



# ELEC428

## Software Defined Networking

S2 Day 2018

*Dept of Engineering*

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#### **Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff

Senior Lecturer

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Contact via 1558

44W ,Room 136

Thursdays 3-4 PM

Credit points

3

Prerequisites

(COMP347 or ELEC345) and COMP229

Corequisites

Co-badged status

Unit description

Software Defined Networking (SDN) is the application of flexible hardware and software programming techniques to separate data and control functions in networking devices to improve operational efficiency and reduce costs. Together with the distribution of network control and virtualization SDNs allow new abstractions to be created that simplify network management and facilitate network evolution. This unit introduces the basic concepts and techniques of SDN including SDN architectures, data and control planes, SDN switches, virtualization, network operating systems, controller platforms, application programming interfaces (APIs), forwarding device interfaces, SDN programming, traffic engineering, and management plane interfaces. Also covered are SDN standards, resilience and scalability, performance evaluation, security, measurement and monitoring and the application of SDNs to cloud networking and data centre networking. The unit includes practical work in setting up and programming SDN capable devices and networks.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

Describe SDN enabling technologies such as network programability and applications

Model network virtualization and network function virtualization, concept and applications  
Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.

Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.

Competency to apply SDN technology for mobile communication networks and SDN Security

## **General Assessment Information**

### **Notifications**

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures are taken to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

### **Report and Assignment Submissions**

In Class Test solutions will be posted within a week after the the test date. Submissions will not be accepted once the solution is posted.

All reports and assignments must be submitted electronically through iLearn (in pdf format). Submissions will undergo plagiarism checkers using the turnitin software and any work deemed to have 20% or higher similarity score may incur academic penalty. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below.

Submissions are expected to be typed set in a logical layout and sequence. The expected workload includes preparation of final copies and clear diagrams.

### **Late submissions**

Late submissions will not be accepted without prior arrangement made at least one week before the submission date. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

### **Grading and passing requirement for unit**

For further details about grading, please refer below in the policies and procedures section.

In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

### **Student Responsibilities**

Be familiar with University policy, procedures and act in accordance with those policy and procedures.

It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term.

Student is to perform the required due diligent for their assessment grade and rectify as soon as possible upon finding any errors.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Class Tests , Week 6,12</u>	50%	No	Week 6,12
<u>SDN LAB</u>	40%	No	weekly
<u>Student Engagement</u>	10%	No	W12

### Class Tests , Week 6,12

Due: **Week 6,12**

Weighting: **50%**

Class Tests

On successful completion you will be able to:

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications

### SDN LAB

Due: **weekly**

Weighting: **40%**

MININET & Openstack

On successful completion you will be able to:

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

# Student Engagement

Due: **W12**

Weighting: **10%**

In Class proactive approach, problem solving, Contribute to the discussion and solutions

On successful completion you will be able to:

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## Delivery and Resources

The Unit delivery consists of interactive classes, Lectures, Brain storming sessions, PBL. Hands on Lab MINNIT Tools and Openstack Tools and projects It is the responsibility of the students to be active and focused regularly, attend the lectures, study the subject resources, and answer the review questions .Students will Accumulate the knowledge through strategies such as quizzes, problem-solving, short presentations, discussion or debates. Work related to SDN, NFV , open flow, open stack applications is performed by students in groups to encourage collaborative learning.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)

- [Special Consideration Policy](#) (**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

#### Learning outcomes

- Describe SDN enabling technologies such as network programmability and applications
- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

#### Assessment tasks

- Class Tests , Week 6,12
- SDN LAB
- Student Engagement

### Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

#### Learning outcomes

- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN

## Security

### Assessment tasks

- SDN LAB
- Student Engagement

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

### Learning outcomes

- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
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### Assessment tasks

- SDN LAB
- Student Engagement

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

### Learning outcomes

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications



- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## **Assessment tasks**

- Class Tests , Week 6,12
- SDN LAB

## **Critical, Analytical and Integrative Thinking**

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## **Learning outcomes**

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## **Assessment tasks**

- Class Tests , Week 6,12
- SDN LAB

## **Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## **Learning outcomes**

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications
- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
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## **Assessment tasks**

- Class Tests , Week 6,12
- SDN LAB

## **Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

## **Learning outcomes**

- Describe SDN enabling technologies such as network programability and applications
- Model network virtualization and network function virtualization, concept and applications
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## **Assessment tasks**

- SDN LAB
- Student Engagement

## **Engaged and Ethical Local and Global citizens**

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded,

sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

## **Learning outcomes**

- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## **Assessment tasks**

- SDN LAB
- Student Engagement

## **Socially and Environmentally Active and Responsible**

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

## **Learning outcomes**

- Demonstrate ability to analyse SDN fundamentals, open flow protocol, open stack and SDN potential.
- Ability to describe to model NFV -SDN application in Data Centres- Cloud computing architecture.
- Competency to apply SDN technology for mobile communication networks and SDN Security

## **Assessment tasks**

- SDN LAB
- Student Engagement

## **Changes from Previous Offering**

- 10 Marks for participation and in Class engagement ,
- New lab