

QR Codes



Presented
by
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for the
Senior Computer User's Group
of Greater Kansas City

January 13, 2023

Why might this topic be useful to you?

- **Quick Response (QR)** codes provide rapid access to machine-readable information such as a web page URL, or access to an app you can install.
- Your smart phone, tablet and computer can read (scan) QR codes faster than you can type the info contained in QR codes.
- Since you do not have to type the info, **you won't make typos** by scanning a QR code instead.
- In a nutshell: QR codes save time and frustration.

Agenda

- Barcodes defined
- Types and uses of linear barcodes
- 2-dimensional (2-D) codes: QR, Data Matrix, PDF-417
- How your smart phone can scan QR codes
- Apps for scanning barcodes and 2-D codes
- An Advanced use of QR codes
- Ways to create QR codes
- Creative uses of QR codes for User Groups

What is a barcode?

- A machine-readable representation of useful data.
- Early examples like Uniform Product Code (UPC) and USPS Zip were a linear arrangement of bars, representing numerals, which gave rise to the name **barcode**.
- Barcodes are more reliable for accurate machine readability than text scanning, even using fonts like MICR designed for text scanning.
- Various types of barcodes exist. Some encode letters as well as numbers.

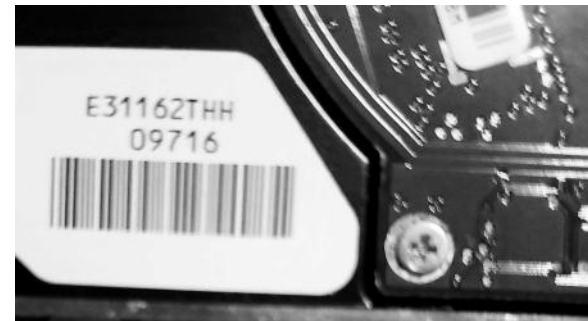
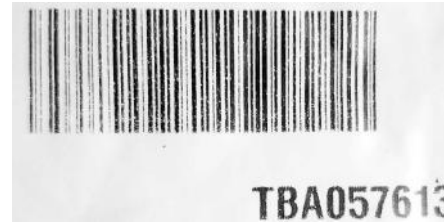
Uniform Product Code (UPC)

- Appears on all mass-produced items for retail sale in the US.
- Scanning at checkout speeds up the checkout process.
- Bar width and spacing represent digits 0 through 9.
- **Symbol Technologies** made a fortune selling barcode scanners and software to retailers.
- The cash register uses the barcode info to look up the product description and price in a database.



Examples of other linear barcode types

- **Ticketmaster** physical ticket: type **ITF**
- **Amazon** shipping label: type **CODE-128** includes numbers and uppercase letters
- **Seagate** 2.5" hard drive: type **CODE-39** includes numbers and uppercase letters



Luggage identifier strips

- These adhesive strips are applied when you check in luggage at an airport.
- Linear barcodes allow for rapid machine identification of the unique ID on the strip.
- Airline servers use the ID to look up luggage owner and destination in a database.
- Code type **ITF**, like Ticketmaster physical tickets



What's in your wallet?

- Linear barcodes now appear on **customer membership and loyalty cards** to convey customer ID.
- **BJ's** discount club on top
- Reloadable entertainment card for **Funland** in Fredericksburg VA.
- **Interagency Senior Pass** for National Park and National Forest admission.
- Barcode acts as backup when magnetic strip is corrupted.



Quick Response (QR) codes

- QR codes are widely used to convey web page URLs, vCard (Contacts record), email address/subject/body text, WiFi network name and password, and other info.
- Square shape, with small squares in 3 corners.
- Online movie ticket purchases often produce a QR code that you can photograph or print to use as your ticket.
- Digital Boarding passes for major airline apps include QR codes for scanning by TSA and at the gate.



Why QR codes are useful

- QR codes contain info that saves you the time and risk of typing a URL, email address, WiFi password, and more. The risk is **typos**.
- The longer the info, the greater the typo risk.
- The Android Samsung **Contacts app** can create a vCard QR code for any one of your contacts, including you.
- Every business card should include a vCard QR code containing all the text info on the business card.



