Planning and Managing a Chromebook Deployment

This article provides a guide to planning the deployment and on-going management of chromebooks in a school. It is intended for people that are leading the deployment process.

Chromebooks are designed to be used with G Suite (previously known as Google Apps for Education or GAFE) and may be used as 1:1 devices or as class sets which are shared between classes.

Guide summary

Chromebooks can be managed using the Google Admin Console. This console has been designed to allow teachers to manage many Chromebooks at once so that students get a consistent and learner-friendly experience.

As well as the technical aspects of deploying and managing Chromebooks, this guide includes suggestions on how to involve your school community, supporting teachers and learners, purchasing, using the Chromebooks at home.

See Google's Chrome Device Deployment Guide and the Connected Learning Advisory BYOD & 1:1 Preparedness Checklist for more information.

Image: http://elearning.tki.org.nz/

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Once you have read this guide you are welcome to contact the Connected Learning Advisory to get more personal assistance. We aim to provide consistent, unbiased advice and are free of charge to all state and state-integrated New Zealand schools and kura. Our advisors can help with all aspects outlined in this guide as well as provide peer review of the decisions you reach before you take your next steps.

For more information visit www.connectedlearning.org.nz
Check out our resources at resources.connectedlearning.org.nz
Call us for personalised service on 0800 700 400
Make a personal inquiry via our online form at query.connectedlearning.org.nz
Email info@connectedlearning.org.nz

Part 1:

Planning for deployment of Chromebooks

Chromebook deployment fits in with your school's vision for learning.

Before you start ensure your Chromebook deployment fits in with your school's vision for learning. Your Chromebook deployment should be just one part of a well-thought out plan for improving learning at your school.

Use the e-Learning Planning Framework and Strategic Thinking Roadmap to assist you with your strategic plans. Ensure your annual and three or five year plans reflect the relative difficulty of changing technology and changing how teachers teach and students learn.

Give teachers, learners, parents and whānau the opportunity to contribute toward the success of your Chromebook deployment. Involve stakeholders at all stages of the project. Ensure that consultation takes place before key decisions are made and that regular feedback occurs.

If caregivers are expected to contribute toward the cost of the Chromebooks, ensure that the rationale of your decision is communicated clearly. Schools cannot compel parents to buy Chromebooks, as outlined in Ministry Circular 2018/01, so plan on having some school-owned devices for students to use.

Prepare and support teachers and learners

Be well prepared and have appropriate expectations.

Teachers and learners will respond best to a Chromebook deployment if they are well prepared and have appropriate expectations:

- ✓ Choose leaders who are likely to champion the project as first implementers of using Chromebooks

- ✓ Review your school's computer use policies and procedures. Consider if you need a separate Chromebook Responsible Use Policy. See Netsafe Kit for Schools for more information.

- ✓ Review your school's Digital Citizenship programme. Netsafe provide very good resources for this.

- ✓ Master the Chrome browser and G Suite before using a Chromebook

- ✓ Allow teachers to become familiar with a Chromebook before using them with a class

✓ Try out the Chromebooks first with a class that handles change well

✓ Have a fallback plan for the first time you use Chromebooks. Plan alternative activities for your class until you are certain you, your students, Chromebooks and wireless network are ready-to-go. In particular, using a class-set of Chromebooks may find weak spots in your school's wireless network. This will cause Chromebooks to have slow or non-functioning internet connections.

✓ The first time you use Chromebooks in a new location, inform your ICT technician. They may even offer to be on hand to troubleshoot any wireless network problems.

Support teachers and learners
Well-supported teachers and learners will make your Chromebook project successful. Things to consider include:

Plan ahead to ensure lessons proceed as intended even if a Chromebook is not available (lost, left at home, damaged or being repaired):

● Students could work alongside classmates (remembering to share work between the group) or use another computer (laptop or desktop that has the Chrome Browser).

● Alternatively 'loaner' Chromebooks could be available for students to use. Track 'loaner' Chromebooks by treating them like a book and using a bar-code scanner to issue them from the school library.

