

IoT Transformation in Healthcare

AVNET[®]
Reach Further™



About Avnet

We design, make, supply & deliver technology solutions

We work with customers of every size, in every corner of the world

15,000+

Employees
worldwide

2,500+

Engineers around
the world

1M+

Engineering
community members

2.1M

Customers in
140+ countries

1,400+

Technology
suppliers WW

122B

Units shipped
annually



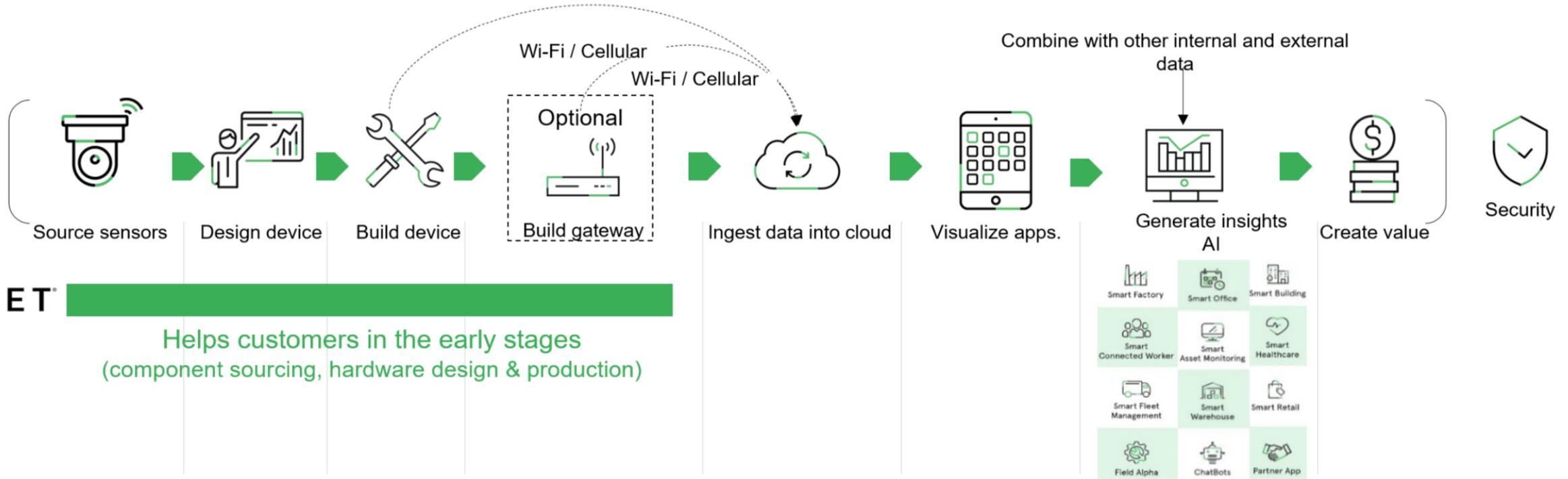
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Locations across the world

