

Stellaris Sandbox: Portfolio Assignment

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Link to HTML Interface: <http://flip3.engr.oregonstate.edu:3845/>

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1 Executive Summary of Project Changes

- Change colors to use RGB hex color codes rather than a choice between a small number of colors.
- Replaced the Systems int starCount attribute with a varchar(16) type attribute that can be one of {"unary", "binary", "trinary"}. Because of the few options available, it makes more sense and is more immersive to use these names rather than a number.
- Changed color attributes to be varchar(7) instead of varchar(6) so that they could include the # symbol in the hex code color (ex: #FFFFFF).
- Change minimum system orbitalRadius to 0.25 in the outline.
- Add a varchar(16) planetType attribute to bodies to further characterize what kind of planet the body is if its type is "planet". This is set at random upon creation and is used only to stylize bodies when they are displayed in JavaScript canvases.
- Add varchar(24) star1Type, star2Type, and star3Type attributes to systems to further characterize what kind of stars it has. For unary systems, star2Type and star3Type default to NULL, and for binary systems, star3Type is NULL. These are set at random upon creation and are used only to stylize systems when they are displayed in JavaScript canvases.

2 Project Outline

In the videogame Stellaris, players control galactic empires competing for control of a galaxy and its resources. Stellaris Sandbox is a database-driven website that will allow users to design a galaxy so that a game of Stellaris can be played in it. This will provide users with the freedom to create new starting circumstances for players, lending itself especially to role-playing oriented players. Stellaris has an average of 14,000 concurrent players on PC alone and a number of active online communities, together making up a large audience with a potential interest in the tool. A custom mod would be needed in order to import the galaxies designed in Stellaris Sandbox into the game itself.

Using Stellaris Sandbox, users can create between 200 and 1000 Systems within the galaxy as well as the hyperlanes that connect them. Users can also create between 0 and 10 Bodies, such as planets, within Systems that can each contain 0 to 3 exploitable Resource deposits. AI-controlled Empires can also be created that span Systems and start off with given quantities of each Resource.

In Stellaris, there is only one galaxy, so Stellaris Sandbox will only allow design of a single galaxy at a time. Since users will be expected to create galaxies with a large number of Systems, Stellaris Sandbox will provide templates and other tools to automatically generate features which can then be edited by the user.

