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Technology Report

# Managing Business Remotely Using the Cloud

## How Connecting and Analyzing Each Location Optimizes Productivity and Lowers Costs

## About the author

An experienced journalist and long-time presence in the U.S. technology marketplace, Larry Anderson is the Editor of leading digital publication SourceSecurity.com US Edition. Mr. Anderson is the website's eyes and ears in the fast-changing security sector, attending industry and corporate events, interviewing leaders and contributing original editorial content to SourceSecurity.com. He leads a team of dedicated editorial and content professionals, guiding the editorial roadmap to ensure that SourceSecurity.com US Edition provides the most relevant content for industry professionals. From 1996 to 2008, Mr. Anderson was editor of Access Control & Security Systems magazine and its affiliated websites. He has written numerous articles for and about some of the largest companies in the security industry and has received numerous awards for editorial excellence. He earned a Bachelor of Arts in journalism from Georgia State University with a minor in marketing.

## Foreword

Technology is changing how companies operate, but businesses with remote sites or multiple locations have been left behind. Compiling and analyzing information from the front lines of business, especially those that focus on customer service, has remained a labor-intensive manual process. Efforts to manage these businesses have often suffered from a lack of good information about operations.

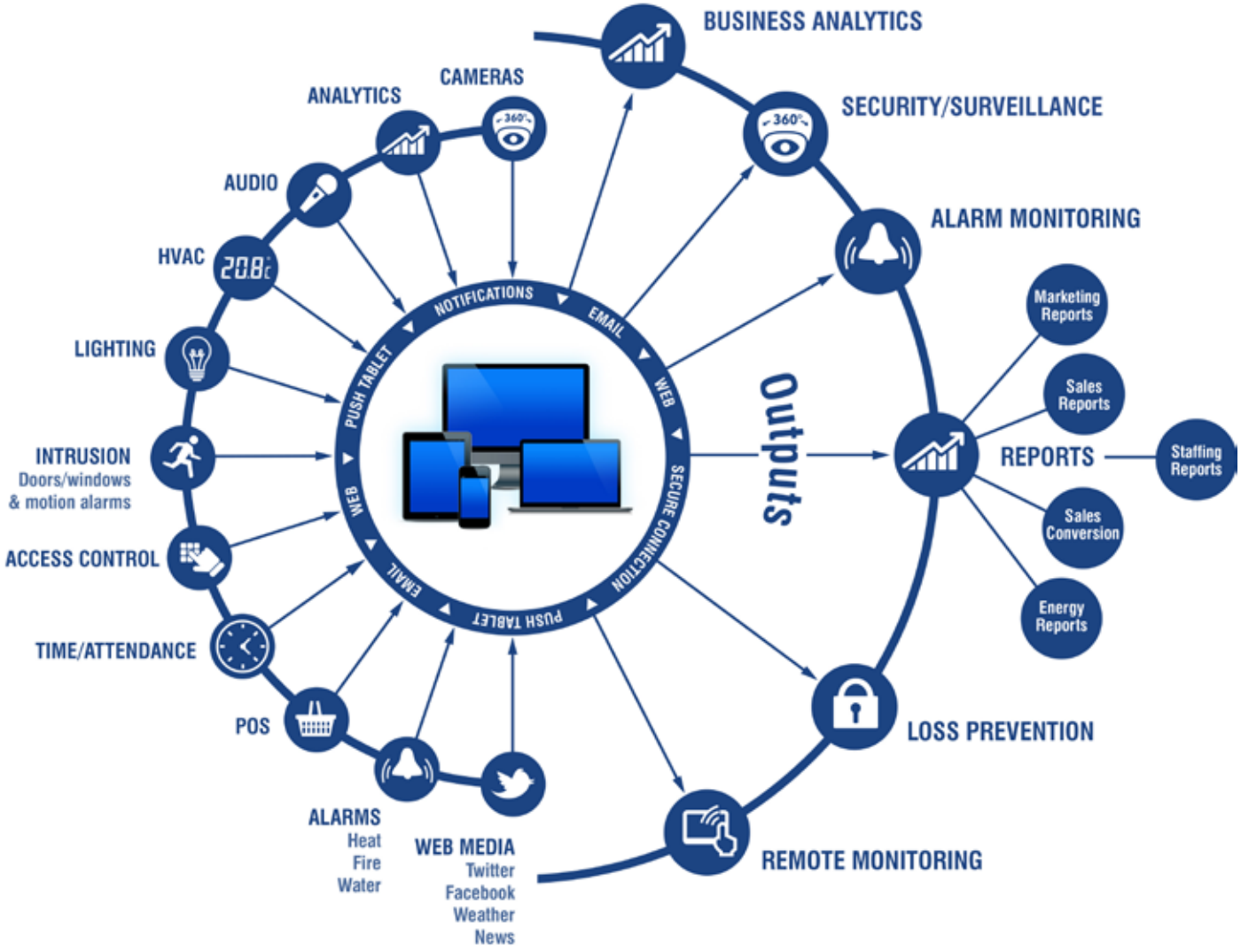
Cloud-based computing can now be combined with automated on-site data collection to change all that. Oncam Technologies has provided SourceSecurity.com a behind-the-scenes look at the launch of a new platform that unifies several current technologies to fulfill the needs of customer-facing businesses for more data about their operations. It's an exciting launch both because it solves a current and urgent problem and because it has broad and sweeping potential in other markets, too.

We appreciate the opportunity to work with Oncam Technologies to report on this new platform as it launches into the market. Oncam generously shared time and resources to inform us about the new platform, answered my hundreds of questions thoroughly (and good naturedly), and worked closely with us at SourceSecurity.com to make this detailed, in-depth report possible. Thanks to all.

We at SourceSecurity.com hope this Technology Report is useful to readers and helps to communicate the intricacies – and the huge potential – of the new technology platform. In today's short-and-fast media climate, I personally have appreciated the rare opportunity to take a "deep dive" into an interesting subject and to report on a technology that solves a long list of current customer problems – and maybe could even transform the industry! If it does, I can say I was there when it started.

Larry Anderson
Editor, SourceSecurity.com US Edition

# The Technology At A Glance




*Inputs and outputs from the OnVu360 platform*

# Managing Business Remotely Using the Cloud

## How Connecting and Analyzing Each Location Optimizes Productivity and Lowers Costs

Effectively managing businesses with multiple locations is a formidable challenge. In the past, business owners could only manage operations by visiting each individual location. In effect, owners and managers either relied solely on abstract data, or they were on the road constantly and could only actually observe operations for a few hours here or there. An owner might be in any particular location only once or twice in several weeks, with little or no control over day-to-day operations except during their personal visits.

