**Contra Development**

CourseID: CS 360 - 001

Milestone # and Date: Milestone 1 - 8/31/21

Project Members: Ethan Moore, Aman Patel, Will Craddock

Client: Dr. Galloway

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# Introduction

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Contra is a run and gun game originally created for arcades and other publicly available places. Original publisher of the game was Konami, and the game was published on February 20, 1987. And in 1988 home version was released for Nintendo Entertainment System, along with various computer formats. Different regions were calling this game with different names, for example the United States was calling it as Contra, PAL region or European were calling it Gryzor or probotector. The Japanese were calling it Kontora. And after the first success in 1988 they published several sequels of Contra since the original game, but none was more popular like the original game.

Let’s talk about the different characters in the game, contra had a lot of characters from different monsters to game heroes and aliens and more. First two are the face of the game, Bill Rizer and second is Lance Bean, they are future Earth’s premier alien-skull-busting specialists. They first appeared in the arcade version of the game and people loved them so very much they have been the default characters ever since. Bill Rizer’s character design is meant to evoke actor Arnold Schwarzenegger. And his name is a combination of two famous actors Bill Paxton (Bill) and Paul Reiser (Rizer). They both appeared in the action Alien movie when the game was first launched. Bill Rizer has then appeared in Contra Return, Super Bomberman R, Contra Evolution, Konami Classics Vol.1, Contra ReBirth, Contra 4, Konami Classics Series: Arcade Hits, Neo Contra, Konami Collector’s Series: Castlevania & Contra and many others.

Second player character Lance Bean is meant to evoke actor Sylvester Stallone’s John Rambo character. And his name is the combination of two actors: Lance Henrikssen (Lance) and Michael Biehn (Bean). Both appeared in the Alien action movie. And he was appeared in the games like Contra Return, Super Bomberman R, Contra Evolution, Konami Classics Vol.1, Contra ReBirth, Contra 4, Konami Classics Series: Arcade Hits, Neo Contra, Konami Collector’s Series: Castlevania & Contra and may other

There was a third character called Lance Gryzor which was present only in the European version of the game and only appeared in the first version of the game. And this version of the character was the combination of both Lance and Bill.

Now we will talk about the popular monsters of the contra series. One of the most dangerous and famous of all was the Java monster also known as Red Falcon of Red Falcon army and one of the highest ranked members of the army too. He was the highest-ranking leader in the command of the first alien invasion attempt on Earth in 2633 A.D. He is recognized as two different monsters, his upper body and head are known as “Emperor Demon Dragon God Java”, While his heart is known as “Gomeramos King”. His appearance in the game is just like his background stories, Java vomits an endless supply of the Bundles (flying and persistent grub-like creatures that attack the player). The player is continuously given new bundles by the Java and the player cannot move to the next corridor until the Java is destroyed.

Once the player has destroyed the upper body and the head of the Java monster his heart remains functioning and is characterized for covering up an entire wall, pulsating rapidly as it provides life to the rest of the biomass. And this monster is known as “Gomeramos King”. And it is protected by the alien eggs surrounding it on both ground and ceiling level against potential threats, which release an unrelenting hoard of scorpion- like creatures. Java first appeared in Contra III: The Alien Wars, as mini-bosses that are fought throughout the final stage.

Another famous weapon/boss of the game is Dogra which is nothing but a tank that shoots cannons and has a spike in the front bumper. Dogra has appeared twice in the stage number 5 known as “Snow Field”. And as the stages are timed it is important to do more damage in less time. So, weapons like Spread Gun, Machine Gun or Rapid-Fire Laser are really helpful in successfully destroying this vehicle. Dogra changes the colors as it takes the damage from the player, and it proceeds to aim the cannon at the player’s current position. In different versions of the game the destruction of the Dogra is meant to be different. For example, in Contra: Evolution Dogra’s can be destroyed with a single stab from Sally’s katana.

