ARTICLE

Exploring Android's File System – Part 3 *by Alan German*

So far we have seen that Android uses multiple disk partitions, multiple mount points, and multiple folders that all make for a complicated file system. However, the real problem for the regular Android user is that some folders, in different storage locations, have the same names. This certainly isn't something that we are used to in the Windows' world, nor is it a feature of Linux, so why do we see such duplication in Android file systems?

> *...I want to say at the outset that the Android storage system is a tragedy. It's a miracle it somehow still works today. There are too many partitions, too many folders, and too many locations to store files.*
>
> PLATYPUS_DIARRHEA; March 2016
>
> reddit

The Android file system is extremely complex as are the reasons for its complexity. We have seen in previous articles that a number of folders are created by Android itself when the system is booted. More folders can be created by installed applications and, in particular, some folders can be written to any external storage (e.g. micro-SD card) that may be available on the Android device. The file system also has a number of legacy features in addition to the use of more modern constructs. A good discussion of the evolution of the file system has been provided by Irfan Latif writing on the Android Enthusiasts Stack Exchange forum.

The net result is that, for any given device, folders having the same name, and essentially having the same purpose, may be present in both the device's internal and external storage locations. For example, Figure 1a shows some of the folders that are present on the internal storage on my Moto G3 smartphone, while Figure 1b shows folders on the installed micro-SD card (external storage). It is evident that a number of folders, e.g. *Alarms*, *Android* and *DCIM*, are present in both storage locations, while others, e.g. *Documents, LOST.DIR*, and *Received-Files* are only found on one of the two locations.
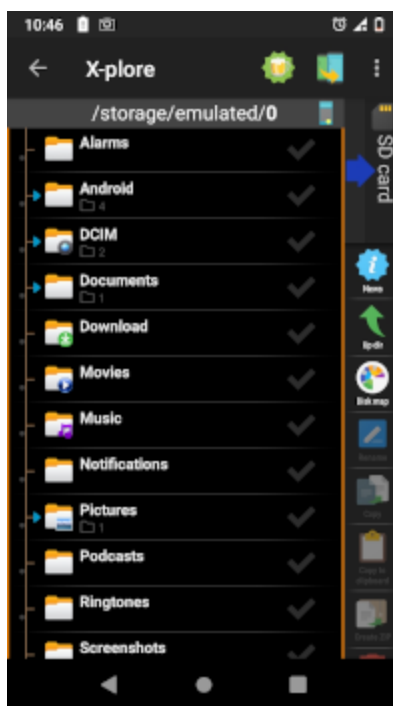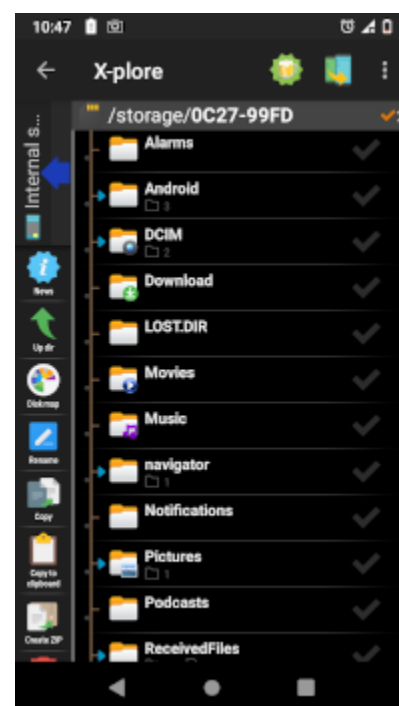

Figure 1a. Internal storage

Figure 1b. External storage

Next Meeting: WEDNESDAY, January 12th, 2022

Next Meeting

Wednesday, January 12, 2022

Due to COVID-19 restrictions, this meeting will be via Zoom video conference.

