Flexible Connectivity and QoE/QoS Management for 5G Networks: the 5G NORMA view

Marco Gramaglia, Ignacio Digon, Vasilis Friderikos, Dirk von Hugo, Christian Mannweiler, Miguel A. Puente, Konstantinos Samdanis, Bessem Sayadi
5G is not 4G+1

The focus of 5G NORMA is on enabling new 5G business.

But 5G NORMA’s innovations will also help to
- increase wireless capacity,
- support very high terminal densities,
- lower latency,
- improve cost efficiency,
- lower energy consumption.
Enabling flexibility

Adaptive (de)composition and allocation of NFs
Joint optimization of RAN and CN
SW-defined Mobile Control

create the flexibility to

• adapt dynamically to daily fluctuations in traffic demand
• adapt to rapid load variations in small cells
• introduce new services and business models quickly
Multi-tenancy & Context awareness

Dedicated networks contained in slices can meet the need of different services and tenants:

- Service quality and performance
- Service-specific functionality
- Adaptation to available infrastructure
## Network Slicing and Programmability

<table>
<thead>
<tr>
<th>Enables</th>
<th>Network Slicing</th>
<th>Network Programmability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi Tenancy</td>
<td>Context awareness</td>
</tr>
<tr>
<td>Advantages</td>
<td>Cost reduction</td>
<td>On Demand provisioning</td>
</tr>
<tr>
<td>Service separation</td>
<td></td>
<td>Support for specific KPIs</td>
</tr>
<tr>
<td>Challenges</td>
<td>Efficient resource sharing</td>
<td>Interface definition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource abstraction</td>
</tr>
</tbody>
</table>
Flexible connectivity & QoE/QoS

Network Slicing

- Mobility scheme selection

QoE to QoS mapping

- QoS monitoring

SDMN
- Controller (SDM-C)
- Coordinator (SDM-X)
- Orchestrator (SDM-O)

Network Programmability
Functional blocks

1. Resource pool management
2. Resource requests
3. Service requirements extraction
4. Mobility information feed
5. Mobility-driven orchestration
6. Mobility requirements
7. QoS reporting

Inter-slice management

SDM-O

SDM-X

SDM-C

QoE Mapping
QoS Monitoring

Mobility Scheme Selection

Mobility Scheme

Intra-slice management
• Apply the network programmability concept beyond SDN
• Split network functions into \textit{controllable} (agents) and \textit{controller} (logic)
• Logic (SDM-C Apps) use the NBI of SDM-C
• Agents are controlled through the SBI
Flexible Service Creation

SDM-C allows flexible scheduler reconfiguration. New services, like low latency ones (autonomous driving) are easily supported while reducing the service creation time from 90 hours to 90 minutes.
- Achieve efficient resource sharing among different slices
- Some functions have to be explicitly shared (i.e., spectrum)
- Other functions may need to be included (i.e. HSS, low scheduler)
SDM-O

• Orchestration happens at two stages
• Inter Network slice: optimal resource allocation
• Intra Network slice: management of slice lifecycle
Conclusion

- **Enablers**
  - SDN
  - NFV
  - Network slicing
  - Network Programmability
  - New concepts

- **QoE/QoS aware Flexible connectivity**
  - SDM-C
  - SDM-O
  - SDM-X

- **5G Goals**
  - Reduced Service Creation Time
  - Improved Cost efficiency
  - Enhanced mobility

- **Allow**
- **Execute**
- **Achieve**

3rd 5GARCH Workshop, Kuala Lumpur, May 23rd 2016