



Internet of Everything (IoE)

Mobility

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January 15, 2014

Today's Topics

- IoE Review
- Smart Objects and LLNs
- Secure Mobility
- Cisco Mobile Experience
- Architectures and Examples

IoT Review



A History of Connections

170 Years Ago:
Invention of the Telegraph

100 Years Ago:
Invention of the Radio

70 Years Ago:
First general purpose
electronic computer

40 Years Ago:
First Internet
connection

20 Years Ago:
World Wide Web

Today

2003:
0.5B Connected
Devices



2005:
IP Traffic:
29 exabytes



2005:
First Smartphone



2008:
Video Traffic:
21 exabytes



2010:
0.5B Smartphones



2010:
7B Connected
Devices



2011:
90M Smartmeters



2012:
50M Connected
Cars



The Internet of Everything

Networked Connection of People, Process, Data, Things

People

Connecting people
in
more relevant,
valuable ways



Process

Delivering the right
information to the right
person (or machine)
at the right time



Data

Leveraging data into
more useful
information for
decision making



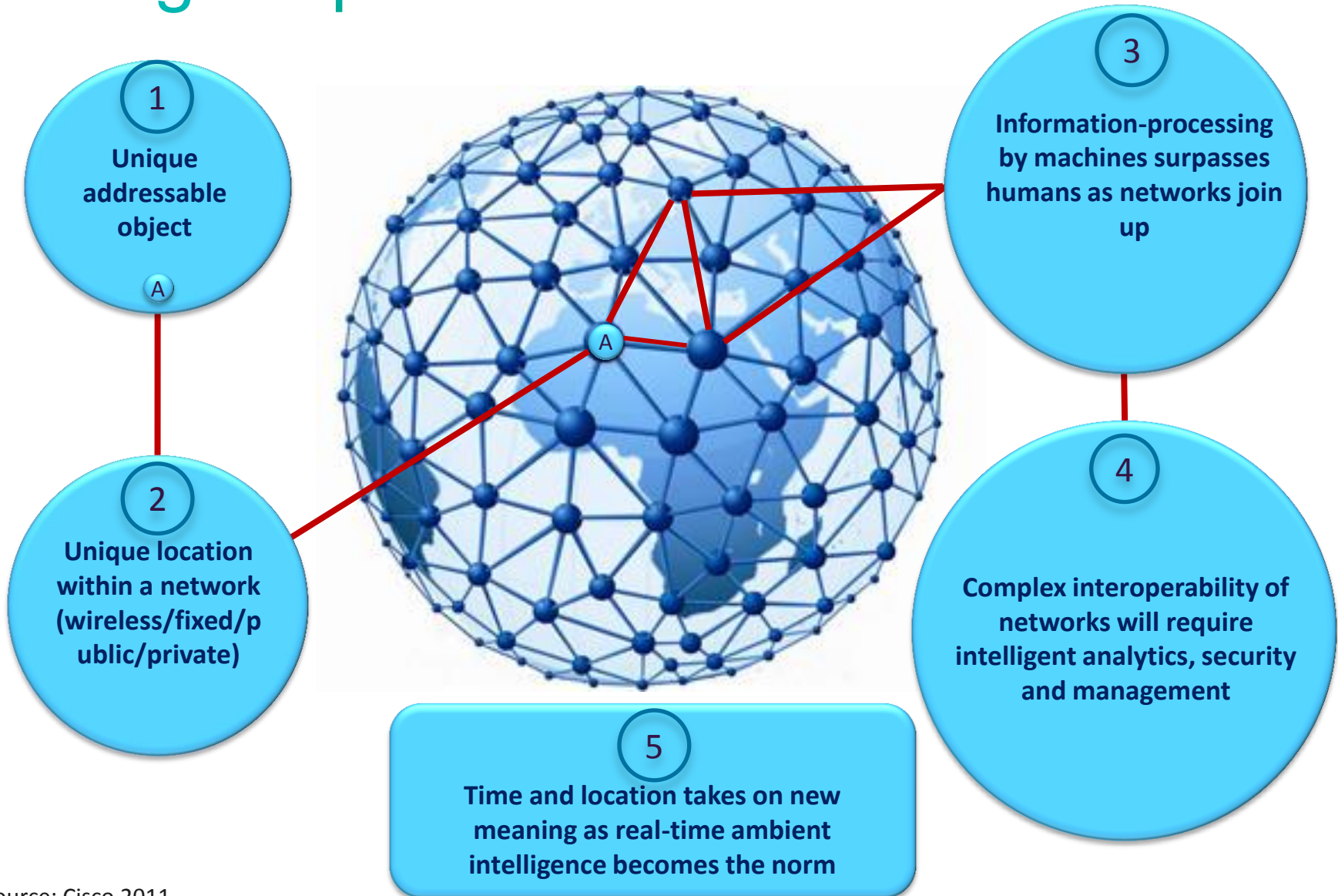
Things

Physical devices and
objects connected to the
Internet and each other for
intelligent decision making;
often called Internet of
Things (IoT)



IoE

Defining Properties of the IoE



Source: Cisco 2011

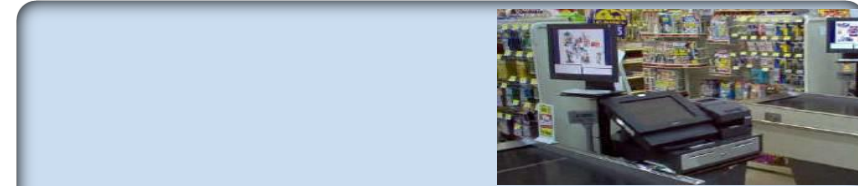
Driving the Internet of Everything



Remote Monitoring and Management



Big Data/Analytics



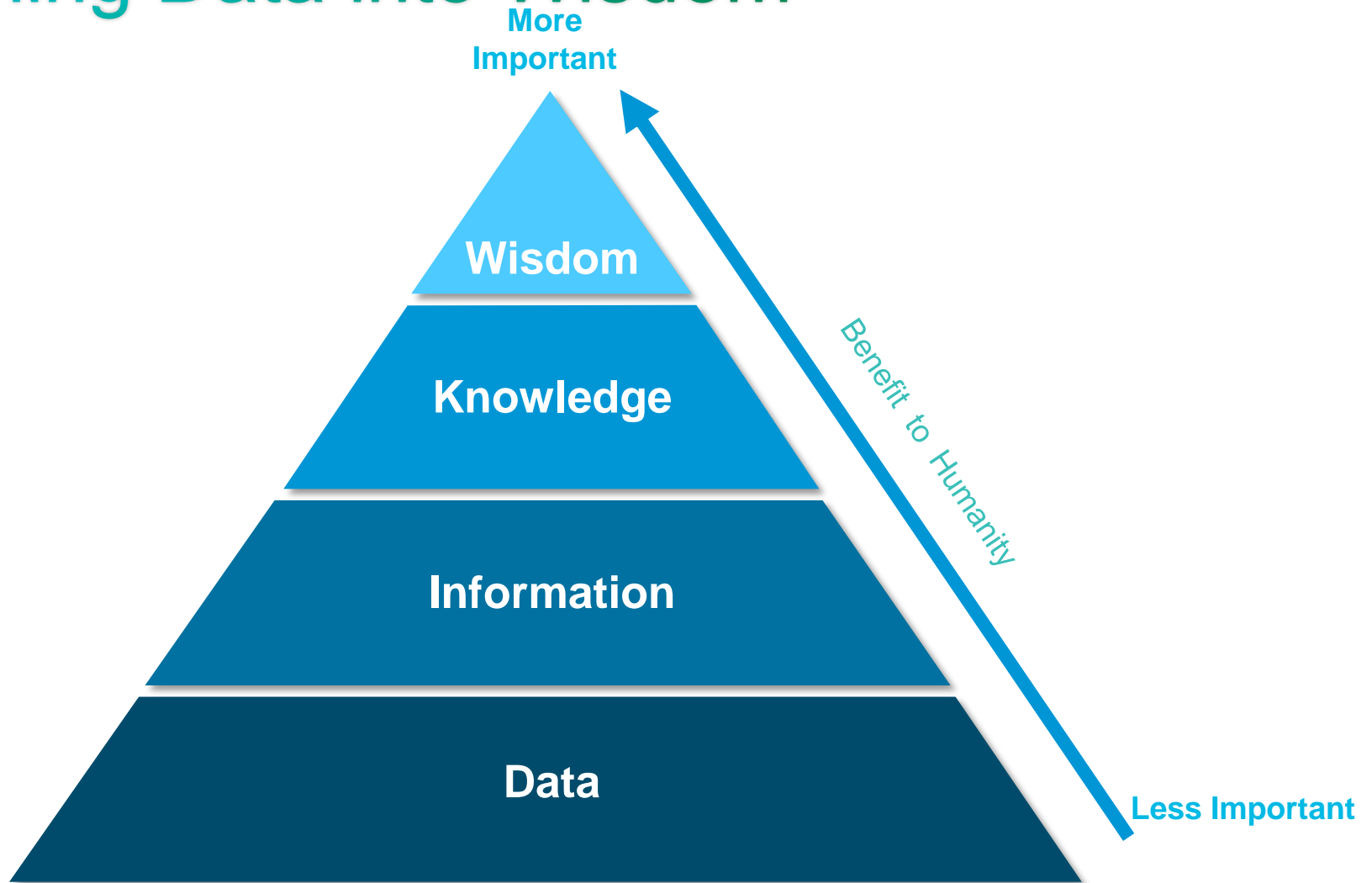
Plant/Store/Hospital Automation



New Connected Assets



The Opportunity: Turning Data into Wisdom



Source: Cisco IBSG, 2011

Smart Objects & LLNs



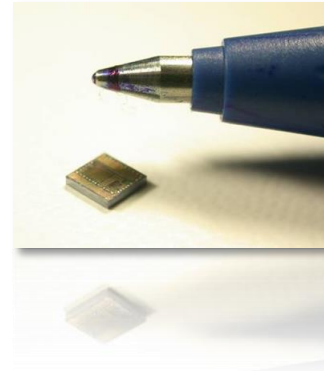
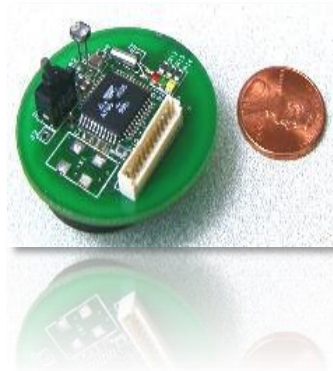
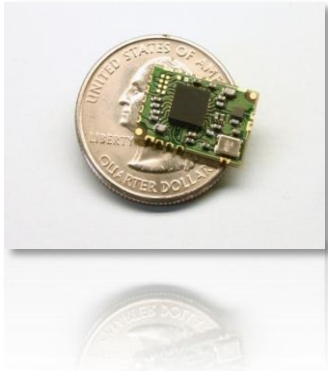
Characteristics of Smart Objects



