ShuhanMiner Business Requirements Document

1. Describing problems

ShuhanMiner is a comprehensive application designed to monitor, manage, and maintain cryptocurrency mining machines. It provides real-time tracking of key performance metrics, including hash rate, temperature, model, status, alerts, and electricity prices. Additionally, it supports remote management operations such as device restarts and firmware updates. ShuhanMiner aims to streamline mining operations management, enhance efficiency, and ensure the longevity of mining equipment. Whether managing small setups or large-scale mining farms, ShuhanMiner offers the necessary tools to maintain optimal performance and maximize profitability.

2. Rules of Business

I have highlighted the nouns in blue and the verbs in brown.

1. Real-time monitoring of mining machine status, including Ip address, hash rate, temperature, model, status, alerts, and electricity prices, with immediate notifications to users in case of anomalies.
2. Users must be able to select multiple mining machines simultaneously for batch restart operations.
3. The batch restart function should be efficient and stable, ensuring minimal downtime.
4. The system should provide restart success/failure feedback to help mining engineers analyze fault recovery.
5. The system must display real-time electricity prices, assisting engineers in deciding whether to continue mining operations.

6. When the electricity price exceeds the preset cost threshold, the system should automatically trigger an alert to notify the user.
7. The system should continuously monitor mining machine temperature data to ensure operations remain within safe limits.
8. If a mining machine's temperature exceeds the safety threshold, the system should trigger a high-temperature alert to notify the user.
9. Mining machines that enter high-temperature protection mode should be clearly marked on the interface for easy identification.
10. The system must support different types of monitoring reports (financial or performance) to meet diverse user needs.
11. The MonitoringSystem must support firmware upgrades based on the firmwareVersion to ensure system stability and performance

3. Nouns and Verbs

Nouns

1.Real-time monitoring

2. Ip address
3. hash rate
4. temperature
5. model
6. status
7. alerts
8. electricity prices
9. notification
10. user
11. anomaly
12. restart operation

13. downtime
14. restart success/failure feedback
15. mining engineer
16. fault recovery
17. mining operation
18. cost threshold
19. alert
20. temperature data
21. safety threshold
22. high-temperature alert
23. high-temperature protection mode
24. interface
25. identification
26. overheated machines
27. fault diagnosis
28. resolution
29. safe limits
30. system
31. monitoring reports
32. MonitoringSystem
33. firmwareVersion
34. financial
35. performance

Verbs

1. select
2. restart
3. analyze

4. display
5. exceeds
6. preset
7. trigger
8. notify
9. monitor
10. remain
11. marked
12. filter
13. sort
14. search
15. accelerate
16. support
17. diverse
18. upgrade

4. Classes and Attributes

MiningMachine

- ipAddress
- temperature
- model
- status
- hashRate
- alerts
- highTemperatureMode

MonitoringSystem

- miningMachines

- faultDiagnosis
- overheatedMachines
- firmwareVersion

Alert

- alertType
- alertLevel
- timestamp
- triggeredBy
- notifiedUsers

RestartOperation

- selectedMachines
- restartTime
- restartDuration
- successfulRestart
- faultRestarts

