

Requirements Report

PZEM

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VERSION HISTORY

Version	Author initials	Changes
0.1	JD	Provide template for students to use
0.2	EA	Edit the template to include the system context, written with the team
0.3	DvW	Implement the feedback given in the lecture
0.4	All	Add elicitation plan
0.5	LB, IN	Implement feedback from student assistant
0.6	EA, IN	Added their elicitation results
0.7	DvW, YA, JD, OE	Added the rest of the elicitation results
0.8	All	Made requirements plan
0.9	All	Validated requirements
1.0	All	Finished report

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1 INTRODUCTION

We are team 3, The Dashboarders and this document presents the elicitations we had to execute and the requirements of our project that were uncovered. Our aim is to solve a machine monitoring problem for PZEM, keeping track of the state of their virtual machines. Our goal with this report is to come up with a dashboard that meets all our client's requirements, visualizing the virtual machines and keeping track of their state, while also showing the progress of one particular virtual machine. The app we are building is going to be developed using the Laravel framework.

This section of the report, the introduction, contains two subchapters, describing the company and the project goals. The second chapter, System context, gives out details about the people involved within this project, the systems in operations, processes, events and documents. The third section presents the Elicitation plan, split into different parts conducted by each individual team member. It presents ways in which our team is gathering raw data from the client. Then, the elicitation results show the results of the elicitation research. After each member has executed her/his elicitation technique, the found requirements are going to be present in the fifth chapter. In the end, the team validates the requirements to check if they are in line with the intended goals for the project requirements.

1.1 Company Description

PZEM, it is the third biggest energy company in the Netherlands, being founded in 1919 and being the only company in the Netherlands that has a gas pipeline. They recently joined the EP NL company, and they produce, trade and sell energy in the Netherlands ensuring the energy balance. They participate in business-to-business marketing. Therefore, their clients are other companies which use a lot of energy. These companies can benefit from PZEM's power plans by taking a subscription. PZEM monitors the costs of the only nuclear power plant in the Netherlands.

1.2 Project Goals

The final product is going to be used by PZEM and their employees from the IT department, for the purpose of increasing cost-effectiveness in their system. They will use the dashboard to see if they need to switch the machines on or off and also monitor the behavior of the machine for a selected time period. Furthermore, it might be used to predict the costs and subscriptions of the machines.

2 SYSTEM CONTEXT

Stakeholders:

- Rolf Daalder
 - IT manager
 - Has sufficient knowledge regarding IT.
 - Will actively use the app by accessing and putting data in it, using the dashboard to actively monitor the status of the machines in operation.
- Xander Lenting
 - Medior Service Coordinator
 - Has sufficient knowledge regarding IT.
 - Will actively use the app by accessing and putting data in it, using the dashboard to actively monitor the status of the machines in operation.
- Daan de Waard
 - Teacher at HZ
 - Senior developer
 - Follows the progress of the project.
 - Proficient in the Laravel framework – can give us advice, regarding what we can and cannot do.
 - Will give feedback on the backend of the app.
- David Garcia Viseu Henriques
 - Second year student
 - Is assisting us in the project management.
 - Gives feedback regarding code, team dynamics and management ethics.
- Trading department of PZEM
 - Different level of IT skills
 - Using the dashboard in their work for the purpose of monitoring the status of virtual machines

Systems in operation:

What they are already using:

- Excel spreadsheets for storing data.
- Teams for communication
- Power BI for making dashboards
- Azure for virtual desktops

Processes:

- **Trading department (users of the future product):** uses Azure Virtual Machines with a route planning software called MapUp to predict the weather, amount of energy that is going to be produced and the amount that will be sold, the price for their energy that is going to be placed on the auction and sold, amount of gas they should buy to be able to run power plants.
- **Power BI department:** keeps track of finances of the company through Power BI dashboards. Makes contracts with each and every party (like windfarm or solar plant etc.) to set regulations on how much money will be transferred to the parties. Usually, the cost depends on the amount of energy that the party produce.
- **IT department (users of the future product):** main architects of the system. Responsible for implementing features that might take place. Also, they fix any issues with the users, solve problems with the servers, set up VMs, calculate the cost for maintaining them etc.
- **Business department:** 'translates' business questions to IT department. Perform duties of business IT consultants.
- **B2B (business to business) department:** Offer electricity contracts to large enterprises (not households), like steel factories, chemical plants etc. They are responsible for establishing the contract and managing different parts of it. Furthermore, to keep track of consumption done by power plants, they hire companies to measure it and provide them with the information about it.

