

Blockchain & Distributed Ledger Technologies

Main title: Running the essentials for the IOTA Blockchain

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ABSTRACT

The goal of our blockchain project is to implement the basics of the IOTA network. This includes running the network, fixing the fountain, being able to do transactions and having a working spammer on the network.

# Introduction TO IOTA

The IOTA blockchain is based on a distributed ledger technology (DLT) and is designed to provide secure and efficient transactions between connected devices (machine-to-machine) on the Internet of Things (IoT) ecosystem. It is an open-source, decentralized platform that uses a unique consensus mechanism called the “Tangle”, which allows for transactions at almost no cost due to its unique graph structure.

The most important difference between IOTA and traditional blockchains is its use of a directed acyclic graph (DAG) data structure rather than a traditional blockchain. In a DAG, each transaction can be connected to several other transactions, forming a web of interconnected transactions. This structure allows for parallel processing of transactions, increasing the speed and scalability of the network.

Another key feature of IOTA is its unique upcoming consensus mechanism and currently number one priority called “Coordicide”.[[1]](#footnote-2) “Coordicide” is a mechanism proposed by the IOTA foundation to remove the central coordinator node from the IOTA network. Instead, it will be replaced with a new consensus mechanism called the “Fast Probabilistic Consensus (FPC) within Byzantine Infrastructures” algorithm[[2]](#footnote-3). This should make the network fully decentralized and autonomous and should improve scalability and security. The implementation of the “Coordicide” mechanism is expected to greatly improve the network's functionality and open the door to new use cases and applications.

In the “Tangle”, each transaction must confirm two previous transactions before it can be added to the network. This process is called "tip selection" and is performed by the sender of the transaction. By requiring each transaction to confirm two previous transactions the network is always in a consistent state and there is no need for mining or other energy-intensive processes.

IOTA digital currency is called MIOTA. MIOTA is used to do transactions on the IOTA network and can be used to pay for goods and services, as well as to transfer value between individuals and devices. One of the key benefits of using the IOTA network to do transactions is that there are no transaction fees due to the characteristics of the “Tangle”, making it a great currency for small transactions such as the ones that likely will be happening with IoT devices.

IOTA's architecture also allows for the implementation of smart contracts[[3]](#footnote-4) using a technology named “Qubic”[[4]](#footnote-5). “Qubic” allows for self-executing contracts with the terms of the agreement encoded directly on them. Smart contracts allow for the automation of certain processes and can be used to create decentralized applications (“dApps”).

IOTA has several partnerships and initiatives in place to promote the adoption and development of its technology.[[5]](#footnote-6) They are partnered with several big firms and organizations to further explore the use of IOTA in various applications such as supply chain management, digital identity, and autonomous vehicles. For example, Bosch has partnered with them to explore further possibilities of automation in their products.[[6]](#footnote-7)

# Basics of the iota network

The official documentation[[7]](#footnote-8) is the best and often only resource you can consult to get information about the IOTA network and solve your problems. To run the IOTA network, we used the official guide[[8]](#footnote-9) of the IOTA Foundation. The key part was cloning the GoShimmer git repository[[9]](#footnote-10). The GoShimmer repository is updated daily, and you have no guarantee that there won’t be breaking changes and that every part is working. Because of this we recommend using our version if you don’t have any additional needs.

The two most important files are “docker-compose.yml” and “docker-compose.local.yml”, both in the “./goschimmer/tools/docker-network” folder. The first one provides a faucet, one node and all other requirements the network needs to run. Make sure that if you ever extend this project not to overwrite any ports that are on there as otherwise the network will crash.

In general, you should only need to edit the “docker-compose.local.yml” file, however you could need to edit other files if you want to further expand the functionality aside from what we already have provided. The “docker-compose.local.yml” file is used to provide additional nodes. To do that copy the content of “peer-master\_22” and paste it below. Then edit ALL the ports to some unused ones and you will have another node. To access the new node go to the corresponding “WEBAPI\_BINDADDRESS”.

TODO:

Delete unnesseary stuff below

Add pictures and describe what is happening there

Document who has done what (they have clear guidelines and examples about that, not just write “we all worked on it”

Correct my stuff

Add test cases? (no idea what he want from us, maybe the pictures are enough)

# SECTION

## Paper title and authors

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# Setting Up Your PapeR

## Subsection

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## Mathematic text and equations

Equations should be justified to the left margin and numbered at the right margin. Leave 6 points before and 6 points after the equation, as indicated in the Equation style on the Word template.

(1)

For equation font sizes, use 9 point for full size, 7 point for subscript and superscript, and 5 point for sub-subscript and sub-superscript.

Use *italics* for variables (*u*); bold for vectors (no arrows) (**u**); bold italic for variable vectors (***u***) and capital bold italic (***U***) for variable matrices. Use *i*th, *j*th, *n*th, not *i*th, *j*th,

*n*th. The order of brackets should be {[()]}, except where brackets have special significance.

