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PROJECT TRILLEK

Game Design Document

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1. High Level Game Concept

Summary

Trillek is a fan game inspired by Notch's retired 0x10^c space exploration/survival and ship building game. The player will set out in space, collecting resources, programming and building their ship, and adventuring with friends. More information about Notch's original game and its intended features can be found here: https://minecraft.wiki/w/0x10c.

Gameplay

Players will go around exploring planets, asteroids, and other space bodies gathering resources to build and expand their ships and stations. Players will need to acquire, from other players, shops, or write it themselves, software for the on-board computer that controls every aspect of the ship or station. Gameplay will focus primarily on the ship and the player's interaction with it, but there will also be space exploration.

Ships and stations will be built using hull plates, compartments, and connecting tubes/hallways. Once the macro structure is complete players will then place objects (chair, lamp, etc) and lay down ducting and power/data lines from various components and systems to the central computer. After the computer has been programmed to use the components and systems, the player will be able fly their ship around exploring; while still expanding and upgrading their ship.

Atmosphere

The tone and the atmosphere of the game is supposed to give off a sense of mystery and suspense. It is supposed to invoke a sense of being lost. In ships, it should feel warm and at home, but a little cramped. Stations are far more spacious than ships, but they might be more complex and a little more cold. Generally, space should feel lonely.

Ship interiors ought to be sparsely illuminated and crammed full of retro-looking technology, and resemble those in sci-fi movies such as 2001, Alien, Silent Running, Dark Star, and similar space media from the same era. Station interiors are more spacious and less utilitarian, and should resemble empty dimly-lit malls, hotels, offices, and similar types of buildings from the late 20th century. Outer space is dark and mostly devoid of stars, and should probably evoke space artwork from around the same time period. In addition to actual technology and artwork from the era, inspiration could be taken from contemporary vaporwave and liminal space imagery.

Technology

Technology should have an 80s-like retrofuturistic aesthetic. Since the ships players pilot are supposed to be from an alternate version of the 1980s, technology should look like it's from the 80s, and/or be about as advanced as technology from the 80s was, except when the gameplay requires technology which is more advanced than what was available then.

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Alien technology would be more advanced than human technology, so more fantastical technologies (such as shield generators, cloaking devices, teleporters, tractor beams and force fields) would usually be of alien origin. A few essential fantastical technologies, like high-efficiency reactors and engines, faster-than-light travel, and artificial gravity, would have been developed in the 1980s in this game's timeline.

Guns would fire glowing plasma projectiles instead of bullets, to better fit the aesthetic, but would otherwise not be more advanced than modern weapons (except for alien weapons, which might have some more unusual properties).

Story

In 1988, a brand new deep sleep chamber was released, the **SPC2000 - Suspension Chamber 2000** by **the Nya Elektriska Corporation**. This sleep chamber would allow humans to colonize Mars and the wider solar system. During the lead-up to the release of the sleep chamber, **Nya Elektriska** ran a competition that would fund anyone creating a spaceship, if they would use and test the **SPC2000.** This led to thousands of ships being created and launched.

The **SPC2000** was compatible with most 16-bit CPUs available at the time, unfortunately, it used big endian, whereas the DCPU-16 specifications called for little endian. This led to a severe bug in the included drivers for any ship using the DCPU-16, causing a requested sleep of 0x0000 0000 0000 0001 years to last for 0x0001 0000 0000 0000 years.

After no ships using the DCPU-16 responded to having reached their destination, **Nya Elektriska** discovered the bug in their driver, but it was too late to stop the deep-space bound ships. These ships won't resume operations and communications for $0x10^c$ years.

It is currently the year $0x10^c$ and players are beginning to awaken and activate their ships computers and robots, only to discover the horrible error in the **SPC2000.** Now players must try to survive in the far flung future with 80s space-age technology.

Pillars

Ship Building

Ships are constructed at various scales. This distinction allows the player to make sense of why they can move giant hull sections or see the flow of power in an unnatural way.

- **Macro scale** - where hull plates and compartments are placed.
- **Micro scale** - where objects such as furniture or containers are placed.
- **Internal connections** - where wires for power and data as well as ducting and hoses for oxygen, water, etc are run.
- **Power system** - visualizes how power is generated and distributed through the ship.

Exploration and Resource Gathering

Resource gathering will be focused on planets, asteroids, and comets.

- **Planets** - largest source of resources, but require the most work.
- **Asteroids** - smaller source of resources, but require less effort to obtain.

- **Comets** - the main use of comets will be collecting of resources required to sustain life (water from ice, and oxygen from splitting H_2O).

Ship Interaction and CPU

Player interaction within their ship is controlled via a central computer for most tasks. Mundane tasks such as opening a door or turning off a light can be done via a switch, but more complex interactions will be handled by the computer. Interaction between different ships will be purely computer driven i.e. a comm system to chat or a docking ring that connects when the ships sync their movement via their computers.

The player interactions depend on the peripherals installed on their computer (a network card and a wireless connection is the minimum, speakers and mic will enable audio interaction).

The interactions will be limited by the bandwidth and the distance between players.

2. Gameplay Mechanics

Player

There are several mechanics that players use to interact with the ship, environment, and game.

- **Tools** - the player has an array of tools at their disposal to repair or edit their ship. These include a handheld welder, pliers, multi-driver (screwdriver with various bits), and duct-tape. Each tool has a use and some are more easily used, but the effect of repair won't be as long or good (duct-tape vs welding).
    - **Handheld welder** - used to join compartments, tubes, ducting, etc permanently. The welder requires a Welding resource to use. The Welding resource provides both the welding material as well as the fuel.
- **Suit** - the player wears a suit at all times. The suit provides some protection from space and low/no atmosphere levels when the helmet is worn as well.
- **Attributes** - Players will have basic attributes that control their survival. These include Oxygen, Temperature, Health, and Hunger/Thirst. If these attributes fall below sustainable levels, the player will die. The rate of death will be determined by the attribute.
    - **Oxygen** - the primary attribute that sustains life. Without oxygen the player will suffocate and die from asphyxiation.

Ship

Ship interaction mechanics include ship building and the associated onboard computer.

- **Building** - the player will build, repair, and customize their ship constantly. Ship building will be expanded upon the the [Pillars > Ship > Building] section, but generally the player

will place hull plates and compartments, then fill the compartments with objects, and finally wire everything together for the computer to control.

- **Computer** - the computer is used to control every aspect of the ship; from doors to lights to ship-to-ship communication. The player will use the computer constantly.
    - **Input** - players will use various input methods to interact with the ship such as keyboard, joystick, and even manual buttons and switches.
    - **Audio/Visual feedback** - computer components such as speakers and monitors will provide the player with constant feedback about ship status and information about the “world” around the ship.

3. Pillars - explained

Ship

The main pillar of Trillek is ship building. Ships are built using hull panels, compartments, and tubes or hallways that connect the compartments. Hull panels can be thought of as a skin or wrapper that contains everything like a shopping bag, whereas compartments are more like the boxes put inside that shopping bag, containing all the objects in the ship such as chairs, desks, crates, etc.

After a ship is built, it can be used to explore the universe. Ships would ideally not ever run out of resources just by idling in space doing nothing, so certain always-running essential functions like power generation and life support would not normally consume any resources. Many other functions though, like engines and weapons, would consume resources that would need to be continually replenished by looting or mining and manufacturing. Resources would also be necessary for placing new objects on the ship and expanding the hull of the ship.

- Building
    - **Macro scale** - this is where the hull room blocks are placed and connected, and is accessed through a special ship editor menu.
        - A ship starts out as a small simple shape, which can have its dimensions expanded and polygons added to it. It’s a bit like turning a default cube into a more complex shape in a modeling program. Expanding it requires an amount of steel proportional to the increased volume.
        - Interiors consist of room blocks that are placed together like Lego with various shapes inside the confines of the outer hull.
        - Room blocks can be connected with hallways or airlocks when 2 blocks are touching.
    - **Micro scale** - this is where objects are placed by the player in first person. These include furniture, containers, and the various mechanical and computer components.

        - Fine grained movement and rotation tools will be available. Additionally keyboard modifiers can be used (e.g. shift to move small units or ctrl to snap to a grid) when moving or rotating.
    - **Internal connections** - this is how objects are able to transmit and receive data, power and resources.
        - Compartment-to-compartment wiring and ducting use special surface links.
        - Wires and ducting for individual components will use inner wall connections or physical cabling.
- Repair
    - Duct tape would quickly but temporarily repair damage, permanently repairing damage would take more time and require a welder or some other sort of tool
    - Damaged elements would be visually different (damage overlay texture, spark and smoke particles) so you know what needs repairs
    - Ships can be damaged by enemy ship weapons, collisions with surfaces, and prolonged exposure to extreme temperatures and pressures. Player weapons would not generally damage ship elements, except for a few particularly fragile ones like exposed wires and pipes (explosive weapons might do some damage though).
- Respawning
    - When a ship is destroyed, there should probably be a way for a player to quickly get their hands on a new ship. One possibility is that ships simply respawn after being destroyed (which is what Notch intended). Of course this raises questions, such as:
        - Where does it respawn? How does one set a ship's spawn point? By docking at a space station? What happens if that station's docks are all occupied when the ship is destroyed? What happens if the station is destroyed? Is there a world spawn point where ships respawn by default?
        - What gets left behind? Just the cargo? What is defined as cargo? Do recent modifications made to a ship carry over when it respawns? Does it leave wreckage behind? Can this wreckage be mined for scrap? Can this be used as an infinite scrap exploit by repeatedly blowing up your own ship? Is there a cost for respawning a ship? If so, where is the cost extracted from? Can you have bank accounts? Can you go into debt? Debt to who?
        - What happens if everyone onboard evacuated before it exploded? Does it respawn by itself with nobody on it? How would players stranded with no ship escape that situation? Is it possible to build a new ship using only common resources on planets and asteroids? What if you're somewhere without those resources?

Bases

Bases use the same building system as ships. The difference is that they don't move around. These can be free-floating in space (space stations) or attached to the surface of an asteroid or planet (surface bases).

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Some ship elements have no purpose in bases (such as engines), and likewise there are some base elements that have no purpose on ships (such as wind turbines or geothermal generators). For the most part though, anything that can be placed on a ship can be placed on a base and vice versa.

Since bases stay in one place, they can serve as meeting points for players, or storage repositories for items and ships, or farms for a local resource. Shipyard or shipdock modules could be used to automatically construct new ships.