QR codes are not the first to be aimed at consumers

- CUE-CAT was a joint effort of DigitalConvergence.com and RadioShack.
- RadioShack gave away the USB scanner device at 7,000+ locations in the US.
- Failed because (1) consumers did not understand why it was useful, and (2) other retailers did not adopt it.



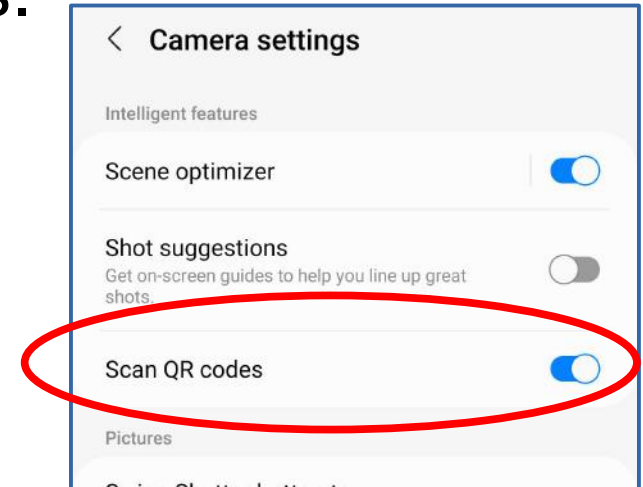
**Your smart phone and tablet
can scan QR codes**

Get out your smart phone or tablet

- Soon, you will have an opportunity to practice scanning a QR code.
- First, you will see how to make sure your phone or tablet Camera app is configured to scan QR codes.

Check Android Camera app configuration

- Open the **Camera app**.
- Tap the **Gear button** in the upper left corner.
- The **Camera Settings** screen opens.
- On the Camera Settings screen, make sure the **Scan QR code switch is turned ON**.

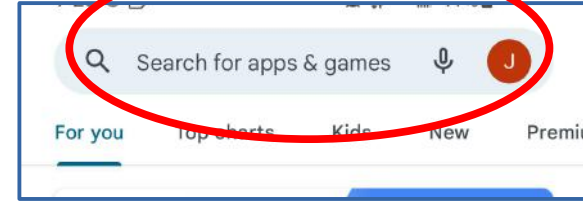


If the Android Camera app does NOT include the Scan QR codes switch

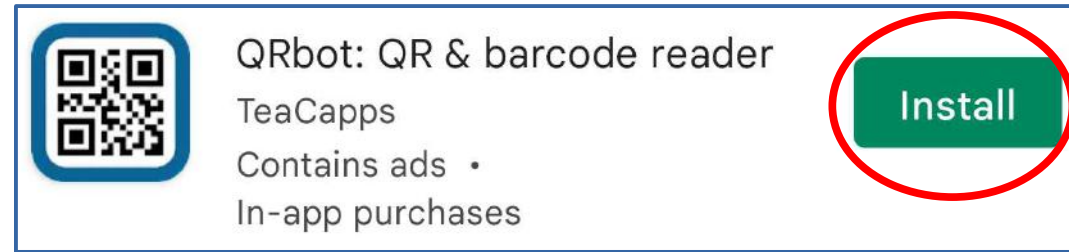
- Open the Play Store app.



- In the Search field at the top of the Play Store app screen, type **QRBOT** and tap the **Search** key.



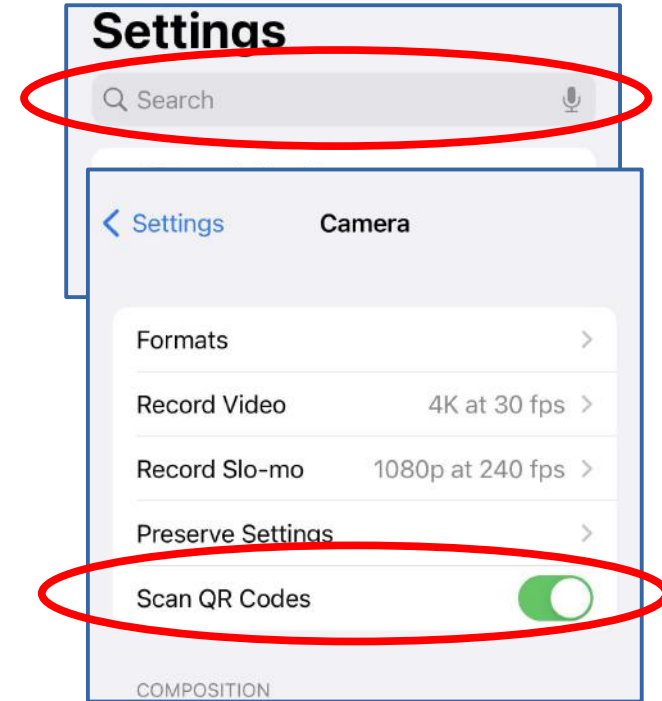
- The free QRBOT app, published by TeaCapps, is at the top of the results.





