









Evaluation of the Privacy and Security Aspects of Connected Televisions



The Digital Standard

Test Name	Criteria	Indicators	Procedure Overview
 Functionality Over Time 	The company will continue to maintain the intended functionality of the product over the product's expected life cycle.	Every feature of the product will continue to work for as long as I can reasonably expect; that is, the manufacturer will not 'brick' certain parts of the product	
 Terms of Service and Privacy Policy documents 	I can easily find, read, and understand the privacy policy and/or terms of service.	The Terms of service (ToS) are easy to find. The ToS are available in the language(s) most commonly	Investigation and analysis of publicly available documentat on to determine what the company clearly discloses
 Data control 	I can see and control everything the company knows about me.	Users can control the collection of their information. Users can delete their	Investigation and analysis of publicly available documentation to determine what the company clearly
 Known Exploit Resistance 	The product is protected from known software vulnerabilities that present a danger from attackers.	The software is secure against known bugs and types of attacks.	Browsers: Identify publicly known vulnerabilities for each browser. Use the original proof of concept code (if known) or devise custom code where necessary, to test the browser for the issue identified in the vulnerability notice. Check if the browser is now protected from the identified vulnerabilities. Apps: Root/allbreak the device

Summary of TV findings

- Investigated 5 TVs:
 - LG, Samsung, Vizio, Sony, and TCL/Roku
- In partnership with Ranking Digital Rights and Disconnect
- Looked at policies, consent flows, data flows, security vulnerabilities

Summary of TV findings

- All models want to watch what you're watching
 - Via “automatic content recognition”
- Could limit data collection, but compromised functionality
- Security vulnerabilities in some of the TVs

Context: Vizio settlement

- FTC settled with Vizio for \$1.5 million in February 2017
- Collection of viewing activity without consent deemed an “unfair practice”
- Commr. Ohlhausen concurrence: Viewing is considered “sensitive” information under US law

What does consent look like?

BRAVIA

Privacy Policy

Enjoy Sony applications and services. For your use of some applications and services, etc., this TV will need to send certain unique number and information on your use and viewing history of this TV to Sony Corporation's servers.

When this TV is connected to the Internet, certain information will be sent to Sony Corporation's global servers. This information is sent for the purposes of:

- providing you with software updates, applications, services, content and advertising,
- helping you find content more easily, and

[view our products, applications and services](#)

[View details](#)

[Agree](#)

[Disagree](#)

SONY

PRIVACYCON

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Smart Hub Terms & Conditions, Privacy Policy

Your use of the Smart TV is governed by the Terms & Conditions and Privacy Policy. You will need to agree and acknowledge your understanding to proceed with set-up.

Terms and Conditions

View details

SAMSUNG GLOBAL PRIVACY POLICY HIGHLIGHTS

View details

Viewing Information Services

View details

Interest Based Advertisement

View details

Voice Recognition Services

View details

Click "I Agree to all" if you agree to the Terms & Conditions, read and understood the Privacy Policy, and want to enable ALL of the Additional Services above. You can also individually choose a specific Additional Service. If you do not wish to enable any of the Additional Services at this time, please click the "OK" to proceed with set-up.

I Agree to all

OK

Loss of functionality

- You could always control collection of viewing data, but with a cost to functionality

USER AGREEMENTS

Additional Services

- Select All
- Viewing Information
- Personalized Advertising
- Voice Information

AGREE

LATER

Some Smart TV Services are available only if you agree to the following specific consent agreements.

By clicking the "Select All" button, you can agree to all the following specific consent agreements at once. Please read each specific consent agreement carefully before you agree.

USER AGREEMENTS
- INCOMPLETE

04



Smart TV experience

Advertising

Microphone

Use info from TV inputs

Enable auto notifications

Using and sharing viewing info from your antenna and devices connected to this TV (including using ACR technology), Roku can suggest streaming content and personalize ads. This choice does not affect info collected through Roku's streaming service. (* for more information)

Post set-up controls

- All of the televisions offered controls in Settings to limit data collection
 - All gave you the ability to stop collection of viewing data
 - BUT, controls were usually hard to find

Post set-up controls

- LG: ☀️ → All Settings → General → About This TV → User Agreements
- Vizio: Settings → System → Reset and Admin
- Roku: Settings → Privacy → Smart TV Experience

How much control?

