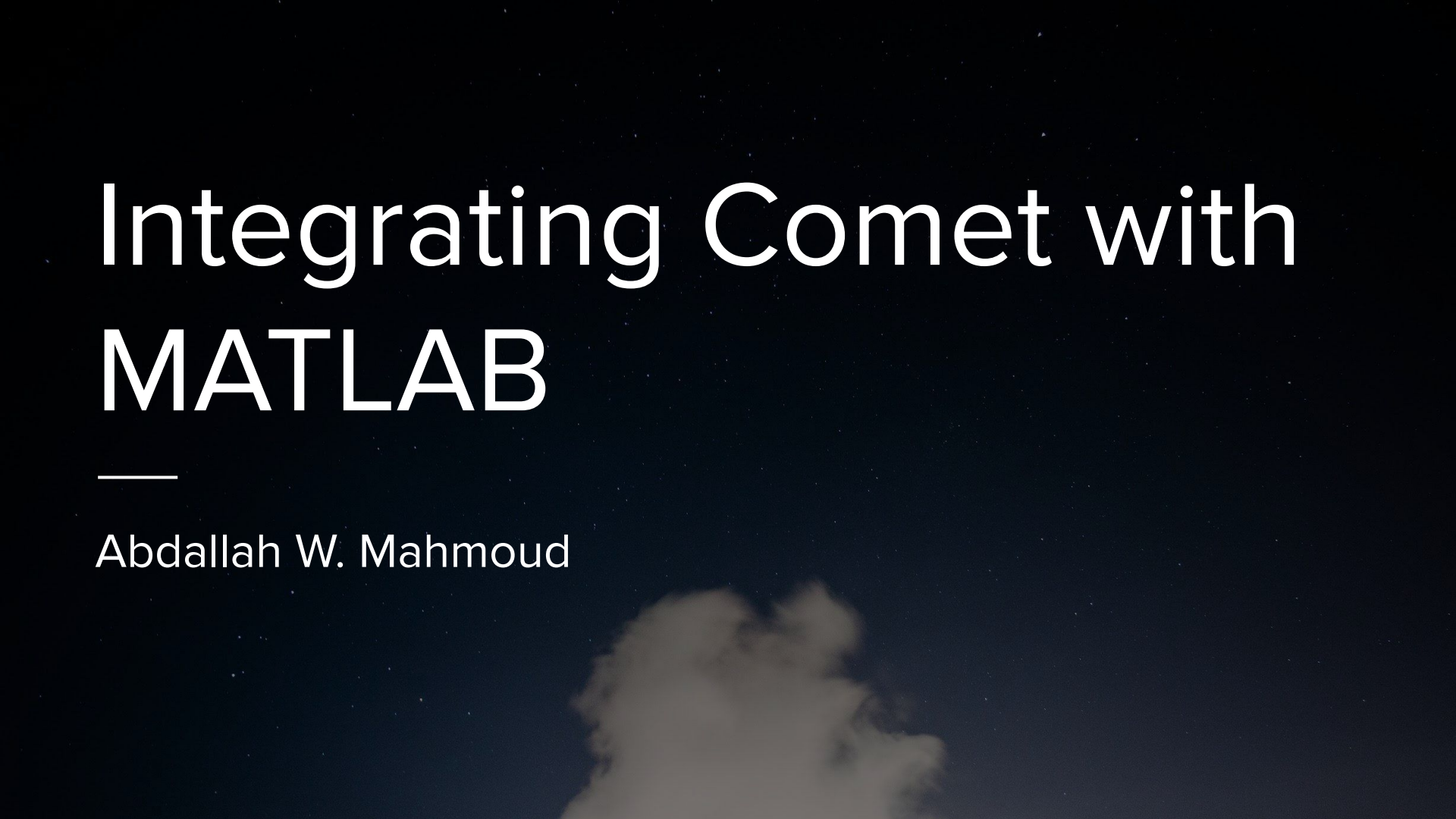
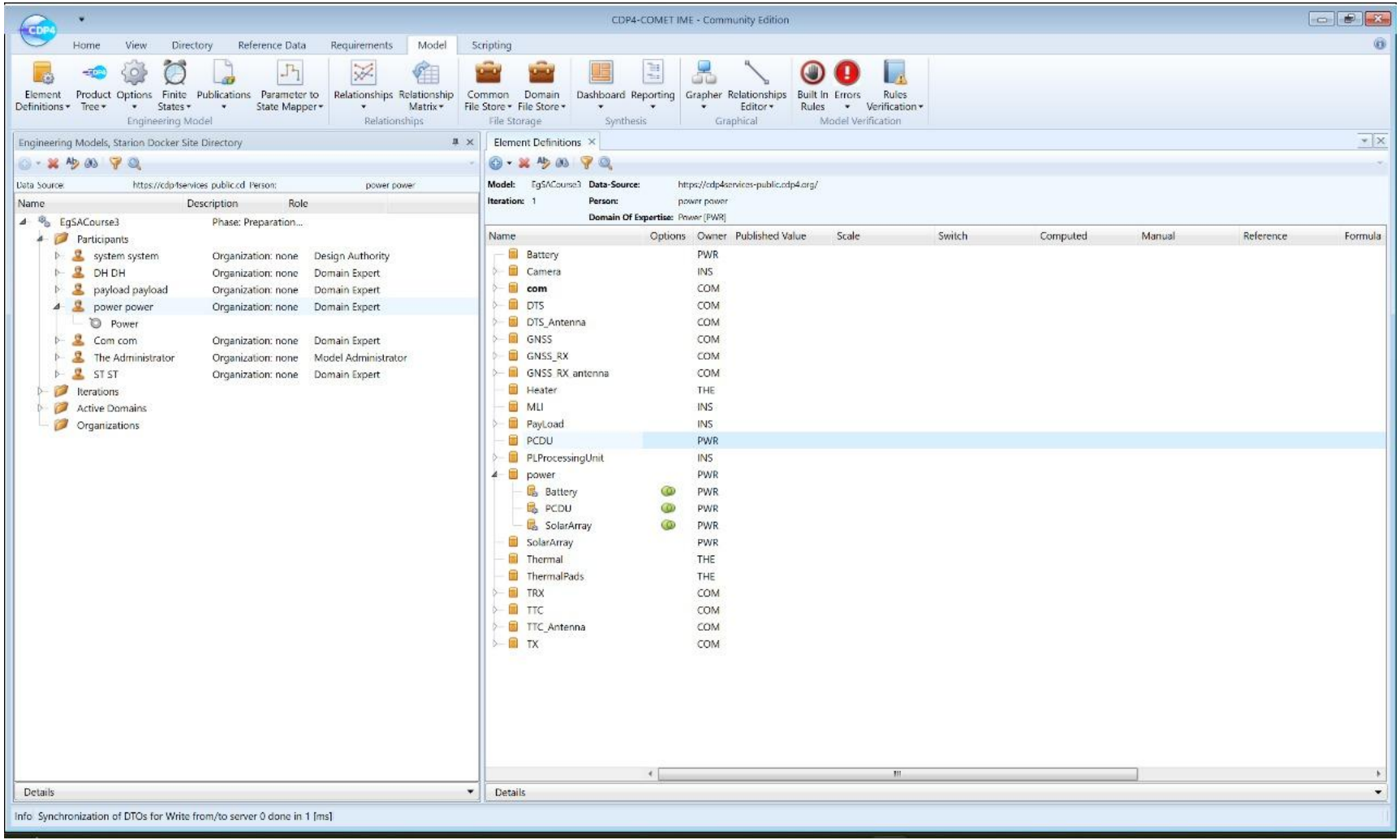
Integrating Comet with MATLAB

