Network Design Patterns

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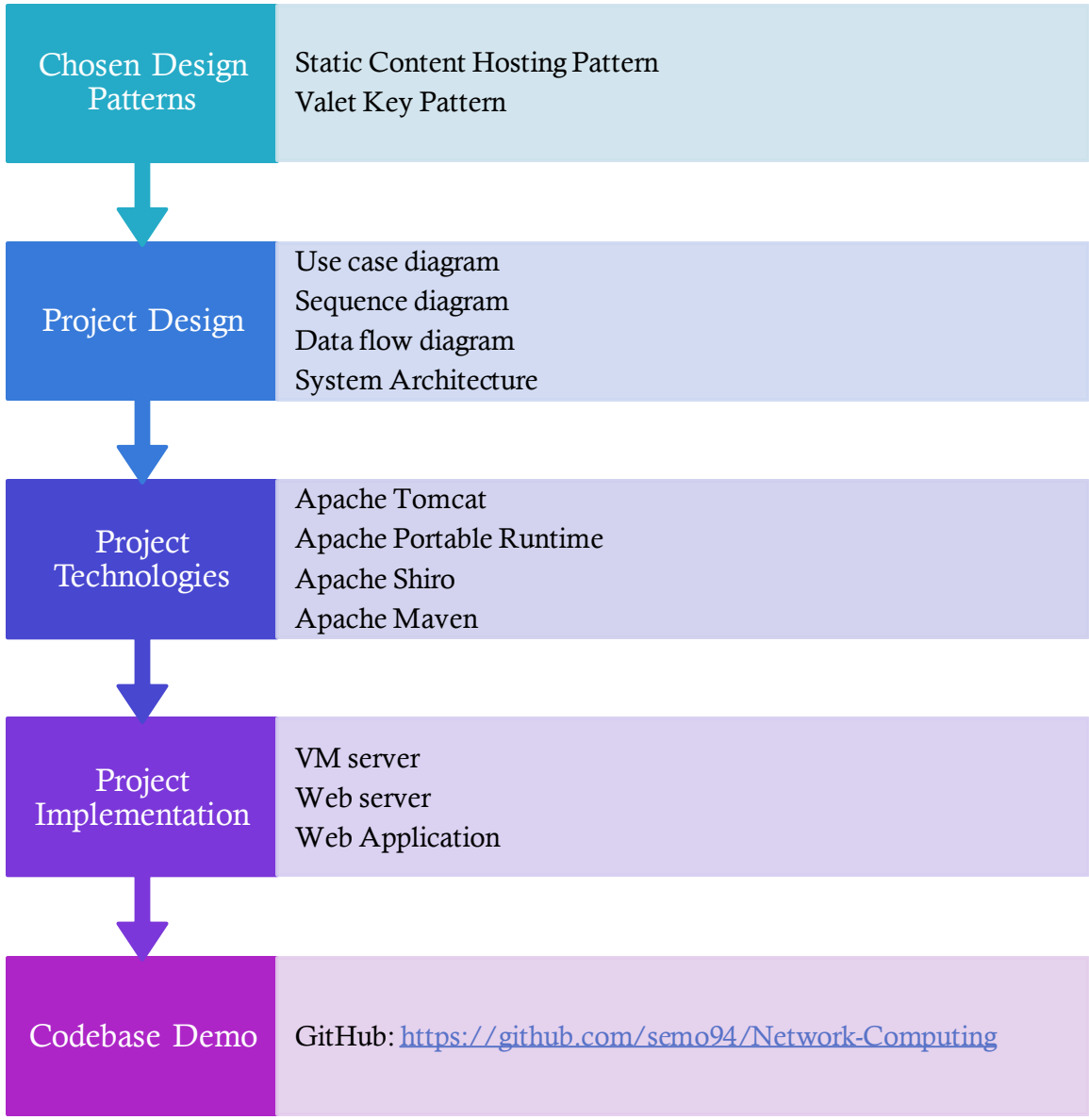
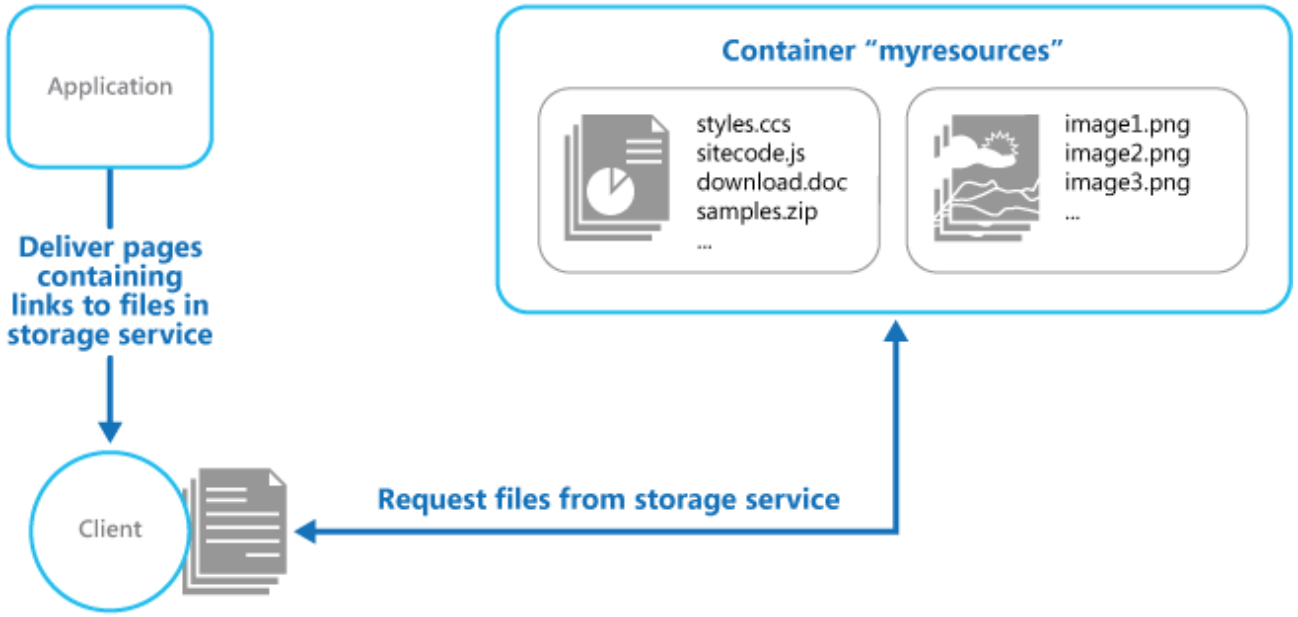
Presentation Outline