Events:

- Make a weather forecast
- Validate the results of calculations done by VM
- Calculate the amount of energy produced and price for it
- Set up Virtual Machines
- Predict possible changes in weather
- Change energy price according to the weather

Documents:

- Their incorporated language is English.
- Laws: to be asked in the interview
- In regards to standards, we are following the already implemented layout and color palate
- Any environmental laws that we should consider?

3 ELICITATION PLAN

3.1 Interview with IT department chair

Planned by: Laura Birau

- I am planning to do this interview in the upcoming meeting with the 2 stakeholders we have so far (23.03.2023, 16:00).
- We have a list of questions available ([Questions](#)) that is constantly changing and expanding
- The aim of this interview is to reach a better/more clear understanding of the problem our client is facing.
- We are planning to record (if possible) this interview so we can look at it later and be able to be more active in interviewing than in writing everything down. I believe this is going to help us in not asking our client certain questions twice during the creating process of the app.
- Some questions are also aimed to discover the client's subconscious requirements.

3.2 User observation

Planned by: Ihor Novikov

- During the meeting at PZEM on 22nd March, I will be observing the working process of a employee (who is potentially going to use our product) to gather information about what does he do during the working day, what tasks does he execute and what tools does he use to do a specific activity.
- To get understanding of the process, I will make some recordings (Support elicitation technique - Recording).
- After I have got an overview of the working day, I will create a diagram of a business processes that are executed during it.
- With all the gathered data we will be able to make a better product in the outcome that will properly fit into the client's environment.

3.3 Brainstorming paradox

Planned by: Jessica Dinova

- I want to execute this elicitation technique with our stakeholders that we are in contact with so that we can gather information about what scenarios should not happen
- This technique might help us evoke subconscious requirements from our client
- After the interview I will bring a big piece of paper to the group that will eventually create a mind map of all the bad scenarios that could happen from the information that we've gathered from our client (Support elicitation technique – Mind mapping)
- Thanks to this mind map with all the ideas we can start thinking about how to eliminate these unpleasant scenarios before they even occur
- This might also help us with unhappy paths in the future

3.4 System archaeology

Planned by: Ertugrul Aktas

- **What must be researched.**
 - The task which must be done to achieve the research results.
 - The goal of the research.

- **Looking into already existing systems, such as implemented graphs and diagrams for costs for example.**
 - Get documents from Teams group in which the clients at PZEM added us.
 - So that we can use it as a template for our own design and dashboard.

- **We already have gathered a bit of information regarding their layout and what environment they're working in, it is called power BI. We have multiple csv files containing data regarding the virtual machines, how are we supposed to read this?**
 - Ask at the meeting on the 22nd how to read the csv files and what we need to take into account when adding the data to the dashboard.
 - So that we can interpret the data so we can properly implement it into our database.

- **Ask either Rolf or Xander for source code of the environment in which they want us to implement our dashboard app.**
 - Ask at the meeting on the 22nd
 - So that we can focus on where we implement our code.

- **Ask how to connect our Laravel app to their system. What kind of tool do we use for this.**
 - Ask at the meeting on the 22nd
 - So that we know how we connect our system to their environment. To integrate our app in their company.

- **Use part of the questionnaire to ask questions regarding code in use.**
 - Ask at the meeting on the 23rd
 - So that we have immediate answers in person and can further have sub questions and elaborations on them

- **What framework did they use to build and set up the environment in which they work.**
 - Ask at the meeting on the 22nd
 - So that we can adapt to their working environment

3.5 Questionnaire

Planned by: Osose Eromonsele

What must be researched

- I will find out the exact requirements the client needs on their dashboard by coming up with a questionnaire
- I will find out who exactly is going to be using the system that we are developing
- I will also find out what are the minimum expectations that the client has for us
- When the project is completed to a satisfiable point, I will interview the client with questionnaires to find out what else could be done to improve the project
- Figuring out their exact problem

Aim

- The aim is to gain an insight into the satisfiers and most compulsory needs of the client
- To gain an insight into the mind of the client by making a questionnaire from their perspective

3.6 Change of perspective

Planned by: Drico van Wijk

- When talking with our clients, I will try to understand their likes and dislikes and find a pattern.
- When planning and talking about our product, I will take on the perspective of the client and try to implement the pattern.
- I think this will improve our way of working because it takes the client into consideration much earlier than usual and a deeper level than usual.
- This will also uncover any subconscious requirements that the client may have because I will be standing in their shoes when tasks are discussed and performed, thus I can tell what the client would like to have and what they don't.
- I will look at other dashboards made by other companies and people to see any missing requirements or features that I think the client would be satisfied with.
- It would also be a good idea to give the client some designs or prototypes and let them select the aspects they thought were good and combine them into our product so that the subconscious requirements are filled

