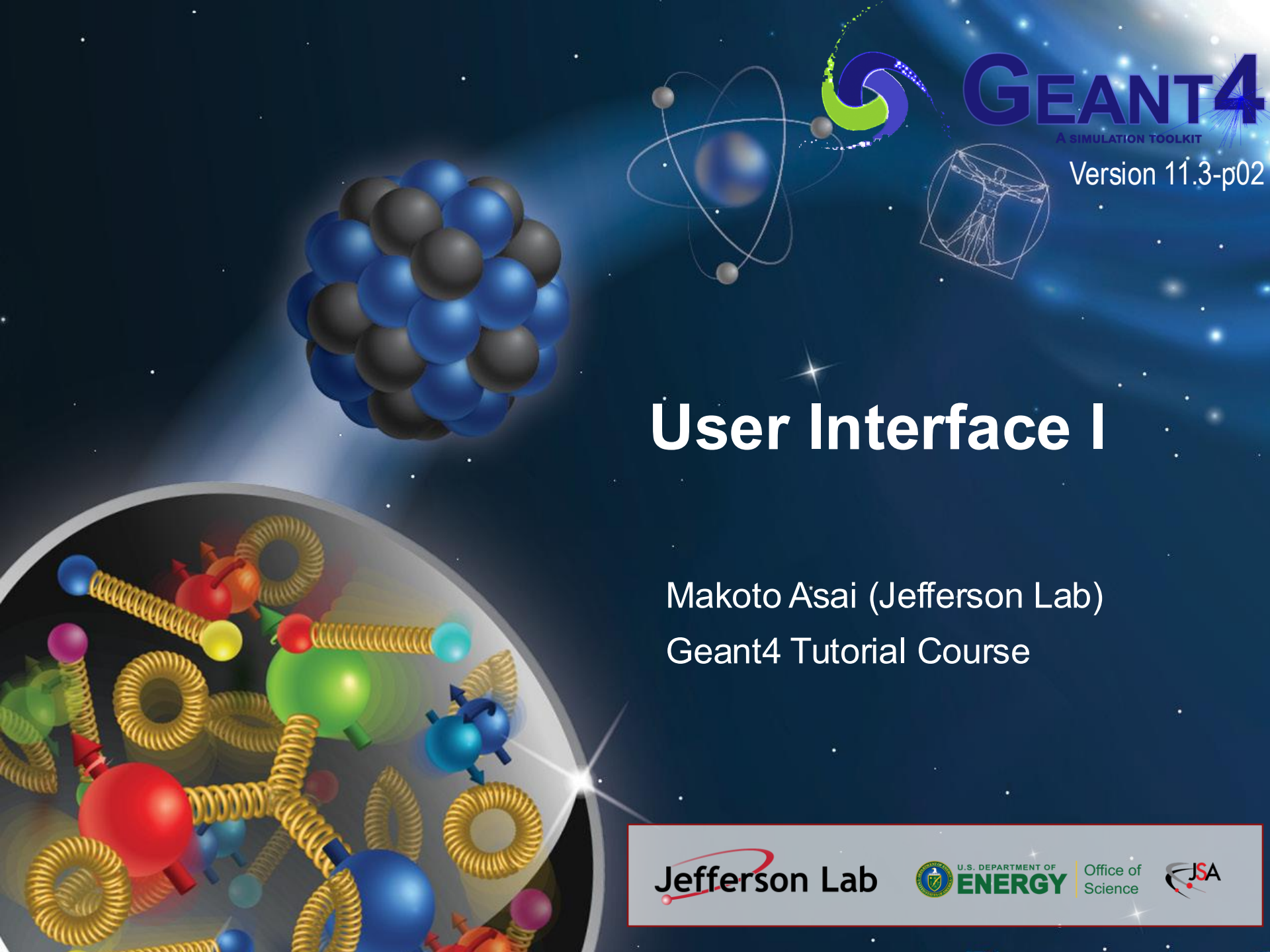

User Interface I

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Geant4 Tutorial Course

Jefferson Lab
U.S. DEPARTMENT OF ENERGY | Office of Science
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- Macro file
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Geant4 UI command