Defense Wall is another famous monster of the game. It appears in the very first stage of the game. This stage is called “Jungle” and Defense Wall is the final enemy to proceed to the next stage which is called “Base”. It looks like a tall and heavily armed defense mechanism that usually guards the entrance to an underground enemy base. And after its debut in the original version this wall has been used in every single contra game as a mini- boss or a boss in one of the earlier stages. Until Contra 4 the core remained passive during encounters, but after Contra 4 it was given the ability to project a powerful energy beam. Another Defense wall which is famous for four different power sources is known as “Garmakilma” which appeared at the end of stage 2 called “Base” guarding the stage 3 called “Waterfall”. Here is the table of the different monsters in the different stages of the contra game line.

| **Stage** | **Name** | **Boss** | **Music** |
| --- | --- | --- | --- |
| **1** | Jungle | Defense Wall | Dense Forest Battle |
| **2** | Base | Garmakilma | Labyrinth Fortress |
| **3** | Waterfall | Gromaides | Waterfall of Bloodshed |
| **4** | Base 2 | Godomuga | Labyrinth Fortress |
| **5** | Snow Field | Dogra ×2 Guldaf | Fortress in the Ice |
| **6** | Energy Zone | Gordea | Fortress in the Fire |
| **7** | Hangar | Final Gate | Dense Forest Battle |
| **8** | Alien's Lair | Emperor Demon Dragon God Java  Gomeramos King | Horrible Heartbeat |

*Table listing Contra level numbers, names, bosses, and music*

Contra is one of the most famous run and gun games of its time. Contra has features like selecting your weapons and characters that evoke actors like Arnold Schwarzenegger and Sylvester Stallone were adding more and more popularity among adults and kids playing games those days. Even today there are a lot of contra fans all around the world playing the desktop version and our team is one of those. Now as we discussed earlier the game has many different weapons, characters, stages and monsters, but in our version, we will be not adding all of those monsters and characters due to the shortage of time and resources, in next few pages we will talk about exactly what stages and monsters we will offer in our version.

# Project Scope

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As we mentioned earlier, the original Contra was offered as an arcade, then there was the Nintendo version and recently there has been desktop and even smartphone versions of the game, but we will just be focusing on the desktop version as discussed with our client Dr. Galloway. Also, we will be creating the version of Contra with fewer stages but they will be more interesting and take longer to finish as we intend to have more than one major monster and bosses on one stage. That way we have fewer stages but the same amount of entertainment for the players.

We will be implementing three stages which will be inspired from stages 1(Jungle), 5(Snow Field), and 8(Alien's Lair). Our goal is to add all the monsters and bosses we can to these three stages and give as much ammunition and weapons we can get to our characters. We will add both main characters to the game and the user will be able to connect to the gamepad to keep the nostalgia of the original game while also implementing remapping support.

## Hardware

The hardware we expect our version of Contra to run on is a Desktop or Laptop. Unity’s requirements for the operating system are either windows 7 or 10. The CPU requirements include x86/x64 architecture with SSE2 support. The graphics API DX 10, DX 11, DX12 capable. Some additional prerequisites are the drivers like visual studio 2015 with the C++ Tools component and Windows 10 SDK. The system resources required to play our remake shouldn’t be intense. The CPU required should be within the last decade. RAM usage should not be greater than 50 megabytes since our game has a more limited scope than the original. The space required to download our remake should be less than a gigabyte since we are not recreating the full game. We are also using the original sprites which are fairly lightweight and bloat free. Our development machines are running modern graphics and processing units. An extra piece of hardware the user may opt for is a NES gamepad. We will develop our game with the Mekela 5.8 foot classic usb wired controller in mind.

## Software

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Front-end frameworks: To be able to create our game and see our behaviors and assets we will use the Unity game engine. The front-end framework’s version we are using is Unity version 2020.3.17f1 LTS. We went with this unity version because it was recommended, and the 2021 version could be too new while the older version could be more stable. The scripting language we will use in Unity is C# version 8.0 that uses the Roslyn C# compiler.



Back-end frameworks: To retrieve the saved data from the user we will utilize a back-end framework. The back-end framework we will use for storing the high score, current level, current players items is php my admin and MySQL. The database will be locally hosted on the user's computer on an open non conflicting arbitrary port. We won’t use a public facing server to access the database but a locally hosted one for save game data.

# Functional Requirements

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1. Main character will be controlled by keyboard.
2. Users will be able to create multiple players and different accounts.
3. We will implement login systems for users and administrators.
4. Users will be able to save their progress once they log out and continue once they log back in. And progress will be displayed on the screen.
5. We will also create a splash screen which displays top scores and login prompts.

# Nonfunctional requirements

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1. We will use the Unity game engine and development environment to create this game.
2. We will try to create a complete replica of the game but fewer stages.
3. We will use pre-developed images, audio and some artwork from the original game.
4. We will be developing source codes for this project.
5. We will use a database to store login information and scores of the players.
6. We will gather and optimize Performance metrics.
7. We will gather and optimize Security metrics.
8. We will gather and optimize User Interface metrics.