Topic: Encryption 101
Speaker: Stephane Richard, OPCUG

If you are using a computer and the internet, you are using cryptography. This presentation provides a basic introduction to cryptography. It covers the definitions of the terms used in cryptography and basic cryptographic processes. The basic mathematical functions used in cryptography are also discussed.

Once the basics are understood, a brief overview of an actual cryptographic algorithm is presented. Some applications of cryptography in our daily life are then presented such as Hypertext Transfer Protocol Secure (HTTPS) and digital signatures. Finally, the impact of quantum computing on classical cryptography is discussed.

About the presenter:

Stephane Richard is now retired after serving Canada for 35 years as a Communications and Electronics Officer in the Canadian Armed Forces for 20 years and in the federal public service for 15 years [more...]

Join us at https://tinyurl.com/opcug-meeting. The Zoom link will be live at 7:15 pm. The meeting will begin at 7:30 pm.

The above link includes the meeting ID and password. However, if you are prompted for the information, use:

Meeting ID: **924 9556 0898**
Password: **opcug**

Instructions for using Zoom are provided here:
https://opcug.ca/wp-content/uploads/Zoom-instructionsv3.pdf

Until further notice, Q&A sessions are no longer held after regular monthly meetings. Hence, monthly meetings now end 1 hour earlier at 9 pm. Everyone is welcome to join us on all other Wednesdays for weekly Q&A sessions.

Coming Up...

February 9
Topic: Getting Started in Genealogical Research
Speakers: Heather Oakley and Mike More, Ottawa branch of the Ontario Genealogical Society

Mike Moore says, "I don't know how many times I have heard somebody say 'I wish I'd known that when I started my genealogy'". There is no RIGHT way to do genealogy but there are better ways. [more…]

March 9
Topic: Microsoft Teams
Speaker: Lawrence Patterson, OPCUG

(details to follow)

April 13
Topic: Office Smackdown
Speakers: Alan German and Chris Taylor, OPCUG

Are there any significant limitations in using LibreOffice instead of Microsoft Office? In this presentation, we will review the features of the major modules of both packages. [more…]

All scheduled regular monthly meetings, weekly Q&A sessions, and a link to OPCUG presentations at the OPL are posted on our website at https://opcug.ca/#upcoming. All events are via video conference until further notice.

2022 CALENDAR		
Meetings	**Date**	**Time and Venue**
Regular Monthly Meeting	Wednesday, January 12th	7:30 pm via Zoom video conference: **https://tinyurl.com/opcug-meeting** To see all scheduled events, visit https://opcug.ca/#upcoming
Q&A Session	N/A	Until further notice, Q&A sessions are no longer held after regular monthly meetings. Join us on all other Wednesdays for weekly Q&A.
Beer BOF (Wing SIG East)	Wednesday, January 12th	Enjoy a cold brew or other beverage in the comfort of your home during the video conference.

2021 PRESIDENT'S REPORT

With the pandemic maintaining its grip on the world, the OPCUG settled into a comfortable online existence. Our procurement of a Zoom Pro account in 2020 allowed us to extend member interaction both geographically—with new members across Canada & the United States, and temporally—with weekly Q&A sessions. These benefits continued throughout 2021.

Membership increased 23% in 2021. This was probably largely due to our "two years for the price of one" special that ended in March 2021. If you know anyone who could benefit from being a member of the OPCUG, the special has returned; new members who join before March 31, 2022 will get two year's membership for their $20.

Getting outside speakers to present at the OPCUG continues to be somewhat of a challenge. In 2021, we had three: Deid Reimer from the Victoria Pi Makers enlightened us about microcontrollers; Mariana Ludmila Cortés from One Laptop Per Child took us on a historical tour of the origins of EdTech; and Tim Cole & Andrea Girones from the Royal Astronomical Society of Canada gave a fascinating presentation on many aspects of astronomy.