To better address the needs of managing remote businesses, Oncam Technologies has introduced the OnVu360 Management Platform to provide continuous off-site monitoring of a wide range of business data, including operations data, point-of-sale (POS) systems, various equipment types, location-by-location comparisons, customer demographics, and other factors critical to business success. Using the new technology platform, multiple business and analytics systems report at each remote location to a simple gateway box, which is linked via the Internet to a full business-analysis software platform in the cloud. The approach provides real-time metrics and business intelligence about each individual location and, collectively, insight into the enterprise as a whole.

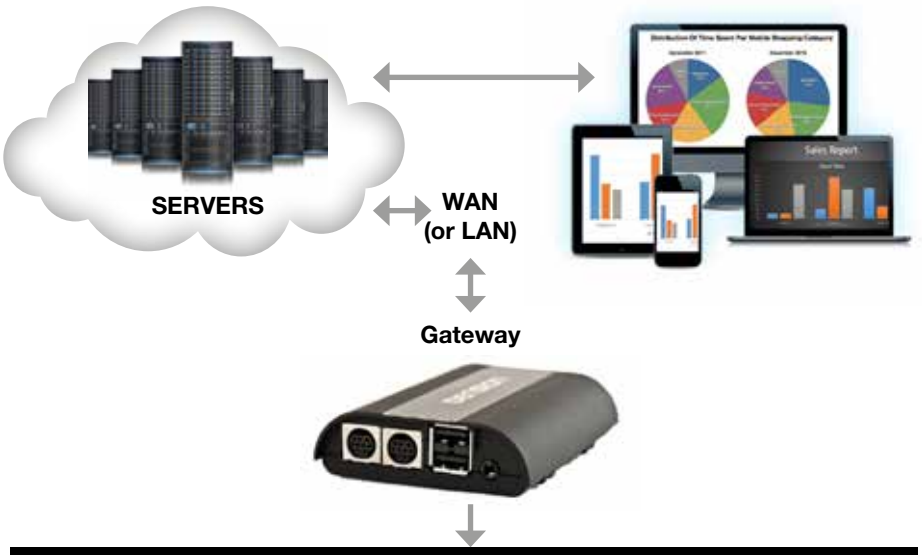
OnVu360 can be used as a flexible, remote-management platform that delivers independent control of 360-degree video streams as well as intelligent analytics and data management to users who log onto a Web site or mobile app. Central-server (cloud) architecture complements the on-site gateway by enabling IP recording and playback, analytics processing, user and device management, notifications, Web services for customized application development, and dynamic addition of new services. The centralized design enables perpetual software updates to ensure that applications will never be out of date.

Each gateway is a Linux machine that runs Oncam's preinstalled software and also contains a Subscriber Identity Module (SIM) card; as an option, it could also hold a portable memory card that would provide an Internet connection using the Global System for Mobile Communications (GSM) network. Each gateway also is compatible with either ZigBee or Z-Wave short-range wireless devices. Both ZigBee and Z-Wave standards combine radio frequency communication and mesh networking to access devices wirelessly. An expanding range of devices, including automation, environmental systems, sensors and security edge devices, employ either ZigBee or Z-Wave communication protocols. Each OnVu360 gateway is compatible with one or the other, depending on system needs. If a device is connected to an IP network, the OnVu360 platform can communicate with it.

*OnVu360 can be used as a flexible, remote-management platform that delivers independent control of video streams as well as intelligent analytics and data management to users who log onto a Web site or mobile app.*

## About Oncam

In July 2012, Oncam Global acquired ownership of Grandeye, a firm specializing in imaging and an innovator of 360-degree camera technology. At that time, the company was renamed Oncam Grandeye and has become known as the leader in its field. Introduction of the Oncam OnVu360 Management Platform signals Oncam's intent to transform from a security-focused company to a wider technology organization under the umbrella brand of Oncam Technologies. Oncam's future will focus on providing customer-focused software as a service (SaaS), independent of hardware and equipment choices.




***System architecture**. Devices communicate through the OnVu360 gateway to a set of back-end servers for further processing and analysis. An OnVu360 client then communicates with the servers directly to either control/view devices or to run reports on the saved analytic data. The OnVu360 client is Web based and designed to run on any platform.*

Software loaded onto the gateway enables initial connectivity and rapid deployment. Once connectivity is established, the software can be updated and maintained by back-end servers, thus allowing addition of new functionality that is transparent to the user. The gateway keeps in constant touch with the cloud-based back-end system, providing a "heartbeat" to confirm continuing communication even when no data is being transmitted. The Oncam gateway software can also be ported to run on a range of other suitable hardware devices; examples could include network video recording (NVR) platforms, routers, set-top boxes, etc.

Once the gateway is installed, the OnVu360 platform can potentially host many applications, including those created by third-party suppliers using OnVu360's application programming interface (API). In addition, Oncam Technologies is planning release of multiple "modules," each expanding the platform's functionality to the benefit of specific applications and/or vertical markets and leveraging Oncam's well-established capabilities as a leading supplier of 360-degree cameras and dewarping software.

The versatile platform has many applications. It should find a receptive customer base in the retail sector, but in reality it enhances capabilities for managing facilities in any vertical market, from banking to hospitality to healthcare to broader corporate business environments. The platform also can be leveraged in public surveillance applications, or even for distance learning and education. Going forward, the OnVu360 platform has the potential to transform the home automation and security market, where it can empower homeowners to remotely manage multiple devices and receive alerts when there is a security breach.

## Meeting a Need in Customer-Focused Environments

The OnVu360 Management Platform's benefits are especially well suited to managing any multi-location business that involves customer service. Examples include chain stores, retail banking, specialty retailers, convenience stores, the hospitality sector and quick-service restaurants.

The details of individual store operation are often critical to maintaining profit margins. In the quick-service restaurant business, for instance, food and labor costs mean the difference between profitability and failure. The OnVu360 system provides information on a variety of elements that impact each. For example, a sandwich shop owner could use video to watch the preparation of each sandwich to see whether quality is being maintained, supplies are being used efficiently, and health and safety procedures being followed.

