Web-based Attacks on Local IoT Devices

See demo & paper:

https://goo.gl/2kxwe8

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Goals

Circumvent browser's single-origin policy

Discover certain IoT devices with JavaScript

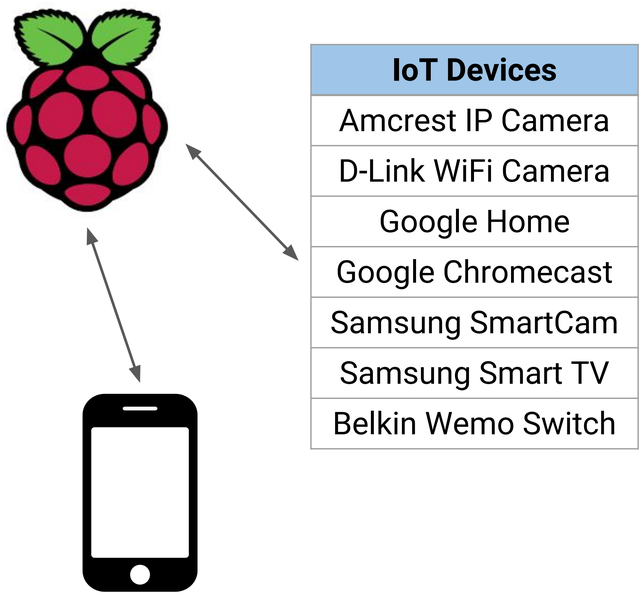
Access & control certain IoT devices with JavaScript

Preparing Attack

Set up a Raspberry Pi as a WiFi access point, connecting 15 IoT devices and an Android phone.

Interact with devices, taking pcaps at the RPi. Observed HTTP endpoints on 7 devices.

Searched for further documentation on HTTP APIs. Total: 35 GET, 8 POST.



IoT Devices
Amcrest IP Camera
D-Link WiFi Camera
Google Home
Google Chromecast
Samsung SmartCam
Samsung Smart TV
Belkin Wemo Switch

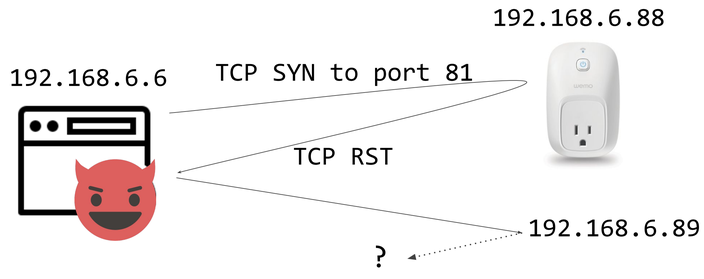
Attack 1: Discover Devices

Step 1: Find active local devices

Scan local subnet on port 81.

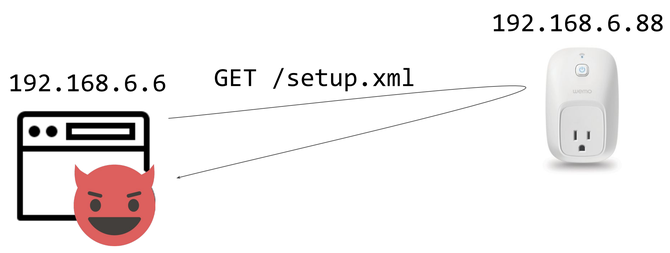
Use Fetch API to send GET.

Measure response time (TCP RST vs timeout).



Step 2: Identify IoT devices

a. Send request for our GET endpoints to active IP addresses, using HTML5 <audio> element.
b. Use resulting MediaError message to infer resource availability (new side channel).

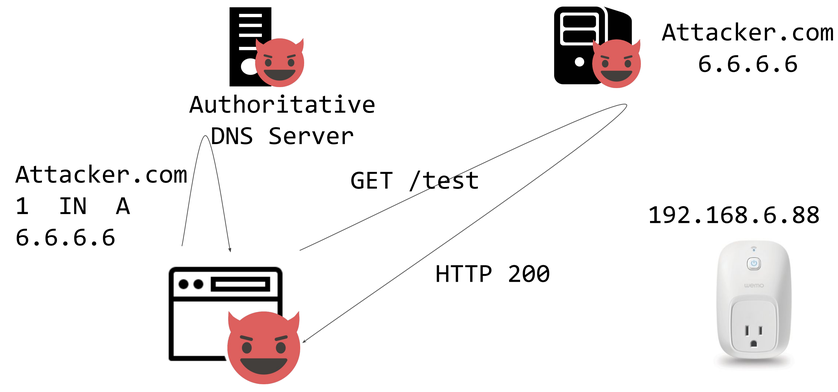


If Exists: `MEDIA_ERR_SRC_NOT_SUPPORTED` "`DEMUXER_ERROR_COULD_NOT_OPEN: FFmpegDemuxer: open context failed`"
Else: `MEDIA_ELEMENT_ERROR` "`Format error`"

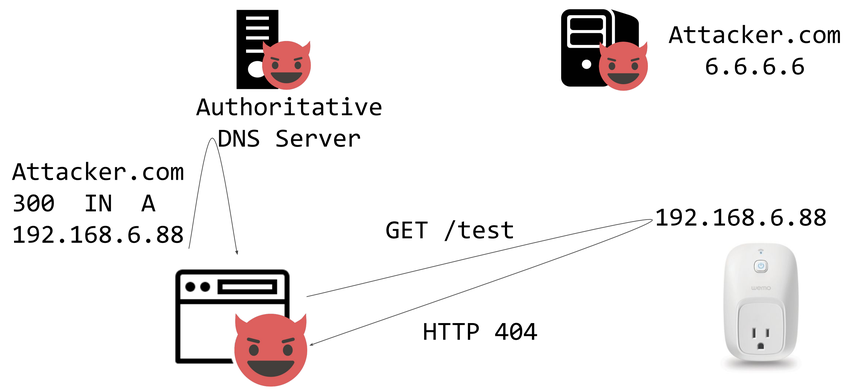
If Exists: `MEDIA_ERR_SRC_NOT_SUPPORTED` "`Failed to init decoder`"
Else: `MEDIA_ELEMENT_ERROR` "`Message 404: Not Found`"

Attack 2: Control Devices

Step 1: Victim visits attacker.com, queries malicious nameserver for attacker.com. Return web server IP with short TTL.



Step 2: Repeatedly visit attacker resource until cache expires.



Step 3: Attacker can directly access resources on targeted IoT device.

Summary

Privacy and security implications.

Problems can be mitigated by IoT vendors, DNS providers, ISPs, and browser vendors.

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