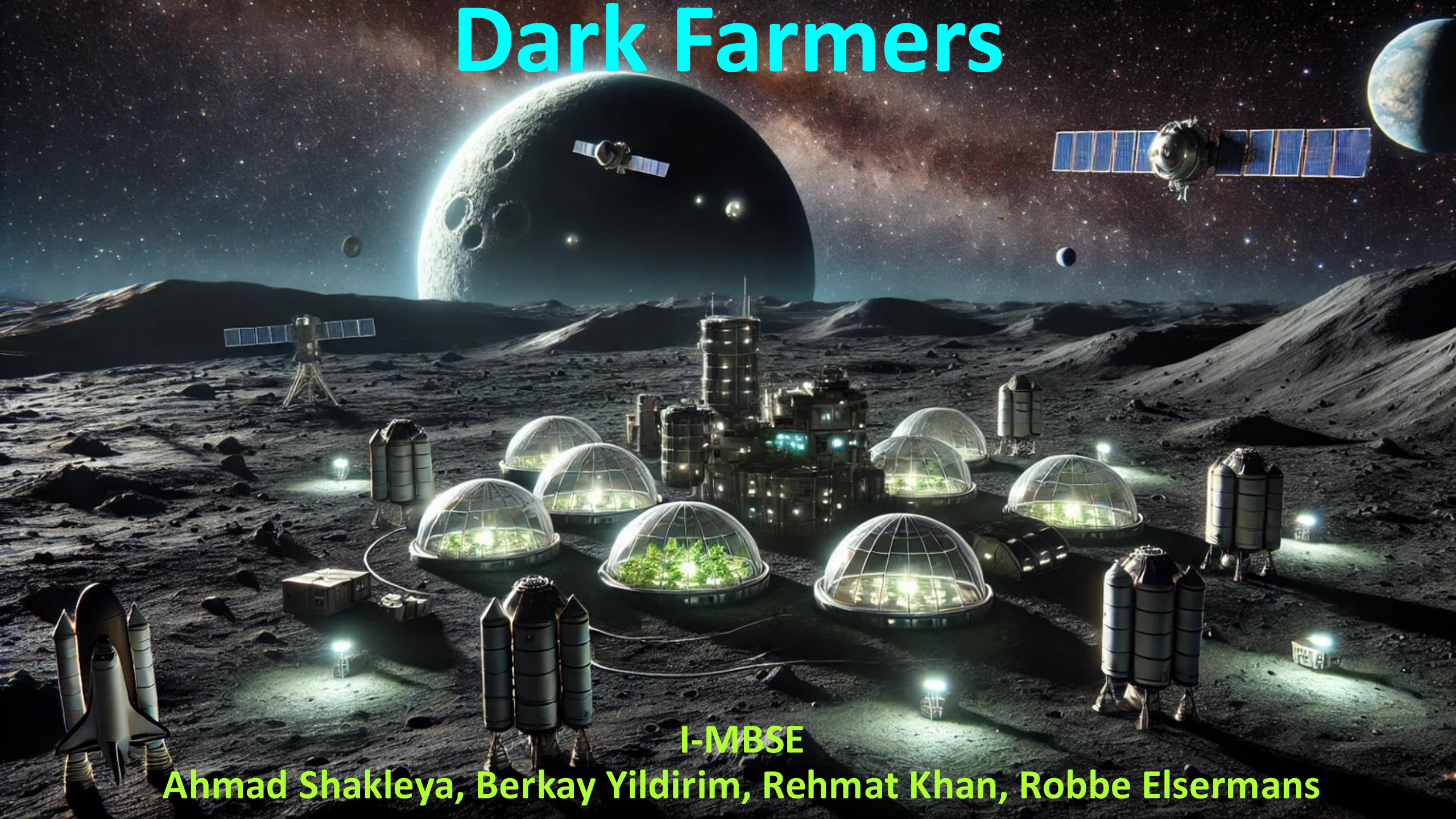
Dark Farmers



I-MBSE

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The presentation itself introduces the mission and the system requirements and constraints, the logical architecture, the physical architecture, and the controller. Finally, a small (recorded) demo of the mission is required. Please highlight the different choices you have made during the design and why you made them. Do think about the link with the theory. You will get extra questions that link the presentation and the work with the theory. Your presentation should be around 20 minutes without questions.

