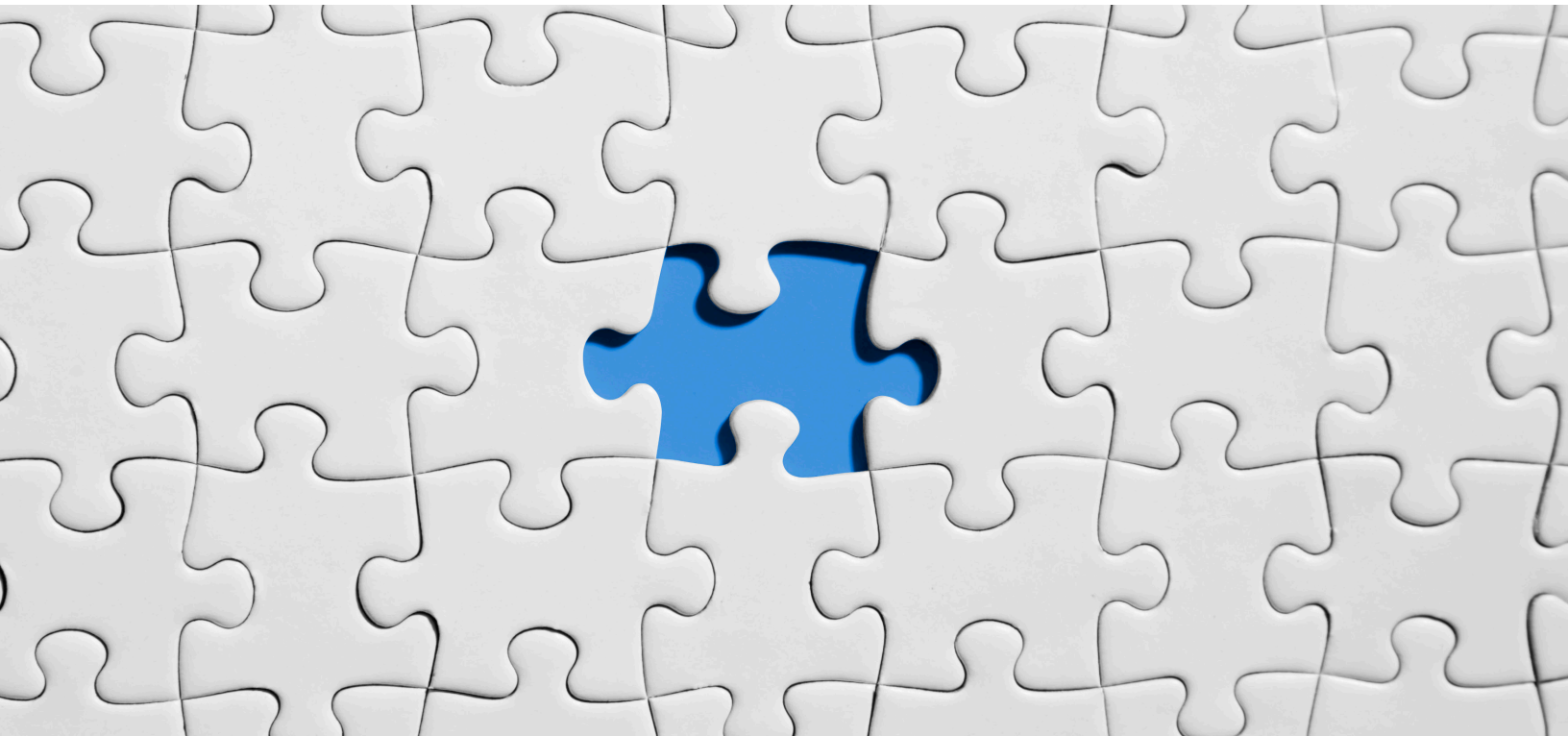


# VIDEO SURVEILLANCE OPTIONS IN A SMART CITY



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## **Abstract**

Ever-increasing population density in urban areas require adequate provision of services and Infrastructure to meet the needs of the residents, visitors and to ensure security by proper monitoring. With monitoring as a requirement for security it is almost evident that there is a primary need in Video Surveillance systems, IoT and analytics in urban areas to make sure that the city is good enough to manage Assets, resources and services efficiently from the data and insights gained from this hence calling these Urban areas as Smart cities. This includes data collected from citizens, devices, buildings and assets that is then processed and analyzed to monitor and manage traffic and transportation systems, power plants, utilities, water supply networks, waste, crime detection, information systems, schools, libraries, hospitals, and other community services, and more.

