

The outcomes of Blockchain Challenge Program

Sony Corporation

as of April 23rd, 2020

Table of Contents

- 1. Blockchain Challenge Program Overview**
- 2. Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 - Blockchain Common DB Overview
 - Feasibility Test Result Overview
 - One day feasibility test result
 - 3days continuous feasibility test result
 - Evaluation result
- 3. What Blockchain means for trustworthy solution**
- 4. Lessons Learned from the outcomes of Blockchain Challenge Program**

Table of Contents

- 1. Blockchain Challenge Program Overview**
- 2. Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 - Blockchain Common DB Overview
 - Feasibility Test Result Overview
 - One day feasibility test result
 - 3days continuous feasibility test result
 - Evaluation result
- 3. What Blockchain means for trustworthy solution**
- 4. Lessons Learned from the outcomes of Blockchain Challenge Program**

Blockchain Challenge Program Overview 1/3

MaaS-pilots in the Netherlands

- The main purpose of the pilots is to learn. It is expected that during the course of the pilots more insights will be gained into what a suitable form of governance is for the MaaS ecosystem. If the conceptual promises of MaaS are fulfilled in practice, there will be many opportunities for more data-driven mobility policy, more efficient utilization and the achievement of other policy goals, such as those concerning target group-oriented transport.
- At this stage, however, the Ministry fully acknowledges that these are pilots and, in pilots, things may also go wrong in order to learn from them. This concerns the emergence of a new platform economy, as platforms can lead to (positive and negative) effects. The MaaS program will monitor the situation and impacts closely.

Blockchain Challenge Program Overview 2/3

Goal of the Blockchain Challenge

- Learning by doing is clearly a central goal in the MaaS pilots of the Ministry, this philosophy is extended to other fields that will relate to MaaS implementation in the future.
- Blockchain may be one of the potential disrupting technologies that can contribute to the successful (future) operation of a MaaS ecosystem. Especially for those functions which require trust to be established in transactions between different (competing) stakeholders, Blockchain could offer a trustworthy solution.
- Transactions that are considered privacy- or financially sensitive normally require complex arrangements to be in place between stakeholders before any data exchange can take place. The Ministry encourages companies to do experiments with Blockchain solutions that would standardize the conditions and facilitate the exchange of this kind of data between stakeholders in the MaaS ecosystem. Also, the technological challenge of processing high transaction volumes at very low latencies is a subject of interest, for MaaS-related transactions for the Netherlands.
- The Blockchain Challenge offers a platform for companies willing to run feasibility tests in the MaaS ecosystem and to present their Blockchain solutions to the Ministry of Infrastructure and Water Management.

Blockchain Challenge Program Overview 3/3

● The data string transaction format within the Ecosystem

- In the MaaS ecosystem, transactions between stakeholders will be registered and processed through a standardized data string, with the following definition:



The following elements are included in the complete data string:

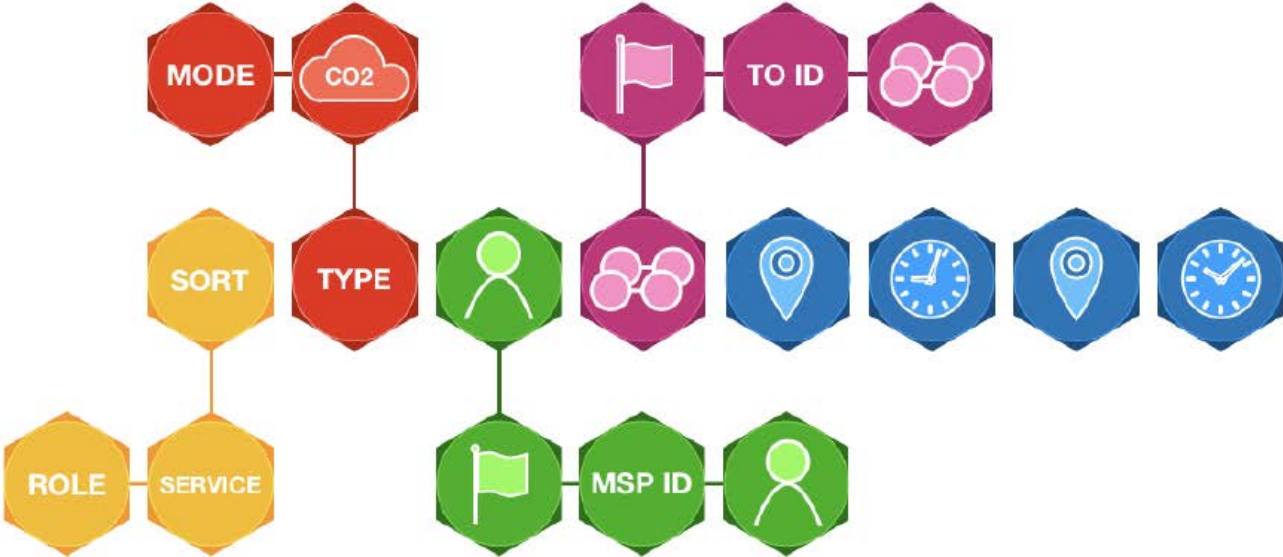
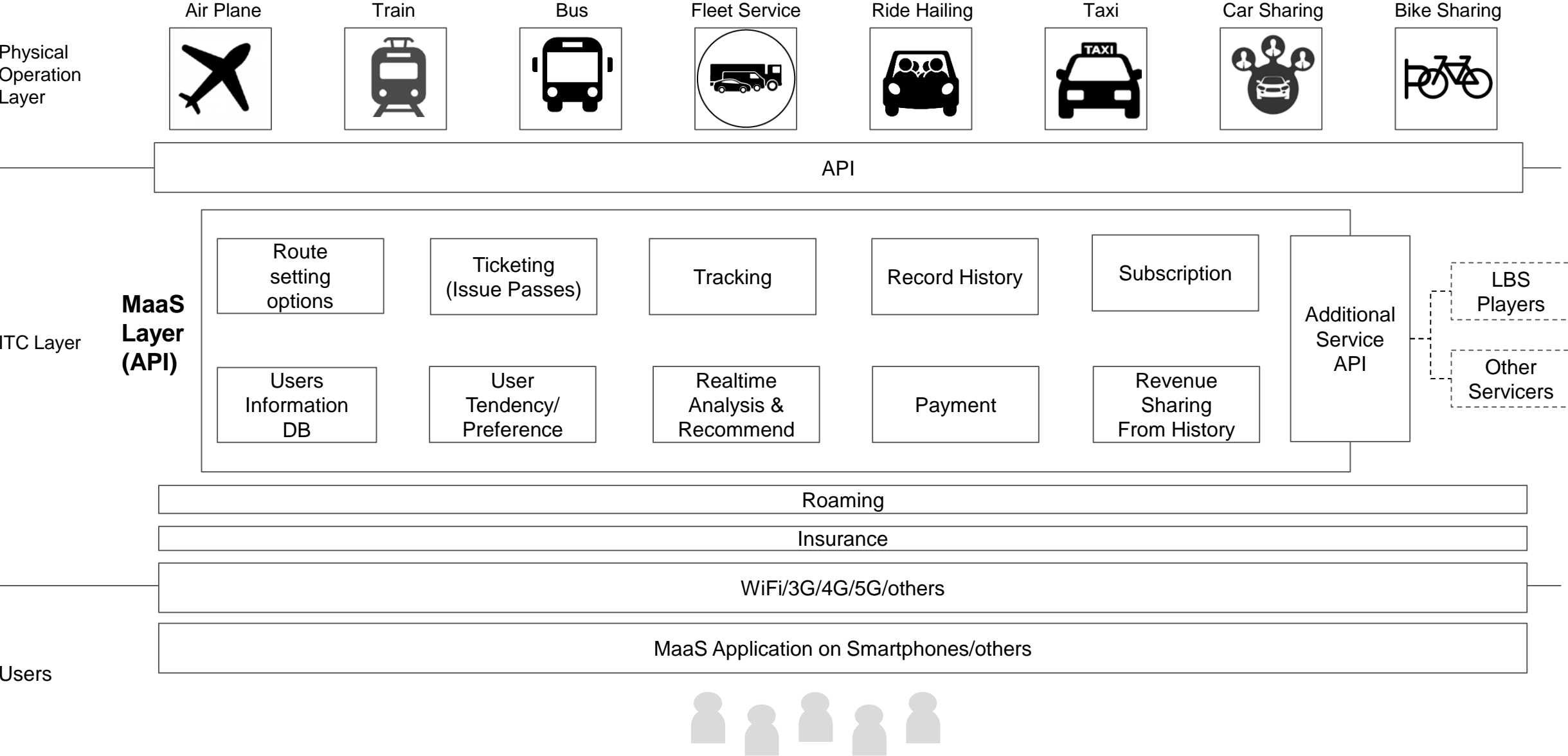


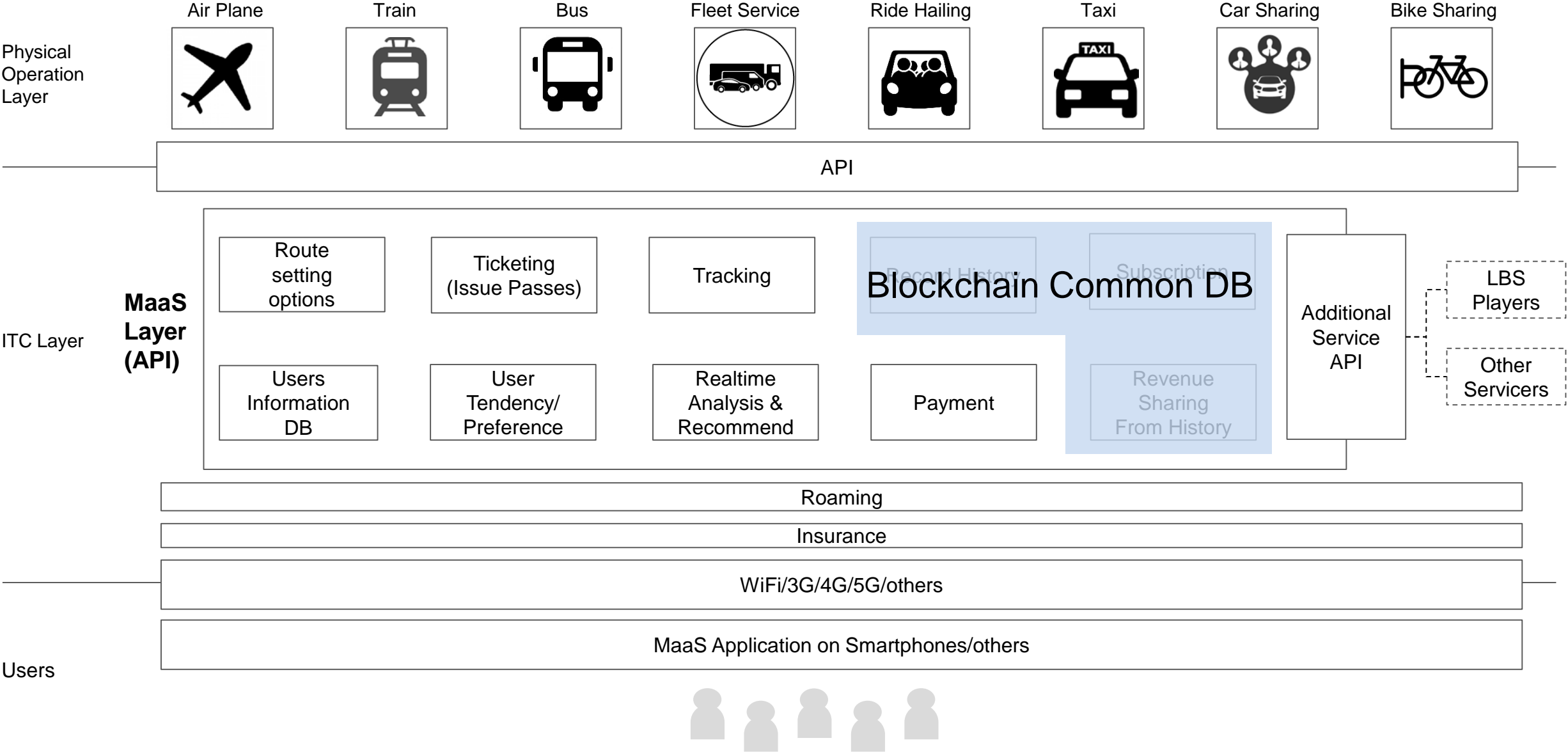
Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

MaaS Industry Analysis



MaaS Industry Analysis & Blockchain Common DB



How Blockchain Common DB works

2. Utilizing transaction record with respective ownership

- MP can utilize transaction data in MP node.
- MaaS can aggregate and utilize each transaction data.