The other 7 general meetings had internal OPCUG presenters: Alan and Brigitte on web hosting using WordPress and Elementor; Chris on keeping passwords safe, typography, and logo creation; Lynda on sharing your photos; Stephane on building a database; Tom on Windows Firewall Control & security layers; and Bob on the history of the digital revolution.

We had great attendance at monthly meetings running from 45 to 68. I would like to extend my thanks, on behalf of all members, to all presenters. I hope everyone found value in the presentations. If you missed any of the meetings, presentation material from past meetings can be found at https://opcug.ca/past-presentations/.

Weekly Q&A sessions continue to be very popular, with attendance between 30 and 49. We covered a huge range of topics, mostly driven by you, the members. We tackled anything from the simple to advanced with an incredible 354 topics! Presentations decks, audio records, and the contents of the chat window for past Q&As can be found at https://opcug.ca/qa-topics/. Everyone is encouraged to contribute info on things you think other members might be interested in, as well as ask your questions about things you hope other members can help with. To our categories of *Follow-up, Share,* and *Question*, in 2021 we added *Computer Basics* where we take on subject that may be second nature to old hands, but may mystify novices. Remember: we were all novices at some point. Can you help bring some basic knowledge to others?

Brigitte's newsletter production continued to entertain and enlighten us. Thanks to all who contributed or consumed content. We are always happy to accept new content from new contributors. One of our newest members, Tristan Wrubleski, joined our regular contributors in the December issue with *Introduction to WinGet*. Thanks Tristan!

Our long-running venture with the Ottawa Public Library remained throughout 2021. Due to the pandemic, they were all virtual-only sessions and much reduced in number. We only had 13 OPL presentations in 2021, well below the average of 72 in the five pre-pandemic years.

Thanks very much for the contributions of the members of the Board of Directors, Mark Cayer (membership), Richard Aylesworth (financial review), Bob Herres (election chair), all who help ensure that the OPCUG runs as smoothly as possible, and all members.

Chris Taylor
President, OPCUG

Two-year Membership
for the Price of One
(but only for a limited time)

Are you thinking of joining OPCUG? Right now, we have a very special membership offer. If you pay the annual $20.00 membership fee before March 31, 2022 we will give you an additional year of membership absolutely free.* That's right - buy one year of membership in our club and get two years of membership at no extra charge. So, take action now. Join OPCUG today and obtain all the benefits of membership for a full two years!

* Note to current members – Do not renew your membership until you receive a renewal notice. This special offer also applies to you in that we will extend the expiry date of your current membership by a full year without you having to pay the annual fee.

Presentations at the Ottawa Public Library

by Chris Taylor

In the spring of 2008, I was contacted by Evelyn Housch, the event coordinator at the Gloucester branch of the Ottawa Public Library (OPL). Evelyn had read my review in our newsletter of *FotoFusion Pro*: software designed to create collages. She wondered if I could give a presentation at her branch on the topic of scrapbooking. While I felt unable to do that topic justice, I suggested that perhaps the OPCUG could give presentations on different topics. This seemed like an excellent symbiotic relationship; the OPL would gain access to skilled presenters and advertise the events through their website, and we would be able to introduce ourselves to a wide audience that might decide to become members.
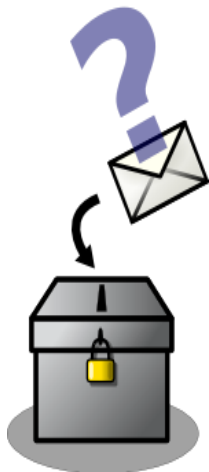
In May 2008, I gave a presentation on *Protecting your computer* and Alan German gave one on *Linux 101*. And with that, we were off to the races.

Unfortunately, some constraints at the OPL have meant that there are no immediate plans for more presentations. Perhaps this is a good time to recap what the OPCUG has provided through the OPL to the citizens of Ottawa.

