LIMITLESS MONITORING AND MANAGEMENT ROOTED IN INTELLIGENCE.

RADIX™

THE RADIX IOT PLATFORM

Radix IoT is a technology company with a mission to **unify data from disjointed building and automation equipment to create meaningful outcomes** for businesses and individuals. Radix IoT supplies an award-winning manufacturer agnostic IoT Platform that allows clients – with one location to tens of thousands – to harness their data for a better business outcome.
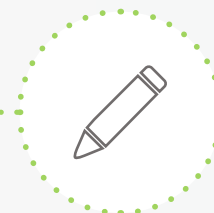
Radix IoT Cloud

Fully managed service allows any customer to deploy an IIoT solution and connect to Edge Mango OS instances from the cloud.

Radix IoT Appliances

Affordable, optional, edge hardware, pre-installed with Mango, for those not wanting to install Mango on their own hardware.

Mango OS

Install on your hardware, VM, Windows, Linux or Mac at the edge. Allows Mango for a single location or connected to the Radix IoT Cloud.

FROM ANALYTICS TO REMOTE
FACILITY MONITORING AND
AUTOMATION, RADIX IOT
USERS HAVE ACCESS TO AN
INTUITIVE, OUT-OF-THE-BOX
FLEXIBLE PLATFORM THAT
TURNS DISJOINTED DATA INTO
BUSINESS SOLUTIONS.

RADIX IOT WORKS TO...

- Connect many systems within a location, providing one place to control and manage everything.
- Seamlessly, reliably, and affordably connect thousands of locations in a property portfolio into a single ecosystem that can be managed from anywhere.
- Allow for simple 'self-service' or 'managed service through Radix IoT' of onboarding, modifications, or offboarding of equipment and locations all from a user-friendly web environment.
- Natively offer critical reporting and alarming, fostering consistent commissioning, triage, asset management, and remote control of sites through comprehensive and easy-to-use web services from Radix IoT.
- Enable consolidated facility data to be useful far beyond just facility management through the ability to push some or all portfolio data to third party services, allowing seamless integration with thousands of external software and analytics tools.
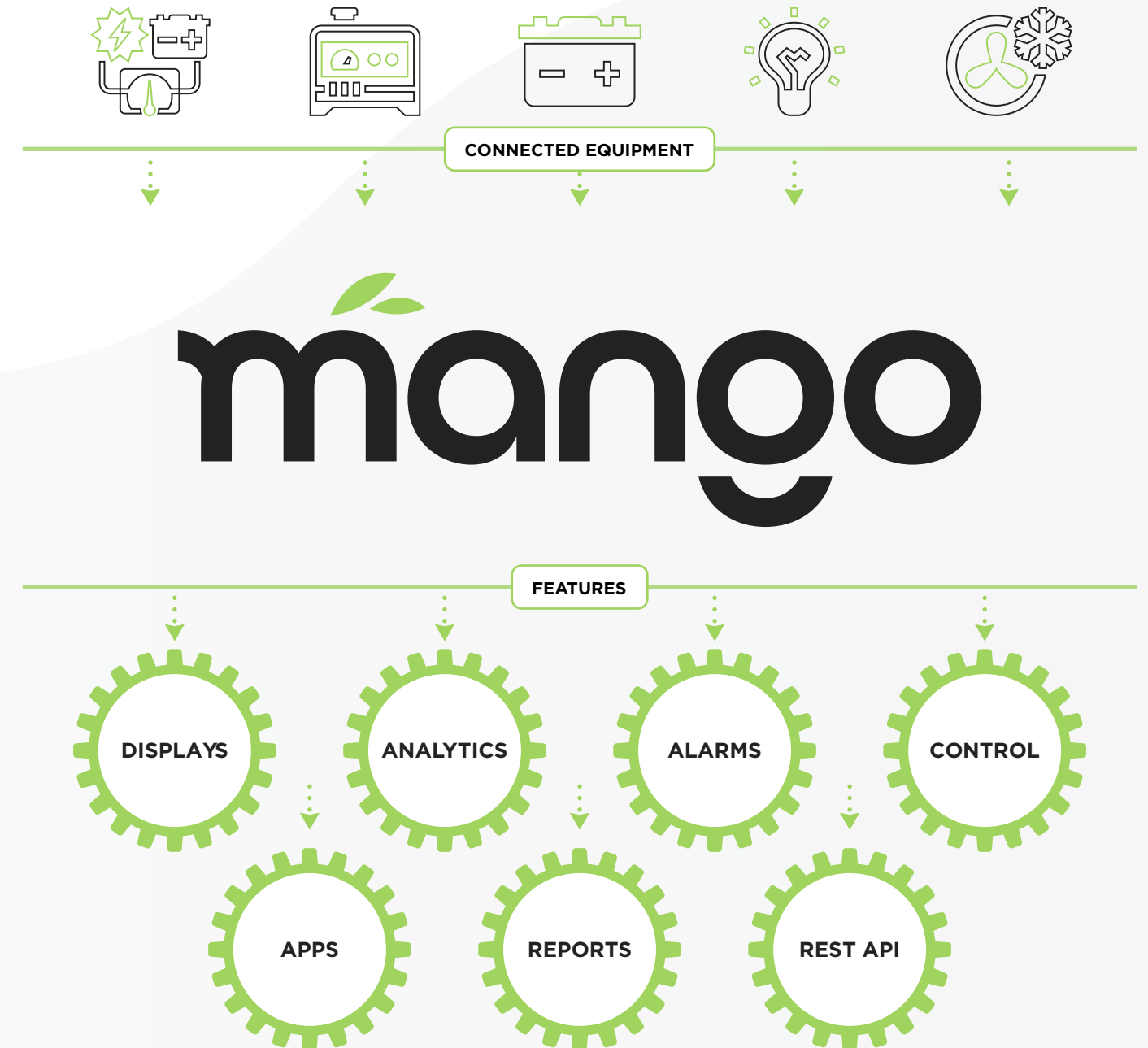
THE FLEXIBLE IOT FRAMEWORK

