Prison Break

breaking out of kiosk mode environments

PRESENTED BY:

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Me

- Gerhard / IKARUS
- Pentester, hacker, researcher, IT/HW/RF security enthusiast
- Especially interested in hardware hacking and wireless systems
- Maybe you know me from MIFARE Classic Tool

Agenda

- What is a kiosk mode environment?
- What is this talk about and what not?
- What interfaces / attack vectors do we have?
- Tips, tricks, stories and demos for kiosk mode breakouts
- Lessons learned
- Q&A + tell your stories, tips and tricks

What is a kiosk mode environment?

“A kiosk mode environment is a system setup where a device or application is locked down to only allow specific functionality, preventing users from accessing anything outside of the intended purpose.“

- The interface is streamlined and restricted
- Users can't access system settings or other applications
- It often runs a single application, like a web browser
- Security measures prevent unauthorized modifications

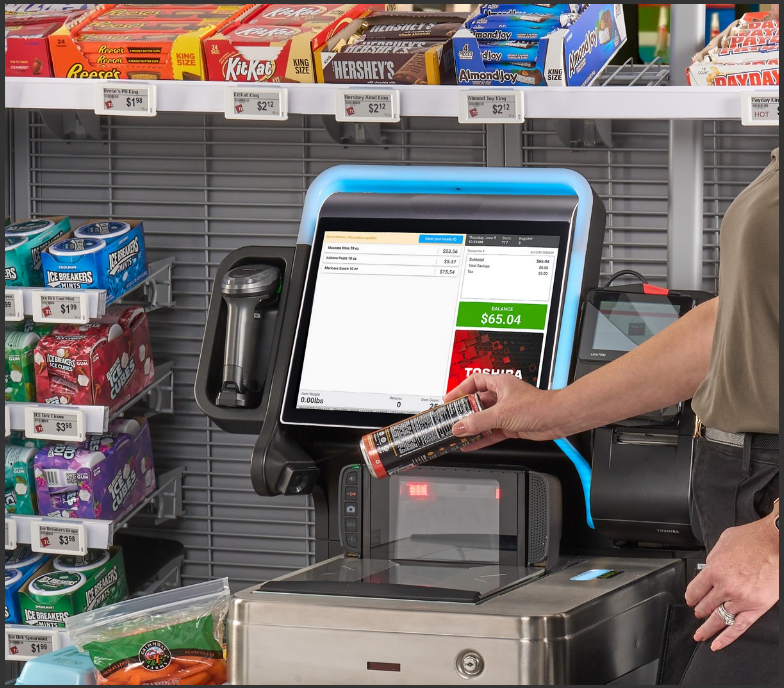
What is a kiosk mode environment?

https://besucherverwaltung.com/kiosk-terminals

What is a kiosk mode environment?

https://besucherverwaltung.com/kiosk-terminalshttps://24x7mag.com/standards/safety/cybersecurity/fda-mitre-offer-cybersecurity-guide-for-legacy-medical-devices/

What is a kiosk mode environment?



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What is a kiosk mode environment?

Examples:

- ATM
- Visitor registration
- Self-service order terminal
- Ticket system for public transport
- Info terminal in a museum

What is this talk about?

- What is it about
  - A collection of tips & tricks about kiosk mode breakouts
  - Main focus on devices
  - Stories and lessons learned from analyzing systems
- What is it NOT about
  - Privilege escalation attacks (out of scope)
  - (Pictures of systems I have tested for a customer)

What is this talk about?

Not about Prison Break mems. Sorry, did not watch the show 😬

Previous work

There has been great research in the past e.g.:

- Paul Craig (DEF CON talks, tools)
- Swissky & community (cheatsheet)
- Syed M. Huda (cheatsheet)
- Shain Lakin (collection of useful breakout links)
- Many more...

What interfaces / attack vectors do we have?