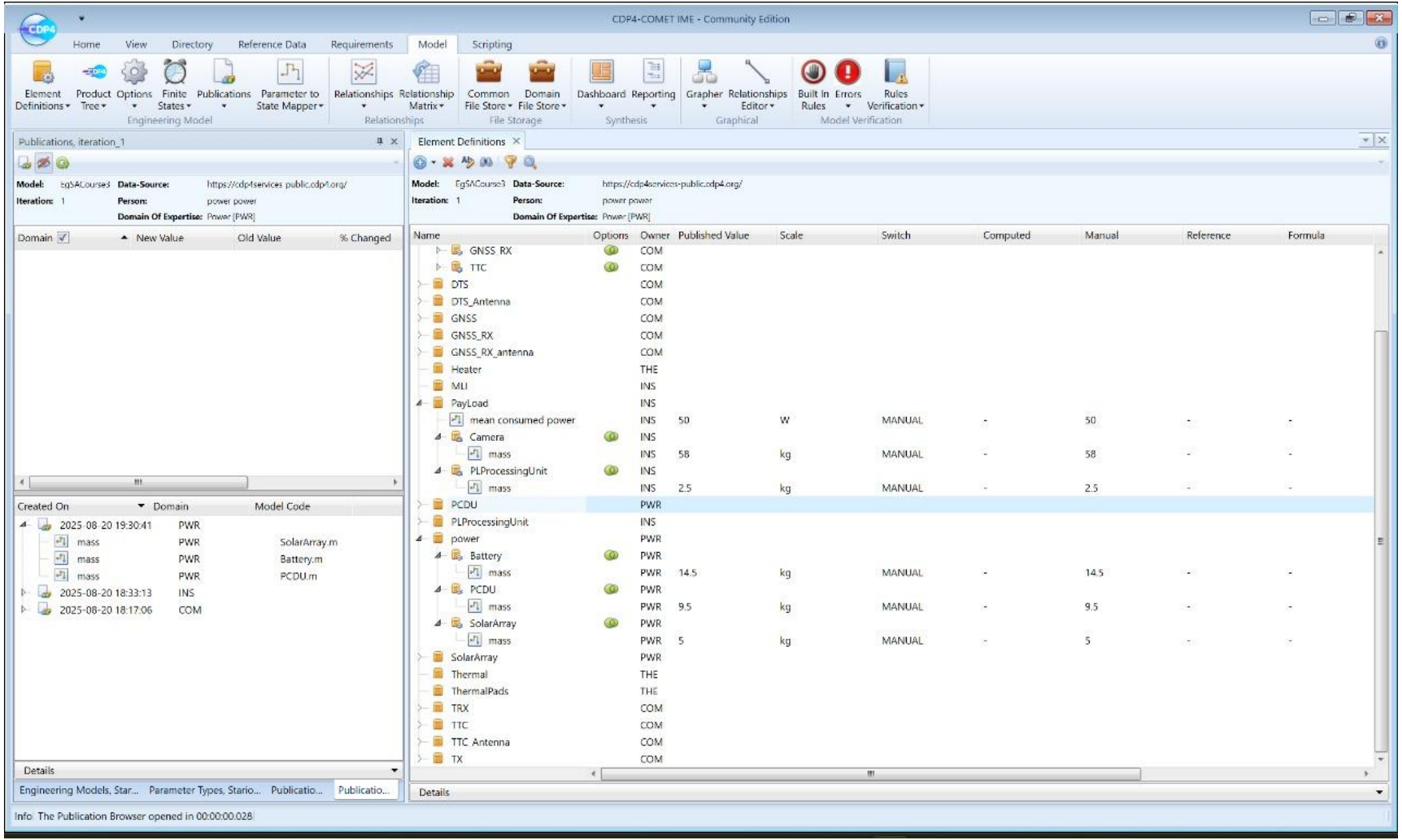
Abdallah W. Mahmoud

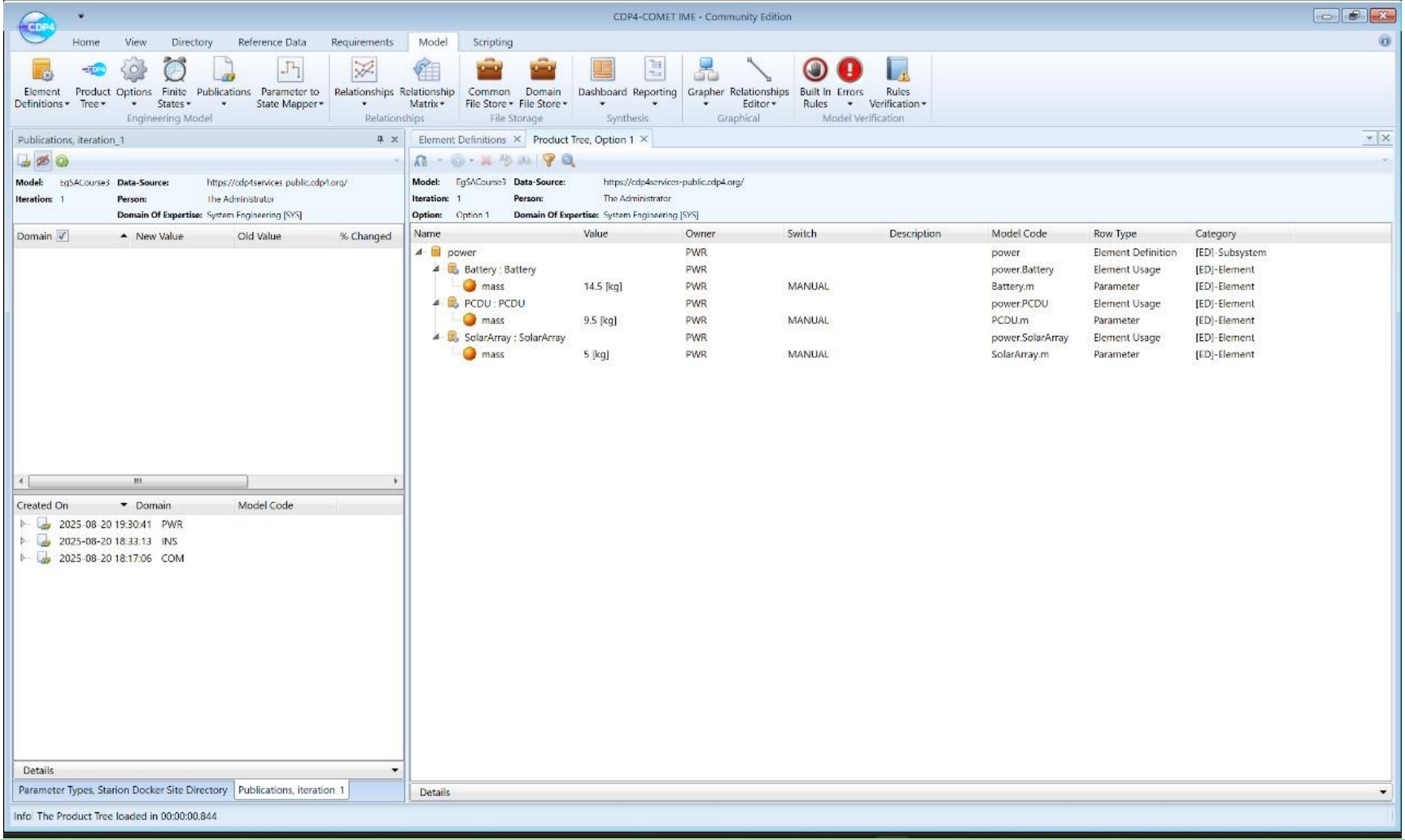


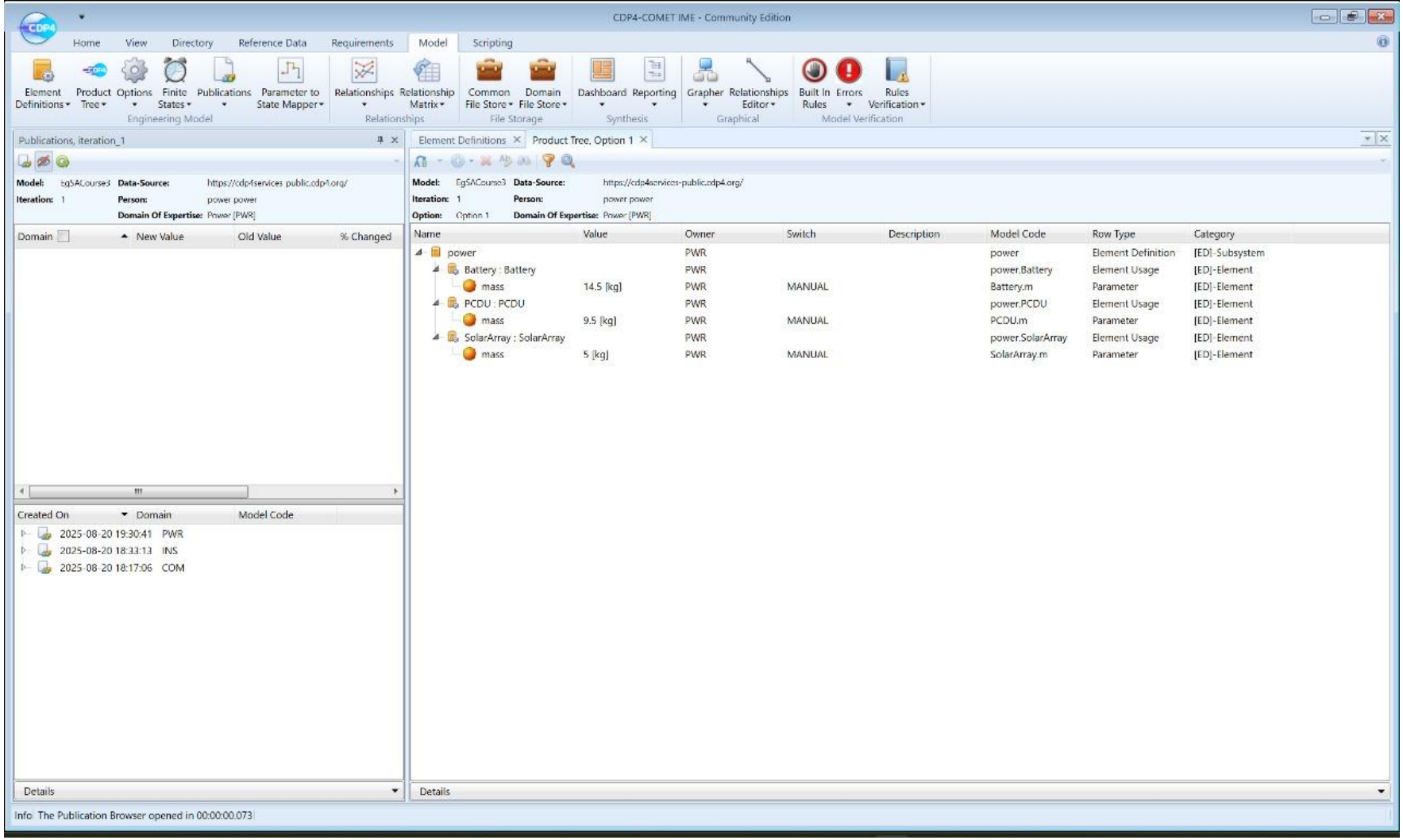
Why I chose Comet

- Very important for organising data into elements and subsystems
- Important for keeping track of your data when working with a complex project
- Engineers can collaborate together without the risk of having their work stolen or corrupted by other engineers


