

Villanova University  
Department of Electrical and Computer Engineering  
ECE 2800 Project Proposal

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# Rune Portal Teleportation System

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## **Abstract**

The objective of this project is to develop the theoretical concepts and applications of teleportation travel methods within the universe of an urban fantasy series. The basis of this project works within the in-world mechanics of the chosen fictional setting, and as such aims to apply engineering principles to the theories and functions of “magical” lore. The first main facet of this proposal focuses on the manipulation of “supernatural” phenomena through a scientific lens which will be explained in both their nature and their utilization in the project. The second major aspect centers around the physical planning and construction of the portal sites within a central headquarters as well as across intercity locations. As a result, this project presents the plans of designing and implementing a portal teleportation system to facilitate the travel needs of a covert organization. The portal system makes use of natural resources and entities within the universe of this world alongside carefully mapped out procedures to create a travel network that is dependable, safe, and protected.

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# **1 Introduction**

## *1.1 Project Overview*

The urban fantasy series of the Bureau of Paranormal Investigations, also known as the PEN [1], centers around the titular covert organization that maintains the peace between the Mundane Plane (the human world) and the existences of the supernatural. The mission of the PEN is to preserve order and protect the lives of all creatures, whether human or otherworldly, all while remaining hidden to everyday human detection. While the majority of lore for this collection of work relies on magic to explain the workings of this universe, we will be applying a scientific lens to the engineering framework of our proposal. This project will be formatted as though all provided concepts and plans of actions are working within the constraints of the in-world mechanics of this fictional entertainment work.

With this in mind, this project aims to design and implement the Rune Portal Teleportation System as the main travel system of the PEN. This project will utilize natural resources and entities of the world (runic languages, frequencies, gemstones, etc.) within the engineering plans for creating a transportation network between the main headquarters of the organization and various locations set up throughout the city. The objective of this project is to establish a reliable and protected travel system that is solely accessible to members of the PEN. This network will facilitate any transportation needs of organization agents as they carry out their duties for the bureau while remaining concealed from both public and enemy discovery.

The two major aspects of building the Rune Portal Teleportation System focus on:

1. The utilization of in-world phenomena to facilitate the connections and power sources of the portals.
2. Drafting plans for and constructing the physical portal sites.

## *1.2 Prior Work*

The use of portal teleportation is currently in use with interdimensional travel between the Mundane Plane (the human world) and the supernatural realm known as the Etheral. In order to achieve this large-scale transportation, this system employs both a higher amount of energy and a higher level of frequencies for its mechanisms. Such portals use greater quantities of the natural gem resource known as Doorkeeper Stones to provide the necessary supply of energy for travel from one dimension to another. Furthermore, such portals harness interdimensional-level frequencies as its connection pathways between the Mundane Plane and the Etheral. This system was developed and perfected primarily by the supernatural race of beings called the Fae, with additional contributions made by another supernatural race called the Wikkans. Such individuals from either race are the leading specialists of portal teleportation regarding the study and application of runic languages and metaphysical frequencies.

### *1.3 Purpose of Project*

The purpose of this project is to establish a portal network for the travel needs of the PEN. These portals will link several transportation hubs within the main headquarters of the organization to various designated sites throughout the city. This travel method will provide an efficient, concealed, and protected means of travel that will help maintain the safety and covertness of agents as they carry out their duties for the bureau. The efficiency of portal transportation is evident in its seeming instantaneous manner of travel, which is optimal for transporting agents both quickly and discreetly. This method of transportation is furthermore ideal for the purposes of maintaining the bureau's anonymity due to its use of widely unknown natural resources and phenomena for its mechanisms.

## **2 Project Definitions**

### *2.1 Objectives*

This project intends to utilize existing electromagnetic waves in order to expedite transportation for employees of the PEN to various locations by creating portals exclusively accessible through gemstone-embedded amulets. The access granted into these electromagnetic wave systems will be privatized, intended only for authorized usage by PEN employees. The design must be able to transport living beings several hundred miles to different locations at immensely high speeds, while remaining discrete and safe. Human life will be able to travel hundreds of miles within a second with the creation of portal networks and distribution of associated PEN employee amulets.

### *2.2 Specifications*

This project intends to include functional specifications such as:

- One set of entrance and exit portals per PEN location – two total portals within each hub – with potential to expand for more than one set of portals per location.
- One amulet per PEN employee, composed of the natural gemstone with a leather strap attached, fastened akin to a necklace.
- One destination dial control box per entrance portal.

The entrance and exit portals simply appear as closed rings built within the structuring of the hub when not in use. When in use, the portals create an open access to electromagnetic highways that have the ability to transport life at the speed of light. This allows any transportation necessary to be completed nearly instantly

The destination dial is a control panel composed of:

- Two digital screens, one with a visual waveform and the other depicting Rune scripture symbols that are representative of the frequency of the waveform on the alternate display.
- A physical dial, able to be rotated both clockwise and counterclockwise in order to set proper destination.
- A rectangular scanning surface, in which the authorized amulet must physically touch in order to grant access to the electromagnetic wave threads.
- An LED which flashes purple when proper access has been granted.

### 2.3 *Constraints*

The constraints relevant to this project are:

- Privatization to only those who are employed by the PEN and authorized for usage.
- Protection of human life from immense energy transfer during transportation.
- Protection of human life against high speed collisions of other users.

