Or why to monitor your home with Zabbix?

WHAT'S UP, HOME?

WHO AM I?

- Janne Pikkarainen from Finland
- Forcepoint since 2014
- A monitoring technical lead at Forcepoint
 - Enterprises, governments, critical infrastructure
 - ► NGFW, ZTNA, DLP ...
- ► A monitoring addict
- ► A walking, talking Zabbix commercial

Linux/monitoring guy since ~2000, have been working at cyber security company

Forcepoint

HISTORY OF MY PROJECT

- ► Started around March 2022 and for fun blogged about it to LinkedIn
- First three posts were boring and usual
- ► My wife accidentally came up with the topic for post number four
 - "I would love to get the data about how often you remember to use your facial cream"
- ► The post got a lot of attention, including from Zabbix the company
- ► Next started to try out weird things every week, and here I am today



WHY AM I MONITORING MY HOME WITH ZABBIX

- ► I have had Cozify smart hub since 2017 for orchestrating home automation
- ► Cozify is great
 - ► for home automation
 - making IoT devices from different manufacturers to work together
- But it completely lacks in reporting
- ► I also have other IoT devices which do need their own apps and a unified interface would be nice
- ► I get to try out things I never could at work
- Give new ideas to whole Zabbix community





WITH ZABBIX, A SINGLE USER INTERFACE TO RULE 'EM ALL

Z	ABBIX « 🗈	Home status					
hom	e-Zabbix	All dashboards / Home status					
	~	Bedroom light power	Bedroom light strip power		Dining area light 1 power	Living room tem	
0	Monitoring ^						
	Dashboard	• (0)	🔵 (0)		🔵 (0)	22	
	Problems						
	Latest data	Guest room ceiling light power	Hue ambient light power		Living room ceiling light power	Freezer tempera	
	Maps						
	Discovery	∂ (1)	♀ (1)		♀ (1)	-2	
Ō	Services ~						
	Inventory ~	Fireplace seasonal light power	TV stand light power		Office light power	Home office tem	
	Reports ~						
		∂ (1)	♀ (1)		🔵 (0)	22	
2							
- 22	Administration ~	Floor light next to sofa power	Dining area light 2 power		AC status	Garage smoke a	
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		Home office lux	Hallway lux		AC target temperature	Camera status	
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BENEFITS OF ZABBIX AT HOME

- One interface for everything
- Excellent alerting capabilities
- Detailed dashboards about anything I want to know about
- Further increases the IoT devices hardware support
- ➤ Affordable and easy to setup; I have a ~130 € Raspberry Pi 4 for Zabbix
- Through play I learn how to monitor the real world

COZIFY AND ZABBIX INTEGRATION

HOW I INTEGRATED ZABBIX WITH COZIFY

- cozify/
- IoT devices
- Scripts poll Cozify API every five minutes
- The scripts save their results to text files
- Zabbix parses the text files

> An unofficial Cozify API Python library implementation: <u>https://pypi.org/project/</u>

► I made set of scripts to query reachability, power status, and other parameters of the



HOW I INTEGRATED ZABBIX WITH COZIFY

Example script: gather the reachability status of devices

#!/usr/bin/python3 from cozify import cloud, hub cloud.authenticate() devices = hub.devices()for id, dev in devices.items(): print('{0}: {1}'.format(dev['name'], dev['state']['reachable']))

HOW I INTEGRATED ZABBIX WITH COZIFY

► Using dependent items, reading values for multiple devices with a single call

Name 🔺	All templates / Cozify Items 127 Triggers 1 Graphs Dashboards Discovery rules Web scenarios	
Bedroom ceiling light reachability	Item Tags 3 Preprocessing 2	
Bedroom light strip reachability	* Name Redroom coiling light reachability	
Dining area light 1 reachability	Name Dedroom cening light reachability	
Dining area light 2 reachability	Type Dependent item ~	
Doorbell button reachability	* Key reachability.bedroomceilinglight	Select
Doorbell reachability	Type of information Numeric (unsigned) ~	
Fireplace seasonal light reachability	* Master item Cozify: Reachability master item ×	Select
Freezer temperature sensor reachability		
Freezer temperature sensor reachability		
Fridge temperature sensor reachability		
Front door camera reachability		
Front door motion sensor reachability		
Garage heater side door reachability		

