GO ABER - FITNESS TRACKING APPLICATION

SEM5640 - Developing Advanced Internet-Based Applications

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INTRODUCTION

Project: Develop an application that acquires activity data from 3rd party sources and keep users engaged through challenges and progress updates

Two systems produced: One Java EE, One .NET

OVERVIEW

- Project Status
- Methodology
- Design
- Implementation & Issues
- Live Demo
- Evaluation & Conclusions

Project Status

PROJECT STATUS

- Majority of requirements completed, with a small number of exceptions
  - Fitbit connectivity in JavaEE
  - Email sending from application
- Application tests
  - User testing – Interoperability notable
  - Mocks and unit tests
  - Cucumber

Design

DESIGN

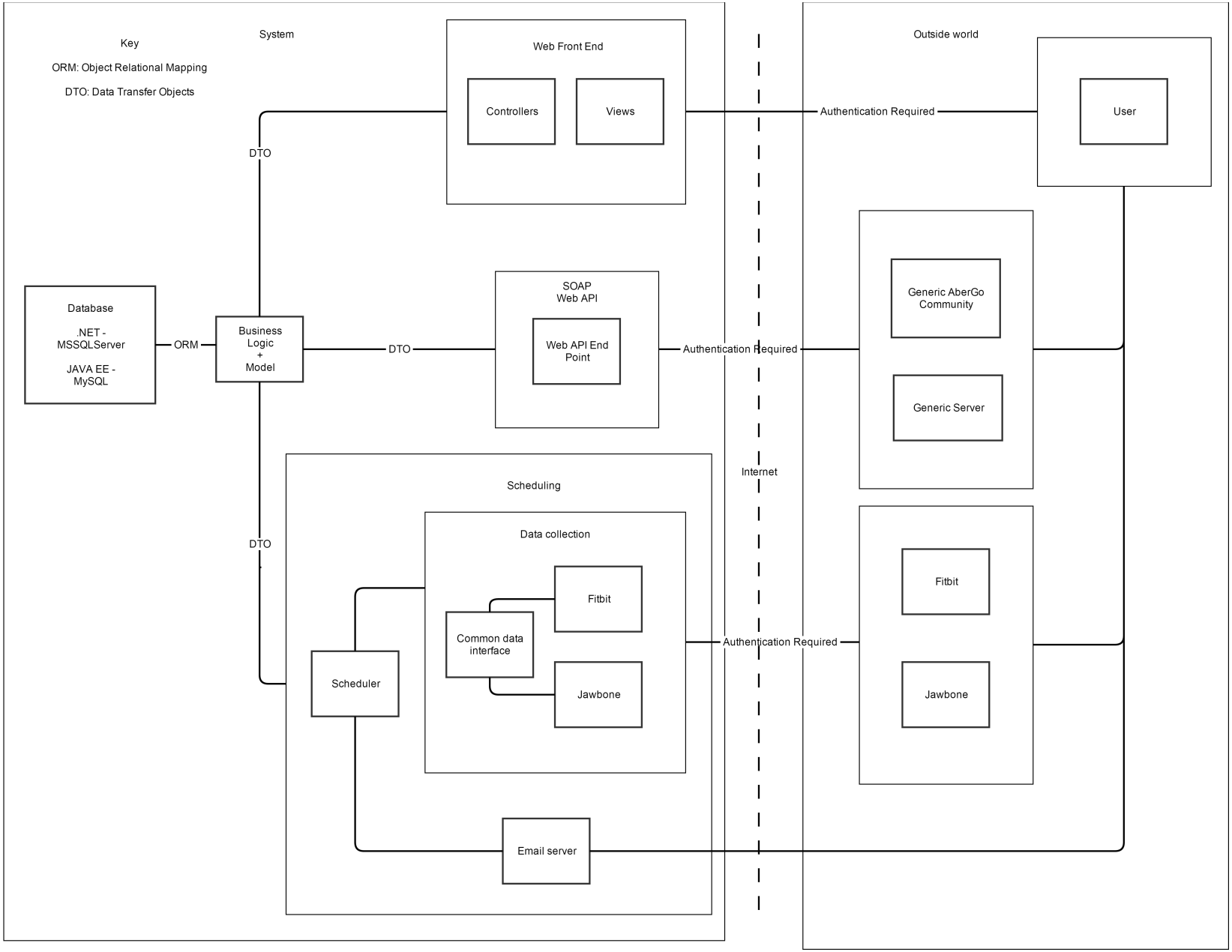
From requirements analysis we a couple of areas where we felt needed to be discussed in more depth.

