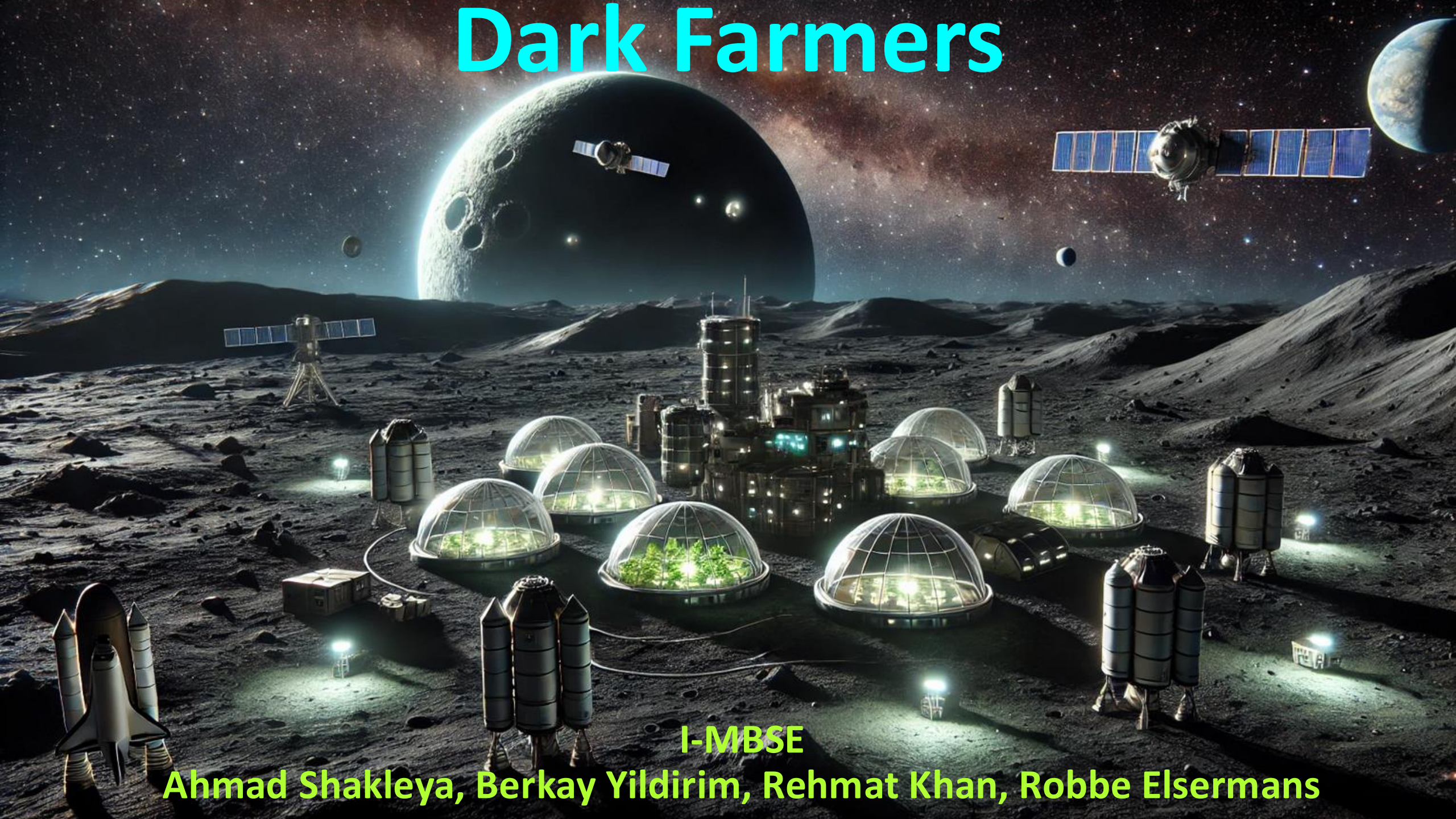
Dark Farmers



I-MBSE

Ahmad Shakleya, Berkay Yildirim, Rehmat Khan, Robbe Elsermans

Mission

- **Experimental farm module on the dark side of Mun**

System requirements and constrains

- **Bring experimental farm module to Mun**
  - Weight: 4000 Kilograms
  - Energy: 0.29 EC/s
- **Provide constant communication between Kerbin and Mun**
  - An emergency communication interval of 10 minutes
  - A normal communication interval of 30 minutes
  - 3 Mit/s
- **No return vessel nor reusability of used components**
- **No kerbin onboard**
- **Delta-V of 5150 m/s -> 5922 m/s (+15%)**
- **Budget -> It is in the name of science!** **(we want to be faster than the Russians)**

System requirements and constrains

Budget

ChatGPT-chat

Given budget by: Chief Financial Officer: Lye G. Batenkaitos

Estimation costs	