## Lists

Single space list items with no extra space between the lines. Mark each item with a solid bullet ‘•’ or with an Arabic numeral followed by a full stop, e.g., 1. 2. 3. and so on. Be consistent in marking list items.

Refer to Section 4.1 for an example of a bulleted list. Following is an example of a numbered list:

1. For complete or near complete sentences begin with a capital letter and end with a full stop.

2. For short phrases, start with lower case letters and end with semicolons.

3. Do not capitalise or punctuate single items.

4. Use a colon to introduce the list.

# Figures and tables

## General appearance

Make sure that all figures, tables, graphs and line drawings are clear and sharp and of the highest quality. Lines should be thick enough to allow proper reproduction. **Also in figures: use embedded arial font type only.**

Diagrams, graphics and photographs should be in **gray scale or in colour** of excellent quality with good contrast.

When preparing figures and tables, make sure that all lettering inside the figure is no smaller than the specified size of the paper text, i.e., **10 point**. Do not include any headlines in the diagrams, graphics or tables. All headlines should be written separately. See the examples below. Do not use different colours in diagrams. If you use a bar graph, please use a pattern that will appear clearly in black and white. Use different patterns instead of colours, as

the colours will not provide sufficient contrast when printed in black and white.

If necessary add a source below the diagram. Do not add any kind of background color in the graph. The background should always be white.

## Numbering, captions and positioning

Number the figures separately from the maps and tables e.g., Figure 1, Figure 2, Figure 3; Table 1, Table 2, Table 3. Map 1, Map 2, Map 3 etc. Use (a), (b), (c) to distinguish individual subjects in a composite figure. See Figures 1 and 2 for examples of figure and caption placement

the paper. Begin the caption with a capital letter and end with a full stop. Always refer to figures as ‘Figure’ and not Fig. Place the figure or table on the text page as close to the relevant citation as possible, preferably at the top of a column. If a figure or table is too large to fit into one column, it may be centred across both columns at the top or the bottom of the page.

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| Spain | 31 | 24 | 19 | 12 |

**Table 1** is an example of how a table or figure may be placed in a column, preferably in the beginning of a column.

# summary

The summary may be placed in the beginning of the article or in the end before the references.

# Author contributions

The following is a sample text. All authors conceived and designed the project idea. P.M. and C.J.T. developed and wrote the business model. B.S. worked on the regulatory implications.  Y.Z. and X.Y. developed the technical implementation and wrote the technical section. Y.Z. wrote the critical overview of the plaftorm selected. All authors revised and accepted the final version of this document.

# References

Arenas, Alex, Albert Díaz Guilera, Jurgen Kurths, Yamir Moreno, and Changsong Zhou (2008) “Synchronization in complex networks”. In: *Physics Reports* 469, pp. 93–153.

Boccaletti, S., Vito Latora, Yamir Moreno, M Chavez, and D.-U Hwang (2006) “Complex networks: Structure and dynamics”. In: *Physics Reports* 424.4- 5, pp. 175–308.

Dijkstra, Edsger W. (1974) “Selected writings on Computing: A Personal Perspective”. In: Springer. Chap. On the role of scientific thought, pp. 60–66.

Geipel, M.M. (2009) “Dynamics of Communities and Code in Open Source Software”. PhD thesis. ETH Zurich.

Max, Muster (2014) “Test title”. In: *Journal* 12.3, pp. 54–60.

Merlo, F., S.A. Slaughter, and C. Francalanci (2009) “The co-evolution of social networks and software structures: a study of open source and closed source projects”. In: *Academy of Management Annual Meeting*. Chicago, Illinois, USA

Willinger, W., D. Alderson, and J.C. Doyle (2009) *Mathematics and the internet: A source of enormous confusion and great potential*. Defense Technical Information Center.

Zanetti, Marcelo Serrano (2012) “The Co-Evolution of Socio-Technical Structures in Sustainable Software Development: Lessons from the Open Source Software Communities”. Submitted

1. https://blog.iota.org/coordicide-the-road-ahead-7d89f41b0ba5/ [↑](#footnote-ref-2)
2. https://www.sciencedirect.com/science/article/abs/pii/S0743731520303634?via%3Dihub [↑](#footnote-ref-3)
3. https://blog.iota.org/an-introduction-to-iota-smart-contracts-16ea6f247936/ [↑](#footnote-ref-4)
4. https://blog.iota.org/the-state-of-qubic-63ffb097da3f/ [↑](#footnote-ref-5)
5. https://www.iota.org/solutions/partnerships [↑](#footnote-ref-6)
6. https://www.ccn.com/bosch-bets-big-on-iota/ [↑](#footnote-ref-7)
7. https://wiki.iota.org/goshimmer/welcome [↑](#footnote-ref-8)
8. https://wiki.iota.org/shimmer/goshimmer/tutorials/setup/ [↑](#footnote-ref-9)
9. https://github.com/iotaledger/goshimmer.git [↑](#footnote-ref-10)