3.7 Perspective Based Reading

Planned by: Yohan Kuruvilla Arikupuram

- I will be spending my time gathering information from clients, researching and analyzing existing documents related to the software project, to understand if any requirements missed out by my teammates can be implemented
- The goal is to analyze documents and do extra research on the internet to understand and identify the relevant requirements and specifications for the project that can be implemented.
- After gathering all the information I can get I will write down the features and requirements that need and can be implemented for the project so that it can meet the requirements of the client.

4 ELICITATION RESULTS

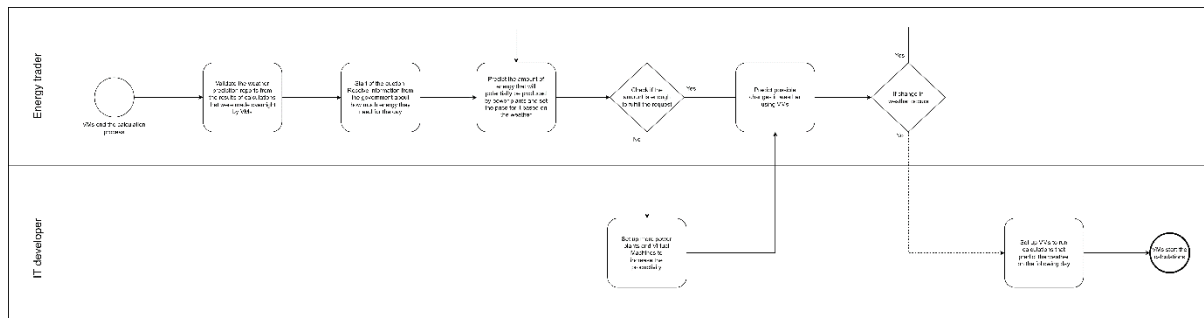
4.1 Interview with IT department chair

Conducted by: Laura Birau

- We do not have any laws we should be aware of for now, but, if the client discovers anything that might be of interest, they will inform us
- Any machine has 3 states: started, stopped (not completely turned off, but still costs money), deallocated (completely turned off, but takes about 10 min for the system to be back online)
- The importance of a CRUD module is still to be discussed further in the project with the client because they are not sure if its existence is relevant for their expectations
- The full answers list can be found in [Questions](#).

4.2 User observation

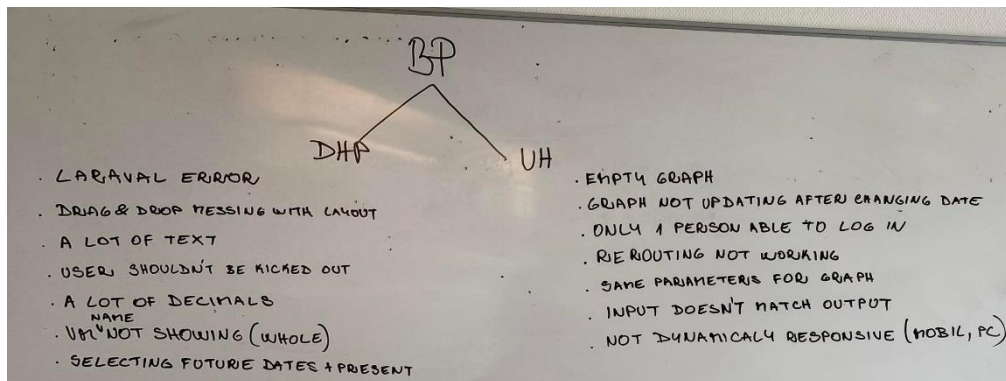
Conducted by: Ihor Novikov



- The above swimlane model shows processes that are executed during the day at PZEM. Our future dashboard will be used by Trading department and IT department.
- Energy traders need information about the number of Virtual machines that are turned on right now. In case of weather change, they inform IT department whether they need more VMs to be set up or if some of them can be turned off.
- IT developers are responsible for turning the specific VM on/off and monitor the amount of money spent on maintaining VMs to increase cost-effectiveness.

