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The Future of Dynamic Software Architecture in Communicating Systems

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The design approaches of Communicating Systems are moving from static to dynamic layered and loosely coupled architectures to meet the adaptability needs of future distributed computing and storage systems and the associated networked services and applications. The decoupling of network functions, the software-based abstraction and virtualization of network resources and functions are being adopted at the different levels of interaction for proactively or reactively adapt the architecture to the evolving needs of the interconnected systems and their applications. Overlay networks and SDN (Software Defined Networks) are the most promising illustrative techniques towards this direction. New architectural advances are observed both for wired and wireless communication networks as well as Internet of Things and Machine-to-Machine communications. Both academic, industrial and standardization efforts are contributing towards the new direction of architecting future generation of communicating systems.

The design of dynamic software architectures in communicating systems raises additional challenges. This includes the complexity and consistency management for the cross-layers and cross-nodes reconfiguration and requires vertical and horizontal coordination mechanisms for both the decision and the execution functions. Automated discovery and integration solutions have also to be developed for mastering the new complexity induced by the new loosely coupled design approaches and its extensive runtime exploitation for dynamic composition. Moreover the cognitive and autonomic approaches have to be more explored to improve the management of the future generation of communicating systems. Future architectural approaches should benefit from the recent advances in software engineering including the microservices design patterns and from cognitive and autonomic computing.