

# System Architecture Document

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Title of Project

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# **1 Introduction**

This introduction provides a brief overview of System Architecture Document for the current iteration of the Post Graduate Application Approval System. It consists of the purpose, scope, problem statement, project objectives, stakeholders and overview of the rest of the document.

## **1.1 Purpose**

This document provides the reader with an architectural overview of the Post Graduate Application Approval System. The primary purpose of this project is to create a single integrated system that facilitates application review and decision making.

This document is intended to elucidate the major architectural decisions that have been made when designing and implementing the system. This is achieved by viewing the system architecture from various perspectives, called views. These views are intended to explain the system architecture through all levels of the development stack, from front-end to back-end.

## **1.2 Scope**

The scope of this document is the design and implementation of the software based Post Graduate Application Approval System which consists of the application upload by the Post Graduate Officer, the intermediary application review by the Supervisor and the final application review made by the Post Graduate Coordinator.

## **1.3 Problem Statement**

Currently, the School of EIE uses a paper based method for the approval of post graduate applications. The primary reasons for this, is as a result of academics not being trained on the SIMS system and paper trail to be kept for transparency purposes. This paper based system involves manual filling and can result in misplacement of documentation. Supervisors are contacted to review applications when the PGO physically sees them or sends an email. The turnaround time of approval of a PG application, the physical space manual filing takes up and the risk for misplacement of documents are all issues with the current process. In order to alleviate these issues a web based system will be used as a central repository for all applications to the School of EIE and manage the process of approval within the school.

## **1.4 Project Objectives**

## **1.5 Stakeholders**

The following lists the stakeholders in the development of this system.

### **School of Electrical and Information Engineering**

- Mrs. Mumtaz Adam: The post graduate officer (PGO).
- Professor Ling Cheng: The post graduate coordinator (PGC).
- Supervisors: Various academics within the school who shall supervise applicants.
- The Applicant.

### **Development Team**

- Professor Ekow Otoo: The product owner.

## **1.6 Overview**

describe the structure and content of rest of report

# **2 Architectural Goals and Constraints**

The architecture of the system has been designed to achieve the following objectives:

1. To assist the application approval process by having all application documents and information in a single digital repository.
2. To assist the Post Graduate Officer with the upload of application documents.
3. To simplify application reviews by having a single integrated view of all important information for each decision maker.
4. To prevent human error by providing notifications and weekly reminders about pending applications.

The significant constraints kept in mind when developing the system were as follows:

1. Security
2. Ease of Use
3. Paperless

## **3 Architectural Representation**

### **3.1 Architectural Views**

The development of the system has various contributors each with their own priorities and tasks. As such, the system needs to be documented from various perspectives to aid, and eventually validate, the completion of a contributor's tasks. The system architecture shall be represented from the following views:

1. Use Case View: This defines the high-level interactions between various actors and the system.
2. Design View: This contains the class and architecture diagrams of the system.
3. Process View: This displays the processes within the system that combine to perform the various interactions defined in the Use Case View.
4. Component View: This displays the User Interface of the system.
5. Database View: This contains the Entity-Relationship Diagram for the system database.

### **3.2 Architectural Design Patterns**

ASP.NET Core framework was used in the implementation of the system. This follows the Model-View-Controller(MVC) design pattern. This design pattern separates the project into three distinct layers:

1. Model: Defines the data structures of the system and directly handles all logic and data within the system. A model class communicates exclusively with its controller.
2. View: A visual representation of a model. Typically in the form of a web page or a component of the web page. The view communicates exclusively with its controller.

3. Controller: Accepts user input and maps it to instructions for models, views and potentially other controllers. Directly responsible for communication between components of the system.

This framework and design pattern was chosen to enhance modularity of the system. This allows for:

- Parallel development
- Efficient code reuse
- Faster bug detection and tracking.
- Greater unit testing coverage.

### **3.3 Architectural Process**

what process was used to design the system.