- A UI command consists of
  - Command directory
  - Command
  - Parameter(s)

```
/run/verbose 1
/vis/viewer/flush
```

- A parameter can be a type of string, boolean, integer, long-integer or double.
  - Space is a delimiter.
  - Use double-quotes (“”) for string with space(s).
- A parameter may be “omittable”. If it is the case, a default value will be taken if you omit the parameter.
  - Default value is either predefined default value or current value according to its definition.
  - If you want to use the default value for your first parameter while you want to set your second parameter, use “!” as a place holder.

```
/dir/command ! second
```

Command submission

- Geant4 UI command can be issued by
  - (G)UI interactive command submission
  - Macro file
  - Hard-coded implementation
    - Slow but no need for the targeting class pointer
    - Should not be used inside an event loop

```
G4UImanager* UI = G4UImanager::GetUIpointer();
UI->ApplyCommand("/control/execute myDefault.mac");
```

- The availability of individual command, the ranges of parameters, the available candidates on individual command parameter may vary according to the implementation of your application and may even vary dynamically during the execution of your job.
- some commands are available only for limited Geant4 application state(s).
  - E.g. **`/run/beamOn`** is available only for *Idle* states.

Command refusal

- Command will be refused in case of
  - Wrong application state
  - Wrong type of parameter
  - Insufficient number of parameters
    - If parameters are not “omittable”
  - Parameter out of its range
    - For integer or double type parameter
  - Parameter out of its candidate list
    - For string type parameter
  - Command not found

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Macro file

- Macro file is an ASCII file that contains UI commands.
- All commands must be given with their full-path directories.
- Use "#" for comment line.
  - First "#" to the end of the line will be ignored.
  - Comment lines will be echoed if **`/control/verbose`** is set to 2.
- Macro file can be executed
  - interactively or in (other) macro file

    `/control/execute` ***`file_name`***
  - hard-coded

```
G4UImanager* UI = G4UImanager::GetUIpointer();
UI->ApplyCommand("/control/execute file_name");
```

Available Commands

- You can get a list of available commands including your custom ones by

  `/control/manual [directory]`

  - Plain text format to standard output

  `/control/createHTML [directory]`

  - HTML file(s) - one file per one (sub-)directory

- List of built-in commands is also available in section 7.1 of *User's Guide For Application Developers.*

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Alias

- Alias can be defined by

  /control/alias [name] [value]

  - It is also set with **/control/loop** and **/control/foreach** commands
  - Aliased value is always treated as a string even if it contains numbers only.

- Alias is to be used with other UI command.
  - Use curly brackets, { and }.
  - For example, frequently used lengthy command can be shortened by aliasing.

```
/control/alias tv /tracking/verbose
{tv} 1
```

  - Aliases can be used recursively.

```
/control/alias file1 /diskA/dirX/fileXX.dat
/control/alias file2 /diskB/dirY/fileYY.dat
/control/alias run 1
/myCmd/getFile {file{run}}
```

Loop

- **/control/loop** and **/control/foreach** commands execute a macro file more than once. Aliased variable name can be used inside the macro file.
- **/control/loop [*macroFile*] [*counterName*]**
  [*initialValue*] [*finalValue*] [*stepSize*]
  - *counterName* is aliased to the number as a loop counter
- **/control/foreach [*macroFile*] [*counterName*] [*valueList*]**
  - *counterName* is aliased to a value in *valueList*
  - *valueList* must be enclosed by double quotes (" ")

- on UI terminal or in another macro file

```
/control/loop myRun.mac Ekin 10. 20. 2.
```