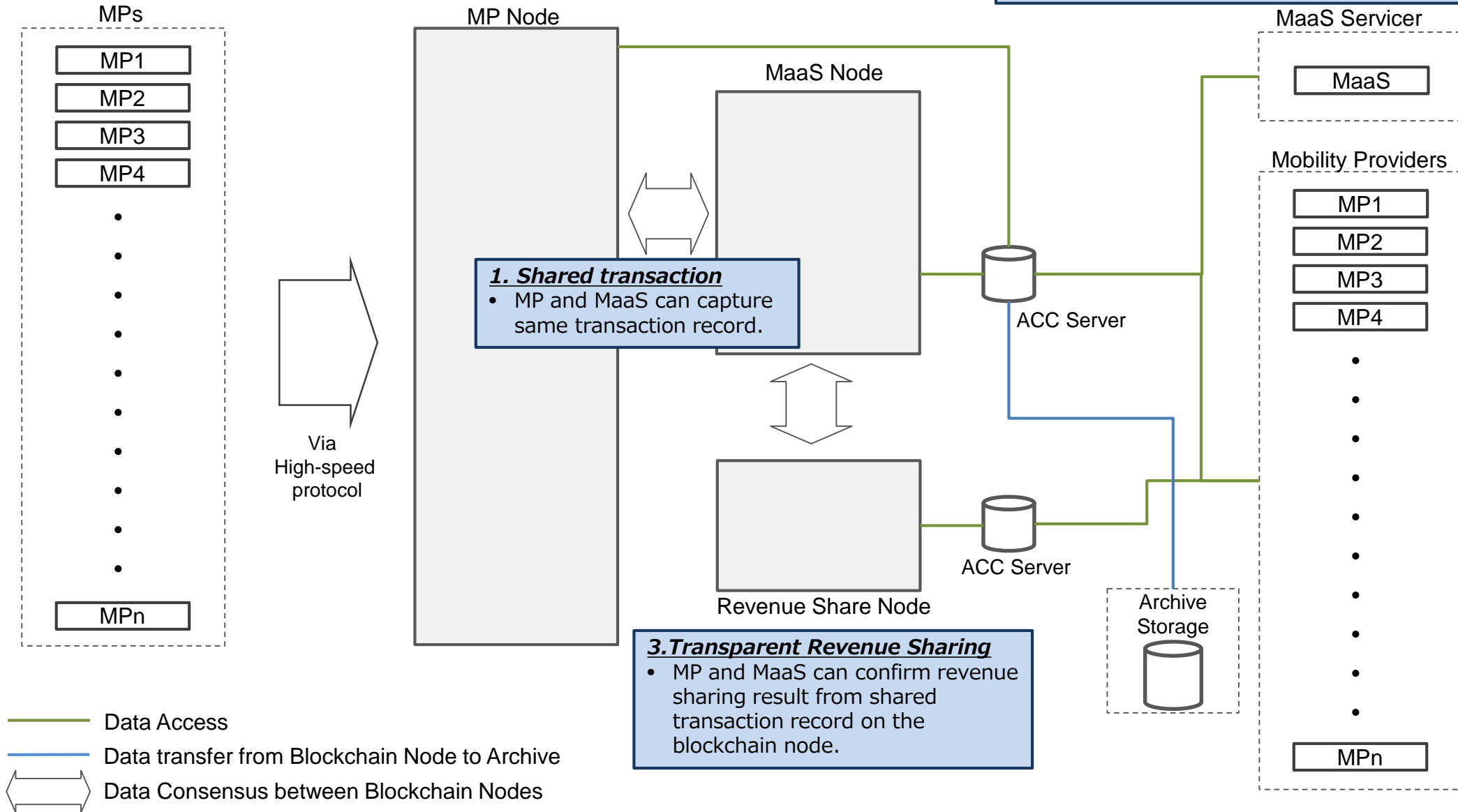


Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

Performance Test Scenario

- Created data set (CSV) for transaction performance test where the number of records is 7 million records/day.
- Set up high speed protocol and Blockchain nodes.
- Prepared CSV test data for transactions to be sent every hour for 18 hours, from 6:00 to 24:00 (UTC +0).
- During the active time period, transactions were sent and the Blockchain nodes processed all transaction requests.
- Transactions were processed among MP and MaaS nodes, i.e., the same transaction must be recorded by both MP and MaaS nodes.
- Captured the start and end time of each Blockchain transaction as performance test results.

Number of test records by hour

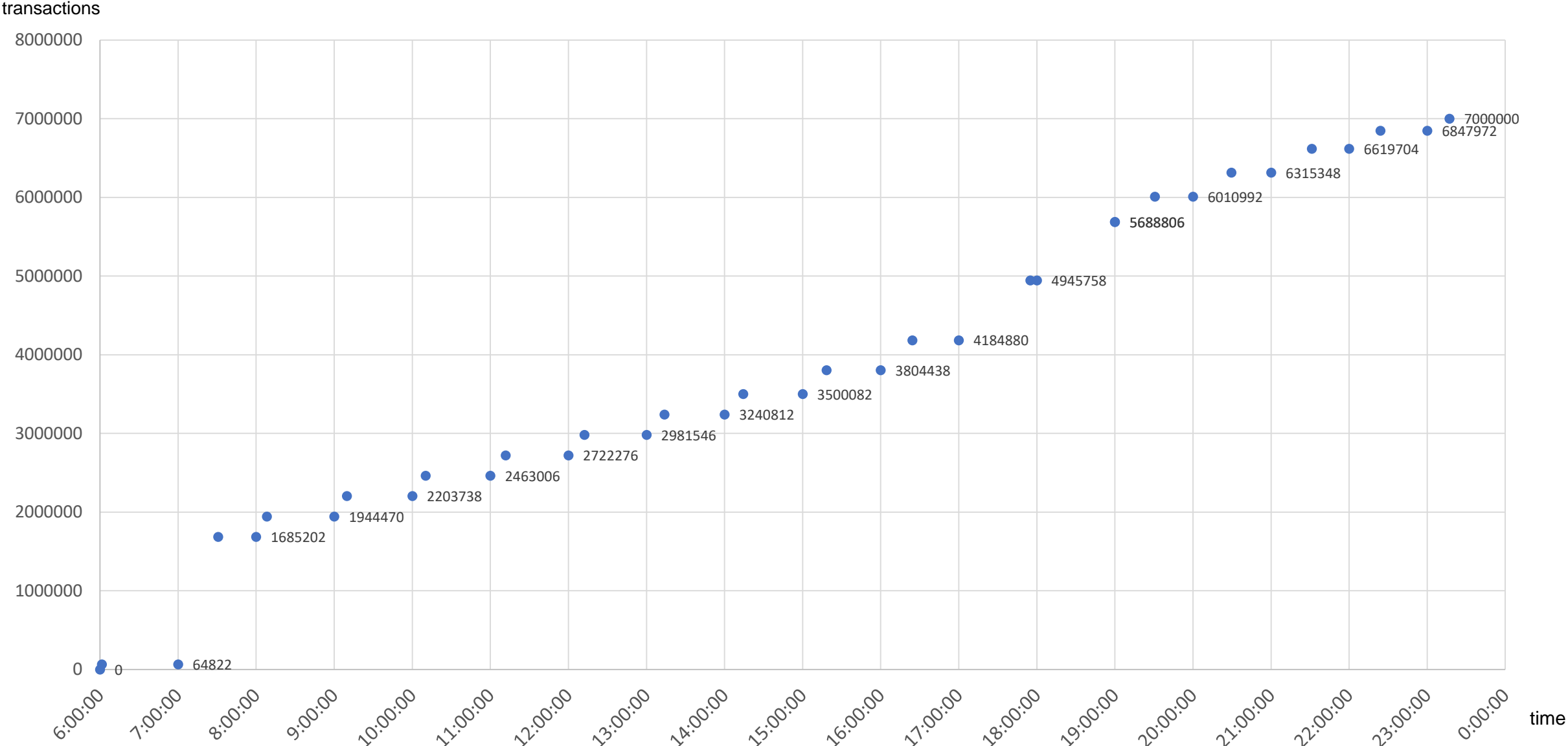
A total of 7 million transaction requests were sent over 18 hours.

hour	# of records	Percentage(%)
6	64822	0.926028571
7	1620380	23.14828571
8	259268	3.703828571
9	259268	3.703828571
10	259268	3.703828571
11	259270	3.703857143
12	259270	3.703857143
13	259266	3.7038
14	259270	3.703857143
15	304356	4.347942857
16	380442	5.434885714
17	760878	10.86968571
18	760878	10.86968571
19	304356	4.347942857
20	304356	4.347942857
21	304356	4.347942857
22	228268	3.260971429
23	152028	2.171828571
total	7000000	100

Morning rush hour

Evening rush hour

Blockchain Common DB Total Transaction Processing for Feb 11th



Performance Result for Feb 11th

Time Range	Start Time	End Time	Duration(minutes)	Total Records
0600-0700	2020-02-11 06:00:34,075	2020-02-11 06:01:26,057	00:52.0	64822
0700-0800	2020-02-11 07:00:56,220	2020-02-11 07:30:47,690	29:51.0	1620380
0800-0900	2020-02-11 08:00:31,969	2020-02-11 08:08:10,350	07:39.0	259268
0900-1000	2020-02-11 09:00:57,096	2020-02-11 09:09:40,128	08:43.0	259268
1000-1100	2020-02-11 10:00:32,233	2020-02-11 10:10:18,965	09:46.0	259268
1100-1200	2020-02-11 11:00:57,208	2020-02-11 11:11:41,306	10:44.0	259270
1200-1300	2020-02-11 12:00:32,489	2020-02-11 12:12:17,071	11:45.0	259270
1300-1400	2020-02-11 13:00:57,458	2020-02-11 13:13:44,866	12:47.0	259266
1400-1500	2020-02-11 14:00:32,709	2020-02-11 14:14:17,319	13:45.0	259270
1500-1600	2020-02-11 15:00:57,700	2020-02-11 15:18:22,412	17:25.0	304356
1600-1700	2020-02-11 16:00:32,997	2020-02-11 16:24:20,926	23:48.0	380442
1700-1800	2020-02-11 17:00:58,007	2020-02-11 17:54:54,237	53:56.0	760878
1800-1900	2020-02-11 18:00:33,439	2020-02-11 18:59:59,990	59:26.0	743048
1900-2000	2020-02-11 19:00:00,118	2020-02-11 19:30:44,164	30:44.0	322186
2000-2100	2020-02-11 20:00:33,923	2020-02-11 20:29:30,651	28:57.0	304356
2100-2200	2020-02-11 21:00:59,051	2020-02-11 21:31:15,161	30:16.0	304356
2200-2300	2020-02-11 22:00:34,266	2020-02-11 22:24:02,633	23:28.0	228268
2300-2400	2020-02-11 23:00:59,267	2020-02-11 23:17:08,834	16:09.0	152028
				7000000