## **4 Architectural View Decomposition**

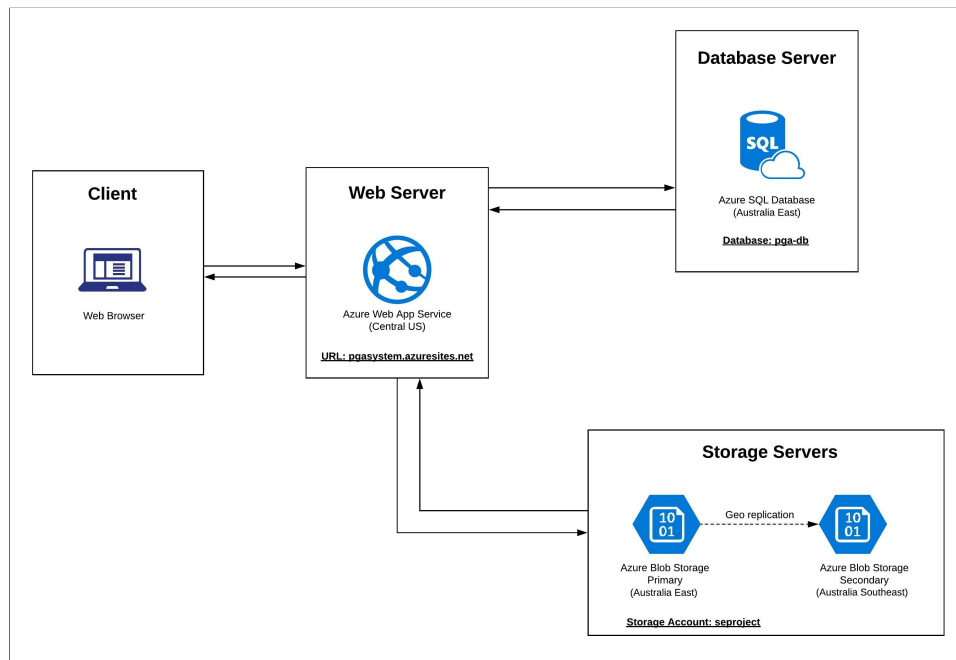
### **4.1 Use-Case View**

use case diagram plus short description of each use case.

#### **4.1.1 Architecturally Significant Use Cases**

describe in detail the use cases that use the most critical part of the system (possibly fully dressed use cases for this)