Computers

An important mechanic in the game is an in-game programmable computer. This virtual computer allows the player to control the various aspects of a ship or space station. This includes things like life support, power generation/distribution, engines status/control, navigation, weapons, defenses, airlocks, doors, etc.

This virtual computer mimics the simple home computers of the 80's. Why? Nearly everyone that has used an 80's computer learned that, with little effort, one could make programs, including games. Since the old computers do not have the complexity of modern devices, you don't need to be a computer geek to understand how to work and program it. Also being so relatively slow (i.e. 0,1 to 1MHz clock speed) means that it's inefficient to make software that requires vast amounts of computations. The player can't just throw CPU cycles at it, and write inefficient code. They have to think and make it efficient, teaching the ability to write efficient programs, a skill that isn't very appreciated today.

For the players that aren't able to write software (i.e. they are too busy, or simply don't know how), there will be basic software installed on these computers that allows basic control of a ship or station with some effort. The player can manually control some components like weapons, but manual control requires the player to be near the controlled game item. Other devices can run by themselves, for example a radar with its own display, an astrogator & orientation unit or a targeting sensor unit, but can be connected to a computer to give information.

There are multiple ways the player can interact with the in-game computers. Apart from the typical keyboard, a player can use joysticks, switches and buttons as inputs. For output, there will be one or many screens (textual or graphical) and other specialized devices, like holographic projectors, light projectors, alphanumeric displays, etc. Additionally, there will be some accessory output devices, like a simple beeper, advanced sound devices or voice synth device (Wargames computer voice-esque).

Players will be allowed to store their own programs and data in different media storage devices in game. Floppy disks will be the most common form of data storage; small hard disks, data tapes, and ROM cartridges are some other possible data storage mediums. Obviously, this would allow players to share/steal programs and data from other players or create malicious software to hijack/sabotage enemy players' computers. There will be some factor of cyber-war in the game. Just like the real world, players will have to be wary of what they are buying and downloading.

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Components

- Power system
    - Management and distribution will be primarily controlled via the computer, but manual control can be done with switches, buttons, levels, etc.
    - Generation
        - Done via era-feasible generators such mini nuclear, solar, or liquid fuel (for thrusters or propulsion)
        - Fuel consuming generators produce more energy, but are limited by the supply of fuel. Non-consumers produce less energy, but are unlimited in use (solar for example as long as there is sunlight).
        - Power sources could include:
            - A low-wattage generator that does not require fuel
            - Combustion and fusion reactors (probably no fission reactors since the future universe is devoid of useful radioactive elements)
            - Solar panels
            - Geothermal, hydroelectric and wind power for surface bases
    - Power cells for storing power, which can be released to provide a temporary power boost, or to provide power if no other source is available
    - Some items would use power and would need to be recharged, either with batteries or by putting them into an item charger device
- Life support
    - A functional air recycler is required to keep a ship habitable. Without it, oxygen levels will continue to drop until reaching zero.
        - Hull breaches or doors open to space will drain air from affected rooms, which will then drain air from adjacent rooms, and so on
        - Fires also drain oxygen from the room they're in, but will burn out if oxygen levels get too low
        - Plants will increase oxygen levels in the room they're in, but not by as much as life support machines
        - Air pressure and oxygen level would probably be two different things (so a room can be pressurized but still have no oxygen)
        - Air recyclers need to be connected to nitrogen and oxygen tanks in order to replenish lost air
        - Toxic and flammable gasses can accumulate inside ships, which air recyclers will reduce over time
    - Temperature needs to be regulated, otherwise a ship may heat up or cool down to dangerous levels (depending on the environment)
        - Overheating is a bigger concern in a vacuum, as a ship's power generator produces heat faster than it can radiate into space. If a ship has no heat sources though, it will get colder instead
        - Heat regulation could be done with a specialized air conditioner device or by the same device as air recycling (a general purpose life support unit)
        - Exterior radiators are needed to remove excess heat from ship interiors
        - Coolant pipes transfer heat directly from heat-generating devices to radiators

        - Interior fans and heaters are used to regulate the air temperature of rooms
    - Artificial gravity is provided by a gravity generator. Without it, everything inside the ship is subjected to external physical forces.
        - Usually this means floating around in zero gravity, but if a ship is moving around a lot, or on a high gravity planet, or upside down in an atmosphere, then everything will get pushed in the appropriate direction.
        - Artificial gravity could also be produced by rotation, allowing for spinning space stations without gravity generators.
        - A gravity panel placed beneath a floor, connected to a gravity generator with a conduit carrying gravity particles, may be required in order to supply artificial gravity to an area.
        - Graviton inverters would invert the effects of connected gravity panels, causing them to push objects instead of pull them
        - Gravity/antigravity emitters can be placed on the outside of a ship to attract or repel other objects, allowing for things like hovering and tractor beams
    - Sprinklers for putting out fires, removing radioactive contamination, and watering plants, require water supplied through pipes
- Propulsion
    - For a ship to move it needs engines. These of course need to face backward for the ship to move forward, but can be placed facing any direction to provide thrust in any direction.
    - For a ship to rotate it would need either reaction wheels or maneuvering thrusters.
    - Traveling above a certain speed requires a special FTL propulsion system.
    - Both normal engines and FTL engines require both external elements (thrusters/nacelles) and internal elements (propellant tanks/warp drives), and would both consume fuel (or maybe just the FTL propulsion system consumes fuel)
    - The volume of the hull, minus the volume of the interior rooms, determines how quickly engines can accelerate a spaceship.
- Defense
    - Shield generators would produce a bubble around a ship that protects it from weapons, collisions and radiation.
        - The shield would take damage from these, though its health would regenerate over time. If it takes too much damage though, it goes down, and you have to wait before raising it again.
        - Would use a fair bit of a ship's power supply while active.
    - Cloak generators would produce a bubble around a ship that makes the contents invisible from outside.
        - If the cloak is touched by anything, the contents become slightly less invisible for a short amount of time. Too much and the cloak goes down, and you have to wait before raising it again.
        - Would use the majority of a ship's power supply while active.
    - Shields and cloaks may require external emitter elements as well as an interior generator element.

    - Both may require some sort of exotic fuel in order to function (muon plasma for shields/tau plasma for cloaks?)
- Weapons
    - At least three main ship-mounted weapon types: cannons (shoot small, fast, inert projectiles), launchers (shoot large, slow, explosive projectiles) and beams (shoot a persistent beam). Each of these would have multiple subtypes, and could be customizable.
    - Weapons can be placed on turrets, which can move to aim at targets, either manually or by computer control.
    - Cannons and launchers (and maybe beams) would need to be supplied with ammunition through conduits.
- Mining and crafting
    - Several types of exterior elements for collecting resources (drills for terrain, cutters for other ships, pumps for liquid, compressors for atmospheres, ramscoops for particles in a vacuum)
        - Alternatively, just drills for collecting resources from solid surfaces, and pumps for collecting resources from the surrounding medium
    - Several types of interior elements for storing resources
        - Crates, lockers, cabinets, shelves, etc, for items that can be held in the inventory
        - Canisters/tanks for resources that don't exist as items, like liquids and gasses)
    - Several types of crafting modules for turning resources into other resources:
        - Furnace: used to smelt ores into ingots and rocks into glass, among other things. Any crafting process that involves transforming a material through heat is done with a furnace.
        - Freezer: used for storing ices and for converting fluids into ices.
        - Electrolyzer: used to combine, separate or transform substances. Any crafting process that involves combining or separating molecules is done with a lab table.
        - Workstation: used to craft smaller things like tools and components. Any crafting process that involves combining substances to make a more complex and refined item is done with a workstation.
        - Assembler: used to craft things like devices and decorations out of processed materials. Any crafting process that involves combining smaller components and materials to make a large object is done with an assembler.
        - More niche and specific crafting stations, such as a kitchen table for making food and medical table for making medicine
    - Items can be transported automatically between these elements by conduits
- Survival
    - The suspension chamber is used for setting player spawn points. For hardcore/perma-death like modes, it would only work once as a starting point.
    - Players would need to be able to heal themselves, so medical devices of some sort (medical beds/cabinets) would be necessary. These could either heal you directly, or simply supply you with medicine.

    - Assuming food exists, devices for farming plants and algae, and devices for converting that into consumable items, would be needed. (grow beds, ovens, refrigerators)
    - Water purifiers and drink dispensers
    - Suit repair and storage stuff
    - Washers/dryers for cleaning items with radioactive/chemical contamination
- Computers
    - The CPU is the computing part of the computer and the most important.
    - CRT Monitors allow players to see and interact with the computer's contents, making them similarly important. Thick, low resolution and limited color palette.
    - Terminals as a lower-end/starter alternative to proper CRT monitors.
    - Floppy drives can have floppy disks inserted, the contents of which can be read and modified by connected computers.
    - Vector projectors for creating line-based holographic images.
    - Buttons and levers which can be mapped to computer inputs. These could be placed on walls by themselves or bundled together onto switch panels. They can either interface with a computer or connect directly to electrical circuits.
    - Antennas allow computers to communicate beyond the ship.
    - Command chairs let the user control a ship's functions using keyboard inputs.
    - Robots can be programmed to do tasks around the ship and can be equipped with tools. They would receive instructions either by inserting a floppy disk into them or by signals from a radio modem. They would also need to be recharged, either by inserting batteries into them or connecting them to a robot charger.
    - Clocks let players and computers measure the passage of time.
    - Some maybe ideas:
        - Supplementary hard drives to boost the total storage of onboard computers
        - Printers for printing out text from a computer for physical storage (so no danger of the data being corrupted by electricity, magnetism or radiation). Players can send faxes from one computer to get printed by another.
        - CCTV cameras which provide a live feed of their POV to a connected monitor (obviously low level of detail to prevent lag from rendering many 3D spaces at once)
- Conduits
    - Conduits would be placeable underneath the panels covering the walls, floors and ceilings of the interiors of ships, or hanging from the ceiling.
        - Electric cables for transmitting power from generators to connected devices
        - Fiber optic cables for transmitting data from computers to connected devices
        - Conveyors for moving items between different containers and devices
        - Pipes for moving fluids between different containers and devices
        - Plasma conduits for moving plasma (need to be powered or else the plasma will be uncontained and may damage the conduit)
    - Surface links let conduits connect to other conduits through walls. When placed on a surface on the inside or outside of a ship, another surface link is created on whatever surface is on the other side of that surface, directly opposite to it. Data, power and resources can travel through surface links, so for example if you

