

# Application of the Blockchain Technology to Laboratory Operations

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**Abstract**—This paper introduces the application of the Blockchain technology on the laboratories operations to increase the efficiency and productivity. A typical EMC test lab was taken as an example to show how the blockchain technology is applied. The result of the productivity and efficiency is derived from the application of the blockchain technology.

**Keywords** – Blockchain, EMC Test, 10m Chamber, Compliance Testing, Product Certifications, Productivity, Efficiency, KPI-Key Performance Index, EU-European Union, FCC-Federal Communication Commission, EUT – Equipment Under Test

## I. INTRODUCTION

Nowadays, manufacturers have higher demanding for products launch that are sooner than their competitors. The test laboratories are facing big challenges to schedule compliance testing for early completion of the testing. A typical EMC testing will usually require for the use of 10m EMC test chambers which is normally the most expensive investment for an EMC compliance test laboratory. In Silicon Valley, California, where the most compliance test labs are located, there are only less than five 10m EMC test chambers that we in good shape. These 10m chambers are mandatory for compliance testing in certain markets such as Korea, Taiwan. For EU compliance, although smaller chamber is allowed the results from 10m chamber prevails if there is any argument on the test results.

Traditional operations of a lab would be a dedicated Program Manager scheduling the chamber based on the first-come first-service on the contracted projects. The Program Manager allocates the most precious lab resources as quasi-government officer, and every schedule is approved by the Program Manager even sometimes the EUT is not ready for testing yet or when the Test Engineer has not idea on the EUT before setting up the EUT in the chamber.

Figure 1 illustrates how a centralized project management operates.

Apparently, the traditional operations of a lab especially with very limited and very precious resources, it's not efficient. An innovative way of operating the lab is sought after.



Figure 1: A centralized project management system

## II. BLOCKCHAIN TECHNOLOGY

Originally developed as the accounting method for the virtual currency “Bitcoin”, the Blockchains – which use what’s known as “distributed ledger” technology (DLT) – are appearing in a variety of commercial applications today. Currently the technology is primarily used to verify transactions, within digital currencies. Doing so creates a record that everyone in the community agrees, and the record authenticity can be verified by the entire community using blockchain instead of a single centralized authority.



Operating a lab is about the using the resources efficiently so to achieve the highest possible productivity. The traditional centralized program management has its advantage if and only if the resource is unlimited and timing is not the concern. However, as mentioned nowadays every manufacturer needs to launch the products soonest possible, timing is very much concerned. The most expensive 10m chamber is very limited resources that no lab can afford to waste.

Decentralizing the scheduling becomes one of the best choices to operate an efficient test lab.

Figure 2 shows how a decentralized ledger technology works.



Basically, the resources are claimed by any individual on first come first taken bases and athetized by the entire community, not allocated by authority.

### III. APPLICATION OF BLOCKCHAIN TECHNOLOGY IN THE LAB OPERATIONS

Operating an efficient lab could be very challenging especially coming across some limited resources, such as a 10m test chamber as in an EMC Test Lab which every project may need. Traditional operating of a lab is to assign the 10m chamber by a centralized program manager. In order to increase the productivity, a 6 time-slots are defined for 24 hours per day and 7 days a week.

Below table shows the BLOCK of each time slot.

Date/Time	8am-12pm	12pm-4pm	4pm-8pm	8pm-12am	12am-4am	4am-8am
Monday	Blue	Blue	Yellow	Yellow	Yellow	Yellow
Tuesday	Blue	Blue	Yellow	Yellow	Yellow	Yellow
Wednesday	Blue	Blue	Yellow	Yellow	Yellow	Yellow
Thursday	Blue	Blue	Yellow	Yellow	Yellow	Yellow
Friday	Blue	Blue	Yellow	Yellow	Yellow	Yellow
Saturday	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Sunday	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Table 1: 10m chamber weekly schedule

This immediately increase the utilization of the 10m chamber from 40 hours per week to 160 hours per week, i.e. three times of more utilization of the 10m chamber, 300% increase of the return on the investment.

The chamber hours are not allocated by the centralized controlled project management instead individually claims the BLOCKs for use when ready to use. Once the BLOCKs are claimed, it's recorded and athetized in the entire community, and secured for the claimed use.

- The benefits of doing this are multifold –
- make full use of the 10m chamber, our precious resources
  - bring the best return on company's investment,
  - offer flexible hours as possible for our fellow members,
  - drive to the maximum productivity, and
  - build self-motivated team with great sense of responsibilities

Example, Mr. John Plotner has three outstanding projects at hands that he must complete within next a few days. The 10m chamber has been completely booked during the regular working hours in last 30 days and will continue to be fully booked in next months during which clients come over to witness or support the testing. By applying this to our lab operation, Mr. John Plotner happily choses two BLOCKs to work from 4:00am – 8:00am and 8:00am-12:00pm to complete his three outstanding projects. Even better, he can go home earlier on Friday afternoon since his wife takes leave on that day so he can spend more time with family on Friday afternoon.

### IV. PRODUCTIVITY AND EFFICIENCY IMPROVEMENT

Using the Blockchain technology has been significantly improved the productivity and efficiency of the lab operations.

The following table show how the lab production throughput has been increased over the last three months.

**TO BE CONTINUED ... WITH REAL DATA ... THREE MONTHS LATER...**

## VI. CONCLUSION

This paper described the application of Blockchain technology on the operation of a typical EMC Compliance Test Lab. The result shows the productivity and efficiency are significantly increased with the assistance of the KPI tools.

## APPENDIX: DISCUSSIONS

Various discussion on the implementation of the Blockchain technology into the lab operations are recorded in the memo of weekly management meetings.

## REFERENCES

- [1] URL: [www.siemac.com](http://www.siemac.com)
- [2] Google key word search "Blockchain Technology"

## V. KEY PERFORMANCE INDEX

One may ask how each individual would be self-motivated to claim the BLOCKS voluntarily. Apart traditional employee's performance review, a KPI – Key Performance Index shall be introduced to the application.

The concept will be the calculation of the contribution on the driven revenue from each individual – the KPI, Key Performance Index. Based on each individual contributors KPI, a percentage of incentive is distributed.

The details of KPI will be designed and implemented as a later stage at the lab.