# MONITORING 5 MILLION SQ FT IN REAL TIME: ORU'S MANGO-POWERED FACILITIES REVOLUTION

Case Study

## IN CONVERSATION WITH DAVID KING, DIRECTOR OF ENERGY MANAGEMENT AT ORU/CITYPLEX

## PARTNER

Originally built as a medical center by Oral Roberts, the CityPlex Towers in Tulsa are now a for-profit business complex owned by ORU's nonprofit, housing hospitals, offices, and over 100 commercial tenants including the U.S. Army Corps of Engineers.

## CHALLENGE

CityPlex lacked automation, relying on manual controls and paper-based work orders across 110 floors.

## SOLUTION

Mango automated all the maintenance and monitoring tasks across the CityPlex Towers and ORU campus facilities.

## BENEFITS

Nearly all the pneumatic controllers have been removed across the 110 combined floors. Mango now monitors over 15,500 points.

The CityPlex Towers of Oral Roberts University (ORU) in Tulsa, Oklahoma, were originally designed to serve as the City of Faith Medical and Research Center, based on the vision of Oral Roberts, founder of ORU. At 648 feet tall and 60 stories, the tallest tower is flanked by the 30-story West Tower and the 20-story East Tower, standing at 348 and 248 feet, respectively. Eight years after the opening, the original Towers closed in 1989. Just a few years later, the facility was reopened as CityPlex Towers, now not only focusing on the medical space, but office space for small and large businesses.

Today, the for-profit CityPlex Towers is owned by the ORU non-profit (across the street). The Towers are home to three hospitals with 25 surgery suites, and over 100 commercial tenants, including call centers, medical offices, data centers, and the U.S. Army Corps of Engineers regional headquarters, which occupies seven floors of the East Tower.

***"Initially, monitoring electric, water, and gas usage was like driving in the rearview mirror. Our energy usage information was, at times, 45-days-old. While we could see what we used last month, we didn't receive our bill until the middle of the following month" says David King, Director of Energy Management at ORU/CityPlex.***

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## THE CHALLENGE

The original CityPlex Towers were equipped with no automated controls. To adjust temperatures throughout the 110 floors, the maintenance staff used screwdrivers to adjust the pneumatic controls. Daily, the staff picked up paper-work order forms from the maintenance shop, walked across the 2.2 million square feet of the three Towers, and filled out job completion paper forms once issues were resolved.

CITYPLEX TOWERS

## THE SOLUTION

The Radix IoT Mango platform automated all the maintenance and monitoring tasks across the CityPlex Towers and ORU campus facilities. Nearly all the pneumatic controllers have been removed across the 110 combined floors. Mango now monitors over 15,500 points.

***"I recommend the Mango platform to organizations needing energy efficiency and management. During our public tours through the Towers, when it comes to the behind-the-scenes tours of our operations, we show everyone our Mango monitors, set up in our maintenance shop area."***

## THE BENEFITS

Mango now monitors nearly five million square feet of combined space at the CityPlex Towers and ORU campus and over 15,500 points, including alarms and controls. The operations team now has up to 90 percent real-time visibility across all its facilities. The demand charges decreased by over 20 percent, with the deployment of the Mango monitoring system along with many HVAC improvements leading to annual savings of over $100,000 per year. CityPlex Towers has also earned an Energy Star rating score of up to 99, setting a "credible and competitive indication of energy efficiency for current and potential tenants." The Mango deployment has played a substantial role in utility savings along with early detection of environmental problems such as temperature, relative humidity (RH), and water detection. Even with the "several-fold" increase in the Towers' occupancy levels over the last years, Mango has allowed King to do "more with the same number of people." The maintenance staff remained constant and includes a dedicated team of licensed engineers at the central plant monitoring station, overseeing operations 24/7 throughout the year. An assistant controls technician was added to help maintain all the IoT device connectivity.

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*David King at the Command Center where multiple monitors provide a big picture view throughout the CityPlex Towers*

***"I wanted real-time information, and Mango provided that. My passion has always focused on energy savings, whether it's utility costs or in the maintenance staff itself. When I started in 2010, there was no energy management system at all for CityPlex Towers, and now we have up to 90% visibility into what's going on throughout all our facilities, and across multiple points. Between the campus and the CityPlex Towers, we're monitoring over 15,500 points."***

## TOWERING INSIGHT: MANGO ELEVATES FACILITIES MONITORING EFFICIENCY

In 2013, David King, Director of Energy Management at ORU and the CityPlex Towers, was asked to monitor electric usage across 30 campus-wide utility system feeders and zones, each linked to a single utility electric meter for each site at the CityPlex Towers and the ORU campus. Since the existing system provided no visibility into the sub-metering of the campus-wide power consumption, it was challenging to pinpoint the specific electricity usage sites. To find a suitable monitoring solution, King evaluated several options in the market before selecting the Radix IoT Mango platform. A comprehensive hardware and software system was then designed and installed at the ORU Campus and the CityPlex Towers, providing real-time visibility and monitoring of multiple power distribution zones.

