

Graduation Blog

Ignas Apšega | 3620557

Table of Contents

Week 17
Week 16
Week 15
Week 145
Week 13
Week 12
Week 11
Week 10
Week 9
Week 8
Week 7
Week 613
Week 514
Week 4
Week 3
Week 2
Wook

What has been done:

- Fixed Snarkjs import module problem for Byonts WEB3 template.
- Implemented easy Circom circuit example with groth16 implementation.
- Implemented Age Check Circom circuit example with plonk implementation.
- Implemented Smart Contract as a proof verifier.

Next week:

• Try to fix the Snarkjs module import for Byonts WEB3 template. It is not currently working and without it the work can not be continued.

What could have been improved:

Could have had more focus and achieved this days before the holidays. Its very important to have good time and tasks management skills.

Notes from the meeting:

I Focused on documents: did C4, explained arithmetic. (Advice: try to make a more complicated example/circuit, need to prepare the final presentation and show Byont first to learn what kind of questions can appear and be ready for that).



12/19/2022 - 12/25/2022

TOTAL HOURS

32:07:11





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE	
 Internships Byont Ventures B.V. 	32:07:11	_	100.0%	
Implementing Circom & SnarkJS to Byonts WEB3 template	32:07:11	-	100.0%	

What has been done:

- Start of implementing Circom and SnarkJS to the Byonts WEB3 template.
- Reiterated through documents and improved them

Next week:

• Try to fix the Snarkjs module import for Byonts WEB3 template. It is not currently working and without it the work can not be continued.

What could have been improved:

Problem solving time management. Calculate how much time you want to spend on a problem and if it does not work out switch to other solution.



12/12/2022 - 12/18/2022

TOTAL HOURS

40:11:34





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	38:33:26	-	95.93%
Implementing Circom & SnarkJS to Byonts WEB3 template	38:33:26	_	95.93%
Without project	1:38:08	_	4.07%
Without description	1:38:08	_	4.07%

What has been done:

- Start of my own Proof of Concept.
- Implemented easy Circom circuit example with groth16 implementation.
- Implemented Age Check Circom circuit example with plonk implementation.
- Tried implementing Smart Contract as a proof verifier.

Next week:

• Try to implement the current progress to the WEB3 template of Byont.

What could have been improved:

Could have spent more time on researching the circuits.

Notes from the meeting:

- "Do something you can explain".
- When making own circuits and own setups, it doesnt work with either Groth16 or PLONK
- You need something "visual" to show what you've done.

byont

12/05/2022 - 12/11/2022

TOTAL HOURS

44:41:46





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	44:41:46	-	100.0%
Snarkjs & circom prototyping	44:41:46	-	100.0%

What has been done:

- Did some more reverse engineering towards Boilerplate of zk-Snark.
- Tried to implement more functionality but ran into critical error which doesn't let to add more functionality

Next week:

• Start making my own proof of concept by reverse engineering the current boilerplate.

What could have been improved:

Better planning for the week.



11/28/2022 - 12/04/2022

TOTAL HOURS

39:59:57





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
● Internships • Byont Ventures B.V.	39:59:57	_	100.0%
Snarkjs & circom prototyping	25:12:35	-	63.03%
Studying Circom documentation	14:47:22	-	36.97%

What has been done:

- Studied Circom documentation more deeply.
- Did some more reverse engineering towards Boilerplate of zk-Snark.

Next week:

• Add more functionalities to the Boilerplate.

What could have been improved:

Could have spent more time on documentation

11/21/2022 - 11/27/2022

byont

TOTAL HOURS

44:22:41





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	44:22:41	_	100.0%
DAO Analysis doc refactoring	1:08:49	_	2.58%
Presentation for Circom and SnarkJS	13:37:22	-	30.7%
Prototyping with SnarkJS and Circom	13:46:29	_	31.04%
Snarkjs mathematics	6:12:46	-	14.0%
Studying Circom documentation	6:44:54	-	15.21%
Studying zk-Snark maths	0:26:21	-	0.99%
Zero-Knowledge Proofs Protocol decision doc	2:26:00	-	5.48%

What has been done:

- Start of portfolio document.
- Had presentation for Circom and SnarkJS.
- Studied Circom documentation more deeply.
- Did some more reverse engineering towards Boilerplate of zk-Snark.

Next week:

• Try to dig around the Github of zk-Snark Boilerplate and see if there is more information about it and how it could be improved..

