

CISCO *Live!*

Let's go



The bridge to possible

Cisco Spaces

How to turn your Wi-Fi Network into Location Based Intelligence

Peter Malic, Technical Solutions Architect

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BRKEWN-2042

How do we calculate location indoors?



Agenda

- Introduction
- Indoor Location
- Spaces Architecture
- Deploying Spaces
- Out of the box Location features
- Summary and next steps

Peter Malic

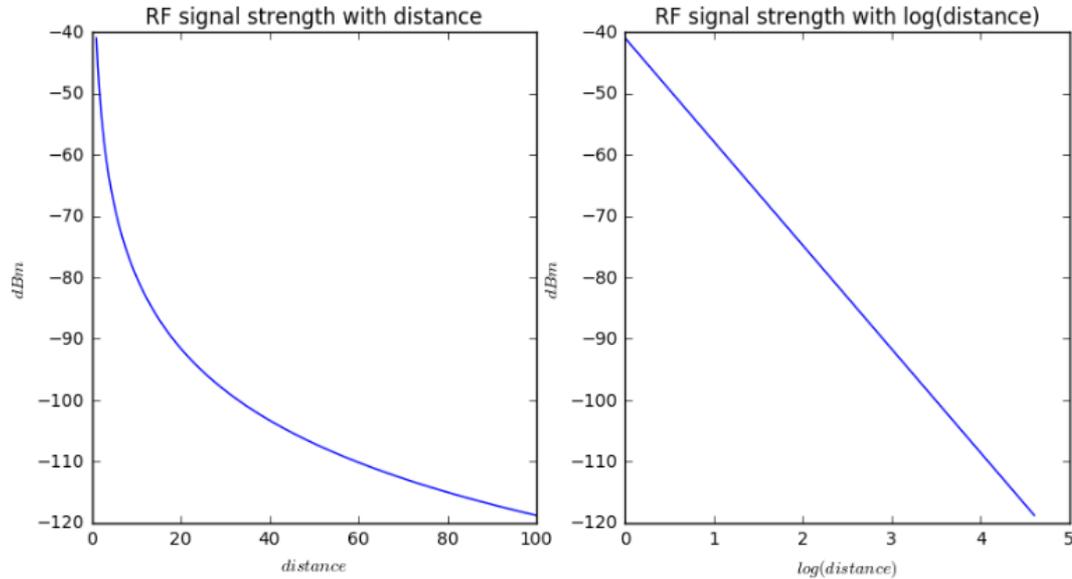
- 2014 as Wireless engineer
- Various roles, different teams, different organizations
- CCIE Enterprise Wireless
- Coffee
- Audio tech
- 2 kids
- Currently IIOT TSA



Indoor Location



How do we calculate location indoors (2)

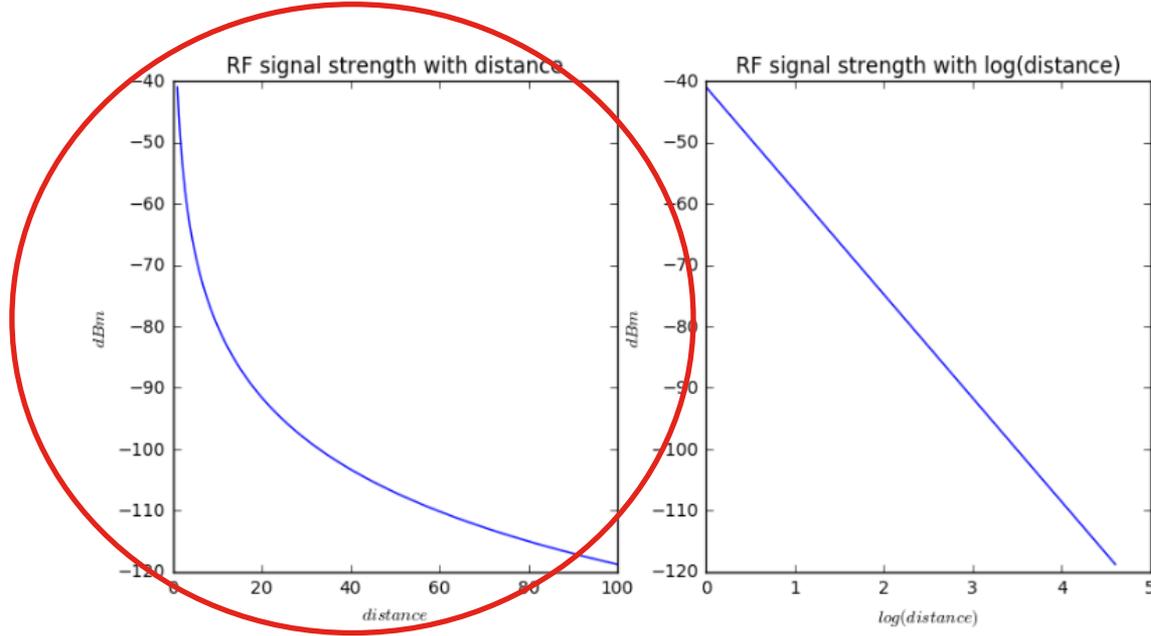


Radio signal strength is a function of distance: $f(\text{distance}) = \text{RSSI}$

How do we calculate location indoors (3)

