

# **JMAG: From Implementation to Efficient Operation**

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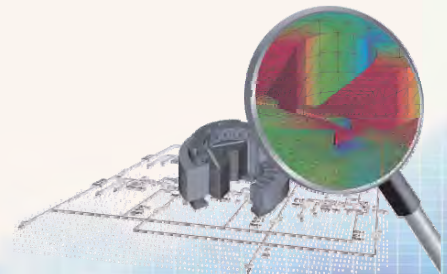
**JSOL Corporation**

**JMAG®**

JMAG Users Conference 2010

# JMAG: From Implementation to Efficient Operation

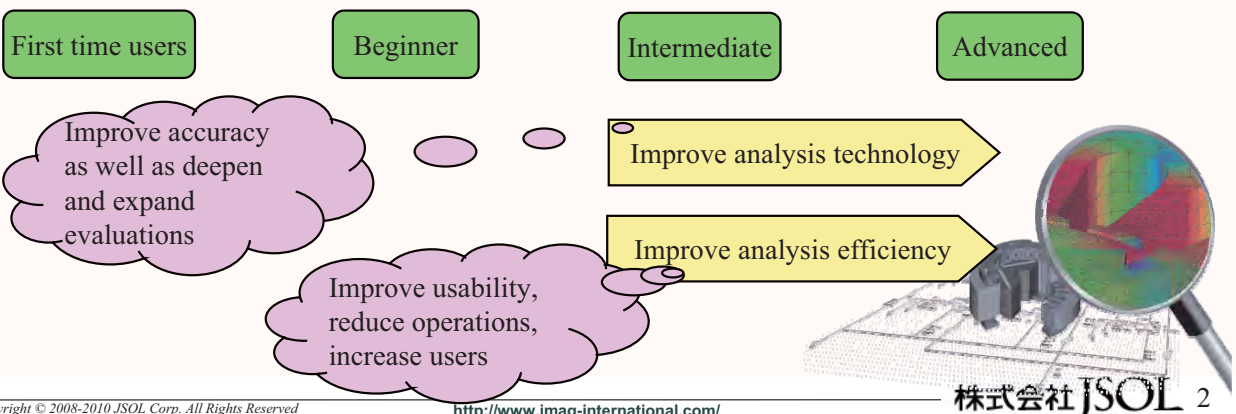
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 Engineering Technology Division  
 JSOL Corporation

Global IT Innovator  
BY DATA DRIVEN**JSOL CORPORATION**

## Preface

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- This seminar describes how to configure and efficiently use JMAG as well as introduces ways to improve users skills for anyone who has implemented, is considering implementing, or are looking for ways to better administrate JMAG.
- This seminar will also provide information to more effective use JMAG, although these topics differ from the analysis technology itself.



## Before Implementing JMAG



When considering implementing JMAG, becoming familiar with the software and evaluating the performance JMAG provides is necessary. Therefore, we have prepared and offer the following information:

### ■ Hands-on Seminars

- These free seminars allow attendees to evaluate the feel of JMAG by actually using the software following a textbook guide at the JSOL offices in Tokyo, Nagoya, and Osaka.

### ■ Trial Licenses

- Free 1-month trial licenses are available for customers to evaluate JMAG on-site.

### ■ Benchmark Testing

- Benchmark testing provides an analysis based on your analysis specifications and reports the analysis results that are obtained so that you can evaluate the analysis accuracy and speed before implementing JMAG.

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## Implementing JMAG



JMAG can be installed and the licenses setup for customers that have decided to implement JMAG.

### ■ Installing JMAG

- JMAG can be installed simply by following the directions displayed by the installation program.
- JMAG can be installed on as many machines (clients) as desired, but only the number of copies that have been licensed can be used.

### ■ Setting Up the License

- The licensing information (number of copies licensed) is setup on the machine for managing licenses.
- The license server determines if a license is available for a client to use.
- A client machine can also be operated as a license server.

The JMAG Support Team is available to help you through any problems you encounter.

