



Review of New Zealand ICT Qualifications

Proposed addition of
Cybersecurity and IT Testing
Qualifications

NEEDS ANALYSIS

November 2017

Compiled for the ICT qualifications developers by NZQA National
Qualification Services (NQS)

Contents

SUMMARY OF STRATEGIC NEED	2
Introduction and justification of proposed qualifications	2
Background	2
Evidence to support the need for the proposed qualifications in Cybersecurity and IT Testing.	3
Cybersecurity	3
Software Testing	6
Supply and demand	8
Demand for roles in New Zealand and job vacancy data	9
Supply of cybersecurity and IT testing qualifications	10
Engagement with stakeholders	11
Proposed additions to the suite of computing and IT qualifications	12
New Zealand Diploma in Cybersecurity (Level 6) (120 credits)	12
New Zealand Diploma in Software Testing (Level 6) (120 credits)	12
NZ Certificate in Information Technology Practitioner with strands in Server Administration, Network Administration, Information Technology Security, and Software Testing (Level 6) (40 credits)[Ref: 2599 v2]	13
Appendices	14
Appendix A: Evidence of need – Diploma in Cybersecurity Qualification ex DPMC	14
Appendix B: Computing and IT Qualifications Landscape – Proposed additions November 2017 (Cybersecurity and Testing)	16
Appendix C: Summary of notes from the Cyber Security Qualification sector workshops 3 & 7 March 2017	17
Appendix D: Summary of notes from the Software Testing Qualification sector workshops 8 & 9 March 2017	19
Appendix E: Long Term Skills Shortages List extract - Immigration NZ	22
Appendix F: Cybersecurity Certifications – Homeland Security List	23
Appendix G: Stakeholder Profile	24

SUMMARY OF STRATEGIC NEED

Introduction and justification of proposed qualifications

The focus of this review is to develop qualifications which will equip people with the skills needed for technical professionals in IT related positions in cybersecurity and software testing, whether that is in an ICT sector business, other business organisations, or the community.

Cybersecurity and testing related roles are occupations identified on the New Zealand Long Term Skill Shortage List (LTSSL), suggesting sustained shortages of skilled workers and on-going demand for graduates skilled in these areas.

Cybersecurity is also a key priority for Government, and the 2015 Cyber Security Strategy signals the government's commitment to ensuring New Zealand is safe, resilient and prosperous online. Support for the intent of the proposed Level 6 cybersecurity qualification is contained in the *New Zealand Cyber Security Strategy Action Plan Annual Report 2016*. Strategic evidence of need for a Level 6 cybersecurity qualification was provided by the Department of Prime Minister and cabinet, and is included as appendix A.

Cybersecurity is critical for New Zealand, and is at the forefront of protecting infrastructure, business and computer networks from attack. Cybersecurity refers to the body of technologies, processes and practices designed to protect networks, computers, programs and data from attack, damage or unauthorised access. In a computing context, security includes both cybersecurity and physical security.

Testing is an important part of the process of protecting and securing IT, so organisations and customers can have confidence in and trust systems. Software testing points out defects and errors during the development, and builds in quality to ensure that what is created does what it is supposed to do. Quality products delivered to customers help in gaining their confidence, and appropriate testing helps minimise the risk of issues or failures occurring.

Significant industry consultation has been undertaken to ascertain that there is genuine industry demand for specialised qualifications in the areas of Software Testing and Information/Cyber Security.

Background

Information on the 2013-2015 Mandatory Review of ICT qualifications at Levels 1-6 is available at <http://www.nzqa.govt.nz/qualifications-standards/qualifications/information-technology-and-computing-qualifications-at-levels-1-6/review-of-ict-qualifications/>, including background, the resulting suite of 14 qualifications, and supporting documentation such as needs analysis, consultations, working group briefs.

The needs analysis report prepared for the ICT qualifications review considered the current and future needs of IT and was compiled to inform the decisions of the Steering Group when designing the future range of computing and IT qualifications, and to summarise the strategic need for the suite of 14 new IT and computing qualifications listed in April 2015. There was comprehensive investigation and analysis to quantify existing and future focused needs in terms of supply and demand for a range of IT professionals. The conclusions reached are exemplified in the summary, and highlight the strategic need for IT qualifications and the specific needs of learners and employers.

There is significant evidence of need in New Zealand for people skilled in cybersecurity and software testing, and there are indications that current qualifications are not fully addressing this

need. A range of IT jobs remain on the Long Term Skill Shortage List produced by MBIE Immigration section (see Appendix E); a range of cybersecurity and software testing jobs are in the lists produced internationally; and job vacancy data provides further evidence of the need for graduates skilled in these fields of IT. Cybersecurity is also an area of priority interest for Government.

The needs of Māori and Pasifika learners have been considered as part of the review, with an initial consensus that for IT this will not impact the design of new qualifications other than to ensure that the context allows for a range of programmes to be developed to meet specific needs of many potential learner groups, including Māori and Pasifika learners.

Evidence to support the need for the proposed qualifications in Cybersecurity and IT Testing.

Cybersecurity and IT testing are growing as professions, and there is evidence to show there are significant shortages of qualified staff and skills gaps for these career paths. The Immigration NZ Long Term Skills Shortage List includes a range of security and testing roles, and employers have indicated difficulties recruiting appropriately qualified staff to fill security and testing analyst type roles.

The needs analysis prepared for the mandatory review of ICT qualifications in November 2013 provides substantive evidence of need for IT professionals in a range of disciplines. At the time it was thought that the cybersecurity and testing job role specialisms may require qualifications at Level 7 or higher, and there were no current qualifications at Levels 1-6 in either discipline to be reviewed at that time. Since the suite of IT qualifications was approved in April 2015, there has been an ongoing interest from the sector to create additional qualifications in the cybersecurity and software testing areas.

Cybersecurity

New Zealand is increasingly reliant on ICT and an open, trusted Internet. Internet connectivity is an integral part of New Zealand's economic growth and international competitiveness. But this technology provides opportunities for those with criminal or hostile intentions.

The 2015 Cyber Security Strategy signals the government's commitment to ensuring New Zealand is secure, resilient and prosperous online. New Zealand's scale and relatively simple telecommunications and network structure enables the public and private sector to work closely together to embed a cyber security culture, and to respond nimbly to evolving cyber risks.

