

# IBM iSeries Systems Operations & Administration

## Course Overview



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# AS/400 – iSeries training

## Development of the AS/400 – iSeries training course

This training course for iSeries Systems Operations and Administration has been under development since the early 90's. It is now complete and available on line @ <http://dsacorp-iel.inquisigr3.com/>

An iSeries Operator manages and controls an iSeries processing environment. At a more basic task level an iSeries Operator manages events and responds to issues. The events and issues can arise from the iSeries system or from an application process.

What are the basic skills needed and required to perform as an iSeries Operator and how does an iSeries Operator go about acquiring them?

One skill is recognizing what a system or an application event/issue looks like. Another is being able to distinguish a system from an application event or issue. A 3<sup>rd</sup> skill is knowing the correct response or action to take, once the type of event or issue is known.

These 3 elements of knowledge (skills) provide an iSeries Operator with the necessary foundation to manage and control any iSeries environment.

This training course delivers the knowledge and experience needed to develop these 3 skills within an iSeries Operator.



# Skills & training content

## Hands on learning and iSeries operator skill sets

This training course makes extensive use of 'hands on learning'. Any given unit of the course will have sections where the student is expected to follow along with their own terminal session.

iSeries operational personnel come from many different backgrounds and levels of experience.

This instructional material is intended to reach the full spectrum of this learning audience.

As the title of the training course implies, this course was designed and written for the iSeries Operator. Therefore you will not find any extended technical discourse on topics such as systems design or application programming.



# Content overview

## A chapter by chapter review & new stuff

We follow with a summary or thumbnail sketch of each chapter in the course.

### *First a note*

As a practical matter we do not intend that the last chapter **be** the last chapter. There are other chapters under development such as security, CL programming and BRMS.

Once you have subscribed to this course, as currently constructed, you are automatically given access to the new courses when they get introduced. We advise all enrolled learners when a new course arrives by email and automatically enroll them in the new course.

I welcome your responses and comments. Please send them along to me at the following email address:

[dcstevens@dsacorp.com](mailto:dcstevens@dsacorp.com)

Thank you for reading this far!



## Chapter review & summary

### Unit – 01 - Heritage

Like anyone else of my generation, I grew up surrounded by the emerging world of desktop technology and midrange computers.

For many of us, a big part of that world was the IBM Rochester, Minnesota facility, the creators of the System/38, the AS/400 and the entire iSeries family of processors and systems.

What made that so special? Why is there something akin to an iSeries cult in some circles? Is it really 64 bits or just PR? What are some of the factors that weighed in to making and creating the IBM iSeries platform and why is the iSeries still considered an advancing technology and fresh today?

These are some of the questions anyone new to the iSeries will have. Maybe they won't know very much at all about the platform and have no clue as to its origins. Perhaps it is a bit presumptuous of us to think they might really care.

However knowing what we know about the heritage of this amazing processing platform really does need to be shared with those of our community that have not had the same experience we have had.

That is what this chapter is intended to do.



## Chapter review & summary

### Unit – 02 – Architecture – 5 elements

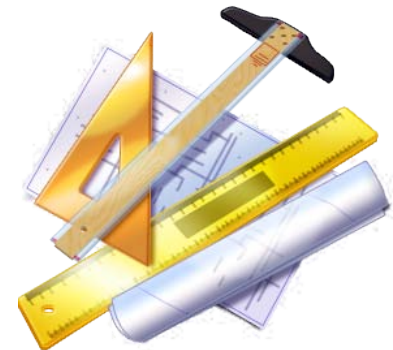
Anyone ever asks you what makes the iSeries a unique platform you can whip out this list of 5 elements and stun them.

Technology independence  
Object-based design  
Hardware integration  
Software integration  
Single level store

So what is so unique about these elements? What are they and how do they work together in a system environment like the iSeries? Why are they important? What is the significance of them versus some other attribute?

We all have questions about any environment that we are involved with. Windows, the latest iPad or the iPhone or the office Black Berry.