Transaction Dashboard for Feb 11th

Pass Transaction Summary

Date : 2020-02-11
Start Time : 06:00 UTC +0
Current Time : 6:03:10 UTC +0
Total No of Transactions : 7,000,000
No Of GetIn Transaction : 3,500,000
No Of GetOut Transaction : 3,500,000
Total amount of sales: 8,737,195,780

Recent transactions

Token Number	Mobility Provider	Amount	Get In Time	Start - Latitude & Longitude	Get Out Time	End - Latitude & Longitude
8b64bc38f5b...	3	1660	2020-02-11T23:53:59	0 : 4.73331	2020-02-11T23:59:59	0 : 4.73331
5be096238f2...	1	500	2020-02-11T23:53:59	0 : 4.73331	2020-02-11T23:59:59	0 : 4.73331
7267f1c4709...	42	1640	2020-02-11T23:53:59	0 : 4.73331	2020-02-11T23:59:59	0 : 4.73331

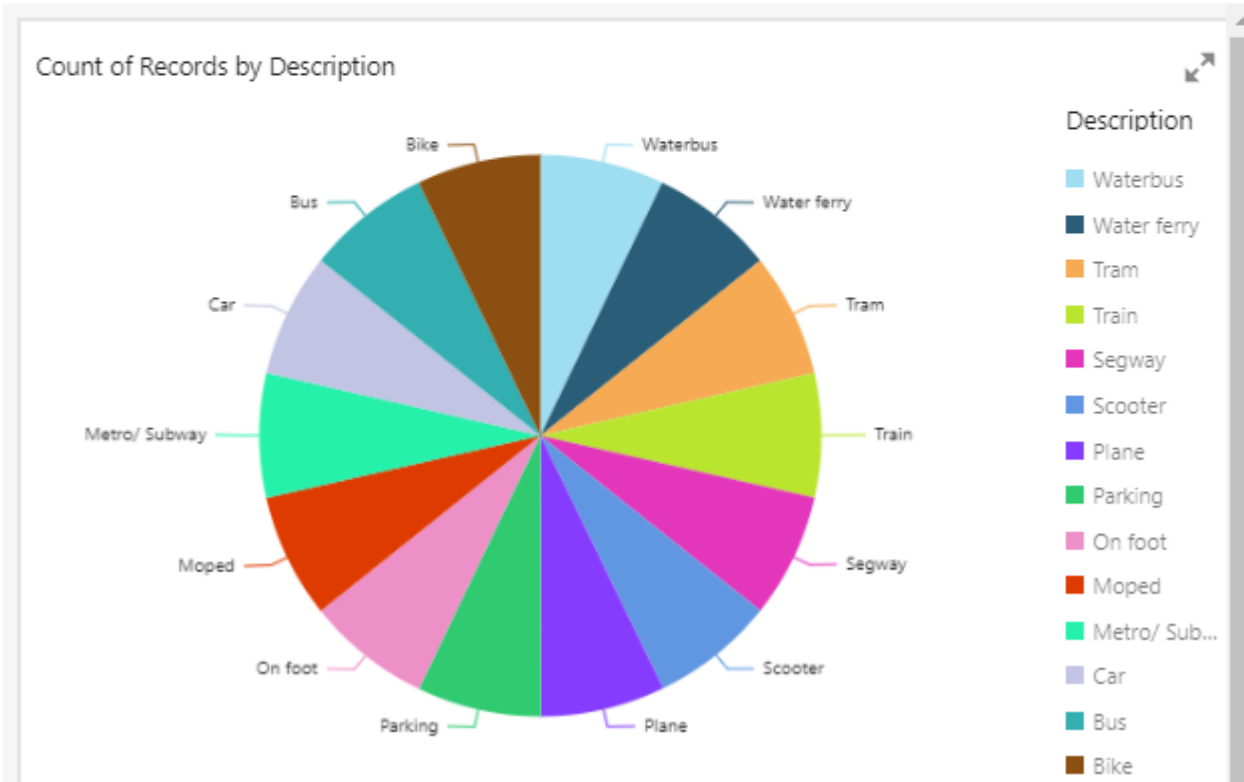
Transportation Dashboard Breakdown for Feb 11th

Visualization example: further changes to be discussed based on industry needs/requirements

Transport Summary

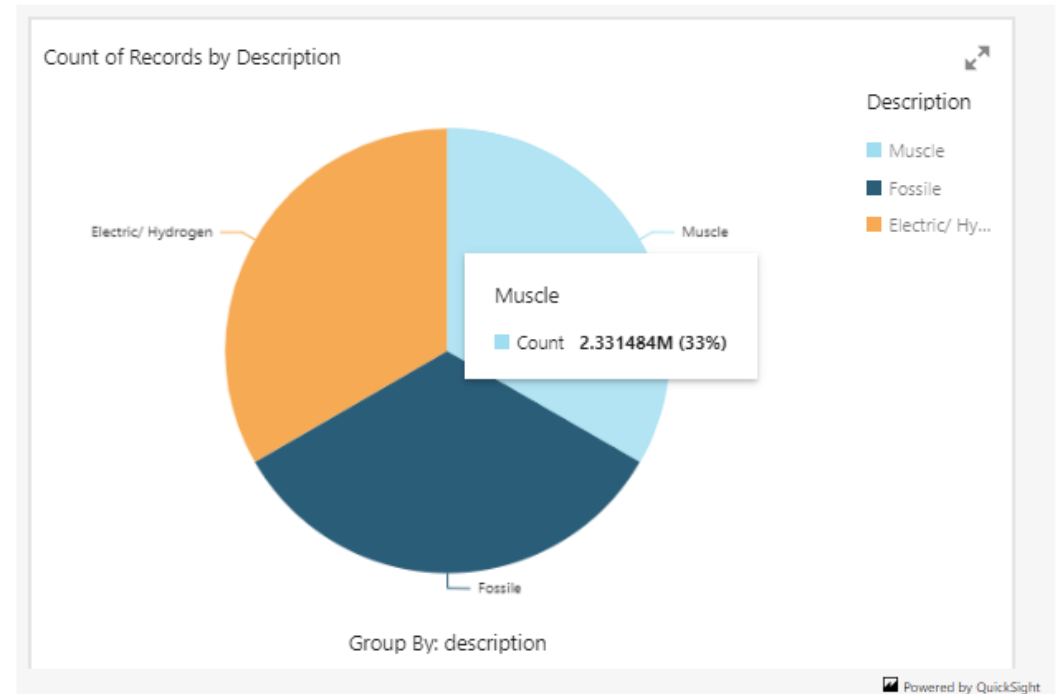
Sort Mode **Energy Label**

Undo Redo



Sort Mode **Energy Label**

Undo Redo



Powered by QuickSight

Revenue Sharing Dashboard Breakdown for Feb 11th

Visualization example: further changes to be discussed based on industry needs/requirements

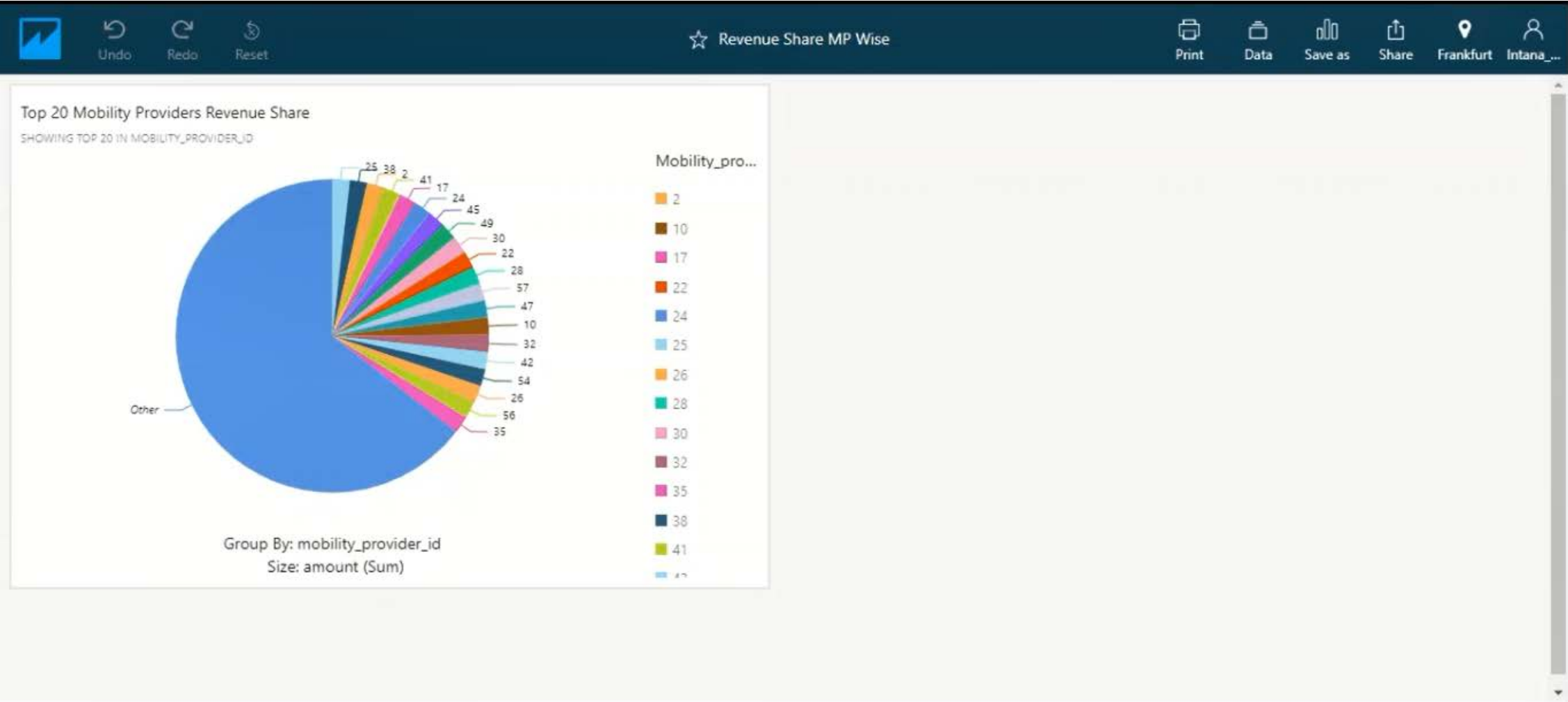
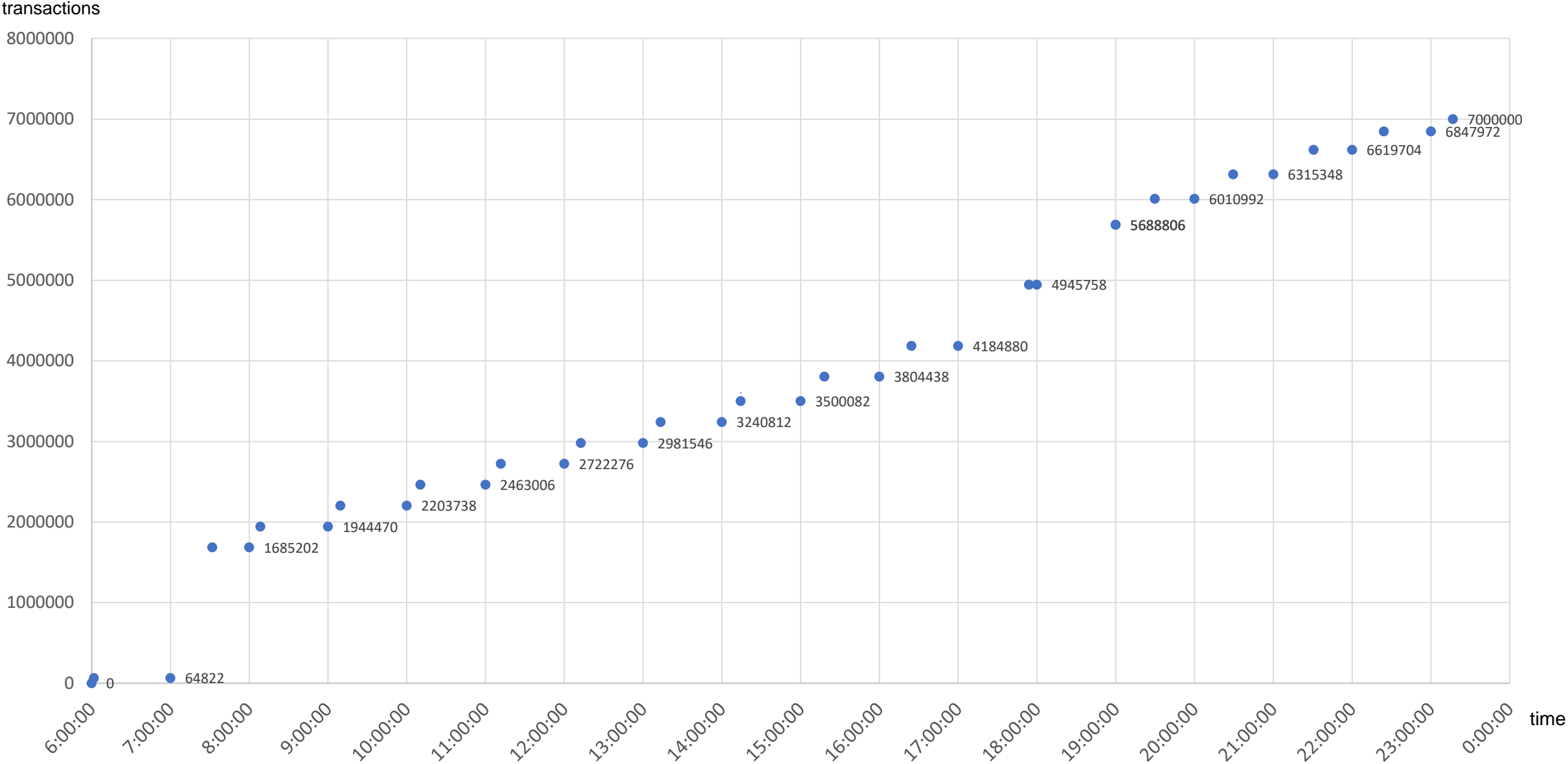


Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

Blockchain Common DB Total Transaction Processing for Mar 4th



Performance Result for Mar 4th

TimeRange	Start Time	End Time	Duration(minutes)	Toral Records
0600-0700	06:00:50.045	06:01:45.033	00:00:54.988	64822
0700-0800	07:00:50.718	07:31:54.337	00:31:03.619	1685202
0800-0900	08:00:47.832	08:08:32.568	00:07:44.736	1944470
0900-1000	09:00:51.325	09:09:25.838	00:08:34.513	2203738
1000-1100	10:00:48.069	10:10:28.110	00:09:40.041	2463006
1100-1200	11:00:51.649	11:11:38.439	00:10:46.790	2722276
1200-1300	12:00:48.230	12:12:37.840	00:11:49.610	2981546
1300-1400	13:00:51.895	13:13:26.629	00:12:34.734	3240812
1400-1500	14:00:48.498	14:14:17.308	00:13:28.810	3500082
1500-1600	15:00:52.085	15:18:04.189	00:17:12.104	3804438
1600-1700	16:00:48.693	16:24:21.876	00:23:33.183	4184880
1700-1800	17:00:52.394	17:53:57.287	00:53:04.893	4945758
1800-1900	18:00:49.058	18:59:59.988	00:59:10.930	5688806
1900-2000	19:00:00.024	19:29:45.402	00:29:45.378	6010992
2000-2100	20:00:49.520	20:29:30.899	00:28:41.379	6315348
2100-2200	21:00:53.114	21:30:42.051	00:29:48.937	6619704
2200-2300	22:00:49.706	22:24:11.873	00:23:22.167	6847972
2300-2400	23:00:53.251	23:16:50.146	00:15:56.895	7000000

Transaction Dashboard for Mar 4th

Pass Transaction Summary

Date : 2020-03-04

Start Time : 06:00 UTC +0

Current Time : 3:56:18 UTC +0

Total No of Transactions : 7,000,000

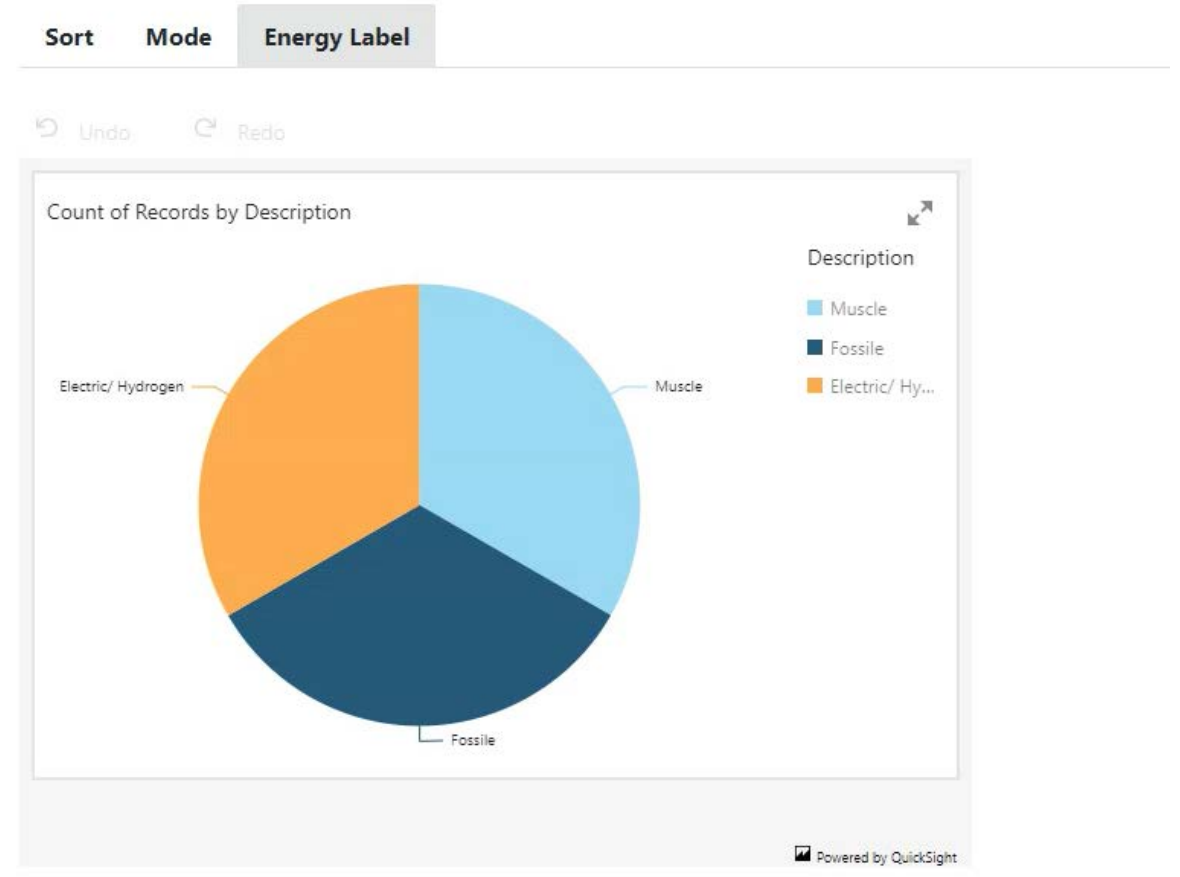
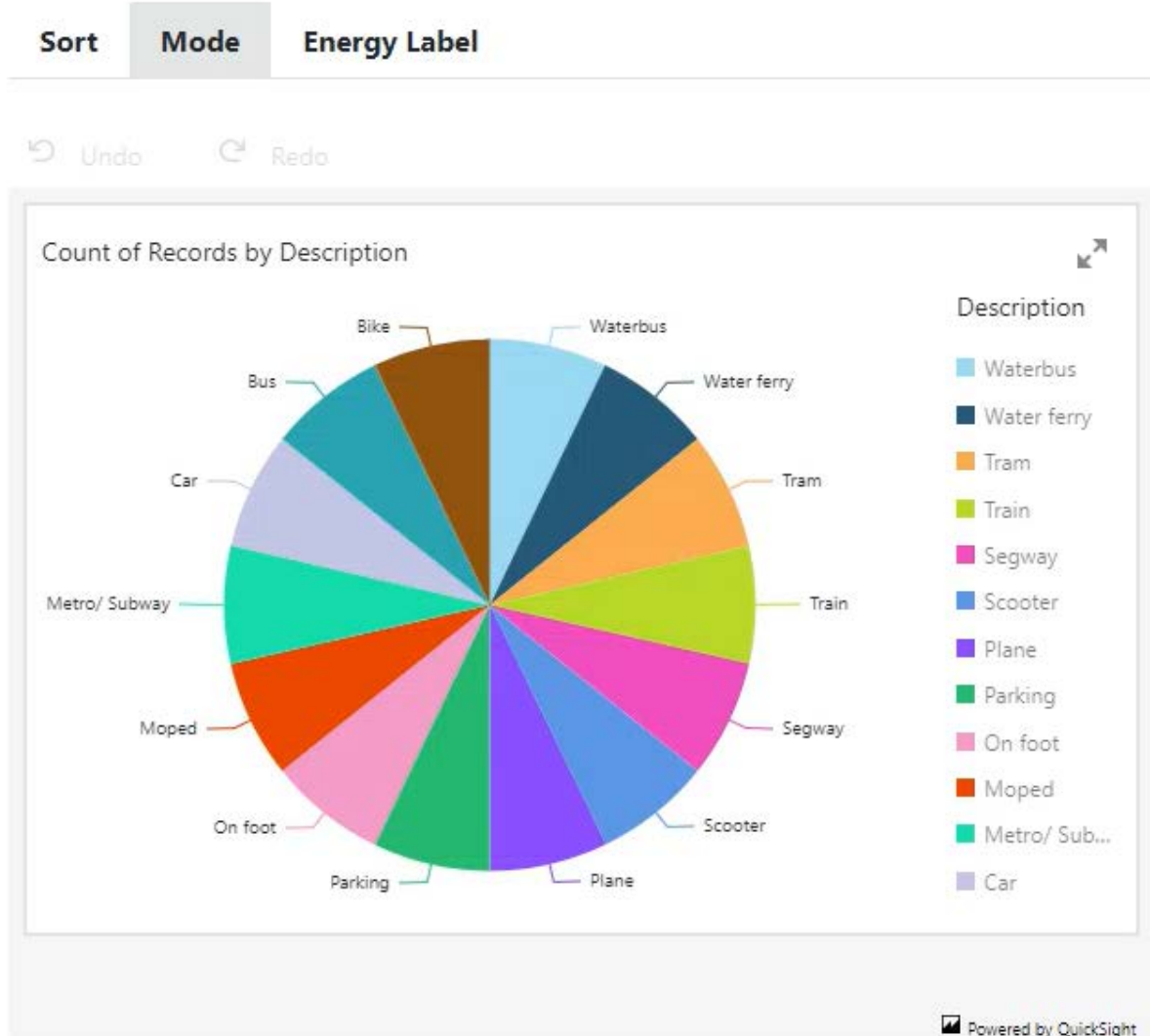
No Of GetIn Transaction : 3,500,000

