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**Internal Assessment Resource**

**Digital Technologies & Hangarau Matihiko Level 2**

This resource supports assessment against Achievement Standard 918951

**Standard title:**  Use advanced techniques to develop a network

**Credits:** 4

**Resource title:** I made my own media server!

**Resource reference:** Digital Technologies & Hangarau Matihiko2.6B

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| This resource:   * Clarifies the requirements of the achievement standard * Supports good assessment practice * Should be subjected to the school’s usual assessment quality assurance process * Should be modified to make the context relevant to students in their school/kura environment and ensure that submitted evidence is authentic |

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| Date version published by Ministry of Education | December 2018 Version 1  To support internal assessment from 2019 |
| Authenticity of evidence | Teachers/kaiako must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.  Using this assessment resource without modification may mean that students’ work is not authentic. The teacher may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

*1Achievement Standard 91895 is derived from both The New Zealand Curriculum and Te Marautanga o Aotearoa*

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**Teacher/Kaiako guidelines**

The following guidelines are supplied to enable teachers/kaiako to carry out valid and consistent assessment using this internal assessment resource.

Teachers/kaiako need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students/ākonga against it.

**Context/Te Horopaki**

The assessment activity requires students, using advanced techniques, to use a computing device (e.g. an old computer or a Raspberry Pi or similar) to create a dedicated location for storing various [digital media](https://en.wikipedia.org/wiki/Digital_media) (meaning digital videos/movies, audio/music, and picture files). This needs to be done in the context of a refined network.

This assessment is done with any combination of hardware and software can be substituted to achieve the same outcome, as long as the setup and configuration undertaken are rigorous enough to meet the standard. It is best to trial this beforehand and help direct students.

Plex, Kodi, Subsonic etc (or another relevant tool) is about more than creating a local server, it is about gathering, delivering content to not just a local network but potentially to a global audience.

Students will develop a short presentation to their class to give feedback on their development and learning, showcasing their working outcome, and answer questions to confirm their understanding.

This standard could easily be extended to incorporate a wide range of other standards depending on the project scope.

**Conditions/Ngā Tikanga**

It is recommended that students should have at least two identified checkpoints with their teacher as they work through this assessment activity to ensure they have an opportunity to ask questions and gather feedback.

The format of the final outcome is recommended to be a concise document drawing together all the development, research and refinement of the student’s proposal process. Evidence can come from print screens, photos, reflections etc. The format of the evidence is not assessed by this achievement standard.

Conditions of Assessment related to this achievement standard can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>

**Resource requirements/Ngā Rauemi**

This task will allow students to investigate, select, install (hardware components and software) and then configure and troubleshoot the outcome. In this assessment, the outcome is to setup and configure a wireless media server.

Most of the hardware for this project is easy to get hold of, you may well have most (or even all) of the bits and pieces you need in your classroom already, or they can be purchased at a reasonable cost.

If equipment is limited, students still need to have the opportunity to justify why the equipment that they have available is fit for purpose and appropriate.

For this exampleof this assessment you will need:

**Basic Hardware selection:**

An old computer or disk drives or Raspberry Pi or similar

Micro SD card or similar storage

Keyboard/mouse/monitor

USB or external drive

**Basic Software selections:**

Appropriate OS software

NOOBS “New Out of Box Software.”

### Dev2Day repository / PLEX / Kodi etc

**Basic configurations:**

Booting the OS

Install/update OS

Configuring Computer

Software configurations

Permissions

IP configuration

The overarching requirements can be summarised as:

1. Connect, add files and test the setup to confirm its functionality
2. Install & update OS
3. Check configurations/troubleshooting (e.g. HTTPS transport package)
4. Configure repository e.g.  
   *wget -O - https://dev2day.de/pms/dev2day-pms.gpg.key | sudo apt-key add -  
   echo "deb https://dev2day.de/pms/ jessie main" | sudo tee /etc/apt/sources.list.d/pms.list  
   sudo apt-get update*
5. Download media server software e.g. PLEX
6. Configure permissions
7. Add files / testing
8. Configure and connect with client

**Additional information/He Kōrero Atu**

This task is written using a Plex server and Raspberry Pi, but they could also select Intel compute stick, or Raspberry Zero, RasPlex, Kodi etc.

