaScript engine in the user's web browser. Node.js enables JavaScript to be used for server-side scripting, and runs scripts server-side to produce dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js has become one of the foundational elements of the "JavaScript everywhere" paradigm, allowing web application development to unify around a single programming language, rather than rely on a different language for writing server side scripts.

E. Firebase

Firebase provides out-of-the-box, zero configuration services which are ready to be used for mobile applications. It takes the hard-work of setting up and configuring and instead gives us an easy-to-use API for performing operations. We make use of the Databases and Authentication feature of Firebase which is very fast and flexible.

F. Webpack

Webpack is an open-source JavaScript module bundler. Webpack takes modules with dependencies and generates static assets representing those modules. It takes the dependencies and generates a dependency graph allowing web developers to use a modular approach for their web application development purposes. The bundler can be used from the command line, or can be configured using a config file which is named `webpack.config.js`. Node.js is required for installing webpack. Another important aspect about webpack is that it is highly extensible by the use of loaders. Loaders allow developers to write custom tasks that they want to perform when bundling files together.

VII. CONCLUSION

The project incorporates many aspects of modern front-end development as well as makes use of efficient backend services to implement a functioning, minimal social network. The web app that's built at the end is fast, interactive and most importantly is built out of the latest and greatest front-end technologies. Anyone can quickly join the network and start interacting with people. This network will stand as a solid foundation for the next set of tasks.

The project we are working on has an ambitious goal and it's a long-term one. We set out to rethink how learning environments work and on our journey, we found that such networks need to be social first and then incorporate individual learning elements. The implementation thus far up to an extent realizes the first goal by building a minimal social network that incorporates the best in modern front-end development. The site is highly modularized and by adding a few more, we can make this a cross-platform application or native application. Our main goal isn't achieved yet and that requires learning the users in the network to provide useful information that can aid in the growth of the user. A few of the things that we are planning to finish by the next phase are:

- 1) Implement a learning mechanism to identify the interests and skills of the users in the system.
- 2) Provide an in-app experience for learning and browsing various learning materials.
- 3) Improve the performance, security of the app and add more social-network features like the ability to chat.

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