In terms of labor costs, overall situational awareness enables business owners to view employee productivity and see which locations may be understaffed or overstaffed, or whether shift patterns have been optimized. Available information includes when each employee logged in or out and, in a retail environment, who sold what using integrated POS data. Each POS transaction is tied to video that shows what took place. Referring back to the sandwich shop example, the video can show if the customer was charged for extra cheese, or if an employee gives free coffee to a friend. Real-time adjustments can be made in staffing; extra workers from one location could easily be dispatched to a location with a shortage. The owner can manage every aspect of his operation remotely across multiple outlets.

*In terms of labor costs, overall situational awareness enables business owners to view employee productivity and see which locations may be understaffed or overstaffed, or whether shift patterns have been optimized*

Highlighting sales trends is also illuminating. What is the precise demographic profile of a location's customers? Why does the medium-sized drink sell better than the large? Why do some locations sell more of some sandwiches than others? Is digital signage having an impact on customer buying behavior? Closely watching store operations sheds light on the causes of such trends – and the effects. How could a best practice that is increasing sales in one store be applied to another? What is one store doing wrong that is hurting its performance in a specific category? Is a particular promotion having the anticipated impact? The answers may be as clear as a video image, or could become obvious when monitoring metrics over time. What do the numbers show? How can crunching numbers from various stores illuminate problems and opportunities for the business? This level of business intelligence is of tremendous value to any retail operation or business that is focused on its customers' experience.

The OnVu360 platform uses an open architecture that easily integrates with any system, whether it's POS, climate control, digital signage, or a wireless door lock. A sensor could determine if a customer is standing in front of a cash register when a transaction takes place. Integrated with the POS system, the sensor could identify when a cash transaction takes place without a customer present (suggesting possible employee theft). Video of each such transaction could be forwarded to the store owner to evaluate and judge whether the transaction is legitimate or is a theft in progress.

## OnVu360's Core Functions

The OnVu360 platform uses a central server architecture that aggregates all the core system functions to an off-site location, including:

- analytics processing and display
- business intelligence reports
- IP video recording and playback
- device management and control
- Web server and Web services for custom application development
- user management
- system redundancy
- notifications system
- camera management and control.

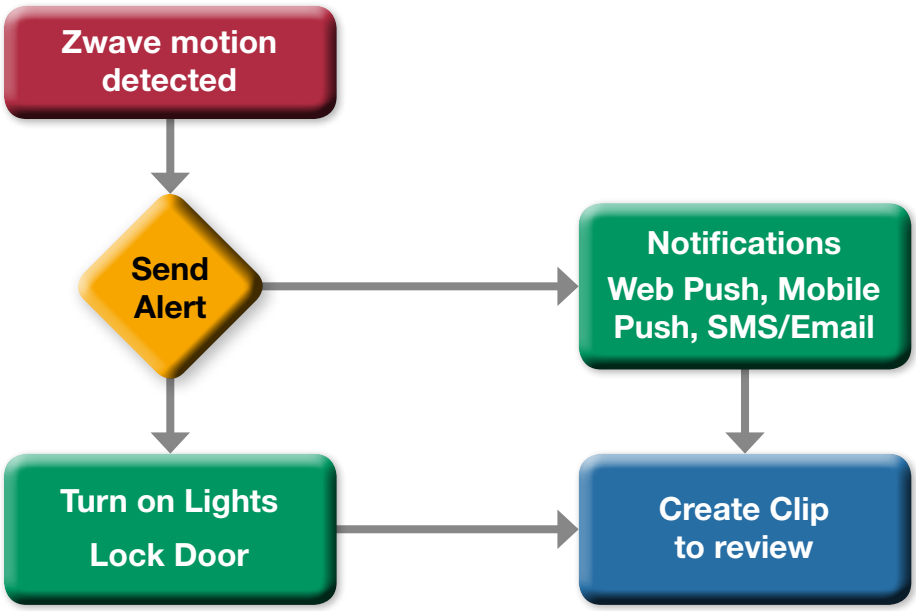
To summarize, here are some benefits of the OnVu360 Management Platform in any customer-focused business. OnVu360 enables owners and managers to:

- understand and improve the customer's experience
- target marketing expenditures more accurately
- deploy the workforce more effectively
- improve sales conversion rates
- optimize the workspace
- react in real time to make daily operations as effective as possible
- reduce fraud and shrinkage
- become a "learning" organization that continuously improves.

## Components of the OnVu360 Platform

A closer look at the elements of the OnVu360 Management Platform can help to explain how it increases efficiency and provides better business control in any vertical market.

**The OnVu360 gateway**. The OnVu360 gateway is integral to the new platform, providing an intelligent way to obtain information to be analyzed using additional computing power available in the cloud. Each gateway is loaded with OnVu360 software. In addition to IP connectivity, each supports cellular connectivity and Z-Wave or ZigBee radio frequency mesh networking. Although information can be held locally, reliable internet connectivity is necessary to get the most from the system, and Oncam has existing relationships with internet service providers (ISPs) and will continue to cultivate additional relationships in the future. As machine-to-machine services and cloud-based systems become more prevalent, the expectation is that ISP companies will provide new, less expensive data plans to accommodate the needs of these systems. In the case of OnVu360, the expectation is to record video locally and to stream metadata from the camera to the cloud to support a variety of analytics and metrics applications. The system is designed to enable use of high-bandwidth streaming once the technology becomes widely available. (At some point, wide area networks [WANs] will have the same infrastructure currently available on a localized network.)




***Platform demo**. The system supports SMS (text messaging) alerts, email alerts and jWebSocket, which enable push-to-browser communication*

Pricing has not yet been announced, but it is anticipated that the OnVu360 platform will be relatively inexpensive. Although OnVu360 software will be sold using a Linux gateway box, the software can just as easily be used with other "boxes," including set-top cable boxes or even gaming system boxes. The software can always be enhanced through the platform, which will run on any device that supports Java, including Windows, Linux and Mac. Flexibility opens the path for possible partnerships between OnVu360 and various cable, telecom and Internet suppliers to provide remote management capabilities to a range of markets. Because data processing takes place in the cloud, minimal gateway software can run anywhere with a minimal impact on processing power

**Back-end services in the cloud**. Back-end services to deploy customer applications are achieved using a Software as a Service (SaaS) model. Upgrades to applications and services are automatic and scalable to each client's needs. Gateway software serves as the "brain" at each remote location, connecting remote services without a need for additional network configuration or port forwarding. Subject to the customer's information-security policies, when the gateway is plugged into a wired or mobile connection, the capabilities of the OnVu360 platform can be made available immediately to any authorized user anywhere in the world. Installation is a very simple, "plug-and-play" procedure.