Category	**Funds (F)**
Farm Module	45 000
Satellite Network	12 000
Launch Vehicle	60 000
Transfer Stage	25 000
Contingency (10%)	15 000
Estimation costs	148 000

System requirements and constrains

ChatGPT-chat antenna

ChatGPT-chat EC

Farm Power - Decisions

Given energy consumption by: Chief Agricultural Scientist: Regulus G. Corneas

Farm module energy EC/day 39 765

Module Energy Consumption				
Item	**EC/Sec**	**Number**	**duration/s**	**Total (Energy) / day**
Communotron 16	18	1	231,64	4 169.52
Farm Module	0,28611207	1	138 984,00	39 765

Total EC Consumption **43 934.52 EC/day**

Total EC Consumption **0.31611207 EC/day**

System requirements and constrains

Farm Power - Decisions

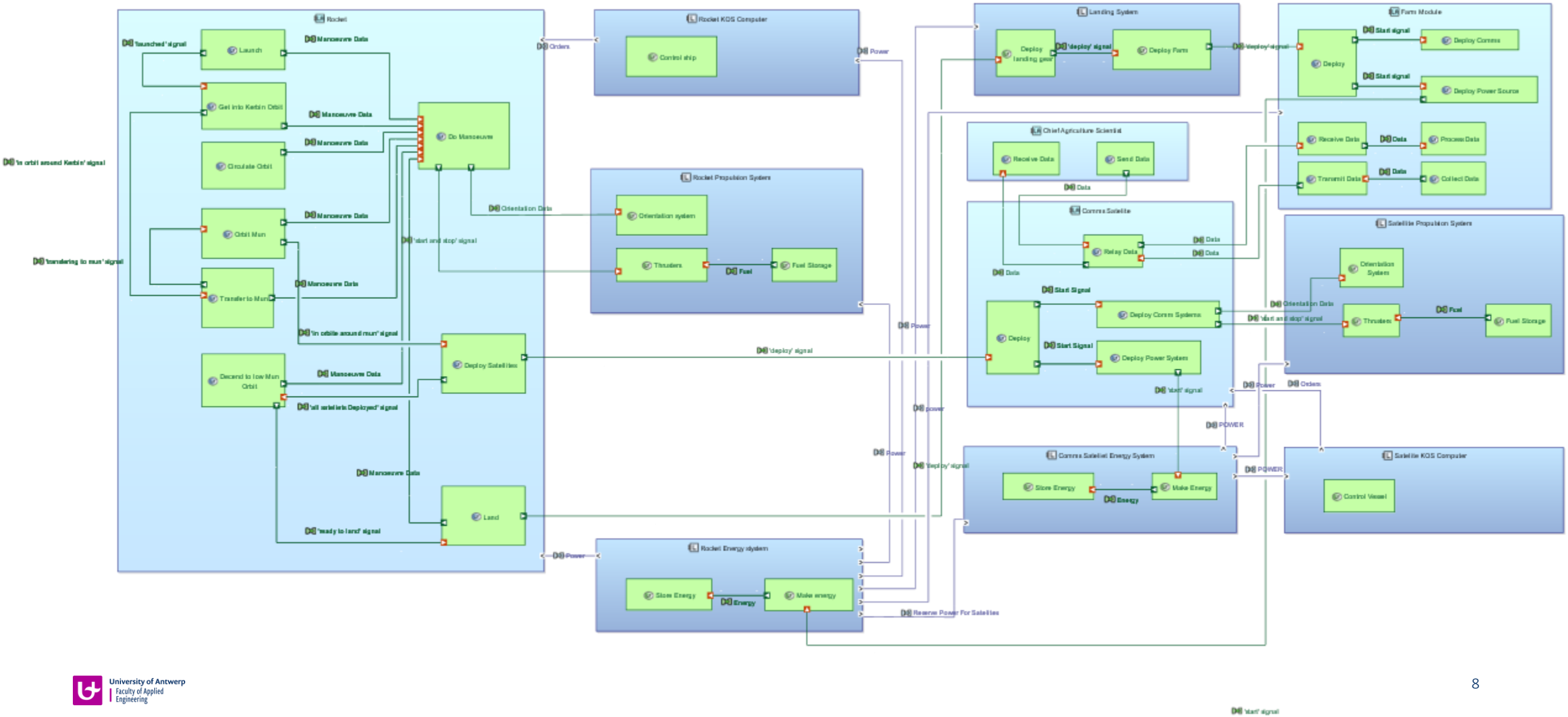
Module Energy Storage			
Item	**Energy storage (EC)**	**Number**	**Total capacity (EC)**
Big round battery	4 000	6	24 000

