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Cubesat Subsystems Preliminary Design: One Software Suite to Bind Them All?

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Designing a nanosatellite requires close interrelation between different fields, with respectively strong level of expertise, all the more so as development progresses. During cubesats preliminary design many budgets are essential (mass, power, link, data, dissipation). Their local inputs, outputs and models are often intertwined. For instance, power budget rely on payload requirement, platform operational up-keeping, eclipses frequencies/duration, and batteries specifications. It will impact mass budget (e.g. number of required batteries, solar panels and wires, etc.), and reciprocally. But dissipation budget will also be concerned (batteries will only work between temperature extrema), heaters and radiators used will also impact mass budget and so on. All this process is, to our current knowledge, far to be unified with an ideal set of tools. Functionalities are often redundant between the different soft used, or even re-developed each time required rather than re-used. Fortunately some software bricks already exist, such as space mechanics libraries. Efforts on standardization are also undertaken (CSSDS) mainly concerning telecommunication protocols, and to a lesser extent, ephemeris formatting or equipment description. Even if they are paving the way for consistently interconnected suite of tools, proceeding end to end mission analysis lack of unified, consistent standards and open source tools.

Here come the idea for one tool to bind them all (and let's hope so not in the darkness bring them) or more precisely, a well defined suite of tools to help to get a strong consistency for a mission analysis preliminary design, which can follow the project to all it's live cycle thanks to a strong interconnection with experts tools. Optimally, each expert should be able to take (up to date) needed inputs on its own tools and provide to the team expected outputs, in a transparent way. Thanks to our previous and on-going nanosatellite projects, we have now a more practical vision on specific nanosatellite project needs, and redundant software usage and developments we are used to be facing.

That also in the scope of SUDOE Nanostar project proposition which aims at supporting training and development of student nanosatellites in Europe, where we are strongly involved (<http://nanostarproject.eu/>).

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