- What can we do with the device/terminal?
- What do we know about the platform? (Windows/Linux/Android/etc. system, used software)
- What input methods do we have? (touch, keyboard, barcode reader)
- What interfaces do we have? (USB, Ethernet, Wi-Fi, Bluetooth)
- What else can we access? (easy to open, power cord)

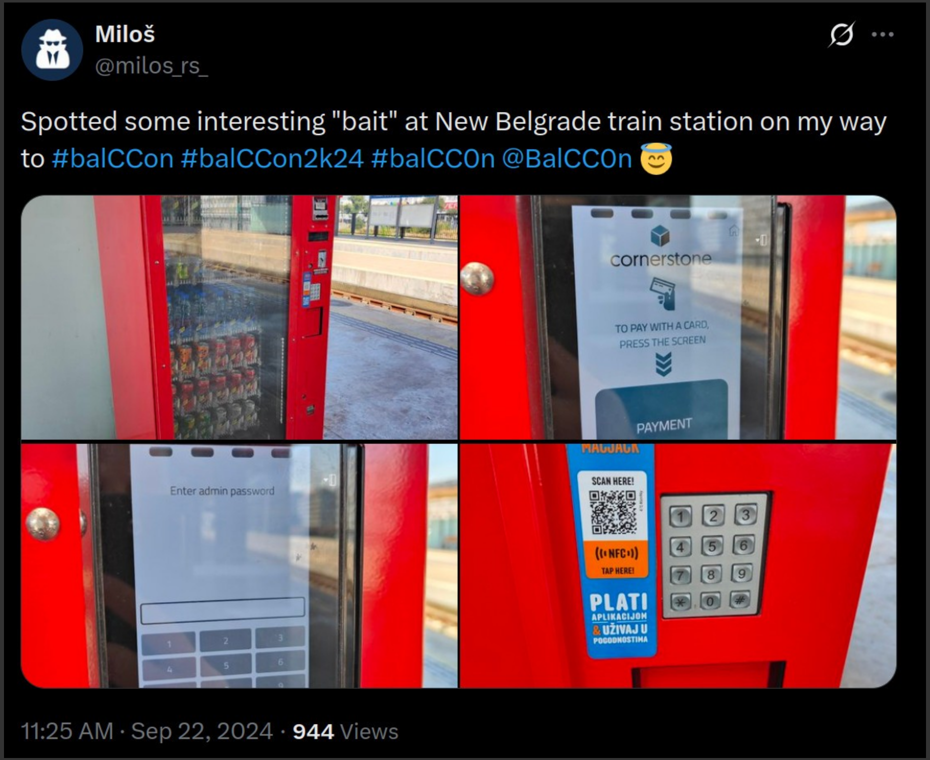
Tips & tricks

- Kiosk application
- Touchscreen/mouse
- Keyboard
- (Re-)booting & Login screen
- Crashing
- USB
- Network (Ethernet/Wi-Fi)
- Android
- Other

Kiosk application

- Most kiosk application have a designed breakout mechanism
- Some require authentication (e.g. PIN)
- Sometimes they are just hidden
- Press/long press/repeatably press on “static” content (logos, clock, version number, etc.)
- Look for known breakout options & default PINs/passwords