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

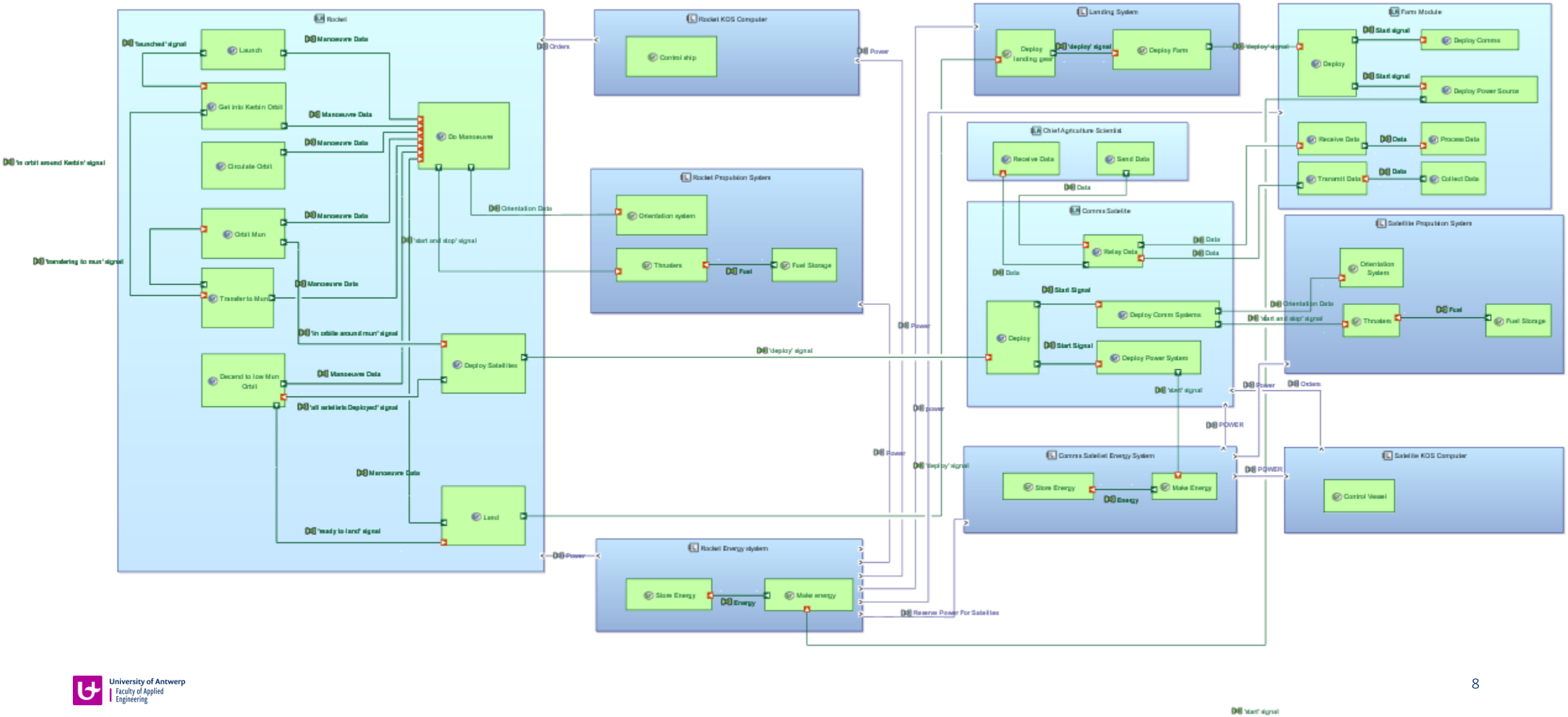
Module Energy Storage			
Item	**Energy storage (EC)**	**Number**	**Total capacity (EC)**
Big round battery	4 000	6	24 000

