Lab 1 – GameEye Product Description

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1. Introduction

An existing societal problem is that gamers lack a software solution that automatically tracks news updates on developing video games. In 2015, there were almost two billion gamers worldwide. This figure is steadily increasing, as it is expected to rise to over three billion gamers by 2023 (Gough, 2019b). Thousands of video games are released every year. The online gaming platform Steam released 9,050 games in 2018 (Gough, 2019a). Video games also often have long development timeframes, which makes staying updated on numerous games for a long period of time tedious. For example, the popular game *Team Fortress 2* was in development for nine years before it was released in 2007 (Dietz, 2011). This societal problem is caused by inadequate game development monitoring solutions, decentralized news sources, lackluster news verification, and independent game developers having difficulty maintaining public attention. The current solution is too time-consuming to resolve the problem. The current solution is finding news on social media such as Reddit or Twitter; or finding news on a search engine such as Google.

The superior solution to the problem is to automate the process of searching for game information through a downloadable application. The application has a user-friendly interface, multifaceted accessibility, and customizability. It is a platform where users search for and follow games that intrigue them. This simplifies the process of searching for video game news because instead of going to various websites, the user will be able to access this platform to find the news that they desire. Users have their own personal watchlists to keep track of followed games.

The solution to the problem is an application called GameEye. GameEye provides news notifications from multiple sources, a customizable notification system, self-organization, links to full sources, and a web application. GameEye monitors any game a user chooses to follow and will notify them when new content on a game they followed is released online. GameEye uses machine learning to classify news articles, videos, images, and updates. Machine learning also analyzes news articles, videos, images, and updates and assign a multi-factor score depending on their impact on a specific user.

2. GameEye Product Description

GameEye is a web application that connects video game fans with news notifications about video games in development. A user will set up their account to monitor specified games in order to receive news and information about the games that they follow. Hardware and software are used to implement GameEye's key product features and capabilities.

2.1 Key Product Features and Capabilities

GameEye offers key product features and capabilities such as prevalent characteristics, authentication, account management, game tracking, searching, web scraping, notifications, settings, and machine learning. Cross-platform support on desktop and mobile devices based on progressive web application (PWA) technologies, offline support, local caching, and connectivity interruption resiliency features are prevalent characterisitcs. Authentication includes secure user login and registration, external provider user login and registration with social media accounts, persistent sessions that do not require a user to login every time they open the app, two-factor authentication, which allows increased security, and password recovery mechanisms. Account management includes the ability for users to change their passwords, modify their profile information, and delete their accounts. Game tracking includes personal watchlists, which display thumbnails next to a game's title; new updates organized by important updates, news articles, images, and videos with thumbnails for news articles; and a list of the most-watched games by users. Searching includes the ability to search for video games based on their titles and support for autocompletion of a search query. Images, videos from official game YouTube channels, and information from news articles from video game news websites are retrieved using web scraping. Users receive cross-platform push notifications for new game updates with a user interface (UI) count of notifications for each game and resource category and suggested video game notifications based on their most-watched games list. Users have the choice of seeing archived resources, seeing impact scores for news articles, receiving notifications and being able to choose which resource categories to be notified about, and submitting feedback. Game updates, assign impact scores for news articles, and extract important information for news articles are classified using machine learning.