CDP4-COMET IME - Community Edition
Home
View
Directory
Reference Data
Requirements
Model
Scripting
Element Definitions
Product Tree
Options
Finite States
Publications
Parameter to State Mapper
Engineering Model
Relationships
Relationship Matrix
Relationships
Common File Store
Domain File Store
File Storage
Dashboard
Reporting
Synthesis
Grapher
Relationships Editor
Graphical
Built In Rules
Errors
Rules Verification
Model Verification
Engineering Models, Starion Docker Site Directory
Data Source: https://cdp4services-public.cd Person: power power
Name
Description
Role
EgSACourse3
Phase: Preparation...
Participants
system system
Organization: none
Design Authority
DH DH
Organization: none
Domain Expert
payload payload
Organization: none
Domain Expert
power power
Organization: none
Domain Expert
Power
Com com
Organization: none
Domain Expert
The Administrator
Organization: none
Model Administrator
ST ST
Organization: none
Domain Expert
Iterations
Active Domains
Organizations
Details
Element Definitions
Model: EgSACourse3
Iteration: 1
Data-Source: https://cdp4services-public.cdp4.org/
Person: power power
Domain Of Expertise: Power [PWR]
Name
Options
Owner
Published Value
Scale
Switch
Computed
Manual
Reference
Formula
Battery PWR
Camera INS
com COM
DTS COM
DTS_Antenna COM
GNSS COM
GNSS_RX COM
GNSS_RX antenna COM
Heater THE
MLI INS
PayLoad INS
PCDU PWR
PLProcessingUnit INS
power PWR
Battery PWR
PCDU PWR
SolarArray PWR
SolarArray PWR
Thermal THE
ThermalPads THE
TRX COM
TTC COM
TTC_Antenna COM
TX COM
Details
Info: Synchronization of DTOs for Write from/to server 0 done in 1 [ms]


CDP4-COMET IME - Community Edition
Home
View
Directory
Reference Data
Requirements
Model
Scripting
Element Definitions
Product Tree
Options
Finite States
Publications
Parameter to State Mapper
Engineering Model
Relationships
Relationship Matrix
Common File Store
Domain File Store
File Storage
Dashboard
Reporting
Synthesis
Grapher
Relationships Editor
Graphical
Built In Rules
Errors
Rules Verification
Model Verification
Publications, iteration_1
Model: EgSACourse3 Data-Source: https://cdp4services public.cdp4.org/
Iteration: 1 Person: power power
Domain Of Expertise: Power [PWR]
Domain
New Value
Old Value
% Changed
Created On
Domain
Model Code
2025-08-20 19:30:41 PWR
mass PWR SolarArray.m
mass PWR Battery.m
mass PWR PCDU.m
2025-08-20 18:33:13 INS
2025-08-20 18:17:06 COM
Details
Engineering Models, Star...
Parameter Types, Stario...
Publicatio...
Publicatio...
Element Definitions
Model: EgSACourse3 Data-Source: https://cdp4services-public.cdp4.org/
Iteration: 1 Person: power power
Domain Of Expertise: Power [PWR]
Name
Options
Owner
Published Value
Scale
Switch
Computed
Manual
Reference
Formula
GNSS_RX COM
TTC COM
DTS COM
DTS_Antenna COM
GNSS COM
GNSS_RX COM
GNSS_RX_antenna COM
Heater THE
MLI INS
PayLoad INS
mean consumed power INS 50 W MANUAL - 50 - -
Camera INS
mass INS 58 kg MANUAL - 58 - -
PLProcessingUnit INS
mass INS 2.5 kg MANUAL - 2.5 - -
PCDU PWR
PLProcessingUnit INS
power PWR
Battery PWR
mass PWR 14.5 kg MANUAL - 14.5 - -
PCDU PWR
mass PWR 9.5 kg MANUAL - 9.5 - -
SolarArray PWR
mass PWR 5 kg MANUAL - 5 - -
SolarArray PWR
Thermal THE
ThermalPads THE
TRX COM
TTC COM
TTC Antenna COM
TX COM
Details
Info The Publication Browser opened in 00:00:00.028


CDP4-COMET IME - Community Edition
Home
View
Directory
Reference Data
Requirements
Model
Scripting
Element Definitions
Product Tree
Options
Finite States
Publications
Parameter to State Mapper
Engineering Model
Relationships
Relationship Matrix
Relationships
Common File Store
Domain File Store
File Storage
Dashboard
Reporting
Synthesis
Grapher
Relationships Editor
Graphical
Built In Rules
Errors
Rules Verification
Model Verification
Publications, iteration_1
Model: EgSACourse3 Data-Source: https://cdp4services public.cdp4.org/
Iteration: 1 Person: The Administrator
Domain Of Expertise: System Engineering [SYS]
Domain
New Value
Old Value
% Changed
Created On
Domain
Model Code
2025-08-20 19:30:41 PWR
2025-08-20 18:33:13 INS
2025-08-20 18:17:06 COM
Details
Parameter Types, Starion Docker Site Directory
Publications, iteration_1
Element Definitions
Product Tree, Option 1
Model: EgSACourse3 Data-Source: https://cdp4services-public.cdp4.org/
Iteration: 1 Person: The Administrator
Option: Option 1 Domain Of Expertise: System Engineering [SYS]
Name
Value
Owner
Switch
Description
Model Code
Row Type
Category
power PWR power Element Definition [ED]-Subsystem
Battery : Battery PWR power.Battery Element Usage [ED]-Element
mass 14.5 [kg] PWR MANUAL Battery.m Parameter [ED]-Element
PCDU : PCDU PWR power.PCDU Element Usage [ED]-Element
mass 9.5 [kg] PWR MANUAL PCDU.m Parameter [ED]-Element
SolarArray : SolarArray PWR power.SolarArray Element Usage [ED]-Element
mass 5 [kg] PWR MANUAL SolarArray.m Parameter [ED]-Element
Details
Info: The Product Tree loaded in 00:00:00.844