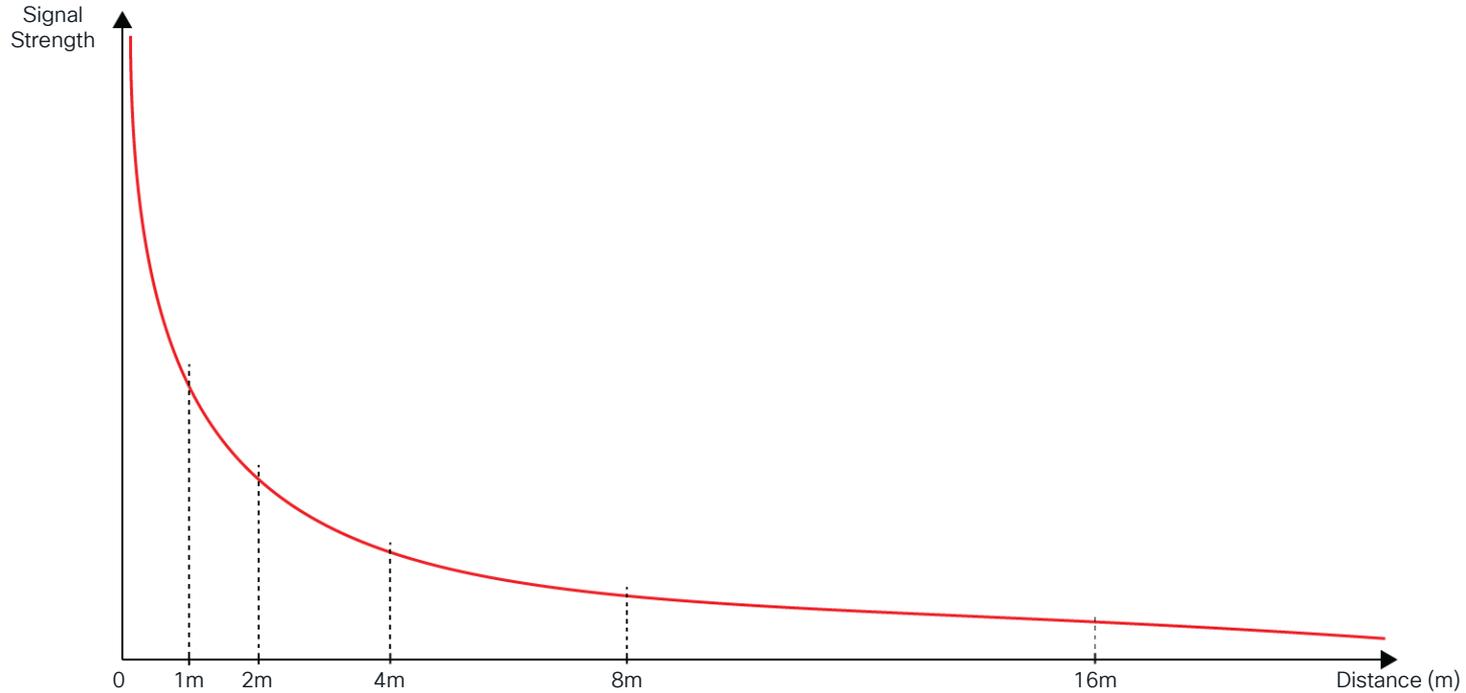


Zoom IN

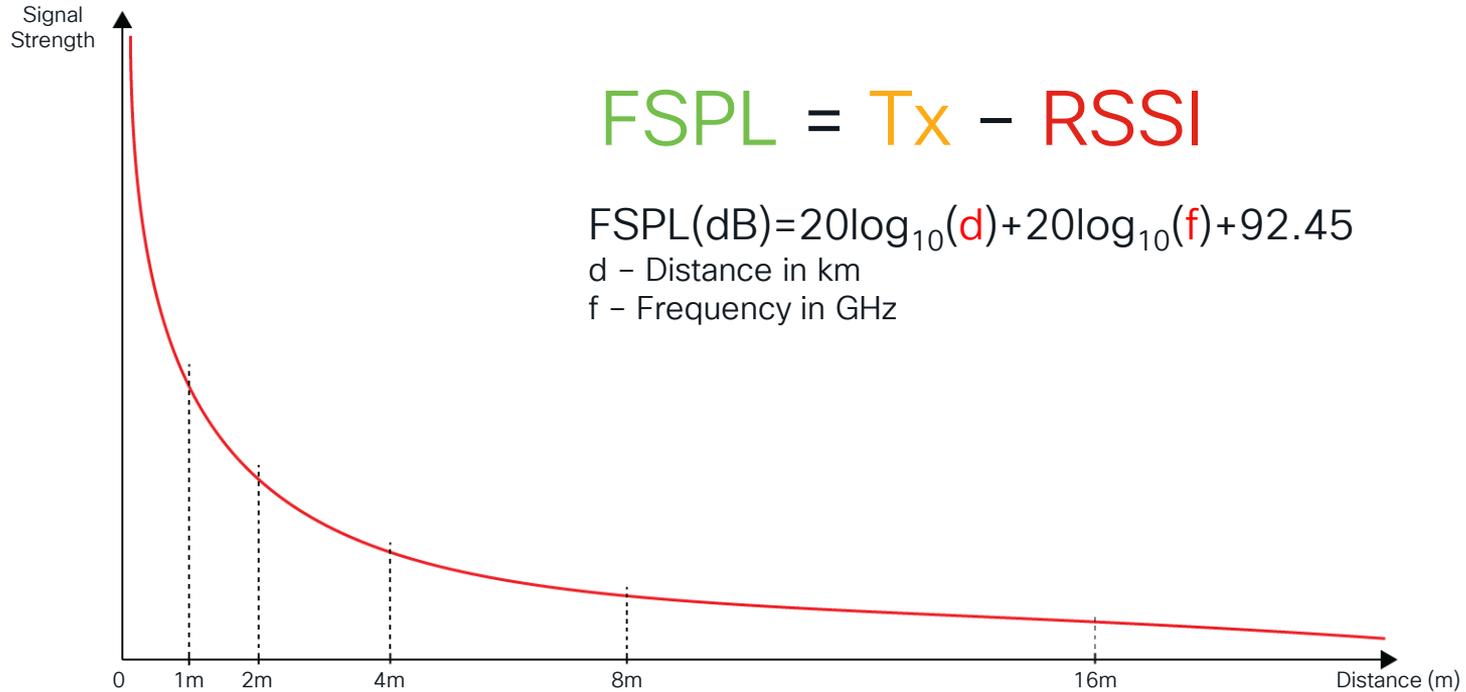


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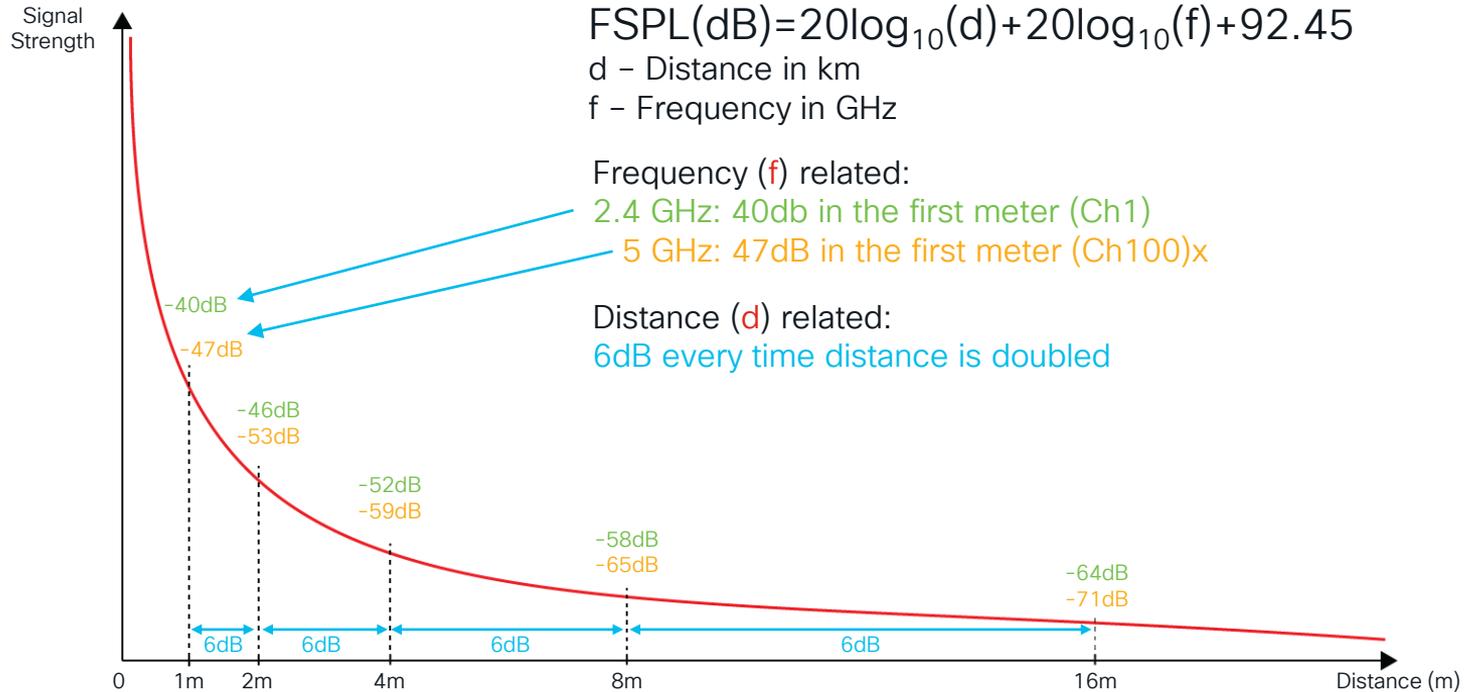
How do we calculate location indoors (4)



How do we calculate location indoors (5)



How do we calculate location indoors (6)



How do we get the distance?

$$\text{FSPL} = \text{Tx} - \text{RSSI}$$

we can derive distance
From FSPL equation

What is Tx then ????

we know RSSI from APs

$$20 \log_{10}(\text{dist}) + 20 \log_{10}(\text{freq}) + 92.45 = \text{Tx} - \text{RSSI}$$

How do we get the distance?

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What is Tx then ????

we know RSSI from APs

$$20 \log_{10}(\text{dist}) + 20 \log_{10}(\text{freq}) + 92.45 = \text{Tx} - \text{RSSI}$$

WE DON'T KNOW EXACTLY

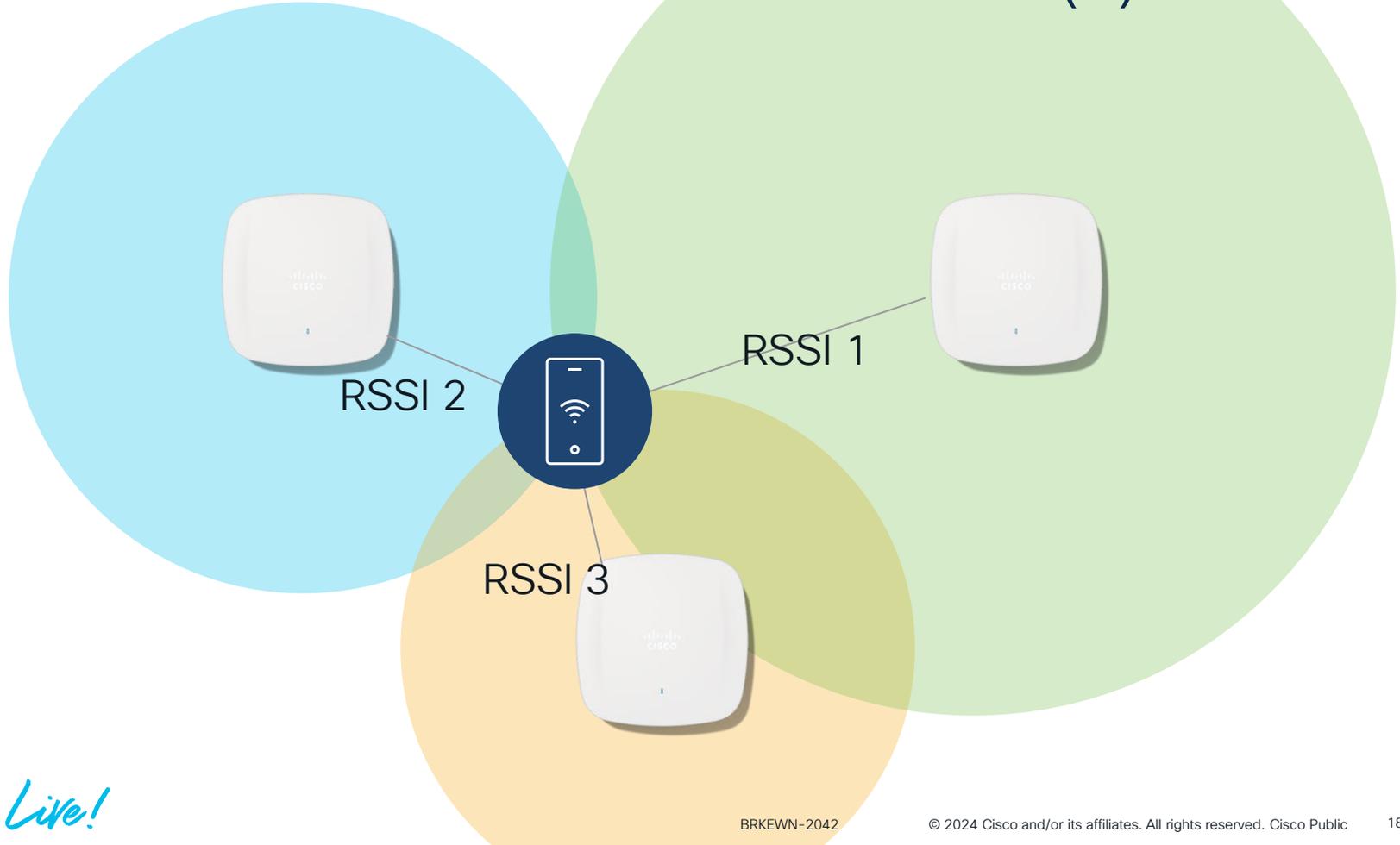
Example of client location

Device @5GHz	Transmit Power (RSSI)	Received Power	Calculated Distance	Error
DEVICE A	19dBm (real)	-44dBm	6.7mtrs	
DEVICE A	15dBm (assumed)	-44dBm	4.3mtrs	-2.3mtrs



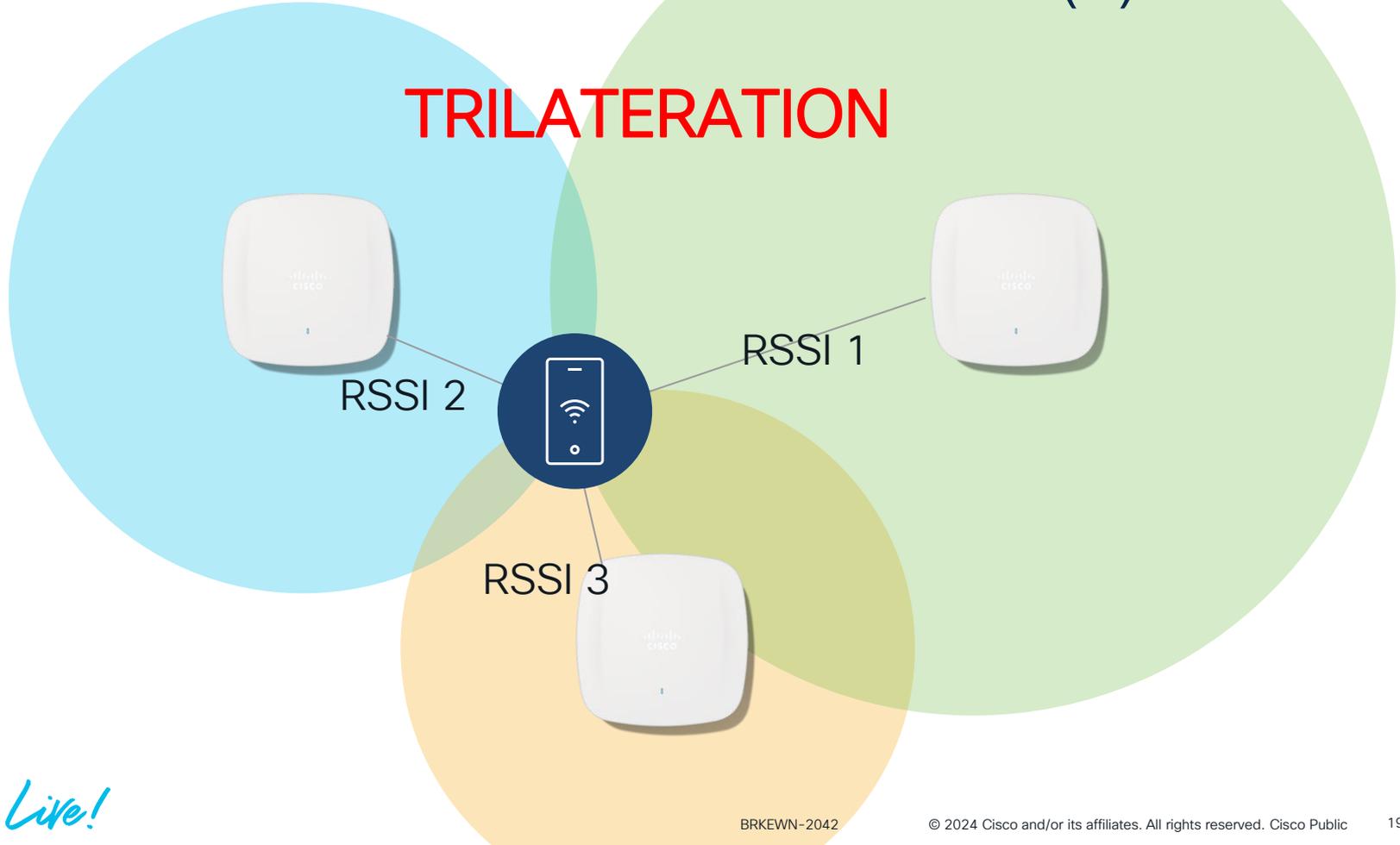
We did not even start talking about environment yet!!