Kiosk application

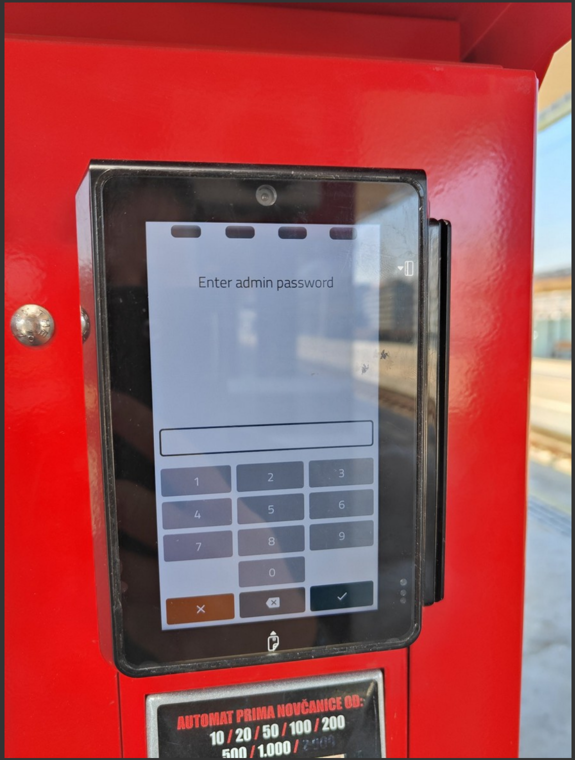


Miloš
@milos_rs_

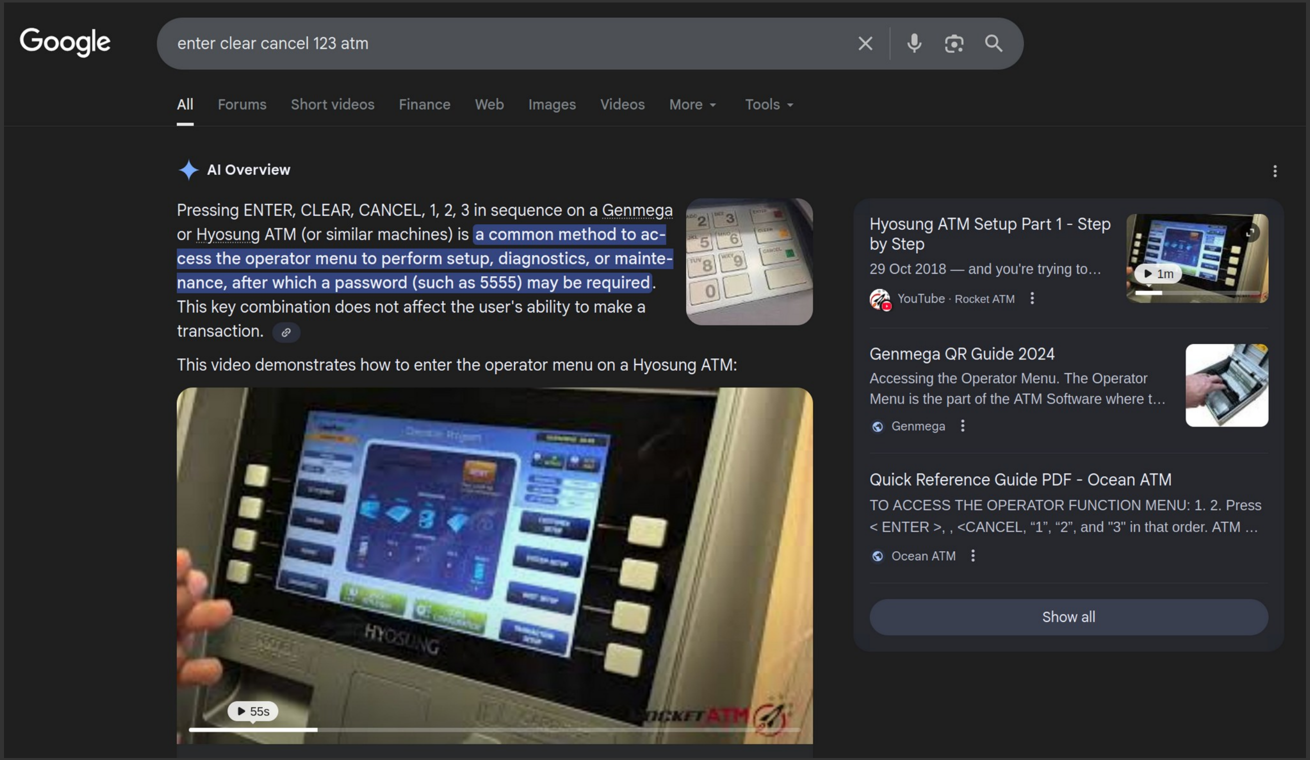
Spotted some interesting "bait" at New Belgrade train station on my way to #balCCon #balCCon2k24 #balCC0n @BalCC0n 😇

cornerstone
TO PAY WITH A CARD, PRESS THE SCREEN
PAYMENT
Enter admin password
SCAN HERE!
NFC
TAP HERE!
PLATI APLIKACIJOM & UŽIVAJ U POGODNOSTIMA

11:25 AM · Sep 22, 2024 · **944** Views



Kiosk application



Pressing ENTER, CLEAR, CANCEL, 1, 2, 3 in sequence on a Genmega or Hyosung ATM (or similar machines) is a common method to access the operator menu to perform setup, diagnostics, or maintenance, after which a password (such as 5555) may be required. This key combination does not affect the user's ability to make a transaction.