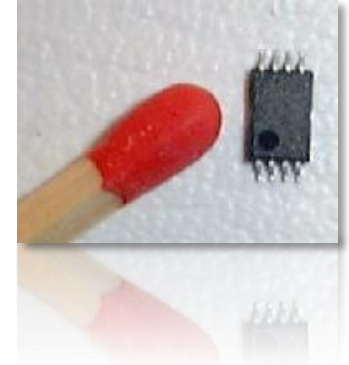
- These devices are **highly constrained** in terms of
 - Physical size
 - CPU power
 - Memory (few tens of kilobytes)
 - Bandwidth (Maximum of 250 KB/s, lower rates the norm)
- Power consumption is critical
 - If it is battery powered then energy efficiency is paramount, batteries might have to last for years
- May operate in harsh environments
 - Challenging physical environment (heat, dust, moisture, interference)
- Wireless capabilities based on Low Power & Lossy Network (LLNs) technology
 - Predominantly IEEE 802.15.4 (2.4 GHz and 900 MHz)
 - Newer RF technologies IEEE 802.15.4g Smart Utility Network (SUN)
- May also run over wired technologies such as IEEE P1901.2 PLC (Power Line)

What is a Low Power Lossy Network (LLN)?

- LLNs comprise a large number of highly constrained devices (smart objects) interconnected by predominantly wireless links of unpredictable quality
- LLNs cover a wide scope of applications
Industrial Monitoring, Building Automation, Connected Home, Healthcare, Environmental Monitoring, Urban Sensor Networks, Energy Management, Asset Tracking, Refrigeration
- Several IETF working groups and Industry Alliance addressing LLNs
IETF - CoRE, 6Lowpan, ROLL
Alliances - IP for Smart Objects Alliance (IPSO)



World's smallest web server



Characteristics of Internet vs Smart Object Networks

Current Internet

Nodes are routers

IGP with typically few hundreds of 100 nodes

Links and Nodes are stable

Node and link bandwidth constraints are generally non-issues

Routing is not application aware

Smart Object Networks

Nodes are sensor/actuators and routers

An order of magnitude larger in nodes

Links are highly unstable Nodes fail more frequently

Nodes & links are highly constrained

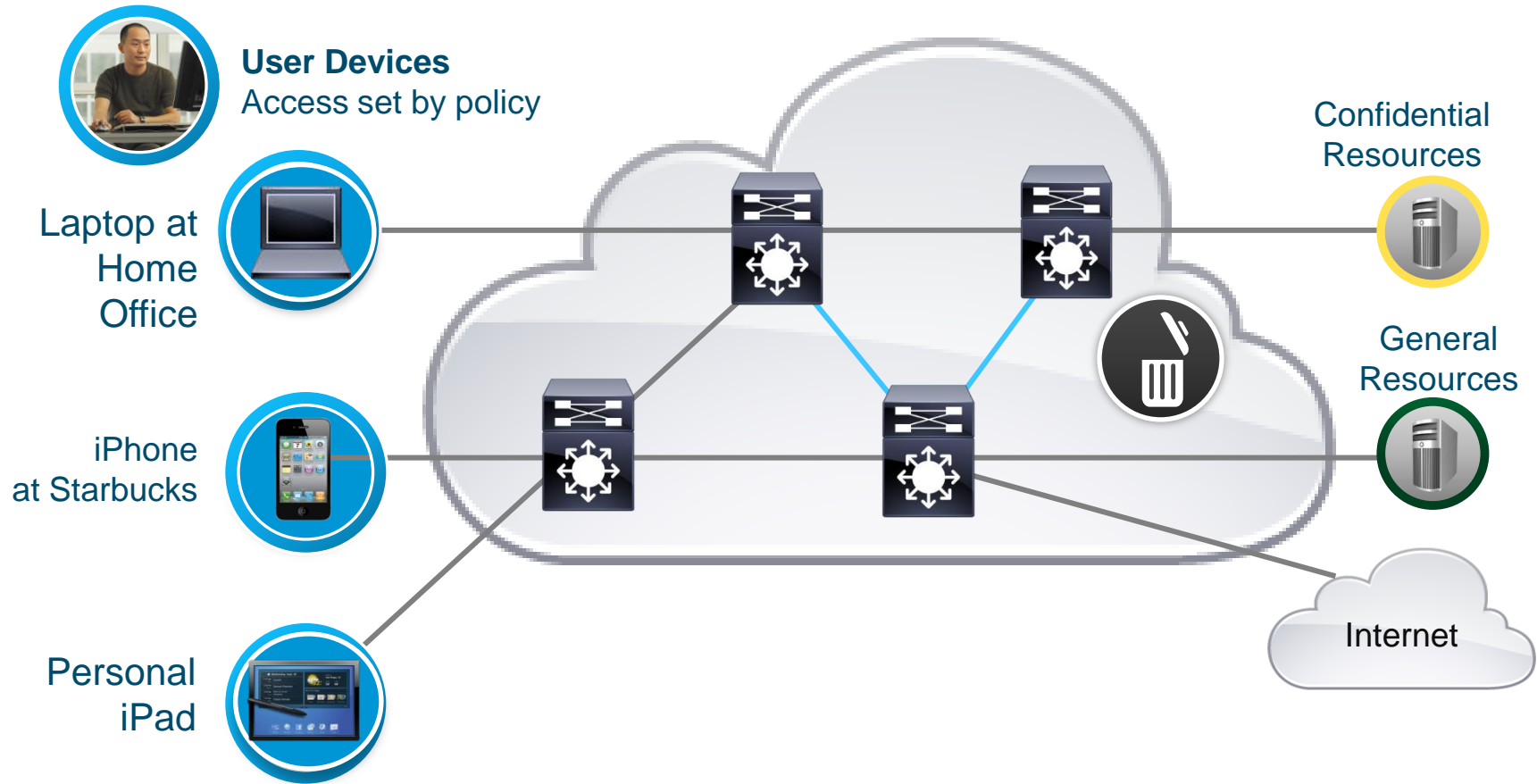
Application-aware routing, in-Band processing is a MUST



Secure Mobility

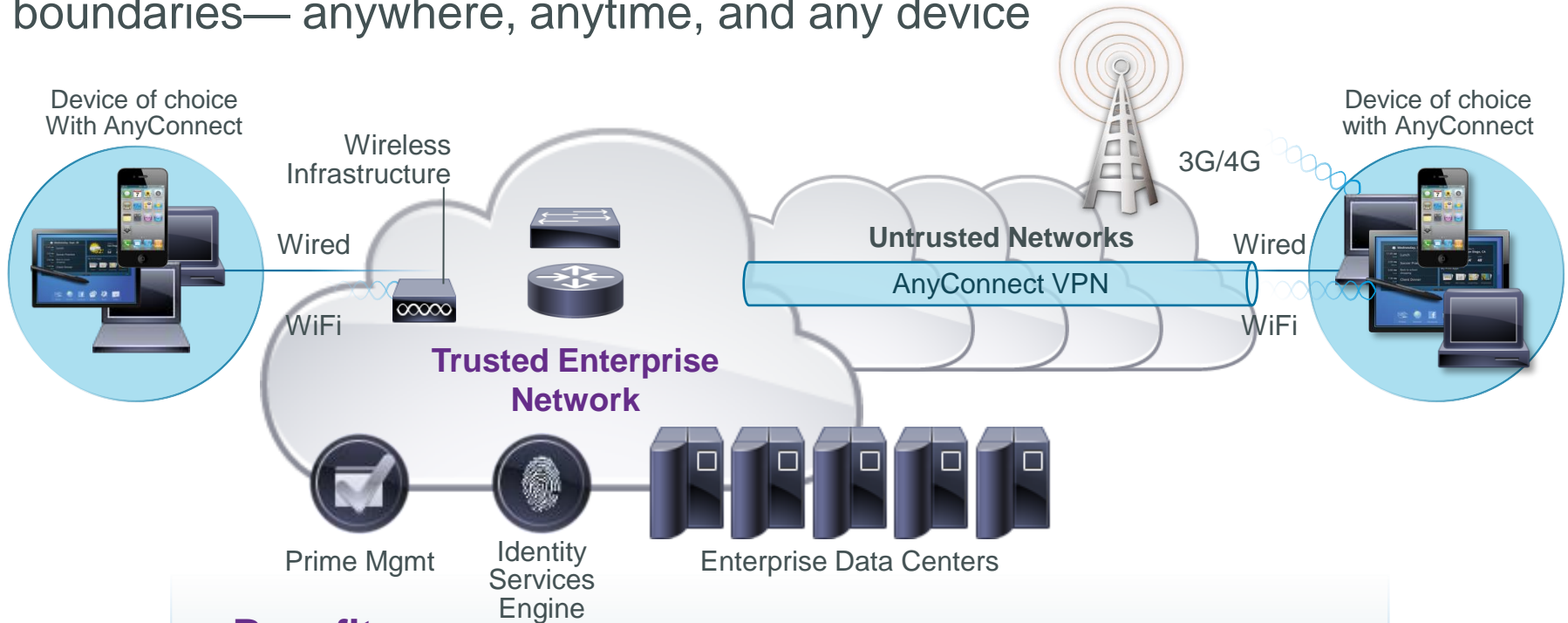


Secure Mobility in Everyday Life



Cisco's Secure Mobility Solution

Extend access to trusted networks and resources across untrusted boundaries— anywhere, anytime, and any device



Benefits

- Mobile users work easily and predictably, whenever and from wherever
- Network managers easily set policy and manage the network to allow secure access to the appropriate resources

Solution Products and Services

Cisco technologies provide best-in-class solution for users & IT managers



Cisco Core Network Infrastructure

Standard features contribute to Secure Mobility



Wireless Infrastructure & Services

Best-of-Breed Mobility Technology



Identity Services Engine (ISE)

Security & Policy Administration



Prime Network Management

Access Management for Wired and Wireless



AnyConnect Mobility Client

Secure, Consistent Access for Voice, Video, Data and Applications



Cisco Advanced Services

Secure Mobility Network Strategy and Architecture Workshop



Cisco Core Network Infrastructure

NetFlow

Traffic accounting and monitoring of packet flow on network

Embedded Event Manager

Powerful sub-system to provide real time network event triggers and automation



Application Visibility & Control

Intelligently apply policy to network traffic based on mission and business priorities

TrustSec

Security enabling features included in applicable Cisco products (802.1x, 802.1ae, SGT, etc.)