connect a wire that has power running through it to a surface link, another wire connected to the opposite surface link will receive that power.
        - Alternatively you may need to individually place 2 separate surface links on directly opposite surfaces for them to connect
        - Alternatively you may need to just run conduits along the sides of walls all the time, and running a conduit from the inside to the outside of a ship would require it to go through an airlock or window
    - Vents can be placed in the space between rooms using the ship editor, and allow air from an air recycler and air conditioner to be distributed evenly throughout a ship (without them, they can only affect the air in nearby rooms). Vents are large enough to crawl through, making it possible for both players and aliens to use them to move around a ship. Vents would probably also be useful for running other kinds of conduits like wires and pipes through a ship.
- Structural
    - Interior lights keep a ship illuminated, exterior lights illuminate a ship's surroundings. These can be directly attached to a surface, or hanging from cables that swing around as a ship moves. Lights are also necessary for growing plants.
    - Panels can be placed over interior surfaces. These come in a variety of patterns and colors, making interior spaces more customizable. They also protect whatever is underneath (such as conduits or the ship's hull) from damage.
    - Stairs, ramps and ladders for going up and down
    - Railings and grates, for thin see-through surfaces
    - Doors are customizable in size and shape and can be opened and closed (if they are powered), and prevent air from leaking out and enemies from breaking in.
    - Elevators are also customizable and can be moved vertically (and maybe horizontally) through elevator shafts.
    - Windows, for looking out into space, or just for making transparent walls between rooms.
    - Force fields are like windows, except that solid objects (excluding projectiles) can pass through them, and they need to be powered, or else air can pass through too.
    - Docking ports for connecting multiple ships together
    - Landing legs for stabilizing landed ships
    - Wheels for ground vehicles
    - Rails and rotors could be used to create sliding and rotating parts on ships (like large doors or elevators)
- Science
    - Navigation Telescopes let players figure out where they are and where they are going. When placed on the outside of a ship and connected to a computer inside the ship, computer monitors or vector projectors can display a wireframe view of nearby space, showing stars, planets, moons, asteroids and ships, along with their trajectories. You can zoom in and out, from the level of a single ship to the level of the entire galaxy.
    - Object Scanners let players learn detailed information about specific targets. Scanning a nearby celestial body or spacecraft with the scanner outputs a wireframe view of the object (or every part of the object in the scanner's field of view, if close up) to connected displays, showing the object's shape and interior

along with other information like the composition and temperature of different areas.
    - Environment Sensors let players figure out what their immediate surroundings are like. They output data about the conditions of their environment, such as temperature, pressure, gravity, and radiation.
    - Specimen analyzers are used for detailed study of certain special items players can find, such as alien organisms and artifacts. Players can place items inside to be scanned, to get detailed information about what the item does.
- Other
    - Teleporters could be used to teleport entities (including players) to remote locations and back again
        - Teleportation systems would probably involve both a pad element and a transmitter element. The transmitter would be aimed in a particular direction and activated, and any objects on the connected pad would be teleported to wherever the transmitter is aimed, and any objects the transmitter is aimed at would be teleported to the pad. Objects can be sent directly from one pad to another by aiming two transmitters at each other.
    - Magnetic clamps could be used to push and pull other ships (and asteroids)
    - Interdictors/warp inhibitors are powerful long-range tractor beams (or something) for forcing other ships into combat range (without these, attacking a ship at FTL speeds would be basically impossible due to the differences in speed and distance involved)
        - Players may be required to pursue and match velocity with their targets, but there should probably be something to cause ships to remain in weapons distance for long enough for ship combat to actually happen
        - The warp inhibitor could be a directional beam that has to be aimed at the target vessel, or an omnidirectional pulse that disrupts the FTL of all nearby ships
    - Vending machines which players with an access code can stock with items and money and set prices for different transactions. This would allow for trade between players without all of them being online at once (also theft-proof, as they drop no contents when destroyed)
    - Shipyards are used as respawn points for ships, and allow players to customize their ship's hull shape and room layout.
        - Shipyards would probably be created by placing assembly arms around the inner surface of a hollow structure, a ship can be constructed by the arms only if all points within the ship's volume can be reached by the arms
- Decoration
    - Chairs, tables, beds, etc
    - Bath and kitchen furniture
    - A variety of space-themed posters from the alternate 80s
    - Planters and vivariums for displaying alien life forms collected from planets

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Player

The player character is a human astronaut who wears a spacesuit at all times. The player's face and the suit's colors can be customized.

- **Inventory** - The player has a hotbar and inventory, at least minecraft-sized, potentially bigger. Items take up slots in this inventory. Some items stack, others don't. Some large items might take up multiple slots at the same time, such as a 2x2 or 1x3 space in the inventory, for example. There could also be equipment slots that certain items can be placed into to give the player a special ability. Players may also be able to craft some simple items in their inventory.
- **Health** - The player has a certain amount of health points (20? 100?) and losing them all means dying and respawning (except in hardcore mode, if that exists). Players take damage from sources like high-speed collisions (such as falling), enemy attacks, running out of oxygen, and being exposed to hostile environments for too long. The main method of healing would be medical kits and/or medical cabinets. Food and water could be required to survive, or could be an optional source of buffs or regeneration.
- **Suit** - The player's suit has a limited air supply that can be replenished either by taking off the helmet in an oxygenated environment or using air tanks. The suit protects the player from most environmental hazards as long as they keep their helmet on, though it won't protect them from environments that are too hot, too cold, too irradiated, too corrosive, or have too much pressure or gravity. Suit upgrades could exist to provide extra resistance against these though. Suits also have built-in jetpacks that make it possible to fly around in low-gravity conditions (there could also be jetpack upgrades enabling flight in higher gravity). Suits could require resources to use (like electricity and propellant) and have their own health meter (requiring special suit repair items to restore), or not.
- **Respawning** - Players can set their spawn point with a suspension chamber. If their suspension chamber is unpowered or damaged, they can either wait until it's fixed, or respawn somewhere else. If it's destroyed, they would have no choice but to respawn somewhere else. That "somewhere else" could be at the world spawn point (if there is a world spawn point), or on a nearby planet or station, or at the most recently visited planet or station.

Hazards

Hazards are things that can kill you. They can also do damage to devices and ships, but are more immediately dangerous to players and other mobs. Most hazards can be found either inside your ship because of something going wrong, or as part of the natural environment in certain places.

- Heat and Cold - Heat can be received from nearby stars or active machinery, and can be radiated back into space. Atmospheres and oceans also apply heat or cold to anything that enters them. Environments that are too hot or too cold are both dangerous. Players

and machinery both need to be kept within a safe temperature range in order to function and not take damage. Too much heat in the presence of oxygen can cause fire, which deals further damage to whatever touches it. Fire can be put out with a fire extinguisher or by depriving it of oxygen.
- Radiation - Radiation is emitted by space itself, and more dangerous levels of radiation are emitted by radioactive objects like stellar remnants. Certain machines can also release radioactive particles when damaged, which contaminate anything they come into contact with. Anything contaminated will emit radiation. Radioactive contamination can be removed with a decontaminator, which is a bit like a fire extinguisher but sprays decontamination fluid.
- Electricity - Damaged wires and devices can send electrical currents through conductive surfaces, which will damage any players or machinery that touch them. Electricity can also come from lightning inside planetary atmospheres.
- Pressure and Gravity - Pressure comes from being immersed in an atmosphere or ocean, gravity comes from being near a space object. Too little pressure or gravity is hazardous to players without spacesuits but otherwise harmless, and ideal for space travel. On the other hand, too much pressure or gravity can easily crush your whole ship.
- Chemicals - Certain gasses and liquids found on planets can deal damage to players, even if they are wearing a suit. Ships may also be affected by some of the more dangerous chemicals. Some useful resources can also be hazardous if they leak out of their containers or pipes.
- Poisons - Some aliens would probably be able to give players various poison effects with their attacks.

Tools

Tools are essential for building and maintaining ships, and for exploring beyond ships. Some tool items include:

- Duct tape: instantly but temporarily repairs damage
- Welder: slowly but permanently repairs damage
- A tool or tools for removing placed elements (wire cutters for wires, pipe wrenches for pipes, screwdrivers or power drills for other stuff, etc)
- Flashlight: shines a directional light (maybe other handheld light sources like lanterns)
- Fire extinguisher: puts out fires
- Flamethrower: the opposite of a fire extinguisher (good for alien hunting)
- Decontaminator: removes radioactive contamination
- Floppy disk: stores data
- Battery: stores power
- Ammunition for weapons that need it (multiple kinds)
- Health kit: heals you
- Medicines for removing debuffs like alien pathogens or radiation poisoning
- Suit repair kit: an item for repairing damage to your suit, if that's a thing (duct tape could also be used for this)
- Suit upgrades for protection from hazardous environments
- Seeds, for growing plants

Feedback - click here

- Probably multiple kinds of food (maybe each food gives a different buff), each food would be made from different farmable plants
- Drinking water and other beverages
- Handheld resource collection tools like drills, power saws and handheld pumps/liquid vacuums (or just bottles)
- Fluid tanks, loaded into fluid vacuums and used for storing gas and liquid collected from the environment
- A handheld communication device (resembling a walkie talkie), can send and receive messages with both other handheld communicators and with ship antennas
- Placeable light sources with self contained power supplies for exploring dark wrecks and caves
- A tool or tools for detecting stuff in the surrounding environment (like metals or enemies) (probably some kind of handheld radar)
- A tool or equippable item that displays information about the environment (like coordinates, temperature, pressure, gravity, radiation, etc)
- Cameras and photographs
- Cassette tapes and players for storing and playing audio tracks (maybe video recordings too)
- Night vision goggles
- Binoculars
- Jetpacks
- Parachutes
- Lots of guns and other weapons
    - The same three general base types as ship-mounted weapons: projectile guns, explosive launchers, and laser guns
    - Three main subtypes for projectile guns: machineguns (higher firing rate and clip size), railguns (higher damage and accuracy), and shotguns (shoots multiple projectiles at once)
    - Projectile and laser guns are available in multiple sizes, with larger weapons being more powerful but more unwieldy (somehow)
    - Different weapons might apply different effects to their targets, such as heat, electricity or radiation
    - Guns could be customizable and consist of interchangeable modules
    - Throwing grenades and placeable explosives
    - Some tools would double as improvised melee weapons
- Upgrade components which you can place inside devices to boost their performance in a particular way, which you can get by looting abandoned ships (notch talked about this a lot). Each would come in multiple variants with different rarities, with the rarer versions being more effective. Alien versions would also exist which would be better than their human equivalents. These could have durability (the longer they're in a functioning device, the lower their durability gets, until they break), or they could last indefinitely. Some could be general-purpose parts that can be used in all devices, others could be specific to one device in particular. Better components might take up more space inside a device. Components could include:
    - Cooling unit - increases resistance to overheating
    - Surge protector - increases resistance to shorting
    - Power distributor - decreases power consumption
    - Power converter - increases operation speed

    - More… (many specific to particular devices)

Materials

Placeable objects, usable tools, and other useful things are crafted out of raw materials. These include:

- Natural resources:
    - Ores
    - Rocks
    - Ices
    - Liquids
    - Gasses
    - Plants
- Crafted with furnace:
    - Ingots
    - Glass
- Crafted with lab table:
    - Plastic
    - Glue
    - Paper
    - Coolant
    - Fertilizer
- Crafted with workstation:
    - Electric cable
    - Fiber optic cable
    - Pipe
    - Microchip
    - Light bulb
    - Battery
    - Floppy disc
    - Most things in the “tools” category
- Crafted with assembler:
    - Most things in the “devices” category

Exploration

The player will use their ship to explore space. The goal is survival and the player must gather resources to accomplish that. Resource gathering will be focused on planets, asteroids, and comets. The amount of resources will be determined during the galaxy generation.