- **Install the free QRBOT app NOW.**

Check iPhone/iPad Camera app configuration

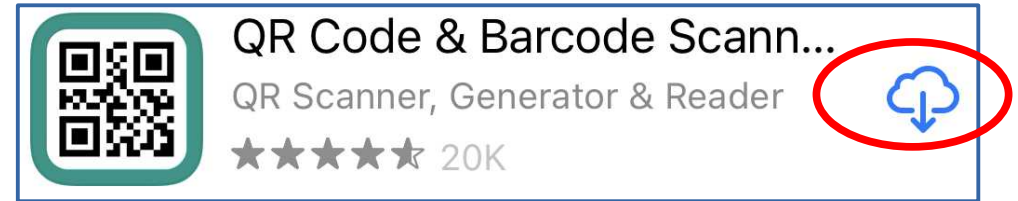
- Open the **Settings app**. If the Search field is not visible, then scroll down and up the Settings app screen slightly.
- In the Search field, type **Camera**.
- In the search results, tap the **Camera app icon** (not the Privacy icon). The Camera app settings screen opens.
- In the Camera app settings screen, make sure the **Scan QR codes switch is ON**.



If your iOS Camera config does NOT include the switch

- Open the App Store app. 
- Tap the Search button  in the lower right corner.
- In the Search field at the top, type **QRBOT** and tap the **search** key.

- In the search results, the app is named **QR Code & Barcode scanner**.



- **Tap the Install button NOW.** On your phone, the app is named **QRBOT**.

Prepare to scan a QR code

- Android 10-13 Camera app users: Camera app should be ready to take a photo.
- Android QRbot users: Start the QRBOT app and tap the **Scan Using the Camera** button
- Apple iOS 11-16 users: Open the **Camera** app
- Apple QRbot users: Start the QRbot app, and tap OK to grant permission to access the camera.

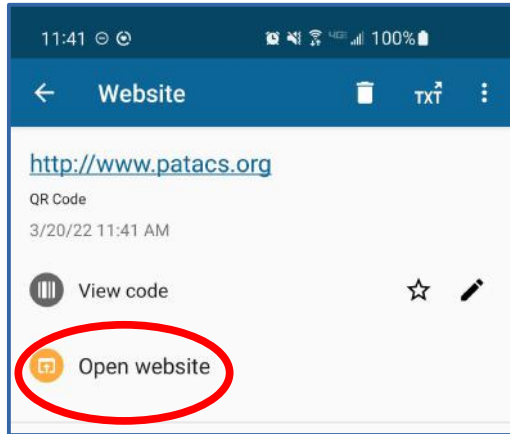
Scan this QR code for practice



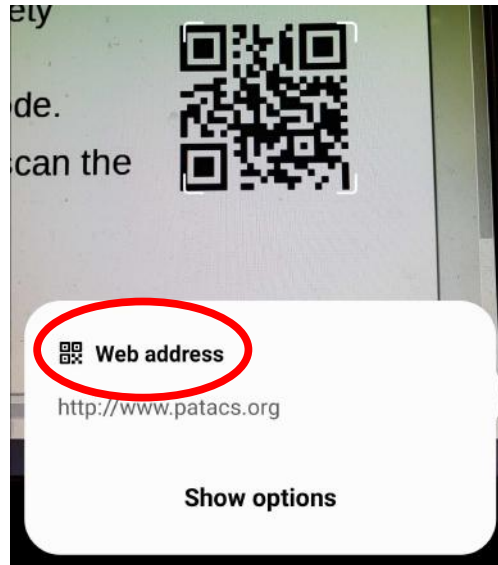
- This QR code contains the URL of my user group, the Potomac Area Technology and Computer Society (PATACS).
- Point the viewfinder on your phone at this QR code.
- You do NOT have to tap the Camera app shutter button!
- The **Camera app** or the **QRbot app** will pop up a button for you to open your web browser app to the www.patacs.com URL.

