



You make **possible**



Cisco Meraki MV

Camera as a Sensor for Enterprise, Not Just
a Tool for Security

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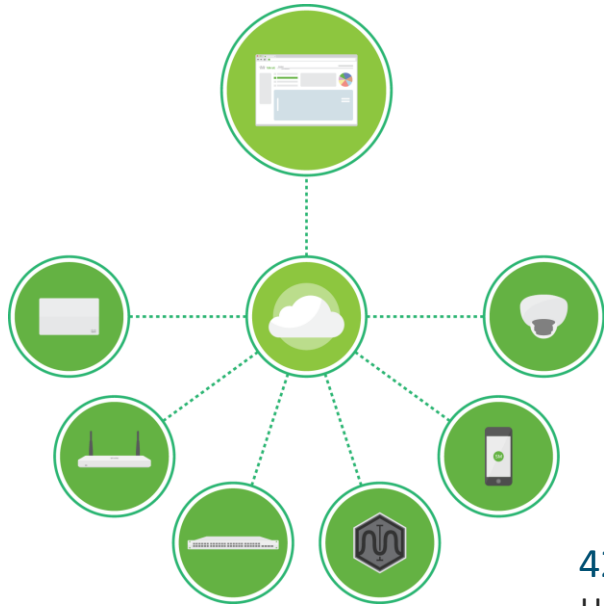
BRKIOT-1004



Agenda

- Introduction and Content Overview
- Current state of camera technology
- Generational leap with a new edge architecture
- Live Meraki MV camera demonstration
- Transition from security cameras to smart cameras
- Machine Learning (ML) Computer Vision (CV) demonstration
- From proof of concept to production: ML CV in the real world
- Q&A

Simplifying IT with Cloud Management



A complete cloud-managed IT solution

Wireless, switching, security, SD-WAN, unified endpoint management (UEM), and smart cameras