Battery Load (%) 91.53025

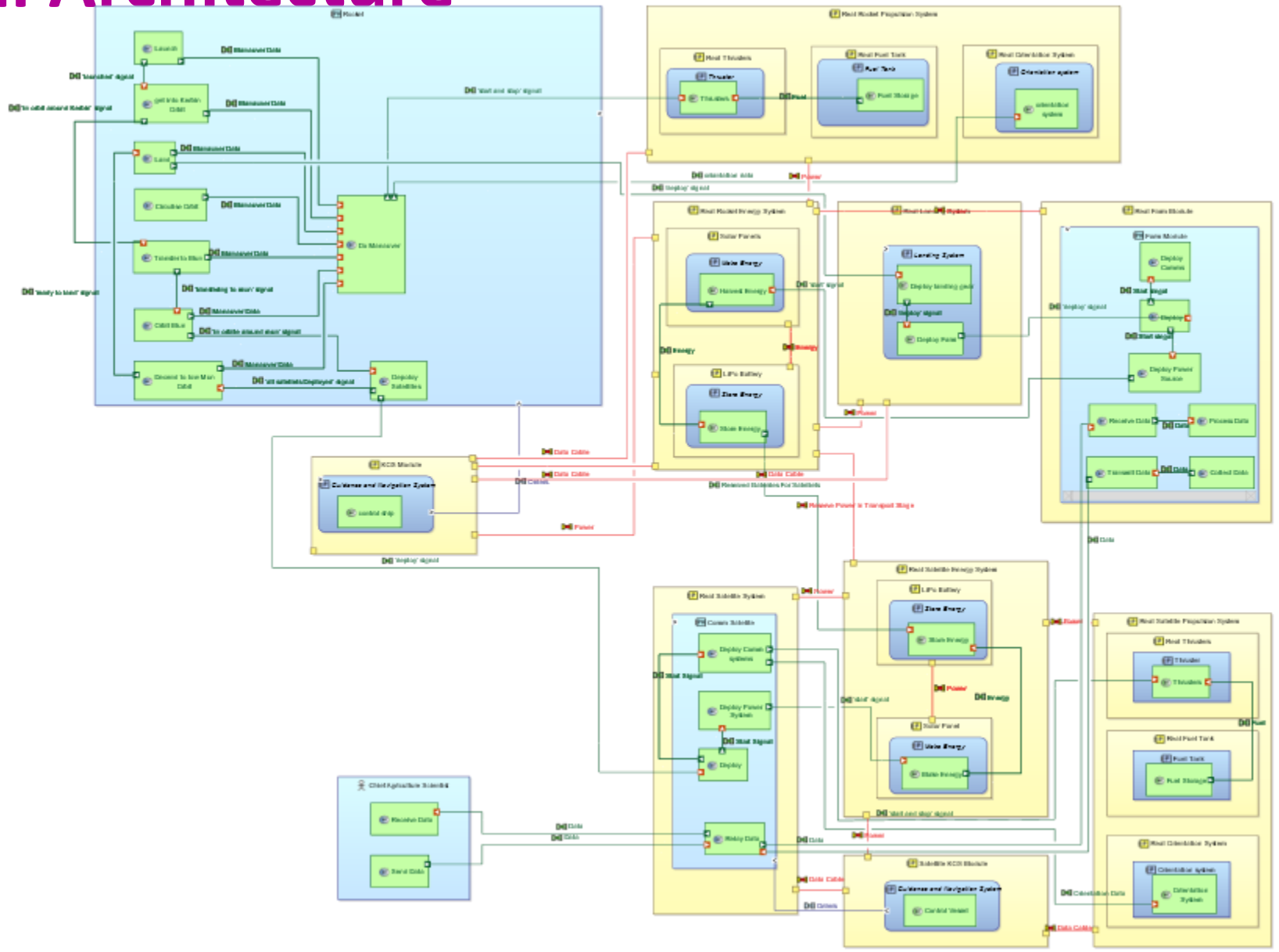
Total charge needed in daytime: 43 934.52