We guide today's ideas into tomorrow's technology

AVNET

Avnet a one-stop-shop for IoT



AVNET

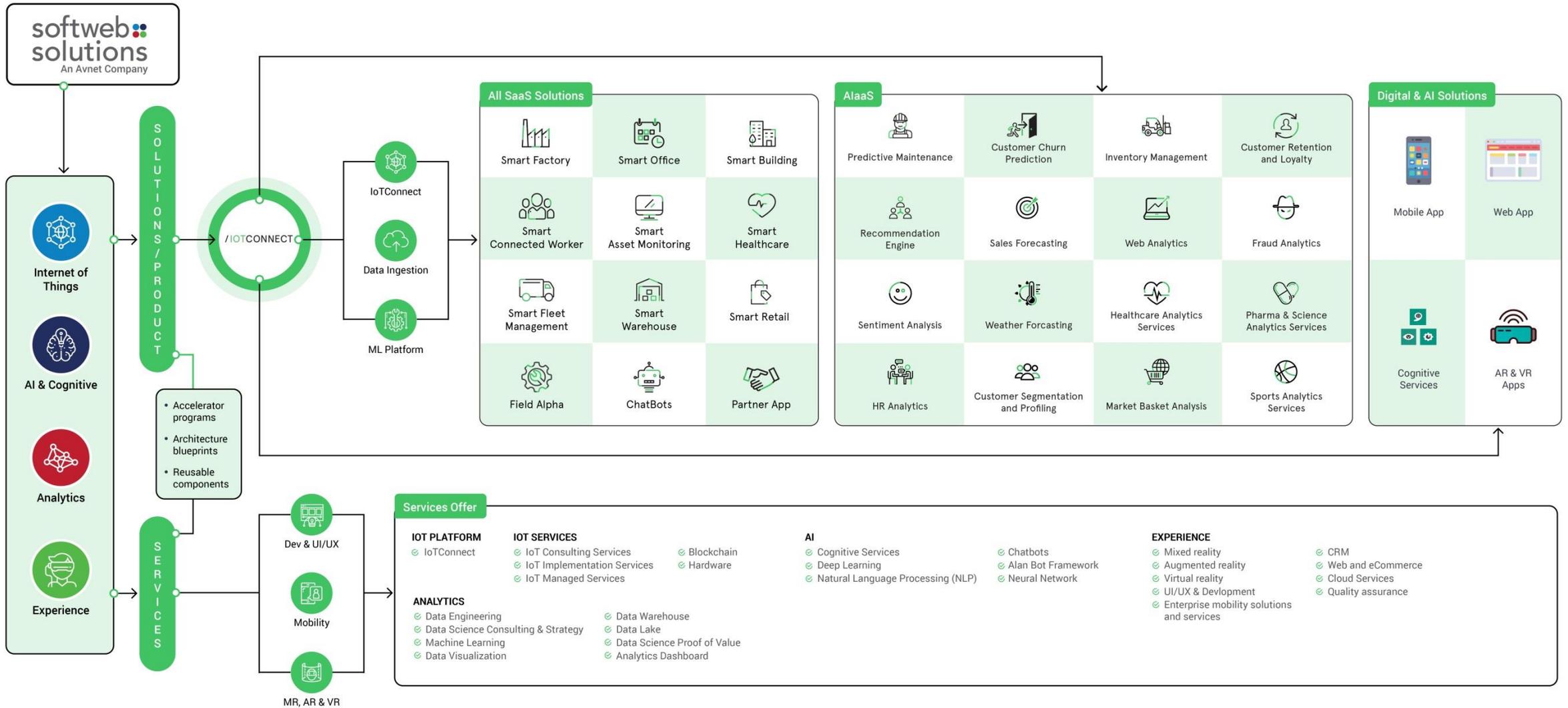
Helps customers in the early stages
(component sourcing, hardware design & production)

AVNET^{ISS}

Helps customer connect devices to the cloud
Generates insights through apps & AI

Customers can now come to Avnet for end-2-end capabilities to deliver actionable business insights

What we do



IoTConnect[®] capabilities and offerings

IoTConnect® capabilities and offerings

Avnet's IoT solution for the healthcare sector allows healthcare facilities to

- Improve the care quality
- Reduce overall expenditure
- Generate new revenue opportunities

Three key areas with which Avnet can help healthcare system integrators:

1. Remote patient monitoring systems
2. Healthcare facilities management
3. Inventory management in hospitals



Remote patient monitoring system

IoT building blocks in healthcare

- Cloud computing to process and derive useful information for caregivers
- Web and mobile applications for meaningful representation of data and decision making

Innovative IoT products and solutions for the modern healthcare industry

- Pre-screening
- Mass screening
- Testing for Covid-19
- Test kits monitoring
- Early warning systems
- Patient monitoring systems





Smart Healthcare

Remote Patient Monitoring and Clinical trials for COVID-19



A clinical research organization needed a more efficient way to manage clinical trials. By implementing Avnet's Smart Healthcare solution, they were able to use connected medical devices and wearables to increase staff productivity, get more accurate data, and make the process safer and more convenient for patients.

ENHANCED STAFF PRODUCTIVITY
Staff can remotely monitor and manage all active trials in real-time from a central dashboard.

INCREASED PATIENT SAFETY
Integrated patient safety monitoring provides real-time data on feedback, vitals, and side effects.