- **Mining** - resources will mostly be underground. Some resources will be on the surface or on the sides of cliffs. Each block of ground (block is used as a general term for a unit of the “physical” world) will contain a specific amount of ore/resources. Once the resources are mined out from the block, the block will disappear. For ore blocks, the

amount of ore will be variable, however, there it will always be higher than a specific minimum. Different ores will have different minimums and maximums. Rarer ores not only appear in smaller veins (a group of blocks) but also will have a smaller minimum and maximum amount of ore per block and will be deeper in the ground. Asteroids work in a similar way to planets. The inside of the asteroid will also be generated in the initial generation process. Some systems might have an asteroid belt containing a denser distribution of asteroids. Some planets will also have rings, which are made up of huge amounts of very small asteroids. Asteroids and planetary surfaces are mainly composed of either native iron, silicon rock, or water ice, though large veins of other less common metals, rocks, and ices are usually found within them as well. Some materials can only be found beyond a certain distance from the nearest star (for example, ice asteroids are never found within the star's ice line). The ice collected from icy asteroids will be used for water, as well as splitting the hydrogen and oxygen to generate fuel and breathable air.

- **Landforms** - asteroids and planets with solid surfaces have landforms on their surfaces that are created by terrain generation. These would include craters, tectonic features like mountain ranges and volcanoes, and erosional features like canyons and rivers. A planet's surface and atmospheric conditions determine the types and frequency of different landforms, so for example an airless planet would have more craters than one with an atmosphere, and a planet with surface liquids would have rivers whereas a planet without surface liquids wouldn't. Some planets once had volcanism and surface liquids and still have landforms created by those processes, even though those processes no longer exist on that planet. Boulders would also be scattered across the surfaces of planets, to make the topography more interesting and to provide reference points for when viewing the ground from a distance.

Locations

- **Asteroid** - small lumpy clumps of solid material. Can be made out of ices, rocks, metals, and combinations of those. Their low gravity (or lack thereof) makes mining them easy.
- **Planet** - an object large enough to be spherical. Like asteroids they can be made of different materials depending on their distance from a star. If they are large enough and not too hot, they can have an atmosphere. Most atmospheres would contain clouds, which would encircle the planet over time. If the atmosphere is thick enough and if it's in the right temperature range, planets can have surface liquids such as lava, water, ammonia and methane. Sometimes a liquid might cover the entire surface. Other liquids might be found in volcanoes (so a water world might have lava volcanoes and a methane world might have water volcanoes, for example), though volcanism will be rare in the future universe, as most worlds would no longer have any internal heat. A rare few of these liquid covered worlds have a handful of alien plants and animals living on them.
- **Gas giant** - an object with an atmosphere but no surface. These can have rings (discs made up of tiny asteroids that orbit the planet) and moons (which are the same as planets or asteroids, except that they orbit a bigger planet). Smaller planets can sometimes have rings and moons, but this is less common. Since tidally locked objects have a hard time supporting satellites on long timescales, and most planets are tidally locked due to all remaining stars being very small, these are both rare features. Brown dwarf sized objects are essentially just large gas giants, as in the future universe all

brown dwarfs will have long since lost their internal heat, and no longer emit light, except for those formed recently by collisions between gas giants.
- **Red dwarf** - although star formation has long since ended, and all red dwarfs from that time have long since burned out, red dwarfs can still form from random collisions of brown dwarfs, and would last for a long time afterwards, so some still exist. Many have aged to the point of no longer being reddish since red dwarfs are expected to become bluer as they age.
- **White dwarf** - the most common star type. Many are no longer white due to losing much of their internal heat over the years, instead being various shades of yellow, orange and red. Some barely emit any light at all, though all would emit at least some light so as to be visible against the darkness of space.
- **Neutron star** - a much smaller, denser and rarer star type. Quark stars could exist which would be smaller, denser and rarer still. No magnetars or pulsars though since they've all run out of the necessary energy.
- **Black hole** - common black holes range in size from stellar-mass (asteroid sized) to intermediate-mass (planet or star sized). The galactic core also has several (or just one) supermassive black holes which are even bigger. Black holes have accretion discs encircling them (neutron stars and white dwarfs sometimes have them too), which emit a lot of light and heat, sometimes enough to create a habitable zone. As a result the largest black holes are the systems that contain the most habitable planets. Large black holes often have stars orbiting them.
- **The galaxy** - the galaxy is a giant spherical galaxy formed long ago from the collision and merger of all the local group galaxies. Its density increases towards the center and decreases towards the edge. Since all remaining stars are extremely dim, when looking out into space, only the very closest or the very brightest stars and accretion discs would be visible. Luckily, ships can be equipped with telescopes that can detect stars invisible to the eye.
- **Ships, stations and bases** - generated crafts and structures, mostly crewed by robots left behind by some now-vanished earlier generation of lost people. Can be found floating in space or on a surface. Some are active and functional, some are ruined and abandoned. Some are safe, others are filled with hostile security systems or aggressive life forms. Some weren't built by humans at all…
- **Megastructures** - big things like ringworlds and dyson spheres, left behind by long gone civilizations.
- **NPCs** - no human NPCs. The players are the only humans left. Instead, any mobs you find will be aliens, robots, or alien robots.

Materials

Objects in the universe are made out of different types of matter, such as:
- **Lithospheres** - asteroids and planetary surfaces are made out of solid matter which can be mined for resources. This terrain could be voxel-based and modifiable, or not. There could be a flat indestructible planet core beneath the voxel terrain, or it could be voxel terrain all the way to the center. The lower the melting point of the solid, the further from stars it is found. Solids could include:
    - Metals
        - Iron - the most common metal, and the most useful. The hulls of ships are made of iron, and many devices and tools require iron to make.

        - Copper - orange metal used for electronics and decoration
        - Silver - white metal used for for electronics and decoration
        - Gold - yellow metal used for for electronics and decoration
        - Titanium - very strong metal
        - Chromium - very hard metal
        - Nickel - another common metal
        - Zinc - electronics component
        - Aluminum - very light metal
        - Lead - very heavy metal
        - Other less common metals would have more niche crafting uses. A large number of metals could exist in the game, but they would all have to serve some unique purpose.
        - Different metals could be used to make decorative interior panels with different textures.
    - Rocks
        - Silicon is what most rocks are mainly made of. It can be used to make glass and microchips.
        - Other less common rock-forming elements include carbon and sulfur, and more would be added as needed.
    - Ices
        - Water ice - frozen water
        - Ammonia ice - frozen ammonia
        - Methane ice - frozen methane
        - Nitrogen ice - frozen nitrogen
        - Dry ice - frozen carbon dioxide
    - Ships and the elements that make up ships are solid as well. A ship's hull and components can be mined for scrap metal. This also applies to stations, bases, and other artificial structures.
    - Plants are solids too, and can be harvested for their own unique resources.
- **Hydrospheres** - on worlds with a surface liquid, this would probably take the form of a single flat liquid layer around the whole object - every space above a certain depth is air, every space below that depth is liquid. If volcanoes exist, their "liquid" would have to be an object with limited dimensions. There could be multiple liquid layers stacked on top of each other on a single world, so if you go deep enough underwater on a water world you could find lava, for example. Ships can go underwater and not flood, since interior rooms are always filled with air, as long as they remain airtight. If a room has any openings to the outside, though, then liquid will be able to pour in. The lower the melting point of a liquid, the further from stars it is found. Liquids could include (from hottest to coldest):
    - Lava - lava is molten rock, and doesn't have many gameplay applications besides damaging things on contact.
    - Water - water is an important resource for life support purposes, and can also be separated into oxygen and hydrogen.
    - Ammonia - ammonia could be used to make fertilizer, disinfectant and refrigerant, or separated into nitrogen and hydrogen.
    - Methane - methane could be used to make heavier hydrocarbons such as plastics, adhesives and combustibles, or separated into carbon and hydrogen.
- **Atmospheres** - atmospheres are made of gas, which slow down objects moving through them (though not as much as liquid). Like liquids, they form a spherical layer around an

object (one that reaches a much higher altitude), which decreases in density further from the surface. Clouds of liquid vapor can also exist in atmospheres, and gas giants are often encircled by cloud bands. Gasses include:
    - Hydrogen - main component of gas giant and brown dwarf atmospheres, and also used as engine propellant and fusion fuel.
    - Nitrogen - main component of many terrestrial atmospheres, and required for life support systems.
    - Oxygen - important secondary component of habitable atmospheres, and required for life support systems.
    - Carbon dioxide - main component of many terrestrial atmospheres, usually more inhospitable ones, and accumulates inside ships if the life support isn't working. It can also be used for fire suppression.
- **Star surfaces** - these are made out of exotic forms of matter like plasma, electron degenerate matter, neutron degenerate matter, quark degenerate matter, and event horizons. These cannot have resources collected from them, since they destroy everything on contact, but exotic particles could be collected from nearby space.

