A Forensic Data Analysis of a Bluetooth Device paired with an Android-based Audio Video Navigation System

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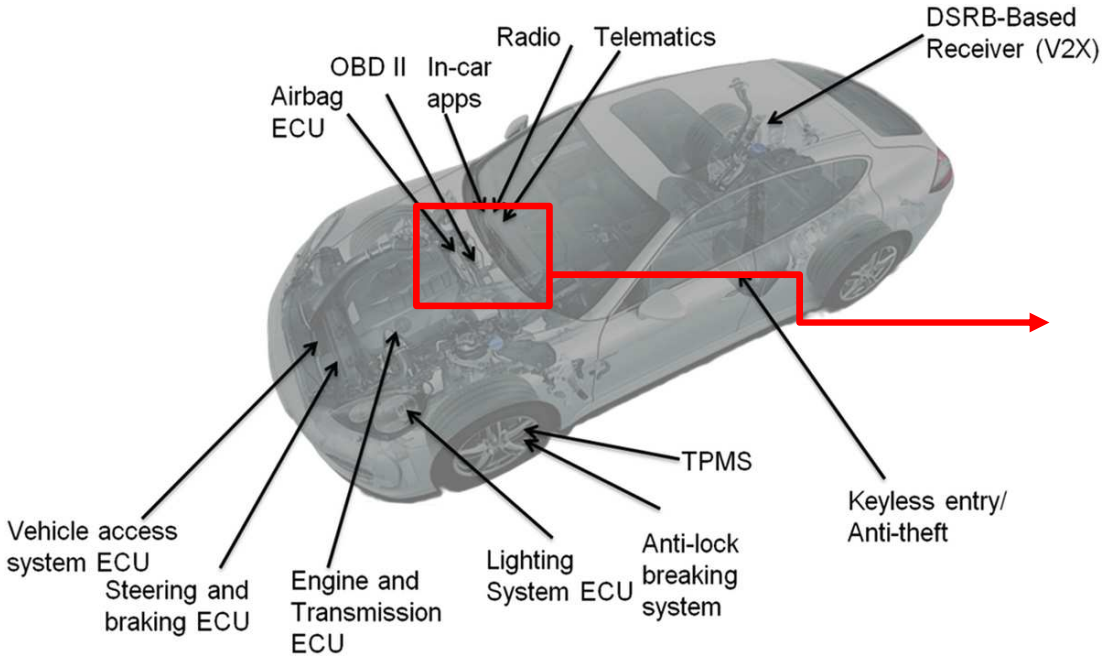
Introduction

- The number of traffic accidents in the death is increasing every year, Accordingly, there are growing interests in research on Car Forensics.
- Recently, Car trend(connected car, Self-driving) requires that new hardware.
  - Engine Control Unit(ECU), Transmission Control Unit(TCU), Audio-Video Navigation(AVN) record various event information including driver's behavior
- Specially, AVN provides various convenient features to a driver.
  - Usually, driver pairs own mobile device to AVN via Bluetooth to using convenient features(Call, Play music, SMS etc…)



Collecting User Data in Android OS-Based AVN

- Target : KIA K5(Android 4.2.2, Jelly Bean)
- To collect from Android OS-based AVN, we obtained an ADB(Android Debugging Bridge) shell through USB connection
- To access userdata(/data) in android OS, we should obtain root privilege shell
  - No way for rooting Android OS based AVN System(Custom Recovery, Tool etc..)
  - Because Android developed on the Linux Kernel, We can exploit the vulnerability of the Linux Kernel to escalate privileges (CVE-2016-5195, Dirty-CoW)
- Finally, We acquired various artifacts(Bluetooth log, Media, DMB, Navigation) from userdata(/data) section

Artifacts	File Location
Bluetooth Logs (Bluetooth History)	/data/data/com.android.provider.bluetooth
Media Play from USB	/data/data/com.android.providers.media
DMB History	/data/data/com.lge.ivi.dmb
Navigation Logs	/data/data/com.mnsoft.navi

Analysis of the collected user data

- We mainly analyzed the data recorded by Bluetooth pairing between AVN and user mobile device
- The userdata stored in the directory name “/data/data/com.android.provider.bluetooth” of the AVN system image
- We obtained various artifacts about Mobile Device Connected to Bluetooth
  - Mac Address, Device Name, Phone Book, Recent Call History
- Because artifacts stored .db file format, we used “DB browser for SQLite” tool

Artifacts	Location and File name	Table	Attribute
Mac Address of Mobile Device Connected to Bluetooth	/databases/BTSetup.db	BTDevList	Address
	/databases/BTContacts.db	Switch_index	dev#_name
	/databases/BTFavorites.db	Switch_index	dev#_name
	/databases/BTCallHistory.db	Switch_index	dev#_name
Device Name of Mobile Device connected to Bluetooth	/databases/BTSetup.db	BTDevList	devname
Phonebook of Mobile Device connected with Bluetooth	/databases/BTContacts.db	Dev#contacts	-
Recent Call of Mobile Device connected with Bluetooth	/databases/BTCallHistory.db	Dev#CallHistory	-

Analysis of the collected user data(Example)

- MAC Address, Mobile Device Name of Mobile Device Connected to Bluetooth

Table BTDevList | 5 entries | Page 1 of 1 | Export to CSV

_id	devname	address	status	a2dp_st...	avrcp_s...	priority
62	iPhone ([redacted])	6C:AB:31:[redacted]	0	0	0	0
63	iPhone ([redacted])	3C:2E:FF:[redacted]	0	0	0	0
65	[redacted]	34:A8:EB:[redacted]	0	0	0	0
66	갤럭시 노트 10	74:9E:F5:[redacted]	0	0	0	0
68	[redacted]의 Galaxy S21	78:46:D4:[redacted]	2	2	0	1

- Recent Call of Mobile Device Connected to Bluetooth

테이블(T): Dev5CallHistory | 모든 열에서 필터링

	_id	vcard_version	storage	type	name	fname	nickname	tel_type	number	date_time
	필터	필터	필터	필터	필터	필터	필터	필터	필터	필터
1	9341	2.1	0	DIALED	NULL	[redacted]	NULL	CELL	0102[redacted]	20210728150928
2	9342	2.1	0	DIALED	NULL	[redacted]	NULL	CELL	0104[redacted]	20210728130845
3	9441	2.1	0	RECEIVED	NULL		NULL	OTHER	070[redacted]	20210727145313
4	9343	2.1	0	DIALED	NULL	[redacted]	NULL	CELL	0108[redacted]	20210727131619
5	9442	2.1	0	RECEIVED	NULL	[redacted]	NULL	CELL	0108[redacted]	20210727131531
6	9443	2.1	0	RECEIVED	NULL		NULL	OTHER	0318[redacted]	20210727110122
7	9444	2.1	0	RECEIVED	NULL		NULL	OTHER	0618[redacted]	20210727105604
8	9445	2.1	0	RECEIVED	NULL	[redacted]	NULL	OTHER	0102[redacted]	20210727094918
9	9391	2.1	0	MISSED	NULL	[redacted]	NULL	OTHER	0102[redacted]	20210727092133
10	9392	2.1	0	MISSED	NULL	[redacted]	NULL	OTHER	0102[redacted]	20210727092025

Conclusion

- We studies the collect and analysis of the communication data between KIA K5 and mobile device via Bluetooth connection
- Except Bluetooth connection history artifacts, other various artifacts exists
- We plan to investigate Navigation record, DMB records, and media usage
  - Also, plan to build automated tools for AVN data analysis

Thank You !

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