Understanding EI&O z/OS Job Classes

This document describes EI&O job classes and how they may be used to adjust the priority and cost of z/OS (MVS) batch jobs.

Related topics include charges, JCL, priority, and batch.

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Understanding EI&O z/OS Job Classes

Have you ever wondered which EI&O job class to use on your z/OS batch job? Have you wished that you could control the turnaround time or cost of your jobs? EI&O offers a variety of choices that you may use on the JOB or JOBPARM statements to alter the priority/cost at which your z/OS batch job will be run.

But first, just what is a job class? It is a way of grouping jobs so that similar jobs get treated the same way by the system. Jobs in the same job class are queued together in the input queue to await execution. Job class designations are based on common characteristics like the size of a job, expected turnaround, tape setups, and more. The job class is a tool that helps you meet your computing needs in a productive and cost-effective way.

To choose an appropriate class, you will need to consider several factors about your job:

- Is your job CPU-bound (does a lot of computation)?
- Is your job I/O-bound (lots of read/write statements)?
- How many tape setups does your job need?

Other things to consider include:

- Be aware of your budgetary constraints.
- Know your turnaround requirement for output (some classes print overnight).
- Some job classes carry a minimum charge. Use caution in selecting these classes to be sure that you will get the results that you expect.
- Basic Access accounts can only use classes 1, 2, A, Q, R, S, and U.
- Classroom accounts are limited to Classes 1, 2, A, Q, and U. (See below for job class descriptions.)
- Some job classes do not allow tape setups. This means that your data and programs must be disk resident or part of the job stream.
- If you ask for special forms to be printed at LOCAL (R0), they will be printed overnight no matter which class you use.

How Class "A" Works

Each job submitted to the z/OS system for batch processing will receive a charge after the job has executed as well as for some types of output (charges are not computed immediately, but will be submitted on at least a daily basis). Jobs submitted under Class A, or with no class
specified, will run at normal priority with regular rates. Regular rates are those listed in the EI&O Charging Algorithm document (D0001) [http://docweb.cns.ufl.edu/docs/d0001/d0001.html].

Normal priority means that your job will be assigned an execution priority based on the estimated number of CPU seconds you specified on your JOB or JOBPARM statement. A higher number of seconds gets a lower priority assignment. For jobs other than "absolute priority" (see below), a print priority is assigned based on the number of lines your job generates; and again, larger jobs get a lower priority. This makes sure that most jobs, the smaller ones, get a chance to run relatively quickly and are not blocked by a few very large jobs.

Class A jobs that request no setups and two seconds or less of CPU time will be set to priority 14. Otherwise, Class A priorities will be computed as follows:

<table>
<thead>
<tr>
<th>CPU Seconds on JOB Statement</th>
<th>Entry Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 1</td>
<td>12</td>
</tr>
<tr>
<td>&lt;= 3</td>
<td>10</td>
</tr>
<tr>
<td>&lt;= 6</td>
<td>9</td>
</tr>
<tr>
<td>&lt;= 10</td>
<td>8</td>
</tr>
<tr>
<td>&lt;= 30</td>
<td>6</td>
</tr>
<tr>
<td>&lt;= 100</td>
<td>4</td>
</tr>
<tr>
<td>&lt;= 300</td>
<td>3</td>
</tr>
<tr>
<td>&lt;= 7200</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 7200</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lines to be Printed</th>
<th>Print Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 50</td>
<td>12</td>
</tr>
<tr>
<td>&lt;= 200</td>
<td>11</td>
</tr>
<tr>
<td>&lt;= 500</td>
<td>10</td>
</tr>
<tr>
<td>&lt;= 1000</td>
<td>9</td>
</tr>
<tr>
<td>&lt;= 2000</td>
<td>8</td>
</tr>
<tr>
<td>&lt;= 5000</td>
<td>7</td>
</tr>
<tr>
<td>&lt;= 10000</td>
<td>6</td>
</tr>
<tr>
<td>&lt;= 30000</td>
<td>5</td>
</tr>
<tr>
<td>&gt; 30000</td>
<td>4</td>
</tr>
</tbody>
</table>

Ideally, all jobs with a priority of 14 will run before all jobs with a priority of 12; and all jobs with a priority of 12 will run before all jobs with a priority of 9; and so on. However, if your job requires limited resources (like multiple tape drives), it will have to wait on the availability of those resources. In the meantime, jobs that do not request limited resources may execute before your job executes even though they have a lower priority than your job.
Batch Job Aging

So how do those very large jobs get their turn to run and print? Both the execution priority and the print priority of all eligible jobs, except those in execution, are incremented by one level each hour. For example, if a job enters the print queue with a priority of 6 at 2 p.m., and it is still in the print queue at 3 p.m., its priority is incremented from 6 to 7. Note: "Aging" only affects jobs with priorities from 3 through 13.