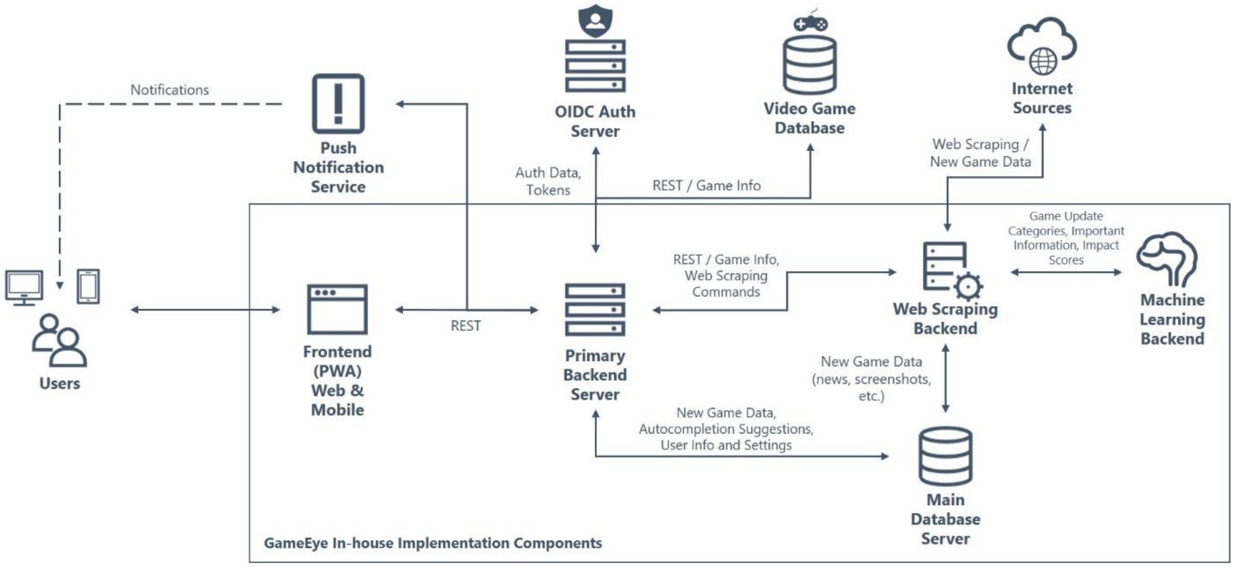
2.2 Major Components

Hardware and software make up GameEye's major components. Hardware consists of the frontend server, the main backend server, the web scraping backend server, the machine learning backend server, and the main database server. Software consists of frontend software, backing software, testing software, machine learning software, natural language processing software, databases, and third party software. WebStorm Integrated Development Environment (IDE) is a frontend software application that facilitates application development. IntelliJ Idea IDE is a backend software IDE developed by JetBrains that allows developers to write Java applications. JUnit Java Framework is a testing framework for Java. Python is an interpreted, high-level, general-purpose machine learning programming language. spaCy library is an open-source library for advance natural language processing. MongoDB is a cross-platform document-oriented database program. Firebase Authentication is third party software that provides backend services and ready-made UI libraries to authenticate users to an app. Figure 1

GameEye's RWP Major Functional Component Diagram (MFCD) lists how GameEye obtains and distributes the information that it receives as a real-world product (RWP).

Figure 1

GameEye's RWP Major Functional Component Diagram


Notifications
Push Notification Service
OIDC Auth Server
Video Game Database
Internet Sources
Auth Data, Tokens
REST / Game Info
Web Scraping / New Game Data
Game Update Categories, Important Information, Impact Scores
REST / Game Info, Web Scraping Commands
Users
Frontend (PWA) Web & Mobile
REST
Primary Backend Server
Web Scraping Backend
Machine Learning Backend
New Game Data (news, screenshots, etc.)
New Game Data, Autocompletion Suggestions, User Info and Settings
Main Database Server
GameEye In-house Implementation Components

3. Identification of Case Study

GameEye is initially provided to members of the ODU Esports Club and other local users before its widespread release for gamers. The ODU Esports Club has over 100 members and they will use the app by testing its features and give a review stating whether or not they like GameEye and if it needs to be improved. The ODU Gaming Club has been selected as the case study due to their close association with ODU. Other organizations such as employees of game review sites can use GameEye in the future. People that want to become gamers in the future may be interested in the app. GameEye can grow in future use by having gamers use it and telling their gamer friends and family members about it.

