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CCNA Collaboration CIVND 210-065

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CIVND Official Cert Guide

BRIAN MORGAN, CCIE No. 4865

JASON BALL

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CCNA Collaboration CIVND 210-065 Official Cert Guide

Brian Morgan, CCIE No. 4865, and Jason Ball

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Technical Editors: Jhun DeLeon, Marcello Federico

Editorial Assistant: Vanessa Evans

Book Designer: Mark Shirar

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Proofreader: Megan Wade-Taxter



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Cisco Systems, Inc.
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Asia Pacific Headquarters
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About the Authors

Brian Morgan, CCIE No. 4865, is a consulting systems engineer with Cisco specializing in collaboration technologies. In over 20 years in the networking industry, he has performed in a number of roles, including pre- and post-sales engineering, network consultant, Certified Cisco Systems Instructor, and engineering director for a telecommunications company. When he is not spending time with family and friends, Brian enjoys working with local high school and college students participating in local Cisco Network Academy programs, as well as STEM and FIRST Robotics programs in North Texas.

Jason Ball is married to his beautiful bride of 18 years, Siobhan Ball. They have two children, Isaac and Maureen. Both children have caught his passion for the technology industry. They are both involved in a robotics program through FIRST Lego League, with his wife coaching both their teams. Through this program, they learn skills like programming, electrical engineering, mechanical engineering, civil engineering, and other skills like gracious professionalism. Outside of this program, his daughter is getting into software design, and his son is taking courses through North Carolina State University called Young Engineers, offered for children between 12 and 18 years of age, where he is furthering his IT skills.

Jason was a slow starter in the IT industry. His beginnings date back to 1989 with an opportunity to work with audio/video systems. In 1993, his focus changed to public speaking. He traveled around for many different types of speaking engagements, encountering groups of varying ages. In 2003, he was introduced to multicast media. This unfamiliar and exciting opportunity rekindled a desire for involvement in technology.

In 2009, a new opportunity presented itself. Jason was recently unemployed when a connection with Scott Waschler, an employee at TANDBERG, opened a door to contract as a technical trainer. In May 2010, Cisco purchased TANDBERG, and a new world of technology emerged. This is a journey that will never end, and Jason is continually hungry to learn all he can and to share that knowledge with others who are also eager to learn.

Jason currently works for Compass Business Solutions, a Learning Partner of Cisco. Compass specializes in teaching Collaboration-related courses, including CIVND 2. He holds many certifications, most of which are with Cisco. His current certifications with Cisco include CCNA Route/Switch, CCDA, CCSI, CCNA Video, CCNA Voice, CCNA Collaboration, CCNP Voice, CCNP Collaboration, CSE, LVCI, BACI, Cisco Video Network Specialist, and TVS Certified Specialist.

About the Technical Reviewers

Jhun DeLeon is an industry veteran when it comes to voice, video, and data networking, having deployed numerous complex TelePresence/videoconferencing projects for large companies with global presence. When Cisco started selling TelePresence solutions, Jhun shifted his focus to TelePresence, or what is called collaboration. Jhun worked at Cisco System as a voice engineer working on unified communications. After Cisco, Jhun has worked with Cisco Partners doing design, architecture, and implementation of unified communications, TelePresence, videoconferencing, digital signage, and physical video surveillance.

Marcello Federico is a technical leader in the Cisco Collaboration Technology group, focused on video technologies and collaboration APIs. He is currently a consulting systems engineer covering the Pacific Northwest Enterprise segment where he works with his customers on creating their unified communications architecture and strategy. Prior to Cisco, Marcello held various systems engineering roles focused on the Enterprise, selling DSP media processing blades, software SDKs, and API stacks. Marcello graduated from the University of Western Ontario and obtained a degree in computer science with a specialization in software engineering. He loves to write code and continues to learn about the latest programming techniques and how to apply them to the Cisco collaboration APIs. He lives in Seattle, WA with his wife, Denise; children, Domenic and Cole; and his trusty old cattle dog, Chester. In his spare time he enjoys playing soccer and golf and spending time with his family.

Dedications

Brian Morgan: This book is dedicated to Sunshine and the pursuit of much and more.

Jason Ball: To my wife, Siobhan. I couldn't do what I do if you didn't do what you do.

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Command Syntax Conventions

The conventions used to present command syntax in this book are the same conventions used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- **Boldface** indicates commands and keywords that are entered literally as shown. In actual configuration examples and output (not general command syntax), boldface indicates commands that are manually input by the user (such as a **show** command).
- *Italic* indicates arguments for which you supply actual values.
- Vertical bars (|) separate alternative, mutually exclusive elements.
- Square brackets ([]) indicate an optional element.
- Braces ({ }) indicate a required choice.
- Braces within brackets ([{ }]) indicate a required choice within an optional element.

Introduction

Professional certifications have been an important part of the computing industry for many years and will continue to become more important. Many reasons exist for these certifications, but the most popularly cited reason is that of credibility. All other considerations held equal, the certified employee/consultant/job candidate is considered more valuable than one who is not.

Goals and Methods

The most important, and somewhat obvious, goal of this book is to help you pass the CCNA Collaboration CIVND exam (210-065). In fact, if the primary objective of this book were different, the book's title would be misleading; however, the methods used in this book to help you pass the CCNA Collaboration CIVND exam are designed to also make you much more knowledgeable about how to do your job. Although this book and the accompanying CD together have more than enough questions to help you prepare for the actual exam, the method in which they are used is not to simply make you memorize as many questions and answers as you possibly can.

One key methodology used in this book is to help you discover the exam topics that you need to review in more depth, to help you fully understand and remember those details, and to help you prove to yourself that you have retained your knowledge of those topics. So, this book does not try to help you pass by memorization, but helps you truly learn and understand the topics. The CCNA Collaboration CIVND exam is just one of the foundation topics in the CCNA Collaboration certification, and the knowledge contained within is vitally important to consider yourself a truly skilled routing/switching engineer or specialist. This book would do you a disservice if it did not attempt to help you learn the material. To that end, the book will help you pass the CIVND exam by using the following methods:

- Helping you discover which test topics you have not mastered
- Providing explanations and information to fill in your knowledge gaps
- Supplying exercises and scenarios that enhance your ability to recall and deduce the answers to test questions
- Providing practice exercises on the topics and the testing process via test questions on the CD

Who Should Read This Book?

This book is not designed to be a general networking topics book, although it can be used for that purpose. This book is intended to tremendously increase your chances of passing the CCNA Collaboration CIVND exam. Although other objectives can be achieved from using this book, the book is written with one goal in mind: to help you pass the exam.

So why should you want to pass the CCNA Collaboration CIVND exam? Because it is one of the milestones toward getting the CCNA Collaboration certification (no small feat in itself). What would getting the CCNA Collaboration mean to you? A raise, a promotion, recognition? Would it enhance your resume? Perhaps it would demonstrate that you are serious about continuing the learning process and that you are not content to rest on your laurels. Maybe it would please your reseller-employer, who needs more certified employees for a higher discount from Cisco. Or one of many other reasons.

