MRI: Development of LHC AnalyNet: a Distributed Computing Instrument for the ATLAS and CMS Experiments of the LHC

*A joint NSF **proposal** of the US ATLAS and US CMS Institutions*

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Joint USATLAS & USCMS Meeting, OSG All Hands, Northwestern University
23 March 2015

LHC AnalyNet

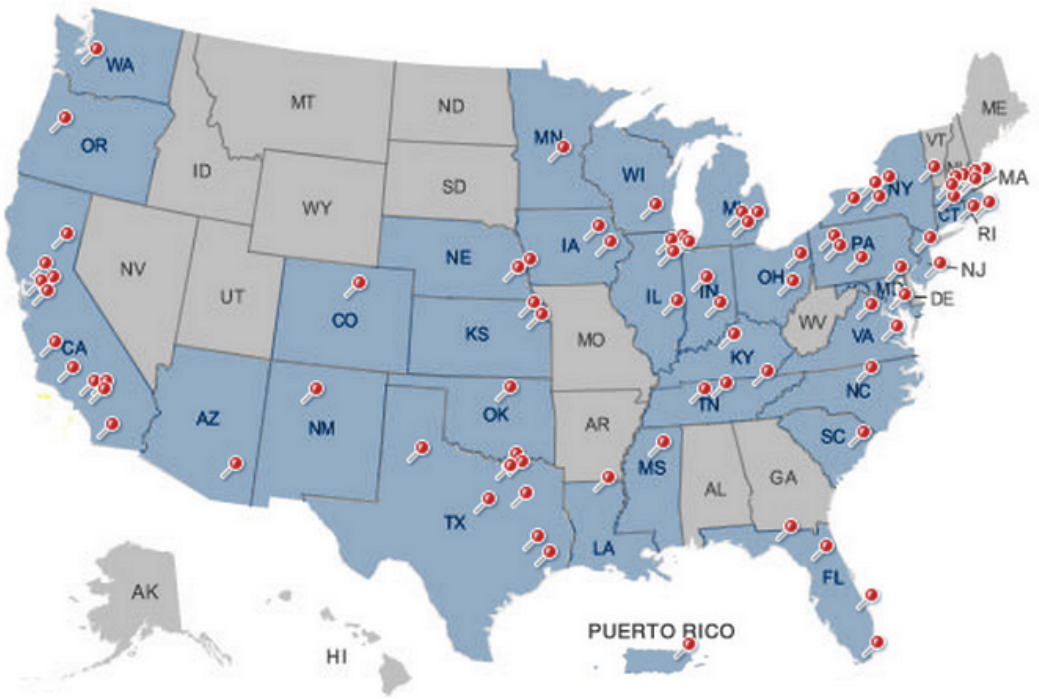
University of Chicago, Columbia University, New York University, Fresno State University, Michigan State University, Northern Illinois University, Stony Brook University, University of Washington, State University of New York-Buffalo, Cornell University, Florida International University, University of Kansas, University of Nebraska-Lincoln, Northeastern University, University of Notre Dame, Purdue University-Calumet, Rutgers University, Vanderbilt University, ***operated as a federated cyberinfrastructure***

MRI LHC AnalyNet - Essentials

- 18 NFS-funded universities in the US LHC program
  - 8 ATLAS, 10 CMS
  - $960k total ($150k Fresno overhead, $140 FTE, rest is equipment)
    - 30% of this is from university cost share
- MRI rules require a “development” proposal
  - “**single, well-integrated instrument**”
  - Advanced Cyberinfrastructure (ACI) design led by Chicago and UCSD

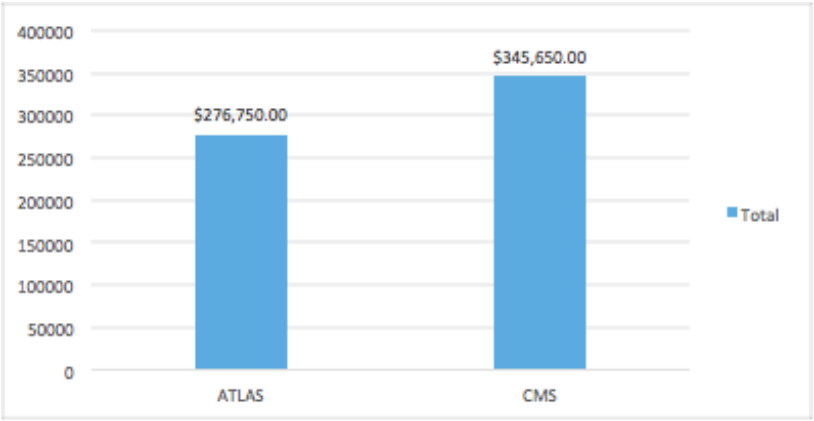
LHC AnalyNet and national ACI

If successful, LHC AnalyNet could be an analysis platform for 96 US LHC institutes