Next step: access the web page

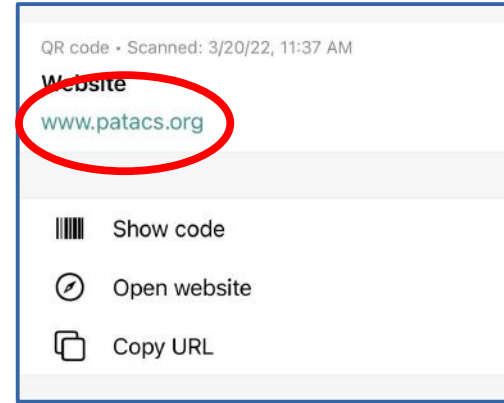
- **Android QRbot**



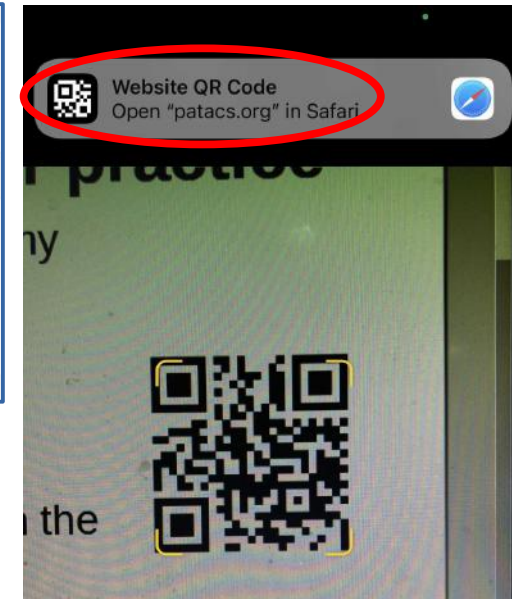
- **Android Camera**



- **Apple QRbot**



- **Apple Camera**



- **Tap the circled link**

Save Now, Scan Later

- Use a Windows or Macintosh computer to watch a presentation like this one.
- If a slide contains a QR code, then you can save time by storing the slide containing a QR code as a **screen image file** on your computer.
- It takes roughly one second to save a screen image.
- After the presentation, you can display the screen image file and scan the QR code at your convenience.
- Instructions appear on the following slides.

Save Now, Scan Later: Windows

- Use this key combo: **Win+PRTSCR (PrintScreen)**
Hold down the Windows key and tap the PrintScreen key.
- When you do that, a screen image file is saved in your **Pictures/Screenshots** folder.
- Each saved screen image file is named screenshot(#).png, where # is a consecutive number.
- Later, at your convenience, you can display the screen image file and scan the QR code.

Save Now, Scan Later: Macintosh

- Use this key combo: **Command+Shift+5**
Hold down the Command and Shift keys, and tap the 5 key.
- When you do that, a screen image file is **saved in your Desktop folder**
- I have not tested this keystroke combo.
- Later, at your convenience, you can display the screen image file and scan the QR code.

Your Windows computer can scan a saved screenshot QR code

- This is valuable when the QR code identifies a web page for downloading a free computer application.



- **FREE QR CODE SCANNER** application:

<https://apps.microsoft.com/store/detail/free-qr-code-scanner/9N7QFLXDQ6QP>

Save Now, Scan Later

Windows: **Win+PRTSCR** (PrintScreen)
Saves to Pictures/Screenshots

Macintosh: **COMMAND+SHIFT+5**
Saves to Desktop

Your Macintosh computer can scan a saved screenshot QR code

- This is valuable when the QR code identifies a web page for downloading a free computer application.
- I have not tried this application.
- **QR JOURNAL** (a free application):
<https://apps.apple.com/us/app/qr-journal/id483820530?mt=12>



Save Now, Scan Later

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Saves to Pictures/Screenshots

Macintosh: **COMMAND+SHIFT+5**
Saves to Desktop

Other QR code data types

Aside from web page URLs, QR codes can contain:

- A **vCard** (a Contacts record) which inserts the contact info as a new record in your Contacts app.
- An **email** (addressee, subject line, and text body) which opens your email app so you can edit and send the email.
- A **WiFi login** (including WiFi name and password) which connects your device to that WiFi.
- There are many other data types for QR codes.



