



Modding Halo Custom Edition

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What I'm creating?

I'm modifying an existing multiplayer map in Halo Custom Edition with AI bots and other custom vehicles. By modifying the multiplayer map, I can control how the battle would be like.

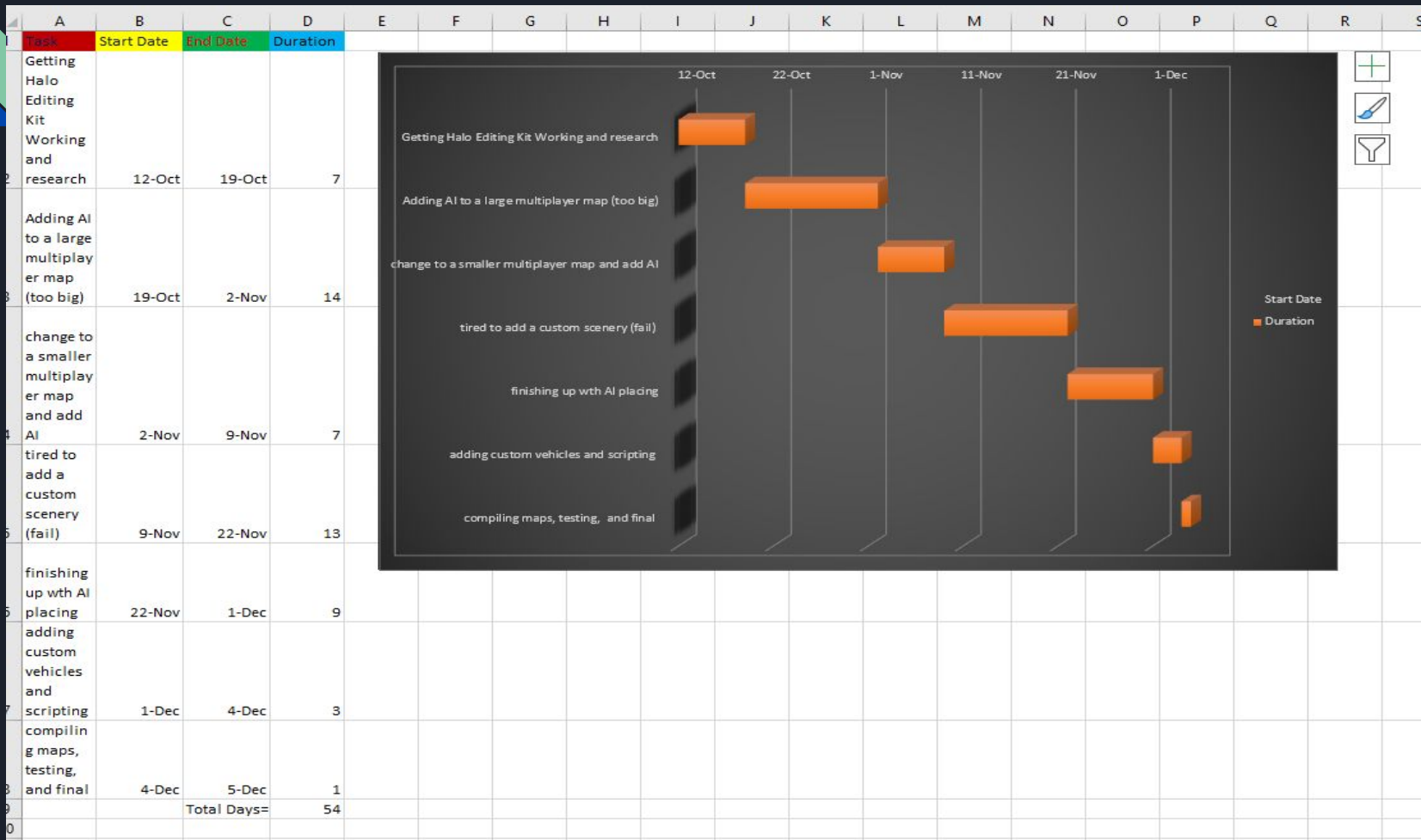
Little backstory and why I choose this instead

At the beginning of the semester, I was trying to create an FPS game in Unity, but after two months, I realized that this wasn't what interested me all along when I signed up for game design. What I was looking for when I joined game design was that I got to pick, dissect, and learn how to code one of my favorite games as a starting point: things like a visual representation of levels and scripting language the game uses and learn from there.

