iStadium
Proposal for Wombats Rugby

32040 Industry Project – Autumn 2020

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Table of Contents

List of Figures

List of Tables

1 Management / Executive Summary

The Wombats Rugby organization requires a state-of-the-art IT solution to be incorporated in their stadium project that will provide a futuristic experience to 80,000 spectators at full capacity. After conducting our analysis, an overall solution that enhances impeccable spectator experience provides easy team management and empowers stadium staff with complete control over the stadium's ongoing activities is proposed.

To address the above scenario, we engage an extensive solution that includes a secure web ticketing system, a smart parking system, and a cutting-edge virtual reality experience for its private box audience. It also includes live entertainment and on-seat refreshment ordering for all audiences at the stands.

Our solution system addresses the fact that leveraging the team performance while optimizing training requirements for the players is critical. It provides trouble-free access to gyms, lockers, meeting rooms, and buildings using a smart access system that uses fast face detection. More importantly, coach towers have instant and secure communication with the field during matches and receive post-match player analytics based on game performance videos.

To support the stadium staff regarding service and management, a scalable and robust cloud-based database system that can handle the immense data flow and storage is a core part of this proposal. It will enable routine work, such as hassle-free staff operations, inventory, and room management. This system will also provide sales analytics of stock, refreshments, tickets, and feedback data to assist business decisions.

These implementations mandate risk control strategies and, therefore, a fully equipped IT support team, multiple database replicas, and replacement hardware along with on-premise database administrators. Other specialized IT staff are to be deployed for the ongoing management of IT services after extensive training to lower each department's average response time.

According to our estimates, our solution to Wombat's Rugby will provide unparalleled satisfaction to its customers, thus significantly increasing profitability. To complete this project without any disruption within the mentioned year 2022 timeframe, we need you to approve 114.2 million Australian dollars in the IT budget.

2 Final Solution Overview

2.1 Solution Introduction

iStadium has proposed a project plan for the Wombats Rugby, which upholds the franchise's goal of having a state-of-the-art IT complex for their Rugby team. The project is designed from the viewer's point of view and keeping with each and every minute requirement in mind. The solution proposed comprises of advanced software running on sophisticated hardware, enhancing the spectators' experience as well as providing ultimate security.

2.2 Objectives

Based on the requirements of the project, the company has formulated certain objectives that define the success of the project, these objectives will be reflected at the completion of the project, and thereafter management team from the Wombats Rugby Franchise will inspect the fulfillment and functioning of these objectives.

1. The proposed project to be completed by the end of 2021
2. The proposed solution should be available 24x7 during the competition season.
3. The proposed solution should be available from 8 am to 5 pm during the off season.
4. To achieve a full proof solution running advanced technologies that are easy to maintain and manage.
5. The solution will implement an immersive Virtual Reality System to provide an engaging experience to the Private Box Spectators.
6. The solution will implement advanced facial recognition software with 24x7 Surveillance System to provide strong security in the complex.
7. The solution will also have a smart parking management system.
8. The project will also promote a cashless transaction by deploying modern payment systems.
9. All the third-party applications should have proper Service Level Agreements to address all future problems.

2.3 High Level Description of the Solution

The overall solution comprises of small individual component working in conjunction with each other, these when put together create a successful solution. The first component is installing an automated facial recognition system configured at the entrance of the stadium providing easy and secure access to the spectators, players, and even the support staff for accessing gyms, offices etc. The biometric system is complimented by the back-end database providing a high level of accuracy and filtering out unauthorised personnel.

Finding a parking spot on a match day can be very challenging and is one of the major factors spoiling the overall experience of the match. Therefore, the solution is putting in place a Smart parking management system for the viewers. The Viewers will be provided with an option to book a parking slot while booking their match ticket itself. The Artificially Intelligent system will suggest parking slots suitable for the user as per their seat. The customer is also provided with an option to highlight their choice of color for their reserved parking spot which helps in easy identification when they arrive in the parking.

After the successful entry into the stadium, the next component comprises of delivering a rich user experience. The stadium consists of 50 VVIP Boxes where each seat has an individual private screen. These screens can be used to order meals, to watch a replay and to order exclusive team’s merchandise from the store located in the complex. All the shops and stalls in the complex encourage cashless transaction for a smooth experience. To take customer experience to next level, an immersive Virtual Reality system is set up to enjoy the real match feel. The VR headsets are available for spectators in private boxes. These devices are connected wirelessly to the server where the advanced software is processing the videos received from the specialised cameras installed in the match field.

3 Scope and Assumptions

This section consists of two segments, i.e., scope and assumptions.

3.1 Scope

The boundary of the project explains an in-depth clarification of different segments that are relevant to the solution as well those which are irrelevant to the solution.

3.1.1 In Scope

1. Provide cashless payment using the EFTPOS system
2. Install face detection application to detect criminal background before issuing and verifying the tickets and staff access.
3. Create AI technology to find the best parking spot at the venue.
4. Install VR technologies for the private box audience.
5. Install private touch screens for all audiences.
6. Provide video processing software for player performance.
7. Provide an application to give overall information about the stadium matches, transport, and user.
8. Install different equipment such as routers, firewalls, servers, card readers, 3D Cameras, PCs, private touch screens, VR Box, Face Detection Camera, EFTPOS, etc.
9. Design an internal as well as external network so that project is accessed internally and externally.
10. Integrate different software inside the system, such as Google Lens, DBMS, and Mobile software, to access the information.
11. The database will be required with a backup system in case of an accident.
12. Security and Data integrity are required, such as Face Detection, High Tech Firewalls, and BlockChain.
13. Organize training for IT and Non-IT staff to use the project.
14. Provide post-delivery support to provide better customer satisfaction.
15. Provide free transport service to all disabled people, women's and children.
16. Provide a schedule plan of the customer's environment to be developed in the form of a Gantt chart.
17. Provide a detailed Service Level Agreement for the user and staff to use this project.

3.1.2 Out of Scope

The proposed arrangement made in this solution won't mention a few sections below:

1. Financial not relevant to proposed solutions.
2. Standard fit-outs are relevant to the room, such as locker in changing rooms, appliances to store and cook food, etc.
3. Administration & staffing – though staffing is included in scope for ongoing management in solutions.
4. Issues identified with legislation and governing bodies such as Tax Laws, immigration Laws, Import / Export Duty Laws, etc.
5. Any / All issues dealt with Privacy Infringement Act.
6. All Bars & Food Stalls, also some general office furniture.

3.2 Assumptions

The following are a few assumptions based on the information gathered during the requirement analysis phase of the project.

1. The spending limit for the project is unlimited. In any case, the proposal should try to focus on limiting the cost, and utilizing of high-class product is recommended.
2. The main stadium office support operates 24 * 7.
3. The cost identified with the utilities for these solutions will cover the overall running costs of the main stadium office, and it won't consider when providing the cost for the proposed solution.
4. The main stadium office locates at Circular Quay, Sydney.
5. The cashless payment is made via EFTPOS.
6. All the tickets will be purchased in AUD.
7. Internet connection is a must.
8. All parking will be in the stadium basement.
9. The capacity of the stadium is 80,000.
10. It will have 30 corporate boxes and 50 private boxes as a part of a section in the stadium which divides 80,000 people.

4 Solution Technologies and Hardware

4.1 Solution Technologies

This Section consist of all the solution technologies that the project is planning to propose for the success of the project.

4.1.1 Facial Recognition System

This solution involves setting up cameras at the entrance of the stadium. These cameras use several advanced algorithms to identify various attributes on the face such as depth of the eye sockets, shape of jawline, height of cheekbones etc. These attributes when combined creates a blueprint of a face. The face is then used by the Artificial Intelligence functioning in the backend server. The AI compares the blueprint of the face rigorously with the database of faces stores in the server. The database of faces contains the facial blueprint of the people with criminal background in the country. The AI will alert the administrator and security staff if any match is found i.e. if any unauthorised guest has entered the stadium.

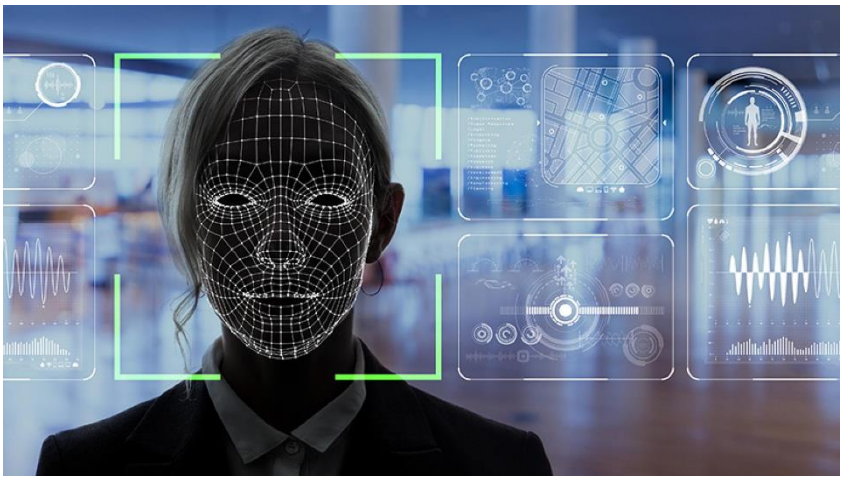


Figure 4.1.1: Facial Recognition System

4.1.2 Smart Parking System

The smart parking system will be put in place to enrich the match day experience of the spectators. This system will involve giving an option to reserve parking spot while booking for their ticket. The user would be asked with few details such as type of Car, and if the car is electric. The AI operating in the backend server will then analyse the user requirements and suggest them the nearest parking spot from their match seat. After confirming the parking spot, the user will also have an option to select the color they want to view in their parking spot that would help them locate their spot when entering the complex. A parking sensor will be installed at every parking spot which is

connected to the backend cloud server that will show the real time availability of that parking spot in case the customer forgot to book the parking before (Sensor Dynamics 2018).

4.1.3 Virtual Reality System

In order to take user experience to next level, a Virtual Reality System will be installed in the stadium. The system will have 3D Cameras from Go Pro installed on the boundary of the field. These cameras will record the match and send the data in real time to the Unity Processing Software. The Software will then convert the received recordings to be compatible with VR Headsets. The VR Headsets will be available for private box spectators and spectators with accessibility needs. The VR headsets will provide an immersive experience to the spectators as if they are in the match itself.

4.2 Hardware

These sections contain all the hardware required for the above stated solutions of the project

4.2.1 Apple iPad Pro

Apple iPads are one of the best tablets in the market. iPads are very popular for their retina eye displays. These displays provide an immersive experience to users. This display, combined with the A12Z bionic chip for processing, makes it the best option to use. For Detailed Specification refer **Appendix A**.

These iPads would have an integrated stadium app that will allow the users to avail of various facilities that the stadium has to offer (Apple).

Figure 4.2.1 Apple ipad Pro

4.2.2 Square Reader EFTPOS Device

Square Reader is a small, elegant-looking device that will be used for accepting EFTPOS payments. The device can accept contactless payments as well as payments by swiping the card. The reader can be connected to a device via Bluetooth or via a cable and provides multiple software supports (Square 2020). For Detailed Specification refer **Appendix A**.

The device would be used in two places:

1. The device would be attached to the armrests of each seats in the VVIP Rooms.
2. The device would also be installed at the food and drinks counter for payments.

Figure 4.2.2 Square Reader

4.2.3 Surface Mounted Place Pod Parking Sensor

PlacePod sensors provide real-time, accurate vehicle detection and are becoming industry standards. This device provides reliable and accurate data while maintaining ultra-low power operations. For Detailed Specification refer **Appendix A**.

These sensors will be installed at every parking spot and will communicate directly with the backend system to show the available or blocked parking spots.

Figure 4.2.3 Parking Sensor

4.2.4 Philips Hue Smart Light

Philips is known for making innovative and quality lighting solutions keeping in mind the efficiency of the product. The device is capable of lighting in 16 million different colors. The device is completely wireless and has an API that can be integrated with another system to control the device. For Detailed Specification refer **Appendix A.**

The lights would be used to indicate the blocked and available parking in the parking lot. The spots can be blocked in advance from the website or the app while booking the tickets.

Also, the spectator can set a custom color for its parking spot that would help him identify his place when he is in the parking lot.

Figure 4.2.4 Smart Light

4.2.5 Jet Charge Car Charging Station

Jet Charge is a global organization providing quality and fast charging solutions for electric cars. For Detailed Specification refer **Appendix A**.

Chargers would be installed at different spots in the parking lot, and customers with an electric car would be given preference for these spots.

Figure 4.2.5 Charging Station

4.2.6 HikVision Face Detection Camera

HikVision is worldwide recognised for providing security and surveillance solutions. HikVision IP Camera's quality is one of the best in the market available today. For Detailed Specification refer **Appendix A**.

These cameras would be installed all around the premise to provide complete surveillance. The Cameras also has an integrated Face Recognition capability, which would help in filtering out criminals and unwanted guests, if any.

Figure 4.2.6 Face Detection Camera

4.2.7 HikVision Ultra Series Network Video Recorder (NVR)

The NVR is used for saving the encoding video from the IP cameras to the desired location. Hikvision NVR is known for using low bandwidth without compromising the video quality. This model NVR is equipped with AI, which helps in filtering out unwanted guests and criminals. Also, the cameras used are of HikVision, as it is better to stay in one ecosystem (HikVision). For Detailed Specification refer **Appendix A**.

The NVR will store the videos in the backend server for future references.

Figure 4.2.7 Network Video Recorder (NVR)

4.2.8 GoPro Max 3D Camera

Go pro max is leading 360-degree camera tech in the industry. The device is generally recognized for its image stabilization and focal length. For Detailed Specification refer **Appendix A**.

These cameras will be installed at the boundary of the field, which will then be connected to the backend systems providing VR capabilities.

Figure 4.2.8 GoPro Max 3D Camera

4.2.9 Oculus Go Virtual Reality Headset

Oculus Go is one in all VR headset that provides High-quality immersive experience. Its crystal-clear optics and optimized 3D-graphics combined and give the highest visual clarity. Audio drivers are built into the headset providing cinematic sound (Oculus). Detailed Specification refers to **Appendix A**.

The VR headsets would be available to use for live entertainment for people in private boxes and audience with accessibility problems. These devices would be paired with the backend system from where the live stream is accessible.

Figure 4.2.9 Oculus Go VR Headset

4.2.10 Cisco FirePower 4100 Firewall

Cisco Firepower 4100 is a high performing, compact internet edge firewall. This device is threat-focused, protecting the organization network against intrusion in real life. It enhances the security of the system by understanding the context of the threat and sharing intelligence with other devices in the network (Cisco). Detailed Specification refers **to Appendix A**.

This Firewall will be used to monitor the incoming and outgoing traffic in the system. The system will also analyze any anomalies in the system, which may disrupt the working of the network.

Figure 4.2.10 Cisco FirePower 4100 Firewall

4.2.11 Cisco Aironet 27021 Wireless Access Point

Cisco Aironet Series provides high intensity experience for campus networks. These are next gen devices designed to work in dense environments. For Detailed Specification refer **Appendix A**.

The stadium will experience a high amount of audience on a match based and most of the solution proposed require access to wireless point, in that case these devices is an optimal choice.

Figure 4.2.11 Cisco Wireless Access Point

4.2.12 Dell PowerEdge M630 Blade Server

The PowerEdge series from Dell provides scalability and is very customisable as per the requirements of the network. The product can automate various tasks such as logging, tech support report etc. For Detailed Specification refer **Appendix A**.

These servers would be used for all purposes in the stadium such for rendering video for VR headsets, for backups etc.

Figure 4.2.12 Dell Blade Server

5 Software

This section is a critical aspect, as it is the central heart of this system. Without the software integration with hardware, our project is useless. Hence, it comprises solutions for application and operations systems, which will be used by all types of customers.

5.1 Applications

It will provide us with a brief outline of the proposed application, which will be used as a solution for this project. It also offers a solution for DBAs to use a database management system and provides a solution for the VVIP audience.

5.1.1 Wombats Rugby Web Portal

Description: Wombats Rugby web portal will be a solution which can be accessed by visitor, staff, vendors, and players. The features of the Wombats Rugby web portal will consist of the following:

1. Upcoming Game Details
2. Online Purchasing of tickets after Face verification
3. Choose either parking spot or public transport
4. Staff Management
5. Online order of Food and Beverages only access in a stadium using Paypal

The application which supports the web portal feature is listed below; details about them can be found in Appendix D.

1. Wordpress

Name: Wordpress **Provider:** Wordpress Foundation	**Description:** Wordpress is an open-sourced software used to build web sites. The most commonly used language and database in Wordpress are PHP and MySQL. **Justification:** The Wombats Rugby web portal will be implemented in Wordpress. We are using WordPress as it is useful in reducing the time to develop the website because it provides multiple plugins that can be integrated easily.

2. My SQL

Name: My SQL **Provider:** Oracle Enterprise	**Description:** My SQL is an open-source database management tool, which is integrated to use in WordPress. **Justification:** We will be using this database tool to store the website data such as game details, ticketing details, staff details, online ordering (food & beverages) details, vendor details, and user details.

3. Paypal

Name: Paypal **Provider:** Paypal Holdings Inc	**Description:** Paypal is an online payment solution, which is used to transact money online. **Justification:** We are using PayPal as our online payment gateway because it is easy to integrate into the website, and Wordpress supports the plugins, which make it easier to integrate. However, we will still be using Square as an alternative EFTPOS for any offline payment made only in the stadium.

4. Amazon Rekognition

Name: Amazon Rekognition **Provider:** Amazon	**Description:** Amazon Rekognition is a tool which uses a deep learning algorithm to analyze the image and videos. **Justification:** We are using Amazon Rekognition as it will analyze the image store in MySQL database while creating the account or purchasing the ticket using a webcam, and that image will be processed using the machine learning techniques to detect the criminal background. Also, it will give staff access.

5.1.2 Wombats Rugby App

Description: Wombats Rugby App is a solution which can be accessed by visitor, staff, vendors, and players. The features of the Wombats Rugby App will consist of the following:

1. Online Purchasing of tickets after Face verification
2. Choose either parking spot or public transport
3. Details of User (Ticket, Parking Reservation, and Contact Details)
4. Transportation Details
5. Team & Player Ranking
6. Game Details

We would be using the following software to integrate live Transportation data with Wombats Rugby APP.

1. Transport NSW Open Data Program

Name: Transport NSW Open Data Program **Provider:** Transport NSW	**Description:** This program is run by Transport NSW to provide a developer with APIs to integrate into their project. **Justification:** Using this program, we would integrate public transport – realtime alerts API, which will be used to provide visitors with live updates of the transportation to reach the venue.

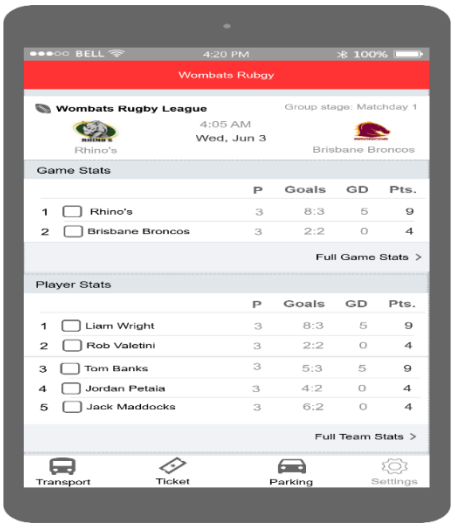


Figure 5.1.2 Mock UI of APP

5.1.3 Parking Solution

Description: Parking solution will be integrated both on the web as well as APP; it will allow all visitor to choose their parking space for their vehicle from the free space only; other spots are reserved for VVIP visitors. The following are the feature of the parking solution:

1. Choose either parking spot or public transport
2. Enter the stadium using the ticket

We would be using google Place APIs to integrate it with our system.

5.1.4 Biometric Solution (Face Detection)

Description: Biometric solutions such as google lens will be integrated with android and ios versions of the Wombats Rugby App, respectively. It will capture the image and process it with its internal machine learning mechanism to detect the criminal background of the visitor as well as give staff access (Biometric Solution). The details about it can be found in Appendix D.

5.1.5 Virtual Stadium Solution

Description: Virtual Stadium solution will provide a solution for VVIP spectators in private boxes. The features of the Virtual Stadium solution will consist of the following:

- The live game made in Unity to be played on the VR headset.

The technology which is used to integrated Live game in VR headset is mentioned below, and a brief detail of this technology can be found in Appendix D.

Name: Unity 3D **Provider:** Unity Technologies	**Description:** Unity is a tool that is used for VR development. It is mostly coded in C# and JavaScript. **Justification:** Unity developer will integrate the Live game to VR headset by capturing video from amazon RDS and processing that video to project it in the 3D environment on VR headset.

5.1.6 Private Entertainment Solution

Description: Private entertainment solutions will provide a solution for all audiences. These solutions will be integrated into seats with an **iPad** as a private screen for each visitor. The features of these screens will provide are as follows:

1. Order food at the seat
2. Listen to music during a game break
3. Watch video during a game break
4. Play video games

5.1.7 Database Solution

Name: Amazon RDS **Provider:** Amazon	**Description:** It is Amazon cloud services to provide a distributed relational database. It helps access distributed data on a single platform. **Justification:** We are using Amazon RDS as it easy to access the different databases created on various database tools. It will also provide a centralized backup system.

5.2 Operating Systems

This project will provide varieties of smaller solutions for the visitor, player, and staff. Therefore, there will always be a need for different operating systems to run them. Identical to the above applications, there will also be a description in this section, which will include the operating system introductions and adequate reason for using it.

5.2.1. Apache Server

Name: Apache Server **Provider:** Apache Software Foundation	**Description:** Apache Server is an open-sourced cross-platform web server, which is developed by Apache Software Foundation's Developer. Apache Server also supports the server scripting languages such as Python, Perl, Tcl, and PHP. **Justification:** We will be using the apache server to installed are web portal as the apache server can easily be integrated with a Wordpress environment. Services like MySQL, Paypal will be installed on this server.