CDP4-COMET IME - Community Edition
Home
View
Directory
Reference Data
Requirements
Model
Scripting
Element Definitions
Product Tree
Options
Finite States
Publications
Parameter to State Mapper
Engineering Model
Relationships
Relationship Matrix
Relationships
Common File Store
Domain File Store
File Storage
Dashboard
Reporting
Synthesis
Grapher
Relationships Editor
Graphical
Built In Rules
Errors
Rules Verification
Model Verification
Publications, iteration_1
Model: EgSACourse3 Data-Source: https://cdp4services public.cdp4.org/
Iteration: 1 Person: power power
Domain Of Expertise: Power [PWR]
Domain
New Value
Old Value
% Changed
Created On
Domain
Model Code
2025-08-20 19:30:41 PWR
2025-08-20 18:33:13 INS
2025-08-20 18:17:06 COM
Details
Element Definitions
Product Tree, Option 1
Model: EgSACourse3 Data-Source: https://cdp4services-public.cdp4.org/
Iteration: 1 Person: power power
Option: Option 1 Domain Of Expertise: Power [PWR]
Name
Value
Owner
Switch
Description
Model Code
Row Type
Category
power PWR power Element Definition [ED]-Subsystem
Battery : Battery PWR power.Battery Element Usage [ED]-Element
mass 14.5 [kg] PWR MANUAL Battery.m Parameter [ED]-Element
PCDU : PCDU PWR power.PCDU Element Usage [ED]-Element
mass 9.5 [kg] PWR MANUAL PCDU.m Parameter [ED]-Element
SolarArray : SolarArray PWR power.SolarArray Element Usage [ED]-Element
mass 5 [kg] PWR MANUAL SolarArray.m Parameter [ED]-Element
Details
Info: The Publication Browser opened in 00:00:00.073

The problem or challenge

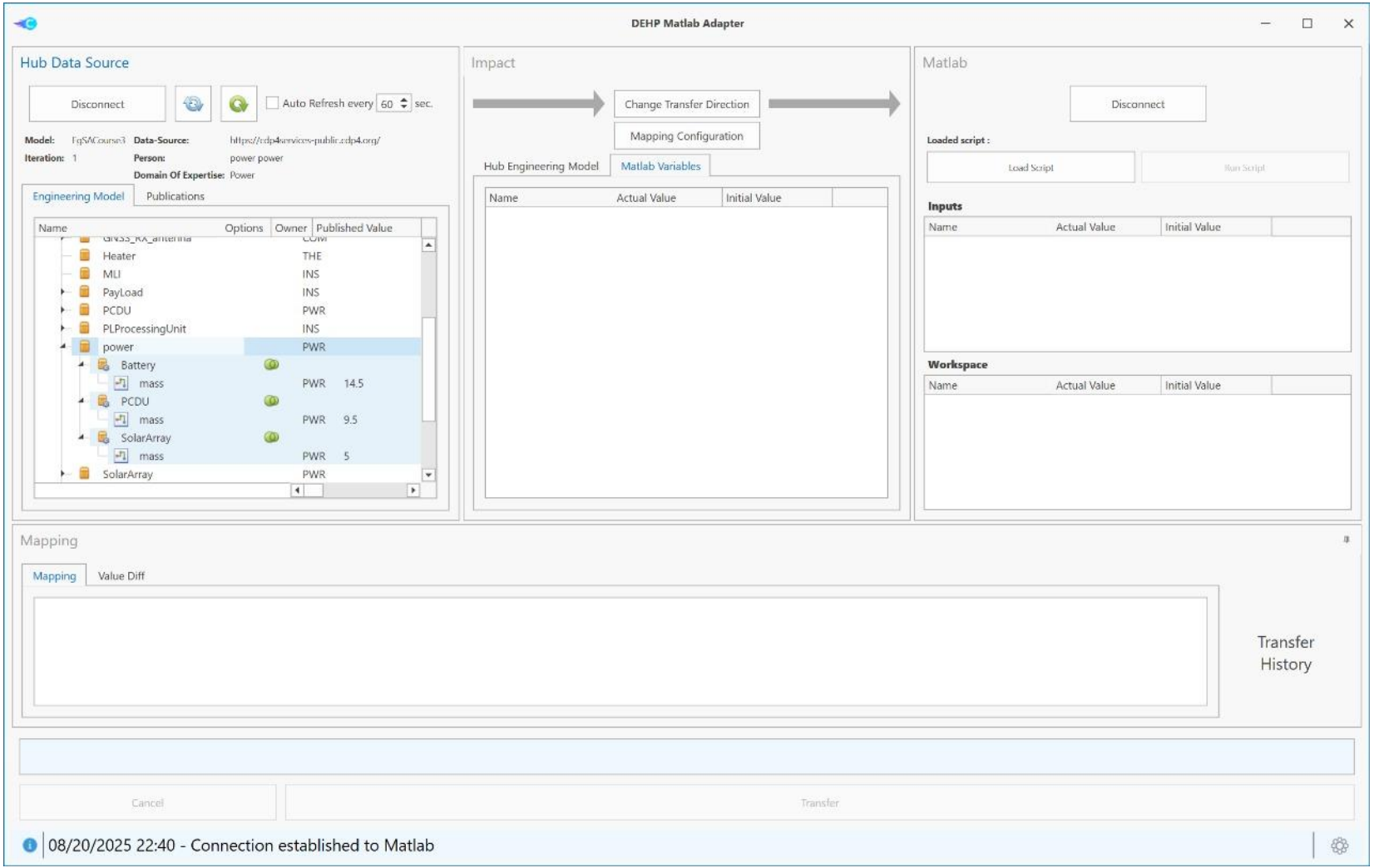
Transferring the data from elements and parameters in COMET to variables and matrices in the MATLAB workspace