Mango OS from Radix IoT is an end-to-end IoT framework that empowers enterprises of any size and application to collect data from existing or new subsystems from multiple data sources and geographic locations into a consolidated data set in the cloud. From the intuitive web interface, Mango enables users to get custom-tailored up-to-the-minute status of all connected equipment in a logical way that makes sense to the business.

Mango integrates with any system that speaks a known industry protocol. Out of the box, Mango inter-operates with whatever systems you already have, making it easy to cohesively collect all your data from different systems, devices and locations, no matter how numerous.

Following data collection and communication, the web-based platform allows for a single, easy to use environment that harnesses this data for up to the minute reporting, trending analytics, alarming, event management, control, and connection to third-party apps and analytics services.

MANGO OS FROM RADIX IOT GATHERS THE DATA YOU NEED, TO IMPROVE HOW YOU DO BUSINESS, WHATEVER BUSINESS YOU'RE IN.

2016 2017 2018 2019

CONNECTED EQUIPMENT

mango

FEATURES

DISPLAYS ANALYTICS ALARMS CONTROL

APPS REPORTS REST API

KEY FEATURES OF MANGO OS

Unlimited Scalability: Mango is infinitely flexible. Collect and manage data from one location to thousands, the same Mango software scales for all types of needs.

Comprehensive IoT Toolkit: Includes all the tools needed to build an IoT solution tailored to an organization's specific needs.

Open Integration: Integrates into/with existing infrastructure – including BMS – regardless of the technology, and portfolios of equipment and software currently in use.

Profoundly Simple: Data-driven from turnkey, self-installed software/hardware and OEM solutions–free of the common complexities and expense of custom programming and steep learning curves.

Advanced Schedules with Exception Calendar: Mango includes a refined scheduling system that can be cloud or edge configured. Schedules can be created at any interval with the ability for exceptions. Rules can be based upon events as well.

Low Cost Entry: Into the platform with transparent pricing. Highly integrable features for connection to cloud analytics services and third-party applications.

Industry Agnostic: Applicable and scalable across all verticals using / collecting data.

Comprehensive & Intuitive Web-based Software: Allowing for self-service deployment, or OEM applications, or full turnkey solutions from Radix IoT.

Free of Vendor Lock: No proprietary controls or sensing hardware required. Mango can work with any telemetry that speaks a known industry language. All data collected can be stored in any cloud infrastructure at your option. In the end all data belongs to you

Secure Platform: Mango was built as an IoT platform first, meaning security has been at the forefront always. Mango follows OWASP guidelines as its base of design. Additionally, Mango undergoes security audits twice a year to assure independent verification. A Radix IoT platform security white paper is available from the radixiot.com website for more information.