As soon as I changed my project to modifying Halo Custom Edition map, I felt much more excited, energized, and eager to learn every single bit about Halo CE. I told myself that this is what I want to learn, initially.

It is something that I always want to know and learn, as a kid, how the level designers design those levels in the campaign. Again, it goes back to the eagerness and how it works. As I was modifying Halo CE map, I felt like a “real” developer, dictating how the AI would battle each other.

Timeline



Prerequisites

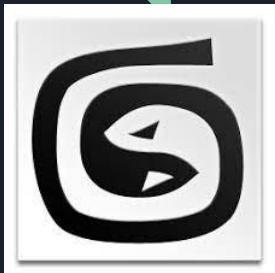


Halo Custom Edition is a PC expansion version of Halo Combat Evolved



Halo Editing Kit (HEK) is official suite of modding tool for Halo Custom Edition released by Gearbox Software.

Nice to have

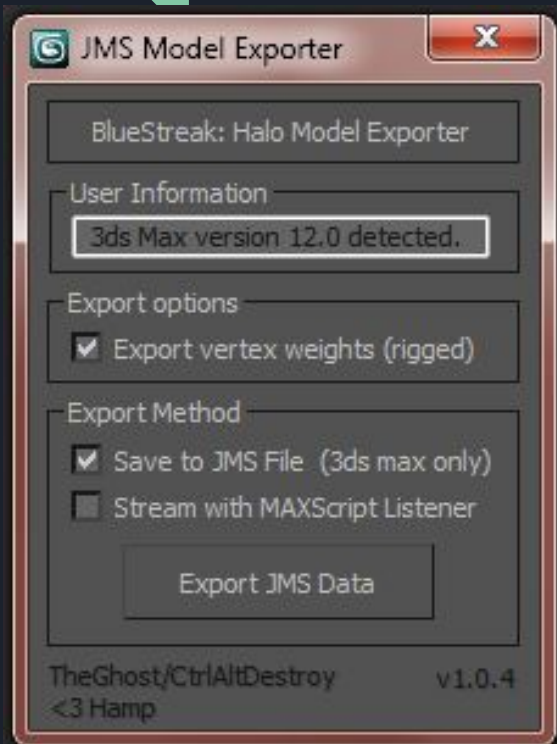


3DS Max, preferably 2012 and below in order for a plugin to work



Halo Editing Kit Plus, is a third party program that's able to extract existing maps and its tags. It's also able to encrypted map with a passcode so someone else won't be able to extract from the map without a passcode.

Nice to have cont'



JMS* Exporter, an plugin for 3DS Max for creating Halo Custom Edition blueprints

*JMS stands for Jointed Model Skeleton

Halo Custom Edition Important folders

The screenshot displays the Windows File Explorer interface for the directory `C:\Program Files (x86)\Microsoft Games\Halo Custom Edition`. The window title is "Halo Custom Edition". The ribbon includes tabs for "File", "Home", "Share", "View", and "Application Tools". The ribbon buttons are categorized into Clipboard (Pin to Quick access, Copy, Paste, Copy path, Paste shortcut), Organize (Move to, Copy to, Delete, Rename), New (New folder, Easy access, New item), Open (Properties, Edit, History), and Select (Select all, Select none, Invert selection, Select).

The address bar shows the path: `This PC > Local Disk (C:) > Program Files (x86) > Microsoft Games > Halo Custom Edition`. The search bar contains "Search Halo Custom Edition".

The left sidebar shows navigation options: Quick access, Creative Cloud Files, OneDrive, This PC, 3D Objects, Desktop, Documents, Downloads, Music, Pictures, Videos, Local Disk (C:), and Network.

