2023 User Group Meeting - MSHELL

March 2023

UNIVERSITY OF LEEDS

ATKINS

Member of the SNC-Lavalin Group

FVVB Ltd

MSHELL

What is MSHELL

- Interactive tool we use in the analysis of problems
- Scripting language
  - selection of tools written as intermediate between programmers / click-and-go modellers
  - allows us to interrogate SATURN .UF* files and perform repeatable actions
  - no user design objective / user interface maintenance

Why are we are releasing it

- Available to "us" when we require extra information, eg on support cases
- Could provide user solutions without waiting for release of next version
- May be useful for users - eg matrix manipulation

MSHELL is NEW

- No training material yet - probably learn by examples

MSHELL - History

Where did MSHELL come from?

- Consideration of 64 bit applications
- DVV introduced blocked matrices for holding TAC matrices
- Memories of pshell

MSHELL

- Internal test bed for 64 bit Fortran application interfacing with SATURN
- Initially to browse the big matrices generated for validation

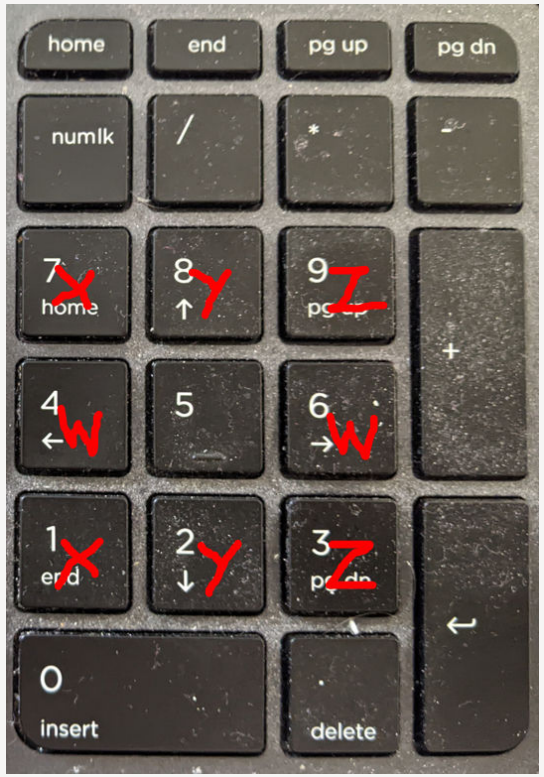
MSHELL - Simple

In its simplest form:

`D> mshell`	Start MSHELL
`MSHELL> get net_T_BYTAC.UFM`	Get matrix into current work area (CWA)
`MSHELL> browse`	Browse the matrix in the CWA
`?h`	Get the browser help
	- browser commands begin ? or
	- a number - using numeric keypad
`.`	Full stop to end browser
`MSHELL> end`	To end MSHELL ...
`D>`	... and get back to the command prompt

Browse

```
MSHELL> browse

SKIMMED CHARGE-PAYING TRIPS

  -LEVEL-   --ROW--  -BLOCK-    10001    10002    10003    10004    10005    10010    10011    10012    10013    10014

      1     10001        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.18     0.00     0.01     0.01     0.01     0.01     0.03     0.02     0.03     0.02

            10002        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.01     0.10     0.05     0.02     0.06     0.01     0.11     0.07     0.27     0.12

            10003        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.01     0.01     0.00     0.02     0.00     0.00     0.01     0.00     0.00     0.03

            10004        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.22     0.02     0.03     0.13     0.02     0.00     0.03     0.02     0.00     0.08

            10005        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.00     0.02     0.01     0.01     0.01     0.00     0.01     0.00     0.01     0.03

            10010        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.06     0.02     0.04     0.01     0.00     0.02     0.01     0.01     0.01     0.04

      2     10001        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.31     0.00     0.04     0.01     0.00     0.00     0.02     0.00     0.01     0.00

            10002        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.00     0.17     0.22     0.03     0.04     0.01     0.16     0.02     0.17     0.06

            10003        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.01     0.02     0.04     0.09     0.01     0.00     0.04     0.00     0.01     0.05

            10004        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.17     0.02     0.14     0.46     0.02     0.00     0.07     0.01     0.01     0.07

            10005        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.00     0.02     0.03     0.02     0.04     0.00     0.01     0.00     0.01     0.02

            10010        1     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
                         2     0.01     0.01     0.12     0.01     0.00     0.03     0.00     0.00     0.00     0.01

--- --- (r 00001:00006/05421 c 00001:00010/05421 l 00001:00002/00006 b 00001:00002/00002)
```