4.3 Brainstorming paradox

Conducted by: Jessica Dinova

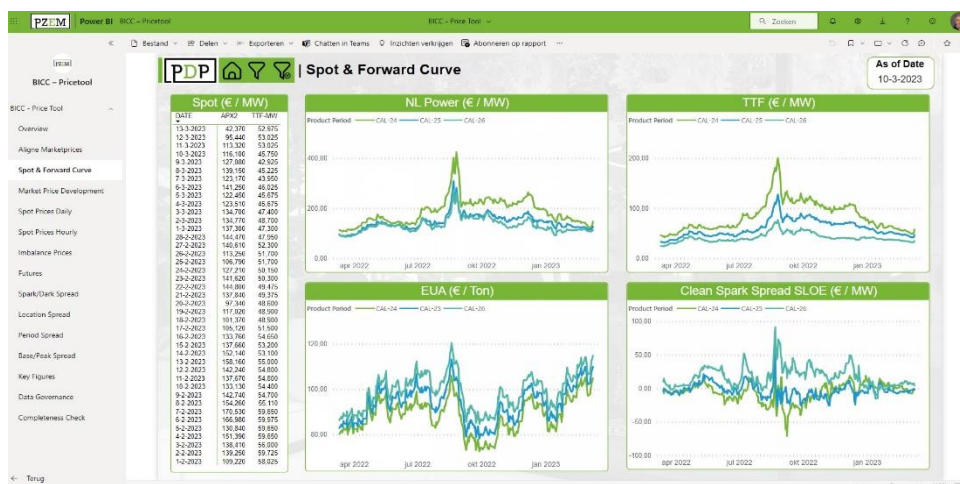


- Picture above shows the outcome of our brainstorming paradox on 30th March
- This brainstorming paradox session helped us to come up with happy and unhappy paths, dissatisfiers and delighters (for example: drag and drop for the layout)
- Together we got overall vision about frasses and terms that we were using, since we lacked some information about this, our initial user stories were not coherent and differed in many ways (for example: links instead of buttons, graphs on one page instead of 1 graph per page and vice versa)
- After the brainstorming session we were able to create 3 unique layouts of the project for our client to choose from

4.4 System archaeology

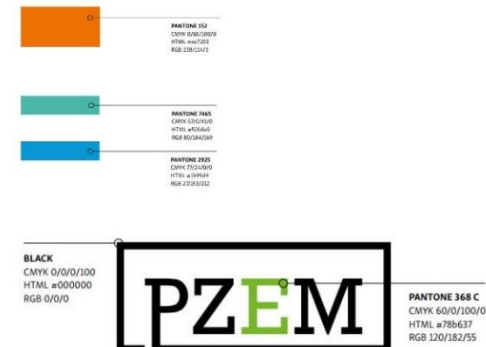
Conducted by: Ertugrul Aktas

- PZEM provided us with their layout and some graphs which they use to monitor changes in cost. These files help us better visualize what guidelines our layout should follow, like positioning of the diagrams and expectations such as color and the as of date in the top right corner.



- PZEM provided us with color codes for their design of their environment

PZEM groen #78b637
Oranje: #ee7203
Turquoise: #50b8a9
Blauw: #1b99d4



- Their environment is Power BI which they use to create dashboards. But they don't want us to create it or connect our app to Power BI. The client wants us to have a separate page/app to visualize the data before we integrate it into their system.
- The clients at PZEM showed us how to read through the csv files and what data is relevant for our project.
- We did not get access to any source code or relevant code for our app. We were told that it would not be beneficial or relevant to our project.
- We cannot connect our app to their system. They specifically mentioned that it is something which we should not worry about yet. We should just get the dashboard to graph the data.
- We should start simple, only try to get the dashboard to display the data in the csv file (given excel sheet).

