General

Game name: AstroRealm
It's a 2D top-down space action/sim sandbox game. Focus on gameplay and minimal storytelling (maybe more narrative-driven).
I want this game to be some combination of Star Valor, Avorion, SpaceRangers, Wayward Terran Frontier, and X-universe games. Also, I want to have a feeling of alive NPCs, like SpaceRangers 2 does (I hate some abstract pirates that from time to time performs stupid suicidal attacks).
It will have a seamless open world. I want spaceships to be modular like there is a hull/base sprite + hull extension module, + some modules like engines, cockpit, etc that can be placed in some slots on top of the base ship sprite (also there will be internal modules that don't affect ships' look, like energy capacitor). I want to make modular space stations as well, and I want a real economy, so some stations should focus on mining, other stations take resources and produce some simple products and top-level stations will produce completely ready-to-use things, like engines, rockets, etc. Also, I want to have at least several corporations (factions). The world should be procedurally generated.
I want the game to be in realistic sci-fi style and maybe with some cyberpunk vibes.

Some initial random ideas

1. World (Life and Economy)
- Lot of technologies
-- Different fractions has different technologies
- Some simple calculation for corps's (faction's) life (numbers: deffence, offence, economy grow, pirates factor, e.t.c)
- In different zones different dangerous level from bad Aliens
--corps may want to collaborate more if dangerous level is high
- Some global crysis that increases over time
-- The crysis can open portals to another dimension wrom what dangerous entityes can come to this world.
-- Crysis can also create some anomalyes in this world, like some quantum anomalyes (areas with unstable quantum mechanics) or other physics anomalyes (gravitational, electric, etc)
-- Different threat levels for different locations
2. Corps (Factions)
- Corps is a corporations (Corp, MegaCorp, HyperCorp)
- Some corporation has own currency (?)
-- No global currecny(?). Only most popular currency.
- Banks can give credit (Corps)
- Some tax mechanics
- Some part of world may be controlled by some government (Sol and inner worlds).
- Weapons and armed ships are disallowed in sectors controlled by government (extra license needed)
- Other outer worlds controlled by private corps.
3. Worlds and Habitats
- Home world(s)/Super colonies
-- Large colonies
-- Small colonies (new/not terraformed worlds - some shifting needed)

-- Super space stations (space cities)
-- Small space stations (people can't leave here long - works with shift - large human traffic)
-- Super small space stations - fully autonomous cheap stations that only do some simple thing. Maybe some maintenance is required for them.
---May be a part in claster of some bigger station that provide maintenance and collect resources. It may be easy target for pirates.
4. Jobs
- Freelance jobs - different types, different rewards, may be outlaw jobs.
- Contracts with corps.
-- Contracts may have long term.
-- Corp may provide ship/equipment and security escort.
-- May be a good point to start the game as an contractor, another option is working for government. Freelance jobs may require better ship/outfit.
- Need good reputation for transporting peoples and even more higher for tourism transporting.
5. NPC
- Each npc has own characteristics:
--courage
--risk/excitement
--loyalty to current corp/contract
--intelligence
--skill
- some npc collaboration
-- npc has relationships: friend/known/enemy/unknown
-- friend npc can make call to other npc/player and ask for collaboration for some job.
6. Pirates
- Gov and Corps defending their space and transports.
- Security has limited fleet tier level, general strength and capacity.
- Corps may pay for arriving to the SOS signal for helping save ships from pirates. Anyway, just saving another ships may be rewarded.
- If player (any npc?) has good reputation, he can sign contract with security.
- Each sector had different pirate level.
- Pirates will try to find more rich sectors with less security level.
- Pirates can collaborates with each other to has more success in sectors with good defense.
- More powerful clans can provide more strong fleet.
- Player/npc can "sign" contracts with pirates to have access to information and collaborate with them.
7. Ships
- It will be good to have procedurally generated ships with some variations. Maybe multimodular.
Other ideas:
- Drones
-- drones can be hacked
- Scanning with probes (EVE Online like)
- Possibility to intercept ships on warp
- Police/"Pirate" scanners to scan ship and its cargo
- Traffic warp lines - the more ships use same path - the less fuel and more speed other ships need to go same path.
- Stealth ability for space-mines
- Armor may cover not whole ship and armor plates may be destroyed.
- Ignore physics (collisions, avoiding system) when objects far away.