- Years of presentations: 14
- Topics: 43
- Presentations: 624
- Presenters: 7
    - Alan German
    - Andrea Wells
    - Bob Walker
    - Chris Taylor
    - Jeff Dubois
    - Lawrence Patterson
    - Lynda Buske
- Branches: 25
- Attendees: over 6,500

We were successful in making a lot of people aware of the existence of the OPCUG and we have many members who found out about us through these presentations. I think we have done our community proud by passing along our knowledge of computers and helped fulfill our motto: *Users helping users*. I would like to pass on my personal thanks to all the other presenters who gave their time and efforts in making this venture such a resounding success.

Nominations for OPCUG Board for 2022

Once a year, the OPCUG holds elections for the 9-member Board of Directors. We are once again coming up to this annual event.

We encourage all members to consider running for a board position or getting involved in some other manner in the operations of the OPCUG.

If you want more information about what is involved, please talk to me or any current or past Board member. Names are listed on the back page of this newsletter and on the web site at https://opcug.ca/executives/ .

Nominations can be submitted by sending an email to nominations@opcug.ca .

Nominations must be received by midnight, December 31, 2021.

Please get involved. Please help the OPCUG continue in its role of Users Helping Users!

Bob Herres
Election Chair, 2022

Exploring Android *(continued from page 1)*

Folders with the same name (but in different locations) can be a major source of confusion. A case in point is the DCIM (Digital Camera Images) folder. DCIM/Camera is often the default storage location for photographs taken with the on-board camera, and the DCIM folder itself is typically located in internal storage. However, many camera apps provide the user with the option of storing photographs on external (secondary) storage. Multiple, high-resolution digital image files can chew up large amounts of storage so, for devices with limited internal storage, storing photos on a micro-SD card provides a mechanism to retain free space in internal storage.

However, even though the camera app may be set to use a DCIM folder in external storage, the DCIM folder in internal storage is retained, and a file manager will display DCIM folders at both storage locations. Often the DCIM folder in internal storage will be empty as all the photographs are being stored on the external drive.

However, it is possible that digital image files may be stored in both locations and this can cause great confusion in gallery apps. The major reason for this is that a gallery app will normally display just the name of the folder containing the images, and will not include the name(s) of the parent folder(s).

Figure 2 illustrates this issue. Note that there are two folders labelled "Camera". The folder on the left contains a single image, while the folder on the right contains 29 images. Checking the properties of the single image tells us that the first folder is located at /storage/emulated/0/DCIM/Camera. So this is the folder that is present in the phone's internal storage. Similarly, the image of the can of deck stain is located at /storage/OC27-99FD/DCIM/Camera, which is a folder on the external micro-SD card.

Figure 2. Gallery App

The other two folders displayed by the app are *ReceivedFiles* and *Screenshots*. The first of these is a folder that I established on the external micro-SD card (/storage/OC27-99FD/ReceivedFiles), primarily for transferring files between the phone and the computer. In contrast, the OPCUG logo image is stored in *Screenshots*. The location of this folder is /storage/emulated/0/Pictures/Screenshots, i.e. it's a folder in internal storage. However, this has been changed from the default location used by the Screenshot Easy app which is /storage/emulated/0/Android/data/com.icecoldapps.screenshoteasy/files/Pictures/Screenshots. Did I say that Android's file system is complex?

So, there we have it. Android's file system is not simple to understand yet, in order to make efficient use of the system, it is necessary to know precisely where certain folders are located. The main trick is to sort out which folders in use are located in internal storage and which are present on an external drive (usually a micro-SD card). As we have seen, the answers are not always easy to obtain since developers can store files associated with their applications in very obscure locations. Nevertheless, with judicious use of a file manager, the locations of specific files can readily be established. Furthermore, life can sometimes be made easier by changing the default storage location to something more meaningful to the end user!

For our final trick in this series we will see how regular users may save space in internal storage. Without root access, such options are extremely limited. However, older phones often don't have large amounts of storage and, in particular, internal storage may be at a premium. Consequently, the ability to create free space in internal storage can be very useful.

