Apollo

User specification

**confidential**

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# Preface

# Disclaimer

Bla blab la bla

# Introduction

# Goal

The goal of Apollo is to provide engineers / designers with a tool that allows them to evaluate, optimize and change new and existing designs to deliver better performance.

# Use cases

Define the different use cases.

Above all the goals for the system should be to make simple things automatic, normal things simple and complicated things easy. Keep the UI as simple as possible and leak proof, but allow gentle degradation into more complicated scenarios.

The different use cases currently envisioned are:

* Robust design
* What-if research / design
* Optimization of existing or new products
* General research

## Robust design

* Design with tolerances (optimal solution with tolerance to change). User is effectively only interested in the final result. However there could be some interest in learning why this solution is the best so we may need to store the data.
* How to approach? Which actions will the user take to start a robust design?
* Iterations in design changes (or is that what-if, regardless we should support this)
* How to specify the tolerances and how to review the results?
* User might want to ‘butt in’ on the iteration process and control one or more parameters manually, fix their ranges, or even hold them constant.
* Should be useable with all different physics models / solvers and all combinations of these models.
* The final solution should be reached quickly and the results should be accurate. More importantly the accuracy of the solution should be known (i.e. the user should know what the tolerances are on the solution).

## What-if research

* Put a design through different parameter studies to see what the differences are. User is normally only interested in the result, i.e. the influences of the different parameters. Possibly this could lead to an optimisation calculation (leaving out the unimportant parameters).
* How is this approached? What actions will be taken, what data is expected and should this data be stored?
* The user may need / want to specify specific variables to keep track of. Allow addition of new variables with their own calculations.
* How will the parameters be specified? How will the parameter range be specified?
* How will the results be presented, graphs, tables, 3d surfaces etc.
* Do users want to compare their results with others? Experiments, simulations?

## Optimization

* Define a design (probably geometry) and optimize its shape or behaviour.
* Which steps will be taken by the user?
* How will the user specify the different optimization variables? It should be really easy. We might also have to indicate a total computation time, so that the user will know how long the total will take (that way the user will probably not define too many variables / steps).
* How will the results be presented. Do we provide an overview of the optimization history and if so what will that overview look like (graphs, tables, movies …).
* Would users want to keep the data generated during the optimization?
* What can an optimization be based on. Simulations only or experimental data as well?
* As with the what-if and robust design tasks the user will probably only care about the final results but they’ll probably want to know that the results are solid (i.e. error margins etc.)

## Research

* General reviewing of a specific model in a specific situation OR several models in a specific situation OR a specific model in multiple situations etc. Need to keep all data and make reviewing of the results easy.
* How will the model be specified?
* How will the situational settings (physics model etc.) be specified? Should be really easy to set and change
* Need error margins for sure. Probably also need additional error data like convergence checking etc.
* Allow for easy comparison of models / situations. Mapping one to another?

General

* Users are generally not interested in performing detailed error analyses but it could be useful to have these (robust design relies on this, and other formats could use the errors to determine the inaccuracies + error bars etc.). So we’ll have to offer the user an easy way out.

Cool stuff?

* Comparison of different simulations or simulations & experiments