



## TIME TO GET 5G-SLICING INTO PERSPECTIVE

5G promises a lot. High bandwidth for some users, ultra-low latency for others and ultra-reliable services for mission critical applications. 5G achieves this network agility using key technologies including network function virtualization (NFV), software defined networking (SDN) and network slicing. NFV segments network resources into modular building blocks by disaggregating software from the underlying hardware, and SDN provides the necessary management and orchestration requirements for infrastructure virtualization. Network slicing tailors virtualized network resources to address specific service demands, such as bandwidth, latency and reliability. This seems analogous to a Lego designer crafting innovative creations with Lego building blocks, but unfortunately it is not quite that simple.

### Most of 5G is not being virtualized

Today 5G core networks generally operate on virtualized infrastructure. However, this is not the case for 5G radio networks (RAN), which represent the largest proportion of 5G-network deployments. Virtualized radio, or so-called cloud-RAN, has not been embraced by mainstream 5G operators and is only being used for private and indoor public networks and by handful of disruptive network operators, like Rakuten in Japan. While network slicing can be theoretically implemented in networks with physical as opposed to virtualized radio infrastructure, the agility of the slices is significantly impaired. Without cloud-RAN, network slicing cannot be implemented end-to-end. Instead, dedicated radio resources are required for each of the various sliced network service classes. For the radio network, this is somewhat akin to the static quality of service (QoS) capabilities that were developed for 3G.

These capabilities proved too expensive because of the excessive reserve resources needed to ensure the QoS capabilities could be met.

Until Tier 1 network operators embrace cloud-RAN for their wide-area networks, we believe that network slicing will best be targeted towards specific applications with localized cloud-RAN deployments. Notable examples include, digital entertainment applications in sports stadiums, digital retail solutions, smart-city and smart-building applications and applications to support Industry 4.0 initiatives in manufacturing plants.

### Virtualization is hard, slicing is even harder

Network slicing adds complexity to network virtualization, which itself is already complex and operationally disruptive. NFV and SDN frameworks were originally proposed by several Tier 1 operators in 2012, but adoption has been slow. Both NFV and SDN require significant operational transformation and have been hindered by management and orchestration challenges, particularly for the large-scale deployments involved.

Until NFV, SDN and their associated operational regimes mature, network slicing will be best suited for targeted services that are geographically localized and don't have onerous orchestration and automation requirements. However, these targeted services will challenge the business models for most mobile network operators, whose retail offerings are driven primarily by mass-market consumer demands. To address this, we believe that mobile operators must cooperate with ecosystem partners that have specialist capabilities and market channels for the network sliced services that are targeted.



## Getting the building blocks in the right place

Network virtualization and slicing depends on enough infrastructure resources being deployed where needed. This is particularly the case for ultra-low latency services, which require networking and edge compute infrastructure near end-users. First order considerations tend to focus average latency requirements. However, for emerging applications, such as augmented and virtual reality, the average latency and its variance are both important. To perform effectively, these applications require that the ultra-low latency conditions are achieved in excess of 99.9 percent of the time. This creates greater demands for networking and edge compute infrastructure near end-users, with adequate capacity and

responsiveness. Only then will the network slicing functionality perform as is intended.

As the mobile industry deploys 5G, there will be a natural tension between technology innovation and the practicalities for commercializing these innovations in the marketplace. Network slicing offers tremendous potential, particularly as 5G is adopted for a broad range of services and applications. However, network slicing is complicated to implement and depends on the maturity of virtualization technologies and their operations. Slicing also depends on ecosystem partnerships that allow for its progressive market adoption. Without these key ingredients, networks slicing runs the risk of technology over-reach and been deemed a failure before it has the opportunity succeed.

### About Tolaga Research

Tolaga is a leading consulting and advisory firm for the mobile industry and the Internet of Things. We are experts in networks, security, critical communications and complex system modeling.

**Our Clients:** Service Providers, Technology Vendors, Enterprise End Users and Private and Institutional Investors

We capitalize on many decades of industry knowledge, implementation experience, advanced modeling and analytics platforms to deliver differentiated services to our clients.

**Our Solutions:** Research Advisory Services, Custom Consulting and Modeling Platforms

### Contact Us

admin@tolaga.com | www.tolaga.com | @TolagaResearch  
Tolaga Research Newton MA, 02109, USA