A video surveillance system is composed of a system of cameras, monitors/display units, and recorders. Cameras may be either analog or digital with a host of possible design features. The design features depend upon the type of environment you want to deploy, cost, and configuration of the video surveillance system.

This article focuses on the Good Better Best option of deploying video surveillance in a smart city.

## **Introduction to Video Surveillance**

Video surveillance systems (VSS) consist of one or more video cameras on a network that send captured video and audio information to a certain place. Unlike television, images are not available to the public. They are live monitored or transmitted to a central location for recording and storage. A VSS contains more than just the CCTV cameras, NVR and server/storage. Let's look at some of them below.

### **Cameras**

For wireless surveillance systems, there are two different types of technology: WIFI cameras and point-to-point wireless linking.

#### **WIFI Cameras**

All-in-one WIFI cameras are popular with homeowners and small businesses. These cameras are small, affordable, and easy to use. They should only be used in small systems though, because having too many WIFI cameras on one network could overwhelm your bandwidth. These cameras will have basic features, so if you need a specific feature or advanced functionality your options will be limited. It should also be noted that very few cameras are battery operated - even a WIFI camera still needs to be plugged in to get power.

#### **Point-to-point Wireless**

If you need to install multiple cameras over a large area, and require specific or advanced features, a wireless point-to-point system is a better option. This type of system allows you to turn an IP system into a wireless system by linking cameras with wireless antennas. These systems use powerful antennas to connect over large distances (although they should have line of sight, ideally), such as connecting surveillance systems in multiple buildings on a college campus or a retail store and its parking garage. The wireless antenna connected to the cameras will communicate with the base station, connecting it to your NVR or VMS. The cameras in these systems also require power, and are not battery operated

### **NVR Recorder**

A hardware device which is not also a camera, NVR recorders are designed to record video surveillance camera footage to storage and must include the vendor's own recorder software. The device includes software for viewing, analytics, centralized management

### **Video Surveillance Management Systems**

A video management system (VMS) orchestrates a surveillance workflow by integrating with cameras, encoders, recording systems, underlying storage infrastructure, client workstations, gateway systems and analytics software, mainly by providing a single interface for video surveillance infrastructure management. The VMS is hosted usually on a server and then used to manage all the activities.

### **Storage**

Content from the surveillance is stored in the storage configured with the video surveillance system. The storage configured can be any type (direct attached, over a network, etc.). It is also possible to have different storage appliances for different purposes (regular use, retention/archival).

## **Surveillance in the Past Decade**

Earlier video surveillance systems were not as developed as they are now. Regular analog cameras were used along with direct attached storage with limited capacity available in most cases and low resolution/frame requirements. Along with this there was no requirement for Analytics and Pattern Recognitions.

## **Emergence of Video Surveillance**

Over the past few years security and monitoring has become a key requirement worldwide. Video surveillance plays a huge role in making this happen through capturing real time images/videos and running analytics and Pattern Recognition within a short span of time.

Implementing video surveillance in urban areas – i.e. smart cities – is crucial. Let's explore some of the challenges when implementing video surveillance in a smart city.

## **Challenges for Surveillance in a Smart city**

There are several factors for implementing Surveillance in a smart city; scale of the city, budget, level of analytics/recognition, etc. Some of the challenges are highlighted below.

### **Capacity & FPS**

In a smart city there is a need to store data for long periods of time with high quality videos. While a 30-second video your camera automatically records on motion won't be very large, a 10-minute video of a break-in at your store will. Additionally, a video recorded at 5MP and a full 30 frames per second (fps) will be helpful in identifying suspects in a video, but also be a very large file.

If you want to record traffic in parking lots and garages, or track visitors as they move around your store, FPS – the measurement of how many frames, or images, per second your camera can record – is an important camera spec to consider. The higher the frame rate, the smoother the video will be even with fast moving objects. The standard is 30 fps, but some cameras can record as high as 60 fps

### **Accessibility & Retention Period**

Video footage should remain accessible to the video management software regardless of where it is stored. Data retained for long periods of time in separate silos can inhibit users if separate manual interaction is required for access. Keeping latency to a minimum for playback and post recording analytics should also be an objective.