5.2.2. Windows 10 Operating System

Name: Windows 10 Operating System **Provider:** Microsoft	**Description:** Windows 10 is an operating system made by Microsoft for the comfort of the public, which is not familiar with the Command-line operating system. **Justification:** We will be installed this OS on the premiss to make it convenient for people involved in this project, such as Staff, Developers, Managers, DBA, and Testers.

5.2.3. Amazon Linux Operating System

Name: Amazon Linux Operating System **Provider:** Amazon	**Description:** Amazon Linux is a combination of multiple Linux operating systems; it is used to configure different AWS services. **Justification:** We are using Amazon Linux as it supports most of the Amazon services, which are useful for this project. It also has inbuilt functionality to take the backup of data using the S3 bucket. Hence we are using Amazon Linux operating system.

5.2.4. Android

Name: Android **Provider:** Google	**Description:** Android is a mobile operating system that is also based on Linux. Android support all google services and is also an open-source operating system to support multiple Applications. **Justification:** We are using Android as an operating system to integrate our Wombats Rugby App due to which we can have a maximum reach of the user to use our software solution.

5.2.5. iOS

Name: iOS **Provider:** Apple	**Description:** iOS is a mobile OS that is owned by Apple. It is famous for its security. **Justification:** We are using iOS as an operating system as it provides enhanced data security of VVIP visitors.

5.3 Other Software

5.3.1. Software Testing Solution

Description: It is also essential to test the software to make the system running fine, to make system bug-free will be using automation testing framework - selenium. The detail specification about this testing framework can be found in Appendix D.

5.3.2. Security Solution

Description: The security solution plays a vital role for both companies as well as the user using the software of the company. These security solutions consist of two types of solution one for data security and protection from viruses, whereas another one for protection against fraudulent activities on online transactions. That software is namely as Blockchain and Norton Firewall. The details about Blockchain and Norton Firewall can be found in Appendix D.

5.3.3. Data Analytics Solution – Amazon Sage maker

Description: Amazon Sage maker is a cloud-based service that uses a machine learning model to predict and analyze the data. ML provides a series of benefits like analysis of the customer data or to predict any kind of security threat in the backend. Hence, it is tough for any IT professional to work on these ML models. Therefore, to avoid these challenges, we will be using Amazon Sage maker as it is committed to overcoming these challenges by providing built-in, standard algorithms of machine learning together with other tools to simplify and speed up the process.

6 Data Management and Database

This section aims to provide a detailed description of the heart of the state-of-the-art stadium, I.e., the multi-functional database system which hosts several connected relational databases. These databases offer analytical advantages and are designed in a distributive way to enable a scope of scale. Considering that the stadium will hold an immense number of audiences and interested parties, the data traffic will be rigorous, changing, and exponential. The stadium can hold 80,000 spectators 24/7 during on season, and the database design must take maximum traffic into account. Furthermore, there is a significant number of data traffic in and out of the system due to:

1. On-site audience and analysis
2. Machine Learning Procedures for Virtual Reality entertainment
3. Customers using the ticketing system from outside the stadium.
4. Spectators are watching replays and matches from during game breaks.
5. Live telecast to the audience enjoying the match from the comfort of their homes.
6. Transport data communication.
7. Website and mobile application traffic

The database design takes all of these into play at a single instance. To enable a current service, a serverless, fast, secure, and robust database system is needed. Amazon RDS, a database in the revolutionary cloud computing environment along with Oracle Database Engine, was selected that provides real-time analytics on the data itself. Alongside these, Amazon Web Services (AWS), a pioneer in the world of multi-tenant cloud-based systems, provide other services such as EC2, S3 storage, CloudWatch monitoring system, etc. In order to successfully support the database system. It reduces administrative burden significantly. Moreover, the advantages that AWS provides relate extensively to this project, and some of them are stated in Figure 5.0.

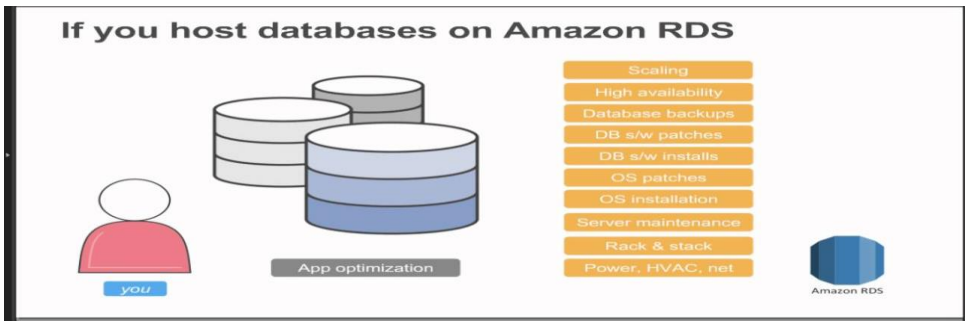


Figure 6.0 Amazon RDS properties to be utilized in the stadium from aws.amazon.com

6.1 Data Management/Data Integrity

The following database design principles have been followed while implementing the database system.

6.1.1 Data Integrity

Full proofing data flow over its life cycle to ensure accuracy and consistency is an essential goal of the stadium's services. The smoothness of storage, processes, and retrieval of data while battling unintended changes, malicious intent, human error, catastrophes, or hardware failure was ensured.

a. **Availability & Durability :** To achieve this and maintain highly consistent availability, the following have been considered:

Physical Integrity: Solutions that will combat the interruption of the system storing and fetching data are provided:

1. **Data loss:** Physical integrity can be violated inside a database for many reasons, and a simple example can be a result of a power outage. Storing data on Amazon RDS means, the stadium's data is replicated to different Availability Zones (AZ). To enable this, Multi-AZ service is mandatory. To maintain high reliability, data replication to 4 AZs on game days has been decided. Lastly, data will also be stored in physical storage inside the stadium arena for sporadic cases.
2. **Backup and restore:** As mentioned previously, Amazon S3 (99.999999999% durability) data storage buckets will facilitate our databases. It, in turn, provides automatic backup services and point-in-time restoration of the lost data. The backup retention process will take 30 minutes and can be initiated automatically at a time between matches. Restoring this data to any specific time in the past only takes a maximum of 5 minutes. Data in physical storage inside the stadium is backed up periodically.
3. **Data Recovery/ System failure/ migration:** In case of a hardware failure in the AWS instance, the host automatically replaces the instance. Snapshots of the existing database architecture can be taken whenever the database administrator prefers. These snapshots, when unencrypted, can be directly transferred to authorized personnel of different Rugby Teams on several match days. It can also be useful in

case of a system failure and migration to another set of the computer system. Using physical storages as a last resort means the data can be used with a new DBMS in case of extreme failure.

Logical Integrity: Protocols to ensure the correctness of data inside the Stadium's RDBMS are stated below:

Software bugs/ Human error: This can be the result of violating integrity constraints. E.g., referential integrity. To avoid such design flaws, we bring Oracle's Database Engine into play. Using an Oracle Engine facilitates the creation of rules that enforces logical integrity along with customized business rules needed to set up the decentralized DB for Wombats.

1. The sale of a jersey or other items can be easily found. A rule is defined that ensures every row in the database can be uniquely identified using a primary key and that primary key is not null, thus maintaining entity integrity.
2. A rule defines that every foreign key within the Wombat's DB is either null or points to an existing primary key, i.e., by restricting the deletion of primary keys (Referential integrity). It connects linked records, such as teams and matches.
3. All character, number, image, and video data are categorized beforehand, I.e., To validate domain integrity, datatypes are previously defined.
4. Transactional integrity is enabled by using CHECK to ensure data between rows of different tables is reliable.
5. CHECK constraints are used to make sure the right values are being inserted in the tables, foreign keys have related primary keys, and these primary keys are unique and not null.
6. Other integrity includes significant rules such as team player numbers are constant, triggers that low alert inventory, salary limitations, etc.

The use of MYSQL was also investigated but found to be incompatible with CHECK constraints that are an integral part of this database design.

6.1.2 ACID Compliance

Maintenance windows inside Amazon RDS can update the virtual device's firmware, e.g., the virtual computer's operating system, where data is stored. During this time, it is possible to lose data as the virtual devices simply need to be restarted. Amazon RDS performs a termination procedure on all queries and requests at that time and rolls back to the previous state, thereby maintaining atomicity, consistency, isolation, and durability. Using Oracle Engine in Amazon RDS ensures the following:

1. It applies for every database transaction, e.g., a ticket purchased by a customer must reflect other procedures such as decreasing the number of available tickets. The entire sequence of actions is either completed or terminated as per the concept of atomicity.
2. To prevent database corruption and maintain consistency, the database is taken from one valid state to another after every transaction.
3. When one customer is reserving a parking spot, that spot is isolated until the session terminated. Thus, such an isolation principle is maintained.
4. In case of system failure, past transaction changes are ensured to be permanent due to Oracle's supportive durability service.

6.1.3 Security & Privacy

Data will not be disclosed to other parties unless legally mandated. Full control over security implementation is provided to the Cloud systems and Database administrator. To stop phishing and data theft, the database system implements encryption on two kinds of data:

a. **Encryption:** Data is encrypted to battle unauthorized readability in the following ways:
    1. **Data at rest:** The system encrypts data at rest using its key management service KMS inside the virtual instances that provide storage. It uses industry-standard encryption AES-256.

       In this system, we put into use Transparent Data Encryption (TDE) and Oracle's Advanced Security option from Oracle Enterprise Edition. It facilitates encryption of data before storing it and also decrypts the data when retrieved from storage. It also helps manage, generate, and store cryptographic keys securely and efficiently.

2. **Data in transit:** The connection between application and database is secured using SSL/ TSL. Whenever a database instance is made available to use, an SSL certificate is generated into the instance by Amazon RDS. Thus, when enabled, data transferred between that application instance and the DB will be encrypted during transfer.

b. **Network Isolation and DB Firewall:** Using industry-standard encryption measures, Amazon's Virtual Private Cloud service allows us to isolate our DB instances (virtual machines with storage) inside our private network. The range of IP addresses of the Stadium machines needs to be specified to connect to this IT infrastructure. It provides inspection network traffic, implementation of different security groups, and access permissions for every request. Thus, the IT infrastructure, along with firewalls and suspicious activity detection systems can inspect each request.

6.1.4 Performance & Provisioning

Having good storage is a critical driver in optimizing the stadium's database performance. In this system, we will be using AWS Provisioned IOPs SSD Storage. It is an SSD backed service that delivers quick and consistent performance. Using Oracle Engine further increased the range of input-output operations per second (IOPs) since AWS can support a high range of IOPs for Oracle (80,000 IOPs). Thus, on peak days at the stadium, the provisioned IOPs will be maximum. To support fault tolerance, multi A-Z deployments are serviced. Furthermore, performance metrics such as latency, throughput, IOPs, and queue-depth are monitored using RDS on its storage instances.

6.1.5 Scalability

The balance between on-season and off-season can be further enhanced by on-click computing. Resources can be scaled up or down in the following manner:

Resource	Maximum Range	Compute Time
Number of CPU	32 vCPUs	few minutes
RAM	244 GiB	few minutes
Storage	64 TB	few minutes

Read Replicas

In addition to this, read replicas are to be used for match data and statistics viewing by the in-house spectators. As this can add up to an enormous number, read replicas provide multiple instances to handle read traffic only as the stadium's data are copied to these replicas.

6.2 DBMS

The database follows the relational database model and contains the following components:

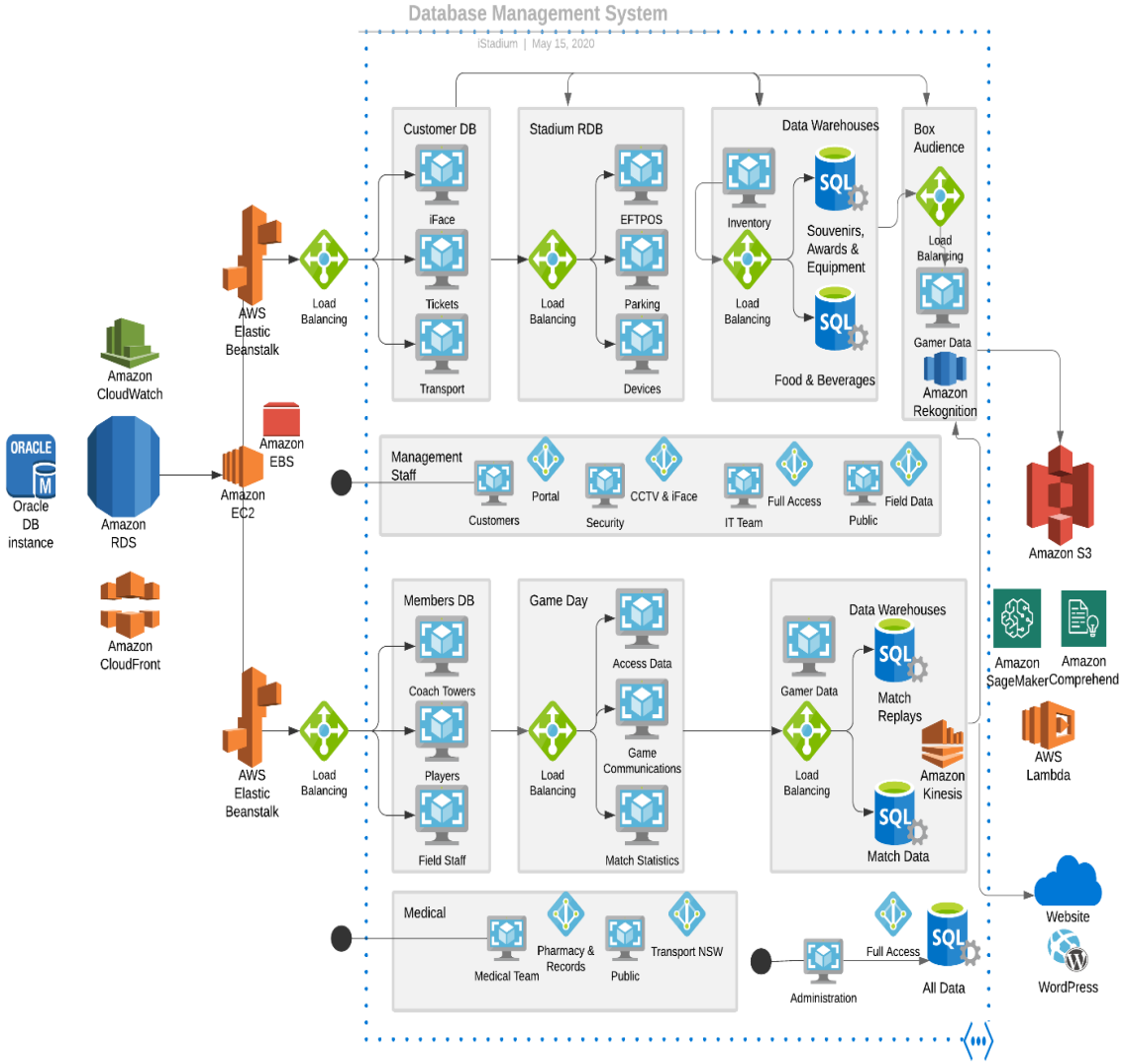


Figure 6.2 Database Architecture & Underlying Technology

6.2.1 Data Lifecycle

Figure 5.2 shows a basic outline of the decentralized DBMS. Each physical department in the stadium will deal with data and the technology used. To enable this, the database management system will serve its usual purpose of receiving, storing, and fetching data for multiple users. Data from all departments are created and stored inside the oracle database in tables with primary keys that identify them. Data flows in from RDS S3 components and are accessible to different users. Customers can view player, team, field-data for an engaging experience. They will also get information such as ticket and parking spot data. The restaurant, bar, and catering staff receive data from the stock tables. Tables are updated with each serving. Inventory and ground equipment, including awards, are stored in a table for retrieval by the stadium's field staff. As well as that, they can read and edit the stadium's field and lighting data. Management and admin will have full access to customer registration data, employee and staff data, parking, car hires, etc. The security team can monitor face data and CCTV videos, which are stored for the long-term. Coach towers that include players can retrieve all match statistics, communications, and performance videos. Medical teams have an extensive connection to health data of every individual, and the transport team is connected to the external Transport NSW database for stadium use. After serving its purpose, data is stored back to S3 storage for next day use. Match data and video replays are served on the website for audience viewing. Data is only to be destroyed every five years with the permission of management.

6.2.2 Database Layer Architecture

As shown in figure 5.2, that data stored through the Oracle DB application is stored inside AWS S3 storage buckets. These Amazon EC2 instances are a part of Amazon Elastic Beanstalk that distribute workloads to the data storage instances. Using SQL Developer or other software applications, users can connect to the Oracle database during the match through AWS RDS. When match and gameplay videos are sent to Oracle data warehouses, this will initiate data analysis and deep learning techniques via Amazon Rekognition, Kinesis, Sagemaker, and Comprehend. Data is retrieved to relevant departments upon each user request.

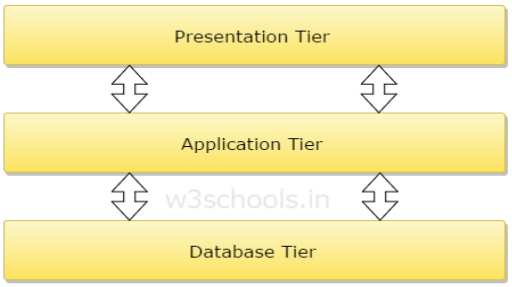


Figure 6.2.2 Database Layers with 3 Tiers (w3schools.in)

Figure 5.2.2 shows the 3-tier database model. The users create each request from the external application interface, I.e., the presentation layer. The application tier processes the request and forwards it to the database tier with the recommended DB functions. The database tier implements these functions and passes the user-expected output, such as a customer trying to find his parking spot to his/ her mobile device application.

6.2.3 DBMS Technology & Implementation

Software: The software required to implement the database are listed below:

a. **Data Handling:**

1. **Amazon RDS:** The database service provided by Amazon for Wombats Rugby. It is a distributed relational database service inside the AWS Cloud.
2. **Oracle DB:** This is the DB engine connected to RDS and is a commonly used leading database technology for everyday transaction processing. Also, it supports Oracle Multimedia that can store video data for processing match video data. Oracle EDQ will compliment data quality management.
3. **Oracle Autonomous Data Warehouse**: will be used for real-time match video analysis data transfer, business intelligence tasks, etc.
4. **SQL Developer:** Lastly, an integral part of the system is SQL Developer (Figure 5.2.3), which will allow developers and data querying in the Oracle Database for the database administrator e.g., creating a new table**.**
5. **Amazon S3:** Cloud storage devices that will store data of customers, employees, players, teams, matches, stock, tickets, parking, field, and any other related data.

b. **Database cloud configuration:**

1. **Amazon EBS:** These are block-level storage volumes required to run instances that stores data. Data is quickly accessible, and previous match data can persist for great lengths of time in the EBS.
2. **Amazon EC2:** Following on from above, EC2 has computed capacities in the cloud, or quite simply, these are virtual computers that the stadium's system will rent from AWS.
3. **AWS Elastic Beanstalk:** Considering there will be enormous traffic from spectators, this service provides load-balancing by switching on more EC2 instances upon a certain threshold. It also includes cloud monitoring for system metrics and notification services during essential activities. The service works together with EC2, S3, and CloudWatch.
4. **AWS CloudWatch:** This is the cloud monitoring system that will be handled by the systems engineer.

c. **For data analytics:**

1. **Amazon Rekognition:** Although most data will be stored in classic Oracle, the system will use Amazon Rekognition, which will implement deep learning algorithms for VR technology used in private boxes.
2. **AWS Lambda:** Function-based service that will facilitate video processing and forwarding by Rekognition.
3. **AWS Kinesis Streams:** Video streams are securely provided to Rekognition through this feature.
4. **Amazon Sagemaker:** Handles all analytical tasks on the data, e.g., training testing models and receiving accuracy measures from the sale of stock for business intelligence.
5. **Amazon Comprehend:** This service will receive feedback data from spectators and run text analytics.

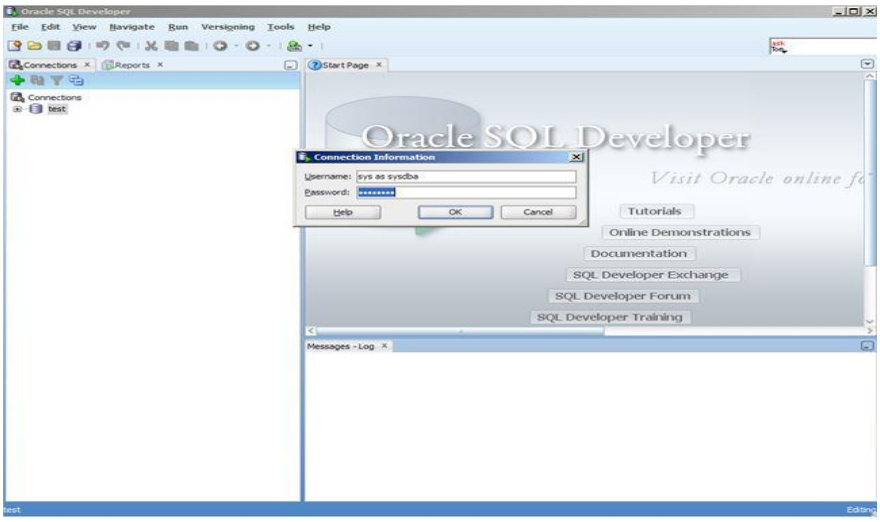


Figure 6.2.3 User Interface of SQL Developer

Hardware: As the data is stored in the cloud, no hardware for database management except high-end internet connectivity and end-user devices such as computers are needed.

6.3 Database Management

To maintain smooth performance, storage optimization, efficiency, security, privacy, and compliance, specific tasks are involved in managing the system's database.