## 4.2 Design View

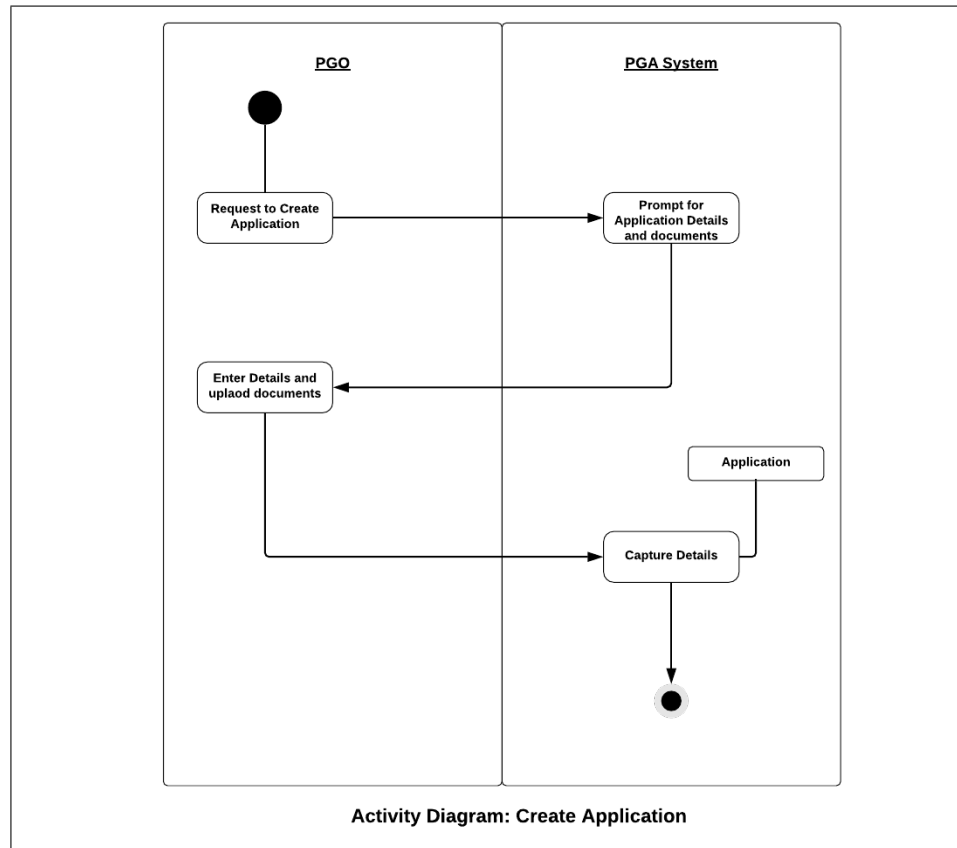


Hardware Architecture Diagram

architecture diagram, class view

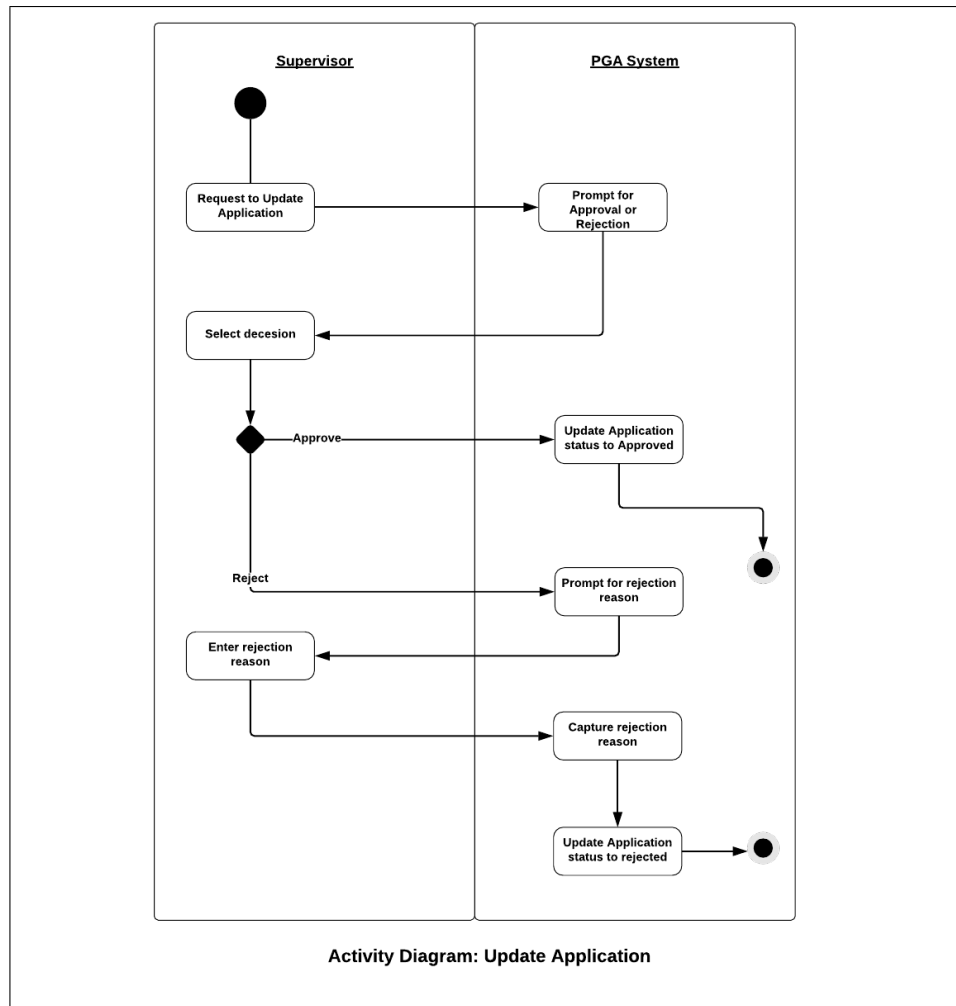
#### 4.2.1 Overview

#### 4.3 Process View



Activity Diagram for the Create Application Use Case



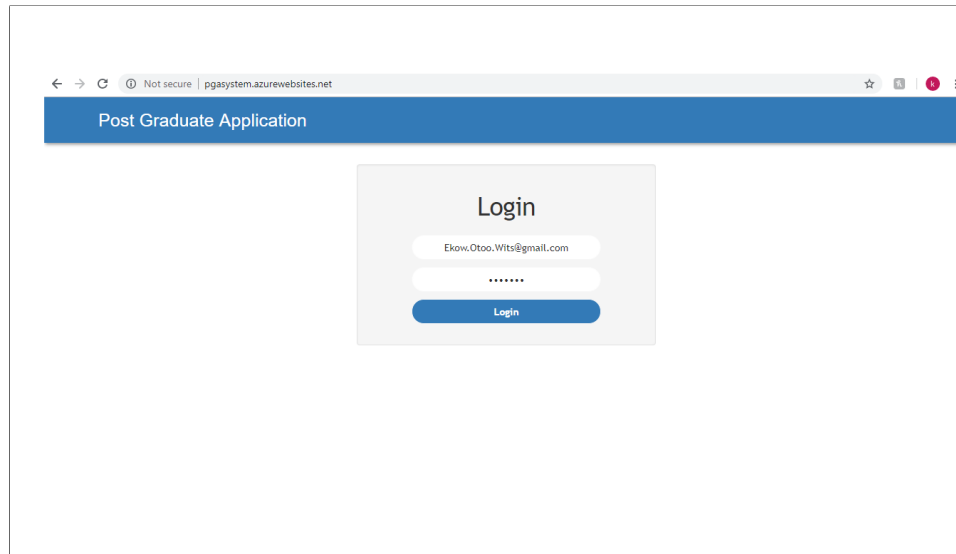


Activity Diagram for the Update Application Use Case

#### 4.4 Component View

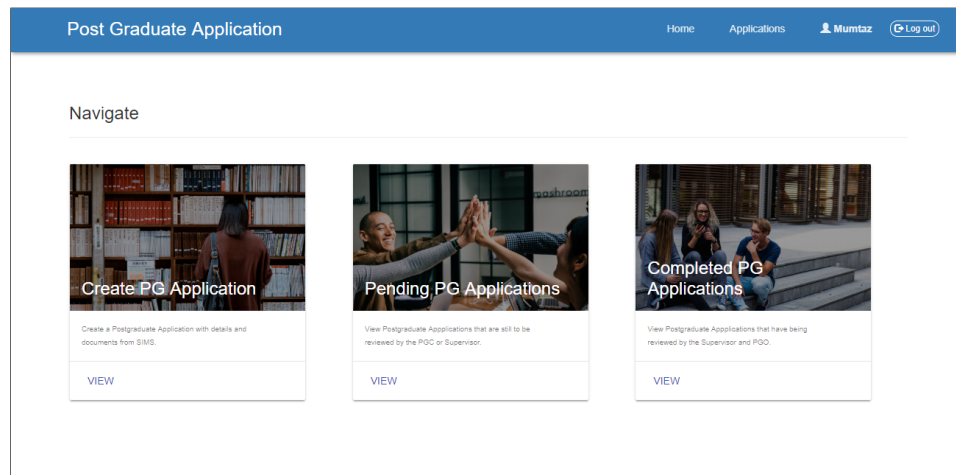
This section describes the User Interface for each user:

#### 4.4.1 Common User Screens



The Login Page

#### 4.4.2 Post Graduate Officer



The PGO Logs in and lands on this screen.

Post Graduate Application

HomeApplicationsMumtazLog out

Demographic Details

First Name:

Last Name

Select Supervisor:

Prof. Ekow Otoo

Select Programme:

Masters by Coursework

Application Files

Title

Curriculum Vitae

Choose File

No file chosen

Title

Previous Qualification

Choose File

No file chosen

Title

South African ID or Passport

Choose File

No file chosen

+ Create

The PGO lands here when they click Create Application.