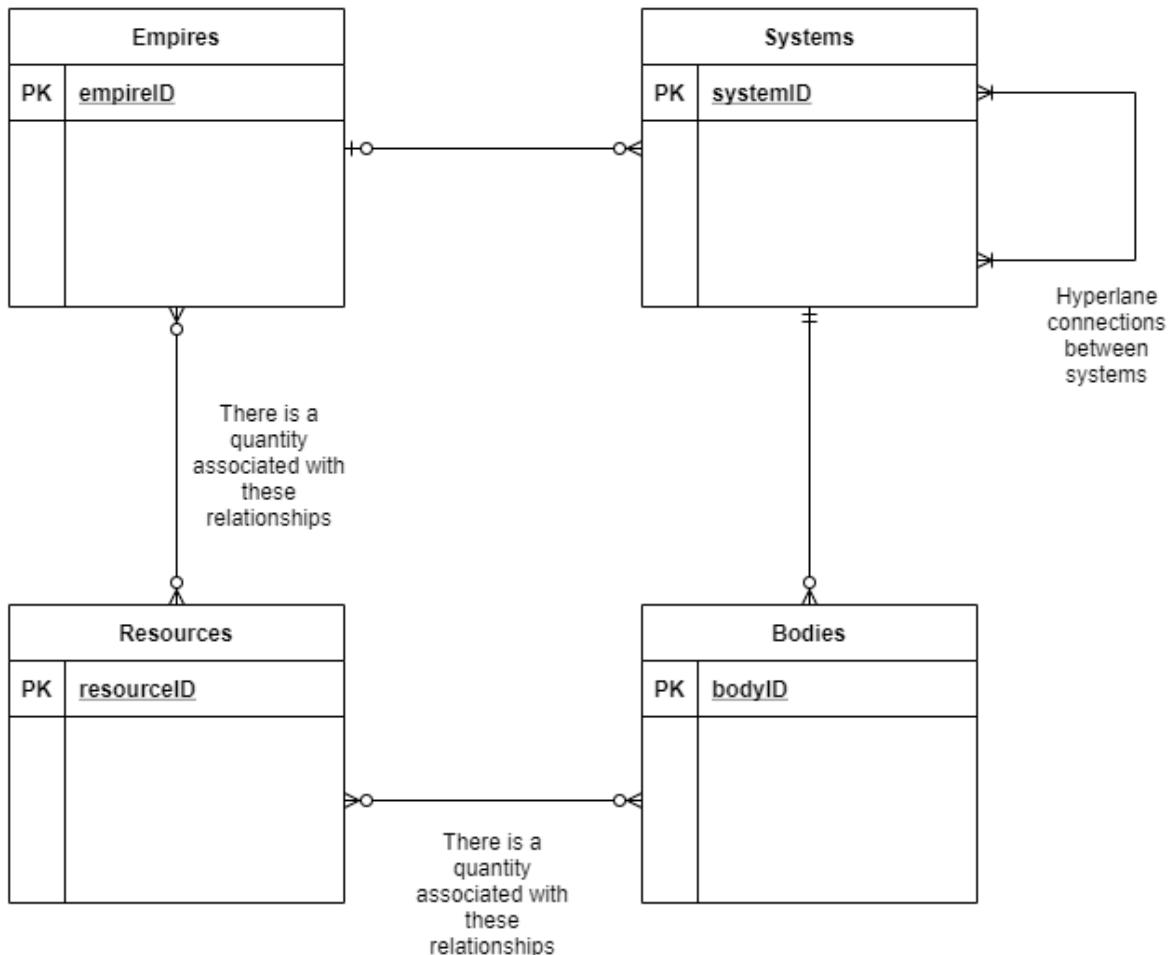
3 Database Outline

- Empires: Pre-existing, AI-controlled galactic empires
 - empireID: int, auto_increment, unique, not NULL, PK
 - name: varchar(255), not NULL
 - aggressiveness: varchar(16), not NULL, one of {"passive", "moderate", "aggressive"}
 - primaryColor: varchar(7), not NULL, the color Hex code
 - secondaryColor: varchar(7), not NULL, the color Hex code
 - isFallenEmpire: bool, not NULL
 - Relationship: 1:M between Empires and Systems, implemented with empireID as a FK within Systems. This relationship represents which empire owns the system.
 - Relationship: M:M between Empires and Resources, implemented in a separate table with empireID and resourceId as FKs and an int resourceQuantity. This represents resource stockpiles owned by an empire. Owner: Logan Traffas
 - Owner: Matthew Macovsky
- Systems: Star systems connected by hyperlanes and controlled by empires
 - systemID: int, auto_increment, unique, not NULL, PK
 - name: varchar(255), not NULL
 - type: varchar(16), not NULL, one of {"unary", "binary", "trinary"}
 - star1Type: varchar(24), default NULL, one of {"class b", "class a", "class f", "class g", "class k", "class m", "class m red giant", "class t brown dwarf"}
 - star2Type: varchar(24), default NULL, one of {"class b", "class a", "class f", "class g", "class k", "class m", "class m red giant", "class t brown dwarf"}
 - star3Type: varchar(24), default NULL, one of {"class b", "class a", "class f", "class g", "class k", "class m", "class m red giant", "class t brown dwarf"}
 - orbitalRadius: float, not NULL, between 0.25 and 1.0
 - theta: float, not NULL, between 0 and 360. The theta and orbitalRadius attributes together indicate the positions of Systems in the galaxy using polar coordinates.
 - empireID: int, FK
 - Relationship: M:M between Systems, implemented in a separate table with system1 and system2 as FKs. This relationship consists of the hyperlane connections between systems. Matthew Macovsky and Logan Traffas will work together on this relationship in the database.
 - Relationship: 1:M between Systems and Bodies, implemented with systemID as a FK within Bodies. Owner: Logan Traffas

- Indirect Relationship: M:M between Systems and Bodies, since Systems contain Bodies which are in turn related to Resources. Does not require explicit implementation in the database.
- Owner: Logan Traffas
- Bodies: Astronomical bodies that reside in systems (namely planets and asteroids)
 - bodyID: int, auto_increment, unique, not NULL, PK
 - name: varchar(255), not NULL
 - type: varchar(16), not NULL, one of {"planet", "asteroid"}
 - planetType: varchar(16), default NULL, one of {"arid", "desert", "savannah", "alpine", "arctic", "tundra", "continental", "ocean", "tropical"}
 - orbitalRadius: float, not NULL, between 0.1 and 1.0
 - theta: float, not NULL, between 0 and 360. The theta and orbitalRadius attributes together indicate the positions of Bodies in Systems using polar coordinates.
 - systemID: int, not NULL, FK
 - Relationship: M:M between Bodies and Resources, implemented in a separate table with bodyID and resourceId as FKs and an int resourceQuantity. This represents resource deposits on a body that can produce that many of that resource per month.
Owner: Matthew Macovsky
 - Owner: Logan Traffas
- Resources: Resource deposits on bodies that can be exploited by empires
 - resourceId: int, auto_increment, unique, not NULL, PK
 - name: varchar(255), not NULL
 - baseMarketValue: float, greater than 0
 - color: varchar(7), not NULL, the color Hex code
 - Owner: Matthew Macovsky

4 Entity-Relationship Diagram

Stellaris Sandbox: ER Diagram



5 Schema

```
Empires(  
    empireID,  
    name,  
    aggressiveness,  
    primaryColor,  
    secondaryColor,  
    isFallenEmpire)  
  
Systems(  
    systemID,  
    name,  
    type,  
    star1Type,  
    star2Type,  
    star3Type,  
    orbitalRadius,  
    theta,  
    empireID)  
  
Bodies(  
    bodyID,  
    name,  
    type,  
    planetType,  
    orbitalRadius,  
    theta,  
    systemID)  
  
Resources(  
    resourceID,  
    name,  
    baseMarketValue,  
    color)  
  
Hyperlanes(  
    system1ID,  
    system2ID)  
  
ResourceStock(  
    empireID,  
    resourceID,  
    quantity)  
  
ResourceDeposits(  
    bodyID,  
    resourceID,  
    quantity)
```

6 Screen Captures

6.1 Home Page

Figure 1: Home page, hub slide.

