Experiences on Implementing 5G and Services for the Verticals

Dr. Pål Grønsund, Telenor Research, 5G-VINNI Coordinator

Workshop on 5G Experimentation Facilities and Vertical Trials, Online, 14th October 2020

(Horizon 2020 ICT-17 project)
5G-VINNI (5G Verticals INNovation Infrastructure)

- Build an open large scale 5G End-to-End facility that can
  - demonstrate that key 5G network KPIs can be met
  - be used by vertical industries to test use cases and validate 5G KPIs
- Consortium: 23 partners (operators, vendors, academics, SMEs)
- External Stakeholder Board (vertical industries)
5G-VINNI E2E Network Slicing Architecture
We agreed on a roadmap for Slice orchestration.

**Ph. 1: 4G ‘Slicing’**
- Customer
  - E2E SO&M
    - NFV MANO
    - RAN
    - Transport
    - CORE
  - 4G EPC
- VPN1
- VPN2
- VPNn

**Ph. 2: 5G Slicing**
- Customer
  - E2E SO&M
    - NFV MANO
    - RAN
    - Transport
    - CORE
  - 5G
  - NSSAI mapping
  - DNSN1
  - DNSN2

**Ph. 3: Network Slice as a Service**
- Customer
  - E2E SO&M
    - NFV MANO
    - RAN
    - Transport
    - CORE
  - 5G
  - NSSAI mapping
  - Global Slice ID (NSSAI)

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Services offered by 5G-VINNI to ICT-19 projects (Main Facility Sites)

<table>
<thead>
<tr>
<th>Network Slice-as-a-Service (NSaaS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eMBB network slice as a service</td>
</tr>
<tr>
<td>uRLLC network slice as a service</td>
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<tr>
<td>mIoT network slice as a service</td>
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<tr>
<td>Customised network slice</td>
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<th>Value Added Services</th>
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<tbody>
<tr>
<td>Monitoring-as-a-Service</td>
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<tr>
<td>Testing-as-a-Service</td>
</tr>
<tr>
<td>Security-as-a-Service</td>
</tr>
<tr>
<td>3rd party VNF hosting</td>
</tr>
<tr>
<td>Distributed data fabric</td>
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<tr>
<td>Edge and Autonomous Edge</td>
</tr>
<tr>
<td>Flexible backhaul for redundancy (e.g. Satellite)</td>
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<tr>
<td>Interconnection with other 5G sites</td>
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</tbody>
</table>
Network Slice-as-a-Service (NSaaS) request - ordering a 5G-VINNI Service Blueprint (VINNI-SB)

VINNI-SB Structure

Service type (§ 4.3.1)
- eMBB
- uRLLC
- mIoT
- Customised

Service Topology (§ 4.3.2)
- SCx: Service Component #X
- SC1, SC2, SC3, SC4, SC5, SC6

Service requirements (§ 4.3.3)
- Performance
- Functionality
- Network Optimisation

Service exposure, monitoring and testing (§ 4.3.4)
- Level 1
- Level 2
- Level 3
- Level 4

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An example integration with Vertical (ICT-19) based on NSaaS
## NSaaS Operation – Service Capability Exposure

<table>
<thead>
<tr>
<th>Customer is able to consume operations related to...</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E2E network slice</strong> application layer config &amp; management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Network slice subnet (and NF)</strong> application layer config &amp; management -&gt; 3GPP scope for RAN and CN, IETF scope for TN.</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Network slice subnet (and NF)</strong> virtualized resource layer config &amp; management -&gt; ETSI NFV network service (and VNF) orchestration</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Resource</strong> control and management at the virtual infrastructure layer -&gt; NFVI with optional EPA capabilities and infrastructural SDN control</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

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Test-as-a-Service (TaaS) providing automated testing services

*from 5G PPP Test, Measurement, and KPIs Validation WG White Paper
Some motivation to conclude the talk

Advanced 5G facilities for Sandboxing and Validation (ICT-17s) + Advanced Verticals use case implementations (ICT-19s, and others) = Innovation, Research value, Digitization, Business value, …

Lots of learnings and value creation so far, let’s keep on the tight cooperation, innovation, research and value creation together!
Please contact 5G-VINNI for further information, discussion and interest

• Web page: http://www.5g-vinni.eu/
• Twitter: @5gVinni
• E-mail: 5G-VINNI-Contact@5g-ppp.eu
• Youtube channel

• norway-facility@5g-vinni.eu
• uk-facility@5g-vinni.eu
• spain-facility@5g-vinni.eu
• greece-facility@5g-vinni.eu
• portugal-facility@5g-vinni.eu
• germany-berlin-facility@5g-vinni.eu
• germany-munich-facility@5g-vinni.eu
• luxemburg-facility@5g-vinni.eu