#	A	B	C	D	E	F	G	H
1	Correlation id	Operation name	Status	Event category	Level	Time	Subscription	Event initiated by
2	4179367-6322-4a66-8b09-10284bce9e0d	Start Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:57:17.081Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
3	4179367-6322-4a66-8b09-10284bce9e0d	Start Virtual Machine	Started	Administrative	Informational	2023-01-31T22:54:36.504Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
4	4179367-6322-4a66-8b09-10284bce9e0d	Start Virtual Machine	Accepted	Administrative	Informational	2023-01-31T22:54:36.509Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
5	18324366-87c2-4e16-b755-1d7f931c9f96	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:55:39.921Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
6	18324366-87c2-4e16-b755-1d7f931c9f96	Delete Virtual Machine	Started	Administrative	Informational	2023-01-31T22:53:18.880Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
7	18324366-87c2-4e16-b755-1d7f931c9f96	Delete Virtual Machine	Accepted	Administrative	Informational	2023-01-31T22:53:39.033Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
8	18324366-87c2-4e16-b755-1d7f931c9f96	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:53:53.122Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
9	af5ee19b-6722-4c01-a151-142d176c7e7e	Health Event Resolved	Resolved	Resource Health	Informational	2023-01-31T22:54:44.773Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
10	af5ee19b-6722-4c01-a151-142d176c7e7e	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:54:40.365Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	
11	af5ee19b-6722-4c01-a151-142d176c7e7e	Health Event Activated	Active	Resource Health	Informational	2023-01-31T22:54:43.139Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	
12	130c19d5-a264-4b16-9c2-43756a06053	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:54:39.774Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	
13	1900248a-6f91-4391-a50f-c38747132a8	Deduplicate Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:50:36.110Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
14	1900248a-6f91-4391-a50f-c38747132a8	Deduplicate Virtual Machine	Started	Administrative	Informational	2023-01-31T22:49:42.483Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
15	1900248a-6f91-4391-a50f-c38747132a8	Deduplicate Virtual Machine	Accepted	Administrative	Informational	2023-01-31T22:49:42.777Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	adff-gzem-wsu-p-dell1
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17	25405722-dacc-4d89-ba66-740d01e2a843	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:50:00.056Z	05a8f631-clcd-44c1-bbb4-2498d2912678	
18	25405722-dacc-4d89-ba66-740d01e2a843	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:00:28.324Z	05a8f631-clcd-44c1-bbb4-2498d2912678	
19	25405722-dacc-4d89-ba66-740d01e2a843	Health Event Activated	Active	Resource Health	Informational	2023-01-31T22:08:37.460Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
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21	1c5a8880-ab7b-49f9-9f81-31b7674db04	Delete Virtual Machine	Started	Administrative	Informational	2023-01-31T22:09:23.949Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
22	1c5a8880-ab7b-49f9-9f81-31b7674db04	Delete Virtual Machine	Accepted	Administrative	Informational	2023-01-31T22:09:24.052Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
23	1c5a8880-ab7b-49f9-9f81-31b7674db04	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:09:26.777Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
24	1c5a8880-ab7b-49f9-9f81-31b7674db04	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:11:24.774Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
25	92972728-8356-4e0d-81a0-84b360674a8d	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:08:35.086Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
26	92972728-8356-4e0d-81a0-84b360674a8d	Delete Virtual Machine	Started	Administrative	Informational	2023-01-31T22:08:35.796Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
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28	92972728-8356-4e0d-81a0-84b360674a8d	Delete Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:08:53.588Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
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30	301a303d-ab1a-4240-ae0f-e6a6f86fcf4	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:09:24.900Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	
31	301a303d-ab1a-4240-ae0f-e6a6f86fcf4	Health Event Updated	Updated	Resource Health	Informational	2023-01-31T22:08:18.114Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	
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36	03a900ae-b81d-436a-bc30-7a7d28ce0c0b	Create or Update Virtual Machine Extension	Started	Administrative	Informational	2023-01-31T22:01:24.680Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
37	03a900ae-b81d-436a-bc30-7a7d28ce0c0b	Create or Update Virtual Machine Extension	Accepted	Administrative	Informational	2023-01-31T22:01:24.682Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
38	03a900ae-b81d-436a-bc30-7a7d28ce0c0b	Create or Update Virtual Machine Extension	Succeeded	Administrative	Informational	2023-01-31T22:01:02.982Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
39	255d6d41-cl7c-4565-a18e-255e2572b7b	Create or Update Virtual Machine Extension	Started	Administrative	Informational	2023-01-31T22:01:14.114Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
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41	255d6d41-cl7c-4565-a18e-255e2572b7b	Create or Update Virtual Machine Extension	Succeeded	Administrative	Informational	2023-01-31T22:01:14.436Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
42	255d6d41-cl7c-4565-a18e-255e2572b7b	Create or Update Virtual Machine Extension	Succeeded	Administrative	Informational	2023-01-31T22:01:42.768Z	05a8f631-clcd-44c1-bbb4-2498d2912678	AzureDataBrics
43	43261689-8947-42a2-ba1d-d442782d3a3a	Create or Update Virtual Machine	Succeeded	Administrative	Informational	2023-01-31T22:01:03.160Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics
44	43261689-8947-42a2-ba1d-d442782d3a3a	Create or Update Virtual Machine	Started	Administrative	Informational	2023-01-31T22:01:03.460Z	1c834885-bcdf-4d5d-b97f-3ba09cfaa84	AzureDataBrics