● Chromeboxes - small, low-cost, desktop PC's running Chrome OS can be used to supplement your Chromebooks. Alternatively, repurpose old, less-powerful, PC's to boot the Chrome browser in kiosk mode and act as a DIY Chromebox.

Provide ongoing support:

● **Self-support:** Encourage teachers and students to help and support themselves and each other as much as possible.

● **FAQ's:** Develop a knowledge base of "what to do if…" that documents self-help fixes (such as how to change the keyboard from UK to US) as well as protocols (for

example how to make a warranty claim) and policies that are relevant to using Chromebooks.

- **Publish:** Self-help documentation can be published on your school website, a Google site or deployed to the Chromebooks using a Google document published as a self-made app (see below).

Purchasing Chromebooks

Follow the procurement process:

In addition to the notes below, you may find the Connected Learning Advisory's [Considerations for Choosing Chromebooks](#) useful.

Get Hands-on

Do a 'hands-on' evaluation of the various models of Chromebook that you are considering purchasing. Ask a vendor or another school if they will loan you a Chromebook for a few days.

Check the: build quality, performance, screen size, keyboard, weight and battery life. Involve both teachers and learners in your evaluation. Use this [this online tool](#) to compare the different models of Chromebook.

Find a supplier

NEW ZEALAND GOVERNMENT PROCUREMENT

New Zealand Schools are eligible to join the [All of Government](#) (AoG) purchasing scheme. Suppliers to AoG are contractually obliged to ensure that their products are not available at a cheaper price through any other channel. Currently, this approach offers approximately 13% saving on bulk purchasing of computers. If the Chromebook package you want is not available in AoG, it may be worth arranging a bulk purchase with other schools.

Insurance and warranty

The usual manufacturer's warranty for a Chromebook is one year. If you pay a little extra to increase this up to three years the Chromebook remains useable for an extended period. Factor in the cost of a bag for each Chromebook, a storage cupboard and a few extra charging units to complete your budget.

Most school insurance policies will have a claim excess that is larger than the cost of a single Chromebook. Device insurance can be obtained with a low claim excess, and your school may find this useful. You will need a protocol for handling warranty and insurance claims.

Bags and Storage

Even if all your students have their own Chromebook, and are expected to look after it themselves, you will need to think of ways to ensure the Chromebooks are safe during, for example, PE.

School-owned Chromebooks will need a safe-storage cabinet or box. Pre-made storage boxes and DIY solutions are available:

Images: digitallearningnz.blogspot.co.nz/ & twitter.com/ngpswcs/status/412691822914195456

Chrome Management License

The ability to control, administer and set policies on Chromebooks greatly reduces the amount of effort to make them a manageable device. Chromebooks are managed using the Google Admin Console.

A one-off license may be purchased for each Chromebook that you wish to manage. The license is specific to the model of Chromebook purchased, but not to the actual device itself.

- Match the number of licenses to the number of each type of device you buy.

- Purchase them from a Google authorized reseller who will add them to your G Suite domain and 'turn on' the ability to manage Chromebooks.

While Chromebooks are very useable without purchasing the Chrome Management License, you will find that the reduction in the amount of time and effort required to manage the devices makes the small additional cost of the license very worthwhile.

Planning for end of life

Chromebooks are supported by Google (updates etc) for at least five years from the date of introduction.

Technical preparation

Ensure your infrastructure supports the Chromebook deployment.

Use this guide alongside Google's excellent [Chrome Device Deployment Guide](#) and [Networking Best Practices for Large Deployments](#) guide. The latter document is more relevant to large schools and is quite technical.

Wireless network and internet
Chromebooks are wireless-only devices and require a robust wireless network and good internet connectivity. If your school is not connected to the N4L, then a connection speed [similar to what the N4L](#) would offer your school is recommended.

Your school's wireless network should be at a standard similar to the Wireless School's Network Upgrade Project (WSNUP). If you uncertain about the suitability of your school's wireless network or internet connectivity, please contact the [Connected Learning Advisory](#) for further advice.

