Omnissiah
Zabbix Summit Online 2021

Jacob Robinson
Systems Engineering Manager
About Me: Jacob Robinson

- Systems Engineering Manager at WeWork, previously an AV Engineer and an Automotive Design Engineer
- Blog - monitoreverything.net
- WeWork is a New York City based commercial real estate company that provides flexible shared workspaces for companies
Zabbix at WeWork

- Zabbix is used as WeWork’s global monitoring solution for every site it operates which includes over 650 buildings and 150,000 active hosts in Zabbix
- Monitoring
  - Devices
    - Network equipment
    - Security cameras
    - AV amplifiers and control systems
  - Items
    - ISP status
    - Wireless client count
    - Device switch port configuration
    - TV power state
Early Monitoring at WeWork

- Manual host creation
- Airtable Bases of devices
- Google Sheets with IPv4 information for user reference
Average Buildings Opened Per Month

- 2017: ~8
- 2018: ~17
- 2019: ~25
Early Monitoring at WeWork

- No standardization for Host names, Templates, Groups
- Dashboards manually created
- Host data became out-of-date quickly
- ICMP and simple SNMP relied on for host status
- Actual host health was unknown
Problem

WeWork operates over 650 buildings connected on an internal network of various devices. Different generations of standards for the network structure as well as the devices on the network cause confusion and create difficulty in accurately recording device and network information.
Problem Simplified

- Over 650 buildings, 150,000 active hosts on the network
- Manual creation too difficult
  - A lot of work – a lot of potential for entry error
  - Devices on incorrect subnet
  - DHCP
Solution - Omnissiah

Develop system that uses limited reference data to automatically detect and identify hosts, generate and update standardized entries, and sync with Zabbix on a regular basis.

"Hail the Omnissiah! He is the God in the Machine, the Source of All Knowledge."
Overview

- Reference data is used for classification and process efficiency
- Microservice architecture is used
- All programs are written in Python 3 and interface with the primary "wework" database
Reference Data

- Important ref_data:
  - Building – all building (site) information such as Marketing Name, Address, Timezone
  - Department – device department such as AV, Networking, Security
  - Device Type – type of device such as Amplifier, Camera, Router
  - Model – device model such as SRX 550, Solstice Pod, TSW-1060
  - Region – region of building such as US (United States), LATAM (Latin America)
  - Subnet – buildings internal IPv4 subnet and netmask
  - Territory – building territory such as Mountain West Texas or South India
  - Vendor – device vendor such as Cisco, Juniper, Mersive, Crestron
  - WAN Subnet – buildings public IPv4 subnet and netmask
Layers

- A layer is a collection of tables from a database with a common purpose and prefix in the name
  - agent_
  - ref_
  - main_
  - zbx_
- Small applications that do something within a specific layer
- Data travels from layer to layer for changing, processing and aggregating depending on the purpose of the layer
Four Steps of a Cycle

1. Prepare external data sources
2. Collect information about hosts from different sources
3. Identify each host type and vendor based on the information collected
4. Create, change, or delete hosts in monitoring based on detection
1. Prepare external data sources

- Provides method of user manual entry when necessary
  - Must be standardized as much as possible
  - Web GUI

- Netbox
  - Building – all building (site) information such as Marketing Name, Address, Timezone
  - Device Type – type of device such as Amplifier, Camera, Router
    - Subnet – buildings internal IPv4 subnet and netmask
    - WAN Subnet – buildings public IPv4 subnet and netmask

- MAC address OUI API
2. Collect information about hosts from different sources

- **Agent Layers** - collects and prepares source data about hosts from various sources
  - Activaire API (background music players)
  - Airtable
  - Enplug API (digital signage players)
  - Netbox API
  - Nmap
  - SNMP scan
  - Solstice Pod API (screen share devices)
  - Wireless Access Points (various APIs, SNMP)

- **Agent sub-layers** - Copies the records from the agent_orig sub-layer and executes queries to correct, delete, or transform the records. This sub-layer helps remove "junk" records and fix minor spelling errors
2. Collect information about hosts from different sources

- SNMP or API
  - Hardware information
    - Make
    - Model
    - Generation
    - Serial number
    - Different MACs for multiple NICs
  - Software information
    - Version
    - Settings
3. Identify each host type and vendor based on the information collected

- Nnml layer - Collects all host data together, trains the neural network with it, and attempts to predict the types of hosts and manufacturers
- Main layer - Combine all the data together and continue to add data such as MAC addresses
  - Main - processes tables from agent sub-layers to set host type and manufacturer
  - Main ARP - saves ARP and MAC tables
  - Main Build - generates main_hosts which is combination of every main table in this layer
4. Create, change, or delete hosts in monitoring based on detection

- Zabbix layer - This layer converts the generated data to the Zabbix structuring and synchronizes it with the current monitoring
  - Host Groups – Uses Zabbix API to copy information about hosts and groups to primary “wework” database
  - From Main – converts main_hosts structure to Zabbix structure
  - Sync – Uses Zabbix API to synchronize Hosts and Groups
4. Create, change, or delete hosts in monitoring based on detection

- Includes:
  - Groups
  - Hosts
    - Groups
    - Templates
    - MACROS
    - Inventory
    - Tags
      - Statistical hosts
      - Dashboards
      - Formulas
  - Statistical hosts
  - Dashboards
  - Formulas
- Creating, updating, deleting
Result

- All hosts detected and identified automatically
- Groups, Templates, Tags are all set automatically
- Visible hostnames have type, vendor, sometimes model, MAC, IP
- Host inventory contains hostname, OS, serial, VLAN, MAC, contact email, location details, lat/long, model, vendor, switch port configuration, predicted floor, time zone
Dashboards

- Automatic creation based on single manually generated dashboard template
  Creation process adapts based on Building, Host, or Group
Problem Revisited

*WeWork operates over 650 buildings connected on an internal network of various devices.*
Omnissiah is scalable to any number of buildings and devices.

*Different generations of standards for the network structure as well as the devices on the network cause confusion and create difficulty in accurately recording device and network information.*
Omnissiah can learn new devices and accurately keep standardized records of the device physical and network information.
User Experience

- Important to make software function well
- Omnissiah allows for users to
  - See more information about hosts
  - Easily search and filter by region, territory, building, device
Example: See more information about hosts

Host inventory

Overview Details

Host name Camera Bosch D01
Visible name Camera Bosch D01

SNMP interface
IP address 0.0.0.0
DNS name
Connectivity 2
Port 161
Default

Hardware F003D43
Software 19950079

Monitoring Web Latest data Problems Graphs Screens

Configuration Host Applications Items Triggers Graphs Discovery Web

Cancel

Host inventory

Overview Details

Type Camera

Serial number A 4002
Tag CCTV

MAC address A 00:00:00:00:00:00

Hardware F003D43
Software 11500575

Location latitude 40.7529715
Location longitude -73.9842168

Model NDC-265-P
Vendor Bosch

Host networks 

Site address A 54 W 40th
Site address B WE-US-88820
Site city NY07 - 54 W 40th
Site state/province Tri-State
Site country US East

Site notes
Example: Easily search and filter
External Applications

- AV Control Center
- Asset Management by Snipe-IT
Success Story

- Q3 2021 WeWork migrated datacenters and changed all LATAM site IP networks
- Omnissiah completed the migration of LATAM with USC in 1 cycle
Zabbix Stats

1 cycle for Omnissiah is roughly 8 hours
Thank you

Have a great Zabbix Summit 2021

Contact me:
Jacob Robinson
jacob.robinson@wework.com
monitoreverything.net