Priority Adjustment Alternatives

There are twelve (12) job classes that you may choose from to adjust the priority and cost of your z/OS batch job. Each of these has distinct limitations as well as benefits. Consider carefully for each job you run to select the best job class for your needs.

CLASS 0: VERYSLOW priority is intended for jobs which require hours of CPU time and modest I/O. Arrangements for using Class 0 must be made in advance through the Operations Supervisor by 4 p.m. Friday. Jobs will be run on a First-In-First-Out (FIFO) basis during weekend operating hours, as resources are available, at the discretion of the Operations Supervisor. Tape setups may be requested at the time the job is submitted by contacting the Operations Supervisor who will determine if the workload is sufficiently slow to allow them.

Rate: Class A charge x 0.10

Minimum: $25.00 minimum charge

Priority: Class 0 operates at priority 0 (lowest) and does not go through the aging process.

CLASS 1: STANDBY jobs are allowed only one tape setup and will run on a FIFO basis at the operator's discretion on nights (after 5:00 p.m.) and weekends. STANDBY jobs can be printed on special forms to locations that allow this. They may be cancelled without notice in order to prevent degradation of services to users paying for higher priorities. Class 1 jobs may be submitted in HOLD on all days of service, but you will need to release them for execution. Operators will cancel jobs that remain in HOLD for more than 10 days. Jobs will NOT be cancelled if they have not executed by the end of the day in which they were submitted; they will be held for possible execution on the following day unless the job queue is full.

Rate: Class A charge x 0.25

Minimum: $0.75

Priority: Class 1 operates at priority 0 (lowest) and does not go through the aging process.

CLASS 2: LOW priority jobs will be run on a FIFO basis at the
operator's discretion on nights (after 5:00 p.m.) and weekends. In most cases, turnaround time will be no worse than overnight, but no minimum or maximum turnaround is guaranteed.

Rate: Class A charge x 0.50

Priority: Class 2 operates at priority 1 and does not go through the aging process.

CLASS 5: URGENT class jobs are assigned an absolute priority of 14 (highest) for fast processing. Because of the quick turnaround time, Class 5 jobs carry a 200 percent surcharge. Do not choose this class if you wish to print on special forms to R0, the local site (overnight), or if you are budget-conscious. Some EI&O remote printing sites print special forms during the day and night. If you are not sure when a Remote area prints special forms, check with an operator at that site. Printing to the IBM 3130 laser printer (NERAFP) is available during all EI&O operating hours.

Rate: Class A charge x 3.00

Priority: Class 5 operates at priority 14 and does not go through the aging process.

CLASS A: See the section called "How Class A Works" for a description of normal processing. Jobs without a CLASS=class parameter will use Class A.

Rate: See the EI&O Charging Algorithm EI&O document (D0001) for charging information.

CLASS P: PRODUCTION priority is encouraged for I/O-bound jobs. They are run in first in/first run order.

Rate: Class A charge x 0.50

Minimum: $8.00 minimum charge

Priority: Class P jobs run at priority 3 with no aging, but with normal (Class A) output priority and aging.

CLASS Q: The QUICK class is used for fast-batch, student job-processors. It is currently available for ASSIST, Pascal, PL/C, SPITBOL, SPSSQ, WATBOL, and WATFIV. CPU time is free. Jobs may have a maximum of two CPU seconds and 500 lines of printed output.

Rate: Free CPU time; other charges at Class A rates

Priority: Same as Class A
CLASS R: The RESEARCH priority is for CPU-intensive research computing jobs. CPU time is free, but all other charges apply at Class A rates. Class R is restricted solely to research users, that is, for jobs running under all 1x... (except 19xx...), 2x... (except 23x...), 4x..., and 6032... access numbers. If you do not know what access number is associated with your userid, type bal at the ready prompt to see your balance, userid, and access number. No tape setups are allowed, so data and programs must be disk resident or part of the job stream. There is one Class R initiator. It will run at all times that batch processing is available at a very low dispatching priority in order to use otherwise unused CPU cycles. There is no guaranteed turnaround time.