User

- userId
- role
- notifications

ElectricityPricing

- currentPrice
- costThreshold
- priceHistory

Notification

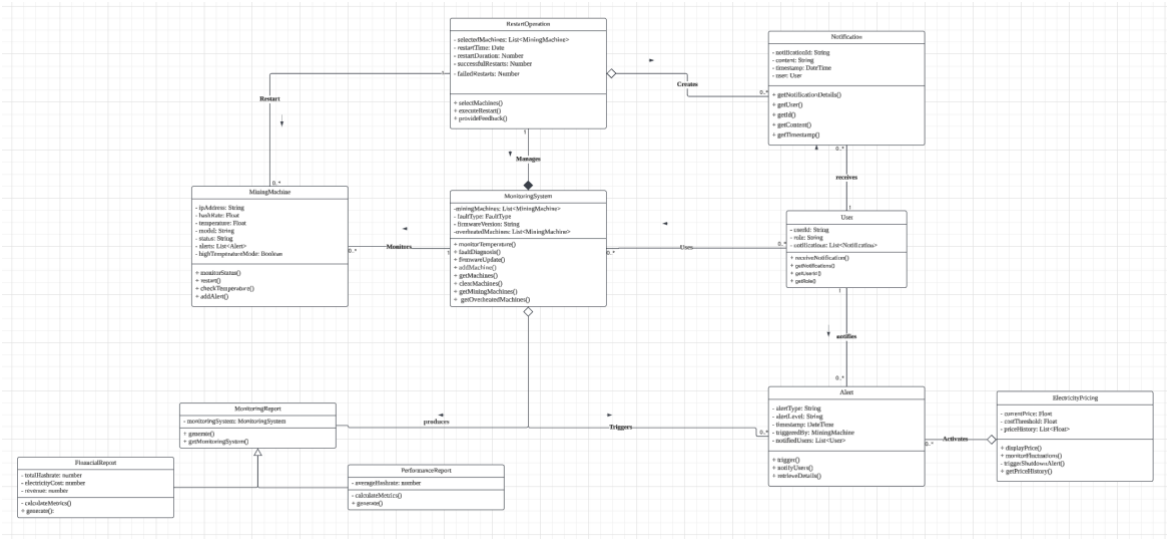
- notificationId

- content
- timestamp
- user

MonitoringReport

- different type
- financialReport
- performanceReport

5. Classes and Attributes



6. Dimensions

1. Scale (Mining Farm Size) – Individual Miners, Small-Scale Mining Operators, Large-Scale Mining Administrators

2. Technical Expertise –Investors, Intermediate Users (Small-Scale Operators), Advanced Users (Engineers/Administrators)

3. Role Responsibilities – Focus on Hardware Management, Cooling Optimization, Financial Investment, etc.

7. Create User Personas

(Reference AI-generated content, specify the details under AI Usage #3 as the source.)

User Persona 1: Alex

Age: 30

Occupation: Mining Operation Engineer

Scale: Manages a large-scale mining farm with thousands of machines.

Technical Level: Advanced user with expertise in mining machine operations.

Role & Responsibilities: Hardware management, ensuring machines run efficiently and profitably.

Background Story

Alex has been working in cryptocurrency mining for several years, gaining expertise in machine maintenance, performance optimization, and cost control. He needs real-time monitoring and batch management tools to efficiently operate thousands of machines and respond quickly to failures.

Scenario & Reason to Use ShuhanMiner

1. Real-time monitoring of hashrate, temperature, and electricity prices to optimize efficiency.
2. Automated alerts for failures, overheating, or power issues to prevent costly downtimes.
3. Batch operations for restarting multiple machines, updating firmware, and optimizing hardware performance.
4. The ability to upgrade firmware based on the firmware version to maintain system stability and efficiency.

User Persona 2: Emily

Age: 28

Occupation: Mining Investor

Scale: Invests in multiple mining farms, monitoring the operation of hundreds of mining machines.

Technical Expertise: Non-technical user, primarily focused on financial returns and mining machine operational data.

Role Responsibilities: Analyzing electricity price trends, equipment health, and overall hashrate to maximize investment returns.

Background Story

Emily is an investor who evaluates mining profitability rather than handling daily machine operations. She prioritizes electricity cost analysis, machine health monitoring, and ensuring optimal hashrate to maximize her returns. She needs an intuitive dashboard with financial insights rather than complex technical tools.

Scenario & Reason to Use ShuhanMiner

1. Monitor electricity price fluctuations and adjust mining strategies based on different time-based pricing.

2. Track machine health to avoid revenue losses due to breakdowns or overheating.

3. View overall hashrate & uptime to ensure machines are operating efficiently.

4. Access financial or performance monitoring reports to evaluate investment profitability and efficiency.

User Persona 3: Ryan

Age: 35

Occupation : Cloud Mining Platform Operator

Scale : Manages a cloud mining platform with thousands of rented mining rigs.

Technical Expertise : Intermediate, balancing technical operations and customer management.

Role & Responsibilities :

Ensuring mining infrastructure operates 24/7.

Managing customer subscriptions and mining contracts.

Background Story

Ryan operates a cloud mining service, renting out mining power to customers worldwide. He needs automated performance tracking, customer reporting, and real-time monitoring to ensure his customers get the best mining efficiency. Downtime

directly affects his business reputation, so he relies on ShuhanMiner for proactive issue detection.

Scenario & Reason to Use ShuhanMiner

1. Monitor machine performance to ensure customers get consistent mining power.
2. Generate automated financial reports for customer billing and earnings analysis.
3. Detect machine failures early to prevent reputation loss and contract disputes.

4. Perform firmware upgrades across rented mining machines to maintain consistent performance.

8. Target audience

(Reference AI-generated content, specify the details under AI Usage #2 as the

source.)

