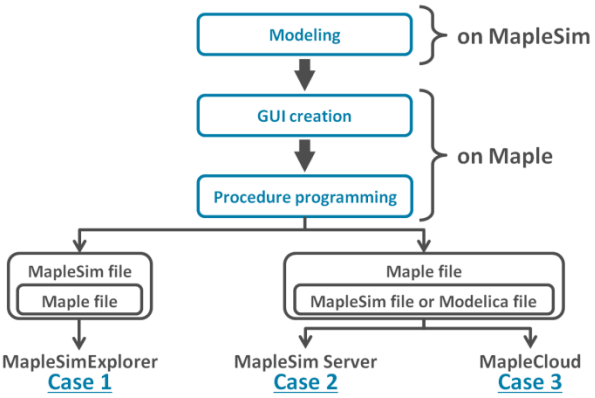

Figure 5. **Workflow of Analysis tools development**

Especially, connection between model and analysis tool is established by using three options:

1. Attach one or multiple Maple files of analysis tool (.mw or .maple) to MapleSim model file (.msim). Then use the MapleSim component of Maple's GUI component to establish connection between model and analysis tools.
2. Attach one or multiple MapleSim model files (.msim or .mo) to Maple file of analysis tool (.maple). And then use Maple command in Maple file to establish connection between models and analysis tools. Figure 6 shows this case.
3. Use Maple command in Maple file of analysis tool (.mw or .maple) to specify file stored path of MapleSim model file (.msim or .mo), which is located at outside the Maple file.

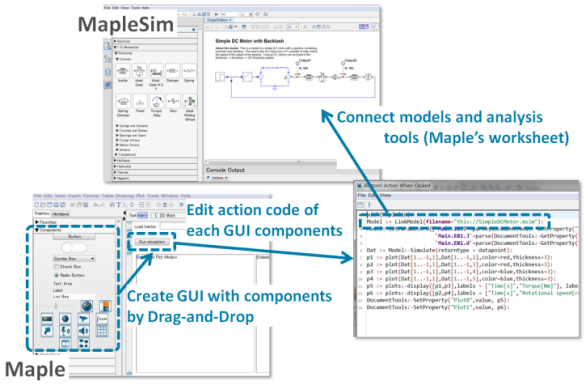

Figure 6. Modeling and Analysis tools development

First option in above case is for using MapleSim Explorer, which is Case 1 in Figure 2 and 5. As typical workflow, simulation experts can simply share the model file which contains one or multiple analysis tools with non-expert users. Then, they can get several analysis results instantly for given target design, which can be expressed within the model. (Figure 7).

Second option can be used for MapleSim Server and MapleCloud, which are corresponding to Case 2 and Case 3. Simulation experts need to upload analysis tool that contains one or multiple models to own web server or MapleCloud's. Then, non-expert users just need to access the specified URL from their web browsers to run analysis tools. With this framework, it is possible to analyze multiple attached models and to do multiple types of analysis which is implemented in the associated Maple file.

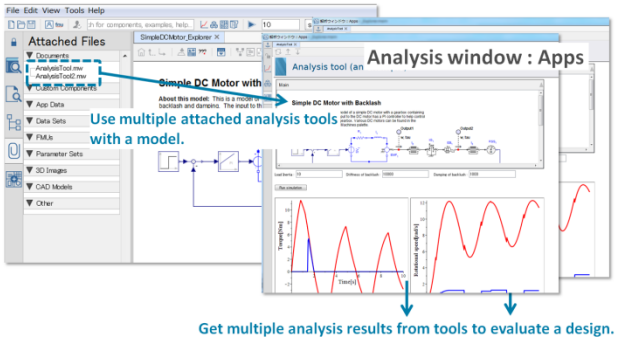

Figure 7. Using MapleSim Explorer

Third option is effective for simple routine tasks with different models only in Case 2. For example, if the definition of interface is fixed, the code generation (FMU and S-Function) can be applied, though it is not analysis task.

Simulation experts need to select what the appropriate file structure is, based on use-cases when they develop models and analysis tools. Meantime, models and analysis tools can be used in common use case for all types of deployment, hence simulation experts can provide analysis environment which is suitable for non-expert users' demand appropriately.

4 Conclusions

In this paper, we introduced typical deployment approaches by Maplesoft product suite. One of difficulties that may occur when simulation experts provide models and analysis tools to non-experts, can be clarified with described approaches. The key factor of how simulation experts can develop analysis tools efficiently is related to flexible file structure for connection between model files and analysis tool files. In this context, Maplesoft technologies allow to access Maple files directly from web browser. We are already working closely with some customers in Japan to see practical increase of usage for Modelica-based models by providing these deployment approaches discussed in this paper.

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