This video demonstrates how to enter the operator menu on a Hyosung ATM:

Hyosung ATM Setup Part 1 - Step by Step
29 Oct 2018 — and you're trying to…
YouTube · Rocket ATM

Genmega QR Guide 2024
Accessing the Operator Menu. The Operator Menu is the part of the ATM Software where t…
Genmega

Quick Reference Guide PDF - Ocean ATM
TO ACCESS THE OPERATOR FUNCTION MENU: 1. 2. Press < ENTER >, , <CANCEL, “1”, “2”, and "3" in that order. ATM …
Ocean ATM

Kiosk application

General things to look out for:

- Links
- Open/save/download options
- Embedded elements (e.g. browser, PDF viewer, etc.)
- (Sometimes: print options)

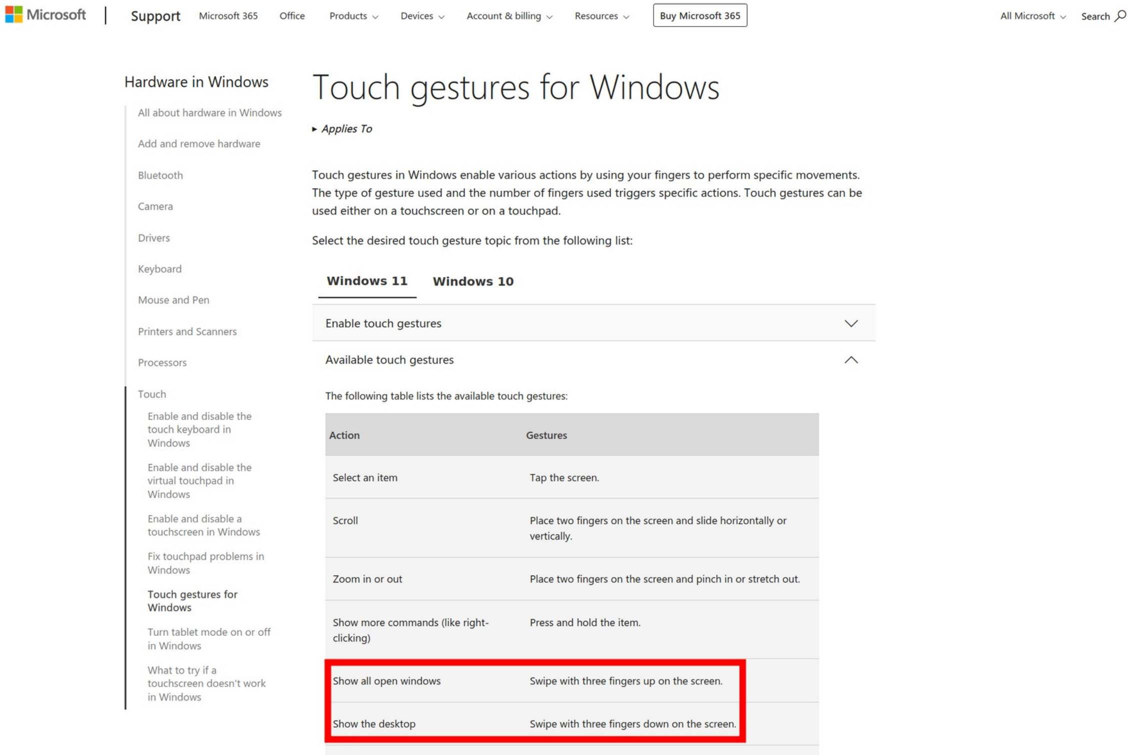
Kiosk application

Demo
breakout from edge with “PDF → open”

Touchscreen / Mouse

- Things to look out for:
  - Long touch/right click (context menus)
  - Drag and drop
  - Screen corners and edges
  - Gestures

Touchscreen / Mouse


Microsoft
Support
Microsoft 365
Office
Products
Devices
Account & billing
Resources
Buy Microsoft 365
All Microsoft
Search
Hardware in Windows
All about hardware in Windows
Add and remove hardware
Bluetooth
Camera
Drivers
Keyboard
Mouse and Pen
Printers and Scanners
Processors
Touch
Enable and disable the touch keyboard in Windows
Enable and disable the virtual touchpad in Windows
Enable and disable a touchscreen in Windows
Fix touchpad problems in Windows
Touch gestures for Windows
Turn tablet mode on or off in Windows
What to try if a touchscreen doesn't work in Windows

Touch gestures for Windows

▸ *Applies To*

Touch gestures in Windows enable various actions by using your fingers to perform specific movements. The type of gesture used and the number of fingers used triggers specific actions. Touch gestures can be used either on a touchscreen or on a touchpad.