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**Student/Akonga instructions**

**Introduction/Kupu Arataki**

This assessment activity requires you to use advanced techniques to create, troubleshoot and configure a wireless media server to create a dedicated location for storing various [digital media](https://en.wikipedia.org/wiki/Digital_media) (meaning digital videos/movies, audio/music, and picture files), that can be accessed by local and remote devices, i.e. Chromecast, plus to be shared to other people globally on mobile phones, tablets, computers and their own Chromecasts/Apple TVs. Students will also need to include the setting up and connecting to other devices in a network, e.g. the tablet or PC that is needed for the Chromecast configuration.

You will need to make some software and hardware selections based on how you develop your outcome. You will need to diagnose, test and troubleshoot your hardware and software throughout this development process.

Your teacher will provide you with access to a range of equipment for this assessment, or you can provide your own. You will need to investigate what equipment is available and choose, based on the capabilities of available equipment.

Teacher note: Insert due dates and timeframes

**Information before you start**

This is not a plug and play media server. This is an independently setup and configured media server.

You are to develop a media server with a PLEX installation that can be accessed by local and remote internet connections.

You will be expected to install and configure a range of protocols and software to create a system that is fit for purpose.

You will be provided with access to a range of hardware and software to create a basic media server. You could also provide your own. You will need to be able to justify why the parts and components selected by you will meet the needs of the end users.

Things to think about as you proceed.

* How will you make software and hardware selections to develop your outcome?
* How will you show that you were able to use appropriate tools, procedures and protocols to install and configure hardware, software and peripherals?
* How will you show that you were able to diagnose, test and troubleshoot your hardware and software throughout your development process?
* How will you clearly demonstrate throughout your development process that you understand relevant tools, procedures and protocols?
* How will you show that you explained and addressed the relevant implications of what you created?

You will need to be familiar with the hardware and software and will need to be able to link this into some wider infrastructure knowledge, so you can justify your decision making.

There are a number of procedures you will need to think about in order to configure, test, diagnose, and troubleshoot to resolve any faults you meet in this project such as:

* Configuring and setting up the media server
* Configuring a router for people to access the server outside the ‘home network’
* Configuring and testing network connectivity
* Installing appropriate software to test the system.

You can present this information in a variety of ways, but it does need to be recorded and evidenced. It is important you regularly check in with your teacher to demonstrate your learning.

You are going to be assessed on your ability to:

* show an understanding of the parts and components selected
* install, test and configure your selected hardware
* install, test and configure your selected software
* show how you have explained and addressed relevant implications and met end-user requirements
* syncing content between users and testing to ensure that it works on mobile phones on a 3G/4G connection.
* test outbound and inbound connections on your internet connection with port forwarding
* show accuracy with using tools, procedures and protocols to refine your project
* explain the what, why and how of your network outcome (e.g. the purpose and function of the parts of components)
* ensure your outcome is fit for purpose by justifying your selections.

You may work with others to help generate ideas and develop those ideas. However, you will be expected to show your own thinking and evidence of how you discussed and combined ideas together to write and submit your own assessment evidence.

You will also be expected to install and configure an appropriate OS, and a range of selected install software. You will need to be familiar with the hardware and software that you use.

There are a number of procedures you will need to think about in order to configure, test, diagnose, and troubleshoot to resolve any faults you meet in this project such as:

* Configuring and booting the selected computer
* Downloading and configuring the selected software.
* Connecting to and testing the setup to confirm its functionality
* Connecting and configuring the media server software
* Configuring Port forwarding.

**Task/Hei Mahi**

You are required to build a standalone offline gaming network.

For this assessment you are required to develop a short presentation to your class to feedback on your development, to showcase your working outcome, and answer questions to confirm understanding.

You will need to:

1. Record your development process undertaken (e.g. photos, notes, print-screens etc.) of the stages as you move through and clearly annotate to show you accurately using
   * 1. tools, procedures and protocols and the improvements or refinements made throughout your setup of the media server
     2. appropriate testing procedures, diagnosing and troubleshooting to identify and resolve setup and configuration errors.
2. Investigate and explain the parts and components and their purpose and function (both hardware and software) to be used for the media server.
3. Explain and address at least three relevant implications of the network and link these implications to your networked media server outcome. These could be ethical, intellectual property considerations and usability, for example, although you may select other ones that you determined were relevant.
4. Test your selected parts and components (both hardware and software) and identify and resolve setup and configuration errors to ensure that the network media server outcome
   * functions as intended
   * is reliable
   * is accurately constructed and meets end-user requirements.

