lpuser

Table of Contents

IBM LP Solutions 1
User Guide for IBM Optimization Linear Solutions 3
OSLSSLV 5
OSLBSLV Module 9
OSLNSLV Module 13

[User's Guide | Download | Bottom of page]

IBM LP Solutions

The LP Solutions product consists of three fully stand-alone application programs, OSLSSLV, OSLBSLV, and OSLNSLV. These programs make use of modules from the optimization library to solve linear programming problems. OSLSSLV uses the simplex method, and OSLBSLV uses an interior point method, to solve generic LP problems. OSLNSLV solves pure network programming problems using a variant of the simplex method that has been specialized for use on such problems. Because this variant takes advantage of the simple structure of the constraint matrix of pure network programming problems, and it can solve its problems up to 50 times as fast as an unspecialized simplex solver. Brief descriptions of the solver algorithms incorporated into these programs are included in the opening sections of the library User's Guide.

Each of the OSL application programs accepts many command line parameters (which may be accessed from a parameter file) to specify program options. The program options available in all the application programs include: the size of the program workspace (limited only by available memory), whether the objective is to be minimized or maximized, names of input and/or output files, and specification of new values for OSL control variables. All the settable control variables are accessible by this means. Control variables and their uses are explained in the library User's Guide.

All the application programs accept problem data (in MPS format) from *stdin*, and direct output to *stdout*. Input data may be piped in from another program, which generates the data or retrieves it from some other source, or it may be read from a file. Output may be redirected into a file in the usual way, or written directly to an output file whose name has been supplied as a program option.

OSLSSLV includes both primal and dual simplex algorithms, and OSLBSLV includes both primal and primal-dual barrier algorithms. The user may specify which algorithm is to be used, or leave the choice to the program itself. At the user's direction OSLBSLV, will switch over to the simplex method: after a specified number of iterations, if numerical difficulties are encountered, or on successful completion, to obtain a basic feasible solution. Both OSLSSLV and OSLBSLV provide access to the library modules that "scale" and "presolve" LP problems. OSLSSLV also provides access to the module that analyzes infeasible problems.

For further information about the IBM LP Solutions product, click on User Guide, to view the document, or on Download to obtain a trial copy of the programs and a sample MPS data set.

If you would like to have softcopy of the html user guide on your PC, click here to download the zipped postscript HTML (74 KB)

If you prefer to handle hardcopy of documentation click here to download either a postscript (271KB) or zipped postscript (88 KB) version of the documentation.

Notes:	1. Viewing these postcript files is problematical. An inability to view them satisfactorily does not necessarily mean that they will not print correctly. 2. There are no hypertext links in the postcript files, and so the cross references are undetectable.

[**Top of Page | Previous Page | User's Guide**]

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IBM Optimization Solutions and Library Linear Programming Solutions

[Oslsslv Guide | Oslbslv Guide | Oslnslv Guide | Download]

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Each of the OSL Linear Programming Solutions modules:

1. Oslsslv for solving LP problems using simplex methods,
2. Oslbslv for solving LP problems using interior point methods, and
3. Oslnslv for solving pure Network problems using special network simplex method,

has its own user's guide. The following comments apply to all three programs.

Usage Examples:

Example 1

oslsslv "?" > sslv.opt

This puts the list of keywords options for the oslsslv program, with explanations of their meanings and default values, into the file named "sslv.opt."

Example 2

oslbslv -dspace=500000 -imaxiterb=70 -input=test1.mps -output=test1.out

The oslbslv program is started and instructed to take input data from the file named "test1.mps." Output will be directed to the file named "test1.out." The program workspace will be set to 500000 16 byte words, and the value of the integer control variable *Imaxiterb* will be set to 70, which will make oslbslv switch to a simplex method after 70 interior point barrier iterations.

Example 3

oslnslv @option.fil

The oslnslv program is started, and instructed to take its options from the file named "option.fil."

An options file should contain program options, one per line, as they would be entered on-line ***without the preceding minus sign***.

[Oslsslv Guide | Oslbslv Guide | Oslnslv Guide | Download]

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Module Name: oslsslv

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Purpose: To solve Linear Programming problems using Simplex methods
Usage: oslsslv ["?"] [-keyword=value] [...] [@keyword_file]
keyword_file: Name of file containing "-keyword=value" strings.
Each "-keyword=value" string in this file must be on a separate line.