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

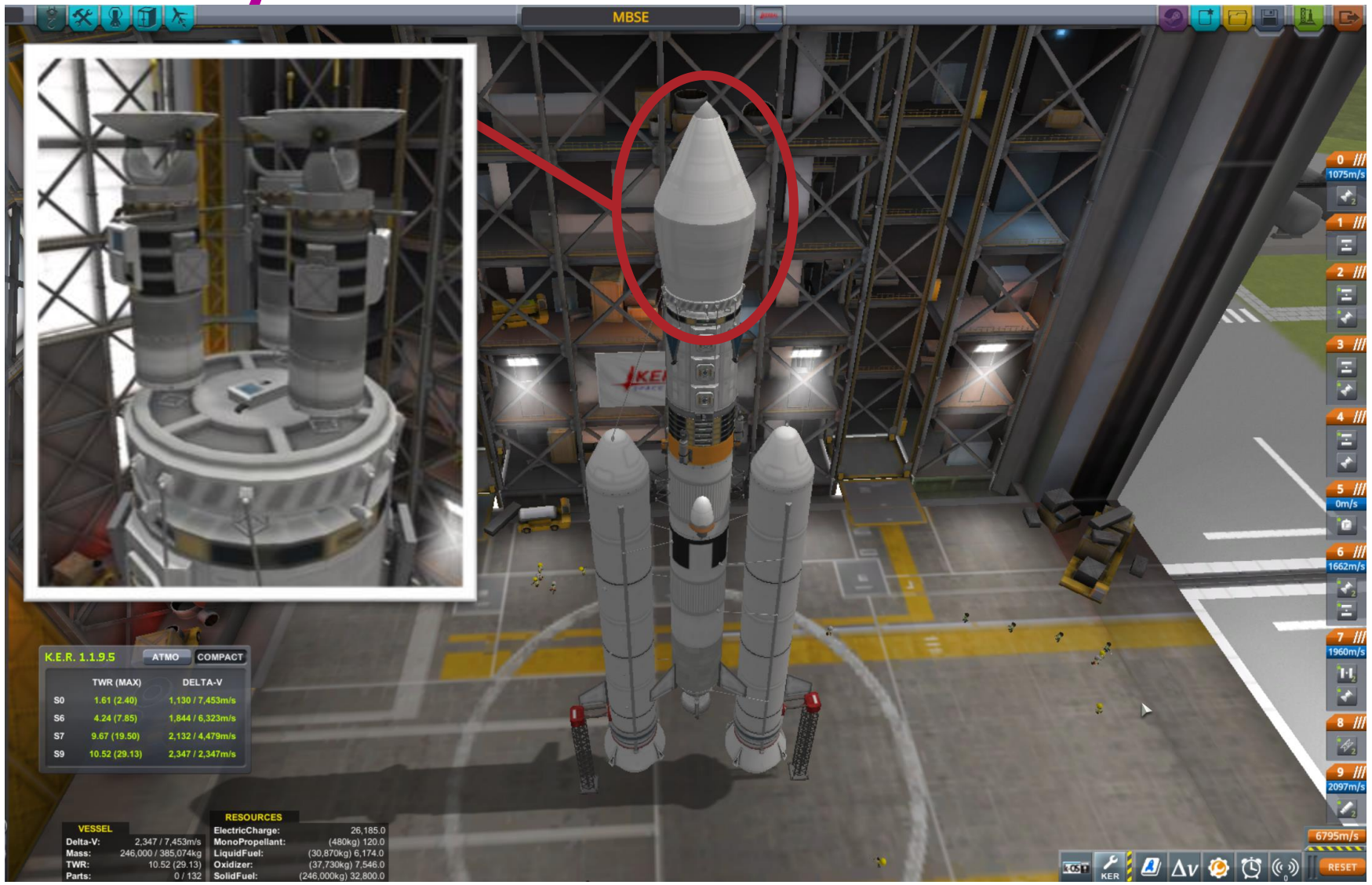
Logical Architecture