Cisco Secure Wireless



Mobility Services Engine

- Wired and wireless location tracking
- Open platform for wireless IPS and other software



Wireless IPS

- Detection of wireless anomalies, unauthorized access, and RF attacks
- RF environment awareness



Wireless Encryption

- Scalable
- Built into hardware
- WPA , WPA2 with AES



Optimal User Experience

- CleanAir
- ClientLink
- IPv6 support
- BandSelect
- VideoStream

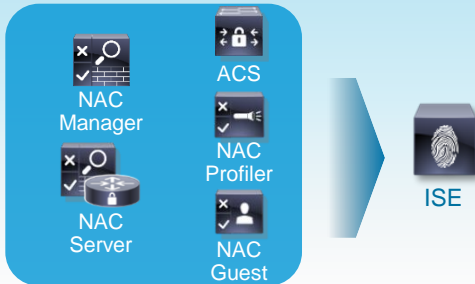


Cisco Identity Services Engine

Security & Policy Administration

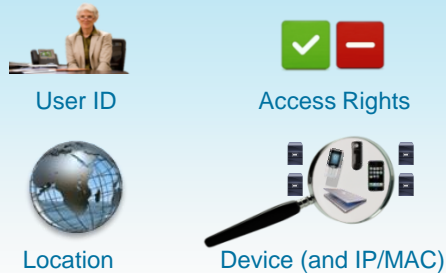


Consolidated Services, Software Packages



Simplify Deployment and Admin

Session Directory



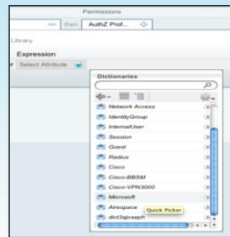
Tracks Active Users and Devices

Flexible Service Deployment



Optimize Where Services Run

Policy Extensibility



Link in Policy Information Points

Manage Security Group Access

SGT	Public	Private
Staff	Permit	Permit
Guest	Permit	Deny

Keep Existing Logical Design

System-wide Monitoring and Troubleshooting



Consolidate Data, Three-Click Drill-In

Single Unified Appliance to set, monitor and report on policy

Cisco Prime Network Management

Access Management for Wired and Wireless



- Prime Infrastructure – One Package for Lifecycle Management
 - All components to do lifecycle management for WLAN's, wired infrastructure and branches, in a single user interface framework
- Prime Assurance Manager
 - Correlated and homogenized information from many network instrumentation sources, including NetFlow, NAM, SNMP, and probes
- New Branch Network Management
 - Manage ISR G2 routers, Catalyst switches, and ASR 1000 in one workflow – included in Prime Infrastructure package



Prime Assurance Manager

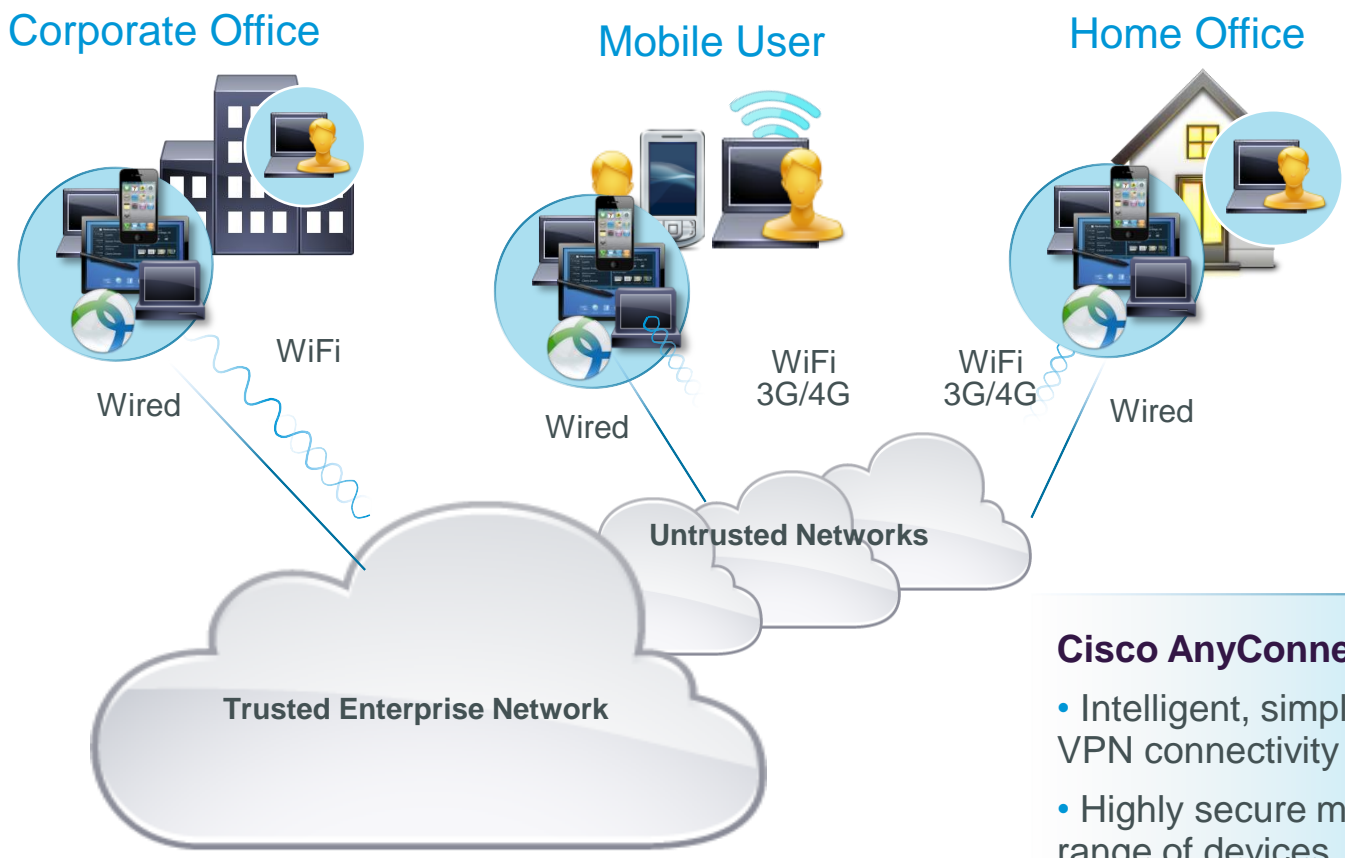
Prime Modules

- (NCS) Cisco Prime Network Control System
- (LMS) Cisco Prime LAN Management Solution
- (CM) Cisco Prime Collaboration Manager
- (NAM) Cisco Prime Network Analysis Module

Improved Network Visibility • Faster Troubleshooting • Eliminate Configuration Errors

Cisco AnyConnect Secure Mobility Client

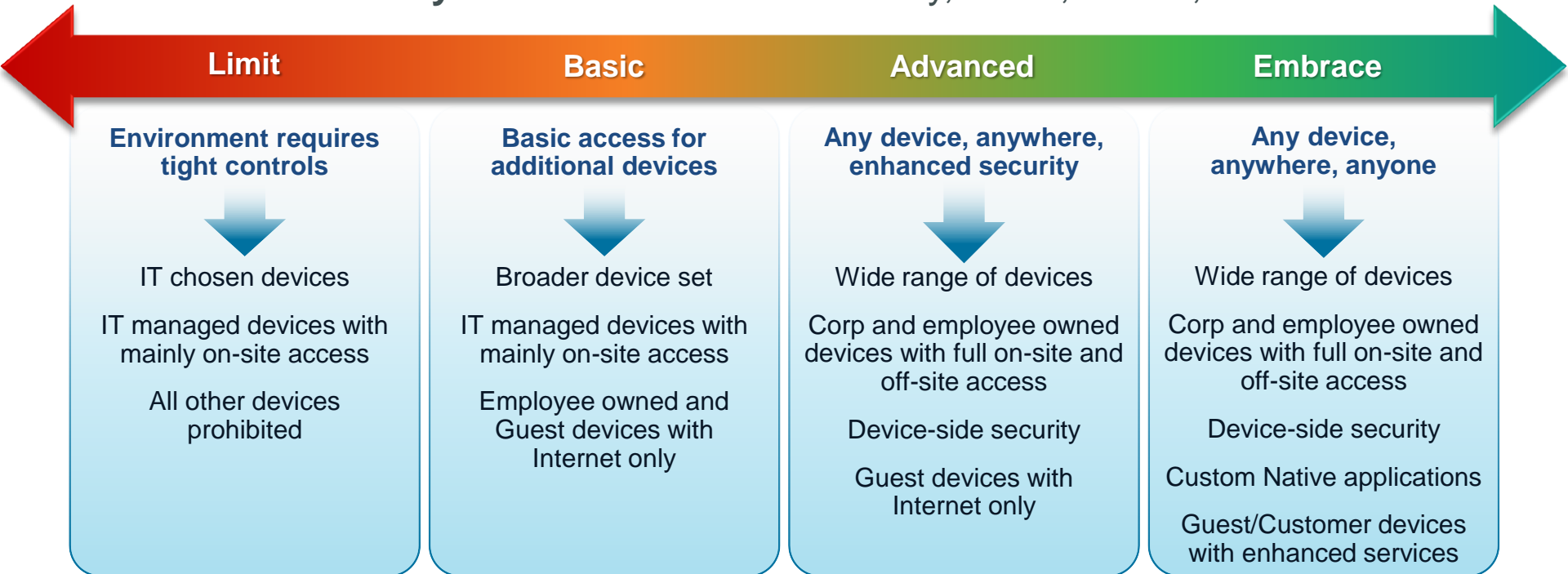
Secure, Consistent Access for Voice, Video, Data and Applications



- Cisco AnyConnect offers**
- Intelligent, simple, and always-on VPN connectivity
 - Highly secure mobility for wide range of devices

Spectrum of Customer Deployment Strategies

✓ Adoption Policy	Restrict, Limit, Allow, Embrace
✓ Device Ownership	Corp, Employee, Hybrid, Guests
✓ Support Model	IT Manage, IT Assist, Self-Supported
✓ Support Level	Production, Guest, Guest+, Best Effort
✓ Data Security	Written Policy, MDM, Virtual, Advanced