Current development plan

- Floating Origin - move the world around the player instead of the player itself. I need this to keep maximum precision around the player. [done]
- World partitioning. Need this to handle a large seamless open world. (The playable world size depends on my progress with other features. It can be not too large, so far)
- Ships physics flight model (Newtonian physics) [done]
- Ships simplified flight model. Need this to handle ships that far from player.
- Ship flight assistant (help with controlling thrusters) [done]
- Ship battle assistant (help with prediction parget-projectile intersection point and aiming) [done/partially done, need updates and polishing]
- Modular ship design [partially done]
- Weapon and damage system [done, need further updates]
- Weapons as visible modules
- Internal ship modules (energy generators, capacitors, shield, etc)
- Simple ships AI (flight to point/target, match speed with target, keep distance from target) [done]
- Ships AI: patrol sector, defend, attack, mine, dock/undock, etc.
- Radar [prototype is done, but needs to be reworked]
- Map (tactical map(?) and full galaxy view map)
- Space background [partially done].
- Celestial objects visuals.
- Procedurally generated galaxy with space biomes (cosmomes?). Star systems, planets, moons, asteroid belts, nebulas, etc. (Not in priority so far)
- Tech levels of items/ship parts.
- Modular space stations.
- Factions
- Faction AI (global strategic AI)
- NPC ships AI(some global AI for freelancers and more tactic AI for general NPCs)
- Thinking of trying some kind of genetic algorithm (or another) for teaching AI decision-making systems (Finite state machine, Behavior tree, or even some simple neural network).
- Game crisis: enemy aliens from a parallel universe. Thay use superior quantum technology

Narrative Concept: "The Quantum Specters"

Background:

The galaxy is a bustling hub of interstellar commerce, political intrigue, and technological advancements, dominated by various corps and mega-corporations. Amidst this complex tapestry, a new threat emerges from a parallel universe: a race of aliens with superior understanding of quantum physics, known as the "Quantum Specters".

Rising Threat:

Initially, these aliens are rare and seen as a curiosity or a manageable nuisance. However, over time, their incursions become more frequent and devastating. Their ability to make small teleportations allows them to ambush fleets and outmaneuver defenses, making them a formidable foe.

Tech Levels and Research:

Players can engage in research to advance their corp's Tech Level, unlocking new ship designs, modules, and weapons. This includes reverse-engineering alien technology from wreckages to develop unique quantum-based abilities, like the "quantum strafe-teleportation module," which provides a strategic edge in combat.

Possible concepts

- They are real entities, can use superior technologies, and come from a parallel universe.
- They are not fully real, but some phantoms or projections from the parallel universe.

Gameplay Dynamics:

Corp Progression:

Each corp progresses technologically at different rates, creating a dynamic power balance. Players can influence or join a corp's research efforts, contributing to or benefiting from their advancements.

Economic and Political Intrigue:

Players navigate a complex web of trade, alliances, and rivalries within the galaxy. They can engage in espionage, sabotage, or trade wars, aligning with corps, mega-corporations, or operating as independent agents.

Alien Technology Race:

As the Quantum Specters become a greater threat, corps race to unlock alien technologies. This leads to high-stakes missions to secure alien wreckages and defend research facilities.

Balancing Act:

Players must balance their efforts between advancing their own power, supporting their corp's research, engaging in economic activities, and defending against the growing alien threat.

Endgame Scenario:

The narrative builds towards a galaxy-wide effort to repel the Quantum Specters. Players' actions and alliances throughout the game influence the final confrontation, with various possible outcomes based on the collective technological advancements and choices made by all corps.

Corp Traits and Reputation System

Corp Traits:

Each corp is characterized by specific traits like aggressiveness, peacefulness, carefulness, bravery, etc.
These traits influence their behavior, such as their tendency to engage in combat, form alliances, or focus on trade and exploration.

Reputation System:

Corps and the player have a reputation score that reflects their actions and decisions.
Player actions like combat, trade, missions, and interactions with other corps impact their reputation.
Corps also have inter-corp reputations, influencing their relationships with each other.