What could have been improved:

Feedback for the week and presentation:

- No maths, blackbox create a number of examples
- Boilerplate check it out again
- Understand the circuits better.
- Give advice(examples).
- Solid advice for Byont.
- Arithmetic circuit. circuit and zkp.
- Dont show stuff you dont know.
- Write or think/Research on what circuits you could write about

11/14/2022 - 11/20/2022

byont

TOTAL HOURS

BILLABLE HOURS

53:28:17

6:14:00





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	53:28:17	0.00 EUR	100.0%
Making presentation	3:02:39	-	5.69%
Sebastians hackathon	6:14:00	0.00 EUR	11.66%
Sebastians hackathon. Setting up environment	4:31:00	_	8.45%
Studying zk-Snark maths	20:12:56	_	37.81%
Zero-Knowledge Proofs Protocol decision doc	11:31:42	_	21.56%
Without description	7:56:00	_	14.84%

What has been done:

- Stripped of Boilerplate of zk-Snarks.
- Better understanding of zk-Snarks protocol. Because I studied the Maths behind.
- Better understanding of Circom/SnarkJS libraries.
- Did a hackathon from Byont on Solidity Smart Contracts (extra task).

Next week:

- Add more functionalities to the Boilerplate.(Right now, it checks and verifies the age only).
- Finish up Zero-Knowledge documents on protocol decision and libraries decision
- Start making a portfolio.

What could have been improved:

I could have worked on the documents throughout the weekend

11/07/2022 - 11/13/2022

byont

TOTAL HOURS

42:40:39





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	42:40:39	-	100.0%
Circom tutorial	5:41:01	-	13.32%
Making presentation	9:33:34	-	22.4%
NextJS tutorial	5:12:25	_	12.2%
SnarkJS Proof of Concept	16:54:50	_	39.63%
Updating documents for Fontys	3:54:00	_	9.14%
Without description	1:24:49	_	3.31%

What has been done:

- Design document.
- Started prototyping with selected zk-Snarks library SnarkJS/Circom.

Here are the weekly meeting notes:

- I will be trying to reverse-engineer the boilerplate I found. Also doing zksnarks library tutorial.
- Going also make a presentation for Fontys and maybe show the demo to others.

Next week:

• Keep on building and prepare for the meeting at Fontys in a week.

What could have been improved:

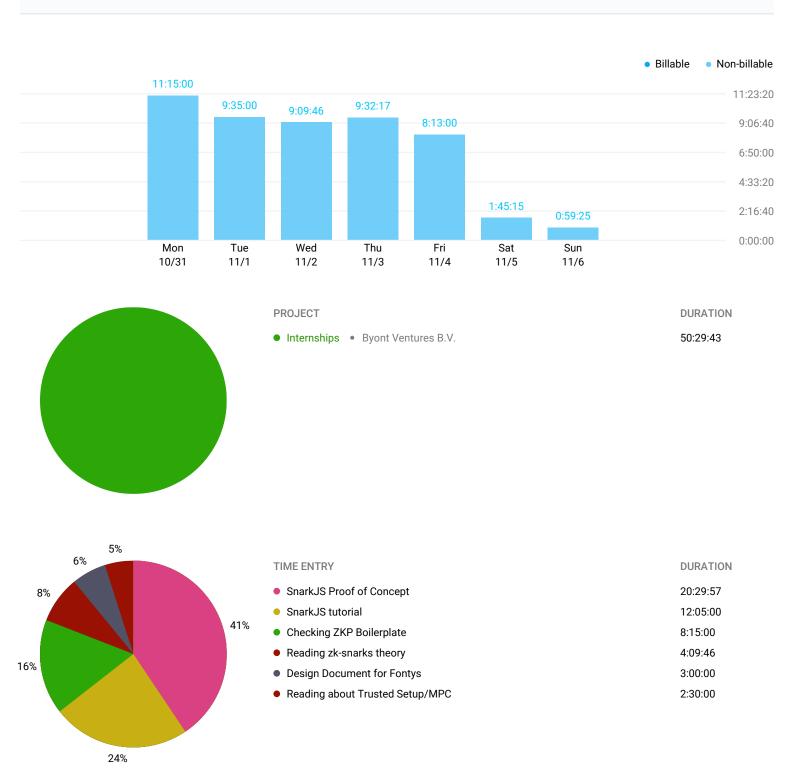
I am happy with this week because I spent extra time.