Ensure you have a robust wireless network with enough IP addresses. Provide 3 IP addresses per person at school. Google's own advice on [Enterprise networking for Chrome devices](#) has further recommendations on WiFi settings, bandwidth and access points.

Firewall and internet filtering settings
Chromebooks require unrestricted access to Google's servers. If your school's firewall is a N4L router, then the required firewall settings should be in place already. If you have your own firewall instead of, or in addition to, the N4L router, then the firewall ports to the destinations in the [Networking Best Practices for Large Deployments](#) guide will need to be opened.

Your internet filtering may need also need adjusting. If you use N4L internet filtering, the required filtering policies that allow access to Google's servers should be in place already. Otherwise, you will need to create a filter that allows direct access to *.google.com, and [this list of ports / domains](#).

Part 2:

Managing your Chromebooks

Asset tracking
Individual Chromebooks will need labelling in some way so that they can be identified easily. Asset labels or barcodes are a good idea. If your Chromebook cases/bags are identical, a good Technology project is to design and make a personalised bag tag/identifier.

Battery-life

Charge the batteries every day even though Chromebooks have a long battery-life. School-owned Chromebooks should be placed on-charge every night.

If the Chromebooks are taken home, set an expectation that the Chromebook will arrive at school fully-charged. Even so, a few strategically placed Chromebook chargers will be a good investment and ensure that work can continue throughout the day.

Setting up your Chromebooks

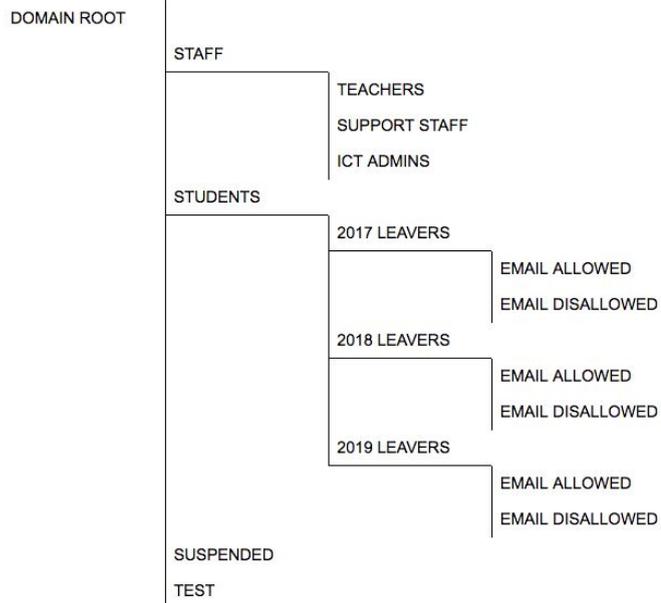Adjust your Google Apps for Education Domain to best manage your Chromebooks.

The management features that the Chrome Admin Console offers are updated continually by Google. Rather than trying to reproduce Google's information, this section offers useful pointers to the documentation and outlines settings that have proved particularly useful. Most of the information below is available from

Prepare your G Suite domain

Adjust your Google Apps for Education Domain to best manage your Chromebooks. For example, you may wish different year groups to have different sets of Chrome Apps on their Chromebooks or want teachers to have the ability to control the apps of their own class.

Both these cases require users in your G Suite domain to be organised into 'groups' or, to use the correct terminology, organisational units (OU's). Common ways to organise G Suite users include: year groups; class groups; teachers; non-teachers. OU's can have sub-OU's and Chromebook policies can be inherited from their parent OU's. Your G Suite user OU's can be set up to give you the control you wish. Create an OU and user to test your device and user policies.

