Evolvable internet architecture

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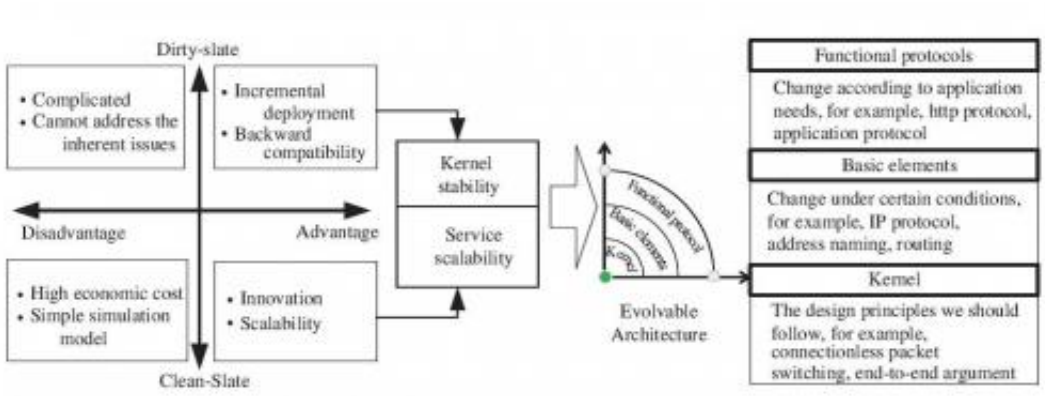
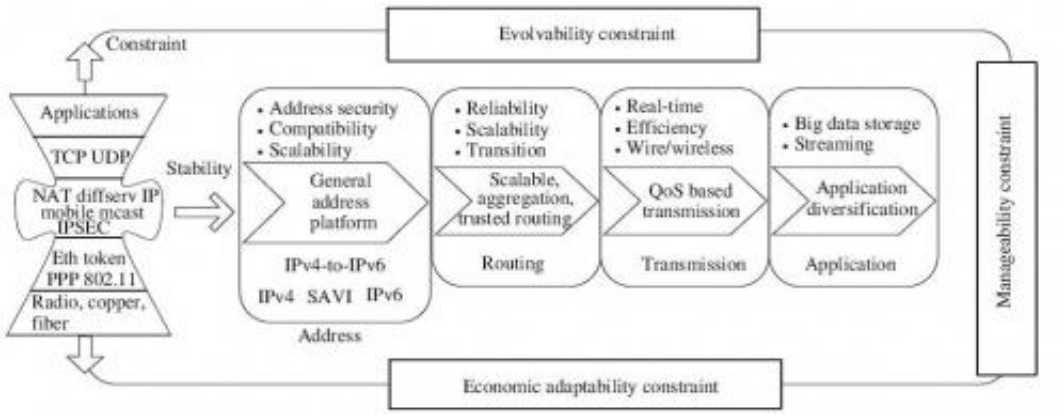


The framework of the evolvable architecture is shown. Credit: ©Science China Press

How to improve the existing architecture to meet kinds of requirements is the key topic in the future Internet research. Professor Xu Ke and his group from Tsinghua National Laboratory for Information Science and Technology (TNList), Department of Computer Science and Technology, Tsinghua University set out to tackle this problem. They have developed a novel evolvable Internet architecture framework under the evolvability constraint, the economic adaptability constraint and the manageability constraint. They consider that the evolvable architecture can be developed from the network layer under these design constraints. Their work, entitled "Towards evolvable internet architecture-design constraints and models analysis", was published in *SCIENCE CHINA Information Sciences*.

The Internet has become a global communication infrastructure. There are about one-third of the world's population now has access to the Internet. However, the role of the Internet has shifted from a "communication channel" to a "communication and data processing repository". It is difficult for the existing Internet architecture to adapt to this change. Although the corresponding researches about future Internet research based on the clean-slate approach and the dirty-slate approach, the two mainstream architecture development ideas, have been conducted for more than ten years in many countries, both of them cannot solve the problems that current Internet architectures facing effectively. The dirty-slate approach which is more conservative can only solve a small range of local issues on the Internet and it makes the architecture evolve into a complex and cumbersome structure. And there exist serious deployment and transition issues in the clean-slate approach which gets out of the situation of current architecture. The novel evolvable Internet architecture find a tradeoff between the clean-slate approach and dirty-slate approach, which combines the advantages of both ideas together and evolving without changing the core principal of the existing architecture.



The technology roadmap realization of the evolvable architecture is shown. Credit: ©Science China Press

Compared with the dirty-slate approach, the evolvable architecture is more flexible. Moreover, the evolvable architecture is more stable compared with the clean-slate approach. On the one hand, the evolvable architecture makes reformation under the core design principle of the current architecture to achieve technology innovation as well as smooth transition from the existing architecture to a new one. On the other hand, it also relaxes the key constraints that limit the extension of the architecture with the aim of providing better support for application requirements. Based on this, the evolvable architecture can be divided into three basic layers as shown in Figure 1.

Besides, to ensure the construction of the evolvable architecture in compliance with the design principles, there are three constraints proposed to insist during building the evolvable architecture. They are evolvability constraint, the economic adaptability constraint and management constraint as shown in Figure 2. Evolvability constraint represents features such as scalability, stability and economic feasibility. The economic constraint aims to capture and analyze the economic adaptability and features of the new network services such as the income of ISPs and users. The manageability constraint aims to solve the network management and control issues such as the identity authentication of users and user-flow control with high-performance.

The Internet address system directly determines the sustainable evolutionary ability of Internet architecture to a large extent. The semantic overload of IP address, almost by design, lacks of consideration of long-term evolution support. Thus, the evolvable Internet architecture designs a general address platform which is able to support multiple address schemes natively and make evolution possible. It serves as the foot-stone for an evolvable Internet has the intrinsic capability to evolve.

The design of the Evolvable Internet architecture is based on the present situation and application demand of current Internet architecture. The

implementation and promotion of this work have strong practical significance. It will make a great contribution towards the development of future Internet architecture and provides an important reference for follow-up researches.

More information: Xu Ke, Zhu Min, Hu GuangWu, et al. Towards evolvable Internet architecture-design constraints and models analysis. *SCI CHINA Information SCI*, 2014 Vol. 57 (11): 1-24. link.springer.com/article/10.1007%2Fs11432-014-5134-4

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