Strategies for Exam Preparation

The strategy you use for the CCNA Collaboration CIVND exam might be slightly different from strategies used by other readers, mainly based on the skills, knowledge, and experience you already have obtained. For instance, if you have attended the CICA and CIVND courses, you might take a different approach than someone who learned collaboration architecture via on-the-job training.

Regardless of the strategy you use or the background you have, the book is designed to help you get to the point where you can pass the exam with the least amount of time required. For instance, there is no need for you to practice or read about IP addressing and subnetting if you fully understand it already. However, many people like to make sure that they truly know a topic and therefore read over material that they already know. Several book features will help you gain the confidence that you need to be convinced that you know some material already, and to also help you know what topics you need to study more.

210-065 CIVND Exam Topics

Table I-1 lists the exam topics for the 210-065 CIVND exam. This table also lists the book parts in which each exam topic is covered.

Table I-1 210-065 CIVND Exam Topics

CICD 210-065 Exam Topic	Chapters in Which Topic Is Covered
1.0 Video Concepts	
<i>1.1 Describe the functional components of video solutions</i>	
1.1.a Provisioning and scheduling management	Chapters 9, 17
1.1.b Video compositing	Chapter 2
1.1.c Streaming video	Chapter 2
1.1.d Recording and storage	Chapter 2
1.1.e Media players	Chapter 2
1.1.f Media convergence	Chapter 2
1.1.g Media management	Chapter 2
1.1.h Video convergence	Chapter 4
2.0 Endpoint Configuration	
<i>2.1 Describe video product models</i>	
2.1.a Mobile devices	Chapter 5
2.1.b Desktop systems	Chapter 5
2.1.c Multi-purpose systems	Chapter 5
2.1.d Surveillance cameras and encoders	Chapter 3
2.1.e Immersive systems	Chapter 7
2.1.f Peripherals and add-ons	Chapter 7
2.1.g Cabling connections	Chapter 7
2.1.h Digital media players	Chapter 2
<i>2.2 Describe environment recommendations</i>	
2.2.a Room lighting recommendations	Chapter 8
2.2.b Room acoustics recommendations	Chapter 8
2.2.c Room power recommendations	Chapter 8
2.2.d Room HVAC recommendations	Chapter 8
2.2.e Room materials (windows, floor material, wall material, etc.)	Chapter 8
2.2.f Room size and background wall	Chapter 8
2.2.g Viewing distance	Chapter 8

CICD 210-065 Exam Topic	Chapters in Which Topic Is Covered
2.2.h Physical security recommendations	Chapter 3
<i>2.3 Implement desktop endpoints and surveillance cameras</i>	
2.3.a Network settings	Chapter 5
2.3.b GUI interface and CLI	Chapter 5
2.3.c Control plane	Chapter 5
2.3.d Cables	Chapter 5
2.3.e Test call	Chapter 6
2.3.f User acceptance test	Chapter 6
2.3.g Microphone calibration	Chapter 6
2.3.h Camera calibration	Chapter 6
2.3.i Media playback on PCs	Chapter 6
<i>2.4 Describe features and functions</i>	
2.4.a Auto collaboration	Chapter 11
2.4.b MCU capabilities versus TelePresence Server	Chapters 14, 15, 16
2.4.c Audio add in	Chapter 11
2.4.d PIP	Chapter 11
2.4.e FECC	Chapter 11
2.4.f Resolution setting	Chapter 11
2.4.g Multiway versus multisite	Chapter 14
3.0 Troubleshooting and Support	
<i>3.1 Describe troubleshooting methodologies</i>	Chapter 13
<i>3.2 Identify endpoint issues</i>	
3.2.a Cabling	Chapter 13
3.2.b Peripherals	Chapter 13
3.2.c Network connectivity	Chapter 13
3.2.d Registration	Chapters 6, 8, 9, 10
3.2.e Call setup	Chapters 6, 10, 11, 12

CICD 210-065 Exam Topic	Chapters in Which Topic Is Covered
3.2.f Media quality	Chapter 13
3.2.g Mid call feature issues	Chapters 10, 13
<i>3.3 Collecting system information</i>	
3.3.a Logs	Chapter 13
3.3.b Status	Chapters 6, 13
<i>3.4 Manage configuration</i>	
3.4.a Backups	Chapters 10, 13
3.4.b Restore	Chapters 10, 13
3.4.c Reset to defaults	Chapters 10, 13
3.4.d Password recovery	Chapters 10, 13
<i>3.5 Implement key CLI commands</i>	Chapter 13
<i>3.6 Monitor events and alerts</i>	Chapter 13
4.0 Conferencing Concepts	
<i>4.1 Describe multipoint control units</i>	Chapter 15
<i>4.2 Describe conferencing features</i>	
4.2.a Switching and layout options	Chapters 10, 14, 15, 16
4.2.b Cascading	Chapters 14, 15, 16
4.2.c Conferencing add-ons	Chapters 14
<i>4.3 Describe scheduling versus adhoc versus on demand features</i>	Chapters 17

CCNA Collaboration CIVND 210-065 Official Certification Guide

The objective of this book is to help you pass the CCNA Collaboration CIVND exam (210-065). While you are learning about topics that can help you pass the CIVND exam, you will also become more knowledgeable about how to do your job. Although this book and the accompanying CD have many exam preparation tasks and example test questions, the method in which they are used is not to simply make you memorize as many questions and answers as you possibly can.

The methodology of this book helps you discover the exam topics about which you need more review, fully understand and remember exam topic details, and prove to yourself that you have retained your knowledge of those topics. So this book helps you pass not by memorization, but by helping you truly learn and understand the topics. The

CIVND exam is just one of the foundation topics in the CCNA Collaboration certification, and the knowledge contained within is vitally important to consider yourself a truly skilled Cisco Collaboration engineer or specialist.

The strategy you use to prepare for the CIVND exam might be slightly different from strategies used by other readers, mainly based on the skills, knowledge, and experience you already have obtained. For instance, if you have attended the CIVND course, you might take a different approach than someone who learned switching through on-the-job training. Regardless of the strategy you use or the background you have, this book is designed to help you get to the point where you can pass the exam with the least amount of time required.

Book Features and Exam Preparation Methods

This book uses several key methodologies to help you discover the exam topics on which you need more review, to help you fully understand and remember those details, and to help you prove to yourself that you have retained your knowledge of those topics.

The book includes many features that provide different ways to study so that you are ready for the exam. If you understand a topic when you read it but do not study it any further, you will probably not be ready to pass the exam with confidence. The features included in this book give you tools that help you determine what you know, review what you know, better learn what you do not know, and be well prepared for the exam. These tools include the following:

- **“Do I Know This Already?” quizzes:** Each chapter begins with a quiz that helps you determine the amount of time you need to spend studying that chapter.
- **Foundation topics:** These are the core sections of each chapter. They explain the protocols, concepts, and configuration for the topics in that chapter.
- **Exam preparation tasks:** The “Exam Preparation Tasks” section lists a series of study activities that should be done after reading the “Foundation Topics” section. Each chapter includes the activities that make the most sense for studying the topics in that chapter. The activities include the following:
 - **Key topics review:** The Key Topic icon is shown next to the most important items in the “Foundation Topics” section of the chapter. The Key Topics Review activity lists the key topics from the chapter and page number. Although the contents of the entire chapter could be on the exam, you should definitely know the information listed in each key topic. Review these topics carefully.
 - **Memory tables:** To help you exercise your memory and memorize some lists of facts, many of the more important lists and tables from the chapter are included in a document on the CD. This document lists only partial information, allowing you to complete the table or list. CD-only Appendix C holds the incomplete tables, and Appendix D includes the completed tables from which you can check your work.