- Conceptual system architecture
- Entity relationship diagram

DESIGN - ARCHITECTURE

Key points:

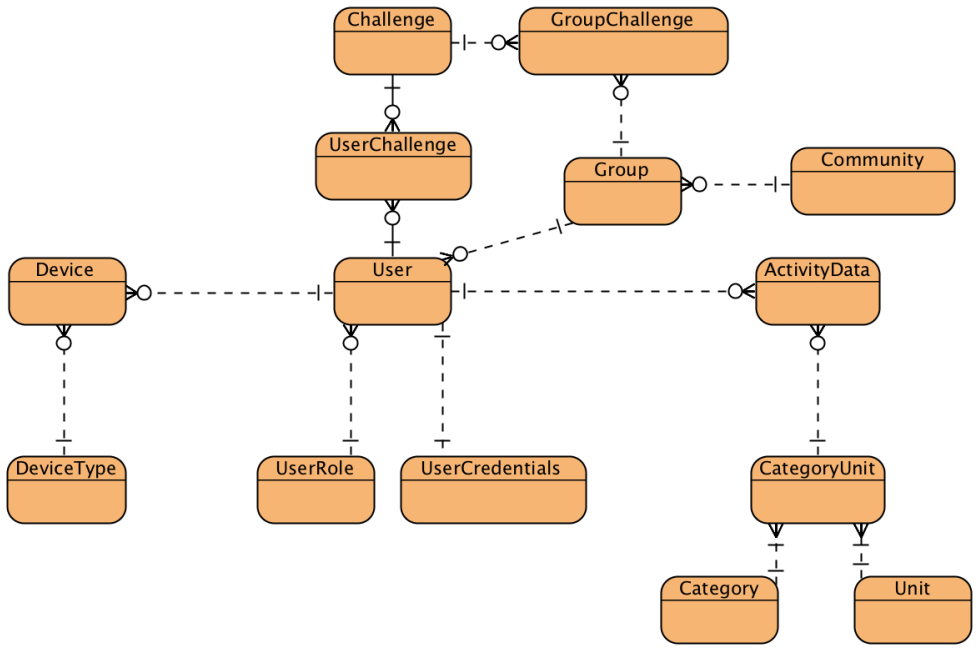
- Our first thoughts on a very high level conceptual overview of the system.
- Should be essentially the same for both. Technology specific decisions left to developer.
- Three distinct client facing parts.
- Business logic deliberately left vague.


Key
ORM: Object Relational Mapping
DTO: Data Transfer Objects
System
Web Front End
Controllers
Views
DTO
Outside world
Authentication Required
User
Database
.NET -
MSSQLServer
JAVA EE -
MySQL
ORM
Business
Logic
+
Model
DTO
SOAP
Web API
Web API End
Point
Authentication Required
Generic AberGo
Community
Generic Server
Internet
Scheduling
DTO
Data collection
Fitbit
Common data
interface
Jawbone
Scheduler
Authentication Required
Fitbit
Jawbone
Email server

DESIGN - ERD

Key Points:

- Artefact from our first discussion a bout the database model
- Activity data:
  One table for all types, one row per entry
- User
  can only have one row
- Our data model very closely mimicked this.



Project Management

PROJECT CHARACTERISTICS

1. **Team Resources**
   - All members expected to hold development responsibilities.
   - Delegation of tasks manageable at the scale of an *individual developer*.
   - Multiple allocation of roles required (between technical and organisational aspects).
2. **Technical Complexity**
   - Lack of prior team knowledge and experience in primary technologies (ASP.NET & JavaEE).
   - Expectation to face technical challenges and need for design review.
   - Required flexibility with respect to work (re-)scheduling and design changes.
   - Too much up-front design likely to be in vain.
   - Deployment of enhanced individual developer skill-sets to appropriate technical areas.
3. **Project Budget**
   - Time represented the primary budget constraint for the project.
   - Prioritisation of work to be crucial given expected technical complexity.
   - No particular expectation for customer-led requirements changes, but important to provide some buffer for this.

DEVELOPMENT METHODOLOGY

SCRUM selected as the primary development methodology.

Iterative approach to development deemed most appropriate given team's lack of prior experience.

- Provided *regular* opportunities to re-evaluate work priorities, and to discuss technical issues as a team.
- Flexibility to re-visit the design in light of technical constraints or new-found developer knowledge/research.

Up-front planning of work allowed for clear visibility in terms of task ownership and bug management.

SCRUM does not enforce a fixed set of development practices. *This allowed for flexibility with respect to testing, design & refactoring*.

DEVELOPMENT APPROACH

Work Planning

- 6-day Sprint cycles (12-day for first sprint).
- Weekly **sprint retrospective** and **sprint planning** meetings. - In collaboration with project manager (Nigel)
- No daily-stand up meeting (*flexbility to do this!*)

Progress Monitoring

- Developers required to estimate remaining work for allocated tasks.
- Estimates collated into a **burn-down chart** for the current sprint.
- Team velocity provided general indication as to the overall performance with respect to accomplishing committed tasks.

Development

- Continuous integration.
- Use of *Git-flow* branching model.
- All individual development work undertaken in both JavaEE & ASP.NET.

Design

- Attempted to adopt an **evolutionary design** approach.
- Team had scope to address issues at a *design level*, rather than been forced to make “ad-hoc” changes/fixes at an implementation level.
- Weekly SCRUM meetings complemented this approach, providing regular opportunities to re-visit the design *all together as a team*.