In the iSeries world we really do need to understand the architecture before we can begin to understand some of the rules and processes that we see used and implemented in this environment. This is what this chapter is intended for.



## Chapter review & summary

### Unit – 03 – Architecture - the file systems

Everyone knows there are multiple file systems supported by the iSeries, correct?

Nope, not everyone really understands that fact. Possibly because it is so well integrated in the overall iSeries environment that no one really notices the differences or takes any notice of the distinction made between one file system or another in the same operation system environment.

However, we know that there are currently 11 different file systems supported by the iSeries operating system.

Some are more frequently used than others such as the 'root' (/) file system, the library files system (QSYS.LIB), the document library services file system (QDLS).

Others, not so much such as the network file system (NFS) or the Netware file system (QNetWare).

Explaining to someone who has a single dimensional view of the iSeries environment that there are really several different file systems underneath becomes a very interesting task.

It is important that an operator understand this structural reality. That is the intent of this chapter.



## Chapter review & summary

### Unit – 04 –Architecture – the job

It seems that any discussion on work management starts out ok with some simple concepts and dialogue. Most of the time this reasonable pace quickly swirls around into a mashup effort describing everything about jobs, subsystems, job queues, priorities and routing steps, all in one breathless blur of pages.

We determined that it was best to separate out the job as a component of the system architecture. This allowed us to deal with the structural content of a job in more detail without getting lost in the larger stadium of work management.

The job is the most significant, self-contained, entity in the work management area. All things tend to come into focus with a job. More importantly it is how work is actually 'defined' on the iSeries.

As a managed entity a job becomes a focus of an operator when managing work in the iSeries environment. The various tools and commands they need to use revolve around the job and its attributes.

Understanding the job, the various types of jobs and where these jobs usually reside is a major piece of the puzzle for anyone trying to figure out the iSeries work environment.

That understanding of a job is what this chapter is intended to provide to an operator.





## Chapter review & summary

### Unit – 05 – Operations Interfaces – Menus & CL Commands

Understanding the structure of the operator interface is sometimes considered obvious or overlooked as a critical piece of the familiar routine.

Would it surprise you to know that most people with no exposure to the iSeries can quickly become acclimated to the basic operational interface by press one or two function keys?

What are the command name structures, work with 'WRK', display 'DSP', start 'STR' and end 'END'?

How does a menu environment work and how is it accessed?

What are the most common commands used by an operator?

Orienting an operator to the command and menu environment that they work in is very important to long term survival. These would be the questions we ask and attempt to answer in this chapter.

This chapter also drives through a number of practical screens and displays demonstrating the use of various commands and menus. The practice effort builds some familiarity with each command and menu.

## Chapter review & summary

### Unit – 06 – Operation Interfaces – Help facilities & keyboard

Knowing when, where and how to request help from the system is important. Using the extensive help and command prompted facilities of the iSeries can fill in a lot of information about any condition, error, event, process or command that an operator encounters.

These help and command prompt facilities are often overlooked and underutilized. They provide an operator with extended textual explanations of each topic with further references to external sources for more information as appropriate.

If looking through a job log for an active job they spot an error or event by pressing the F1 key they are provided with a detailed description of the condition or error.

When entering any command by pressing F4 with the command and thereafter for each parameter of the command they are given a step by step description of the command and each aspect of the parameters used by the command.

How many times have you seen an instruction advising the use of function key F14 and then turned to your keyboard where you see function keys F1 through F12.



## Chapter review & summary

### Unit – 06 – Operation Interfaces – Help facilities & keyboard (continued)

You, of course, already knew that you needed to use the shifted function to get an F14 (shift F2). But the fact is that many operators new to the iSeries or to the environment will not know to use a shifted function key.

We break down a few of the more important functional key strokes used in operations such as system request.

This is a general awareness chapter.



## Chapter review & summary

### Unit – 07 – Operation Interfaces – the consoles & Client Access

Quick, how many consoles can an iSeries have? Ok, trick question, there can be only one console on any iSeries server.

