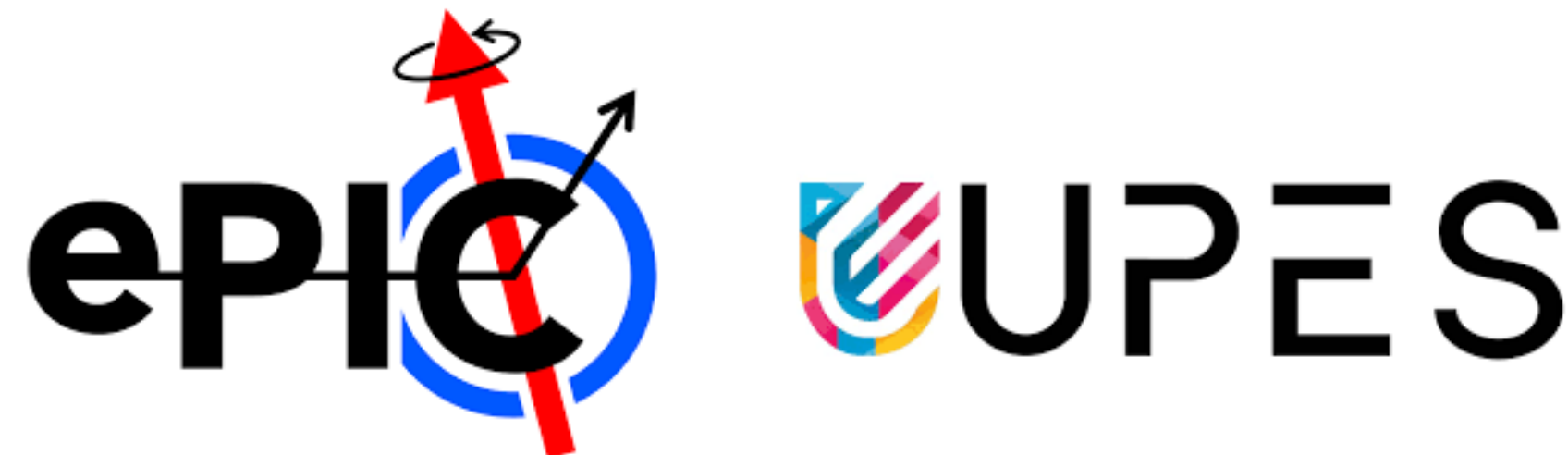# Distributed Computing Software Development at EIC/ePIC

Dr. Vipin Gaur

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RANKED AMONGST TOP 100 UNIVERSITIES IN INDIA

| RANKED AMONGST TOP 25 INSTITUTIONS IN LAW | RANKED AMONGST TOP 50 INSTITUTIONS IN MANAGEMENT | RANKED AMONGST TOP 100 INSTITUTIONS IN ENGINEERING |

by nirf ranking 2021

School for Life

18+ Years of Legacy

UGC, NAAC (A), NBA and IACBE Accredited

8 Schools

1.2 Million Sqft built up campus in Dehradun

140+ Programs
UG: 78 I PG: 41 I Integrated: 13 I Ph.D.: 18

12204 Fulltime Students
In State: **18%**
Out of State: **82%**

746 Faculty Members

300+ Patents
(Published)

150+ Funded Research Projects

8 SCHOOLS

- ENGINEERING
- DESIGN
- LAW
- MODERN MEDIA
- COMPUTER SCIENCE
- BUSINESS
- HEALTH SCIENCES
- LIBERAL STUDIES

4

2

Experience

- Associate Professor at UPES (present): ~2.5 years

- Research Scientist at Virginia Tech (USA) and High Energy Accelerator Research Organization/KEK (Japan): ~5.5 years

- Post Doctoral Fellow at Tata Institute of Fundamental Research (India): 3 years

Projects:

- Serving as an Institutional Representative for Belle & Belle II projects at KEK

- Serving as an Institutional Representative for FCC project at CERN

Dr. Vipin Gaur

Students

Following 4 students have expressed interest to contribute to the Distributed Computing software development for ePIC