**Key
Topic**

- **Definition of key terms:** Although Cisco exams might be unlikely to ask a question such as “Define this term,” the CIVND exam requires that you learn and know a lot of networking terminology. This section lists some of the most important terms from the chapter, asking you to write a short definition and compare your answer to the Glossary at the end of the book.
- **CD-based practice exam:** The companion CD contains an exam engine, including a bank of multiple-choice questions. You can use the practice exams to get a feel for the actual exam content and to gauge your knowledge of switching topics.

How This Book Is Organized

Although this book could be read cover to cover, it is designed to be flexible and allow you to easily move between chapters and sections of chapters to cover just the material that you need more work with. Chapters 1 through 17 are the core chapters and can be covered in any order. If you do intend to read them all, the order in the book is an excellent sequence to use.

The core chapters, Chapters 1 through 17, cover the following topics:

- **Chapter 1, “Introduction to Video Communications”**—This chapter discusses Cisco collaboration architecture from the perspective of prescriptive design using the Cisco Preferred Architecture documentation available at Cisco.com.
- **Chapter 2, “Cisco Digital Media and Content Delivery”**—This chapter wanders back in time for a brief history lesson on legacy digital media architecture. It then moves back into the twenty-first century to discuss the Cisco Digital Media Suite, Digital Signs, Cisco Cast, and Show and Share.
- **Chapter 3, “Cisco Video Surveillance”**—This chapter takes a look at video from a physical security standpoint. The discussion covers legacy closed-circuit television, Cisco’s physical security solutions, and Cisco video-surveillance components and architectures.
- **Chapter 4, “Cisco Collaboration Overview”**—This chapter examines the evolution of videoconferencing, beginning with legacy videoconferencing architectures and working forward to today’s Cisco collaboration solutions. This discussion includes an overview of the Cisco collaboration components and general collaboration architecture.
- **Chapter 5, “Cisco IP Phones, Desktop Endpoints, and Jabber Overview”**—As the title implies, this chapter focuses on the Cisco collaboration endpoint portfolio. This includes current Cisco IP Phones, desktop units, and Cisco Jabber.
- **Chapter 6, “Configuring Cisco Unified IP Phones and Cisco Jabber”**—This chapter focuses on the configuration of Cisco IP Phones both in Cisco Unified Communications Manager and on the phones themselves. It describes the requirements for phone registration and how to verify phone status information. Also

included in this chapter is a breakdown of the configuration and registration of Cisco Jabber. This includes the client installation, configuration (on both the client side and CUCM side), and verification.

- **Chapter 7, “Cisco TelePresence Endpoint Characteristics and Installation”**—This chapter discusses the Cisco TelePresence endpoint portfolio, including desktop units such as the EX and DX series endpoints and room-based and immersive endpoints. In addition, this chapter covers intelligent proximity features available on newer endpoints. There is some discussion of Cisco TC software components and deployment, C series codec configuration options, and the Cisco Jabber Video for TelePresence client (formerly known as Movi).
- **Chapter 8, “Configuring Cisco TelePresence CTS Software-Based Endpoints”**—This chapter focuses on the setup and configuration of Cisco TelePresence Server-based endpoints and on user provisioning for their use.
- **Chapter 9, “Configuring Cisco DX650 Endpoints”**—This chapter goes into the setup and configuration of Cisco’s new collaboration desktop experience endpoint, the DX650. This is a dramatic departure from Cisco’s traditional endpoint look and feel, creating an entirely new user experience. This chapter discusses the operating system, parameter configurations, and how to register the endpoint with CUCM.
- **Chapter 10, “Configuring Cisco TelePresence TC Software-Based Endpoints”**—This chapter discusses the installation, configuration, and troubleshooting of Cisco TelePresence TC software-based endpoints. This includes code upgrades, peripheral calibration, and how to enable intelligent proximity. These endpoints are capable of utilizing the Cisco Touch series control panels. So, there is some discussion of Touch panel configuration. In addition, this chapter walks through available call control options and configuration using both SIP and H.323 protocol options. These options include near- and far-end camera control, media encryption, mobility, and the configuration and deployment of Cisco Jabber Video for TelePresence (Movi).
- **Chapter 11, “Cisco Legacy Edge Architecture”**—This chapter provides something of an evolutionary picture of Cisco’s edge access architecture. This includes the concepts of firewall traversal and video call control, both inside the network and outside. This chapter then discusses Cisco’s newest edge architecture, known as Expressway, sometimes called collaboration edge. It is an evolution of firewall-traversal technologies to include a wide range of collaboration services in order to provide a seamless, VPN-less user experience. This chapter covers the components of the architecture, the mobile and remote access solution, and Cisco Jabber Guest.
- **Chapter 12, “Operating and Troubleshooting Cisco TelePresence Endpoints”**—This chapter focuses on what to do when things may not be working as planned or expected. The discussion covers the collection of logs and status information from TC software-based endpoints, TC software configuration and maintenance, and issue identification/isolation. The discussion then shifts focus to Cisco TelePresence CTS endpoints for the same discussion points. Closing out the chapter is a discussion on troubleshooting and problem reporting on the DX650 and issue identification/isolation for Cisco the Jabber Video for TelePresence (Movi) client.

- **Chapter 13, “Cisco Multipoint Solution”**—This chapter digs into the products and solution components involved in deploying multipoint, multisite, and multiway videoconferencing features.
- **Chapter 14, “Cisco TelePresence MCUs”**—This chapter describes the purpose, configuration, deployment, and use of Cisco TelePresence MCU hardware.
- **Chapter 15, “Cisco TelePresence Server”**—This chapter discusses the installation, configuration, and deployment of Cisco TelePresence Server in both VCS and CUCM call control environments.
- **Chapter 16, “Cisco TelePresence Management Suite”**—This chapter provides a look into TMS for endpoint provisioning and management, conference resource scheduling and management, and videoconference monitoring and reporting.
- **Chapter 17, “Cisco WebEx Solutions”**—This chapter discusses Cisco WebEx Meeting Center for cloud-based web, audio, and videoconferencing. Cisco WebEx Meeting Center also includes the ability to allow for screen sharing, remote control, file transfer, whiteboarding/annotation, and recording of conferences.

In addition to the 17 main chapters, this book includes tools to help you verify that you are prepared to take the exam. Chapter 18, “Final Preparation,” includes guidelines that you can follow in the final days before the exam. Also, the CD-ROM includes quiz questions and memory tables that you can work through to verify your knowledge of the subject matter.