Battery Load (%) 91.53025

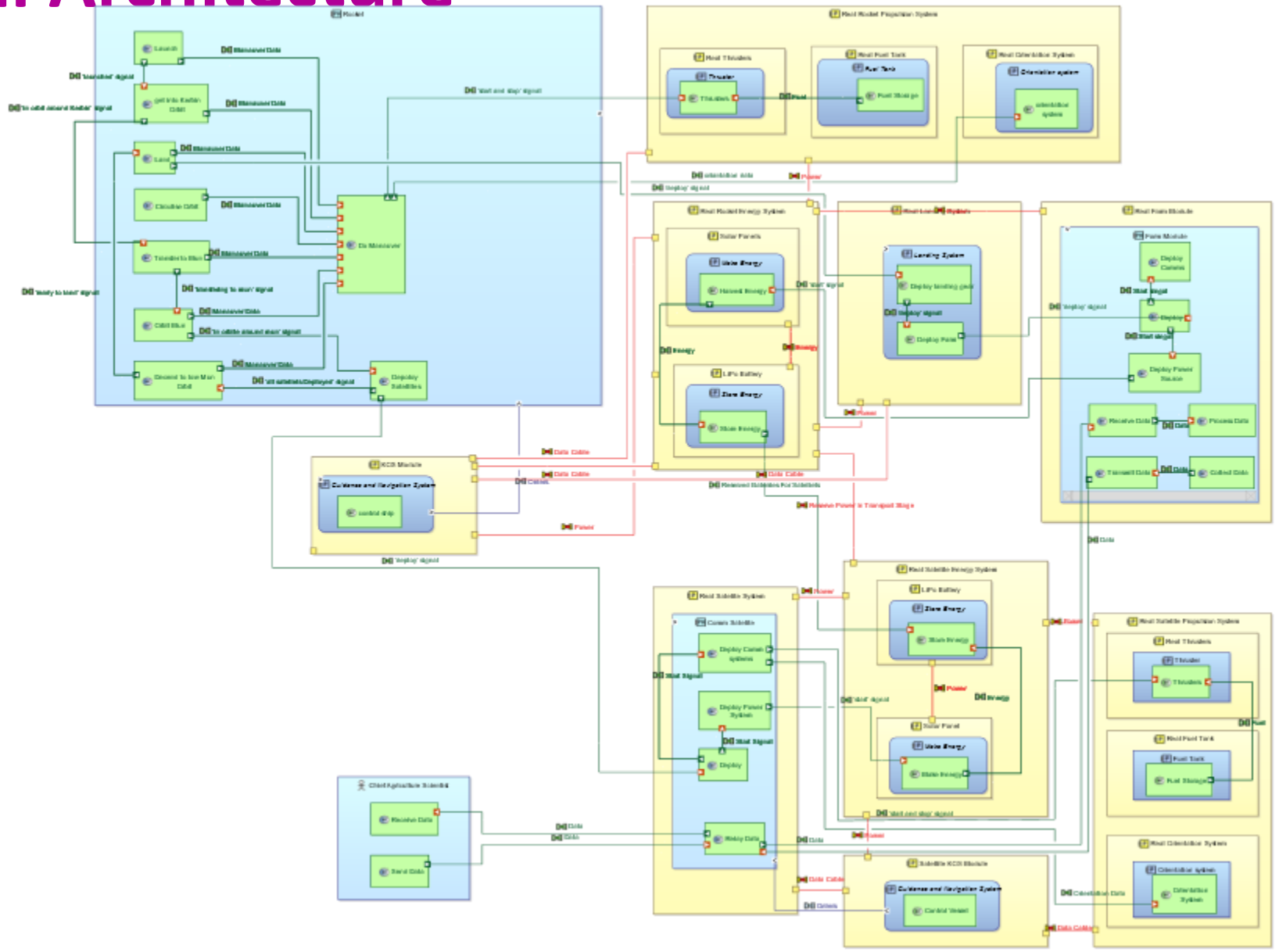
Total charge needed in daytime: 43 934.52