6.3.1 Access Control

The database is integrated with an identity and access management system that controls which resources each user group can access. Furthermore, tagging these resources (e.g., DB instances) lets user groups get access to support with the same tags. In this system, a rule has been set so that only database developers have access to development instances, whereas database administrators get access to production instances. The following software applications are necessary to enable the DBMS:

1. A master account that has all privileges, including making new user accounts and grant privileges, has been provided to the **Cloud solutions architect.**
2. **Database administrators** get access to the data via SQL Developer that provides querying and therefore facilitates granular data storage access. DBAs can also change the read/ write privileges of IT, support professionals, along with data.
3. **IT support officers** get read/write level access to the SQL tables and records.
4. **Customers** get access to data via website and mobile application.

5. **General Staff members, field staff, HR, admin, and management** shall get access to department-specific data via the Oracle DB connected software application interface.
6. Essential members such as **players, coaches, team members, and game management professionals** get access to statistics and video data via the team interface of the application,
7. **Business Analysts and Data Scientists** are granted access to video data through business intelligence application interface and AWS services using the AWS Management Console.
8. Lastly, the database is hosted by AWS, and any changes to be made in the AWS service requires interaction by the **Cloud Solutions Architect.**

Insider Access

Although external security threats and hacker attacks have been addressed, it is crucial to managing security risks imposed by insiders. One possible cause can be from the database administrator. Database activity streams (DAS) contain real-time database activity inside a stream and protect the DB from such threats. We will be using IBM's third-party Security Guardium Data Protection to achieve an almost real-time view of database activity as well as alert notifications. Thus, detection of threats and taking approaches to neutralize these threats can be made on time. Furthermore, DAS is beyond the database administrator's access privileges.

6.3.2 Database Management

Key operational measures such as storage, memory, computation utilization, instances, input/output are available to the Cloud Architect in real-time to enhance monitoring capacity and detect performance issues. Important events are also automatically identified, and alerts are sent forward by the system. To ensure the database functions effectively after implementation, the following management protocols are to be executed:

Quality & Usability Management

Oracle provides an excellent data quality environment that results in easy and appropriate data usability. It gives consistent data in the correct format. Oracle EDQ, which is the data quality management tool, ensures data is updated, governed, and useful for its cause to each end-user respective of their roles.

a. **General data uses:**
    1. For everyday viewing and updating processes such as stadium access data, employee salary, customer registrations, souvenir, stock updates etc.
    2. Customer views of player and team statistics, general player information, match replays.
    3. Field data such as moisture levels are sent to coach towers and data analyst team.
    4. All communication data between coach towers and players are stored for after-match analysis.
    5. Stock data is sent to Sagemaker for analysis.

b. **Video data use:**
    1. Video analysis on each player's performance will be provided as output to coach towers.
    2. Virtual Reality entertainment to audience boxes is provided.
    3. Match replays are forwarded to spectator devices and websites for home viewing.
    4. Parking data to assist cars to find their spots on match days.

c. **Image data uses:**
    1. To recognize customers via google lens.
    2. Security protocols.

6.3.3 Warehousing & Analytics

The Oracle Data Warehouse is used instead of S3 storage devices to implement faster video data analytics. Audience in private boxes will be provided live entertainment to play similar scenarios using VR technology as occurred during the match (Figure 5.2.3). To implement this within a matter of minutes, data warehousing is key. A DW will only contain the data that is needed for this particular action; thus, less and faster computation is achieved. In addition to this, the DW will provide image data for deep learning models inside the google lens application and stock data (food, inventory, tickets, feedback, etc.) to conduct sales analytics and improve profit margins. The data analyst team will also make field quality predictions using previous data. Lastly, game communication data between coach-towers and players will be used for post-game analysis to improve team performance.

Figure 6.3.3 Data analytics in real-time using Amazon Kinesis

6.3.4 Support

The IT support team handles all database queries and complaints received from customers and staff from respective departments. DB Health checks will be conducted every fortnight to optimize performance. It can also include additional provisioning resources with the help of the solutions architect. Whenever an issue arises, the IT support officer can make necessary changes inside the database or contact the solutions architect for cloud-level configuration. All customer or staff user accounts are to be handled by this team, whereas DBAs will grant and refuse access to the database to different roles. The DBA manages infrastructure-level organizations such as distributing department-specific privileges to the correct IT support officers and troubleshoots database problems. The DBAs will investigate any pattern during DB audits before it turns into an issue. DB update recommendations are also provided monthly by the DBA. Lastly, any unsolved problem can be communicated with AWS directly.

6.3.5 Compliance

The system provides a strong compliance framework where it is possible to evaluate and monitor performance, security, and other metrics. These can be easily compared to regulatory requirements. To check AWS compliance documents, AWS Artifact is the on-demand service that leads anyone to security and other audit reports.

7 Business Issues

7.1 Risks

In any business continuity plan, all the internal and external risks need to be identified. To improve the probability of a project arriving at an effective resolution, a set of risk preventive actions needs to be planned according to the identified risks.

7.1.1 Risk

Types of risks are listed below:

1. **Unexpected IT Outage**

   Having 24hour IT availability has become the most significant commodity in our digital life as all the systems are connected. IT service outage in one part may collapse the whole system. Experiencing frequent outages can impact more than just the bottom line. Even though the likelihood of these kinds of risks happening is very rare, we have to include this unexpected risk in our risk management program.

2. **Faulty AI technology**

   Multiple sensors will be used in the AI-driven parking solution. So, any inaccuracy in algorithm or algorithm bias (caused by less trained or incomplete data) during rush hour may cause chaos between customers and result in a collision in the parking area.

3. **Information theft**

   Information theft or identity theft occurs at the point when someone gains unapproved access to a person's specifically distinguishing data and use it to perpetrate misrepresentation or different violations. To become a VIP member of WOMBATS RUGBY, spectators have to share their personal information along with credit card details. All this data will be stored in the system. Any mishandling of these data may raise the potential risk of the security breach and information theft of the valuable spectators.

4. **Power outage**

   Power outage or force blackouts are usually caused by heavy raining, thunderstorms, or potentially high breezes that harm electrical cables and hardware. Disruption in electrical power supply will cause interference with the effectiveness of the proposed solution.

5. **Network disruption**

   The whole system will be interconnected with each other using internal network infrastructure. A small amount of downtime created by unexpected network discontinuance will cause major disruption in the business process and significant expense, in terms of losing revenue.

6. **Fault in ticket booking**

   Any fault in the ticket booking process or cancellation of the booked tickets without charging any cancellation fee because of system failure will cost the revenue of the company.

7. **Misuse of equipment/ stealing**

   All the spectators are going to have their private touch screen smart devices attached to their seats. Any misuse of the provided equipment or stealing will result in a loss in revenue for the company. Furthermore, the company may get bad reviews or complaints from the next spectators who are supposed to use that facility next. Installed CCTV-camera service will help to detect the person responsible and can be held accountable.

7.1.2 Solution Technologies / Hardware Risks

S No.	Risk Description	Intensity	Strategy
1	Fault in EFTPOS Devices	**HIGH**	Physical examination and testing of all the EFTPOS devices every three weeks
2	Sensor malfunction in PlacePod	**LOW**	Necessary vendors will be contracted to solve this issue within one day
3	Unresponsive touch screen in private devices of VIP customers	**MEDIUM**	Extra devices will be available on the premises to replace the damaged ones, and within one week the maintenance of the damaged devices should be done
4	Broken charging station inside the stadium	**LOW**	Examination and testing of all the charging station every one month

Table 7.1.2 Solution Technologies / Hardware Risks

7.1.3 Software Risks

S No.	Risk Description	Intensity	Strategy
1	Scamming risk due to PayPal	**MEDIUM**	Having written refund policy with PayPal
2	Missing information due to integration problem with Transport NSW open data program	**MEDIUM**	Increased alignment and real-time integration with Transport NSW open data program to the system
3	Incompatibility with smartphones	**LOW**	Updating compatibility of the mobile application twice every year
4	Slow software operation due to bottleneck situation	**HIGH**	Updating with strong scalability in the software design

Table 7.1.3 Software Risks

7.1.4 Data Risks

S No.	Risk Description	Intensity	Strategy
1	Vendor lock-in (vendors having access to the personal data of the customers)	**MEDIUM**	Written legal contracts with the vendors, mentioning the convenient workflow and signoff.
2	Data theft by the invasion of hacker	**HIGH**	Capturing all traffic 24x7 on the fastest link and monthly inspection of the archived traffic to determine any sign of data leak.
3	Risks of exposing data due to multi-tenant environment in Amazon EC2	**LOW**	Taking control by defining different access levels and monitoring dataflows across the network
4	Data loss due to Incorrect security setting in S3 data storage	**LOW**	Rechecking the lockdown ACLs (access control list) to the Amazon S3 bucket and maintaining well-configured bucket policy.

Table 7.1.4 Data Risks

7.1.5 Fraud Risks

S No.	Risk Description	Intensity	Strategy
1	Misleading data provided by customers while booking the ticket	**HIGH**	Confirm booking after confirming personal identification
2	Using parking facilities through the mobile application without booking tickets/ Tailgating in parking space	**LOW**	Parking solution will be provided only to those spectators who have booking ticket confirmation

Table 7.1.5 Fraud Risks

7.2 Risk Management

Priority-wise risk management:

Risk Intensity	Time limit to resolve the issue
High	Within two hours
Medium	Within four hours
Low	Within one day
Negligible	Within one week

Type of risk management

S No	Risks	Management Measure
1.	Unexpected IT Outage	Regular health check-up of overall connections of the devices every month.
2.	Faulty AI technology	Using the Algorithmic hygiene framework in parking solutions will mitigate this risk.
3.	Information theft	All the personal data including credit card information will be encrypted before storing
4.	Power outage	Backup power supply will be provided in the premises
5.	Network disruption	Redundant network service will be provided
6.	Fault in ticket booking	Several testing will be done before implementing ticket booking facilities in the system, fault checking on regular also be performed at the proper interval after implementation
7.	Misuse of equipment/ stealing	CCTV camera footage will be monitored closely to mitigate this risk.

7.2.1 Backup Strategy

To run a successful business, any company needs to have an effective and comprehensive backup strategy plan. To formulate a backup strategy plan, first, we need to decide which are the most crucial data for the company that needs to have a backup. Then we have to determine the data backup plan along with the frequency of the procedures. Finally, the whole backup strategy will go through several testing and monitoring to measure the accuracy of the processes. For Wombat's Rugby project, we developed back-up plans for several crucial factors:

1. **Data Backup Strategy:**

   We are using Amazon S3 service as our cloud storage device to store all the data related to customers, employees, players, teams, and matches. These essential data will be stored in different servers of multiple regions to ensure the redundancy. Automated data entry solution we also are integrated to prevent any data loss in case of IT outage while storing the data. Data backup procedures will be performed every day at 1 am and 1 pm.

2. **Network outage backup strategy:**

   A lot of factors can create a network outage, such as- Network configuration issues caused by human error, a down interface link of a network device, bottleneck situation, damage of network device. All the network services will be documented and stored in the backup server periodically every month. In addition to that, monitoring line networks and using the auto-discovery procedure will be performed twice every month to find faults and breakage in the entire system. Any issues found from this procedure will be solved within 1day.

3. **Physical resource backup strategy:**

   In Wombat's Rugby project, we are using a lot of high-cost equipment to create an amazing and exciting experience for the spectators. A backup strategy plan needs to be in place to use at the time of any disaster to protect these physical resources. A list of all the physical facilities with service qualities will be documented. The list will be updated every week on Saturday by carrying out a daily check-up of the physical equipment's condition and performance

7.2.2 Disaster Recovery

Despite having a strong security and safety policy, every company should detailed disaster recovery cycle with step by explicit step guidelines. To have an organized business continuity plan, our stepped disaster recovery plan is given below:

1. Analyse and determine the type of determination. All the following steps will be finalized depending on this step
2. The next step will be mitigating the disaster to minimize the risk as soon as possible
3. The following step is tracking the cause of the disaster and analysing the cause.
4. After that, the responsible way of the disaster will be established depending on the type of disaster
5. Recovering the lost data and information will be a step of this disaster recovery planning

7.3 Staffing and Training

Staff requirement planning and recruitment is a process where a company identifies its need for human resource professionals to run the company smoothly and achieve business goals. In this section, we pointed out the individual work responsibilities of the staff during the project implementation as well as in the recurring stage. Furthermore, we developed a training program to train the staff with the necessary skills to operate the whole system on a regular basis.

7.3.1 Staff Requirements (for the management of the solution when live)

Staff requirements of the Wombat Rugby project can be divided into two segments- initial implementation stage, ongoing stage.

7.3.1.1 Initial implementation stage:

Position	No. Of staff	Responsibilities
Project Manager	1	- overall project planning and implementation - following up with project progress systematically - managing project requirements
IT Manager	1	-implementing and monitoring all the hardware and software requirements -creating IT and business alignment strategies -reporting to project manager
System architect	4	-overall design and integration of the whole system including hardware, software, and database -defining system backup strategy
Network Architect	3	-developing network solution according to business requirements -designing and modeling of the network structure and extension to the network
Database Engineer	3	-determine the structure of the entire database -designing, developing and implementation of database architecture according to business need -establish data loading and extraction process
Software tester	3	-documenting software test scenarios according to software requirements -performing software test to determine software reliability and performance -documenting and analyzing test results
Data scientists	2	-building a custom data model and AI algorithm for face detection feature of the system. -monitoring accuracy of the data models.

Table 7.3.1.1 List of Implementation Staff

7.3.1.2 Project ongoing stage:

Position	No. Of staff	Responsibilities
IT team leader	1	-monitoring and maintaining the overall IT project -managing and coordinating the IT team
Network specialist	2	-conducting network troubleshooting to diagnose network problems and derive possible solutions -performing network quality check-up periodically -reconfiguring networks according to business requirements
Hardware specialist	2	-monitoring hardware health and performance -troubleshoot common hardware problems -communicating with external hardware vendors
Database admin	2	- facilitates data storage access according to project need -control read/ write privileges of IT support professionals -configuring and rechecking Amazon S3 bucket access control list periodically
IT support help desk	6	-troubleshooting common technical issues -communicating with the customers/spectators and providing general IT solutions -understanding the complex IT issues and forwarding them to specific specialists (hardware, software, database)
Trainer	3	-developing and updating training materials to train the staff about the system -conducting and guiding training sessions -monitoring the new staffs for 1st one month on how they are handling the software and the technical equipment.
Business analyst	2	-providing insights via data visualization to create a marketing strategy and improvise product solution.
Cloud solution architect	1	-creating a new user account to have access to cloud applications. - monitoring the company's cloud privacy to ensure IT security.

Table 7.3.1.2 List of Project Staff

7.3.2 Training Programs

After the implementation of Wombat's Rugby project, the company will need a set of well-trained staff with the necessary skills to run the system solution successfully. In this section, we have documented the planning of the training programs and processes. To establish a successful training program, we will follow these necessary steps-

1. Identify training goals and objectives
2. Document training plans including delivery methods, communication style, timelines, and effectiveness measurement process
3. Develop the content of the training
4. Survey to measure the effectiveness of the training program

The training will be conducted in several segments, and both technical and non-technical staffs will be participating in these training-

1. **Orientation:** In the orientation segments, all the staff will get acquainted with overall system features and operations. Staff will also get a knowledge of business goals, views, and objectives through this segment. The materials of the training will also be handed out to the staff on that day.

   Duration: 2 hours

   Delivery method: Face to face
2. **Product and service knowledge:** In this segment, the staff will be introduced to our solution services and products as well as the deliverables we are trying to achieve through the solutions. This training is held separately for different departments handling different parts of the system. Staffs will be trained on both the general module and in-depth module of the product & services.

   Duration: 1 day

   Delivery method: Online
3. **Soft skills:** The staff will go through a short training session in the soft skill-building segment. By participating in this segment, they will build interpersonal communication skills and learn how to achieve a successful working relationship while working in a team.

   Duration: 2 hours

   Delivery method: Online

4. **Technical skills:** Through this segment, the staff will learn about the technical solutions of our system and how to operate them daily. They will go through the process where they will learn how to module their skills and experiences according to the system's technical features. This segment will be conducted in 2 phases-

   Standard technical skills- for all the team members

   Comprehensive technical skills- for different team handling different responsibilities

   Duration: 5 days

   Delivery method: face-to-face

5. **General equipment operation skills:** In Wombat's Rugby project, we have implemented a lot of high-functioning equipment. A general will needed to train the staff on how to operate this equipment. In this session, the staff will get acquainted with the integrated hardware of the system and their functionalities.

   Duration: 3 hours.

   Delivery method: Online

6. **Customer service skills:** This training session will be solely dedicated to the customer service team members. They will get training on how to troubleshoot general IT issues encountered by the customers/spectators and recommend possible solutions.

   Duration: 1 day

   Delivery method: Face-to-face

8 Project Management

8.1 High-level overview of Rollout & Project Implementation strategy

"The Wombats Rugby Stadium" is to be opening with the modern technologies in Sydney. In our approach, we will have three development teams consecutively on database development, software development, and cloud application development. The plan will deliver an advanced application along with various functions to distribute the best services and all information about the stadium matches, transport, and for the user. For this purpose, those approaches convey an extraordinary experience to the audience. In the stadium, there will be VR technologies for the private box audience, AI technology will be used to help customers to find the best parking spot at the venue, and every viewer will be able to use private touch screens at their designated seat, also will be applying high technology- Face Detection when entering the Stadium for security purposes. The project will be complete in 18 months.

The project will begin with the project study. It is the first process to distinguish the project problems, its outcome, alternatives, aim, objectives, the project process, goal, timeframe, budget, stakeholders, and partners. The useful resources assembled can help to comprehend the obligation and conditions of the project in-depth and the viewpoint of the business partners and stakeholders. Moreover, the project design, layout, and expectations are discussed. The project study will admit the criterion to regulate the associates to commence.

The second part is the Pre-planning. It is to manage wisely to select and negotiate with related stakeholders, partners, community members, and analyze the gathered requirements that benefit solutions. This procedure will discuss which technology will fit the project and provide benefits to the audiences. The pre-planning will be complete from the scoping stage. Planning resources, for instance, online-Visual Paradigm, UML, user stories, and MS-words and other tools, are utilized to pursue a resolution. The selected partners are to be reviewed with the explicit objective to have an upcoming solution and consistent.

Third Part is Requirement Gathering, one of the most critical processes in this project. The purpose is to produce a record of technical, system, and functional requirements from the different business partners and stakeholders. This gathering requirement

specification process will benefit management, and it will determine the key objective, background resources, and related information to extra appropriate material. It can be done during the stakeholder meetings; the techniques used for requirement gathering in this project are interviews, use cases, and questionnaires.

The fourth part is Scoping. It is to identify the project scope to provide the borderline of the project describes in a detailed explanation of various sections that are related to the solution also that are irrelevant to the solution. Project planning, which included project scope, contains defining and proposal a list of project aim, objectives, deliverables, structures, purposes, responsibilities, duties, timeframe, and budget.

Fifth Part is High-Level Design, which included two main parts, that are Preliminary design and Design overview. This architecture figure provides an overview of the whole system, showing the primary modules which produce for the services and method. The HLD documents embrace a high-level architecture figure that portraying the structure of the systems, for example, database, application, and technological architecture. The highest-level design defines every stage, scheme, products, services, and method which contains the significant implementations that require to be complete to them. The HLD uses generic to moderately technical phrases for a user of the system.

Sixth to Eighth part is Network setup, hardware setup, and software development. All attributes are to reach with distinct and advanced and updated features to audiences. In the hardware setup, we used the latest devices for the spectators. For instance, Private Screens, Sensors in parking spots, Face Detection Cameras, Network Video Recorder (NVR), 3D Cameras, and Virtual Reality Headsets to ensure they may have extraordinary experiences. In software development team is responsible for website and application for mobile users, they will finish promptly with quality services. Once it is completed, customers can use web services or applications to access useful information. Some key features for the website included upcoming game/event details, online purchasing of tickets, select parking spot or public transport, staff management, and order food online. Other key features of the mobile application are Online Purchasing of tickets after Face verification, select parking spot or public transport, Details of User and Transportation Details. Meanwhile, installation for network setup, hardware setup, and the software will begin when site furnishing is complete.

Ninth Part is Database Development; the goal is to deliver a comprehensive description of the project. We use Amazon cloud services (AWS) to provide a distributed relational database and supports access distributed data on a single platform. We are also selecting Amazon RDS as it easy to access the various databases built on different database tools that can provide a centralized backup system.

Ten Part is System Integration; an effective integration development performance can cover a wide-range scope to certify the initiative encounter every detailed requirement. It includes integrating current sub-systems to produce distinct & latest value to the audience and users. It is to have efficient communication and interaction across the IT system team members to hastening information flow & decrease the operative budget for the department. Integration is the move of carrying minor sections into one system that purposes as one. These relations often developed along the sections of the flow and control layer of the individual system to help the free flow of data over the systems.

Eleven Part is Testing. Testing is to be performed to validate adaptableness, flexibility, dependability, and consistency of the solutions. The testing is to syndicate all the former components together, specifically the mobile and website need to run flawlessly with zero errors. The IT team is involved and respond to this testing. Testing will help regulate when two interconnected errands or results run as projected. Testing is completed in times with individual section link of the solutions that attach another is tested after execution. Many testing tools and real-time circumstances and conditions are utilized to examine and assess the solutions offered.

The twelfth part is Training. It is a significant stage in the planning process. All staff will be required to attend a training program. It is essential to verify every staff comprehends the duties without any doubt. First, begin with the implementation teams then to the ongoing management staff. The implementation team is giving the training previously to run the execution stage. The training and staff program and plan correspondingly have been explained in the earlier section of the report.

The thirteenth part is Implementation. The implementation of tactics and plan is utilized to execute the project. It is to records the project working and well to use. The strategy indicates the change management process, workflow, training, and meetings. This process is the critical stage that records the project shifting from the closed stage (succeeding testing, user plan & strategies, evaluation) to the open stage.

The final part is Support; it is prepared and part of the project. It is delivered by estimated SLAs, along with maintenance of the resolutions.

After several weeks of preparation for opening the stadium, thoroughly assess the testing system, the staff will retain and sustain the system, and keep to the update and ensure the system working at the best result. All team members know their responsibilities and ensure they can complete within budget and on time.