How do we calculate location indoors (8)



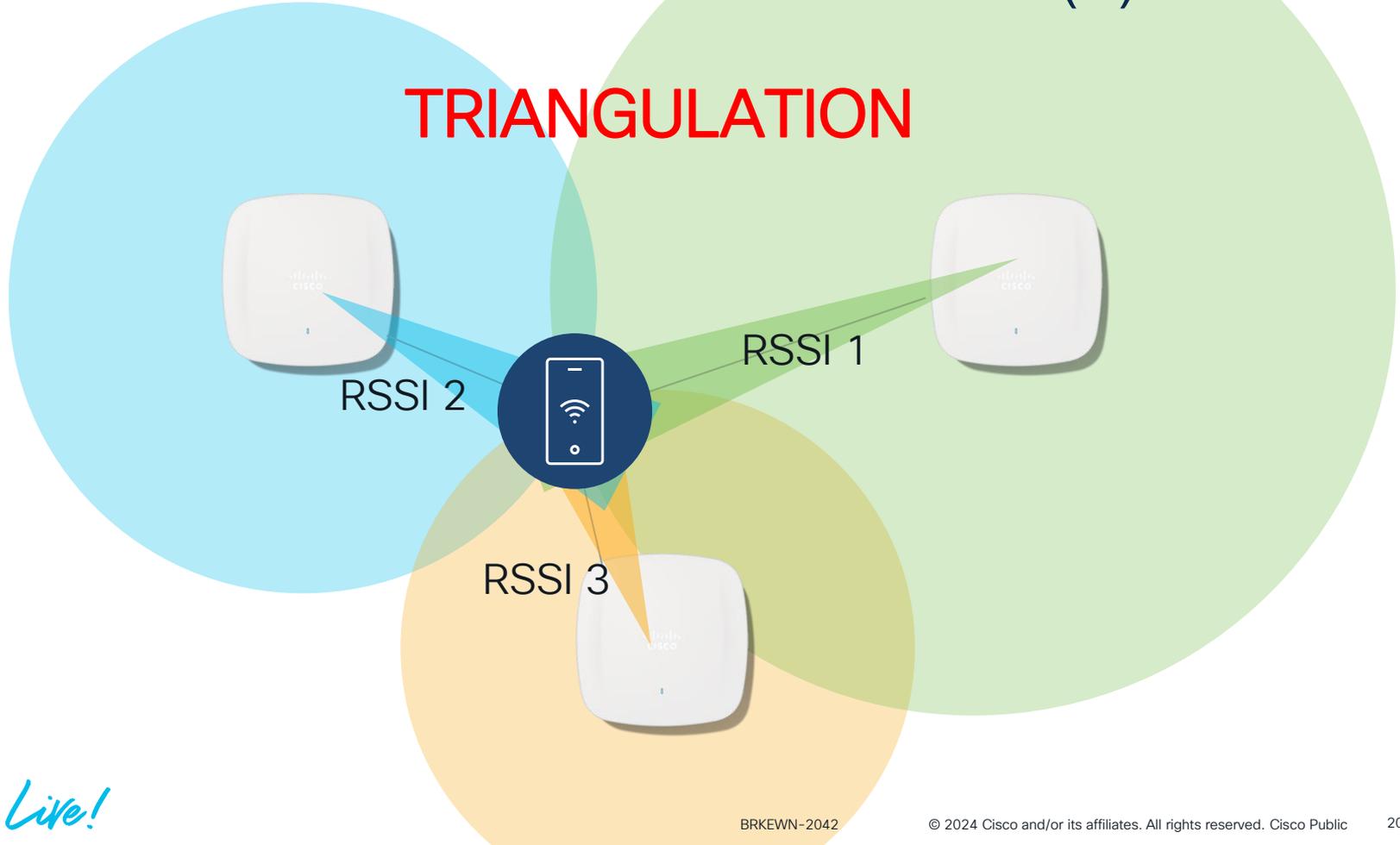
How do we calculate location indoors (9)

TRILATERATION

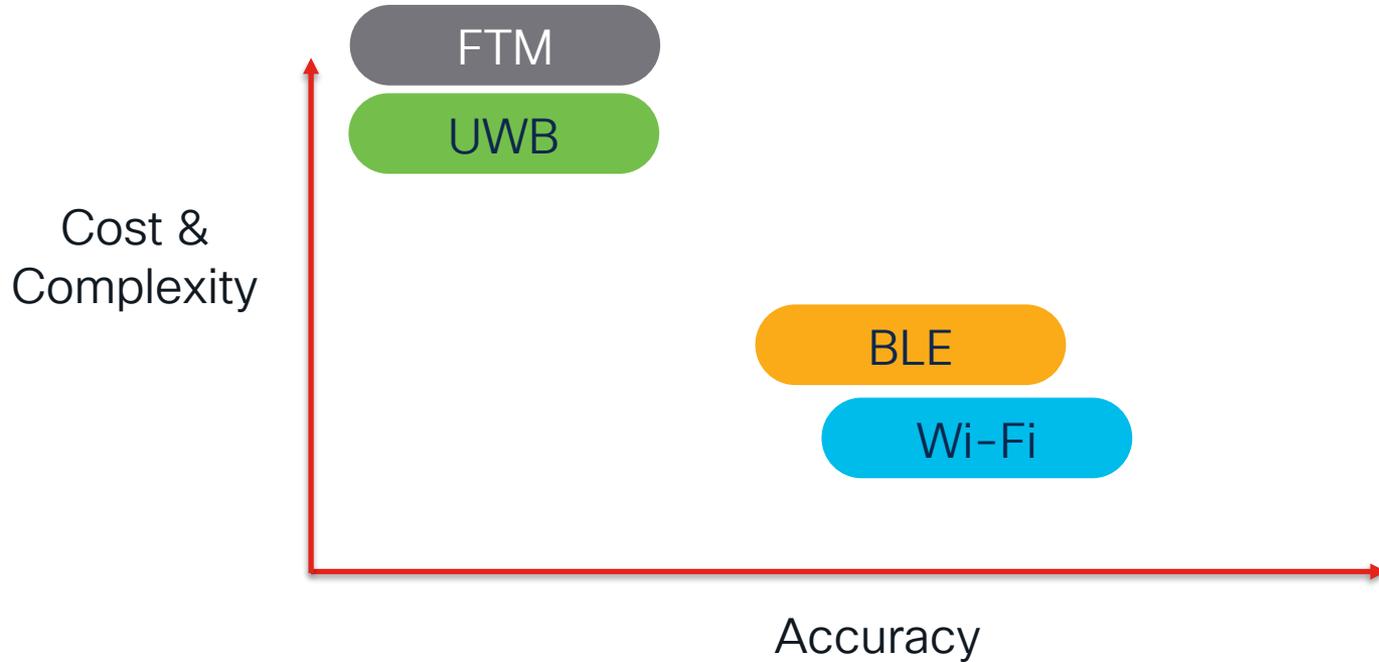


How do we calculate location indoors (9)

TRIANGULATION

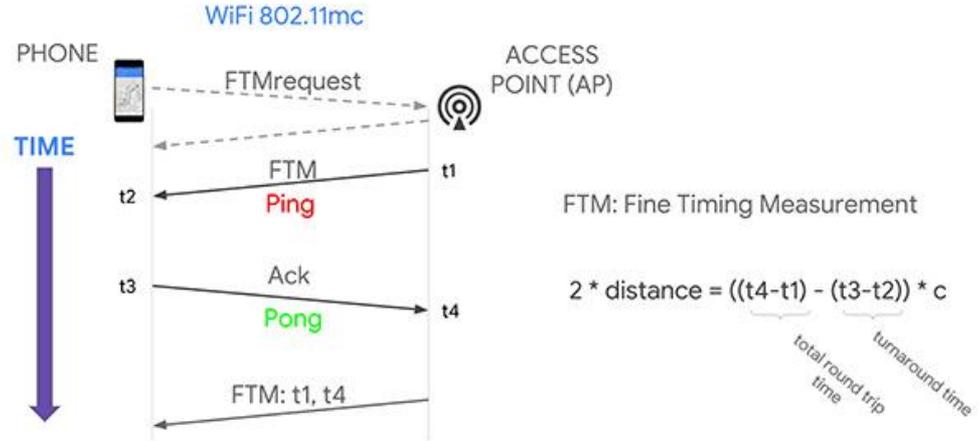


Are there any other methods?



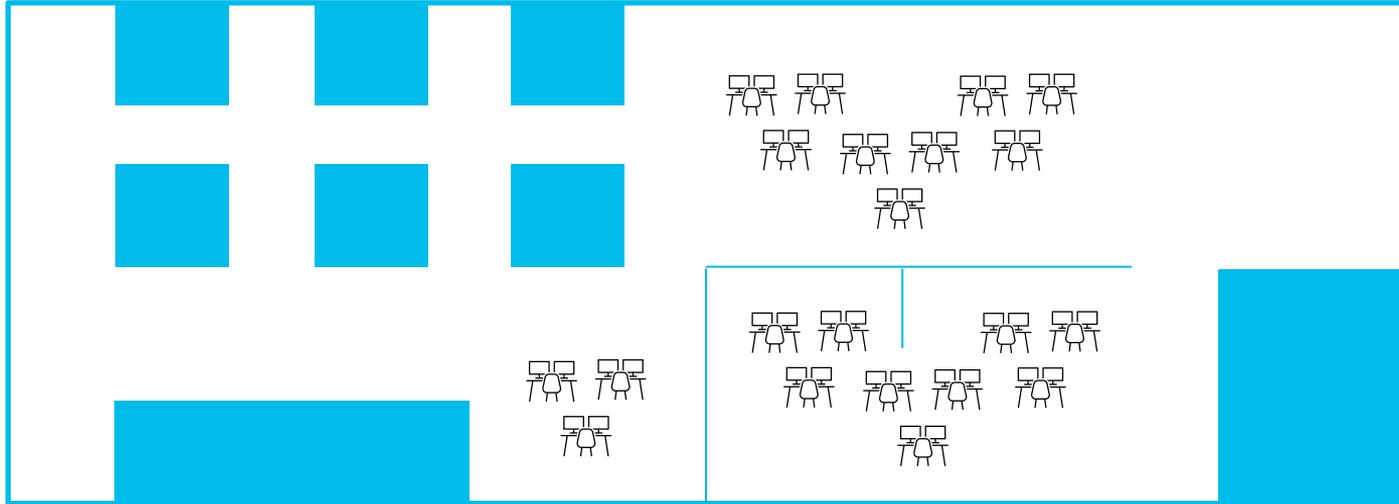
FTM – Fine Time Measurement

- Resilient than RSSI as its RTT based
- Disruptive operation in certain cases
- Needs Calibration to compensate antenna and firmware delays
- Higher the bandwidth lower the sampling delay, better the accuracy
- Performed on 5Ghz and 6Ghz