INDUSTRY AGNOSTIC & ADAPTABLE

Because of its flexibility, Mango OS is very adaptable to any application where precise, sub-second high resolution data is required. It is manufacturer-independent, industry agnostic and integrates easily with other systems without fear of proprietary vendor lock.

There are plenty of instances where Mango OS is used by a variety of customers of various shapes and sizes.

MANGO IS WELL SUITED TO MONITORING A SINGLE LOCATION BUT TRULY EXCELS IN MONITORING AND MANAGEMENT OF MULTI-LOCATION, GEOGRAPHICALLY DISTRIBUTED PORTFOLIOS AND CAN SCALE TO ACCOMMODATE THOUSANDS OF SITES WITH EASE.

The following are a few of the markets in which our customers have found outstanding value in Mango:

Edge / Critical Facilities

By definition, edge facilities are closer to the end user - geographically distributed, often unmanned and numerous. Mango monitors all the critical systems of these sites remotely, regardless of the software or data sources present, from a central location. This makes predictive and preventative maintenance possible, which minimizes disasters and controls the expenditures associated with engineering visits. Mango also integrates with surveillance systems, to bolster security at sites with no employees.

Carrier / Edge Telecommunications

Telecommunications infrastructure is distributed, often hard to reach and seldom has staff on site. They can also number in the thousands and cross borders. At the same time, uptime is of the utmost importance. Mango integrates with the variety of systems on site, enabling remote monitoring and management. This data enables the diagnosis and prioritizing of problems from afar, and triaging of work to boost efficiency of service calls. Proactive maintenance increases reliability and minimizes expensive surprises.

Industrial Automation / IoT

Industrial automation has been forever changed by the growth of IoT. They now have better sources of data, monitoring and control. Mango helps bring all that varied data together to make it useful and actionable. Mango's easy integration with these data sources helps boost on-site safety and energy conservation, while improving maintenance, workflow and controlling operating expenses. Historical data can be used for long-term improvement while live data empowers reporting and prompt, data-driven business decisions.

Property Management

In the case of property management, there is plenty of data being collected, from a diverse portfolio of buildings and systems. The challenge is to free the data from its trade silos in order to share it and get greater value from it. Mango gathers all this data remotely, which enables users to improve efficiency quickly. Once the data is unified, further analytics can uncover opportunities to reduce redundancies and optimize operations. Custom reports share the results with different stakeholders in ways that are most helpful to them.

Utilities

As more municipalities invest in smart city infrastructure, the need for monitoring of various operating systems becomes vital. Mango gathers information from a great variety of systems making reduced energy consumption, streamlined operations and improved quality of life for residents possible. Public utilities require uninterrupted uptime and data-driven decision-making while balancing operation costs.

A TYPICAL APPLICATION DESIGN

Mango OS is a single software that gets deployed on a piece of hardware in the field to allow for control and management locally. The power in Mango however is that this field instance can then communicate up to another Mango instance in the cloud, allowing remote control and operation of thousands of field devices from a central location.

TYPICALLY MANGO IS INSTALLED ON A RADIX IOT APPLIANCE AT EACH SITE, OFTEN REFERRED TO AS 'THE EDGE' WHICH IS CONFIGURED AND CONNECTED TO ALL OF THE LOCAL SUBSYSTEMS AND DEVICES AT THAT LOCATION.

From here the edge device speaks to another instance of Mango which typically is a server in the cloud. This cloud instance is where data is stored from all the edge locations, and allows remote configuration, management, and monitoring of all of the downstream devices. A key advantage to this architecture is that with Mango running at the edge, all logic and data is retained and continues to operate should there be a loss of connectivity between the edge and the cloud, and resynchronizes once the connection has been restored. Eliminating any data disparity caused by the loss of connectivity.

Users can then access the cloud directly through any mobile or desktop device through a web browser and access the features of Mango's monitoring and management system.

