Preparing for the El Capitan Programing Environment

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June 25, 2021

LLNL-PRES-823785
This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC

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El Capitan Programming Environment

- Compilers:
  - Cray PE (C/C++ are LLVM-based; Cray Fortran)
  - AMD ROCm (LLVM open source, including flang)
  - GCC
- Primary Programming Languages and Models
  - C, C++, Fortran
  - RAJA/Kokkos
  - OpenMP
  - HIP (Cray PE and ROCm)
- At LLNL, RAJA is the preferred model for most large multi-physics codes
  - OpenMP is preferred for Fortran codes and libraries
  - Some HIP/CUDA
- Expect capabilities very similar to Frontier

Livermore computing supports both open and secure systems

System	Top500 Rank	Program	Manufacture/ Model	Processor Architecture	OS	Inter-connect	Avg Power Demand (KW)	Nodes	Cores	Memory (GB)	Peak TFLOP/s
Unclassified Network (OCF)											
Lassen	17	ASC+M&IC	IBM	IBM P9	RHEL	2x IB EDR	TBD	792	34,848	253,440	23,047.2
Quartz (CTS-1)	135	ASC+M&IC	Penguin	Intel Xeon E5-2695 v4	TOSS	Omni-Path	TBD	3,136	112,896	401,408	3793.3
Pascal		ASC+M&IC	Penguin	Intel Xeon E5-2695 v4	TOSS	IB EDR	TBD	163	5,868	41,728	1700.0
RZTopaz		ASC	Penguin	Intel Xeon E5-2695 v4	TOSS	Omni-Path	TBD	768	27,648	98,304	929.0
RZManta		ASC	IBM	IBM Power8+	RHEL	IB EDR	TBD	36	720	11,520	597.6
Ray		ASC+M&IC	IBM	IBM Power8+	RHEL	IB EDR	TBD	54	1,080	17,280	896.4
RZAnsel		ASC	IBM	IBM P9	RHEL	2x IB EDR	TBD	54	2,376	17,280	1,570.0
Catalyst		ASC+M&IC	Cray	Intel Xeon E5-2695 v2	TOSS	IB QDR	TBD	324	7,776	41,472	149.3
Mammoth		ASC+M&IC	Supermicro	AMD Rome	TOSS	Omni-Path	TBD	69	8,832	131,072	294.0
Ruby	79	ASC+M&IC+CARES	Supermicro	Intel Xeon CLX-8276L	TOSS	Omni-Path	TBD	1,512	84,672	290,304	5959.2
Corona		ASC+M&IC+CARES	Penguin, Supermicr	AMD Naples, AMD Rome	TOSS	IB HDR	TBD	291	13,968	127,488	11335.0
Syrah		ASC+M&IC	Cray	Inetl Xeon E5-2670	TOSS	IB QDR	TBD	324	5,184	20,736	107.8
Surface		ASC+M&IC	Cray	Intel Xeon E5-2670	TOSS	IB FDR	TBD	162	2,592	41,500	451.9
Borax (CTS-1)		ASC+M&IC	Penguin	Intel Xeon E5-2695 v4	TOSS	N/A	TBD	48	1,728	6,144	58.1
RZTrona (CTS-1)		ASC	Penguin	Intel Xeon E5-2695 v4	TOSS	N/A	TBD	48	1,728	6,144	58.1
OCF Totals	Systems	15									50,946.9
Classified Network (SCF)											
Pinot(SNSI)		M&IC	Penguin	Intel Xeon E5-2695	TOSS	Omni-Path	TBD	187	6,732	23,936	232.2
Sierra	3	ASC	IBM	IBM P9	RHEL		TBD	4,320	190,080	1,382,400	125,626.0
Jade+Jadeita (CTS-1	134	ASC	Penguin	Intel Xeon E5-2695 v4	TOSS	Omni-Path	TBD	2,688	96,768	344,064	3251.4
Mica		ASC	Penguin	Intel Xeon E5-2695 v4	TOSS	Omni-Path	TBD	384	13,824	49,152	464.5
Magma	94	ASC	Penguin	Intel Cascade Lake AP 9242	TOSS	Omni-Path	TBD	722	69,312	296,448	5454.0
Shark		ASC	IBM	IBM Power8+	RHEL	IB EDR	TBD	36	720	11,520	597.6
Tron		ASC	Supermicro	Intel Cascade Lake	TOSS	IB EDR	TBD	146	4,672	56,064	433.6
Agate (CTS-1)		ASC	Penguin	Intel Xeon E5-2695 v4	TOSS	N/A	TBD	48	1,728	6,144	58.1
SCF Totals	Systems	9									136,117.4
Combined Totals		24									187,064.3

https://hpc.llnl.gov/hardware/platforms

LLNL has consistently provided open computing with the same architecture as our most advanced systems

Open	Secure
Vulcan	Sequoia
Lassen	Sierra
Tuolumne	El Capitan

The computing scholar program is a great way to bootstrap collaboration with LLNL

We rely on our scholar program to bring in the best and brightest students and to develop a pipeline for full-time hires

81 full-time hires since 2016

Microprograms: Data Science Summer Institute, HPC Cluster Engineer Academy, Earth Sciences Academy

198 total students in 2019

~30% returning students
~27% female students

55% graduate students
43% undergraduate students
2% faculty scholars

87 universities; 8 outside U.S.