Module Energy Harvesting					
Item	**EC/sec**	**Number**	**Duration/day (s)**	**Total harvested energy (EC)**	**Charge of battery (%)**
Gigantor XL Solar Array	24,4	1	69 492	1 695 604,8	3 819,118965
OX-STAT-XL Photovoltaic Panels	2,8	1	69 492	194 577,6	438,2595534
OX-STAT Photovoltaic Panels	0,35	3	69 492	729 66,6	166,0803396
SP-L 1x6 Photovoltaic Panels	1,64	1	69 492	113 966,88	256,6948813

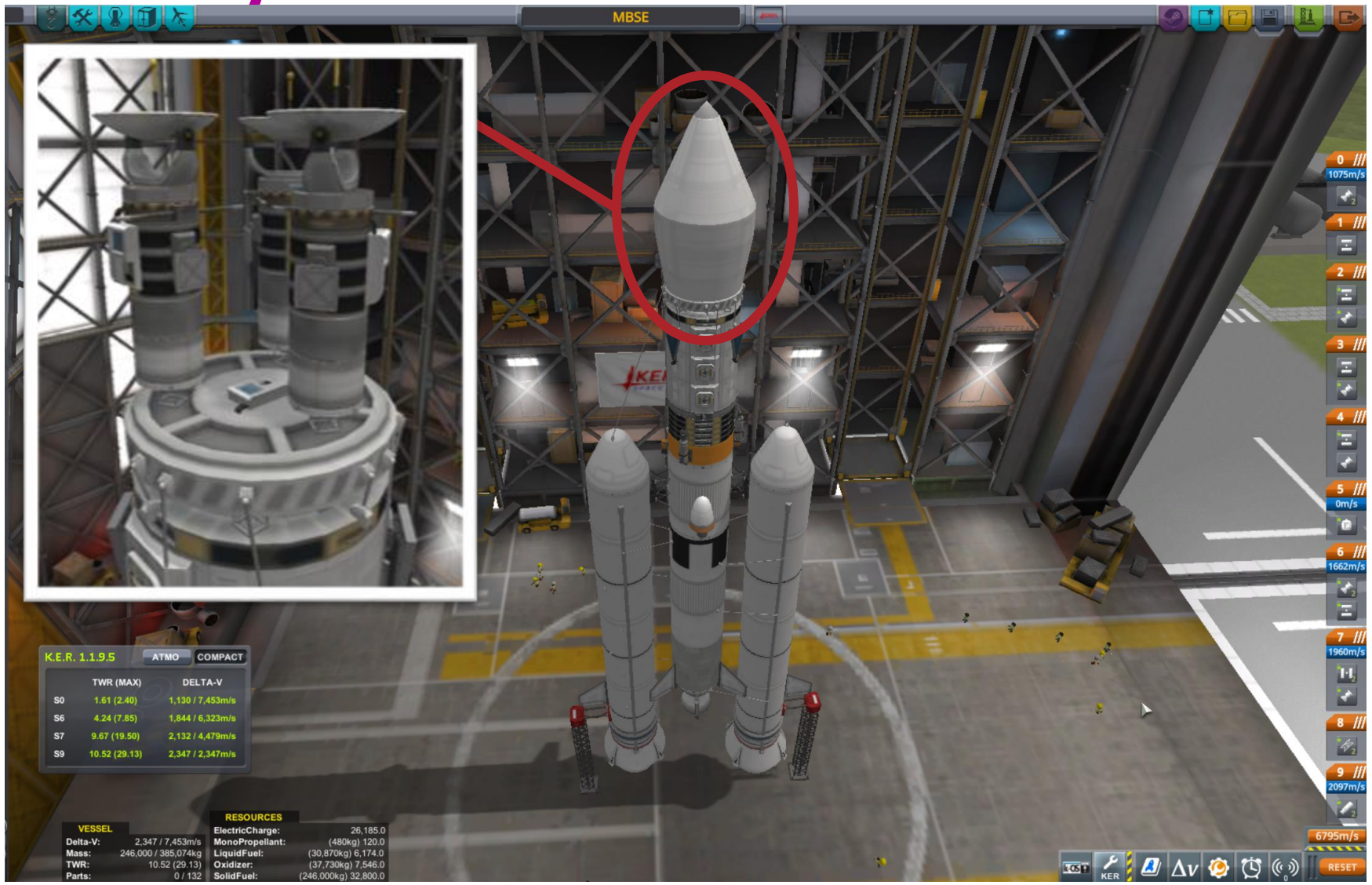