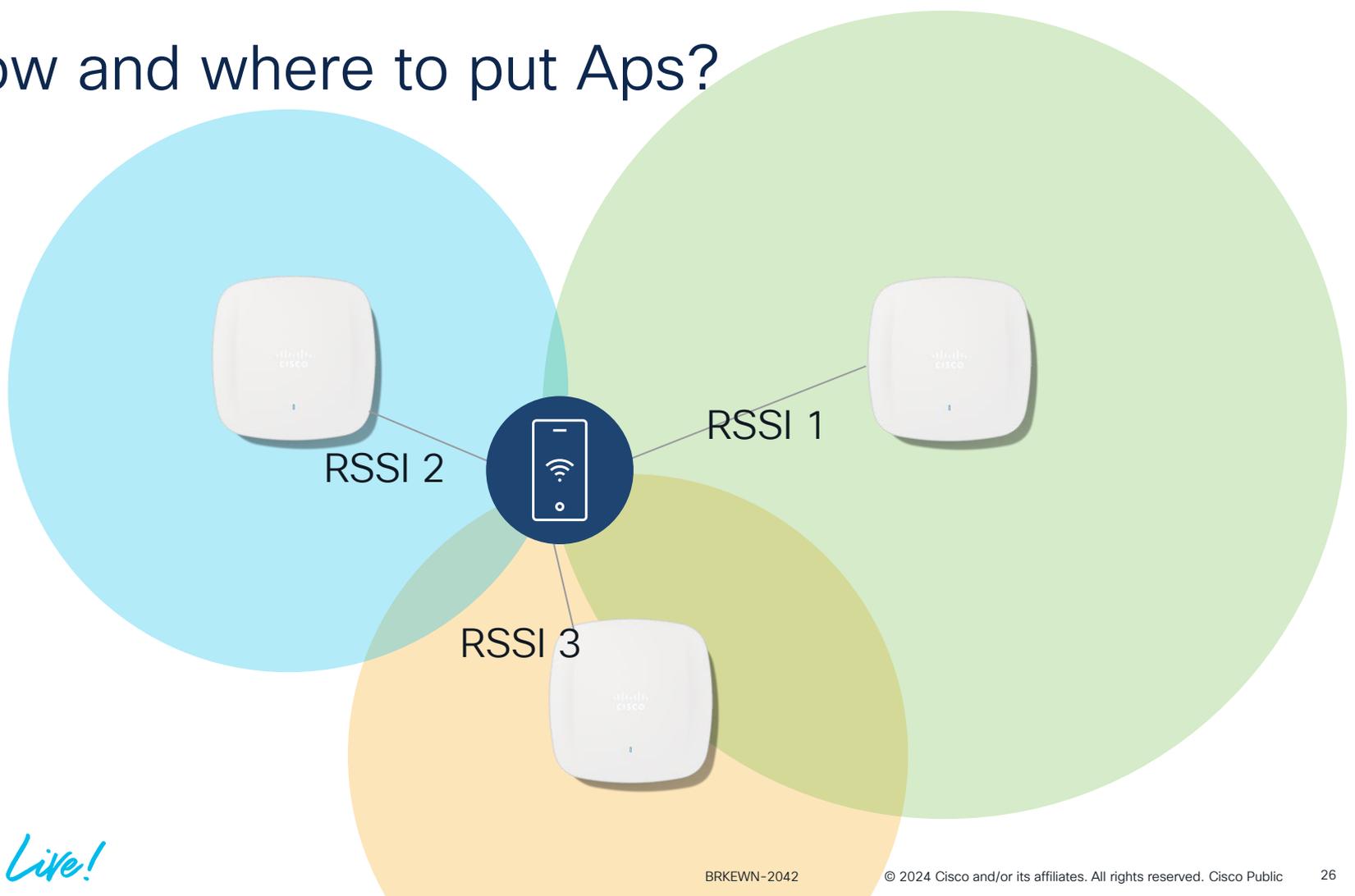


AP Placement

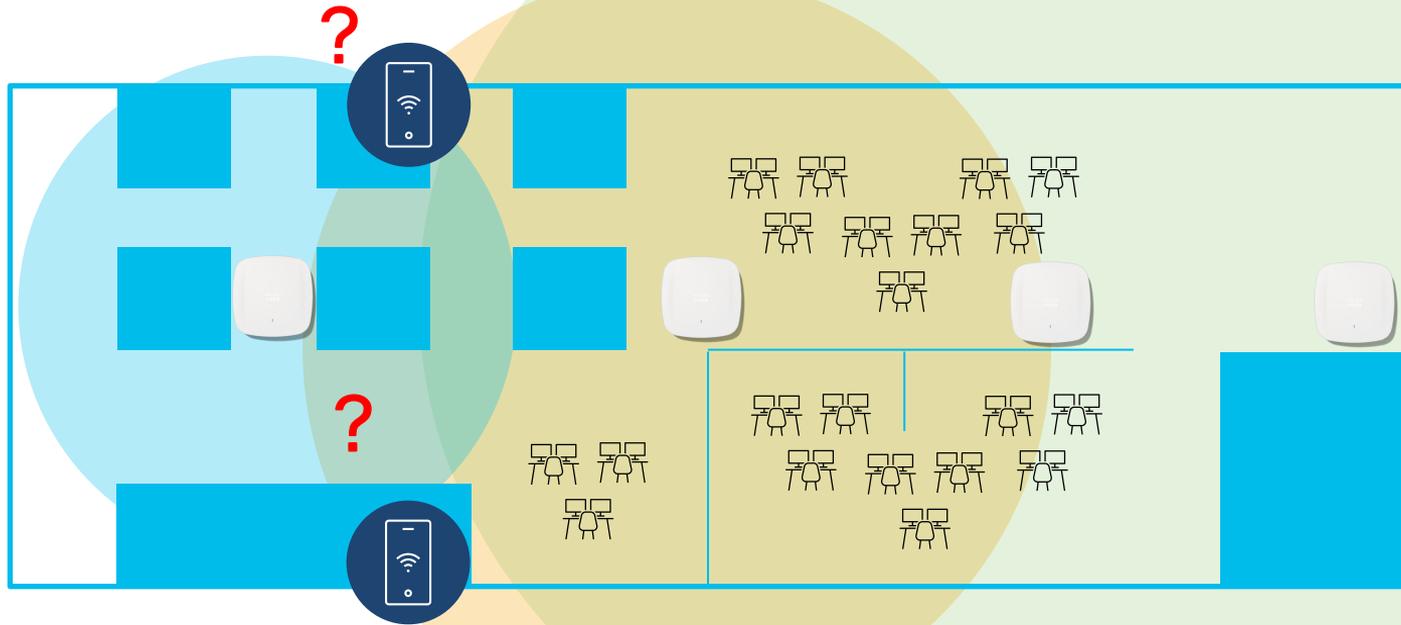
How and where to put Aps?



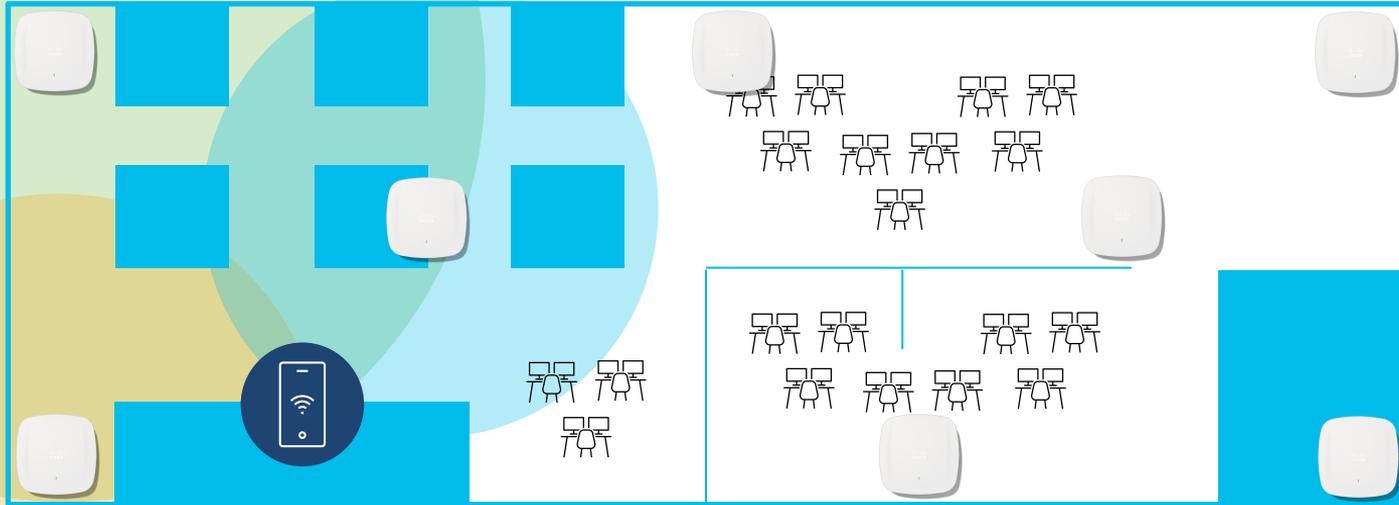
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How and where to put Aps?



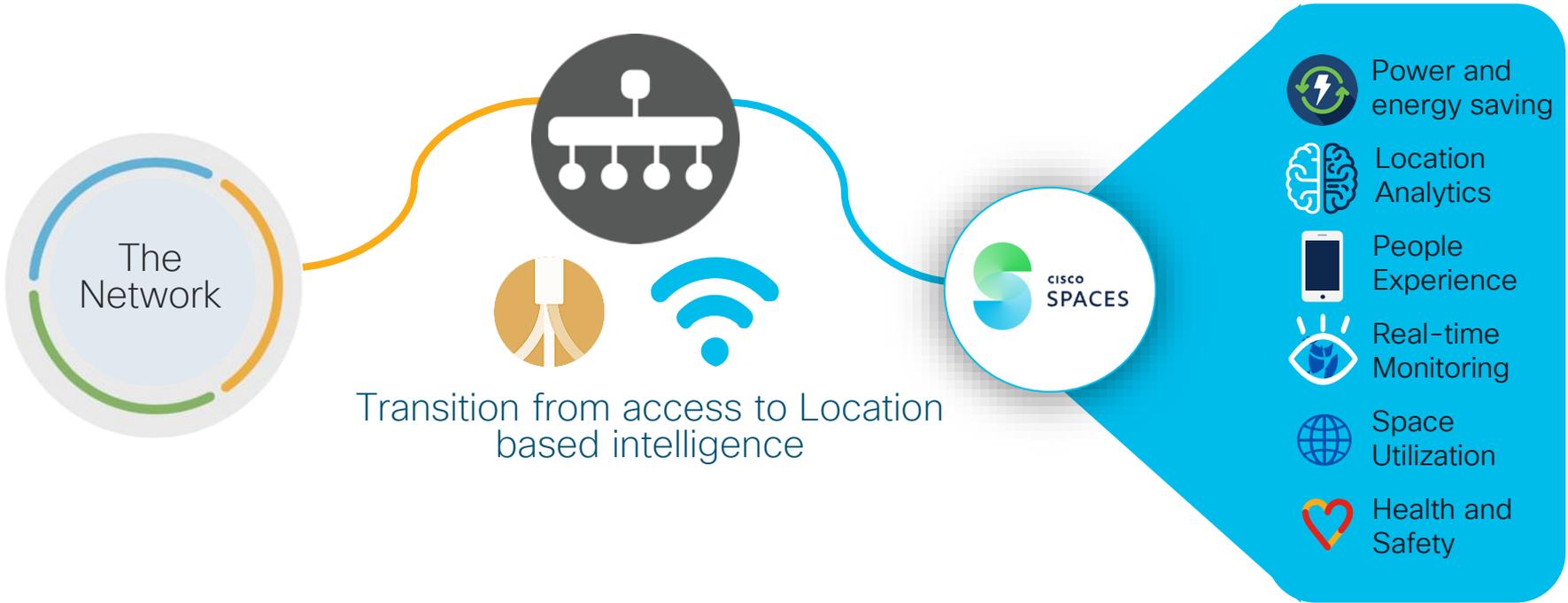
How and where to put Aps?