In addition, you can find the following appendixes on the CD that is included with this book:

- Appendix C, “Memory Tables,” holds the key tables and lists from each chapter with some of the content removed. You can print this appendix, and as a memory exercise, complete the tables and lists. The goal is to help you memorize facts that can be useful on the exams.
- Appendix D, “Memory Table Answer Key,” contains the answer key for the exercises in Appendix D.
- Appendix E, “Study Planner,” is a spreadsheet with major study milestones, where you can track your progress through your study.

For More Information

If you have any comments about the book, you can submit those at Cisco.com. Just go to the website, select **Contact Us**, and type in your message.

Cisco might make changes that affect the CIVND exam from time to time. You should always check <http://www.cisco.com/web/learning/certifications/associate/index.html> for the latest details. Register your product at ciscopress.com/register for convenient access to downloads, updates, and corrections as they become available.

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This chapter covers the following topics:

- **Legacy CCTV Video-Surveillance Architecture Evolution:** This section covers the evolution of video surveillance from the early CCTV monitoring systems to the IP cameras in use today.
- **Cisco Physical Security Solution:** This section covers the hardware and software products of the Cisco video-surveillance solution.
- **Cisco Video-Surveillance Components:** This section provides an overview of Cisco cameras and analytics, Cisco video-surveillance management software, and the Cisco media management and storage components.

Cisco Video Surveillance

The Cisco CIVND 2 course is designed to cover Cisco video solutions. Most people assume that means video communications exclusively. However, Cisco has many products in other venues of video, like IP video surveillance and digital signage. To some degree, all three of these venues overlap. However, each can stand independently from the others as well.

This chapter offers a high-level overview of the solution Cisco offers in IP surveillance. The first section reviews legacy closed-circuit TV (CCTV) video-surveillance architecture and how it has evolved into what is available today. The subsequent sections cover Cisco's physical security offering, the components involved with their solution, and the architectural design of how all the different elements work together.

“Do I Know This Already?” Quiz

The “Do I Know This Already?” quiz allows you to assess whether you should read this entire chapter thoroughly or jump to the “Exam Preparation Tasks” section. If you are in doubt about your answers to these questions or your own assessment of your knowledge of the topics, read the entire chapter. Table 3-1 lists the major headings in this chapter and their corresponding “Do I Know This Already?” quiz questions. You can find the answers in Appendix A, “Answers to the ‘Do I Know This Already?’ Quizzes.”

Table 3-1 “Do I Know This Already?” Section-to-Question Mapping

Foundation Topics Section	Questions
Legacy CCTV Video-Surveillance Architectures Evolution	1–2
Cisco Physical Security Solution	3–4
Cisco Video-Surveillance Components	6–9

Caution The goal of self-assessment is to gauge your mastery of the topics in this chapter. If you do not know the answer to a question or are only partially sure of the answer, you should mark that question as wrong for purposes of the self-assessment. Giving yourself credit for an answer you correctly guess skews your self-assessment results and might provide you with a false sense of security.

1. In a traditional video-surveillance solution, what product is used to allow multiple cameras feed to display on a single monitor?
 - a. CCTV
 - b. Multiplexer
 - c. Multicast
 - d. VHS recorder
2. As the traditional video-surveillance solution evolved, what product was developed that increases the capacity of recordable storage?
 - a. VHS recorder
 - b. Encoders
 - c. DMPs
 - d. DVRs
3. What product allows for Cisco Physical Access Gateway devices to connect conventional wired sensors, along with other physical-security elements, through a converged IP network?
 - a. Cisco IPICS
 - b. The Cisco Physical Access Manager appliance
 - c. Cisco VSM
 - d. Cisco Video Surveillance Multiservices Platform
4. What Cisco product is a complete IP-based dispatch and incidence-response solution?
 - a. Cisco IPICS
 - b. The Cisco Physical Access Manager appliance
 - c. Cisco Video Surveillance Manager
 - d. Cisco Video Surveillance Multiservices Platform

5. What Cisco product is used to leverage analog video cameras in an IP video-surveillance deployment?
 - a. VSM
 - b. ISR
 - c. Encoders
 - d. Decoders
6. Which Cisco product is responsible for changing layouts that are displayed on the viewer portal stations?
 - a. Cisco Video Surveillance Manager
 - b. Cisco Video Media Server Software
 - c. Cisco Video Operations Manager Software
 - d. Cisco Video Virtual Matrix Software
7. Which Cisco product is responsible for sending video feeds to storage and viewer portal stations?
 - a. Cisco VSM
 - b. Cisco Video Media Server Software
 - c. Cisco Video Operations Manager Software
 - d. Cisco Video Virtual Matrix Software
8. Which Cisco product is responsible for interacting with the video-surveillance software through a web portal?
 - a. Cisco VSM
 - b. Cisco Video Media Server Software
 - c. Cisco Video Operations Manager Software
 - d. Cisco Video Virtual Matrix Software
9. Which Cisco product allows for up to 1 TB of storage for video-surveillance feed?
 - a. Cisco Video Surveillance Multiservices Platform
 - b. Cisco Integrated Services Router Generation 2
 - c. NAS
 - d. DAS

Foundation Topics

Legacy CCTV Video-Surveillance Architecture Evolution

In a famous scene in the movie *Indiana Jones and the Temple of Doom*, Indiana Jones triggers a chain reaction of booby traps that threaten his and his companions' lives. Although this is obvious Hollywood lore, the idea of booby traps being used to protect valuables is no new concept. They can be considered as a primitive form of surveillance that has evolved into something quite elaborate.

Video surveillance is not a new concept either. The earliest report about video cameras being used for monitoring was in 1965. These early monitoring solutions used closed-circuit television (CCTV) monitoring systems. The idea of CCTV is that a camera, drawing power from a wall outlet, also has a coaxial cable that connected it to a TV monitor. This allows for the image being captured by the camera to be displayed on the TV. If control of the camera is desired, like pan tilt zoom (PTZ), a third cable is used, called a serial cable.

Video surveillance really hit its stride when recording using tape cassettes was introduced. Magnetic tape recording devices were used as early as the 1950s, but such devices were very expensive. Judicial systems like police departments and courtrooms used this early form of monitoring, as did banks, gas stations, and other public high-risk facilities. By the 1970s, two predominant tape cassette formats took the lead in the market: Video Home System (VHS) and Betamax. Ultimately, VHS excelled in the consumer market, and Betamax went away. In retrospect, there are issues with using tape recording devices like VHS cassettes. First, the quality was so limiting that it was often hard to make out facial recognition when someone was caught on tape. Second, the recording time on a VHS cassette was limited to about 2 to 4 hours. This can be extended up to double the time length using Long Play (LP), or triple the time length using Extended Play (EP), also known as Super Long Play (SLP). By using LP or EP/SLP, the already poor quality is reduced.