A goal of the cyber security strategy action plan is building cyber capability, and it specifies promoting cyber security education and training, including building a cyber security professional workforce as key.

A refreshed **NZ Cyber Security Strategy**, accompanying Action Plan, and a National Plan to address Cybercrime, were released on 10 December 2015. This Strategy signalled the Government's commitment to ensuring New Zealand is secure, resilient and prosperous online. The strategy has four intersecting goals (Cyber Resilience, Cyber Capability, International Cooperation, Addressing Cybercrime), depicted in the diagram¹ below.

¹ New Zealand Cyber Security Strategy – four intersecting goals – available at <https://www.dpmc.govt.nz/publications/new-zealands-cyber-security-strategy>



Support for the intent of the proposed Level 6 qualification is contained in the *New Zealand Cyber Security Strategy Action Plan Annual Report 2016* available at <https://www.dpmc.govt.nz/sites/default/files/2017-06/nzcass-action-plan-annual-report-2016.pdf>

The following was published in the 2016 Annual Report showing progress to December 2016.

Action 4: Promote cyber security education and training, including building a cyber security professional workforce.

- *A Cyber Security Skills Taskforce (the Taskforce) has been established to address the cyber security skills shortage in New Zealand.*
- *The Taskforce membership is made up of industry, academic and education representatives and is focusing on the following actions:*
 - *Developing a level 6 Diploma in Cyber Security, listed on the New Zealand Qualifications Framework (NZQF).*
 - *Working with industry to develop an internship programme for the second year of the Diploma course.*
 - *Developing a secondary school programme to position students for the Diploma.*
- *Work is underway to develop the NZQF listed level 6 Cyber security qualification, with agreement from the New Zealand Qualifications Authority to proceed to consultation on the qualification demand and level*

To further explore and confirm the need for the proposed security and testing qualifications, **roundtable sector meetings** were held in March 2017 to determine the level of interest in and clarify the need for the Level 6 Diploma qualification to be developed. Summary notes from these meetings are included as appendix C and D.

Prior to this, the National Cyber Policy Office (Department of the Prime Minister and Cabinet) and Connect Smart have collaborated with the sector in a range of ways, including:

- New Zealand's first **Cyber Security Summit**, held in Auckland May 2016 – workshop 1 Closing the Cyber Security Skills Gap, facilitated by David Eaton, CTO Hewlett Packard Enterprise NZ, was attended by 90-100 industry and academic representatives. Notes of the outcomes from this session are available on request.

- **Skills workshop 2016** - a smaller workshop of interested people following the summit. Notes of the outcomes from this session are available on request. The findings summarise the current state, future state, and proposed skills taskforce.
- **Advance Security Summit – Addressing a Critical Skills Shortage**, November 2016. Roundtable discussion facilitated by NZ Tech, and an extract from the executive summary follows:

Cybercrime is on the increase. Criminals have determined that it is safer and more lucrative to rob and extort online than via traditional methods. This realisation is driving an increasing number of criminals and criminal organisations into cybercrime. In response, there is an increasing demand for cyber security professionals. Recent reports suggest there is a global skills shortage of more than one million cyber security professionals, as government and corporations struggle to keep up with the large growth in cyber threats.

Subsequently, the New Zealand government's Cyber Security Strategy identifies the development of cyber capabilities as one of its four pillar strategies. A collaborative private-public sector taskforce has been established to proactively initiate solutions within New Zealand to help address this emerging challenge. The NZTech Leaders Forum at the Security Summit brought together another group of tech leaders to further explore the cyber skills challenge and discussion identified a range of insights around developing education, clear pathways, skills list.

Raising awareness of cyber security as a specialisation and building cyber security capability is important to close the gap between demand and supply and grow the cyber security workforce to meet current and future demand.

The Cyber Security Skills Report was prepared for the Greater Wellington Regional Council in September 2016, and contains a range of information on cybersecurity being critical to NZ, skills shortages, skills frameworks, information specific to the Wellington region.

Research was based on the following factors:

- Understanding the scope of the cybersecurity workforce pipeline;
- Establishing a baseline of current cybersecurity capabilities and proficiencies; and
- Identifying the general training needs of the cybersecurity workforce.

A collaborative approach was adopted in informing their report. This acknowledged a national imperative driven by implementing the NZ Cyber Security Strategy, TechNZ's Digital Nation work, and momentum from the private and tertiary sectors to be engaged in supporting the development of the industry. The need for continued collaboration between government, business, training institutions and the regions was continually reinforced in workshop discussions.

The **US Department of Homeland Security**, through the National Initiative for Cybersecurity Careers and Studies (NICCS) is promoting and developing tools and resources related to cyber education information. Cybersecurity certifications are valuable for anyone in the cybersecurity space, and NICCS has compiled a list of well-known industry certifications, and this is available at appendix F.

Software Testing

Testing related roles are occupations identified on the New Zealand Long Term Skill Shortage List, suggesting on-going demand for graduates skilled in this area. New Zealand job vacancy data also shows a significant number of vacancies for IT/Software testing roles (58 for test analyst/tester roles on Seek 10 August 2017).

There are many different types of testing – unit, integration, functional, system, stress, performance, usability, acceptance to name a few, and the pool of trained testers is insufficient to meet demand. Some organisations identify people from within their organisations and provide on the job training in testing, but stakeholders have indicated they welcome the possibility of a New Zealand qualification in software testing.

Testing is an important part of the process of protecting and securing IT environments, so organisations and customers can have confidence in and trust systems. Software testing points out defects and errors during the development, and builds in quality to ensure that what is created does what it is supposed to do. Quality products delivered to customers help in gaining their confidence, and appropriate testing helps minimise the risk of issues or failures occurring.

The software testing industry has been evolving, with the rapid scale of development (widespread adoption of agile methodologies) and new technologies keeping both developers and testers continuously striving to upgrade their skills to address the challenges posed by emerging technologies and getting apps to market faster whilst retaining robust and secure user-friendly performance.