DASHBOARD TIME

I CAN SEE MY HOME STATUS FROM ONE CENTRAL PLACE

Z	ABBIX « 🔊	Home status				
hom	e-Zabbix	All dashboards / Home status				
	Ч.	Bedroom light power	Bedroom light strip power		Dining area light 1 power	Living room tem
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I CAN VISUALISE EVERYTHING IN GRAPHS









I CAN SEE THE PROBLEMS VISUALISED IN 3D IMAGES



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I CAN ALSO EXPLORE IN INTERACTIVE 3D



MQTT SUPPORT ALLOWS ME TO OBSERVE AND CONTROL OUR AC VIA ZABBIX

USEFUL EXAMPLES

EXAMPLES FOR TODAY

- Monitoring my facial cream usage
- ► Is our dog in her bed?
- Monitoring a dumb Roomba iRobot runtime
- Integrating Zabbix with Blender 3D software
- Integrating Zabbix with an IoT remote
- Controlling our AC using Zabbix MQTT

FACIAL CREAM USAGE MONITORING

- ➤ A simple 10-20€ door sensor in a box detects when I open/close the box
- ► If I don't touch the box in 12 hours, Zabbix complains to me as I should use the cream twice a day to prevent dry skin
- Potential door sensor real-world use cases:
 - ► Medical: did the elderly remember to take their meds?
 - Convenience: temporarily turn off the AC if doors/ windows are open for longer than X minutes
 - Safety: you forgot to close the backyard door, go close it
 - **Safety**: someone opened the safe

IS THE DOG IN HER BED?

- A 30 € environmental monitoring Bluetooth beacon, RuuviTag measures temperature, humidity and movement
- ► I placed RuuviTag to our Lily the French Bulldog's bed to monitor how many hours per day she's there
- RuuviTag measurements are read by Bluewalker command which has native support for parsing RuuviTag. Zabbix treats the results file as a log file and stores the results
- Guesses made based on temperature changes; if Lily is in the bed, it's warmer

BED TEMPERATURE GRAPH

13:00	12:00					
14:00	13:00					
	14:00					

IS THE DOG IN HER BED?

- > From the temperature-based guessing, it's easy to see the pattern
- Lily spends her nights pretty much non-stop in her bed, during the day not so much
- Potential real-world use cases:
 - ► Medical: Are the elderly in their beds when they are supposed to be? > Logistics: Be sure that something stays within a temperature range during
 - transfer

MONITORING ROOMBA IROBOT VACUUM CLEANER

- ► Utilising RuuviTag, this time with its movement sensors
- Measures the time how long Roomba spends vacuum cleaning at a time
- ► Potential real-world use cases:
 - Verify that something that SHOULD be moving, really is moving; maybe a conveyor belt
 - Verify that something that should NOT be moving, is not moving: a safe in the move is probably a bad thing
 - > Verify that something is moving at the speed it should move

I modelled my home with Sweet Home 3D and exported the scene to OBJ format recognised by Blender 3D software

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- In Blender, tagged the monitored parts of my home with names equal with Zabbix item names
- ► Blender has a Python API
- In case of alert, Zabbix action scripts call the Blender API, changes the affected devices to red color and asks Blender to render the scene
- Blender then saves a static PNG image file and a X3D scene for interactive 3D environment

► This is how it works

Alert happens Action: ssh into my Mac and run Blender script

Blender renders & saves the files back to my Raspberry

Zabbix trigger operation

Operations Steps Details Start in Duration Action Run script "Make Blender sweat" on hosts: Personal MacBook Pro Immediately Default Edit Remove Add

Calling Blender with CLI arguments: /usr/local/bin/blender_zabbix.py -- "\$1"