*You should document the tests you performed, and any modifications because of those tests.*

1. Using information gained from your testing procedures, diagnosing and troubleshooting to inform further development and improve the quality of the media server.
2. Justify your choice of parts and components (hardware and software) selections.

**Assessment schedule/Mahere Aromatawai: Digital Technologies & Hangarau Matihiko 91865 – I made my own media server!**

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| **Evidence/Judgements for Achievement/Paetae** | **Evidence/Judgements for Achievement with Merit/Kaiaka** | **Evidence/Judgements for Achievement with Excellence/Kairangi** |
| Use advanced techniques to develop a network.  The student has:   * used appropriate tools, procedures and protocols to install and configure hardware (including peripherals) and software   **For example (partial evidence):**  *“I downloaded Raspian but wanted to ensure I had the latest updates. I opened the command line (it’s the black and blue box on the taskbar) and typed: sudo apt-get update sudo apt-get upgrade”*  *I connected the Server to Plex but needed to check and test the configurations on the router correctly supporting:*   * *NAT-PMP or* * *UPnP*   *Although these features are common on modern routers it was disabled by default.*   * undertaken a range of appropriate testing procedures, diagnosing and troubleshooting to identify and resolve setup and configuration errors   **For example (partial evidence):**  *“I tried to download plex and got this error:*  *“E: the value “jessie” is invalid for APT:Default-Release as such a release is not available in the sources.”*  *I searched this on the internet and found:*  *“sudo apt-get install -t jessie plexmediaserver” --> “sudo apt-get install -t strech plexmediaserver”*  *My router doesn’t support NAT-PMP or UPnP*  *so I needed to set up a manual Port Forward.*   * investigated the parts and components (hardware and software) to be used   **For example (partial evidence):**  *“I needed to choose a software to install on the Pi, I looked up* [*https://www.htpcbeginner.com/media-server-software-options-2017/*](https://www.htpcbeginner.com/media-server-software-options-2017/) *and chose Plex.”*  *My teacher had a range of equipment available. I selected the Raspberry Pi and PLEX because…*  *We had Raspberry Pi’s in the classroom. I went onto the web and started to look up whether a raspberry Pi would be up to the task, or whether I should use my old laptop. It turns out that Raspberry Pi is used frequently, and most people are reporting that it is good. I will use it.*  *The Raspberry Pi 2 Model B that we have in class feature a BCM2836 ARMv7 Quad Core Processor running at 900MHz. The board now features 1GB RAM which makes it now run more powerful applications. The board is capable of streaming High definition video output at 1080p resolution.*  *Features:*   * *Broadcom BCM2836 900MHz Quad Core ARM Cortex-A7 CPU* * *1GB RAM* * *4 USB ports* * *40 GPIO pins* * *Full HDMI port* * *Ethernet port* * *Combined 3.5mm audio jack and composite video* * *Camera interface (CSI)* * *Display interface (DSI)* * *Micro SD card slot* * *VideoCore IV 3D graphics core*   *These features will be sufficient for a media server because..."*   * explained relevant implications   **For example (partial evidence):**  *"For accessibility either the server or the access point needs to provide the IP address because if both try to, other devices on the network may become confused and not able to access the files* *…*  *Functionally. The media sever will need to make it easy for people to access the videos on a range of devices because….."*    *The examples above are indicative samples only* | Use advanced techniques to develop an informed network.  The student has:   * used information gained from testing procedures, diagnosing and troubleshooting to inform further development and improve the quality of the specified network   **For example (partial evidence):**  *"There appears to be an update for plex. To enable this update to happen you have to do a manual update. I had to read the forums on how to update plex on a Raspberry Pi, as I could not do it using the web-based system. I needed to find out the ip address of the RPi, which meant I had to access the router, which only had mac addresses listed in it. So, I tried each individual ip address on the network till I had a connection, note down the IP address next time. However, an easier way would be to run network mapping software to be able to find out the ip address of the connected devices and what ports are open. When I had a connection, I used terminal to access the RPi shell using the username and password for the RPi. I then ran the sudo apt-get update and sudo apt-get upgrade commands, which updated the RPi, I then checked the plex player to see whether the update installed, this took 15 minutes to update. I checked the version on the web interface and it says it is now up to date."*  **For example (partial evidence):**  *"I got an error: The value ‘jessie’ is invalid for APT::Default-Release as such a release is not available in the sources.” Tried all and finally got it working by following the instructions on https://www.dev2day.de/projects/ # become root sudo su # add my public key wget -O – https://dev2day.de/pms/dev2day-pms.gpg.key | apt-key add – # add my PMS repo echo “deb [arch=armhf] https://dev2day.de/pms/ jessie main” >> /etc/apt/sources.list.d/pms.list # activate https apt-get install apt-transport-https # enable armhf support dpkg –add-architecture armhf # update the repos apt-get update # install PMS apt-get install plexmediaserver-installer:armhf Needed a reboot and it started working."