Integrated hardware, software, and cloud services

Lead in cloud-managed IT

Among Cisco's fastest growing portfolios

420k+
Unique
customers

5.7M+
Active Meraki
dashboard users

3.5M+
Meraki devices
online

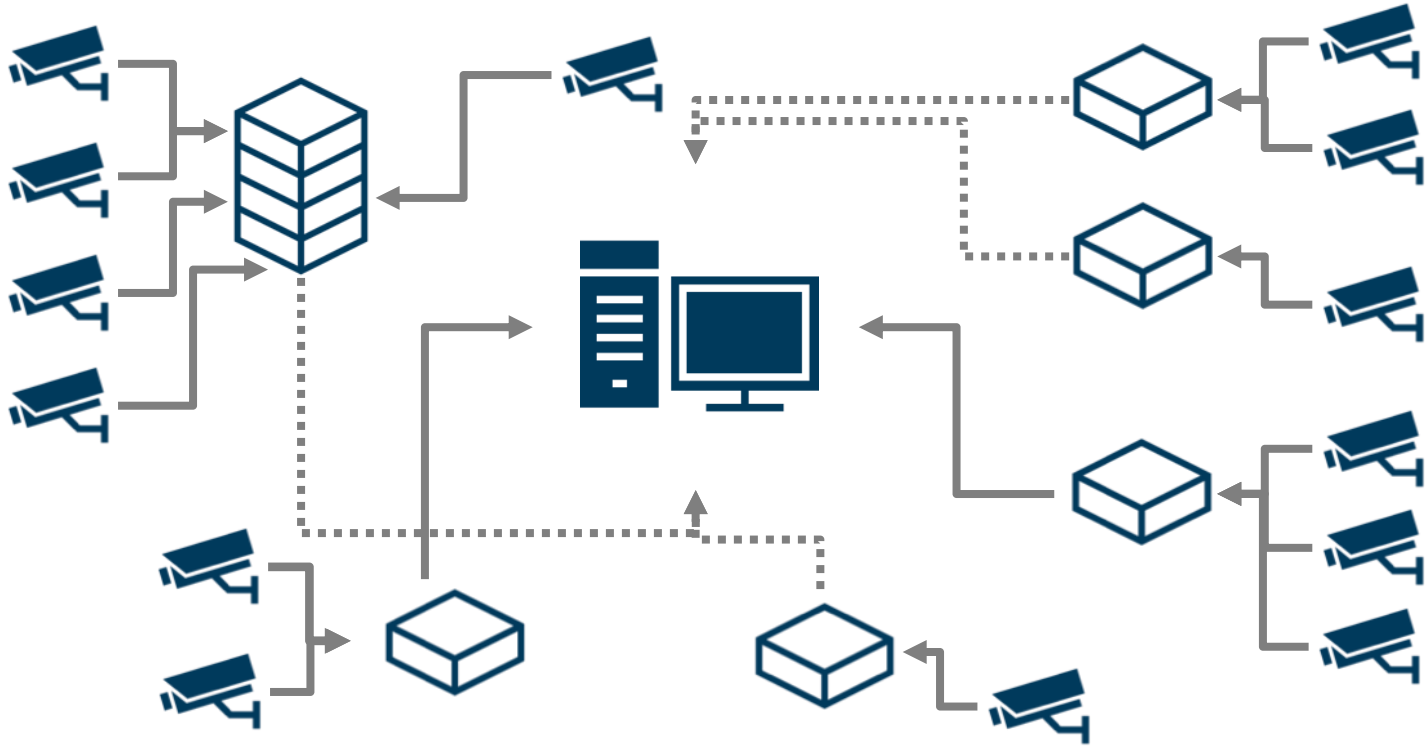
30M+
Daily
API calls

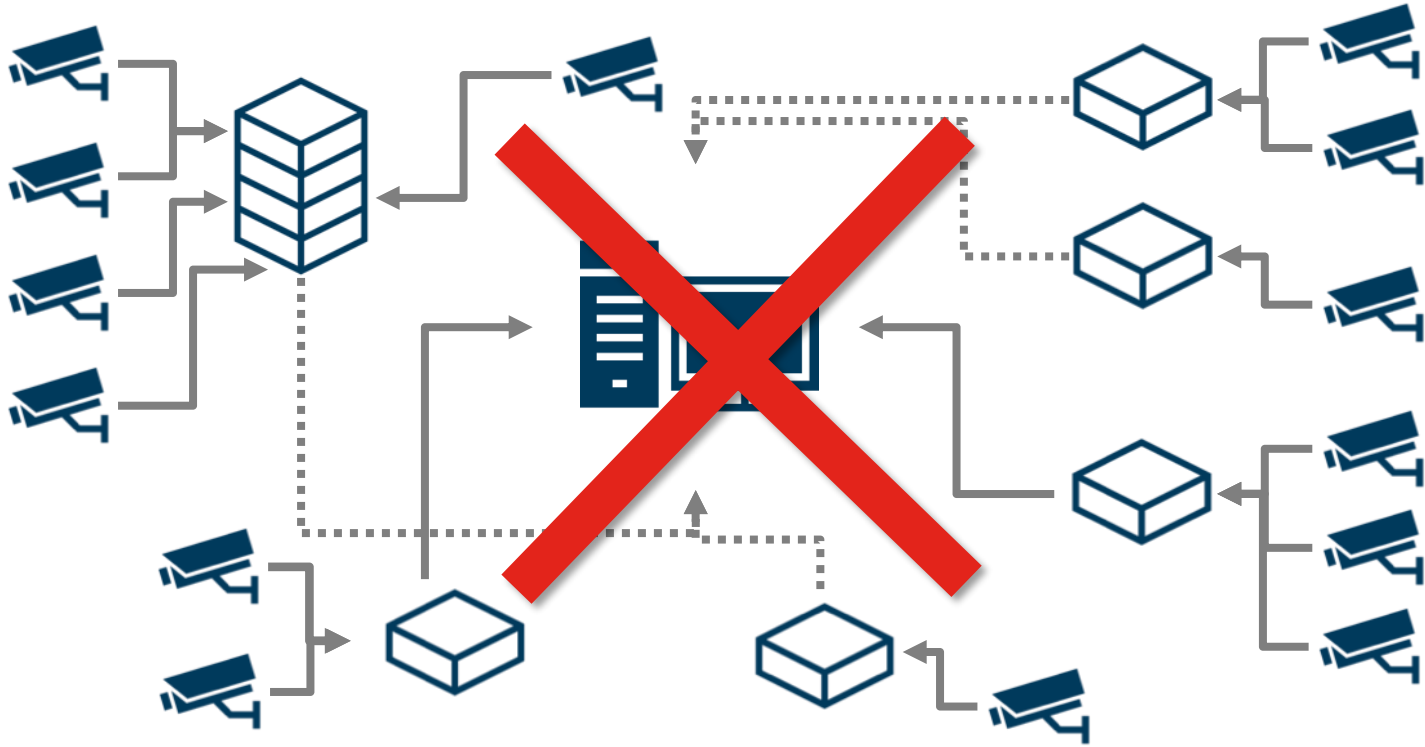
When We Think of Security Cameras



The Painful Reality







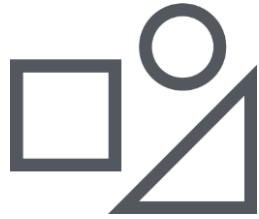
A New Edge Architecture with Meraki MV



You make the power of data **possible**

Focusing on solving problems, not building features.