Valid Keywords and Default Values:

maxmin = min|max - default: min
input = input_mps_file - default: standard input
output = listing_file - default: standard output
dspace = value - default: 400000
isolmask = value - default: 0
iprtinfomask = value - default: 31
presolve = yes|no - default: yes
presolvetype = 0|1|2|3 - default: 3
crash = yes|no - default: yes
scale = yes|no - default: yes
inbasis = in_basis_file - default: null
outbasis = out_basis_file - default: null
imaxiter = value - default: 9999999
infeas = value - default: 0
alg = osl|primal|dual - default: osl
osli_n_ = value - default: a function of n
oslr_n_ = value - default: a function of n
oslc_n_ = value - default: a function of n

Explanation of Keywords:

maxmin : Solve as a maximization or minimization problem.
input : Name of file containing input data - MPS format.
output : Name of file to receive OSL messages.
dspace : Size in double words of OSL work area.
isolmask : Matrix bit mask for EKKPRTS print function.

= 1 : selects the rows
= 2 : selects the columns
= 4 : selects the nonzero elements of the model
= 8 : selects the infeasible elements of the model
= 15 or 0 or 16 : selects the entire matrix

iprtinfomask : Solution information bit mask for EKKPRTS print function.

= 1 : selects the statistics
= 2 : selects iteration count, value of the objective function and the problem status
= 4 : selects the names of the columns and rows
= 8 : selects the status of each variable
= 16 : selects the row and column solution values
= 32 : selects the dual values and reduced costs
= 64 : selects the lower bounds
= 128 : selects the upper bounds
= 256 : selects the input costs
= 512 : selects the matrix elements
= 0 : selects all of first six options (same as 63).

presolve : Use EKKPRSL function to pre-solve problem.
presolvetype : Type of reduction to be performed by EKKPRSL.

= 0 : the redundant rows are eliminated, the variables summing to zero are fixed.
= 1 : type 0 reductions are done and the doubleton rows are eliminated.
= 2 : type 0 reductions are done and variable substitutions performed.
= 3 : all of type 0, 1, and 2 reductions are performed.

crash : Use EKKCRSH function to create a starting basis.
scale : Use EKKSCAL function to scale the coefficient matrix.
inbasis : Name of file containing an input basis to be used by EKKBASI.
outbasis : Name of file containing an output basis created by EKKBASO.
imaxiter : The maximum number of iterations that OSL will perform.
alg : Simplex algorithm to be used.

= primal : primal algorithm
= dual : dual algorithm
= osl : algorithm to be selected by OSL

infeas : Infeasibility analysis bit mask for EKKNFES function

= 0 : no analysis is performed.
= 1 : outputs messages identifying infeasibilities.
= 2 : finds one or more 'powerful infeasibilities'.
= 4 : finds an 'influential constraint'.
= 8 : finds an irreducible infeasible subset (IIS) of constraints.

osli_n_ : OSL Integer Control variable n; 0 < n < 62
oslr_n_ : OSL Real Control variable n; 0 < n < 46
oslc_n_ : OSL Character Control variable n; 0 < n < 11

See the library User's Guide for more information on Control variables.

Example 1

oslsslv "?"
This command results in the usage information and display of valid keywords, their meanings along with the default values.

Example 2

oslsslv -imaxiter=20000 < test1.mps > test1.out
The oslsslv program is started using test1.mps as input data. Output is directed to the file test1.out. The program will stop after 20000 iterations.

Example 3

If the file key_file.001 contains the following 4 lines:

```
presolve=no
alg=dual
imaxiter=20000
osli_36_=132
```

then the command:

oslsslv -dspace=1000000 @key_file.001 < test1.mps > test1.out

will start oslsslv with a work area of 1 million double words. The ekkprsl() pre-solve function will not be invoked. The dual algorithm will be used. The application will stop after 20000 iterations. The maximum number of characters on each line of output is 132.

Example 4

The command:

```
oslsslv -dspace=1000000 @key_file.001 -input=test1.mps -output=test1.out
```

is equivalent to:

```
oslsslv -dspace=1000000 @key_file.001 < test1.mps > test1.out
```

---

oslsslv USAGE NOTES

1. If oslsslv is having difficulty with a problem, then you should increase the size of OSL work area using the "dspace" keyword and try solving the problem again.