Future State: More Integrated Security



**CLOUD-BASED
THREAT INTEL
& DEFENSE
(SIO)**

ATTACKS

APPLICATION
REPUTATION

SITE
REPUTATION

MALWARE



**COMMON
POLICY,
MANAGEMENT
&
CONTEXT**

COMMON
MANAGEMENT

SHARED
POLICY

ROLES BASED
CONTROLS



**NETWORK
ENFORCED
POLICY**

ACCESS

FW

IPS

VPN

WEB

EMAIL

APPLIANCES

ROUTERS

SWITCHES

WIRELESS

VIRTUAL

VISIBILITY

CONTROL

Why Identity Is Important

1 **Authentication**

Who are you?
80% of supplementary methods authenticates the user

Keep the Outsiders Out

2 **Authorization**

Where can you go?
Based on authentication, user is placed in correct VLAN or given access to network resources

Keep the Insiders Honest

3 **Personalize the Network**

What service level to you receive?
The user can be given per-user services (ACLs today, more to come)

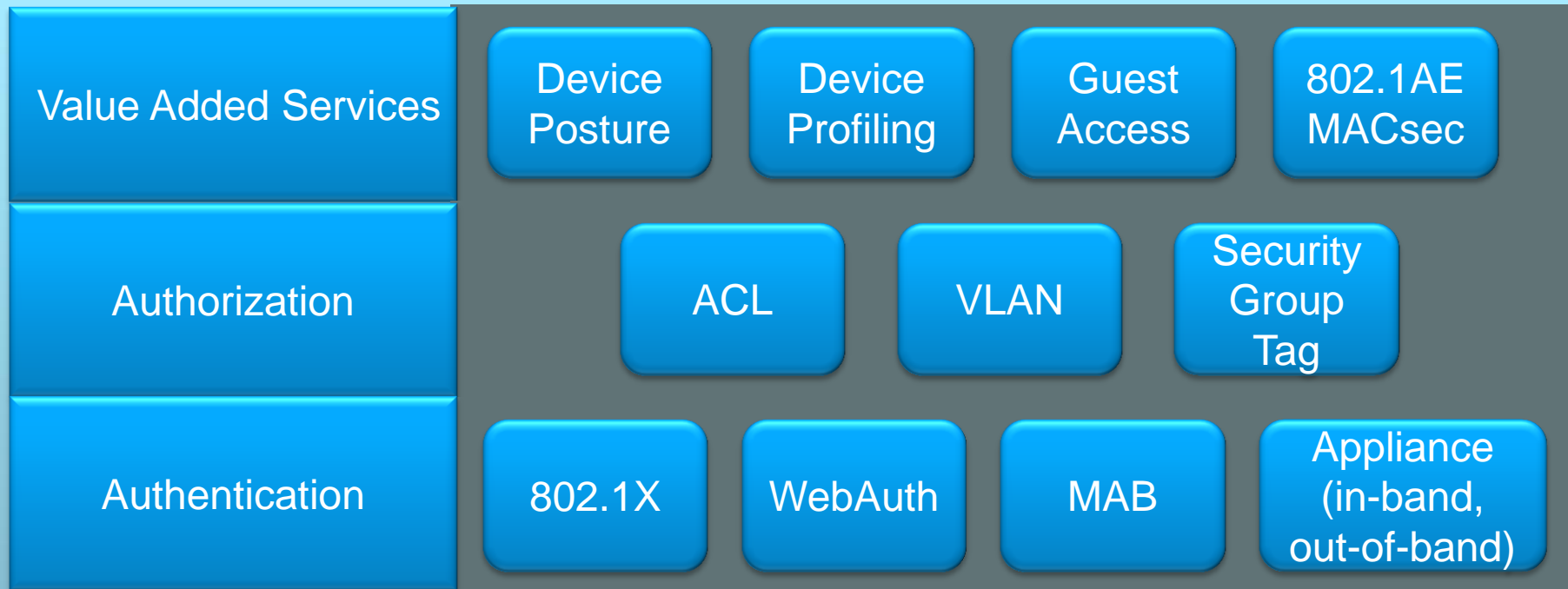
4 **Visibility/Accounting**

What are you doing?
User's identity and location can be used for tracking and accounting

Increase Network Visibility

Leveraging the TrustSec Architecture

Common Policy



Policy Driven Authentication & Authorization

Access Scenarios

Identity Information

Other Conditions

Authorization (Controlling Access)



Manufacturing Device,
Managed Asset



Security Camera G/W
Agentless Asset
MAC: F5 AB 8B 65 00 D4



Francois Didier
Corporate
HQ—Remote Access
6 p.m.

Group:
Manuf



Group:
Facility



Group:
Guest

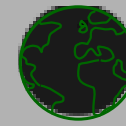


+

Time and Date



Posture



Location



Device Type



Access Type



Broad Access

Limited Access

Guest/Internet

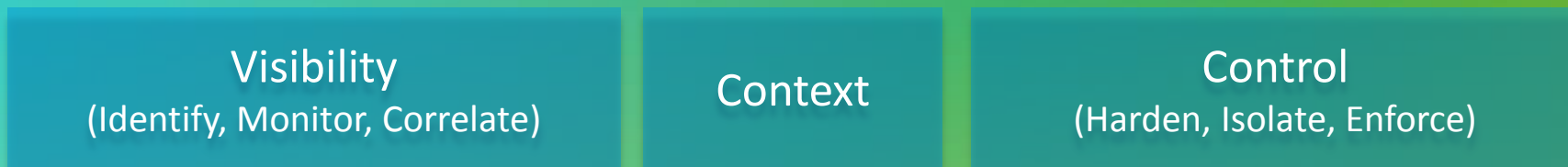
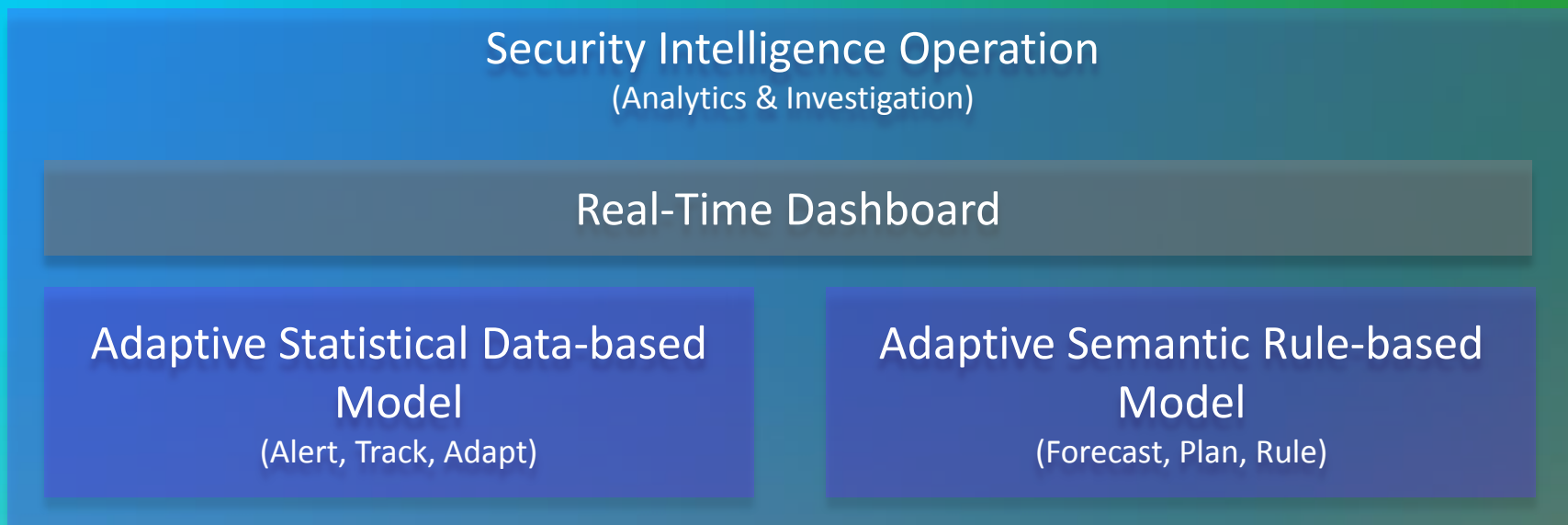
Quarantine

Deny Access



Track Activity for
Compliance

Visibility, Control and SIO



SIO

SensorBase

4 TB

DATA RECEIVED PER DAY

Dynamic Updates

6,500+

IPS SIGNATURES PRODUCED

30B

HTTP://

WEB REQUESTS

750,000+

GLOBALLY DEPLOYED DEVICES

3 to 5

MINUTE UPDATES

8M+

RULES per DAY

35%



WORLDWIDE TRAFFIC

100M



EMAIL MESSAGES

20+

PUBLICATIONS PRODUCED

200+

PARAMETERS TRACKED

Real-Time Dashboard

- Real-Time
- Informative
- Interactive

Cisco Security Intelligence Operations

Distributed Security Rules

Rule Name	Deployment Interval	Last Deployment	Deployment Status
Email: IronPort Anti-Spam	5 minutes	2012-11-29 17:11:00	Successful
Email: VOF	5 minutes	2012-11-29 17:09:56	Successful
Firewall: Botnet Traffic Filters (L4TM)	1 week	2012-11-22 17:17:31	Successful
IPS: Anomaly Detection	1 week	2012-11-24 00:56:58	Successful
IPS: Global Correlation	15 minutes	2012-11-29 17:01:54	Retry
Web: WBRS	5 minutes	2012-11-29 17:11:16	Successful
Web: Botnet Traffic Filters (L4TM)	5 minutes	2012-11-29 17:10:50	Successful
Web: Exploit Site Activity	5 minutes	2012-11-29 17:11:27	Successful
Web: Static URL Category	5 minutes	2012-11-29 17:10:05	Retry
Web: Dynamic URL Category	5 minutes	2012-11-29 17:10:29	Successful

Dynamic Security Queries

Query Name	Active Queries	Queries Per Day
Reputation	486,111	30,001,237,889

Threat Parameters Under Management

Parameter	Value	Coverage
IP Address Reputation	19,111,326	35.4% of corporate email
URL Reputation	160,003,103	99.9% of Active Servers Covered
Product Vulnerability	39,983	

Botnet Activity

Botnet	Time	Nodes Detected
Scribi	2012-11-29 16:18:28	303,791
Bobax	2012-11-29 16:49:43	181,929
Rustock	2012-11-29 17:01:36	151,024