MV Development Principles



Cost reduction through
architectural
simplification



Operational
simplification through
automation



Business value through
intelligence

Meraki MV Smart Camera Family



Security cameras that do more
than just security

The only security camera from a cloud leader

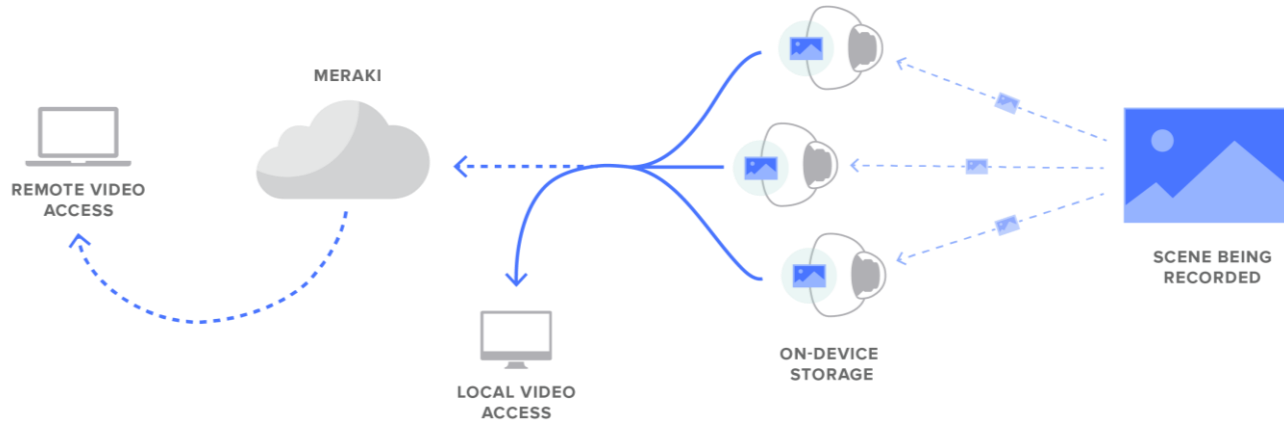
Managed through the Meraki dashboard

Up to 512GB solid state storage on each camera, plus
wireless and audio

Motion and schedule-based recording, plus cloud
archive options

Act as sensors, not just security cameras

Cutting Edge Architecture



BANDWIDTH CONSCIOUS

Less than 50kbps upstream bandwidth per camera when not watching video

INTELLIGENT STREAMING

View locally, or view remotely via cloud proxy streaming, from the Meraki dashboard

HYBRID VIDEO PROCESSING

Video is analyzed on camera, motion indexed in the cloud

MV Development Principles



Cost reduction through
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Motion Recap

Composite images, built in camera

Activity is summarized in a single image

Find the answer without watching video





MV Camera Demonstration

Camera as a Sensor

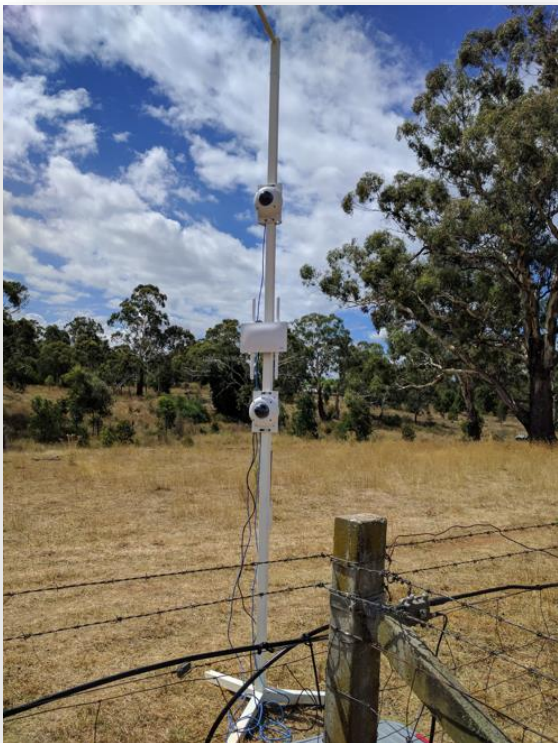


You make the power of data **possible**

Why do people want cameras?



Camera as a sensor, not just a
tool for security.



A video camera,
where you don't watch video.



What if we gave you the answer?

Meraki MV Smart Cameras

Powerful Qualcomm Snapdragon SoC

All ML CV inference performed in camera

Enables advanced analytics for real time:

