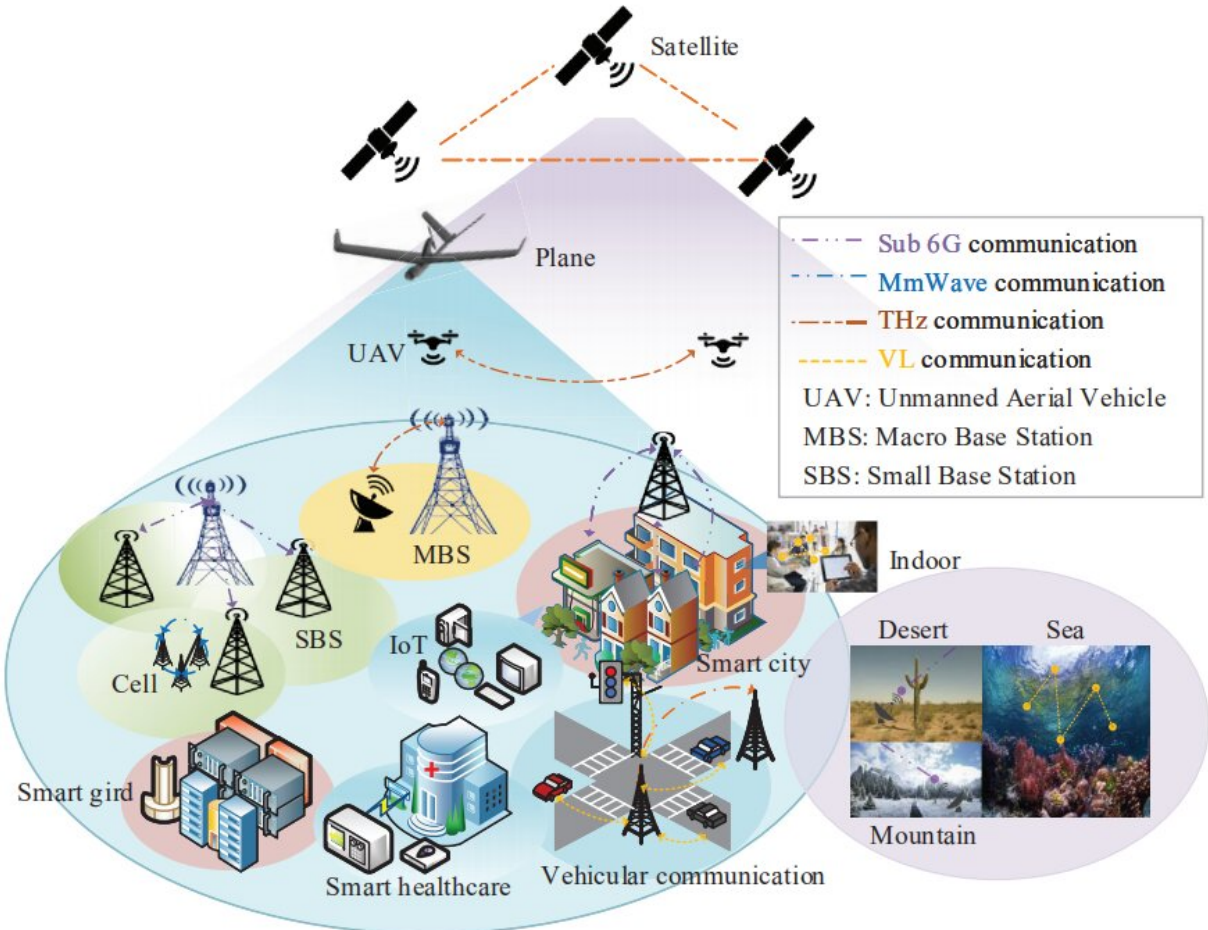# Spectrumchain: A disruptive dynamic spectrum sharing framework for 6G

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6G scenario and spectrum usage. Credit: Science China Press

With the advancement of the 6G, the 6G vision becomes more clear. 6G

wireless network will support full spectrum, full coverage, and all-scenario applications, and is expected to achieve the ultimate connection performance with a Tbps-level transmission rate. Hence, 6G wireless networks will require hundreds of megahertz to tens of gigahertz spectrum resources, which suffer severe spectrum deficit.