A ComputerWeekly article “Industry warned it faces a dire shortage of IT testers”² outlines UK testing specialist ImagoQA concerns about the shortage of experienced testing professionals, and that software testing is seen as a crucial risk management element in IT projects, especially e-business system development.

Technavio, an independent technology research and advisory company, analysed the key challenges faced by the Global Software Testing Services market, highlighting in particular the “Shortage of Skilled Labour”³.

The Global Pure Play Software Testing Services market is growing rapidly, thus increasing the demand for skilled labour. However, this has created a disparity in supply and demand, as a result of which, sourcing and retaining skilled labour has become a challenge.

The shortage of availability of required skills is now becoming a major challenge for the software testing organisations.

² ComputerWeekly.com article available at <http://www.computerweekly.com/feature/Industry-warned-it-faces-a-dire-shortage-of-IT-testers>

³ Technavio Global Software Testing Services Market 2011-2015, Technavio available at <https://www.linkedin.com/pulse/shortage-skilled-testing-resources-istqb-can-help-official-network>

The market outlook of software testing services is expected to grow 11% during 2016-2020 according to Technavio's Global Software Testing Services market 2016-2020 report⁴. Their 2017-2021 report⁵ predicts strong growth for agile testing and test automation.



Feedback from Software Testing stakeholders

Assurity have advised they do two things to fill in the skills shortage – Graduate Programme and Fresh Start. The graduate programme is recruitment through university aimed at fresh tech and non-tech graduates who go through on the job training and are required to get International Software Testing Qualifications Board (ISTQB) certifications. The fresh start programme is aimed at professionals who want to move to software testing, and they go through the same training as graduates and are required to get ISTQB Certifications.

QualIT also do an overseas recruitment drive – see <http://qualit.co.nz/move-to-nz/>, and have a testing career path and internal mentoring to develop their testers.

Weta Digital advised they have been trying to build a test team but have had a difficult time finding suitable candidates. They are looking for testers who have the social and technical skills to thrive in a complex technical environment which deliberately provides quite a lot of freedom to their engineers and artists. Weta Digital have been looking for testers for over a year and have so far only managed to hire one person locally. They have had to increasingly look overseas because of the lack of talent they've been able to find locally, even though they would much prefer to hire from within New Zealand.

⁴ <https://www.technavio.com/report/global-it-professional-services-software-testing-services-market>

⁵ <https://www.technavio.com/report/global-it-professional-services-global-software-testing-market-2017-2021>

Planit NZ also have a recruitment programme for software testers, with a graduate programme aimed at aspiring software testers that involves training, work experience, on-going mentoring and ISTQB Foundation Certificate.

Planit also advised that according to Research and Markets, the Software and IT Testing Market is forecast to grow at a combined annual growth rate of 11% between 2016 and 2020, maintaining a trend of growth since the early 2000's. Anecdotally the majority of employees in the sector in New Zealand is comprised of immigrant visas, particularly from India and the Philippines, which have high numbers of highly trained university or academy graduates with software testing skills. The focus on key skills shortage industries by Immigration NZ has encouraged a relatively large increase in this demographic.

Equivalent New Zealand graduates and jobseekers have had less opportunity to train and develop these skills before their entry into the job market. According to the 2016 Planit Testing Index, software testing comprises approximately 20% of all IT Project spend, but is considerably underrepresented in the Tertiary education sector, in comparison with other IT disciplines such as coding. The majority of training is provided by private certification providers.

The proposed level 6 qualifications provide an up-to-date rigorous equivalent qualification that would help to fill the gap that currently exists satisfying local employer demand and providing a foundation for New Zealand to provide equivalently skilled graduates as the major IT hub nations.

Supply and demand

The 2013 ICT [Needs Analysis](#)⁶ provides information relevant to the IT professional workforce including the *employment and vacancy data analysis* (section 5) and the *skills and competencies for the ICT Sector* (Section 6), and also the analysis of the current situation included existing ICT qualifications (section 7).

An ICT Sector Report [Success Breeds Success](#)⁷ Edition 2017 prepared by the Ministry of Business, Innovation and Employment (MBIE), focuses on NZ's IT Product and service sector. It provides an overview of the New Zealand ICT sector, sector definitions, key themes and trends in data.

In the Minister's foreward, Hon Simon Bridges states:

"New Zealand's IT product and services firms are growing and this growth shows no signs of slowing. In 2016 the ICT sector was made up of 11,067 firms employing 29,700 people and contributed \$3.6 billion dollars to New Zealand's GDP. These firms invested \$436 million in R&D in the last year, more than any other sector in the economy.

...

Our challenge is to further develop our training and career pathways to meet the demands of the sector. This is not only vital for the future of the sector itself, but also for New Zealand's economic future."

This report provides general information on the state of the ICT sector, ICT related immigration (p36 – includes ICT Support and test engineers, and ICT security specialists), IT services

⁶ The 2013 ICT qualifications review Needs analysis is available from <http://www.nzqa.govt.nz/qualifications-standards/qualifications/information-technology-and-computing-qualifications-at-levels-1-6/review-of-ict-qualifications/>

⁷ MBIE NZ Sectors Report Series – Information and Communications Technology – Success Breeds Success Edition 2017 available at <http://www.mbie.govt.nz/info-services/business/business-growth-agenda/sectors-reports-series/pdf-image-library/information-and-communications-technology-report/2017-ict-report.pdf>

occupations and growth in the past 10 years (p42). It also provides further reading on digital sector reports and publications (p90).

The New Zealand Technology Industry Association publication [Digital Nation New Zealand – from tech sector to digital nation](#)⁸ analyses the impact of the Tech Sector and Technology on the New Zealand economy.

In Digital Nation (p43), Steven Newman, Chief Executive of ERoad comments “the tech sector is currently creating more jobs than there are trained people in New Zealand to fill them. As the tech sector continues to grow at a rapid pace, job creation will continue to grow.” The report also notes that “The tech sector creates many good jobs and stimulates the economy but the sector is constantly challenged by skills shortages” (p 46).

In the conclusions (p93) the report comments on growing the tech sector – “the number one catalyst for the success of the tech sector is a sustainable supply of skilled resources. Whilst there is currently a global shortage of tech skills, immigration will only get us so far. NZ must enhance its own education system to develop a sustainable local talent base.”