10/31/2022 - 11/06/2022

byont

TOTAL HOURS

50:29:43





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	50:29:43	-	100.0%
Checking ZKP Boilerplate	8:15:00	-	16.34%
Design Document for Fontys	3:00:00	-	5.94%
Reading about Trusted Setup/MPC	2:30:00	_	4.95%
Reading zk-snarks theory	4:09:46	_	8.24%
SnarkJS Proof of Concept	20:29:57	_	40.6%
SnarkJS tutorial	12:05:00	_	23.93%

What has been done:

- Started looking into Zero-knowledge proofs tooling(started with Bulletproofs library).
- Bulletproofs implementation library does not look suitable and does not have enough documentation for beginners.
- DAO analysis document.
- Start of the Design document.
- Start of the Zero-Knowledge tooling research document.

Here are the weekly meeting notes:

- Look at diff applications that have already implemented ZKPs and try to reverseengineer them. The most important thing for is just to understand how it works and how to build this kind of stuff.
- Start building stuff, as much as possible, as we need more hands-on experience.
- Somesort of demo would be nice.
- Could use the Web3 template that Byont has in their repository.

Next week:

• Its important to start building. At the end of the week it would be nice to have some sort of Proof of Concept or demo.

What could have been improved:

Punctuality and I wish started looking into ICT Competences before.

10/24/2022 - 10/30/2022

byont

TOTAL HOURS

37:25:00





PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	33:25:00	_	89.31%
DAOs research Fontys documentation	16:00:00	-	42.76%
Design Document for Fontys	6:25:00	_	17.15%
ZKP tooling Fontys documentation	4:00:00	_	10.69%
ZKP tooling research - Bulletproofs	7:00:00	-	18.71%
Lunch / Breaks	4:00:00	-	10.69%
Without description	4:00:00	-	10.69%

What has been done:

- In-depth research on Zero-Knowledge tooling (libraries, etc)
- Improved DAO privacy blog

Here are the weekly meeting notes:

- Do as much coding as possible as we are very overdue with starting coding
- Do PoC together, but then we will separate and do our own stuff.
- Need to concentrate on coding more as the uni wants to see the whole cycle of Software Engineering, such as Software Design, Tests, etc.

Next week:

- Prototyping on chosen ZKP library
- Improve DAO privacy blog
- Start drafting Portfolio

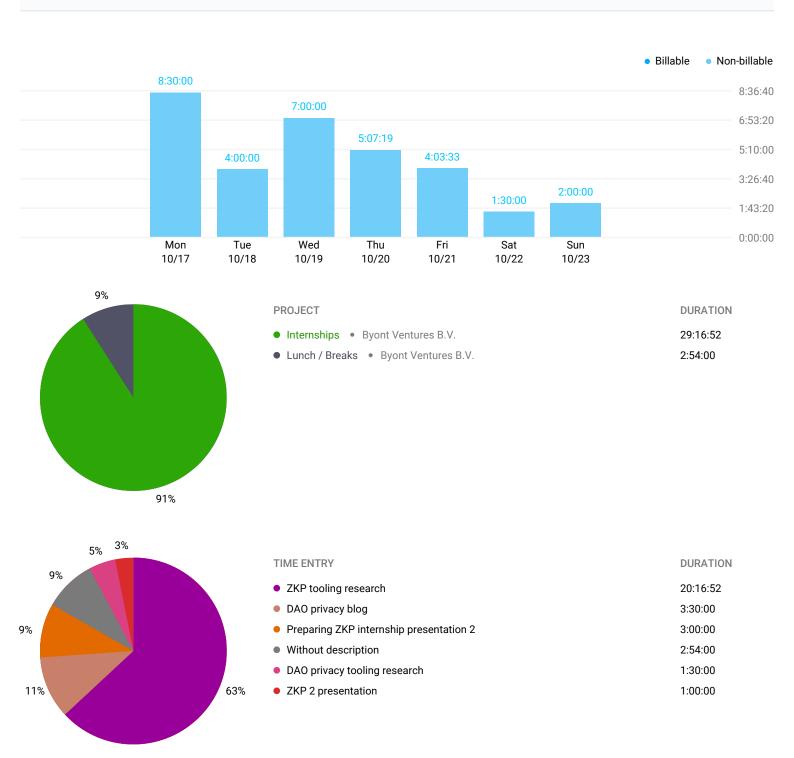
What could have been improved:

• I could have started with drafting Portfolio before.