Together, the gateway and the cloud-based platform can control multiple devices throughout a remote location and unify their functionality into a broader system. The platform is designed to be "future-proof" and to accommodate additional capabilities as they are added over time.

The system involves zero configuration and connects with minimal hardware, can be scaled to meet demand, and provides access to video and the variety of other devices anywhere, anytime. Plugging the gateway into an Internet connection gets the system up and running, able to talk to the cloud, and ready to discover any cameras or other devices it can connect to. The software does everything. For security purposes, the gateway contains a configurable "white-list" of cameras to ensure that it only connects to authorized camera feeds.

Although OnVu360 systems can use public cloud services, the back-end software could also be used in any "private cloud" or even on an enterprise server if a customer prefers. Remote access allows perpetual updates of the software and the addition of new capabilities over time in any scenario.

The OnVu360 solution is best viewed as a platform that can enable a wide variety of different applications and services. In line with this philosophy, the openness of the OnVu360 solution makes it ideal for development of third-party solutions with multiple partners. The RESTful Web Services programming interface enables developers to build applications to expand the range of services offered to customers in a variety of markets. No specialized skill is required beyond the approach widely used by most Web developers. (RESTful Services API is widely used on Web-based platforms such as Dropbox, Facebook, etc.)

In the cloud system, services can easily be added "on the fly" as requested by the customer without having to visit a site for additional installation. Minimizing costs, additional functionality can be added to multiple business locations simultaneously without needing to update each location individually. Therefore, introducing the first, critical application to the customer is also the first step to providing an additional array of capabilities that use the same gateway box. The gateway is designed to "talk" to a

*Plugging the gateway into an Internet connection gets the system up and running, able to talk to the cloud, and ready to discover any cameras or other devices it can connect to.*

*Reports are interactive and enable users to "drill into" the information and experiment with various scenarios. Spread sheets and dashboards display the resulting business intelligence.*

range of edge devices, from cameras to access control, to digital signage, to HVAC systems, to switches to wireless door locks. The single platform forms the basis for multiple systems to be added over time in a "pay-as-you-go" approach that promotes long-term customer relationships and the ability to expand business to existing customers over time.

**Simplified user interface**. Logging into the system triggers a permissions architecture that regulates which cameras or devices a particular user may have access to. The interface also monitors operation of each device, showing which are online (green) or offline (red). Red means the operator should address a problem by either using the device manager software or by visiting on-site.

It's easy for users to set up functionality; everything is done through the user interface (UI). The platform simplifies configuration, management, the addition of cameras, or moving cameras to new locations, and modules enable management of various third-party devices, including ZigBee and Z-Wave-enabled systems. Remote sites can be managed from anywhere.

As an example, when the gateway is plugged in, the network auto-discovers cameras, and pre-installed cameras appear as MAC addresses. If cameras have not been preconfigured, they can be added using "discover camera" functionality. Cameras can also be renamed. In short, the system is easy to configure, even by non-technology-oriented users.

The system supports SMS (text messaging) alerts, email alerts and jWebSocket, which enable push-to-browser communication. If an operator is logged in, a pop-up alert designates if something is happening. In the mobile environment, users may opt-in to push notifications.

With cloud-based systems, robust information-security arrangements are key and Oncam has addressed this aspect carefully. The user-management system enables modification of users in the system, or creation of new users with various permissions. Permission levels cover which users have access to which video or other information, and the system is flexible to allow additional permission levels. Using permissions, users also control which gateways or devices can be accessed by whom. Once the manager sets up access configurations, they cannot be changed by operators.

Using the business intelligence interface, a simplified UI enables users to run reports in a couple of easy steps, specifying dates (a month, a day, or a quarter) or time ranges (e.g., early shift vs. late shift), and which camera(s) or other devices the reports should compile data from. Reports might include an hourly count for a specific day, for example. Reports are interactive and enable users to "drill into" the information and experiment with various scenarios. Spread sheets and dashboards display the resulting business intelligence that can guide operations. Now, business owners can correlate footfall with sales and address other business operations parameters, in one location or in hundreds of locations, to provide real business intelligence enterprise-wide.

Using the dashboard user interface, operators manage various camera feeds, reports, switches, etc. within a single platform.

All the OnVu360 client interfaces are built on top of the OnVu360 Web Services Application Programming Interface (API), based on RESTful Web Services specification. The OnVu360 clients also support Oncam Grandeye's range of 360-degree video dewarping software development kits (SDKs) for Web, Mobile, Windows and Linux.


***Web-based count report**. Generated by the OnVu360 client, Web reports can show multiple data points in one graph while enabling the user to change report frequency, duration of reporting or the type of display (line, bar or grid).*

## 360-Degree Cameras Provide Visibility at Remote Locations

Oncam's established expertise with 360-degree cameras provides a perfect complement for the new OnVu360 Platform. Oncam contends that the route to effective 360-degree surveillance lies in the dewarping software and the capabilities it offers. Dewarping software transforms a single 360-degree image into multiple images with no distortions. A camera's total 360-degree fisheye image is recorded, and software capabilities can be applied either live or on the recorded video. Streaming video can be stored locally using USB storage and/or SD recording. An operator can shift and/or magnify the part of an image that is displayed in a dewarped view. In effect, the software capability enables virtual pan-tilt-zoom (PTZ) operation either in live video or in recorded video.

For example, an operator could move around and zoom into video that was recorded yesterday to follow a person or event. The operator sees multiple "camera" views – all depicting part of a larger 360-degree image – either live or archived. Because the views are from the same camera, the images are perfectly time-synchronized. An item or person moves from one view into another at the same exact moment in time. The user experience is similar to multiple cameras watching an item and "handing off" from one to another. The user can follow anything they want anywhere within the entire 360 view. Because video is recorded, an operator can follow an individual or an object across time, too, as it appears at various times and locations.

*The operator sees multiple "camera" views – all depicting part of a larger 360-degree image. Because the views are from the same camera, the images are perfectly time-synchronized.*

The role of 360-degree cameras depends on the application. The key to choosing the right video camera for any use is to consider if it is "fit for purpose." Narrow-view cameras have specific roles and capabilities that 360-degree cameras cannot touch. In contrast, 360-degree cameras offer many advantages, specifically greater overall situational awareness and the ability to view large areas.

