

# HANDS-ON AUTOMOTIVE EXPLOITATION

BASIC BLUETOOTH BUFFER OVERFLOW

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SECURE OUR STREETS - 2022



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# WHOAMI

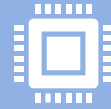
- "Automotive Cybersecurity Technology Architect" at White Motion
  - Subsidiary of Marelli (International Automotive Tier1 Supplier)
  - Based in Tokyo
- Trilingual Car Hacking Enthusiast
  - English, Arabic, and Japanese
  - Ex-Admin of ASRG (Automotive Security Research Group) Detroit
  - Founder of ASRG Japan
- Jack of all some trades, master of none
- Recent areas of interest:
  - Bluetooth
  - USB
  - RF
  - Fighting with obscure Taiwanese microcontrollers
- Hobbies include fighting games, cooking, playing the ukulele, and getting lost

# OBJECTIVES OF THIS TALK

- Short Explanation of Automotive Bluetooth
- Short Overview of Buffer Overflow Software Vuln.
- Short Real-Time Demo
- Q&A



# SHORT BLUETOOTH INTRO



Short-range, cable replacement technology



Very widely used, used in almost all IoT devices worldwide



Sensor data, audio data, file transfers, media, etc.



Advertised ranges can be very long, but in practice most applications are within 30m.

# WHAT IS A BUFFER OVERFLOW VULNERABILITY?

The background is a dark blue gradient with a subtle pattern of small white dots. On the right side, there are several circular technical diagrams. One large diagram is a gauge with a scale from 0 to 210, with major ticks every 10 units and minor ticks every 2 units. It has a white needle pointing towards the 180 mark. Below it is another gauge with a scale from 0 to 100, with a needle pointing towards the 80 mark. There are also some dashed lines and other circular elements scattered across the background.

# BUFFER OVERFLOW

- Software Vulnerability
  - Input Data  $>$  Allocated Buffer Size
  - Memory Corruption
  - Overwrite Variables
  - Execution Interference
- No Input Validation
- Mainly Affect C/C++



# DEMO TIME!

\*BUT FIRST, A SHORT DISCLAIMER

- The vulnerable program used in this demo is intentionally made to be VERY insecure
- This is in no way reflective of Bluetooth applications used in any modern vehicle
- This vulnerability in no way reflects the security posture of any company's product(s)

# DEMO PLATFORM

- Simple Password Input Over Bluetooth
  - Correct Password (HiKamel) → Root Privileges Granted!
  - Incorrect Password → Goodbye!
- Easy enough, right? Let's do some trials!



# DEMO TRIALS

TRIAL	Expected Outcome	Observed Outcome
INCORRECT PASSWORD		
CORRECT PASSWORD		
????????????????		

# CONCLUSION

- The buffer overflow attack clearly invoked unintended functionality from the target
- This vulnerability was *an issue with the application running on the target – NOT the target's Bluetooth implementation itself*
- Attacking the Bluetooth protocol itself would be a different area of study entirely – but not impossible at all!

# REFERENCES USED

- Bluetooth Specification RFCOMM V12
  - [https://www.bluetooth.org/docman/handlers/DownloadDoc.ashx?doc\\_id=263754](https://www.bluetooth.org/docman/handlers/DownloadDoc.ashx?doc_id=263754)
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  - <https://www.wired.com/story/tesla-model-x-hack-bluetooth/>
- Tesla BLE Relay Article
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# THANK YOU!

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