Equipment (e.g. US ATLAS)

Institute	Experimen	LRU	Disk (TB)2	Ideal Cost	NSF Share	University Cost Share	Fresno Overhead	Total
Chicago	ATLAS	2	80	$ 44,800.00	$ 31,360.00	$ 13,440.00	$ 10,000.00	$ 54,800.00
MSU	ATLAS	2	60	$ 43,100.00	$ 30,170.00	$ 12,930.00	$ 10,000.00	$ 53,100.00
Stony Brook	ATLAS	2	55	$ 42,675.00	$ 29,872.50	$ 12,802.50	$ 10,000.00	$ 52,675.00
UW	ATLAS	2	45	$ 41,825.00	$ 29,277.50	$ 12,547.50	$ 10,000.00	$ 51,825.00
NYU	ATLAS	2	40	$ 41,400.00	$ 28,980.00	$ 12,420.00	$ 10,000.00	$ 51,400.00
Columbia	ATLAS	1	30	$ 21,550.00	$ 15,085.00	$ 6,465.00	$ 6,034.00	$ 27,584.00
NIU	ATLAS	1	30	$ 21,550.00	$ 15,085.00	$ 6,465.00	$ 6,034.00	$ 27,584.00
Fresno	ATLAS	1	10	$ 19,850.00	$ 19,850.00	$ -	$ -	$ 19,850.00



Aggregate LHC AnalyNet capacity

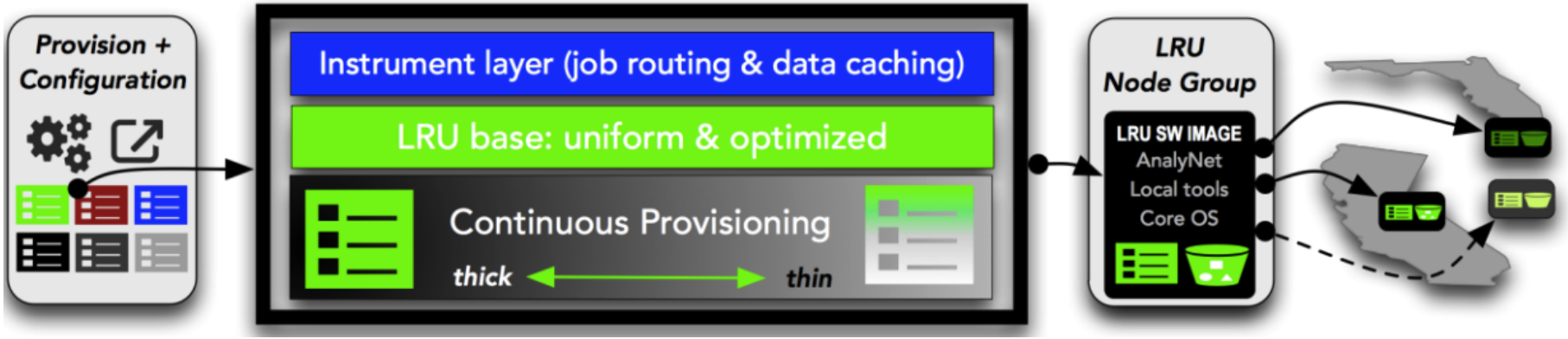
LRU (ATLAS+CMS)	29
Logical cores	3712
Storage TB (raw)	845

Development

- 0.5 FTE-year at Chicago and Notre Dame
- Two significant work areas:
  - Multi-site provisioning and configuration management
  - Job routing and Xrootd caching network
- Both heavily leverage external efforts
  - Provisioning: DevOps at Chicago and Notre Dame
  - Caching: AAA (CMS, OSG), FAX (ATLAS)
  - Job routing HTCondor (UW) and CI Connect (UC)