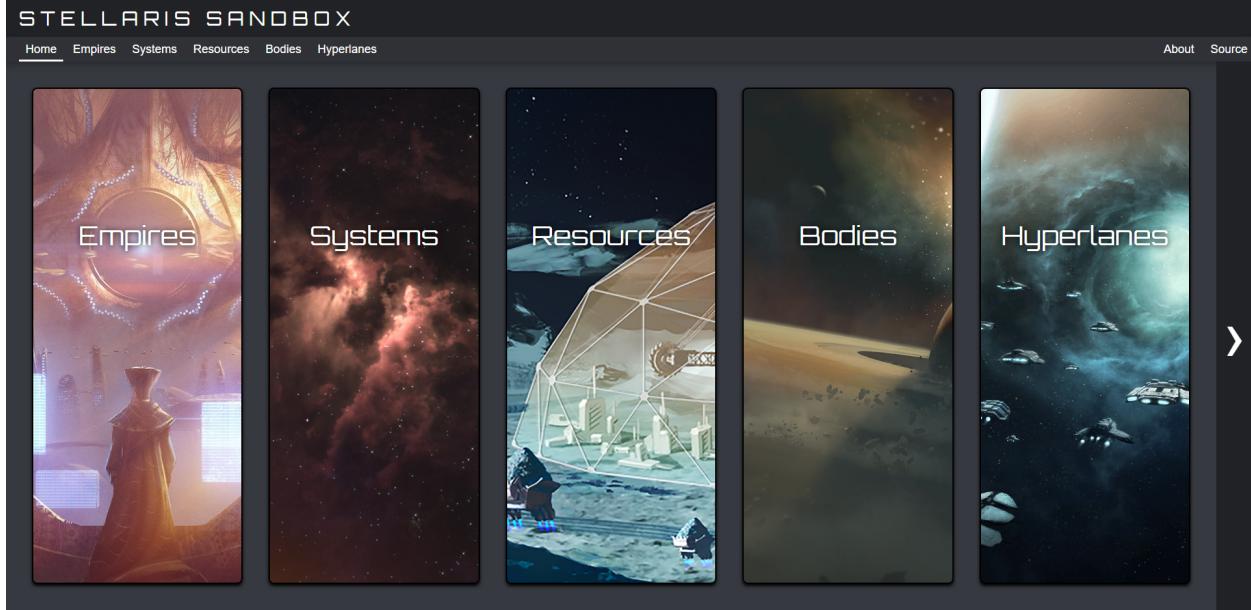
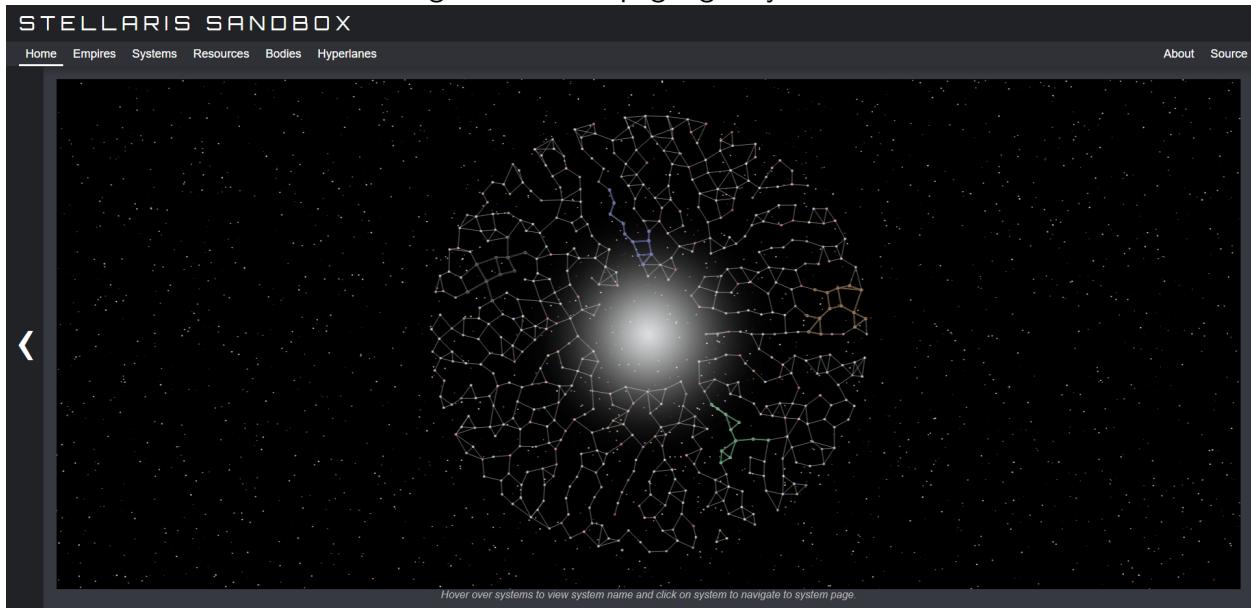


Figure 2: Home page, galaxy slide.



6.2 Empires

Figure 3: BROWSE Empires page.

The screenshot shows the 'Empires' section of the STELLARIS SANDBOX interface. At the top, there's a navigation bar with links for Home, Empires, Systems, Resources, Bodies, Hyperlanes, About, and Source. Below the navigation is a search bar labeled 'Search empires by name'. A table lists four empires:

Name	Aggressiveness	Primary Color	Secondary Color	Fallen Empire	Action
Borg Community	Moderate	#20853C	#BD4B4B	Yes	View Edit Delete
Jhelma Dominion	Passive	#693504	#000000	No	View Edit Delete
Tzynn Empire	Aggressive	#000000	#7A1707	No	View Edit Delete
United Nations of Earth	Moderate	#3841A1	#000000	No	View Edit Delete

Figure 4: DELETE Empire page.

This screenshot shows the same 'Empires' page as Figure 3, but with a modal dialog box overlaid. The dialog box contains the text 'Are you sure?' and two buttons: 'Yes' and 'No'. This indicates that a delete operation is about to be performed on one of the listed empires.

Figure 5: CREATE Empire page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

Create New Empire

Name:

Aggressiveness: Passive Moderate Aggressive

Primary Color:

Secondary Color:

Fallen Empire:

Resource Stocks

Create New Resource Stock A resource stock exists for each resource, so no new ones can be created.