Email Traffic Alert

IP Address	Vol.	Rep.
222.76.214.57	5.5	Poor
189.143.8.15	4.5	Poor
189.72.170.115	2.9	Poor
208.84.101.165	2.6	Poor
193.252.22.29	0.3	Good
212.214.213.238	0.3	Poor
76.162.254.116	6.9	Neutral
192.203.222.29	6.0	Neutral

Threat Correlation

Threat URLs

Web Server	IP Address	Rep.
www.brothersoft.com	68.26.180.23	Poor
www.rocketchdownload.com	38.102.53.137	Neutral
chennaiplus.net	208.113.167.238	Neutral
anroflighttraining.com	66.96.130.122	Neutral
tizytwtyvj.prv.pl	194.94.24.158	Poor
www.collegehumor.com	208.77.88.40	Good

Threat Rule Publication

Rule	Time	Platform
URL (insidevideo/exe\$)	2012-11-29 17:13:11	All Email Web IPS
CON (ch/gallery/\$\$\$/exe)	2012-11-29 17:13:16	All Email Web IPS
URL (insidevideo/exe\$)	2012-11-29 17:13:23	All Email Web IPS
URL (video/php\$)	2012-11-29 17:13:27	All Email Web IPS
MES (out/phon\$\$\$/bin)	2012-11-29 17:13:32	All Email Web IPS
URL (gallery/video/php\$)	2012-11-29 17:13:36	All Email Web IPS

Dashboard **SensorBase** **Threat Operations Center** **Advanced Protection**

- Automation
- Recommendation
- Robustness

Acknowledgement to Cisco SIO concept demo



Cisco Mobile Experience - CMX



What Is CMX?



ANALYTICS – Onsite, Online & Social

Connected Mobile Experiences

Leveraging Location-Based Services for Unprecedented Business Value



INDOOR GPS

- "Turn-by-turn" directions within venue to any location (departments, products, rooms, cafeteria, gift shop, ATM, etc.)



TARGETED MESSAGING

- Targeted personalized messaging based on customer location
- Location-based push notifications



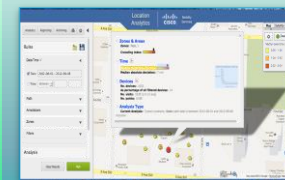
LOCATION-SPECIFIC ONBOARDING

- Targeted information for guests based on their location (captive portal)
- Automatically connect to the dedicated wireless SSID network



SYSTEM INTEGRATIONS

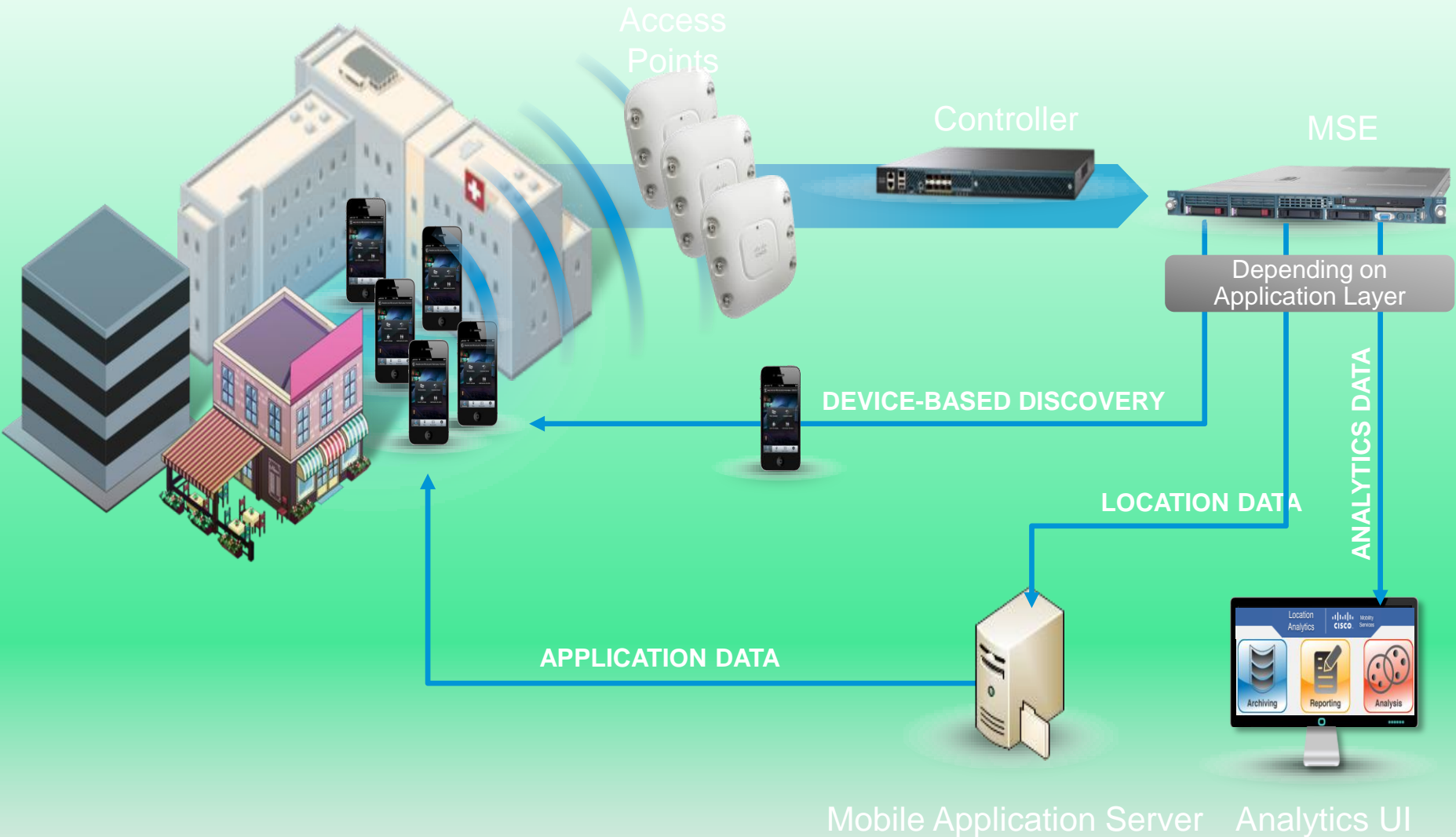
- Integration with systems including registration, property-management systems, product databases, and other location-based service applications



ANALYTICS

- Use gathered data to run reports and gain insight into online, onsite and social customer trends
- Analyze aggregate locations, URLs, and demographics

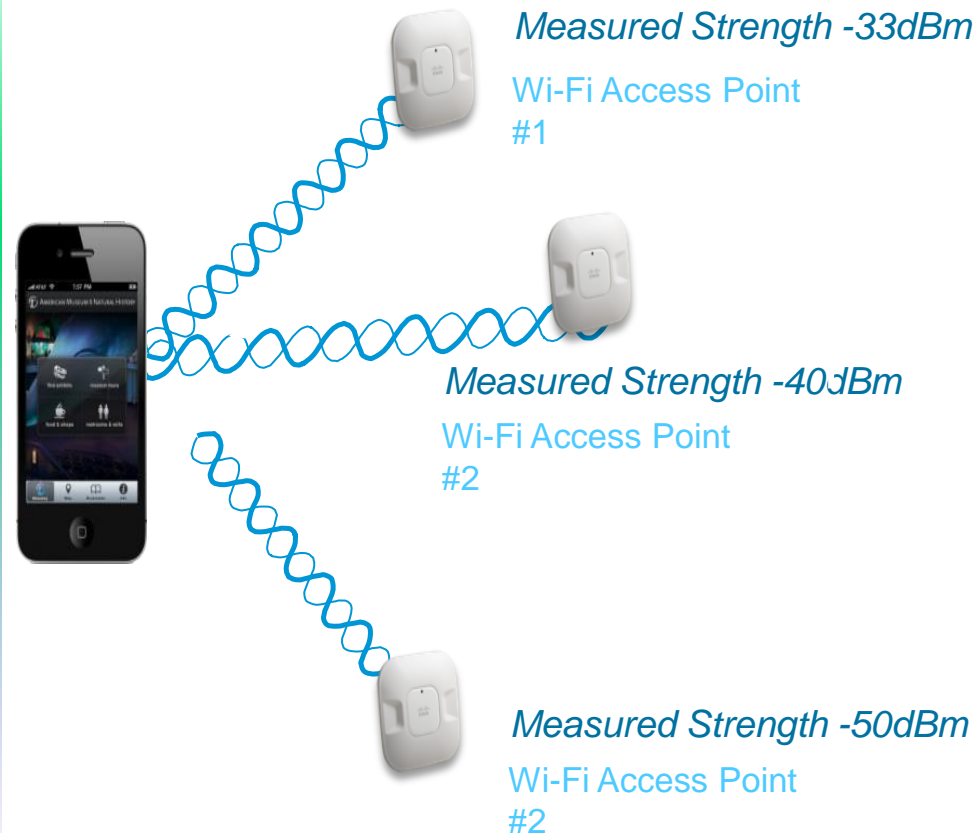
How Does CMX Work?