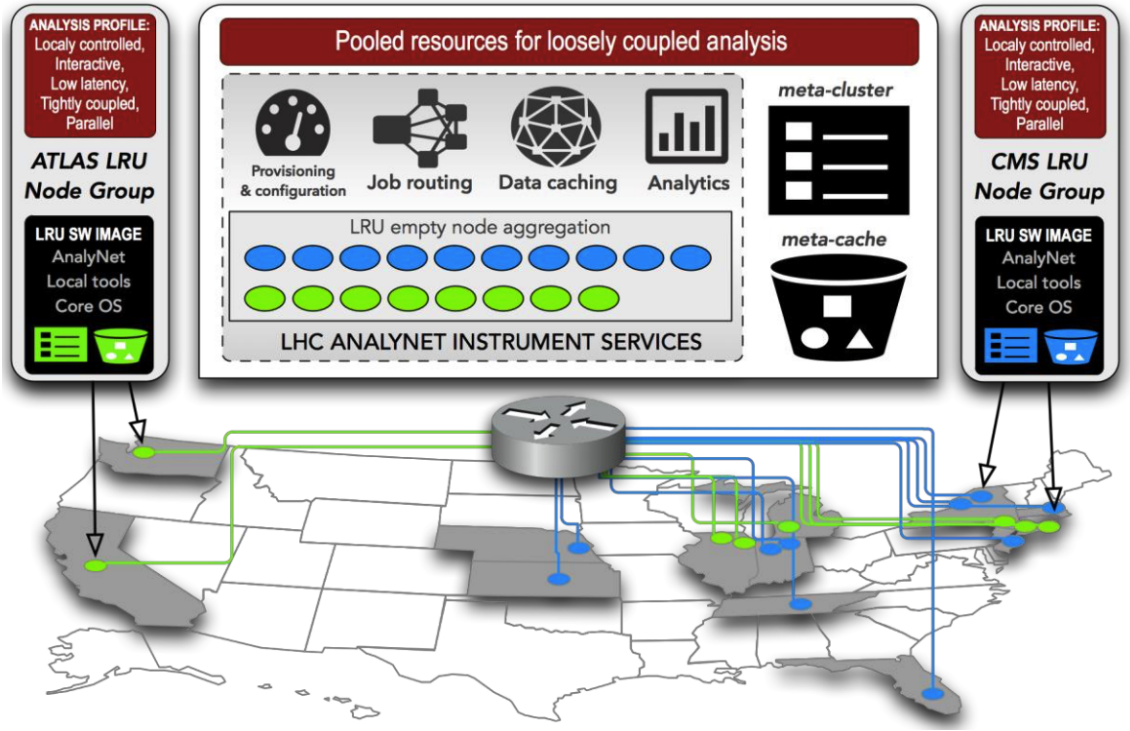
Wide area provisioning: novel!

- Centrally coorindated provisioning (images, configuration, services) to reduce labor cost (time) & increase uniformity
- Automated quick updates
- Flexible to adapt to existing config & build systems