Collecting resources is an important part of the game. Solid resources can be collected by tools, handheld and ship-mounted, such as drills and cutters, and can be held in the inventory and stored in item containers. Liquids, gasses and particles would have to be collected with pumps or other special tools and couldn't be directly stored in the inventory, but instead would be stored in their own special containers.

Several types of manufacturing machines can be used for converting raw resources into useful items. For example furnaces can turn metals into ingots, and 3D printers can use ingots to make construction elements and tools. Rocks and ices can be used on their own for various purposes or separated into their component elements in a chemistry lab.

NPCs

The universe would be populated by aliens, robots, and alien robots.

- **Animals** - these would be of low intelligence and mostly live on the few habitable worlds that exist. The number of animal species per world varies but is always small. Some worlds might only have one, or none. These species could be procedurally generated by adding a few modifications to one of several base types, or the same few species could be distributed across the whole galaxy, for some mysterious reason. There would be swimming, walking and flying species, and passive, neutral and hostile species. The environment could influence their appearance, for example they might have the same colors as local plants for camouflage, and the local gravity would influence their general shape. Some species may be farmable or tameable. Alien plants would also exist which would follow the same principles except for being stationary objects. There could be resources exclusively obtainable from alien plants and animals.
- **Monsters** - One or more species of alien would exist which are more dangerous than typical surface lifeforms. These aliens would be primarily found not in natural environments but in ancient wrecks and ruins, and would be extremely hostile either to your ship's systems or to players themselves. If one of these should get aboard your

ship it will quickly become a serious problem. These could include small aliens that only attack your ship's machinery and avoid players, medium-sized aliens that are aggressive to players but not hard to kill, or large aliens impervious to weapons that can only be defeated by clever manipulation of the environment.

- **Robots** - Most of the still-active ships and stations are crewed by robots of human origin, the same kinds of robots players can make and control themselves. However, these robots, and their ships, rather than having built-in AI like aliens do, instead run on DCPU-16 programs, given to them long ago by their creators. Sometimes they are programmed to act friendly to humans they encounter, others are not, and pose a threat. Either way, it is possible, if you know what you're doing, to reprogram their AI to serve your own purposes, or to copy and reuse the code they run on for yourself. There are also robots of alien origin that crew alien ships and protect alien ruins.

AI Ships/Stations/Bases

Generated ships, stations and bases would be procedurally generated. For ships and stations, a random shape for the outer hull is created (with different algorithms for the hull shapes of ships and stations, and for ships and stations created by different factions/species), then the interior is filled in with rooms, then functional elements are placed throughout the inside and outside, then those are connected by the necessary conduits. The procedural generator would populate them with sufficient amounts of NPCs, loot, and decorations, and would make sure they have all the necessary parts (at least one exterior door, a power supply, etc), and they would tend to be mostly symmetrical. Larger ones would be rarer, and bases and stations would tend to be bigger than ships. In the case of wrecks and ruins, random damage is also applied.

Bases would sometimes be only one building but would usually consist of a collection of interconnected buildings. Each building would range in size from a small shack to a large skyscraper, and bases would have anywhere from only one to over a hundred individual buildings. Some planets would generate only one small base, while other rarer planets might be covered in dozens of cities.

There would be several NPC "factions" (at least two, a hostile and neutral one), and the shapes and colors of their constructions would be noticeably different from each other. Wrecks and ruins would either resemble the constructions of these extant factions or belong to an extinct faction, which there could be several of. Alien constructions would be even more different and probably employ unusual materials.

Friendly stations and bases could have vending machines, stocked by the robotic crew, that players could use to buy and sell items. Their prices would be based on the local abundance of different resources.

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Aliens

Although there would be no remaining intelligent life forms in the universe, there is a great deal of alien technology left lying around by long-gone aliens. For the sake of simplicity, there would probably only be one of these long-lost alien civilizations in the game, although there could conceivably be more. The alien technology you can find is generally superior to the human technology you can make, with the tradeoff being that it is more limited in supply. Aliens also have their own set of decorative panels and furniture, which is distinctly different from human decorative materials.

One possibility is that these aliens' technology is advanced enough that their computers are too powerful to realistically work as real emulated in-game CPUs, and as such, players would not be able to use them like real computers. Instead, the alien ships and robots would simply use standard enemy AI, rather than running on actual emulated code.

A more interesting possibility is that the aliens were another civilization that also experienced the same endianness error long before humans did. As a result, they were also sent 0x10c years into the future, but arrived much earlier. While they were near the level of technology of the humans of the alternate 1980s, they were in most areas a few decades ahead, so their technology is still more advanced. Since they experienced the same software bug, their computers are fairly similar to human computers, with a similar processing power and storage space, but there are several key differences. While their computer architecture is similar to typical human computers of the 1980s, and runs on a typical assembly language that also uses hexadecimal math, the code is written using an alien language in an alien alphabet (the standard galactic alphabet). Their monitors use a different color palette, and are vertical instead of horizontal.

Alien devices were designed to interface with alien computers running alien code. As a result, using alien technology together with human computers, or vice versa, may require programs that translate human code into alien code and back again. The reward for going through all this trouble is being able to use and automate much better technology on your ship.

Scale and Physics

The universe is big, but maybe not as big as the real universe, since scaling it down would make it easier for players to get from one place to another more quickly and to make a bigger impact on the universe. It could be 1/1 scale (like real life), or 1/10th scale (like kerbal space program), or 1/100th scale (like space engineers), or something else.

The relative sizes and distances between objects, though, are realistic. Planets orbit and spin around stars, and moons do the same around planets. Binary objects orbit barycenters. Rings are made of asteroids that orbit their planet in lanes, each moving at a different speed, so that different parts of the ring can move at more or less the correct orbital speed without each individual ring particle needing its own physics simulation. (alternatively rings could just be a 2D

object with no collisions, or the asteroids could be instanced.) Small free-floating asteroids might be physics objects that can be pushed around by ships, but at some point there would be a transition point where bigger asteroids instead become essentially tiny planets on a fixed course.

In order for planets and moons to be able to orbit, though, realistic orbital mechanics would be necessary, which would mean every object in space (including ships) would need to be subject to the same physics.

Of course, for orbital mechanics to work properly, there can't be a speed limit like in many other space games, or at least not a speed limit low enough to matter. This would mean that ships would be encountering each other at extreme speeds unless they were intentionally in similar trajectories. This can be mitigated by scaling down the universe, which decreases the speeds necessary for orbiting. The game could also automatically slow down ships when they get near other objects (such as other ships), though it can't do this too much or else orbits aren't possible. There could be a changing speed limit equivalent to about double the velocity needed for a circular orbit at a given location, but two ships in orbits going in opposite directions around a planet would pass each other at greater than this speed anyway (though the speeds would be smaller in a downscaled universe). Regardless, the realistic speed differences could simply be something that makes the game stand out and makes combat more interesting. And there are games such as elite dangerous or rodina that have realistic orbital mechanics and dogfight-style space combat at the same time, so these problems clearly have solutions.

With realistic orbital mechanics, space stations, rather than being in fixed positions in space, are also in orbits, usually circular ones close to a planet or moon. Since they're mobile objects like ships, the only real difference between a station and ship is that a station has no engines, so a ship could easily be converted into a station, and vice versa, just by removing or adding propulsion capabilities.

Realistic orbital mechanics also comes with the added difficulty that you might be on a collision course with a planet and not know it. In kerbal space program you can see your trajectory in the map screen, and this game could have the same feature, but it might be better to require players to use their ship's equipment to figure that out themselves. Programs could be written that use sensor input to display a ship's trajectory on a computer monitor, for example.

The alternative is to not use realistic orbital mechanics and instead have objects remain stationary and limit the speed of ships. Alternatively, things like asteroids and planets could have realistic orbits, but everything within a large sphere around those objects would remain stationary relative to that object by default, and moving objects would gradually slow down. Within this sphere would be another sphere where gravity takes effect. If a moon approaches a stationary object near a planet, or a planet approaches a stationary object near a star, then that object would enter the moon or planet's gravitational influence and become stationary relative to that moon or planet.

Even without realistic orbital mechanics, ships' engines would need to produce a very wide range of thrust, from delicate docking maneuvers to traveling between planets in minutes, so the thrust output of engines would be highly adjustable. Inter-system travel could involve teleporting a ship from one instanced system to another with a special jump drive, or, if all systems are part

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of a single continuous space, it would involve simply physically traveling from one star to another through interstellar space. Rogue planets could exist in this space, although they would receive no illumination whatsoever and be practically invisible.

The galaxy would be big but, again, maybe not as big as the real galaxy (the real galaxy that will be formed in the future from galactic collisions, anyway). Notch mentioned a figure of about 100,000 stars on a few occasions, “big enough to feel big but small enough that players could visit them all”.

4. Graphics

Style Attributes

The color scheme will mostly focus on neon and muted colors. But this gray can be covered up with blues, reds, and different shades of white. The colors, for the most part, will be quite muted. The accents will mostly be bright oranges, yellows, and green. These colors will be quite vibrant. For the most part, the HUD of the player will either be blues or oranges.

The graphics style is going to be pixelish cartoony, reminiscent of how the original 0x10c was done. The gray is supposed to be more raw and unfinished. The other colors are supposed to represent a more finished product. An unfinished product would mostly be gray, but as it becomes more and more finished, more and more colors will appear. The gray is the framework.

The models for the most part will be somewhat simplistic. The textures, normal maps, specular maps, emission maps, etc. will be the things that make the models intricate and visually appealing.

Well-designed feedback, both good (e.g. leveling up) and bad (e.g. being hit), are great for teaching the player how to play through trial and error, instead of scripting a lengthy tutorial. What kind of visual feedback are you going to use to let the player know they’re interacting with something? That they *can* interact with something?