The main content area displays the following files and folders:

File/Folder Name	File Type	Size/Date
blitzkrieg	Folder	
Halo Editing Kit Plus	Folder	
tags	Folder	
debug.txt	Text Document	1.03 MB
gamespy.ico	Icon	1.05 KB
haloce.exe	Halo	Microsoft Corporation
ksimeui.dll	Dynamic Link Library	1.1.2.7, 35.1 KB
patchw32.dll	Dynamic Link Library	7.0.0.0
Setupenu.dll	Dynamic Link Library	1.1.1.14, Microsoft Games AutoRun/Setup ...
UninstEK.exe	Microsoft Games AutoRun/Setup	Microsoft Corporation
content	Folder	
HEK_Tutorial	Folder	
Watson	Folder	
ebustpx.sem	SEM File	0 bytes
gamestate.txt	Text Document	0 bytes
haloceded.exe	Halo	Microsoft Corporation
KSMML.xsd	XML Schema File	36.1 KB
PidGen.dll	Dynamic Link Library	1.6.0.80, PidGen
SetupHEK.dll	Dynamic Link Library	1.1.1.14, Microsoft Games AutoRun/Setup ...
vorbis.dll	Dynamic Link Library	1.0.0.1, Vorbis Dynamic Link Library
controls	Folder	
maps	Folder	
binkw32.dll	Dynamic Link Library	1.5.21.0
Eula.dll	Dynamic Link Library	1.1.0.712, EulaDll
GSArcade.exe	Application	1.0.0.0, 9/26/2003 1:45 PM
haloupdate.cfg	CFG File	28 bytes
mgspid.dll	Dynamic Link Library	1.1.0.815, MGSPID
Readme.rtf	Rich Text Format	37.4 KB
Strings.dll	Dynamic Link Library	1.0.0.1, Halo Strings
vorbisenc.dll	Dynamic Link Library	1.0.0.1, Vorbisenc Dynamic Link Library
data	Folder	
redist	Folder	
chktrust.exe	Microsoft Trust ChkTrust Utility	Microsoft Corporation
Eula.rtf	Rich Text Format	9.64 KB
guerrilla.cfg	CFG File	48 bytes
haloupdate.exe	Halo Update	Microsoft Corporation
msvcv71.dll	Dynamic Link Library	7.10.3052.4, Microsoft® C Runtime Library
sapien.config	XML Configuration File	10.2 KB
tag_dump.txt	Text Document	484 KB
vorbisfile.dll	Dynamic Link Library	1.0.0.1, Vorbisfile Dynamic Link Library
directx	Folder	
Setup	Folder	
cmd.exe	Windows Command Processor	Microsoft Corporation
faviconico	Icon	2.41 KB
guerrilla.exe	Guerrilla MFC Application	Microsoft
heap_dump.txt	Text Document	4.34 MB
network.log	Text Document	608 KB
sapien.exe	Sapien for HaloPC	Microsoft
tool.exe	Application	10/30/2022 10:22 PM, 3.46 MB
xiph_license.txt	Text Document	1.51 KB
Gamespy Metrics	Folder	
shaders	Folder	
config.txt	Text Document	22.1 KB
game_time_statistics.txt	Text Document	0 bytes
halo1.ico	Icon	29.2 KB
Keystone.dll	Dynamic Link Library	1.1.2.8, Keystone
ogg.dll	Dynamic Link Library	1.0.0.1, Ogg Dynamic Link Library
sapien_model_index.dat	DAT File	492 KB
Uninstal.exe	Microsoft Games AutoRun/Setup	Microsoft Corporation

Sapien



sapien.exe

Sapien for HaloPC

Microsoft

Sapien is a visual representation of the final map in the game. This is the primary program for placing trigger volumes, add vehicles, AI bots, spawn points and anything else that's physically be positioned (weapons, flag bases, camera position for cutscenes) is done here

Sapien's development environment

The screenshot displays the Sapien development environment. The main window, titled "Sapien", features a menu bar (File, Edit, View, Help) and a toolbar. The central "Game window" shows a 3D landscape with a large crater, trees, and purple mechs. A "Hierarchy view" panel on the right lists the scene's structure, including "Mission", "Objects", "Player starting points", "AI", "Comments", "Game data", and "Cluster properties". Below it, the "Properties palette" is open, showing various settings for the selected object, such as "type" (multiplayer), "flags" (cortana hack, use demo UI), "local north" (0), and "editor scenario data" (bytes).