Resource	Quantity
Alloys	90000
Energy Credits	80000
Engineering Research	140000
Minerals	100000
Physics Research	135000
Society Research	130000

Owned Systems

Name

Figure 6: READ Empire page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

View Empire

Name: Borg Commonwealth

Aggressiveness: Passive Moderate Aggressive

Primary Color:

Secondary Color:

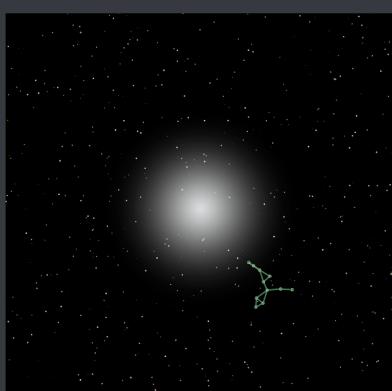
Fallen Empire:

Resource Stocks

Resource	Quantity
Alloys	90000
Energy Credits	80000
Engineering Research	140000
Minerals	100000
Physics Research	135000
Society Research	130000

Owned Systems

Name
Alvymra



Hover over systems to view system name and click on system to navigate to system page.

Figure 7: READ/UPDATE Empire page.

The screenshot shows the 'Edit Empire' page of the Stellaris Sandbox application. The top navigation bar includes links for Home, Empires, Systems, Resources, Bodies, Hyperlanes, About, and Source. On the left, there's a sidebar titled 'Edit Empire' with fields for Name (Borg Commonwealth), Aggressiveness (set to Aggressive), Primary Color (green), Secondary Color (red), and Fallen Empire (checked). Below this is a section for 'Resource Stocks' showing current quantities for various resources: Alloys (90000), Energy Credits (80000), Engineering Research (140000), Minerals (100000), Physics Research (135000), and Society Research (130000). A note indicates that no new resource stocks can be created. At the bottom, the 'Owned Systems' section lists 'Alvyrra' with options to Highlight, View, Edit, or Remove Ownership. The main right area displays a star map with a highlighted system and a tooltip instructing users to hover over systems to view names and navigate to their pages.

6.3 Systems

Figure 8: BROWSE Systems page.

The screenshot shows the STELLARIS SANDBOX interface. At the top, there's a navigation bar with links for Home, Empires, Systems, Resources, Bodies, Hyperlanes, About, and Source. Below the navigation bar is a search bar labeled "Search systems by name". A table lists various systems with columns for Name, Type, Orbital Radius, and Theta. Each system entry includes "Highlight", "View", "Edit", and "Delete" buttons. To the right of the table is a map of the galaxy with a grid overlay, showing the positions of different systems. A tooltip at the bottom right of the map area says: "Hover over systems to view system name and click on system to navigate to system page."

Name	Type	Orbital Radius	Theta	
Acamar	Trinary	0.250631	246.505	[Highlight] [View] [Edit] [Delete]
Acculum	Trinary	0.347823	151.992	[Highlight] [View] [Edit] [Delete]
Adranell	Binary	0.347967	225.319	[Highlight] [View] [Edit] [Delete]
Adimir	Binary	0.908379	341.592	[Highlight] [View] [Edit] [Delete]
Aesir	Unary	0.855902	345.02	[Highlight] [View] [Edit] [Delete]
Aethos	Trinary	0.852398	334.217	[Highlight] [View] [Edit] [Delete]
Afmyke	Trinary	0.446057	296.493	[Highlight] [View] [Edit] [Delete]
Ajam	Trinary	0.445648	246.507	[Highlight] [View] [Edit] [Delete]
Ajandis	Binary	0.946708	168.79	[Highlight] [View] [Edit] [Delete]
Alamak	Binary	0.699288	0.814448	[Highlight] [View] [Edit] [Delete]
Aldebaran	Trinary	0.946313	146.696	[Highlight] [View] [Edit] [Delete]
Alidib	Trinary	0.593428	80.6708	[Highlight] [View] [Edit] [Delete]
Alioth	Binary	0.945219	184.634	[Highlight] [View] [Edit] [Delete]
Almach	Unary	0.588681	139.418	[Highlight] [View] [Edit] [Delete]
Alpha Hydri	Binary	0.552514	75.5904	[Highlight] [View] [Edit] [Delete]
Alvyrta	Unary	0.64288	299.336	[Highlight] [View] [Edit] [Delete]
Anachonus	Binary	0.805517	196.033	[Highlight] [View] [Edit] [Delete]
Antak Rham	Trinary	0.490433	276.994	[Highlight] [View] [Edit] [Delete]

Figure 9: DELETE System page.

This screenshot shows the STELLARIS SANDBOX interface after selecting the delete option for a system. A confirmation dialog box titled "Are you sure?" is centered on the screen, with "Yes" and "No" buttons below it. The background shows the same list of systems and galaxy map as Figure 8, but the "Delete" button for the selected system (Ajandis) is now grayed out, indicating the process is underway or confirmed.