Post Graduate Application

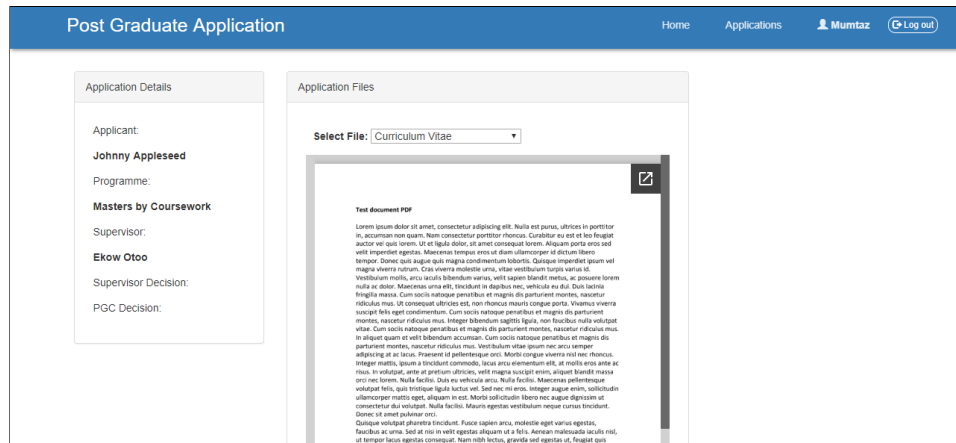
HomeApplicationsMumtazLog out

Applications in Approval Process

Application ID	Applicant	Programme	Status	Supervisor	Supervisor Decision	PGC Decision	Details
38		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
39		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
40		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
41		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
42		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
43		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
44		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
45		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
46		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
47		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>
48		Masters by Coursework	Pending_Supervisor_Approval	Prof. Otoo			<a href="#">View</a>

The PGO lands here when they click Pending Applications from the home page. Here a list of applications with pending decisions, from either a Supervisor or the PGC, is displayed.

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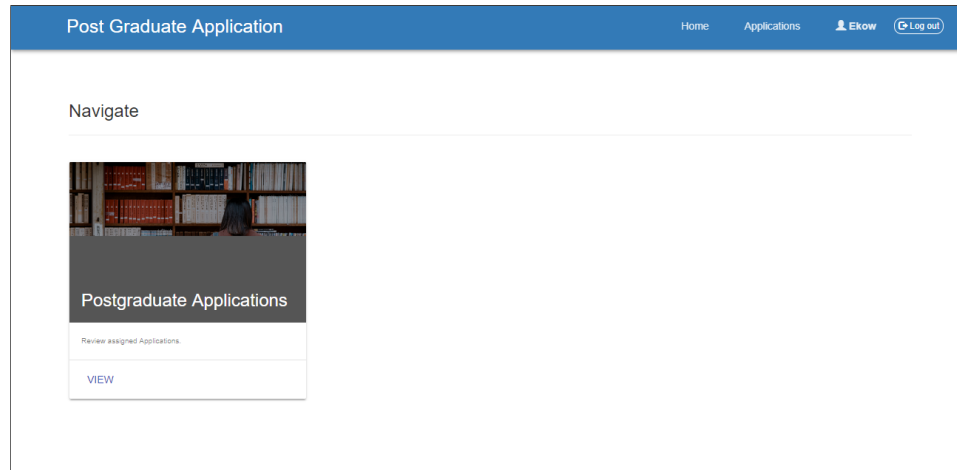


Once the PGO selects an application to view, this screen is displayed. It displays applicant and application information as well as a file viewer.

Applications To Review						
Application ID	Applicant	Programme	Status	Supervisor Decision	PGC Decision	Details
20	Schuaib Alhassar	Masters by Research	Pending_PGO_Review	Accept	Reject	<a href="#">View</a>
21	Al-Hamrui Assad	Masters by Research	Pending_PGO_Review	Accept	Accept	<a href="#">View</a>
65	Marc sf	Masters by Coursework	Pending_PGO_Review	Accept	Accept	<a href="#">View</a>
76		Masters by Coursework	Pending_PGO_Review	Reject	Reject	<a href="#">View</a>

This page displays applications where the PGC has made a final decision.

### 4.4.3 Supervisor



The Landing Page for a Supervisor

Post Graduate Application				
Current Applications				
ID	Applicant	Programme	Status	Details
23		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
25		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
26		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
28		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
29		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
30		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
31		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
32		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
33		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
34		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>
35		Masters by Coursework	Pending_Supervisor_Approval	<a href="#">View</a>

The Supervisor can see all pending applications that need their decision.

The view application page for the Supervisor. It displays applicant and application information, a file viewer and a decision picker.

Post Graduate Application

HomeApplicationsLingLog out

Navigate

---

Postgraduate Applications

Review assigned Applications.