System Requirements

The installation instructions included in the download instructions include System Requirements.

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Module Name: oslbslv

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Purpose: To solve LP problems Interior-Point Barrier methods
Usage: oslbslv ["?"] [-keyword=value] [...] [@keyword_file]
keyword_file: Name of file containing "-keyword=value" strings.
Each "-keyword=value" string in this file must be on a separate line.

Valid Keywords and Default Values:

Maxmin = min|max - default: min
input = input_mps_file - default: standard input
output = listing_file - default: standard output
dspace = value - default: 400000
isolmask = value - default: 0
iprtinfomask = value - default: 31
presolve = yes|no - default: yes
presolvetype = 0|1|2|3 - default: 3
scale = yes|no - default: yes
outbasis = out_basis_file - default: null
imaxiter = value - default: 9999999
imaxiterb = value - default: 100
alg = 0|1|2|3 - default: 0
sslvswch = 0|1|2|3 - default: 2
osli_n_= value - default: a function of n
oslr_n_= value - default: a function of n
oslc_n_= value - default: a function of n

Explanation of Keywords:

maxmin : Solve as a maximization or minimization problem.
input : Name of file containing input data - MPS format.
output : Name of file to receive output messages.
dspace : Size in double words of work area.
isolmask : Matrix bit mask for EKKPRTS print function.

= 1 : selects the rows
= 2 : selects the columns
= 4 : selects the nonzero elements of the model
= 8 : selects the infeasible elements of the model
= 15 or 0 or 16 : selects the entire matrix

iprtinfomask : Solution information bit mask for EKKPRTS print function.

= 1 : selects the statistics
= 2 : selects iteration count, value of the objective function and the problem status
= 4 : selects the names of the columns and rows
= 8 : selects the status of each variable
= 16 : selects the row and column solution values
= 32 : selects the dual values and reduced costs
= 64 : selects the lower bounds
= 128 : selects the upper bounds
= 256 : selects the input costs
= 512 : selects the matrix elements
= 0 : selects all of first six options (same as 63).

presolve : Use EKKPRSL function to pre-solve problem.
presolvetype : Type of reduction to be performed by EKKPRSL.

= 0 : the redundant rows are eliminated, the variables summing to zero are fixed.
= 1 : type 0 reductions are done and the doubleton rows are eliminated.
= 2 : type 0 reductions are done and variable substitutions performed.
= 3 : all of type 0, 1, and 2 reductions are performed.

scale : Use EKKSCAL function to scale the coefficient matrix.
outbasis : Name of file containing an output basis created by EKKBASO.
imaxiter : The max. number of Simplex iterations that will perform done.
imaxiterb : The max. number of Barrier iterations that will perform done.
alg : Interior-Point Barrier alg. to be used by EKKBSLV function.

= 0 : algorithm to be chosen by the solver
= 1 : primal barrier algorithm
= 2 : primal-dual barrier algorithm

= 3 : primal-dual barrier alg. with predictor-corrector

sslvswch : Simplex method switch (to obtain a basic solution).

= 0 : EKKBSLV never switch to the simplex method
= 1 : EKKBSLV switches to the simplex method if numerical instabilities arise
= 2 : EKKBSLV switches to the simplex method when it completes or if numerical instabilities arise
= 3 : EKKBSLV switches to the simplex method immediately if it is appropriate after analyzing the matrix, at completion, or if numerical instabilities arise

osli_n_ : Integer Control variable n; 0 < n < 62
oslr_n_ : Real Control variable n; 0 < n < 46
oslc_n_ : Character Control variable n; 0 < n < 11

See the library User's Guide for more information on Control variables.