Key Topic

Another great advancement in video surveillance was the introduction of multiplexers. Multiplexers allow for recording several cameras at a single time. In many cases, more than a dozen cameras were used at a single time. Some of the technologies around multiplexing would allow snapshot recording and motion detection recording of cameras, where they would only start recording when motion was detected. Though multiplexers brought many advantages to video monitoring, there were still many disadvantages that would need to be overcome. With a single camera, the monitor view of the camera encompassed the whole screen. With multiplexers, each camera view frame was compressed so that all camera feeds could be viewed simultaneously on the monitor. This affected the video quality even more because these smaller images could not be selected to enlarge for more detail. Figure 3-1 illustrates how a multiplexer can be used in video surveillance.

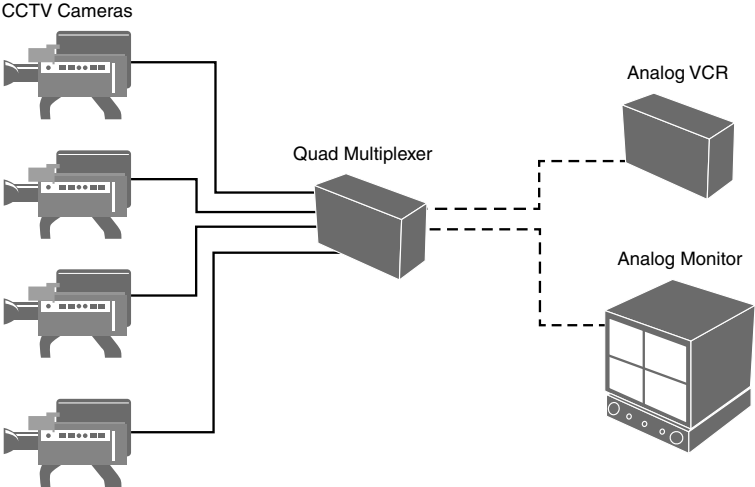


Figure 3-1 Usage of a Multiplexer in a Video-Surveillance Solution

It is said that invention comes from 10 percent sweat and 90 percent necessity. All the advancements leading up to this point in the evolution of video surveillance were great, revolutionary achievements for analog video monitoring. The next phase in this evolutionary process brought analog video into the digital world. One of the necessary advancements addressed the limit of tape recording devices, as well as the quality of the recorded video feed. Digital video recorders (DVRs) were introduced into video surveillance circa late 1990s. In addition to a significant increase in recorded video quality and duration of recording, there were many other advantages of using DVRs. One such advantage allowed for viewers to go back and view prerecorded video without disrupting the recording process. Another advantage is that you can select a smaller frame and enlarge it to a full-screen view. Figure 3-2 illustrates how you can use a DVR in a video-surveillance solution.

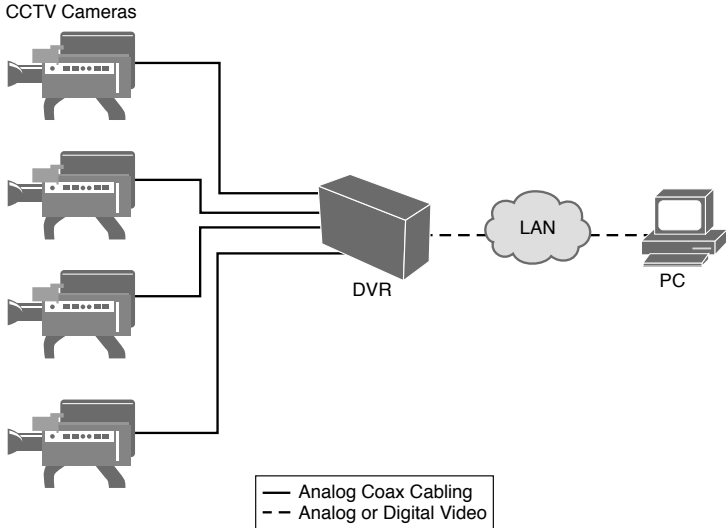


Figure 3-2 DVR Usages in a Video-Surveillance Solution

In the late 1990s and early 2000s, broadband and high-speed Internet were introduced. With technology taking off, and the Internet driving the information age, several more great advancements were made in the video-surveillance world. IP access to DVRs allowed viewers to access multiple locations from a central remote location. However, because analog camera had to have a physical connection to the DVR (whether directly connected or through a multiplexer), there was still a physical security issue because the DVR had to be on premises with the cameras. Encoders were introduced to video surveillance, allowing the analog signal to be converted to digital format before it was sent to the DVR. Encoders could send the digital format of the signal over an IP network to the DVR; therefore, DVRs no longer had to be stored on premises.

The introduction of IP cameras brought much advancement in the technology of video surveillance. The IP camera converted the analog video being recorded to digital format natively on the camera. This eliminated the need for encoders and traditional analog cameras. In addition, IP cameras could support Power over Ethernet (PoE), and the PTZ control of a camera could be sent over Ethernet as well. This allowed for a single cable to be run to each camera instead of the three (power, coaxial, and control) cables needed for a traditional analog camera. A modern video-surveillance solution allows for a combination of IP cameras and analog cameras with encoders to be used. Companies can still leverage their older analog cameras longer without doing an expensive tear-and-replace when upgrading their surveillance solution. As needed, those analog cameras can be upgraded to IP cameras.

Cisco Physical Security Solution

Key Topic

Although Cisco had already been involved in the video-surveillance market, they made a key acquisition in May 2007 of BroadWare Technologies. This acquisition brought many new and highly developed tools to Cisco's solution. With these new products available, Cisco developed a strategy based on a differentiated physical security product suit that builds on Cisco's Medianet integration. The two main components of Cisco's video-surveillance solution are hardware and software products. Hardware products include Cisco Video IP Surveillance Cameras, encoders, and physical security management and storage servers. Software products are used for monitoring video surveillance and controlling different aspects of the monitoring tools. You will learn more about these products later in this chapter. Other solution elements include the Cisco Physical Access Manager and the Cisco IP Interoperability and Collaboration System (Cisco IPICS).

The Cisco Physical Access Manager appliance is a physical intrusion-detection solution using Cisco Physical Access Gateway devices to connect conventional wired sensors, along with other physical security elements through a converged IP network. The Cisco Physical Access Manager appliance is a hardware and software solution that provides advanced configuration and management of the Cisco Physical Access Control system. The Cisco Physical Access Manager desktop client is used to define access control rules, enroll users, manage badges, and configure the Cisco Physical Access Gateway modules, among other tasks.

The Cisco IPICS is a complete IP-based dispatch and incidence-response solution with several capabilities. This solution provides an enhanced dispatch console; UHF and VHF radio interoperability; emergency first-responder notification; and integration with IP phones, cell phones, PCs, and mobile devices.

A Cisco end-to-end solution can be broken down into three categories:

- Threat detection can be categorized by the physical security elements in a surveillance solution, such as cameras, motion sensors, and access control.
- Threat monitoring is based on real-time and recorded threat-monitoring services. Such services may include door sensors and badges, fingerprint scanners or other biometric sensors, video-surveillance monitoring software, and other media management and storage components.
- The third category of the Cisco end-to-end solution is threat response. This service includes the IPICS allowing integration with existing communication devices, whether that be a Voice over IP (VoIP), public switched telephone network (PSTN), or video collaboration solution.

