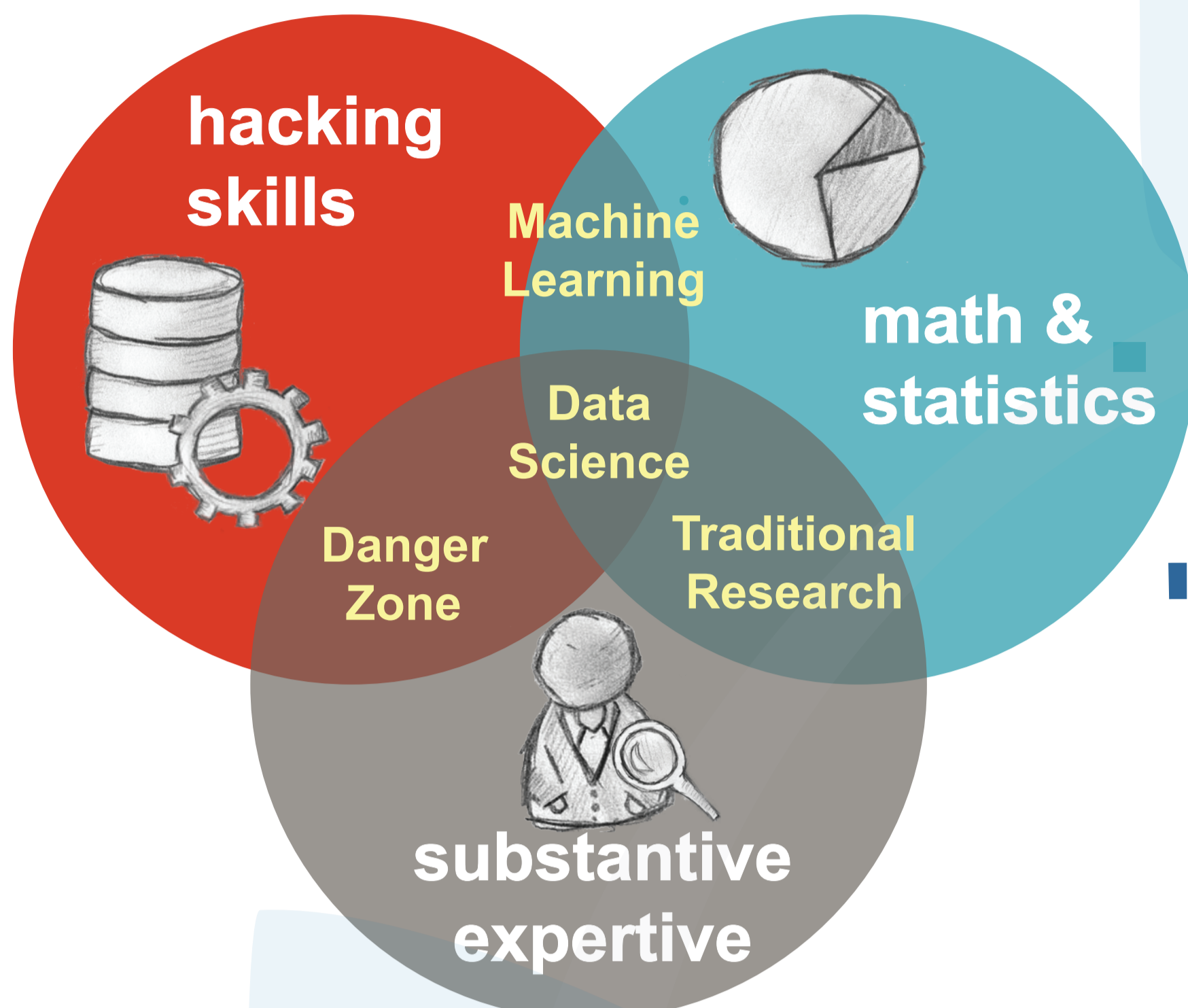


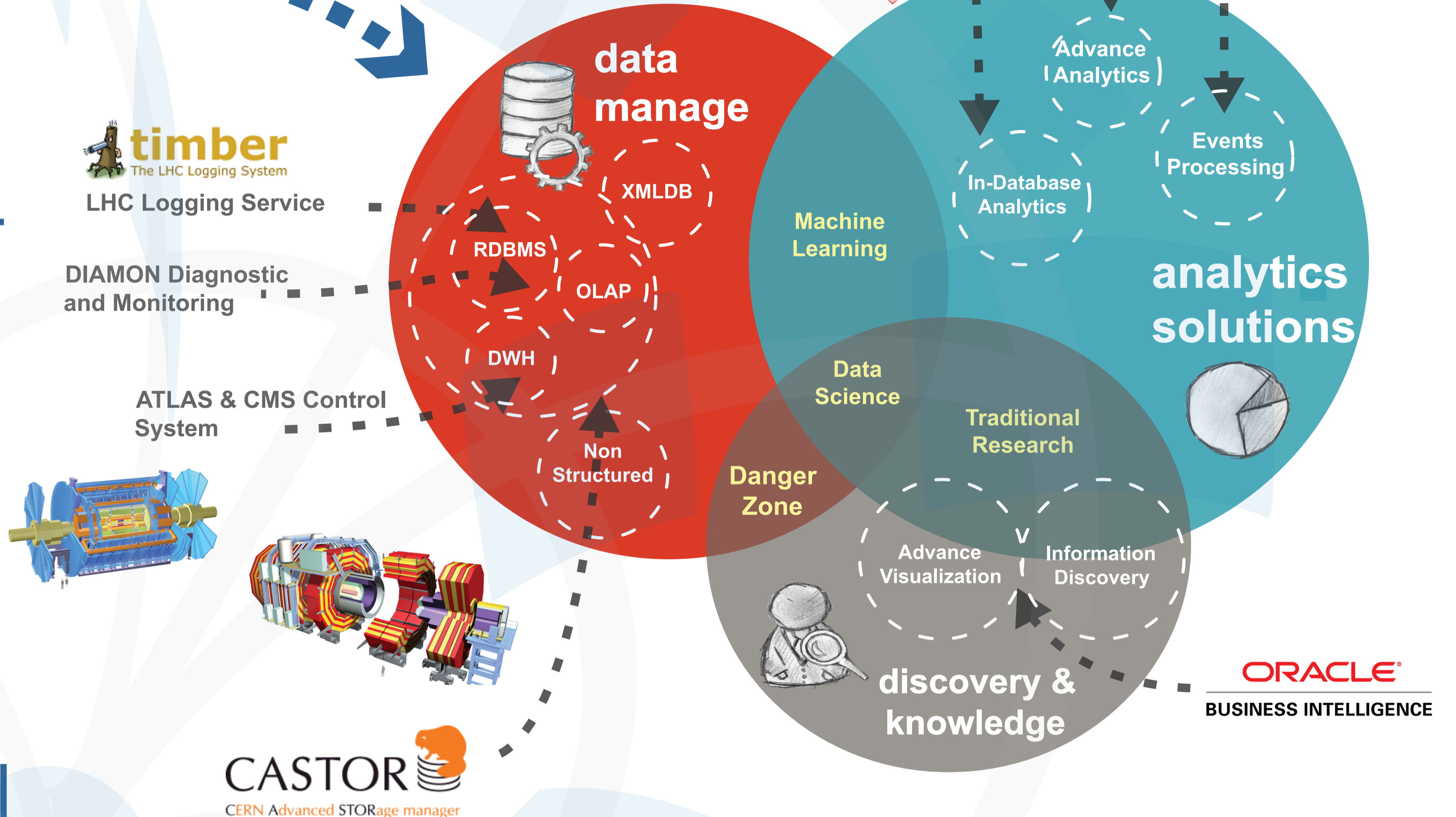
### The openlab Data Analytics Project

During the past decades, CERN has been gathering and storing an enormous amount of data. This process is costly in terms of technical and human resources. However, the exploitation of the collected data, in other words, the extraction of potential benefits from our data investments, has been pushed into the background or placed on the bottom of our priorities. **Data is the new soil** and it requires nurturing, enriching and managing. This requires additional efforts, but it is clear that those efforts will **generate important value**. The openlab data analytics project aims to change the situation and demonstrates that small investments in data analytics can lead to big benefits.