8.2 Project Plan

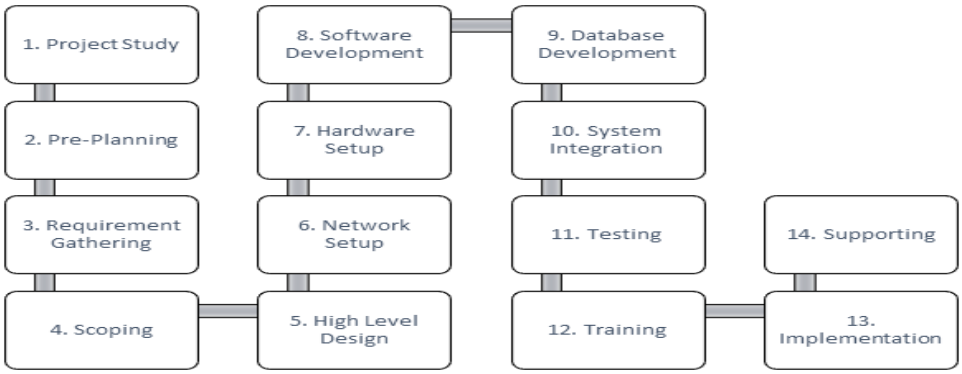


Figure 8.2 Project workflow

8.2.1 Phase 1 – Project Study

To begin, the project manager in this phrase will lead the project by meetings with different stakeholders and to understand the nature of this project to identify project processes, requirements, problems, goals, objectives, timeframe, and budget.

8.2.2 Phase 2 – Pre-Planning

Project Manager can consolidate the ideas from different stakeholders and business partners to provide an optimal solution for what devices, technology, software, and applications best fit for the project.

8.2.3 Phase 3 – Requirement Gathering

After pre-planning phrases, different techniques are utilized to produce the list of technical, system, and functional requirements of the project.

8.2.4 Phase 4 – Scoping

Scoping included two parts, which are scope and assumption. It provides the borderline of the project and describes in a detailed explanation of various sections that are related to the solution.

8.2.5 Phase 5 – High-Level Design

HLD will be performed; the architecture diagram provides an overview of the whole system, showing the primary modules which produce for the services and method.

8.2.6 Phase 6 – Network Setup

Inspect and install the cable or wireless internet equipment. Configure internet equipment. To test the usability and feasibility of the network.

8.2.7 Phase 7 – Hardware Setup

When the network setup is complete, the hardware setup will begin to install and test the hardware systems in the Wombats Rugby.

8.2.8 Phase 8 – Software Development

The software team can start the install software on the hardware devices. Such an example is the Wombats Rugby Web Portal and App.

8.2.9 Phase 9 – Database Development

Procured indispensable database, implement database, inquiry DMBS, obtain the pilot function of DBMS, test pilot DBMS, purchase the DBMS, test, and add new DBMS to the rest of the IT network and ensure is working with network and all other applications.

8.2.10 Phase 10 – System Integration

System Integrator will conduct system Integration. When the system integration phase is complete, the testing phase will be followed.

8.2.11 Phase 11 – Testing

The testing phase will be performed by the system tester and followed by the managers and the implementation teams. The entire preceding stages are required to complete and provided their last products.

8.2.12 Phase 12 – Training

Prepare the teaching program of the new system for staff, classify, and schedule the staff for training, arrange appropriate training classes, conduct training, and assess and evaluate staff skills of using new systems after the training.

8.2.13 Phase 13 – Implementation

After the training phase, the devoted team will continuously monitor the process of the project. The change management process will be used to execute the project.

8.2.14 Phase 14 – Supporting

Supporting phrase is the final phase of the project, as included in the solution, and divided into two segments: long term and short-term support. Service Levels and Agreements distribute it; it ensures the maintenance of the systems.

8.3 Project Management

8.3.1 Project Monitoring

Project Monitoring, Change Management, and Project Staff Requirement are significant to the success of the "Wombats Rugby" project. This strategy allows the project manager to distinguish the issues, concerns, and challenges in advance to convey these to the appropriate groups (such as Sponsors, clients, project team and other related stakeholders, etc.). Also, to prepare substitutes or options on better how to control these issues, concerns, and challenges.

This project will contain a variety of strategies to certify the project is remained on schedule and within budget. These strategies will include meetings, reports, a project staff requirement, and a project change management process.

8.3.1.1 Project Meetings

Several meetings will be held throughout the project. It is to maintain the stakeholders updated on how the project is progressing, make amendments if necessary, and provide regular updates amongst the project team.

The below table summarizes what meetings will take place throughout the project and the frequency.

Meeting Type	Description	Held by	Attendees	Frequency	Time Hours
Kick-off Meeting	Introduce its aim and goals and overview of the project. Proclaim the duties and responsibilities of the people in command. Formally start up the Project.	Project Manager	Project Manager, Project Sponsor, Project Team and Stakeholders.	Once-Beginning of the project	1.5
Stand-up Meeting	For the project team to distribute what has been done, recent tasks, and any concerns.	Project Manager	Project Manager and Project team	Fortnightly	0.15
IT Meeting	Discuss the cooperation aspects with the IT sector.	Project Manager	Project Manager, Project Staff and Sstakeholders	Monthly	1-1.5

Financial Meeting	Discuss the cooperation aspects with the Financial sector.	Project Manager	Project Manager, Head of Finance & Finance / Accounting staff	Monthly	1-1.5
Project Team Status / Project stakeholder Meeting	To follow up and review and deliver updates on the development of the current project to the stakeholders. To discuss and determine concerns. Additionally, to close deliverables once they have been finished hence new tasks can start.	Project Manager	Project Manager, Project Stakeholders, and Sponsors.	Monthly	1
Steering Committee Meeting	Report recent improvement and changes in the project and inspect whether the project is correct.	Project Manager	Project Manager, stakeholders and Steering Committee.	Monthly	1
Community Consultation Committee Meeting	To give discussion connecting an advocate / supporter and spokesman of the community, stakeholders, local council on concerns involving this project.	Chair of Community Consultative Committees	Independent Chair, Community members, Project Manager, Local Council Representatives, Stakeholders, Guess Speakers.	Monthly	1.45 - 2
Change Request Meeting	Discuss change request	Project Manager	Project Manager, Project stakeholders	Once-when it required	0.5 - 1
Project Closure Meeting	Officially conclude the meeting once every obligations and deliverable have been gathered. Assess the outcome of the project. Recap the experience gained from this project.	Project Manager	Project Manager, Project Sponsors, and Project Stakeholders.	Once- End of the Project	1

Table 8.3.1.1 Project Meetings

8.3.1.2 Project Reports:

Reports will be frequently issued to the expected personnel of the project. The report will be containing routine status updates to certify tasks are being finished on time and within budget.

Below is a table of categories of reports and their frequency.

Report Type	Description	Distribution List	Frequency
Monthly Status Update	To provide a summary of tasks completed in the earlier month, also plan for completion in the coming month and concerns status.	Project Manager, Project team, Project Stakeholders and Project Sponsor	Monthly
New Location Proposal Report	To give the Project Sponsor and Finance Stakeholders a request of the possible site before purchasing.	Project Sponsor and Finance Stakeholder	Once- When the site has been discovered but not yet purchased.
Project Closure Report	Gives a report with tasks completed, which specifications were encountered, and the total cost of the project.	Project Manager, Project Stakeholders and Project Sponsor, Project Team	Once- the end of the project

Table 8.3.1.2 Project Reports

The project planning is the initial phase where a project schedule is prepared. For the Wombats Rugby project, a project plan will be created before any of the processes are implemented. The project plan will include breaking down every task from highest to the lowest level, the schedule, and the timeframe allocated to each task for the project. The completion of a detailed project plan will indicate that the project phases can now be implemented.

8.3.2 Change Management

Many businesses and corporations will continually change. Change is essential for progressing and profitability. Such actions included procedures modifies, innovative technology changes, compliance initiatives, reforming the structure, and consumer facilities advancement. A steady change management process can support in reducing the effect of proceeding with your business and your workforce (Smartsheet 2020).

Change management is the regulation that directs how we plan, organize, provide, and assist people in embracing implement to lead executive achievement and consequences effectively. Change management provides a structured methodology for helping the people in your association (Prosci).

We believed by applying a change management approach, it can benefit this “Wombats Rugby” project in many ways. Underneath sections such as three levels of Change Management, Kotter's eight steps change management approach, frequent issues, success, and failure factors in change management.

8.3.2.1 Three Levels of Change Management

1. **Individual Change Management:** Individual change management involves the comprehension of a person's experience change, and the factors require to change effectively. Similarly, it allows understanding the elements can help individual compose a positive conversion: Appropriate information, sufficient time, and training, and to adopt new changes in the new environment (Prosci).
2. **Organizational Change Management:** In change occurs at Individual change stages, which is difficult for a project team to cope with implementation on one on one basis. Organizational change management delivers the steps and activities to take at the project level to support the groups or single persons who are affected by a project. Organizational change management distinguishes and identifying those who are required to change during the outcome of the project. The critical activities in organizational change management consist built a specific strategy for maintaining the effected workforce to obtain the alertness, management, education, and training required to implement effectively. Organizational change management's emphasis on good personal transitions would be the primary goal and actions. Organizational change management is significant to project management. The differences between project management and change management are project management maintains the project method is designed, built, and distributed. In contrast, change management offers the project solution is successfully comprised, implemented, and utilized (Prosci).

3. **Business Change Management Capability:** Business change management is an organizational core competency that delivers aggressive differentiation and the ability to adapt to the ever-changing world effectually. Business change management capability means tremendous change management is embedded in the company's responsibilities, framework, procedures, projects, and management competencies (Prosci). Change management processes are persistently and effectively applied to initiatives, managers have the skills to lead their workforce via implementation, and teams understand what to ask for to be successful. The result of business change management capability is that personal adopt change further rapidly and effectively, and corporations can react rapidly to Industry changes, comprise planning initiatives, and undertake new technology approach more rapidly and with lower efficiency influence. This capability does no longer occur via chance but allows a tactical method to embed change management throughout an organization.

8.3.2.2 Change Management Responsibilities

Stakeholders	Change Management Responsibility
Change Control Board	Necessary review and approval (or reject) of change request.
Steering Committee	Final review and approval (or rejection) of change request.
Project Manager	Manage the team to support the change.

Table 8.3.2.2 – Change Management Responsibilities

8.3.2.3 Change Management Process

Activities	●Assess change ●Assess impacted group ●Assess group sponsors ●Define the change as part of the charter	●Assess sampling of impacted individuals ●Assess communications ●Design the communications feedback processes/ tools	●Assess sampling of impacted individuals ●Assess impacted group ●Identify the source of resistance	●Assess sampling of impacted individuals ●Assess communications ●Identify new roles, tasks, tools, equipment's	●Assess Behaviour change ●Identify Implementation issues
Deliverables	●Assessment results ●Change definition ●Change Management strategy ●Risk Management Plan ●Communication Plan	●Assessment results ●Sponsor plan ●Updated communications plan	●Assessment results ●Resistance Plan ●Updated communications plan	●Assessment results ●Training Plan for staff	●Training plan and tools ●Recognition and rewards program ●Integrate into a performance management system

Figure 8.3.2.3 Change Management Process

In the "Wombats Rugby" project, the change management process outlines the implementation proposed and adopted to help progress and enhancement in the organization, and implementation which unforeseen hence required by the conditions and situations.

The "Wombats Rugby" project includes three main phases that is 1) Preparation for change, 2) Managing change, and 3) Emphasis Change.

In phase 1 mainly include defining the change activities and strategy. The questions may ask during period 1; is it necessary to have new business partners or stakeholder engagement to make the initiative effective? What methods can impact this initiative?

In phase 2, it contains the steps to measure. It analyzes and the various activities such as to assess communications, Design the communications feedback processes, Sponsor plan, Updated communications plan, Assess sampling of impacted individuals, Assess affected group, and Identify the source of resistance. Kotter's Eight-Step Change Management Process will be used during this phase.

In phase 3 is the emphasis change process, which includes improvement and control procedures. The activities are Assess sampling of impacted individuals, Assess communications, Identify new roles, tasks, tools, equipment, Assess Behaviour change, and Identify Implementation issues.

Underneath we provide eight steps Change Management Process used in the "Wombats Rugby" project.

8.3.2.4 Kotter's Eight-Step Change Management Process

1. **Create Urgency**: Share the earnestness of change to others. Begin with the Objective, always prepare for change and adapt to new aspects. Apply data and graphical demonstrations to deliver the purpose of change that can benefit the team members (Tutorials point).
2. **Form a powerful coalition**: Knowing who to work with is vital for any project. During the change process, many people will get involved. Find the right person, develop a team that people can help you to achieve the vision. Take and lead the team; exchange the ideas of change—delegate duties and to each member. On the other hand, it is essential to recognize the team members at all organizational levels. These people will bring different skills, experiences, and even perspective on the table. To support and mindful and include those in the change management team.
3. **Create a vision for change**: The vision can be the final goal for everyone. Understand the vision can help the team and the stakeholders recognize the purpose of working on the change process. The initial stage of the process is to express a vision of the final goal. Build your team and reinforce the message to everyone. Overcome obstacles is essential. Invite more people to join the group. Consider individual concerns, listen carefully. Be sincere, an open mind, and effective communications can benefit to the process.
4. **Communicate the vision:** Communication is the key to the success of any project. It is essential to share the same vision and insights. Always maintain the same principles and aligned with the organizations so that everyone is unified. Minor implementation unlikely to have a big effect on the project. However, it should associate with objectives, which eventually oblige the tactics efforts.

5. **Remove obstacles:** Continually pay attention to problems and eliminate them immediately when they are revealed. There are many challenges during the change process; these may consist: further education or new skills, aspects that stop change, extra new equipment or systems for new means, restructure work details, and revise performance review standards.
6. **Create short-term wins:** It is essential to acknowledge the final success of the project. Meanwhile, to make Rapid Successes to the team and those who get involved by the change process. It is an excellent path to push the team forward and have fulfillment, and the organization can instantly observe the benefits of the implementation initiative. The initial aim can be reachable, giving you and your team a motive to praise relatively quickly after the change. It will benefit the adaption in cooperation with the change management process in addition to the implementation (Smartsheet 2020).
7. **Build on the change:** It is crucial to finish the change process. As we know in change management involves planning, organizing, leading, controlling, and monitoring. The early stage needed additional observance. The questions can ask, such as are implementations continuing when anticipated? Do unexpected issues prevent the implementation of change? What are the unforeseen adverse effects? It is essential to be motivated and be consistent. Have frequent meetings can help to discuss matters that need to improve or the challenges facing (Tutorials point).
8. **Make it stick:** Apply structure to integrate implementation in life and shared lifestyle and values (Tutorials point). Principles of Monitoring is useful, and it can help the organization to have more control. Always be aware and be sensitive to unusual matters. Act when needed.

8.3.2.5 Frequent issues of Change Management

1. Change management is encountered with the underlying complexities of integration and navigation and human issues. Change management is required to consider the individual part that feels and how they are managed play a substantial role in applying change effectively (Wikipedia 2020).

2. The human aspects of change management could be harsh to measures and predict, as an individual do not naturally like modify or adapt. Many change methodologies concur that change is challenging. Consequently, engaging teams and organizations ahead of time, employing process, continually adapting for progress is vital to achievement. Such activities consist of preparing, procurement, procedure, materials, effective communication, and continuous evaluation (Smartsheet 2020).

8.3.2.6 Factors of success and failure in change management

a. **Reasons for success in change management:**
    1. Identify measurable, which plan and develop a commercial case for their accomplishment that would be continuously revised.
    2. Monitor changes, threats, needs, budget, ethical and social concerns.
    3. Efficient communication, which notifies multiple stakeholders of the explanation for the implementation, the advantages of effective execution, and specifications of the change.
    4. Develop efficient instructions and training for workers in the companies to follow.
    5. To offer an Individual Interview to relieve several implemented-correlated concerns.

b. Reasons for failure in change management
    1. Misunderstanding or poor communication with the stakeholders.
    2. Begin on a solution ahead of the primary issue is completely comprehended.
    3. Not justify and confirm the recommended resolution. Ineffective strategy for assurance.
    4. Have not considered with Contingency and Risk.
    5. Not devote time on methodically investigating the individuals and styles that are engaged.

8.3.2.7 Project change control process

It is unavoidable that changes occur in the project. Project changes must be controlled by ensuing a specific project change control process to maintain project steadiness.

The following are the steps performed in the 'Wombats Rugby' project to receive, assess, accept, reject, or defer proposed project changes.

a. Submit the change request with supporting statements to the project team, **including**:
    1. **Actual request:** State the change item clearly
    2. **Reason for the request:** Present the potential impact on the project if the application cannot be completed in time or explain why the request is needed
    3. **Conditions of success:** List the requirements are expected to meet to achieve the success of the change
    4. **Expected value:** Present the value gain from the completion of the request
b. Review the change request with the whole project team during a change request meeting
c. Categorize changes, define options, and create a response document to the stakeholders, **including**:
    1. **Categorize changes into three groups:** changes that must have, changes that are good to have, and changes that the project can live without
    2. **Option number and name**
    3. **Proposed solution:** Propose a feasible solution to the change request
    4. **Proposed timeline:** Propose an estimated timeframe to show how long the solution will take to be done
    5. **Impacts on the project:** State the cost of the changes and the potential influence on the result of the project clearly
    6. **The expiry date for proposed changes:** Set a time and duration for the stakeholders to consider the change options and make the decision

d. **Final decision and approval:** Accept, reject, or defer the proposed project changes.

Furthermore, all the change requests that are received during the 'Wombats Rugby' project will be recorded in a change request log for future reference.

8.3.3 Project Staff Requirements

The Project Staff requirement has occurred in the implementation phase; these staffs are significant to the project. When the project is complete, implementation members are not required, while recurring staff will be involved and perform in the regular operation and support the daily activities of the business. For Staff, Requirements can go to section 7.3.1

The below table will present the details of the implementation members.

S No	Position	Responsibility	No of Staff
1	Project Manager	-Accountable for the project requirement, scope, activities planning, time estimation, the first point of contact, monitoring & Control & quality processes, and budget approvals. -Accountable for implementation plan and tactics and authorization for a backup plan.	1
2	Project Coordinator	-Helping Project Manager organizing and managing project schedules, resources, tools, and equipment. -Communicating with customers to identify and outline project requirements, scopes, and its aim. -Certifying the customers' needs are encountered as the project changes -Collaborate with the implementation team members and develop a good relationship. -Summarize the reports of the project and be prepared to present useful information to other stakeholders, for example, the organization's management and the team members.	1
3	Business Analyst	-To complete business analysis with the help of data perceptions, visions, and understanding. -Recommend business improvement ideas, strategies, and approaches.	1
4	Software Developer	-In charge of distribution or integration of off the shelf software presented. -Install & setup the software -Assess and examine the software -Make software implementation when needed. -Fix the software bugs (debug).	4

5	System Integrator	-To model, plan, develop, synthesize, and change technical applications that are personalized to encounter an organization's requests. -Along with specialists and experts in the IT section, systems integrator assesses and examines and verifies software to regulate suitability earlier integration into the corporation's primary system.	3
6	System Testers	-System testers encounter with managers and implementation teams to comprehend the systems they examine and to produce testing tactics approaches and strategies for an individual system. -Testers classify what sections of a system can be assessed utilizing automation tools and the parts that entail manual testing. -Tester to certify the system is creating output as desired.	3
7	System Architect	-System architects oversee designing and changes impermanent & extended tactics aims and objectives for coordinating and sustaining software and systems. -System architect required every planned and establish system architectures are associated with a certain company's goals.	2
8	Database Specialist	-Obtain the request from in-place operators -Monitor, update, and maintain the database. -Produce reinforcement and improvement approach. -Accomplish capability planning and fixing and assured the Database system.	2
9	Network Specialist	-Installation and set up the network system. -Network configuration. -Troubleshoot network when required.	3
10	Hardware Specialist	-Installation and set-up hardware system. -Adjust hardware systems as required. -Troubleshoot hardware system as needed.	3
11	Change Manager	-In charge of the change management process (see section 7.4.2 Change management)	1

Table 8.3.3 List of Implementation Members

9 Support

9.1 Overview

iStadium must provide full technical support to the Wombats Rugby project to render this project a success. Implementation teams such as Stadium devices (VR, Private Screen, and Parking) implementation team, website and application development team, and system integration team, which will also be there other than those outlined in section 7.3.1.

Support for varieties of solutions has been classified into separate teams based on their roles and responsibilities. Some of these are list below based on the solutions and personnel responsible for it.

Solutions	Responsibility
Biometric Solution (Face Detection), Virtual Stadium Solution, Private Entertainment Solution	System integration team or System Architect
Wombats Rugby Web Portal	Website Developer
Wombats Rugby App	Application Developer

Table 9.1 Solution support responsibility based on their role

9.2 Implementation Support

It is essential to offer a committed team for a project to succeed. In order to respond to any complaints and queries during implementation, our implementing team will be working closely with the client. We will have a qualified project manager who will be looking after the complete implementation process of the software. He will also be capable of managing the people, processes, and technologies to perform the task at every stage and to communicate with relevant stakeholders adequately.

The implementation teams were established in section 7.3.1, where they were provided with equipment and technology complementing their potential skills to execute this project successfully. Project Managers utilize web-based tools – Jira to track and keep an update about the project. To build and implement the various solution, Software developers will use software development environments such as XCode, Android Studio, My SQL, and GitHub. In order to provide adequate assistance for this project, the project manager will continuously monitor the tasks to detect any defect/ issues is impacting the timeframe of the project or not; therefore, the project manager will take appropriate action if necessary to implement the project on time.

9.3 Post Implementation Support

Post-Implementation support is usually given after the implementation of the project, which is generally after going live. Support for visitors, staff, vendors, and players of Wombats Rugby will be provided in the post-implementation phase. To provide enhanced support to the clients and customers, we will be using a three-tier model which consist of Low, High, and Highest level. In addition to this three-level of support, we will provide all clients with a user manual to troubleshoot by themselves.