E-mail: [jmag-support@sci.jsol.co.jp](mailto:jmag-support@sci.jsol.co.jp)

Telephone: 03-5859-6023 (10:00 am - 17:00 pm)

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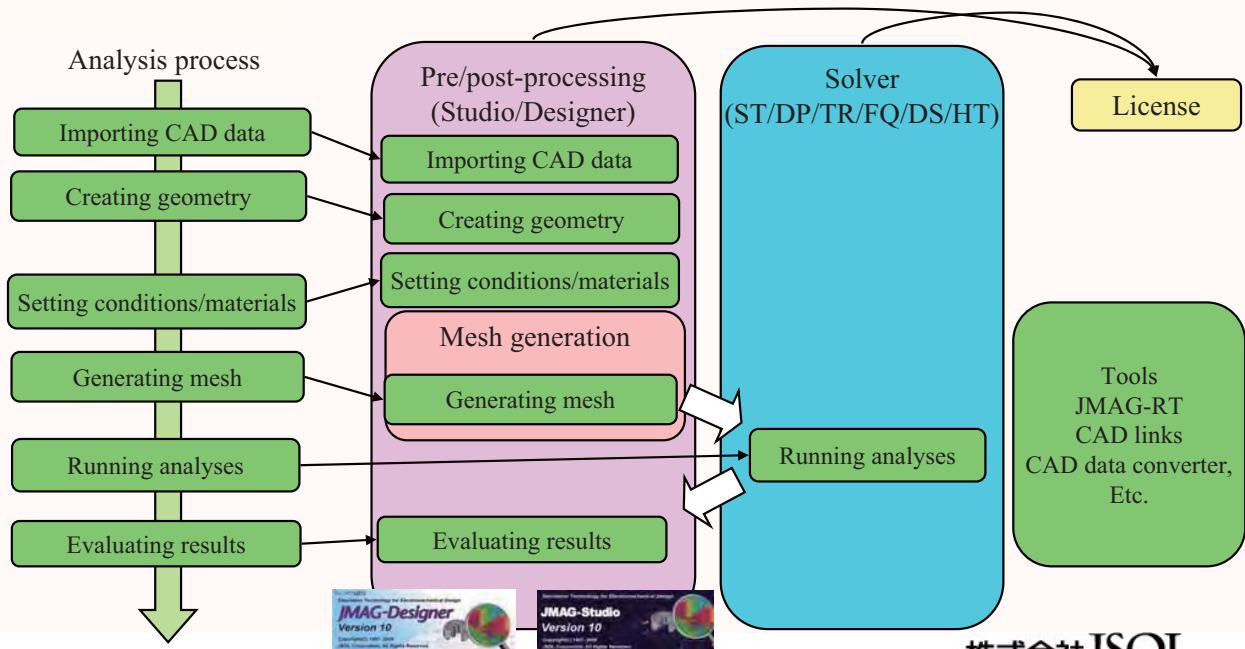
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## Structure of the JMAG Package

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- The JMAG package is largely broken down to pre/post processing and the solver.
- Magnetic field, thermal, structural, and electric field analysis solvers are available.