Dynamic Relations Based on Interactions:

Corps' relationships are influenced by their traits, reputation scores, and specific interactions (e.g., trade volume, joint ventures, conflicts).
The player's reputation affects how corps perceive and interact with them, impacting available missions, trade deals, and potential alliances or rivalries.
Implementation in Gameplay

Trait-Based Behavior Modeling:

Program corp AI to make decisions and respond to situations based on their traits. For instance, a 'peaceful' corp might prefer trade agreements over combat engagements.
Implement a system where corp traits can evolve over time based on game events and player interactions.

Reputation Mechanics:

Create a clear and intuitive UI element to display reputation scores for the player and corps.
Ensure that reputation changes are logical and consistent with player actions and corp interactions.

Relation Modifiers:

Develop a formula to calculate corp relationships based on traits, reputations, and interaction modifiers.
Include special events or missions that can significantly impact these relationships, like a joint defense against alien invaders or a trade embargo.

Player Influence on Corp Dynamics:

Allow player actions to significantly impact corp standings and relations. For example, helping a corp in a battle could improve relations, while attacking their ships could harm them.
Offer players strategic choices in aligning with or opposing certain corps, with tangible consequences in the game world.

Narrative Integration

- Integrate the corp traits and reputations into the broader narrative, including the Quantum Specters threat. For example, how a corp reacts to the alien invasion can be influenced by their inherent traits.
- Use these dynamics to create a living, evolving galaxy where player actions and corp behaviors contribute to a unique and immersive story experience.

Corp Focus Implementation

Defining Corp Focus:

Each corp has a primary Focus, such as Mining, Production, Technology, Military, etc.
The Focus of a corp influences its behavior, priorities, resource allocation, and types of missions or quests it offers.
A corp's Focus is influenced by its traits (e.g., a high 'Scientific' trait increases the likelihood of a Technology Focus).

Influence on Corp Relations:

Corps' Focus areas significantly influence their potential alliances and rivalries.
Military-focused corps might prefer to ally with Production or Technology corps to get benefits from them rather than competing with other Military corps.
Mining, Production, and Technology corps could seek alliances with Military corps for protection and strategic advantages.

Dynamic Focus Shifts:

Corps can shift their Focus based on game events, such as changes in the 'Alien Hazard' level or shifts in the galaxy's political landscape.
Players can influence these Focus shifts through their actions and decisions, like supporting certain types of development within a corp.

Integrating Focus in Gameplay

Visual Representation and UI:

Develop a clear UI element to display each corp's Focus, along with its traits and current relations.
This helps players quickly understand the dynamics at play and make informed decisions.

Focus-Based Behavior and Missions:

Program corps to offer missions, trade deals, and diplomatic options based on their Focus.
This could include unique missions that are only available from corps with a specific Focus.

Strategic Alliances and Rivalries:

Create a dynamic system where players can observe and influence the shifting alliances and rivalries based on corps' Focus areas.
Include diplomatic missions or events where players can mediate or influence the outcome of these relationships.

Narrative Integration:

Weave the concept of Focus into the game's narrative and lore. For example, a corp shifting its Focus to Military in response to the escalating alien threat can be a significant plot point.

Balancing and Considerations

- **Balancing Game Dynamics:** Ensure that the Focus system is balanced so that no particular Focus type becomes too dominant or irrelevant.
- **Player Influence:** Allow players to have a meaningful impact on corp Focus through their actions, but also ensure that corps have their own agency and logic in changing Focus.
- **Reflecting Changes in the Game World:** Changes in a corp's Focus should be visibly reflected in the game world, such as changes in the types of ships they deploy, the structures they build, or the missions they offer.

Corp Conservatism Trait Implementation

Defining the Trait:

The Openness/Conservatism trait represents a corp's flexibility and receptiveness to change and external influences.
High Openness indicates a corp that is more adaptable and responsive to player/other corp actions and changing circumstances.
High Conservatism suggests a corp that is more rigid, sticking to traditional ways and less influenced by external factors.

Impact on Corp Dynamics:

This trait doesn't directly affect technological advancement but influences how quickly and significantly a corp can change its diplomatic stance, Focus, and other trait stats.
A more 'Open' corp is likely to respond faster to player/other corp actions and global events, whereas a 'Conservative' corp would be slower to react and change.

Player Influence and Corp Relationships:

The player's ability to influence a corp is partly determined by this trait. It's easier to sway or form alliances with 'Open' corps.
'Conservative' corps require more effort and time to influence, but their alliances might be more stable once formed.