4.5 Questionnaire

Conducted by: Eromonsele Osose

- I came up with different questions to ascertain exactly what the client needed us to do for the project.
- I was able to gather information from the client based on their current needs and asking them questions about their current systems and its limitations
- From the questionnaire, I was able to gather that they currently use reporting tools from Microsoft and the major limitation of their current system is that it is focused more on cost. It does not help them manage the time their virtual machines come on and off. They also mentioned the fact that although looking for the time a machine is turned on or off is not impossible, it is quite difficult.
- Security wise, their current system is quite secure since it is provided by Microsoft. They have a login feature implemented into their current system that permits only the employees to login. I also thought of asking them if their security has ever been breached and their answer was no. They explained to me that they are working with an IT security provider to prevent breaches of the company's information as much as possible.
- I went on to ask about the one feature that they would want to see on our dashboard that they currently do not have with their current system. Their response was, Virtualization of data! In their current system, the virtualization of data is only based on cost, but they would also like to see what they could improve on and what machines are on and probably predict the cost of VM's based on available trends.
- I asked the client if they've tried using other systems and what the outcome was? They replied that this is their first system and they only started using it just a while ago. Prior to this, everything was done on physical and virtual servers in datacenters. But unlike these systems where the costs remain constant, the price of Microsoft Azure systems does change when a VM is turned off for a period.
- I also asked what exactly are the expectations that the company has from our team on a weekly/Bi-weekly basis. They answered by saying that they think the most important thing is the sprint reviews. As far as they know our current progress on a Bi-weekly basis, they are satisfied.
- I proceeded to ask them about what they feel will be the biggest satisfiers/dissatisfiers of our project. They then provided our team with MVPs in the form of user stories which will help our team to be on the right track during our project. On the other hand, the biggest dissatisfiers will be not having anything to look at at the end of the project.
- I followed up by procure about what employees at the company will be using our dashboard. The client's response was that the dashboard will be used by most of the IT oriented employees and then those employees can then easily show this data to the business employees
- Finally, I asked them what they feel could be the biggest thing that could limit us from achieving or creating the dashboard from their impression of our team. They answered by saying that from what they've seen so far, they do not see any limitations and that they are very optimistic that we can provide them with the results that they desire.

4.6 Perspective - Based Reading

Conducted by: Yohan Kuruvilla Arikupuram

- The client gave us several excel sheets, with crucial information like the cost analysis of the VM's, the schedule of turning on/off the VM's over the course of January and February. With such information, it becomes easier to understand how we'll be structuring our dashboard to our client needs.
- On looking at dashboards used by other companies for their needs, one thing common is that it requires users to use their company email and password to log onto the dashboard to ensure security and that access to the dashboard is given based on their roles in the company.
- On reading more about the design of similar projects, an important feature that needs to be implemented is that the dashboard should be structured in a way that it provides insights into the virtual machine usage and its associated cost which will help the client in optimizing and planning the usage of the virtual machines and help them in reducing the costs of running them in the future by predicting the trends.
- I noticed that the most common way of displaying large amounts of data on a dashboard in the form of diagrams as it helps us to understand the data in a much more concrete way. In fact, the client has given us sample images on how the data can be visualized which are in the form of graphs on the dashboard.
- Another feature that is implemented in such projects is that the client has the option to customize the visualization options based on their preference (it can be a bar chart or line graph or pie charts, etc.).
- I did look at some features that other companies have implemented, I noticed that alert notifications are implemented when certain virtual machines are running longer than expected or when not needed.
- Another feature that can be implemented is that the dashboard is made accessible from mobile devices, which makes it much easier to access the dashboard.

4.7 Change of perspective

Conducted by: Drico van Wijk

- The client has told us that we have complete creative freedom, but obviously we want the product to be in line with their design, so one requirement is that the design of their website is incorporated.
- In the design of other companies, there are multiple types of visual indicators, we have asked the client and they said that we need to have a primary visual first and any other would be appreciated but want to be implemented.
- Extrapolating the data from the other designs, we can deduce that color-coded results are very popular, we have asked the client and the status should be color coded to help organize the dashboard.
- Because we have complete creative freedom, we cannot get subconscious requirements easily, so we showed the client a few designs and asked them what parts they like about it and note those down as requirements.