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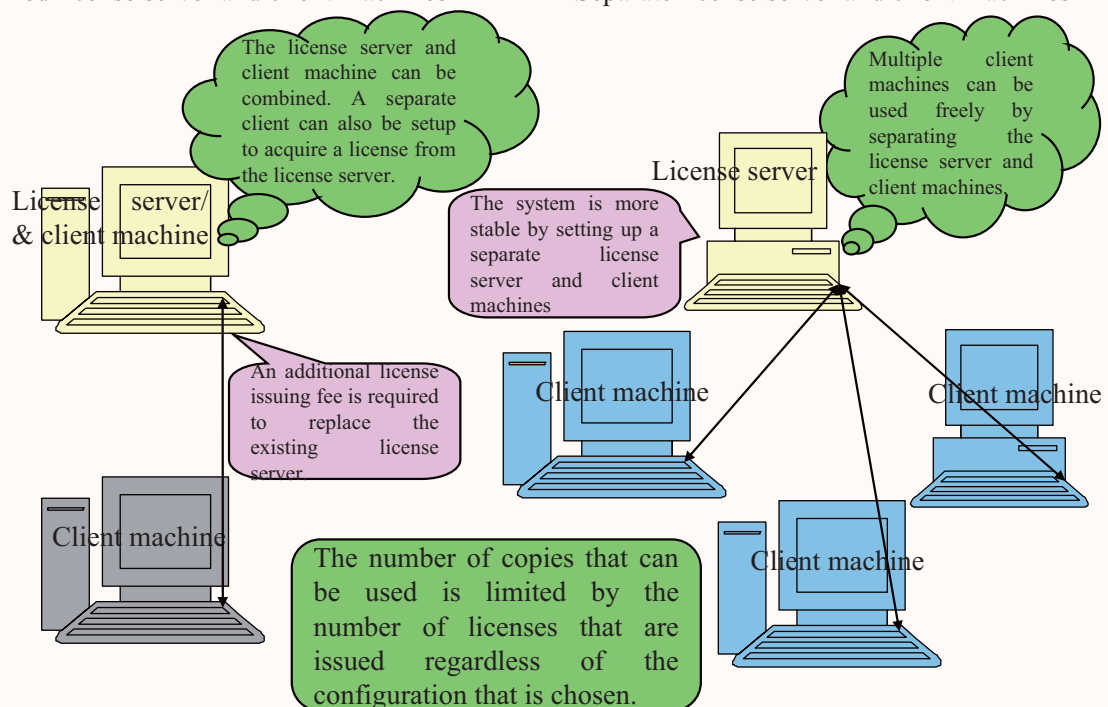
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## Relationship of the License Server and Client Machine

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Combined license server and client machines

Separate license server and client machines



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## Introductory Training

### ■ Self Learning System

- The "Self Learning System (SLS)" can be used after installing JMAG-Designer.
- JMAG can be learned using the actual operations by automatically aligned windows of JMAG and SLS.

The SLS interface is shown with three main modes:

- Outline Mode**
  - Provides an overview of analyses using an animation.
  - The outline mode offers a great way to become familiar with each analysis.
- Tour Mode**
  - Provides actual procedures to set each analysis using an animation.
  - The Tour Mode offers a great way to learn each analysis comprehensively.
- Practice mode**
  - Provides a text based procedure manual of the procedures used to set each analysis.
  - The practice mode offers a great hands-on way to learn each analysis comprehensively.

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## Introductory Training

### ■ Application Notes

- Each Application Note is an analysis example by application. Each Application Note contains the documentation describing each analysis as well as the sample data to run the analysis.
  - There are currently about 150 Application Notes available.
  - The Application Notes can be displayed from [Help] on the menu bar in JMAG-Designer.
- Each user can learn the techniques for the analysis they would like to run using the various documentation.

The Application Catalog shows a grid of application notes with icons and titles. The Analysis Specifications section shows a detailed view of a specific application note, including a 3D model and a table of specifications.

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## Introductory Training

### ■ Introductory Seminars

- These seminars are targeted to users just starting to use JMAG. The information focuses on the basic knowledge and operations required to setup an analysis.
- The first half of the seminar is a lecture format focusing on the fundamental knowledge helpful to performing magnetic field analysis. The second half of the seminar is a hands-on format that teaches JMAG by actually performing operations. A JMAG-Studio and JMAG-Designer version of the Introductory Seminar are offered.
- The consistent flow of analyses is introduced using examples such as PM motors for rotating machines and static apparatuses for transformers.
- This seminar is run by a JSOL engineer at the JSOL offices in Tokyo, Nagoya, and Osaka.



**Free campaign running  
until December 2010**

## User Support

### ■ Using the technical support

- Technical support is provided by both e-mail and telephone.
- Many users worry whether a question is appropriate for the JMAG Support Team. The user support should be used proactively as the JMAG team's goal is to help users advance their skills.

### ■ Latest Service Packs

- The features in JMAG are enhanced every 2 months.
- The service packs can be downloaded from the JMAG-International website. Get the most out of the JMAG features through the service packs.
- JMAG can be updated using the service packs without updating your license.

### ■ Version Upgrades

- New features are added and existing features are dramatically enhanced once each year.
- The installation media to upgrade your version of JMAG is sent by CS.

## Reaching an Intermediate to Advanced Skill Level

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Users that are comfortable in design and evaluation using JMAG to some degree can improve their skills even further.