How Location is Calculated

Out of Data Path for Higher Scalability

1. APs detect signal strength from mobile device beacon
2. Signal strengths sent by Controllers to the Cisco MSE
3. RF fingerprinting / triangulation based on signal strengths; calculates device location



Connected Mobile Experiences

Solution Architecture



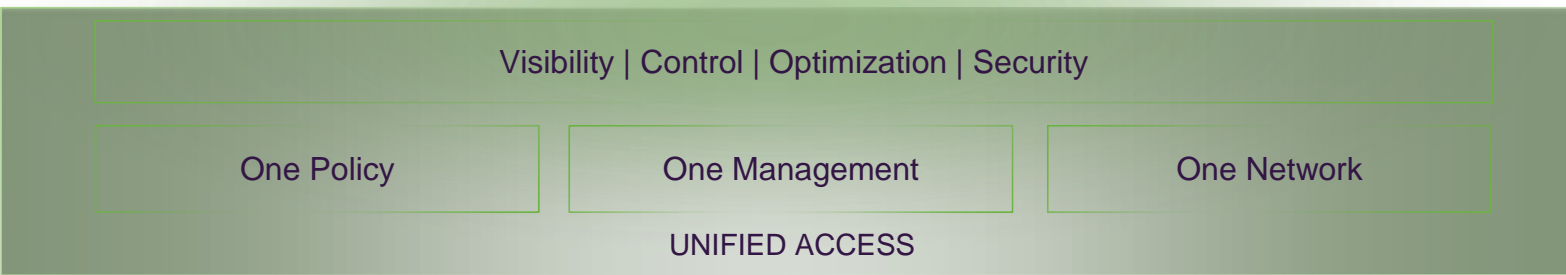
MOBILE APPLICATION SERVICES



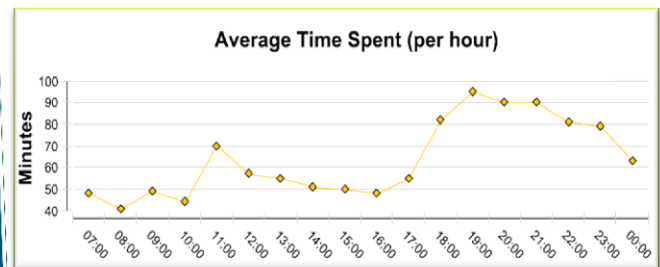
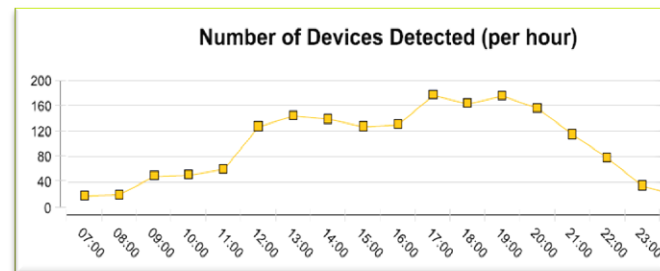
MOBILE NETWORK SERVICES



NETWORK ELEMENT LAYER



ThinkSmart Location Analytics



MSE

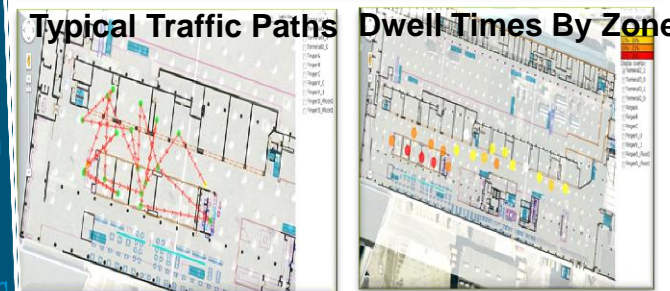
- Detects presence, locates & tracks

ThinkSmart

- Aggregates and enhances location data for Analytics and Reporting
- Classifies, groups into representative areas (cluster points) based on specified criteria
- Provides dwell time, crowding and other parameters in these representative areas
- Shows typical paths
- Shows breakouts of devices along alternative paths
- Threshold & Policy based alerting
- Reporting (rules engine)



Mobile Users



ThinkSmart Analytics

Improving Customer Experience through Location Analytics

ThinkSmart Location Analytics

Location Analytics | CISCO | Mobility Services

Analytics Reporting Archiving

Rules

Date/Time ✓

✓ Date: 2012-08-01 - 2012-08-05

Between

Filters

Analysis

Clear Results Run

Map Satellite Terrain

Devices

Number of devices

- 272 - 753
- 753 - 1234
- 1234 - 1716
- 1716 - 2197

Icon colors correlate to number of devices seen in this region

Filters and rules to select which data to view. For example narrowing the dates for the query.

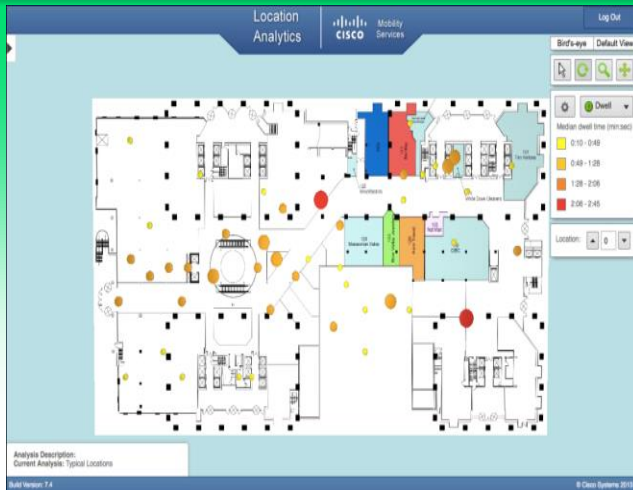
Different colored zones represent the different stores. Zones defined by user and multiple zones can be set within a store.

Map data ©2012 Google - Terms of Use Report a map error

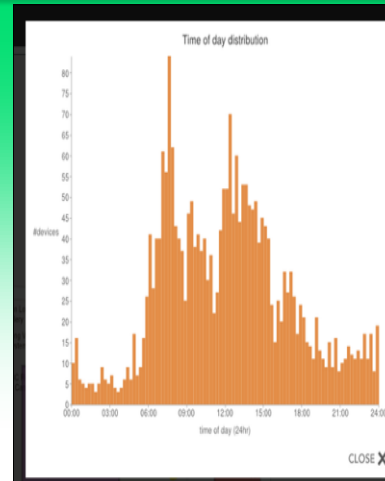
© Cisco Systems 2012

Analytics that Aid Business Decisions

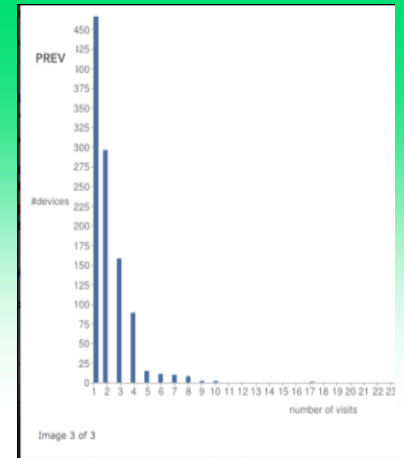
Which Area Did People Spend Time At?



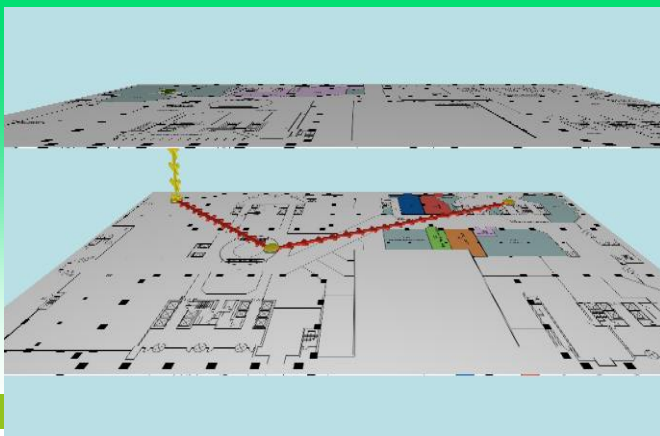
Peak Times in the Venue?



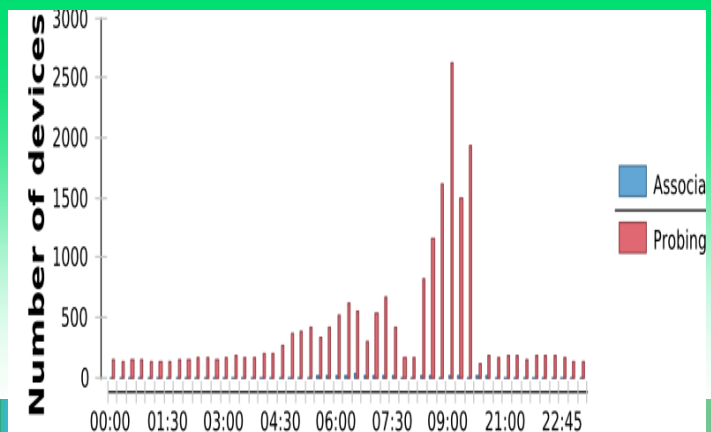
New or Repeat Customers?



Most Frequently Used Paths in the Venue



WiFi Stats: Associated vs Non-associated Devices



CMX Partner Ecosystem



Cisco and Ecosystem Partners Apps and Services

We've Only Just Begun ...



Solve Environmental Challenges



Thrive in Smart Communities



Live Enriched, Healthier Lives



Redefine Work Models



Focus on Improved Safety



Achieve Energy Efficiency

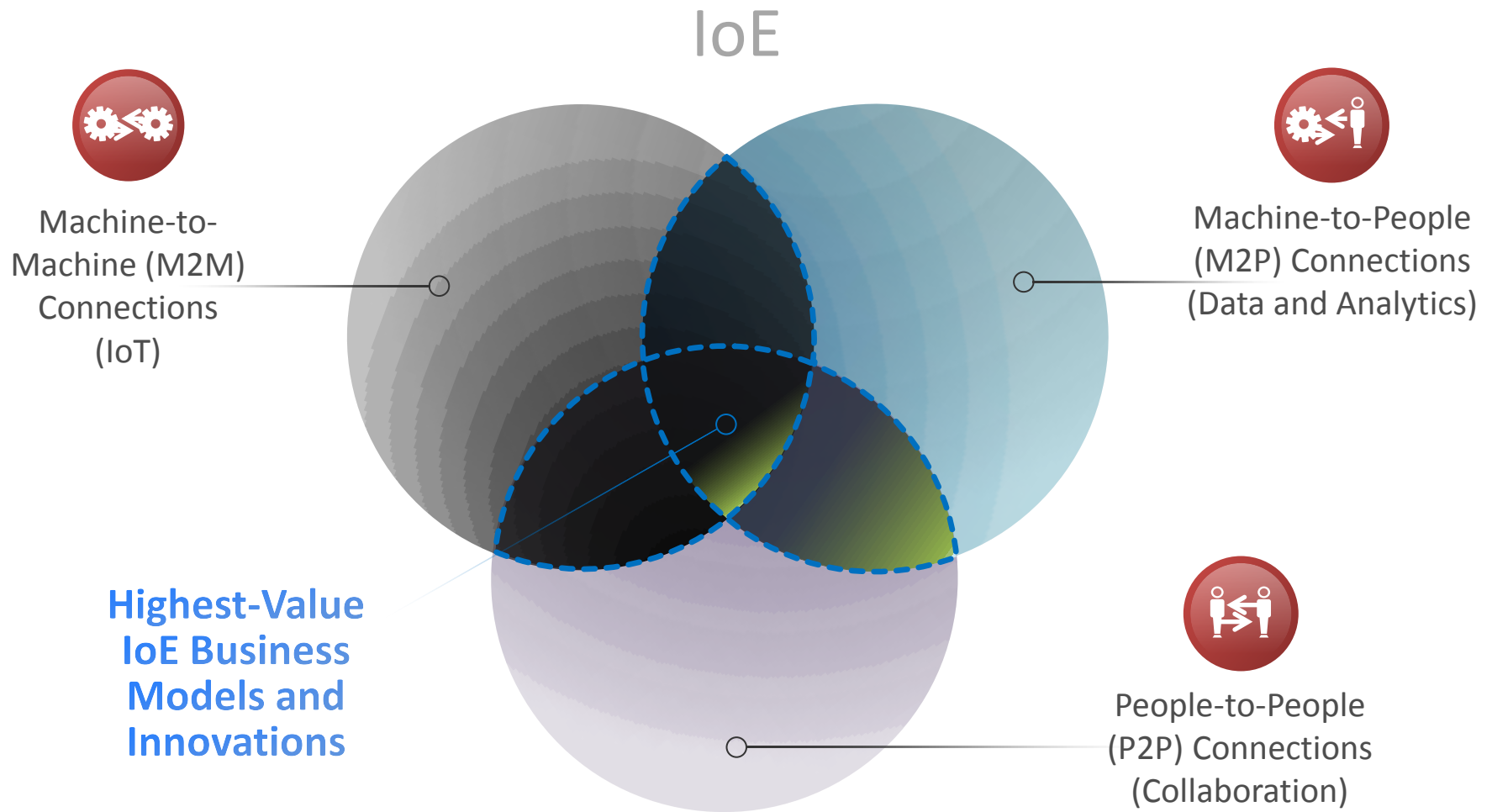
... to change the way the world works, lives,
plays, and learns