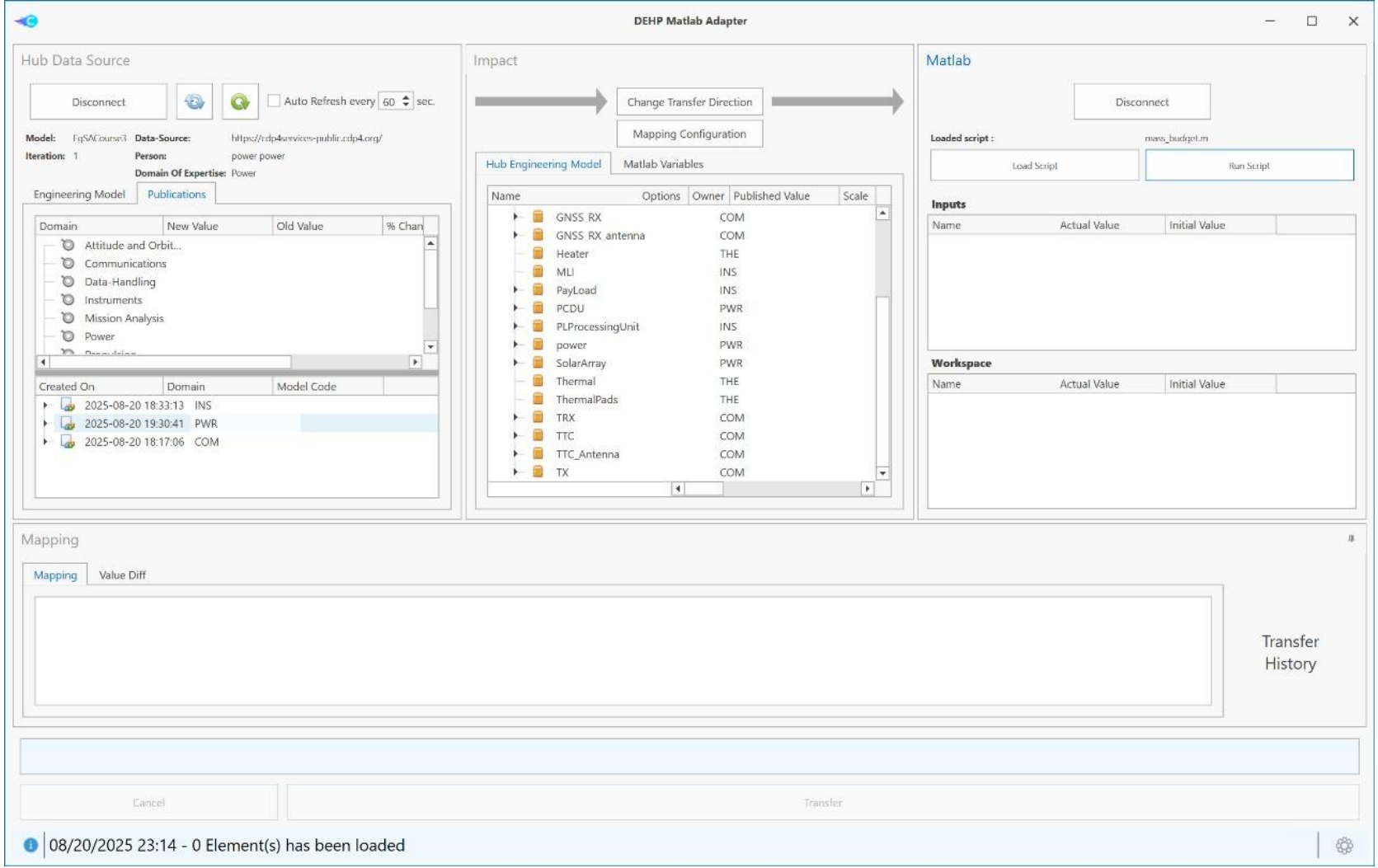
The solution

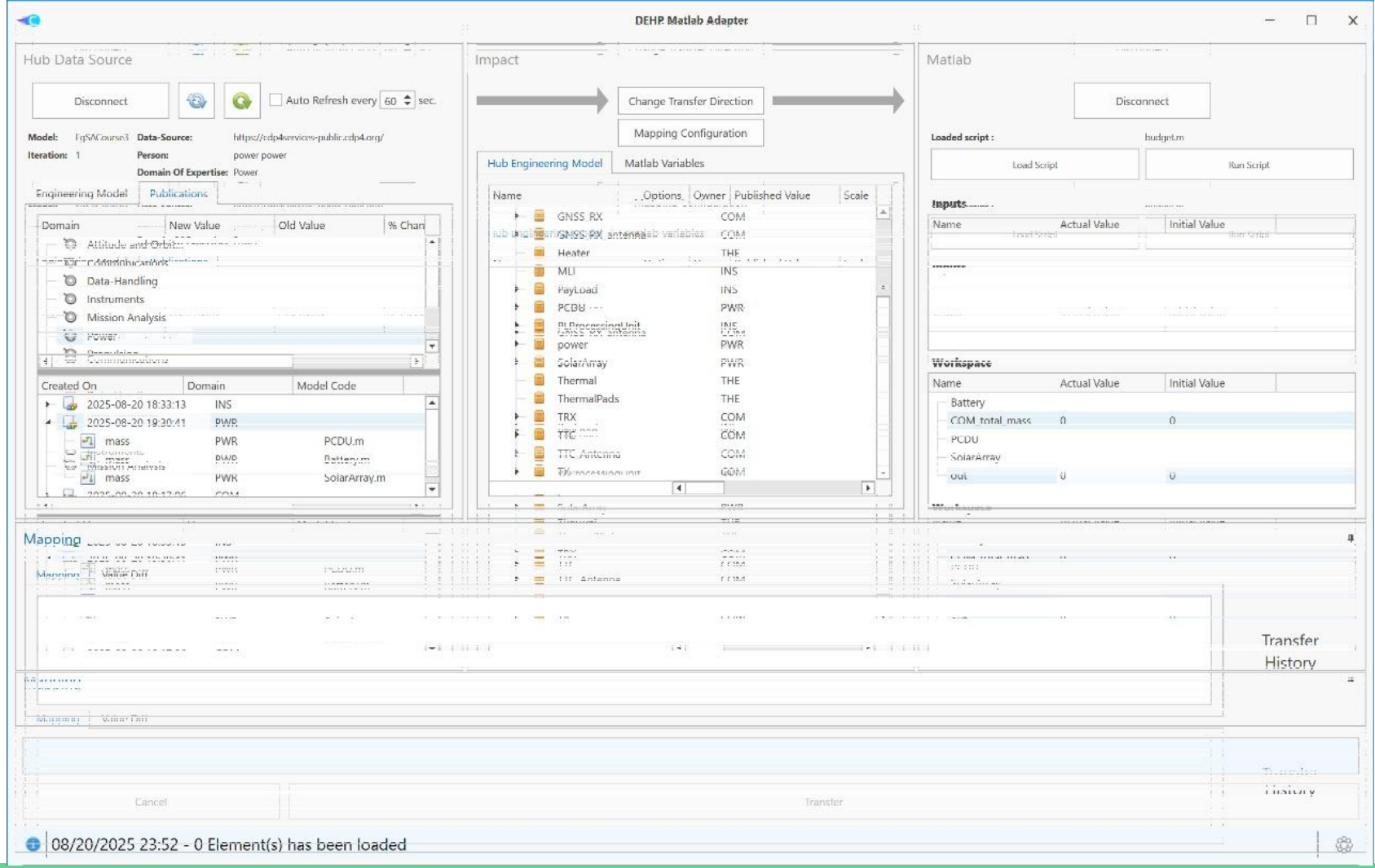
Installing a MATLAB DEHP Adapter

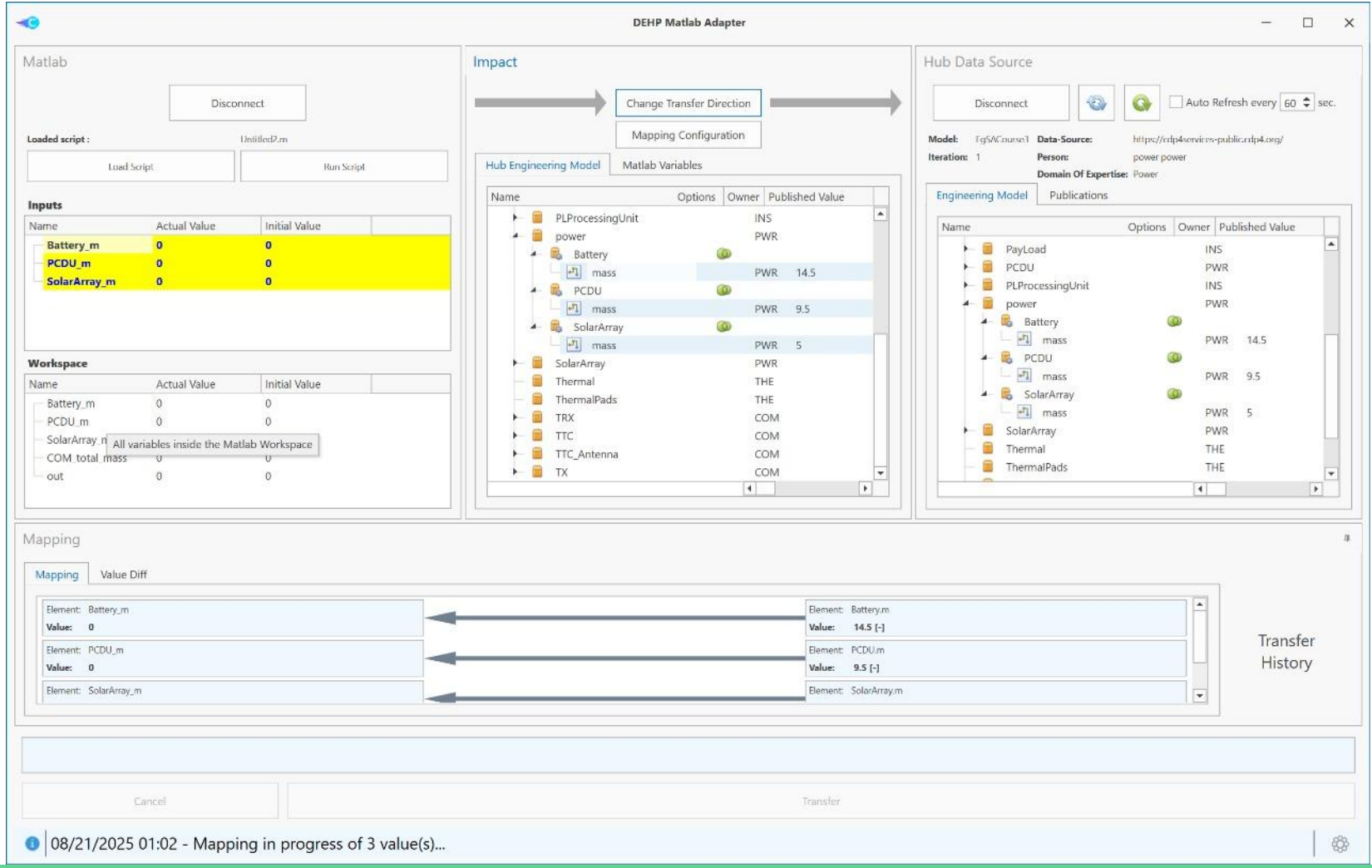
What is a MATLAB DEHP Adapter?

It is a platform which acts like a two-sided port. From one side, you connect it to the MATLAB version installed. From the other side, you connect it to COMET.