These constraints have all been intensely considered and solutions have been proposed and planned for each limitation. Portal access is intended to be secure by the private distribution of amulets amongst PEN employees, each containing a powerful gemstone. This gemstone acts as a power source for the portal and the portal cannot be physically accessed without a successful scan. This gemstone also acts as an absorber for the mass amounts of energy produced and afflicted to the user when traveling at the speed of an electromagnetic wave. This thus protects the user from combusting upon usage from immense energy transfer. The user is also protected because, unlike vehicular transportation, users are unable to collide. With separate entrance and exit portals for a singular hub location, those traveling to and from the same location at the same moment will not face collisions.

### 2.4 *Impacts*

There are currently no known environmental impacts affecting the electromagnetic wave plane in regards to the deployment of our project. The natural state of city hub locations will be minimally modified in order to camouflage the portals among their environments to prevent public detection. However, the energy created by the transportation system will not result in any collateral damage to the hubs or the surrounding area. Intending to keep this new development of travel concealed, similarly to the entirety of the PEN, as long as the bureau remains undercover this new development will not have any societal detriments. Within the PEN's role of security between humans and the supernatural, instantaneous travel will beneficially impact PEN employees' roles in protecting society substantially. The gemstones implanted in the amulets have all been ethically sourced. In order to reduce the chance of unethical operation of the portals, all set destinations and user amulet scans will be tracked by the PEN in order to create

accountability and discourage any usage of the portals for illegal, unethical, or otherwise disapproved motives.

## **3     Design Overview**

### *3.1    Feasibility Analysis*

The establishment of the Rune Portal Teleportation System for the PEN will essentially be a similar, smaller-scale version of the current interdimensional travel network between the Mundane Plane (the human world) and the Etheral (the supernatural realm). The principal aspect that remains the same between this project and its more extensive predecessor system is the use of Runes. The symbol-based language will be the primary code for designating portals as well as constructing the privatization basis of the system itself. The central elements that differ between this project and the interdimensional portal network are the power supply requirements and the frequencies utilized. Limiting the localization of portal sites to the central headquarters of the bureau as well as a select collection of intercity stations will help mitigate the necessary amount of power supplies. This system will only require a reduced quantity of the natural gems, Doorkeeper Stones, for the power sources due to the fact that the bounds of the networks span an area of coverage confined to a city rather than spanning between separate realms. The portals for the teleportation system of the PEN will likewise harness a lower level of frequencies that are solely localized to the Mundane Plane as opposed to higher levels of frequencies used by the interdimensional system. The exact personnel that will be hired will be centralized around specialists in similar fields of engineering study on account of the more human-centric nature of the project. Accompanying this scientific-centric staff will be teams of more supernatural-based individuals who are well versed in the studies and applications of runic languages.

### *3.2    Proposed Approach*

All portals will be assigned a specific arrangement of Runes to indicate their exact location marker, which will serve as their recognized “names” within the system. Setting the target portal that a user wishes to travel to would be done so by configuring a destination dial attached to each physical structure. The portals for this project will harness Mundane-level frequencies for its network of connections between linked locations, and will be powered by smaller quantities of Doorkeeper Stones fitted to the amulets of PEN agents.

The central hub of the Rune Portal Teleportation System will be stationed within a branch of the bureau’s main facility solely dedicated as the transportation base. Each sector of this wing will have separate chambers specified according to the general region of the city the portals will link with (Downtown, Suburbs, Outskirts, etc.). The exact number of portals needed for each



intercity sector will be determined by the sector's size, which will in turn determine the layout for each chamber of the transportation base in the main headquarters. Each portal will be given a certain status designation to maintain a steady flow of travel without the potential of collisions from agents who may be leaving and arriving simultaneously from the same areas.

The main staff of the portal mechanisms will consist of teams with engineering and supernatural field backgrounds. Power supply and the harnessing of frequencies will primarily fall under the administration of human specialists in Energy Systems, Radio Frequency, and Electromagnetism. Fae and Wikkan professionals who have worked with interdimensional portal travel will supervise mechanisms regarding the composition and implementation of Runes.

### 3.3 Major Portal Network Aspects

The following section will detail the major aspects of the portal networks for this project with the outline as follows: (1) Rune Coding; (2) Amulets; and (3) Portal Transportation Logistics. The overarching subject of the first and second subsections will cover the features that factor into the portal mechanisms (location markers, system security, power supply, etc.). The third and final subsection will explain the operations of how the portals themselves facilitate travel between locations.