HIGHER PATIENT SATISFACTION
Make trials more convenient for patients with automated medication reminders and the ability to participate from remote locations.

REDUCED TIME TO MARKET
Faster, more efficient trials help you speed innovation and get new medications and equipment on the market more quickly.

Use Case: IoT-enabled devices in Healthcare

Finger cuff measures vital signs

Non-invasive, measures 6 vital signs in 3 minutes, including

- Blood pressure
- Respiratory rate
- Temperature
- Heart rate
- Spo2 (oxygen saturation)
- Heart rate variability

Role of IoT products and solutions

- Electrical & mechanical products
- Mobile and web applications
- IoTConnect platform

Impact on customers

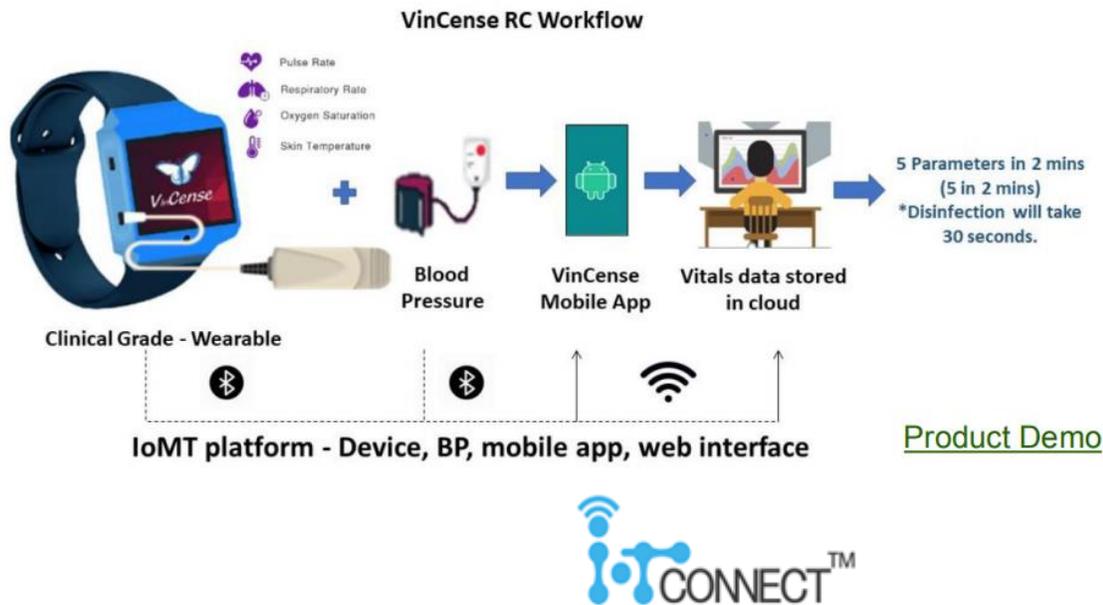
- Personal, mobile, non-invasive
- Measure vitals with a single device / form factor



IoT-enabled Devices in Healthcare - Use Cases

VinCense remote patient monitoring

- Transforms healthcare delivery and management



Key components

- VinCense wearables
- Mobile applications
- BLE devices
- EMR
- WiFi/Data
- VinCense Web interface
- IoT platform for rich insights

Key features

- Real-time notifications and SMS alerts
- Emergency assistance sought
- Automated collection of vitals periodically
- Offline data logging
- Pain management
- Remote monitoring

Use Cases of Vincense

Smart Health Passport

Wireless Home Monitoring (more effective)



VinCense COVID-19 Risk Detection Protocol (CRDP)	VS	IR Thermometer
✓ Respiratory rate		✗
✓ Oxygen Saturation		✗
✓ Pulse rate		✗
✓ Skin Temp		✓
✓ Clinical grade accuracy		✗
✓ Real time health surveillance		✗

VinCense COVID-19 Risk Detection Protocol	VS	Fingertip Pulse Oximeter
✓ Respiratory rate		✗
✓ Oxygen Saturation		✓
✓ Pulse rate		✓
✓ Skin temp		✗
✓ Clinical grade accuracy		✗
✓ Real time health surveillance		✗