In case of any complaints, we will track them using are ticketing management software, which will track all tickets logged or support calls made. Therefore, this will make the support team monitor the issues and solved them as quickly as possible.

All these support services will be designed, keeping the company's future growth into consideration, due to which company will always have excellent client feedback and rating.

10 Service Levels and Agreement

10.1 Overview

This section will focus on the service level agreement of the iStadium's proposed solution for the WOMBATS RUGBY project. A service-level agreement (SLA) defines the level of service is expected from a vendor, specifying the metrics by which performance of the services will measured, as well as including the remedies or and back-up strategies if agreed-on service levels are not fulfilled. Specialist organizations need SLAs to assist them with overseeing client desires and characterize the seriousness levels and conditions under which they are not at risk for blackouts or execution issues.

10.2 Application Availability

The applications will be hosted by using the Apache server.

Service Level Description	**Specification/ indicator**
Availability for user navigation for the mobile app	20,000 users can use the application simultaneously on the scheduled game day and 10,000 users at any other time of the month.
Uptime for user navigation web portal	The applications will be available to the users 24/7, excluding the maintenance time
Percentage of PayPal availability and successful transaction time limit	99.9 % availability during business hours, all transactions will be responded within 10 seconds
Parking solution accessibility	99.5% availability through the app all the time
Amazon web service EC2 availability	99.99% availability 24/7 to response any SQL queries

Table 10.2 Service Level Arrangement for Solution of Application Availability

10.3Infrastructure Reliability

1. Backup local server: Local backup server with () storage will be available in the system and will be updated periodically to give back up service in any case of connection loss with the cloud storage.
2. Hardware health check-up and back up: Hardware specialists will be checking the health of the hardware each week and inform vendors in any case of issues.
3. Reliability of network infrastructure: The network infrastructure will be up 24/7 every day of the year, excluding the maintained time. The possible downtime for the maintenance will be 2-3hours.

10.4Transaction Times

Service Level Description	Specification/ indicator
Number of successful API requests from one application to another	100 requests per minute
Response time for HTTP requests from the user interface to Apache server	The system will respond to any HTTP request within ~500 milliseconds
SQL queries handled by MySQL in AWS	70,000 SQL queries per minute
Response time of face detection algorithm	250 milliseconds for each face detection

Table 10.4 Service Level Arrangement for Solution of Transaction Time

10.5Break-Fix

Outage Type	Response Time	Response Way	Guiding principal
Non-functional Eftpos device	2 day	Internal	In spot hardware specialists will troubleshoot to solve the issue
Damaged VR headset	1 day	External	Vendors will be contacted and if the device has the remaining warranty period it will be replaced with a spare one without any cost. Otherwise, it will be charged.
Broken private screen device	1 hour	External	Vendors will be contacted and if the device has a remaining warranty period it will be replaced with a spare one without any cost. Otherwise, it will be charged.
Fault between connections of devices	1 hour	Internal	In spot network specialists will troubleshoot the internal device connections from his portal to resolve the connection issue

Table 10.5 Service Level Arrangement for Solution of Break Fix

10.6KPIs

1. The downtime of the whole system can be expected less than 10 minutes
2. The system will have a successful throughput of 95% of the time
3. The system will handle 1000 successful ticket booking per hour
4. The food ordering application will handle 500 successful orders per minute
5. The parking solution will suggest 1000 successful parking solution per minute
6. The transaction time of electronic payments will be 10 seconds, with a 99% success rate, and all the revenue will be deposited in the bank within 2 days.

11 Costs

To establish the project as a true state-of-the-art 21st-century entertainment symbol, we have invested heavily in different technology-specific solutions. The term ‘value for money' has been kept consistent throughout the planning of the project budget.

11.1 Overview

It understands what the benefits and costs of a project help significantly in selecting the appropriate resources. The estimation of the project’s resources can also be a key factor in driving the project’s success. Therefore, to choose the resources that will suit the Wombats Rugby Stadium, a pro and con based decision-making strategy was implemented. A cost and benefits analysis has been performed for every alternative to the resource before selection. It can be challenging to draw such measurements since although it is simple to assign a monetary value to the resource, the benefits such as spectator satisfaction is difficult to estimate. Considering that this is a sound investment, the most suitable and best in the market resources, along with their costs, were chosen. The expenses have been divided into three segments: implementation cost, recurring cost, and total costs.

The initial costs include the initial costs such as recruitment, salary, and transport of the employees needed to initiate the project. The recruitment is to be done by Michael Page, a recruitment agency with four decades of expertise.

Implementation costs include the cost of technology systems such as the DBMS, hardware, and software, and salaries of other IT staff members. It also consists of all the expenditure required while establishing technological infrastructure. Training costs of the employees specifically while implementing software and hardware and all other technology installation such as seat screens fall under this category. Equipment cost during implementation is another expenditure that was considered.

Installing the technology is just half the job done as maintenance is key to a functional infrastructure. After the project is complete, there are incoming costs that need to be addressed in the budget. As the stadium will be running every day during the season, recurring expenses such as maintenance, adding new cloud servers or hosting, and staffing costs have been elaborated.

11.2 Solution Implementation Costs

This budget consists of two sections: initial and implementation. The initial costs include the short-term salary of the recruitment team and the initial contractual staff salaries, e.g., project manager salary and other expenses such as transport, computer devices for initial documentation purposes, and printing. The wages have been taken from existing market salaries from the job seeker websites. Transport such as company cars and computational devices are derived from online websites of certain providers. Implementation costs such as software, hardware, and database implementation are taken from the provider's official website. Other implementation costs, such as training staff about the new software and hardware as well as installation, have been discussed.

Solution Implementation	Costs (AUD)
Initial Costs:	
IT Recruitment Agency	900,000
Contractual Staff Salary	1,950,000
Project Staff Transport	5000
Workstation devices:	
Computers x40	30,000
Printers x5	15,000
Total	**2,900,000**
Implementation Costs:	
Hardware	108,517,970
Software	677,270
Database	62,247
Installation	135,000
Training	238,000
Total	**109,630,487**
Total Solution Implementation	**112,530,487**

Table 11.2 Solution Implementation Costs

11.3 Recurring Costs

This section consists of three sections, which are maintenance costs, additional computational costs, and permanent employee salaries, who will be responsible for the stadium's IT functionality. Considering the degree importance of this core functionality, a higher salary investment to hire the best in the market was decided. The maintenance costs include tech replacement at 5% every five years of each category, such as hardware (e.g., computers) and network devices. On the contrary, all media screens are to be replaced every two years or within a shorter timeframe when agreed. These costs have been estimated as an annual figure, and the additional charges have

been derived from the cloud provider's business website. Other staffing needs, such as training new staff, have also been considered and mentioned below.

Recurring Expenses	Amount (AUD) per annum
Permanent Staff Salary	**1,168,000**
Maintenance:	
Hardware & Network Devices	5,425,899
Software Licenses	311,370
Total	**330,000**
Additional Resources:	
Hardware & Networks Devices	120,000
Cloud Resources incl. DBMS	25,000
Total	**145,000**
New IT Staff Training	**12000**
Total Recurring Costs	**1,655,000**

Table 11.3 Recurring Costs

11.4Total Cost

The total cost contains all initial, solution implementation, and recurring costs for the first year only. As we can see, most of the total cost is solution-specific and the second most big number is the staff salary. For circumstances unknown, a significant amount has been kept aside, which is estimated at 8% of the total cost. These emergency costs are to be used in case of unknown circumstances and risks. According to our research, the benefits outweigh the costs, and therefore this budget has been chosen suitable for our goal, I.e., to achieve the maximum 'value for money.'

Expenditure	Amount (AUD)
Total Solution Implementation Costs	112,530,487
Total Recurring Costs	1,655,000
Emergency Costs	15,000
Total Cost	**114,200,487**

Table 11.4 Total Costs

12 Conclusion/Summary

To conclude, the proposed IT solution for Wombat's Rugby will enable them to accelerate the team's workflow as well as the players' performance by using multiple-system solutions. Our system will also provide its spectators with fantastic experience with integrated and modern information technology. In this project, we also designed the system layout to achieve IT-business alignment so that the solution can execute all the business goals successfully. This proposal will change the traditional experience of the stadium spectators henceforth.

13 Bibliography / References

Amazon, *Amazon RDS Features*. Available from: https://aws.amazon.com/rds/features/#ha [Accessed: May 22, 2020].

Amazon, *AWS Backup | Centralized Cloud Backup*. Available from: https://aws.amazon.com/backup/ [Accessed: May 22, 2020].

Apple, *Buy for trade in for a new iPad Pro- Apple*. Available from: https://www.apple.com/au/shop/buy-ipad/ipad-pro?afid=p238%7CLvkcHsEv-dc_mtid_18707vxu38484_pcrid_72086861464785_pgrid_1153388352817679_&cid=aos-au-kwbi-ipad--slid---product- [Accessed: May 22, 2020].

Barracuda Networks Inc (2018), *Replication to Amazon Web Services*. Available from: https://campus.barracuda.com/product/backup/doc/71238373/replication-to-amazon-web-services/?sl=AWNtrLEL2E_97iy_k3YS&so=3 [Accessed: May 22, 2020].

Bianca, A. (2017), *The characteristic of an organizational impact*. Available from: https://bizfluent.com/info-8546897-characteristics-organizational-impact.html [Accessed: May 22, 2020].

Biometric Solution, *Biometric Solution, Fingerprint Scanner, Fingerprint Reader, Thumbprint Software, Access Control Solution*. Available from: biometricsolution.com/ [Accessed: May 22, 2020].

Bradshaw, K. (2017), *4 Reasons Why Businesses Need to Regularly Back Up Information, Dobson Technologies*. Available from: https://www.dobson.net/4-reasons-why-businesses-need-to-regularly-back-up-information [Accessed: May 10, 2020].

Broekho, M. & Stomp, R. (2015), *Why Do Companies Need Data Governance? Viewpoints Media, LLC,* . Available from: http://viewpoints.io/entry/why-do-companies-need-data-governance [Accessed: May 12, 2020].

Cisco, *Cisco Firepower 4100 Series - NGFW Applicances - Cisco*. Available from: https://www.cisco.com/c/en/us/products/security/firepower-4100-series/index.html [Accessed: May 22, 2020].

Dell, *PowerEdge M630 Blade Server | DELL AUSTRALIA*. Available from: https://www.dell.com/en-au/work/shop/productdetailstxn/poweredge-m630 [Accessed: May 22, 2020].

Elmblad, S. (2018), *'Software updates and upgrades', The balance*. Available from: https://www.thebalance.com/what-is-a-software-update-vs-software-upgrade-1294256 [Accessed: May 22, 2020].

Gopro, *MAX 360 Degree Action Camera | GoPro*. Available from: https://gopro.com/en/au/shop/cameras/max/CHDHZ-201-master.html [Accessed: May 22, 2020].

Harvard Business Review, S. (2016), *'The Four Phases of Project Management'*. Available from: https://hbr.org/2016/11/the-four-phases-of-project-management [Accessed: May 22, 2020].

Hikvision, *DS-2CD2685G1-IZS|Pro Series (EasyIP)|Hikvision*. Available from: https://www.hikvision.com/au-en/products/IP-Products/Network-Cameras/Pro-Series-EasyIP-/ds-2cd2685g1-izs/ [Accessed: May 22, 2020].

Krogh, P. (2015), *Backup Overview, American Society of Media Photographers*. Available from: http://www.dpbestflow.org/backup/backup-overview - 321 [Accessed: May 22, 2020].

Mearian, L. (2019), *What is blockchain? The complete guide*. Available from: https://www.computerworld.com/article/3191077/what-is-blockchain-the-complete-guide.html [Accessed: May 19, 2020].

Microsoft, *Software Download*. Available from: https://www.microsoft.com/en-au/software-download/ [Accessed: May 22, 2020].

Lindros, K. (2016), *12 hardware and software vulnerabilities which needs to be addressed*. Available from: https://www.computerworld.com/article/3130119/security/12-hardware-and-software-vulnerabilities-you-should-address-now.html [Accessed: May 22, 2020].

Malsam, W. (2018), *'Project Management Processes & Phases'*. Available from: https://www.projectmanager.com/blog/project-management-processes-phases [Accessed: May 22, 2020].

Michele, M. (2018), *'Change Management: making organizational change happen effectively*. Available from: https://www.mindtools.com/pages/article/newPPM_87.htm [Accessed: May 22, 2020].

Microsoft Inc. (2017), *Build a Modern Data Warehouse with the Microsoft Data Warehouse Fast Track Program with SQL Server 2017*. Available from: http://download.microsoft.com/download/E/C/B/ECBE1A8D-B5D1-4D0A-B3CC-7D0B478BE18A/Build_a_Modern_Data_Warehouse_EN_US.pdf [Accessed: May 11, 2020].

Oculus, *Oculus Go: Standalone VR Headset | Oculus*. Available from: https://www.oculus.com/go/ [Accessed: May 22, 2020].

PMBOK (2017), *'Risks in project management'*. Available from: https://project-management.com/types-of-risk-in-project-management [Accessed: May 22, 2020].

Pni (2018), *PlacePod Smart Parking Sensor | PNI Sensor*. Available from: https://www.pnicorp.com/placepod/ [Accessed: May 22, 2020].

Prosci, What is Change Management? Available from: https://www.prosci.com/resources/articles/what-is-change-management [Accessed: May 14, 2020].

Prosci (2018), *Prosci change management methodology overview* . Available from: https://www.prosci.com/change-management/thought-leadership-library/change-management-methodology-overview [Accessed: May 22, 2020].

Rengasamy, S. (2008), *Project monitoring and evaluation | Slideshare*. Available from: https://www.slideshare.net/srengasamy/project-monitoring-evaluation-s-presentation [Accessed: May 16, 2020].

Ringlead Inc (2012), The Benefits Of Using Database Management Systems. Available from: https://www.ringlead.com/blog/the-benefits-of-using-database-management-systems/ [Accessed: May 20, 2020].

Rouse, M. (2016), *Hardware security | Techtarget*. Available from: https://searchitoperations.techtarget.com/definition/hardware-security [Accessed: May 20, 2020].

Sensor Dynamics (2018), *Resident vehicle parking system*. Available from: https://www.sensordynamics.com.au/parking-enforcement-services [Accessed: May 17, 2020].

Sethiawan, I.B., *The Rollout Phase of the IT Project, IT Project Management*. Available from: http://itpmpro.blogspot.com/2007/07/rollout-phase-of-it-project.html [Accessed: May 19, 2020].

Shinder, D. (2006), *10 things you can do to protect your data | TechRepublic*. Available from: https://www.techrepublic.com/article/10-things-you-can-do-to-protect-your-data [Accessed: May 16, 2020].

Slideshare (2018), *Dealing with hardware incompatibility*. Available from: https://www.slideshare.net/SafeBytesSoftware/dealing-with-hardware-incompatibility [Accessed: May 18, 2020].

Smartsheet (2020), 8 Elements of an Effective Change Management Process. Available from: https://www.smartsheet.com/8-elements-effective-change-management-process [Accessed: May 14, 2020].

Spacey, J. (2015), *Types of data risk | Simplicable*. Available from: https://simplicable.com/new/data-risks [Accessed: May 17, 2020].

Square (2020), *The tap-and-go credit card reader - Accept Mobile Payment | Square*. Available from: https://squareup.com/au/en/hardware/reader?device=c&gclid=Cj0KCQjwzZj2BRDVARIsABs3l9JipW-Atx3sWpDB-woE9Xq9D1lnr3RtmZRs-O7txamndVwENMRrJqsaArBiEALw_wcB&gclsrc=aw.ds&kw=%2Bsquare+%2Breader&kwid=p53646044867&matchtype=b&pcrid=415331372841&pdv=c&pkw=%2Bsquare+%2Breader&pmt=b&pub=GOOGLE [Accessed: May 22, 2020].

Techopedia (2018), *Database Management System (DBMS)*. Available from: https://www.techopedia.com/definition/24361/database-management-systems-dbms [Accessed: May 17, 2020].

Techtarget, S. (2019), *Free IT disaster recovery plan template and guide*. Available from: https://searchdisasterrecovery.techtarget.com/feature/IT-disaster-recovery-DR-plan-template-A-free-download-and-guide [Accessed: May 22, 2020].

Telecommunication Engineering Centre (2017), "Technical Report - M2M/IoT Enablement in Smart Homes", *Telecommuncations Engineering* , vol. 1, no. pp. 1-82.

Thakur, D., *What are the Functions and Service of DBMS*. Available from: http://ecomputernotes.com/fundamental/what-is-a-database/functions-and-service-of-dbms [Accessed: May 20, 2020].

Transport for NSW, *Homepage | Transport for NSW*. Available from: https://www.transport.nsw.gov.au/ [Accessed: May 22, 2020].

Tutorialspoint, Change Management Process-Tutorialspoint. Available from: https://www.tutorialspoint.com/management_concepts/change_management_process.htm [Accessed: May 15, 2020].

University of California Berkeley (2018), *Data Encryption in Transit Guideline | UC Regents*. Available from: https://security.berkeley.edu/data-encryption-transit-guideline [Accessed: May 16, 2020].

Wahba, P. (2018), *Amazon dishes about its first Amazon GO Cashier-less store | Fortune*. Available from: http://fortune.com/2018/03/19/amazon-go [Accessed: May 18, 2020].

Wikipedia (2020), Change management. Available from: https://en.wikipedia.org/wiki/Change_management [Accessed: May 14, 2020].

Wingfield, N. (2018), *Inside Amazon GO: the store of future | NYTimes*. Available from: https://www.nytimes.com/2018/01/21/technology/inside-amazon-go-a-store-of-the-future.html [Accessed: May 18, 2020].

Witshire, S. (2017), *Writing a disaster recovery plan for your small business | Ontrack*. Available from: https://www.ontrack.com/au/blog/2017/03/10/writing-a-disa-free-template/amp [Accessed: May 13, 2020].

Zamora, W. (2016), *10 ways to protect against hackers | Malwarebytes*. Available from: https://blog.malwarebytes.com/101/2015/10/10-ways-to-protect-against-hackers [Accessed: May 18, 2020].

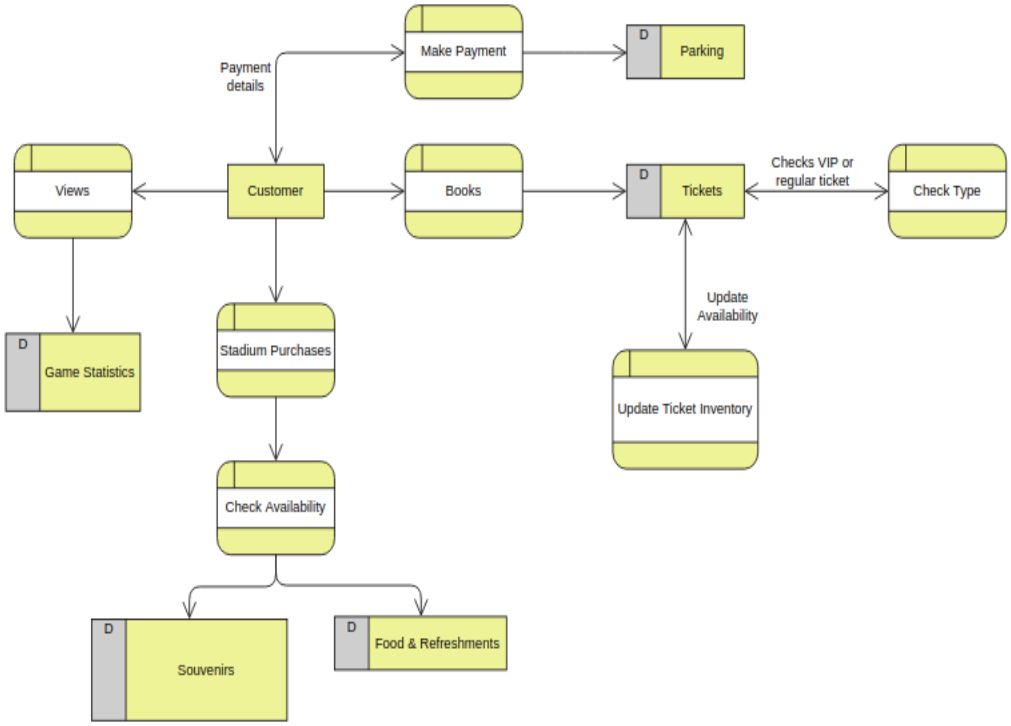
Appendix A – Technologies / Hardware Specifications

Private Screens	
Manufacturer	Apple
Model	iPad Pro
Specification	
Dimensions	47.6 x 178.5 x 5.9 mm
Display	IPS LCD capacitive touchscreen, 16M colors 11.0 inches, 366.5 cm2 (~82.9% screen-to-body ratio)
Chipset	Apple A12Z Bionic
Operating System	iPad OS 13.4
CPU	Octa-Core
EFTPOS Device	
Manufacturer	Square
Model	Square Reader
Specification	
Dimensions	2.6 x 0.4 x 2.6 inches
Material	Aluminium
Weight	1.98 oz.
Compatible OS	iOS 10.0+ and Android 5.0+
Smart Parking Sensors	
Manufacturer	Place Pod
Model	Surface Mounted Sensors
Specification	
Dimensions	9.0 in (22.86 cm) diameter 1.25 in (3.15 cm) height
Installation Position	Centre of the Parking Space
Battery Life	Up to 7 years
Output	2 states: • Occupied • Vacant
Storage Temperature	-40°C to +85°C
Smart Parking Light	
Manufacturer	Philips
Model	Hue Adore Light
Specification	
Dimensions	48.5 mm x 116 mm x 461 mm
Design	Metal Synthetics
Lifetime up to	30,000 h
Color	Chrome
Mains Power	Range 100v – 240v 50 – 60Hz
Control	Smart Control with Hue Bridge
Car Charging Station	
Manufacturer	Jet Charge
Model	DC Charger
Specification	
Dimensions	111.4 cm x 41.3 cm x 22 cm
Usage	Suitable for use with large population
Charge Rate	7.2kW/22kW charge rate (Capable of both single and three phase charging)
Weight	50 Kg
Certification	ZE and EV Ready Certified