Figure 10: CREATE System page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

Create New System

Name:	<input type="text"/>
Type:	<input checked="" type="radio"/> Unary <input type="radio"/> Binary <input type="radio"/> Trinary
Orbital Radius:	<input type="text"/> 0.5
Theta:	<input type="text"/> 0
Owning Empire:	<input type="text"/>

Bodies

Name	Type
Create	Cancel

Figure 11: READ System page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

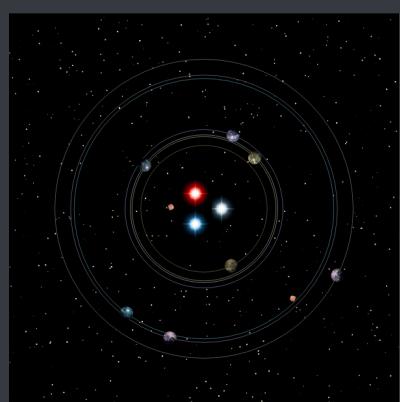
View System

Name:	<input type="text"/> Acamar
Type:	<input type="radio"/> Unary <input type="radio"/> Binary <input checked="" type="radio"/> Trinary
Orbital Radius:	<input type="text"/> 0.250631
Theta:	<input type="text"/> 246.595
Owning Empire:	<input type="text"/> None

Bodies

Name	Type				
Acamar 9192-233-D	asteroid	Highlight	View	Edit	Delete
Acamar BT-QW1	asteroid	Highlight	View	Edit	Delete
Acamar III	planet	Highlight	View	Edit	Delete
Acamar IV	planet	Highlight	View	Edit	Delete
Acamar IX	planet	Highlight	View	Edit	Delete
Acamar V	planet	Highlight	View	Edit	Delete
Acamar VI	planet	Highlight	View	Edit	Delete
Acamar VII	planet	Highlight	View	Edit	Delete
Acamar VIII	planet	Highlight	View	Edit	Delete

[Return](#)



Hover over bodies to view body name and click on body to navigate to body page.

Figure 12: READ/UPDATE System page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

Edit System

Name:	Acamar
Type:	<input checked="" type="radio"/> Unary <input type="radio"/> Binary <input checked="" type="radio"/> Trinary
Orbital Radius:	0.250631
Theta:	246.505
Owning Empire:	None

Bodies

Name	Type
Acamar 9192-233-D	asteroid
Acamar BT-QW1	asteroid
Acamar III	planet
Acamar IV	planet
Acamar IX	planet
Acamar V	planet
Acamar VI	planet
Acamar VII	planet
Acamar VIII	planet

[Create New Body](#)

[Save](#) [Cancel](#)

6.4 Bodies

Figure 13: BROWSE Bodies page.

The screenshot shows the 'Bodies' section of the STELLARIS SANDBOX interface. At the top, there is a navigation bar with links for Home, Empires, Systems, Resources, Bodies (which is underlined), and Hyperspace. Below the navigation bar is a search bar labeled 'Search bodies by name'. The main content area displays a table of celestial bodies:

Name	Type	Orbital Radius	Theta	
Acamar 9192-233-D	Asteroid	0.19	177.34	[View] [Edit] [Delete]
Acamar BT-QW1	Asteroid	0.72	314.84	[View] [Edit] [Delete]
Acamar III	Planet	0.45	68.41	[View] [Edit] [Delete]
Acamar IV	Planet	0.41	45.12	[View] [Edit] [Delete]
Acamar IX	Planet	0.74	233.34	[View] [Edit] [Delete]
Acamar V	Planet	0.42	143.74	[View] [Edit] [Delete]
Acamar VI	Planet	0.36	295.59	[View] [Edit] [Delete]
Acamar VII	Planet	0.76	255.23	[View] [Edit] [Delete]
Acamar VIII	Planet	0.85	333.59	[View] [Edit] [Delete]
Acculum I	Planet	0.85	248.82	[View] [Edit] [Delete]
Acculum II	Planet	0.38	28.97	[View] [Edit] [Delete]
Acculum III	Planet	0.96	10.42	[View] [Edit] [Delete]
Acculum IV	Planet	0.12	151.41	[View] [Edit] [Delete]
Acculum IX	Planet	0.88	329.89	[View] [Edit] [Delete]
Acculum V	Planet	0.99	259.77	[View] [Edit] [Delete]
Acculum VI	Planet	0.96	209.93	[View] [Edit] [Delete]
Acculum VII	Planet	0.2	51.28	[View] [Edit] [Delete]
Acculum VIII	Planet	0.42	215.08	[View] [Edit] [Delete]
localhost:3845				

Figure 14: DELETE Body page.