An Advanced QR code use case:

**The SMART Health Card
vaccination record**

Paper vaccination record (CDC Card)

- CDC paper vaccination cards became valuable during the pandemic when COVID-19 vaccinations were approved for emergency use.
- General media reported a number of posts online encouraging **CDC card fraud**: blank card images, and valid vaccination batch data to put on blank cards.
- As a result of those reports, states and chain pharmacies that provided COVID-19 vaccinations looked for ways to provide vaccinated individuals with **fraud-proof vaccination records**.

Fraud-proof vaccination record

- **The Commons Project** developed a fraud-proof QR code based solution called the **SMART Health card**
- As of January 8, 2022, the SMART Health Card is provided to vaccinated individuals by 24 states (but not Kansas or Missouri); all Canadian provinces; and pharmacies including Walmart, CVS, Walgreens/Rite Aid, and Kaiser Permanente

The **SMART Health Card PDF** looks like this.

Note this PDF doc does **NOT** update automatically.

In November 2021, I downloaded an updated PDF doc showing my late October booster shot.

 
COVID-19 Vaccination Record
As of 10/08/2021

John Krout
Date of Birth: [REDACTED]

Dose 1: 03/11/2021, Moderna,
002B21A, Arlington County Public Health -
DHS/CHS
COVID-19, mRNA, LNP-S, PF, 100 mcg/0.5
mL dose

Dose 2: 04/08/2021, Moderna,
021B21A, Arlington County Public Health -
DHS/CHS
COVID-19, mRNA, LNP-S, PF, 100 mcg/0.5
mL dose



This COVID-19 Vaccination Record is based on information recorded in the Virginia Immunization Information System by providers, and may not include vaccinations administered outside Virginia or by federal government agencies. The vaccinations listed above are valid even if the lot number and/or provider information is not visible.

Once you save or print your record, your copy will not automatically update. If you receive an additional dose of the COVID-19 vaccine, be sure to obtain an updated version of your record at [vaccinate.virginia.gov](https://www.vaccinate.virginia.gov).

The QR code on your record is compatible with the SMART Health Card format and can be scanned with the [Verifier](#) app to confirm your vaccination record and that the record was issued by the Virginia Department of Health. The QR code contains name, date of birth, dates of vaccination, manufacturer, lot information, and provider for each dose of vaccine received.

For more information about your vaccination record, including QR codes, visit [Frequently Asked Questions](#). For more information about COVID-19 vaccination, visit [vaccinate.virginia.gov](https://www.vaccinate.virginia.gov) or call 877-VAX-IN-VA (877-829-4682).





I did that after each of my two booster shots in 2022 as well.

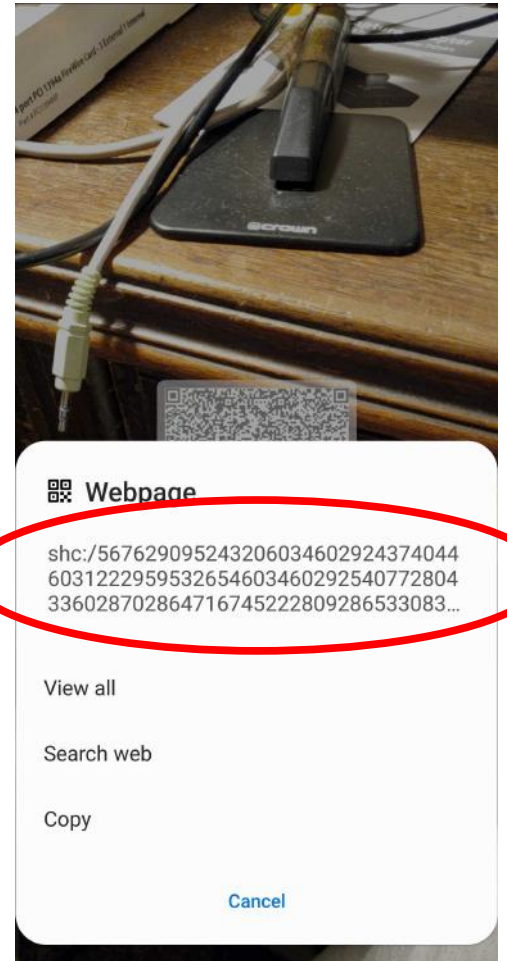
Virginia Department of Health (VDH)