Avnet COVID-19 Self Test System Overview



Wellue OxySmart™
Fingertip Pulse
Oximeter

Easy to use Mobile application for users and a clinical portal running in Azure cloud



The Solution: Door Access Product

- Face Recognition & Face Mask Detection Algorithm
- Thermal Imaging Body Temp Detection
- Integrated Antibacterial Touch Screen Display

Avnet's Role

- Design & prototyping
- IoT Connect Certified (In-Progress)
- Supply chain

Impact to Customer

- Completes Face Recognition and Body Temp Detection in Seconds
- Integrated Touchless Sanitizer



CareSpace Health Band

Developed SDK for corporate branded experience

- iOS, Android and Apple Watch App experiences

Edge Detection & User enabled health anomaly compliance

Skin Detection with Ambient temp algorithms



CareSpace



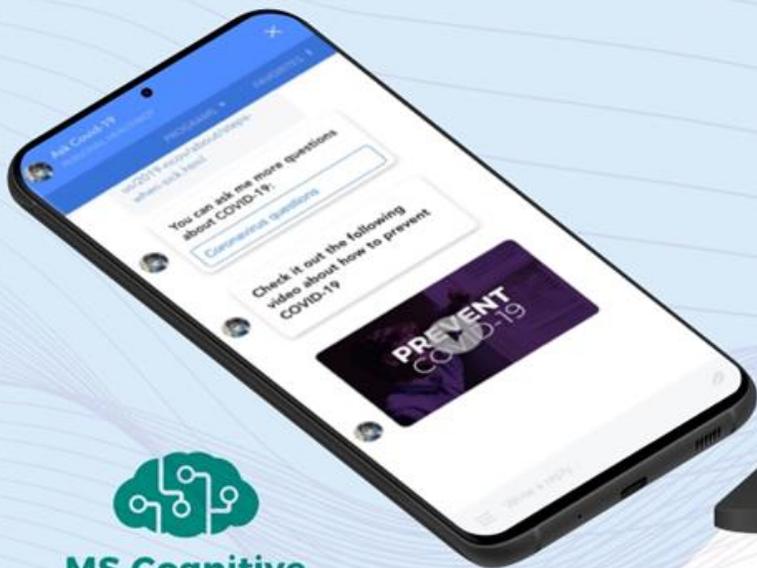
MS Teams



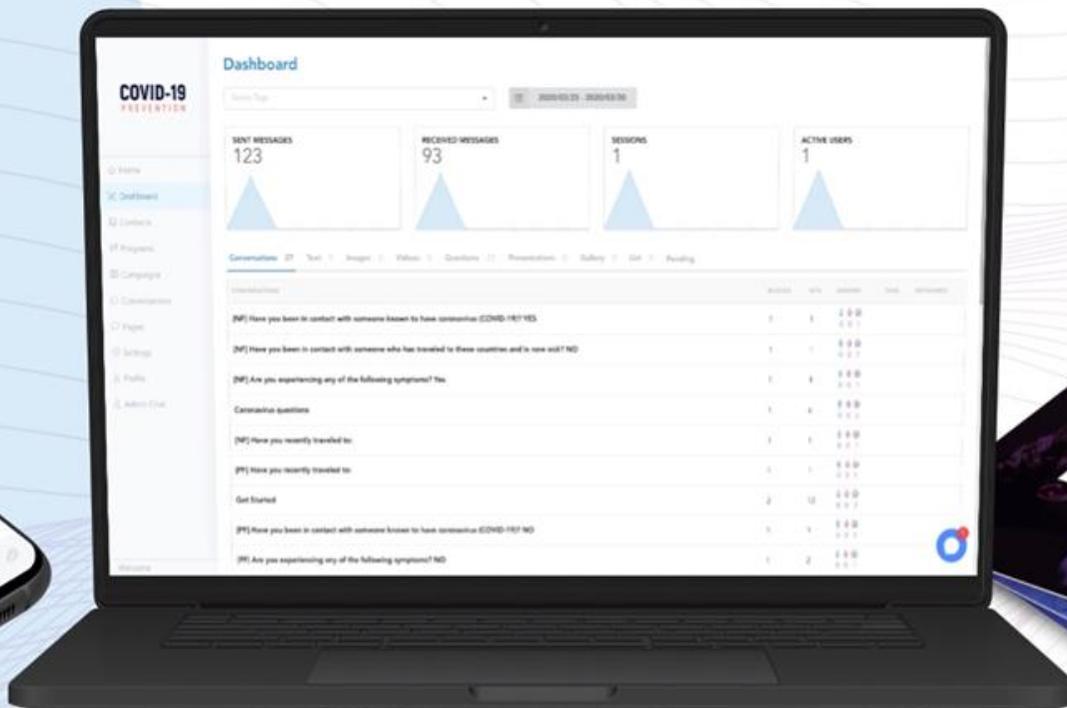
Botkit



IoT Hub



MS Cognitive Services



Sentinel



Azure Key Vault



Azure Alert



ACR



AKS



Azure SQL Database



Azure API for FHIR



Azure Security Center



Azure Monitor



Log Analytics



Cosmos DB



Function App



Event Hubs



Storage (Azure)



Cosmos DB



IoT Hub



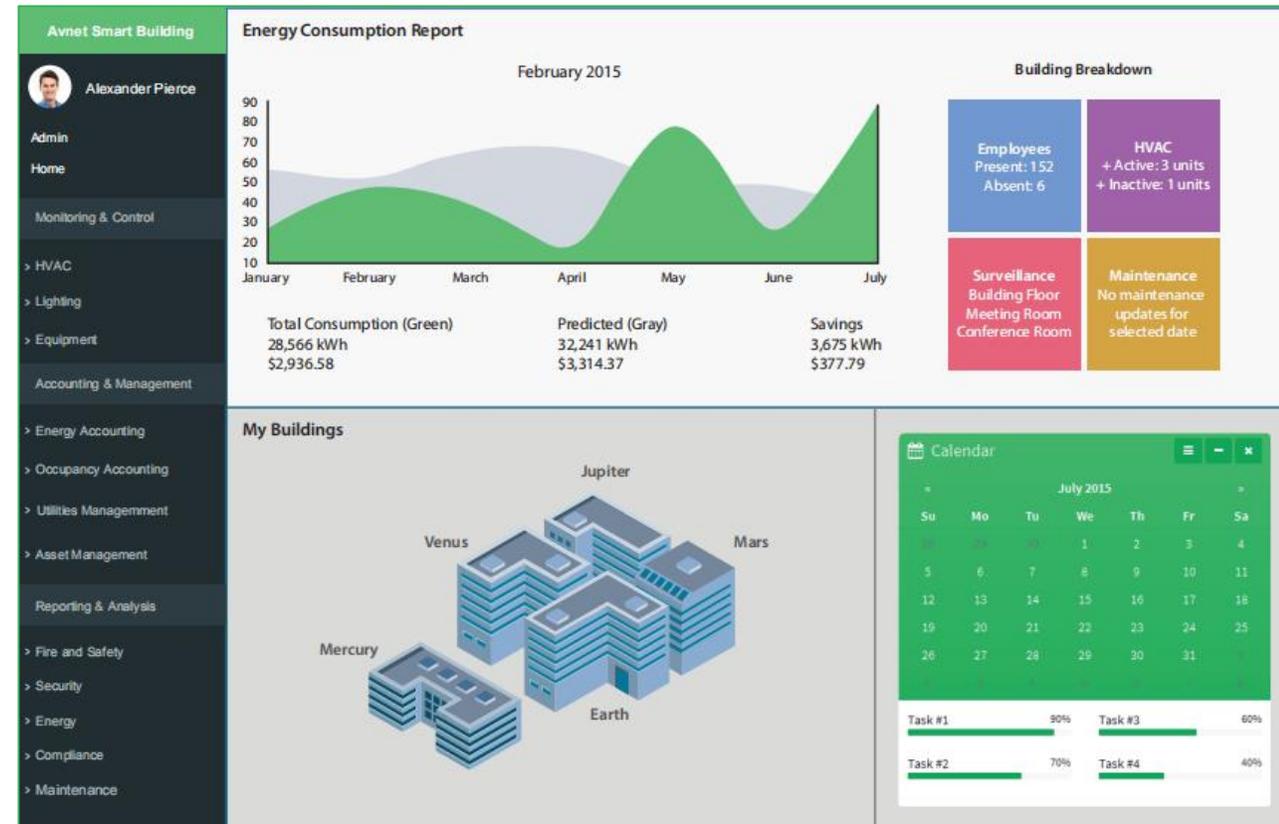
Function App

CONNECTED DEVICE ECOSYSTEM

Smart Facility for Healthcare

Avnet's IoTConnect Platform can help SIs to build smart solutions, which includes:

- **Sensor control and monitoring** – Interconnected sensors provide control and analysis
- **Extend the healthcare facility's safety** – Enable authorized personnel to react quickly to safety events
- **Customized software** – Scenario-based sensor control decreases energy consumption
- **Secure doors and gates** – Role-based access ensures optimum security
- **Eliminate human monitoring** – Maintenance alerts, service schedules and fault detection



Setting up a smart factory for leading pharmaceuticals

IoTConnect helps Intas build a smart factory. This results in centralized remote management, predictive analytics, real-time telemetry & analytics along with performance anomaly diagnosis.

The solution is also Title 21 CFR Part 11 compliant.

Hardware connected to IoTConnect

PLCs and HMIs - The first phase was connecting 74 PLCs. This included PLCs of major brands such as -

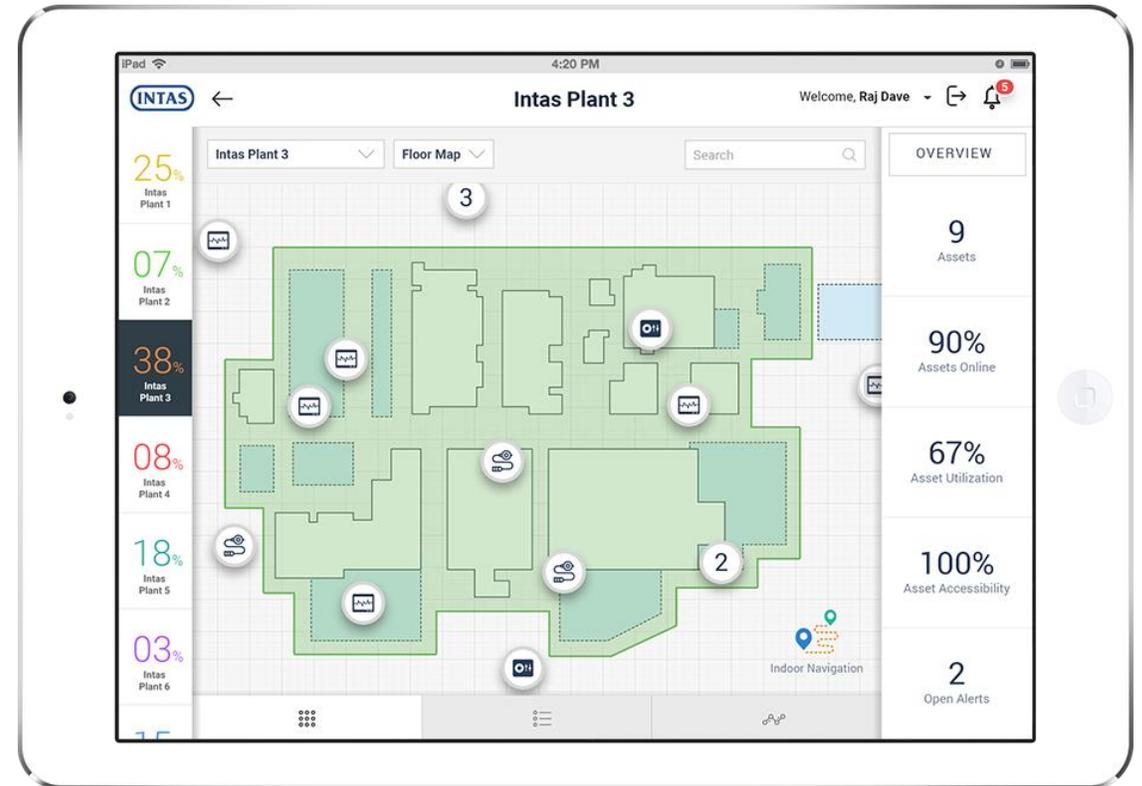
- Panasonic
- Siemens
- Mitsubishi
- Allen-Bradley
- Omron