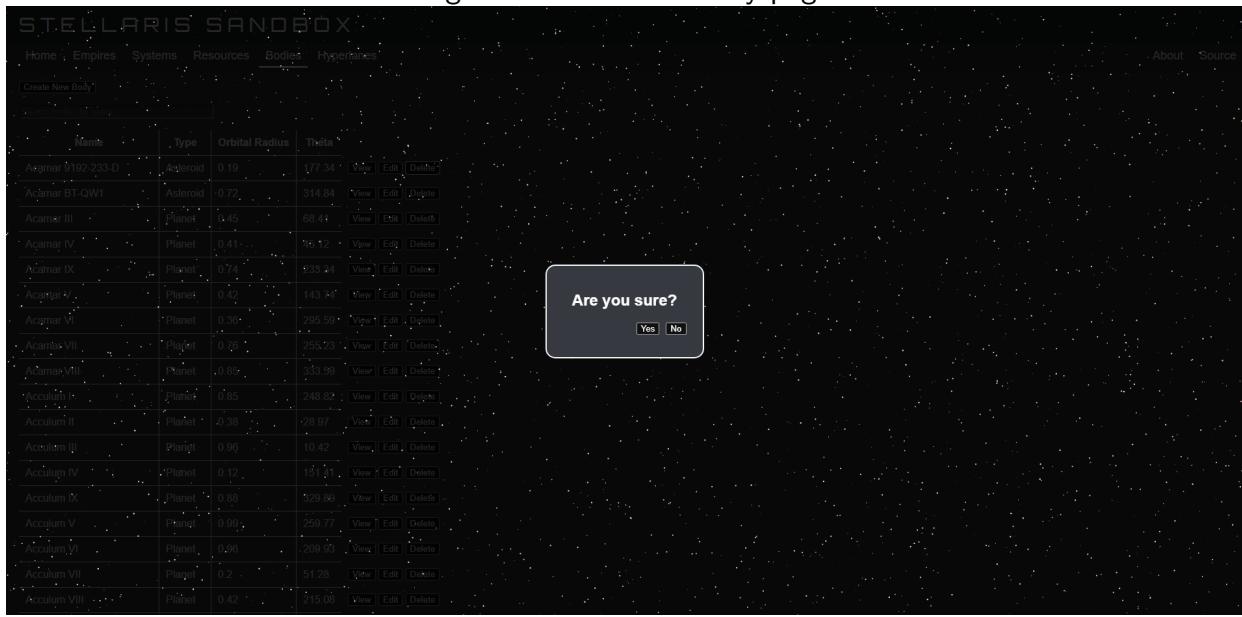


Figure 15: CREATE Body page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

Create New Body

Name:	<input type="text"/>
Type:	<input checked="" type="radio"/> Planet <input type="radio"/> Asteroid
Orbital Radius:	<input type="text"/>
Theta:	<input type="text"/> 0
Parent System:	<input type="text"/> Adumir <input type="button" value="Go To"/>

Resource Deposits

Create New Resource Deposit | A resource deposit exists for each resource, so no new ones can be created.

Resource	Quantity
Alloys	1
Society Research	2

localhost:3845

Figure 16: READ Body page.

STELLARIS SANDBOX

Home Empires Systems Resources Bodies Hyperlanes About Source

View Body

Name:	Adumir V
Type:	<input checked="" type="radio"/> Planet <input type="radio"/> Asteroid
Orbital Radius:	0.5
Theta:	7.49
Parent System:	Adumir <input type="button" value="Go To"/>

Resource Deposits

Resource	Quantity
Alloys	1
Society Research	2

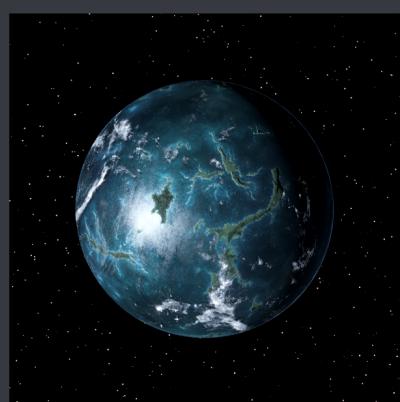
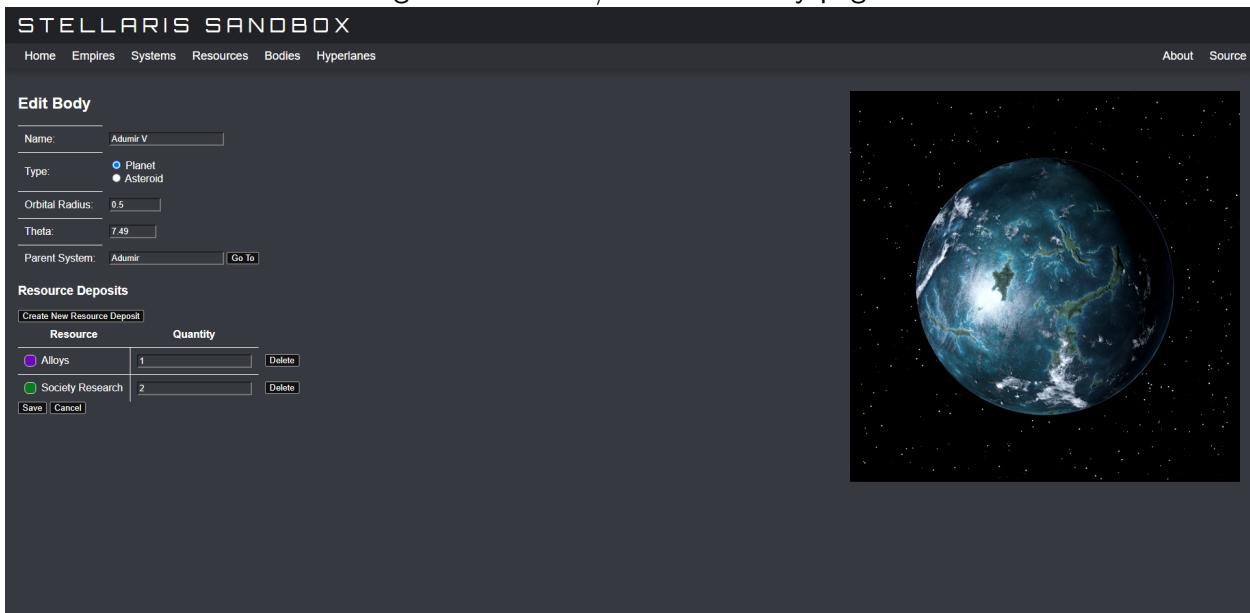


Figure 17: READ/UPDATE Body page.



6.5 Resources

Figure 18: BROWSE Resources page.

The screenshot shows the Stellaris Sandbox interface with the "Resources" tab selected. A table lists various resources:

Name	Base Market Value	Color	
Alloys	2	#6C07BA	View Edit Delete
Energy Credits	1	#EDE021	View Edit Delete
Engineering Research	N/A	#D9990F	View Edit Delete
Minerals	0.5	#BA1F07	View Edit Delete
Physics Research	N/A	#223BE0	View Edit Delete
Society Research	N/A	#0A7A1E	View Edit Delete

Figure 19: DELETE Resource page.