Large-Scale Mining Farm Administrator

1. Scale: Manages a large mining farm with thousands of mining machines.
2. Technical Expertise: Advanced user, proficient in mining machine operations and maintenance.
3. Role Responsibilities: Hardware management, ensuring efficient mining machine operations.

Key Needs:

1. Manage hundreds to thousands of mining machines and optimize operations.
2. Require real-time monitoring of hashrate, electricity costs, and temperature.
3. Utilize batch management and electricity price alerts to reduce costs.

Small-Scale Mining Operator

1. Scale: Operates a small mining farm with dozens to hundreds of mining machines.
2. Technical Expertise: Intermediate user with some technical expertise.
3. Role Responsibilities: Cooling optimization, ensuring stable mining farm operations.

Key Needs:

1. Environmental Monitoring: Track temperature, humidity, and fan status.

2. Energy Optimization: Intelligently adjust hashrate and dynamically modify operating modes.

3. Remote Maintenance: Monitor mining machine status anytime with anomaly alerts.

Mining Investor

1. Scale: Individual or institutional investor, not directly managing mining machines.

2. Technical Expertise: Non-technical user, focused on financial data.

3. Role Responsibilities: Financial investment, profitability analysis.

Key Needs:

1. Profitability Analysis: Historical data, revenue forecasting, ROI calculation.

2. Cost Control: Electricity price trends, hosting fees, mining difficulty changes.

9. Challenge Questions

(Reference AI-generated content, specify the details under AI Usage #1 as the

source.)

1. How can ShuhanMiner efficiently process and display real-time data for thousands of mining machines without delays?
2. How can the system intelligently manage high-temperature alerts and prevent hardware damage?
3. How can the system ensure stable and reliable batch restart operations for largescale mining farms?

Potential Solutions for ShuhanMiner

1. To achieve real-time data processing and display for thousands of mining machines, ShuhanMiner can utilize broadcast technology to obtain the IP addresses of the machines, ensuring efficient handling and display of real-time data while minimizing delays. Specifically, ShuhanMiner can send UDP broadcast messages within the local network, and all mining machines listening on a predefined port can respond with their respective IP addresses upon receiving the broadcast.

2. To prevent hardware damage caused by overheating, ShuhanMiner can deploy a real-time monitoring and alert system that continuously tracks environmental parameters such as temperature and humidity using sensors.

3. In large-scale mining farms, the stability of batch restart operations is crucial. ShuhanMiner can implement automated and distributed restart management,

utilizing scheduling algorithms and distributed systems to coordinate the restart process of each device, preventing excessive power and network load caused by simultaneous restarts.

10. User Stories

User Persona 1: Alex - Mining Farm Administrator

1. Batch Restart for Overheated Machines:

   Alex needs to quickly restart multiple mining machines when they enter high-temperature protection mode to minimize downtime.

2. Firmware Upgrades for Stability:

   He requires batch firmware updates to keep thousands of machines running optimally and securely.

3. Performance Reports for Efficiency:

   Alex depends on performance reports to analyze hashrate, detect faulty machines, and improve farm operations.

User Persona 2: Emily - Mining Investor

1. Electricity Price Tracking for Profit Maximization:

   Emily monitors electricity price trends and alerts to decide the most cost-effective mining times.

2. Machine Health Monitoring for Investment Security:

   She tracks overheating risks and prevent unexpected shutdowns.

3. Financial Reports for ROI Analysis:

   Emily uses financial reports to calculate revenue, electricity costs, and overall mining profitability.

User Persona 3: Ryan - Cloud Mining Platform Operator

1. Automated Firmware Updates for Client Machines:

Ryan needs bulk firmware updates to ensure all rented machines stay optimized for customers.