### ■ Improve analysis efficiency

- Increase Efficiency = Learn and utilize the JMAG features.
- Increase those using JMAG = Increase the number of people using JMAG so that simple evaluations can be performed by wider group of people.

### ■ Improve analysis technology

- Go deeper
  - Compare prototypes to improve analysis accuracy
  - This requires a certain amount of self study.
- Go broader
  - The technology and effectiveness of magnetic field analysis can contribute more to product design by expanding the range of analyses to control simulations as well as thermal and structural analyses.

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## Intermediate Training

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### ■ Intermediate seminars (workshops)

- The purpose of these seminars is to help users familiar with JMAG to perform more comprehensive analysis as well as try new types of analyses.
- Differing from the introductory seminars, this free form hands-on type seminar using practical examples provides the logic behind each type of analysis and the operation of the specialized features to improve users' analysis skills.
- An engineer is available to answer any questions that the users may have.
- Each user chooses the type of analysis they would like to learn, and then follows the procedures using a Tutorial. Don't hesitate to try a new type of analysis as these seminars provide a way of learning JMAG that is closer to each application that users would like to try.

### ■ Skill-up Seminars

- The Skill-up Seminars are an electromagnetic field analysis training course aimed at improving the analysis skill level of users using JMAG.
- Each seminar focuses on a feature in JMAG, such as the mesh and solver. Hints and tips to attain more efficient analyses with higher accuracy are introduced.



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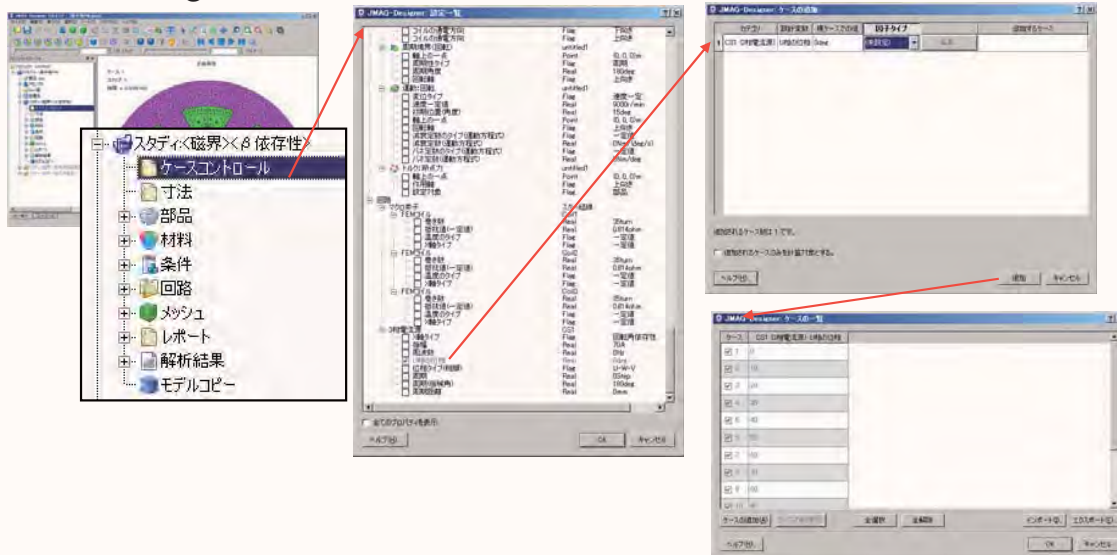
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## Streamlining Analyses

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### ■ Using the Case Control (JMAG-Designer)

- Almost all of the settings in JMAG can be used for parametric analyses.
- The results obtained for each case can be compared easily using the graph manager.