Trillek 3D Modeling Guide to General Practices

Graphics Needed

See Trillek Art Asset
Trillek Assets Trello board

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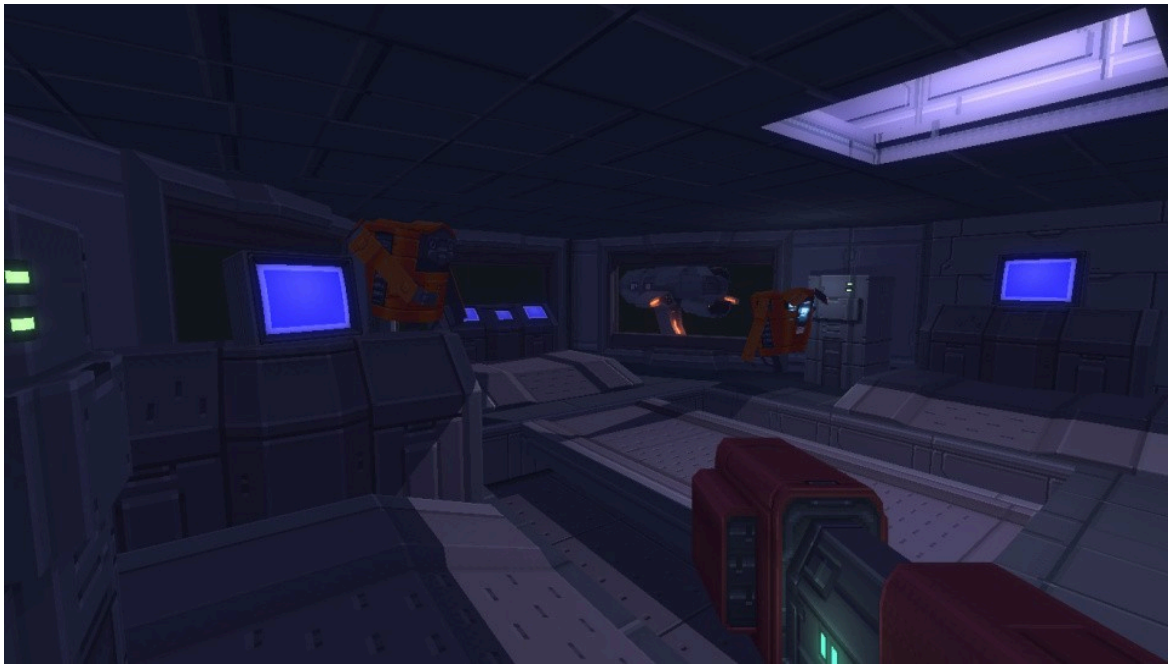

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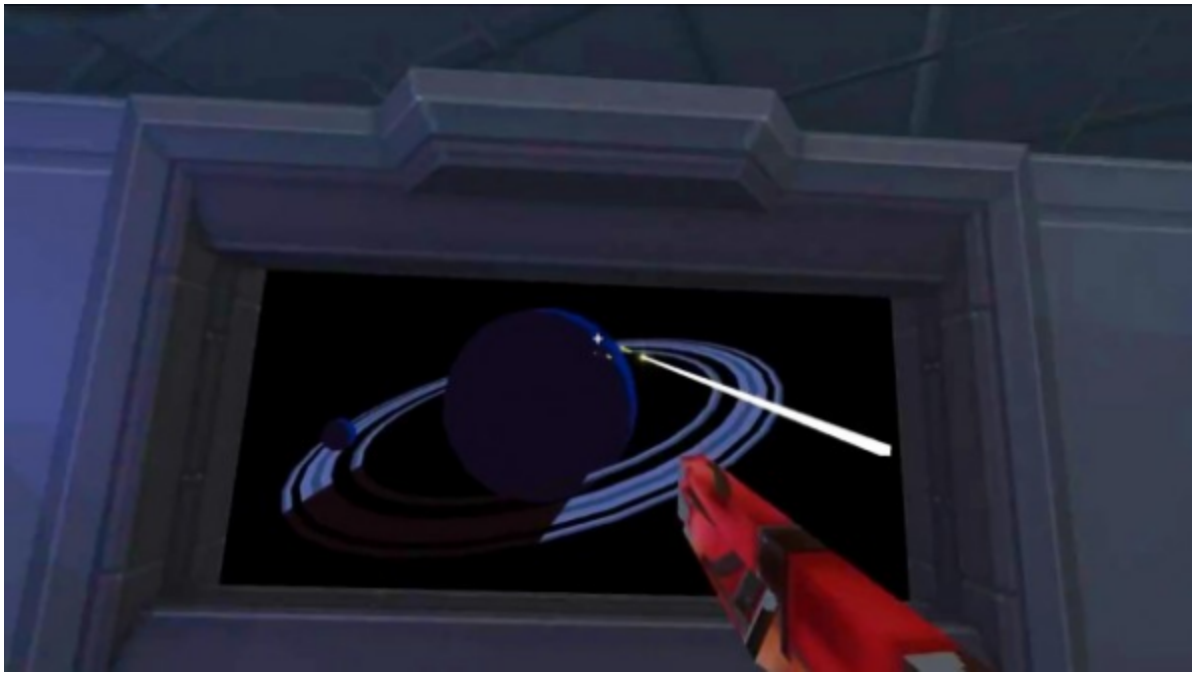

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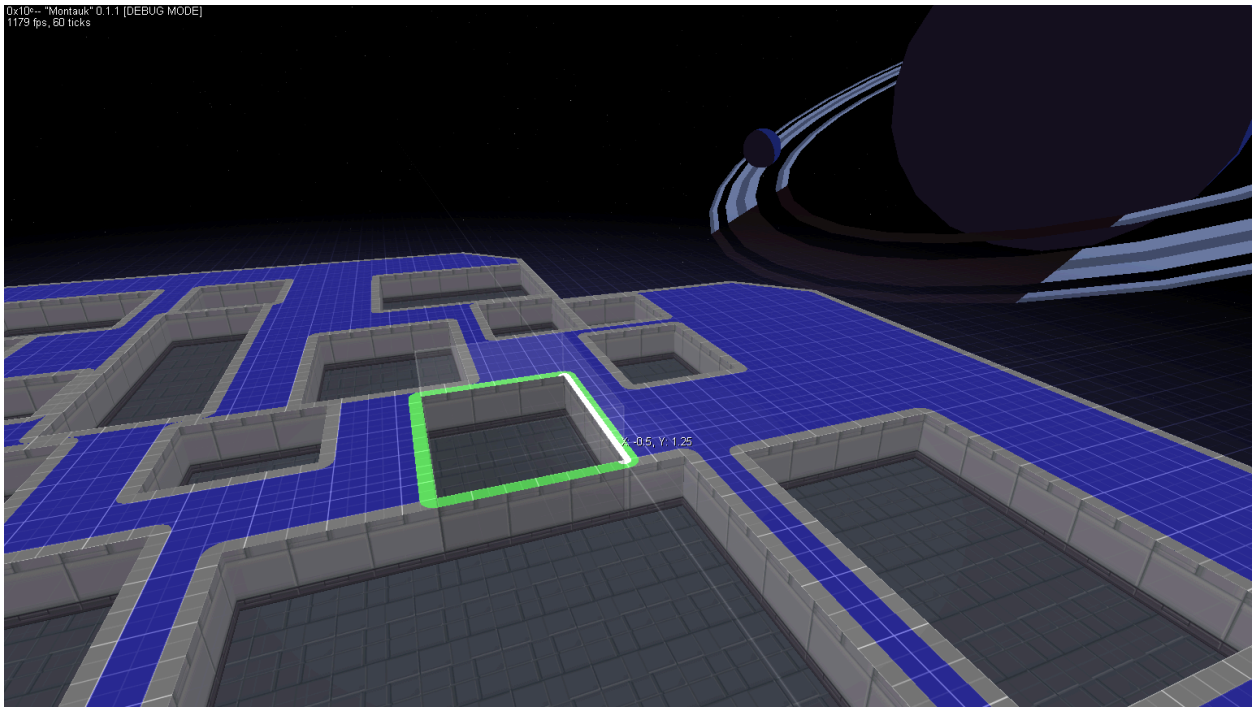

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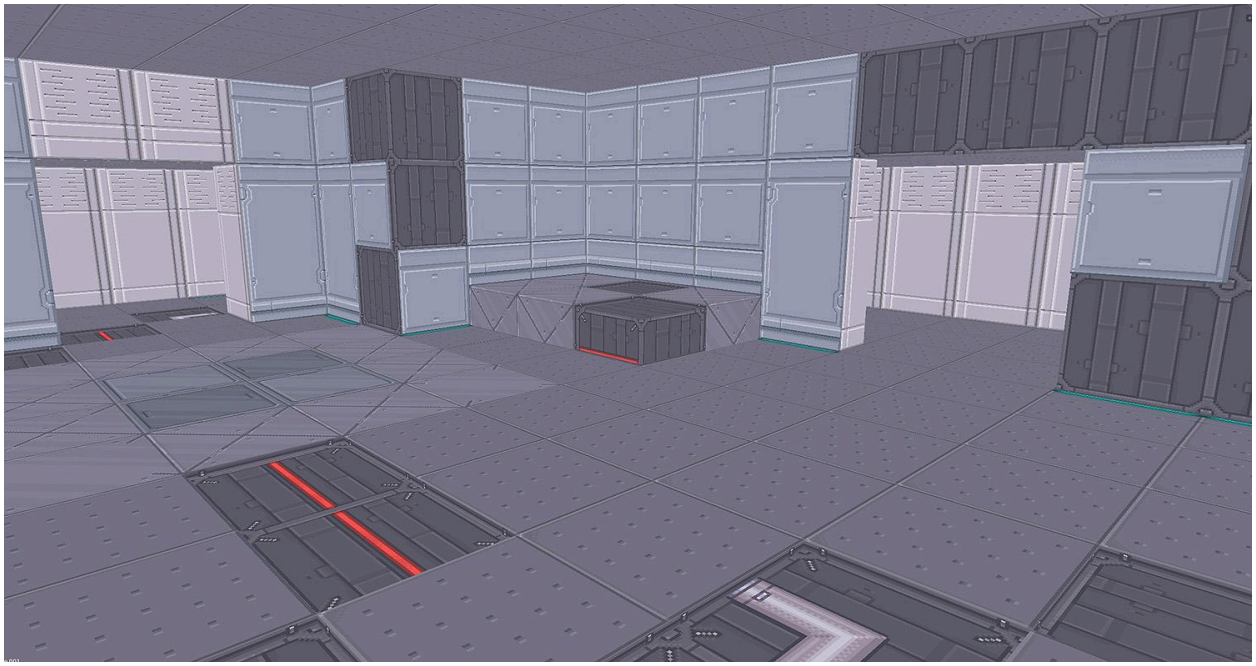

