

Course Content

Course Title (English)	Network Virtualization and Security
Course Title (Chinese)	虛擬化網路與安全
Credit	3
Instructor	Prof. Shan-Hsiang Shen 沈上翔 教授
Outline	<p>Next-generation 5G cellular networks will support various applications, including Industry 4.0, vehicle network, and IoT. The applications require different criterion. Network virtualization is developed to satisfy the requirements by combining software and hardware resources into a single software-based administrative entity. This course introduces several network virtualization technologies including software-defined networking, P4 language, network slicing, and network function virtualization. All topics start from the concept and then open source software is provided to build up virtualized networks. The new security issues for the new network technologies are also introduced. In addition, students can have a chance to operate their own experimental networks and work on related course projects.</p> <p>Week Description</p> <ol style="list-style-type: none">1 Introduction to network virtualization2 The data plane of software-defined networks (SDN)3 The control plane of SDN4 The security issues and security modules in SDN5 SDN experiments with Mininet + ONOS6 P4 languages

	<p>7 P4 runtime with SDN</p> <p>8 Network security with P4 modules</p> <p>9 P4 experiments with BMv2 + Mininet</p> <p>10 Introduction to network function virtualization (NFV)</p> <p>11 OpenStack for NFV</p> <p>12 Security issues in NFV</p> <p>13 Experiments to build up virtualized functions</p> <p>14 Introduction to network slicing</p> <p>15 OpenVirteX: open source platform for network slicing</p> <p>16 Final project presentation</p> <p>17 Final project presentation</p> <p>18 Final project presentation</p>
Goal	<ul style="list-style-type: none"> • Distinguish between the functions of data plane and control plane in SDN • Design complex networks on Mininet + ONOS • Understand the security issues in SDN • Distinguish between SDN and P4 • Develop/program new functions in P4 switches • Learn how ONOS controls P4 switches • Learn how to manage network functions via OpenStack • Understand the security issues for NFV • Slice network resources for different applications
English Teaching	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
Teaching Material	<input checked="" type="checkbox"/> English <input type="checkbox"/> Chinese