No one knows for certain when IoT became closely related to blockchain, which tends to be even closer this year. Whenever mentioned, IoT is necessarily followed by blockchain; whenever blockchain is mentioned, the topic also necessarily involves IoT. The public might wonder whether it is IoT that benefits from the popularity of blockchain or it is blockchain that forces IoT to block “bullets”. Now, let’s find out the truth.

The term “Internet of Things (IoT)” was coined by Kevin Ashton, executive director of the Auto-ID Lab at MIT in 1999 when he was speaking at Procter & Gamble. After that, the development and growth of the Internet of Things became “unstoppable”. Data show that, there were approximately 8.4 billion smart devices connected to the Internet in 2017, such as thermostats, cameras, street lights and other electronic products. Besides, according to statistics from McKinsey & Company (outside China), this figure may reach 25 billion by 2025 and the entire economy scale will reach 6 trillion US dollars.

Are these large figures quite flashy to your eyes? Although the IoT technology has been widely used throughout the world, its shortcomings have become increasingly prominent.

In a traditional IoT mode, it is often the equipment manufacturer’s data center (server) that collects the information of all connected equipment and devices, which entails that the server must possess powerful operating and storage capabilities. Moreover, as the number of IoT equipment and devices grows geometrically, the maintenance costs of servers will also increase dramatically, and it is difficult for SMEs to maintain.

In addition, in terms of communication compatibility, the global IoT platform lacks a unified language and it is likely to cause communications between multiple IoT devices to be blocked. This is due to the apparent fragmentation of the IoT industry. Whether they are smart homes, smart home appliances, robots, or smart cars, etc., the networks they connect are fragmented and closed. Moreover, the status quo of the IoT industry is still the isolation of different sections, and their respective influences are also relatively limited. It is difficult to reach a unified standard in a short period of time.

What remains most serious is IoT security. Network attacks in the field of IoT have become a reality, and Reaper was the most memorable IoT botnet last year. According to the data released by China National Vulnerability Database (CNVD), 80% of all IoT terminal equipment and devices are subject to the risk of privacy disclosure or abuse; 70% of them have no encryption in their network communications; 60% of them have vulnerabilities in their web interfaces, and 60% of them do not have their software updates encrypted. Once attacked, no user will have any privacy.

For the above reasons, IoT development is obviously facing bottlenecks, and this is also the main reason why it urgently needs to “join hands” with blockchain. How will blockchain transform IoT, or, in another word, what is the value that blockchain can bring to IoT? In short, blockchain technology is expected to bring about an IOT that is without “certification” of any third party.

Everyone knows that, blockchain is a computer database that records transaction data, but such databases are stored in many different places. Additionally, its distributed network architecture provides a mechanism that allows equipment and devices to reach certain consensus, without the need to authenticate with the data center (server). In that manner, even if one or two nodes are attacked, the data of the entire network system are still reliable and secured.

For example, blockchain technology can provide an infrastructure for several devices, helping them to transfer properties such as money or data to each other through a secured and reliable smart contract. In this process, all smart devices operate autonomously without the need of centralized authorization.

At the current stage, the combination of IoT and blockchain technology is still in its early stages, which, however, does not stop the entry of large Internet companies. For instance, IBM Blockchain has allowed (private) blockchain to be extended to cognitive IoT; China Unicom has united many companies and research institutes to establish an IoT blockchain standard project; SAP has released the Leonardo ecosystem for integrating IoT. Undoubtedly, SMEs are even less likely to miss this feast of IoT + blockchain, and some teams have already emerged. It is Ruff Chain.

Ruff Chain is an architecture integrating IoT with blockchains, composed of a distributed operating system and an open main chain. The core issues it is to address are the trusted interoperability and paid interoperability among IoT equipment and devices in different systems,

Based on the Ruff OS IoT operating system, which was developed by Ruff Company two years ago and has been mature and put into commercial operation, Ruff Chain easily solves the problem of fragmentation (closedness) hardware devices and hardware/software interoperability and unifies the programming interface. As to the issue of trust, Ruff Chain proposes to address it through the DPoS consensus algorithm and multi-node ledger, in which Ruff Token is used as the token for stimulation, consumption and transaction within the Ruff public blockchain ecosystem. At present, the Ruff team is exploring more possibilities with the blockchain technology.