Retention plays an important role in determining the right capacity and storage solution; thus, suitable storage must be configured. It is possible to have active and retention tiers on separate storage platforms.

### **Drive Performance**

Because a surveillance system runs intensive management software and must store large amounts of data, the hard drives you choose for your surveillance system are very important. While you cannot eliminate the possibility of hardware malfunction or failure, selecting hardware designed for professional video surveillance applications is your best option for optimal system performance.

A traditional hard drive has spinning discs, while a solid-state drive (SSD) uses different technology to remove the spinning parts. Because it has no moving parts, a SSD is believed to last longer. However, this is still relatively new technology and has not been extensively tested in video surveillance systems.

### **Motion Detention**

Motion detection is an important tool for securing your business or building. To understand motion detection, you first need to understand how a camera works. Inside the camera is an image sensor, which the camera lens directs light to – when light hits the image sensor each individual pixel records how much light it's getting. That pattern of light and dark areas on the pixels becomes the complete video image you see.

### **Budget & Scale**

Despite what some might believe, an IP-based security camera system is quite affordable and can provide a hefty return on investment if used to its fullest. Meanwhile, the cost of cabling CCTV cameras (also called "analog") can be 2-3 times more expensive than the cost of installing IP cameras. How is that possible? Consider this: CCTV camera systems require two separate cables, one for powering the cameras and the other for sending video signals. This tends to increase installation cost.

IP camera systems on the other hand only require an Ethernet cable to send and receive data. This simplifies installation since the Ethernet cable provides both power and network connectivity, bypassing the need to hire certified electricians when installing your system.

Scale of the project in the smart city is also a crucial factor as there is a lot of cameras and cabling involved along with a better server/storage configuration for better read/write performance. Other dependencies include the areas of surveillance, such as Vehicle Parking system, Crowd Monitoring, Traffic Control system, Self-Checkout Supermarkets, use of video analytics for logistics tracking or time keeping.

### **Good-Better-Best for Video Surveillance in a Smart city**

With the background provided on video surveillance in a smart city, let's explore Dell Technologies offerings to help us understand and get more insight on how Good-Better-Best Surveillance Environments would look with a broad server, storage, and network portfolio along with integration of best-in-class VMS vendors.

Figure 1 provides an example of how the environment would look. This could vary according to the environment and requirements.

## What Good Looks like

When implementing VS in a smart city, a good option is where we have a small environment with a decent number of cameras, recorders and low-medium requirements on bandwidth, clarity, frames per second (FPS) and not requiring ultra-low latency. Figure 1 depicts an environment suitable for this.