#### 3.3.1 Rune Coding

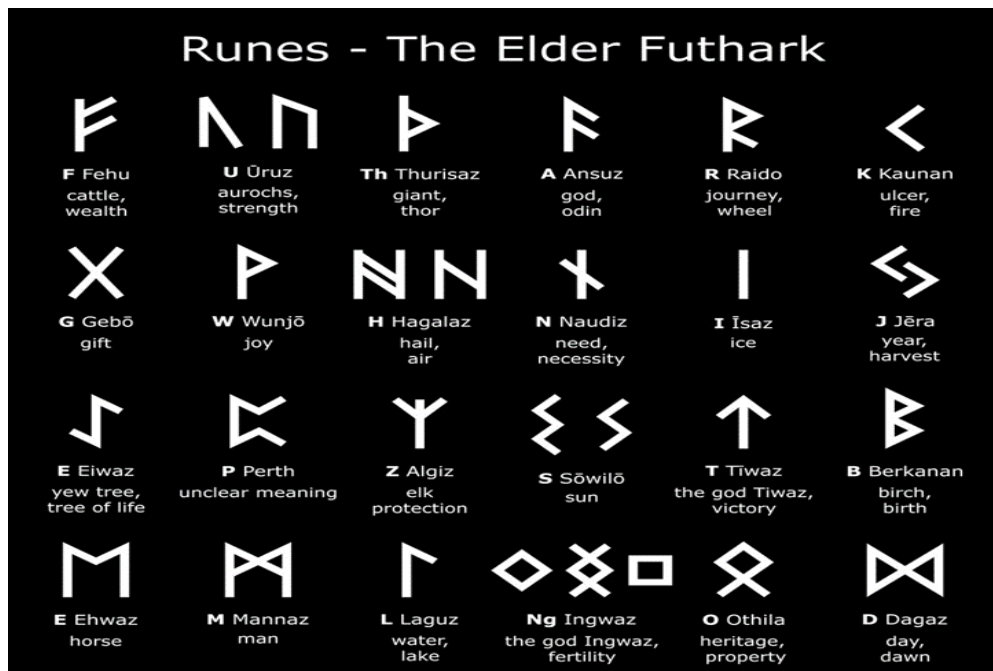


Figure 1: Runes (symbol-based language) [2]

Runes are the symbol-based language of the Etheral that will be utilized in the portal system of this project, similarly to how they are used with the interdimensional portal system between the human and supernatural realms. These symbols must be organized in specific arrangements in order to receive the desired effects of their purposes.

Firstly, Runes will act as the identifying markers that will designate each portal as a recognized site within the system. The portal identifier symbols of intercity locations will be determined by what sector of the city it is stationed in, and the symbols of headquarters-based portals will be categorized according to the chamber the portal is housed in. All marker designations can be extended to alphanumeric format if a sector requires more than one portal to accurately cover its expanse. Moreover, Runes will also be employed to identify a portal as either ‘Outgoing’ or ‘Incoming’, and portal access will be denied despite agents having the necessary credentials if they try to use a portal contrary to its designated status. This safety measure is put into place so as to prevent any potential collisions between travelers who may be simultaneously leaving from and arriving at the same location.

Secondly, Runes will be used in an application called ‘Ward Cybersecurity’ to keep this transportation system private and protected to members of the PEN. A certain alphanumeric symbol arrangement will be inscribed onto the amulets issued to each agent based on their department within the organization as well as a personalized member ID. Likewise, the portals themselves will be additionally equipped with protective wards to ensure that no outside interferences tamper with the overall network (ex: foreign portal trying to connect with the system, unknown amulet trying to access the system, modifying the location marker of a portal, etc.). These defensive measures will ensure that the portal system is safe for the sole transportation access of PEN agents.

### 3.3.2 *Amulets*

Each PEN agent is issued an amulet upon becoming an official member of one of the four major departments within the bureau (Acquisitions, Rehabilitation, Research, or Termination). The amulets are fitted with a natural gem resource known as a Doorkeeper Stone attached to a leather cord, and are designed to be worn as necklaces. The gemstone is inscribed with a personalized, alphanumeric Rune arrangement dependent on the department of the agent and the individual's official member ID.

The amulets serve purposes of member privatization, power supply, and user protection for this system. Using amulets as a substitute for conventional methods of member identification helps ensure that PEN agents are the only users that have access to the system. The Doorkeeper Stones fitted to the amulets act as the catalyst for triggering the connection between the portals of linked locations (explained further in the following subsection). Additionally, the gemstones protect users as they travel between portals by absorbing the immense energy given off by the connective frequencies this system harnesses.

### *3.3.3 Portal Transportation Logistics*

This section will explain the mechanics of the overall Rune Portal Teleportation System as well as the operations of how the portals enable travel between locations.

The two major components of the overall portal network are: the Mundane-level frequencies (connective pathways) and the portals (access gates). The Mundane-level frequencies, known as Itineris Threads, are similar in concept to the entities called Ley Lines [3] which were founded by photographer and amateur archaeologist Alfred Watkins. Watkins described Ley Lines as supernaturally charted lines that connect historic or prominent landmarks across the world. Itineris Threads are supernatural and omnipresent frequencies that exist throughout the fabric of the Mundane Plane, theoretically creating connections between any and all locations in the human realm. The portals of this system will function as physical gateways that tap into and harness these frequencies to form pathways between designated locations.

To operate any portal, the user must first configure the destination dial affixed to the current portal structure they are using to the Runes that match the portal of the desired location, linking the two sites by harnessing a connection of Itineris Threads between them. The user then taps their amulet to the adjacent scanner, and the power from the Doorkeeper Stone is accepted into the portal if the amulet has a recognized identification within the organization's personnel database. The energy from the gemstone of the amulet triggers a magnetic attraction between the Runes of the current and set locations, triggering a resonance among the Itineris Threads at that particular frequency. This energy build-up finally opens a pathway between the two portals, giving users a nearly instantaneous method of travel. And while traveling along the pathways between portals, the amulet of the user absorbs the immense amount of energy that has been induced so that this discharge is not emitted directly into their body.

## **4 Administration**

### *4.1 Facilities/Resources/Labor*

Resources listed in order of collection based on the anticipated schedule (to follow) begin with gathering of Doorkeeper Stones which will be mined and collected by hired labor. Gathering of metal and stone resources will be included in the initial gathering to be used for construction of our portal sites. The required resources for construction include fieldstones, aluminum, and tungsten.