While Oklahoma's regulated electric and tariff rates keep the per-kilowatt-hour utility costs very reasonable, the demand charges on the electric bills are often very high. These fees are based on the maximum peak kW customers use during a peak demand billing period.

With Mango, King can now monitor the demand, and the capacity needed to meet peak usage periods, even during short peaks. Air handler units at the ORU campus and CityPlex Towers are equipped with variable frequency drives that allow demand-based speed adjustments, which significantly reduce kilowatt consumption during on & off-peak periods. Controlling the demand usage has eliminated overpayment, especially during fluctuating demand periods. Over the past decade, these improvements have resulted in multimillion-dollar savings in energy costs, as reported by the Campus and Towers' management.

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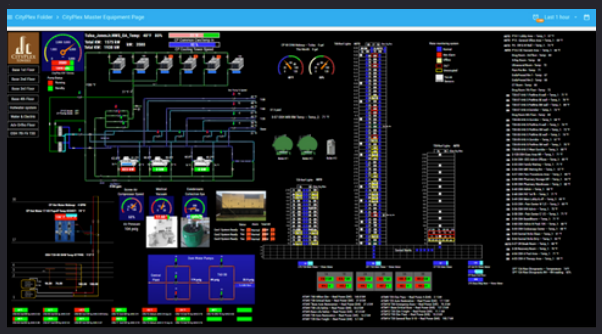
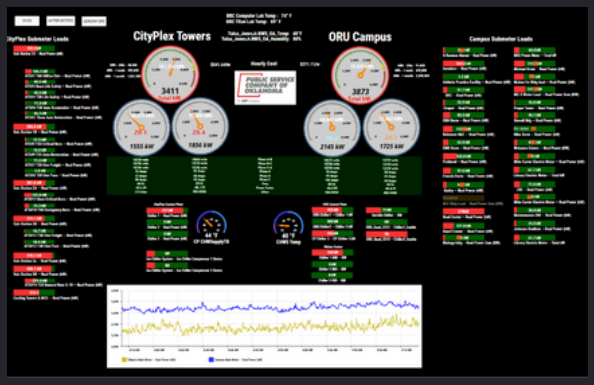
## OVERCOMING ROLLOUT ROADBLOCKS AND TACKLING LEGACY EQUIPMENT CHALLENGES

Mango's rollout faced several challenges, particularly in monitoring of individual buildings while minimizing downtime. Using a current transformer (CT) wrapped around the cable, all hardware was housed inside the transformer cabinet set outdoors. Since data was transmitted to the central Mango system using a wireless radio network, the initial radio limitations affected efficient performance levels. Working with the Radix IoT support team, King upgraded to more reliable radios, significantly reducing downtime caused by such environmental factors as tree leaves and windy days. Also, during higher summer temperatures, some components in the original transformers were replaced, while the overall equipment remained durably reliable. Besides a few temperature-related outages and equipment replacements, due to flooding and moisture from heavy rains, Mango has remained reliable. Now, since the electric meter inside switchgear connects directly to Mango, there is no need to install the devices in the external transformers at the newly constructed ORU campus buildings.

Mango's biggest advantage over other software on the market, King says, is its interoperability with other systems. Since each campus building has its own automation system, as buildings are upgraded, King integrates Tridium's Niagara framework to pull data into the Mango platform and vice versa. Mango remains the primary monitoring system, while building automation systems are used for temperature adjustments across the buildings and floors.






*"Before Mango, we had limited visibility for the history of the temperature, when the air handlers started, or any such critical insights. Since incorporating all these data points into Mango, when we get a temperature call for an area, we can go back and look at what was going on before and then go to the floor to make changes. Now we have a better understanding of what's going on as a continual process."*

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## OVERCOMING ROLLOUT ROADBLOCKS AND TACKLING LEGACY EQUIPMENT CHALLENGES

With the CityPlex Towers rising over 600 feet, another major monitoring area for the operations team is the high static water pressure in chilled water piping in the lower floors. This can reach up to 300 pounds and poses a constant risk, since even a small pinhole leak can lead to significant damage due to this pressure. To manage potential water damage in the 60-story building, wireless water detection sensors are connected to the Mango system. In the event of a leak, the maintenance staff can quickly identify the source and extent of a leak and initiate an efficient maintenance response. Since the tower graphics on the Mango dashboard indicate specific points, when sensors go off, staff can refer to the images and determine the precise source of the leak and how far it has spread.