Static Content Hosting Pattern

Problem: Web applications contains static resources. Performance?

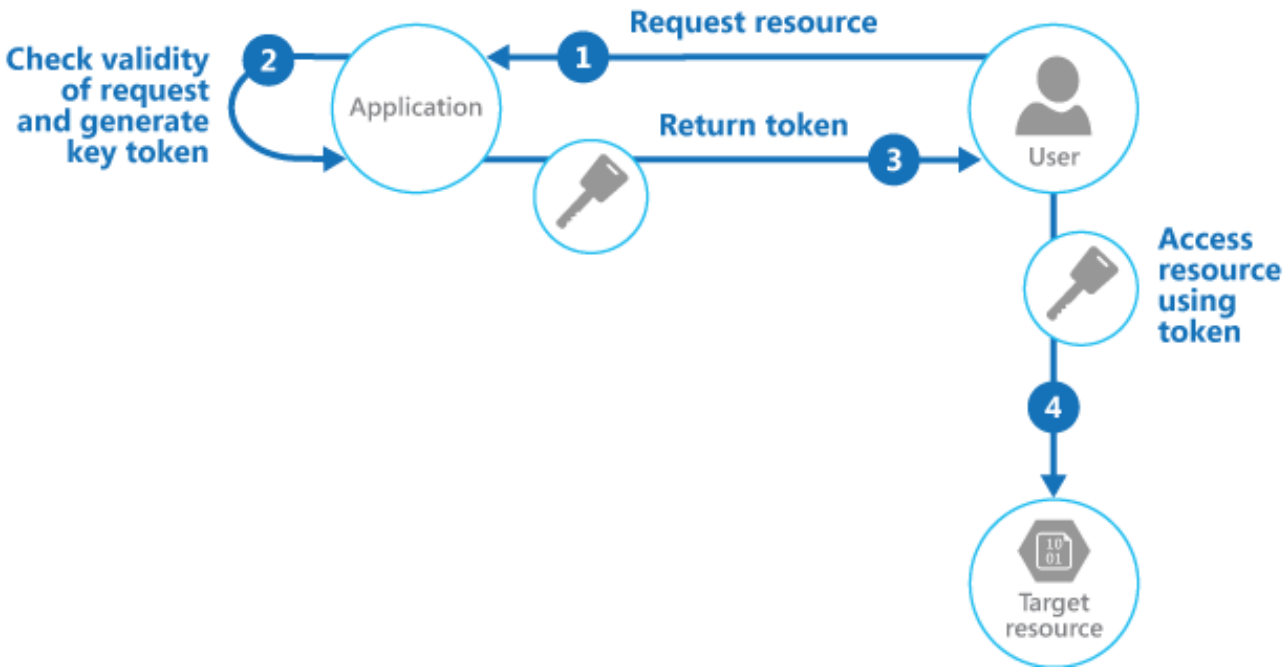