"Fit for purpose" also applies to how the cameras are used. For example, a narrow-view camera needs a higher frame rate to ensure that it doesn't miss any important action. A person or object could "flash" through a narrow field-of-view and no image be captured, especially if the camera is operating at a slower frame rate. In contrast, one can't "flash"

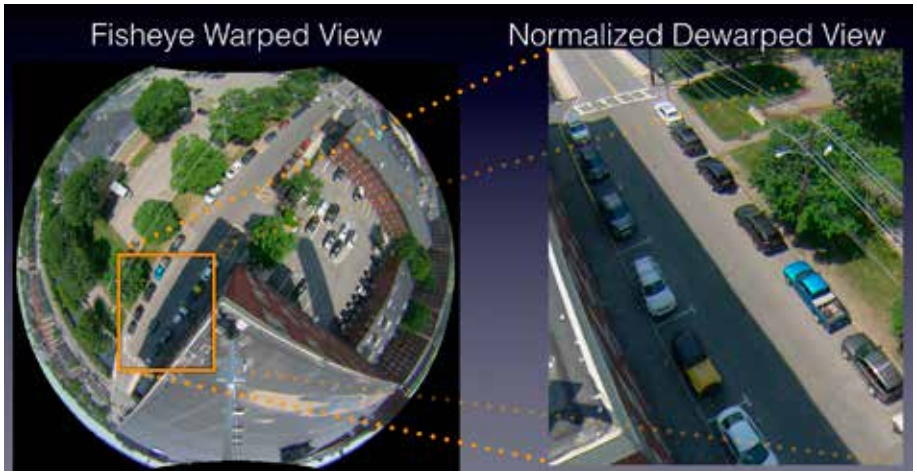
*Dewarping coordinates can be saved as part of the dashboard to recreate whatever camera views, positioning and zoom levels are appropriate to an operator's needs.*

through the view of a 360-degree camera. The large image area ensures that any person or object would be captured, even if using a slower frame rate. On the other hand, a narrow-view camera mounted at a "choke point" is unrivalled in its ability to capture face images.

The 360-degree camera is much smaller than typical dome cameras. Potential criminals might not notice it or realize it's a camera. (The camera could also be mounted covertly.) The camera's low profile means it doesn't interfere with aesthetics in prestigious locations. One major cruise line has installed hundreds of 360-degree cameras on board its ships to meet requirements to provide footage to the Coast Guard of security events reported on board.

From any PC, a store owner can view a real-time dashboard showing various elements of store operation and also can access a 360-degree camera overview of each store. The owner can pan, tilt and zoom virtually within the camera's broad view to zero in on whatever he or she wants to look at.

Additional functionality of 360-degree cameras is helping business owners do more. Using OnVu360, cameras can be viewed in the browser environment using standard web technologies. Multiple virtual-camera views, all originating in the same 360-degree video feed, can be controlled in real-time, panned, tilted or zoomed-in on a specific subject to be viewed. Dewarping coordinates can be saved as part of the dashboard to recreate whatever camera views, positioning and zoom levels are appropriate to an operator's needs. The system can also interface with sensors for automated response; for example, a window sensor could trigger a specific zoomed-in, dewarped view that is derived from the recorded 360-degree image.



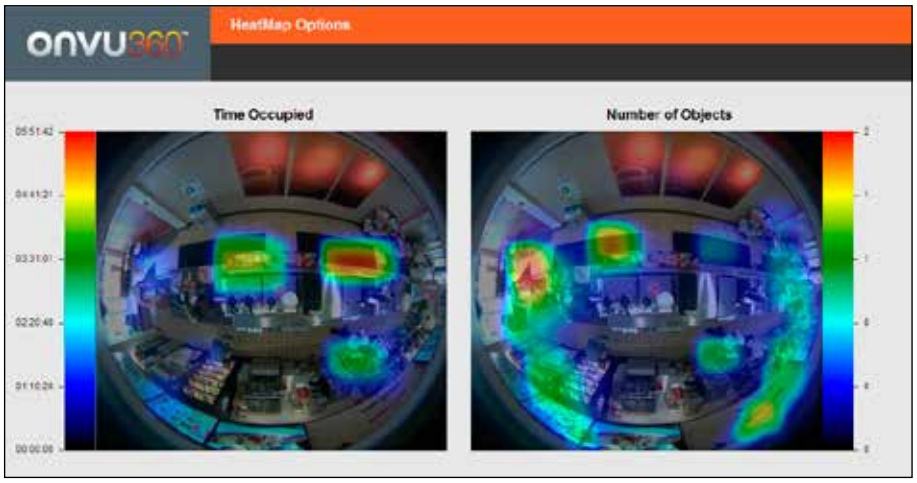

***Fisheye view/normalized view**. OnVu360's dewarping technology displays a wide angle view (left) that can be rotated, tilted and zoomed to create unique virtual views (right) through the Web or mobile client interface. Each client has its own independent control of these views on either live or recorded video streams.*

Ongoing advancements in 360-degree camera resolution and quality continue to push the boundaries of existing bandwidth and storage limits, with higher quality images now being stored in the cloud. In order to find the "sweet spot" between available bandwidth and stream resolution, the system gateway provides intelligence that evaluates remote-site bandwidth and can make recommendations on the ideal resolution for storage in the cloud. As bandwidth increases over time, the gateway can adjust to increase image resolution and maximize bandwidth. To eliminate system chokepoints, multicasting of live and recorded streams is performed server side, where bandwidth is more readily available.

## Easy Configuration of Video Analytics

Setting the parameters for video analytics involves establishing the parameters for the 360-degree camera itself, and then creating settings related to movement or other analytics functions. Analytics functionality must accommodate for application-specific variables such as lighting and floor reflectivity. The 360-degree cameras provide the ability to analyze wide area images, thus complementing narrow-view cameras focusing on smaller areas. Analytics also have to take into account the distortion of the lens. Broad-view tracking follows a subject throughout a store, which would require multiple narrow-view cameras working in tandem. Analytics functionality isn't dependent on cameras "handing off" the moving object from one camera to the next. Objects can be "tagged" based on movement, color, speed, trajectory, location, etc. – and tracked throughout the entire 360-degree camera view.

Analytics reside in both the camera and the server. The OnVu360 system's distributed architecture appears to have significant advantages over either fully centralized NVR-centric analytics solutions, or camera-only analytic solutions, especially in multi-location applications.