*   * explained the purpose and function of the parts and components (hardware and software)   **For example (partial evidence):**  *“I needed to choose a software to install on the Pi, I looked up* [*https://www.htpcbeginner.com/media-server-software-options-2017/*](https://www.htpcbeginner.com/media-server-software-options-2017/) *and after consideration decided to look into Kodi, Plex and OpenFLIXR. I found… and decided that Plex is able to …”*  *"I was usi*ng an *old router, I had hoped that it would have NAT-PMP or UPnP options so that I could quickly configure the network addressing, however I was not so lucky, and then had manually set up IP address forwarding which required me to set up a static IP address on the Raspberry Pi rather than the dynamic IP address.*  *I found that if you manually forward your port in your router, then you must enable the Manually specify port checkbox. If you don’t, your Server will not use the specified port."*   * addressed relevant implications.   **For example (partial evidence):**  *“I wanted to check out the legalities of setting up a media server, seeing if it will store a range of media, that potentially comes from a range of places.*  *I decided that I wouldn’t download and put movies on it at home, and this didn’t bother me as we already have Netflix. I thought I’d show my mum how it worked. And then put all our photos and home videos on it, so that we could get it all off our computer, but also still view it through TV, and not infringe. A win-win!’*  *The examples above are indicative samples only* | Use advanced techniques to develop a refined network.  The student has:   * accurately used tools, procedures and protocols to ensure the outcome meets end-user requirements * justified the choice of parts and components (hardware and software).   **For example (partial evidence):**  *“The teacher asks for the class to observe the student explaining the configurations of the media-server setup, and question the student on what they were doing, and why. They can ask detailed questions to test the knowledge of the students from a bank of questions.*  *The teacher could also query the students on particular selections. For example:*  *“Why did you set the IP address the way you did?” OR*  *“Why did you decide to use Plex instead of Kodi?”*  *The student looked at the materials that were available in the classroom and was able to carry out good research and justify why the Pi would be suitable for the task.*  *“My problem is that I've found inconsistent reviews regarding the performance of the Pi. Some sources say, the board isn't powerful enough to render the GUI, which results in lagging, while others say, they play HD videos without any issues.*  *“I investigated the potential of the Pi for my server. I tested network shares from my main computer. Over a network cable I have not seen any lag. There are only a couple of places where I can say I have experienced "lag". When trying to access the menu during playback it takes 3-4 seconds before it displays, but that's trivial in my opinion. Also, after closing the menu while the video was still playing in the background, I have noticed a slight increase in the playback speed as if it were trying to catch up, but that might just have been because of the amount of time I had spent in the menu while troubleshooting a sound issue.*  *Besides that, everything runs very smooth. Menu transitions are fluid, even during playback. Audio and Video sync up. Setup is pretty much nil. I had to adjust my screen alignment, but I am also using an older TV. The only problem I am faced with now is DVD playback and figuring out how to get the samba "shortcuts" to the proper sections, if that is even possible. Overall the Raspberry Pi that were available were clearly fit for purpose for making a media server.*  *“… I chose to use Plex as it is a great way to organise and consume media on nearly any smart device and …”*  *“One of the considerations that now needs to be considered is that it needs a wired in connection as where the RPi has been placed is too far away from the wireless access point and is causing buffering issues to happen.”*  *“I needed to ensure that the media server was able to sync content between users and making sure that it works on mobile phones on a 3G/4G connection.”*  *Alternatively, the teacher could have students face a dragons den of other students where they ask a series of questions to test the knowledge of the students/group of students. This could be annotated or filmed for evidence.*  *The plex system has been used by Mum and Dad to add content, be able to be used when the grandparents are over to show family movies and the endless trip photographs of our holiday, which put them to sleep. Parents were also able to share the content with family overseas to be able to see the photos as well, just hope I don't see them on facebook."*  *The examples above are indicative samples only.* |

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the achievement standard.