Zabbix URL widget shows the output

/Applications/Blender.app/Contents/MacOS/Blender /Users/jaba/Blender/whatsuphome.blend -o /tmp/zabbix3d.png -b -P

► ... and the Python script for the relevant part

import bpy,sys

argv = sys.argv

argv = argv[argv.index("--") + 1:]

material = bpy.data.materials[sys.argv[8]]

inputs = material.node_tree.nodes["Principled BSDF"].inputs

color = inputs["Base Color"].default_value

color[0] = 1.0

color[1] = 0

color[2] = 0

bpy.context.scene.render.resolution_x = 800

bpy.context.scene.render.resolution_y = 600

bpy.context.scene.render.resolution_percentage = 100

bpy.ops.render.render(write_still=True)

bpy.ops.export_scene.x3d(filepath="/tmp/zabbix.x3d")

- As a result I can see the alerting devices in both static 3D images and as a real-time 3D world embedded into Zabbix user interface
- Potential real-world use cases
 - Electricians, plumbers, guards, medics...
 could find the alert location in a big
 building much faster if the alert visually
 shows the exact location of the problem
 - Call center can instruct the field personnel where they should be heading
 - A sysadmin could see the exact rack and server location in case of a physical failure

INTEGRATING ZABBIX WITH A REMOTE

- ► I integrated Zabbix with a 10 € IoT remote control ► In my case, it was just then showing some short messages ("Help! Out of beer!", "Dinner is ready"...) in a Grafana dashboard
- ► This was just for fun and never really used, but ...
- ▶ ... in the real world, integrating Zabbix with physical push buttons:
 - Something in a factory not working? Push a button next to failed device to make Zabbix notice it
 - > Push a button to indicate that help is needed in room X

CONTROLLING OUR AC THROUGH ZABBIX MQTT SUPPORT

- Our air-conditioner has Wi-Fi and MQTT support
- ► I installed *Mosquitto* to my Raspberry Pi 4 to gather MQTT events
- > Zabbix can read the events natively with its *mqtt.get*

Aircon: Airconditioner fan speed

Aircon: Airconditioner mode

Aircon: Airconditioner power

- ► For write operations, I'm using Zabbix action scripts and mosquitto pub command, for example below sets the temperature to whatever Celsius instructed by Zabbix
 - mosquitto pub-h 127.0.0.1 -m \$1 -t /aircon/a043b089d3bb/ temp/set -d

//aircon/a043b089d3bb/fanspeed/value" "/aircon/a043b089d3bb/mode/value"

","/aircon/a043b089d3bb/power/value"]

OTHER STUFF I HAVE TRIED OUT

- > Philips OneBlade shaver remaining runtime estimated by audio frequency
- Control/query Zabbix through Siri
- Show Zabbix alerts on xscreensaver Star Wars module
- ► Take screenshots of our local lunch restaurant menus when updated
- Monitor how many hours I wear my Bluetooth headset per week
- Check if the laptop webcam is on
- RTSP video stream
- Monitor our baby's stroller cabin temperature

> Make sure that our home security camera video is up by making Zabbix to watch

LET'S SUMMARIZE

OUTCOME OF THIS PROJECT

- ► I now know much more about how Cozify behaves when we are not at home
- ► I now have a central UI for everything IoT
- ► More knowledge about the reliability of each IoT device
- Easy to check any historical data: temperatures, humidities, AC usage status, reliability of our Internet connection...
- Learnt many lessons on how to monitor the real world
- ➤ Yes, would do this again!

ozify behaves when we are not at home IoT

FOR MORE INFORMATION

- Read the Zabbix blog at <u>https://blog.zabbix.com/</u>
- ► For the technical implementation of my stuff, check out my GitHub at <u>https://</u> github.com/jannepikkarainen/whatsuphome/
- Connect me on LinkedIn: <u>https://linkedin.com/in/jannepik/</u>
- Throw me an e-mail: janne.pikkarainen@pm.me

THANK YOU!