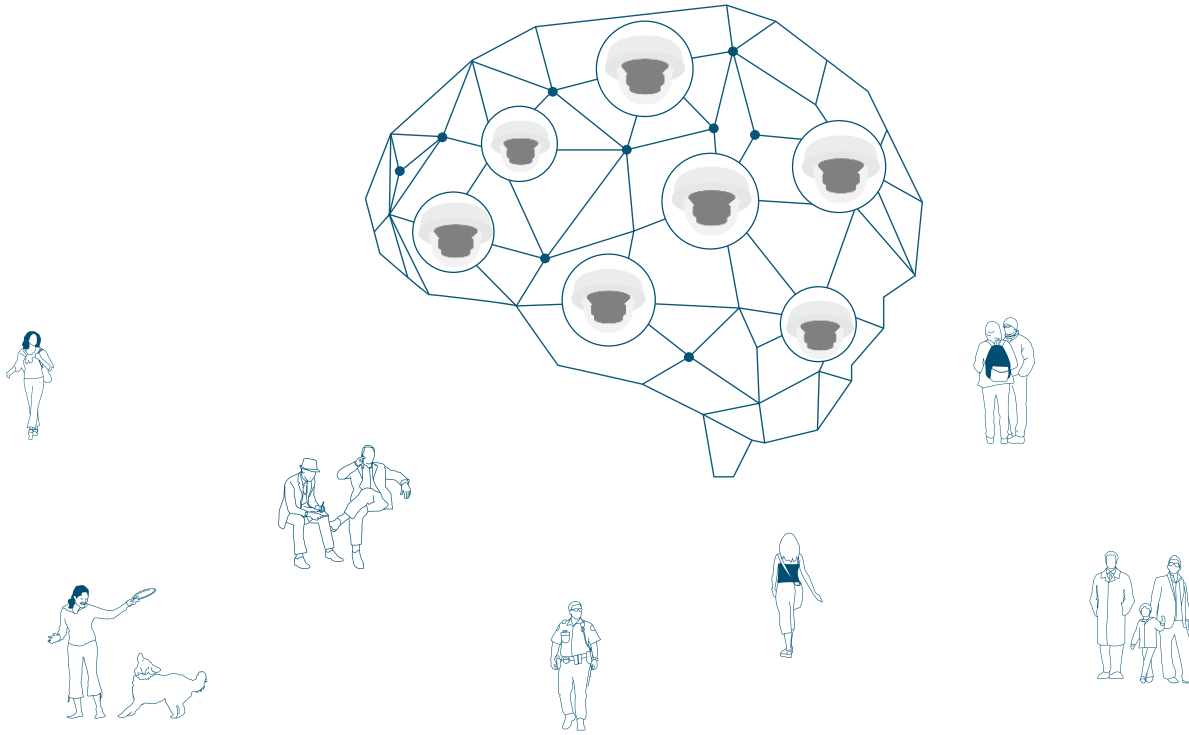
- Object Detection

- Object Classification

- Object Tracking



Machine Learning



Object Detection



FUNCTIONALITY

Anonymized person and vehicle detection

POSSIBLE USE CASES

People counting to understand in-store customer behavior patterns

Vehicle counting to understand drive-thru wait times

People detection available on all second generation MV cameras (MVx2 models)

Vehicle detection available on MV72



ML CV Demonstration

ML CV in the Real World



You make the power of data **possible**





MV Development Principles



Cost reduction through
architectural
simplification

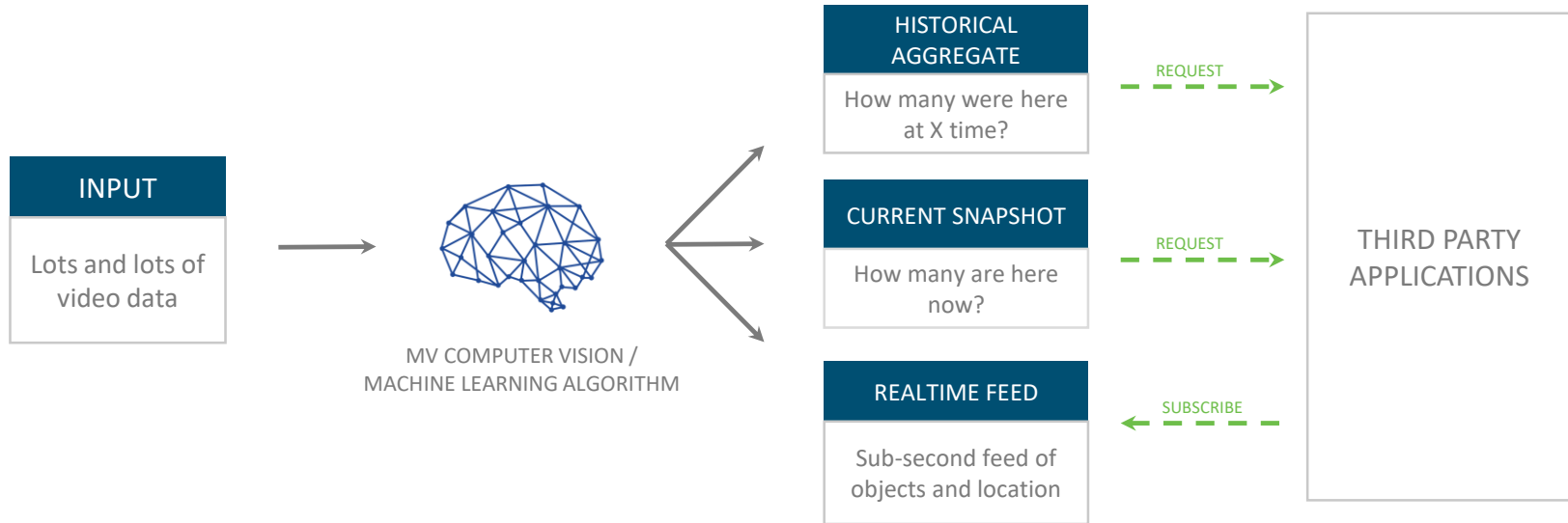


Operational
simplification through
automation



Business value through
intelligence

Meraki MV Sense



An API that uses smarter data to solve business problems

Why This Matters



ENABLES MORE
INTEGRATIONS



ELIMINATES MORE
INFRASTRUCTURE

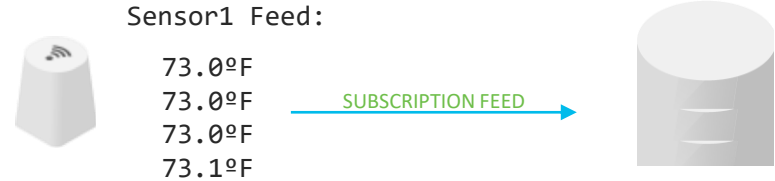


ACCELERATES BUSINESS
OUTCOMES

What is MQTT?