4. GameEye Product Prototype Description

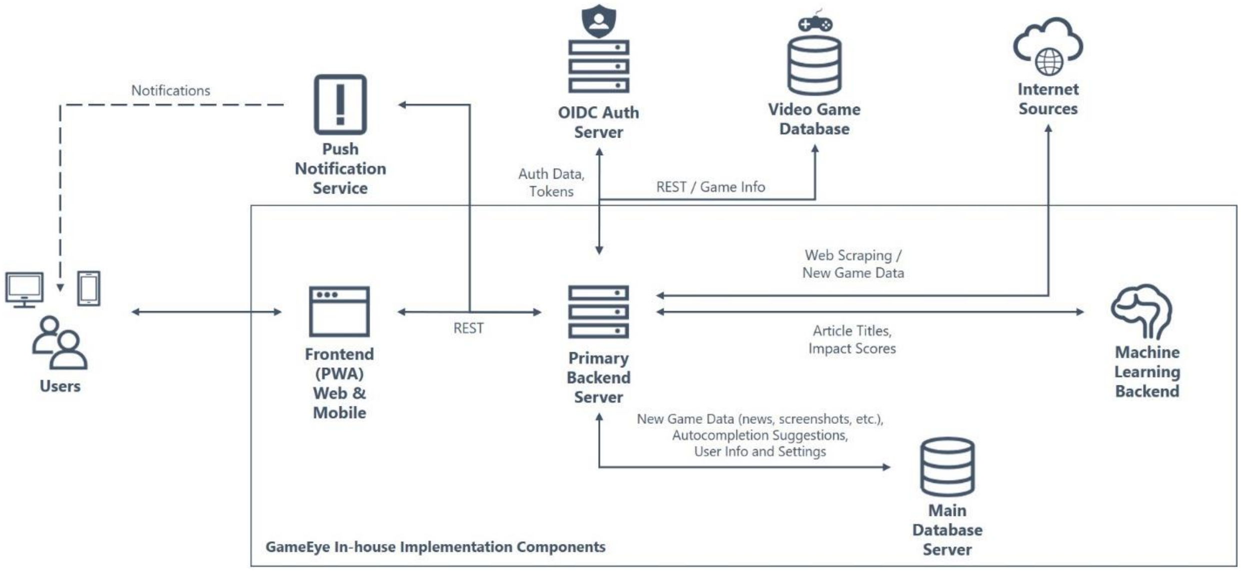
The goal of GameEye's prototype is to provide enough functionality to be able to show off what GameEye is capable of. GameEye includes general features, authentication, account management, searching, game tracking, settings, machine learning, and notifications.

4.1 Prototype Features and Capabilities

The features and capabilities of GameEye's prototype include robust user authentication and external provider authentication support, account management features for users to change their passwords and modify their profile information, game searching with autocompletion, personal game watchlists, web scraping for news articles, redirection to sources upon clicking scraped resources, and a most-watched games list. Other features include settings for toggling the visibility of archived resources, impact scores, and notifications; classification of news articles using machine learning; scoring the impact of news articles using machine learning; and cross-platform push notifications for new game updates and UI count of notifications. The features that demonstrate GameEye's success are scraping data from multiple online sources and for multiple different resource categories such as news articles; offering robust authentication mechanism for users; game searching and fast autocompletion; a personal watchclist; a list where users can see the most watched games on the platform; cross-platform support and push notifications; customization capabilities; a variety of settings regarding content and notifications; and using machine learning to classify news articles and their impact scores. Risk mitigation involves scraping Really Simple Syndication (RSS) Feeds to protect against source website structure changes which would cause web scraping to fail; storing video game database content on GameEye's database for redundancy in case IGDB goes down; making platforms scalable; using load balancers; and multiple instances of servers and databases to protect against high load. Risk mitigation also involves caching content of user devices so that the application does not appear blank in case the main database fails and having more instances of the main database for redundancy; using database encryption and a third party authentication provider to safeguard identifiable information; providing a manual to help users understand the application; and using proper coding practices to prevent NoSQL injection, XSS, data exposure, broken authentication, and access controls. Figure 2 GameEye's Prototype Major Functional Component Diagram (MFCD) lists GameEye's features and capabilities as a prototype.