The Information, Technology and Digital (ITD) Skills Survey November 2016 findings also show half of respondents indicated the number of people with required skills has impacted on their ability to recruit and retain the right ITD people to their Government organisation.

Demand for roles in New Zealand and job vacancy data

A skills shortage exists when there are not enough people with a particular skill to meet demand, and the range of situations in which an employer finds it hard to find a worker with the right skills. Skills shortages have been demonstrated in the fields of cybersecurity and software testing.

Jobs currently on the Immigration New Zealand’s long term skills shortage list include:

- Software Tester (ANZSCO # 261314)
- Systems Analyst (ANZSCO # 261112)
- ICT Security Specialist (ANZSCO # 262112)
- ICT Quality Assurance Engineer (ANZSCO # 263211)
- ICT Systems Test Engineer (ANZSCO # 263213)
- ICT Support and Test Engineers nec (ANZSCO # 263299)

Jobs showing skills shortage at Careers NZ⁹ specific to the proposed new qualifications include:

- Test analyst - Test analysts design and carry out testing processes for new computer software and systems, analyse the results and identify any problems
- Security analyst - Security analysts protect the information systems and computer networks of an organisation so information cannot be illegally accessed. They create security processes and monitor the IT security framework

Penetration testers and security consultants are also on the skills shortage lists, but such roles would be more suitable for graduates that have worked in the field for a few years.

⁸ The New Zealand Technology Industry Association publication Digital Nation New Zealand – from tech sector to digital nation is available from <https://nztech.org.nz/reports/>

⁹ Careers NZ – Jobs in skill shortage <https://www.careers.govt.nz/jobs-database/whats-happening-in-the-job-market/skill-shortage-jobs/result/it-and-telecommunications>

Advertised job vacancy snapshot

A search of NZ job vacancy websites Seek and Trademe provide a snapshot of current vacancies in cybersecurity and testing roles.

- Seek accessed 10 August 2017 – 37 vacancies in NZ for cybersecurity related roles;
- Seek accessed 10 August 2017 - 58 job vacancies found for test analyst/tester roles
- Trademe jobs 10 August 2017 – 7 vacancies in NZ for cybersecurity related roles
- Trademe jobs 10 August 2017 – 8 vacancies in NZ for test analyst/tester related roles

The number of vacancies supports the evidence of demand and that there is a shortage of suitably qualified individuals for roles in security and IT testing.

A recent TechRepublic article¹⁰ states job postings in the cybersecurity field have gone up 74% over the past five years, and although this is a USA based source, it tends to reflect the global trends. In the same article Frank Schettini, chief innovation officer at ISACA, is quoted as saying “There aren’t enough people in the industry to fill jobs, and CISOs acknowledge that they are hiring people who they know don’t have the right skills - they are taking whatever they can get”.

Supply of cybersecurity and IT testing qualifications

There is only one current testing or security qualification at Levels 1 to 6 listed on the New Zealand Qualifications Framework (NZQF), and it is an IT Security strand in the NZ Certificate in IT Practitioner (Level 6) [Ref [2599](#)].

There are a range of university and polytechnic degrees and post-graduate diplomas in IT/Computer Science that may include a paper on one or both of these specialist areas, but no specific qualifications have been identified in this space.

There are a range of internationally recognised industry certifications in various aspects of testing and cybersecurity, including those listed in Appendix F (Homeland security list of Cybersecurity Certifications) and those offered by organisations such as the International Software Testing Qualifications Board ([ISTQB](#)) and promoted in New Zealand by the Australia and New Zealand Testing Board (ANZTB).

The ANZTB have provided data on the number of people certified in New Zealand for a range of their Certifications, including Certified Tester Foundation level, agile tester, Advanced level test manager, test analyst and technical test analyst.

Many universities in New Zealand have or are developing specialist cybersecurity degrees or postgraduate qualifications or courses in IT Testing or security, but there is a lack of sub-degree qualifications to meet industry demand.

¹⁰ TechRepublic article *How to build a successful career in cybersecurity* accessed 17 August 2017 from <http://www.techrepublic.com/resource-library/whitepapers/how-to-build-a-successful-career-in-cybersecurity-free-pdf/?ftag=TR Ee09998f&bhid=25014909191508183344673012137103>

Engagement with stakeholders

NZQA National Qualifications Service and IT Professionals New Zealand, as qualification developers (co-leads) of sub-degree IT and computing qualifications in New Zealand, have undertaken significant industry consultation to ascertain whether there is genuine industry demand for specialised qualifications in the areas of Software Testing and Information/Cyber Security. The stakeholder profile is included as Appendix G.

Consultation included hosting multiple workshops with stakeholders in March 2017, one-on-one discussions with key industry stakeholders and education providers (since mid-2016), as well as a formal written consultation process for employers and experts in June 2017. More than 200 specialist companies, experts and educators participated in the consultation exercise to July 2017. Notes from the workshops are attached as appendix C and D, with further information available from the review [webpage](#).

Following detailed consideration of the consultation evidence, the co-leads concluded that:

- There is clear and consistent evidence of industry demand for a sub-degree Software Testing qualification pathway to a "tier 1" test analyst role or similar, and therefore the co-leads proceeded with development of a qualification in this space (Level 6 Diploma, 120 credits).
- Clear evidence to support adding a Testing strand in the existing 40-credit NZ Certificate in IT Practitioner qualification [Ref: [2599](#)].
- There is clear and consistent evidence of industry demand for a dedicated qualification pathway in cyber / information security. The initial consultation was inconclusive as to whether this should be at a sub-degree, graduate level, or both. A significant percentage of experts who responded were concerned that (1) the quantity and complexity of knowledge necessary for a specialist "tier 1" security analyst role, and (2) the level of prior education or knowledge necessary prior to commencement of study for a specialist qualification in this space, would necessitate a qualification at the post-graduate level rather than the sub-degree level.
- Notwithstanding these concerns, there was evidence of industry demand and a very high level of support for proceeding with the initial development of a sub-degree qualification. The co-leads therefore proceeded with the development of a draft qualification (Level 6 Diploma, 120 credits), recognising it will be necessary to conclusively test the relevance of this draft qualification with employers prior to listing to ensure that a sub-degree qualification is able to contain sufficient quantity and complexity of learning to meet industry needs.