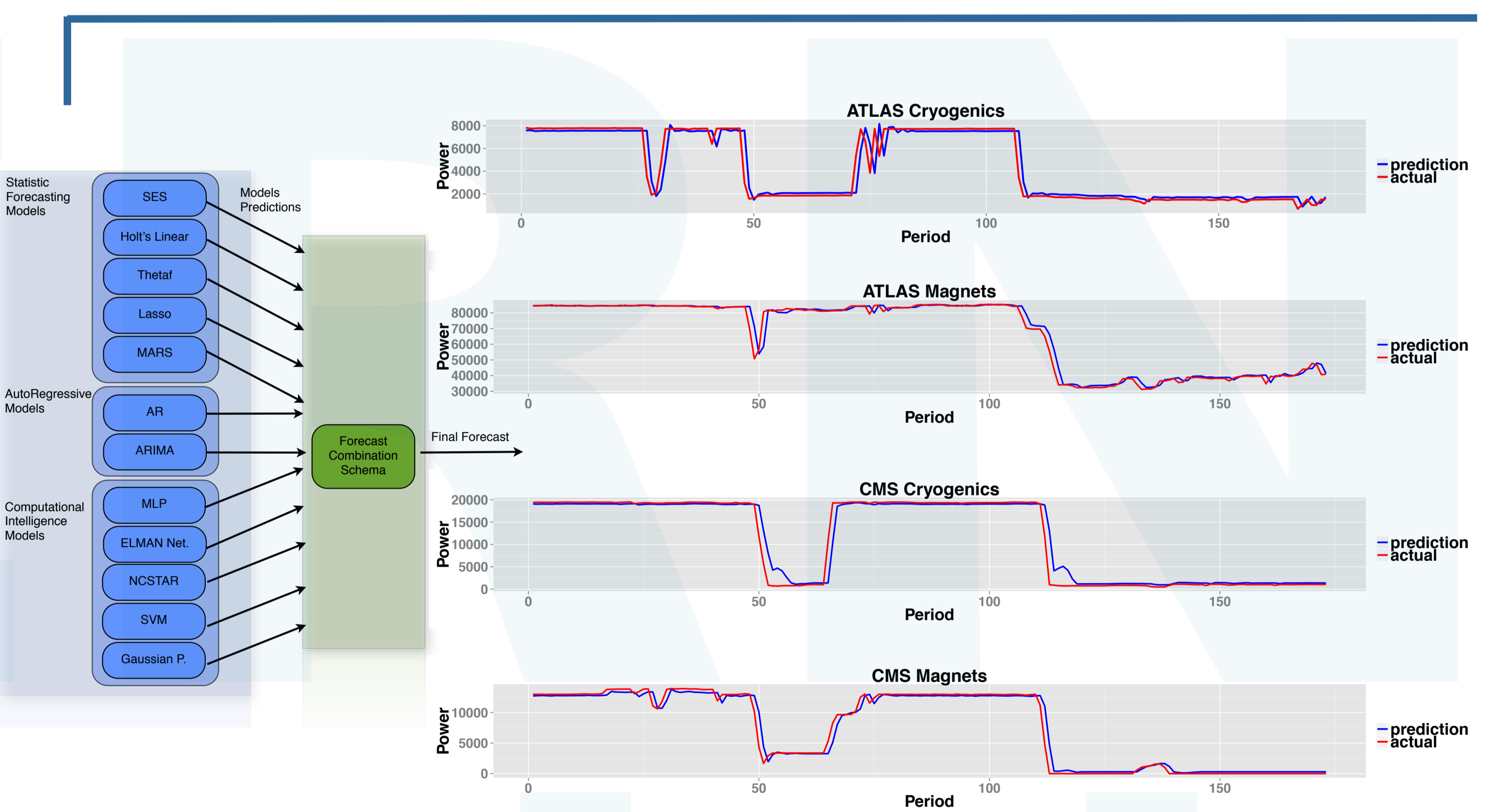
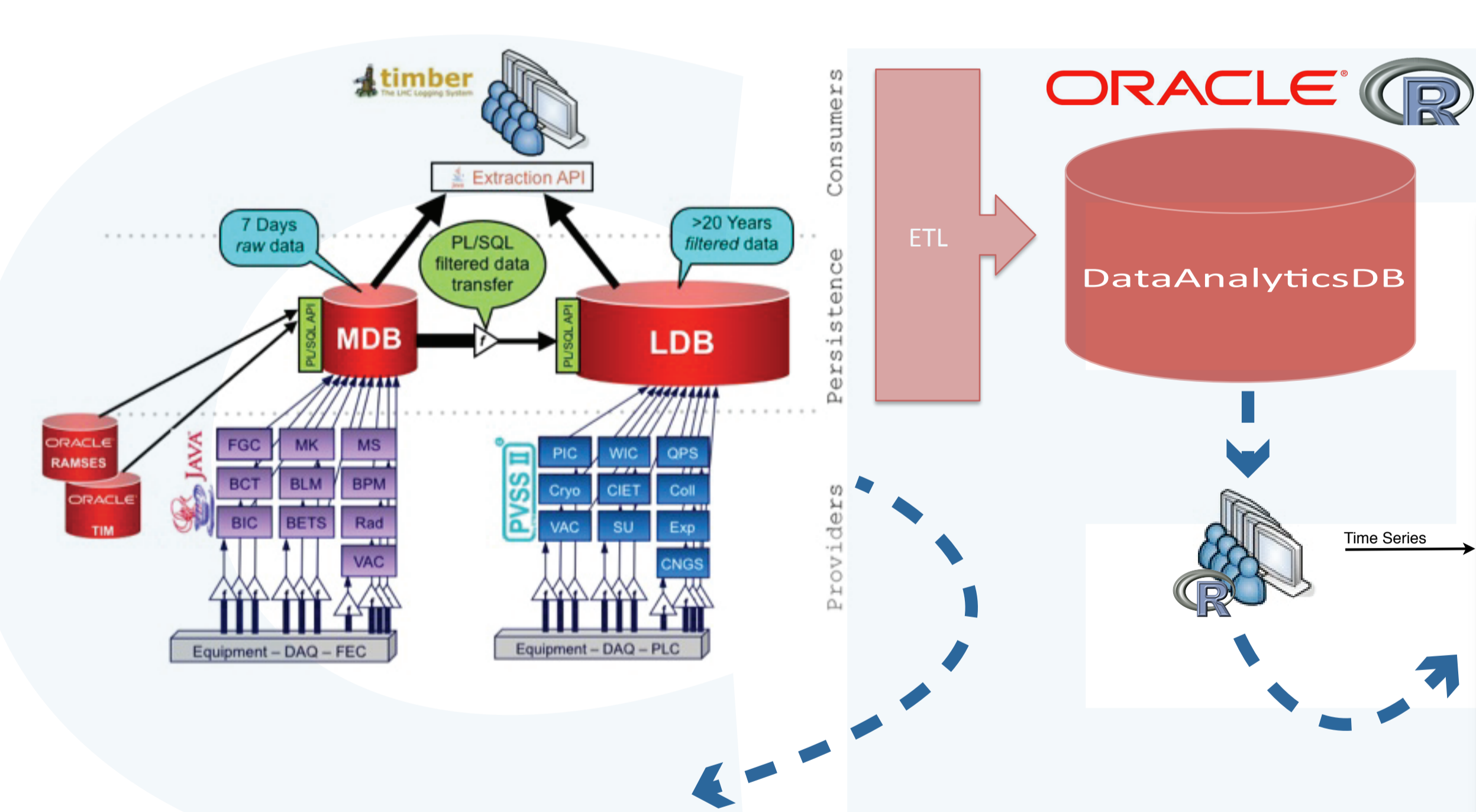
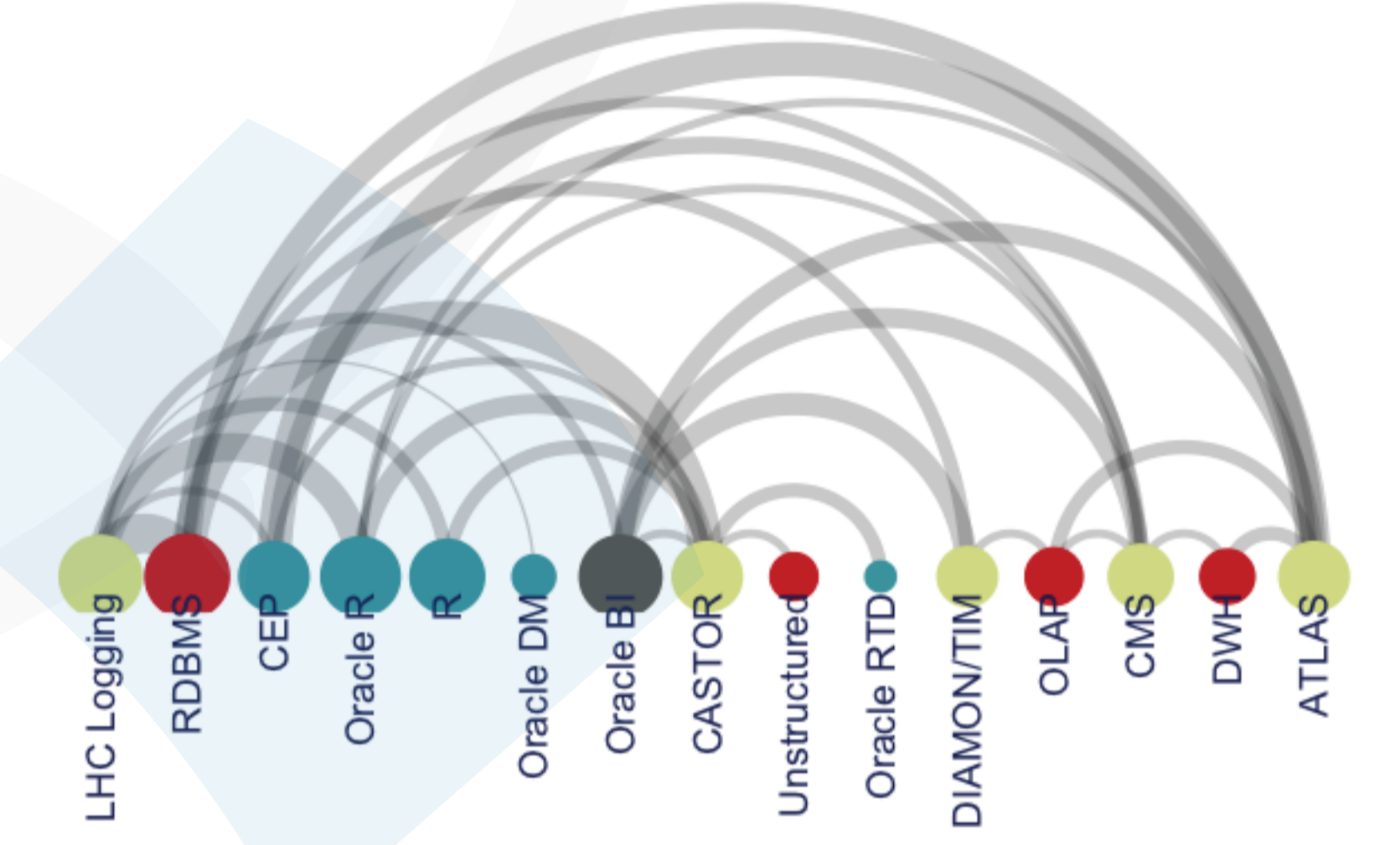
### Data Science and CERN Analytic Environment

- Beams Department:** Diagnostic and Monitoring system (DIAMON). Status and key performance indicators analysis for the LHC control infrastructure.
- Information Technology:** CERN Advanced STORAGE Manager (CASTOR) Forecasting system evolution for preventing potential incidents by spotting trends and patterns in historical data.
- CMS Experiment:** Automated high voltage trip recovery. Analysis of Complex Event Processing (CEP) conclusions.
- ATLAS Experiment:** Real time monitoring and anomaly detection. Analysis of CEP output data.
- LHC Logging Service:** Complex in-database time series analysis and forecasting. Oracle R Enterprise for in-database analytics.



### Using Oracle advanced analytics to forecast CERN Accelerators power consumption

Power consumption forecast has become one of the major research fields in electrical engineering. Forecasting the CERN accelerators complex power consumption is **extremely challenging** due to the **high complexity** and variety of the underlying processes but also **critical given the high level** of consumption, around 1000 GWh. The CERN Electrical Network Supervisor acquires thousands measures per minute for all the subsystems that conform the CERN accelerators complex. Later it stores them in the **CERN Accelerator Logging Service** where the data is persisted in Oracle RAC. Within this context, we demonstrate the importance of performing in-database analytics and how **Oracle Advanced Analytics** has made that possible.



Results obtained for power consumption forecasting for ATLAS and CMS magnets and cryogenic systems. Last block test set approach was applied with 20% of the data which represents a forecast horizon of 173 days.