# Organizational approach

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Group has decided to meet twice a week that is Tuesday over the discord call and Thursday in person to discuss the progress and task each group member must perform. Group also meets with the client every week on Friday at 4:00PM over the Zoom to share the progress of the project. Group has also decided to meet outside of the scheduled time if necessary. The organization and version control method we will use for our project is GitHub. The group member hosting the repository is Ethan Moore or also known as the github user eldm-ethanmoore. The project is the repository Contra-Remake-CS360. This repository will contain our draft, weekly progress reports, and general project files like scripts and assets.

Sprint 1 overall team evaluation: Our team has three members and here is the background of all three members.

* Aman Patel: I am a CS major currently in my senior year, have a little experience in java coding and data structures. Am also familiar with the database functionality. Have worked in groups in the past so I will be an asset for this team moving forward.
* Ethan Moore: My major is also CS, and I am in my sophomore year. I have experience with java, python, solidity, some JavaScript, and C/C++. My main interest is in blockchain development and writing smart contracts. The most I have used the unity game engine for is to manipulate the player object via firing a ray at another game object to displace myself upward. I have worked on one group project in the past so this will be a new learning experience.
* Will Craddock: I am a CS major, and I am a post baccalaureate student. I have experience with Java, C++, C#, and HTML. The area that I am interested in is game design. I also have experience in making a game in unity as that was the focus of a group I had worked with in the past. My main focuses in that project were projectile mechanics and some inventory mechanics. I have worked with groups in the past over multiple subjects so there’s a lot I can bring to this team.

We have spent 5 hours a week each on the requirements. This time has been spent both on discord and in Raymond Cravens library planning and working on our draft and presentation. The days we have been working jointly are on Tuesdays and Thursdays.

# Technical feasibility

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The technicality of our project includes unity version 2020.3.17f1 and C# version 8.0. It should be feasible to implement C# scripts since all group members are familiar with scripting and programming. We are also vaguely familiar with using Unity so learning and understanding both Unity’s development environment and the C# programming language shouldn’t be a risk in our project to remake the NES game Contra. An added guarantee of the project's feasibility using Unity is that we will all complete Unity tutorials and read documentation before writing source code. The database portion will utilize phpMyAdmin and MySQL for the saved game data.

# Schedule feasibility

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To get everything done in an orderly manner, and to see how much we are getting done our team will be using two tools. First is the Gantt chart and another is the activity graph. Gantt chart will cover the whole project and will give the client and other stakeholders a better view of how the team is preparing and performing the tasks and what they are planning next. An activity graph will be how the team is adding those pieces together and how much time they are spending in doing that as a team. Let's first talk about the project and our estimated time to complete the project.

## Duration

Our project is divided into four sprints. Each sprint will be about three to four weeks long. We will be following the Sequential or Waterfall Process model to complete the project. It means we will complete task 1 and then start on the next task.

* Our initiation of the project was on August 23rd when sprint one started and will end on September 12th. During this sprint we will be gathering all the requirements from the client and other sources like previous creations and similar works. Then our other task during this sprint will be team organization and feasibility study. We will familiarize ourselves with the Unity Game engine interface on which we will be creating the game. And also, during all this we will be keeping and updating the documentation so it will be easier for all stakeholders involved in the project to know what's going on and later after the project is finished for maintenance purposes.
* Second sprint will begin on September 13th and will end on October 10th. During the sprint 2 we will design the different aspects of the game and again keep the complete documentation updated on what we are doing.
* Third sprint will begin on October 11th and will end on November 7th. During the sprint 3 we will be implementing the actual game using the unity game engine developer and again keep the complete documentation updated on what we are coding.
* Final sprint will last for the remainder of the semester and will consist of testing our product and changing what needs to be changed in the game, keeping all the records of how we achieved the desired results and documenting the mistakes we made along the way.