Subhangi

Purvika

- BS CS 4th year

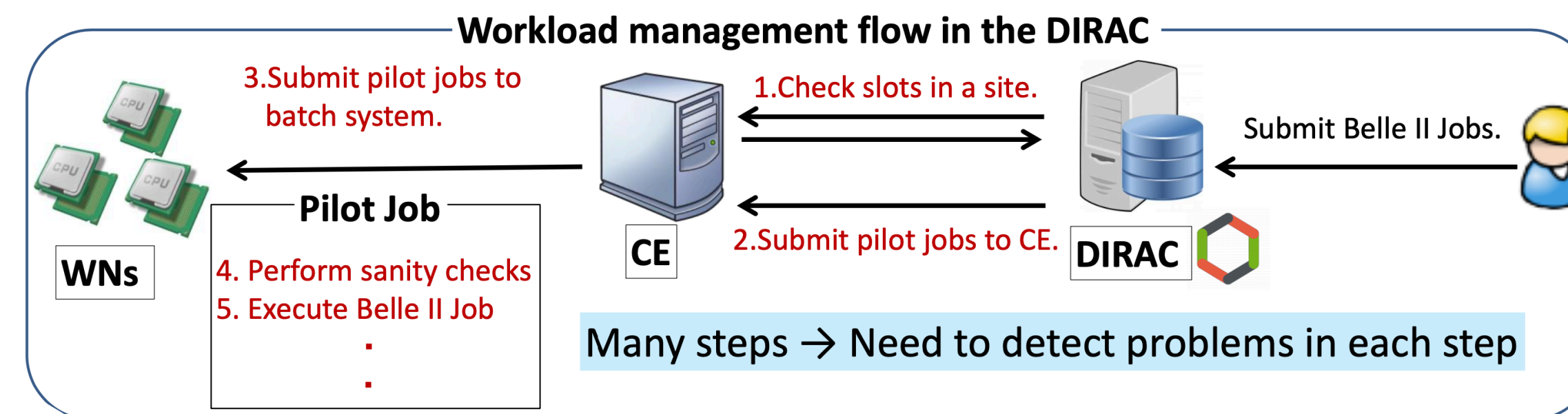- Specialization: AI ML

Abhishek

Hassan

- BS CS 4th year

- Specialization: DevOps

- To translate the collisions inside the ePIC into physics results, the information obtained by each component of the detector will be stored and processed

- The computing system plays a key role for the success of the experiment, management of the data that can easily be accessed and analyzed by the researchers

- The ePIC computing system is expected to manage the processing of massive raw data, production of copious simulation as well as many concurrent user analysis jobs

- In order to process these large-scale data and provide the physics results in a timely fashion, ePIC has adopted existing distributed GRID computing technology

○ We can have a distributed system that can use resources in computing centers located in the different participating countries and takes advantage of both modern Grid and Cloud computing techniques, connecting the computing resources of collaborating institutes in the world via high speed networks

○ All this can be achieved with an interware which is a GRID solution that exploits distributed heterogeneous resources including Grids, Clouds, HPCs and Batch systems

○ In Belle II, UPES is one of the top contributor to the development of this distributed computing software "BelleDIRAC" which is a flavor of CERN DIRAC (Distributed Infrastructure with Remote Agent Control)

- We have a good command over Distributed Computing software development:

  - In 2023 two of my students Manikantan and Neel got selected for MS CS/PhD CS respectively at the North Eastern University (Boston) and New Jersey Institute of Technology

  - In 2024 my student Aarushi has been selected for MS CS at University of Southern California, Arizona State University and North Eastern University

- Our experience with BelleDIRAC will be useful for ePIC

- The GRID operations are complicated:

Workload management flow in the DIRAC

3.Submit pilot jobs to batch system.

1.Check slots in a site.

Submit Belle II Jobs.

Pilot Job
4. Perform sanity checks
5. Execute Belle II Job

WNs

CE 2.Submit pilot jobs to CE. **DIRAC**

Many steps → Need to detect problems in each step

- Any failure requires an immediate intervention from software developers in order to provide physics results in a timely manner and we are ready for it

- UPES is registered in the EICUG and my students have joined the Production WG to assist with simulation campaigns

- In future, I also plan to establish an ePIC GRID computing facility at UPES, based on my experience with the installation and operations of the Belle II GRID computing facility at UPES