

Trip Report: ACAT 2016

Enric Tejedor

EP-SFT meeting, 29/02/2016



Acknowledgements

- Thanks to **Pere**, **Lorenzo** and **Andrei** for their feedback for the presentation

- West Chile (~100 km from Santiago)
- Major seaport



Source: Wikipedia

- Universidad Técnica Federico Santa María (UTFSM)
- Science & technology studies



Source: Wikipedia

- From the website:

“The 17th edition of ACAT aims to [...] bring together **computer science** researchers and practitioners, and researchers from **particle and nuclear physics, astronomy and astrophysics and accelerator science** to explore [...] **computing, automated data analysis** as well as **theoretical calculation technologies**.”



- 5 days, ~100 participants
- Plenary sessions + three tracks:
 - Computing Technology for Physics Research
 - Data Analysis – Algorithms and tools
 - Computations in Theoretical Physics

We'll focus on these two

- ROOT development Roadmap (plenary) – [Pere](#)
 - Current status, plans and ideas
 - Positive feedback: new interfaces, modularisation, notebooks
- Machine learning tools in ROOT – [Lorenzo](#)
 - TMVA redesign and latest developments: RMVA, PyMVA
- GeantV: from CPU to accelerators – [Andrei](#)
 - Status of the project and recent progress on coprocessors: XeonPhi and GPU
 - Positive feedback: GeantV demonstrator + generic interface to backends
- Data Mining as a Service – [Enric](#)
 - Interest for custom environment, caching of results
 - Volunteers for beta testing

- Grid & (HPC) cluster computing, distributed processing - Optimization
 - Data placement
 - Data caching
 - Scheduling
 - How to optimise app execution
 - How to detect anomalies, monitoring
 - **Main topic**
- Parallelisation
 - AthenaMT
 - Vectorisation in simulation: GeantV
 - Statistical analysis: GooFit (GPU)
 - **Few contributions**

- Machine learning, new analysis methods
 - Estimation of likelihood ratio
 - Re-weight distributions using BDTs
 - SVMs (to be integrated in TMVA)
 - **High presence**
- Online processing
 - Triggers: soft vs hard
 - Different strategies depending on experiment
 - **Deal with increased luminosity**
- Declarative syntax for analysis
 - `Events.SelectMany(jets)`
 - `.Where(|jet.eta| < 2.0)`
 - `.Do(hist.Fill(jet.pT));`

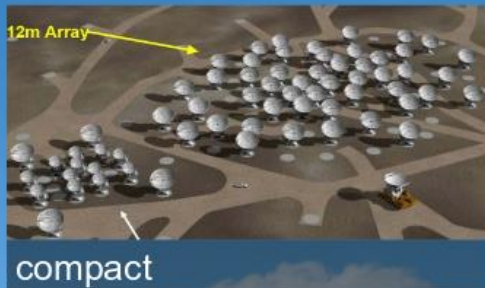


What is ALMA?

J. Ibsen



The Atacama Large Millimeter/sub-millimeter Array (ALMA) is an array composed of **66 antennas**, using ***aperture synthesis***, as a “zoom telescope” over the *entire accessible mm/submm* wavelength range



Built to operate
>30 yrs



Dark silicon

- Chip power will remain capped at current levels (because of cooling costs and known cooling technologies)
- Moore's law enables more transistors per unit area, but post Dennard scaling power per unit area increases
- Thus, **dark silicon**, i.e. not all areas can be simultaneously used, **becomes a necessity**
- **On-die dynamic power management** (voltage, frequency, clock, power) will be a necessity. For maximum performance and energy efficiency this may propagate up to the application level.

Remark 1. New technology has made it possible for voltage control to move onto the die, enabling increasingly refined control of subdomains of a die

Remark 2. Recent processor chips has a dedicated processor for power control, including control of voltage, frequency, power and clock distribution to subdomains of the chip.

- Workshop atmosphere
 - Medium number of participants
 - Many discussions
- Expected more talks about Cloud / service orientation
 - Most infrastructure talks were Grid or (HPC) cluster oriented
 - Few cloud efforts (usually hybrid setups)
 - Almost no containerised deployments
- Few approaches explore big data platforms
 - When mentioned, usually for non-physics analysis (system monitoring, processing of metadata)
- Machine learning hype has reached HEP as well
 - Discussion of analysis methods
- Parallelisation
 - Mainly in frameworks
 - Need to engage people!