♦♦♦

Quick Tip 39: Check shortened URLs
by Chris Taylor

URLs are *Uniform Resource Locators*. A geeky way of saying *addresses*. URLs can be long … *really long*. In 2002, TinyURL launched as a service for shortening URLs. You can go to TinyURL.com, enter in a long URL and TinyURL will spit out a shortened URL that you can use instead. When you–or anyone else–clicks the link, TinyURL will redirect your browser to the original URL.

There are many URL shortening services available, including t.co, goo.gl, bit.ly, amzn.to, tinyurl.com, ow.ly, youtu.be and others.

The problem is that a bad actor can use a shortened URL to disguise where their link will take you. While you might not click a link **http://we-will-hack-you.com**, you might click on **https://tinyurl.com/Qd42Wexc** and be taken to **http://we-will-hack-you.com**.

A nifty service is available to decode shortened URLs. Browse to http://checkshorturl.com/ and enter in any shortened URL, such as https://tinyurl.com/calcard and it will give you the original address - https://anabpd.ansi.org/Accreditation/credentialing/certificate-issuers/AllDirectoryListing?prgID=228,238&statusID=4 along with some details about the destination, including links to check the site's reputation at Web Of Trust, SiteAdvisor, Google, and Norton. You can also check the true URL's reputation at VirusTotal.com.

THROUGH THE LENS

A guide to digital photography for computer enthusiasts. After the click of your camera, you're only half done!

Sometimes the world is black and white!
by Lynda Buske

All of us have seen stunning black and white images but it can be tricky to determine which images would best suit this approach. I rarely figure this out while I'm shooting and so I always have my camera set for colour images. It is easy enough afterwards to switch to black and white (or grayscale) on my computer — certainly easier than to change a black and white image into colour!

So which types of photos lend themselves to black and white treatment? There is a handy feature in Windows 10 that allows you toggle between a full colour screen and black and white. That means everything you view on your screen (not just pics) will be monochrome. First, make sure the feature is enabled. Go to *Settings | Ease of Access | Color filters* and turn on the slider for *Turn on color filters*. Then in the section *Select a color filter...*, choose *Grayscale* and put a checkmark in the box *Allow the shortcut key to toggle filter on or off*. You can then toggle off color filters. Fire up whatever program you use to look at your pics then press and hold the Windows key (   ) and the Ctrl key and press C. You can then flip through your photos so see which ones may look good in black and white without actually creating a black and white image file.

Toggle the feature off by again pressing and holding the Windows key (   ) and the Ctrl key and press C to put your screen back to normal colours and then use your favourite photo editing software (e.g., Windows Photos, Lightroom, Photoscape X) to convert your image to monochrome.

To create a black and white image in your photo editing software, the simplest way is to desaturate the photo entirely by setting the saturation tool to zero. This is often just a slider bar in the colour adjustment section. In the free software, Photoscape X, there is actually a "grey scale" setting that I find does a better job than simply desaturating. To further refine your image, you can adjust the individual "black" and "white" bars in the colour adjustment area.

Figure 1

Figure 2

I most often think of using black and white when I'm editing pictures with people. If they are the main subject, I might not want clothing or background colours to distract from faces and if they are not the main object of interest but just adding to a larger scene, then again, I may not want the bright colours of their clothes to detract or clash with the rest of the image. See Figure 1.

Other photos where black and white might work well are those that are almost monochromatic to begin with or the main subject is black, white or gray. See Figure 2. This could also include photos where the objects of interest are silhouetted.

Sometimes interesting textures can be emphasized in black and white. See Figures 3 & 4.

Figure 3

Figure 4

*Lynda regularly gives presentations for the OPCUG at the **Ottawa Public Library** (https://opcug.ca/opl-presentations/).*
This article is also in PDF format on the OPCUG website (https://opcug.ca/digital-photography/).