## COMPLIANCE, COMPETITIVE ADVANTAGE, AND SMART SAVINGS

One of CityPlex Towers' major tenants is a doctor-owned outpatient hospital where surgeries are conducted Monday through Friday, and few patient suites accommodate overnight stays. Like all healthcare facilities, the hospital must meet specific criteria to achieve accreditations, which, in addition to patient care and safety, governance and leadership, include facility management and safety, and emergency preparedness. While unusual for a hospital to be housed in a multi-tenant building, Mango and other software are used to record and report on the hospital's environmental systems, as well as monitoring of the surgery suites' air exchanges, and other equipment throughout the facilities, especially during summer humid weather.

*"Within Mango, we've created the graphics for a quick overview of multiple floors, buildings, and devices. Our staff uses Mango to view the bigger picture, across multiple systems all at once, so they know what's going on with individual building automations. Mango has a little pop-up window where I can put my mouse over a point value and pull up the historical data in multiple ways. This makes Mango much easier and less cumbersome to use than other systems."*

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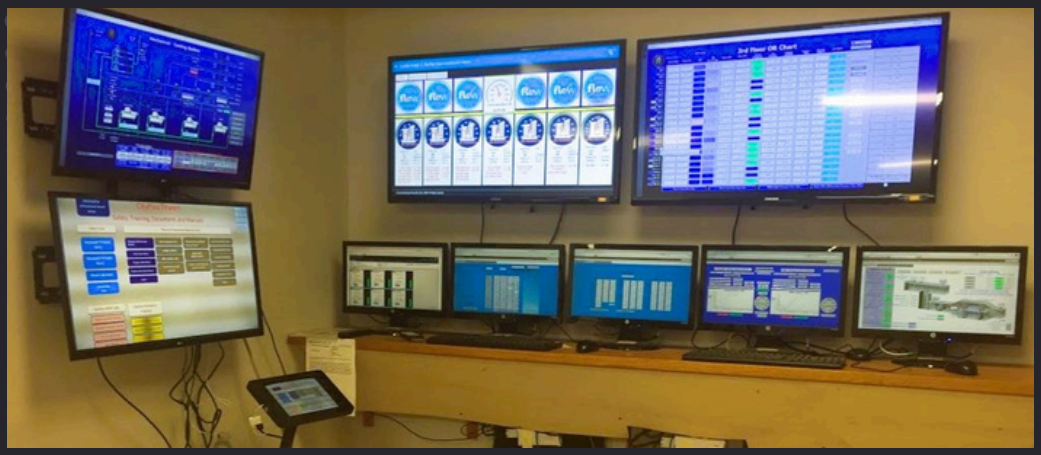
## COMPLIANCE, COMPETITIVE ADVANTAGE, AND SMART SAVINGS



In addition to the hospital, the Towers host tenants that occupy spaces as small as 170 square feet, to those with over 100,000 square feet. The U.S. Army Corps of Engineers regional headquarters occupies seven floors of the Towers. In addition to related tenants working with the Engineers, there are several call centers, data centers, doctors' and attorneys' offices, and other tenants.

The property's single utility bill reflects facility-wide submeters that track all electric usage, including that of the data centers, which operate generators and air conditioning systems and manage their kilowatt hours as specified in their lease. Each month, when meters are read, the total kilowatt hours consumed are calculated to determine the blended cost per kilowatt hour. Based on this calculation, the data centers reimburse their share of the electricity usage based on the sub-meter readings.

Since CityPlex Towers is part of a for-profit facility, securing a General Services Administration (GSA) lease required an Energy Star rating of 75 or higher. King started the certification process for CityPlex Towers in 2010, and later in 2013 for the ORU Campus.