DEHP Matlab Adapter
Hub Data Source
Disconnect
Auto Refresh every 60 sec.
Model: FqSACourse3
Iteration: 1
Data-Source: https://edp4services-public.edp4.org/
Person: power power
Domain Of Expertise: Power
Engineering Model
Publications
Name
Options
Owner
Published Value
Heater THE
MLI INS
PayLoad INS
PCDU PWR
PLProcessingUnit INS
power PWR
Battery
mass PWR 14.5
PCDU
mass PWR 9.5
SolarArray
mass PWR 5
SolarArray PWR
Impact
Change Transfer Direction
Mapping Configuration
Hub Engineering Model
Matlab Variables
Name
Actual Value
Initial Value
Matlab
Disconnect
Loaded script :
Load Script
Run Script
Inputs
Name
Actual Value
Initial Value
Workspace
Name
Actual Value
Initial Value
Mapping
Mapping
Value Diff
Transfer History
Cancel
Transfer
08/20/2025 22:40 - Connection established to Matlab


DEHP Matlab Adapter
Hub Data Source
Disconnect
Auto Refresh every 60 sec.
Model: FqSACourse3
Iteration: 1
Data-Source: https://cdp4services-public.cdp4.org/
Person: power power
Domain Of Expertise: Power
Engineering Model
Publications
Domain
New Value
Old Value
% Chan
Attitude and Orbit...
Communications
Data-Handling
Instruments
Mission Analysis
Power
Created On
Domain
Model Code
2025-08-20 18:33:13 INS
2025-08-20 19:30:41 PWR
2025-08-20 18:17:06 COM
Impact
Change Transfer Direction
Mapping Configuration
Hub Engineering Model
Matlab Variables
Name
Options
Owner
Published Value
Scale
GNSS_RX COM
GNSS_RX_antenna COM
Heater THE
MLI INS
PayLoad INS
PCDU PWR
PLProcessingUnit INS
power PWR
SolarArray PWR
Thermal THE
ThermalPads THE
TRX COM
TTC COM
TTC_Antenna COM
TX COM
Matlab
Disconnect
Loaded script :
mass_budget.m
Load Script
Run Script
Inputs
Name
Actual Value
Initial Value
Workspace
Name
Actual Value
Initial Value
Mapping
Mapping
Value Diff
Transfer History
Cancel
Transfer
08/20/2025 23:14 - 0 Element(s) has been loaded


DEHP Matlab Adapter
Hub Data Source
Disconnect
Auto Refresh every 60 sec.
Model: FqSACourse3
Data-Source: https://cdp4services-public.cdp4.org/
Iteration: 1
Person: power power
Domain Of Expertise: Power
Engineering Model
Publications
Domain
New Value
Old Value
% Chan
Attitude and Orbit
Data-Handling
Instruments
Mission Analysis
Power
Created On
Domain
Model Code
2025-08-20 18:33:13 INS
2025-08-20 19:30:41 PWR
mass PWR PCDU.m
mass PWR SolarArray.m
Impact
Change Transfer Direction
Mapping Configuration
Hub Engineering Model
Matlab Variables
Name
Options
Owner
Published Value
Scale
GNSS RX COM
GNSS RX antenna COM
Heater THE
MLI INS
PayLoad INS
PCDU PWR
power PWR
SolarArray PWR
Thermal THE
ThermalPads THE
TRX COM
TTC COM
TTC_Antenna COM
Matlab
Disconnect
Loaded script :
budget.m
Load Script
Run Script
Inputs
Name
Actual Value
Initial Value
Workspace
Name
Actual Value
Initial Value
Battery
COM_total_mass 0 0
PCDU
SolarArray
out 0 0
Mapping
Value Diff
Transfer History
Cancel
Transfer
08/20/2025 23:52 - 0 Element(s) has been loaded


DEHP Matlab Adapter
Matlab
Disconnect
Loaded script :
Untitled2.m
Load Script
Run Script
Inputs
Name
Actual Value
Initial Value
Battery_m 0 0
PCDU_m 0 0
SolarArray_m 0 0
Workspace
Name
Actual Value
Initial Value
Battery_m 0 0
PCDU_m 0 0
SolarArray_m
COM_total_mass 0 0
out 0 0
All variables inside the Matlab Workspace
Impact
Change Transfer Direction
Mapping Configuration
Hub Engineering Model
Matlab Variables
Name
Options
Owner
Published Value
PLProcessingUnit INS
power PWR
Battery
mass PWR 14.5
PCDU
mass PWR 9.5
SolarArray
mass PWR 5
SolarArray PWR
Thermal THE
ThermalPads THE
TRX COM
TTC COM
TTC_Antenna COM
TX COM
Hub Data Source
Disconnect
Auto Refresh every 60 sec.
Model: EgSACourse3
Data-Source: https://cdp4services-public.cdp4.org/
Iteration: 1
Person: power power
Domain Of Expertise: Power
Engineering Model
Publications
Name
Options
Owner
Published Value
PayLoad INS
PCDU PWR
PLProcessingUnit INS
power PWR
Battery
mass PWR 14.5
PCDU
mass PWR 9.5
SolarArray
mass PWR 5
SolarArray PWR
Thermal THE
ThermalPads THE
Mapping
Mapping
Value Diff
Element: Battery_m
Value: 0
Element: Battery.m
Value: 14.5 [-]
Element: PCDU_m
Value: 0
Element: PCDU.m
Value: 9.5 [-]
Element: SolarArray_m
Element: SolarArray.m
Transfer History
Cancel
Transfer
08/21/2025 01:02 - Mapping in progress of 3 value(s)...

Editor - C:\Users\abdal\OneDrive\Desktop\Untitled2.m

mass_budget.m | budget.m | Untitled2.m

```
% compute_total_mass.m
% ------------------------------------------------------
% This script calculates the total power subsystem mass.
% Input variables come from COMET through the DEHP Adapter:
%   Battery_m, PCDU_m, SolarArray_m
%
% The result is written to 'out' so DEHP can transfer it back.

% ------------------------------------------------------
% Safety: initialize to 0 if any variable is missing
if ~exist('Battery_m','var'), Battery_m = 0; end
if ~exist('PCDU_m','var'), PCDU_m = 0; end
if ~exist('SolarArray_m','var'), SolarArray_m = 0; end

% ------------------------------------------------------
% Compute total mass
COM_total_mass = Battery_m + PCDU_m + SolarArray_m;

% ------------------------------------------------------
% Display for debugging
fprintf('\n--- Subsystem Masses (kg) ---\n');
fprintf('Battery:     %.2f\n', Battery_m);
fprintf('PCDU:            %.2f\n', PCDU_m);
fprintf('SolarArray: %.2f\n', SolarArray_m);

% ------------------------------------------------------
% IMPORTANT: publish result to a variable called "out"
% DEHP will only allow you to map it back to COMET if "out" exists.
out = COM_total_mass;

```

Thank You