Solution: Storage service!



Valet Key Pattern

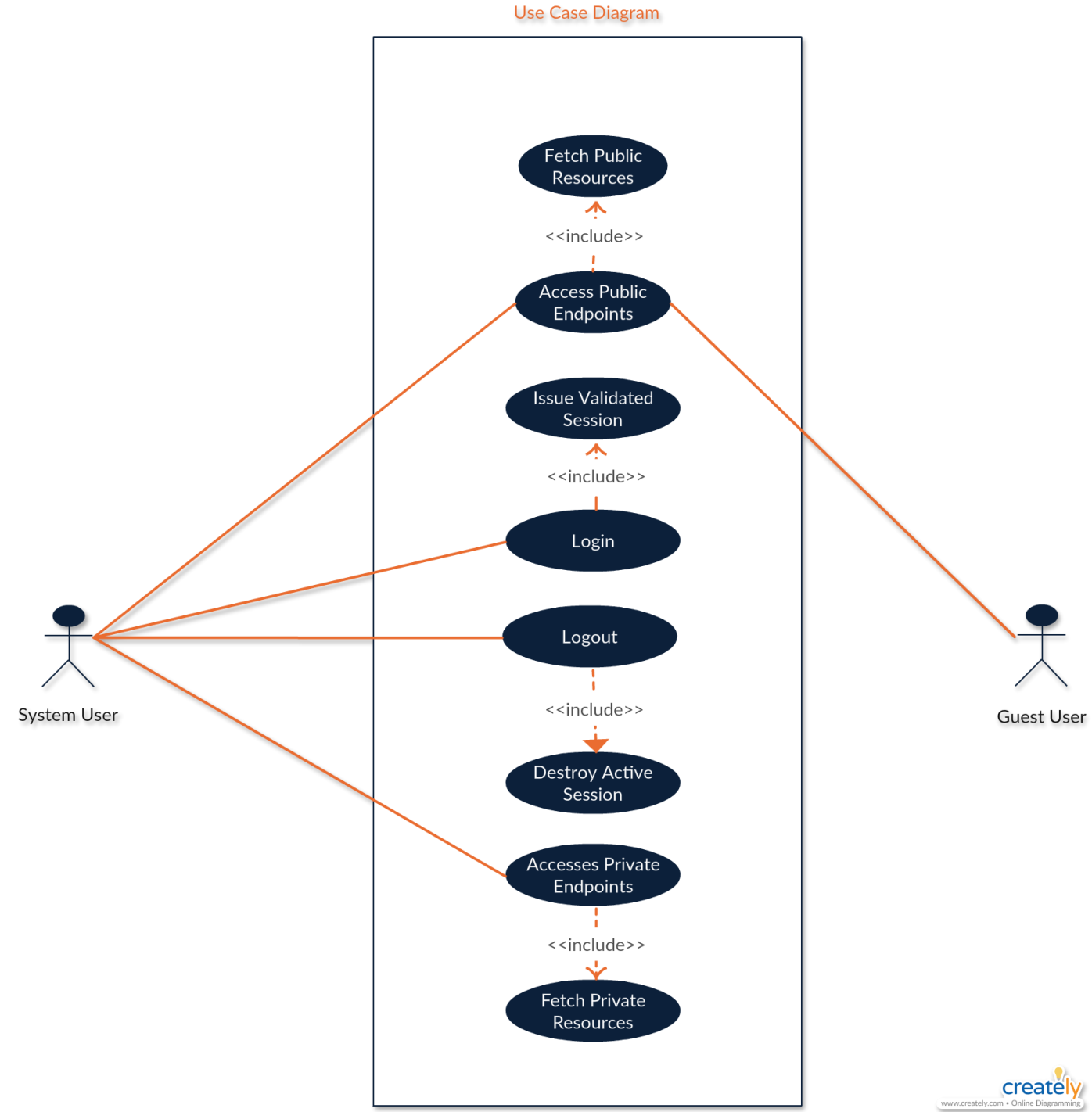
Problem: Security?