Logical Architecture



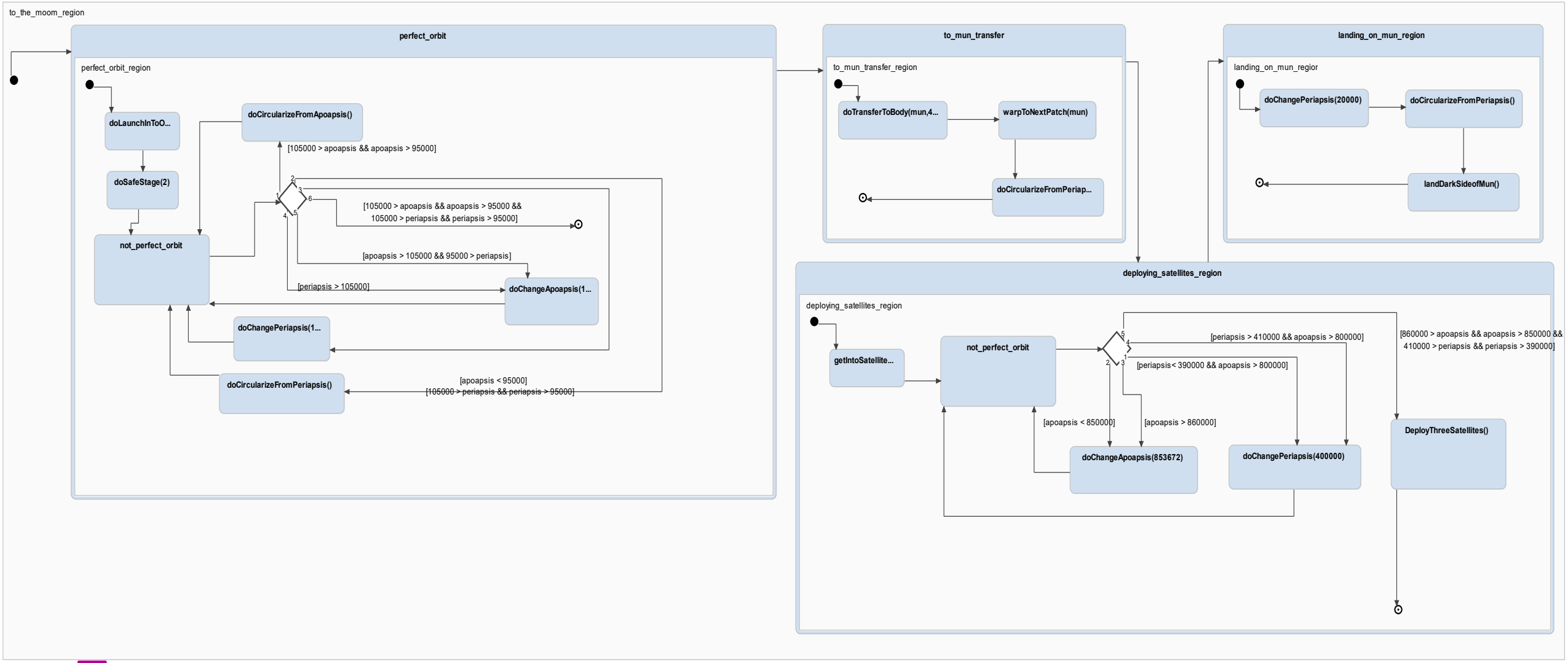
Physical Architecture



Physical Assembly



Controller Architecture



Demo

System requirements and constrains

Budget - Outcome

actual costs		
Category	**Funds (F)**	**difference with estimation**
Farm Module	37 046	7 954
Satellite Network	18 270	-6 270
Launch Vehicle	63 090	-3 090
Transfer Stage	12 300	2 700
Contingency (15%)	4 050	11 950