Two expert working groups (security and testing) established to develop the qualifications were convened in July and August, and an e-support network were invited to consider the drafts and provide feedback to inform the refinement of the proposed qualifications.

A full consultation on the draft qualifications was undertaken in September 2017, and results from this have been used by the working groups to further refine the draft qualifications and confirm that they are supported to proceed to approval to develop.

Proposed additions to the suite of computing and IT qualifications

The suite of IT and computing qualifications (see Appendix B) are designed to recognise generalist skills and knowledge relevant to many contexts, and also include specialist areas to allow for separate credentialing in the IT Professional areas.

The proposed additional Cybersecurity and Software Testing qualifications include:

- New Zealand Diploma in Cybersecurity (Level 6) (120 credits)
- New Zealand Diploma in Software Testing (Level 6) (120 credits)
- New Zealand Certificate in IT Practitioner (Level 6) (40 credits) – new strand in Software Testing

The qualifications are expected to be delivered and obtained in a range of contexts, integrating practical experience. Feedback to the review indicated support for these proposed additions to the suite of IT qualifications, and to provide opportunities for linkages to international industry certifications where appropriate, such as those offered by ISTQB, Microsoft, and some of those listed on the Homeland Security Cybersecurity Certifications webpage (see Appendix F).

The overall message from feedback was in support of relevant certifications ‘dropping out’ of broader New Zealand qualifications through programme design. Also, that these regularly updated international vendor certifications should not just be repackaged as a New Zealand qualification for funding purposes, but be available as an opportunity for providers to include in their design of current programmes towards the proposed new New Zealand IT qualifications to meet the needs of the sector. The proposed qualifications are worded in a way that allows enough flexibility for a range of programmes to be developed with potential linkages to current internationally recognised industry certifications.

New Zealand Diploma in Cybersecurity (Level 6) (120 credits)

The *NZ Diploma in Cybersecurity* is intended to provide a pathway for learners with existing IT qualifications or relevant industry experience to use this qualification to extend their knowledge and technical expertise with specialised re-training into the field of cybersecurity.

The Diploma will share the core skills required of all IT graduates at Level 6, and include specialised learning from an IT security perspective such as cybersecurity risk assessment, controls, reporting, ethical impacts, incident classification and handling processes, and IT business continuity. It would equip graduates for entry-level roles such as security analyst, security tester, security administrator, incident analyst, information assurance analyst, security assessor/auditor, security engineer, security developer or other cybersecurity related support roles.

New Zealand Diploma in Software Testing (Level 6) (120 credits)

The *NZ Diploma in Software Testing* is intended to provide a pathway for learners with existing IT qualifications or relevant industry experience to use this qualification to extend their knowledge and technical expertise with specialised re-training into the field of software testing.

The Diploma will share the core skills required of all IT graduates at Level 6, and include specialised learning from a software testing perspective such as principles underpinning sound testing practice, tester’s role in development, creating and executing tests (including creating and running test scripts to automate testing), analysing and reporting testing outcomes to

enable effective decision making. It would equip graduates for entry-level roles such as test analyst, tester, test engineer or other testing related support roles.

NZ Certificate in Information Technology Practitioner with strands in Server Administration, Network Administration, Information Technology Security, and Software Testing (Level 6) (40 credits)[Ref: 2599 v2]

The current IT practitioner qualification is stranded in order to recognise the specific skills and knowledge required of practitioners to update specialist skills to remain current in one of the specified areas of IT practice (Server Administration, Network Administration, and IT Security), and stakeholders support the addition of a software testing strand.

The NZ Certificate in Information Technology (Practitioner) is intended to meet the supply and demand needs of learners and industry in providing the short, sharp training that is required to enable learners to remain up to date in a sector that operates in an ever-changing landscape. The intent is to produce a graduate profile that is sufficiently generic and flexible enough to enable a range of programmes and internationally recognised vendor certifications to be aligned to the certificate, through programme design.

The proposed software testing strand will share the core skills required of all graduates of strands in the Level 6 NZ Certificate in IT Practitioner, and additionally graduates will be able to apply current and emerging knowledge, skills and techniques of software testing in one or more test disciplines to highlight quality issues and risks.

Appendices

Appendix A: Evidence of need – Diploma in Cybersecurity Qualification ex DPMC

Provided by the DPMC Cyber Policy Office February 2017

The global cybersecurity skills shortage is widely reported and increasing

Estimates of the global cybersecurity workforce shortfall range from one to two million positions unfilled by 2019. A recent report that surveyed eight countries (Australia, France, Germany, Israel, Japan, Mexico, the UK and the US) found that 82 percent of IT professionals are reporting a shortage of relevant security skills and 71 percent say the shortage is having 'direct and measurable damage' to their organisation's security networks.¹¹

What do we know about the cybersecurity skills shortage in New Zealand?

The overseas surveys have not included New Zealand, and to date we have not collected quantitative data on the scale of the shortage here. However, reports indicate that the cybersecurity skills shortage is equally, if not more of, a problem for New Zealand, as we are competing for talent on a global basis, which is difficult when New Zealand companies cannot compete with the salaries of larger overseas organisations.¹²

The Cyber Security Summit in May 2016 included a workshop on the cybersecurity skills shortage, attended by approximately 100 mostly industry representatives. This workshop, and a further workshop in June with 27 industry and academic representatives, highlighted the difficult industry have in recruiting cybersecurity professionals. Organisations reported on the difficulty in filling cybersecurity roles across the board, often taking months to fill positions, having to rely on immigrants, and often not being able to grow their business as result of this skills shortage. The workshop in June recommended an immediate action to address the lack of a workforce 'pipeline'.

The Greater Wellington Regional Council has identified cybersecurity skills growth as an opportunity and a concern for the Wellington region. They commissioned research from kMatrix to understand the demand for cybersecurity roles across the region. As apparent in the table below, there are multiple roles within the cybersecurity profession. The kMatrix projection shows that growth in cybersecurity roles is expected across the board. Anecdotal evidence of the current shortage of different roles within cybersecurity supports this finding.