Property Management · **Data Centers** · **Industrial Automation** · **Utilities** · **Oil & Gas**
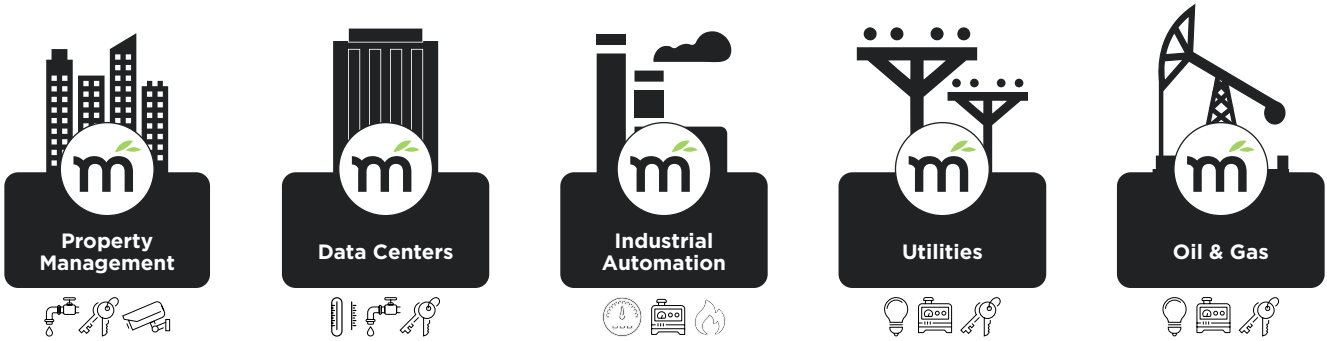
Radix IoT Cloud

Work Order Management

Third Party Cloud Services

Billing or Task Services

Facility Management
- Generator fuel/ maintenance status
- Beacon light status
- Remote access control and monitoring

Network Operations
- Trouble detection
- Surveillance camera views
- Service ticketing
- Remote diagnostics

Operations Management
- Energy reporting of portfolio and outlier detection
- Downtime reporting
- Upgrade provisioning

Field Service
- Dispatch requests
- Camera views or remote diagnostics

FROM SINGLE SITE TO GLOBAL