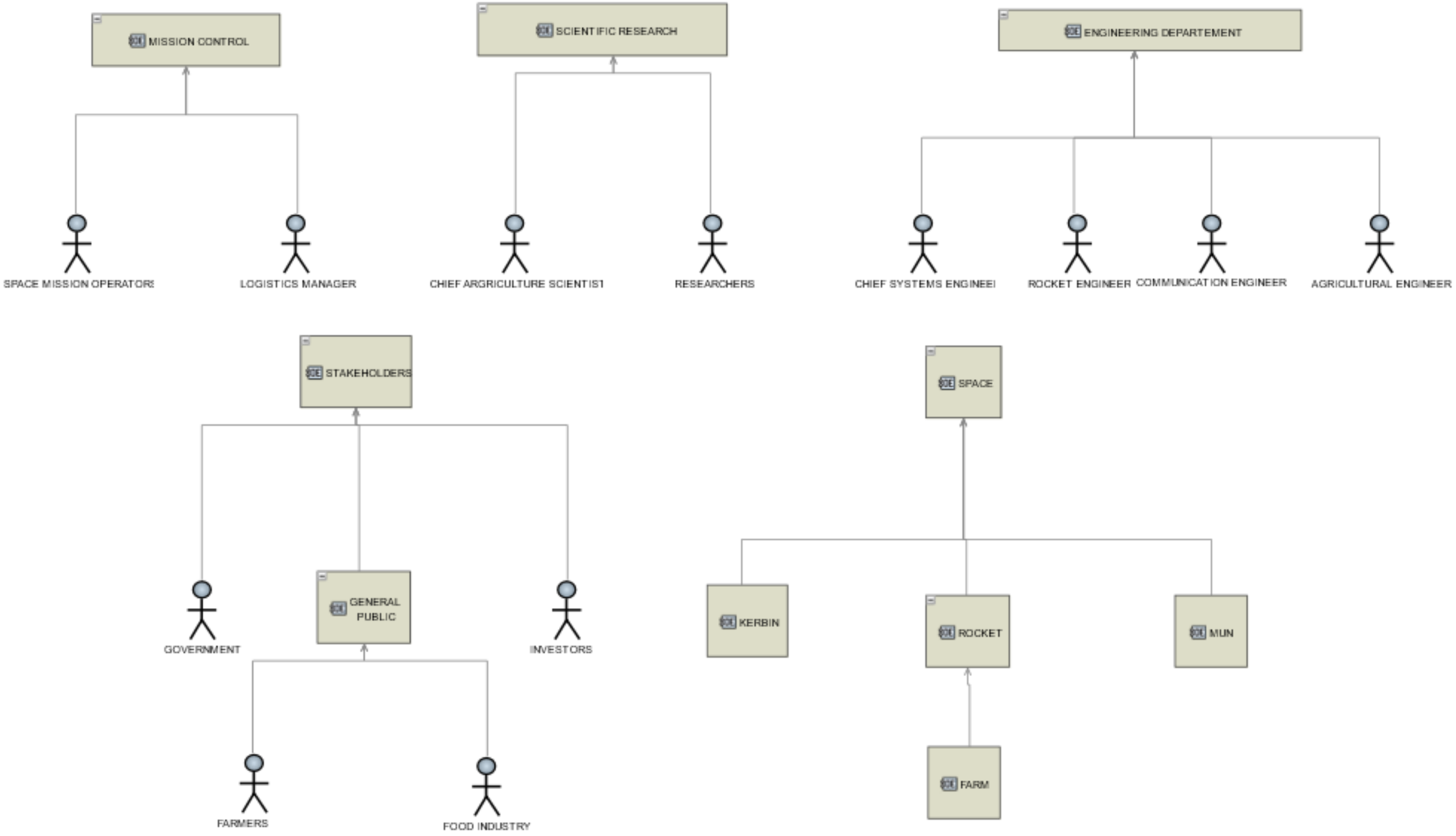
Total: 134 756 F

budget leftover 25 244 F

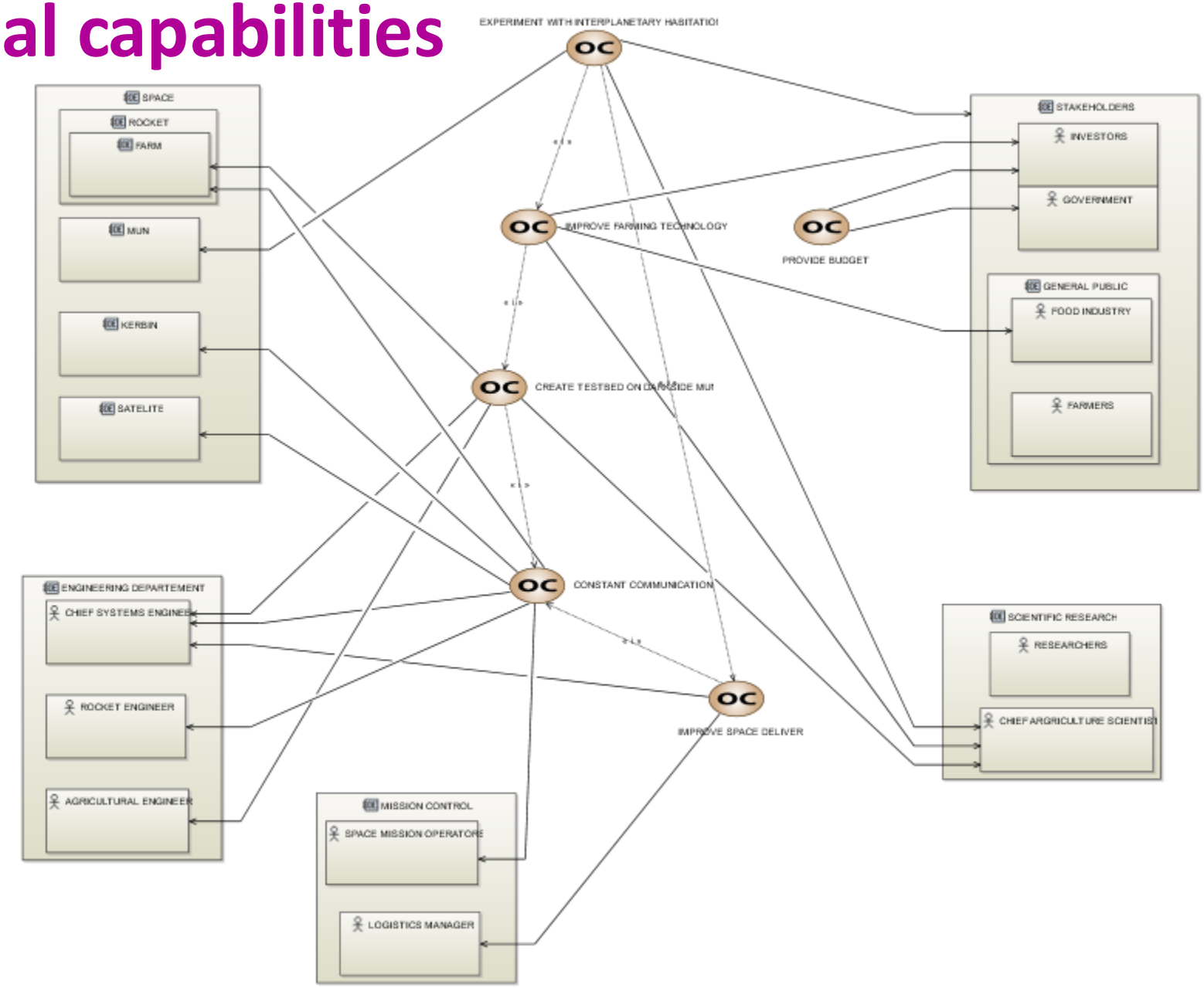
Excel workdocument

Cost per used part				
Part	**Amount**	**Cost**	**Category**	**Sub-total**
Mk2 Lander Can	3	3202	Farm Module	9606
Communotron 16	1	300	Farm Module	300
Z-4K Rechargeable Battery Bank	6	4500	Farm Module	27000
OX-STAT Photovoltaic Panels	2	70	Farm Module	140
Cubic Octagonal Strut	7	16	Contingency (15%)	112
Octagonal Strut	1	20	Contingency (15%)	20
AE-FF2 Airstream Protective Shell	2,5	12	Contingency (15%)	630
CompoMax Radial Tubeless	4	300	Contingency (15%)	1200
TD-06 Decoupler	3	150	Contingency (15%)	450