Solution: Sessions/Tokens



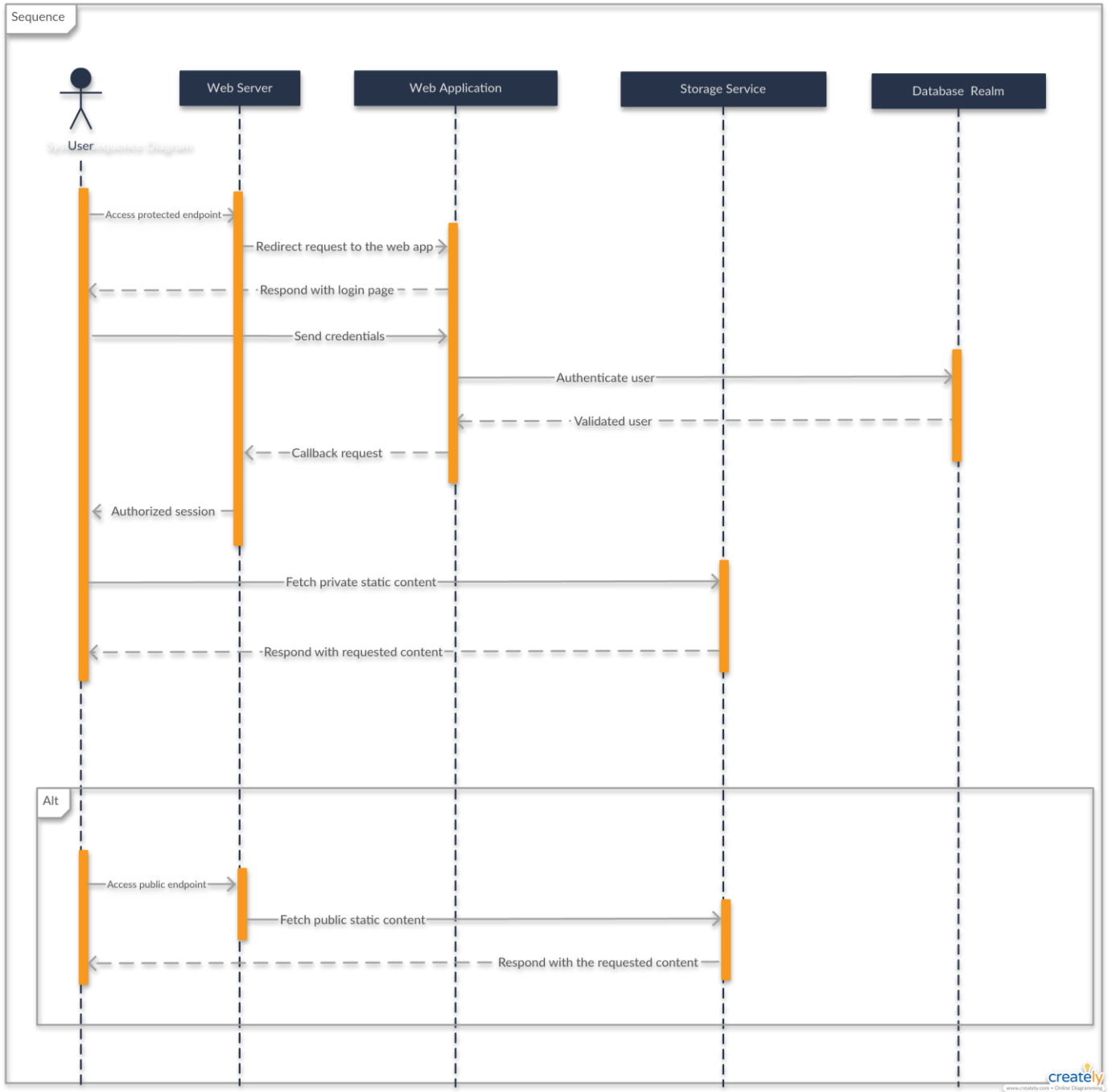
System Design

Use Case Diagram



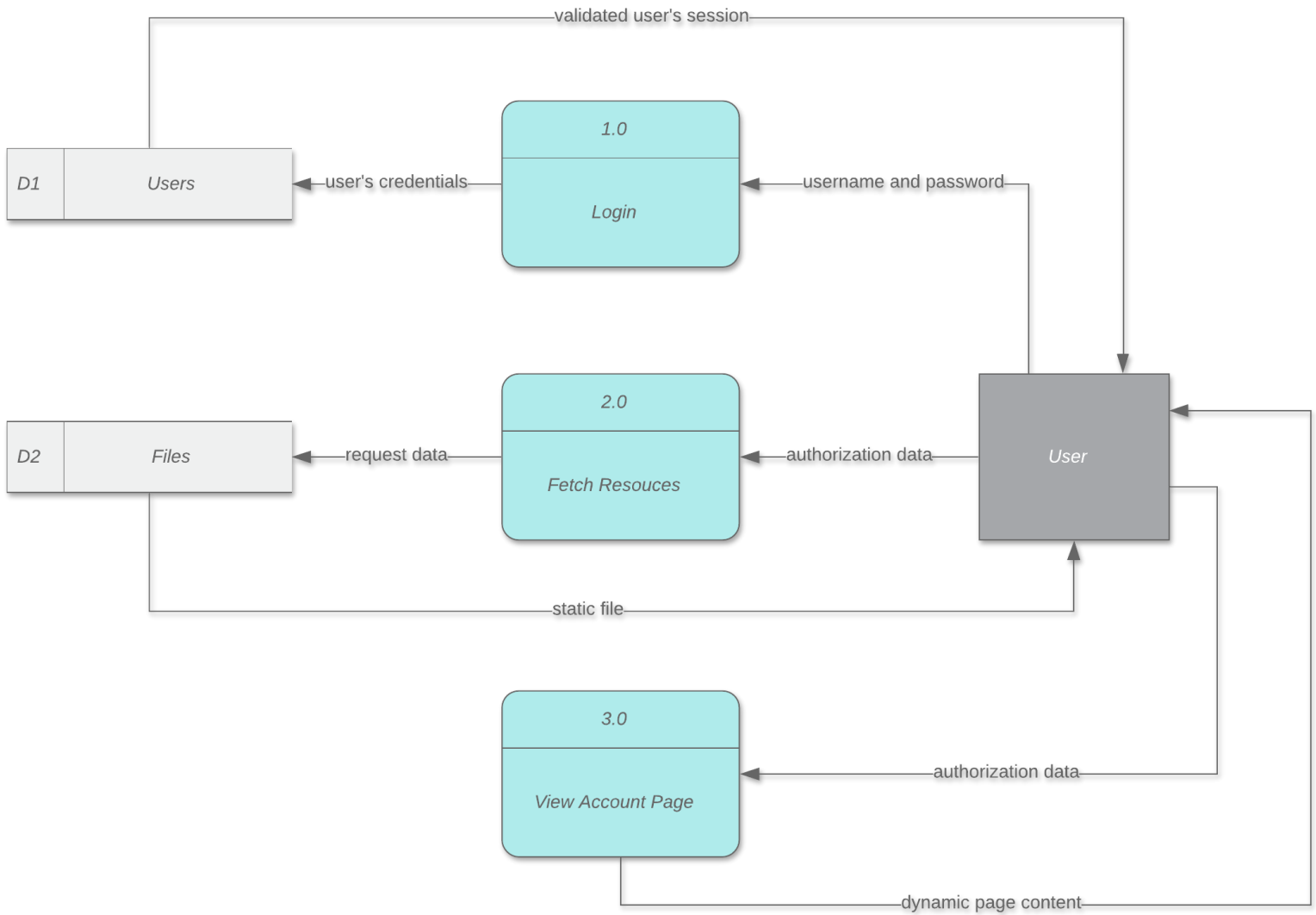
System Design

Sequence Diagram



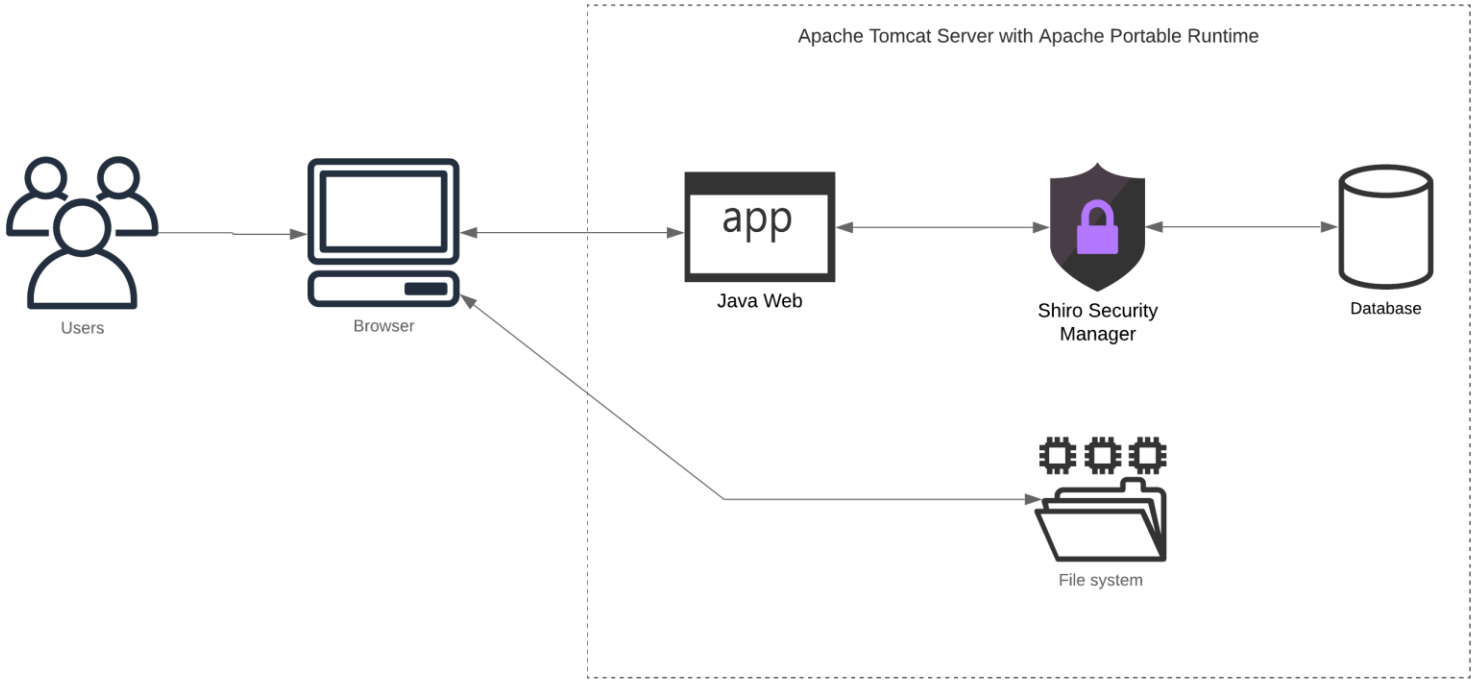
System Design

Data Flow Diagram



System Design

System Architecture



Project Technologies

- Web application: Java Web
- Application Server? **Apache** Tomcat
- Web Server? **Apache** Portable Runtime (APR)
- Security Framework: **Apache** Shiro
- Automation Tool: **Apache** Maven

Build Virtual Machine Server

Headless Ubuntu Server hosted on Oracle VirtualBox

Challenges?

1) Goal: mimic cloud hosted VMs.
How? Double NATting, Static IP
Result -> allow SSH from the host machine

2) Goal: a convenient way of data transferring
How? VirtualBox Additions
Result -> one shared folder between the guest (Ubuntu) and the host (MacOS)

Useful Resources:

- https://zachknox.com/mac/macos/2016/07/26/headless-ubuntu-vm.html
- https://www.virtualbox.org/manual/ch04.html

