ONGOING RESEARCH AT IITB

Research Group led By Prof. Abhay Karandikar & Prof. Prasanna Chaporkar

SDN FOR MULTI-RAT NETWORKS

SDN is a promising approach for control and management of networks. We are investigating SDN based multi-RAT network architectures for achieving optimal resource allocation. We have also formulated learning based algorithms for RAT selection in multi-RAT networks.

FRUGAL 5G

Due to lack of broadband connectivity, even today the majority of the rural population is unable to take advantage of its benefits. We aim to understand the challenges and requirements of rural broadband connectivity and plan to standardize an appropriate network architecture.

NETWORK SLICING

Network slicing is a virtualization technique that enables co-existence of multiple logical networks over shared infrastructure. We are currently exploring algorithms for automating slice creation and scaling. Our interests also include algorithms for slice mobility and infrastructure sharing between operators.

DUAL/MULTI CONNECTIVITY

Multi-RAT Dual Connectivity (MR-DC) is an important feature in 5G networks wherein a user can simultaneously receive data from multiple base stations. MR-DC improves per-user throughput and reduces handover failures. We have proposed an SDN based architecture for MR-DC and have developed scheduling algorithms to ensure throughput fairness.

Research Group led by Prof. Mythili Vutukuru

SDN AND NFV FOR 5G CORE

We are looking at research problems in the domains of NFV and SDN, especially in the context of the design of future telecom networks. We are evaluating the performance of different network stacks (kernel and kernel bypass) for NFV and developing frameworks to enable quick prototyping of the VNFs like the 5G core. We are also aiming at improving the scalability of SDN networks by offloading computation from control-plane to programmable dataplane switches.

STANDARDIZATION INITIATIVES

P1930.1

This Standard specifies a middleware for vendor independent management and control of Wireless Networks, specifically, management & control of Access Points for IEEE 802.11 based WLAN and BaseStations for IEEE 802.22 based WRAN, in accordance with the SDN paradigm.

Working Group	SDN-MCM - SDN based Middleware for Control and Management of Networks
Society	COM - IEEE Communications Society
Website	http://bit.ly/ieeep19301

P2061

This Standard specifies an architecture for a low mobility and energy efficient network for affordable broadband access. The network comprises of a wireless middle-mile, an access network and the associated control and management functions. The architecture also specifies the major interfaces in the network.

Working Group	FRUGAL5G - Frugal 5G Networks
Society	COM - IEEE Communications Society
Website	http://bit.ly/ieeep2061

5G Testbed - WLAN InterWorking with 5G Core

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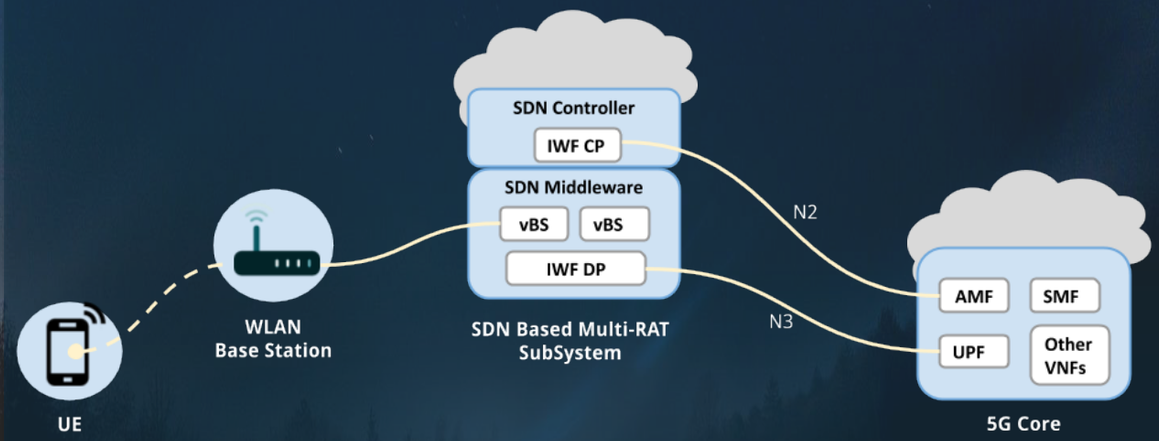
5G TEST-BED: AN IITB PERSPECTIVE

The 5G Test-bed project is aimed at developing a 3GPP compliant network for the research community and industry end-users. The Test-bed incorporates the next generation Core and 3GPP access such as New Radio (NR), LTE as well as non-3GPP access networks such as WLANs.

UNIFIED MULTI-RAT RAN

IIT Bombay aims to unify several Radio Access Technologies (RATs) under an SDN-based framework referred to as the Multi-RAT subsystem, which includes an SDN Controller, an SDN Middleware along with the radio nodes. We also aim to integrate the Subsystem with the 5G Core through an InterWorking Function (IWF).

HIGH LEVEL ARCHITECTURE



USE CASES

5G Core

- Mobile Edge computing
- Network slicing
- On-demand seamless scalability

Multi-RAT and IWF

- Ubiquitous connectivity
- Dual-connectivity
- Network Slicing

INTERWORKING FUNCTION

With the enhancement in radio communications, end users are offered with a wide range of access technologies which can connect to the core network. An InterWorking Function is the interface for the RATs to communicate with the 5G core.

THE FIFTH GENERATION CORE

The 5G core being developed at IIT Bombay follows the latest design principles and best practices. It is modular, software-based Virtual Network Functions (VNFs) that can run on commodity hardware, in accordance with the principle of Network Function Virtualization (NFV).

The VNFs are cloud-native, fault tolerant and scalable on demand using standard cloud management tools. The control plane is built over HTTP REST-based APIs, as per Service Based Architecture (SBA) paradigm. The high performing data plane is built over DPDK (Data Plane Development Kit) and programmable hardware.