

## Master-Thesis @ High-Tech Enterprise

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| <b>Topic</b>              | <b>Development of an application to measure OAM parameters in MPLS networks using segment routing (SPRING)</b>  |
| <b>Motivation/Goal</b>    | <p>In MPLS networks it is very often required to validate the proper working of the data plane by sending and tracking test packets (probes). With LDP and RSVP as the current signalling protocols deployed in MPLS networks you can only verify specific/selected links through the control plane or with dedicated probes directly attached to the router.</p> <p>Source packet routing in networking (SPRING) provides an alternative method to signal transport labels in MPLS networks and offers an interesting approach to realize OAM functionality. With SPRING you could verify more 2000 segments by sending a single 9000 Byte sized packet. Moreover, SPRING provides mechanisms to direct the packets to any link in the network independent of the position of the sender, which in turn reduces the number of probes required.</p> <p>A statically configured testbed with a state-of-the-art load generator already proved the concept using current software deployed on Juniper Networks MX-routers. The IETF (Internet Engineering Task Force) issued a draft document for this use case under "draft-ietf-spring-oam-usecase" der IETF (Internet Egnineering Task Force).</p> |
| <b>Topics/Subjects</b>    | <p>Development of an application to measure OAM parameters in MPLS networks using segment routing (SPRING). The application should enable and support the following functions/requirements:</p> <ul style="list-style-type: none"><li>• Sending of MPLS pakets with IP payload which will use lable stacking to steer the packet through the network.</li><li>• Verify that the sent packet had been received back by the transmitting server.</li><li>• Retrieval of the link-labels assigned by the rotuter to craft a probing-packet with support of at least the following options:<ul style="list-style-type: none"><li>○ accessing the link-state database of the participating routing nodes through SSH/NETCONF or SNMP</li><li>○ accessing the routing process or SDN controller to retrieve topology information that was created using BGP-LS</li></ul></li></ul>  |
| <b>Required knowlegde</b> | <ul style="list-style-type: none"><li>• Solid foundation of IP and MPLS networks</li><li>• Detailed knowledge of IS-IS and BGP would be beneficial</li><li>• Solid understanding and practical experience in programming with Python</li><li>• Experience with software development frameworks and tools like Eclipse and Git/Github would be beneficial</li></ul><br><ul style="list-style-type: none"><li>• Fluent in English (Oral and written)</li><li>• Good command of German language would be beneficial but is not required</li></ul>  |



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| <b>Expected duration</b>     | 3-6 Months  |
| <b>Start date</b>            | October 2016  |
| <b>Supervisor at Xantaro</b> | Dipl.-Ing. (FH) Sebastian Graf  |
| <b>Location</b>              | Work from home, occasional presence at our XT3Lab in Frankfurt or our offices in Cologne and Frankfurt might be required. Travelling expenses will be covered by Xantaro. |
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| <b>Project reference no.</b> | 790003  |