Lab 2: Identifying Architecture Characteristics

GridScope:

Description: A company who builds management software for electrical grids needs to update their outdated software solution. They plan to sell their offering as a platform, known as GridScope.

Users: Small to medium size market electric market companies, able to accommodate electrical grids from 750,000-1,500,000 electrical customers

Requirements:

1. The system shall be configurable for specific grid company characteristics (e.g., province/state, tax rates, etc.).
2. The system shall provide a state-of-the-art user experience.
3. The system shall provide dashboards with analytics reports with near-real time data from the grid.
4. The system shall have excellent reporting capabilities.
5. The system shall contain sophisticated analytics-based engines to determine best throughput/money.
6. The system shall be administered through either desktop or mobile devices.
7. The system shall have a security penetration attempt reporting feature.

Additional Context:

- Four nines (99.99%) reliability is needed
- Turn-key deployment on remote sites is highly desired
- Security is a first-class concern
- Company wants to shift from managing electrical grids to becoming a software reseller

1. Identify the *explicit* architecture characteristics from the *domain concerns*, specifically the domain-level predictions about expected metrics. For each identified characteristic, provide a brief justification of its relevance to the system.

> **Scalability**: the system will need to handle a large number of concurrent users (customers) without serious performance degradation
>
> **Reliability**: The stakeholders have expressed this concern explicitly with a prediction/statement about the expected reliability

2. Identify the *explicit* architecture characteristics from the *requirements*. Be sure to consider each part of the requirements to see if it contributes to an architecture characteristic. For each identified characteristic, provide a brief justification of its relevance to the system.

> **Configurability**: each company should be able to easily change aspects of the

software's configuration

Accessibility: a state-of-the-art user experience implies the providing access to all users, including those with disabilities like color blindness or hearing loss

Usability: a state-of-the-art user experience implies an adequate interface that that supports ease of use for a variety of users

Performance: the data needs to be ingested in near-real time

Portability: the system will need to run on more than one platform (desktop and mobile)

Security: security penetration attempt reporting implies the needs for structures to support intrusion detection and reporting

Installability: turn-key deployment implies ease of system installation on all necessary platforms

3. Identify the *implicit* architecture characteristics based on your knowledge of software solutions of managing critical systems (such as electric grids). For each identified characteristic, provide a brief justification of its relevance to the system.

Elasticity: considering how many electric companies have the notion of "peak times," it is expected that the system may need to handle bursts of demand from customers

Availability: the critically of electric utilities implies the solution should be available 24/7

Recoverability: the critically of electric utilities implies the need to be able to recover from any
faults, failures or even security attacks

Robustness: the critically of electric utilities implies the need to be able to handle error and boundary conditions

Safety: considering the context of electric grid management, safety should be an important consideration as issues can lead to harm to humans

Privacy: depending on the data that is collected by the system, privacy may be a consideration (especially if customer data is collected)

Legal: considering how electric utilities are regulated, there may be legal considerations regarding the way the application is to be built or deployed

4. Compile the architecture characteristics identified in Problems 1–3 in a final (prioritized) list of architecture characteristics for the GridScope system. Separate those characteristics that are architectural and those that may be design concerns. Briefly explain your considerations for making the separation. Describe several trade-offs that may need to be made when architecting the GridScope system.

A final (prioritized) list of architecture characteristics for the GridScope system may be as follows:
1. Security
2. Reliability
3. Robustness
4. Recoverability
5. Availability
6. Safety
7. Portability
8. Performance
9. Scalability
10. Elasticity
11. Accessibility
12. Usability
13. Legal
14. Installability

The prioritization is determined based on the considerations of the requirements and domain concerns. In practice, the final list and prioritization should be determined in consultation with the stakeholders.
The following characteristics may be design concerns rather than architectural concerns:

Configurability: this implies custom behavior described in the problem domain that may be locally overridden

Accuracy: this depends specifically on the interpretation of "excellent" in the requirements

Privacy: this depends on how the which data is collected and how it is collected and stored

For each of these characteristics more consideration must be made to determine if it influences some structural aspect of the design and is critical or important to the application. In practice, the architect, tech lead, developers, and domain analysts should collaborate to decide how best to implement these

characteristics.

Given the list of architecturally-relevant characteristics some important trade-offs that may need to be made when architecting the GridScope system include:

Security vs. Performance: security should take priority (based on the requirements)

Security vs. Usability: security should take priority (based on the requirements)

Performance vs. Portability: the requirements imply portability (desktop and mobile) s required so performance must be adjusted to accommodate