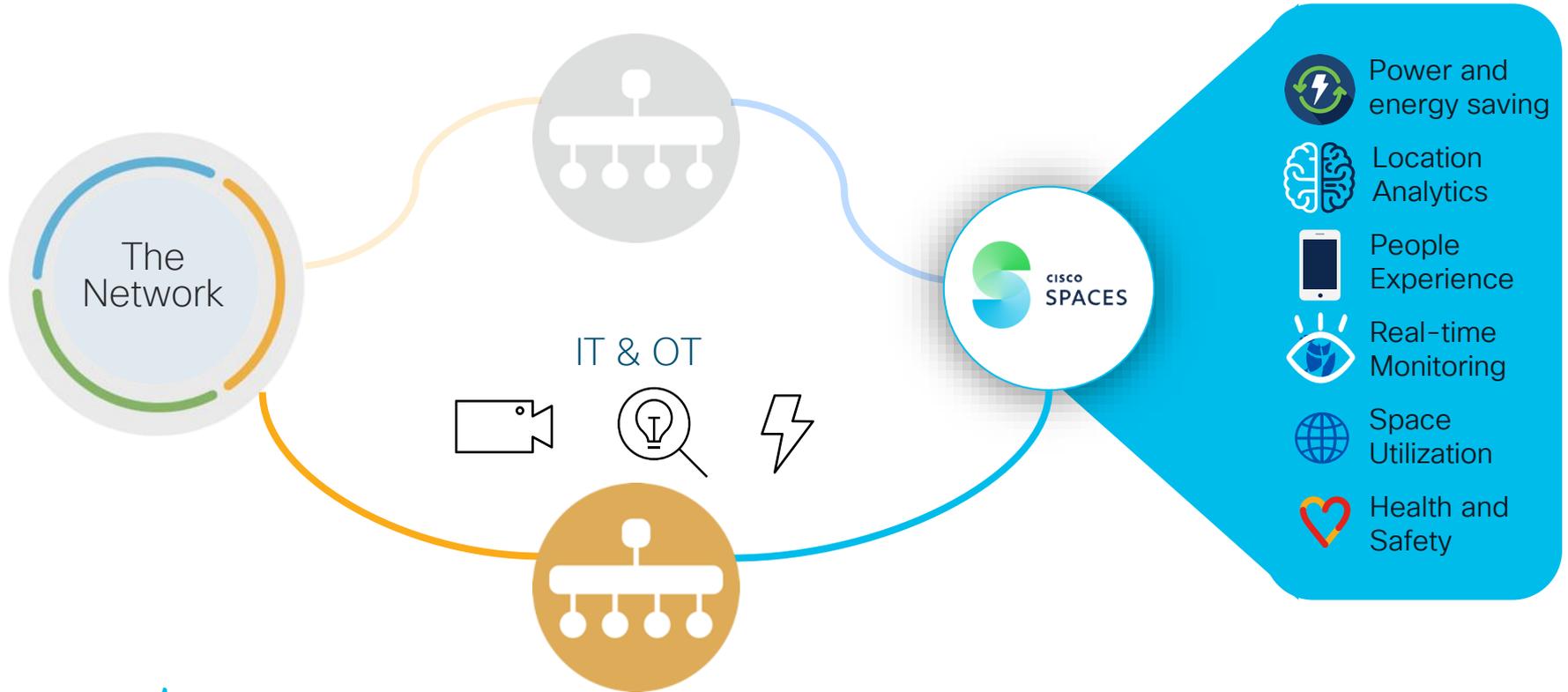
Cisco Spaces Capabilities



Use your network as foundation



Use your network as foundation



High-Level Cisco Spaces Setup Flow

01

Activate Cisco Spaces Account

- Activate Account for Purchased licensing
- Start a Free Trial

02

Integrate Wi-Fi Components

- Install Connector
- Integrate AireOS/Catalyst WLC
- Integrate with Meraki

03

Build Location Hierarchy

- Import Wi-Fi Maps
- Organize Meraki Networks
- Fill in Location Data

04

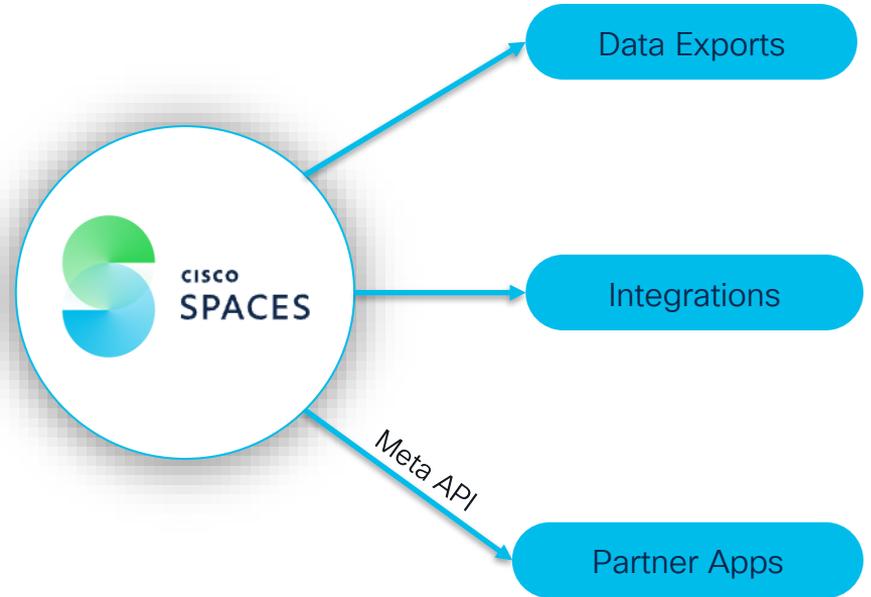
Use Cisco Spaces Apps

- Start Using Apps
- Define Rules to Power Apps

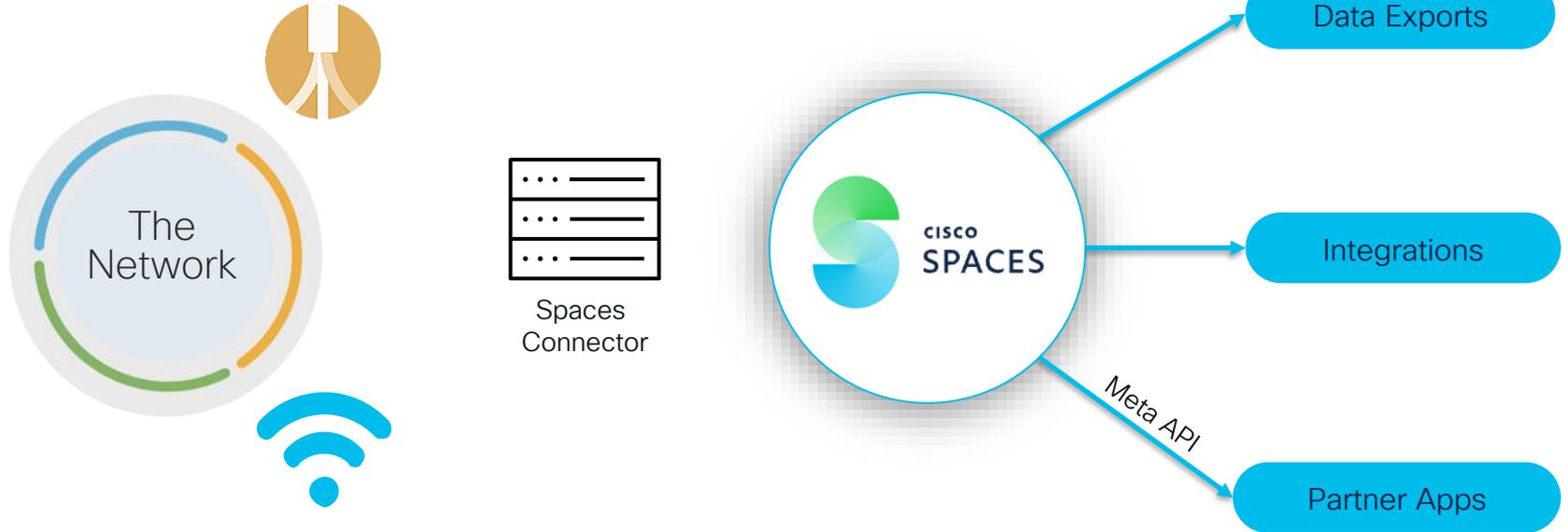
Architecture and Deployment



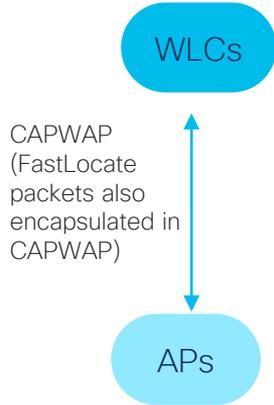
Cisco Spaces Architecture



Cisco Spaces Architecture



Cisco Spaces Architecture

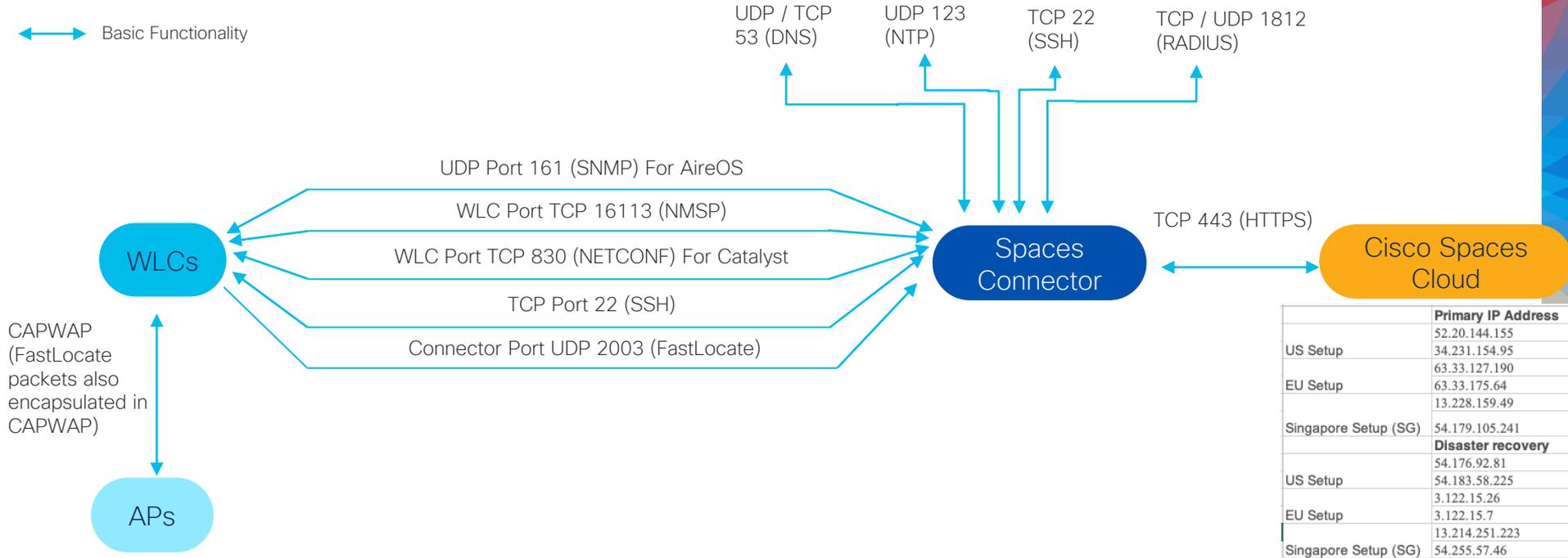


	Primary IP Address
	52.20.144.155
US Setup	34.231.154.95
	63.33.127.190
EU Setup	63.33.175.64
	13.228.159.49
Singapore Setup (SG)	54.179.105.241
	Disaster recovery
	54.176.92.81
US Setup	54.183.58.225
	3.122.15.26
EU Setup	3.122.15.7
	13.214.251.223
Singapore Setup (SG)	54.255.57.46