The primary required facilities will include the Portal Hubs in the main headquarters and the Intercity Portal Sites. The main HQ facilities are already available although the portals will have to be constructed. At each of the portal sites, the teleportation portals will be constructed with the non-magnetic, energy dissipating, aluminum, tungsten, and stone. As the teleportation

portals are meant to be secret, external facilities will need to be constructed or acquired to house each of the hubs. Laboratory facilities and administrative offices are mostly acquired already, but will require compensation for existing facilities in use as well as expansion as needed.

The required labor will begin with physical laborers for gathering of Doorkeeper Stones and transportation of materials and equipment. Metal workers and masons will be hired for construction of portals and some required facilities. In terms of engineering, we will need specialists in Radio-Frequency Engineering, Electro-Magnetic/Electrical Engineering, and Energy Systems Engineering. The system design has been created by the leading team of engineers, but we require engineers with this background to be best for assimilating into our project from the portal frequency manipulation to management of the Doorkeeper Stones and energy.

With the sensitivity of this project in terms of secrecy and new materials, special equipment will be necessary. We will need mining equipment for physical laborers along with special safety equipment for the large amounts of energy and magnetism. We will require vehicles for transportation of materials and people. The highly magnetic materials will require special containers for transportation and storage. Beyond safety equipment for our physical systems, we will require equipment for masons and metal workers. The engineering team will require expanded lab safety equipment and compensation for existing equipment. Finally, we will need production of special safety equipment prior to implementation of amulets.

## *4.2 Schedule & Major Tasks*

The overall planned project timeframe is about six months from project pitches and gathering of funds to completion of testing for implementation. Most of the theoretical research and experimentation has been completed by the trio of scientists, headed by Julia Duarte. The main part of the project will be completion of schematics and translations from models to larger physical systems. Lastly, we will be testing the system for overall functionality and safety as well as monitoring for unexpected impacts.

The breakdown of our anticipated schedule (seen below) begins with two weeks of pitches and fund gathering. Overlapping with the end of the initial period will be an anticipated half month period of initial hiring, with Joseph DeMarco as administrator, to be continued into the next half month alongside material gathering. Material gathering will be done with hired physical laborers to harvest Doorkeeper Stones, the base power and control source of our teleportation system.

Following hiring, we have planned a 10-day training and team building session. This will include integration of our engineering team with our physical structures development team before training all personnel in our project's new technology, energy sources, and equipment. Once all the teams are assembled and resources collected, there will be three months of main production. This will include implementation of the theoretical and modeled systems, completed

by the hired engineers and the project leads, as well as construction of our physical teleportation portals, completed by the physical laborers such as masons and metal workers. The main production period will conclude with integration of the structure and the energy system completed with both the engineering and the physical systems teams together.

The final period will be three week of testing for safety and functionality. Tests will be conducted with non-human mammals to start and then continue to integrate human use. Subject health and area impact will be monitored primarily by the engineering team during each testing phase. By this time the physical systems team will be minimized for budget, keeping a reduced number of specialists on staff for potential adjustments. Planned into our schedule are a few weeks of flexibility room to be distributed where necessary.

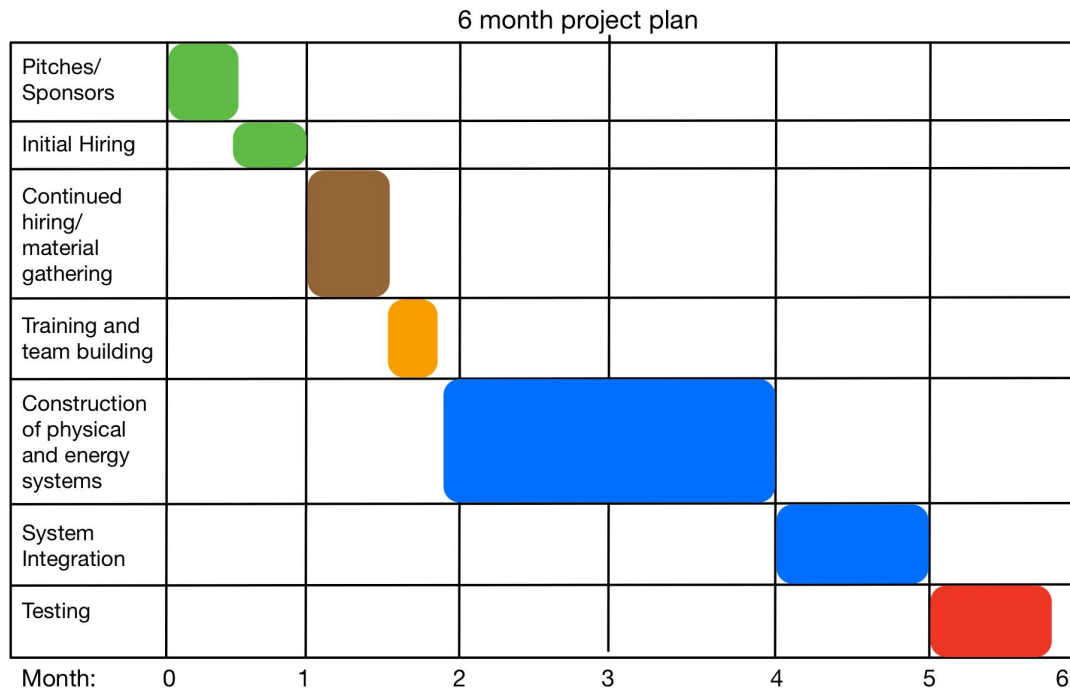


Figure 2: Anticipated Schedule Breakdown

### 4.3 Budget

The first costs to be accounted for will be in labor. To begin, physical laborers: miners, metalworkers, and masons will require \$30/hr each [4]. We estimate a necessary \$60,000 total salary for a mining team of about 15. For about a 16-person team of metal workers and masons working across the first 2 months of the construction period, we will need about \$200,000. After the initial construction period we will maintain about 8 physical laborers for project integration and late troubleshooting, requiring about \$80,000 in the final month.