Select the desired touch gesture topic from the following list:

Windows 11 **Windows 10**

Enable touch gestures

Available touch gestures

The following table lists the available touch gestures:

Action	Gestures
Select an item	Tap the screen.
Scroll	Place two fingers on the screen and slide horizontally or vertically.
Zoom in or out	Place two fingers on the screen and pinch in or stretch out.
Show more commands (like right-clicking)	Press and hold the item.
Show all open windows	Swipe with three fingers up on the screen.
Show the desktop	Swipe with three fingers down on the screen.

https://support.microsoft.com/en-us/windows/touch-gestures-for-windows-a9d28305-4818-a5df-4e2b-e5590f850741

Touchscreen / Mouse

Demo
gesture breakout on ticket system

Keyboard

- Maybe the terminal has one build into it (likely to not have “all” keys)
- Maybe you can plug in your own keyboard via USB
- There are a LOT of keys and keyboard shortcuts which may help with breaking out
- Some examples: Ctrl+Alt+Del, Ctrl+Shift+Esc, Win+X, Win+R, Win+E, Alt+Tab, Alt+Esc, Win+Tab, Win+D
- Watch out for stateful/custom keyboard shortcuts (first X then Y)

Keyboard

Demo
lesser known keyboard shortcuts
(Shift x5, Shift+Alt+Print)

(Re-)booting & Login screen

- Might give you access to system options (BIOS/UEFI)
  - Time, boot order, build-in EFI shell
- Might allow you to boot from a different medium
- There might be timeframes where you can access other programs
- Might allow you to access Windows repair & boot options

(Re-)booting & Login screen

Demo
deactivated sticky keys

(Re-)booting & Login screen

Demo
from login screen to cmd

Crashing

- Overexerted applications might crash or Windows might offer to kill the not responding application (e.g. rapidly change languages)
- It might be to trigger a resource exhaustion via e.g. the network interface (SYN flooding, TLS (re)negotiation, etc.)
- Slow external resources (e.g. emulated USB flash drive) might cause the UI to hang (kill not responding application)
- Blue screen error might give access to Windows repair & boot options

Crashing

Demo

leftover cmd.exe running a program

USB

- Obvious: try if a USB keyboard works
- USB flash drive with “dirty bit” → might trigger repair popup
- BitLocker to Go encrypted drives might trigger a popup
- Devices might trigger a “co-driver installation” popup
- If flash drives are forbidden, MTP devices (Android phone) might work
- If the keyboard protocol is forbidden, a (emulated) mouse with a full keyboard might work

USB

Demo
co-driver install on Windows

Network (Ethernet/Wi-Fi)

- Sorry, no ready-to-use tips & tricks here (yet?)
- There might be services running that help with breaking out (RDP, SMB, etc.)
- Do a portscan and work from there

Android

Look out for

- Android Debug Bridge (adb)
  - Check network and USB
  - Also check when running in safeboot or fastboot
- Recovery mode & bootloader (side loading apps)
- Attach a keyboard and check typical keys & shortcuts
- Check other interfaces (e.g. NFC, camera with QR code reader, etc.)

Other

- (Android) devices with NFC
  - Might support NDEF data format and act on it
- Bluetooth enabled devices
  - Force-pairing might work (CVE-2023-45866, great on “older” Android/Linux)
  - Pairing a BT keyboard might work/help

Other

- Barcode/QR code reader
  - Often emulate a HID device (USB keyboard)
  - Sometimes can be programmed to support keyboard shortcuts
  - Sometimes can be programmed though barcodes
- URI handlers
  - Especially great if you can surf to a attacker controlled website

Other

Demo
Android and NDEF NFC tags

Other

Demo

URI handlers

Let’s recap

- There are endless ways to break out!
- There is no “one way to rule them all”
- Possibilities to break out are mostly tied to available inputs, interfaces and how the system can be accessed

Lessons learned – “Blue Team”

- Don’t build your kiosk mode terminal on a full-featured platform by removing features (e.g. “normal” Windows 10).
- Build you platform with only the features needed for operation (e.g. Yocto Linux, no Xserver, no desktop, no additional drivers, etc.)
- All input is evil! Validate everything & build/use robust system
- Hiding functions is not security; use strong authentication for admin
- Don’t reinvent the wheel, use well known features/software

Lessons learned – “Red Team”

- Check what interfaces/attack vectors are available
- Be creative
- Be persistent
- Do your research

Kiosk mode breakout: tips & tricks

https://github.com/ikarus23/kiosk-mode-breakout

Contributions
Welcome!

Questions?

Share your stories, tips & tricks!

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