Integrating into Gameplay

In-Game Representation:

Clearly display each corp's Openness/Conservatism level in the game's UI, alongside other corp traits and information.
This helps players strategize their approach to diplomacy and alliances.

Influencing Corp Decisions:

Allow players to undertake specific actions or missions that can influence a corp's traits, including their level of Openness or Conservatism.
These actions can include diplomatic missions, joint operations, trade agreements, or propaganda campaigns.

Dynamic Corp Behavior:

Program corp AI to make decisions and react to events in accordance with their Openness/Conservatism level.
'Open' corps might quickly shift their Focus or form new alliances, while 'Conservative' corps maintain consistent strategies and long-term allies.

Narrative Integration:

Use this trait to add richness to the game's story. For example, a 'Conservative' corp might initially resist joining forces against the alien threat but could be gradually convinced through player actions.

Enemy of My Enemy Is My Friend

Dynamic Corp Alliances:

Corps should dynamically form alliances based on shared threats. For example, if Corp A is threatened by Corp B, and the player or another corp is also in conflict with Corp B, Corp A might propose an alliance or offer support.
These alliances could be temporary, related to the duration of the shared threat, or evolve into long-term relationships depending on the game's progression.

Shared Threat Mechanism:

Implement a system that evaluates shared threats between corps and the player. This system should factor in recent conflicts, territorial disputes, and economic competitions.
The game could have events or missions triggered by these shared threats, encouraging players to ally with corps against a common enemy.

Reputation and Diplomacy Influence:

A player's actions against a common enemy should positively influence their reputation with the threatened corp.
Offer diplomatic options to formalize alliances or non-aggression pacts based on shared enemies.
Bonus for Relations with a Friend's Friend

Extended Alliance Network:

Create a system where forming an alliance with one corp indirectly boosts the player’s standing with that corp’s allies.
For instance, if the player is allied with Corp A, which is friendly with Corp C, the player receives a smaller but significant reputation boost with Corp C.

Complex Diplomatic Web:

Design the game's diplomacy to reflect a web of alliances and enmities, where the player's actions with one corp can ripple through their network of relationships.
This system encourages players to consider the broader implications of their alliances and conflicts.

Corp Relationship Display:

Implement a UI element that clearly shows corp relationships, including indirect relationships through mutual allies.

This helps players understand and strategize their diplomatic actions within the complex web of corp relationships.

Quests and Missions Impact:

Ensure that missions or quests given by a corp positively affect the player's standing with that corp's allies.
This can create interesting gameplay choices, where players may take on missions not just for direct rewards but for the diplomatic benefits.

Dynamic World Response:

The game world should dynamically respond to these evolving relationships, with NPC dialogue, corp behavior, and available missions changing to reflect the current diplomatic landscape.

MegaCorps

Corporation alliances can grow into something larger, megacorps. This megacorp will give less freedom to included corporations and can decide a direction of what all included corporations should focus on.
In case when corporations are not in the megacorp, they can try to influence their ally to do what they want more. For example, a military corporation will ask an ally tech corporation to research more military technologies, the tech corp will ask the mining corp to focus on specific resources needed for their current research plans, the mining corp will ask the production corp to build more miner facilities and ships, and ask military corp to defend their asteroid belts and so on.
The "asking" for something from another ally corp, is a request, and if corp will do what was asked, then their relations will become stronger, but if it is declined, the asked corp will be offended.
The corp can decline the request if it doesn't match their current corp goals, but will take into account the need to keep good relations. Also, the more one corp influences another, the more likely their request will be satisfied (some influence multiplier?).
But if all these corps are in the megacorp, then the main corp will dictate what inner corps will do directly, without asking/influencing.
The corp can become a megacorp and start controlling other corp when its influence level reaches some point.
The more one corp depends on another and the more they are friendly, the more influence the other corp has.
If two megacorps merge into one megacorp, all sub-corps of the merged one become sub-corps of the new parent MegaCorp. The focus of the merged MegaCorp is a combination of focuses of merged corps, but the more back influence the merged corp had, the more their previous focus affected the MegaCorp's focus.
The player (his corp) is an exception. Only NPC corps can influence each other and the Player on NPC corp, but NPC corp has no influence level on the Player. NPC corps can make requests for something, but the player makes his own decision to satisfy it or not. (Influence mechanics is some kind of simulation of human relationships)

The sub-corporation should be totally encapsulated, other Corps and MegaCorps can make a business only with the parent MegaCorp. So sub-corps can do some micromanagement, but all other decisions will be made by the parent MegaCorp.