5 REQUIREMENTS

5.1 Jessica Dinova

- As an energy trader I want to be able to select a VM in the dashboard visualization so that I can get a better overview of the usage of the VM
 - Given: An energy trader wants to select a VM from the dashboard visualization
 - When: An energy trader selects a VM by clicking on the name of the VM
 - Then: They will be redirected to the page dedicated to the selected VM
 - When: There is no additional information about the VM
 - Then: An error message is shown
- As an energy trader I want to be able to see usage of VM in graph visualization so that I can predict tomorrow's usage based on the visualization
 - Given: An energy trader wants to see the usage of the VM over the past week
 - When: They redirect to the page with graph
 - Then: They can see graph that contains peaks and flatlines
 - When: There was no usage for a day in the week for the VM
 - Then: The graph visualization will only show flat line for that day
- As a manager I want to be able to see which user has initiated a start/stop event on a VM so that I can correctly charge the initiator
 - Given: A manager is looking at the start/stop events of VM
 - When: A user initiates a start/stop event
 - Then: A manager can see who initiated the start/stop event
 - When: The dashboard is not updated
 - Then: An old username is displayed

5.2 Ihor Novikov

- As an IT developer, I want to be able to set a time period for the dashboard graphs shown so that I can analyze past status changes of the VMs.
 - Given: IT developer wants to check how many VMs were turned on and off during the past period
 - When: IT developer selects the timespan
 - Then: The graphs get updated with the needed information
 - When: Time set incorrectly
 - Then: Error message is shown
- As an IT developer, I want to see the amount of machines that are running/stopped to see what VM I can turn on/off.
 - Given: Trader wants to check the overview of VMs
 - When: Trader scrolls down to the 'VMs Overview' diagram
 - Then: Trader gets an information about currently running or stopped Virtual Machines
 - When: There is no data to show on the diagram
 - Then: Error message is shown
- As an IT developer, I want to see the amount of money spent on maintaining VMs over a certain period of time so that I can analyze if the amount spent on running the VMs correlates with the amount of energy that is being produced by power plants.
 - Given: IT developer wants to have a look at the costs
 - When: IT developer selects the timespan
 - Then: The information is shown on the graph
 - When: Time set incorrectly
 - Then: Error is shown

5.3 Laura Birau

- As an IT developer I want to be able to see which VM are on/off at any given time so I can take that into consideration when I calculate the energy need.
 - Given: on the home page
 - When: the VMs are switched on
 - Then: the new information is displayed instantly
 - When: a machine is not updated on time
 - Then: the measurements are going to be out of range and say that in a message
- As an energy trader I want to access a visualization of data for one machine, so I can quickly check it at any given time.
 - Given: on the home page
 - When: the button "see graph" is clicked
 - Then: the page "graph view" should be shown for that specific machine in the time chosen
 - When: a machine does not have that view implemented
 - Then: an error message should be displayed stating "data unavailable" or a specific message for the situation
- As an energy trader I want the ability to check the data for multiple machines for any time slot so I can match my expectations/calculations with reality.
 - Given: on the main page
 - When: the time slot is specified, and the "see graph" button is clicked
 - Then: the "graph view" page is displayed
 - When: one of the machines has not been operating for the given time slot
 - Then: the message "machine not in operation" is displayed on the screen

5.4 Ertugrul Aktas

- As an administrator, I want to manage who can access the dashboard, so that only the qualified individuals in the company can access sensitive information.
 - Given: on the main page
 - When: trying to login as a qualified individual
 - Then: get access to the dashboard
 - When: trying to login as an unqualified individual
 - Then: don't get access to the dashboard
- As an energy trader, I want to see trends in the detailing the cost of maintaining the virtual machines, so that I can make predictions on what future maintenance costs will be.
 - Given: on the dashboard page
 - When: select desired VM
 - Then: graph displaying the cost for maintaining the VM
 - When: no maintenance cost data available for that VM
 - Then: no graph displayed, instead a message saying: no data
- As a business trader, I want to see the cost and usage of a specific machine on a certain day, so that I can have insight into the efficiency of the given machine
 - Given: on the dashboard page
 - When: select the desired VM and usage and cost data.
 - Then: a graph is displayed of the cost alongside the usage
 - When: cost and usage haven't been monitored
 - Then: graph displays message: no data