For our small team of 4 on-site engineers we will need to pay for 5 months of training in our systems as well as construction, integration, and final testing of the portal system. We will need about \$260,000 to cover each engineer's salary of \$75/hr.

For mining equipment, materials, material transportation vehicles, worker safety equipment, special safety equipment, construction equipment, and construction safety equipment we will require an estimated \$160,000. Facilities costs will be about \$300,000 across portal construction, facility construction, adjustment, and management.

Finally, Administrative costs will include pay for lead scientists, travel throughout the project between meetings and between portal hubs, as well as miscellaneous expenses, all totalling an estimated \$1.9 million.

Summing labor, materials and equipment, facilities, and administrative, the total project price comes out to be an estimated \$2.96 million.

### Project Costs

Total: \$2.96 million

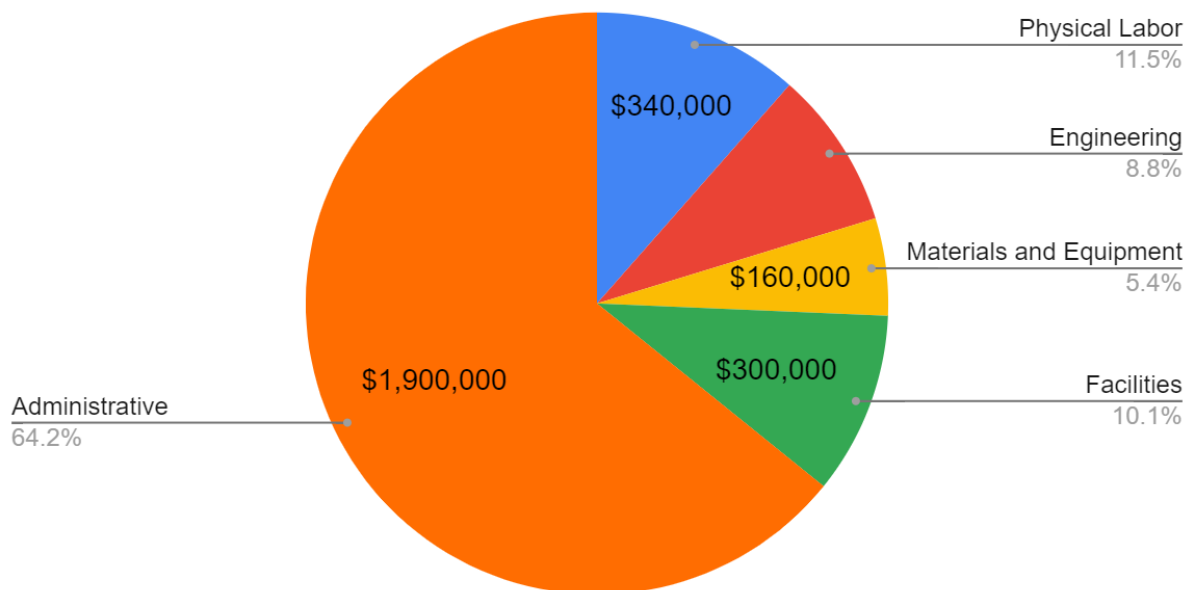


Figure 3: Project Costs Pie Chart

## 5 Conclusion

In conclusion, the Rune Portal Teleportation System proves to be an ideal travel network for the Bureau of Paranormal Investigations. Through the utilization of natural phenomena and resources, a reliable and protected transportation system will be established between teleportation hubs within the main headquarters of the organization and various designated locations throughout the city. This system will provide a method of transportation to move agents efficiently as they carry out their duties for the bureau while also maintaining the covert nature of the organization overall. The safety measures engineered within the design of this system will

keep agents safe while using portals for their travel needs as well as ensuring that only authorized personnel have access to the system. Ultimately, the Rune Portal Teleportation System will be a key asset in facilitating the duties of the Bureau of Paranormal Investigations to keep the peace between the existences of humans and the supernatural beyond the scope of everyday detection.

