

The background of the slide features a high-resolution image of the Earth from space, showing the Western Hemisphere with North and South America visible. A vertical line divides the image in half. To the right of this line, a complex network of colorful, glowing lines (in shades of blue, green, and orange) spirals inward, resembling a stylized representation of orbital paths or data flow. The entire scene is set against a dark, starry space background with small white crosses marking specific points.

# arm

## WG5 / J3 Joint Meeting 12<sup>th</sup> – 16<sup>th</sup> June 2023

Manchester, UK

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# Fortran standards



- + From June 12 to June 16, Arm Manchester hosted the annual meeting of the ISO (International Organization for Standardization) WG5 committee.
  - WG5 (or JTC1/SC22/WG5) is part of the ISO and International Electrotechnical Commission's ([IEC](#)) Joint Technical Committee ([JTC1](#)) responsible for the development of international standards for Information Technology, including programming languages.
  - WG5 is responsible for the production and maintenance of the Fortran language standard.
  - populated by subject matter experts nominated by their respective national bodies (BSI in the case of the UK)
  - includes representatives from industry and academia, including compiler developers, users and other interested parties.
- + **Arm** has several staff members on the committee, and members of the UK Panel, and is also a member of the US standards body INCITS, and the US Fortran Committee\*
- + Many familiar names in silicon, and software, for server and High Performance Compute (HPC) are represented on the Committee, including: Intel; NVIDIA; IBM; and Arm.
- + WG5 meets on an **annual** basis in a **joint meeting with INCITS/Fortran**.
- + This meeting is an important step in the development and publication of each new standard
  - corrigenda for existing standards are approved
  - responses from the individual country bodies are addressed
  - feature set for future standards are debated and voted.
- + Fortran remains the backbone of a lot of numerical modelling in the HPC-dominated fields of scientific research. Codebases have typically evolved over decades to meet new modelling challenges, exploit the dramatic growth in leadership class HPC, leverage new HPC architectures and technologies, and integrate better with a complex research-software ecosystem that has seen the growth of other languages.

\* now called "INCITS/Fortran", formerly PL22.3, but referred to, almost universally, by the name of an even older incarnation - "J3"



# Arm Manchester



- + From June 12 to June 16, **Arm Manchester** hosted the annual meeting of WG5 & INCITES/Fortran committees
- + The first “in person” meeting since 2019 (Arm Manchester was originally planning to host in 2020)
- + **Arm Manchester** is Arm’s 2<sup>nd</sup> largest UK office
  - A Northern hub to complement Arm’s Global HQ in Cambridge
- + Approx. 400 staff based at 11 Portland Street, near Piccadilly Gardens, in central Manchester
- + Manchester office includes teams working on toolchain and library development for cloud and HPC applications:
  - Compilers
    - + Arm Compiler for Linux – LLVM based C, C++ and **Fortran** toolchain
    - + Upstream LLVM
    - + Upstream GCC
    - + ...and more.
  - Libraries
    - + Arm Performance Libraries (“vendor” BLAS libs, FFT, sparse etc.)
    - + Arm Optimized Routines (optimized math.h implementations)
    - + ...and more.

# Progress

## + The main tasks for the meeting were:

- address any interpretations, edits, and comments from national bodies (and the ISO Secretariat) on the Fortran 2023 Draft International Standard (DIS);
- agree a worklist for the next iteration of the standard - Fortran 202Y (where Y = 8, probably).

## + Progress on both fronts.

- Most of the work needed to move from DIS to a Final DIS (FDIS) was completed.
  - + some outstanding issues meeting the requirements from the ISO secretariat
  - + these were resolved in the weeks that followed the meeting when ISO approved a waiver.
- Strategic plan approved to deliver the 2023 standard by the end of the year

