



SVM Quick Start Guide

1 Introduction

The following are instructions for installing and running the System Value Modeling (SVM) tool developed by Lockheed Martin for the DARPA F6 program.

2 Requirements

The SVM tool was developed for Matlab[®] 7.6 (R2008a). Other versions of Matlab may produce errors.

3 Installation

Unzip the SVM files into a dedicated folder. Change the directory in Matlab to this folder. At the prompt type

```
> install
```

If an *ArchitectureFiles* directory does not exist, one will be created and populated with the architecture files appropriate for the combination of number of payloads, number of spacecraft and technology choices.

4 Running the simulation

To run the simulation, at the prompt type

```
> runMetisSvm
```

Choose the type of simulation you want to perform:

- 1) run a limited set of baseline architectures
- 2) run a specific architecture file
- 3) run all architectures in a specific directory
- 4) run a Monte-Carlo simulation for a specific architecture file
- 5) run a Monte-Carlo simulation for all architectures in a specific directory

Depending on the choice made, you'll be prompted to enter a filename or choose a directory.

By default, the results will be stored in *Results* directory.

5 Basic results analysis

To plot the cash flow of a particular run, load the corresponding results file with Matlab load command

```
> load filename
```

and then type:

```
> plotResultsCashFlow(value, constants, archname)
```

To plot the state history, again, load the results file and type:

```
> plotResultsStateHistory(value, constants, archname)
```

To plot the Mean-Sigma or Revenue-Cost graphs, use the command
> MeanSigma_factors

and select the directory where the files are located. One change that must be made to this file is the number of Monte Carlo runs per architecture. The following line must be modified:

```
numRuns = 10; % number of Monte Carlo runs for each  
architecture
```

Also, the Tagichi matrix must match the Tagichi matrix in `genOrthogonalX.m`

6 Modifications

Several basic modifications can be made in order to explore various scenarios. In most cases, in order for the changes to take effect, the directory *ArchitectureFiles* will have to be deleted and the architecture files reinstalled with the `install` command.

6.1 Number of spacecraft and technology options

Array L320WPT in file `ArchGenerator\genOrthogonalX.m` contains all the combinations of number of spacecraft and technology options to be explored. For each of these options, all the possible combinations of payloads will be explored.

Column 1 of the L320WPT array contains the number of spacecraft in the cluster. The rest of the columns contain the technology options. For example, column 4 contains the choice of propulsion technology. Line 171 defines the possible options and lists 0 as Chemical and 2 as EMFF. Line 250 selects one of these choices based on the entry in column 4 of the L320WPT matrix. Some technology options have been made virtually constant by selecting only one option (e.g. routing mode has been set to 1 – proactive – in line 233)

6.2 Payloads

All payload characteristics are found in the file `Payload\payloadDatabaseInitialize.m`. Payload characteristics can be modified in this file. The only caveat is that the last payload must be the EMFF pseudo-payload, if EMFF is to be explored.

6.3 Types of payloads

File `ArchGenerator\genArchs.m` allows for a variety of payload selections from the `payloadDatabaseInitialize.m` file

If, on line 87, `payloadEnhancerFlag = 0`, then only the first 5 payloads in the `payloadDatabaseInitialize.m` file will be used.

If, on line 87, `payloadEnhancerFlag = 1`, then lines 110 and 111 describe the combination of primary and secondary payloads. For example, if the assignment is

```
payloadToBeEnhanced = [1 3 5 1 2 3 4 5];  
payloadEnhancer = [6 6 7 8 8 8 8 8];
```

Everytime there is a payload 1, there will also be payloads 6 and 8; everytime there is a payload 5, there will also be payloads 7 and 8. In this case, payload 8 is the EMFF pseudo-payload.

6.4 Constants

File *initializeConstants.m* allows the simulation to explore various options which will not be compared against each other during a simulation run. For example, line 62 allows the launch cost model to be based on historical costs or on fixed cost per Kg by changing constant `constants.launch.costModel`. Another suggested section for exploration is `Scenario Uncertainty Selection`. Here various failure modes can be turned on or off.

6.5 Lifetimes

If a full space of lifetimes is desired, run `modifyArchLifetimes.m` for each architecture. See help in `modifyArchLifetime.m`

7 Additional Information

For additional information and assumptions please see the Program of Record (PoR) document or contact the Lockheed Martin F6 team.