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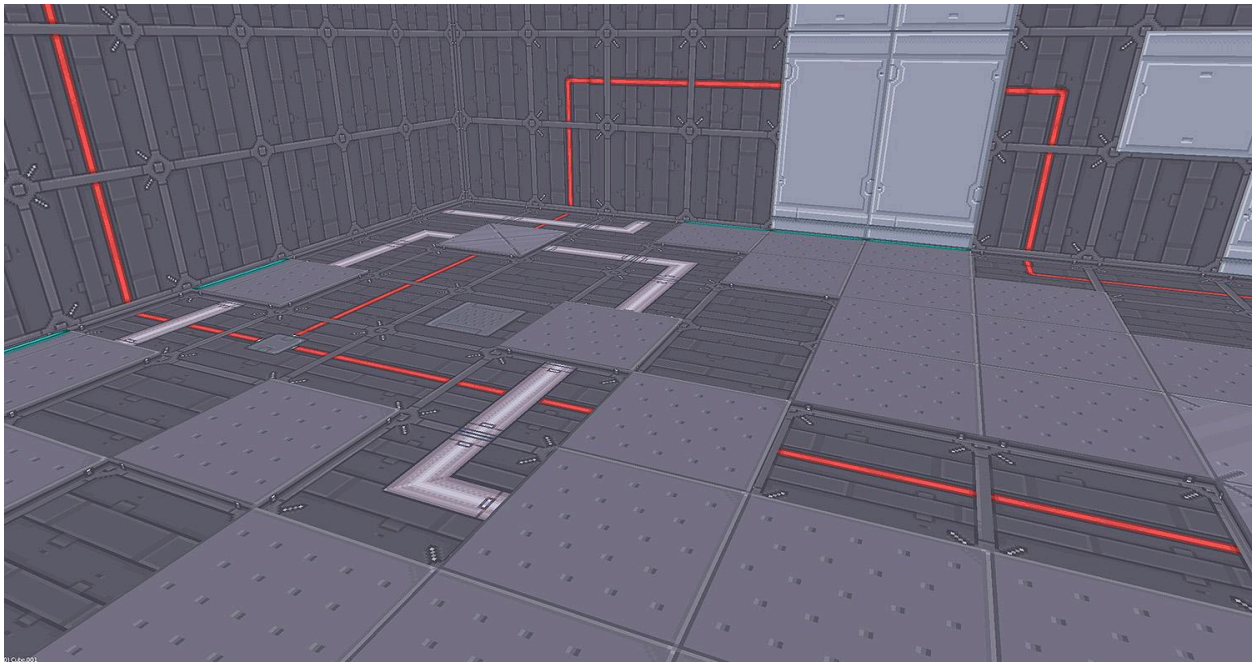

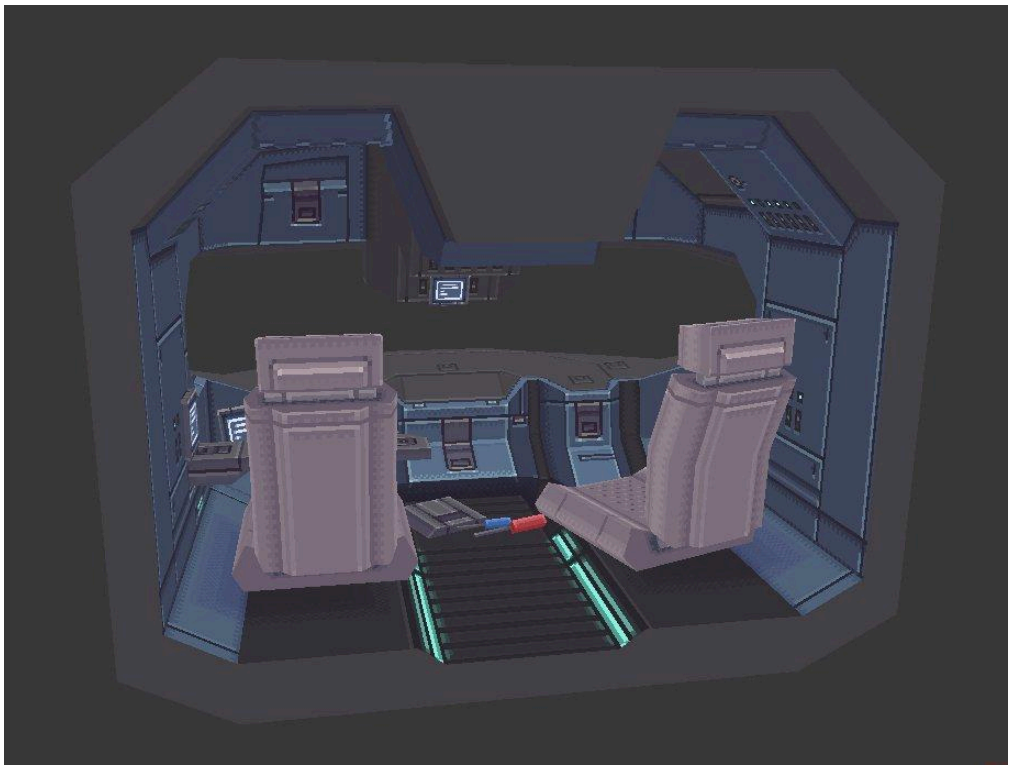

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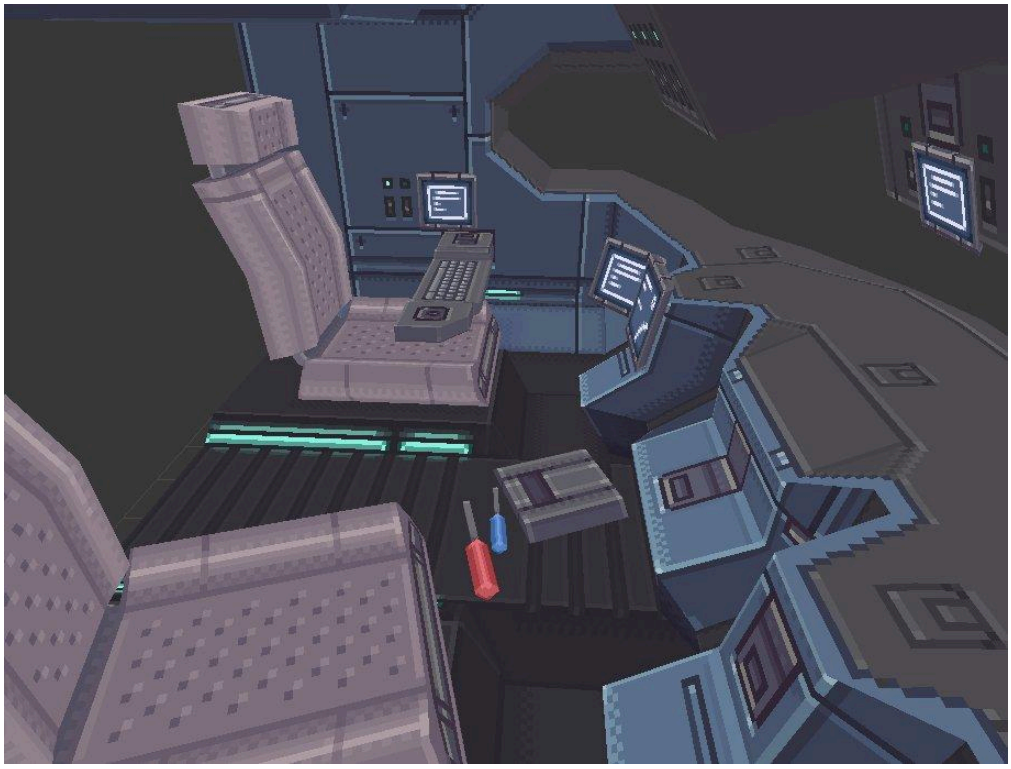