Based on the kMatrix projections, Wellington will see 14 percent growth in required cybersecurity roles over the two years to 2018, translating to an additional 265 positions. Extrapolated to the whole of New Zealand, this equates to projected growth of just under 1900 positions across the range of technical cybersecurity roles, over the next two years. Based on industry feedback, this is expected to be a conservative estimation.

Table One: Projected growth in cybersecurity roles in the Wellington region

¹¹ Hacking the Skills Shortage: A study of the international shortage in cybersecurity skills. Available at <http://www.mcafee.com/us/resources/reports/rp-hacking-skills-shortage.pdf>

¹² <http://www.nbr.co.nz/article/serious-cybersecurity-skills-shortage-sparks-calls-better-training-ns-p-192244>

Job Title	New Zealand Heads 2016	Wellington Heads 2016	Wellington Forecast Heads 2018	% Wellington to NZ	Wellington Number Growth over 2 years	Wellington % Growth over 2 years
CISO – Chief Information Security Officer	151	22	32	15%	10	45%
Cryptographer/Cryptanalyst	94	14	20	15%	6	43%
Cyber Incident Response Specialist	107	17	23	16%	6	35%
Cyber Security Forensic analyst	110	17	24	15%	7	41%
Cyber Threat Intelligence Analyst	248	35	45	14%	10	29%
Database Security Manager	151	24	36	16%	12	50%
Deputy CISO/CIAO	61	10	12	16%	2	20%
Incident handler	246	34	40	14%	6	18%
Information assurance Manager	133	18	30	14%	12	67%
Network security administrator	242	35	48	14%	13	37%
Penetration tester	234	33	51	14%	18	55%
Project manager	278	40	48	14%	8	20%
Security advisor	182	25	29	14%	4	16%
Security analyst	397	56	78	14%	22	39%
Security Architect – Consulting	132	21	33	16%	12	57%
Security architect – products& solutions	95	14	20	15%	6	43%
Security Auditor	123	19	25	15%	6	32%
Security Consultant – Management	311	44	60	14%	16	36%
Security engineer	147	19	26	13%	7	37%
Security Operations Manager	84	13	18	15%	5	38%
Security Software Developer	474	65	91	14%	26	40%
Security strategist	154	22	30	14%	8	36%
Security systems administrator	116	16	22	14%	6	38%
Security tester	265	33	43	12%	10	30%
Technical security consultant	114	16	27	14%	11	69%
Web security	300	42	58	14%	16	38%
	4949	704	969	14%	265	38%

Traditional tertiary qualifications are only part of the answer

One of the findings from the 'Hacking the Skills Shortage' report was that there are better ways than traditional tertiary degrees to acquire cybersecurity skills. This finding is backed up by workshops and discussions with industry here in New Zealand. Respondents and participants ranked hands on experience and professional certifications as an alternative way to acquire the cybersecurity skills industry requires, in addition to traditional degree-level course. Industry also sees this as a way to build capability more quickly than would be possible with traditional degree courses.

Many universities in New Zealand have developed specialist cybersecurity degrees and postgraduate courses, or are in the process of developing these. There is currently a lack of sub-degree courses to meet the demand of industry.

Appendix B: Computing and IT Qualifications Landscape – Proposed additions November 2017 (Cybersecurity and Testing)

Computing and IT Qualifications Landscape - Proposed additions November 2017 (Cybersecurity and Software Testing)											
NZQF Level	IT as a Tool		IT as a profession								
1	General education review	1									
2	NZ Certificate in Computing (User Fundamentals) (40 credits) [Ref:2591]	2									
3	NZ Certificate in Computing (Intermediate User) (60 credits) [Ref:2592]	3									
4	NZ Certificate in Computing (Advanced User) (60 credits) [Ref:2593]	4	NZ Certificate in Information Technology Essentials (60 credits) [Ref:2594]								
5		5	NZ Certificate in Information Technology (60 credits) [Ref:2595]								
			NZ Diploma in Information Technology Technical Support (120 credits) [Ref:2596]	NZ Diploma in Information Systems (120 credits) [Ref:2597]		NZ Diploma in Web Design & Development (120 credits) [Ref:2598]				Pathways from any of the Level 5 NZ Dip quals or Level 6 Ref: 2604	
6		6	NZ Diploma in Networking (120 credits) [Ref:2600]	NZ Diploma in Systems Administration (120 credits) [Ref:2601]	NZ Diploma in Database Administration (120 credits) [Ref:2602]	NZ Diploma in Info Systems (strands in Business Analysis, User experience, IT Project Management, and IS Innovation) (120 credits) [Ref:2603]		NZ Diploma in Software Development (240 credits) [Ref:2604]	NZ Certificate in Information Technology Practitioner (strands in Server Administration, Network Administration, IT Security, ADD Software Testing) (40 credits) [Ref:2599]	NZ Diploma in Cyber security (120 credits)	NZ Diploma in Software Testing (120 credits)

Possible pathways..... Bachelor Degrees (Level 7); Industry Certifications (Level 5, 6, 7)

Appendix C: Summary of notes from the Cyber Security Qualification sector workshops 3 & 7 March 2017

Summary of notes from Cyber security qualification sector workshops 3 & 7 March 2017

Key question considered

Does New Zealand need a cyber security qualification and what evidence of need is there?

Context

IT Professionals New Zealand and the NZQA National Qualifications Services team are co-developers of sub-degree computing and IT qualifications on the NZ Qualifications Framework.

36 attended the sector meetings held 3 & 7 March 2017 in Auckland and Wellington, to explore the need for a cyber security qualification in New Zealand.

It was noted that there isn't any dedicated security or testing qualification in the new IT qualification suite, as in 2013 it was thought they may sit at Level 7, outside the scope of the review. Some existing IT/Engineering degree qualifications have a paper/course (elective) within it on these topics, but no specialist qualification.