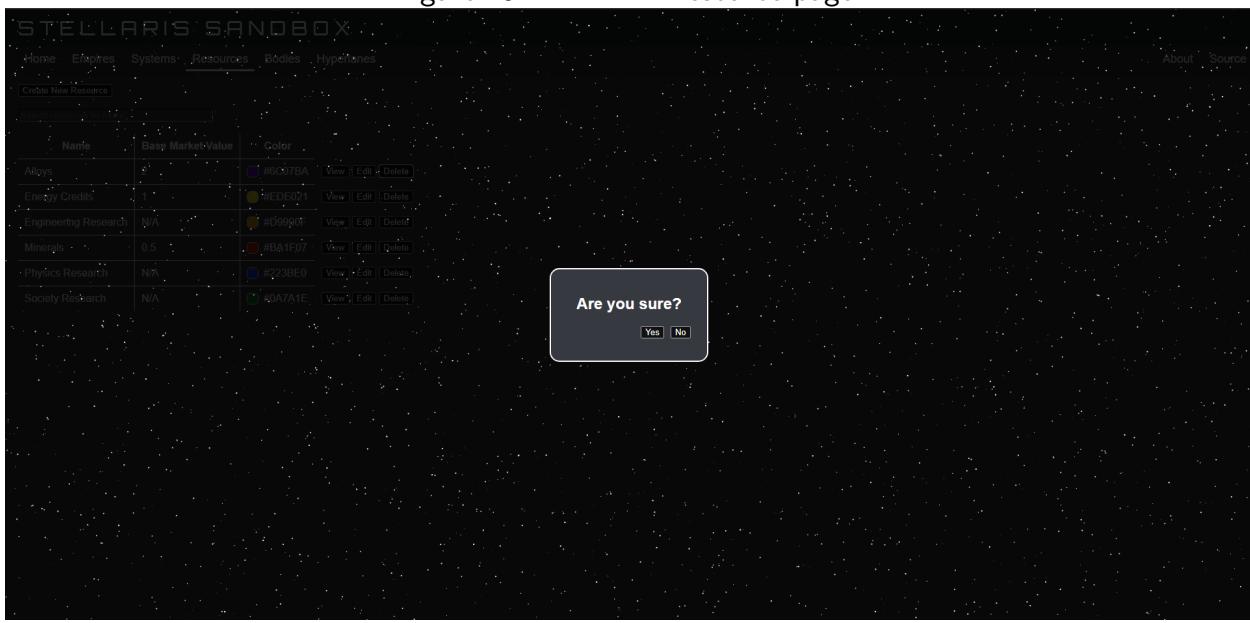


Figure 20: CREATE Resource page.

The screenshot shows the 'Create New Resource' form. At the top left is the 'STELLARIS SANDBOX' logo. Below it is a navigation bar with links: Home, Empires, Systems, Resources, Bodies, Hyperlanes, About, and Source. The main area has a dark background with white text. It contains fields for 'Name' (with a text input box), 'Base Market Value' (with a dropdown menu showing 'Applicable'), and 'Color' (with a color picker). At the bottom are 'Create' and 'Cancel' buttons.

Figure 21: READ Resource page.

The screenshot shows the 'View Resource' form. At the top left is the 'STELLARIS SANDBOX' logo. Below it is a navigation bar with links: Home, Empires, Systems, Resources, Bodies, Hyperlanes, About, and Source. The main area has a dark background with white text. It contains fields for 'Name' (set to 'Alloys'), 'Base Market Value' (set to '2'), and 'Color' (set to purple). At the bottom is a single 'Return' button.

Figure 22: READ/UPDATE Resource page.

The screenshot shows a dark-themed web application window titled "STELLARIS SANDBOX". At the top, there is a navigation bar with links: Home, Empires, Systems, Resources, Bodies, and Hyperlanes. On the far right of the header, there are "About" and "Source" links. Below the header, the main content area has a title "Edit Resource". Underneath the title, there are four input fields: "Name:" with the value "Alloys", a checked checkbox labeled "Applicable", "Base Market Value:" with the value "2", and a color swatch showing a purple square. At the bottom of the form, there are "Save" and "Cancel" buttons.

6.6 Hyperlanes

Figure 23: BROWSE/READ Hyperlanes page.