5.5 Drico van Wijk

- As an energy trader I want to be able to click a button or drag a graph to show a visualization of the amount of VM's that were turned on in the last day or the other timeframes, because this will help calculate the cost of yesterday's energy usage.
 - Given: on the dashboard page
 - When: clicking a button or dragging a graph to the visualization board
 - Then: shows a visualization of the data collected in the timeframe
 - When: clicking a button or dragging a graph to the visualization board does not work
 - Then: the energy trader will receive an error notification that something went wrong
- As an energy trader I want to be able to use different graph visualizations such as a table, donut chart, bar chart and bullet graph when I am viewing my data, because it will help with looking at it from different angles and the understanding of the data.
 - Given: on the dashboard page
 - When: selecting the preferred visualization and they get properly displayed
 - Then: the application displays the selected methods
 - When: selecting the preferred visualization and they do not get properly displayed
 - Then: the application does not display the selected graphs
- As an energy trader I want to be able to access the dashboard smoothly if I am on a different menu, because this will ensure fluidity for me which will result in a better appeal of the product.
 - Given: on the application of the client
 - When: switching from another tab on the application to the dashboard
 - Then: be able switch between them with a smooth feeling
 - When: switching from another tab on the application to the dashboard goes wrong
 - Then: The program will take too long and throw an error that the system is not working properly

5.6 Yohan Kuruvilla Arikupuram

- As an analyst, I want to be able to see an overview of every single VM that will be given on the table on the dashboard to understand the costs the company pays for running the VM's so as to think of ways to run it in the most economical manner.
 - Given: On the dashboard
 - When: I open the dashboard, and I select a button in a table for a particular VM
 - Then: I should be taken to a page with different diagrams showing for example the cost vs time graph for the VM's.
 - When: I open the dashboard, and I select a button in a table for a particular VM.
 - Then: An error is shown and am not taken to required page
- As an IT developer, I want to be able to select the time-period for the cost-time graph so that I can get a concrete idea of the cost of running the VM's for a particular period.
 - Given: On the dashboard
 - When: The user selects a period between 2 dates on the side of the dashboard.
 - Then: They are directed to a page with different diagrams showing the required data between the selected dates.
 - When: The user selects a period between 2 dates on the side of the dashboard.
 - Then: An error is shown, and the required page is not shown
- As an IT developer, I want to be able to view different types of visualizations - like graphs, charts and pie diagrams to better understand when the VM's are on/off and what the cost of running them is as this will help in planning when the VM's can be switched on/off when not necessary to save money.
 - Given: On the page regarding the selected VM on the dashboard.
 - When: The user selects the button to see more data regarding the function of a VM over a period.
 - Then: They are directed to a page with different diagrams showing the data.
 - When: The user selects the button to see more data regarding the function of a VM over a period.
 - Then: An error is shown, and they are not directed to the required page.

5.7 Eromonsele Osose

- As an IT developer I want to be able to view a cost graph of virtual machines, based on the most recent trends to have a visual representation of the data
 - Given: The user is on the main dashboard page
 - When: The user clicks on 'view costs' to view the cost of energy based on trends
 - Then: The user should be able to view a graphical representation of the trend
 - When: No trends are available at the time of request
 - Then: the page will display an empty graph and show an error message
- As a user, I want to be able to view the exact times that a machine was turned on or off, that way users are well informed of its status in proper detail.
 - Given: the user logs on to the dashboard
 - When: the user selects an already turned-on machine
 - Then: they should also be able to see the specific time the machine came on
 - When: the user selects an already turned-on machine
 - Then: the time a machine was turned on or off isn't displayed and error message is shown
- As an IT developer, I want to be able to read the status of the machines on the database, so that the current states of the machines are viewed.
 - Given: The IT developer logs onto the dashboard
 - When: user clicks on view virtual machine
 - Then: They should be able to read the status of that machine
 - When: User clicks on view virtual machine
 - Then: The error message is shown

6 VALIDATION RESULTS

Validation technique:

- Looking from different perspectives and views.
 - By reading through and giving feedback on each other's work.

Plan for validating the requests:

6.1 Walk Through with Commenting

- The whole team gathered in a room to read through our requirement
- Ihor presented the screen with everyone's user stories
- Drico and Ertugrul checked if the user stories can be understood for an outside individual
- Jessica and Ihor were checking whether the role is correctly assigned
- Laura checked if the user story fits in the system context of our projects
- Osose and Yohan were checking if the acceptance criteria were matching the user stories
- Results:
 - We commented on each user story together, making sure that everyone is analysing from their perspective
 - We made changes on the user stories and we are planning to show them to our client on the demo we have on the 31st of March

6.2 Prototype

As a result of our first validation technique, we concluded that we need a prototype to combine our visions upon how the product should look like

- Everyone made their own design of the dashboard, and presented it on one of the team meetings. After that we discussed every one of them and came up with three possible concepts of the future application. We will present all of them on demo 31st of March and then Rolf and Xander can decide which one of the designs suits them better (or combination of the designs).
- Results:
 - Rolf and Xander chose the concept they like
 - We discussed in detail the functionality of the chosen design based on our user stories