Radix IoT strives to seamlessly fit into existing infrastructures for businesses and any model. As such, Mango is exceptionally flexible on its deployment architecture to work with what is already in place. Three models are most common.

Standalone Model

Use Mango to monitor a single site or building. Data is gathered by, and users connect directly to the local Mango instance to access dashboards, run reports, and view alarms.

Campus Model

Individual Mango instances run on edge acquisition appliances such as Radix IoT hardware to connect to subsystems in individual buildings or equipment. These edge locations are then collected to another Mango instance either in the cloud or on a server at a central location.
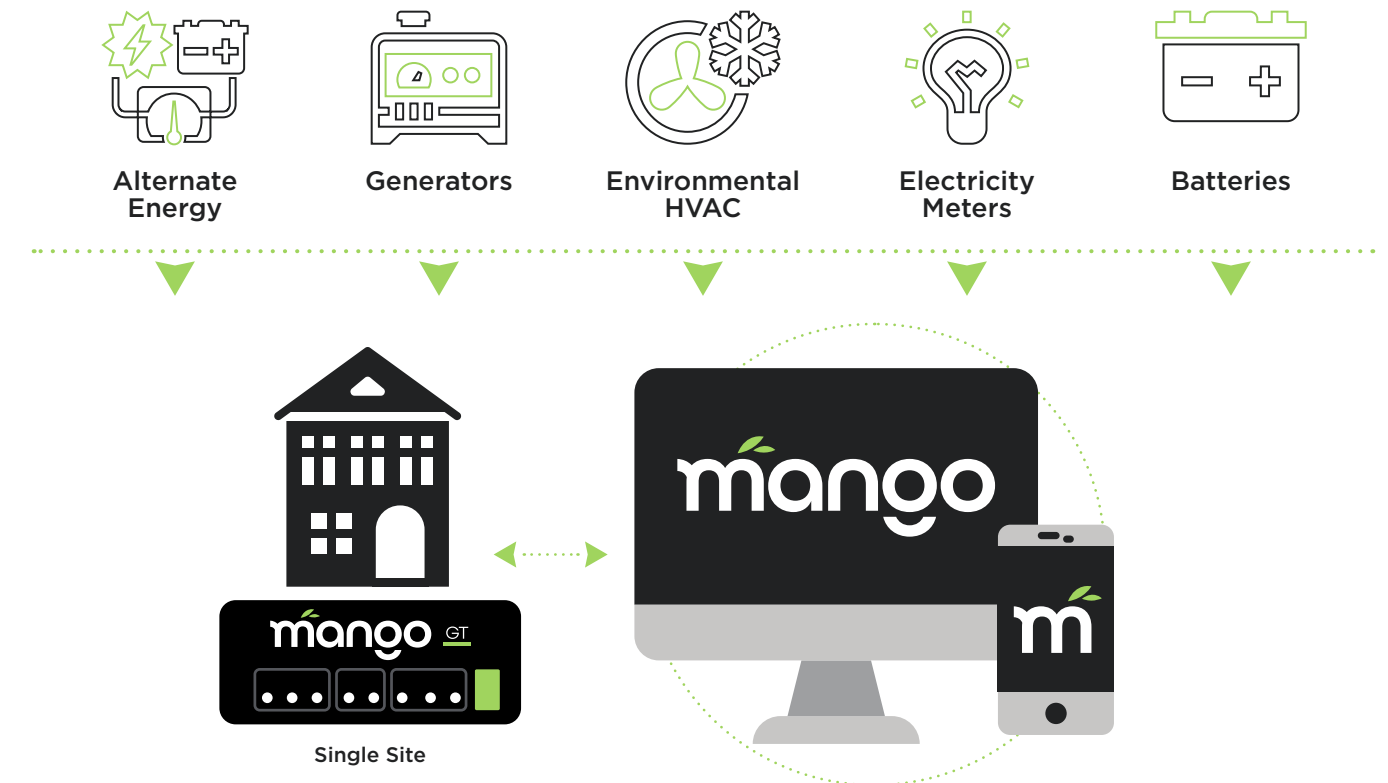
Global Model