- in myRun.mac

```
/control/foreach mySingleRun.mac pname "p pi- mu-"
```

- in mySingleRun.mac

```
/gun/particle {pname}
/gun/energy {Ekin} GeV
/run/beamOn 100
```

Embedded macro file

New in version 11.4 to be released in December 2025

- "@@" keyword can be placed in any UI command that takes a macro file name, and it creates a temporal macro file with following UI commands until /control/endRecord command comes.
  - Note that this "@@" mechanism works recursively.

```
/control/loop @@ Ekin 10. 20. 2.
  /control/foreach @@ pname "p pi- mu-"
    /gun/particle {pname}
    /gun/energy {Ekin} GeV
    /run/beamOn 100
  /control/endRecord
/control/endRecord
```

- Indentation is not mandatory, but beneficial for readability reason.

Embedded macro file

New in version 11.4 to be released in December 2025

- Temporal file is deleted immediately after execution of the UI command that created the temporal file.
- But, by putting a file name between a pair of “@”, the temporal macro file is stored with that file name.
  - This is useful if the created macro file must be executed later.

```
/vis/scene/add/endOfRunMacro @draw.mac@
  /control/loop @drawSlice.mac@ iColumn 0 29 7
    /score/drawColumn boxMesh_1 nOfStepGamma 0 {iColumn}
  /control/endRecord
/control/endRecord
```

- If specified macro file already exists, it is overwritten.

Some other useful UI commands

- `/control/shell <shell_command>`
  - Execute a Unix shell command (e.g. */control/shell ls*)
- `/control/getEnv <shell_variable_name>`
  - Get a shell variable value and define it as an alias.
- `/control/getVal <alias_name> <UI_command> <index>`
  - Get the current value of the UI command and define it as an alias.
  - <index> is the index of the parameter to take if the command has more than one parameters.
- `/control/add <alias_name> <val_1> <val_2>`
- `/control/subtract <alias_name> <val_1> <val_2>`
- `/control/multiply <alias_name> <val_1> <val_2>`
- `/control/divide <alias_name> <val_1> <val_2>`
- `/control/reminder <alias_name> <val_1> <val_2>`
  - *<val_1> and/or <val_2>* can be aliases.
  - If *<alias_name>* already exists, value is overwritten.

Some other useful UI commands

- /control/if *<val_1> <comp> <val_2> <macro_file>*
  - *<comp> can be > >= < <= == !=*
  - *<val_1>, <val_2> can be alias.*
- /control/strif *<str_1> <comp> <str_2> <macro_file>*
  - *<comp> can be == !=*
  - *<str_1>, <str_2> can be alias*
  - *E.g.*
    /control/getVal particleName /gun/particle
    /control/strif {particleName} == proton myProtonMacro.mac
- /control/ifBatch *<macro_file>*
- /control/ifInteractive *<macro_file>*
  - *E.g. /control/ifInteractive vis.mac*

Embedded macro file feature (new in version 11.4 to be released in December 2025) can be used here

```
/control/ifBatch @@
        /.../...
        /.../...
/control/endRecord
```

Some other useful UI commands

- Similar to the commands in the previous page, but take a UI command rather than a macro file name
  - /control/doif *<val_1> <comp> <val_2> <UI_command>*
  - /control/strdoif *<str_1> <comp> <str_2> <UI_command>*
  - /control/doifBatch *<UI_command>*
  - /control/doifInteractive *<UI_command>*

- /control/useDoublePrecision
  - Use double precision for printing out the current parameter value.
- ?*UIcommand* - show current parameter values of the command

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Batch mode / interactive mode

- In your *main()*

```
int main(int argc, char** argv)
{
      …
  if (argc != 1)
   { // batch mode
     G4String command = "/control/execute ";
     G4String fileName = argv[1];
     UImanager->ApplyCommand(command+fileName);
   }
  else
   {  // interactive mode : define UI session
     G4UIExecutive* ui = new G4UIExecutive(argc, argv);
     ui->SessionStart();
     delete ui;
   }
```