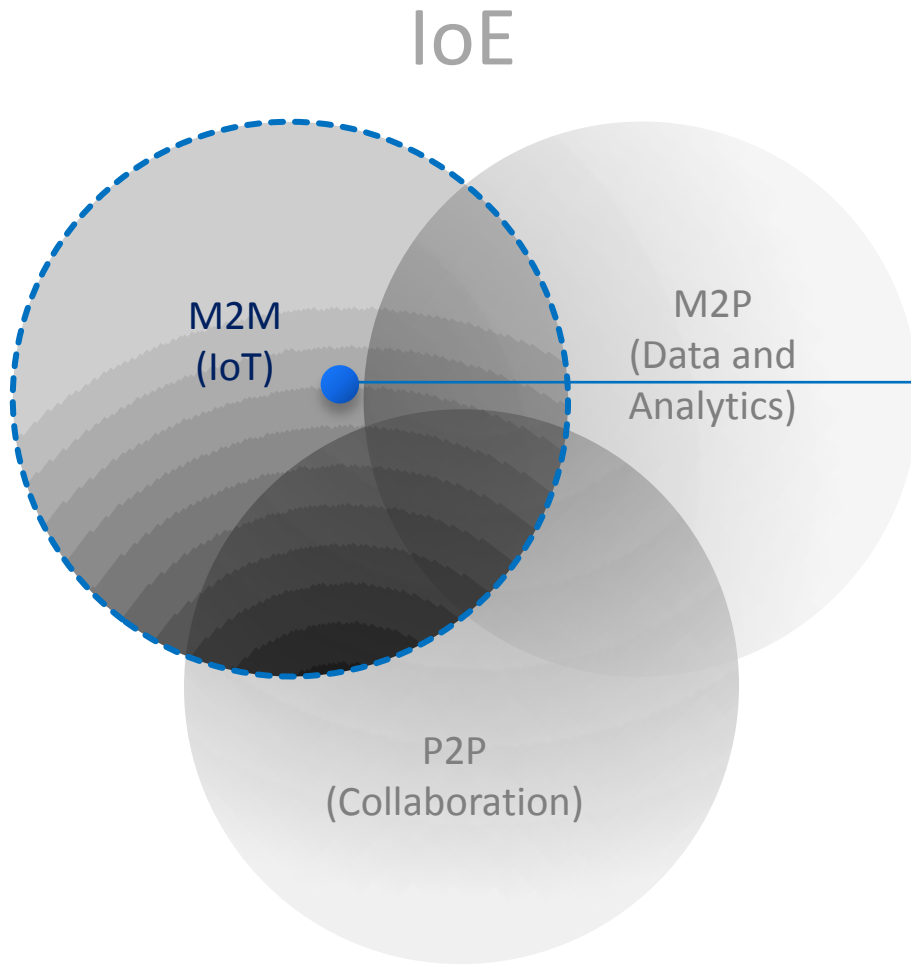
Thank you.



IoE: Connecting the Unconnected to Generate Business Value



IoE Value in Action: Using M2M Connections to Monitor Assets

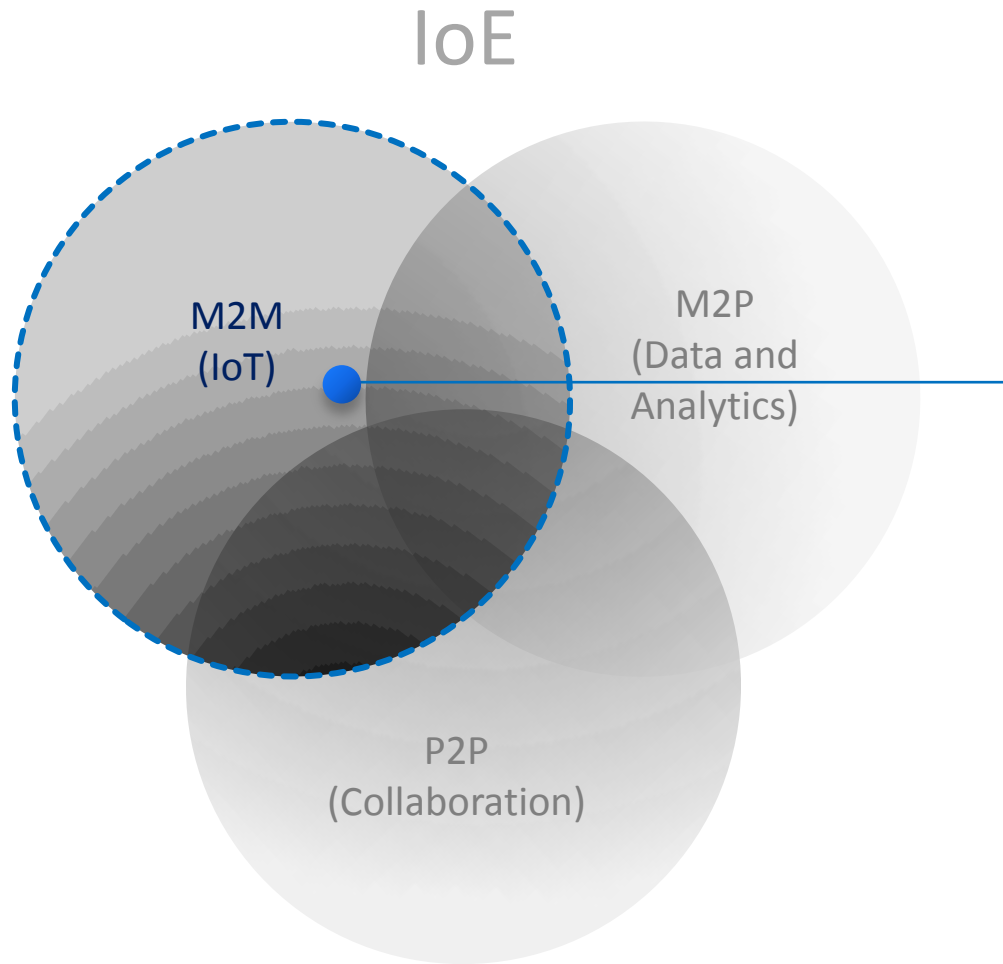


Asset Monitoring

Business Problems Solved

- Value from “lighting up” “dark” assets?
- What’s their condition?
- Are they secure?

Asset Monitoring: Tire Manufacturer Increases Efficiency With Real Time



Challenge

- Increase production and efficiency in its North America manufacturing plant

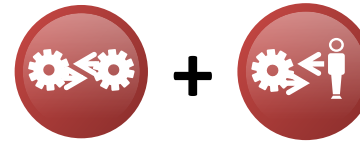
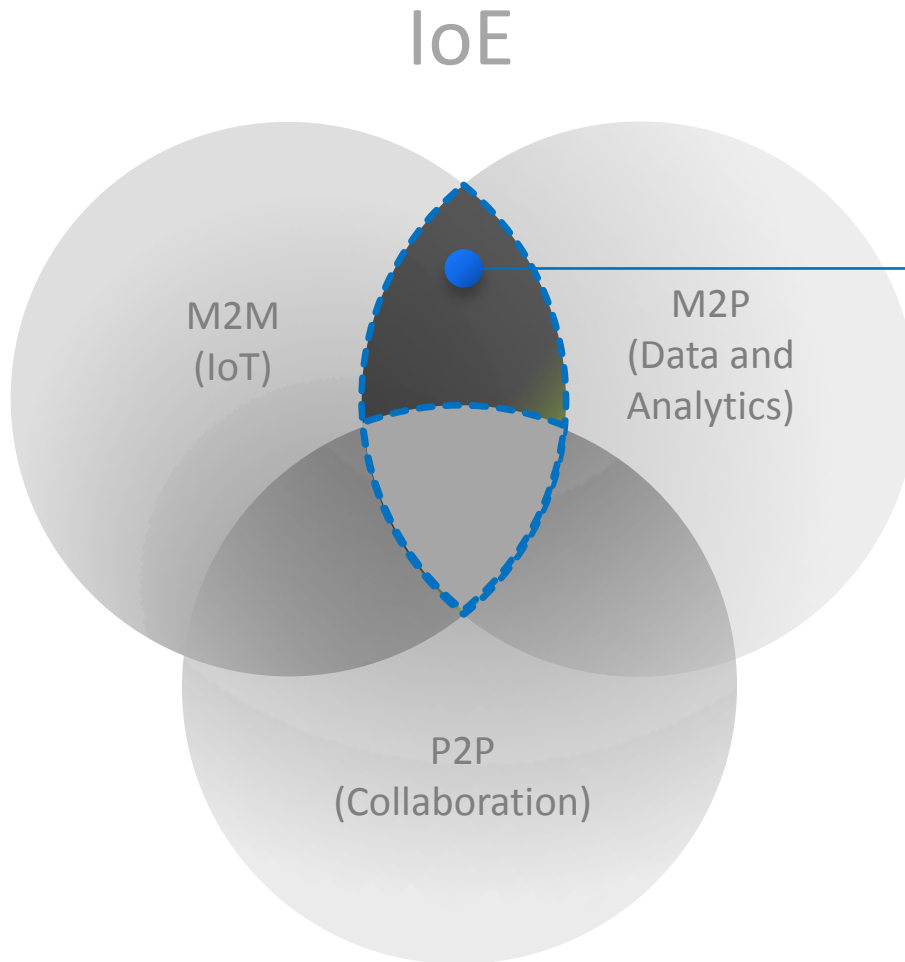
Solution