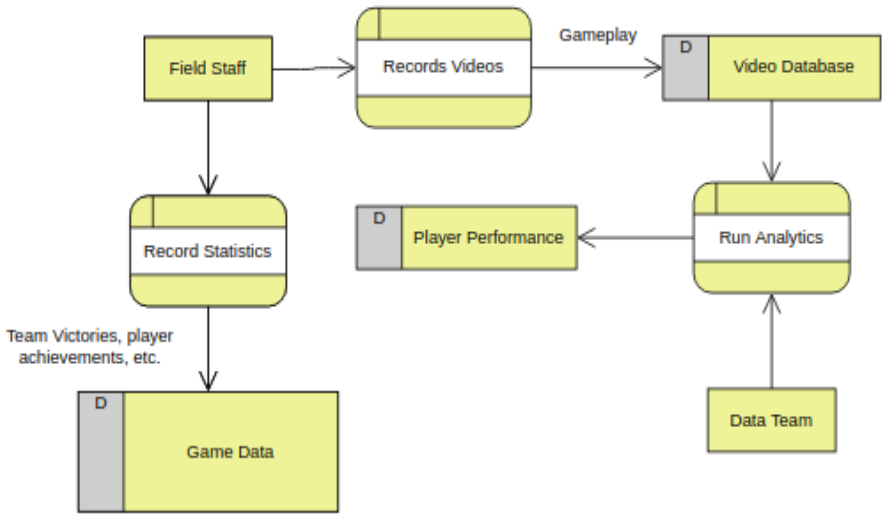
Face Detection Camera	
Manufacturer	HikVision
Model	DS-2CD7A
Specification	
Dimensions	Camera: Φ144 × 347 mm (Φ5.7″ × 13.7″)
Image Sensor	1/1.8’ Progressive Scan CMOS
Lens	8 to 32 mm
Focus	Auto, Semi-auto and Manual
Frame Rate	50fps
Network Video Recorder (NVR)	
Manufacturer	HikVision
Model	DS-9632NI-I8
Specification	
Dimensions	445 × 470 ×90 mm
Video Resolution	12 MP/8 MP/6 MP/5 MP/4 MP/3MP/1080p/UXGA/ 4CIF/DCIF/2CIF/CIF/QCIF
Decoding Format	H.265/H.265+/H.264/H.264+/MPEG4
Protocols Supported	TCP/IP, DHCP, Hik-Connect, DNS, DDNS, NTP, SADP, SMTP, NFS, iSCSI, UPnP™, HTTPS
Power Supply	100 to 240 VAC, 50 to 60 Hz 200 W
3D Cameras	
Manufacturer	GoPro
Model	
Specification	
Dimensions	2.5 x 2.7 x 1.6
Resolution	5.7K (Photo) 5K (Video)
Number of Lenses	2
Angle of View	360 Degree
Focal Length	8.9 mm
VR Headset	
Manufacturer	Oculus
Model	Go
Specification	
Dimensions	10 x 10 x 10 cm
Weight	470 g
Screen	2560×1440 5.5" (538ppi) fast-switching LCD with standard 60Hz refresh, "overclocked" 72Hz refresh
CPU	Quad-core Qualcomm Snapdragon 821 (two 2.3GHz Kryo HP cores and two 2.15GHz Kryo cores)
RAM	3GB
GPU	Adreno 530
Operating System	Android 7.1.2 Nougat
Networking	802.11b/g/n/ac, Bluetooth 4.1, GPS
Battery	2600 mAh
Firewall	
Manufacturer	Cisco
Model	Firepower 4100
Specification	
Dimensions	1.75 x 16.89 x 29.7 in. (4.4 x 42.9 x 75.4 cm)
Network Modules	8 x 10 Gigabit Ethernet Enhanced Small Form-Factor Pluggable (SFP+) network modules ◦ 4 x 40 Gigabit Ethernet Quad SFP+ network modules ◦ 8-port 1Gbps copper, FTW (fail to wire) Network Module ◦ 6-port 1 Gbps SX Fiber FTW (fail to wire) Network Module ◦ 6-port 10Gbps SR Fiber FTW (fail to wire) Network Module

Fans	6 hot-swappable fans
Weight	36 lb
Maximum number of interfaces	Up to 24 x 10 Gigabit Ethernet (SFP+) interfaces; up to 8 x 40 Gigabit Ethernet (QSFP+) interfaces with 2 network modules
Wireless Access Point	
Manufacturer	Cisco
Model	Aironet 2702i
Specification	
Dimensions	22.1 x 22.1 x 5.1 cm
Weight	1 Kg
Ideal for	Large Enterprises that require advanced features
Max Data Rate 5GHz	1.3 Gbps
Power	802.3at PoE+ - Enhanced PoE - Cisco AP2700 power injectors - Cisco AP2700 local power supply
Server	
Manufacturer	Dell
Model	PowerEdge M630
Specification	
Processor	Inte® Xeon® processor E5-2600 v3
Operating System	Compatible with Microsoft Windows Server and Red Hat Linux
Chipset	Intel C610 series chipset
Memory	Up to 1.5TB
Storage	4 x 1.8" SSD 2 x 2.5" PCIe SSD
Graphic Card	Integrated Matrox G200 with iDRAC8

Appendix B – Data Flow Diagram

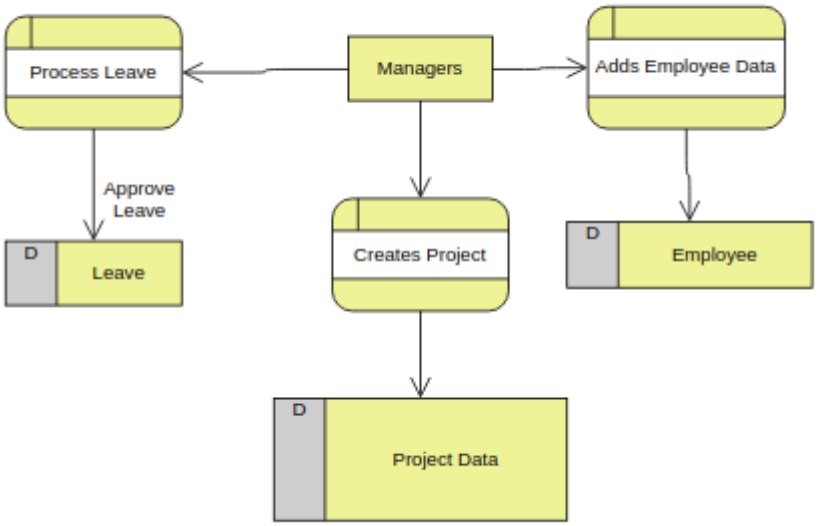


Customer Data Flow Diagram



Game Data Flow Diagram

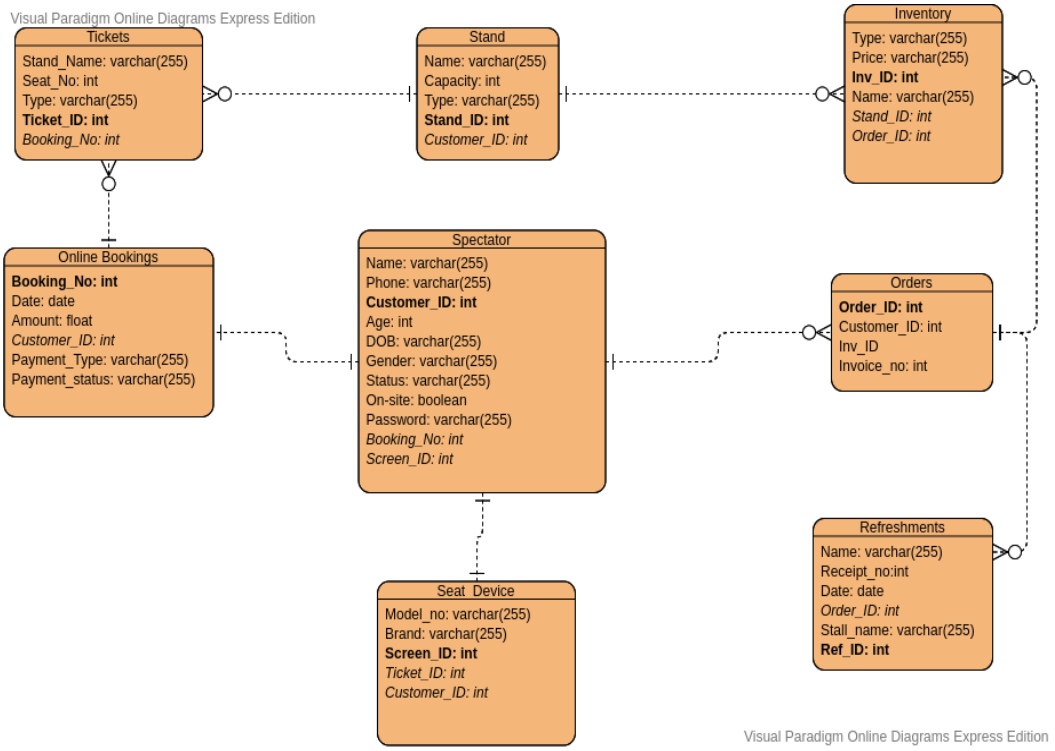
Appendix B – Data Flow Diagram



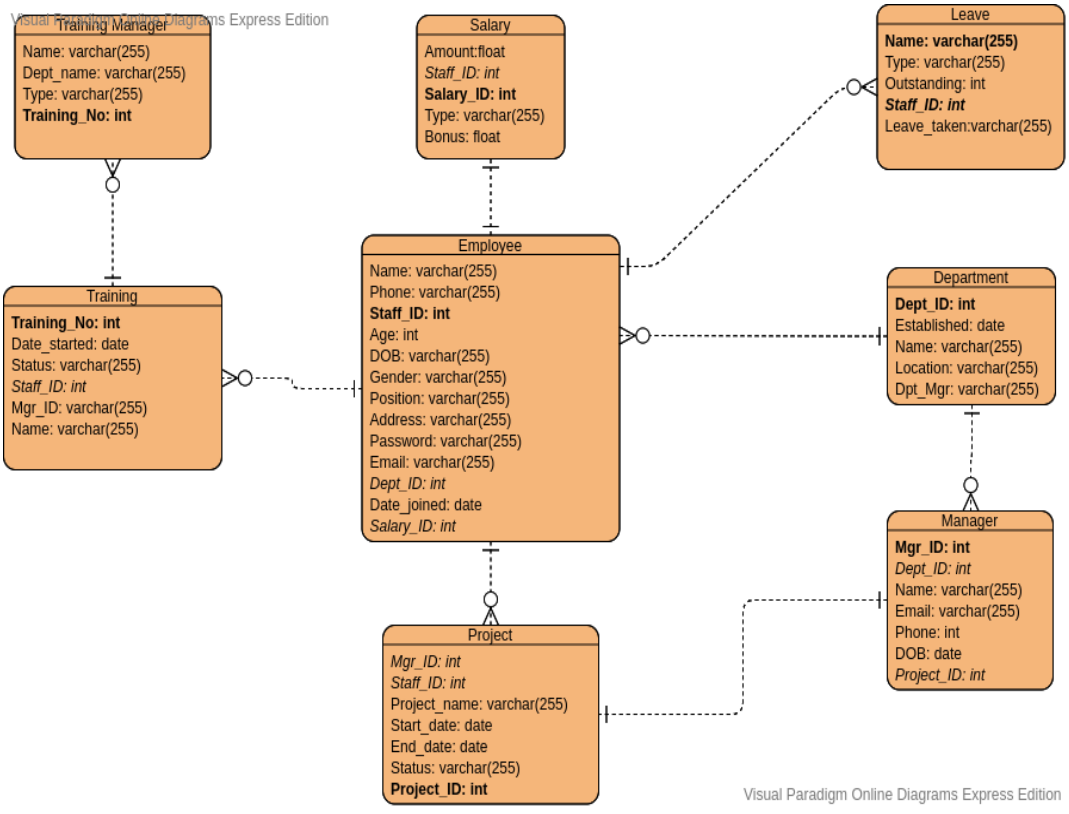
Staff Data Flow Diagram

Appendix C – Entity Relationship Diagram

All ERD segments are connected by the Oracle Database Engine.