Cisco Spaces Architecture

↔ Basic Functionality



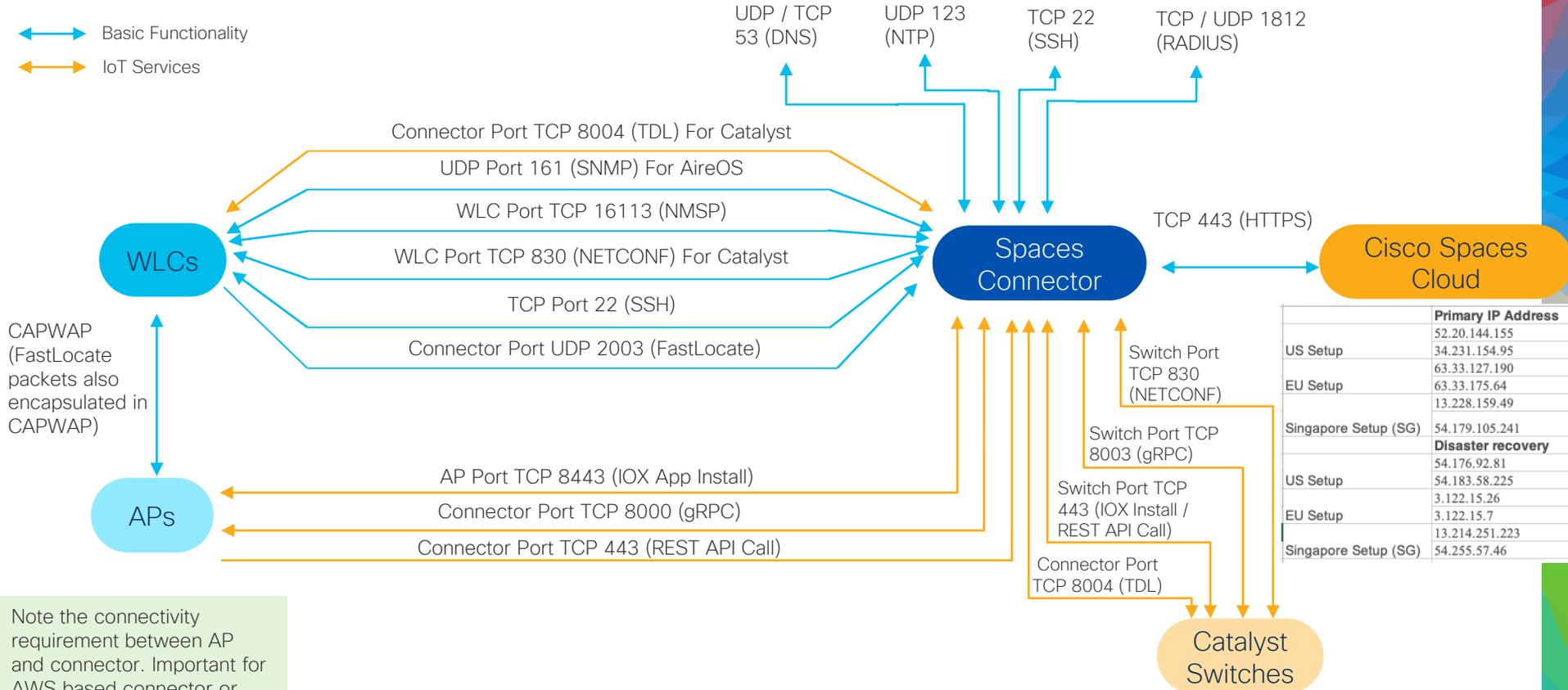
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Catalyst
Switches

Note the connectivity requirement between AP and connector. Important for AWS based connector or FlexConnect AP

Cisco Spaces Architecture

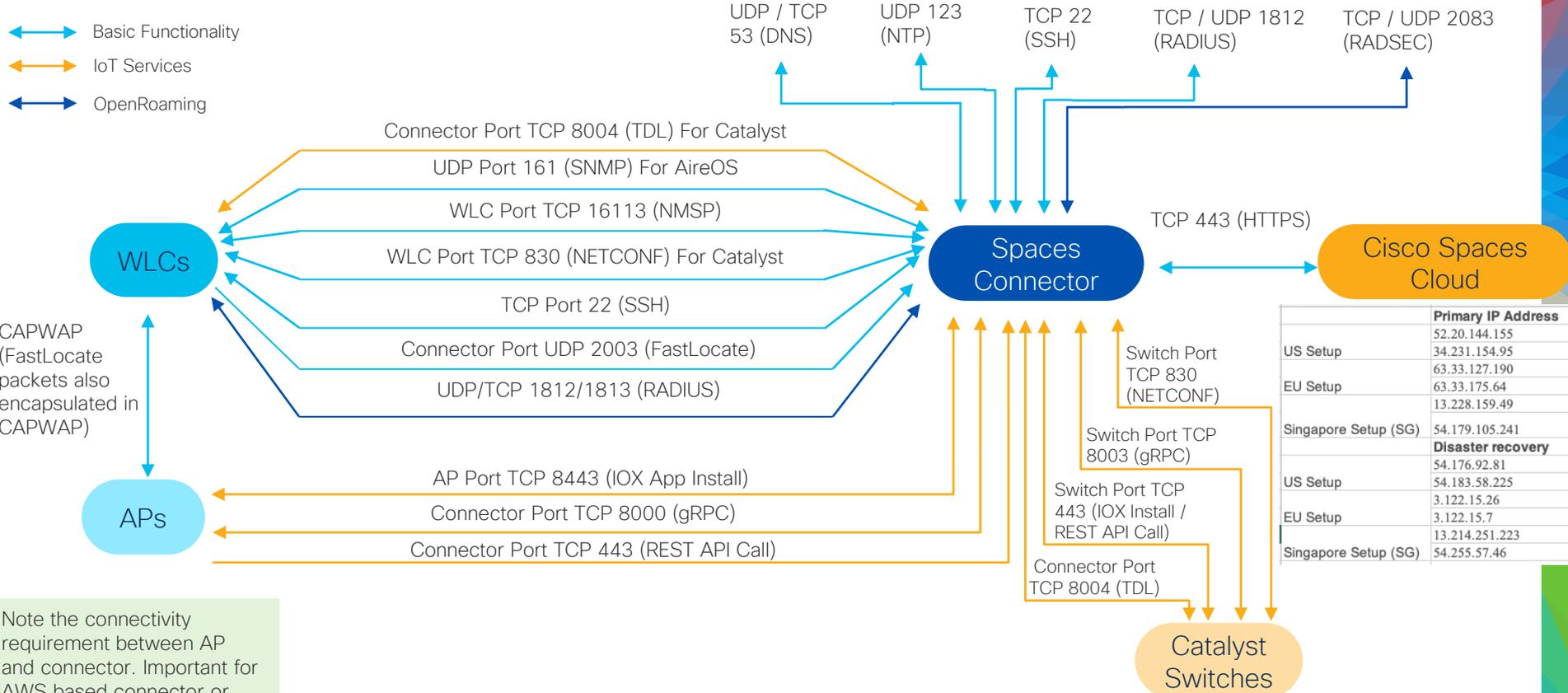
↔ Basic Functionality
↔ IoT Services



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Note the connectivity requirement between AP and connector. Important for AWS based connector or FlexConnect AP

Cisco Spaces Architecture



Note the connectivity requirement between AP and connector. Important for AWS based connector or FlexConnect AP

Why Cisco Spaces Connector ?

- Recommended way of connecting your network to Cisco Spaces Cloud
- Free VM to download in OVA form
- Created to handle high scale and performance, security and HA
- “Lightweight” and easy to deploy control point towards your cloud (open ports [HERE](#))
- One Connector can support multiple WLCs (Max 16 recommended)
- Dual interface option available for easier firewall configurations and DMZ deployments

OVA Type	vCPU	RAM	Storage (HDD OK) 2.X / 3.X
Standard (Recommended for most deployments)	2	4 GB	60 GB / 120 GB
Advanced 1	4	8 GB	60 GB / 120 GB
Advanced 2	8	16 GB	60 GB / 120 GB

*Always refer to release notes for each version

Spaces Connector 3.X

- Modular architecture
- Makes future upgrades easier
- Detailed service-based metrics for monitoring
- New troubleshooting section for diagnostic checks

The screenshot displays the Cisco Spaces Connector 3.0 dashboard. On the left is a navigation menu with options: Dashboard, Configure Connector, Configure HTTP proxy, Privacy Settings, Manage API Keys, and Troubleshoot. The main content area is divided into three sections:

- Connector 3.0 Overview:** A blue card showing the connector name, hostname (connector-pod), and IP address (10.10.111.11), with a 'Show More' link.
- General Information:** A table listing various identifiers and network settings.

General Information	
Connector Name	Gateway
Tenant ID	Proxy
Connector ID	Netmask
Instance ID	NTP Address
DNS Server	NTP Status
Domain	
- Health:** A table showing system metrics.

Health	
Cloud Reachability	Connected
CPU Percentage Usage	2% 🟢
Disk Percentage Usage	10.2% 🟢
Disk Usage	9448.29 MB 🟡
Memory Usage	2174.77 MB 🟡
Memory Percentage Usage	56.74% 🟡
Running Status	Up 🟢
System Load Average	0 🟢
Up time	86d 3h 38m 20s 🟢

*Always refer to release notes for each version

Connect Meraki Network

- Enable Analytics and Scanning API key in Meraki dashboard
- Add and configure a Post URL
- Import networks in Spaces dashboard
- After adding Meraki networks into the Location hierarchy created Meraki maps will be imported into Spaces Map Services

The screenshot shows the Meraki dashboard interface. On the left is a navigation menu with 'Network-wide' selected. The main content area is divided into several sections: 'Traffic analysis' with a dropdown for 'Basic: collect generic traffic categories'; 'Location and scanning' with 'Analytics enabled' and 'Scanning API enabled' dropdowns, and a table for 'Post URLs'. The table has columns for Status, Post URL, Secret, API Version, and Radio Type. One entry is visible with a green status, a Post URL starting with 'https://location.dnaspaces.io/notifications/Meraki/m...', a masked secret, API Version 'V3', and Radio Type 'WiFi'. Below this is the 'Client privacy' section with 'No timespan limit' and '1970-01-01' options. At the bottom is the 'Twilio account information' section with input fields for 'Account SID' and 'Auth Token'.

3 Import Meraki Networks into Location Hierarchy
Connect Meraki with DNA Spaces using the API key.

1 / 1	organization(s) imported	Import Networks Sync Status
1 / 1	networks imported	

*Always refer to current deployment guide for exact steps

Few more steps
before we are
up and running

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- Define Rules to Power Apps

Start with Location Hierarchy in Cisco Spaces

CISCO SPACES

Location Hierarchy - Beta

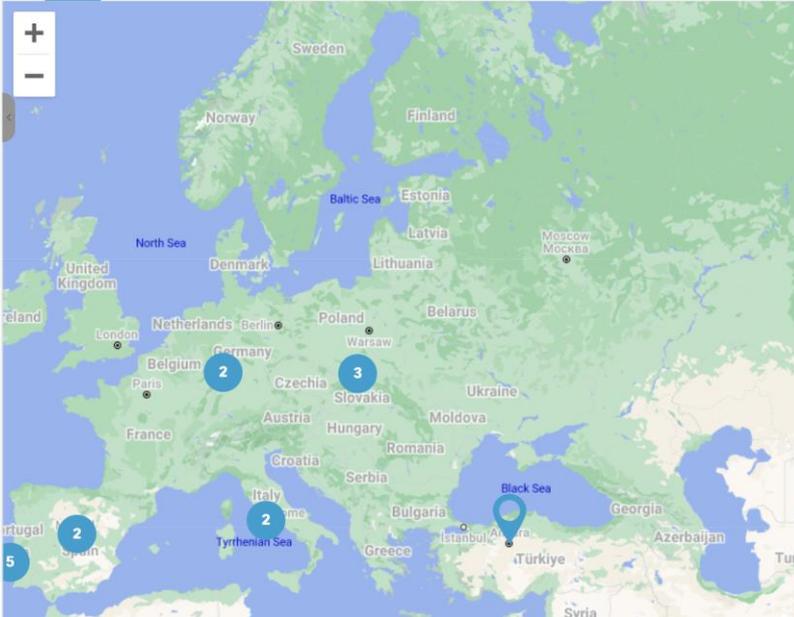
Q Search

PeterMalic

 **PeterMalic** ...
PeterMalic

2	18	8	22	1	33	4
Org	Campus	Group	Building	Wlc	Floor	Zone

Map Location Info Network Devices Metadata



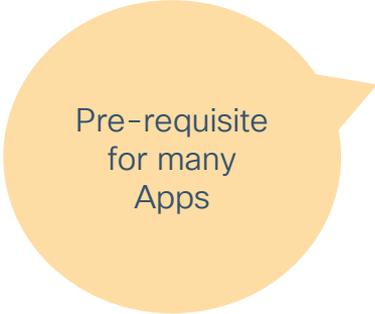
The map shows Europe with several location markers: a blue circle with '2' in Spain, a blue circle with '2' in France, a blue circle with '3' in Czechia, and a blue circle with '5' in Portugal. A red location pin is placed in Turkey near Istanbul. The map also shows various countries and bodies of water like the North Sea, Baltic Sea, and Black Sea.