Components of a Cisco Digital Media Suite (DMS) could be incorporated, as well, such as PCs, Digital Media Player (DMPs), Cisco LCD Displays, and the Cisco Digital Media Manager (DMM). All three of these services work together to offer a complete and highly effective Cisco video-surveillance solution.

Cisco Video-Surveillance Components

The remainder of this chapter covers Cisco cameras and analytics, Cisco video-surveillance management software, and the Cisco media management and storage components. The Cisco video-surveillance solution can be divided into four service domains:

- Input and output devices
- Management
- Storage
- Interactive view

Input and output devices are Cisco IP cameras, analog cameras, encoders, microphones, motion sensors, and PTZ control. This chapter does not go into microphones and motion sensors in a Cisco video-surveillance solution. Management elements include features like central management of previously mentioned devices, operations like PTZ and camera switching, media control, distribution, and layout changes. Management can also determine where recorded media is to be stored. Storage involves compressing media when needed and using scalable storage solutions, whether that be locally attached storage or a network-attached storage (NAS) or storage-area network (SAN). Interactive view elements monitor endpoints such as operator view stations. It also contains distribution elements notifications and media store distribution.

Input and Output Devices

The Cisco IP cameras include standard-definition (SD) and high-definition (HD) capabilities. They communicate using IP and standards-based interfaces and protocols such as MPEG and H.264. Cisco IP surveillance cameras also include embedded security and networking, motion detection, and video analytics. As mentioned before, Cisco Medianet offers the features PoE, automated provisioning, bandwidth optimization, storage optimization, and enhanced network security. There are four series of cameras to choose from in the Cisco

solution. Each has different capabilities to cater to the various needs of the customers. Some come in a box model, and some come in the dome model. The 6000 series comes in both box and dome models. Figure 3-3 shows box and dome cameras.



Figure 3-3 *Box and Dome Cameras*

The Cisco Video Surveillance 7000 series IP cameras support a 5-megapixel lens. It is an outdoor fixed HD camera in vandal-resistant housing. This series offers excellent image quality with resolutions up to 2560x1920 and PTZ support. The Cisco Video Surveillance 6000 series IP cameras support a 2.1-megapixel lens and offers HD video capability in bullet, box, and dome models. These cameras can be used indoors or outdoor and support up to 1080p30 resolutions. The Cisco Video Surveillance 4500E series IP cameras offer true HD video at 1080p, with H.264 compression. These dome IP digital cameras are designed for superior performance in a wide variety of video-surveillance applications. The Cisco Video Surveillance 3000 series IP cameras are full-functioning HD cameras with H.264 support. These dome cameras can support resolutions up to 1280x800 at 30 frames per second. The Cisco Video Surveillance PTZ series IP cameras are available in SD or HD resolutions. Cisco PTZ IP cameras can be remotely controlled to monitor a wider area than traditional fixed cameras. Table 3-2 compares each of the camera series mentioned.

Table 3-2 Cisco Video-Surveillance Camera Features

Camera Model	Camera Type	Resolution
Cisco Video Surveillance 7000 series	5-megapixel HD IP dome cameras	Resolutions up to 2650x1920
Cisco Video Surveillance 6000 series	2.1-megapixel HD IP dome, bullet, and box cameras	1080p30
Cisco Video Surveillance 4500E series	True 1080p HD multipurpose camera	1080p30 or 720p60
Cisco Video Surveillance 3000 series	HD cameras IP dome cameras	1280x800 at 30 fps
Cisco Video Surveillance PTZ series	SD and HD IP 360 dome cameras	Up to 1080p

Another output device is the Cisco Video Surveillance Encoder. These devices use digital signal processors (DSPs) to convert analog signal from legacy analog cameras to digital format. Encoders are an optional component of the Cisco Physical Security Multiservices Platform, and the Cisco Video Surveillance Media Server Software must be installed on the server to use them. There are two cards available offering either 16 BNC connection panel or an 8 BNC connection panel on a single card. The resolution of these capture cards is D1, with motion JPEG (M-JPEG) and H.264 support. D1 resolution is 704x480, and is the highest SD resolution available in common analog-based CCTV deployments. Additional support on these encoder cards includes RS-232 for remote PTZ control of cameras.

Note that although only Cisco IP surveillance cameras are mentioned in this chapter, third-party systems are supported by the Cisco DMS solution. This includes third-party IP surveillance cameras and legacy analog cameras through encoders. Also, Cisco IP surveillance cameras are supported by third-party management software, as well.

Management

The Cisco Video Surveillance Manager Software (VSMS) is the management and control plane for the Cisco video-surveillance solution components. Cisco VSMS is a software suite that includes the Cisco Video Surveillance Operations Manager, Cisco Video Surveillance Media Server, and Cisco Video Surveillance Virtual Matrix. These software components of the VSM are the three management software solutions that are discussed in this section.

The Cisco Video Surveillance Media Server software is the core component of the network-centric Cisco video-surveillance solution. This software is responsible for the recording, storing, and streaming of video feeds. The Cisco Video Surveillance Storage System complements the Cisco Video Surveillance Media Server software. Video can be stored in direct-attached storage (DAS), NAS, and SAN storage systems. The way it works is that each IP camera or encoder sends a single video stream to the Cisco Video Surveillance Media Server. This software is responsible for simultaneously distributing live and archived video streams to viewers over an IP network. In case of multiple view requests, the software replicates the unique input video streams to multiple output streams, based on request. For archive viewing, the Cisco Video Surveillance Media Server continuously receives video from the IP camera or encoder, as configured per the archive settings. The software sends video streams to the viewer only when requested. In environments with remote branch locations, this process becomes efficient because traffic needs to traverse the network only when requested by remote viewers. Video requests and streams are delivered to the viewer by using HTTP traffic (TCP port 80) or over HTTPS (TCP port 443).

The Cisco Video Surveillance Operations Manager is the core engine for the Cisco surveillance solution. It offers centralized administration of all the Cisco video-surveillance solution components and supports Cisco video-surveillance endpoints. For security purposes, it uses authentication and access management for video feeds. Application programming interfaces (APIs) can be used for third-party integration, and third-party camera and encoder support is provided. Tools available in the Cisco Video Surveillance Operations Manager include a web-based portal that can be used to configure, manage, display, and control video from any Cisco surveillance camera or encoder. Many third-party endpoints are supported as well. Tools are available to manage multiple Cisco Video Surveillance Media

Server instances and Cisco Video Surveillance Virtual Matrix instances and users. There are also tools that control different recording options such as motion-based, schedule-based, and event-based recording. For low-bandwidth link connections, the Cisco Video Surveillance Operations Manager can perform rapid investigations using an integrated forensic search tool.