No Of GetOut Transaction : 3,500,000

Total amount of sales: 8,737,195,780

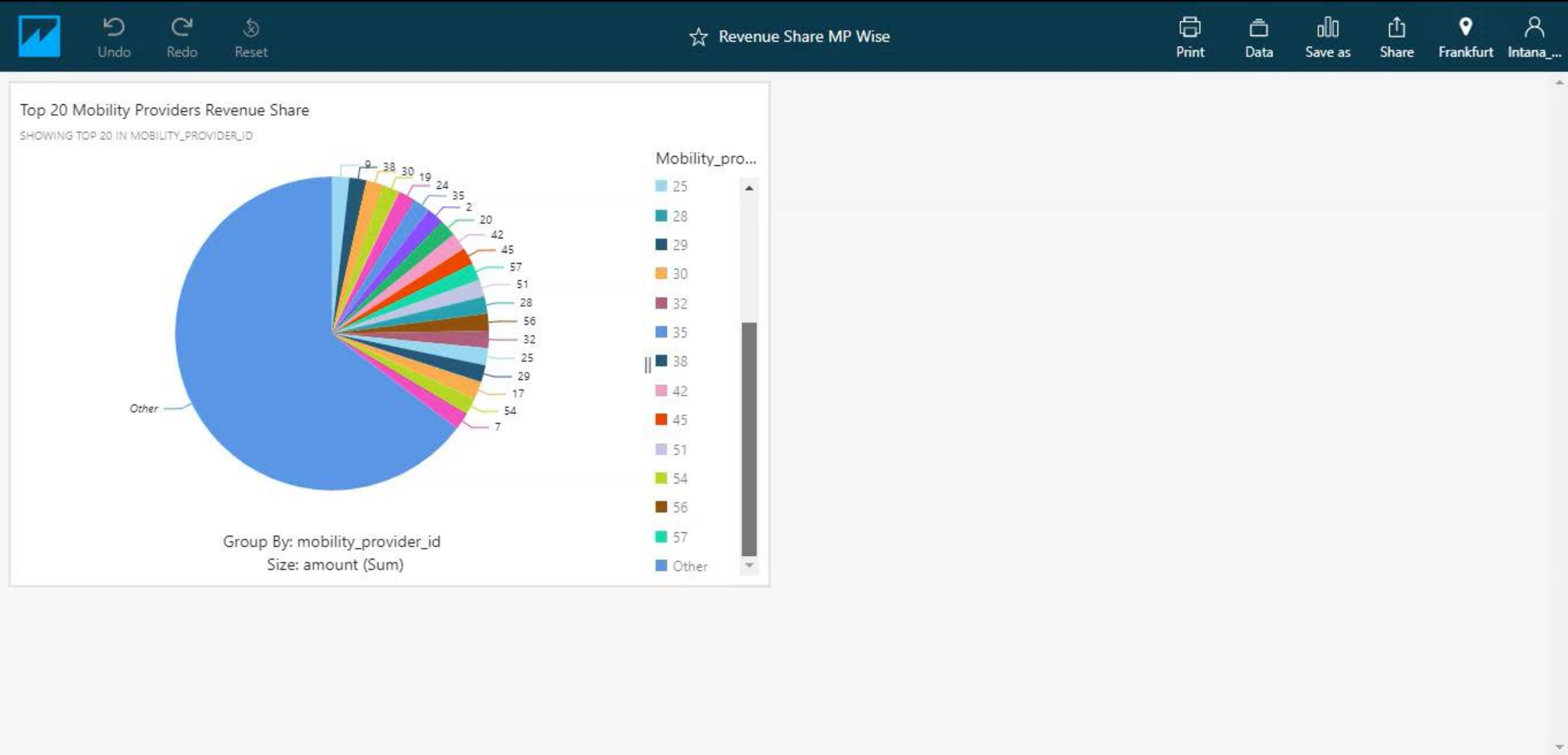
Transportation Dashboard Breakdown for Mar 4th

Visualization example: further changes to be discussed based on industry needs/requirements

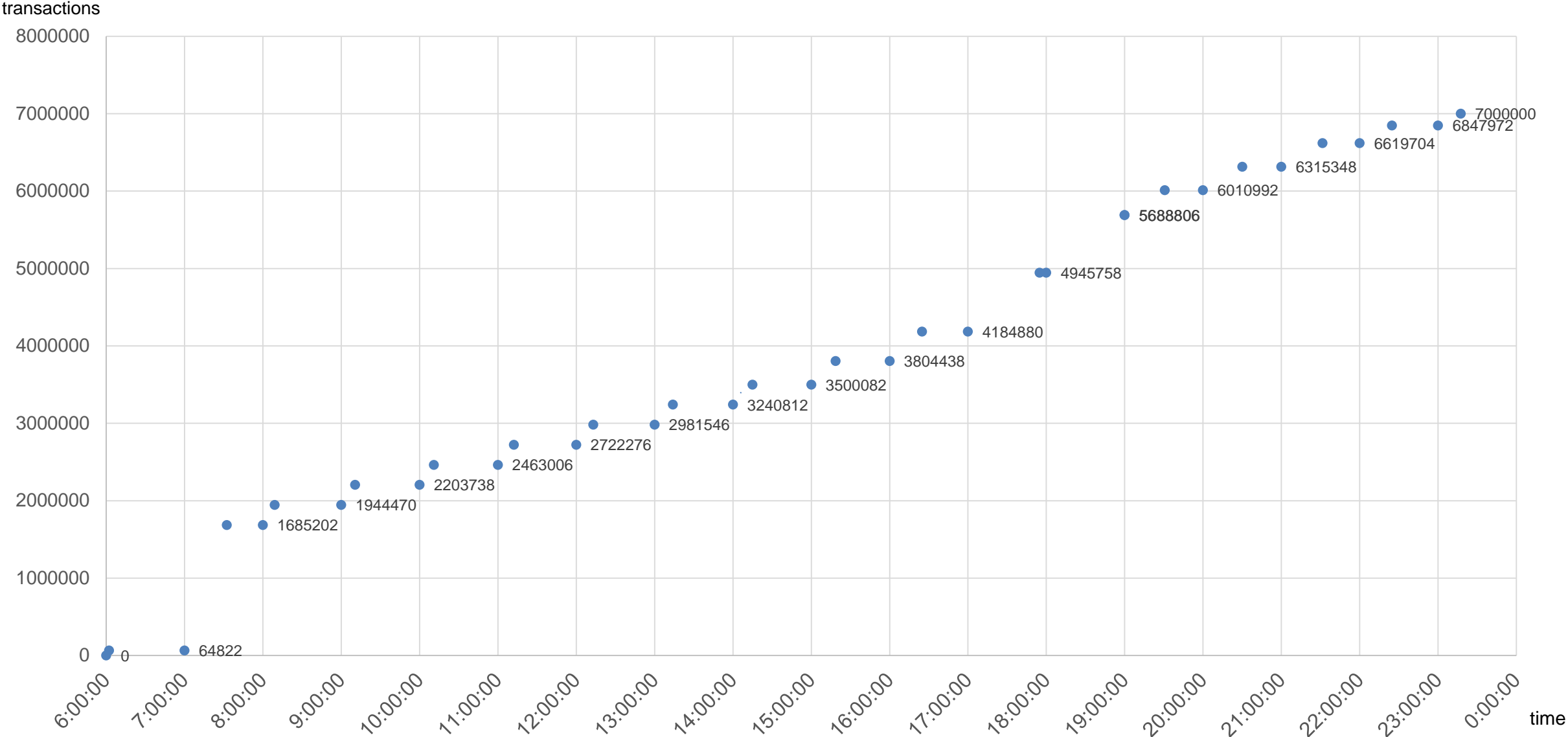


Revenue Sharing Dashboard Breakdown for Mar 4th

Visualization example: further changes to be discussed based on industry needs/requirements



Blockchain Common DB Total Transaction Processing for Mar 5th



Performance Result for Mar 5th

Time Range	Start Time	End Time	Duration(minutes)	Toral Records
0600-0700	06:01:22.422	06:02:12.587	00:00:50.165	64822
0700-0800	07:01:25.444	07:32:21.967	00:30:56.523	1685202
0800-0900	08:01:20.470	08:09:03.193	00:07:42.723	1944470
0900-1000	09:01:26.175	09:10:00.375	00:08:34.200	2203738
1000-1100	10:01:20.683	10:11:04.646	00:09:43.963	2463006
1100-1200	11:01:26.403	11:12:13.860	00:10:47.457	2722276
1200-1300	12:01:20.893	12:13:09.067	00:11:48.174	2981546
1300-1400	13:01:26.591	13:14:01.454	00:12:34.863	3240812
1400-1500	14:01:21.107	14:14:56.504	00:13:35.397	3500082
1500-1600	15:01:26.826	15:18:34.625	00:17:07.799	3804438
1600-1700	16:01:21.306	16:24:48.730	00:23:27.424	4184880
1700-1800	17:01:27.055	17:54:50.349	00:53:23.294	4945758
1800-1900	18:01:21.738	18:59:59.987	00:58:38.249	5688806
1900-2000	19:00:00.005	19:30:43.476	00:30:43.471	6010992
2000-2100	20:01:22.089	20:30:05.795	00:28:43.706	6315348
2100-2200	21:01:27.802	21:31:33.797	00:30:05.995	6619704
2200-2300	22:01:22.333	22:24:39.160	00:23:16.827	6847972
2300-2400	23:01:27.983	23:17:21.412	00:15:53.429	7000000