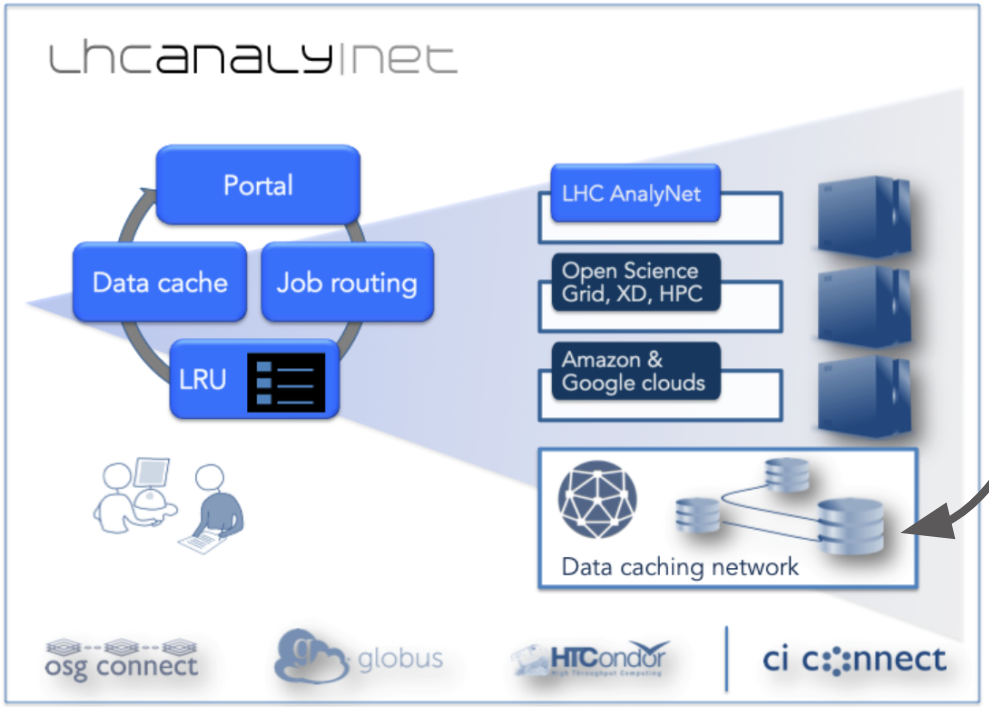
Central services

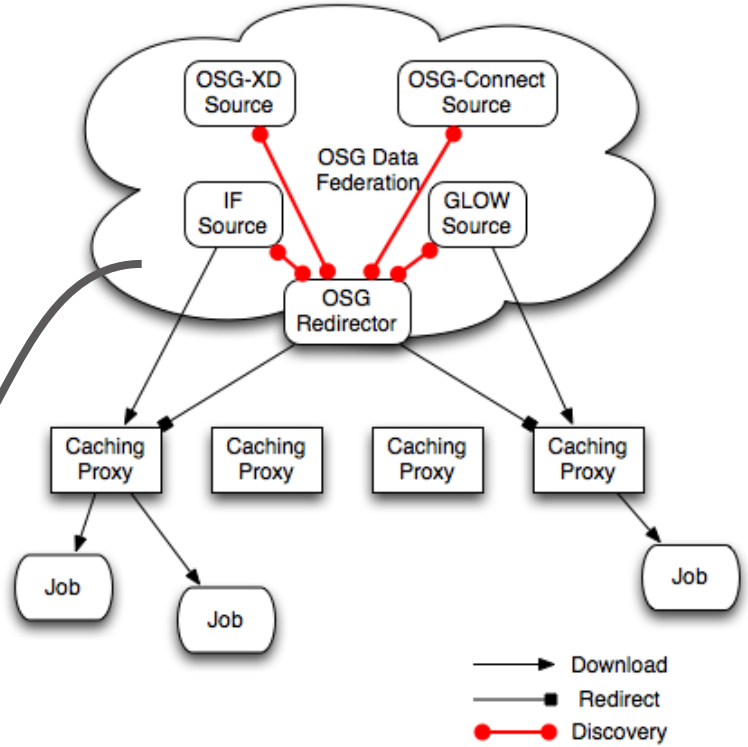
Central “instrument” services coordinate provisioning, job routing, data caching, and analytics.



Job routing & data caching

c.f. Brian's talk tomorrow





LHC AnalyNet milestones

If funded the project period of one year will be needed to realize the system fully

Work package	Description	Milestone Schedule
WP1: Equipment (EQ)	Procurement and installation of LRU servers and central instrument equipment.	EQ-1 September 2015 EQ-2 October 2015 EQ-3 December 2015
WP2: Central Instrument (CI)	Installation and configuration of central job routing and data caching services.	CI-1 November 2015 CI-2 December 2015 CI-3 January 2016 CI-4 February 2016
WP3: LRU Node Groups (NG)	Provisioning and configuration LRU node groups, performance metrics.	NG-1 December 2015 NG-2 December 2015 NG-3 February 2016 SNG-3 April 2016
WP4: Operations (OP)	On-going operation: software updates and troubleshooting, instrument-wide status monitoring, analytics, performance assessments, policy review.	OP-1 January 2016 OP-2 February 2016 OP-3 March 2016 OP-4 April 2016 OP-5 April 2016 OP-6 June 2016 OP-7 June 2016 OP-8 July 2016

Conclusions

- No word yet as to MRI funding result
  - Prospects overall don’t seem too good, based on recent agency review
- However, the ideas and collabortion are worthy of a pilot project at least, and potentially a future funding opportunity