Progress with B & E Examples Work Plan

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Outline

- Status of Coding Guidelines and Macro Review
- Clang tools
- Status of Work Plan Items

Coding Guidelines

- Defined in 2011, **updated in 2021**
  - **Version 2.1** (at the new Geant4 web site)
- Following the coding guidelines is requested when adding a new example
  - Most of the guidelines are checked semi-automatically
- The list of violators (examples files) of naming conventions was moved from the wiki page in GitLab as an issue:
  - https://gitlab.cern.ch/geant4/geant4-dev/-/issues/144
  - Direct notification of the authors, links to MRs with fixes -
- Further improvements can be achieved using clang-format, clang-tidy
  - The possible benefits and progress are discussed on the next slides

Coding Guidelines Update - Reminder

- Name conventions
  - 1. **Class names** are defined within **a single namespace**, specific to each example. Eg. B1, B2, etc. for the basic examples.
    - Class names without a namespace can be still defined in the categories where this convention is already in use.*
- Coding rules
  - 1. Declare **overriding virtual functions** in the header files with keyword **override**.
  - 2. **Initialize class data members** using default member initializer **in the class definition (.hh)**. Both initialization with braces or assignment are possible. This prevents from use of uninitialized values.
  - 4. The **UI commands** defined in the example should be used in the cdash test macro(s) **as much as possible**.

Coding Guidelines Update – Reminder - 2

- Style rules
  - 1. **Avoid using long lines** (more than **100** characters) where possible.

- Documentation
  - 4. All macros provided with the example should be documented in `README`.

Clang Tools: clang-format

- https://clang.llvm.org/docs/ClangFormat.html
- Tool for formatting code, configurable formatting style
- Can enforce some guidelines which we have already in place: long lines, tabulation
- Cannot be applied for a subset of features only, eg. just for our guidelines
- The configuration for Geant4 source code (.clang-format file in the top geant4 directory) is discussed at Gitlab Issue #97
  - Most of updates discussed here were already merged in master
  - Milestone: 11.1.0 release

examples/.clang-format ?

- For the time being I see just one option, "IncludeCategories", that we need to set different for the examples:

    - **The ordering of includes** defined for Geant4 source code puts the highest priority to G4* classes

    - In examples, we prefer to include the example classes first, before the G4 classes (to avoid implicit includes from G4 classes), however most of examples do not use a specific prefix

- Unfortunately clang-format does not allow to override just one option

    - We would need to include the complete file with a redefined rule

Clang-tidy

- https://clang.llvm.org/extra/clang-tidy/
- Tool providing an extensible framework for diagnosing and fixing typical programming errors, like style violations, interface misuse, or bugs that can be deduced via static analysis.
- Presented by Ben Morgan at the last Collaboration Meeting (slides)
- The checks can be defined via `.clang-tidy` configuration file or can be applied one by one
- The list of recommended checks was discussed at Gitlab Issue #94 and the agreed lists of checks are now included in the Geant4 Coding Guidelines document
- All these checks were applied **in all basic examples**
- We can encourage the examples developers to go on also with the extended examples

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- New examples:
  - Biasing: DXTRAN (MCNP-like option), occurrence interaction of charged particles
  - Hadronic: example for monitoring particle fluences - DONE
  - Parameterisation: gflash example for sampling calorimeter (all existing examples show usage in homogeneous media) – in progress
  - Polarisation: new Pol02 example
  - RunAndEvent: example for sub-event parallelism
  - Medical/dna examples:
    - molecularDNA: validation and development with protons and He4 ions
    - example for the RBE/LET calculation
    - example for microdosimetry: calculation of microdosimetry spectra in a cylindrical domain at the specific water depth imitating silicon detector (in the existing example there is randomly placed spherical volume)
    - example for radio-biology
    - example for ultra-high dose rate

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- Existing examples improvements (cont.):

  - *Biasing*: Resolve the overlap in biasing B02/B03 and GB03 examples which implement the same use case.

  - *Electromagnetic & Hadronic*: updating selected examples with usage of G4Accumulable.

  - *Errorpropagation*: Porting Geant4e to MT.

  - *Medical*: Extend the DICOM reader with the RT Dose format.

  - *Medical/dna*:

    - Try to include new cross-sections for gas materials in the already existing icsd example

    - Add the possibility to use the SBS method in the medical/dna/scavenger example.

    - DNA damage in plasmids with IRT – Example dnadamage2 ready for submitting

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- Code review:
  - Continue with the macros and tests review: make sure that provided macros cover all commands implemented in example and the cdash test covers all important example use cases. - In progress: This year DONE for biasing examples

- Coding guidelines:
  - Review the status and update the table on the Wiki page - DONE

  - Finish the examples not yet completed (dicomReader) – The classes use 'the' prefix for data member instead of 'f'; can be excluded from checking.