MQTT is an industry standard, lightweight messaging protocol for sensors.

It uses publish/subscribe operations to exchange data between clients and servers.



MQTT provides a simple, standards-based way to get camera data to other systems.

MV Sense MQTT

ts: time

frame: unique identifier for image frame

oid: object ID

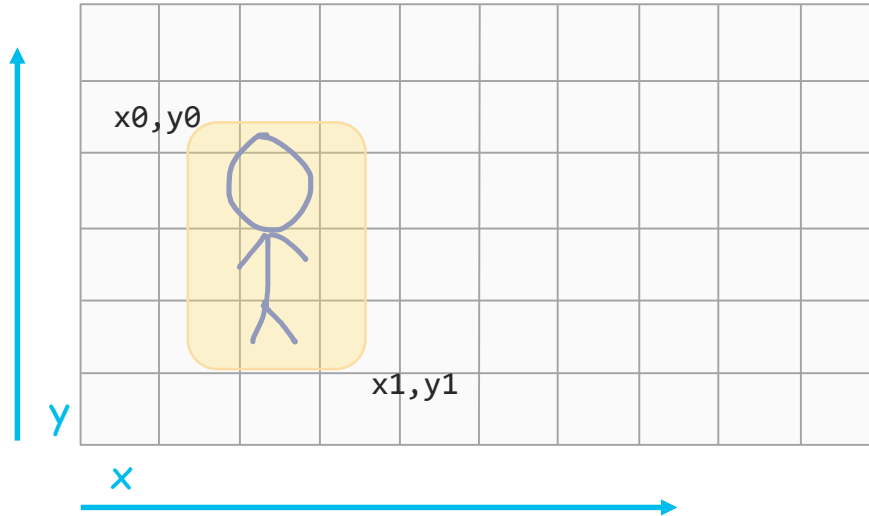
x0,x1; y0,y1: location

type: object type

```
{ "ts": 1568934928647, "objects":  
  [ { "frame": 328, "oid": 13, "x0": 0.809, "x1": 0.696, "y0":  
    0.696, "y1": 0.356, "type": "person" } ] }  
{ "ts": 1568934928928, "objects":  
  [ { "frame": 331, "oid": 13, "x0": 0.745, "x1": 0.673, "y0":  
    0.664, "y1": 0.265, "type": "person" } ] }  
{ "ts": 1568934929129, "objects":  
  [ { "frame": 326, "oid": 1, "x0": 0.629, "x1": 0.245, "y0":  
    0.593, "y1": 0.201, "type": "vehicle" } ] }  
{ "ts": 1568934929328, "objects":  
  [ { "frame": 328, "oid": 1, "x0": 0.631, "x1": 0.245, "y0":  
    0.602, "y1": 0.204, "type": "vehicle" } ] }
```

Sample MQTT Feed

MQTT with MV Sense



MQTT Feed

When is it?

ts :1568324692746

What is it?

type : person

Which one is it?

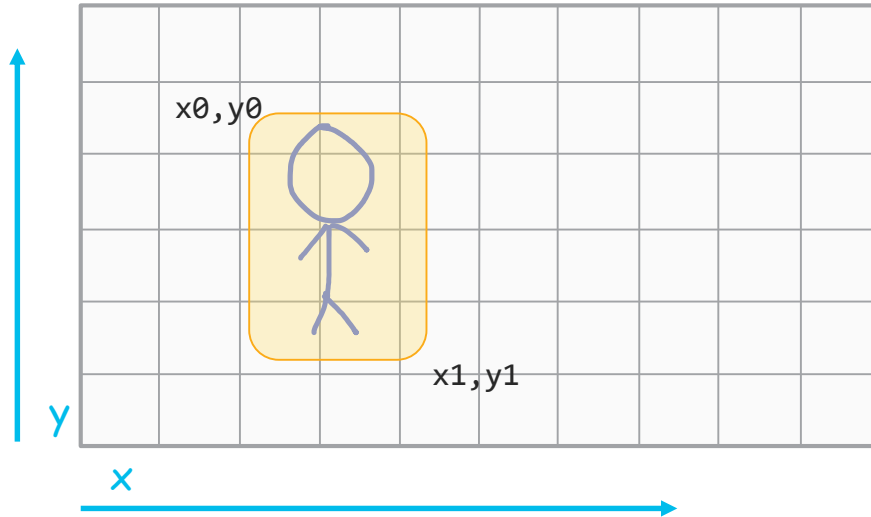
oid : 5

Where is it?

x_0 : 0.458, x_1 : 0.793;

y_0 :0.738, y_1 :0.111

MQTT with MV Sense



MQTT Feed

When is it?

ts :156832469**5574**

What is it?

type : person

Which one is it?

oid : 5

Where is it?

x0: 0.**581**, x1: 0.**67**;