48-7S "Spark" Liquid Fuel Engine	3	240	Transfer Stage	720
Oscar-B Fuel Tank	3	70	Satellite Network	210
Z-200 Rechargeable Battery Bank	9	360	Satellite Network	3240
OX-4W 3x2 Photovoltaic Panels	6	380	Satellite Network	2280
Small Inline Reaction Wheel	3	600	Satellite Network	1800
Communotron 16-S	3	300	Satellite Network	900
Probodobodyne OKTO2	3	1480	Satellite Network	4440
RA-2 Relay Antenna	3	1800	Satellite Network	5400
24-77 "Twitch" Liquid Fuel Engine	2	230	Transfer Stage	460
TD-25 Decoupler	1	300	Transfer Stage	300
Rockomax X200-32 Fuel Tank	2	3000	Transfer Stage	6000
TS-25 Stack Separator	1	400	Transfer Stage	400
Rockomax Jumbo-64 Fuel Tank	1	5750	Launch Vehicle	5750
Mk-55 "Thud" Liquid Fuel Engine	2	820	Launch Vehicle	1640
RC-L01 Remote Guidance Unit	1	3400	Transfer Stage	3400
RE-M3 "Mainsail" Liquid Fuel Engine	1	13000	Launch Vehicle	13000
Delta-Deluxe Winglet	5	600	Launch Vehicle	3000
TT-70 Radial Decoupler	2	700	Launch Vehicle	1400
S2-33 "Clydesdale" Solid Fuel Booster	2	18500	Launch Vehicle	37000
Protective Rocket Nose Cone Mk7	2	450	Launch Vehicle	900
EAS-4 Strut Connector	39	42	Contingency (15%)	1638
TT18-A Launch Stability Enhancer	2	200	Launch Vehicle	400
LT-2 Landing Strut	3	340	Transfer Stage	1020

Operational entities



Operational capabilities



Operational architecture