Testing

- No “official” testing strategy was adopted, however aspects from both TDD and BDD were utilised (e.g. Acceptance testing and regular re-factoring).
- Two “levels” of testing:
  1. **Unit & Regression Testing** - Undertaken by component author. **Included the use of mocked test doubles.**
  2. **Acceptance Testing** - Undertaken either: manually as part of integration process; or automatically via Cucumber framework.

VISUAL STUDIO ONLINE

Suite of web-based tools designed to support development teams wishing to deliver software using an agile approach.

Free for teams with up to five developers.

Included a comprehensive range of facilities, including:

- Interactive Kanban-style work planning boards
- Automatic tracking and presentation of project metrics (inc. velocity, burn-down and cumulative flow)
- Integrated Git-based version control system
- Integrated build server & automated testing environment (Continuous Integration)

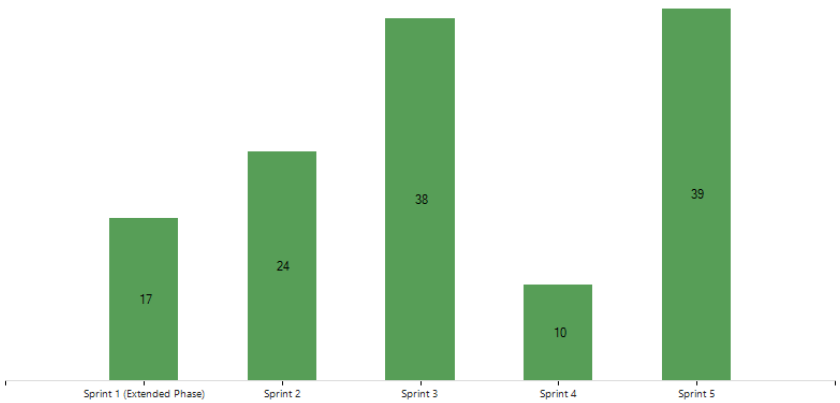


Figure 1: Team velocity performance over project duration.

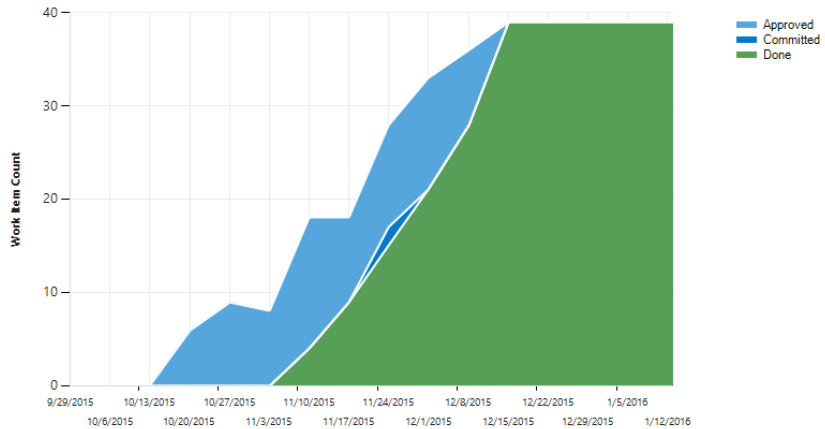


Figure 2: Cumulative flow of features over project duration.

Implementation

	JavaEE	ASP.NET
Authentication	JDBC Realm	Identity Framework
ORM	JPA (EclipseLink)	Entity Framework (Code First)
Scheduling	Managed Execution Schedular	Hangfire Library
UI	Primefaces Library	ASP.NET Razor

Table 1: Key technology choices between JavaEE & ASP.NET platforms.

Key Issues:

1. JavaEE Realms
   - Lack of clear vendor documentation.
   - Resorted to following tutorials created by previous affected developers.
   - Glassfish configuration (`asadmin` tool for scripting)
2. Change of RDBMS
   - Originally chose to use MySQL - common between both platforms.
   - Switched to using SQL Server for ASP.NET - default support by Identity Framework.
   - Caused unintended delays due to the need to revise the database structure.
3. Multi-tier Architecture
   - Application design could have been improved to better support a multi-tier architecture.
   - Significant proportion of business logic residing in controller classes or service classes organised in WAR.
   - Partial support for Service Layer pattern (via dedicated service classes).

Demonstration

EVALUATION

- Starting development
  - Key concerns and questions addressed
  - Setting up development machines was time consuming, including a database change
- During development and testing
  - Use of TFS was hugely useful during sprints
  - Tests were created, though more could have been done, and more efficiently
- Team collaborated successfully, and put in an even amount of effort from the requirements stage through to the documentation and demonstration stage of the project

CONCLUSIONS

- Produced two working applications
- Followed methodology & improved as we went along
- Major issues were time, testing, and lack of experience with technology.

Any Questions?

Slide Design: Matthias Vogelgesang - (Github)