- VDH maintains the central database of vaccination records for Virginia residents vaccinated by local government health departments in Virginia.
- VDH now offers the secure SMART Health Card to document and prove your vaccination status, in 2 parts.
- **Part 1:** you can download from VDH your own personal SMART Health Card PDF file.
- **Part 2:** A free SMART Health Card **Verifier app** reads and decrypts the QR code contents.

Why the SMART Health Card is considered to be Fraud-proof

The SMART Health Card QR code is *encrypted*

- I tried scanning the QR code using the built-in Camera app QR scanner in Android 11.
- I saw a very long string of digits. I tapped that string of digits.
- My phone told me it lacked the appropriate app to display QR code data.



Encryption provides security

- The name, birthdate, and vaccination details are **encrypted** in the QR code.
- The encryption is modern dual-key asymmetric encryption invented by Rivest et al at MIT.
- One key encrypts, and the related other key decrypts.
- One key is kept **private by the key pair owner**, and the related other key is **public, shared by the owner** with all who may need to communicate with the owner.
- Anything encrypted with either of the keys can be decrypted successfully using the related other key.

Encryption provides security

- How it works:
- An owner of dual keys wants to send encrypted info to others who have his public keys
- Owner encrypts with his private key
- Recipients can decrypt successfully if they have the public key
- Successful decryption proves that the message came from the owner of the private key, therefore is not fake.

Why encryption provides security

The dual-key approach ensures:

- Only recipients who have the public key can decrypt and read a message encrypted using the sender's private key.
- The reverse is also true: Only the private key owner (the original sender) can decrypt and read a message encrypted using the public key.
- Nobody else who lacks a key can create a forged message that will be accepted as real.

What can you do with that SMART Health card PDF file?

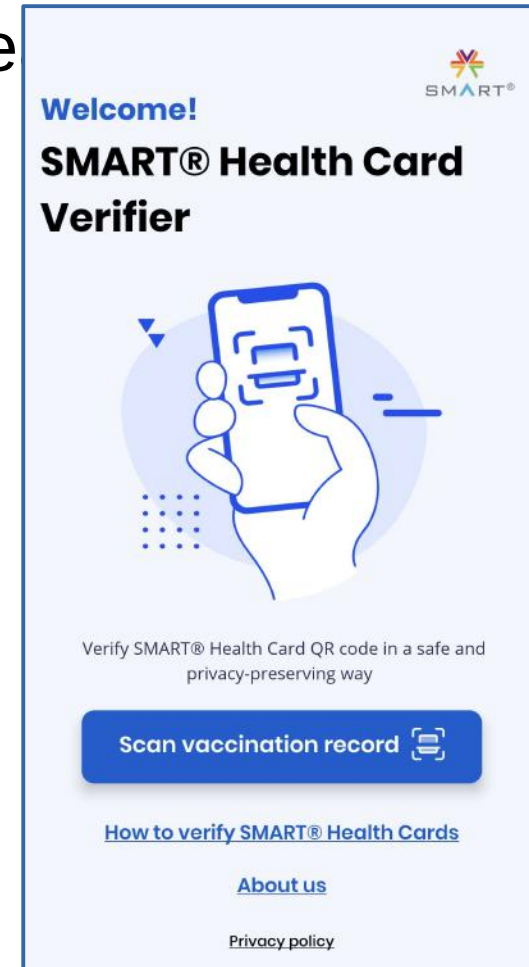
- Save it on your computer
- Put it on your phone so you can show it to a Verifier app whenever you need to do so
- Learn how to put a PDF Shortcut on the phone's Home screen so you can display the SMART Health Card PDF easily
- Store the SMART Health Card PDF in a **Wallet app** such as Apple Wallet, Google Wallet or Samsung Wallet