- CCIE
- Colombia
- demo_Test
- EMEA
- Global
- IndustrialSites
- ITALY
- Juma
- Meraki_test
- Poland
- Portugal
- Slovakia
- SONAE Rec - admendo
- Spain
- TBMM Rec - admendo
- test

Moving from using existing network hierarchy structure to a facilities/business hierarchy

Start with Location Hierarchy in Cisco Spaces

- Creating a good location hierarchy is highly recommended in Cisco Spaces!
- Translates IT based hierarchy to business taxonomy



Pre-requisite
for many
Apps

Using Catalyst Center or PI Maps (Recommended)	Import the Hierarchy present in DNA Center or Prime Infrastructure along with floor maps, AP placements and calibration information.
Creating Location Hierarchy Manually	Only use if maps are not available. Import the controller and manually create different node and Select APs.
Via Meraki Networks	Meraki networks are imported into the location hierarchy and follow the structure as defined in Meraki.

Location hierarchy and maps

Prerequisite or highly recommended for majority of Applications

- Creating a good location hierarchy is **highly recommended** in Cisco Spaces!
- Translates IT based hierarchy to **business taxonomy**.
- Add **Exclusion and Inclusion Zones in the maps** for best accuracy of calculated locations in Detect and Locate
- Create **accurate floor maps** for best granularity and accuracy of location calculations and analytics.
- **Add accurate metadata** to the nodes of Location Hierarchy for highest value. Example: Area of building / floors, occupancy limits, tags, address and time zone etc.
- Create **sub-zones or groups in Hierarchy** for use in other applications and rule engines

Building Rich Map

- Transforming floorplan CAD file into 3D Rich map
- Enhancing the experience with Webex devices and other sensors available

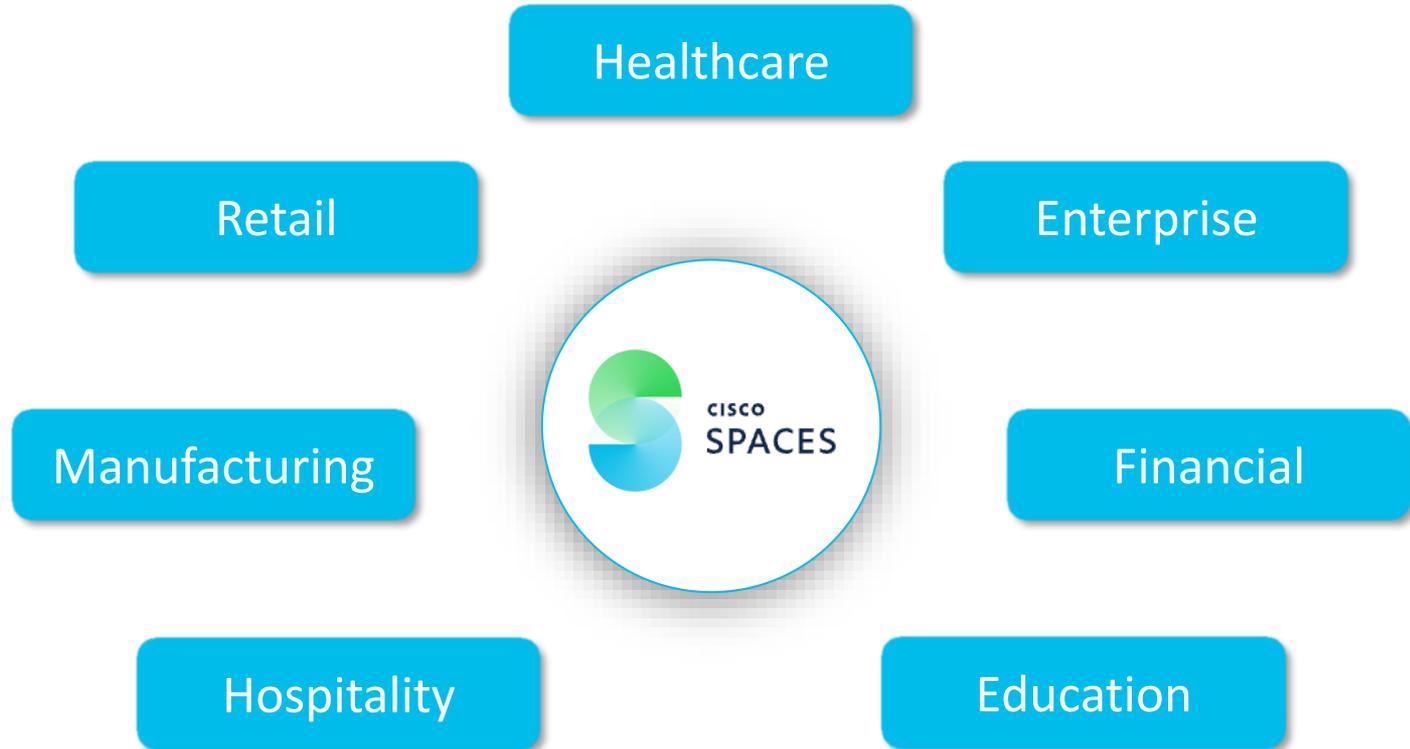
Network Map



Facility Map



Look into different verticals



Look into different verticals

	Wi-Fi count	Challenges
Workspace	User-id data is a close approximation of actual numbers Device count trends correlate strongly with badge data at the daily count/location level	User-Id availability Vertical definition SSID labeling SSID discipline 'Campus impact'
Education	Similar as above	User-id availability SSID labelling SSID discipline Device/person separation 'Campus Impact'
Retail and Verticals with low % of associated clients / high guest count	Good for trends and behavioral metrics but limited for counts	Crowded entrances could impact count Cannot count zones with no clear entrances (density metric as a proxy) Cannot count unique visitors due to other challenges

Location Features



Detect & Locate

View and track devices in your deployment

Value

Operational efficiency

IT productivity

Use cases

- View and track devices in your deployment
- Access to client history and API to access both real-time and historical data (ACT license)

Right Now

Gain a real-time view of visitor behavior at your properties.

Value

Understand behaviors

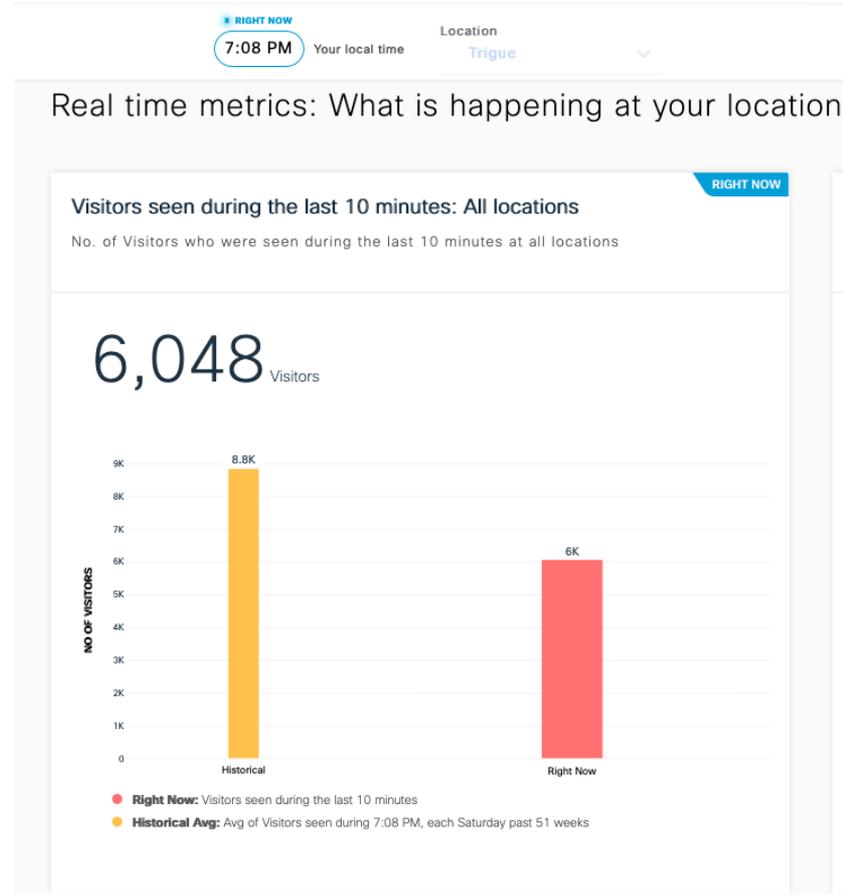
Optimize operations and staffing

Use cases

- Get a real time view of the visitors currently present at your locations
- Respond to change in presence levels within location

Right Now – App Overview

- Provides a *real time count* of the number of people at a physical location or group of locations
- Compare with the *historical average*
- Two types of data sources:
 - Wi-Fi network data
 - Meraki Camera data
- Automated Triggers
- Assist with Safety and Compliance



Behavior Metrics

Gain a real-time view of visitor behavior at your properties.