Rate: Class A rates with no CPU charge
Priority: This class operates at priority 1 with no aging.

CLASS S: The EVENING RESEARCH priority is also for CPU-intensive jobs. Class S runs on weekends, holidays, and after 6 p.m on weekdays and has the same restrictions as Class R.

Rate: Class R x 0.50

CLASS U: Class U charges for printing only and may only be used for the execution of accounting functions (e.g. CHRGLIST).

Rate: Class A printing charges only
Priority: Class A

CLASS W: The WEEKEND class is for research applications only and is available on weekends and holidays. Userids with jobs run under Class W will be billed a flat $500.00 for the weekend, regardless of the number of jobs run. No tape setups are allowed. Advance arrangements to use this class must be made with the EI&O Operations Manager.

Rate: $500 flat fee

**Choosing a Job Class**

**Example 1. Small job**

Suppose that you have a small job that requires no tapes, no special forms, and less than 5 seconds of CPU time. Perhaps you want to read a file and create a SAS data set; or compile a program; or use IEBGENER to copy a data set. Which job class should you use?

If your chief concern is fast turnaround, you should use Class A, Q, or U. Classes Q and U require that your job be using particular languages or utilities. Class A has no such
requirements, and because your job is small, it won't cost very much.

If cost is more important than turnaround, you should consider Classes 1, 2, R, or S. Class P is not a practical choice for a small job. Although it is discounted, it carries an $8.00 minimum charge. Class R or Class S may be right for you if your userid qualifies (see the aforementioned Class R discussion).

Classes 1 and 2 have substantial discounts, but which to use is not always obvious. For example, if your job would cost less than $1.50 to run in Class A, it would be less expensive to use Class 2 even though it has a smaller discount associated with it. This is because Class 1 has a minimum charge of $0.75 per job. If your job would cost more than $3.00 in Class A, Class 1 (the intuitive choice with a 75% discount) becomes cheaper to use.

**Example 2. Small research job**

You have a small research job that runs only occasionally. If it requires no tape setups, you will make your job class choice among Classes 1, 2, A, G, Q, R, or S. If turnaround time is most important, you will choose Class Q (or Class A, if the job will not run in Class Q). Evaluate the other possibilities as explained in Example #1.

But what if your job does require tape setups? Some job classes do not allow them. If your job will use only one tape, choose from Classes 1, 2, or A, depending on your turnaround and cost requirements. If your job will use multiple tapes, your practical choices are narrowed to Class 2 or Class A.

**Example 3. Administrative job**

Administrative jobs (payroll, financial aid, etc.) characteristically run regularly, use multiple tapes, and use extensive I/O (lots of read/write statements). Job classes to consider for this type of job include Classes 0, 2, A, or P. As always, if turnaround time is the single most important factor to you, use Class 5. However, Class P, the production class, was created especially to facilitate administrative jobs and is the job class that we recommend to you for this purpose.

If you can afford a longer turnaround time, you may be able to beat the Class P cost (minimum $8.00/job) of running your job. Class 0 will give you a 90 percent discount but your job will run only during weekend hours and will incur a $25 minimum charge. Class 2 is cost effective if your job would cost less than $16 at Class A rates and would give you overnight turnaround. If your job would cost more than $16 at Class A rates, you should use Class P. It will cost the same as Class 2 but will give you better than overnight turnaround. If your job requires one or no tapes, then Class 1 is also an option.

**Example 4. Long running research job**

This job requires a great deal of CPU time. A discussion regarding job classes for this type of
job is beyond the scope of this document. However, here are a few suggestions.

If your job does not require tape setups, choose from the following job classes: 0, 1, A, R, S, or W. If tape setups are required for your job, consider that it MAY be cost effective to move your files to disk, use a cheaper job class, and then delete the disk data sets to avoid storage costs. Class A is more expensive, of course, but will give you fast turnaround unless you are using more than 16M of memory. In that case, your job would not run until the weekend.

If you have a long running research job and would like assistance in choosing an appropriate job class, call the EI&O Support Desk [http://www.cns.ufl.edu/support/].

Example 5. Any job requesting special forms at LOCAL (R0)

Any job of any size requesting special forms to be printed at LOCAL (R0) will print overnight. Do not use the more expensive jobs classes for these jobs. It will not improve job turnaround. Instead, consider using Class 1 or Class 2 depending on your job characteristics.

Your Comments are Welcome

We welcome your comments and suggestions on this and all UFIT documentation. Please send your comments to:

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