Corp requests are some kind of trading or contract.

Examples:
Complex contracts:
- security contract with military corp to defend mining ships.
- contract with tech corp to provide some technology on a subscription basis (the most progressive technology is related to galaxy average tech level, the most expensive contract is)
- contract with tech corp to do research on some needed technology.
- contract with the mining company to supply some amount of resources (single or constant supply)
- contract with production corp for supplying some production (rockets, ship modules, hulls, etc. for military corp)

Simple trading:
- Buying some resources from the mining corp.
- Buying some products from production corp.
- Buying some technology from tech corp (super expensive and require good rep).
- Buying ready-to-fight military ships/fleets from mil corp.

The price of contracts depends on corps relations. Contracts and trading deals will increase corps relations.
The higher the percentage of the corp's income is from deals with other corp, the more influence level other corp gain.

Corps also can place offers for contracts to give ability any non-enemy corp/freelance NPC/Player to accept it and make a contract. The friendly corps still will have some discounts/bonuses.

Corp structure

- Corp has own facilities (stations)
- Corp can group stations into some cluster.
- NPC (some ship) belongs to some corp.
- Corp can group NPCs into fleets, to work with them more effectively.
- Each NPC/fleet has its role (military, miner, transport/trader, explorer, etc.)
- Each station has its own demands. (need some resources, need to sell some products, or need defense)
- Station/cluster can have a task, given by its corp (focus on the production of some particular product, or research some specific technology).
- Corp can assign NPC/fleet to the station to satisfy its demands.
- NPC/fleet will take jobs from stations to satisfy its demands.
- By accepting a contract corp will assign tasks to stations/cluster and/or NPCs/fleets.

Tech levels

Each thing, like station module, ship, ship module, gun, etc. should have its own tech level. The higer tech level of thing, the beter it is.
If the tech level of the product is less than the tech level of the station that produces it, then the station will have bonuses for producing it (produce faster, with fewer resources spent). Maybe the produced item may have some bonus for stats as well (quality). In the opposite situation, it will

have penalties. So corp can focus on the production quantity or superiority in tech level of production.

Quantum-Aliens Behavior Progression

Early Game - Isolated Incursions:

Initially, quantum-aliens appear in remote, less populated areas of space.
They target lone ships or small outposts, creating a sense of mystery and sporadic threat.
These early encounters serve as introductions to the aliens' unique capabilities, like quantum teleportation.

Mid-Game - Escalating Aggression:

As the game progresses, the frequency and boldness of the quantum-aliens' attacks increase.
They begin targeting larger convoys, minor space stations, or fringe colonies, leading to more significant confrontations.
Players and NPC corps start to recognize the growing threat, leading to more focused efforts to understand and counter the aliens.

Late Game - Direct Assaults on Populated Zones:

In the later stages, quantum-aliens become bolder, attacking heavily populated zones and major corp bases.
Their targets might include important trade hubs, large colonies, or central stations of major corps.
This phase marks the peak of their threat, requiring concerted efforts from players and NPC corps to defend key areas and counterattack.
Implementing the Behavior in Game

Randomized Attack Patterns:

Implement a system where quantum-alien attacks are somewhat randomized but increase in frequency and severity over time.
Ensure that the early game encounters are manageable but gradually become more challenging.

Player and Corp Responses:

Allow player actions and corp responses to these attacks to influence the game's progression. For instance, successful defenses could delay the escalation of attacks.
Include missions or events triggered by these attacks, like rescue operations, retaliatory strikes, or research missions to gather alien technology.

Dynamic News and Intel System:

Create an in-game news or intel system to inform players about alien activities, increasing the sense of a living, evolving world.
Use this system to hint at the growing danger and provide context for the aliens' actions.

Balancing Challenge and Player Progression:

Carefully balance the difficulty of these encounters to match the player's progression and capabilities.
Ensure that players have the means to upgrade and prepare for the escalating threat.