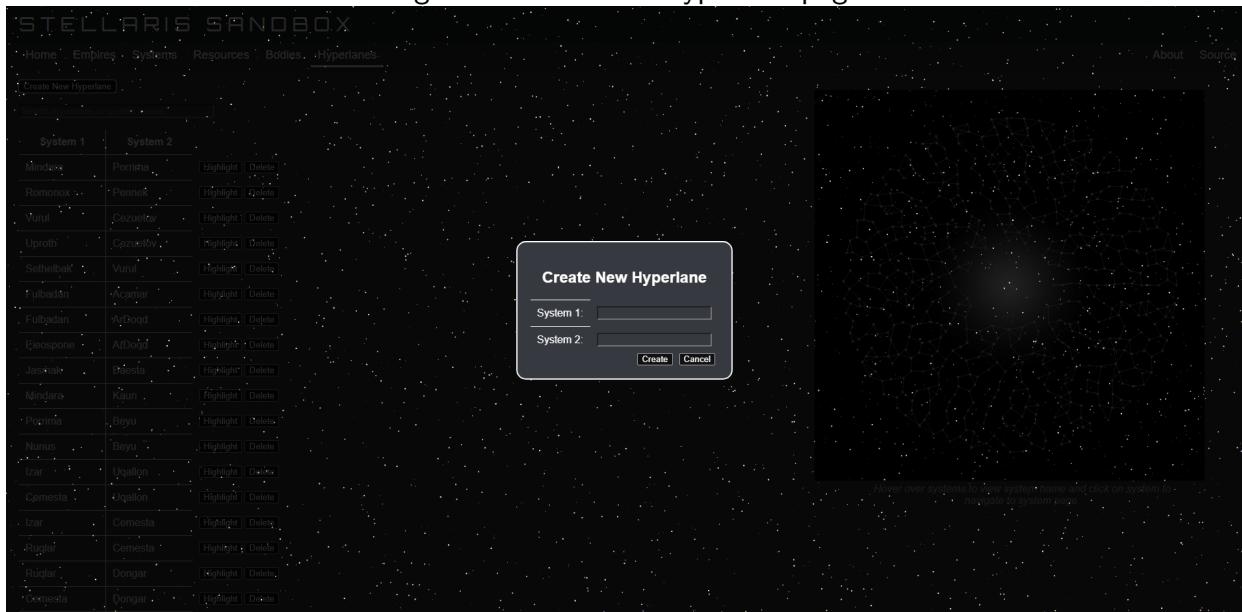
The screenshot shows the Stellaris Sandbox interface with the "Hyperlanes" tab selected. On the left, a table lists hyperlane connections between various star systems. Each row contains two system names under "System 1" and "System 2", followed by a "Highlight" and "Delete" button. A search bar at the top allows filtering by system name. To the right of the table is a large, complex network visualization representing the interconnectedness of the hyperlanes. A tooltip at the bottom right of the visualization area reads: "Hover over systems to view system name and click on system to navigate to system page."

System 1	System 2	
Mindara	Porrina	Highlight Delete
Romonox	Pennek	Highlight Delete
Vurul	Cezuelov	Highlight Delete
Uproth	Cezuelov	Highlight Delete
Sethebak	Vurul	Highlight Delete
Fubadan	Acamar	Highlight Delete
Fubadan	ArDoqd	Highlight Delete
Eieospone	ArDoqd	Highlight Delete
Jasmak	Baesta	Highlight Delete
Mindara	Kauri	Highlight Delete
Porrina	Beyu	Highlight Delete
Nunus	Beyu	Highlight Delete
Izar	Ugallon	Highlight Delete
Cemesta	Ugallon	Highlight Delete
Izar	Cemesta	Highlight Delete
Ruglar	Cemesta	Highlight Delete
Ruglar	Dongar	Highlight Delete
Cemesta	Dongar	Highlight Delete

Figure 24: DELETE Hyperlane page.

This screenshot is similar to Figure 23, showing the Stellaris Sandbox Hyperlanes page. However, a modal dialog box titled "Are you sure?" is centered on the screen, containing "Yes" and "No" buttons. The rest of the interface, including the table of hyperlane connections and the network visualization, appears identical to Figure 23.

Figure 25: CREATE Hyperlane page.



6.7 Miscellany

Figure 26: About page.

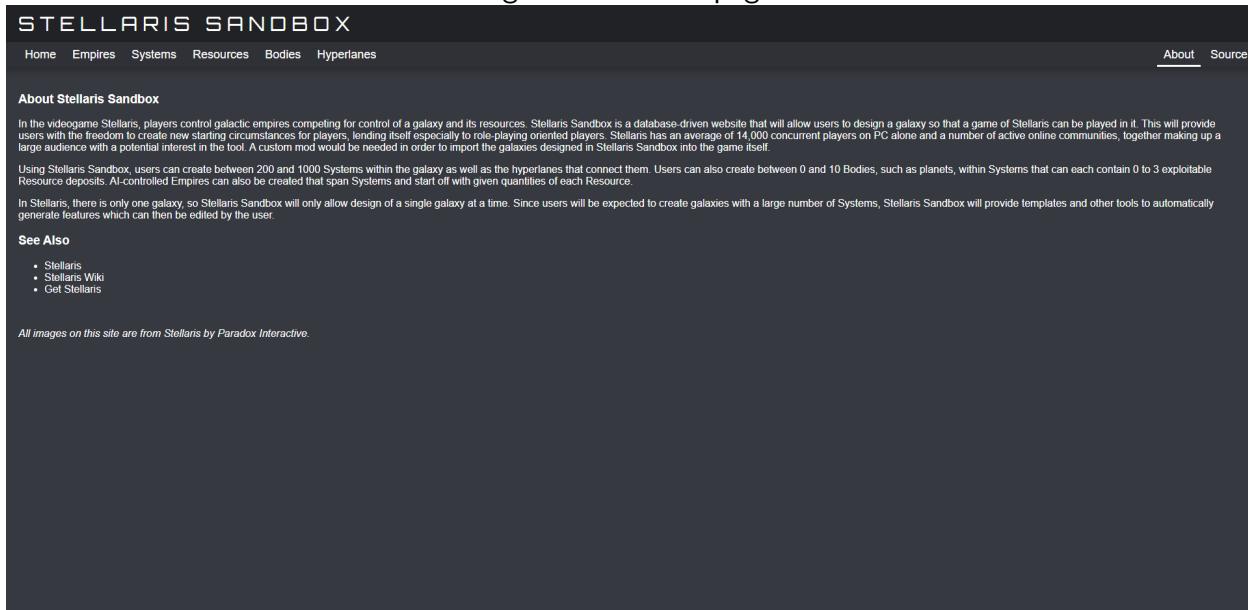


Figure 27: 404 page.