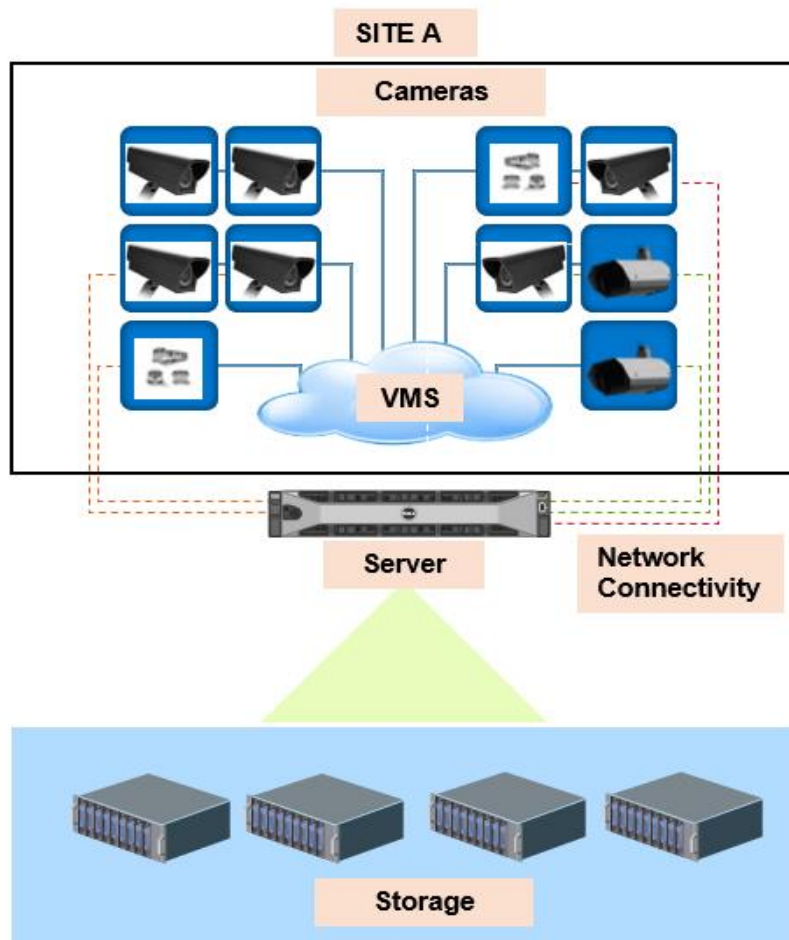


Figure 1

Figure 1 depicts a small the environment with just one site with cameras. The storage and server requirements are not highly demanding with low to medium bandwidth/ resolution requirements. Also, Surveillance time will be for only a few hours a day, thus not requiring a huge amount of capacity. From a Dell Technologies view, a PowerEdge server can be used along with internal storage or if necessary, the whole setup can be connected to external storage as well.

This kind of setup can be used in a small smart city with little or no analytics and recognition, where key areas of application, i.e. Traffic Monitoring, Crowd Monitoring, Vehicle Parking system, etc. require minimal analysis.



## What Better Looks like

A better implementation of VS in a smart city is where we have a medium to large environment with multiple sites and a good number of cameras, recorders and medium-high requirements on bandwidth, clarity, FPS and low latency.