***Heatmap view**. A high-traffic heat map visually shows business owners where their customers spend most of their time and for how long. This information is vital to removing traffic roadblocks, expediting the time to service or validating product placement.*

Toolsets enable users to manage camera analytics. A configuration page lets users configure cameras in general related to the environment, and specifically in terms of report type and the analytics being employed. Reports might highlight people counts, dwell times related to specified zones, object stopped, etc. Flexible settings enable each report type to be customized related to length of dwell time and other variables. The system defines a "grid" covering the entire 360-degree view, and any part of the grid can be specified in designating a zone to apply analytics. Operators might measure when someone crosses a line in a certain direction and how many people cross the line. People counting and other analytics could provide data on how many people come into the store, which can be compared to overall store sales to analyze sales per customer. "Heat maps" can display analysis of dwell times, occupancy and other variables to highlight customer activity and high-traffic areas.

*Analytics functionality isn't dependent on cameras "handing off" the moving object from one camera to the next. Objects can be "tagged" based on movement, color, speed, trajectory, location, etc.*

## How Secure Is It?

Security has been an important consideration in developing the OnVu360 gateway. Communication from the gateway to the back-end cloud software is minimized in the interest of security. Also, effort has gone into avoiding exposure of IP addresses of gateways or cameras externally, which could be a security vulnerability. The gateway communicates with the cloud servers over standard ports, keeping standard security firewalls intact.

## Dewarped Images on Mobile Devices

The ability to view dewarped 360-degree images on mobile devices is a welcome capability of remote monitoring systems.

Oncam's dewarping software is now available to SDK partners and is being applied to a variety of devices such as iOS and Android. A broader variety of devices can now access 360-degree video, and each client enables users to pan, tilt and zoom within a video stream. Multiple clients can view the same stream simultaneously and can look at different points of interest by controlling their panned, tilted and zoomed-in views using individual client interfaces (and without regard for how many others are viewing the stream and how they may be "moving around" in it.) Oncam browser applications combine graphics processing and dewarping using standard web tools. Oncam patents cover the use of Graphics Processing Cards and OpenGL, a common graphics language in the gaming market, to speed up the dewarping process.

In effect, each user has a unique perspective and views multiple "virtual" cameras that are derived from the 360-degree view, dewarped and presented as any other camera view in the context of a video management system, for example. Any 360-degree image can be viewed in the fisheye "warped" view and also in the normalized "dewarped" view, and any part of the image can be viewed separately and dewarped ("flattened"). Each client type, whether mobile, browser or thick client software, has this ability as long as the client dewarper is present. However a user views or manipulates an image being viewed, the full, original, 360-degree fisheyed warped view is recorded and preserved as needed for evidentiary purposes. The chain of evidence is maintained, and the system has been accepted in at least one courtroom (and the dewarped view also displayed for the convenience and easier viewing of jurors).

## Application Focus: Quick-Service Restaurant Chain

A current quick-service-restaurant (QSR) customer of Oncam's 360-degree cameras is constantly looking for new ways to use the cameras to boost business operations. A brief examination of how the chain uses the cameras illustrates opportunities for the new OnVu360 system to the broader market.

The 360-degree cameras are either ceiling- or wall-mounted. The system can dewarp a still image or dewarp when video is played back. However, the full 360-degree image is always recorded and stored. Dewarped "sections" of the 360-degree fisheye image look to operators like separate cameras, and are displayed right alongside narrow-view cameras in video client software.

The company has both individually owned and franchised locations, and it is looking to develop an audit program that provides metrics and reports on various business operation parameters. For example, questionable POS transactions can be identified, flagged, and a report can summarize the activity, including possible lost revenue. Such information can help a franchise owner manage multiple locations more effectively – and profitably. Cloud systems make it easy and inexpensive to analyze store metrics, which can be replicated

from one store to another. Sharing information among stores and measuring best practices enable better operation of store locations, and greater profitability for the company and its franchisees. The corporate approach is to test and "prove" the benefits of these technologies at corporate stores and then to "sell" the franchisees on implementing the approach using hard numbers from corporate stores as proof of concept.

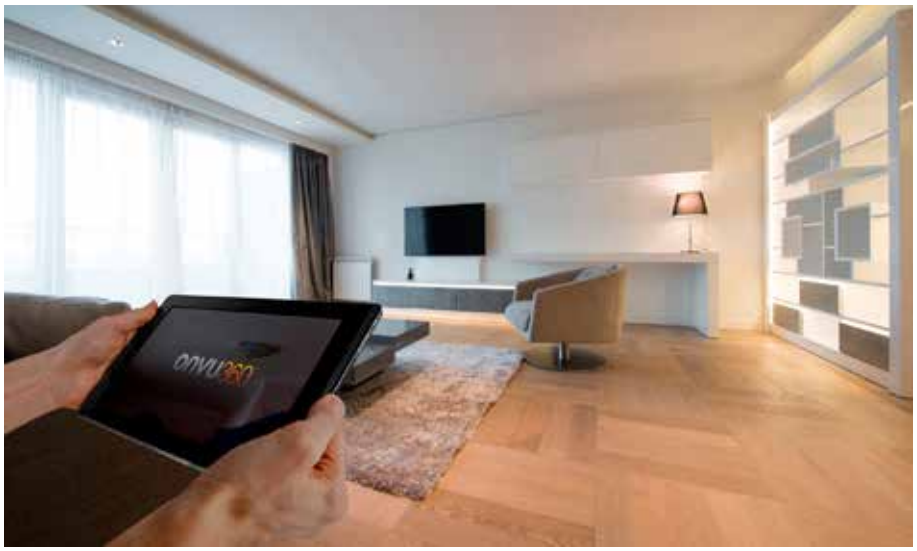
The OnVu360 system provides a live overview of store operations to enable remote management, which lowers costs and increases efficiency. A single owner or franchisee could monitors dozens or even hundreds of stores remotely, moving virtually from one store to another to check on operations. The system also can compile a variety of information from multiple stores, store it and analyze data to review trends and best practices to boost overall operations.

*For the home-security market, 360-degree view cameras have huge potential. Launch of the OnVu360 platform expands on opportunities in the home-security/ automation market.*

## Home Automation Market Applications

For the home-security market, 360-degree view cameras have huge potential. Launch of the OnVu360 platform expands on opportunities in the home-security/automation market. As technology evolves and manufacturing costs decline, inexpensive 360-degree cameras could provide a new level of visibility for a homeowner, with wide images showing large areas available from a mobile phone, tablet or other device. The camera would capture the whole picture, and an easy app would let the homeowner pan, tilt and zoom (virtually) around to see what is going on. The camera can monitor whether the cleaning lady arrived, whether there is smoke or water leakage, etc., much better than a small camera mounted in the corner of the room. In the home-security market, 360-degree cameras can also help to minimize installation infrastructure and simplify system design.