2. Financial Reports for Customer Billing:

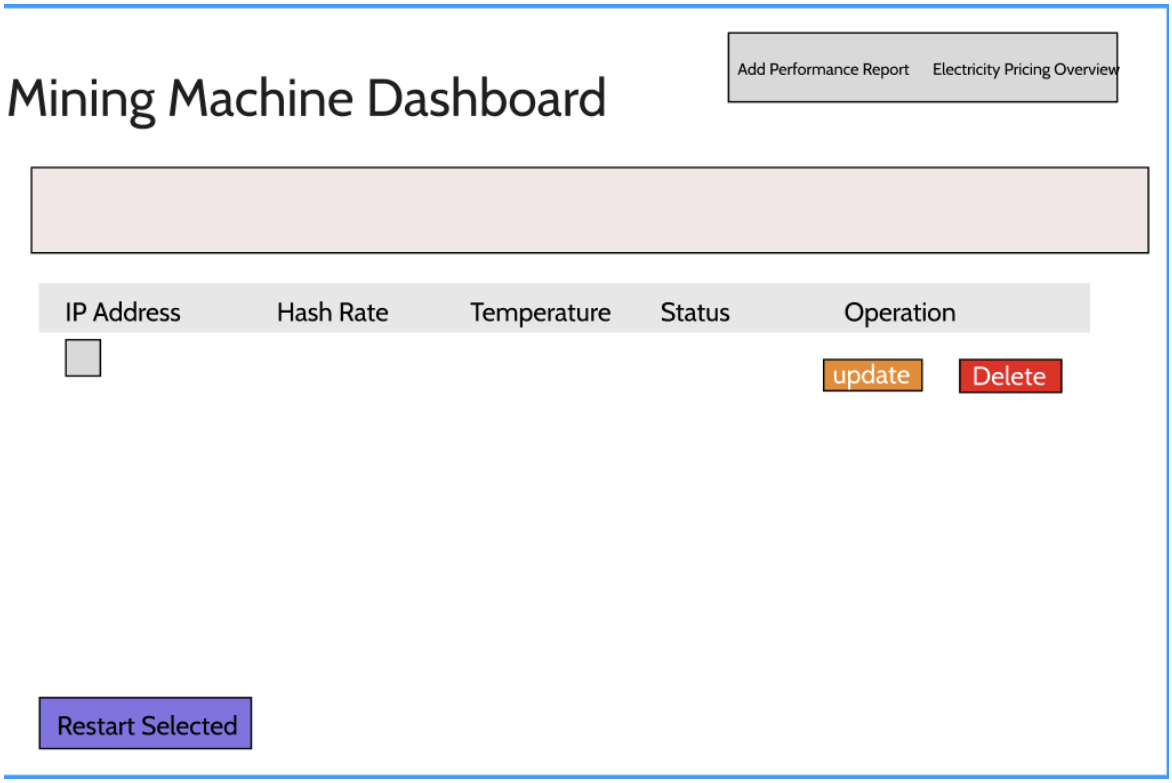
   He requires automated reports to provide clear revenue summaries to cloud mining clients.

3. Performance Reports for Service Quality:

   Ryan tracks machine performance reports to maintain uptime guarantees and deliver consistent mining power.

11. Interface Mockups

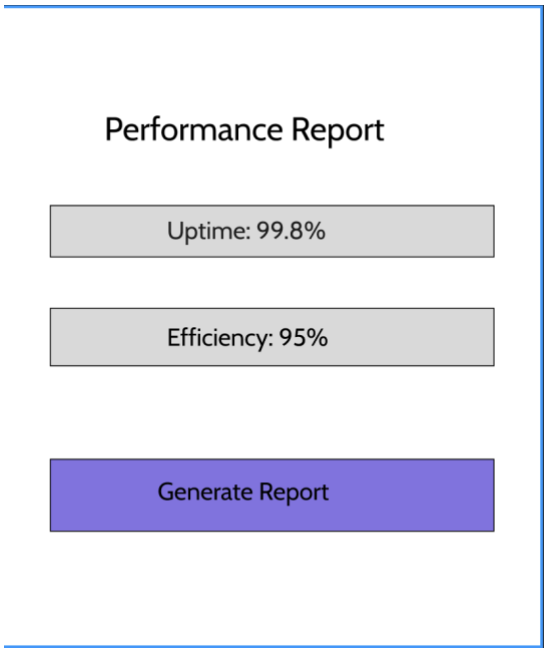
Monitoring's interface



Shows real-time data with a batch restart button.

Alex needs to quickly restart multiple mining machines when they enter high-temperature protection mode to minimize downtime.

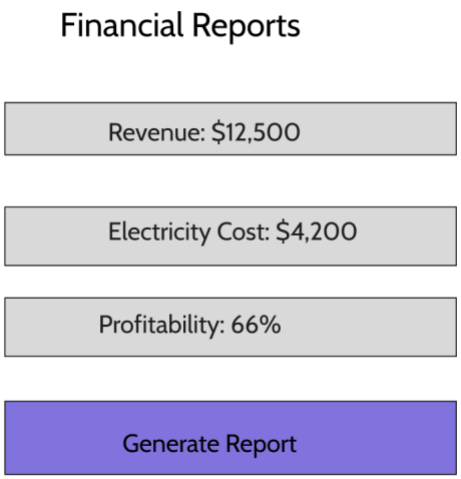
Report’s interface



Provides system efficiency insights and allows report generation.