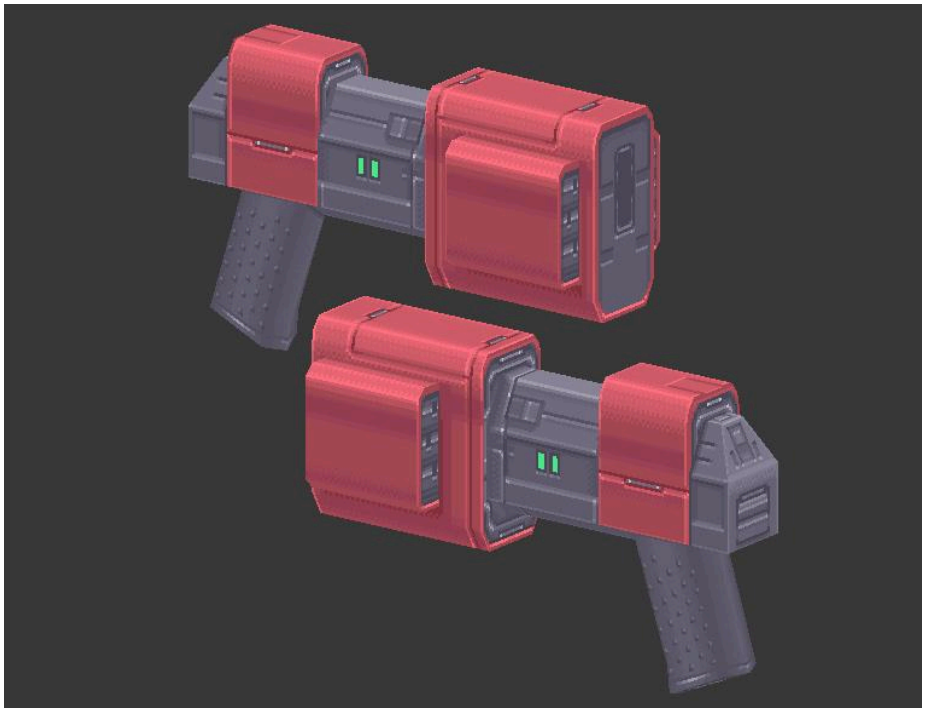

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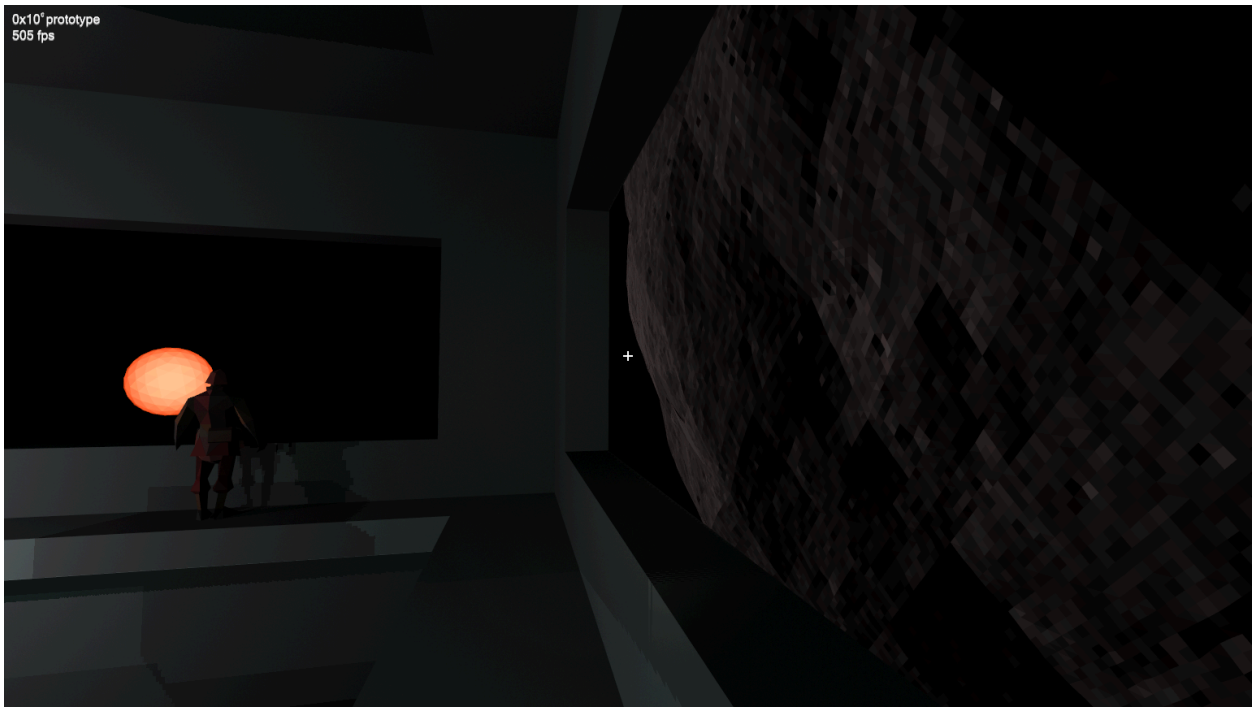

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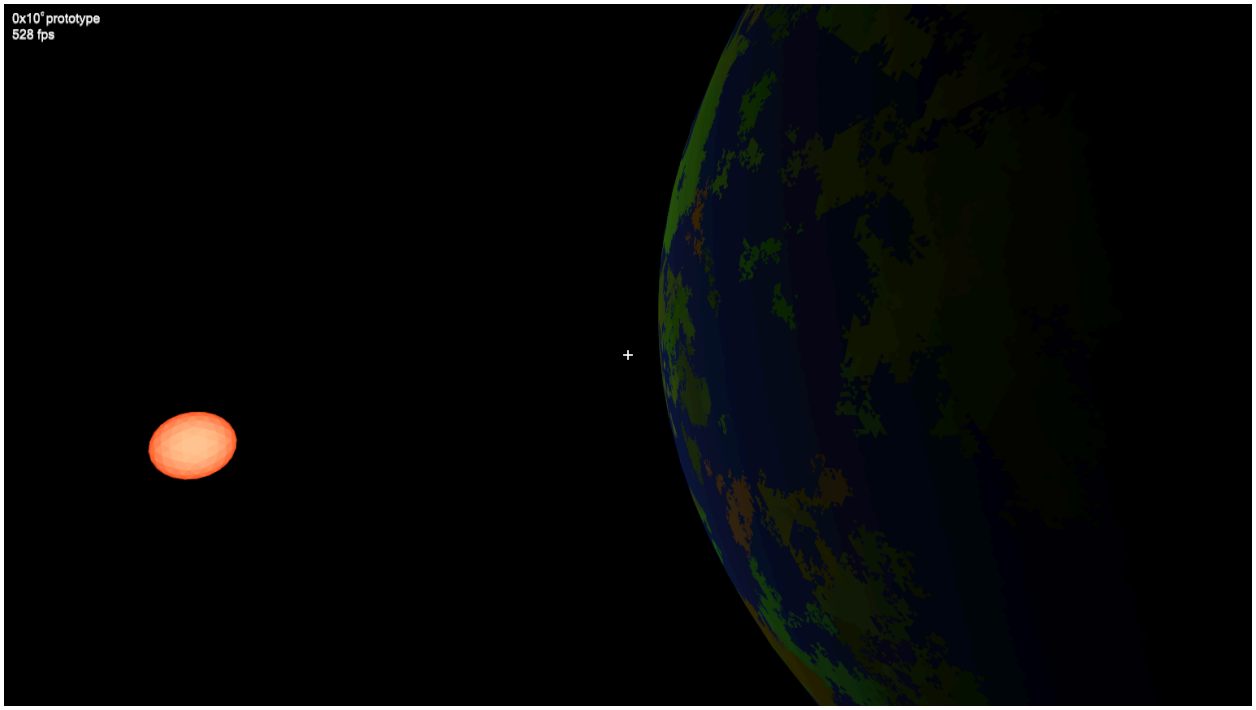

5. Sounds/Music

Style Attributes

Again, consistency is key. Define that consistency here. What kind of instruments do you want to use in your music? Any particular tempo, key? Influences, genre? Mood?

Stylistically, what kind of sound effects are you looking for? Do you want to exaggerate actions with lengthy, cartoony sounds (e.g. Mario's jump), or use just enough to let the player know something happened (e.g. Mega Man's landing)? Going for realism? You can use the music style as a bit of a reference too.

Remember, auditory feedback should stand out from the music and other sound effects so the player hears it well. Volume, panning, and frequency/pitch are all important aspects to consider in both music *and* sounds - so plan accordingly!

Example music:
0x10c Soundtrack

Music/Sounds Needed

See Trillek Audio Assets

Feedback - click here

6. User Interaction

Screens

- Title Screen
    - Options
        - Sound sliders
            - Music
            - Background sound
        - Graphics
            - FOV Sliders
        - Key bindings
            - Rebindable keys
            - Controller and flightstick support
- World Selection
    - Generate new galaxy
        - Generated seed
            - Predetermined seeds (Ex. “1337” will generate a world with super hard enemies and underpowered player ships, will need to be 1337 at the game)
        - Editable variables/modifiers to galaxy generation
            - Resource density
            - Number of planets
            - Number of stars
- Game
    - Inventory
        - Player equipment
            - Limited in space
            - Containers can augments number of items that can be carried
                - Tools belt
                - Backpack
            - Completely weight based
                - As amount carried increases, movement speed decreases
    - Player statistics and vitals
        - Health
        - 0_2
    - Dialogs/windows
        - Crafting tools
            - 3d printer
            - CAD mill

Feedback - click here

Controls

Standard rebindable FPS controls: WASD movement, mouselook, shift-to-sprint.

Interacting with objects will be proximity based. The player will press a key (R) or click the mouse (this will pose a problem when a player has a weapon out) to give the object input focus until the player presses a key (Esc) to release focus.

7. Development

Phoenix Protocol Schedule

- Milestone 0.11 - “Test Level” May 31 2018
    - Basic synchronized client/server movement
    - Placing of entities synchronized between client and server
        - Should be stored on server if multiplayer
    - Connecting of components to power and data
- Milestone 0.12 - “My First Ship” Summer 2018

Original Schedule

- Alpha 1 - Minimal playable demo
    - Add gameplay elements to engine
        - Object placement
        - Virtual Computer controlled entities
        - “Drive” ships
        - Triggers
    - Clean-up/finish JSON loading and saving
        - Implement ToStream and FromStream methods in System and SystemValue, and proxify them in component.cpp for each component
        - Make what happens in these methods consistent
    - Simple GUI
        - Allow interacting with scripting via CLI?
        - Display player vitals or other statistics
    - 3D text rendering
        - Used to place a name or other data in the world
    - Network
        - Polish minimal transport layer (TCP and “urgent” UDP)
        - Fake “reliable” UDP (will use TCP)
        - Polish authentication layer (needs persistent storage for login/key)

Feedback - click here

    - For artists
        - Preliminary ship/escape pod (could use from http://www.solcommand.com/)
        - Test models w/ normal maps and diffuse
            - Preferably spheres or cubes
        - Environment objects
            - Crate (will show one aspect the art direction)
                - 1 m x 1 m x 1 m
                - 1 m x 0.5 m x 0.5 m
- Alpha 2 - Now with networking and wires!
    - User session
        - GUI login page
        - user's profile storage (JSON?)
        - GUID attribution on connection
    - Networking
        - Implement UDP reliable (Quake3 style)
        - Define data synchronization categories
        - Define message grammar for each category
        - Multiplayer exploration
            - For artists: basic character models (will not be final)
        - Streaming entity creation/changes to each client
    - Running of conduit and wires
        - Implement a "snapping" behaviors that causes continuous elements to line up when placed next to an existing element or a compatible nature
    - For artists
        - Basic wires, at least 4 kinds
- Alpha 3 - Now with character inventory and tools!
    - Player inventory
        - Allow players to pick up, use, and remove items
        - Allow trading between players
            - Through a dialog?
            - Credit
    - Enhanced GUI
        - Dialogs
            - Crafting(?)
            - Options
            - Messages
                - Logs
    - For artists: preliminary meshes for tools
        - Basic character model
        - Backpack (no real animation needed, except when on character mesh)
        - Monkey wrench
        - Wirecutter
        - Hammer
        - Basic melee weapon
- Alpha 4 - Now with more weapons??
    - Artist stuff
        - More tools

[Feedback - click here]

                - Screwdriver
                - Power drill
            - Weapons (modular)
                - Basic assault rifle receiver
                    - Extended magazine
                - Revolver (little customizability)
                - 1-2 barrels
                - 1-2 muzzles
                - 1-2 scopes (w/ overlays)
                    - Short distance
                    - Long distance
                - 1 stock
- Alpha 5 - Now with even more weapons???
    - Artist stuff
        - Weapons
            - Basic bolt-action rifle receiver
                - Extended magazine
            - 1-2 more barrels
            - 2-3 more muzzles
            - 1-2 more stocks
            - 1-2 more scopes
    - Ship/planet collision (as per paultech)
        - Include damage data and effects of damage
    - Character
        - Sidepacks
        - Fanny packs
        - Helmets
- Backburner
    - Volumetric clouds
    - Visual cues (lives wires)