iDirect Operation and Maintenance (iOM) iDX 4.4 Course Syllabus

March 31, 2022

503H8

iDirect Government

iDirect Operation and Maintenance (iOM)

The **iDirect Operation and Maintenance** (iOM) course is intended for personnel who are responsible for the basic configuration, operation and maintenance of iDirect satellite communications products and networks. Specifically, the course is for Network Operation Center (NOC) engineers at the hub site rather than the remote site, as well as individuals just entering this career field who will be working with iDirect products for the first time.

This course provides learners with all the basic skills required to install applicable software. In addition, each learner should be able to operate, manage, and maintain a typical iDirect satellite network at a basic level.

This course is the established prerequisite for:

- ***Advanced iOM***
- ***iDirect Quality of Service (QoS) Boot Camp (iQBC)***

Presented in a clear and technical manner, this course provides a combination of lecture, demonstrations, practical exercises/hands on, module reviews and a final examination that will give each learner a comprehensive overview of Network Operations from the iDirect perspective. In addition to the Learner Instructional Manual handouts are provided, as required, to supplement existing course material and provide additional up-to-date details on currently released software and hardware, as well as changes in important processes affecting the basic iDirect network.

As previously stated, this course gives each learner an in-depth understanding of the iDirect hardware and software platforms up to, and including all new hardware and software related to the Evolution Defense Release 4.4. Each learner will complete hands-on exercises using a fully functional iDirect system to reinforce most of the course material and theoretical lectures. Each learner is expected to master each of the concepts presented and the information/skills received during this training upon return to your respective organizations.

Prerequisite Learner Skills

Each learner attending an Evolution Defense 4.4 iDirect Operation and Maintenance course should have a beginner to intermediate understanding of satellite communications and some familiarity with Internet Protocol (IP) theory. This knowledge will be essential when laying the foundation for all hands-on exercises as well as providing each learner with a basic understanding of principles discussed throughout the course.

- **NOTE: We strongly recommend that you review the Satellite Communications and Data Communications online learning modules before arriving to take the iOM course. You should have received a link to this vital information as part of your registration process. You can read the material online or download it to a PC. We recommend that you keep the information somewhere suitable for future reference material. If you did not receive the link to the pre-reading materials, send an email to training@idirectgov.com.**

A fundamental understanding of VSAT technology and normal eye-hand coordination for hardware assembly is also desired. Basic software installation is also desired since each learner will be required to install the iVantage suite of applications on their laptop. An elementary user level knowledge of Linux is also desired for this course because you will be working with system/applications that require a working knowledge of these commands.

While the theoretical knowledge and skills mentioned above are not required to attend this course, they are highly recommended for each learner to receive maximum benefit from the five-day training course.

Learner Outcomes

Upon completion of this course, each learner will be able to:

- Identify all new hardware and software associated with the release of Evolution Defense 4.4
- Understand how the licensing feature applies to the hardware and features of any iDirect network
- Install the client applications from the iVantage suite
- Build networks and remotes through iBuilder
- Load image packages and options files using Web UI to the Hub Line Card and the Remote
- Perform basic routine maintenance on their iDirect network utilizing principles acquired during the lecture and hands-on portions of this course
- Perform basic troubleshooting of an iDirect network and identify escalation protocol to solve more complex issues
- Understand how to access information by utilizing the TAC web page
- Understand the principal operation and basic configuration requirements of an iDirect TDMA/Star network
- Configure all necessary components in the system to create new networks
- Perform the proper technique to commission new remotes in a network
- Perform the proper techniques to manage and maintain iDirect networks
- Understand and explain the fundamentals of DVB-S2 and Adaptive Coding and Modulation (ACM) and how they apply to and within an iDirect network
- Fundamentals of TRANSEC network and its operation

The tasks listed above are not all inclusive but represent a high-level view of the basic learner outcomes. Each learner will receive additional information, knowledge and skills as a result of interaction with the other learners in the training session as well as interaction with the instructor and/or other iDirect Government employees.

Course Goal and Objectives

The preparation of this training material is focused, in its intent, to prepare each learner with the ability to perform essential job functions when they return to their company or organization. At the end of each module there will be several questions that each learner must complete: the **Learner Knowledge Assessment**. The instructor will conduct question and answer sessions to alleviate any concerns or questions during a review of each module.

At the end of the five-day training session, a final written exam, which is open book, may be administered covering the topics presented during the training session. The final examination may cover information not presented in the training session but is included in the training manual.

Upon successful completion of all course requirements, the individual will receive a certificate of course completion and will be certified to perform basic configuration, operation, and maintenance on networks using iDirect equipment.