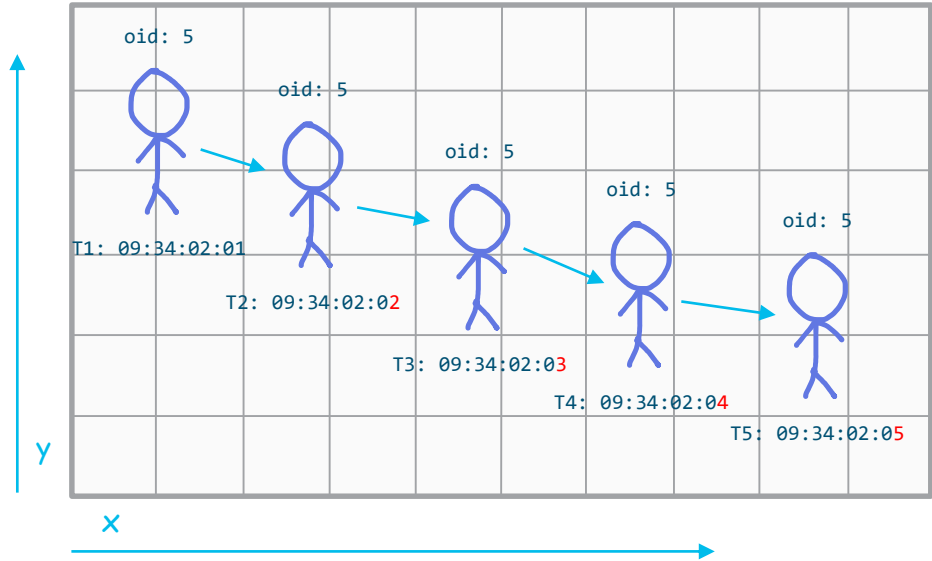
y0:0.**787**, y1:0.**16**

Time and location change.

Object ID stays the same.

Time + Location = Directionality

Understanding the path that objects take within a space.



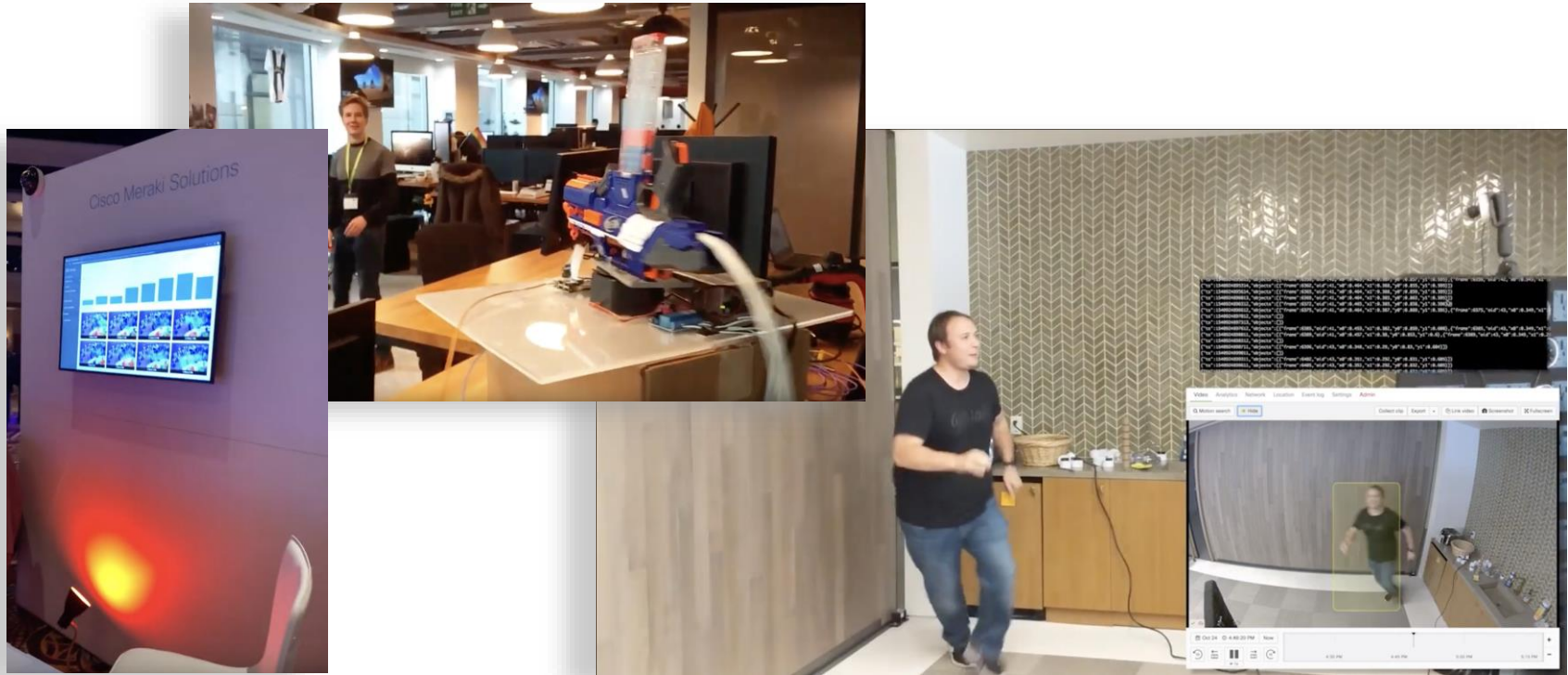


Putting it all Together



You make the power of data **possible**

What Can MV Smart Cameras Enable?