Narrative Integration

- Weave the quantum-aliens' behavior into the overarching narrative of the game. Their growing boldness could be tied to story elements, like discovering their motives or finding ways to counter their technology.
- Use their progression to drive the narrative forward, creating a sense of urgency and importance in the player's actions and decisions.

Lore Concept: "The Quantum Rift and the Shattered Galaxy"

The Galaxy's Era of Prosperity:

The game is set in a galaxy known for its vibrant interstellar commerce, advanced technology, and diverse political landscape, governed by various corps and mega-corporations.
This era of prosperity is fueled by advanced technology and a booming economy, with corps vying for resources, territory, and technological supremacy.

Discovery of the Quantum Rift:

The narrative begins with the discovery of a Quantum Rift, a mysterious anomaly in space-time, by a coalition of the galaxy's most powerful corps.
Initial exploration and experiments with the Rift reveal the potential for groundbreaking technological advancements, sparking a new race for quantum tech among corps.

The Arrival of Quantum-Aliens:

Unbeknownst to the galaxy's inhabitants, the Rift is a gateway to a parallel universe, home to the quantum-aliens – a highly advanced and enigmatic race.
The quantum-aliens, perceiving the Rift's opening as a threat, begin incursions into the galaxy to assess and neutralize potential dangers.

Escalating Conflict:

The quantum-aliens' attacks start as isolated incidents but gradually escalate, posing a significant threat to the galaxy's stability.
Corps initially dismiss these incursions as manageable anomalies, but as attacks become more frequent and destructive, the reality of the threat sets in.

Race for Quantum Technologies:

In response to the growing alien threat, corps accelerate their research into quantum technologies, using debris and technology salvaged from alien encounters.
Players can engage in missions to recover alien tech, research new technologies, and influence their corp's progression.

Galactic Response and Player's Role:

The galaxy's corps are forced to reconsider their rivalries in the face of a common enemy. Alliances form, strategies are debated, and the galaxy's political landscape evolves dynamically.
Players navigate this complex scenario, balancing their allegiances, participating in the tech race, and engaging in both combat and diplomatic efforts against the backdrop of the quantum-alien threat.

The Deepening Mystery:

As players delve deeper into the conflict, they uncover more about the quantum-aliens – their motives, their connection to the Rift, and the potential for a deeper, more ancient cosmic mystery linking their universe with the aliens'.

Narrative Themes and Elements

- **Mystery and Discovery:** The lore is rich with mysteries and discoveries, from the nature of the Quantum Rift to the true intentions of the quantum-aliens.
- **Technological Evolution:** A key theme is the rapid advancement of technology, influenced by the alien threat and the galaxy's response to it.
- **Dynamic Politics:** The evolving political landscape, driven by the alien incursions and the tech race, provides a backdrop for intrigue and shifting alliances.
- **Player Agency:** Players have significant agency in shaping the narrative through their actions, decisions, and allegiances.

Enhanced Corp Relations

Alliance and Technology Sharing:

Corps that are allies can share technologies, accelerating their respective research progress.
Implement a system where allied corps periodically exchange tech points or specific technology advancements.

Scientific Trait:

Each corp has a 'Scientific' trait, determining their investment in technology research.
This trait affects how quickly a corp can develop new technologies and their overall technological progression.

Reputation Modification - 'Alien Defended':

Corp/Player gains the 'Alien Defended' reputation boost when they successfully defeat quantum-aliens.

This boost significantly enhances their standing in the galaxy, affecting their relations with other corps.

Global Modification - 'Alien Hazard':

The 'Alien Hazard' is a global modifier that reflects the overall threat level posed by the quantum-aliens.
As the alien threat intensifies, this modifier increases, impacting how corps perceive and react to the alien menace.
A higher 'Alien Hazard' level increases the likelihood of corps setting aside differences to unite against the common threat.

AI

Hierarchical Task Network Planning (HTN) will be used as the main decision-making system.
Papers:

- https://pages.mtu.edu/~nilufer/classes/cs5811/2012-fall/lecture-slides/cs5811-ch11b-htn.pdf
- https://www.gameaipro.com/GameAIPro/GameAIPro_Chapter12_Exploring_HTN_Planners_through_Example.pdf

AI structure

Main AI

- **Role:** Oversees overall strategic decisions and coordinates sub-AIs.
- **Responsibilities:**
    - Makes high-level decisions considering all facets of the faction's operations.
    - Prioritizes and allocates resources across different departments based on current needs and long-term goals.