- Scope of controls and data collection was sometimes unclear

Please visit the "settings" menu of your Smart TV for choices that may be available to you if you do not wish to continue to receive personalized recommendations or certain enhanced features on your Smart TV. If you disable such personalized recommendations or additional features, then the information and content displayed on your Smart TV may not be as relevant to you. **But please bear in mind that Samsung may still collect information about your usage of the Smart TV for other purposes as described in the main body of this Privacy Policy.**

ip:dst: host contains samsungacr.com

No.	Time	Source	Destination	Protocol	Length	Info
211	0.966344	172.16.42.138	log-ingestion.samsungacr.com	TCP	74	50757 → 443 [SYN] Seq=0 Win=29200 Len=0
315	1.904853	172.16.42.138	log-ingestion.samsungacr.com	TCP	74	[TCP Retransmission] 50757 → 443 [SYN] Seq=0 Win=29200 Len=0
375	3.041432	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [ACK] Seq=1 Ack=1 Win=29200 Len=0
377	3.042302	172.16.42.138	log-ingestion.samsungacr.com	TLSv1_	583	Client Hello
415	3.245504	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	[TCP Dup ACK 375#1] 50757 → 443 [ACK] Seq=1 Ack=1 Win=29200 Len=0
420	3.266521	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [ACK] Seq=518 Ack=1449 Win=29200 Len=0
423	3.290866	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [ACK] Seq=518 Ack=2092 Win=29200 Len=0
425	3.323291	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [ACK] Seq=518 Ack=4092 Win=29200 Len=0
427	3.367913	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [ACK] Seq=518 Ack=5221 Win=29200 Len=0
429	3.376069	172.16.42.138	log-ingestion.samsungacr.com	TLSv1_	192	Client Key Exchange, Change Cipher S
493	4.048420	172.16.42.138	log-ingestion.samsungacr.com	TLSv1_	359	Application Data
564	4.622691	172.16.42.138	log-ingestion.samsungacr.com	TLSv1_	97	Encrypted Alert
568	4.629861	172.16.42.138	log-ingestion.samsungacr.com	TCP	66	50757 → 443 [FIN, ACK] Seq=608 Ack=608 Len=0
650	5.658914	172.16.42.138	log-ingestion.samsungacr.com	TCP	54	50757 → 443 [RST] Seq=968 Win=0 Len=0
653	5.666618	172.16.42.138	log-ingestion.samsungacr.com	TCP	54	50757 → 443 [RST] Seq=968 Win=0 Len=0
654	5.666884	172.16.42.138	log-ingestion.samsungacr.com	TCP	54	50757 → 443 [RST] Seq=968 Win=0 Len=0
1974	24.171613	172.16.42.138	log-ingestion.samsungacr.com	TCP	74	46814 → 443 [SYN] Seq=0 Win=29200 Len=0
2005	25.171606	172.16.42.138	log-ingestion.samsungacr.com	TCP	74	[TCP Retransmission] 46814 → 443 [SYN] Seq=0 Win=29200 Len=0

▶ Frame 211: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
 ▶ Ethernet II, Src: SamsungE_42:e3:fa (6B:27:37:42:e3:fa), Dst: OrientPo_a5:09:4f (08:13:37:a5:09:4f)
 ▶ Internet Protocol Version 4, Src: 172.16.42.138 (172.16.42.138), Dst: log-ingestion.samsungacr.com (107.25.11.210)
 ▶ Transmission Control Protocol, Src Port: 50757, Dst Port: 443, Seq: 0, Len: 0

```

0000  00 13 37 a5 09 4f 68 27 37 42 e3 fa 08 00 45 00  ...J..Oh' 7B....E.
0010  00 3c b9 ab 00 00 00 06 33 8d ac 10 2a 8a 0b 17  .<..q.q. 3...w.k.
0020  80 d2 c0 45 81 bb 0c 7a d1 74 00 00 00 00 a8 82  ...E..iz .t.....
0030  72 10 16 04 00 00 82 04 05 b4 04 02 00 8a 03 99  .....
0040  68 df 00 00 00 00 01 03 03 07  .....
  
```

samsung-acr Rackets: 24901 - Displayed: 540 (2.2%) - Load time: 0.0-0.01 - Profile: Default



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Help improve Android TV

Help improve your Android TV by automatically sending diagnostic and usage data to Google. This information won't be used to identify you and helps teams working on things like app performance and new Google features. Learn more at <http://g.co/AndroidUsageHelp>.

Yes

No

Security vulnerabilities

- Discovered vulnerabilities in the Roku OS and Samsung API's that allowed hackers to manipulate the television
 - Change channel or volume, disconnect from internet
 - No evidence that information was vulnerable, or that hackers could leverage holes to access other devices

Future work

- More detailed findings about Smart TVs
- Similar investigations into other products
- Incorporate into standard ratings process where appropriate
- Other criteria: interoperability, repairability