Historically, the large home-security market has lagged behind technological development, with providers clinging to antiquated alarm panels and telephone-line technologies used widely since the 1950s and 1960s. Even when wireless sensors have been employed, they typically tie into the legacy system with no impact on system operation. There is very limited or no verification capability. Obviously, visual verification using video is the best option, but narrow-view cameras can only see limited areas and do not provide situational awareness. In contrast, 360-view cameras see more than many additional narrow-view cameras, while providing real-time images to the homeowner of what's happening.



## OnVu360 Platform Billing

The OnVu360 Management Platform is integrated with custom Web-based billing and customer relationship management (CRM) services featuring customer package creation and subscription-based models. The OnVu360 billing system is integrated directly into the back-end services so that new features can be enabled immediately after they are purchased. The system is designed to grow as the client's needs grow.

Increasingly, given the availability of mobile apps and broader networks, more security customers are likely to opt to "self-monitor" their homes and call the police themselves if there is a crime in progress. This capability could supplant – or at a minimum augment – the alarm-monitoring industry over time, especially given the industry's continuing problems of false alarms, police forces that won't respond, etc. The insurance industry would also benefit from a more empowered approach to security on the part of homeowners.

The OnVu360 software runs on any Linux or Windows Embedded Device, such as a hardware gateway, a set-top box or a camera, and provides a secure connection to the OnVu360 back-end servers. Any residential set-top box can become a gateway to home security and automation. The combination of the intelligent hub and cloud-based architecture forms the basis for intelligent management of multiple systems in the residential environment, too.

## OnVu360 Has Applications in Multiple Verticals

The OnVu360 platform provides connectivity to enable video and analytics to be used in multiple ways across various markets. Connectivity through the cloud increases the ability to leverage metrics and situational awareness in a variety of verticals, including:

**Banking**. Service is a critical differentiator in the banking sector, especially among VIP customers. OnVu360's metrics related to wait times, customer traffic and other service variables coincide well with the need to ensure superior service, even across multiple banking sites and branches. There are also obvious security advantages of video in the banking sector.

**Managing remote facilities**. Facility management companies need the ability to monitor heating, lighting and other systems remotely, and can also benefit from analyzing the activities of cleaning staff and other personnel.

**Transportation facilities**. Busy transportation hubs are a customer service environment and also face additional challenges such as controlling crowds, people counting, managing queues, etc. Centralized control of remote facilities, from subway stations to bus stops, can increase efficiency and lower costs for large transportation systems.

**Broader business applications**. Any business that involves the customer experience can benefit from real-world metrics of business operations. Businesses need to react rapidly to events and changing business conditions, and OnVu360 offers the needed data to fine-tune any customer service situation. Anyone seeking to manage a remote work force can benefit from tracking and analyzing activity and the consequent impact on business success.

**Healthcare**. How often does a nurse visit a patient in an elderly care facility? How much time does he or she spend with the patient? The same analytics used in retail organizations can be applied to this important market, which is facing rapid growth in the next several years based on demographic trends alone. Applications also extend to the broader healthcare market, where the need to control costs and boost efficiency are driving technology innovation.

**Distance learning and education**. Video and the Internet have vastly expanded the opportunities for distance learning. Students thousands of miles away can pan, tilt and zoom in to view any demonstration; student doctors can watch a medical procedure

from any angle they want by interfacing with a video image. A remote teacher could zoom in on any student who has a question or wants to make a point. Applications can expand the ability to leverage the expertise of a "super-teacher" across a wider audience of students, adding efficiency to the education process and lowering costs.

**Mobile policing/public surveillance**. A 360-degree camera is small and can easily transmit video using wireless networks. In high-crime areas, a camera can be installed on a temporary basis to view activity, enabling police to pan, tilt and zoom virtually within the larger area to view possible criminal activity. The camera's smaller profile could enable such a system to be "semi-covert." A camera at an intersection can be streamed over the Internet to allow anyone to view traffic conditions – or to a police department to monitor and resolve accidents.

**Hospitality**. A "virtual concierge" could access real-time video of local restaurants, enabling guests to see the crowd and view the surroundings before making a reservation. The same information could be accessed from a tablet computer from a hotel room. Meeting planners could view facilities remotely, and monitor events as they progress, with the ability to respond to any crisis in real-time. Monitoring corporate events has many of the same advantages as retail – the ability to count customers, analyze dwell times, ensure rapid service, etc.

**Education**. School security advantages are obvious, but what about the opportunity to provide an image to a parent (through a sign-in portal) of their child's education experience, or even what their child is doing at a daycare center?

## Technology Road Map: A Flexible Platform for Multiple Applications

OnVu360's gateway and related cloud software systems are not a single product but rather a platform offering expansion opportunities to develop specific products for a wide variety of business needs. OnVu360 provides a useful and low-cost ecosystem around which a variety of third-party solutions can be developed. Oncam hopes the technology will provide an opportunity for partners – even non-traditional partners and those outside security – to bring new and innovative solutions to the market.

To expand functionality of the OnVu360 Management Platform, Oncam is looking for third-party partners to embrace the technology and focus on specific vertical markets. In addition to third-party development, Oncam is moving ahead with its own new products to enable customers to realize the platform's full potential.

Oncam's initial product launch is the business intelligence (BI) module, which includes the gateway and 360-degree camera and access to the cloud-service portal, providing expansive business-intelligence capabilities and creating the infrastructure for the later addition of new modules as they are developed and delivered through the cloud with no additional equipment needed on site. Analytics can track where customers move in the store, where they dwell, and how they react to various product-placement scenarios. A retailer may know that more people are buying handbags than shoes, but now they can have access to data that could explain why, based on customer movement, product positioning and other variables. Emerging video analytics can ascertain customer traits such as age, gender and ethnicity to provide additional demographics and to analyze how they impact sales trends. Interactive signage can be targeted to customers based on video analysis of their age and gender.

### OnVu360's Underlying Patents

OnVu360's capabilities and functionality reflect Oncam International's intellectual property resources, including U.S. Patents that cover:

- moving a physical alarm panel to a central server and emulating it through software (granted).
- providing video data streams to multiple users, including dewarping to supply each user his or her own unique perspective (pending).
- mobile point-of-sale (POS) surveillance using analytics and 360-degree technology to record and track transactions on POS devices moving throughout a location (pending).
- intelligence in the OnVu360 gateway that detects current camera count and available bandwidth to estimate the best possible resolution, frame rate and streaming for the cloud (pending).