Alex depends on performance reports to analyze hashrate, detect faulty machines, and improve farm operations.

Ryan tracks machine performance reports to maintain uptime guarantees and deliver consistent mining power

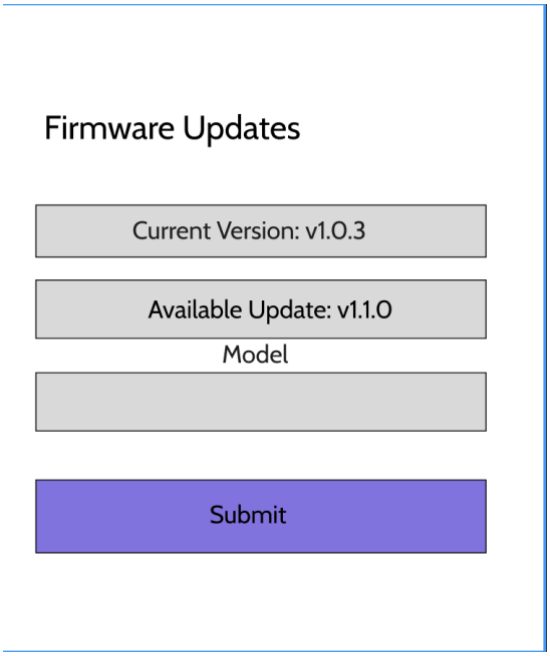


Displays revenue, electricity costs, and profitability, with a report generation feature.

Emily uses financial reports to calculate revenue, electricity costs, and overall mining profitability.

Ryan requires automated reports to provide clear revenue summaries to cloud mining clients.

Firmware Update's interface



Displays the current version and allows batch updates

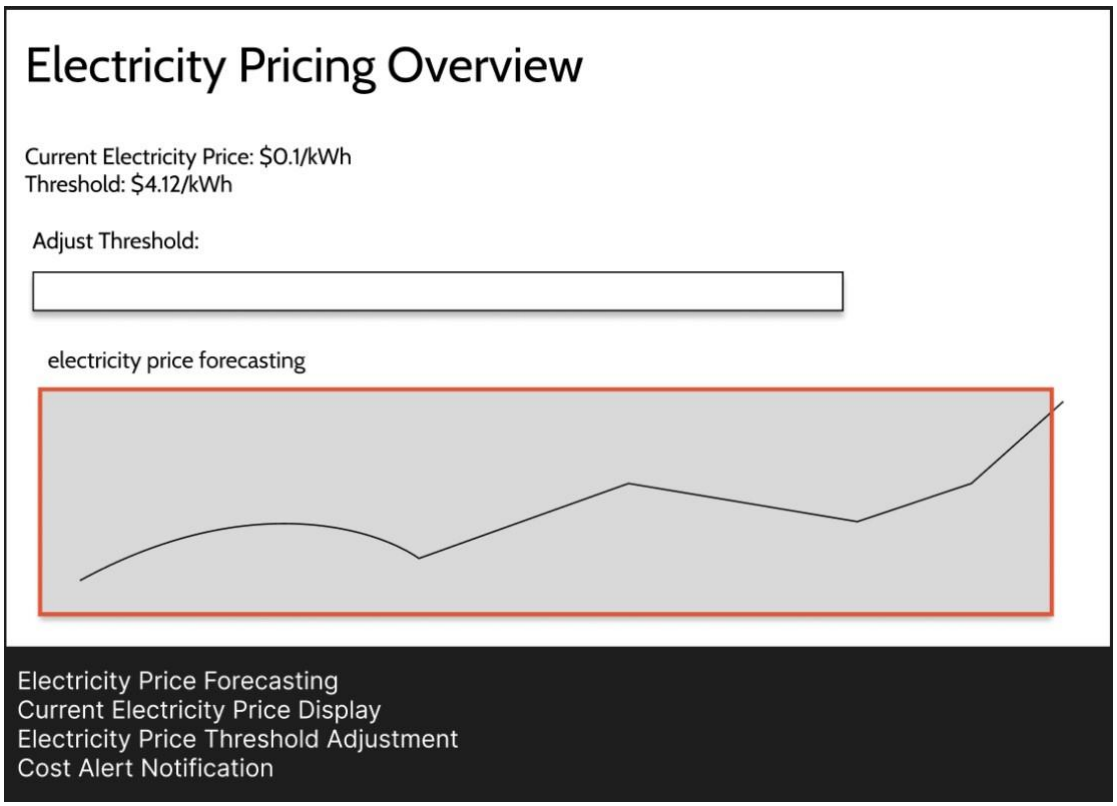
Alex requires batch firmware updates to keep thousands of machines running optimally and securely.