Meanwhile, current spectrum management usually adopts static allocation and exclusive usage, which further exacerbates the spectrum demand-supply imbalance. Therefore, a secure, efficient, and refined spectrum resource management architecture is in urgent demand to realize trusted access, on-demand spectrum resource allocation, and full-process regulation of spectrum usage.

The emergence of blockchain technology provides a new solution for building a distributed multi-party collaborative management architecture. The blockchain-based distributed multi-level spectrum blockchain provides a new solution for 6G spectrum management and secure regulation, which is of great significance to promote the management of 6G spectrum resources and the 6G application.

In this paper, a blockchain-based distributed multi-level dynamic spectrum management architecture, i.e. SpectrumChain, is proposed for the first time. The unique technical advantages of blockchain for dynamic spectrum management, spectrum blockchain architecture. and related key enablers are described in detail.
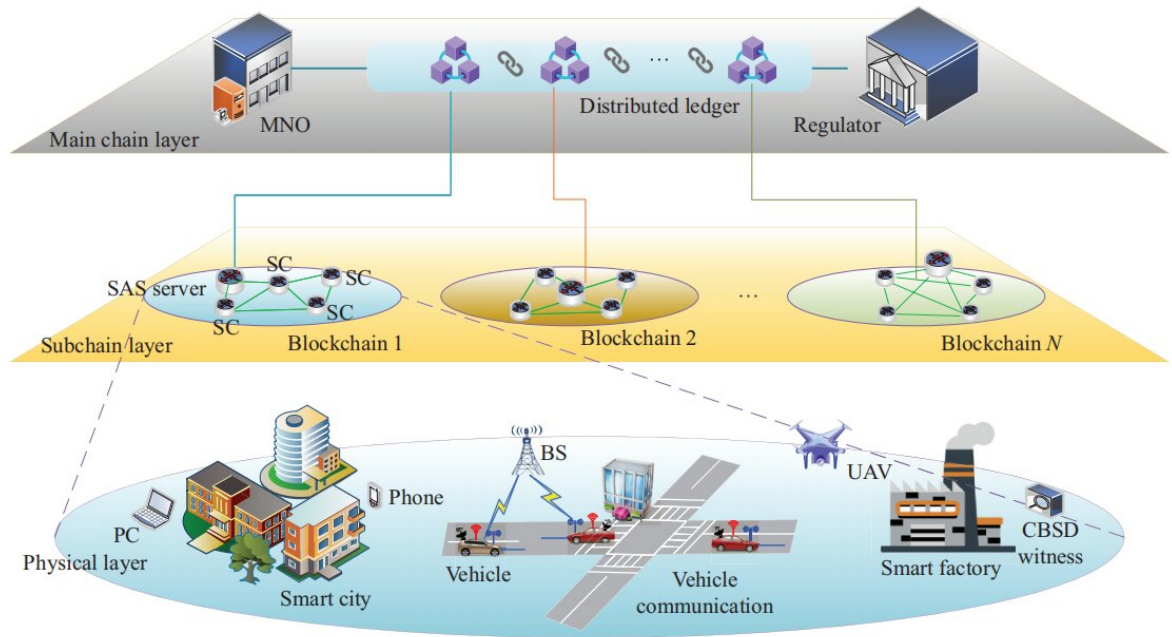
SpectrumChain architecture. Credit: Science China Press

The main chain runs global spectrum resource trading and regulation publishing services, whereas each subchain runs local spectrum sharing. The main chain comprises possibly multiple MNOs, a regulator, and multiple SAS servers, where MNOs can sell/buy spectrum resources with each other for their demand, and the regulator can publish regulative information for security and fair spectrum sharing.

A subchain is curated by a local committee comprising an SAS server and multiple spectrum controllers, where spectrum controllers can rent spectrum resources to meet BSs' spectrum demand. The SAS server may update the data of the subchain to the main chain at a certain frequency. Compared with the existing SAS architecture, the hierarchical SpectrumChain architecture can achieve a consensus-based fault-tolerant decision process at the global level and the local level.

This capability not only facilitates the DSS processing efficiency but also guarantees certain isolation between different services with flexible scalability.

The paper is published in the journal *Science China Information Sciences*.

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