Individual Mango instances run on edge acquisition appliances such as Radix IoT hardware to connect to subsystems in individual buildings or equipment. These edge locations are then collected to a Mango instance in the cloud allowing large-scale deployments remotely.

STANDALONE MODEL

Mango is deployed on an appliance such as a Radix IoT hardware or other computer device and connected to all of the existing or new subsystems for which remote monitoring and management is desired. Mango then communicates with these devices via standard protocols and locally collects the data allowing for custom dashboards to be built, trending analytics, alarming, and event management all through the embedded Mango web-browser.

Ideal Applications

○ Stand-alone buildings or structures
○ Local factory or production system management
○ Anywhere that has several pieces of equipment that require collective monitoring and management from a single pane of glass view

| Alternate Energy | Generators | Environmental HVAC | Electricity Meters | Batteries |

Single Site

14

15

CAMPUS MODEL

Mango is deployed on several appliances such as a Radix IoT hardware or other computer devices and connected to all of the existing or new subsystems in various locations or structures. These edge instances of Mango then communicate via the internet through a Mango service known as Cloud-Connect to another instance of Mango that can be located on-premise or in any cloud environment. This enterprise server can then remotely control all of the edge instances of Mango as well as collect data required for server-side analytics to be run.
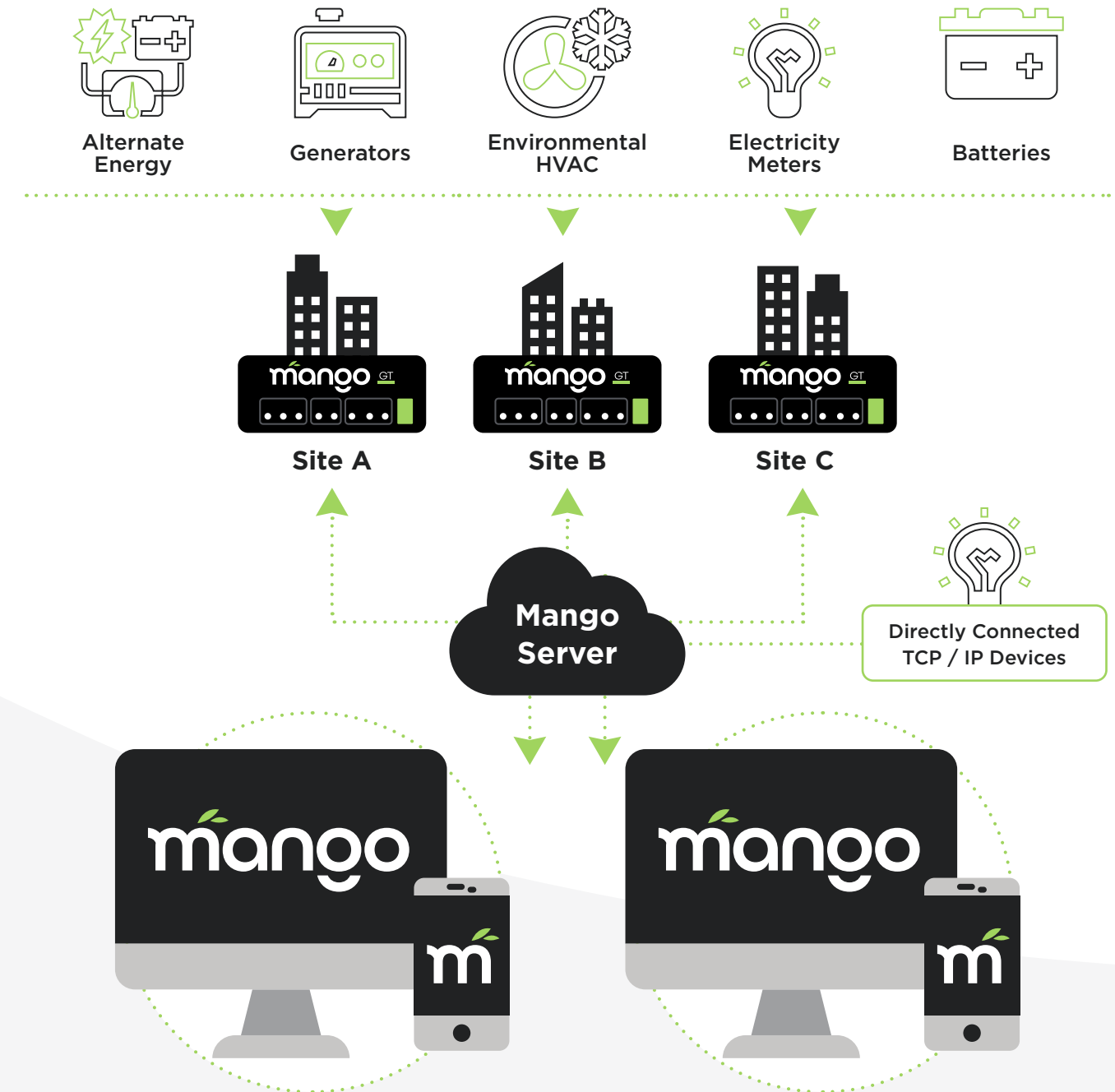
THE POWER OF THIS MODEL IS IN THAT A FULL VERSION OF MANGO IS RUNNING BOTH AT THE EDGE LOCATION AND AT THE SERVER ALLOWING CUSTOM DASHBOARDING, ANALYTICS, AND REPORTING TO BE AUTONOMOUS IN EACH LOCATION AND ON THE SERVER.

This model provides fault tolerance should the server connection be lost (as all data for each site is still retained at the edge). Additionally, different dashboards and analytics can exist at each location, while a master roll-up of data is available at the server level.

It also should be noted that TCP/IP devices such as ethernet capable BMS systems, meters, and more can be directly connected to the server without the need for edge appliances.

Ideal Applications

- Multi-site campuses or multi-dwelling residential
- Multi-site industrial automation

Alternate Energy   Generators   Environmental HVAC   Electricity Meters   Batteries