Value

Understand behavior

Space optimization

Optimize operations

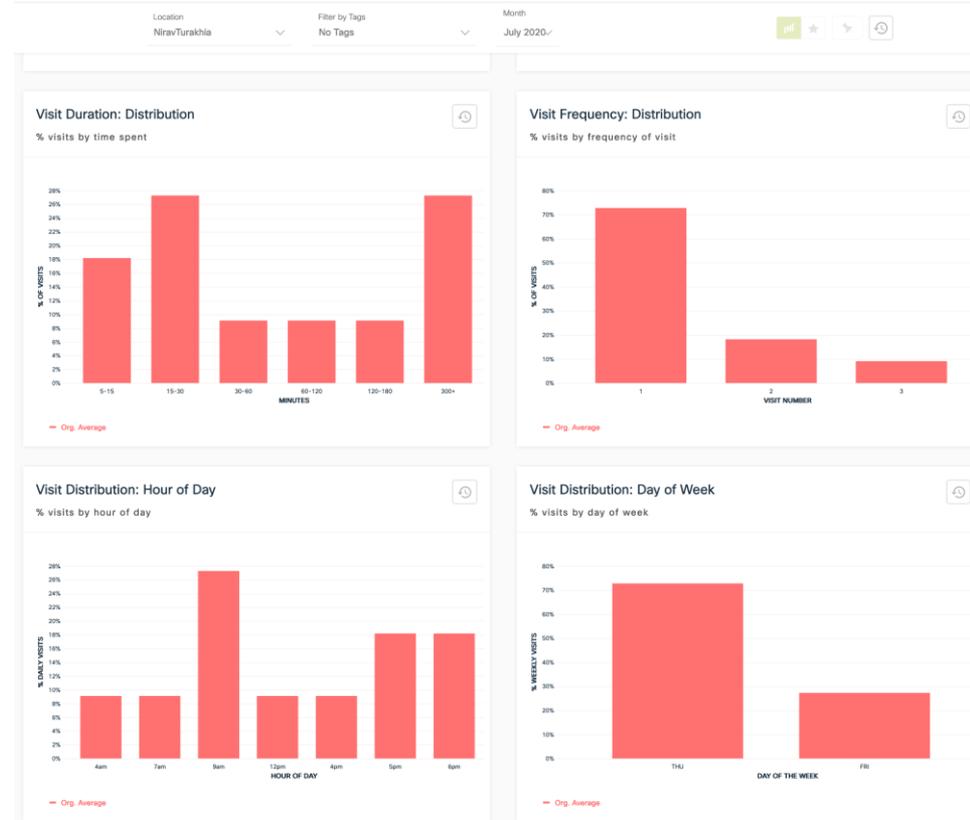
Drive productivity

Use cases

- Get understanding of on-site customer behavior across locations
- Understand peak days and times to make informed decisions such as staffing
- Measure customer loyalty by identifying new vs repeat visitors
- Benchmark performance of locations to understand below or above-average performance
- Correlate location behavior with other data sources such as - PoS, CRMs, loyalty database, etc. to get a 360-degree view of customer

Behavior Metrics

- Gives a monthly-report of how people are behaving at locations – helpful for LOB use cases and business users
- Can choose to view report by:
 - Location Name
 - Tags created
 - Month
 - Historical View
- Associated Wi-Fi devices
- Vertical dependent metrics – A client is considered to end the visit if no location update seen for:
 - Workspace: 10 hours
 - Education: 10 hours
 - Retail: 3 hours
 - Generic: 3 hours
- Additional vertical specific insights



Behavior Metrics



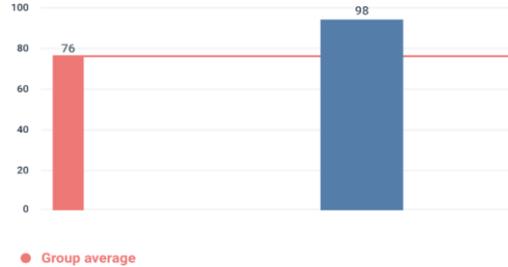
Behavior Metrics

Gold standard performance metrics for physical spaces

Average Visit Duration

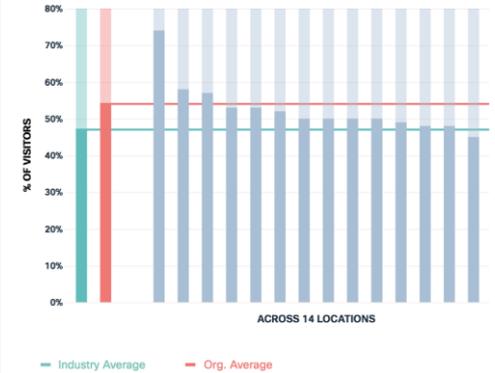
98 mins

PERCENTILE
96 +1 since last month



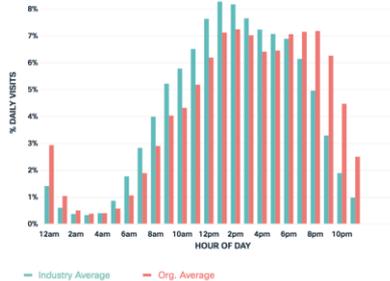
Repeat Visitors: Across Locations

% of shoppers who repeat visit



on: Hour of Day

hour of day



Visit Distribution: Day of Week

% weekly visits by day of week



Location Analytics

Gain visibility into behavior patterns.

Value

Understand behavior

Space optimization

Optimize operations

Drive productivity

Use cases

- Gain visibility into customer behavior patterns
- Create custom views and reports, filter by locations, date range
- Access historical trends to understand how customers interact with different parts of buildings or environments

Location Analytics

BETA

ACT FEATURES

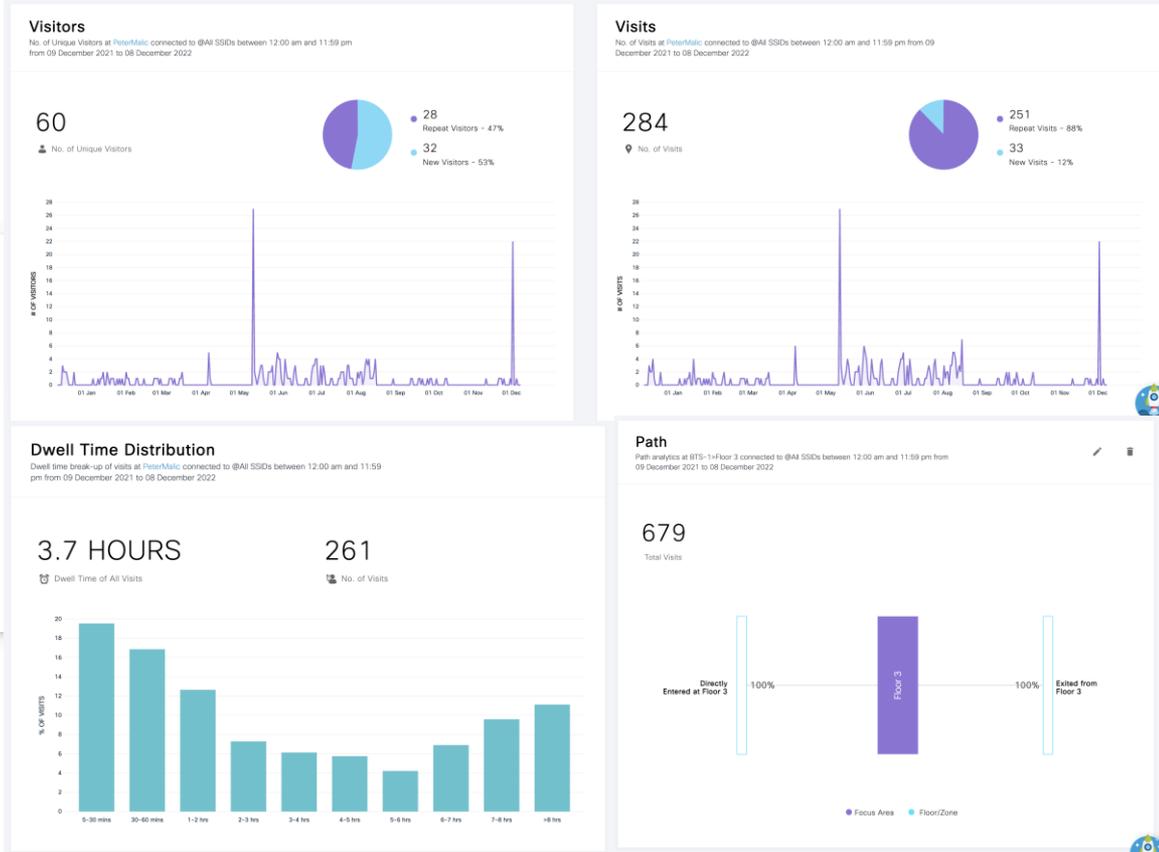


Location Analytics

Gain visibility into customer behavior and patterns

ACTIVE DEVICES

990441



Impact Analytics

See the impact of events & changes to your business location on your behavior metrics.

Value

Understand behavior

Space optimization

Optimize operations

Drive productivity

Use cases

- Gain visibility into customer behavior patterns
- Create custom views and reports, filter by locations, date range
- Access historical trends to understand how customers interact with different parts of buildings or environments

Impact Analytics

Measure the impact of events through our interactive tool



Did shopper visit duration rise during the Black Friday sale?

Did the frequency of university attendance increase post holidays?

Did employees spend more time at the workspace post redecoration?

Location: Northland | Compared To: Period DURING event | Event Duration: Mar 15, 2020 - Mar 28, 2020 | Delete



Impact Analysis

See the impact of events & changes to your business location on your behavior metrics.

Now see Impact of COVID19

EVENTS MEASURING IMPACT

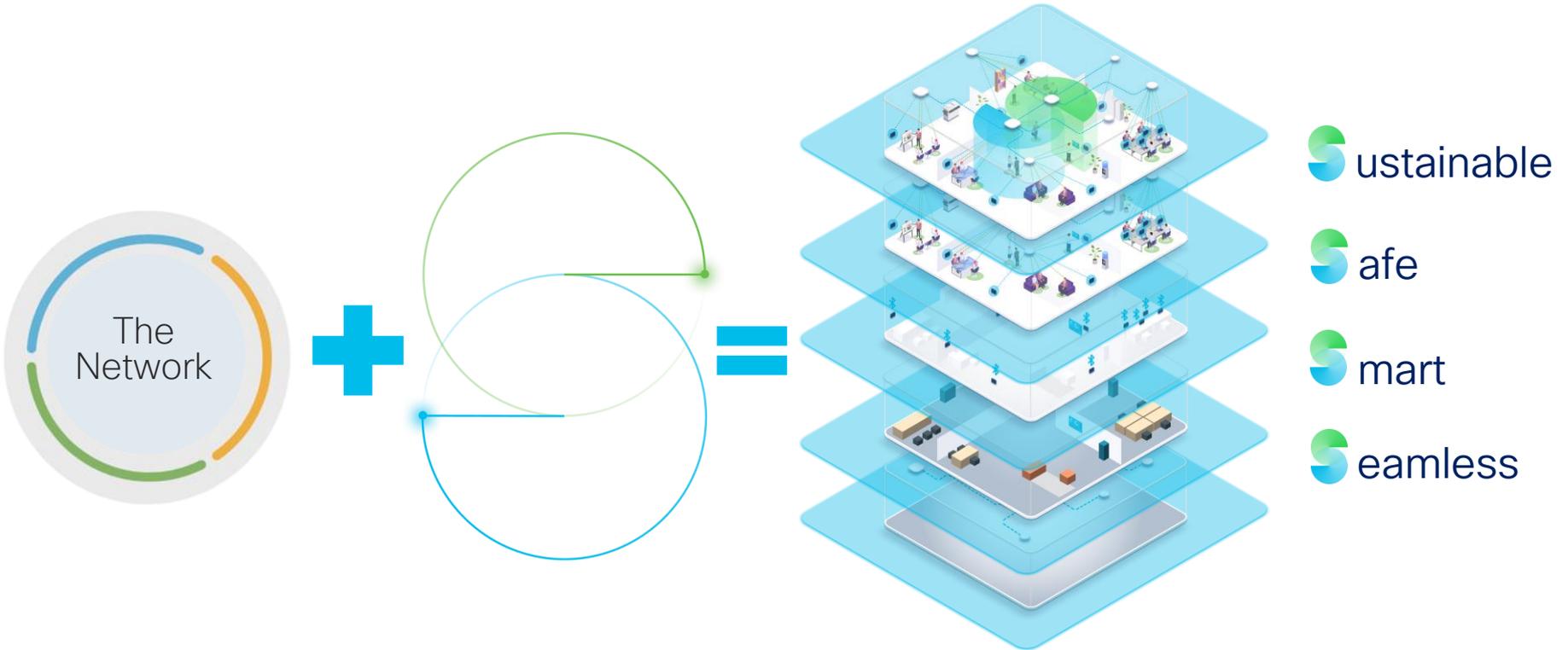
18



Demo

CISCO *Live!*

What now?





The bridge to possible

Thank you

CISCO *Live!*

The Cisco Live! logo features the word "CISCO" in a bold, black, sans-serif font, followed by "Live!" in a black, cursive script font. The background of the entire image is a vibrant, multi-colored abstract pattern of overlapping, wavy bands in shades of red, orange, yellow, green, and blue, creating a sense of motion and energy.

CISCO *Live!*

Let's go