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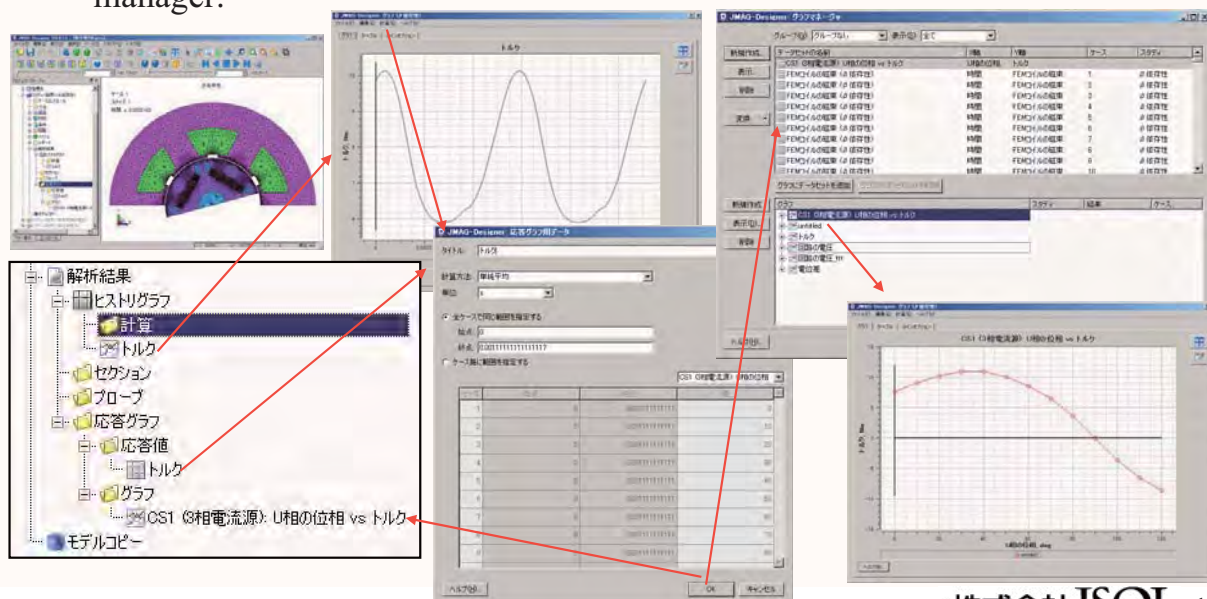
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## Streamlining Analyses

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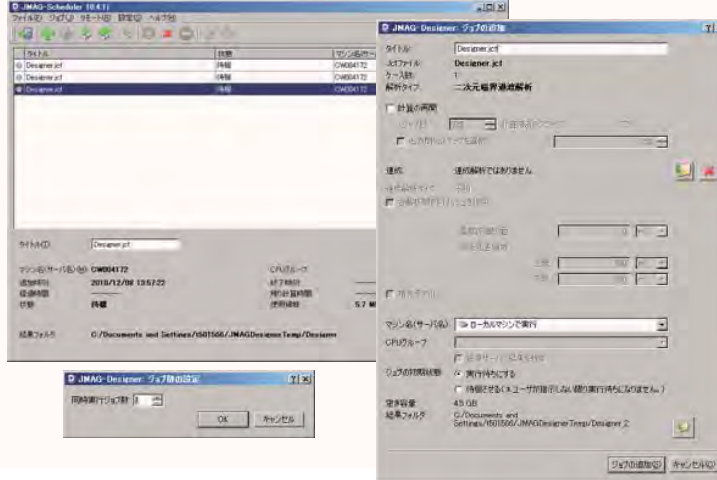
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## Streamlining Analyses

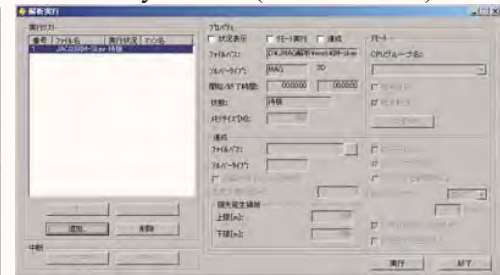
### ■ Using JMAG-Scheduler (JMAG-Designer)/Analysis Tool (JMAG-Studio)

- These features allow analyses to be run without using the pre/post processing.
- Operations become more efficient because analysis models can be created and analysis results can be confirmed while other analysis calculations are being performed.