The Cisco Video Surveillance Virtual Matrix is a remotely controlled video-display application used to monitor video feeds in a command center or any monitoring environment. It enables users to control video being displayed on multiple local or remote monitors. It supports many layouts, and so operators can choose a predefined layout of cameras and push it out to the displays of all users or choose to send different users various layouts with different camera feeds. The Cisco Video Surveillance Virtual Matrix can also be integrated with other monitoring system components to automatically display video in response to user-defined event triggers. Such triggers could be from fire-monitoring systems, door sensors, and motion detectors, to name a few. Table 3-3 illustrates the three video-surveillance software components and the functions they perform.

**Key
Topic**
Table 3-3 Video-Surveillance Software Functions

Video-Surveillance Software	Video-Surveillance Software Functions
Cisco Video Surveillance Media Server	Responsible for the recording, storing, and streaming of video feeds
Cisco Video Surveillance Operations Manager	Offers centralized administration of all the Cisco video-surveillance solution components and supports Cisco video-surveillance endpoints
Cisco Video Surveillance Virtual Matrix	Supports many layouts, and so operators can choose a predefined layout of cameras and push it out to the displays of all users or choose to send different users various layouts with different camera feeds

Storage

Many storage components can be used. Those that have already been mentioned include DAS, NAS, and SAN storage. The Cisco Video Surveillance Multiservices Platform has also been mentioned, and is discussed further in this section. In addition, the Cisco Integrated Services Router (ISR)-based Cisco video-surveillance elements warrant discussion.

The Cisco Video Surveillance Multiservices Platform is an easy-to-use and easy-to-deploy server suite. It offers scalable storage in a 1-RU up to a 4-RU server platform, storing up to 24 TB. As mentioned before, it supports video encoding with the optional encoder cards. There are four products in the Cisco Video Surveillance Multiservices Platform available. The virtualized applications for Unified Computing System (UCS) offer the same high security as other offerings, along with other benefits of operating in a virtualized environment. The physical footprint of an organization is reduced, and the installation process is simplified, by eliminating the need for extra cabling, complexity, and power consumption. The Cisco Connected Safety and Security (CSS) UCS Platform series come in two models: the Cisco CSS UCS C220 (1-RU) and the Cisco CSS UCS C240 (2-RU). The CSS UCS Platform

series comes with a variety of choices for physical security applications. Among those are video surveillance, physical access control (1-RU only), and incident response. The next generations of Cisco Video Surveillance Multiservices Platform offerings are the Cisco Physical Security Storage System 4-RU (CPS-SS: 4-RU) and the Cisco Physical Security Storage System 4-RU-EX (CPS-SS: 4-RU-EX). This series is ideal for performing backup to disk and bulk data storage.

Cisco video-surveillance cards are also available for the Cisco Integrated Services Router Generation 2 (ISR-G2). These module cards make management of analog cameras in remote offices more efficient, while supporting an IP video-surveillance network. When the ISR-G2 routers are used with the Cisco video-surveillance cards, 1 TB of DAS storage is made available.

Key Topic

The Cisco Analog Video Gateway Module provides support for analog cameras, PTZ, alarm input, and control relay output. This module can support up to 16 analog cameras in a single card. The Cisco Analog Video Gateway Module is controlled by Cisco Video Surveillance Stream Manager. Cisco Analog Video Gateway Module encoders and decoders use the MPEG4 video compression codec, allowing for streams to be sent over the network using D1 resolutions up to 30 fps. The encoder that connects to the analog camera simultaneously records two MPEG4 streams at different resolutions. This enables viewers to observe high-quality streams, while a lower-quality recording will use less storage space.

The Cisco Video Management and Storage System Module implements the Cisco Video Surveillance Media Server and the Cisco Video Surveillance Operations Manager for the branch office. The Cisco Video Management and Storage System Module supports IP video cameras connected to the ISR through the IP network, in addition to any analog cameras connected through the Cisco Analog Video Gateway Module and most third-party cameras. Notifications can be sent from the router using e-mail messages, pages, and SMS.

Table 3-4 illustrates the two storage options discussed in this section, with their storage capacities and the type of storage available natively to the systems.

Key Topic

Table 3-4 Cisco Storage Options

Cisco Storage Device	Storage Capacity	Type of Storage available
Cisco Video Surveillance Multiservices Platform	Up to 24 TB	DAS
Cisco Integrated Services Router Generation 2	Up to 1 TB	DAS

Interactive View

The Cisco video-surveillance solution is based on service domains. The domains that have already been discussed include the VSM software suite and video-surveillance storage systems. The Cisco video-surveillance solution can integrate with other Cisco connected physical security elements such as media and threat distribution, the Cisco DMS, and Cisco's Collaboration endpoints. Other architectural domains include video input and edge analytics, sensors, PTZ camera control, and interactive output. This section takes all the elements

that have been discussed and explains the flow of media, the communication signaling paths, and interactive views that can be used in a Cisco video-surveillance solution. The two scenarios that are discussed are the Cisco Video Surveillance Operations Manager Viewer and the Cisco Video Surveillance Matrix Viewer.

When an operator is interacting with the Cisco video-surveillance software, the Cisco Video Surveillance Operations Manager software is being used through Microsoft ActiveX web browser. This traffic can use TCP port 80 (HTTP) or 443 (HTTPS). The following steps outline the process Cisco's video-surveillance software follows to change camera views:

1. Using this software, the operator can select which cameras need to be viewed on which displays and in what camera positions.
2. The Cisco Video Surveillance Operations Manager then sends a signal to the Cisco Video Surveillance Media Server requesting the video feed from the selected cameras.
3. The Cisco Video Surveillance Media Server requests video feed from the appropriate cameras.
4. The camera sends the video feed to the Cisco Video Surveillance Media Server.
5. The Cisco Video Surveillance Media Server using TCP, UDP, or multicast sends these views to the Cisco Video Surveillance Operations Manager.
6. The Cisco Video Surveillance Operations Manager updates the view on the appropriate view portal stations based on the parameters selected by the operations manager. The protocol used is based on what was requested by the Cisco Video Surveillance Operations Manager.

Note The number of video feeds that can be shown depends on the CPU, RAM, and so on of the computer. If all the feeds are displayed, some might show as thumbnails only or might even make the PC unresponsive.

If another Cisco Video Surveillance Operations Manager Viewer requests the video from the same IP camera, the Cisco Video Surveillance Media Server simply replicates the video stream as requested. No additional requests are made to the camera. Figure 3-4 illustrates the Operations Manager Viewer scenario.