THROUGH THE LENS

(continued from previous page)

I also use black and white for photos where I am purposely trying to draw attention to a shadow. Again, the accompanying colours may be quite unimportant but still distracting. See Figures 5 & 6.

Figure 5

Figure 6

Figure 7

When you use black and white in nature or landscape photography, try to ensure that the viewer's brain can easily fill in the colour. We know grass is green and skies are often blue but if you are showing a blossom, we may not be able to guess the colour. See Figure 7. Trees look fine in black and white providing, of course, you are not trying to show autumn foliage!
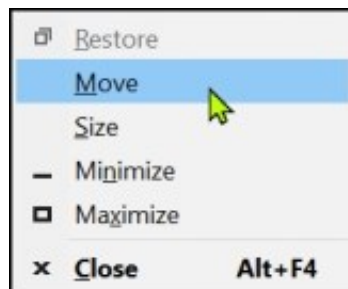
♦♦♦

Quick Tip 40: Finding a lost window
by Chris Taylor

Most Windows programs remember where they were last open on your screen. When you close and reopen them, they open at the last location. Occasionally, a program might record the wrong information and open completely off-screen, which makes it difficult to use to say the least.

Make sure the program has the focus by making sure its icon is highlighted on the taskbar.

Press Alt-space and a context menu will appear at an edge of the screen.

Press the **M** key to select **Move**. The missing window will be off-screen near where the context menu appears. You can use the arrow keys to move the window back onto the visible desktop.

When I recently tried this, *PowerToys Run* opened rather than my wanted context menu. I could have temporarily disabled *PowerToys Run* or redefined its shortcut, but a simpler option was to hold down the shift key while right-clicking on the running program's icon on the Taskbar. The context menu appeared and I could use the M key followed by arrow keys to move the window back on-screen. Using this method, I had to guess which way to arrow in order to get the window back on-screen.

OTTAWA PC NEWS

Ottawa PC News is the newsletter of the Ottawa PC Users' Group (OPCUG), and is published monthly except in July and August. The opinions expressed in this newsletter may not necessarily represent the views of the club or its members.

Member participation is encouraged. If you would like to contribute an article to Ottawa PC News, please submit it to the newsletter editor (contact info below). Deadline for submissions is three Sundays before the next General Meeting.

To receive the monthly newsletter by email, send an email to:
opcug-newsletter+subscribe@googlegroups.com (leave subject and body fields blank)
You do **not** need to create a Gmail or Google Groups account.

To subscribe to other OPCUG Google Groups member services, go to:
https://opcug.ca/google-groups-how-to/

Group Meetings

OPCUG meets on the second Wednesday in the month, except July and August, at the Riverside United Church, 3191 Riverside Drive, Ottawa. Parking is free at the church. OCTranspo bus #90 stops nearby. Details at https://opcug.ca/venue/.
(NOTE: Due to COVID-19 safety guidelines, all our events are via video conference until further notice. Details at https://opcug.ca/venue/)

Meetings are 7:30–9:00 p.m. followed by a Q&A Session until 10 p.m.

OPCUG Membership Fees:	$20 per year
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Follow us on Facebook:	**https://www.facebook.com/opcug**
Follow us on Twitter:	**https://www.twitter.com/opcug**

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Q&A HAS GONE ON-LINE! WEEKLY!

Because of the pandemic, the OPCUG is holding weekly Q&A sessions in Zoom video-conferences.

Join us every Wednesday (except on regular monthly meeting nights) at 7:30 pm to discuss computer issues. Questions (and answers) on any computer-related issue are welcome. Or, do you have a favourite computer program or topic that you would like to share with the group? Send your questions, answers, or the details of what you would like to share to:
SuggestionBox@opcug.ca

Everyone is welcome to attend Q&A sessions and to ask questions about their specific computer-related problems. Join us at: https://tinyurl.com/opcug-meeting (if you use the Zoom client, the meeting ID is **924 9556 0898** and the password is **opcug**).