Game window

Hierarchy view

Properties palette

Ready

Pointer | Camera | Camera Speed: 60x

Ready

Instances Selected: 0

Hierarchy View

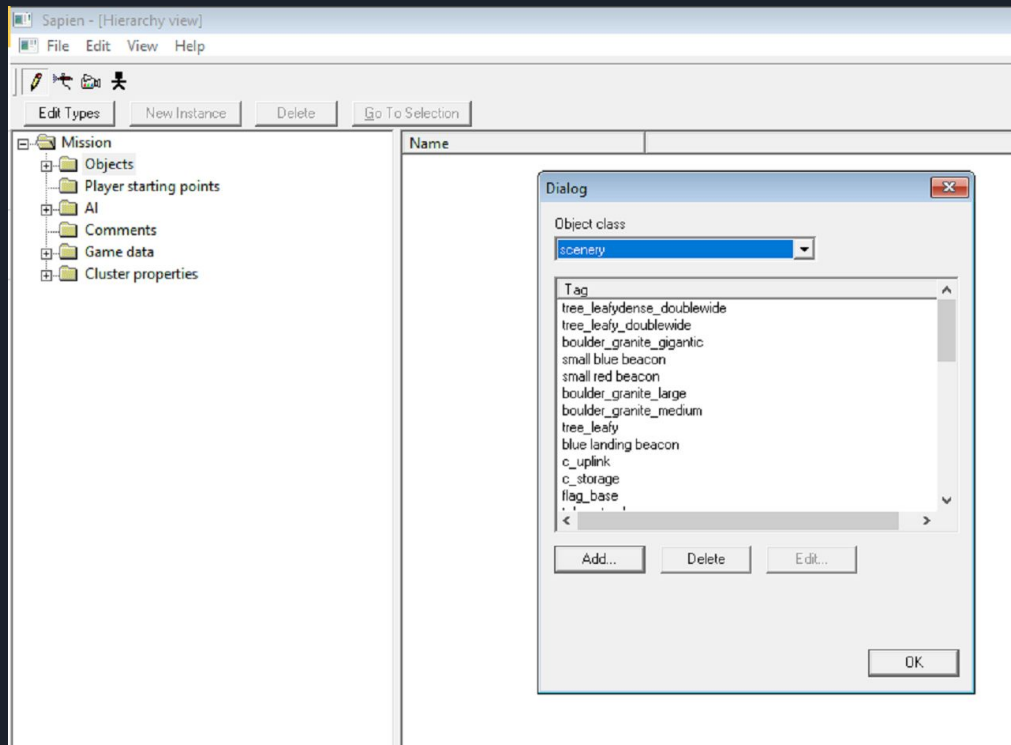
Click on Edit Type to bring up the Dialog window which shows everything that's already loaded

Object Class are as follows:



A screenshot of a list of object classes in a software interface. The list is displayed in a white window with a blue header. The 'vehicle' class is highlighted in blue. The list includes:

- scenery
- vehicle
- biped
- equipment
- weapon
- device_machine
- device_control
- sound_scenery
- device_light_fixture
- detail_object_collection
- decal
- actor_variant
- fog_palette
- weather_palette
- background_sound_palette
- sound_environment_palette



Properties Palette for (AI)

Name: naming convention (for yourself)

Actor type: what kind of ai enemy or ally

Platoon: no documentation on this one

Initial state: spawn with this state (sleeping, moving back and forth, fleeing and etc)

Return state: after initial state had been met

Flags: no documentation on this too

Unique leader type: only apply to marines

Maneuver to squad: no documentation

Squad delay time: time delay for the squad

And the rest are the properties of the ai engagement , spawn time, number of lives (spawn total = 0 = infinity lives)

The screenshot shows a 'Properties palette' window for an AI unit named 'JACKAL'. The window contains various configuration options:

- name:** JACKAL
- actor type:** jackal major plasma pistol
- platoon:** NONE
- initial state:** moving - loop back and forth
- return state:** moving - loop back and forth
- flags:** A list of checkboxes: unused, never search, start timer immediately, no timer, delay forever, magic sight after timer, automatic migration. All are currently unchecked.
- unique leader type:** normal
- maneuver to squad:** NONE
- squad delay time:** 1 seconds
- attacking:** B
- attacking search:** B
- attacking guard:** B
- defending:** B
- defending search:** B
- defending guard:** B
- pursuing:** B
- normal diff count:** 1
- insane diff count:** 1
- major upgrade:** normal
- respawn min actors:** 3
- respawn max actors:** 3
- respawn total:** 0
- respawn delay:** 15 to 30 seconds

Instances Selected: 0

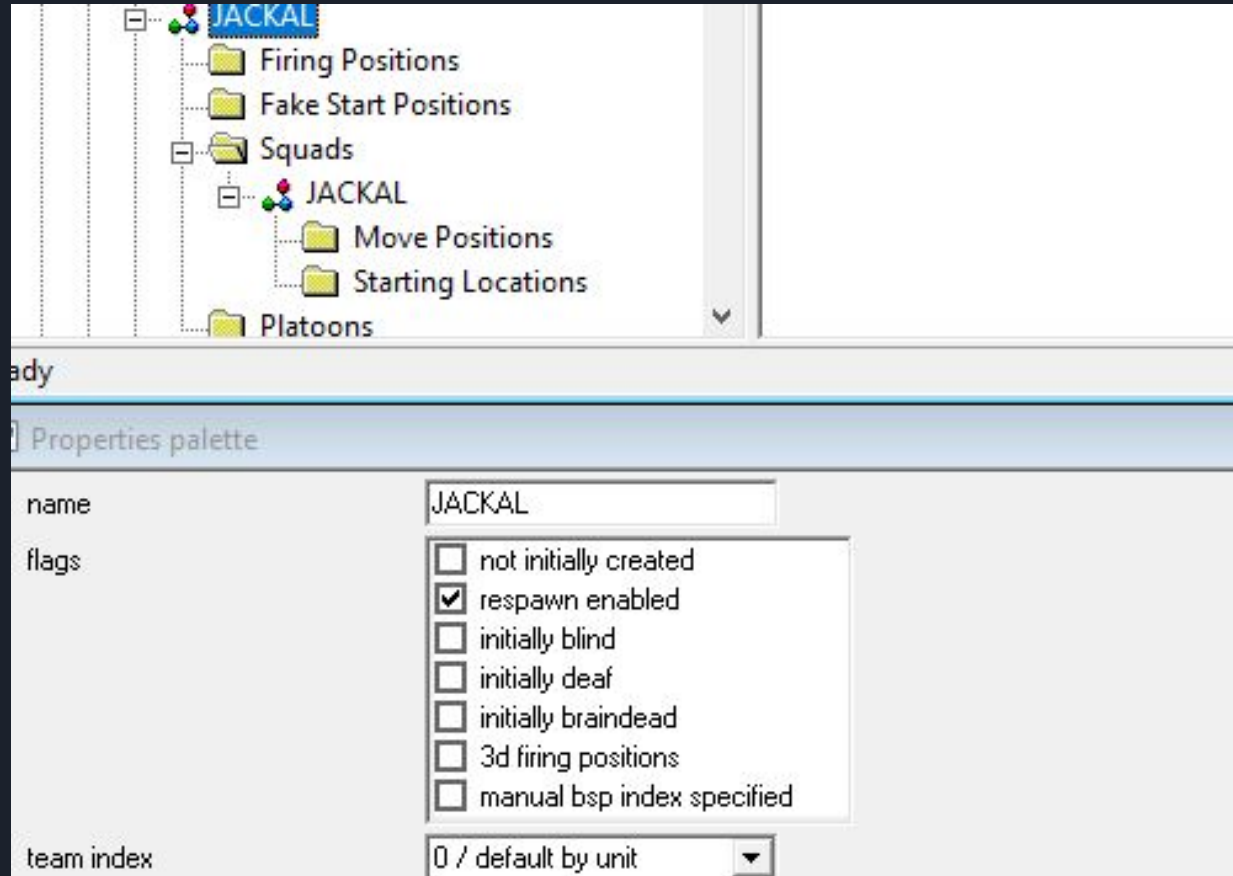
Properties Palette for (AI) cont'

In order for the AI to spawn, user need to place **starting locations** (aka spawns) and make sure the respawn enable flag is checked. Or else the AI won't spawn.