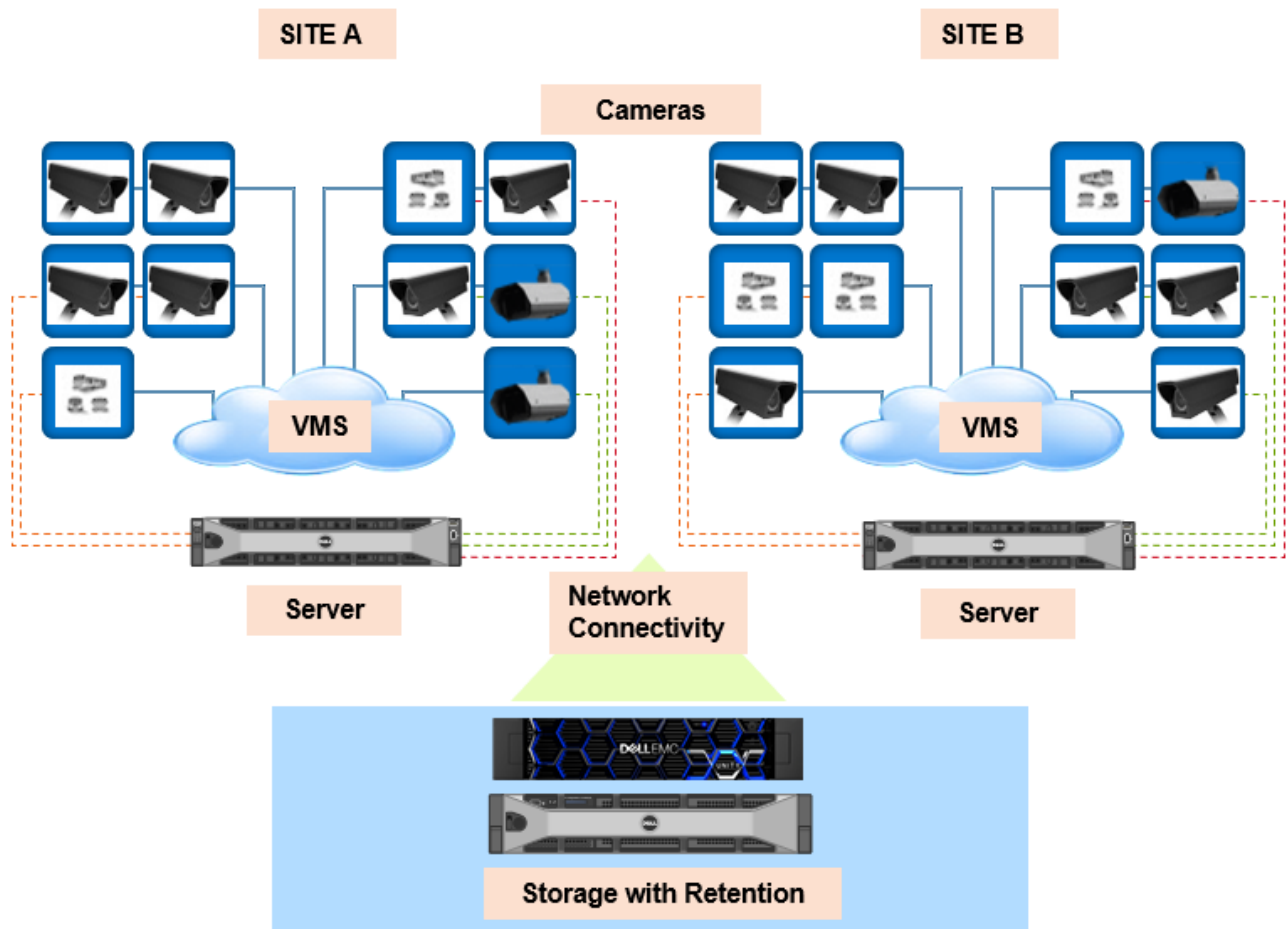


Figure 2

Figure 2 shows a multi-site environment with cameras and storage and server requirement from medium to high with medium to high bandwidth/ resolution requirements. Surveillance time per day will be for almost the whole day. From a Dell Technologies view a PowerEdge server can be used along with PowerStore, Unity, SC Series as the Storage configuration.

This kind of setup can be used in a large smart city with numerous cameras in multiple locations far apart with a decent requirement for video analytics and pattern recognition. Key areas of application are Traffic Monitoring, Crowd Monitoring, Vehicle Parking system, Self-Checkout Supermarkets, use of video analytics for logistics tracking or time keeping, etc. where monitoring and analysis is needed.

## “AI Is Making an Impact on The Surveillance World”

Issues like people tracking, area monitoring, parking occupancy, vehicle analytics and traffic monitoring are crucial. Amid the Covid-19 crisis, many companies have spent considerable effort in building AI-based systems to ensure social distancing in public areas. The pervasive nature of AI is leading to a level of sophistication that was unheard of a few years ago.

- Steve Nouri (Forbes Councils Member)

### What Best Looks Like

Implementation of VS in a smart city is the best option for medium to large multi-site environments with a good number of cameras, recorders and medium-high requirements for bandwidth, clarity, FPS and low latency.

