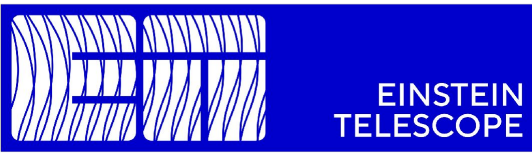


ET cost exercise

EIB Working Group on Computing cost estimation

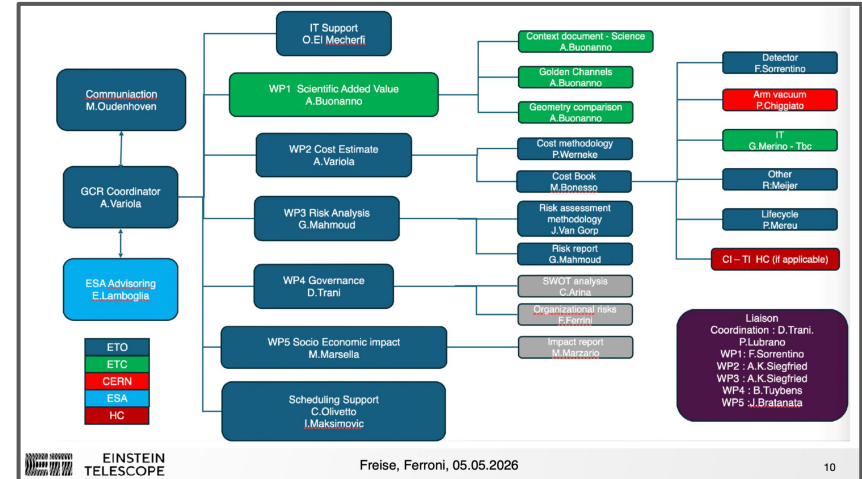


ET computing cost estimate to be done in the context of the ETO Geometry Comparison Report project.

Slides from the “News from ETO” plenary yesterday

GCR - Overview

- The BGR has tasked ETO with delivering a Geometry Comparison Report (GCR).
- ETO has organised the Geometry Comparison Report activity as a project, and work package leaders have been assigned.
- The full list of tasks, deliverables and milestones are organised in a detailed and complete Work Breakdown Structure.
- Engagement with stakeholders, especially the ET Collaboration and the ET Host Consortia has been a key aspect of the planning from the beginning.



Background

- Cost of computing systems driven by
 - Hardware: servers, CPU/GPU, storage, networks ...
 - Electricity consumption can be derived/modelled from hardware capacity
 - People: software development & operation
- We can now build on D8.1 & D8.2 - Computing and Data Requirements & Model
 - Estimations derived from analogies with LVK
 - Simple extrapolations (e.g. x1000 more events) don't work
 - Need to make assumptions with LARGE uncertainties
 - e.g. algorithmic speedup factor of 100 - currently demonstrated at the individual algorithm level, assume they can be successfully applied to the entire end-to-end workflow.

D8.2 - hardware estimates



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	Minimal Scenario	Operational Safety Margin
Operations Storage buffer (TB)	800	1600
Long-term storage (PB)	10	20
CPU Cores	2150	6450
RAM (GB)	6300	18900
Network (per site)	100 Gb/s	2 * 100 Gb/s

Table 4.2: Baseline On-site computing requirements per ET interferometer, required to support the Detector operations workflows. Network requirements are given per ET site.

Storage	Negligible (Streaming data)
CPU (MHS06)	4
Latency	< 10s

Table 4.3: Baseline Rapid GW Alert computing requirements.

Custodial storage	2 * 10 PB / ET interferometer / year
CPU (MHS06)	0.6
RAM (GB)	2 GB/core
Throughput to WNs	25 kbps/core

Table 4.4: Baseline Offline computing requirements needed to support the Offline analysis workflows of the ET Collaboration.

D8.2 - Personnel estimates



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Activity	FTEs	Description
On-site computing	4 (per site)	Dedicated personnel based on-site
Core Software Engineering team	4	CI/CD, runtime environment, release management, etc.
Software Framework	4	Framework and core software librarians
Core Infrastructure team	3	Provision the computing platform for ET services
Coordination team	2	Dedicated management team responsible for overall planning and measuring performance (DORA) metrics
Chief Information Security Officer(s)	2	Dedicated security officers
Identity and Access Management	2	IAM and ETMD service DevOps
Data streaming service	2	Service DevOps
GW Event & Alert services	4	Service DevOps
Distributed Data service	2	Service DevOps
Data archival	1	Data archival service and archival site liaisons
Conditions database	1	DQSegDB service DevOps
WMS, accounting and monitoring	2	DevOps for WMS, accounting and monitoring, and ACS services
ET Computing Support team	2	Training, documentation, user support
Open Science support team	6	Data and software curation; websites and training materials, etc.

Table 8.1: Personnel requirement estimates for ET Computing.

Product Breakdown Structure



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Evolution from the PBS from 2023 to be used as a skeleton for the cost estimation

PBS Level	PBS Code	System / Sub-system / Component
1	1	On-Site Computing
1	2	Rapid GW Alert System
1	3	Offline Science Computing
1	4	Data Management & Storage
1	5	Distributed Computing Services & Middleware
1	6	Software Infrastructure & Engineering
1	7	Collaboration e-Infrastructure & Support

Product Breakdown Structure



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PBS Level	PBS Code	System / Sub-system / Component
1		1 On-Site Computing
2	1.1	Data Acquisition & Detector Control
2	1.2	Real-Time Calibration & Data Quality
2	1.3	On-Site Data Transfer & Network
2	1.4	On-Site Computing Operations (Personnel)
1		2 Rapid GW Alert System
2	2.1	Rapid Alert compute cluster
2	2.2	Search Pipelines Software
2	2.3	GW Event Database & Event Manager Service
2	2.4	Event Enrichment & Parameter Estimation Pipeline Software
2	2.5	Alert Distribution Infrastructure
2	2.6	Rapid Alert System Operations (Personnel)
1		3 Offline Science Computing
2	3.1	Offline computing resource pledges
2	3.2	Simulation & Mock Data Challenge (MDC) Software
2	3.3	Interactive analysis facility (ET Analysis Portal)
1		4 Data Management & Storage
2	4.1	RAW data archival on-site
2	4.2	Raw data archival distributed copy
2	4.3	Time-Critical Data Streaming Framework
2	4.4	Distributed Data Management (Data Lake)
2	4.5	Software distribution system (CVMFS-like)
2	4.4	Open Science Data Service
2	4.5	Data Management Operations (Personnel)
1		5 Distributed Computing Services & Middleware
2	5.1	Workload Management System (WMS)
2	5.2	Inter-Site Network Services
2	5.3	Middleware & Infrastructure Operations (Personnel)
1		6 Software Infrastructure & Engineering
2	6.1	Software Framework & Common Libraries
2	6.3	Software Engineering Operations (Personnel)
1		7 Collaboration e-Infrastructure & Support
2	7.1	Communication & Collaboration Services
2	7.2	Software development & CI/CD Infrastructure
2	7.3	User Support & Training Infrastructure
2	7.4	Governance & Coordination Tools
2	7.5	Collaboration Support Operations (Personnel)
2	7.6	Identity & Access Management (IAM)
2	7.7	Cybersecurity operations service