The Smart Health Card Verifier app

- Available to the general public on the Google Play Store and the Apple App Store for free
- Uses network services; the app sends QR code contents to Commons Project servers for decryption; public decryption keys are not inside the app.
- Validity result determined by the servers is sent back to the app.
- If no network is available (e.g., airplane mode), then the Verifier app will NOT scan anything

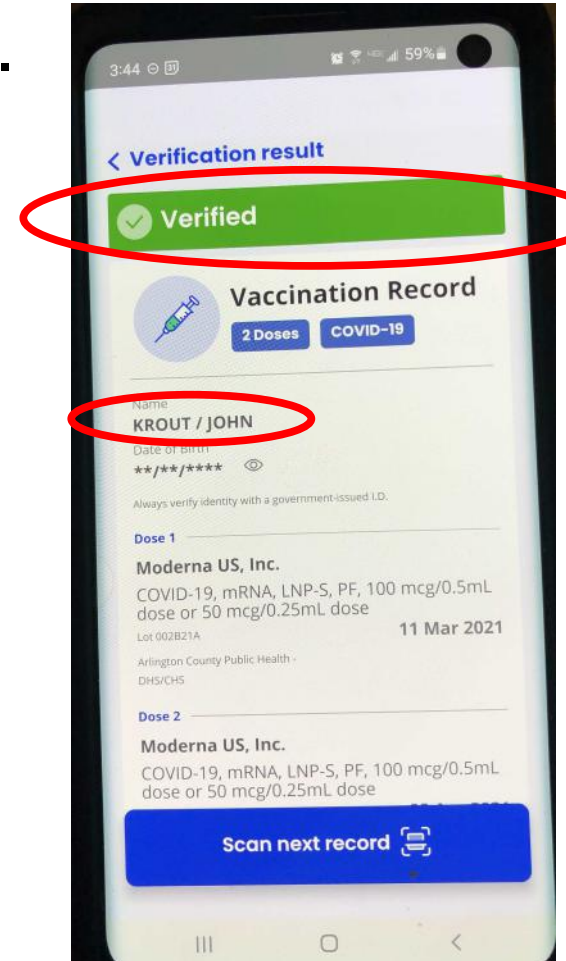
The Smart Health Card Verifier App

- On an Android 11/12 smart phone, the app appears with the name **Verifier** and this icon:
- App icon for iOS 15 is identical
- Main screen includes a **Scan Vaccination Record button**
- Scan result: Green/Yellow/Red
Green means scanned barcode is valid and issuer is trusted
Orange means barcode is valid and **issuer is not trusted**
Red means barcode is **not valid**




A Verification Result Example

- The color code is prominent at the top.
- The name included in the QR code is displayed also.
- The Verifier app prevents Android screen capture, for privacy reasons.
- I used my iPhone X to take this photo of the Verifier Results screen on my Android phone.



An easily spotted forgery attempt

- Alteration of the encrypted QR code makes it impossible to decrypt.
- A forger could alter **only** the clear text printed on the SMART Health Card. 
- **Forgery**: Put a substitute name and DOB in the clear text.
- The Verifier app would say the QR code is valid, but the **decrypted name displayed by the Verifier app would *not match the forged name in the clear text.***

How to CREATE QR codes

LibreOffice version 7

- LibreOffice is a free downloadable suite of MS-like office apps including **Writer**, **Impress** (like PowerPoint), **Calc** (like Excel), and more.
- Supports creation of **URL and text QR codes**.
- Pull down the **Insert menu**, and select **Object**. A sub-menu appears.
- In the sub-menu, select **QR code**. A dialog box pops up.
- In the dialog box, type or paste the URL or text, and choose an error correction level.
- The generated QR code is inserted in your doc.

Web sites to Create QR codes

- www.qr-code-generator.com

Scan the QR code



- This site can create 13 QR code content types.

- GoQR.me

Scan the QR code



- This site can create 9 QR code content types and provides error correction level controls.

- Both sites download the generated QR code to your computer.