Summary from cyber security meetings

- Evidence of need for a cyber security qualification through skills shortages in cyber security – locally, globally, and a growth area (can't get enough people to fill skills gaps in security analyst roles).
- Some vendor Certificates are highly valued in the Cyber security space (see NICCS – Cyber security Certifications [list](#)), although some less well-valued where content can be rote-learned. Examples of existing options include CREST (Australian Cert), OSCP (hands on for offensive security - hacking), ISC2, SANS, MooC's, security boot-camps, Bug Bounty.
- NZ Cyber Security Skills [Taskforce](#) is keen to develop a Level 6 qualification that would include practical placements as an alternative pathway into junior security roles.
- Sector meeting feedback indicates that job roles are most likely to be entry level security analyst and maybe engineer. Not seen as suitable for entry level pen-testers, auditors, incident responders (degree qualified and significant work experience important for these roles).
- Two key target markets - school leavers (primarily a shorter study/learn on the job practical option), and re-trainers (mature re-trainers with practical IT experience).
- Compulsory practical aspects are most attractive to employers – the quality of these is important. Educators would support the qualification based on feedback from industry that they would employ graduates. *Note: Need industry commitment to providing placements for practical aspects of the qualification (providers advised issues with getting placements for current degree students).*
- Important to include practical application, industry engagement, consideration of funding for employers to support proposed internships etc. Query around

apprenticeships and how these might work, along with flexibility for retraining on the job/part-time.

- 1+ year Diploma qualification outline considered by attendees – seen as an added pathway rather than a solution to the industry skills-gap problem.
- Proposed qualification could provide foundational knowledge for a Tier 1 security analyst, but thin understanding requiring on-the-job upskilling.
- NZ Certificate in IT Practitioner (IT security strand) option exists for retraining/upskilling those with suitable practical IT experience.

Following is the typed version of what was on the whiteboard

Gaps	Job Roles	Need
<ul style="list-style-type: none"> • Industry certificates • Hacker mindset • Understand environment • Analytical/ability to learn • Speed of change • Foundational knowledge • Practical application • Industry involvement • Practical components /interns • Pre-requisites – broad IT base (school, Level 5 Certificate/Diploma or equivalent experience). 	<ul style="list-style-type: none"> • Breakers – Pen-testers (hackers) • Builders – junior engineers • Hunters – junior analysts (next step would be incident responders but need more forensic skills) 	<ul style="list-style-type: none"> • Yes – if practical component embedded (2 year option with significant 1 year internship). • Range of target markets – primarily a shorter study/learn on the job practical option for school leavers; mature re-trainers with practical IT experience

Appendix D: Summary of notes from the Software Testing Qualification sector workshops 8 & 9 March 2017

Summary of notes from Software testing qualification sector workshops 8 & 9 March 2017

Key question considered

Does New Zealand need a software testing qualification and what evidence of need is there?

Context

IT Professionals New Zealand and the NZQA National Qualifications Services team are co-developers of sub-degree computing and IT qualifications on the NZ Qualifications Framework.

26 **attended** the sector meetings held 8 & 9 March 2017 in Auckland and Wellington, to explore the need for a software testing qualification in New Zealand.

It was noted that there isn't any dedicated security or testing qualification in the new IT qualification suite, as in 2013 it was thought they may sit at Level 7, outside the scope of the review. Some existing IT/Engineering degree qualifications have a paper/course (elective) within it on these topics, but no specialist qualification.

Summary from software testing meetings

- Evidence of need for a software testing qualification through skills shortages in software testing – locally, globally, and a growth area.
- Few/limited vendor Certificates – although practicing Certifications through ITSQB ANZTB; BBST re association of software testing for practitioner badging (not entry level).
- Sector meeting feedback that job roles most likely to be entry level testing analyst and maybe engineer (dependent on pathway as more coding skills required for junior testing engineer roles). Two mindsets – user side and technical side (coding, system design).
- Two key target markets - school leavers (primarily a short study/learn on the job practical option), and re-trainers (mature re-trainers with practical IT experience).
- Compulsory practical aspects are most attractive to employers – quality of these is important. Educators would support the qualification based on feedback from industry that they would employ graduates. *Note: Need industry commitment to providing placements for practical aspects of the qualification (providers advised issues with getting placements for current degree students).*
- Important to include practical application, industry engagement, funding for employers to support proposed internships etc. Query around apprenticeships and how these might work, along with flexibility for retraining on the job/part-time.
- Diploma qualification outline – seen as an added pathway rather than a solution to the industry skills-gap problem. Maybe suitable as a strand in existing Level 6 IS or software development qualification, or a shorter standalone testing Certificate.
- The proposed dedicated qualification in the software testing space could build capability in the sector – but some interest in a short, sharp graduate programme with 2-3 months worth of practical and testing specific training with part-time options, maybe blended online learning could be attractive to employers and would-be testers.
- Proposed qualification could provide foundational knowledge for a Tier 1 software testing analyst, but requiring on-the-job upskilling/application.

- NZ Certificate in IT Practitioner (software testing strand) possible option for retraining/upskilling those with suitable practical IT experience, but not suitable for new entrants to testing.
- Threads of what buckets of learning could look like may be grouped as follows – learning (what’s required), modelling (test problem/analysis), performing (testing), reporting; attributes sought include test experience, automation, people skills, organisation skills/knowledge, learning/growth mindset. Person characteristics include adaptability, important to be able to deal with uncertainty, emerging technologies systems, process and approach. General and soft skills to include at least project management, working in teams, presentation and reporting skills.

Following is the typed up version of what was on the whiteboard – Auckland meeting

Exists	Gaps	Job Roles	Need
<ul style="list-style-type: none"> • Testing or QA – changing role • ISTQB – Certification for practitioners • Graduates of IT related qualifications • Immigrants (generally post-graduate) • Cross skilling – different disciplines and move into testing 	<ul style="list-style-type: none"> • Adaptability/ability to learn • Attitude • Analytical skills • Tester mindset • Context and methodology • How teams function • Pre-requisites – broad IT base (digital technologies at school, Level 5 Certificate/Diploma or equivalent experience). 	<ul style="list-style-type: none"> • Entry level/junior test engineers (automation scripting) • Entry level/junior test analysts <p>Note: Development skills are advantageous for both roles but critical for test engineers.</p>	<ul style="list-style-type: none"> • Not enough people with the right skills •