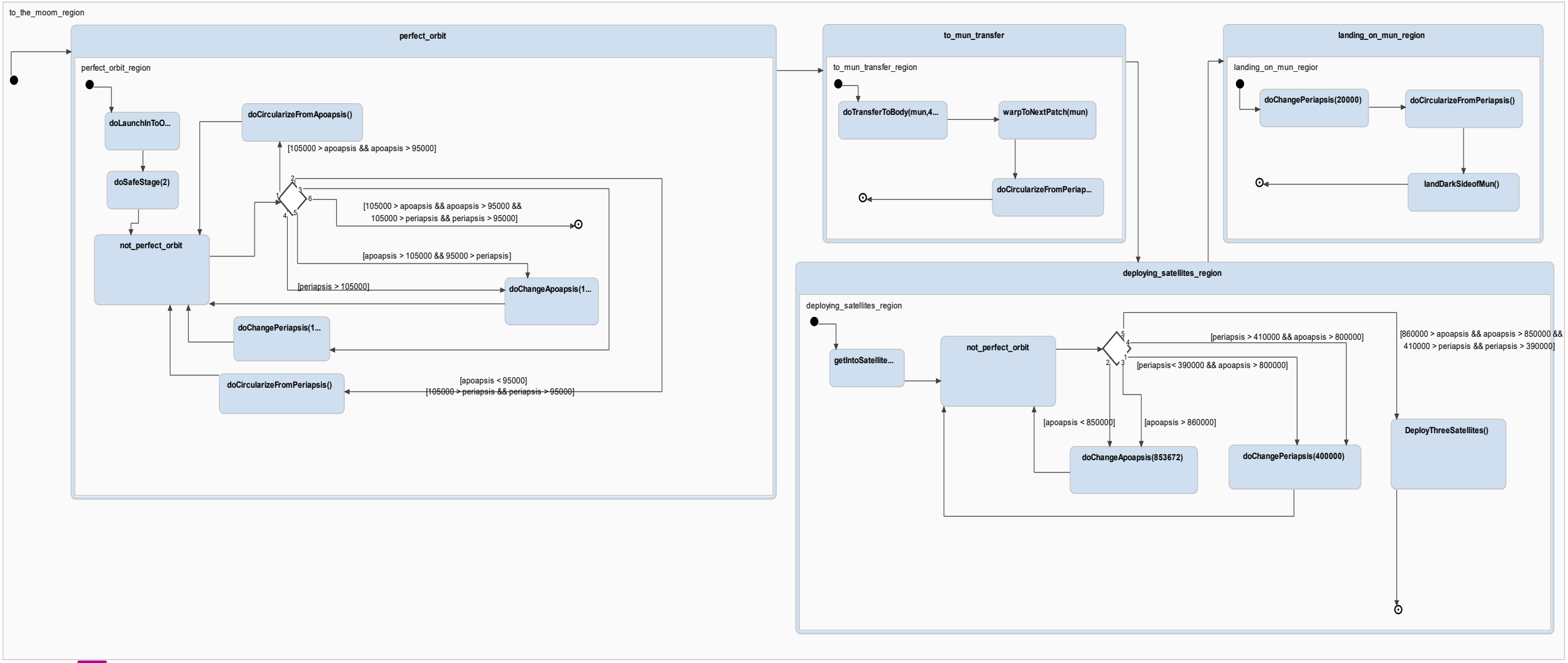
Physical Architecture



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