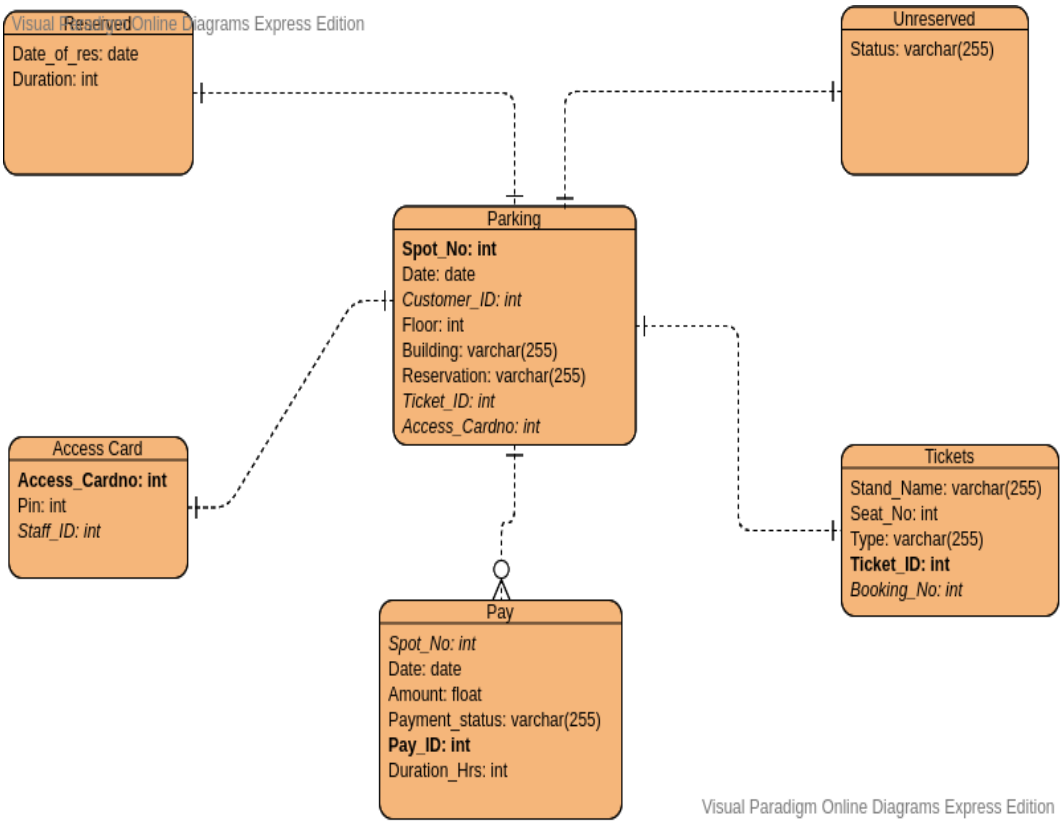


ERD Segment of Customer/ Spectator

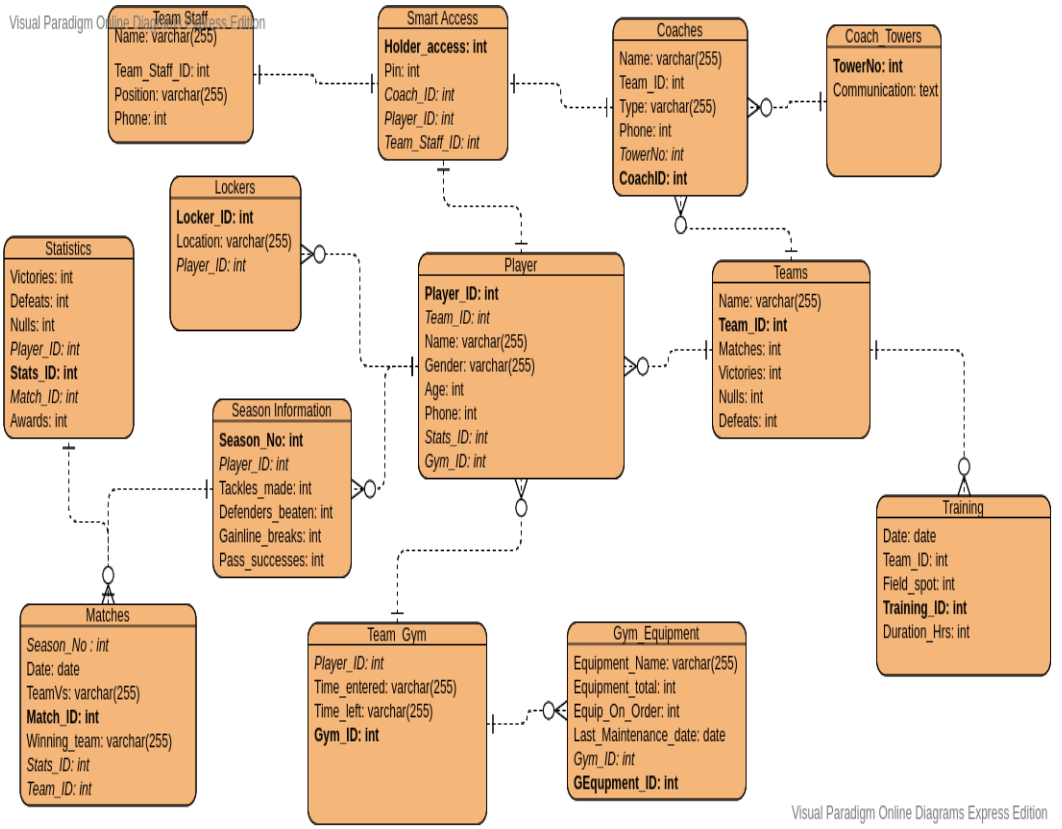


Employee ERD segment

Appendix C – Entity Relationship Diagram

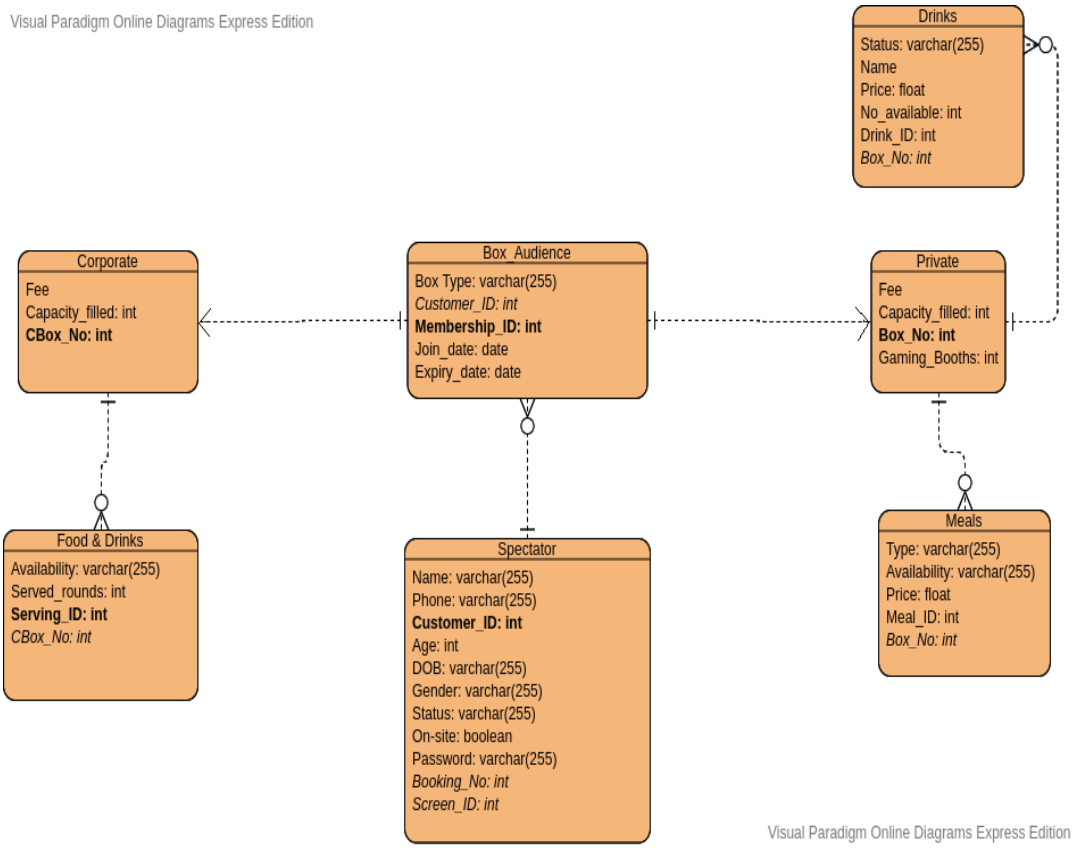


Parking System ERD

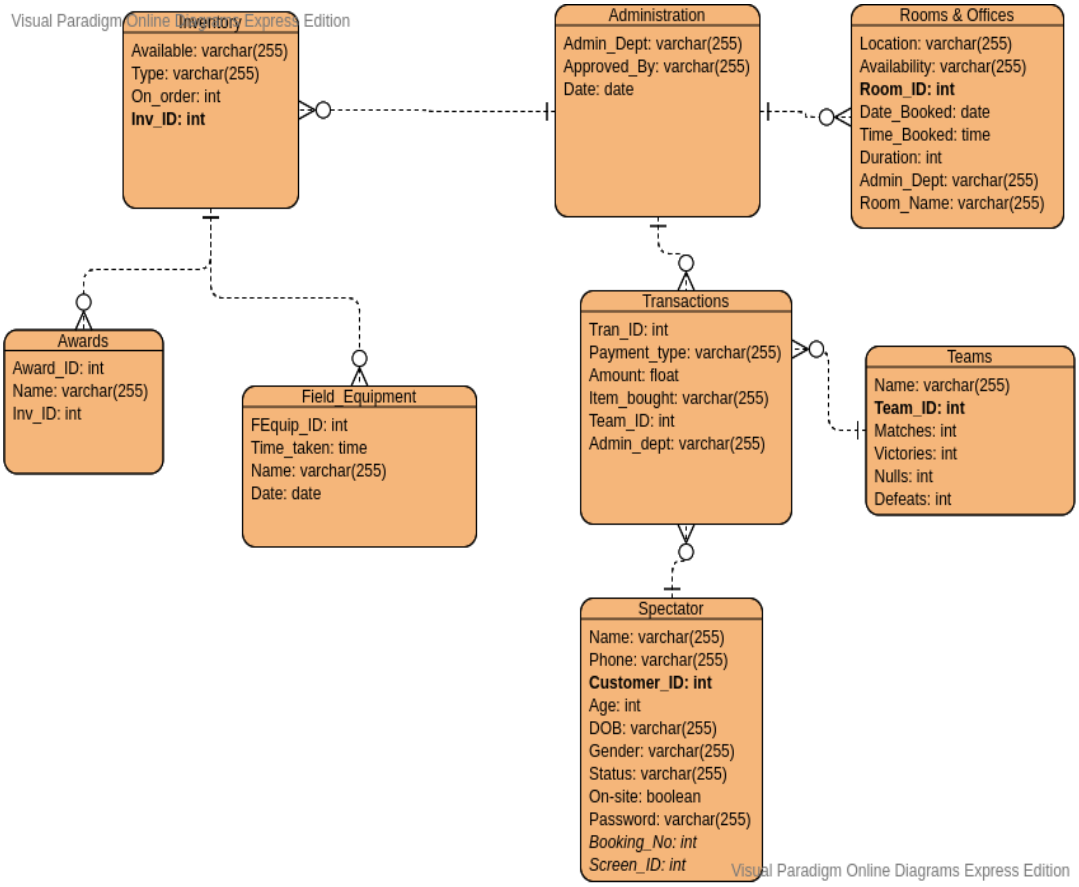


ERD segment of teams, players, coaches and statistics

Appendix C – Entity Relationship Diagram

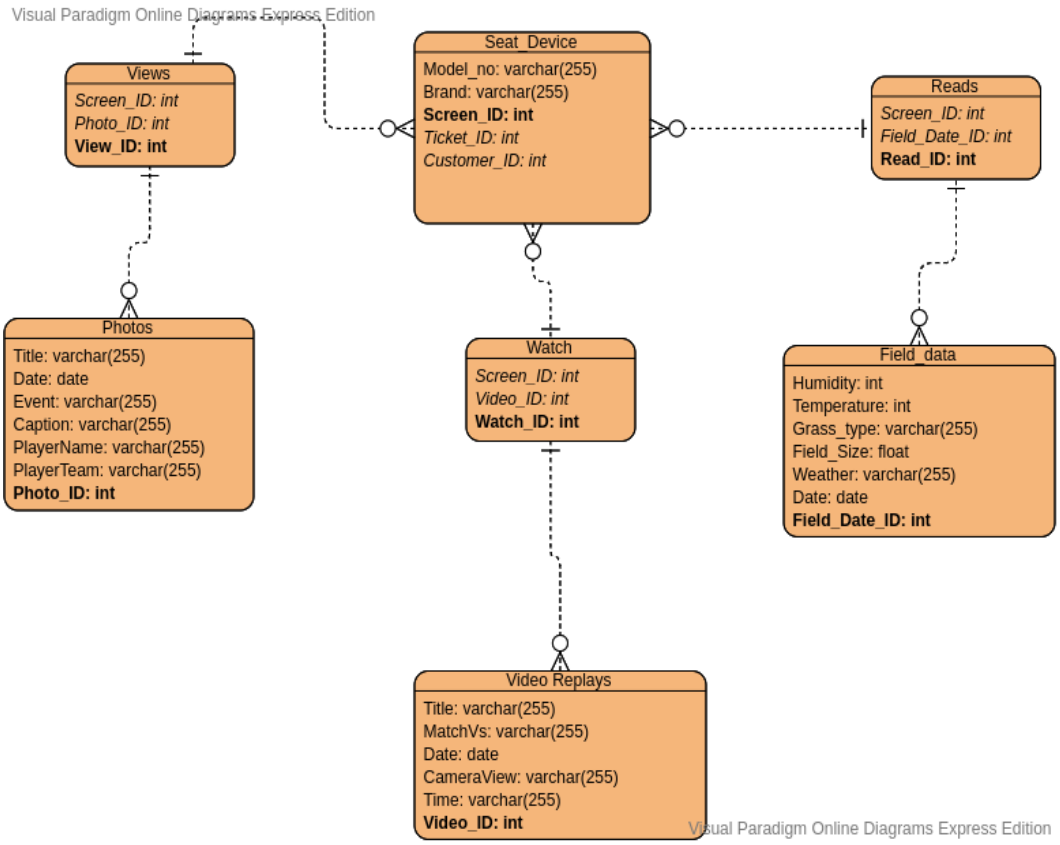


Box Audience ERD (Private & Corporate)



ERD segment of Administration Department

Appendix C – Entity Relationship Diagram



ERD Segment of Videos & Images Database

Appendix D – Software Specifications

1. **Amazon Recognition**

   Amazon Rekognition is a tool that uses a deep learning algorithm to analyze the image and videos. With Amazon Rekognition, our Wombats Rugby software, whether it is a web portal or App, can remember and detect the face capture by camera or stored in the database. Amazon Rekognition then can compare those capture faces with the world's criminal database to check the criminal background after successful verification of the criminal history, the account is created, or a venue ticket is issued. This software will also grant access to staff.

   Benefits of using Amazon Recognition

   There are five main benefits of using Amazon Recognition. They are as follows:

   1. It can seamlessly integrate efficient image recognition technology into our web or mobile system.
   2. Artificial intelligence is the backbone of Amazon Recognition
   3. Efficient and faster image analysis
   4. It is low in cost
   5. It integrates flawlessly with popular AWS services such as Amazon S3 and AWS lambda.

2. **Unity 3D**

   Unit is a game engine developed by Unity Technologies. It is a tool that is used for VR development. It also provides an ability to transform any 2D games to 3D games. It is used in various industries such as gaming, media & entertainment, and automobile. It is mostly coded in C# and JavaScript. We would be using this integrate the Live game on VR game headset by capturing video for amazon RDS and processing that video to project it in the 3D environment on VR headset.

   It uses different tools and tools to bring the 2D image to life. Those tools are as follows:

   1. High Definition Render Pipeline
   2. XR interaction toolkit
   3. Particle System

4. Spatial audio
5. Stereo Instancing

3. Google Lens

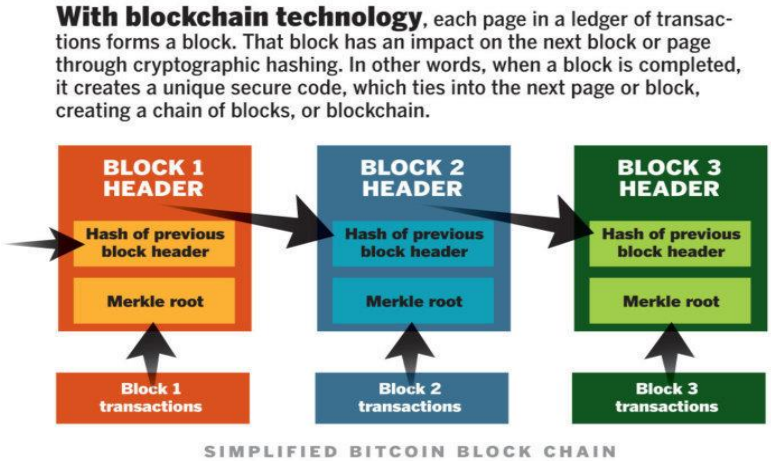
Google Lens is an image recognition technique developed by Google Inc. It is designed to generate accurate information about the object (face) that is identified using the deep learning and neural network analysis.

We will be using the Google Lens, which will help capture the object such as an image of a face and send it to Amazon Recognition to process it with its internal mechanism and give the resultant information about the processed image of the user.

4. BlockChain

Blockchain, which began to emerge as a real-world tech option in 2016 and 2017, is poised to change IT in much the same way open-source software did a quarter-century ago. And in the same way, Linux took more than a decade to become a cornerstone in modern application development; Blockchain will likely take years to become a lower cost, more efficient way to share information and data between open and private business networks. (Mearian 2019)

The chaining technique makes the intruder unsuccessful, as Blockchain converts the data to another block of the chain after every transaction; hence it this is the more critical algorithm for a system with payment transactions incorporated on a network.



The working of BlockChain (Mearian 2019)

5. **Norton Firewall**

   When you are running a company, the customer always demands that there is a trust build so that their data is safe, and it is private to everyone except the customer itself. Hence, to provide such kind of security, we will be using the best antivirus and firewall software to be incorporated into our system.

   Norton is a security software that was founded by Peter Norton, and the company name was formerly known as Norton by Symantec. We would be using the Business version of this software.

   Key Features & Benefits of Norton: -

   1. Virus Removal Guarantee
   2. Spam Blocking
   3. Internet Protection System
   4. Safe browsing for Facebook
   5. 24*7 Support of Monitoring
   6. Identity Safe
   7. Multiple Device Support
   8. Remote Lock, Wipe and Locate
   9. Scream Alarm
   10. Security
   11. Ease of Management

6. **Software Testing Framework – Selenium**

   Selenium is an open-sourced software testing framework. Selenium offers an IDE that is used to record and play the testing; it is more useful to tester or person who is not familiar with coding. It also provides different domain-specific languages to write the test script in multiple programming languages such as C#, Java, PHP, Perl, and Python. Selenium is most widely used as it is open-sourced and supports numerous programming languages and multiple browsers to test.

Appendix E – Detailed Breakdown of Costs

Detailed Project Team costs:

Employees	Salary (AUD)
Project Manager	140,000
Project Coordinator	82,000
Business Analyst	90,000
Software Developer x2	176,000
Software Testers x2	200,000
Systems Integrator x2	190,000
System Testers x3	184,000
Systems Architect	150,000
Database Engineer	170,000
Network Architect	150,000
Network Specialist	130,000
Hardware Specialist x2	172,000
Change Manager	116,000
Total	**1,950,000**

Detailed Ongoing Team Costs:

Employees	Salary (AUD)
IT Manager	130,000
Business Analyst x2	90,000
Cloud Solutions Architect	153,000
Database Administrator (Specialist) x2	170,000
Data Scientist	185,000
Network Administrator	80,000
IT Support Team x6	360,000
Total	**1,168,000**

Training Costs Breakdown:

Staff	Costs (AUD)
ICT Trainer x3	195,000
Field staff training	3000
Employee Training	20,000
Staff & Management Training	10,000
Bar & caterer training	8000
Team & Coach ICT training	2000
Total	**238,000**

Infrastructure Costs:

Hardware & Network Devices Costs:

Name	Unit(s)	Amount (AUD)
Apple 11-inch iPad Pro	80,050 (required) + 500 (extra)	107,131,500
Square Readers	50 (boxes) + 30 (stands)	4800
Placepod sensors	1500 (parking spots)	600,000
Phillips Hue Smart Light	500	100,000
JetCharge Charging Stations	200	142,000
HikVision Face Detection Cams	40+10 (extra)	55,000
Network Video Recorders	30	16,470
GoPro 3D Cameras	10	7000
VR Headsets (Oculus Go)	5 (boxes)+1000(special needs audience)	201,000
FirePower 4100	5	60,000
Aironet 27021	25	130,000
Dell PowerEdge Server	10	15,000
Cisco Routers	120	55200
Total		**108,517,970**

Appendix E – Detailed Breakdown of Costs

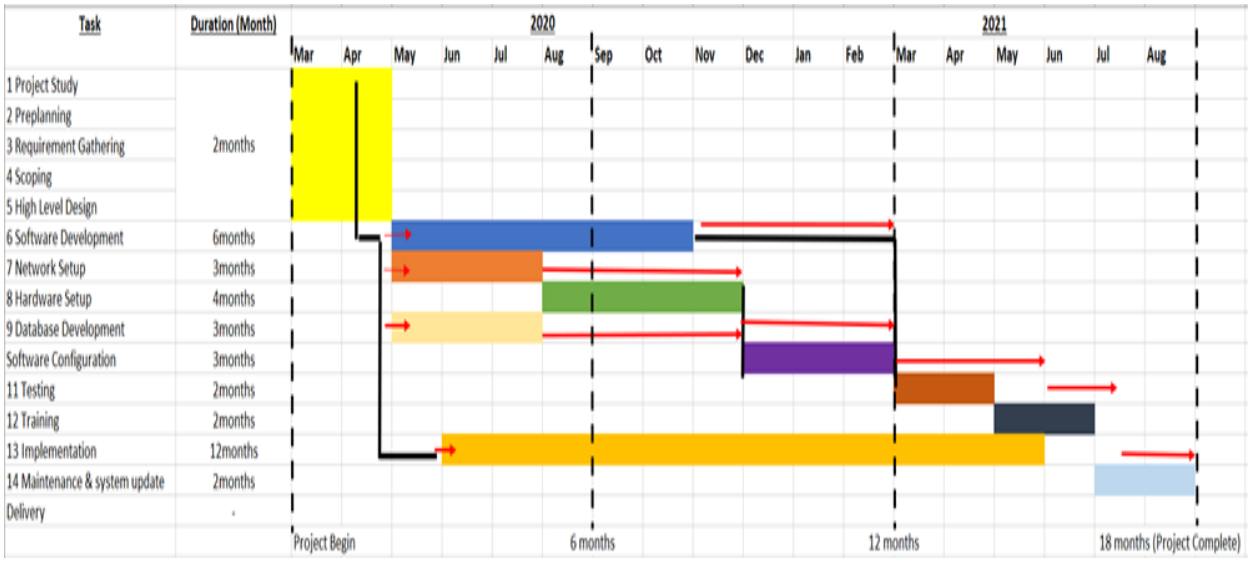
Annual Software Licenses and Cloud Database Costs:

Name	Amount (AUD)
Wordpress	300
Paypal	300,000
Amazon Rekognition Face Detection	2000
Smart Parking System	90,000
Google Lens	FREE
Selenium	8400
VR Game Unity 3D Pro	2000
Private Screen App	30,000
Windows 10 OS x50	3450
Office365 Business Premium	120
Norton Antivirus x50	3500
Total	**677,270**

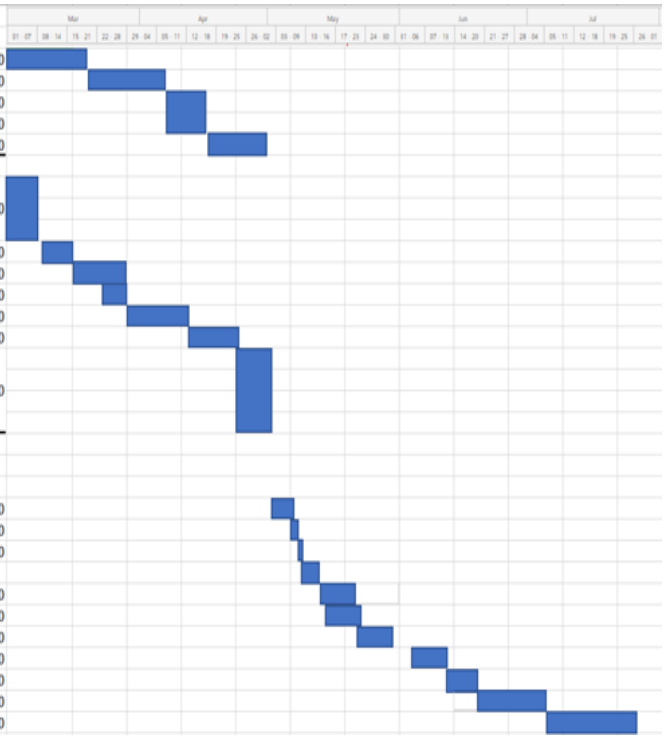
Database Breakdown Costs:

Name	Amount (AUD)
Oracle Enterprise DB (x5 sockets)	237,500
Amazon RDS data storage	11,500
Data Analysis with Sagemaker	3200
Amazon Comprehend	40
Amazon Kinesis Data Streams	1565
S3 Storages	7560
Amazon EC2 virtual instances	922
Amazon EBS	3750
CloudWatch	7560
CloudFront	2400
Total	**62,247**

Appendix F – Implementation Gantt Chart

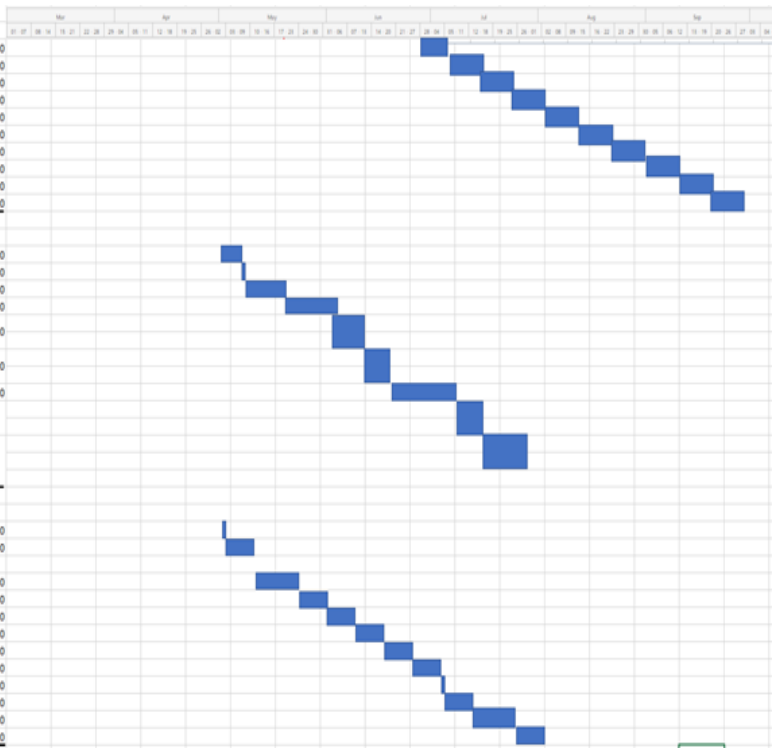


Task Name	Duration	Start	Finish
1 Project Plan, stregies and preparation	2months		
1.1 Project Study	2.5 weeks	01/03/2020	18/03/2020
1.2 Preplanning	2.5 weeks	19/03/2020	06/04/2020
1.3 Requirement Gathering	1 week	07/04/2020	13/04/2020
1.4 Scoping		07/04/2020	13/04/2020
1.5 High Level Design	2 weeks	14/04/2020	30/04/2020
1.6 IT architecture plan including hardware, network, and security solution	2months		
1.6.1 Determine and document hardware requirements			
1.6.2 Determine and document network requirements	1 week	01/03/2020	07/03/2020
1.6.3 Determine and document security requirements			
1.6.4 Research available vendors for RFP	1 week	08/03/2020	14/03/2020
1.6.5 Contact potential RFP vendors	2 weeks	15/03/2020	28/03/2020
1.6.6 Send RFP to vendors	1 week	22/03/2020	28/03/2020
1.6.7 Meet with vendors to provide more detail for RFP	2 weeks	29/03/2020	11/04/2020
1.6.8 Receive offers for RFP.	1.5 weeks	12/04/2020	23/04/2020
1.6.9 Compare RFP offers from different vendors			
1.6.10 Select RFP that meets requirements and within budget	1 week	24/04/2020	30/04/2020
1.6.11 Contact chosen vendor			
1.6.12 Sign agreement with chosen vendor			
2 Project process, development & Implementation			
2.1 Software Development	6 months		
2.1.1 Provide software solution for the infrastructure			
2.1.1.1 Analyse the software requirement	4 days	01/05/2020	04/05/2020
2.1.1.2 List the softwares used for solutions	2 days	05/05/2020	06/05/2020
2.1.1.3 Purchase softwares	1 day	07/05/2020	07/05/2020
2.1.1.4 Implement the softwares			
2.1.1.4.1 Setup staging Environment	5 days	08/05/2020	13/05/2020
2.1.1.4.2 Layout Design	9 days	14/05/2020	22/05/2020
2.1.1.4.3 Interface Design	9 days	23/05/2020	31/05/2020
2.1.1.4.4 Stack Integration	9 days	01/06/2020	09/06/2020
2.1.1.4.5 Features Acquire	9 days	10/06/2020	19/06/2020
2.1.1.4.6 Implement Metrics	9 days	20/06/2020	29/06/2020
2.1.1.4.7 Coding	27 days	30/06/2020	26/06/2020