- Use **RFID sensors** to monitor production inventory on plant floor

Business Value

- Reduced production delays
- Real-time inventory visibility on plant floor
- Cut lost inventory by 20%

IoE in Action: Combining Connections for Greater Value

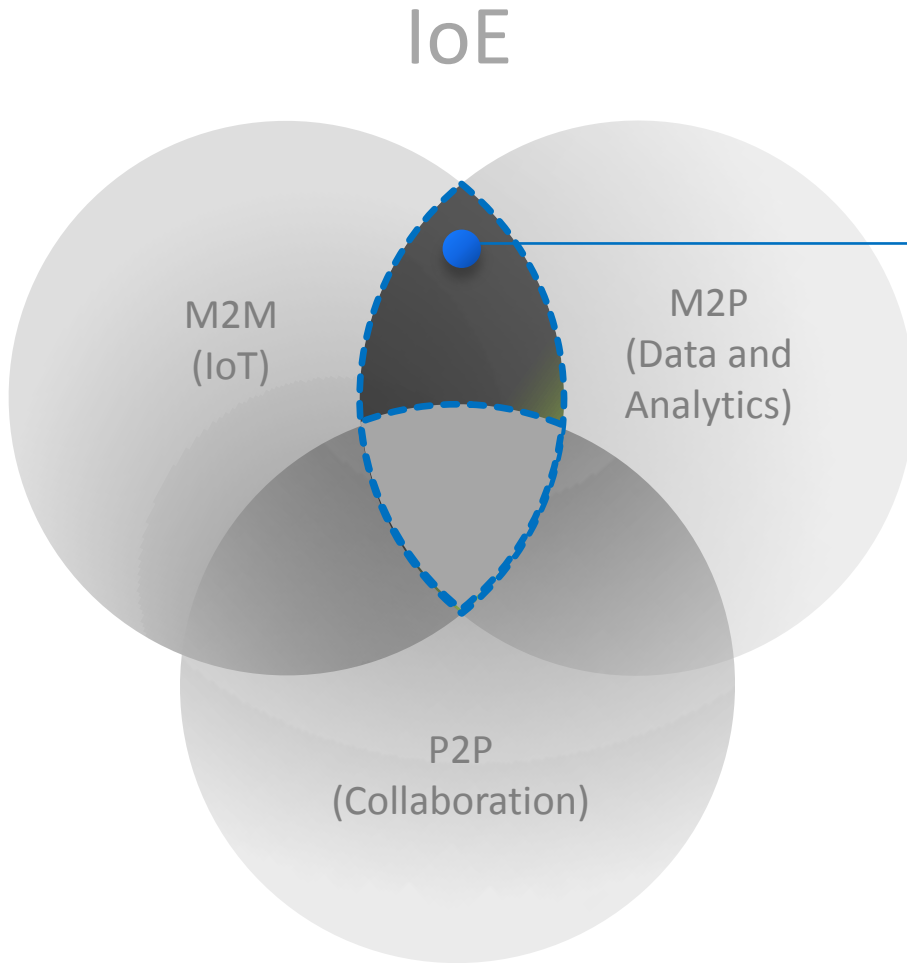


Predictive Monitoring

Business Problems Solved

- How can I maximize the productivity and availability of my assets?
- How can I prevent disruptions in the production/availability of my products and services?

Predictive Maintenance: Rail Road



Challenge

- Prevent train derailments, which cause delays and millions in damages

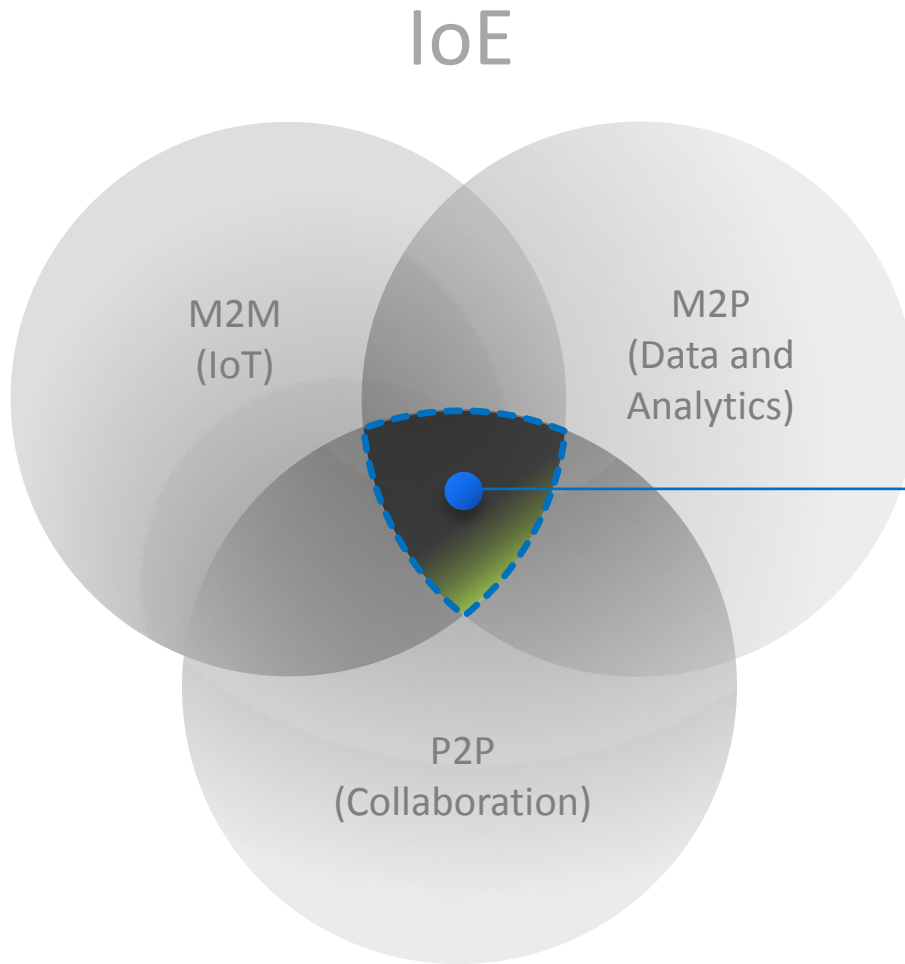
Solution

- Placed **sensors** every 20 miles of track check for overheating
- **Data analytics** predict which wheels need repairs, alert driver

Business Value

- They cut bearing-related derailments by 75%

IoE in Action: Enabling New Business Models Through Multiple Connections

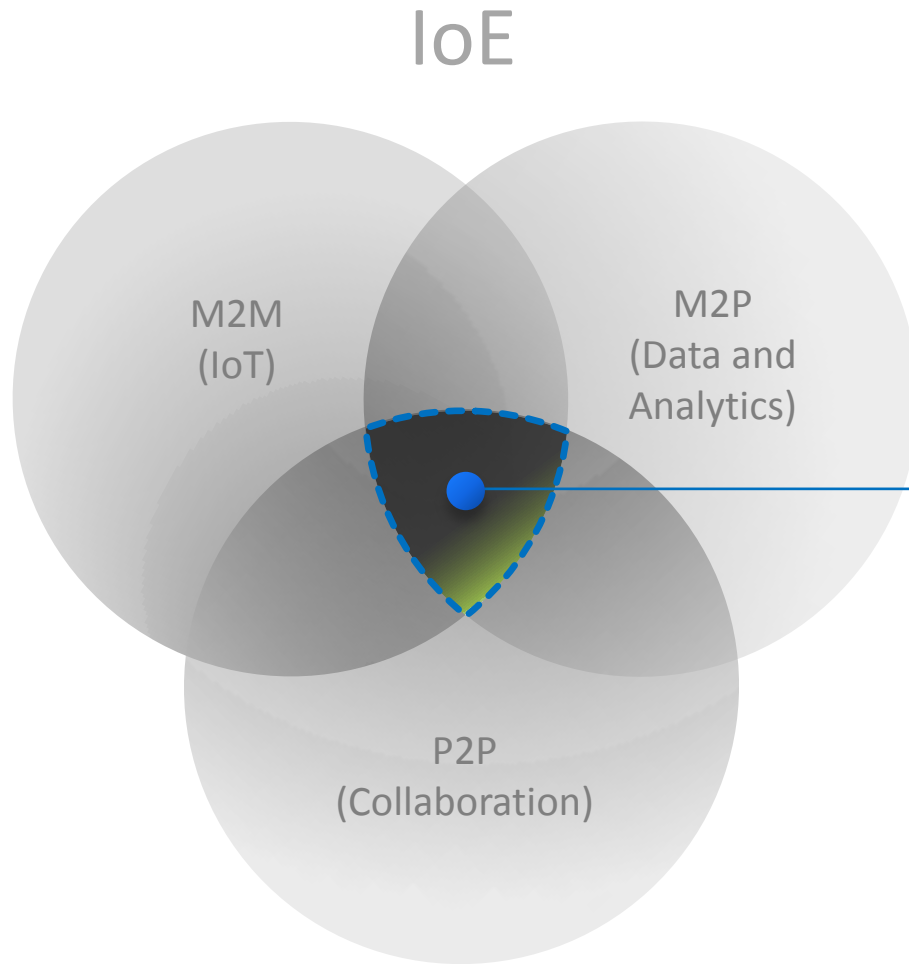


Turning Products Into Services

Business Problems Solved

- How can I differentiate myself from competitors?
- How can I create new ways for customers to consume my products and services?
- How can I turn the purchase of a product into an annuity revenue stream?

Capital Equipment-as-a-Service: Aircraft Engine Manufacturer



Challenge

- Create new business model for selling and maintaining aircraft engines

Solution

- TotalCare service for aircraft engines combines **sensors**, **predictive analytics**, and **collaboration**

Business Value

- 73% of RR's civil aircraft engines, and 92% sold to airlines, now covered by TotalCare