# Progress

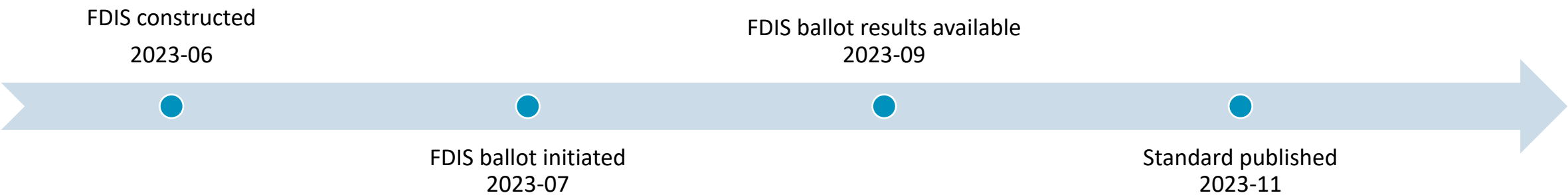
- ✦ The worklist for F202Y was drafted and will be finalized at the next WG5 in 2024.
  - It includes some clear 'crowd pleasers':
    - Implicit typing (of "God is real, unless declared integer" fame) could be marked as obsolete
      - <https://j3-fortran.org/doc/year/23/23-177.txt>
      - *note: it will still be supported, but compilers will be expected to generate appropriate warnings on its use!*
    - Generics is making significant progress with broad agreement over the requirements and a workable syntax mapped out.
      - Requirements: <https://j3-fortran.org/doc/year/23/23-103r1.txt>
      - Proposed syntax: <https://j3-fortran.org/doc/year/23/23-102r5.txt>
      - Examples, usecases, discussion and notes: <https://github.com/j3-fortran/generics>
      - There are several additional use cases to be covered, as well as some corner cases and loopholes to deal with.
      - Quite verbose, thanks in part to the adoption of 'strong concepts' and explicit instantiation.
      - The result will, **hopefully**, be robust and amenable to compile-time checking.
      - Could be described as "Fortranic"!
      - A push to include a more lightweight source form, to cover some common simple use cases for generics.

# Progress

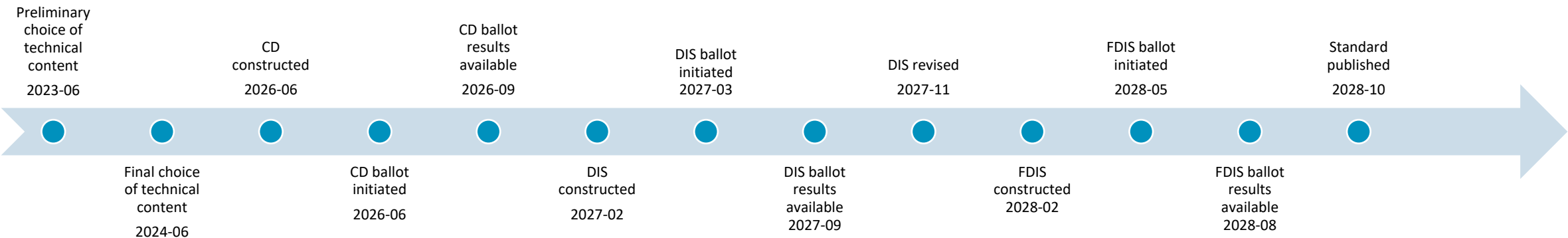
- ✦ There are also a few topics that have a lot of potential, but with plenty to work out still:
  - Asynchronous tasking
    - <https://j3-fortran.org/doc/year/23/23-174.pdf>
  - A Fortran pre-processor
    - <https://j3-fortran.org/doc/year/23/23-192r1.txt>
  - Ability to define the default kinds from within a program unit
    - <https://j3-fortran.org/doc/year/23/23-199r1.txt>
- ✦ ...and several requirements to keep pace with changes to the C and IEEE-754 standards.

# Strategic plans

## Fortran 2023



## Fortran 202Y



# Future meetings

- + INCITS/Fortran (<https://j3-fortran.org/doc/meeting>)
  - #231 - October 16 - 20, 2023, College Park, MD, USA
  - #232 - February 26 - March 1, 2024, Berkeley, CA, USA
  - #232 - June 24 - 28, 2024, Berkeley, CA, USA
- + WG5 (<https://wg5-fortran.org/meetings.html>)
  - June 24 - 28, 2024, Berkeley, CA, USA



# More information

- ✦ The minutes for the WG5 meeting are available from [wg5-fortran.org](http://wg5-fortran.org):
  - [ISO/IEC JTC1/SC22/N2226](#);
  - resolutions are available here: [ISO/IEC JTC1/SC22/N2225](#);
  - strategic plan is available here: [ISO/IEC JTC1/SC22/N2220](#)
- ✦ The Final Draft International Standard (FDIS), issued as ISO/IEC JTC1/SC22/N2218, is not a public document.



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