## 6 Technical Concept Sketches

### 6.1 *PEN Agent Amulet*

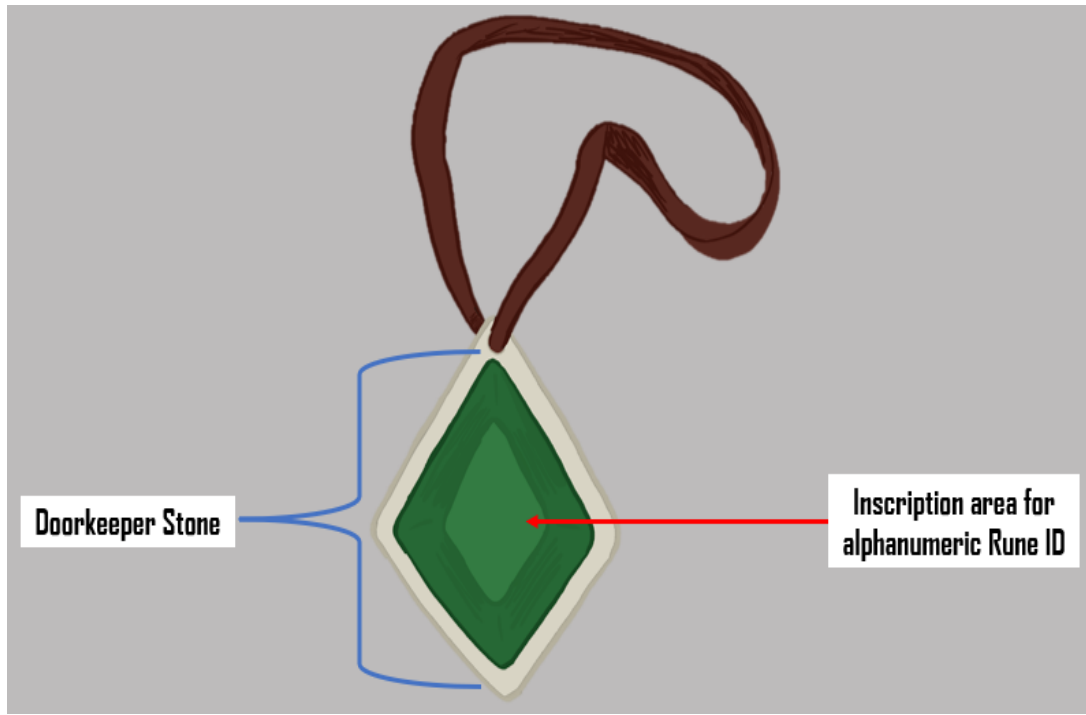


Figure 4: Amulet to be distributed among PEN agents (not to scale)

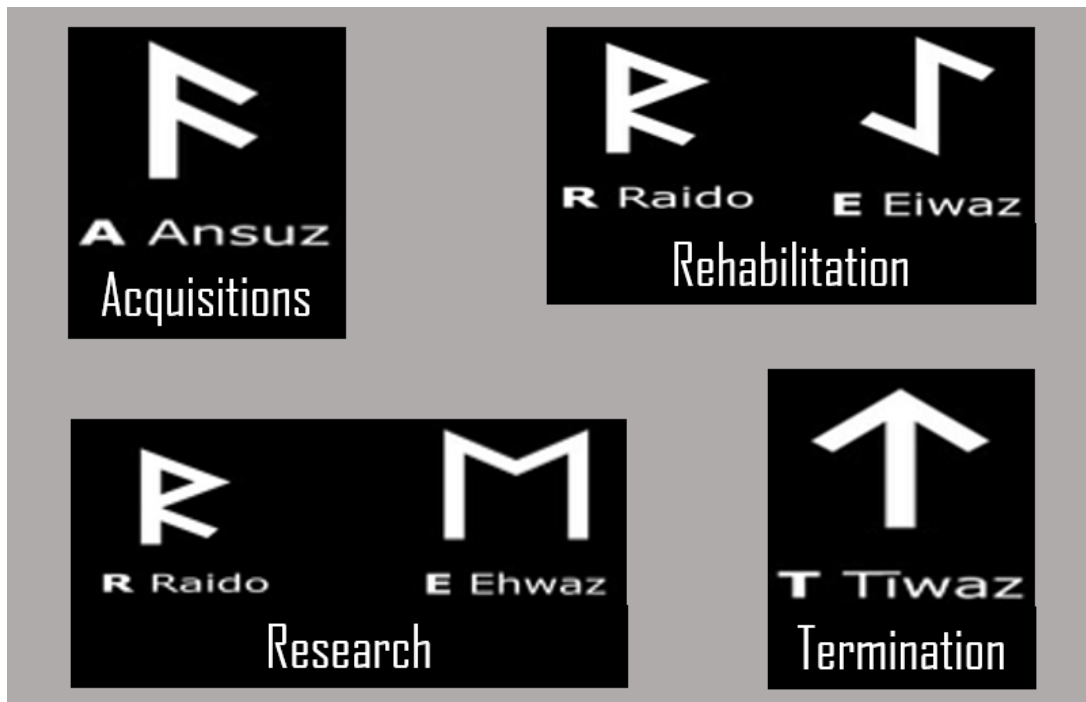


Figure 5: Rune arrangements designating PEN agent's department (inscribed on the amulet face)