The fact that there can be multiple different ‘types’ of console devices for an iSeries can be a bit confusing. These console types will have been sorted through and one selected by the team that installs the iSeries server initially.

That is just how it is these days. So what is an operator supposed to know and understand about a console device?

How is this display device any different than any other display device?

What is an HMC and how is that defined and accessed?

What is IBM’s Client Access desktop suite of products?

What is the Client Access Navigator desktop application? How is it used by an operator? When might it be used?

We put some attention on these important interfaces and use some practical demonstrations for emphasis.



## Chapter review & summary

### Unit – 08 – Messages & Message Management

Messages are the vocabulary used by all processes in an iSeries environment to talk with one another and the system.

As an operator observes and manages processing on the iSeries environment they will encounter messages in one form or another that arrive from every process in the environment.

Some messages can be informational, job ending normally, processing started and so on.

Other messages can be alerts indicating errors were encountered in a process or job. Some require intervention while others declare the process failed and has been ended.

Where do messages come from? How are they defined? Where are they defined? What happens when a message is sent by a job or process?

What is 1<sup>st</sup> and 2<sup>nd</sup> level text and how can that information help understand the condition or meaning of the message?

These questions and more are asked and partially answered in this chapter. Some of the additional information needed to fully answer a question is derived from external research using the provided IBM manuals and notes.



## Chapter review & summary

### Unit – 09 – Logs & Log Management

There are two main types of logs within the iSeries, the system log and the job log. We discuss both types and how they are maintained and managed.

QHST is the system log and is closely followed by operations since it represents the activities or major activities taking place within the iSeries environment. More or less any message sent to the system operator message queue (QSYSOPR) will also be written to the QHST system log.

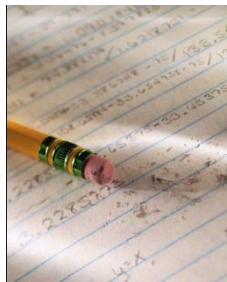
What are the various logging levels of a job and what is the importance of each logging level?

We walk through a number of scenarios that adjust the logging level of a job and then inspect the results of the job's log.

We also discuss where most job logs reside in the system environment and why.

We walk through the operational view of the system history file QHST and discuss what we are going to see in this log file that pertains to the operational health of the iSeries server.

We also include a brief discussion of how some operational data can be derived from the history file using simple scan techniques to derive the jobs that have started or ended within a specific period of time.



## Chapter review & summary

### Unit – 10 – Jobs & Job Management

This is part one of our work management discussion. This chapter describes and discusses jobs.

Jobs, what are their characteristics? What are you looking at when you perform a WRKJOB operation on a job from the WRKACTJOB display?

Each of those menu items is discussed.

What are the various job types? There are 8 job types within an iSeries environment. What are their unique attributes and functional roles in the overall scheme of things?

If you were ever asked what that particular job is, why it is running in the subsystem it is currently running in, how long does it normally run, who owns it?

This chapter will provide you with some of the answers to those questions.



## Chapter review & summary

### Unit – 11 – Subsystems & Managing Work

This is the second part of our work management discussion. This chapter covers managing work from the point where it enters the iSeries environment.

The focus of this chapter is on how work takes place within an iSeries environment.

We break down the major processing environments in the iSeries known as subsystems. It is within the definition and use of a subsystem that work is allowed to materialize and be processed.

Understanding how subsystems perform this basic function is an important element of the operational role. We cover all of the major design points of any subsystem description and do close up review of some of the more important environments.

We discuss and review the major pieces of any IPL and how this process is controlled by a controlling subsystem and a startup program.

We review memory and CPU resources to see how they are directly affected and utilized by the resource statements included in a subsystem definition.

We discuss the normal alignment of memory and memory pools within any iSeries environment and how this alignment effects processing within the iSeries.