Transaction Dashboard for Mar 5th

Pass Transaction Summary

Date : 2020-03-05

Start Time : 06:00 UTC +0

Current Time : 23:42:12 UTC +0

Total No of Transactions : 7,000,000

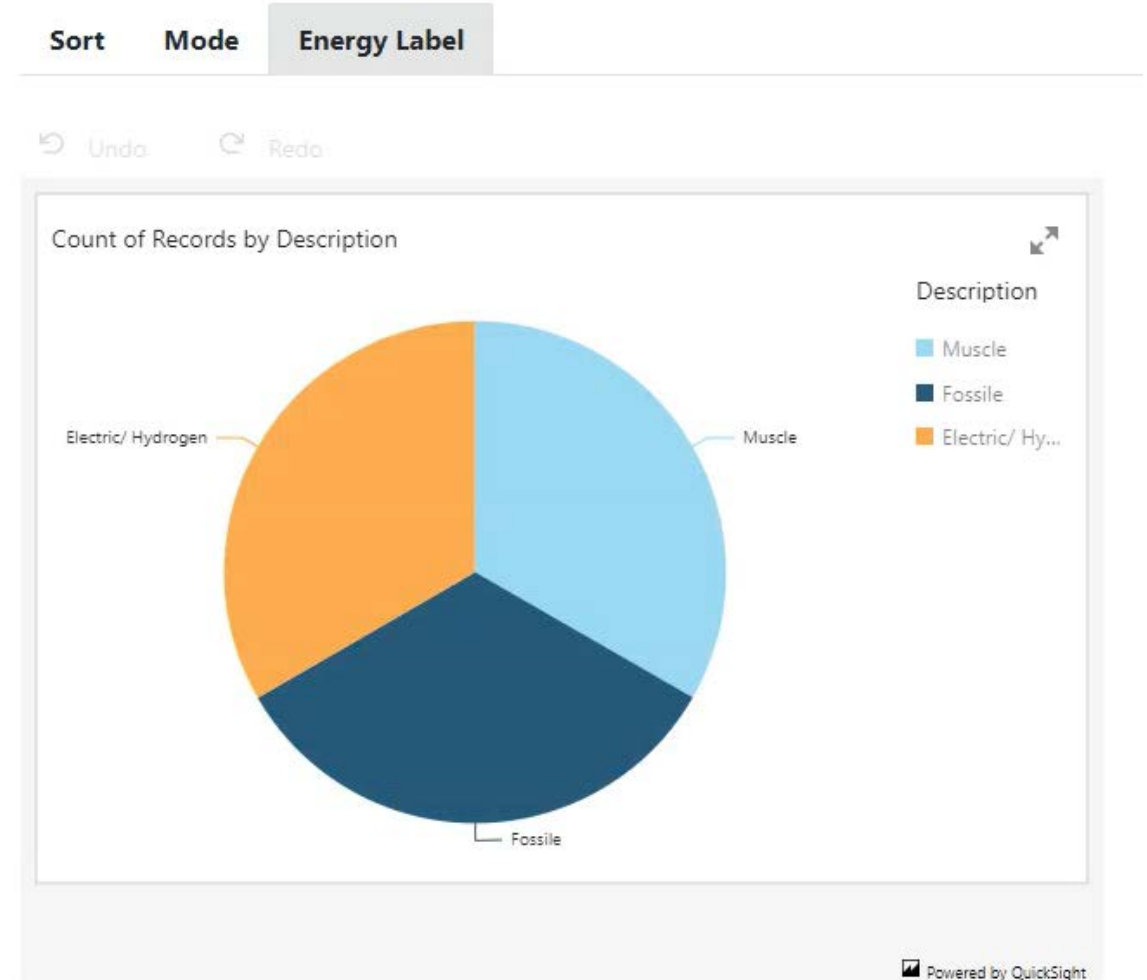
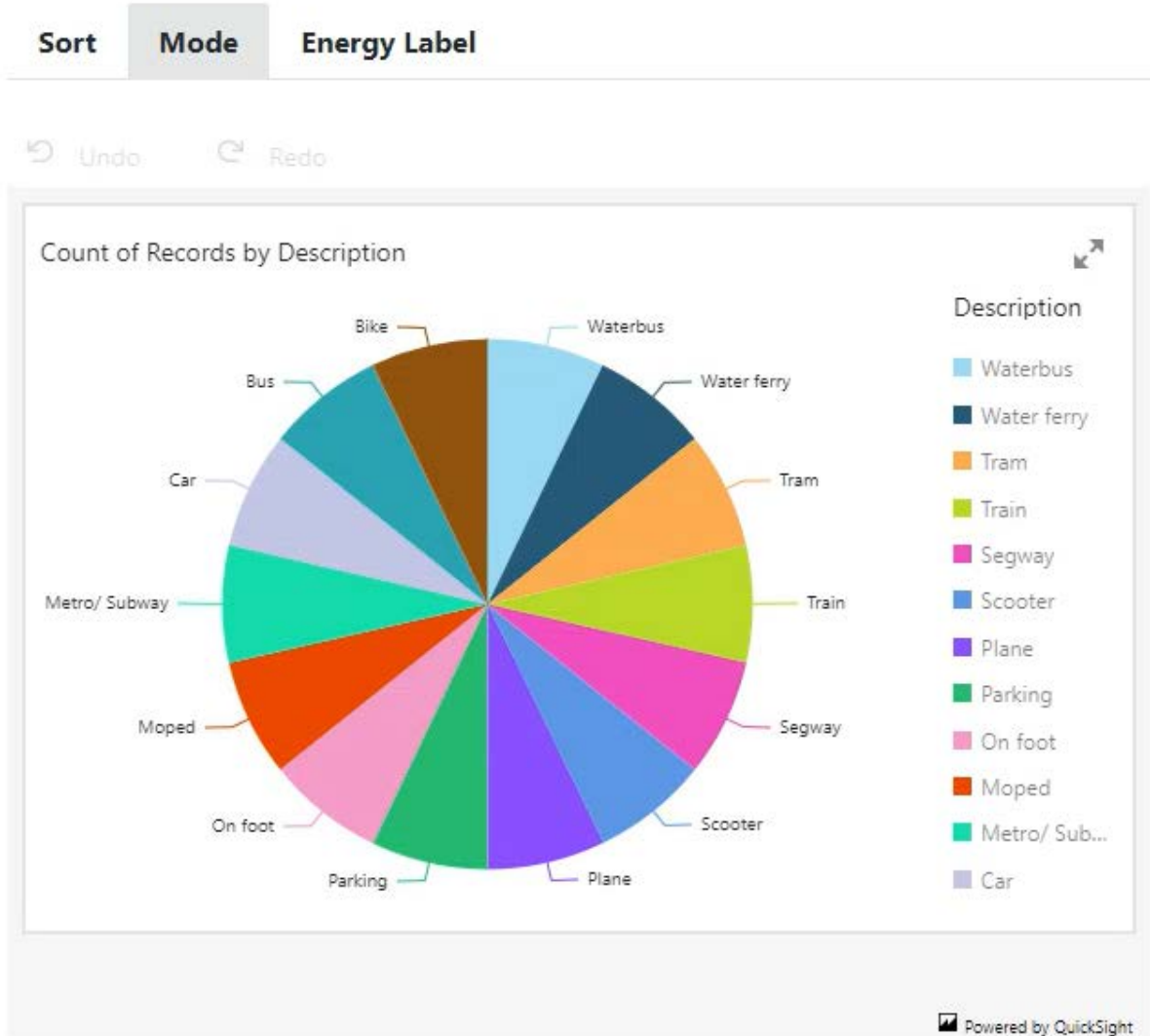
No Of GetIn Transaction : 3,500,000

No Of GetOut Transaction : 3,500,000

Total amount of sales: 8,737,195,780

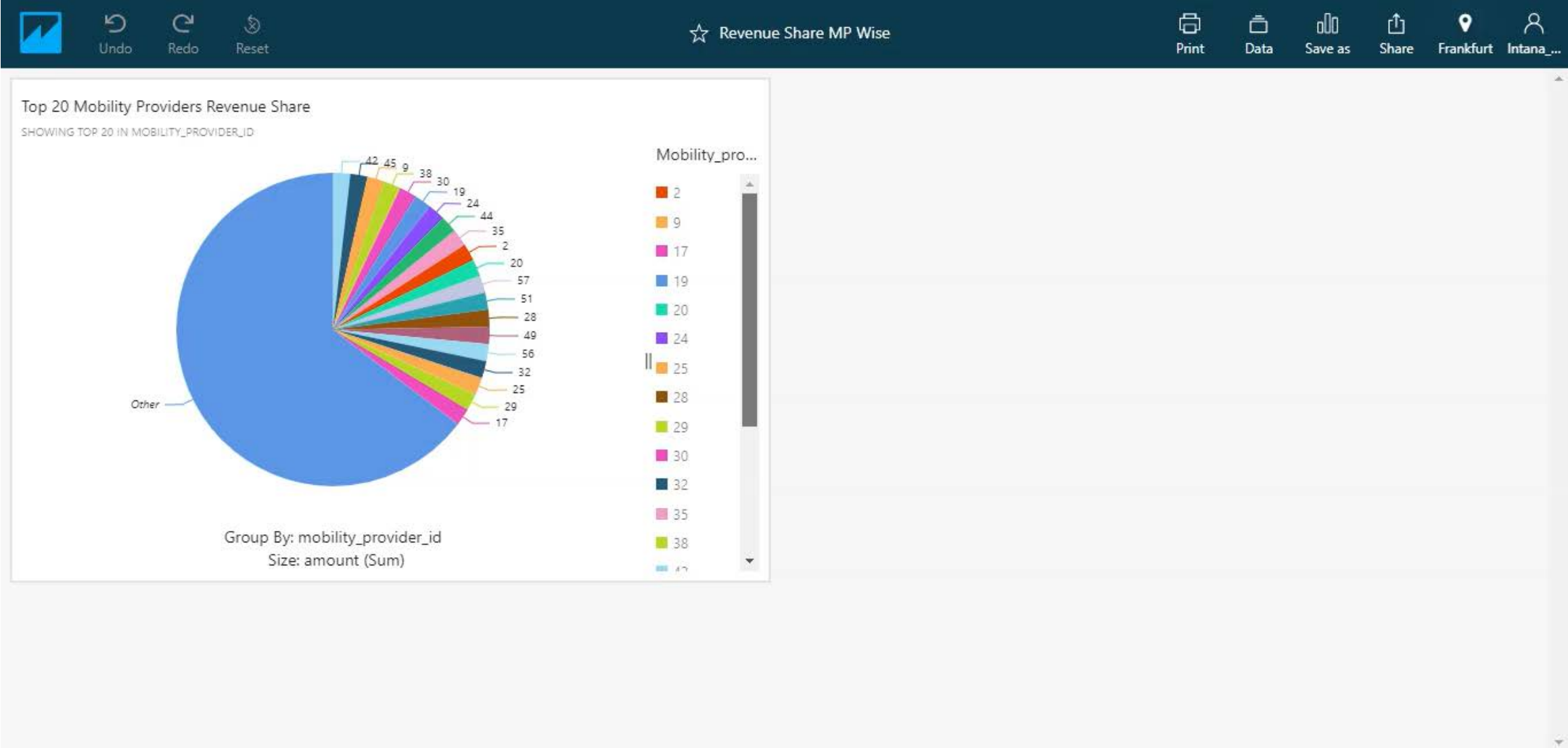
Transportation Dashboard Breakdown for Mar 5th

Visualization Example: it would be improved from discussion for the industry's needs/requirements

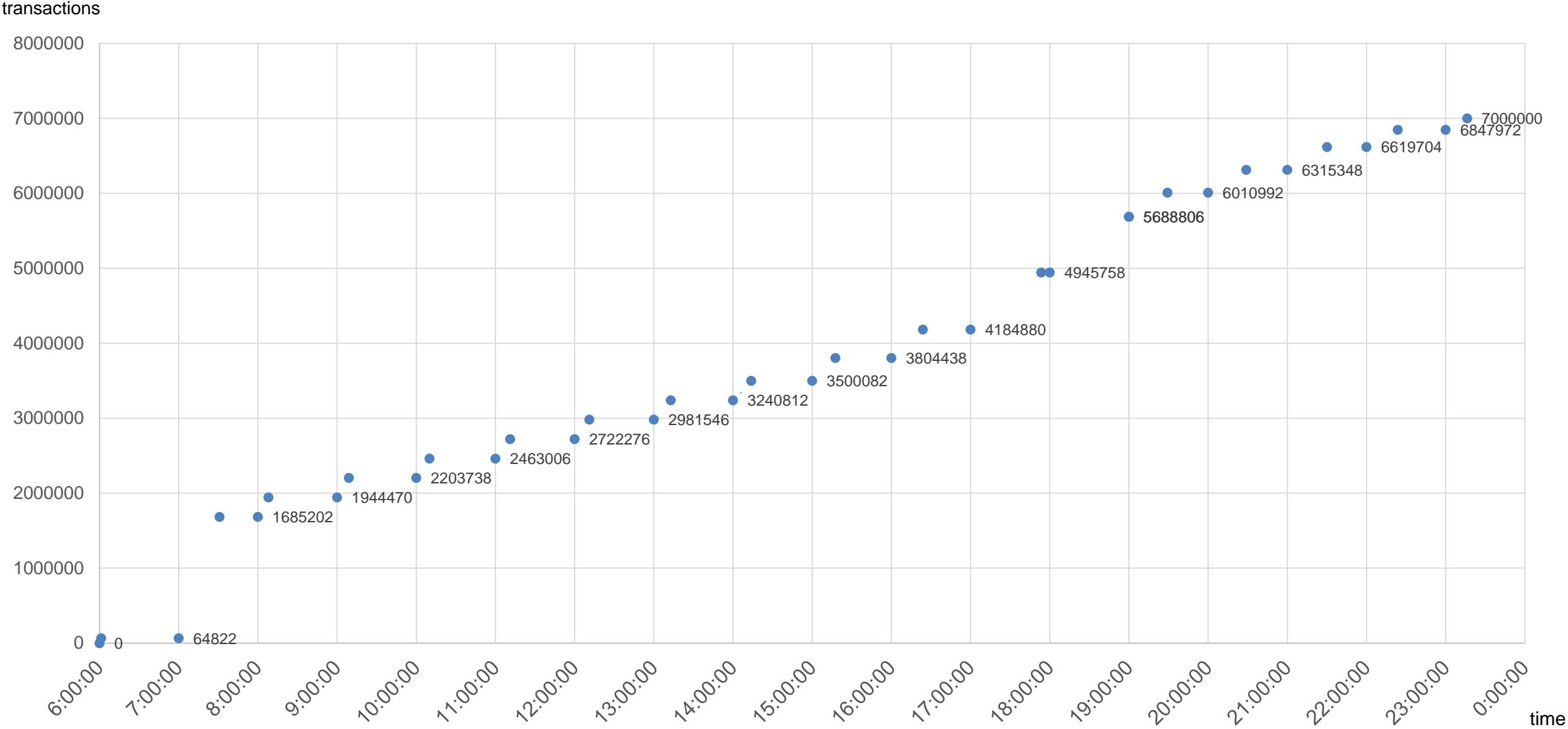


Revenue Sharing Dashboard Breakdown for Mar 5th

Visualization example: further changes to be discussed based on industry needs/requirements