*Mobile POS involves use of a handheld tablet in lieu of a traditional "cash register" or checkout station. But what about security and loss prevention?*

For current retail customers using Oncam 360-degree cameras for security and situational awareness, the analytics module can augment operational efficiency and manage remote sites more effectively. Even in the retail world, where analog still rules the vast majority of video installations, analytics capabilities of the 360-degree IP camera can boost the value proposition and return on investment (ROI) to make the technology that much more valuable.

An additional module, soon to be introduced, will provide local video recording (hard-disk or SD recording) to enable both on-site and off-site video storage. Video will be recorded locally; or on major events, it can record to the cloud. A module will also enable all-cloud recording. The system is flexible to accommodate any customer's preference of local versus cloud recording – some will prefer to record to the cloud and others might "push" events to the cloud.

Future innovation around the OnVu360 platform will combine 360-degree imaging technology with object-tracking analytics to verify mobile point-of-sale (POS) transactions, a major emerging trend in retailing. Mobile POS involves use of a handheld tablet in lieu of a traditional "cash register" or checkout station. The ability to complete customer transactions from anywhere in a store using a tablet device frees up associates to increase their interaction with customers, but what about security and loss prevention? Traditionally, video cameras have been mounted above cash stations to watch transactions, but the approach is a challenge if the "cash station" moves everywhere in the store with an employee. The use of a 360-degree camera to cover an entire sales area or an entire store can keep watch on transactions that occur anywhere. Indoor GPS and tracking technologies can provide coordinates of where a tablet device is in the store to trigger which part of the 360-degree camera view would capture any transaction. With no blind spots (where an employee might hide out to complete an unauthorized transaction), retailers again have video of any transaction. Dewarped video of any transaction anywhere in the store can be linked to data of actual transactions taking place to ensure security.

## Opportunities for the Future … and Now

The OnVu360 Management Platform reflects a broader trend toward use of the Internet or intranet to connect machines and processes rather than human beings. In the future, many more devices will be connected and communicate via the Internet, IP networks and intranets, providing new capabilities and conveniences for consumers and businesses. For business applications today, OnVu360 offers an affordable, scalable, flexible solution that can be as comprehensive as the customer wants it to be, leveraging a suite of built-in capabilities and cloud-based architecture to enable additional, customized functionalities to be added easily.

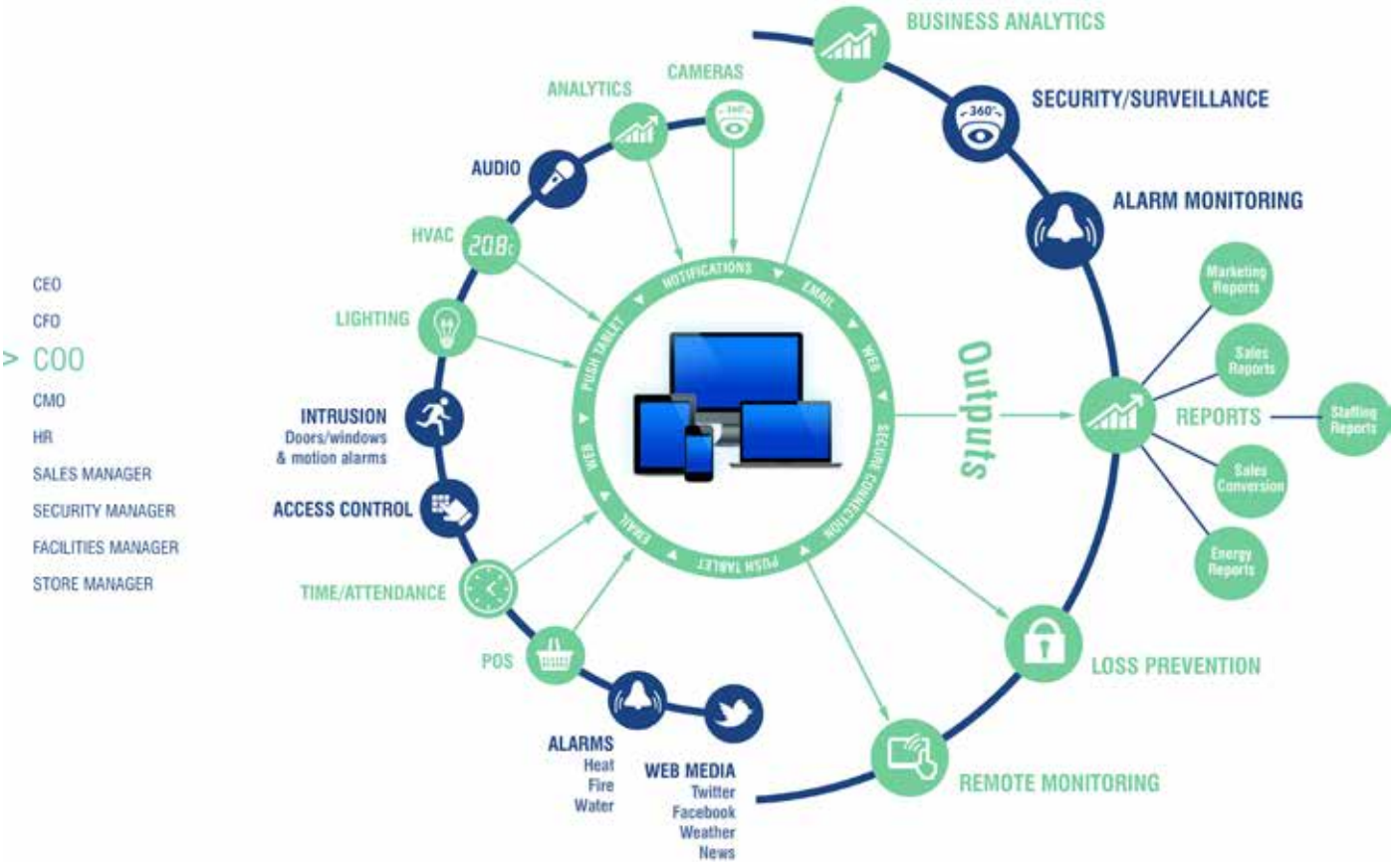



*Diagram illustrates how a Chief Operating Officer could use the OnVu360 platform to view business or store operations remotely and have access to business analytics, sales, marketing, sales energy and loss prevention reports. Different job functions can access a variety of reports and devices to give them the business intelligence they need.*

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