Site A   Site B   Site C

Mango Server

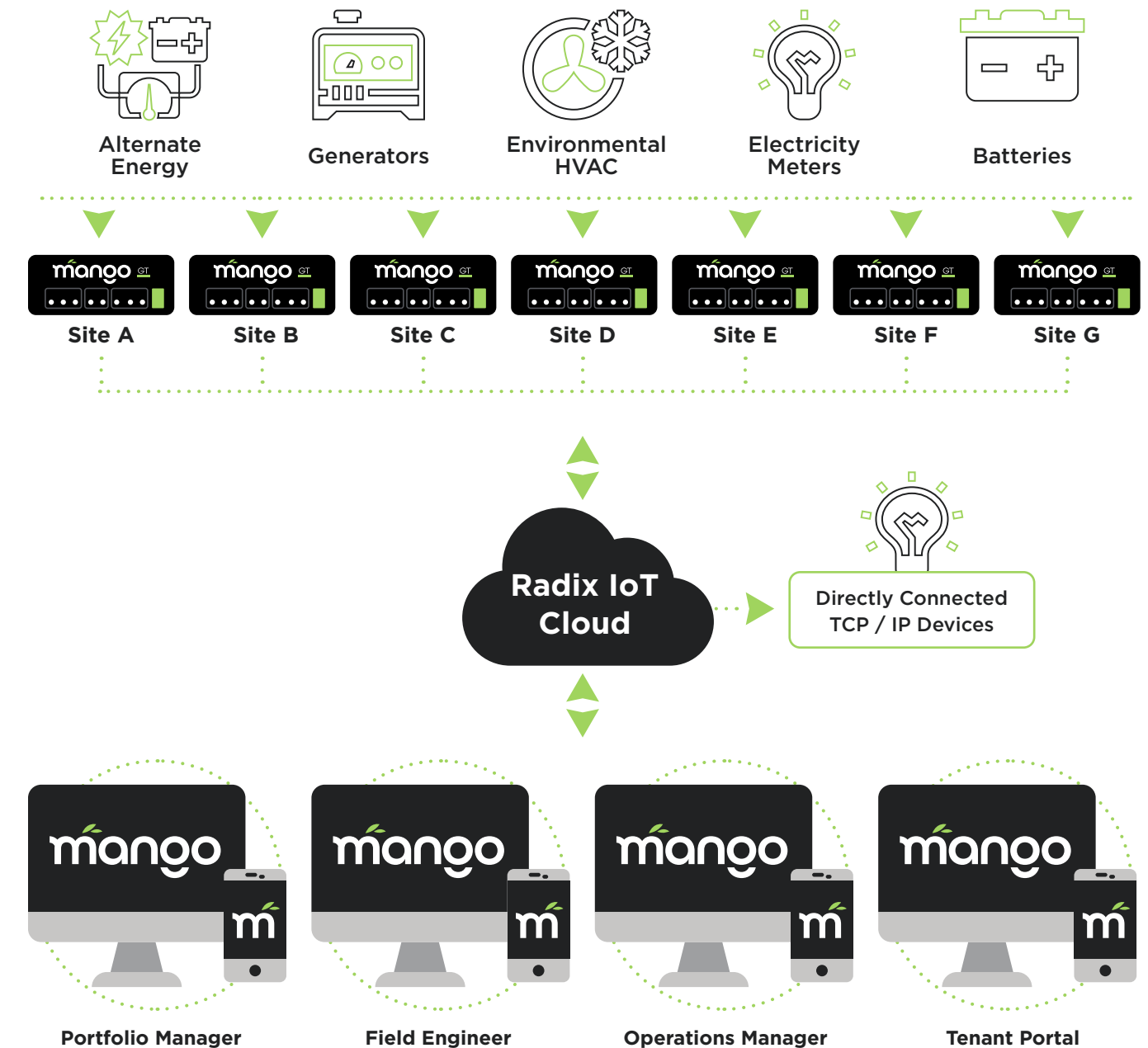Directly Connected TCP / IP Devices

GLOBAL MODEL

Mango is deployed on edge appliances such as a Radix IoT hardware or other computer devices and connected to all of the existing or new subsystems and IoT devices in various locations or structures globally. These edge instances of Mango then communicate via the internet through Cloud-Connect to the Radix IoT Cloud, which has a full server instance of Mango OS running. The Radix IoT Cloud can then remotely control all of the edge instances of Mango and collect data required for server-side analytics to be run.

THE RADIX IOT CLOUD IS A MANAGED SERVICE BY RADIX IOT AND ALLOWS FROM ONE TO TENS OF THOUSANDS OF REMOTE LOCATIONS TO RUN WHILE ALLOWING COMPLETE WEB-BASED CONTROL OF THE DEPLOYMENT ALL REMOTELY.

All of the features of the campus-wide model are available in the global model with the additional benefit of scale and cloud management and redundancy provided by Radix IoT. Additionally, the Radix IoT Cloud can be custom-tailored to a look and feel of an organization.
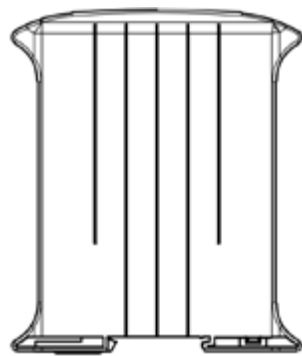
Ideal Applications

- Telecommunications infrastructure
- Municipal infrastructure
- Edge data center remote management
- OEM applications

Alternate Energy · Generators · Environmental HVAC · Electricity Meters · Batteries

Site A · Site B · Site C · Site D · Site E · Site F · Site G

Radix IoT Cloud

Directly Connected TCP / IP Devices

Portfolio Manager · Field Engineer · Operations Manager · Tenant Portal

RADIX IOT APPLIANCES

Anyone can bring hardware and install Mango on their own to get going. Mango can be installed on a device as small as a Raspberry Pie, but really excels with an Atom or above processor. Radix IoT also offers several different hardware appliances that come running Mango out of the box and ready to go; each made for different applications based on scale requirements.