Google's Manage Chrome Devices site.

```
DOMAIN ROOT
  STAFF
        TEACHERS
        SUPPORT STAFF
        ICT ADMINS
  STUDENTS
        2017 LEAVERS
                EMAIL ALLOWED
                EMAIL DISALLOWED
        2018 LEAVERS
                EMAIL ALLOWED
                EMAIL DISALLOWED
        2019 LEAVERS
                EMAIL ALLOWED
                EMAIL DISALLOWED
  SUSPENDED
  TEST
```

Accessibility settings
Consider the needs of your students and staff and turn on appropriate accessibility settings so that they can be used when needed.

Network Settings - Technical Information
Chromebook network settings, including connecting to wireless networks are easy to configure. See Appendix 1 for more information.

Printing
Google Cloud Print (GCP) is the standard way that printing is managed on Chromebooks.

Use a desktop or laptop machine that is connected to the printers and is left on all the time (or will be on when Chromebook printing is needed). Install the Google Cloud Print Service Connector. The connector is available for both Windows and Linux, OSX (or any operating system that uses the Common Unix Printing System). This service allows the desktop or laptop to act as a printing proxy and share printers with Chromebooks. Manage the printing for your Chromebooks from the same machine that the Connector is installed on.

Some printers can be purchased 'Cloud Print ready'. Consider this when you purchase a printer. A printer that has been set up for Cloud Print can be shared with specific users or groups. The

sharing settings for the printer work similarly to the sharing in Google Drive.

Some third-party printing services augment GCP by enabling print-auditing, queue control and print quotas. Papercut is an example of one of these applications.

User and Device Policies

Set appropriate permissions or policies for different users in your school and for each device

User policies
User policies are applied when a user who is a member of a particular organisational unit (OU) logs into a device or signs into the Chrome browser on another device (Windows, Apple, Linux, Android).

A comprehensive list of Chrome user policies is maintained by Google. User policies include items such as wireless network settings, automatically installing apps, pinning apps to the taskbar, which web pages open at start up and some printing settings. The Chrome Management License is not required to set User Policies.

Device policies
Device policies are applied to the Chromebook, regardless of who is using the device. A list of device policies and how to set them is maintained by Google. A Chrome Device Management License is required to set device policies.

Read through the list of policies and consider how they may be useful to you. For example, devices can be deprovisioned from your G Suite domain, or disabled if they are lost or stolen. The "Disabled device return instructions" setting allows you to include a return address and contact phone number on the device boot screen.

Device settings can also be used to restrict who is able to log in to the Chromebook, alternatively the Chromebook can be set to "kiosk mode". Some Google Cloud Print settings are also controlled by device policies.

Use the 'Mobile devices' section of the Device Management panel with caution. This section enables management of the G Suite aspects of the device (Gmail etc) of anyone who signs into your G

Suite domain using a mobile device, even if the device is not owned by your school.

The first month

Be prepared to give support and troubleshoot at short notice.

Monitoring your wireless use
During the first month of your Chromebook deployment, be prepared to discover that your wireless network coverage or performance may require improving. Move or add Wireless Access Points to suit where your Chromebooks are being used. Encourage your teachers to have alternative lessons planned if using Chromebooks at a location or classroom that has yet to be confirmed as having good wireless performance.

Support teachers and learners
Help staff and students to personalise their Chromebooks so that each user can make the most of their device.

Set aside time to support teachers and students during the first stages of a Chromebook deployment.

- Be prepared to give support at short-notice.
- Show users how to solve their own problems.
- Document the most common problems and their solutions, and share this as a Google Document to help users support themselves.
- Publish this to the internet and share it as a Chrome app using Chrome App Builder.

Get feedback
Something is certain to go not quite as intended during the first few months of a Chromebook deployment.

- Ensure that students and staff are able to feedback what works well and what needs improving.
- Canvas the views of a cross-section of stakeholders to improve the impact of your Chromebook deployment.

Using Chromebooks at Home

School students spend much more time at home than at school. Increase the educational impact of a Chromebook by having it available for use at home. This may be be particularly relevant if the Chromebook is considered a personal device for the exclusive use of the student.

With your stakeholders (school, students, parents) consider:

- What the appropriate expectations of using the Chromebook at home are:
  - Hours of use
  - Where it is used
  - Parent has the final say!