## 6.2 Destination Dial

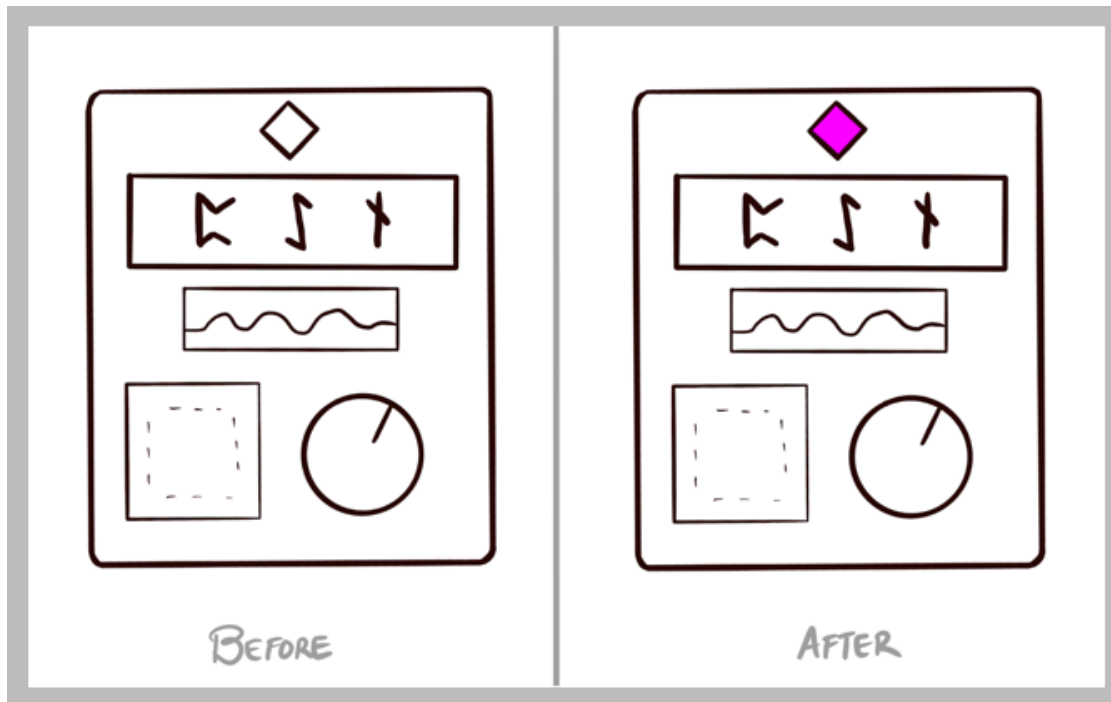


Figure 6: The destination dial control box before and after a successful amulet scan