This course is comprised of nine learning modules, which are summarized below.

Module 1 – iDirect System Overview

This module establishes the foundations for all the subsequent modules of the iDirect Operation and Maintenance (iOM) course. During the first part, the iDirect network topology and all its hardware components are covered, clearly specifying their main functionality and the interaction between them.
After the big picture is presented, the downstream DVB-S2 carrier is examined in detail, paying special attention to the Adaptive Coding and Modulation (ACM) properties and how iDirect has implemented the standard. The feedback mechanism and MODCOD selection algorithm are explained and the main characteristics of an adaptive carrier are discussed.
When the downstream carrier is understood, the module moves towards the upstream D-TDMA carriers, grouped in Inroute Groups. The proprietary D-TDMA protocol structure is discussed, and the nature of the iDirect overhead is uncovered. The student will learn about the frame, traffic and acquisition slots, and how they are allocated to the remotes of the network.
At the end of the module, the upstream SCPC Return carrier is presented as a high efficiency alternative to D-TDMA carriers for remotes with a continuous traffic demand.

Through lecture, presentation and visual display each learner will be able to understand and explain the basic iDirect network foundation, the nature of all the downstream and upstream carriers and the quality-of-service basics that are applied when distributing the traffic slots to the physical remotes on the network. Each learner will understand how data packets travel within the standard iDirect network and how the specific iDirect processes relate and operate within SATCOM and DATACOM.

Module 2 – Hub Components

In this module the hub side components previously introduced are covered in detail, starting with the 20-Slot hub and its accessories.
There is a section for the transmit and receive line cards, covering topics related to multiple channel demodulation line cards, redundancy and failover mechanism and specifying the internal synchronization that takes place along one specific network line card's.
The Network Monitoring System (NMS) is presented next, with all its internal services and databases being covered. The database consolidation, backup and replication processes will be discussed in depth as they are part of the daily maintenance scripts running on the Linux server. A quick look at the distributed NMS configuration will provide the learner with the necessary awareness to upgrade to a more advanced setup if necessary.
After the NMS servers, the Protocol Processor servers and its internal services will be discussed. The students will understand the load balancing nature of the servers and the automatically controlled failover mechanism.

Through lecture, presentation and visual display each learner will be able to understand and explain all the hub side components that are part of a standard iDirect installation, including, but not limited, to chassis, line cards, NMS and Protocol Processor servers.

Module 3 – Satellite Routers

This module focuses on the satellite routers (also known as remote modems), describing the main functionalities of each of them and highlighting their differences. The learner will become familiar with the mentioned devices, learning how to access them through serial, telnet and ssh connections and will even use the iVantage software tools Web UI to install, upgrade and commission a satellite router from scratch.
The commissioning process is also explained in this module, paying special attention to the antenna pointing tool included in the Web UI, the 1dB compression test and the cross-polarization test.

Through lecture, presentation and visual display each learner will be able to understand and explain all the available satellite routers and their main characteristics, being able to completely upgrade a new device installing the latest firmware images and configuration files using the Web UI and commissioning the terminal after that.

Module 4 – Remote Acquisition

Understanding the remote acquisition process is critical to ensure the healthiness of an iDirect satellite network. Most of the events that prevent a remote from joining the network can be easily explained by reviewing the most commons causes related to the acquisition process: power, frequency and timing offsets. The Uplink Control Process (UCP) that ensures and maximizes the stability of the upstream link through the reduction of those offsets is also discussed in this module.
The acquisition process will be covered from two different points of view: hub side and remote side. Details on the acquisition window aperture will be provided, and the two acquisition schemes available discussed: traditional fast acquisition vs. superburst.

Through lecture, presentation and visual display each learner will be able to understand and explain the two variations of the remote acquisition process. The student will realize the three main offsets that can prevent the acquisition for being successful and how the UCP process can address them all.

Module 5 – Network Configuration

The entire module content will focus on the creation of a complete network configuration from scratch using the iBuilder software tool. The instructor will detail all the required components to be configured, listing all the mandatory and optional fields per component, from the spacecraft to the teleport, from the chassis to the antenna, from the line card to the satellite router.
A demo will be performed in which the learners will observe how the trainer creates a new network setup, only to proceed on their own in the most complete hands-on exercise of this training course.

Through lecture, presentation and visual display each learner will be able to understand and explain the network configuration process using the iBuilder software tool, being confident enough to create a completely new network configuration without assistance.