10/17/2022 - 10/23/2022

TOTAL HOURS

32:10:52



Byont Page 1/2

PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	29:16:52	_	90.99%
DAO privacy blog	3:30:00	-	10.88%
DAO privacy tooling research	1:30:00	_	4.66%
Preparing ZKP internship presentation 2	3:00:00	_	9.32%
ZKP 2 presentation	1:00:00	-	3.11%
ZKP tooling research	20:16:52	_	63.02%
Lunch / Breaks	2:54:00	_	9.01%
Without description	2:54:00	-	9.01%

Byont Page 2/2

What has been done:

- Second presentation about ZKPs and DAOs
- DAO privacy tooling research

Here are the weekly meeting notes:

- Update Fontys Canvas
- Start concepting

Next week:

Continue to look into tooling of Zero-Knowledge Proofs, finish the privacy of DAOs blog

10/10/2022 - 10/16/2022

TOTAL HOURS

BILLABLE HOURS

40:00:00

4:00:00



Byont Page 1/2

PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	36:00:00	0.00 EUR	90.0%
DAO privacy blog draft	4:00:00	_	10.0%
DAO privacy tooling blog	2:45:00	_	6.88%
DAO privacy tooling research	22:45:00	_	56.88%
Fixing Fontys Canvas	1:30:00	_	3.75%
meeting with jasper	1:00:00	_	2.5%
Metaseum sc	4:00:00	0.00 EUR	10.0%
● Lunch / Breaks • Byont Ventures B.V.	4:00:00	-	10.0%
Without description	4:00:00	_	10.0%

Byont Page 2/2

What has been done:

- Finished The Privacy of DAOs blog draft
- External task to look into ZKP(blockchain) games

Here are the weekly meeting notes:

- I can refer to Vitalis article about ZKP applicability for DAOs
- Jasper will have meeting with Selcuk regards Metaseum Smart Contract
- We decided that it is good idea to make document/blog look at DAO tooling about that.

For all:

- Ask if Eric is fine with coming on Mon and having a presentation (that we are going to prepare for Byont)
- We should also send guys invites for google calendar so that everyone was prepared

Next week:

Start prototyping possible tooling of Zero-Knowledge, start writing blog about current tools for DAO privacy/management

What could have been improved:

• I should have showed up to the office all the days even if I am late to come. Because I am very productive there.

10/03/2022 - 10/09/2022

TOTAL HOURS

28:30:00



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	27:30:00	-	96.49%
DAO privacy blog draft	5:30:00	-	19.3%
DAOs general research	11:30:00	_	40.35%
Fixing Fontys Canvas	6:00:00	_	21.05%
meeting with jasper	0:30:00	_	1.75%
ZKP Games	4:00:00	_	14.04%
● Lunch / Breaks • Byont Ventures B.V.	1:00:00	_	3.51%
Without description	1:00:00	-	3.51%

What has been done:

• External task to develop a smart contract for Metaseum

Here are the weekly meeting notes:

- Ignas was mostly working with the smart contract during the week
- Ignas is going to begin writing a blog about DAO privacy and conducting further research
- We can have a presentation next week(in depth about ZKPs), as this week Byont is very busy.
- We should check google Calendar, check everyone's availability and text everyone checking if they can join the presentation at particular time next week.
- Jasper would like us to research ZKP in games (not only casino and gambling, but in general) at least a day or two in the upcoming weeks. No hurry, but the sooner the better.

Next week:

Schedule one day to look into gambling blockchain games and their privacy solutions of it. Also, the final version for the first blog about DAOs and start researching:

• What tools are there for improving privacy for DAOs?