Ryan needs bulk firmware updates to ensure all rented machines stay optimized for customers.

Tracks overheating risks and machine failures.

Emily tracks overheating risks and prevent unexpected shutdowns.

Electricity Price Tracking



Emily monitors electricity price trends and alerts to decide the most cost-effective mining times.

12. AI usage

#1

I used AI to give me the Potential Solutions of Challenge Questions

Model: ChatGPT 4o

Attachment: Challenge Questions

Prompts:

1. How can ShuhanMiner efficiently process and display real-time data for thousands of mining machines without delays?

ShuhanMiner can implement asynchronous data streaming and distributed processing to handle large-scale real-time monitoring efficiently.

WebSockets & MQTT Protocol: Enables real-time data updates without constant polling.

Edge Computing & Local Processing: Offloads some computations to the mining machines before sending only essential data to the central system.

Database Optimization (Time-Series DB like InfluxDB): Stores and retrieves high-frequency mining metrics efficiently.

Load Balancing & Microservices Architecture: Distributes processing across multiple servers to avoid bottlenecks and maintain responsiveness.

2. How can the system intelligently manage high-temperature alerts and prevent hardware damage?

ShuhanMiner employs predictive analytics and automated cooling strategies to manage high-temperature risks.

AI-Based Predictive Temperature Analysis: Uses historical data and machine learning models to predict overheating risks before they occur.

Automated Cooling & Load Balancing: The system can adjust fan speeds, redistribute mining workloads, or temporarily pause high-risk machines.

Real-Time Alerts & Smart Actions: When temperatures exceed thresholds, the system sends instant notifications and can trigger automated shutdowns or cooling system activation.

Configurable Safety Policies: Allows users to define temperature limits and pre-set actions to prevent hardware damage.

3. How can the system ensure stable and reliable batch restart operations for large-scale mining farms?

ShuhanMiner ensures efficient and fault-tolerant batch restarts by implementing the following strategies:

Parallelized Restart Execution: Machines restart in controlled batches to prevent power surges or network congestion.

Dependency & Health Checks: Ensures that critical infrastructure (like network and power supply) is stable before executing batch restarts.

Rollback Mechanism & Redundancy: If a batch restart fails, the system can roll back changes or retry using alternate nodes.

Smart Scheduling & Prioritization: Machines with the most urgent needs (e.g., overheating risks) are restarted first, ensuring the least disruption to operations.

These solutions enhance efficiency, reduce downtime, and prevent operational failures in large-scale mining farms.

How it was used: I have refined the " Potential Solutions " section by

incorporating the ideas and keywords provided in the Prompts.

How you verified that the results were correct:

I asked my friends in the industry about the first question, and they used broadcast messages to implement it. So I did not use

#2

I used AI summarize to Target audience

Model: ChatGPT 4o

Attachment: User Stories

Prompts:

Large-Scale Mining Farm Administrator

Scale: Manages a large mining farm with thousands of mining machines.

Technical Expertise: Advanced user, proficient in mining machine operations and maintenance.

Role Responsibilities: Hardware management, ensuring efficient mining machine operations.

Small-Scale Mining Operator

Scale: Operates a small mining farm with dozens to hundreds of mining machines.

Technical Expertise: Intermediate user with some technical expertise.

Role Responsibilities: Cooling optimization, ensuring stable mining farm operations.

Mining Investor

Scale: Individual or institutional investor, not directly managing mining machines.

Technical Expertise: Non-technical user, focused on financial data.

Role Responsibilities: Financial investment, profitability analysis.

How it was used: I have refined the " Target audience " section by

incorporating the ideas and keywords provided in the Prompts.

How you verified that the results were correct: I compared my User Stories and found that they were basically the same.

#3

I used AI Expanded User Personas by Dimensions

Model: ChatGPT 4o

Attachment: User Personas && Dimensions

Prompts:

Like Occupation : Cloud Mining Platform Operator

Scale : Manages a cloud mining platform with thousands of rented mining rigs.

Technical Expertise : Intermediate, balancing technical operations and customer management.

How it was used: I have refined the " User Personas " section by

incorporating the ideas and keywords provided in the Prompts.

How you verified that the results were correct: I compared my Dimensions and found that they were basically the same.