In all, it is highly likely that, the blockchain technology is a highly feasible solution to IoT. Nonetheless, there is one thing we must admit: there is still a long way to go for the combination of the two; the promoters need to promote it continuously and in steps in order to live a “good life”.

没有人确切知道物联网何时与区块链密切相关，而今年的区块链往往更加紧密。无论何时提及，物联网都必然伴随着区块链；每当提到区块链，话题也必然涉及到物联网。公众可能会怀疑，究竟是物联网受益于区块链的普及，还是区块链迫使物联网挡住了“子弹”。现在，让我们找出真相。

“物联网 (IoT)”一词是 1999 年麻省理工学院 Auto-ID 实验室执行董事 Kevin Ashton 在宝洁公司演讲时创造的。此后，物联网的发展壮大变得“势不可挡”。数据显示，2017年约有84亿台智能设备接入互联网，如温控器、摄像头、路灯等电子产品。此外，据麦肯锡（中国以外）统计，到2025年这一数字可能达到250亿，整个经济规模将达到6万亿美元。

这些大人物在你眼里是不是很浮华？尽管物联网技术在全球范围内得到广泛应用，但其缺点也日益突出。

在传统的物联网模式中，往往是设备制造商的数据中心（服务器）收集所有连接的设备和设备的信息，这就要求服务器必须具备强大的运行和存储能力。而且，随着物联网设备和设备的数量呈几何级增长，服务器的维护成本也将急剧增加，中小企业难以维护。

此外，在通信兼容性方面，全球物联网平台缺乏统一的语言，很可能导致多个物联网设备之间的通信受阻。这是由于物联网行业明显的碎片化。无论是智能家居、智能家电、机器人，还是智能汽车等，它们所连接的网络都是碎片化的、封闭的。而且，物联网行业的现状依然是各板块相互隔离，各自的影响也相对有限。短时间内很难达到统一的标准。

仍然最严重的是物联网安全。物联网领域的网络攻击已经成为现实，而 Reaper 是去年最令人难忘的物联网僵尸网络。根据中国国家漏洞数据库（CNVD）公布的数据，80%的物联网终端设备和设备存在隐私泄露或滥用的风险；其中 70% 的网络通信没有加密；其中 60% 的 Web 界面存在漏洞，其中 60% 的软件更新未加密。一旦受到攻击，用户将没有任何隐私。

基于以上原因，物联网发展显然面临瓶颈，这也是其迫切需要与区块链“携手”的主要原因。区块链将如何改变物联网，或者说，区块链能给物联网带来什么价值？简而言之，区块链技术有望带来无需任何第三方“认证”的物联网。

大家都知道，区块链是一个记录交易数据的计算机数据库，但是这样的数据库存储在很多不同的地方。此外，其分布式网络架构提供了一种机制，允许设备和设备达成一定的共识，而无需与数据中心（服务器）进行身份验证。这样，即使一两个节点受到攻击，整个网络系统的数据仍然是可靠和安全的。

例如，区块链技术可以为多个设备提供基础设施，帮助它们通过安全可靠的智能合约相互转移资金或数据等财产。在这个过程中，所有智能设备自主运行，无需集中授权。

现阶段，物联网与区块链技术的结合仍处于起步阶段，但这并不妨碍大型互联网公司的进入。例如，IBM 区块链允许（私有）区块链扩展到认知物联网；中国联通联合多家企业和科研院所建立物联网区块链标准项目；SAP 发布了用于集成物联网的 Leonardo 生态系统。毫无疑问，中小企业更不可能错过这场物联网+区块链的盛宴，一些团队已经崭露头角。这是Ruff链。

Ruff Chain是物联网与区块链相结合的架构，由分布式操作系统和开放式主链组成。它要解决的核心问题是物联网设备和不同系统中的设备之间的可信互操作和付费互操作，

Ruff Chain基于Ruff公司两年前研发成熟并投入商业运营的Ruff OS物联网操作系统，轻松解决硬件设备碎片化（封闭）和软硬件互通问题，统一编程界面。对于信任问题，Ruff Chain 提出通过 DPoS 共识算法和多节点账本来解决，其中 Ruff Token 作为 Ruff 公链生态系统内激励、消费和交易的代币。目前，Ruff 团队正在用区块链技术探索更多的可能性。

总而言之，区块链技术很有可能是物联网的一种高度可行的解决方案。尽管如此，我们必须承认一件事：两者的结合还有很长的路要走；推广者需要不断地、有步骤地推广它，才能过上“美好的生活”。