***"Multiple monitors at the maintenance shop provide the staff with a big picture view of water and electric consumption throughout the CityPlex Towers. In a 60-story building, a water break on one of the floors does not only stay on that floor, it quickly spreads throughout every floor below. We want to see the big picture and know where the cooling and electrical loads are after hours, to determine if we are turning off enough equipment and devices. The main goal with Mango is to get the big picture, while we use a third-party automation system for the smaller, drill-down controls."***

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## COMPLIANCE, COMPETITIVE ADVANTAGE, AND SMART SAVINGS

These competitive advantages are significant for potential tenants and the shareholders. While the facilities "are not perfect", King admits that the Towers' high Energy Star ranking is "a rare achievement," reflecting the "impressively low" utility costs per square foot, compared to similar facilities in the area. In 2016, CityPlex Towers won The Outstanding Building of the Year (TOBY) in the Over 1 Million Square Foot Category from the Building Owners and Managers Association (BOMA). Winners are required an EPA's ENERGY STAR certification, which CityPlex scored 93, performing in the top 7 percent of similar facilities nationwide, reflecting on average 35 percent less energy and release 35 percent less carbon dioxide than typical buildings.

While the kWh rate remains fixed, utility generating fuel costs account for nearly 50 percent of the electricity bill. Fluctuating prices of natural gas, which are used for the generators, affect utility costs since utility companies recalibrate their charges every six months. A recent utility bill increased by 30 percent. While the fluctuating prices can't be controlled, Mango allows King and his team to manage energy usage, shielding tenants from the rising costs.

Over the past four years, the additional four new buildings and a fifth building now underway have increased utility usage at ORU Campus. Even with these increases, King says the utility costs are "still not near what it was 10 years ago."

***"Thanks to improvements in controls and efficiency, we pursued the government lease confidently, and to our relief, our first Energy Star score was 92, and since then we have consistently achieved scores of 93, 95, and even 99. This efficiency positions us to attract more tenants who appreciate the savings on their utility bills, meanwhile our current tenants are happy to be shielded from fluctuations in electric costs."***

***"Since CityPlex Towers' monthly leases include utilities, we need to monitor and conserve energy – which is part of our bottom line, not the tenants. Our tenants work with us to ensure we can be conservative while still meeting their needs."***

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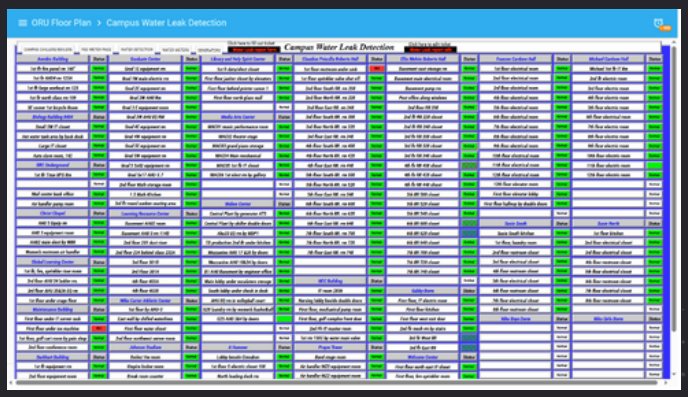
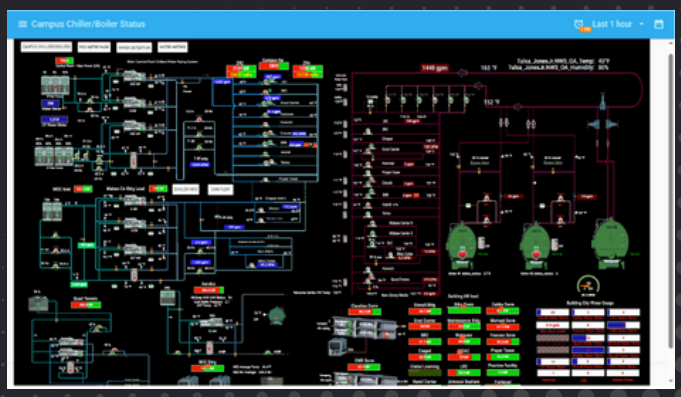
## FUTURE IS HEADED TO THE CLOUD

As new buildings are added to the ORU campus, they are equipped with building automation systems using Tridium Niagara and integrated with other campus buildings. The critical monitoring points are then connected to the Mango system, using an overlay of graphics pages that provide the operations team visibility across the Towers and the ORU campus.

A maintenance technician and a stationary engineer monitor all the equipment 24/7 to ensure full safety. In addition, the stationary engineer records and monitors equipment information every two hours to meet city code compliance.





*Radix IoT's Mango platform unifies data from all your systems, vendors, and sites into one clear view. It aggregates and normalizes data from any source, giving teams and leadership instant visibility without logging into separate systems or juggling passwords. Mango is protocol driven, vendor agnostic, and works with what you already have. Want to see how Mango can work for your team?* ***Let's connect.***

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