Build Web Server and Application Server

Old common Vs. New prefered impemetation:

HTTPD (reverse proxy) + Tomcat server Vs. Tomcat srver extended with Tomcat Native library and conttected with APR

Tomcat Native Library: optional component for use with Apache Tomcat
that allows Tomcat to use certain native resources for performance and compatibility. Give

APR: Tomcat can use the Apache Portable Runtime to provide superior scalability, performance, and better integration with native server technologies.

Web and Application Servers CONT...

Challenges?

1) APR and Native libraries are sort of complicated to install and configure.

Why? Many versions have different ways to configure. **Good luck** finding the right answer on Stackoverflow :)

2) Allow tomcat to use ports 80 and 443 instead of 8080 and 8443

Why? Linux user privilages. Solution: **authbind**

3) Configure SSL/TLS

Why? Local development environment. Solution: **self assigned certificate**

Useful Resources:

- https://tomcat.apache.org/tomcat-9.0-doc/apr.html
- http://tomcat.apache.org/native-doc/
- http://shiro-user.582556.n2.nabble.com/How-to-configure-static-Resource-on-WebServer-for-Authentication-amp-Authorization-td6850961.html
- https://serverfault.com/questions/889122/how-to-get-tomcat-9-to-work-with-authbind-to-bind-to-port-80
- https://yimingsun.wordpress.com/2012/03/12/step-by-step-instructions-on-self-signed-certificate-and-tomcat-over-ssl/

Write Application code

JavaServer Pages (JSP)

Dynamiclly generates web pages

It's high-level abstraction of Java servlets. JSPs are translated into servlets at runtime, therefore JSP is a Servlet!

Apache Shiro framework

Three ways to integrate Shiro with java web:

1) Programmatic (vanilla)

2) Annotation based (papular with Spring)

3) JSP TagLib/JSP Standard Tag Library (JSTL)

Maven Automation tool

Compile the source code -> perform unit tests -> build WAR file -> automatically deploy WAR file