Appendix F – Implementation Gantt Chart

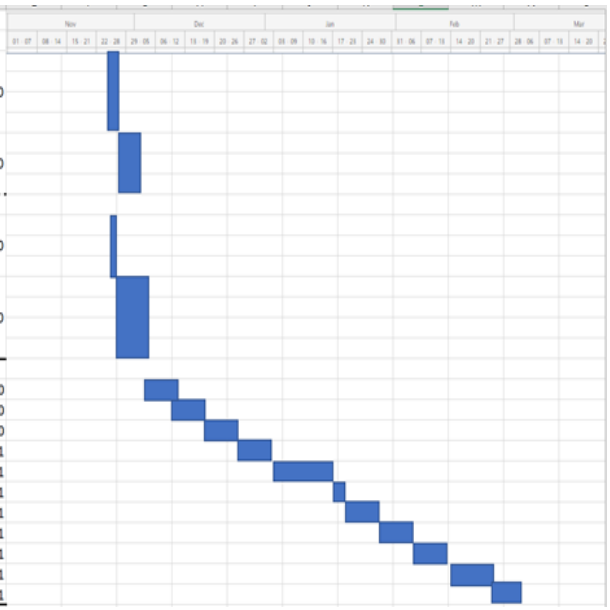
Task Name	Duration	Start	Finish
2.1.1.4.8 Early Usability Testing	9 days	27/06/2020	05/07/2020
2.1.1.4.9 Prototype	9 days	06/07/2020	14/07/2020
2.1.1.4.10 Testing	9 days	15/07/2020	23/07/2020
2.1.1.4.11 Feedback	9 days	24/07/2020	01/08/2020
2.1.1.4.12 Debigging	9 days	02/08/2020	11/08/2020
2.1.1.4.13 Improvement	9 days	12/08/2020	21/08/2020
2.1.1.4.14 Detail Analysis	9 days	22/08/2020	30/08/2020
2.1.1.4.15 Review	9 days	31/08/2020	08/09/2020
2.1.1.4.16 Final Testing	9 days	09/09/2020	17/09/2020
2.1.1.4.17 Product Release	9 days	18/09/2020	27/09/2020
2.2 Network Setup	3months		
2.2.1 Prepare a network topology for network			
2.2.1.1 Inspect the locations that are required to install all equipments.	5days	01/05/2020	05/05/2020
2.2.1.2 Purchase the hardware (internet equipment)	1day	06/05/2020	06/05/2020
2.2.1.3 Analyse the network requirements for the Stadium & carpark	2weeks	07/05/2020	19/05/2020
2.2.1.4 Plan and implement topology for Stadium & carpark	2weeks	20/05/2020	02/06/2020
2.2.1.5 Aquire team	1week	03/06/2020	09/06/2020
2.2.1.6 Gather Hardware			
2.2.1.7 Clearing the size	1week	10/06/2020	16/06/2020
2.2.1.8 Setup Parameter			
2.2.1.9 Installment	3weeks	17/06/2020	05/07/2020
2.2.1.10 Early Testing	1week	06/07/2020	12/07/2020
2.2.1.11 Compile Report			
2.2.1.12 Aquire confirmation			
2.2.1.13 Configure the internet equipment	2weeks	13/07/2020	26/07/2020
2.2.1.14 Final Testing of the network			
2.3 Database Development	3months		
2.3.1 Provide database solution for infrastructure with cloud (AWS)			
2.3.1.1 Procured the database	1day	01/05/2020	01/05/2020
2.3.1.2 Analyse the software requirement	1 week	02/05/2020	08/05/2020
2.3.2 Implement database into solution			
2.3.2.1 Implement the database	2 weeks	09/05/2020	21/05/2020
2.3.2.2 Final assessment & appraisal of the database	1week	22/05/2020	28/05/2020
2.3.2.3 Obtain pilot function of (DBMS) from various suppliers	1week	29/05/2020	04/06/2020
2.3.2.4 Examine pilot database management system (DBMS)	1week	05/06/2020	11/06/2020
2.3.2.5 Contrast the capability of pilot system	1week	12/06/2020	18/06/2020
2.3.2.6 Regulate the top database management system (DBMS)	1week	19/06/2020	25/06/2020
2.3.2.7 Procure the database management system (DBMS)	1day	25/06/2020	25/06/2020
2.3.2.8 Add new database management system (DBMS) to rest of IT network	1week	26/06/2020	02/07/2020
2.3.2.9 Test new database management system is working with network and al	2weeks	03/07/2020	15/07/2020
2.3.2.10 Enable access to database management system for users	1week	16/07/2020	22/07/2020



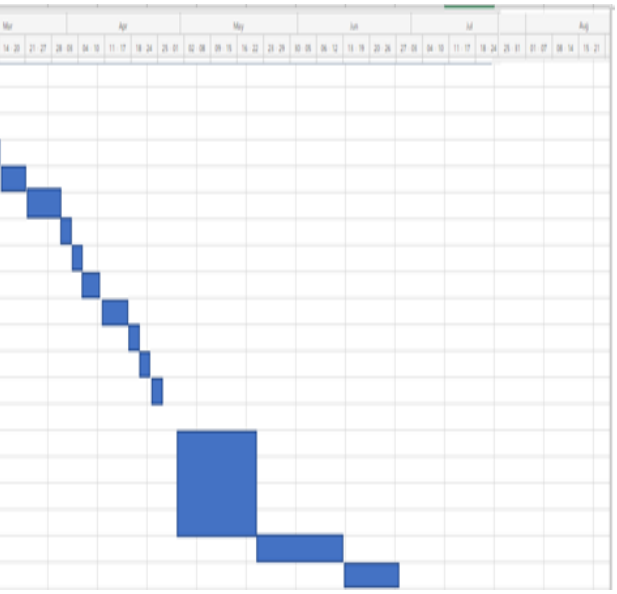
3 Hardware Setup	4months		
3.1 Provide secure Face detection cameras (biometric system) enabled entry to Stadium, carpark and other areas			
3.1.1 Search suitable system	1 day	01/08/2020	01/08/2020
3.1.2 Order system as per requirement	2 days	02/08/2020	03/08/2020
3.1.3 Install the Bio-metric system at the selected locations	3.5 weeks	04/08/2020	26/08/2020
3.1.4 Test the system			
3.2 Parking Sensors at Parking Spot			
3.2.1 Gather requirement for parking senors	1 day	27/08/2020	27/08/2020
3.2.2 Search the best sensor location			
3.2.3 Purchase Parking Sensor for each parking spot	2 days	28/08/2020	29/08/2020
3.2.4 Install the parking sensor device	3.5 weeks	30/08/2020	23/09/2020
3.2.5 Test the parking sensor			
3.3 Install Philips Hue Smart Light			
3.3.1 Gather requirement for Smart Light	1 day	24/09/2020	24/09/2020
3.3.2 Purchase the Smart Light per requirement	2 days	25/09/2020	26/09/2020
3.3.3 Install the Smart Light in designated location	3 weeks	27/09/2020	17/10/2020
3.3.4 Test the Smart Light			
3.4 Install Private Screens for VVIP Customers			
3.4.1 Gather requirement for Private screen	1 day	18/10/2020	18/10/2020
3.4.2 Purchase the Private Screens per requirement			
3.4.3 Install the private screen in designated location	2 weeks	19/10/2020	01/11/2020
3.4.4 Test the private screen			
3.5 Install Eftpos devices			
3.5.1 Search the suitable device			
3.5.2 Gather requirement for Eftpos devices	3 days	02/11/2020	04/11/2020
3.5.3 Order devices per requirement			
3.5.4 Install Eftpos devices in designated spot	3 days	05/11/2020	07/11/2020
3.5.5 Test Eftpos devices			
3.6 Charging stations: Install Jet Charge- DC Charger			
3.6.1 Gather requirement for DC charger			
3.6.2 Search the best DC Charger location on for Charging station	3 days	08/11/2020	10/11/2020
3.6.3 Purchase DC Charger			
3.6.4 Install the DC Charger	2 weeks	11/11/2020	24/11/2020
3.6.5 Test the DC Charger			

Appendix F – Implementation Gantt Chart

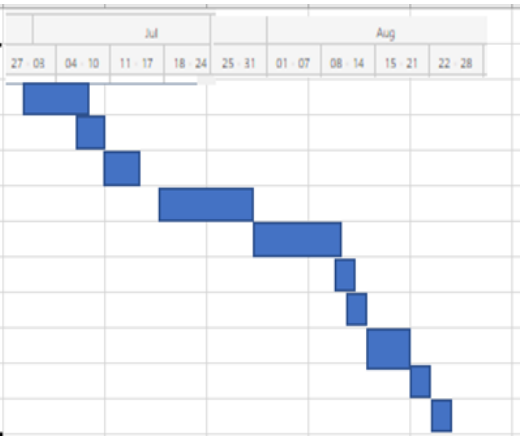
3.7 Install Virtual Reality Headsets- Oculus Go			
3.7.1 Gather requirement for Oculus Go			
3.7.2 Search the best headset location	3days	25/11/2020	27/11/2020
3.7.3 Purchase headset per requirement			
3.7.4 Install the VR headset in designated location			
3.7.5 Install bluetooth device			
3.7.6 Purchase controlling app	4days	27/11/2020	30/11/2020
3.7.7 Perform Testing			
3.8 Install 3D Cameras- GoPro Max			
3.8.1 Gather requirement for GoPro Max			
3.8.2 Search the best location for 3D Cameras	2days	25/11/2020	26/11/2020
3.8.3 Purchase GoPro Max per requirement			
3.8.4 Install 3D Cameras in designated location			
3.8.5 Purchase controlling app	5days	26/11/2020	30/11/2020
3.8.6 Configure 3D Cameras			
3.8.7 Perform Testing			
4 Software Configuration	3months		
4.1 Aquire team	9days	01/12/2020	09/12/2020
4.2 Gather Software	5days	10/12/2020	14/12/2020
4.3 Prepare hardware devices	9days	15/12/2020	24/12/2020
4.4 Setup Parameter	9days	25/12/2020	02/01/2021
4.5 Installment	2 weeks	03/01/2021	16/01/2021
4.6 Early Testing	5days	17/01/2021	21/01/2021
4.7 Compile Report	9days	22/01/2021	30/01/2021
4.8 Discussion	9days	31/01/2021	08/02/2021
4.9 Setup	9days	09/02/2021	17/02/2021
4.10 Aquire confirmation	6days	18/02/2021	23/02/2021
4.11 Final Testing of Software	4days	24/02/2021	28/02/2021



5 Testing	2months		
5.1 Aquire team	6days	01/03/2021	06/03/2021
5.2 Environment Setup	3days	07/03/2021	09/03/2021
5.3 Early Testing	6days	10/03/2021	15/03/2021
5.4 Improvement	6days	16/03/2021	21/03/2021
5.5 Testing	9days	22/03/2021	30/03/2021
5.6 Improvement	3days	31/03/2021	02/04/2021
5.7 Compile Report	3days	03/04/2021	05/04/2021
5.8 Aquire confirmation	6days	06/04/2021	11/04/2021
5.9 Discussion	6days	12/04/2021	17/04/2021
5.10 Setup	3days	18/04/2021	20/04/2021
5.11 Process validation	3days	21/04/2021	23/04/2021
5.12 Certification	3days	24/04/2021	26/04/2021
6 Training	2months		
6.1 Prepare the teaching content of new systems	4weeks	01/05/2021	19/05/2021
6.2 Prepare training manual for managing the new systems			
6.3 Classify & schedule the staff for training			
6.4 Arrange appropriate training classes			
6.5 Conduct training for staff	4weeks	20/05/2021	12/06/2021
6.6 Assess and evaluate staff's skills of using new systems after the training	2weeks	13/06/2021	26/06/2021



7 Maintenance & system update	2months		
7.1 Aquire team	6days	01/07/2021	06/07/2021
7.2 Analysis	3days	07/07/2021	09/07/2021
7.3 Environment Setup	6days	10/07/2021	15/07/2021
7.4 Process Vaildation	12days	16/07/2021	27/07/2021
7.5 Monitoring	9days	28/07/2021	06/08/2021
7.6 Aquire Update	3days	07/08/2021	09/08/2021
7.7 Update System	3days	10/08/2021	12/08/2021
7.8 Improvement	6days	13/08/2021	18/08/2021
7.9 Compile Report	3days	19/08/2021	21/08/2021
7.10 Report	3days	22/08/2021	24/08/2021



Appendix G – Change Management Processes

Change Management Process

Activities	●Assess change ●Assess impacted group ●Assess group sponsors ●Define the change as part of the charter	●Assess sampling of impacted individuals ●Assess communications ●Design the communications feedback processes/ tools	●Assess sampling of impacted individuals ●Assess impacted group ●Identify the source of resistance	●Assess sampling of impacted individuals ●Assess communications ●Identify new roles, tasks, tools, equipment's	●Assess Behaviour change ●Identify Implementation issues
Deliverables	●Assessment results ●Change definition ●Change Management strategy ●Risk Management Plan ●Communication Plan	●Assessment results ●Sponsor plan ●Updated communications plan	●Assessment results ●Resistance Plan ●Updated communications plan	●Assessment results ●Training Plan for staff	●Training plan and tools ●Recognition and rewards program ●Integrate into a performance management system

Change Management Process

Appendix H – Initial Service Level Agreement

SERVICE LEVEL AGREEMENT (SLA)

between

Wombats Rugby

and

iStadium

for

Consultation Services

25 May 2020

Purpose

1 The purpose of this Support Service Level Agreement (SLA) is to formalize an arrangement between Wombats Rugby (hereinafter, the *Organization*) and iStadium (hereinafter, the *Vendor*) to deliver equipment and support services, at specific levels of support, and at an agreed-upon cost.

2 This SLA is intended to provide details of the provision of equipment and support services by iStadium.

3 This SLA will evolve over time, with additional knowledge of the client requirements, as well as the introduction of new devices and services into the support portfolio provided by iStadium.

Scope of Agreement

The following equipment and services are provided in response to the proposal submitted by the Vendor to the Organization in accordance with a Request for Proposals for Wombats Rugby Project.

Services and Requests Covered Under This Agreement

The following services are provided by the Vendor to the Organization:

1. Consultation and Development: This is all-inclusive of equipment and all consultation services.
2. *Manufacturer Preventative Maintenance:* Preventative maintenance of the devices shall be performed as the frequency prescribed by the manufacturer
3. *Guaranteed Service Response Time:* The guaranteed in-person response time following any service call shall be four (4) business hours or less, normal business hours (8 a.m. - 5:30 p.m., Monday - Friday). The response time begins when the request is logged with the Vendor's problem-ticketing system and is stopped when the technician logs the arrival at the equipment site and meets with the Key Operator.
4. *Device Uptime Levels:* The guaranteed in-person response time following any service call is four (4) business hours or less. If the Vendor is unable to respond[1] to any service call within four (4) hours from the time the call was placed the Vendor shall provide copies, on that device, at no charge for the following month, and all penalties related to replacement and further meter cost reductions apply to any device that falls below 95% uptime for any twenty (20) working day period.

The minimum acceptable level of *uptime* for any device shall be 95% as determined by the following formula:

Uptime = (Total Time[2] – Lost Time[3])/Total Time x 100%

- If uptime for a device falls within the 94-90% range during any twenty (20) working day period, the meterage charge to the Organization shall be reduced or credited by 15% on that device.
- If uptime for a device falls within the 89-80% range for any twenty (20) working day period, the meterage charge to the Organization shall be reduced or credited by 30%.
- If uptime for a device falls with the range of 79% or lower for any twenty (20) working day period, no monthly payment or full credit will be extended for meterage will result up to the specified monthly figure for the equipment for a one-month period.
- If a device experiences less than 95% uptime during three (3) consecutive twenty (20) working day periods, the Vendor will replace the device with an equivalent device for the remaining term of the contract at no additional cost to the Organization.
- If a technician cannot satisfactorily repair a machine fault within two (2) business days, the Vendor shall provide or loan a multifunctional printer equal to the existing model. The Vendor shall ensure that the loaned device connects to the network and prints with existing drivers and controllers. This loaned device shall be provided at no additional cost to the Organization, including no additional meter costs and no additional delivery costs until the existing device is fully operational and functioning in an intended manner.
- In the event a device has had more than three (3) service calls for the same fault in any quarter period, a Service Supervisor/Manager shall evaluate the performance of the device and fully correct all problems with the device. If that device then requires a further service call for the same fault within the next 90 days, the Vendor will remove the device and loan the department a similar or equivalent model until the problem device is repaired and tested at the Vendor's service facility. All penalties and meter cost reductions apply to any device that falls below 95% uptime for any twenty (20) working day period.

1. *Equipment Moves:* All equipment moves/relocations shall be at no charge. This includes off-site storage if required, removal, re-install, testing, and training.
2. *After-Hours Support:* All requests for support for non-business hours shall be deemed to be After-Hours Support. After-Hours Support will be provided free-of-charge if the Vendor is notified 24 hours in advance of the request for After-Hours Support.
3. *Training:* On-site training shall be provided with each piece of equipment. Key Operators and selected users shall be trained for each device, and all retraining shall be provided as needed. Training shall include device functionality and usage, special features, and service call generation. Additional functionality added later will be included with the upgrade, including but not limited to networking, and scanning.
4. *Network Support*: Vendor support staff shall be available aftermarket support of networking devices and assisting the Organization's staff. This includes conducting site surveys and proposing devices or deployment strategies.
5. *Upgrades to Application Software and Associated Devices*: This occurs when an upgrade to an existing device is released; includes operating system upgrades, device upgrades, software upgrades, and manufacturer-required upgrades. (Manufacturer requires the Vendor to upgrade in order to maintain Vendor support.) The upgrade shall be coordinated with the preventative maintenance service calls or schedule with the Organization to reduce downtime.
6. REPLACEMENT POLICY: If a device cannot be repaired on-site, a replacement of equal capability may be introduced to lessen downtime. If the device is un-repairable, a replacement of like or greater capability will be provided for the remaining term of the agreement. If a device is down for more than 28.5 hours (3 business days), the device shall have a temporary placement.

Changes to Service Level Agreement (SLA)

Termination of Agreement

The Organization may terminate this agreement without penalty if the Vendor repeatedly violates the terms of this agreement. In such an event, the Organization shall give the Vendor 30 days written notice of intent to terminate, delivered to the Vendor.

Amendment to Agreement

Any amendment to the Terms and Conditions of this agreement would require the approval of the Vendor and the Wombats Rugby Executive. The amendment of the agreement would take place through an addendum to this agreement.

There will be an opportunity on a quarterly basis to make adjustments to this SLA. The Vendor and the Organization should work together to make changes at that time.

Processes and Procedures Related to This Agreement

Call Management Process

The Vendor's problem-ticket system will be used by all support team levels (where approval and technical access has been granted) to record and track all problem reports, inquiries, or other types of calls received by support. This provides the Vendor with the ability to provide metrics with regard to this SLA.

SLA Funding Agreement

Billing for services provided under this agreement will be accomplished through direct billing to the Vendor under the terms and conditions of the appropriate Purchase Order raised for these services. All overage costs shall be itemized on an invoice per device with reporting of the associated user accounts.

Levels of Support

Only two levels of support are provided under this agreement. These levels, which are integrated into the Vendor's support process, are defined as follows: Standard Coverage and After-Hours Coverage. Both levels are inclusive within the contract, with no further cost.

This is the support provided by the appropriate Vendor help desk when it receives the Support Request from the Organization. This represents generalist support. If this level of support

cannot resolve the problem, the Support Request is passed to the Vendor's Level-2 supports, which is then passed to the support specialists.

Support Requests are taken by the Help Desk as follows:

Help Desks	Hours	Phone Contact
Standard Coverage	8:00 a.m. – 5:30 p.m., EST, Monday – Friday (After hours, leave a voice message for a return call the following business day.),	+61 417 898 554
After-Hours Coverage	5:30 p.m. – 8:00 a.m., EST, seven days a week	+61 456 654 890

During critical processing periods, support is extended to after-hours for agreed-upon periods of support is requested by the Organization contacting the Vendor. The Organization shall notify the vendor 24 hours in advance by phone or e-mail.

Infrastructure Support Manager

The Organization Infrastructure Support Manager will provide the overall direction of the activities required from the Organization's Information Services Department, participate directly in the associated deliverables, and will negotiate with the Vendor's support manager regarding the introduction of enhancements and the scheduling of tasks. The Infrastructure Support Manager will report to the Organization Program Manager, with duties that include:

- Liaising with other Organization groups
- Assessing the workload for each support request and assigning work to the team member having the appropriate technical knowledge
- Assisting in conducting all root-cause analysis and bug-fix isolation and resolution activities, and associated documentation for the individual tasks, as assigned by the Organization Program Manager
- Acting as a point of contact for all issues for the Organization's infrastructure
- Determining (for enhancements) the potential high-level effort for all changes
- Identifying all tasks associated with each support request and deriving estimates for the completion of each task for Organization staff and resources
- Conducting and participating in testing with the Vendor as needed
- Providing knowledge transfer to crucial Organization support specialists regularly.

Appendix I – Glossary

Algorithm: Many rules to be followed to solve problems.

Android Studio: A platform used to build mobile applications using android systems.

API: A software that allows two applications to connect.

Autonomous: When associated with technology, it means any function that doesn't require instructions.

Backup: Making copies of data.

Bionic: Consists of an electromechanical part.

Biometrics: These are physical aspects used for identifying individuals.

Blockchain: A data structure that holds transactional records.

Database Engine: The core of the DBMS, which handles the main functions of data storage and retrieval. This is also accessible via APIs.

DBMS: A software package made to make use of data inside a database.

Encryption: A procedure by which information is transformed into a secret code to enhance security.

Firewall: A system made to prevent unauthorized access to a network.

Github: A platform on the web that makes it easy for users to work together on projects.

Operating System: An interface that works between a user and a computer.

Transaction: A small unit of work consisting of the low-level task(s) inside a program.

Stream: A series of data elements.

System Architecture: A conceptual model consisting of the behavior and architecture of a system.

Virtual Reality: A simulation that is similar to the real world created by using technology.

Appendix J – ACRONYM

3D: Three Dimensions

ACID: Atomicity Consistency Isolation Durability

AES: Advanced Encryption Standard

AI: Artificial Intelligence

API: Application Program Interface

APP: Application

AUD: Australian Dollars

AWS: Amazon Web Services

A-Z: Availability Zones

CCTV: Closed Circuit Television

CPU: Central Processing Unit

DB: Database

DBA: Database Administrator

DBMS: Database Management System

DW: Data Warehouse

DC: Direct Current

EC2: Elastic Compute Cloud

EDQ: Enterprise Data Quality

EFTPOS: Electronic fund transfer at point of sale

ERD: Entity-Relationship Diagram

HR: Human Resources

HTTP: HyperText Transfer Protocol

IOPs: Input/ Output Operations per second

Appendix J – ACRONYM

IP: Internet Protocol

IT: Information Technology

KPI: Key Performance Indicator

MS: Microsoft

NSW: New South Wales

PHP: Hypertext Pre-processor

RAM: Random Access Memory

RDBMS: Relational Database Management System

RDS: Relational Database Service

S3: Simple storage service

SQL: Structured Query Language

SSD: Solid-state drive

SSL: Secure Sockets Layer

UML: Unified Modelling Language

VR: Virtual Reality

VIP: Very important person

VVIP: Very very important person