Electronic Research Project Proposal Management System using Spring and Hibernate Framework

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Abstract: Researchers and scientist need a platform (framework) to reproduce there work to world, so in proposed system we designed a framework which is developed using spring, Hibernate, designed using HTML5, CSS3 with RSA, Digital signature to make the framework secure. PostgreSQL database was used as back end. The existing system has overcome the time consuming process of research proposal submission, scrutiny, review, obtaining required reports and certificates, monitoring etc. Architecture is integrated with the two frameworks which is suitable for enterprise web application. The architecture hands business logic of Webwork to Spring; utilize beans configuration to manage the related classes; manage objects relation of between controller and data access object through Spring and make data persistence by Hibernate, from RSA and Digital signature we avoid man middle attack, eavesdropping. The verification shows, this system can achieve the standardization and paperless Research proposals. We can still provide the high security with implementing SSL and Deploying the framework in cloud.

Keywords: Framework, SSL, Digital signature, RSA, eavesdropping, Research.

1. Introduction

With the development of education, the reform can reflect The progress, which is not only in educational philosophy but in educational technique and means. However, as an important link in the teaching process, the examination I always the one of major parts of consuming human and material resource in this process. As researchers got great attention by web application project over the years, these applications are developed which are valuable in terms of transparency, accuracy, efficiency and security but web applications are becoming complex day by day. The open source application platform Spring and hibernate based on J2EE, provide integrated framework and uses layered structure. The ePPMS developed has almost achieved the paperless of Proposal Submission, Evaluation, Technical and financial approval, transparency and security. The major Layers involved in the system development are:

JSP (Java server pages) is a technology that helps software developers create dynamically generated web pages based on HTML, XML, or other document types. Released in 1999 by Sun Microsystems, JSP is similar to PHP and ASP, but it uses the Java programming language.

Below is the architecture of how JSP works:

Comparing with the manual process of proposal submission the system has the various advantages like Flexibility in submission of proposal, easy, fast evaluation process and transparency in Proposal Processing, saves the physical space, email and SMS facility to know the status of proposal anytime, Maintain data integrity and security and provides role based access, responsive web design.

Figure 1: Java servlet pages.

Figure 2: Layered approach
RSA:
RSA is one of the first practicable public-key cryptosystems and is widely used for secure data transmission. In such a cryptosystem, the encryption key is public and differs from the decryption key which is kept secret. In RSA, this asymmetry is based on the practical difficulty of factoring the product of two large prime numbers, the factoring problem. RSA stands for Ron Rivest, Adi Shamir and Leonard Adleman.

Digital Signature
DSA is a pair of large numbers that are computed according to the specified algorithm within parameters that enable the authentication of the signatory, and as a consequence, the integrity of the data attached. Digital signatures are generated through DSA, as well as verified. Signatures are generated in conjunction with the use of a private key; verification takes place in reference to a corresponding public key. Each signatory has their own paired public (assumed to be known to the general public) and private (known only to the user) keys. Because a signature can only be generated by an authorized person using their private key, the corresponding public key can be used by anyone to verify the signature.

2. Existing System
Manual Research proposal Submission:
The manual submission of research paper has following drawbacks.
- Time consumption for submitting a proposal reviewing a proposal report status, communication certificate
- No flexibility nor extendibility
- Unproven Security Model

Proposed System
3.1 Work mechanism of spring framework
Place the 7 basic modules of spring are AOP, ORM, DAO, Web MVC, Context package, Core package and Web package. Core packages provide Inversion of Control and dependency injection. The lengthy JDBC code is eliminated by JDBC abstraction layer provided by Data access object. Object relation mapping and Aspect oriented programming is provided by ORM and AOP packages respectively. A web application implementation is provided by MVC package.
The complete process is shown in figure II. The incoming request from the JSP is dispatched to handler which calls the appropriate controller. The dispatcher Servlet is declared in web.xml file as:

![Diagram of Work mechanism of spring](image)

**Figure 7:** Work mechanism of spring

The Controller process the request using model class, service class and data access object, and returns the view name to dispatcher servlet which return the view back to user.

### 3.2 Work mechanism of hibernate

Hibernate separates business logic and data access by object relation mapping [1]. It uses object relation files and used as persistence layer which mainly consists of configuration files, persistence objects and mapping files as shown in figure III, the configuration files deals with the database connection information and mapping files provides mapping relationship between objects and database tables.

The session interface creates and destroys a session object [1]. Session buffers Hibernate automatically generated SQL statements and data to be reused in future. Hibernate uses Hibernate query language for query processing.

![Diagram of Work mechanism of Hibernate](image)

**Figure 8:** Work mechanism of Hibernate

### 3.3 System Architecture

In Architecture we have 5 roles principal investigator, member secretary, Special invite, program advisory comitee and director. The job of principal investigator is the one who propose new papers.

Member secretary is the one who manages proposals, Referee evaluates the proposals, Advisory comitee calls the person for meeting and decides to accept the proposal or not and finally the director approves the financial formalities.

### 3.4 RSA and Digital Signature

To make the framework secure we have the RSA and Digital signature.

RSA works on presentation layer with asymmetric encryption, the admin will encrypt the data with a public key and the user can decrypt the data with private key.

Digital Signature works on two phases:

**Generation of signature:**

We use RSA algorithm with assymetric encryption for generating private key (key pairs are randomly generates by RSA), the Digital signature authority will sign the packet with a message, the message with public key will be saved in the database so that this can be used in verification purpose later.
Verifying Signature

Public key used here will be mathematically related to the private key used in the signature generation algorithm. This verifying step is done while publishing paper to the principal.

- Signature bytes would be stored in the database. It will be read as it is. Its format will be BYTES and not STRING
- Verification process will read the data and checks it against the read signature and the public key

4. System Implementation

Manual submission of proposal was a burden for researchers and coordinating personnel for obtaining the project proposals, scrutiny, send to Reviewers, obtaining progress reports and certificates, etc. Automation has speed up these activities

4.1 Registration of Roles

The director is the one who decides the roles and responsibilities of principal investigator, member secretary and program advisory committee.

4.2 Submission of research paper

Principal investigator logs in to website with his username and password. He adds his new ideas and submits the paper.

4.3 Evaluation paper

Special invite will review’s the paper based on his knowledge and decides to approve or reject.

4.4 Schedule meeting

Program advisory committee verifies following points
- No of proposals.
- Are proposals reviewed??
- Rejected or accepted??
If the proposals are accepted advisory committee calls the principal investigator for meeting.

4.5 Financial Approval

Finally director meets the principal investigator and completes the financial formalities.

5. Results

Above figure shows addition new proposal by principal investigator.

Above figure shows the no of proposals.

6. Conclusion and future enhancement:

This paper is for Sciences and Engineering Research Board India. The system is highly reliable till now. Spring and Hibernate architecture is an effective lightweight J2EE application solution. RSA and digital signature gives the security to which was missing in any journals. In future we can provide more security with SSL.

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References