Figure 2

GameEye's Prototype Major Functional Component Diagram

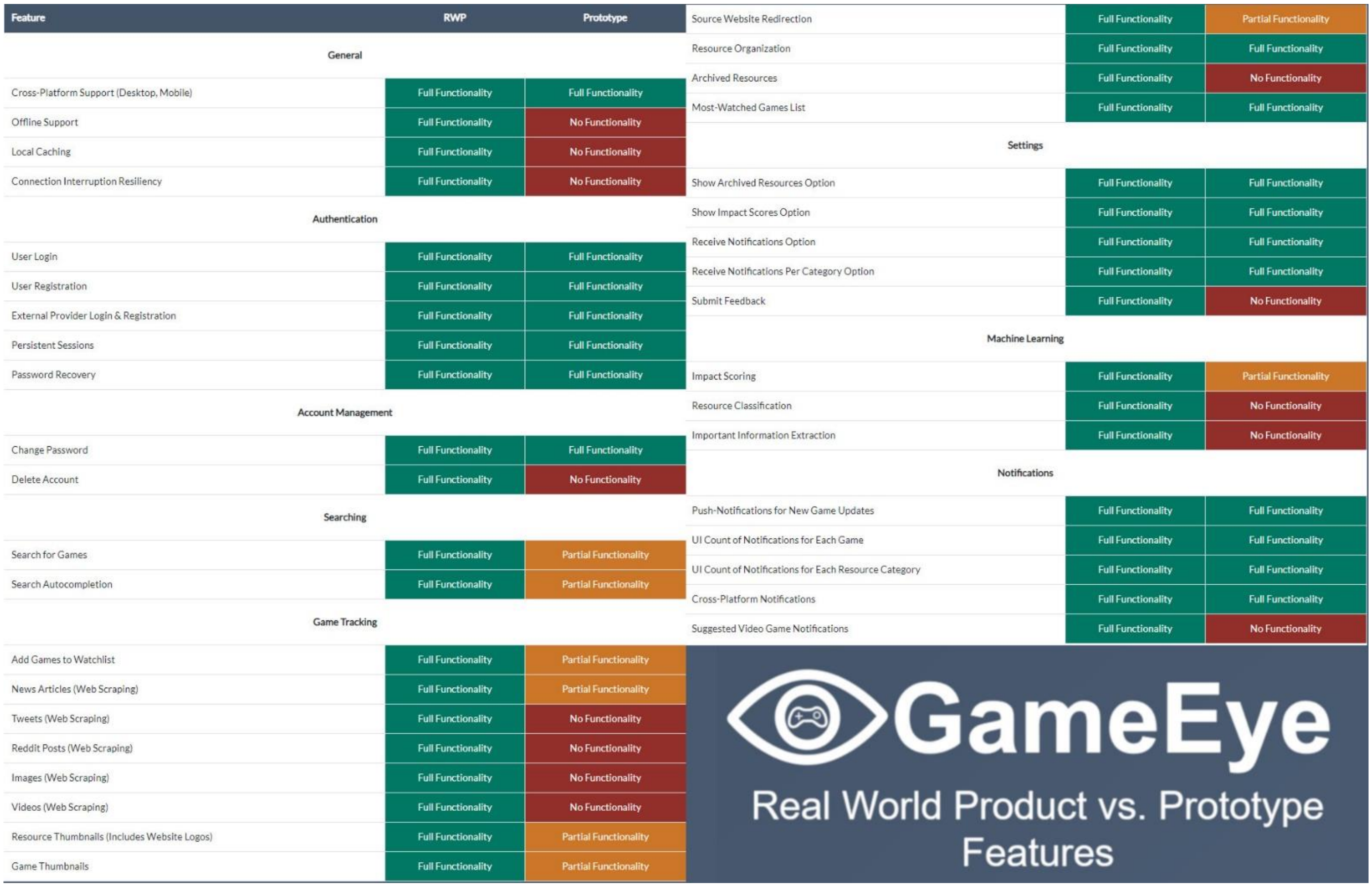

Notifications
Push Notification Service
OIDC Auth Server
Video Game Database
Internet Sources
Auth Data, Tokens
REST / Game Info
Web Scraping / New Game Data
Users
Frontend (PWA) Web & Mobile
REST
Primary Backend Server
Article Titles, Impact Scores
Machine Learning Backend
New Game Data (news, screenshots, etc.), Autocompletion Suggestions, User Info and Settings
Main Database Server
GameEye In-house Implementation Components

4.2 Prototype Architecture

The prototype utilizes the same architecture as the real-world product for the replicated servers for load balancing that would be present in the real-world product. The prototype has many of the same features that the real-world product has. However, the prototype does not carry functionality for offline support; local caching; connection interruption resiliency; deleting accounts; web scraping for images, videos, Tweets, and Reddit posts; archived resources; submitting feedback; resource classification; important information extraction; and suggested video game notifications. The prototype includes the following features with partial functionality: searching for games, search autocompletion, adding games to a watchlist, web scraping for news articles, resource thumbnails including website logos, game thumbnails, source website redirection, and impact scoring. Table 1 lists GameEye's features in a prototype state and as a real-world product.