JMAG-Scheduler (JMAG-Designer)



Analysis Tool (JMAG-Studio)



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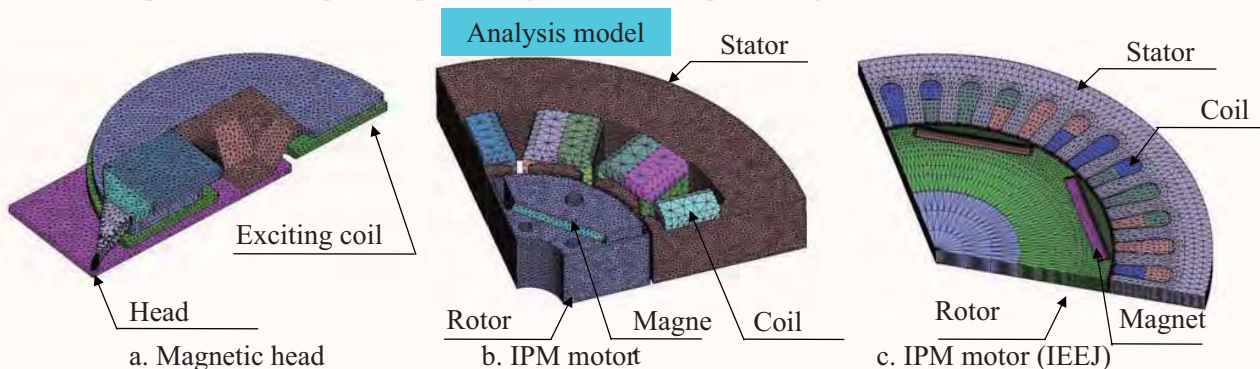
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## Streamlining Analyses

### ■ Large-scale problems

- Analyses with 1,000,000 elements can be performed in a 64-bit environment.
- Large scale problems can be solved quickly by the parallel solver using SMP/DMP.
  - Shared Memory Processing (SMP): Parallel processing on a single machine that can be managed easily. There are restrictions on the number of threads that can be used.
  - Distributed Memory Processing (DMP): Parallel processing across multiple machines that provides better parallel processing efficiency. Depends largely on the communication rate.



Model Name	Analysis Type	Elements	Elements Type
Magnetic head	Static magnetic	1,208,182	Tetrahedron
IPM motor	Transient	474,984	Tetrahedron
IEEJ IPM motor	Transient	299,584	Pentahedron

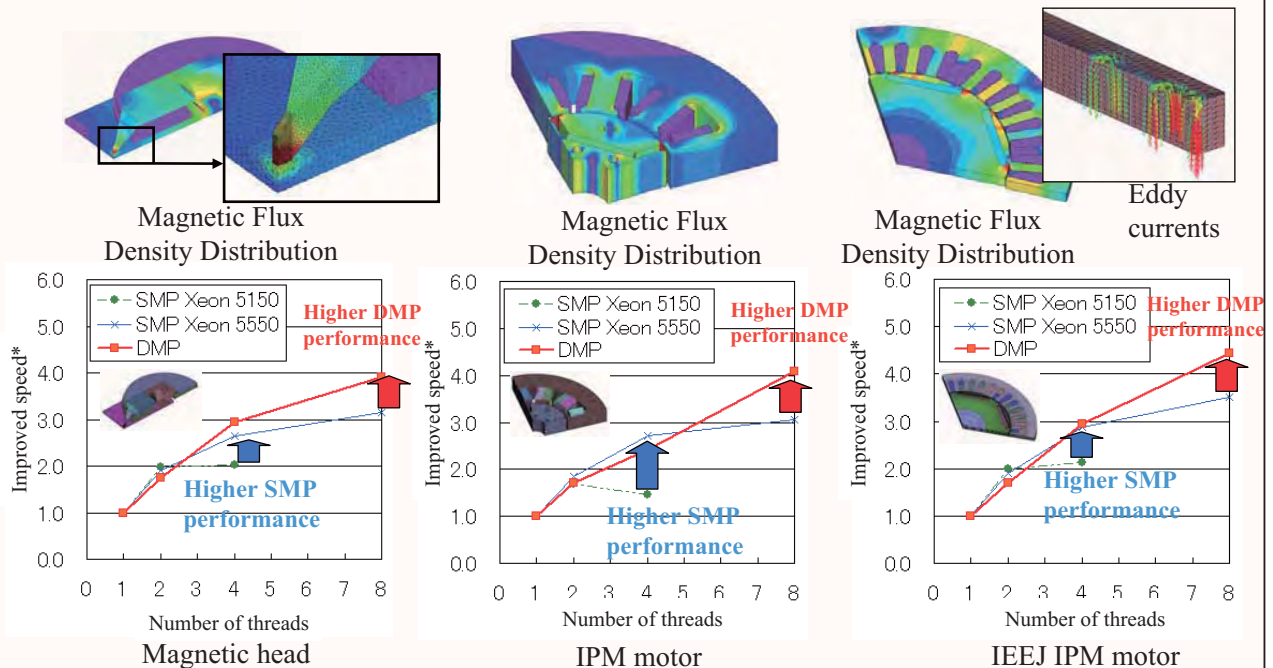
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## Streamlining Analyses