MV Sense + Snapshot with 3rd Party CV Services



Cisco Meraki MV - Cloud Augmentation 4:52 AM



Meraki MV Snapshot

Camera: MV Sense Demo

Camera Link: <https://n85.meraki.com/MV-Sense-Demo-Ne/n/EVwtjcvb/manage.timestamp=1563277951533>

Interesting Objects:

Object 1: Glasses **Confidence:** 99.23

Object 2: Accessories **Confidence:** 99.23

Object 3: Accessory **Confidence:** 99.23

Object 4: Person **Confidence:** 98.31

Object 5: Human **Confidence:** 98.31

Facial Observations:

Face 1: **Gender:** Male **Age Range:** 35-52 **Emotional State:** Happy

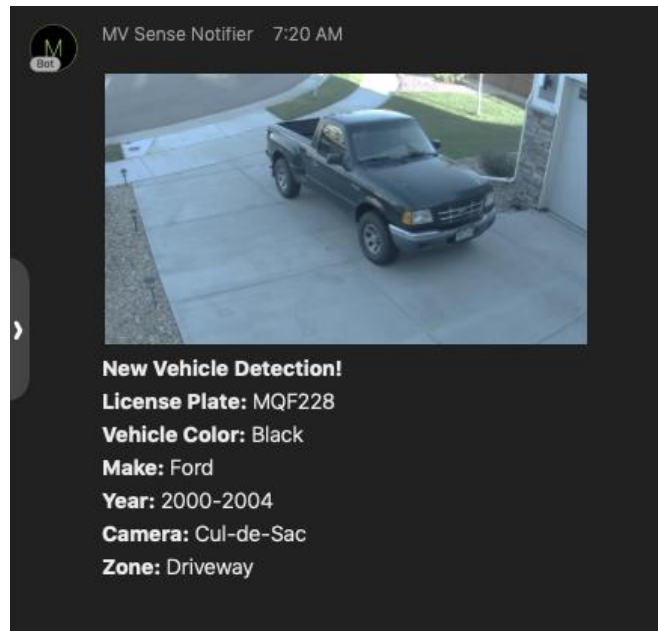
Text Detections (LPR):

1: Meraki

2: SONOS

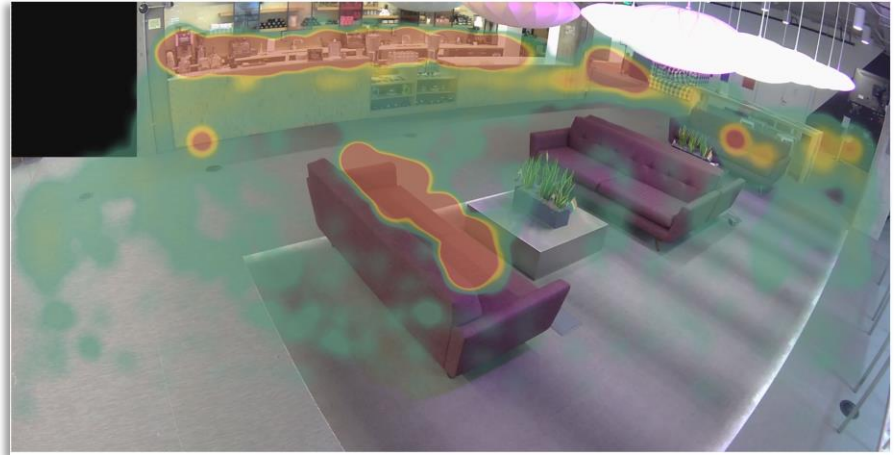
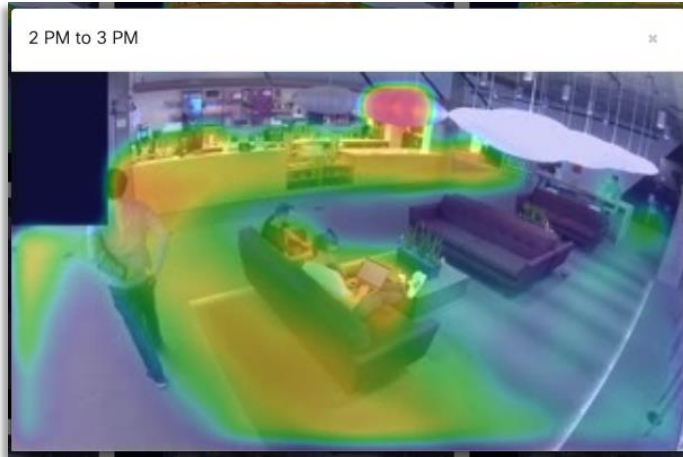
AWS Rekognition