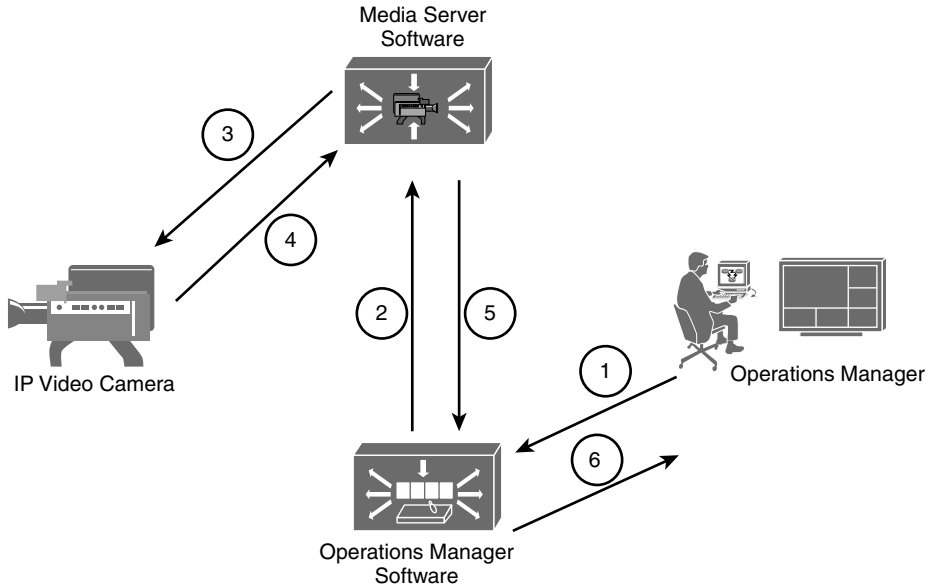


Figure 3-4 Operations Manager Viewer Flow Scenario

The process for switching layout views using a Cisco video-surveillance solution is similar to the previous scenario. Again, when an operator is interacting with the Cisco video-surveillance software, the Cisco Video Surveillance Operations Manager is being used. The following steps outline the process Cisco's video-surveillance software takes to change layouts and update camera views:

1. Using this software, the operator can select which layout is desired and which cameras need to be viewed within the different panes on that particular layout. That communication is sent to the Cisco Video Surveillance Operations Manager through the web portal.
2. The Cisco Video Surveillance Operations Manager then sends a signal to the Cisco Video Surveillance Virtual Matrix requesting a particular layout.
3. The Cisco Video Surveillance Virtual Matrix determines what layout and what cameras are to be used. Then the Cisco Video Surveillance Virtual Matrix sends a signal to the Cisco Video Surveillance Media Server to request video feed from the appropriate cameras.
4. The Cisco Video Surveillance Media Server requests video feed from the appropriate cameras.
5. The camera sends the video feed to the Cisco Video Surveillance Media Server.
6. The Cisco Video Surveillance Media Server sends these views to the Cisco Video Surveillance Virtual Matrix.
7. The Cisco Video Surveillance Virtual Matrix sends the communication to the operations view portal monitors directly.

The Cisco Video Surveillance Virtual Matrix sends a keepalive message to the operations view portal monitors periodically to confirm that the displays are still active. Figure 3-5 illustrates the Cisco Video Matrix Viewer scenario.

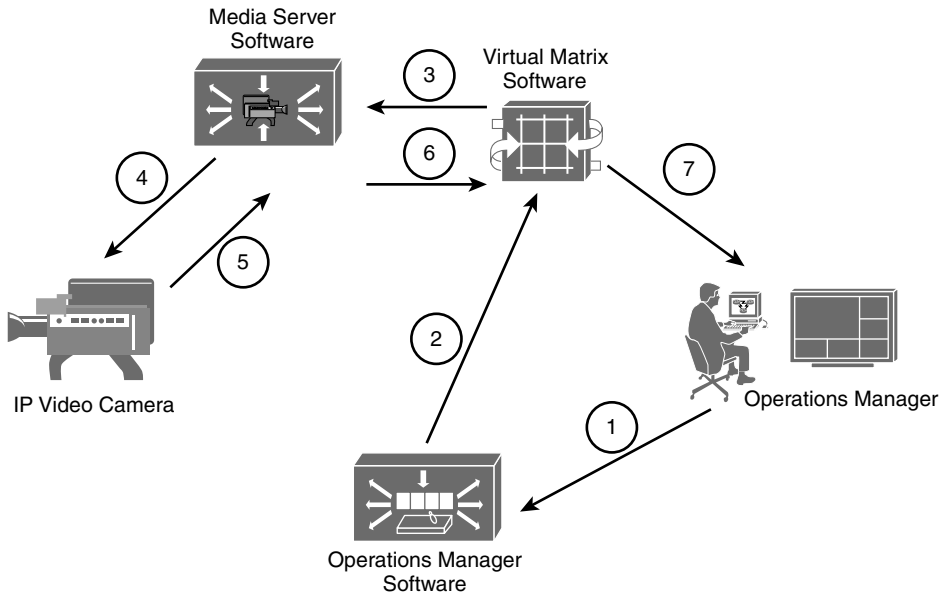


Figure 3-5 *Cisco Video Matrix Viewer Flow Scenario*

Summary

Because of greater needs, the desire for better quality, and key advancements in technology, video surveillance has evolved from its rudimentary form over several decades. From these advancements, Cisco offers a robust and secure video-surveillance solution for customers based on modern-day needs. The Cisco video-surveillance solution offers a wide assortment of IP video cameras and encoders that enable you to leverage analog camera that may already be in use. You can manage these components securely and effectively by using Cisco's VSM software suite, which includes the Cisco Video Surveillance Operations Manager, Cisco Video Surveillance Media Server, and Cisco Video Surveillance Virtual Matrix. This software platform offers integration with other components within an organization like emergency response and other secure devices incorporated into the business environment. All of this is supported on a Cisco Video Surveillance Multiservices Platform. This server basis has scalable built-in storage and can integrate with NAS and SAN storage as well. The Cisco ISR allows for remote management of remote office facilities, completing the Cisco video-surveillance solution. Memory tables are provided for review of key information discussed during this chapter. Review these memory tables to ensure a solid understanding of these topics.

Exam Preparation Tasks

As mentioned in the section “How to Use This Book” in the Introduction, you have a couple of choices for exam preparation: the exercises here, Chapter 18, “Final Preparation,” and the exam simulation questions on the CD.

Review All Key Topics

Review the most important topics in this chapter, noted with the Key Topic icon in the outer margin of the page. Table 3-5 lists a reference of these key topics and the page numbers on which each is found.

3

Key
Topic

Table 3-5 Key Topics for Chapter 3

Key Topic Element	Description	Page Number
Paragraph	Use of multiplexers and DVRs	40
Paragraph	Physical intrusion-detection solutions	42
Table 3-3	Cisco video-surveillance software functions	46
Paragraph	Cisco ISR module options	47
Table 3-4	Cisco video-surveillance storage capacity and type	47

Complete the Tables and Lists from Memory

Print a copy of Appendix C, “Memory Tables” (found on the CD), or at least the section for this chapter, and complete the tables and lists from memory. Appendix D, “Memory Table Answer Key,” also on the CD, includes completed tables and lists so that you can check your work.

Define Key Terms

Define the following key terms from this chapter and check your answers in the Glossary:

CCTV, Cisco IPICS, Cisco Video Media Server, Cisco Video Operations Manager, Cisco Video Virtual Matrix, CSS UCS, DAS, DSP, DVR, EP, HD, HTTP, HTTPS, LP, multicast, NAS, PoE, PTZ, SAN, SD, SLP, TCP, UCS, UDP, unicast, VHS, VoIP, VSM



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