### Improved analysis speed and accuracy



\* : Speed comparison = Analysis time without parallel processing / Analysis time with parallel processing

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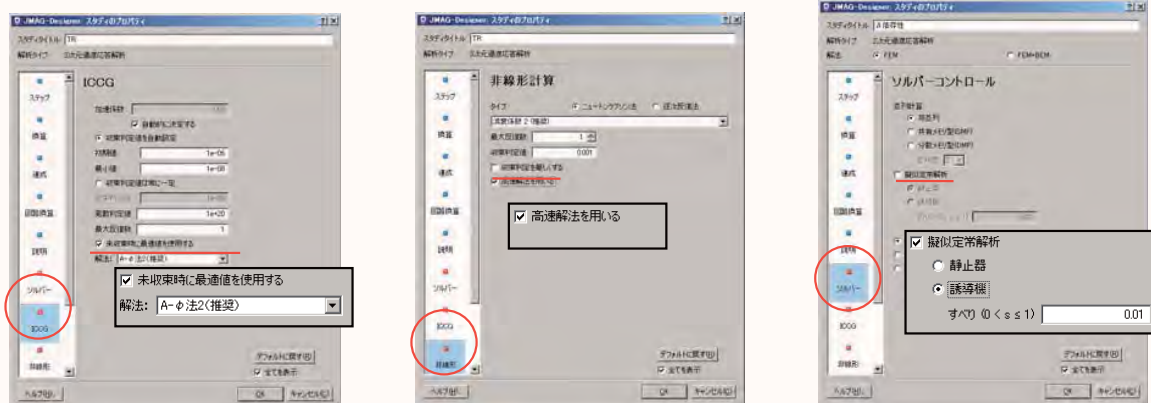
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## Streamlining Analyses

### High-speed Solver

- Using the A-phi method: Increases the speed of problems including eddy currents for 3D magnetic field analyses.
- Nonlinear high-speed calculations: Increases the speed by reducing the number of nonlinear iterations in transient analyses. This is advantageous for calculations with multiple cases.
- Steady-State Approximate Transient Analysis: Quickly reaches a steady state limiting the initial transient behavior for analyses of induction machines and transformers.



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## Streamlining Analyses

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### JMAG remote system

- JMAG offers a feature to integrate multiple analysis jobs as a single results file, such as JMAG-RT, inductance analyses, etc. The JMAG remote system is a feature to separate the various calculation jobs.

- The flow of the analysis is as follows:

1. Install JMAG and the remote system

Management server = Remote system

Client = JMAG only

CPU Node, JMAG, and the remote system

2. Set the management server

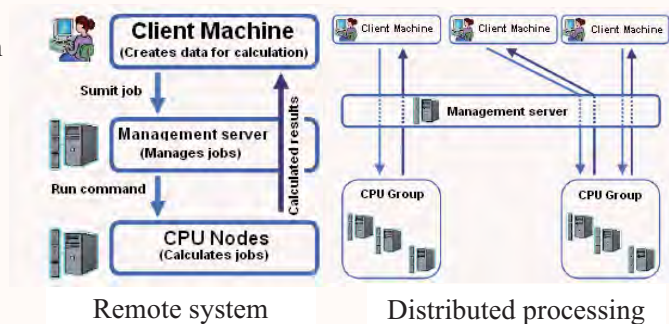
Can be setup using a Web browser

3. Start the server management screen

4. Specify each machine

5. Set the CPU group

6. Remotely run the analysis



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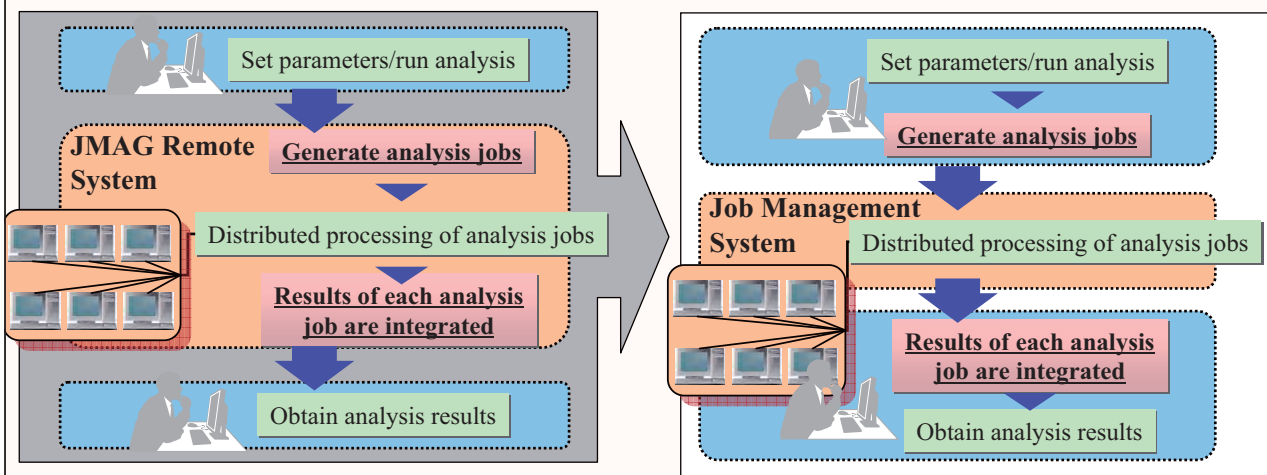
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## Streamlining Analyses

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### Providing an interface for job management systems

- The interface for the analysis program is being upgraded to run the analysis jobs created by the internal processes of the JMAG remote system using any job management system.



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## Streamlining Analyses



The following services are available when the calculation load becomes overwhelming due to tight development schedules.

### ■ Analyses Resourcing

- JSOL runs and obtains results on their machines using JMAG data provided by the client, and then sends the results back to the client via DVD.
- This service is optimal for broad analyses such as creating JMAG-RT models or running parametric analyses for large scale models.

### ■ Analysis Outsourcing

- JSOL creates an analysis model based on the clients requirements, and then runs the calculation.
- Please contact a sales representative if you are interested.

## Improve analysis technology



### ■ Linking to 3rd-party software

#### ■ Using CAD data

- CAD Link (JMAG-Designer/CAPRI Link): Data can be shared between CAD and JMAG so that the geometry can be modified while maintaining the condition settings. Supports CATIA, NX, and Pro/E.
- Importing CAD data: CATIA V5, CATIA V4, and IGES (3D)
- Standard import: SAT, DXF, IGES (2D)

#### ■ Optimization software

- modeFRONTIER: JMAG offers a direct interface to modeFRONTIER
- Optimus: JMAG offers a direct interface to Optimus
  - ◆ Other 3rd-party software is supported using scripts.

#### ■ Links to other software

- Abaqus: Analysis results from JMAG can be imported into Abaqus. JMAG can refer to the analysis results obtained in Abaqus.
- Acusolve: Analysis results obtained in JMAG can be directly imported into Acusolve.

#### ■ Circuit/control simulations

- Simulink: Links and direct links to Simulink can be established using JMAG-RT.
- PSIM: Links and direct links to PSIM can be established using JMAG-RT.
  - ◆ Support for real time simulations is also possible through JMAG-RT.

## Conclusion



- This seminar has described how to configure and efficiently use JMAG as well as introduced ways to improve users skills for anyone who has implemented, is considering implementing, or are looking for ways to better administrate JMAG.
- Using this information as a base, JMAG can be used more efficiently to speed up analysis operations.

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## Contact



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