Cisco *live!*



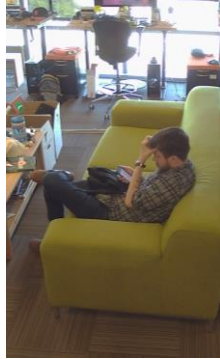
OpenALPR

Person Heatmap



Anomaly Detection with Azure

One person is detected



```
{ "epoch": 1552951436594, "anomaly": 0 }  
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{ "epoch": 1552951438993, "anomaly": 0 }  
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{ "epoch": 1552951441389, "anomaly": 0 }  
{ "epoch": 1552951442591, "anomaly": 0 }  
{ "epoch": 1552951443790, "anomaly": 0 }  
{ "epoch": 1552951444990, "anomaly": 0 }  
{ "epoch": 1552951446188, "anomaly": 0 }  
{ "epoch": 1552951447387, "anomaly": 0 }  
{ "epoch": 1552951448588, "anomaly": 0 }  
{ "epoch": 1552951449985, "anomaly": 0 }  
{ "epoch": 1552951451286, "anomaly": 1 }  
{ "epoch": 1552951452487, "anomaly": 1 }  
{ "epoch": 1552951453684, "anomaly": 1 }  
{ "epoch": 1552951455082, "anomaly": 1 }
```



Two people are detected

MV Sense data stream sent to Azure. Azure detects anomalies (spikes and dips) in number of objects over time.

MV Sense Applications

Add / Modify Camera
 (8) | TCEA 2019 | Camera 2 - MV12W

Network (8)
 TCEA 2019

Camera (8) (Requires Network)
 Camera 2 - MV12W

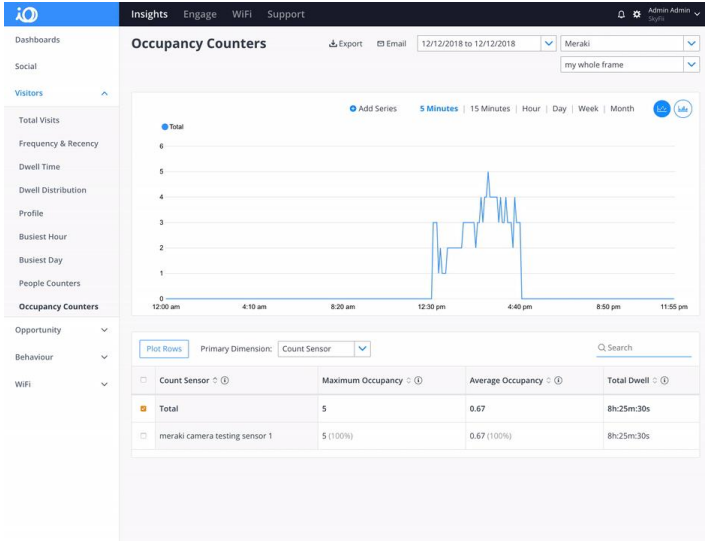
Camera (8) Zones (Up to 5)
 TCEA Splash / Zone (2) / Zone (3) / Zone (4) / Zone (5)

Mobile Alert if people counter Threshold is met or exceeded.
 Multiple mobile numbers can be added with a comma between the, please include the country code. Example:- +447887100100,+447738001001

Zone 1 - Mobile Number(s) Threshold

Table Top has exceeded it's threshold please report to this area. People counted 3

05 February 2019 12:00 - 05 February 2019 17:00
 -33 People total occupancy
 Last Refreshed : 15:19



Physical Security Meets Business Intelligence

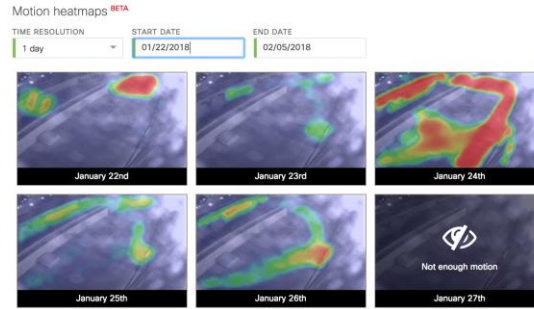


MOTION SEARCH

Isolate key motion events

Motion Recap results summarize activity in a single image

Easily export important video segments

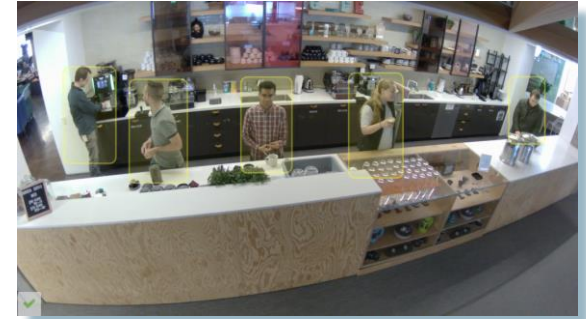


MOTION HEAT MAPS

See relative motion in an area over time

Choose hour-by-hour or day-by-day view

Generated entirely from metadata



OBJECT DETECTION

Detection and classification of objects

People and vehicle counting over time

Data available to third party applications via MV Sense API



Thank you





You make **possible**