- If the home internet connection is suitable for using a Chromebook:
  - Wifi available
  - Bandwidth
  - Data-cap

- What digital citizenship opportunities are available for parents and students

N4L filtering at home
You may want to think about extending the filtering available through the N4L to students when they are away from the school site. This is possible, but not particularly easy and requires some technical skill. A proxy server, hosted at school, is configured to listen on a public IP address. The next-hop of the server should be the N4L gateway. The Chromebooks are configured to use the proxy server using the Admin Console. Split-horizon DNS is used to prevent the Chromebooks using proxy server when they are at school. Using this method, the Chromebooks will be forced to use the proxy server and the N4L when connecting to the internet when the they are outside (but not when inside) the school's network.

Off Hours
It is also possible to set 'Off Hours' policies so that policies that are set to be pertinent to a school setting, such as disabling log-ins from guests or outside of the school domain, can be relaxed outside of school hours.

Troubleshooting

Ensure you are able to access help quickly.

Where to get help
Ensure you are able to access help quickly. Use the numerous online forums and groups that are dedicated to the educational use of Chromebooks. The Connected Learning Advisory is also a great source of free and unbiased advice.

- Technical help on using Chromebooks - Google

- VLN Chromebook user group

- [Google in Education community for schools using Chromebook and G suite -Australia & NZ](#)

- [Chromebook Central Help](#) forum -the main international Chromebook help forum

Common problems
Chromebooks are very reliable and there is remarkably little to go wrong. However, here are a few tips that might help you fix one when things have gone pear-shaped.

- Ensure the keyboard is set to US if a " appears instead of a @

- Ensure the timezone and time and date are set correctly

- Ensure that the Chromebook uses Google's DNS servers (8.8.8.8)

- Diagnose a faulty screen cable by attaching the Chromebook to a data-projector and using a HDMI cable to see if the display works

[A more comprehensive guide to fixing Chromebook problems](#) is also available.

For all other problems reinstall ChromeOS. This is very easy and takes about 5 minutes. First, download the correct ChromeOS image. Next, reinstall the image. You will require an empty USB thumb drive.

Getting the correct ChromeOS image and reinstalling ChromeOS
Download and reinstall the correct ChromeOS image for your particular Chromebook by [following these instructions.](#)
Reinstalling ChromeOS is very easy and takes just a few minutes.

Useful Links

- [Google's own Chrome Device Deployment Guide](#)
- [Networking Best Practices for Large Deployments](#)
- [Google Cloud Print](#)
- [Manage Chrome Devices](#)
- [Organizational Policies FAQ](#)
- [Fix Chromebook Issues](#)
- [Chromebook Help Center](#)
- [Chrome App Builder](#)

Appendix 1 - Chromebook Network Settings

If you use N4L SSL inspection (to filter for example HTTPS connections to social media such as Facebook), you will need to install a certificate on the Chromebooks. Manage this from the network settings menu. Download the certificate and re-encode it from DER to X.509 PEM format.

1. Log into your N4L Web Filtering Dashboard

2. Click on the Admin tab

3. Choose Certificates from the HTTPS Inspection drop-down menu

4. Search the list of certificates and choose the one which has been created specifically for your school. Note: You'll be able to identify this by the name of the certificate and the time period it covers (e.g Greenwood_High_School_Jan_2014-2021)

5. Download the certificate using the Download link on the right hand side

6. Convert the certificate to X.509 PEM format on a linux machine using openSSL as follows: openssl x509 -inform der -in <cert name>.crt -outform pem -out <cert name>.pem

7. On request, the N4L will convert certificates for schools.Contact the N4L helpdesk (0800 LEARNING) if you wish them to do this.

This guide has been produced in response to a number of specific queries about Chromebooks from schools. It should not be read as a recommendation or endorsement of any specific product. The Connected Learning Advisory is a Ministry of Education supported service that provides schools with technology information relevant to their queries and does not recommend one product over another.

Last Updated: 4/4/17