Save Now, Scan Later

Windows: **Win+PRTSCR** (PrintScreen)
Saves to Pictures/Screenshots

Macintosh: **COMMAND+SHIFT+5**
Saves to Desktop

Built-In Apps create QR codes

- Samsung Android 11-13 **Contacts** can create a vCard QR code of a record, including a photo in the middle of the QR code if a photo exists in the Contacts record.
- Android 11-13 **Settings** can create a **WiFi QR code** for login to the WiFi network currently in use by the phone or tablet.



The QRbot app can *create* QR codes

- The free app for iOS supports eleven QR content types
- The app can create **other code types**, if you buy the Pro version



Creative QR codes for User Groups

Create QR codes for user group meetings/newsletters/flyers/Web pages

- URL of user group membership application.
- URL of user group web site.
- Zoom meeting URL for user group.
- vCard of meeting site physical address for user group.
- URL of public Google Calendar of user group meetings.
- Login, including password, for WiFi at user group meeting site.



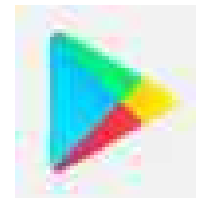
Apps and Web sites mentioned in this presentation

So you can practice
Save Now, Scan Later

The QRbot app



Get the app on the Google Play Store



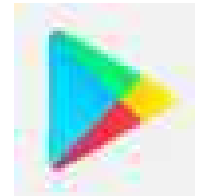
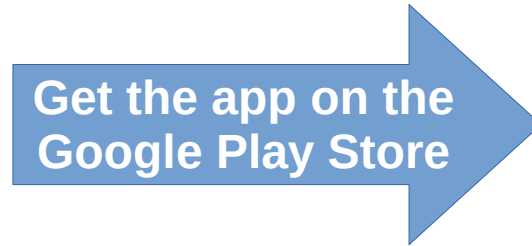
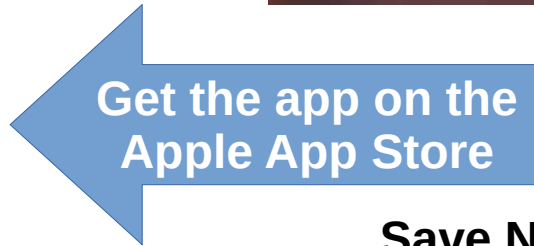
Get the app on the Apple App Store

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The SMART Health Card Verifier app



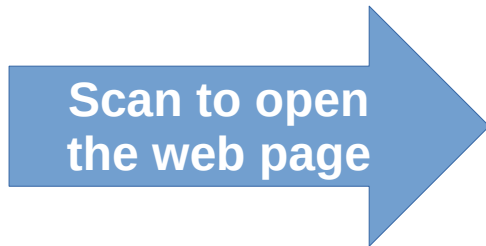
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The online list of SMART Health Card trusted issuer organizations

- www.commontrustnetwork.org/verifier-list



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- **FREE QR CODE SCANNER** application:
<https://apps.microsoft.com/store/detail/free-qr-code-scanner/9N7QFLXDQ6QP>



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- I have not tried this application.
- **QR JOURNAL** (a free application):
<https://apps.apple.com/us/app/qr-journal/id483820530?mt=12>



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Saves to Desktop

Preview of Coming Attractions

My next public presentation of a *new topic*:

Saturday, January 21 at 1:00 PM ET

BLUETOOTH AND PAIRING

for **Potomac Area Technology and Computer Society**
(www.patacs.org)

Send your email request for a guest pass to [ffxmtg\(at\)patacs.org](mailto:ffxmtg@patacs.org) including your full name, city and state, and user group name.

OR **scan the QR code** to create the email and then fill in the blanks for your name and city/state.



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Saves to Desktop

The End

- John Krout, jkrouit.apcug.presenter@gmail.com
- Potomac Area Technology and Computer Society
www.patacs.org



PS

The **APCUG Wednesday Workshop** on January 25, 2023, will include my presentation on **Google Public Calendars**.

You will learn:

- The nature and advantages of a *public* digital calendar
- How to create a Google calendar and make it viewable by the public
- How to create, modify and delete calendar entries for group meetings
- How to include club info such as meeting address and club web page address, and meeting reminders