VIEW

14

Post Graduate Application				
Current Applications				
ID	Applicant	Programme	Status	Details
22		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
24		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
27		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
37		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
53		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
62		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
64		Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
66	Marc sdf	Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
67	df dsf	Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>
68	df dsf	Masters by Coursework	Pending_PGC_Approval	<a href="#">View</a>

The PGC can see all pending applications that have been accepted by a Supervisor that need final approval.

Post Graduate Application		
Home	Applications	Ling Log out
<div>Application Details</div> <div> Applicant:  <b>Johnny Appleseed</b> </div> <div> Programme:  <b>Masters by Coursework</b> </div> <div> Supervisor:  <b>Ekw Otoo</b> </div> <div> Supervisor Decision:  <b>Accept</b> </div> <div> PGC Decision: </div>	<div>Application Files</div> <div> Select File: Curriculum Vitae </div> <div> <div>Test document PDF</div> <div> <p>           Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla est purus, ultrices in partitior in, accumsan non quam. Nam consectetur partitior. Conatibus eu sed et tunc frangit auctor vel quis torum. Ut et ligula dolor, sit amet consequat torum. Aliquam porta eros sed velit imperdiet egetibus. Maecenas torum eros et diam ullamcorper et dictum libero tempus. Donec quis augue ipsum magna condimentum lobortis. Quisque imperdiet quam vel magna viverra rutrum. Cras viverra molestie urna, vitae vestibulum turpis varius id. Vestibulum mollis, arcu ac nulla interdum varius, vel sapien blandit metus, ac pretium torum nulla ac dolor. Maecenas urna elit, interdum in dapibus nec, vehicula eu dui. Duis lacinia frangit massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Ut consequat ultricies elit, non rhoncus mauris congue porta. Vivamus viverra suscipit felis eget condimentum. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. In aliquet quam et velit bibendum accumsan. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Vestibulum vitae quam nec eros semper adipiscing et ac lacus. Praesent id partitiorque orci. Morbi congue viverra nisl nec rhoncus. Integer mauris, ipsum a interdum congue, lacus arcu elementum elit, at nulla eros ante ac nunc. In volutpat, ante at pretium ultricies, velit magna suscipit eros, aliquet blandit massa orci nec torum. Nulla facilis. Quis ex vehicula arcu. Nulla facilis. Maecenas pellentesque volutpat felis, quis tristique ligula lacus vel. Sed nec mi eros, semper sagitt eros, vestibulum ullamcorper mattis eget, aliquam in est. Morbi sollicitudin libero nec augue dignissim et conenatur dai volutpat. Nulla facilis. Mauris egetibus vestibulum neque torum blandit. Donec ut amet pulvinar orci. Quisque volutpat pharetra interdum. Fusce sapien arcu, molestie eget varius egetibus, faucibus ac urna. Sed et nisl in velit egetibus aliquam ut a felis. Aenean malesuada scellus nisl, ut torum lacus imperdiet consequat. Nam volut lacus, arcu nisl sed egetibus ut, frangit quam.         </p> </div> </div>	

The view application page for the PGC. It displays applicant and application information, a file viewer and a decision picker.

## 4.5 Database View

This section contains the Entity-Relationship Diagram for the System Database:

TEST TARGET	GENERATE LOAD FROM
<a href="http://pgasystem.azurewebsites.net">http://pgasystem.azurewebsites.net</a>	<b>Southeast Asia</b>
STATE	DURATION (MINUTES)
<b>Completed</b>	<b>1 minute</b>
USER LOAD	VSTS ACCOUNT
<b>40 concurrent users</b>	<a href="https://clt-9750d00c-93ea-4ead-95b1-aff9a1...">https://clt-9750d00c-93ea-4ead-95b1-aff9a1...</a>

Test Details

## 5 Performance

A stress test was conducted on the system. The Microsoft Azure performance testing framework was used.