MSHELL - matrix manipulation

```
MSHELL> define net F41ref38_AM
MSHELL> get @net@_TIJ_BYTAC.UFM
MSHELL> sum all blockwise
MSHELL> keep x
MSHELL> summary
```

Set internal variable
Get "bytac" matrix using internal variable
Sum all the blocks together
Save the CWA in internal storage as "x"
Show summary of created matrix

```
MSHELL> summary
  IB  BLKNAME IL  LEVNAME          SUM        DIAGS   NCELLS  NONZERO        MIN          MAX     MIN(NZ)     MAX(NZ)
   1   __ALL__  1        1    587912.30    305330.10 29387241 24312027     0.0000   49656.8203      0.0000  49656.8203
   1   __ALL__  2        2   4880025.50   3072493.84 29387241 25978649     0.0000 522341.3750      0.0000 522341.3750
   1   __ALL__  3        3     35761.99       888.75 29387241 17683321     0.0000      22.1087      0.0000     22.1087
   1   __ALL__  4        4     16071.80       294.33 29387241  5627635     0.0000      38.0930      0.0000     38.0930
   1   __ALL__  5        5    702361.93    387975.28 29387241 18545504     0.0000   52694.4531      0.0000  52694.4531
   1   __ALL__  6        6    235818.93     91262.78 29387241 11032997     0.0000   23983.4883      0.0000  23983.4883
```

```
MSHELL> get @net@_TIJ.UFM
MSHELL> subtract x
MSHELL> summary
```

Get the "total" trip matrix
Subtract "x"
Show summary of differences

```
MSHELL> summary
  IB  BLKNAME IL  LEVNAME          SUM        DIAGS   NCELLS  NONZERO        MIN          MAX     MIN(NZ)     MAX(NZ)
   1         1  1        1        -0.03         0.00 29387241 24306604    -0.0005       0.0000     -0.0005      0.0000
   1         1  2        2        -0.21         0.00 29387241 25973565    -0.0078       0.0000     -0.0078      0.0000
   1         1  3        3         0.00         0.00 29387241 17678424     0.0000       0.0000      0.0000      0.0000
   1         1  4        4         0.00         0.00 29387241  5623355     0.0000       0.0000      0.0000      0.0000
   1         1  5        5        -0.04         0.00 29387241 18541408    -0.0020       0.0000     -0.0020      0.0000
   1         1  6        6        -0.02         0.00 29387241 11032129    -0.0010       0.0000     -0.0010      0.0000
```

MSHELL - not just matrices

```
MSHELL> define net F41ref38_AM
MSHELL> get @net@.UFS
MSHELL> listparms equals NCENTS
MSHELL> makeset znames ZONENAMES
MSHELL> makeset ucs UCNAMES
MSHELL> # we can now create matrix of ones
MSHELL> create . zonenames znames levelnames ucs value 1
```

Set internal variable

Get assigned network

Look at parameter

```
MSHELL> listparms equals NCENTS
 LISTPARMS NAMED NCENTS
NCENTS=5421
```

Keep the zonenames in set "znames"

... and the userclassnames in "ucs"

Comment beginning #

The "." means here, the current work area

```
MSHELL> browse
```

```
Matrix created - set 1
  -LEVEL-   --ROW--   -BLOCK-    10001    10002    10003    10004    10005    10010    10011    10012    10013    10014

 CAR_BUSI     10001          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10002          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10003          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10004          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10005          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10010          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00

 CAR_OTHE     10001          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10002          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10003          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10004          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10005          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
              10010          1     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00


--- --- (r 00001:00006/05421 c 00001:00010/05421 l 00001:00002/00006 b 00001:00001/00001)
```

MSHELL - help

`MSHELL> help MSHELL`	To get version number
`MSHELL> help Help`	To get the Help section of the help information
`MSHELL> help SUBTRACT`	To get the info for the SUBTRACT command
`MSHELL> help`	Gives ALL the help!

Oh, and as an afterthought...

`MSHELL> title Costs + 10 sec`	You may want to set a title,
`MSHELL> type COST`	the type, (COST/TRIP)
`MSHELL> units SECS`	the units, and then...
`MSHELL> write output.UFM`	... write out the CWA as a SATURN matrix!

... and "batch" call of script file

`D> call mshell yourscript.m parm1 parm2` – with parameters