Table 1

RWP vs Prototype Features



Feature	RWP	Prototype
General		
Cross-Platform Support (Desktop, Mobile)	Full Functionality	Full Functionality
Offline Support	Full Functionality	No Functionality
Local Caching	Full Functionality	No Functionality
Connection Interruption Resiliency	Full Functionality	No Functionality
Authentication		
User Login	Full Functionality	Full Functionality
User Registration	Full Functionality	Full Functionality
External Provider Login & Registration	Full Functionality	Full Functionality
Persistent Sessions	Full Functionality	Full Functionality
Password Recovery	Full Functionality	Full Functionality
Account Management		
Change Password	Full Functionality	Full Functionality
Delete Account	Full Functionality	No Functionality
Searching		
Search for Games	Full Functionality	Partial Functionality
Search Autocompletion	Full Functionality	Partial Functionality
Game Tracking		
Add Games to Watchlist	Full Functionality	Partial Functionality
News Articles (Web Scraping)	Full Functionality	Partial Functionality
Tweets (Web Scraping)	Full Functionality	No Functionality
Reddit Posts (Web Scraping)	Full Functionality	No Functionality
Images (Web Scraping)	Full Functionality	No Functionality
Videos (Web Scraping)	Full Functionality	No Functionality
Resource Thumbnails (Includes Website Logos)	Full Functionality	Partial Functionality
Game Thumbnails	Full Functionality	Partial Functionality
Source Website Redirection	Full Functionality	Partial Functionality
Resource Organization	Full Functionality	Full Functionality
Archived Resources	Full Functionality	No Functionality
Most-Watched Games List	Full Functionality	Full Functionality
Settings		
Show Archived Resources Option	Full Functionality	Full Functionality
Show Impact Scores Option	Full Functionality	Full Functionality
Receive Notifications Option	Full Functionality	Full Functionality
Receive Notifications Per Category Option	Full Functionality	Full Functionality
Submit Feedback	Full Functionality	No Functionality
Machine Learning		
Impact Scoring	Full Functionality	Partial Functionality
Resource Classification	Full Functionality	No Functionality
Important Information Extraction	Full Functionality	No Functionality
Notifications		
Push-Notifications for New Game Updates	Full Functionality	Full Functionality
UI Count of Notifications for Each Game	Full Functionality	Full Functionality
UI Count of Notifications for Each Resource Category	Full Functionality	Full Functionality
Cross-Platform Notifications	Full Functionality	Full Functionality
Suggested Video Game Notifications	Full Functionality	No Functionality

GameEye

Real World Product vs. Prototype Features

4.3 Prototype Development Challenges

The challenges in developing the prototype include learning new technology and frameworks required for implementation, collecting and labeling data for machine learning models, properly securing communication between the multiple backends, implementing robust caching of frontend content for connectivity interruption resiliency and performance, and implementing robust web scraping with future-proof mechanisms in case source websites change.

5. Glossary

Angular Framework: Platform for building mobile and desktop applications.

API: Application Programming Interface; a set of functions and procedures allowing creation of applications that access the features or data of an operating system, application, or other services.

AWS: Amazon® Web Services; Amazon® subsidiary that provides on-demand cloud computing platforms and APIs.

CSS: Cascading Style Sheets; used to stylize webpages.

Guest: Initial role for users who have not created an account on GameEye.

Hitlist: List of highly watched video games by users.

HTML: Hypertext Markup Language; used as markup for documents meant to be displayed in a web browser.

IDE: Integrated development environment; application that facilitates application development.

IGDB: Internet Game Database; database of known video games; accessed by REST API to populate GameEye's database.

Impact Score: A score from 1-3 on the impact some news has on a game and its players; it is computed using machine learning.

Indie Games: Games developed by individuals or smaller teams of people without the financial support of larger game publishers.

IntelliJ Idea: IDE developed by JetBrains to write Java applications and will be used in the back-end development of GameEye.

JavaScript: Object-oriented language used to create dynamic, interactive effects on webpages.

Jest JavaScript Framework: Testing framework maintained by Facebook Inc.

JSoup Library: Java library for working with real-world HTML; extracting and manipulating data.

JUnit Java Framework: A testing framework for Java.

Keras (Python Deep Learning Library): Open-source neural-network library written in Python.

MongoDB: A cross-platform document-oriented database program.

Noise Filtering: Shown data catered to an individual's content preferences.

OIDC Authentication: Authentication protocol based on the OAuth 2.0 family of specifications.

PWA: Progressive Web Application; a type of application software delivered through the web which is built using common web technologies including HTML, CSS, and JavaScript.

Python: Interpreted, high-level, general-purpose programming language.

REST: Representational State Transfer; a software architectural style used in creating web services.

RSS Feed: Really simple syndication; **w**eb feed that allows users and applications to access updates to websites in a standardized, computer-readable format.

Scikit-learn Library: Software machine learning library for the Python programming language.

SpaCy Library: An open-source software library for advanced natural language processing.

Spring Framework: Application framework and inversion of control container for the Java platform.

Tester: GameEye beta testers; users of the application in its prototype phase who will provide feedback on their experience.

Web Scraping: Data scraping for extracting data from websites.

WebStorm: IDE developed by JetBrains to write JavaScript code.

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