Blockchain Common DB Total Transaction Processing for Mar 6th



Performance Result for Mar 6th

Time Range	Start Time	End Time	Duration(minutes)	Total Records
0600-0700	06:00:22.100	06:01:18.049	00:00:55.949	64822
0700-0800	07:00:21.348	07:30:55.670	00:30:34.322	1685202
0800-0900	08:00:20.216	08:08:05.028	00:07:44.812	1944470
0900-1000	09:00:22.036	09:08:54.633	00:08:32.597	2203738
1000-1100	10:00:20.519	10:09:59.483	00:09:38.964	2463006
1100-1200	11:00:22.301	11:11:06.977	00:10:44.676	2722276
1200-1300	12:00:20.687	12:12:10.858	00:11:50.171	2981546
1300-1400	13:00:22.519	13:12:51.021	00:12:28.502	3240812
1400-1500	14:00:20.828	14:13:50.388	00:13:29.560	3500082
1500-1600	15:00:22.693	15:17:30.731	00:17:08.038	3804438
1600-1700	16:00:21.056	16:23:50.800	00:23:29.744	4184880
1700-1800	17:00:22.953	17:53:34.347	00:53:11.394	4945758
1800-1900	18:00:21.528	18:59:59.993	00:59:38.465	5688806
1900-2000	19:00:00.027	19:29:11.186	00:29:11.159	6010992
2000-2100	20:00:21.859	20:28:49.893	00:28:28.034	6315348
2100-2200	21:00:23.713	21:30:09.376	00:29:45.663	6619704
2200-2300	22:00:22.083	22:23:38.184	00:23:16.101	6847972
2300-2400	23:00:23.956	23:16:16.995	00:15:53.039	7000000

Transaction Dashboard for Mar 6th

Pass Transaction Summary

Date : 2020-03-06

Start Time : 06:00 UTC +0

Current Time : 23:35:36 UTC +0

Total No of Transactions : 7,000,000

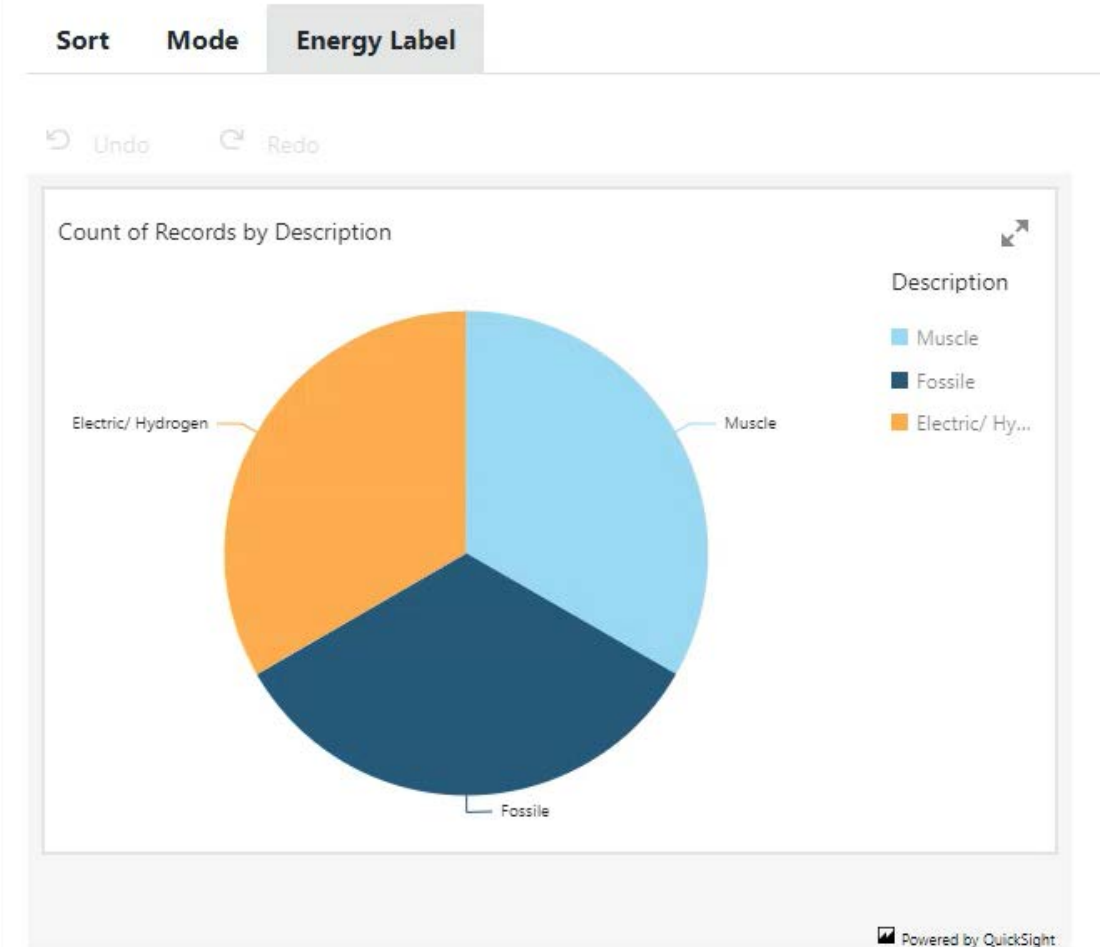
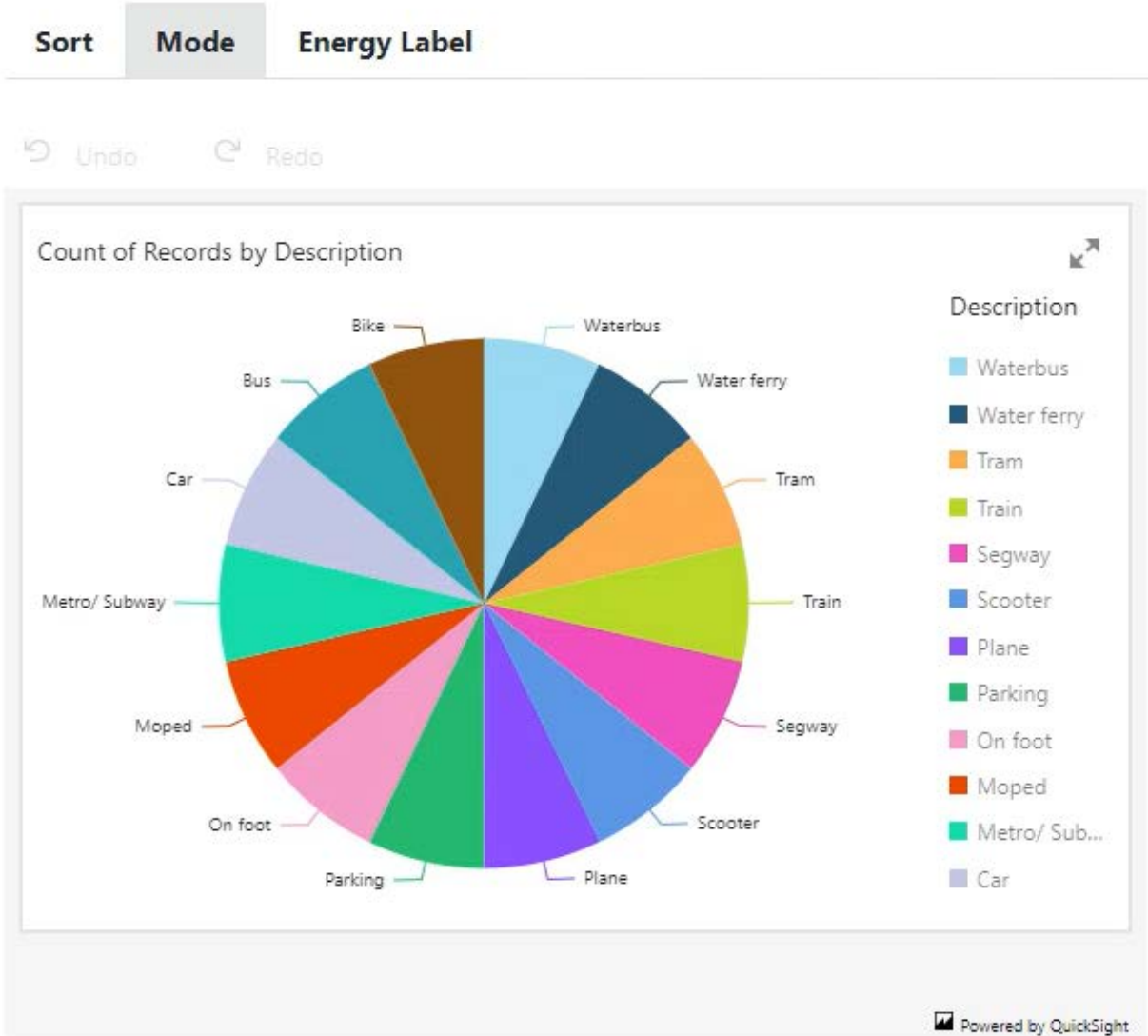
No Of GetIn Transaction : 3,500,000

No Of GetOut Transaction : 3,500,000

Total amount of sales: 8,737,195,780

Transportation Dashboard Breakdown for Mar 6th

Visualization example: further changes to be discussed based on industry needs/requirements



Revenue Sharing Dashboard Breakdown for Mar 6th

Visualization example: further changes to be discussed based on industry needs/requirements