Module 6 – Network Monitoring

When the network is built, up and running, it is paramount to monitor all aspects of network performance. iMonitor's sophisticated network performance and traffic reporting features make it possible to monitor and prevent problems before they occur. In this module, learners will become familiar with the specifications, features, and operation of iMonitor and how it works within the Network Management System (NMS).

Through lecture, presentation and visual display each learner will be able to understand, explain and demonstrate all applicable components of the iMonitor application to observe, monitor, and track performance of elements within an iDirect network.

Module 7 – Remote Troubleshooting

The last module of the training is focused on remote troubleshooting. All the main causes that can prevent a satellite router from transmitting and receiving traffic will be discussed, starting from the antenna pointing remote site receive chain, the downstream carrier reception, the burst time plan decoding, the remote site transmit chain and the acquisition process. This module is a must for iDirect installers as it will help them identify the potential problems that may arise when commissioning or troubleshooting satellite routers.

Through lecture, presentation and visual display each learner will be able to understand and explain the main causes of remote failures, knowing how to identify the problem and recover from it in a timely and professional manner.

Module 8 – TRANSEC Module

This module focuses on the TRANSEC (TRANsmission SECurity) feature, describing the main functionalities of each component such as line card, remote, and protocol processor. The learner will become familiar with TRANSEC regarding the implementation and troubleshooting. The commissioning TRANSEC remote process is also explained in this module, paying special attention to the different TRANSEC commissioning process for the 9000 series remotes.

Through lecture, presentation and visual display each learner will be able to understand and explain TRANSEC. The learner will be able to configure TRANSEC network and commissioning a remote in TRANSEC network.

Module 9 – Advanced Features

When the learners are familiar with iBuilder and iMonitor and have used them to create new configurations and monitor their networks behavior, this module will cover additional advanced features that could be used, optionally, within an iDirect network.
Adaptive D-TDMA is, by far, the most useful advanced feature that will be covered within the module. The students will understand the advantages of using Adaptive D-TDMA over classic D-TDMA, the difference between C/N and C/No, the feedback mechanism, the short-term, medium-term and long-term adaptivity mechanism. This section will also include an instructor-led demo.
Other features briefly introduced in this module will be iDirect Group Quality of Service, Global NMS and Automatic Beam Switching. The complexity of those features and their importance to the iDirect network causes all of them to have specific training courses.

Through lecture, presentation and visual display each learner will be able to understand and explain advanced features than can be configured using iBuilder, realizing the potential situations in which network design stages could benefit from using them.

Course Administration

1) *Welcome*
2) *Instructor Introduction*
3) *Points of Contact*
4) *Training Hours and Attendance*
5) *Break and Lunch*
6) *Restroom*
7) *Attire and Professional Decorum*
8) *Rules Concerning Electronic Devices (Cell Phones, Pagers, and other Devices)*
9) *Faxes, UPS, Fed-Ex*
10) *Accommodations*
11) *Site Emergency Procedures*
12) *Course Introduction*
13) *Learner Skills and Knowledge Review*
14) *Course Goals and Objectives*
15) *Course Daily Activities (see Table 1)*
16) *Course Materials*
17) *Lab Safety*
18) *Final Examination*
19) *Learner Introduction*

NOTE: Training provided is based on the version utilized or requested by the organization if training is conducted on site**.** *All iOM training in Herndon will be conducted according to the latest version.* In addition, each attendee must download the material on Satellite Communications and Data Communications from the iDirect Government website. This material must be read prior to attending the basic iOM training session. The URL to download this information will be provided by the Senior Training Program Coordinator after course registration.

Handouts supplement existing course material and provide additional up-to-date detail on software and hardware components. All students will receive, in addition to the User Training Guide, a Student Workbook, which contains all exercises and labs for the course.

Students are evaluated during the course to ensure that they have attained a level of understanding that will enable them to operate iDirect equipment, as well as to diagnose problems as they occur from a basic level. At the end of the class the student will receive a final written exam and, upon successful completion of all course requirements, will be certified to configuration, operate and maintain, and perform basic troubleshooting of any network utilizing iDirect equipment.

Hands-on, Demonstrations, and Exercises

Hands-on, demonstrations and exercises are interspersed throughout the iOM training course. Each learner will have the opportunity to display knowledge and skills obtained through the

lecture and demonstrations performed by the instructor. At the completion of each demonstration and exercises the learner should be able to perform the task with minimal instructor assists.

Course Critique, Certificate Presentation

Following the completion of the class, the course final exam will be given and reviewed. Course critiques will be distributed and collected after completion for review by iDirect Government management. Course completion certificates will be provided to each learner who has completed all assigned phases of instruction.

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