Common Protocols Supported:

- BACnet
- Haystack
- Modbus
- MQTT
- SNMP
- DNP3
- SQL
- CSV files

- Excel files
- HTTP
- TCP
- Serial
- Scripting
- Meta data
- REST API
- ... and more

Common Radix IoT Connected Sub-Systems:

- Building management
- HVAC equipment (RTUs, VAVs, PTACs, etc)
- SCADA
- Video surveillance
- Network infrastructure for monitoring
- Solar, generation and alternative energy systems
- Power metering
- Security systems
- Refrigeration safety monitoring
- Lighting systems, devices and panels
- Water metering
- Access control solutions
- Local user interface and HMI sub-systems

*And many others, including custom proprietary protocols.*

Mango GT

Perfect for small installations, the Mango GT allows for ethernet connectivity and has two RS-485 ports for communications with serial devices. It's ideal for standalone applications or smaller campus installations. Common uses for the Mango GT are residential, small retail, and small industrial applications.

RD 121C

The RD 121C Micro IoT Appliance is built specifically for the OEM market but also apt for facilities with medium sized data connectivity needs. It sports dual ethernet, USB, a configurable RS232/RS485 serial port, and local Digital IO. Additionally, it comes with a global cellular capability for communications back up, all in a tiny footprint.
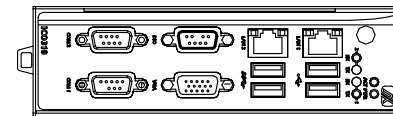
RD 201C

The RD 201C Edge is for larger installations, such as commercial property portfolio management, telecommunications, and edge data centers. It sports dual ethernet, USB, several configurable RS232/RS422/RS485 serial ports, GPS, and local Digital IO. Additionally, it comes with a global cellular capability for communications back up and has an option of a dual cellular redundancy. The RD121C also can support video surveillance.

MANGO MAKES IT SIMPLE

Simple, competitive, straight-forward pricing allows you to grow at your own pace. Scale up or down, it's all up to you and your needs. We also make things simple for OEMs, integrators and solution providers.

OEMs

Why start from scratch when you don't have to? OEM integrations that leverage Mango as part of their offerings save time and money bringing new features and capabilities to their users. The cost to license Mango as an OEM is a fraction of the cost to develop and maintain a new product. OEMs benefit from customizations, custom branding, special pricing options and ongoing support and improvements.

From sophisticated IT to high-tech telecom applications, Mango OS, because of its ability to communicate with other technology and its compatibility and scalability, has enhanced the functioning of a surprising variety of products and services.

Integrators and Solution Providers

Integrators and solution providers will find that the Mango products will give them a substantial competitive advantage over other products, adding greater value to your offering. With significantly lower costs per point and total cost of ownership, Mango OS makes it possible to offer your customers all their information in one unified IoT Platform – all their subsystems on a single backbone. Since Mango OS is so flexible and integrates with any equipment, it should definitely be part of your arsenal.

Enterprise Solutions from Radix IoT

Radix IoT works with large enterprises for customized Mango solutions to meet worldwide deployment needs. Using Mango's flexibility of features, coupled with the Radix IoT Cloud, Radix IoT can make a solution to meet your exact needs without the expense of a ground-up effort.

MAKING ASTUTE BUSINESS DECISIONS DEPENDS ON ACCESS TO AND UNDERSTANDING YOUR REMOTE DATA, FROM ONE SITE OR THOUSANDS. LET'S GET STARTED TODAY.

RADIX™

RadixIoT.com
14555 N. Dallas Parkway #125
Dallas, TX 75254

info@radixiot.com
+1 (833) 248-2691

@RadixIot

Dallas, TX | Mountain View, CA | Nashville, TN | Chicago, IL
South America | South Asia

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