IEEE SDN Initiative :: Outreach:
Towards a comprehensive, suitaintable wiki catalogue of testbeds and open source toolkits

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Internet: http://www.sdn-os-toolkits.org/
Network Softwarization

Existing
- CLIs
- Closed Source
- Vendor Lead
- Classic Network Appliances

New
- APIs
- Open Source
- Customer Lead
- Network Function Virtualization (NFV)

Adapted from: Kyle Mestery, Next Generation Network Developer Skills
Why Open Source in Networking?

- Higher reliability, more flexibility
- Faster, lower cost, and higher quality development
- Collaborative decisions about new features and roadmaps
- A common environment for users and app developers
- Ability for users to focus resources on differentiating development
- Opportunity to drive open standards

**Bottom Line:** The open source model significantly accelerates consensus, delivering high performing, peer-reviewed code that forms a basis for an ecosystem of solutions.

Source: Open Source in a Closed Network – Prodip Sen (OPNFV Summit 2015)
Evolving and accelerating the path to standardization

<table>
<thead>
<tr>
<th>Present with SDN</th>
<th>Past / Traditional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>Vendors</td>
</tr>
<tr>
<td>Goals</td>
<td>Enable multiple solutions (interoperability)</td>
</tr>
<tr>
<td>Deliverables</td>
<td>Documents</td>
</tr>
<tr>
<td>Quantity of Standards</td>
<td>More</td>
</tr>
<tr>
<td>Timetable</td>
<td>Many years</td>
</tr>
<tr>
<td>Validation</td>
<td>Products and deployments after release</td>
</tr>
<tr>
<td>Point of Control</td>
<td>Seat at standards committee table</td>
</tr>
<tr>
<td>Parties Involved</td>
<td>Vendors who can afford membership fees. Experts and academics with high standing in their fields</td>
</tr>
</tbody>
</table>

Further Reading:
- IETF Trends and Observations draft-arkko-ietf-trends-and-observations-00
- Source of figure: A. Manzalini et al., “Towards 5G Software-Defined Ecosystems”
Standard Development & Open Source Organizations

## Testbeds around the globe

<table>
<thead>
<tr>
<th>Title</th>
<th>location</th>
<th>owner organization</th>
<th>short description</th>
<th>website</th>
</tr>
</thead>
<tbody>
<tr>
<td>5G Center for Innovative Networks</td>
<td>Turkey</td>
<td>NETAS</td>
<td>5GNET based in Istanbul focuses on wireless access technologies and performs combined functionalities with a wide function equipped laboratory and venture capital.</td>
<td>N/A</td>
</tr>
<tr>
<td>5G Experimental Facilities</td>
<td>UK</td>
<td>University of Bristol</td>
<td>The facility aims to create a unique, fully flexible, programmable and open experimental platform for all networks and IT technologies.</td>
<td>N/A</td>
</tr>
<tr>
<td>5G haus</td>
<td>Germany</td>
<td>Deutsche Telekom</td>
<td>DT has set-up a European wide program for the coordination, planning, and carrying out of 5G related experiments, tests, and field trials.</td>
<td><a href="https://www.telekom.com/5ghaus">https://www.telekom.com/5ghaus</a></td>
</tr>
<tr>
<td>5G Lab Germany</td>
<td>Germany</td>
<td>TU Dresden</td>
<td>It is an interdisciplinary team with more than 500 researchers and aims to deliver key technologies for enabling 5G. The 5G Holistic Testbed consists of several connected test-beds which enable holistic research approaches for areas from silicon, wireless, networks, edge clouds and applications.</td>
<td><a href="http://5glab.de">http://5glab.de</a></td>
</tr>
<tr>
<td>5G Playground</td>
<td>Germany, Berlin</td>
<td>Fraunhofer FOKUS</td>
<td>5G playground encompasses a comprehensive, highly customizable and re-configurable network environment, based on commercially available components and the Fraunhofer own toolkits</td>
<td>5GPlayground.org</td>
</tr>
<tr>
<td>5G Wireless Innovation Center, Argela</td>
<td>Turkey</td>
<td>Istanbul</td>
<td>5GWiN based in Istanbul and Silicon Valley focuses on software defined future radio access technologies. Current projects listed as ULAB to develop 4G base station, short and long range Small Cell, programmable C-RAN.</td>
<td><a href="http://www.ttinvestorrelations.com/turk-telekom-group/group-companies/argela.aspx">http://www.ttinvestorrelations.com/turk-telekom-group/group-companies/argela.aspx</a></td>
</tr>
<tr>
<td>5G-EmPOWER testbed</td>
<td>Italy</td>
<td>Create-Net</td>
<td>5G-EmPOWER developed by Create-Net is a unique and open toolkit for SDN/NFV research and experimentation over wireless and mobile networks.</td>
<td><a href="https://github.com/5g-empower/5g-empower.github.io/wiki/Overview">https://github.com/5g-empower/5g-empower.github.io/wiki/Overview</a></td>
</tr>
</tbody>
</table>


Source: the SDN Catalogue
Research and development around Software Defined Networking (SDN) and Network Function Virtualization (NFV) is vast and testbeds and related toolkits in academia addressing SDN, NFV, Mobile Edge Computing (MEC) and 5G technologies are being set-up

- A strong impact on the industry is anticipated

Many open source initiatives with high potentials are not known by other researchers due to the lack of visibility

- Scientific publications are a good mean for those researchers to get some visibility, but that’s not enough
Many researchers, students, product developers have no idea how to get started

- The large number of existing activities makes very difficult the selection process of the tools needed for supporting their requirements

How to get started???
Towards a “Wikipedia” of Toolkits & Testbeds
Toolkits:
- From initial 90 to current 170+ projects

Testbeds:
Phase 2: Initial version of the Wiki

– Some existing wiki toolkits have been analyzed:
  – Selected Atlassian Confluence directly supported by and integrated with the IEEE service infrastructure and used in other open source initiative (OPNFV)

– Generation of the structure. Separation between:
  – toolkits and testbeds

– Tagging (labels) mechanism based on main functionalities / scope provided of each individual toolkit or testbed
  – It facilitates classification and navigation
Phase 3: Open the Wiki to the public community

- Managed by the community
  - Open to any registered user
  - Scales nicely / cost-effective (effort/per-person)
  - Content updates, curation, etc.

- Area caretakers to validate updates

Wiki overview

Live demo
Acknowledgements

Thanks to all volunteers that contributed to the realization of the catalogue

- INTRIG MSc and PhD students @ Unicamp
- See ~30 names under the “Contributors” tab: http://bit.do/oss-sdn-nfv

- Giuseppe Carella (TU Berlin)
  - Co-producer and leader of the testbed catalogue efforts
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