Data Acquisition Hardware

- Masibus MINT Communication Processor (Data Connector)
- Masibus MINT Intelligent Digital and Analog I/Os (I/O device)

IoT Gateway

- Dell Edge Gateway 3003



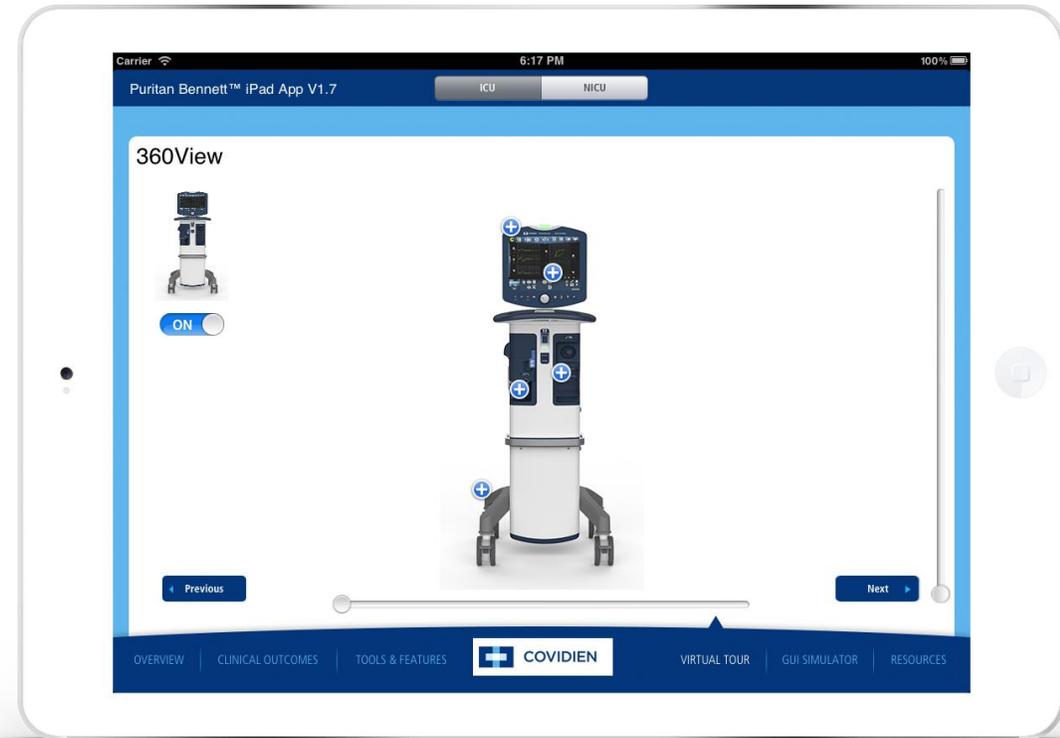
An iPad app that helps a medical devices company market its ventilator machines



Covidien needed an effective iPad application which displays the various features of the ventilator machine. The iPad solution built on Azure created by us highlighted the ventilator's features which helped the client's marketing professionals in creating good presentations to their potential customers.

Key Features:

- Provides 360-degree view of the ventilator system which is helpful in marketing it.
- Users can view information related to different positions of the ventilator.
- Displays all the information about the ventilator system and its features.
- Users can view as well as send product information files via email.



Inventory management for pharmacies with IoT

Managing pharmaceutical inventory is critical.