## Chapter review & summary

### Unit – 11 – Subsystems & Managing Work (continued)

We develop the operational ‘walk around’ process and discuss the steps in the procedure to be used by the operator. Highlights include specific guidelines for thresholds of memory or CPU usage, server jobs that must be active and subsystems that must be started and running.

We take a close up review of all normally ‘required’ servers within an iSeries environment. We expand on the discussion of what should be considered ‘normally’ active server including the TCP server environment.

We discuss the changing ‘nature’ of remote users, how they have evolved from the ‘green screen world’ to using server-attached processes with SQL-based inquiries and other extended database processes.

We discuss the concepts of stopping, starting and changing a process. We extend this to moving, holding, releasing or changing a job (process) and review the impact to ongoing system processes, as well as dependencies for other related jobs to the job being changed, started or ended.



## Chapter review & summary

### Unit – 11 – Subsystems & Managing Work (continued)

We also note in this material, readers and writers with a discussion on ‘holding’ a queue or a spooled file and subsequently releasing it.

Ending something: What happens when you want to end a job? And the job does not want to end? What do you do? What type of job is it? Who owns the job? What user profile is attached to the job? Are there any dependencies or other locks being held by the job?

These are the questions that run through anyone’s mind when first thinking about ending any job on an iSeries or at least they should be. We discuss this task along with other ‘ending’ tasks and their specific requirements and impacts.

Starting something: What happens when you start a subsystem, a TCP server, a series of prestart jobs or some other process? What is the impact to the iSeries environment?

Again, this is something you should be thinking of when you first think about starting something within an iSeries environment.



## Chapter review & summary

### Unit – 12 – Printers & Managing Printers

An often overlooked technology, printers and printer management is something we wanted to focus on from an operational perspective.

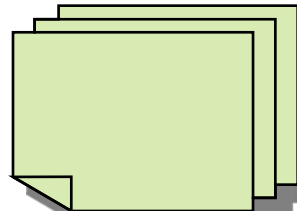
Visual data, as represented by printed output, is represented in the iSeries as a spooled file. Data written to a spooled file is considered ‘final form’ data, in that it is not capable of being changed from its current form.

We chase down of the writer terminology and discuss the various printer processes that exist within the iSeries environment.

Included is a discussion of the various print data streams supported by the iSeries. We also discuss the file-based design behind spooling, the printer file and the spooled file.

We spend some amount of time with the nuances of a PDF writer environment and blend this in with the new ‘paperless’ office environment that is taking shape in many business environments.

We discuss the manner in which printer writer jobs are started, managed and ended. The process of moving data from a file to printer file and then to a spool file is discussed in some detail. We present the various ‘types’ of writers that can be used within the iSeries, including local, remote and virtual writers.



## Chapter review & summary

### Unit – 13 – Save & Restore :: Backup & Recovery

This might actually be one of the more important chapters of the course since it discusses the important operational task of saving (backing up) the iSeries server on a regular and consistent basis.

It also presents a somewhat detailed review of restore operations with a suggested guideline for accomplishing this important task in an ‘active’ iSeries environment.

The aspects of any backup are discussed in some detail with emphasis given to processing the critical libraries in any environment as broken down by IBM with their special names such as \*ALLUSR or \*IBM when the SAVLIB command is discussed.

We provide access to various templates and diagrams from IBM that align the various save and restore commands depicting them in command order (option order) along with their save or restore equivalent command.

What is your save strategy? When do you normally perform a save operation? What is the scope of the save? What type of media do you use? What happens to the media once it is used in a save operation?



## Chapter review & summary

### Unit – 13 – Save & Restore :: Backup & Recovery (continued)

What methods of performing a save are available?

We present and discuss, in detail, the three most common methods used today, the GO SAVE menu options, BRMS or another 3<sup>rd</sup> party package and user written CL programs.

We review the most common recovery situations or disaster events from which a recovery is required. We discuss the structure and design of some widely used ‘protection’ mechanisms, including UPS, RAID and replication (mirroring).

We also review two of the more important game-changing technologies to the recovery environment, external disk and virtual tape.



# End of Course Overview



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