Military AI (Sub-AI)

- **Role:** Manages military operations and defense.
- **Responsibilities:**
    - Plans and executes defensive and offensive military strategies.
    - Manages fleet deployments and territorial defense.

Fleet AI (Sub-Sub-AI)

- **Role:** Controls individual fleets.
- **Responsibilities:**
    - Executes specific military missions assigned by Military AI.
    - Engages in combat, patrols sectors, and protects assets.

Base Defense AI (Sub-Sub-AI)

- **Role:** Manages defense of key locations.
- **Responsibilities:**
    - Organizes defenses of stations and important planets.
    - Coordinates with Fleet AI for reinforcement and support.

Economic AI (Sub-AI)

- **Role:** Oversees the faction's economy.
- **Responsibilities:**
    - Manages resource collection, production, and trade.
    - Balances economic growth with other faction needs.

Production AI (Sub-Sub-AI)

- **Role:** Manages production facilities.
- **Responsibilities:**
    - Oversees manufacturing and resource processing.
    - Adjusts production priorities based on economic AI directives.

Trade AI (Sub-Sub-AI)

- **Role:** Manages trade operations.
- **Responsibilities:**
    - Analyzes market trends and opportunities.
    - Oversees trade fleets and trade routes.

Diplomatic AI (Sub-AI)

- **Role:** Handles foreign relations.
- **Responsibilities:**
    - Engages in negotiations and treaties with other factions.
    - Manages alliances and diplomatic missions.

Espionage AI (Sub-Sub-AI)

- **Role:** Conducts intelligence and espionage.
- **Responsibilities:**
    - Gathers intelligence on other factions.
    - Supports diplomatic efforts with critical information.

Research AI (Sub-AI)

- **Role:** Drives technological advancement.
- **Responsibilities:**
    - Prioritizes research goals.
    - Oversees technological development and innovation.

Exploration AI (Sub-Sub-AI)

- **Role:** Explores and surveys new areas.
- **Responsibilities:**
    - Identifies new resource-rich areas or strategic locations.
    - Provides data to inform research and development.

Expanded AI Hierarchy

Military sub-AI:

- Oversees overall military strategy and operations.
- Delegates specific objectives to Fleet AIs (e.g., defend a territory, engage an enemy faction).

Fleet AI:

- Manages a group of ships as a single unit.
- Makes tactical decisions based on the objective provided by the Military sub-AI (e.g., formation strategies, target prioritization).

Ship-In-Fleet AI:

- Controls individual ships within a fleet.
- Executes specific maneuvers and actions based on Fleet AI's tactics (e.g., engaging targets, evasive maneuvers).

Communication and Event System

- **Sub-AI Interaction:** Sub-AIs communicate through an event system, sending and receiving notifications about various game states and needs.
- **Event-Based Decisions:** Sub-AIs respond to events either by adjusting their plans or by requesting assistance from other sub-AIs.
- **Main AI as a Mediator:** The Main AI can act as a mediator, processing requests from sub-AIs and facilitating decision-making that aligns with the faction's overall strategy.

AI structure example scenario: Mining an Asteroid Belt

Initial Request by Mining AI:

- Mining AI identifies a valuable asteroid belt in a territory controlled by a neutral faction.
- It sends a request to the Main AI, including an estimation of the belt's value and potential mining benefits.

Evaluation by Main AI:

- The Main AI assesses the importance of the request based on the faction's current goals, resources, and strategic priorities.
- The Main AI then consults with the Diplomatic AI to evaluate the political ramifications of pursuing this asteroid belt.

Consultation with Diplomatic AI:

- Diplomatic AI assesses the potential impact on relationships with the neutral faction and other factions.
- It might suggest negotiation or alliance-building as an alternative to military action.

Military AI Involvement:

- If military action is considered, the Main AI requests an evaluation from the Military AI.
- Military AI estimates the effort and risk involved in taking control of the asteroid belt and reports back.

Decision-Making Process:

- The Main AI synthesizes inputs from Mining, Diplomatic, and Military AIs.
- It decides the best course of action: negotiate, seek allies' help, or initiate military action.

Feedback Loop:

- The Main AI communicates the decision to the relevant sub-AIs.
- Mining AI either proceeds with mining (if approved) or seeks alternative sites.