## 6.3 Transportation Portals

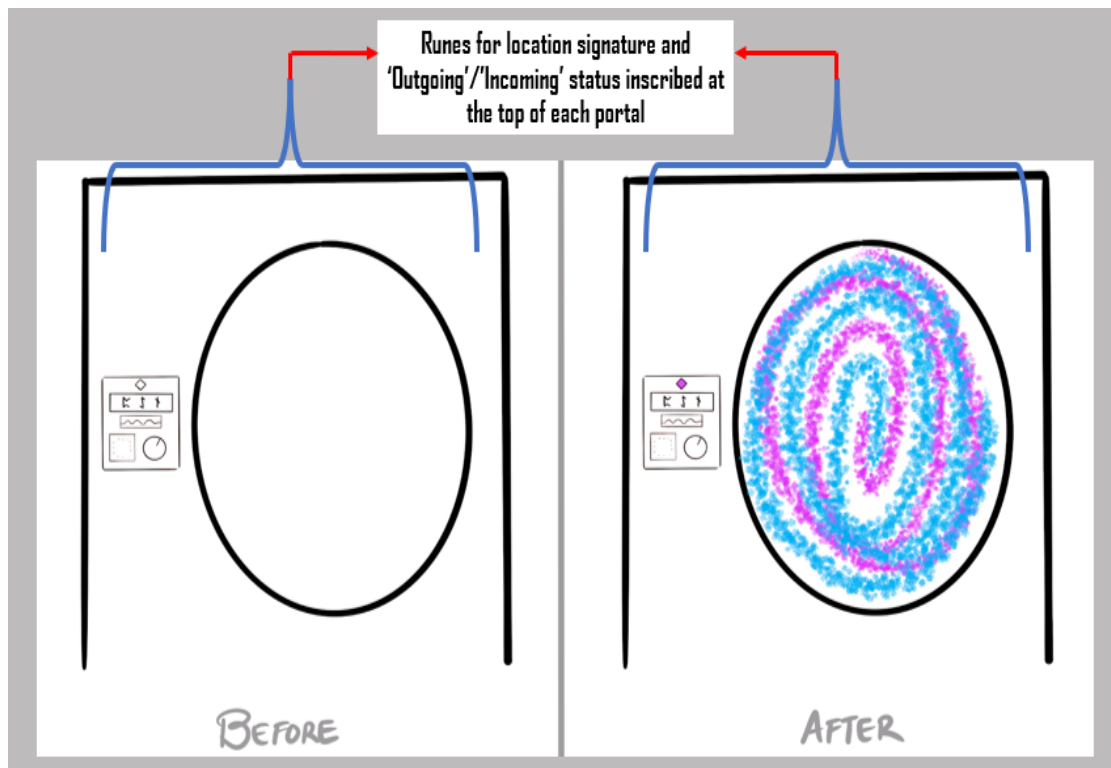


Figure 7: The transportation portals before and after a successful amulet scan

## 6.4 Portal Hub Layouts

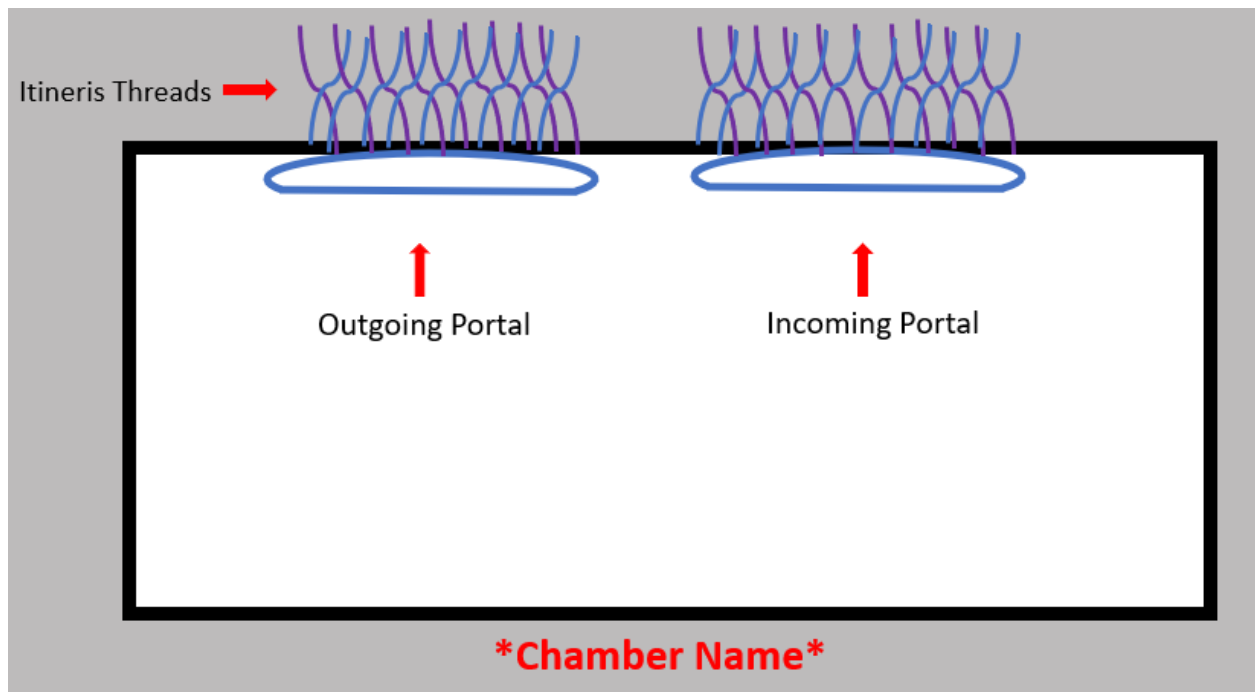


Figure 8: Layout of headquarters-based portal chamber that only requires one pair of ‘Outgoing’ & ‘Incoming’ portals

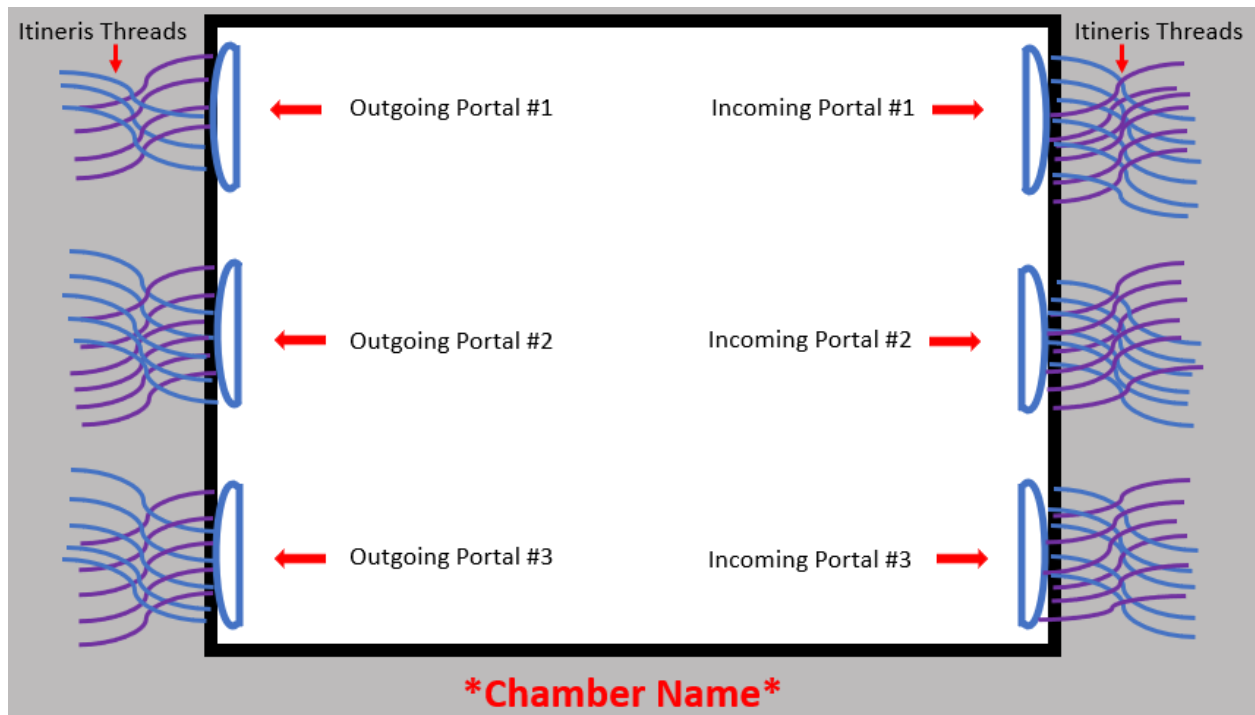


Figure 9: Layout of headquarters-based portal chamber that requires multiple pairs of ‘Outgoing’ & ‘Incoming’ portals

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