Following is typed up version of what was on the whiteboard – Wellington meeting

Gaps	Job Roles	Need	Employ graduate?
<ul style="list-style-type: none"> • Placements (<i>mentioned, not listed on whiteboard</i>) • Big IT picture understanding needed to do well in testing 	<ol style="list-style-type: none"> 1. Entry level/junior test engineers (automation scripting testers) 2. Entry level/junior test analysts (user/exploratory testers) <p>Note: Development skills are advantageous for both roles but critical for test engineers.</p>	<ul style="list-style-type: none"> • Reskilling – short, sharp • Not enough people with the right skills 	<ul style="list-style-type: none"> • Query whether the testing industry would have confidence in a Level 6 NZ qualification • Mindset shift required re value of a qualification at Diploma Level 6

Software testing – strawman qualification content areas

Following is typed up version of changes to strawman from Auckland meeting

1 Fundamental concepts of testing	2 Test design analysis (incl test phases)	3 Testing phases Pre-test environment and test data
4 Usability concepts	5 Test context and practices (incl development approaches) execution methodologies	6 Testing toolbox Techniques – automated testing, non-technical user testing
7 Communication skills - and core skills (problem solving, interpersonal, professionalism etc)	8 Technical and vs Functional aspects	9 Manual vs automated testing

Following is typed up version of changes to strawman from Wellington meeting

1. Fundamental concepts / Quality criteria	2. Test analysis - modelling	3. Environment and Data - architecture and querying
4. Usability concepts - security, performance, accessibility	5. Testing Context and practices (inc dev approaches)	6. Testing Techniques and automation. Explorative testing (new box?)
7. Communication skills - presentation skills, reporting, professional practice, project management	8. Technical vs Functional aspects OR Functional & non-functional	9. Testing toolbox or Tool Concepts

Appendix E: Long Term Skills Shortages List extract - Immigration NZ

Jobs currently on the Immigration New Zealand's long term skills shortage list include:

<http://skillshortages.immigration.govt.nz/>

ICT, Electronics and Telecommunications

ICT Project Manager (135112),

Organisation and Methods Analyst (224712), ICT

Business Analyst (261111),

Systems Analyst (261112),

Multimedia Specialist (261211),

Web Developer (261212),

Analyst Programmer (261311),

Developer Programmer (261312),

Software Engineer (261313),

Software Tester (261314),

Software and Applications Programmers nec (261399),

Database Administrator (262111),

ICT Security Specialist (262112),

Systems Administrator (262113),

Computer Network and Systems Engineer (263111),

Network Administrator (263112),

ICT Quality Assurance Engineer (263211),

ICT Support Engineer (263212),

ICT Systems Test Engineer (263213),

ICT Support and Test Engineers nec (263299),

Telecommunications Engineer (263311),

Telecommunications Network Engineer (263312), ICT

Customer Support Officer (313112)

Appendix F: Cybersecurity Certifications – Homeland Security List

Sourced from the USA Homeland Security webpage: <https://niccs.us-cert.gov/featured-stories/cybersecurity-certifications> (Published Date: April 3, 2017)

NICCS' vision is to provide the nation with the tools and resources necessary to ensure the Nation's workforce has the appropriate training and education tools in the cybersecurity field. We also aim to increase awareness of valuable tools and resources available to help educate you during your studies and career.

Cybersecurity certifications are valuable for anyone in the cybersecurity space, and NICCS has compiled a list of well-known industry certifications. Some are perfect starting points on your career path and others will help increase future career opportunities. NICCS wants to highlight those certifications in need which will help close the skill gaps in the cybersecurity workforce.

We encourage you to investigate the certifications below. Once you determine which is the right certification for you, visit the Education and Training Catalog to find a cybersecurity training provider in your local area or online.

- [A+](#)
- [Advanced Security Practitioner](#)
- [Certified Authorization Professional \(CAP\)](#)
- [Certified Cloud Security Professional \(CCSP\)](#)
- [Certified Cyber Forensics Professional \(CCFP\)](#)
- [Certified Ethical Hacker \(CEH\)](#)
- [Certified Expert Penetration Tester \(CEPT\)](#)
- [Certified Incident Handler \(CIH\)](#)
- [Certified Information Security Manager \(CISM\)](#)
- [Certified Information System Auditor \(CISA\)](#)
- [Certified Information Systems Security Professional \(CISSP\)](#)
- [Certified Penetration Tester \(CPT\)](#)
- [Certified Penetration Testing Consultant \(CPTC\)](#)
- [Certified Penetration Testing Engineer \(CPTe\)](#)
- [Certified Secure Software Lifecycle Professional \(CSSLP\)](#)
- [Certified Security Analyst \(CSA\)](#)
- [Certified Security Testing Associate \(CSTA\)](#)
- [Certified Virtualization Professional \(CVP\)](#)
- [CyberSec First Responder \(CFR\)](#)
- [HealthCare Information Security and Privacy Practitioner \(HCISPP\)](#)
- [Master Mobile Application Developer \(MMAD\)](#)
- [Network+](#)
- [Offensive Security Certified Professional \(OSCP\)](#)
- [Security+](#)
- [Security Essentials Certification \(SEC\)](#)
- [Server+](#)
- [Systems Security Certified Practitioner \(SSCP\)](#)

This list is compiled from current course listings in the Education and Training Catalog, and verified as current and relevant offerings by leading providers and developers of cybersecurity certifications.

Appendix G: Stakeholder Profile

Stakeholder name (Individual, group or organisation)
Industry organisations including professional and industry groups, and the broad IT community these industry groups reach (e.g. ITP, NZTech, TPN, NZRise, Software NZ, ANZTB, CITRENZ, ITENZ, NZACDITT) as well as other informal user groups and networking associations
Designated agencies, including Government agencies such as Department of the Prime Minister and Cabinet (DPMC), Ministry of Education, Tertiary Education Commission, NZQA, Education NZ; Ministry of Business, Innovation & Employment (Labour and Immigration NZ); Ministry of Pacific Island Affairs; Ministry of Social development
Employers and other organisations and people who express an interest, including the Cyber Security Skills Taskforce, Planit Testing, Assurity, Qual IT, contractors, community groups and ITOs.
Current ICT qualification owners (or programme owners)
ITPs, PTEs, Māori and Pasifika providers, secondary schools; and their respective peak bodies and consultation networks
Students, learners and graduates
IT Computing qualification developers and sector specialists
Cybersecurity and Software Testing Working Groups