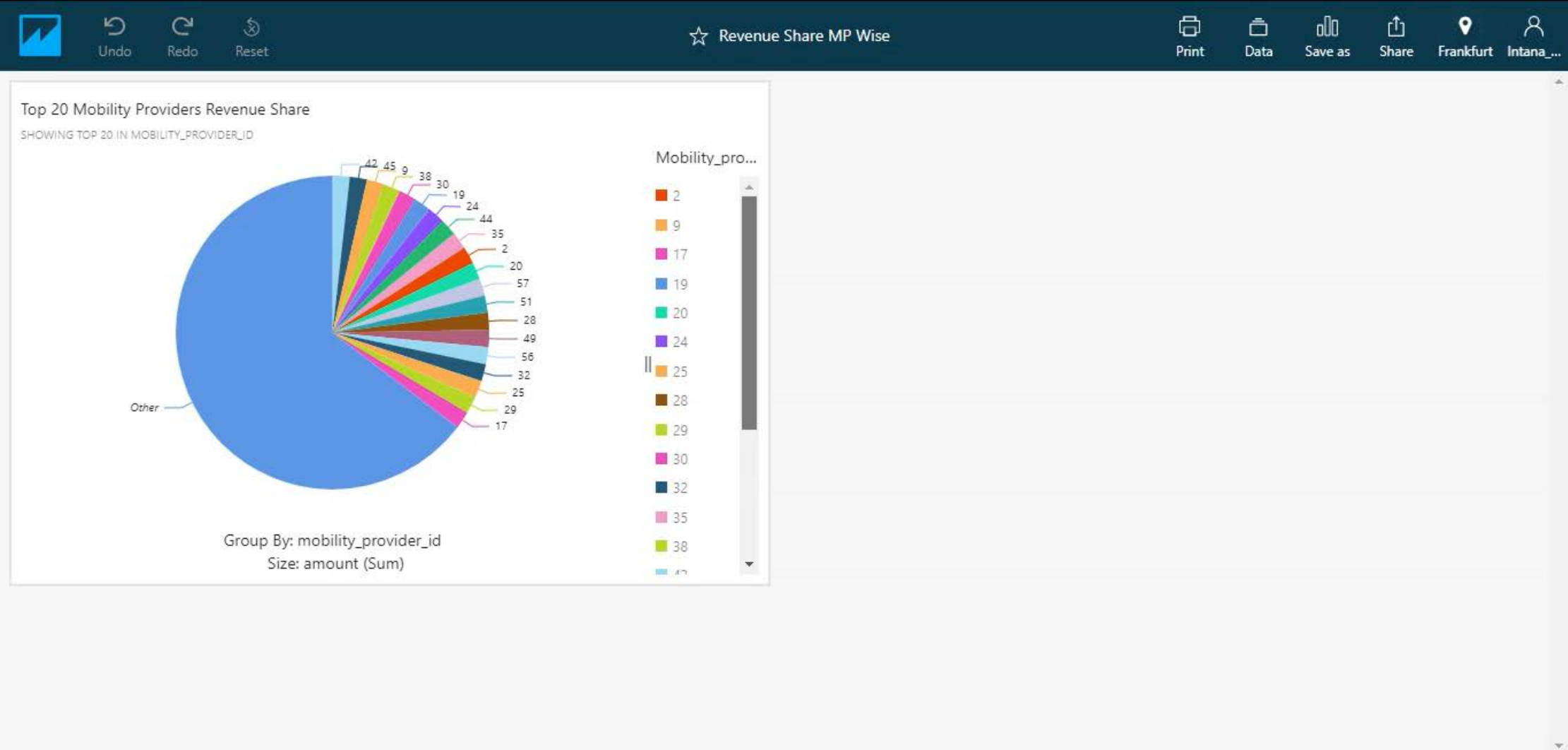


Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

Feasibility Test Result Overview

Evaluation Points	Output
<p>Performance</p> <p>I. Evaluation of capabilities for real-time recording of multi-modal MaaS transactions in a Blockchain solution, based on the current transaction estimation for the Netherlands (7mil tx/day, 2.5bil tx/year).</p> <p>II. Evaluation of scalability potential to theoretically increase the transaction volume of multi-modal MaaS transactions in the near future.</p>	<p>I. Performance Test Result</p> <ul style="list-style-type: none"> • Peak transaction result: approximately 900tx/sec • One day transaction result: completed 7mil tx/day • 3days continuous transaction result: completed 7mil tx/day continuously • Off-load data demo for long term recording: applicable, confirmed <p>II. The possibility of increasing transaction data in the near future</p> <ul style="list-style-type: none"> • current design concept and theoretical expansion model of blockchain common DB design: applicable, confirmed
<p>Record/Share data scheme</p> <p>III. Evaluation of capabilities to make/register transaction records in a Blockchain solution.</p> <p>IV. Evaluation of capabilities to share the data records on the Blockchain to necessary entities in a dashboard/visual example.</p>	<p>Record/Share data scheme</p> <p>III. Confirm record result and discuss improvement points: completed 7mil transaction, provided sample dashboard. The industry can decide business rules of how to share the data among related entities.</p> <p>IV. Evaluate sharing result, discuss and pick up future themes/ improvement points: provided sample dashboard. The industry can decide business rules of how to share the data among related entities.</p>
<p>Draft cost estimation</p> <p>V. For a Blockchain solution to become feasible as a common infrastructure among multi-modal MaaS related entities in the ecosystem, applicants are requested to provide a draft cost estimation for the solution.</p>	<p>Draft cost estimation</p> <p>V. Provide draft cost estimation with options and then discuss what is best way for sharing the cost of Blockchain common DB among relative entities, ROI point of view, preferable features and functions in near future: confirmed, it is not possible to disclose due to confidential information.</p>

Key architectural elements evaluation points1/3

Requirements	Applicable or Not	If not applicable, the reason and improvement points
<p>Data sovereignty:It is always the data owner that determines the terms and conditions of use of the data provided (terms and conditions can simply be »attached«to the respective data).</p>	<p>Applicable, The industry can decide rules and conditions, which data is provided to whom on Blockchain Common DB.</p>	
<p>Secure data exchange: A special security concept featuring various levels of protection ensures that data is exchanged securely across the entire data supply chain(and not just in bilateral data exchange).</p>	<p>Not (Applicable only among Blockchain Common DB related entities)</p>	<p>Need to design for the secure data exchange with other systems(other than Blockchain Common DB).</p>
<p>Decentral approach(distributed architecture): The MaaS Data Space is constituted by the total of all end points connected to the Space via the Apps and Data services. This means that there is no central authority in charge of data management or supervision of adherence to data governance principles. In this respect, the MaaS Data Space represents an alternative architecture that is different from both centralized data management concepts (like so-called »data lakes«, for example) and decentralized data networks (which usually have no generally applicable »rules of the game«). What architecture will be used in the end depends on how beneficial each architecture turns out to be in economic terms for each individual application scenario. This is why the MaaS Data Space initiative presumes various coexisting architectures from the outset, converging in the end into one MaaS-architecture.</p>	<p>Applicable, Blockchain Common DB can be managed by MaaS industry, which is based on MaaS industry business rules and process, it is a kind of automatic business operation.</p>	
<p>Data governance (»rules of the game«): As the Industrial Data Space comes with a distributed architecture, and therefore has no central supervisory authority, data governance principles are commonly developed as »rules of the game«. These rules are derived from the requirements of the users and determine the rights and duties required for data management in to be established in the Ecosystem</p>	<p>Applicable MaaS industry can decide business rules as industry. the rules are based on the policy in the region(These rules are derived from the requirements of the users and determine the rights and duties required for data management in to be established in the Ecosystem)</p>	

Key architectural elements evaluation points2/3

Requirements	Applicable or Not	If not applicable, the reason and improvement points
<p>Network of platforms and services: Providers of data can be individual companies, but also »things« (i.e. single entities within the »internet of things«, such as cars, machines, or operating resources) or individuals. Other Data Providers may be data platforms or data marketplaces currently being established.</p>	<p>Not, not prepared data market place. Blockchain Common DB can provide the transaction record data to necessary entities which is based on business rules and eco-system in MaaS Industry.</p>	<p>Out of scope of feasibility test</p>
<p>Economies of scale and networking effects: The MaaS Data Space provides data services for secure exchange and easy linkage of data. It thereby represents an infrastructure, as using the MaaS Data Space will facilitate the development and use of services (smart services, for example). While these services must rely on data services as offered by the MaaS Data Space, they are not an element of the range of services of the MaaS Data Space themselves. Therefore, economies of scale and networking effects will be critical for the success of the MaaS Data Space: The more participants the MaaS Data Space will have, the more it will become »the place to be« for Data Providers, Data Users, and data service providers alike.</p>	<p>Not</p>	<p>Out of scope of feasibility test</p> <p>But the MaaS industry can analyze the recorded data on Blockchain Common DB, and utilize it to economics of scale and networking effects.</p>
<p>Open approach (neutral and user-driven): The MaaS Data Space is a user-driven initiative. Regarding the reference architecture model, it is based on a participatory development process, with design decisions being made jointly by the MaaS Service Providers, Transport & Transaction Operators and governmental and transport bodies.</p>	<p>Applicable, Blockchain Common DB provider provides the blockchain environment for the trusted records among related entities, which is based on MaaS Industry requirements.</p>	
<p>Trust: (certified participants): It is important for all participants in the MaaS Data Space to trust the identity of each Data Provider and Data User. Therefore all »end points« may connect to the Industrial Data Space via certified software (the »MaaS Data Space Connector«) only. The Connector may also incorporate authentication and authorization functionality.</p>	<p>Applicable, Blockchain Common DB features are integrity, trusted and transparent transaction record among related entities in MaaS industry. The industry can decide which data is provided whom under certain security</p>	

Key architectural elements evaluation points3/3

Requirements	Applicable or Not	If not applicable, the reason and improvement points
<p>Coexistence: The new MaaS dataspace must evolve with respect for current contracts, concessions and other arrangements for Transport and Transaction Processors. Transitional measures to facilitate the transition must be taken in due time.</p>	<p>Applicable, Blockchain Common DB features are Integrity, trusted and transparent transaction record among related entities in MaaS industry. it is a kind of automatic business process which is based on the industry business rules. Blockchain Common DB can be co-existed with current systems.</p>	

Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

What Blockchain means for trustworthy solutions

- 1. Blockchain technology is suitable for sharing transaction records transparently among related entities in a secure and trusted way. Improved coordination within existing and developing parts of the MaaS industry can be achieved through transparent data sharing among related stakeholders.**
- 2. MaaS-related entities can decide on business rules for data management of an industry-common distributed ledger. It would be healthy operation to compare with a simple connection between mobility providers and specific players' centralized DBs.**
- 3. Governments, city authorities and other mobility providers will be able to monitor and analyze travel records so as to continuously improve operations in the future data-driven era.**

Table of Contents

1. **Blockchain Challenge Program Overview**
2. **Outcomes of Blockchain Challenge Program from Sony as applicant of Blockchain Challenge Program**
 1. Blockchain Common DB Overview
 2. Feasibility Test Result Overview
 1. One day feasibility test result
 2. 3days continuous feasibility test result
 3. Evaluation result
3. **What Blockchain means for trustworthy solution**
4. **Lessons Learned from the outcomes of Blockchain Challenge Program**

Lessons Learned from the outcomes of Blockchain Challenge Program

1. Lessons Learned

- Blockchain is useful for sharing transaction records transparently among related entities in a secure and trusted way.
 1. Blockchain is addressable/scalable for huge transaction volume records in MaaS Industry rather than expectation.
 2. Blockchain is addressable for the requirement of sharing/analysis in MaaS Industry rather than expectation.

2. Suggestions for further consideration

1. The most important point for healthy operation is to define the business rules for data management of an industry-common distributed ledger as MaaS Industry.
 2. It is possible for MaaS industry to define clear discussion processes for the definition of business rules in MaaS Industry by the utilization of Blockchain, such as:
 - I. Data scheme
 - II. The way of data stream for each data
 - III. Who can access which data
 - IV. The way of revenue sharing confirmation and finalization
 - V. How to share analysis data from facts
 - VI. The way of management for Blockchain system as MaaS industry
- If the MaaS industry can proceed the above discussions, it would be real business process re-engineering for the establishment of MaaS industry.

Pros & Cons for the introduction of Blockchain Common DB

	The introduction of Blockchain Common DB	Further possibility
Pros	<ul style="list-style-type: none"> • Integrity, trusted and transparent transaction record among related entities in MaaS industry for harmonization of MaaS industry and the further MaaS industry development. • Government, City authorities and other major players can monitor, analyze from travel records and then continuously can improve the total operations from the analysis • Blockchain Common DB provider provides blockchain environment. MaaS related entities can decide business rules as industry. • Possible to share the cost of Blockchain Common DB for the trusted transaction in MaaS industry 	<ul style="list-style-type: none"> • If the MaaS industry gains certain level of integrity, trusted and transparent transaction on blockchain among related entities in near future, it is possible to link to the B2B remittance/B2C account based payment via API for the business process re-engineering as MaaS industry, it has the possibility to improve whole MaaS industry business process as next generation(It is a kind of automatic business process among related entities).
Cons	<ul style="list-style-type: none"> • Additional cost for the integrity, trusted and transparent transaction record among related entities in MaaS industry for harmonization of MaaS industry and the further MaaS industry development. • The point of management of Blockchain is governance and business rules in the industry, such as how to make consortium for the management of Blockchain, who can access which data, how to share analysis data, how to change business rules. 	<ul style="list-style-type: none"> • Would be able to define consortium body for MaaS eco-system. • Would be able to make direction for the industry standard.