Key challenges:

1. Lack of well-designed information system
2. Medicine stock management
3. Customer safety

IoT-based sensors can be deployed:

1. At the main entrance
2. In medicine stock chambers
3. For coolers and HVAC
4. At billing counters

Solution:

1. Reduce overheads and improve productivity
2. Enhance customer's experience
3. Ensure higher safety



IoT-based pharmacy solutions

1. At the main entrance

Magnetic sensors

- Monitors the number of times the main door opens/closes
- Whether the door is kept open for a long time
- Sends alerts if doors are kept open for long
- Also monitors open-check the customer temperature/closing of refrigerator doors

Temperature monitoring module

- Monitor customer's body temperature in COVID-19 era
- A green light turns on up if the temperature is normal
- A red light turns on if the temperature exceeds a threshold level
- Notifies the staff inside the premises of such visitor

2. In the medicine stock chamber

Smart sensors

- Medicine stock chamber consists of multiple racks
- Detects if the racks are occupied or empty
- Indoor air quality monitoring sensors
- IoTConnect platform for real-time stock visibility
- It uses the FIFO algorithm to ensure the reduction in losses
- Alert the status of each rack
- Helps to frequently ensure sufficiency of stock

IoT-based pharmacy solutions

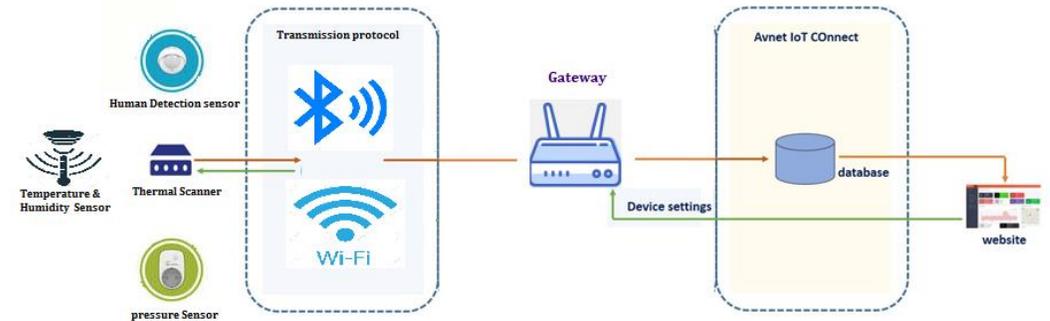
3. Coolers and HVAC

Smart sensors and IoTConnect platform

- Provides a stable environment round the clock
- Checks the working condition of coolers automatically
- Monitors different cooler parameters
- Temperature measurement
- Monitors humidity and compressor vibration
- Keeps a tab on the cooler power
- Alert the workers in case of any malfunctions
- Reports regarding the condition of the cooler
- Ensures better longevity for the coolers

4. At the billing counters

- Human detection sensors
- Monitors the presence of desk operator
- Detects if the counter is occupied or empty
- Alert if the desk is vacant
- Real-time insights of people at the counter
- Helps in managing the crowd at the counter



Other healthcare use cases

1. Virtual clinical trials

- Patient-centric trials to reduce patient and site burden
- **Technology** - IoT platform (IoTConnect), Power BI, Azure ML and Angular JS for web application

2. Platform for senior care

- Connected care services and smart wearable devices to improve the quality of life for seniors
- **Technology** - Azure services, Mobile App

3. Smart wheelchair cushion for pressure ulcers

- Pressure sensors to monitor pressures in the seat
- **Technology** - Azure IoT Central, Power BI, Angular JS

4. VibroHealth to stop Parkinson trembling (Not Impossible)

- Wearable technology to help people with Parkinson
- **Technology** - IoT Platform (IoTConnect), Angular JS

5. Smart cozy crib

- Boosts baby's sleep, offers secure swaddling and alerts the parents if the child is awake
- **Technology** - IoT Platform (IoTConnect), Mobile App.

6. Baby-care centric solution

- Smart vital tracker for babies
- **Technology** - IoT Platform (IoTConnect), Angular JS

7. Smart water treatment for Hemodialysis patients

- A cloud-based solution to connect water treatment systems with AI for Predictive analytics
- **Technology** - IoT Platform (IoTConnect), Power BI

8. Skin-data platform

- Smart bed sheet to monitor the pressure on different parts of the patient's body, temperature and humidity
- **Technology** - Azure IoT Central, Power BI, Python

9. Self-health monitoring

- For routine test such as, respiratory rate, temperature, heart rate variability, BP, Spo2, etc.
- **Technology** - IoT Platform (IoTConnect), Mobile App

Thank you

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