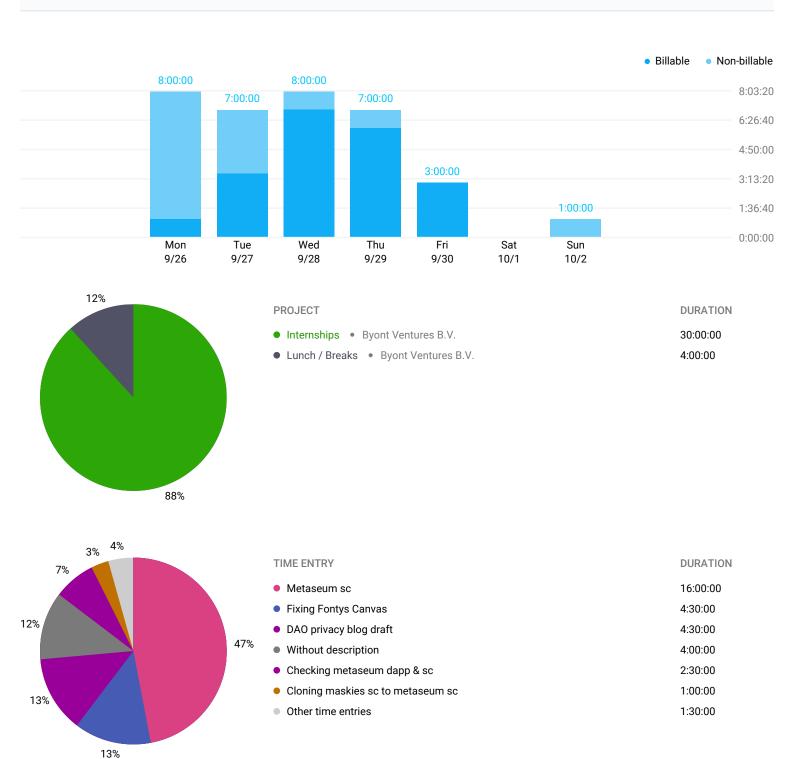
09/26/2022 - 10/02/2022

TOTAL HOURS

34:00:00

BILLABLE HOURS

20:30:00



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	30:00:00	0.00 EUR	88.24%
Checking metaseum dapp & sc	2:30:00	0.00 EUR	7.35%
Cloning maskies sc to metaseum sc	1:00:00	0.00 EUR	2.94%
DAO privacy blog draft	4:30:00	_	13.24%
Fixing Fontys Canvas	4:30:00	_	13.24%
meeting with jasper	0:30:00	_	1.47%
Metaseum sc	16:00:00	0.00 EUR	47.06%
Setting up metaseum	1:00:00	0.00 EUR	2.94%
Lunch / Breaks	4:00:00	-	11.76%
Without description	4:00:00	_	11.76%

What has been done:

• In-depth research of what is DAO, how it operates and its privacy problems.

Here are the weekly meeting notes:

- One of the downsides of lacking privacy in DAOs: people may find out who you are in real life, and it can even lead to threats from others.
- Can look at writing more specific information inside the Blog for DAOs, e.g., privacy issues inside DAOs.
- We should look at ZKPs applicability in gambling and casino games and how a "gamble" aspect of the games can be protected. Some of these games use Oracle.

Next week:

Side-task smart contract for <u>Metaseum</u>. Look into gambling blockchain games and their privacy solutions of it. Also, the final version for the first blog about DAOs and start researching:

• What tools are there for improving privacy for DAOs?

09/19/2022 - 09/25/2022

TOTAL HOURS

24:30:00



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	21:30:00	-	87.76%
DAOs general research	18:30:00	_	75.51%
meeting with jasper	1:00:00	_	4.08%
Project plan	2:00:00	_	8.16%
● Lunch / Breaks • Byont Ventures B.V.	3:00:00	_	12.24%
Without description	3:00:00	-	12.24%

What has been done:

- Improved Project plan
- Presentation at Byont "What are ZK-Proofs?"
- Personal research on ZK-Proofs(on a deeper level)
- Start researching about DAOs

Here are the weekly meeting notes:

- We can leave a link to a 3-colorable graph in Blog 1
- Going to finish Blog 2(ZK-Proofs on a deeper level)
- It is a good idea to make a blog about DAO

Next week:

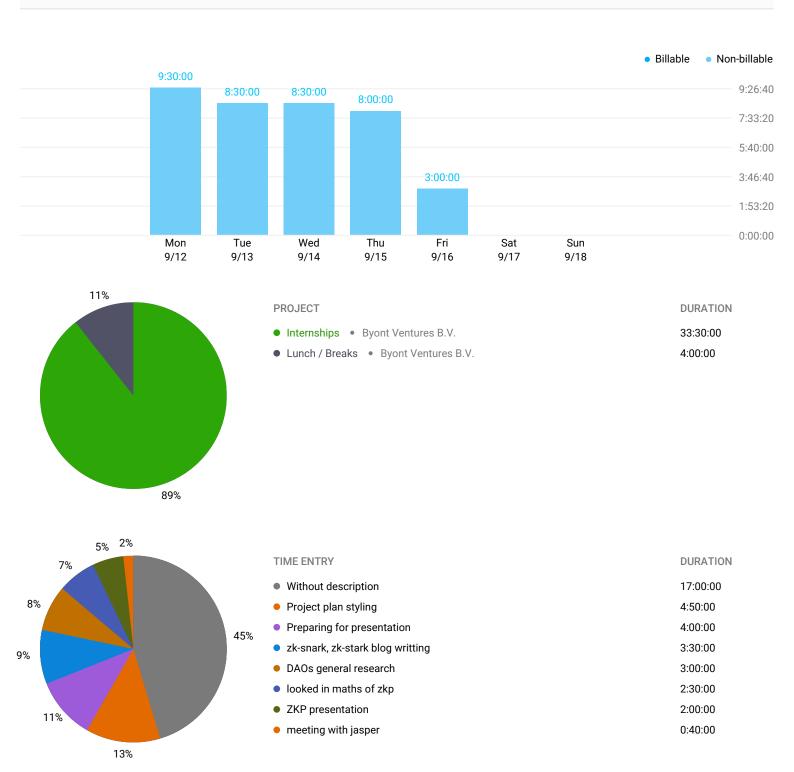
Meeting for Project plan approval. Start executing the Project Plan research phase:

- What is a DAO?
- How do DAOs operate?
- What are the main activities in DAO people participate in?

09/12/2022 - 09/18/2022

TOTAL HOURS

37:30:00



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
• Internships • Byont Ventures B.V.	33:30:00	_	89.33%
DAOs general research	3:00:00	_	8.0%
looked in maths of zkp	2:30:00	-	6.67%
meeting with jasper	0:40:00	_	1.78%
Preparing for presentation	4:00:00	_	10.67%
Project plan styling	4:50:00	_	12.89%
zk-snark, zk-stark blog writting	3:30:00	-	9.33%
ZKP presentation	2:00:00	_	5.33%
Without description	13:00:00	-	34.67%
Lunch / Breaks	4:00:00	-	10.67%
Without description	4:00:00	-	10.67%

What has been done:

- Project plan
- Blog What are ZK-Proofs?
- Personal research on ZK-Proofs(general understanding)

I had a lot of feedback on the Project Plan. Here is the weekly meeting notes:

- We need to look at posting blogs on the Byont website, coming up with our own markdown, CSS, etc.
- Jasper will look at the blog once again and leave comments about what can be improved
- The project plan looks good, but needs to get feedback from Eric; Jasper suggested contacting people that really participate in DAOs to get their insight; "is it really a problem that DAOs don't have enough privacy?" a question that can be added.
- During the presentation we should mention all the examples but explain one more specifically (both for real-life and blockchain)

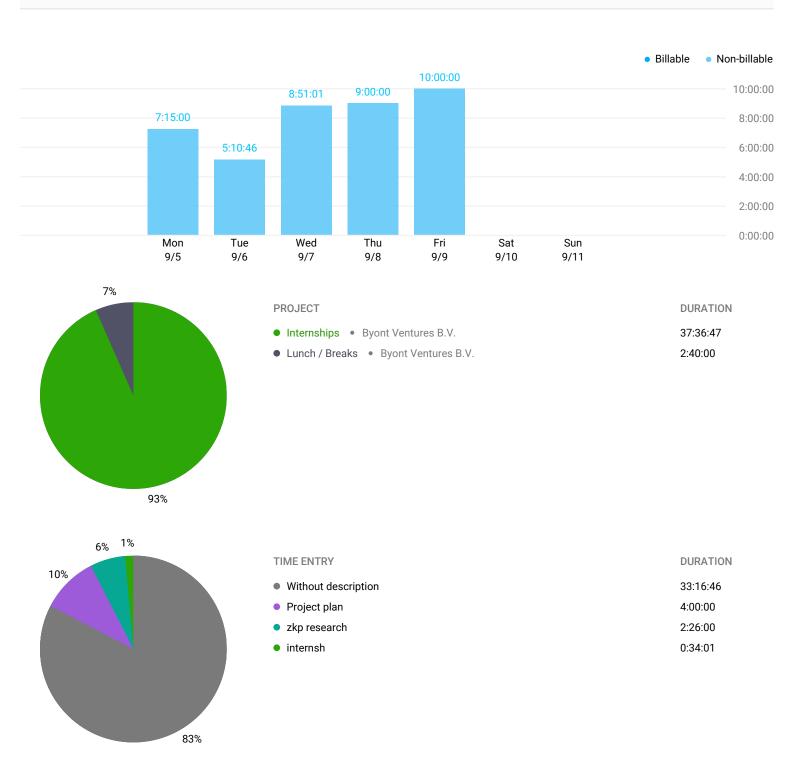
Next week:

ZK-Proofs general research presentation, start deeper research into ZK-Proofs

09/05/2022 - 09/11/2022

TOTAL HOURS

40:16:47



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	37:36:47	-	93.38%
internsh	0:34:01	_	1.41%
Project plan	4:00:00	_	9.93%
zkp research	2:26:00	_	6.04%
Without description	30:36:46	_	76.0%
Lunch / Breaks	2:40:00	_	6.62%
Without description	2:40:00	-	6.62%

What has been done:

- Onboarding
- Initial draft of a Project Plan
- Start research on ZK-Proofs

I had feedback on project plan and what first deliverable could be. Here is the notes after the week:

- We can try to look at Polkadot.
- Write a lot of documentation telling what we learned, how everything works and etc.
- Think about writing blogs on LinkedIn about ZKP
- Think about having a half-hour meeting with Byont every week to explain what we learned and how it works, etc.
- Try to do general research on our for us both to realise how everything works; make more deep research separately; make blogs together
- While writing articles we can have a series of those, where we link them in case we explained something that is worth mentioning in previous articles. We could also begin with general ZKP research and then go deeper while writing the whole series of articles.
- Deliverables for the end of the week: finish Project Plan, conduct general research separately, make a first (draft version of) blog.

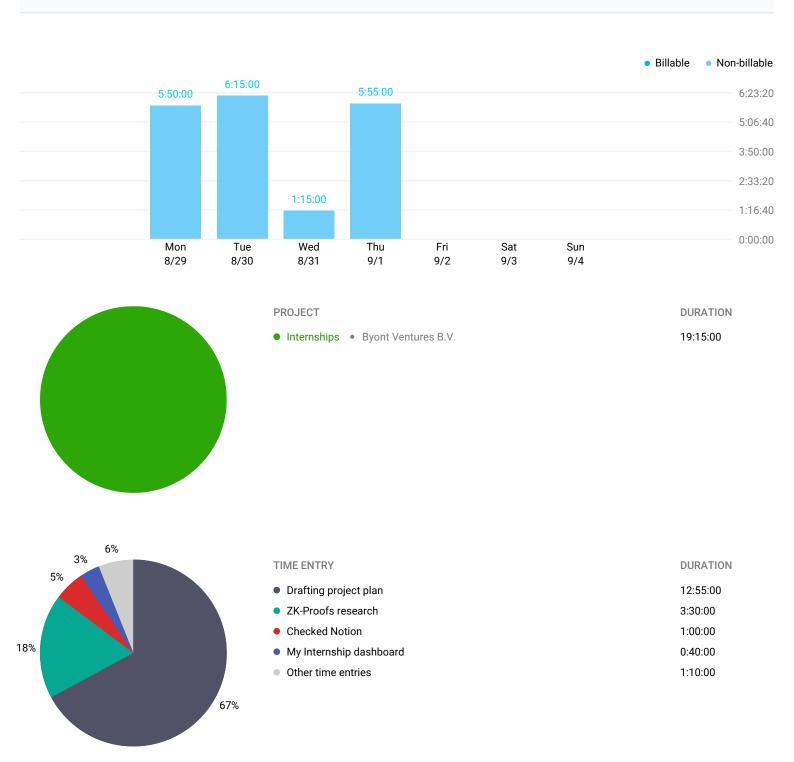
Next week:

Work on project plan and fix main research question and sub-questions

08/29/2022 - 09/04/2022

TOTAL HOURS

19:15:00



PROJECT - TIME ENTRY	DURATION	AMOUNT	PERCENTAGE
 Internships Byont Ventures B.V. 	19:15:00	-	100.0%
Checked Notion	1:00:00	-	5.19%
Drafting project plan	12:55:00	_	67.1%
Meeting with Eric	0:30:00	-	2.6%
My Internship dashboard	0:40:00	_	3.46%
Onboarding	0:40:00	_	3.46%
ZK-Proofs research	3:30:00	_	18.18%