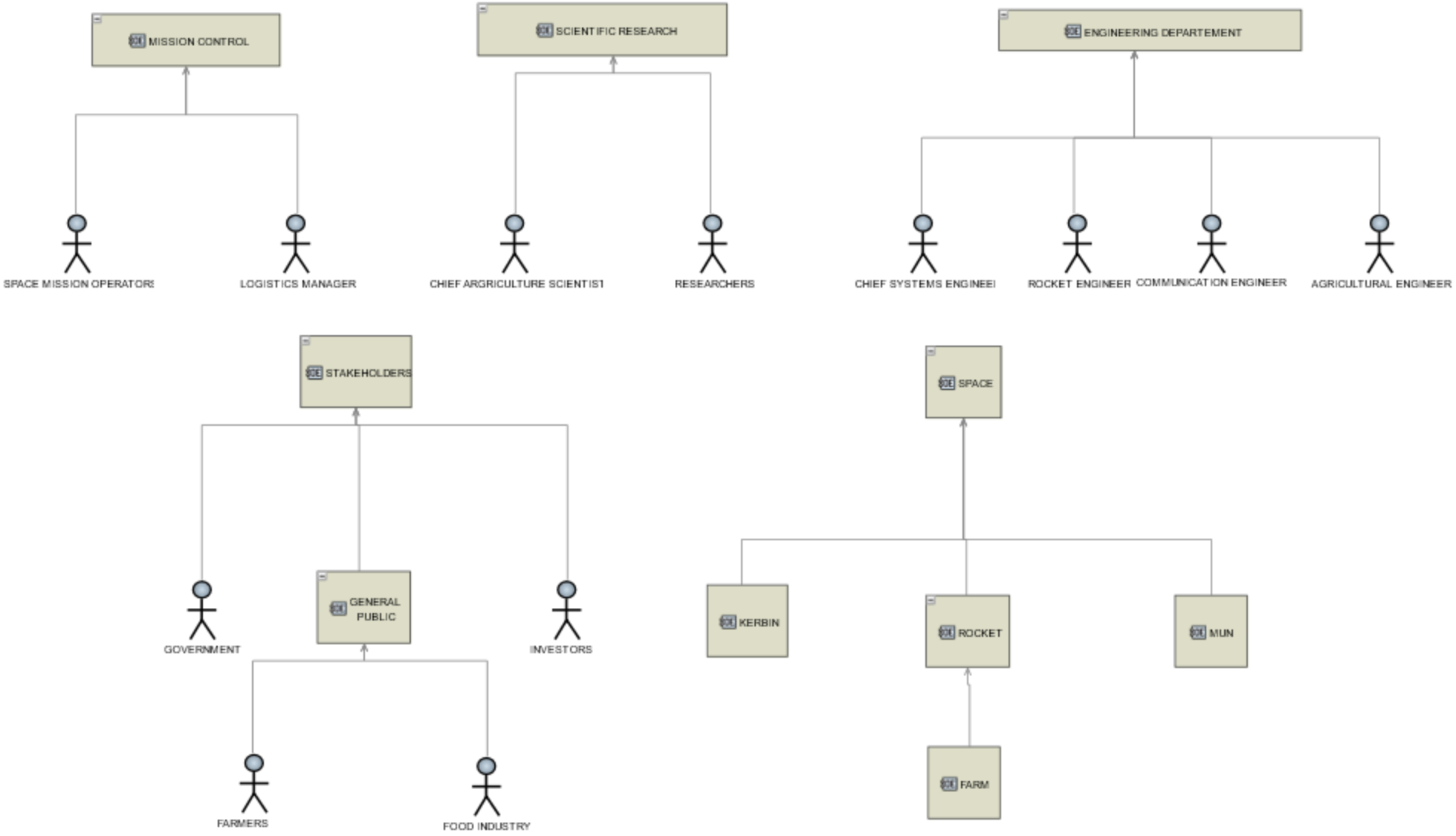
Total: 134 756 F

budget leftover 25 244 F