Example 1
oslbslv "?"
This command results in the usage information and display of valid keywords, their meanings along with the default values.
Example 2
oslbslv -imaxiterb=70 < test1.mps > test1.out
The oslbslv program is started using test1.mps as input data. Output is directed to the file test1.out. The program will switch to a Simplex method after 70 Interior-Point Barrier iterations.
Example 3
If the file key_file.001 contains the following 4 lines:

```
presolve=no
alg=1
imaxiterb=70
osli_36_=132
```

then the command:

oslbslv -dspace=1000000 @key_file.001 < test1.mps > test1.out

will start oslbslv with a work area of 1 million double words. The ekkprsl() pre-solve function will not be invoked. The Primal-Barrier algorithm will be used. The program will switch to a Simplex method after 70 Interior-Point Barrier iterations. The maximum number of characters on each line of output is 132.
Example 4
The command:
oslbslv -dspace=1000000 @key_file.001 -input=test1.mps -output=test1.out
is equivalent to:
oslbslv -dspace=1000000 @key_file.001 < test1.mps > test1.out

---

oslbslv USAGE NOTES

1. If oslbslv is having difficulty with a problem, then you should increase the size of work area using the "dspace" keyword and try solving the problem again.

System Requirements

The installation instructions in the download package include System Requirements

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Module Name: oslnslv

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Purpose: To solve Linear Network Programming problems
Usage: oslnslv ["?"] [-keyword=value] [...] [@keyword_file]
keyword_file: Name of file containing "-keyword=value" strings.
Each "-keyword=value" string in this file must be on a separate line.

Valid Keywords and Default Values:

Maxmin = min|max - default: min
Input = input_mps_file - default: standard input
Output = listing_file - default: standard output
Dspace = value - default: 400000
Isolmask =v alue - default: 0
Iprtinfomask = value - default: 31
inbasis = in_basis_file - default: null
outbasis = out_basis_file - default: null
imaxiter = value - default: 9999999
osli_n_ = value - default: a function of n
oslr_n_ = value - default: a function of n
oslc_n_ = value - default: a function of n

Explanation of Keywords:

maxmin : Solve as a maximization or minimization problem.
input : Name of file containing input data - MPS format.
output : Name of file to receive OSL messages.
dspace : Size in double words of OSL work area.
isolmask : Matrix bit mask for EKKPRTS print function.

= 1 : selects the rows
= 2 : selects the columns
= 4 : selects the nonzero elements of the model
= 8 : selects the infeasible elements of the model
= 15 or 0 or 16 : selects the entire matrix

iprtinfomask : Solution information bit mask for EKKPRTS print function.

= 1 : selects the statistics
= 2 : selects iteration count, value of the objective

function and the problem status

= 4 : selects the names of the columns and rows
= 8 : selects the status of each variable
= 16 : selects the row and column solution values
= 32 : selects the dual values and reduced costs
= 64 : selects the lower bounds
= 128 : selects the upper bounds
= 256 : selects the input costs
= 512 : selects the matrix elements
= 0 : selects all of first six options (same as 63).

inbasis : Name of file containing an input basis to be used by EKKBASI.
outbasis : Name of file containing an output basis created by EKKBASO.
imaxiter : The maximum number of iterations that OSL will perform.
osli_n_ : OSL Integer Control variable n; 0 < n < 62
oslr_n_ : OSL Real Control variable n; 0 < n < 46
oslc_n_ : OSL Character Control variable n; 0 < n < 11

See the library User's Guide for more information on Control variables.

Example 1
oslnslv "?"
This command results in the usage information and display of valid keywords, their meanings along with the default values.

Example 2

oslnslv -imaxiter=20000 < test1.mps > test1.out
The oslnslv program is started using test1.mps as input data. Output is directed to the file test1.out. The program will stop after 20000 iterations.

Example 3
If the file key_file.001 contains the following 4 lines:

```
maxmin=max
imaxiter=20000
isolmask=7
osli_36_=132
```

then the command:

```
oslnslv -dspace=1000000 @key_file.001 < test1.mps > test1.out
```

will start oslnslv with a work area of 1 million double words. The problem is solved as a maximization problem. The program will stop after 20000 iterations. The ekkprts() print function will select only non-zero columns and rows. The maximum number of characters on each line of output is 132.

Example 4
The command:

```
oslnslv -dspace=1000000 @key_file.001 -input=test1.mps -output=test1.out
```

is equivalent to:

```
oslnslv -dspace=1000000 @key_file.001 < test1.mps > test1.out
```

---

oslnslv USAGE NOTES
1. If oslnslv is having difficulty with a problem, then you should increase the size of OSL work area using the "dspace" keyword and try solving the problem again.

System Requirements

The installation instructions in the download package include System Requirements.

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