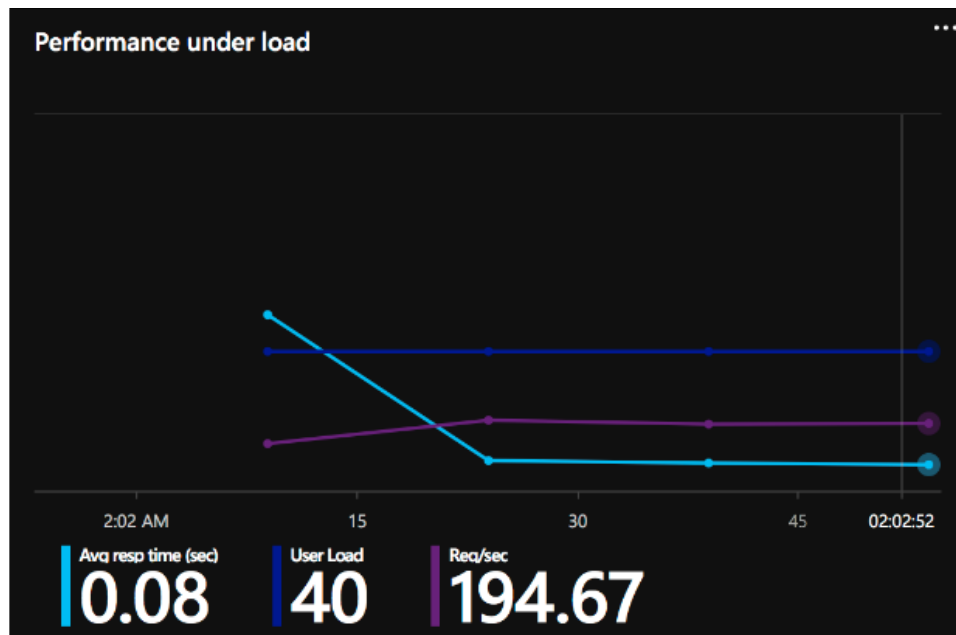
### 5.1 Test Details and Results

The test details and results are as follows:

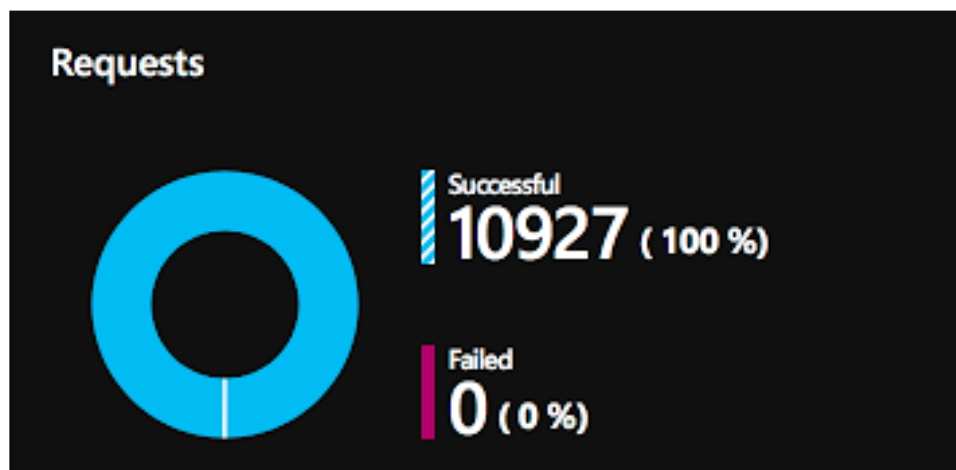
TEST TARGET	GENERATE LOAD FROM
<a href="http://pgasystem.azurewebsites.net">http://pgasystem.azurewebsites.net</a>	<b>Southeast Asia</b>
STATE	DURATION (MINUTES)
<b>Completed</b>	<b>1 minute</b>
USER LOAD	VSTS ACCOUNT
<b>40 concurrent users</b>	<a href="https://clt-9750d00c-93ea-4ead-95b1-aff9a1...">https://clt-9750d00c-93ea-4ead-95b1-aff9a1...</a>

Test Details





Temporal Plot of Average response time, the user load and the requests per second.



Test Results with 100% request success.

## 6 Quality

This sections describes system quality concerns for future development on the system:

- Use bundling and minifying of static css/js files to improve performance, see microsoft docs.
- Use caution when storing binary data in relational databases, as it can adversely impact performance.
- Using base64 string from byte array impacts page load times severely (5-10 second load time on a 214kb file).