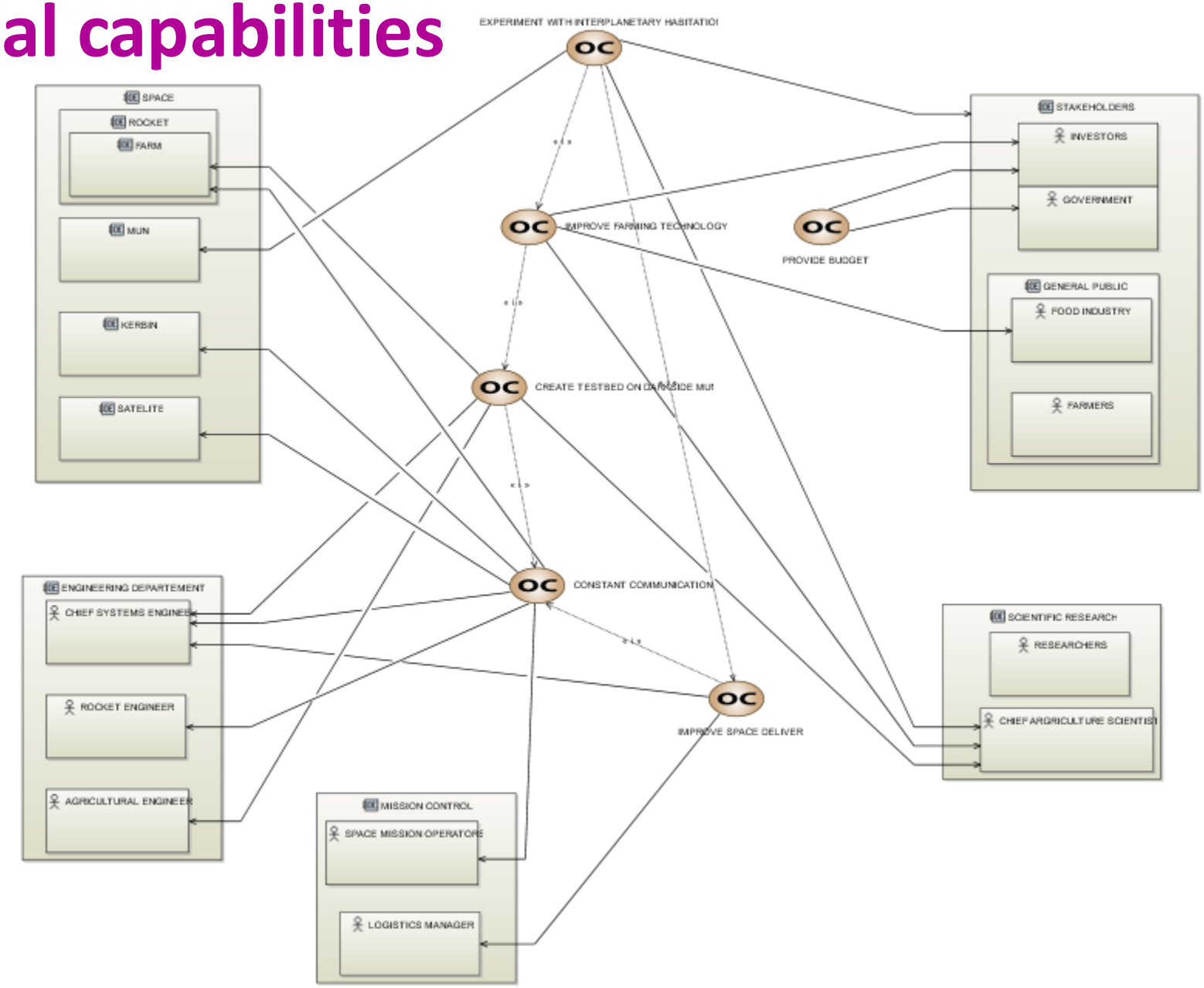
Excel workdocument

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