## Current Sprint

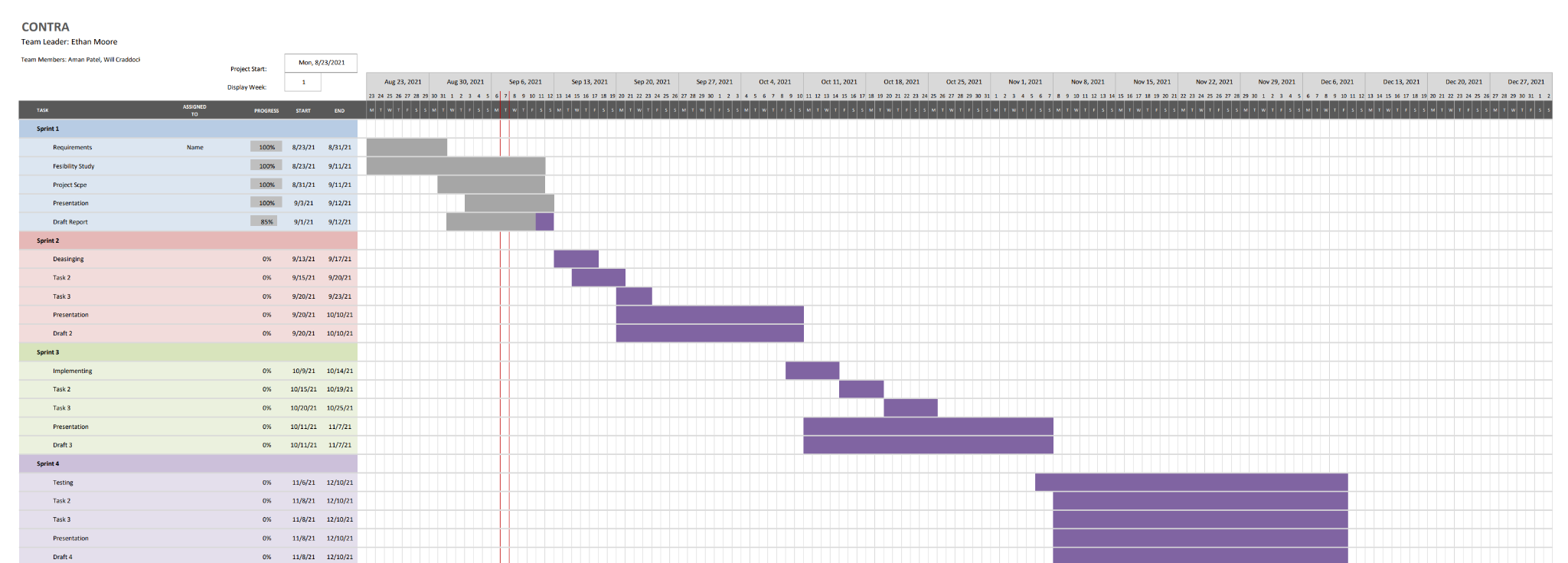
Estimated time for each task:

● Feasibility Study is estimated to take the entire duration of sprint one

● Researching the scope of the project will take one to two weeks

● Making the presentation should take one week

Overall, the feasibility study is estimated to take the longest time to complete due to the length and the fact that the feasibility study is updated throughout the entirety of sprint one. Our Gantt chart is as follows. We don’t have the specific dates for the topic and the deadlines for the other sprints at this time. We are aware of all the tasks and dates for the sprint 1 which we have mentioned in the Gantt chart.



# Progress visibility

To maintain the visibility of the project to our team members, client, and other stakeholders we have decided to have an activity graph for every sprint. Which will be created by the team members by the end of every sprint. Activity graph will give the information of what team did during the sprint and what time they spent on a particular task as a team and what task helped for the completion of a bigger task. Other than activity graph we are meeting with the client every Friday over the zoom to discuss the progress of the project and what the team plans to do over the next week and every week the team will provide a weekly progress report as a formal report of what team did and what they plan to do next week.

Activity Graph: As mentioned above we started with the requirements where we all spend 15 hours together, then we spent about 27 hours learning and exploring the Unity game engine and, we spent 9 hours for feasibility study. All this helped us finish our major task of the sprint which was to create a documentation and presentation for the requirements and feasibility. Dotted arrows means that event helped finish the major event during that sprint.



# Risk analysis

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Risk analysis is something that most businesses take seriously. This has not changed in our group project. We have looked at this from different angles to ensure that we have a plan if something were to go wrong. We have investigated potential risks that could come up in the future and have provided some examples.

Potential risks

* Hardware malfunctions
* Incompatible code/code malfunctions
* Schedule availability
* Physical health
* Extreme weather
* Unknown factors
* Previous commitments
* Person leaves the project

Our group has brainstormed ideas/solutions for all this situation if they came up. We are using different hardware systems to create this game and we are keeping all in the cloud-based storage systems like GitHub to store our codes and google docs for our documentation. That way even if one of our laptops or PCs broke still our data is not destroyed or harmed. We have assigned different tasks to different group members and a backup group member to complete a particular task so if some is not available another group member can get that task done.

Looking at these risk factors the risk with the most potential to occur is most likely a piece of hardware or software being incompatible or malfunctioning. Rest assured we have a contingency plan if any of these risks were to come up.