Move Positions: makes the AI move to that point you have placed on the map.

Fire Positions: the place where they would fire their weapons*

*Of course there are exception to this however



Halo Scripting

In order to compile scripts, the Tag and Data folder path have to be identical

```
(<void> object_pvs_set_object <object>)
```

Sets the specified object as the special place that activates everything it sees.

```
(<void> object_set_collideable <object> <boolean>)  
(object_set_collideable (player0) true)  
(object_set_collideable (player0) false)
```

false prevents any object from colliding with the given object

```
(<void> object_set_facing <object> <cutscene_flag>)  
(object_set_facing (player0) blue_base_flag)
```

Turns the specified object in the direction of the specified flag

```
(<void> object_set_melee_attack_inhibited <object> <boolean>)  
(object_set_melee_attack_inhibited (player0) true)  
(object_set_melee_attack_inhibited (player0) false)
```

false prevents object from using melee attack

Script is in .hsc file format which is Blam Language

Guerilla



guerilla.exe

Guerilla MFC Application

Microsoft

Guerilla is a second program that lets user edit and create properties of AI. Properties like accuracy, how far the AI can shoot and see, damage, hitpoints, and other attributes. This is also the program that let us create new ai properties and add them to existing biped that has no ai yet. And other capability which I do not know due to limited documentation.

Tool

Maximum file size for multiplayer is 128MB* Any file over that size would crash the game.

The only exception is single player which can go up to 3 times the multiplayer file size

```
C:\Program Files (x86)\Microsoft Games\Halo Custom Edition\cmd.exe
The system cannot find message text for message number 0x2350 in the message file for Application.

(c) Microsoft Corporation. All rights reserved.
Not enough memory resources are available to process this command.

C:\Program Files (x86)\Microsoft Games\Halo Custom Edition>tool build-cache-file levels\test\deathisland\z
Couldn't read map file './toolbeta.map'
WARNING: 11 clusters in structure_bsp levels\test\deathisland\deathisland have no background sound or sound environment.

culling uncompressed model vertices...done
culling uncompressed structure bsp vertices...done
culling uncompressed model animation data...done
building predicted resources for structures...done
structure bsp 'levels\test\deathisland\deathisland' is 4.81M
tag headers and names are 0.36M
streaming model vertex and index buffers...done
streaming tags.....done
writing vertex and index buffers...done 20.95M
writing tags...done (4547 tags for 16.02M)
total tag size is 20.83M (2.17M free)
compressing 107.38M...done
successfully built cache file.
Cache pack file bitmaps hits: 974 for 55.43M
Cache pack file bitmaps adds/misses: 388 for 21.14M
Cache pack file sounds hits: 678 for 14.67M
Cache pack file sounds adds/misses: 2284 for 45.64M
Cache pack file loc hits: 104 for 0.22M
Cache pack file loc adds/misses: 0 for 0.00M
```

In order to play the things the user see in Sapien, the user must type in this command into cmd: "tool build-cache-file levels\namefolder1\namefolder2\name.scenario"*



Challenges

- Unfortunately there's so little documentation of creating new maps
- User created map with AI bots (not possible due to tool.exe not creating the required resources)
- When running into problems creating map(s), it is completely unsolvable; Tool.exe is painful to use as it doesn't let me create shaders.
- An old engine (I don't mind)
- File size limit of 128MB (Multiplayer)
- Vehicles not spawning
- gathering exception data (game crash)



Overcome some of the challenges

- Due to the limited time, I didn't try to troubleshoot why the tool wasn't creating my map. Instead, I decided to modify an existing map with AI bots and how I want them to play out.
- Because of the file size limit, I was forced to use a smaller existing map to edit and add AI.
- Found a script that spawns vehicles.
- Trial and error and some research helped me solve gathering exception data (crash in game).



Thank You