Useful Resources:

https://dzone.com/articles/make-tomcat-part-your-maven

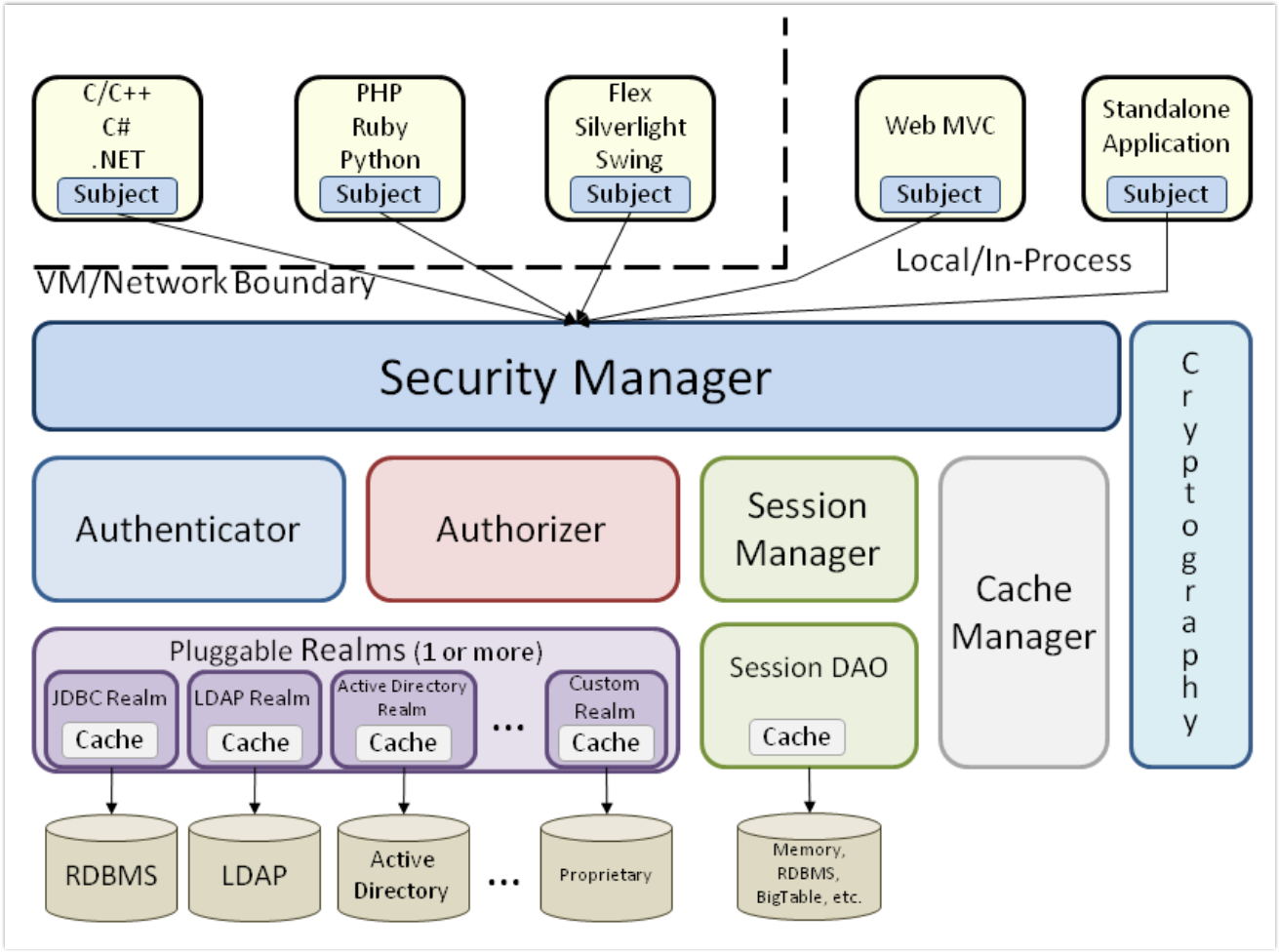
Shiro Architecture

Useful Resources:

https://shiro.apache.org/authentication.html

https://shiro.apache.org/authorization.html

https://shiro.apache.org/architecture.html



Codebase Demonstration

Project's repository on GitHub:

https://github.com/semo94/Network-Computing