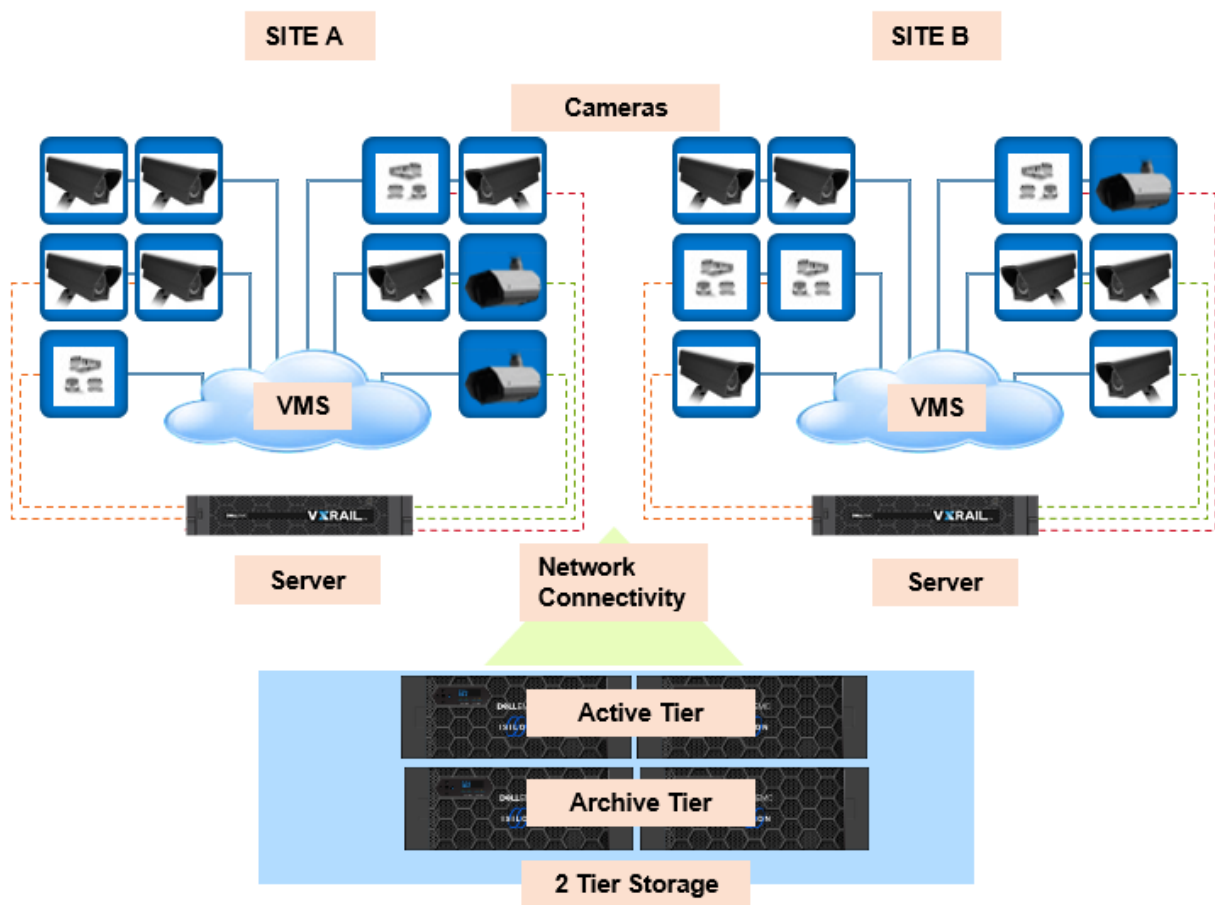


Figure 3

Figure 3 depicts a multi-site environment with cameras and with storage and servers requiring a high level of bandwidth/ resolution since they will have to be used for Analytics and Face/Pattern Recognition, which also adds to Surveillance time per day; typically almost the whole day. Dell Technologies Vxrail solution can handle this level of Compute and Storage requirements while harnessing the benefits of a hyper-converged infrastructure (HCI) solution. Since Analytics and Pattern recognition will be a mandatory activity in this environment it is necessary to have a storage solution with no compromises that can handle the latency requirements, data retrieval and have a pool of unstructured storage data (video files). PowerScale (formerly Isilon) is the solution for storage that can flawlessly address the requirements of this environment.

This kind of setup can be used in a large smart city with numerous HD cameras in multiple locations far apart with high involvement on video analytics and pattern recognition. Key applications are Vehicle Parking Suggestions, Self-Checkout Supermarkets, use of video analytics for logistics tracking or time keeping, Traffic Congestion Guide, checking the temperature of people entering an office/store, authorized entry and exit using cameras, etc. where Analytics is a mandatory use case.

The use cases above exemplify how Dell Technologies can help you set up a Video Surveillance and Analytics solution. Contact your Dell Technologies Sales Representative to find out more about these workstreams.

## **Benefits of VS in a Smart city**

Implementing Video Surveillance in a smart city reduces manual intervention, such as ensuring rules and regulations set by the authorities are followed. Video Surveillance solves the majority of these issues that arise daily. For example:

- how many vehicles exceeded the speed limit on a given day?
- What happened at a location at a specific time?
- Has anyone had a parking issue at a location?
- Did anyone try to destroy public property (water, transportation, buildings, gardens, etc.) in the smart city?

## **Role of Dell Technologies**

As a technology leader in driving human progress, Dell Technologies is committed to partnering with customers in driving innovation; in this case, a smart city with Video Surveillance as a use case. Also, the flexibility of Dell Financial Services (DFS) and Flex on Demand programs make it is a straightforward decision to get started on modernizing your smart city.

## **References**

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