*Information in this document can be used for the grant submissions “Resources and Environment” and “Facilities and Equipment” sections*

UCSF-IHG Genomics Core Services

**Faculty Director: Pui-Yan Kwok, MD, PhD**

**DNA Extraction Services**

**Contact**

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Please contact Eunice Wan to discuss your DNA extraction and project needs. Our facility can prepare high quality DNA samples from blood in good yields.

**Axiom Genotyping Core**

**Contact**

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The Axiom Genotyping Core (AxiomGen Core) at UCSF provides quality service for high-throughput SNP genotyping on the Affymetrix Axiom platform using the Beckman Coulter Biomek FXP Target Prep Express System and the GeneTitan MC Instrument. The Axiom Genome-Wide Array Plates include 700,000-900,000 common and rare SNP and insertion/deletions in Caucasian, Asian, Latino, and West African populations. The Axiom Exome Array contains more than 300,000 coding SNPs. Our facility also performs gene expression analysis on Affymetrix Array platform. To ensure high quality data, the team of experienced staff uses the 2100 Envision, Invitrogen Qubit, NanoDrop 8000, Agilent 2100 Bioanalyzer, Invitrogen E-Base electrophoresis, Quant-iT PicoGreen, and Fragment Analyzer to check DNA quality and quantity.

**Next Generation Sequencing Service**

**Contact**

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The UCSF Next Generation Sequencing Service (NGS Core) is equipped with the Illumina 5system for RNASeq and whole genome, whole exome, and targeted DNA sequencing up to pair-ended 100 base pair (PE100bp) reads. It also has the recommended systems that complements the HiSeq 2500, including the Covaris S2 sonicator, BioRad C1000 thermal cycler, Eppendorf Vacufuge plus, Thermo Scientific Nanodrop 8000, Clare Chemical Research's Dark, and Advanced Analytical Fragment Analyzer. All ancillary instruments are controlled by either a Hewlett-Packard laptop computer or a Dell laptop computer.

The HiSeq 2500 has a capacity of running 2 pair-ended flowcells with a turnaround time of about 11 days. With the v3 chemistry, it routinely produces 750-850K clusters/mm2 (232,560,000 clusters/lane) or about 186M reads/lane, which is equivalent to 37.2G bases per lane for a PE100bp sequencing reaction. Sequencing data will be made available to the user via a Dell Workstation (with Dual Intel® Xeon® Processor X5560, 2.8GHz, 48G RAM) in gzipped fastq format (~100G bytes per lane) and transferred via an external hard drive.

**Data Storage and Analysis**

**Contact**

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The IHG Computational Cluster consists of 50 Dell R620 compute nodes, each has 128GB of 1600Mhz RAM, two Intel Xeon E5-2660 8 Core sockets (16 cores per server). In addition we have two larger memory and socket servers which are Dell R820 servers, each has 1TB of 1333mhz RAM and four Intel E5-4640 2.4ghz 8 core processors (32 cores per server). Each server is imaged and network booted with a customized version of CentOS 6.4. Each node is wired for communications on a closed 1Gb, 10Gb and FDR infiniband (IB) network. The 1Gb network is for node-to-node communications and connects to each rack via Dell 6248, 48 port 1Gb switches. The 10Gb connections are for tier 3 storage over NFS and connect to each rack with Dell S4810 Force 10 switches via optical SFP transceivers. The FDR IB is for high speed node to node communications for MPIO and our GPFS file store from Data Domain Networks (DDN). The IB network is currently in a 2:1 blocking ratio. Our Infiniband network uses Mellanox components to form a leaf / spine topology for rapid scale out as we add more equipment. The Spine switches are composed of a pair of SX6036 36 port switches, while the leaf switches are SX6025 switches. A dedicated unified fabric manager server, which is a Dell R610 server, acts as the UFM administrative interface into the IB network.

In addition, we have a PCI flash based storage node which is based on a HP DL380P with (3) FusionIO PCI flash storage cards in a RAID-0 configuration to provide 4.5TB of useable storage space. The node has 2 Intel(R) Xeon(R) CPU E5-2650 v2 @ 2.60GHz 8 core sockets for a total of 16 cores and has 128GB of RAM. The node also has the same 1GB,10GB and FDR IB interconnects as other nodes.

Our IB storage is provided by Data Domain Networks (DDN) and is composed of a DDN SFA-12k-20 with (80) 10k RPM SAS drives in SS8460 enclosures. The total RAW capacity is 72TB, with roughly 51TB usable.

Our tier 3 storage (510 TB raw capacity) is provided by a Dell R820, with 64GB of RAM and four Intel E5-4640 2.4ghz 8 core processors (32 cores per server). This server uses LSI 9208-E HBA pass-through to directly connect (4) SATA-based JBODS from Super Micro which contain 45 drives in a 4U enclosure. The server is loaded with FreeBSD 9 and we leverage the ZFS file system on the JBOD enclosures in a RAIDZ2 striped configuration.

Users enter and exit the network through a pair of Dell R720 servers, each with 64GB of RAM and two Intel E5-2660 2.2ghz 8 Core CPU sockets. The servers are connected in a LACP active passive pair composed of  (2) 10Gb SFP+  transceivers going to two discreet UCSF switches. This configuration helps to prevent a single point of failure should one of the upstream UCSF switches fail. The servers are running CentOS 6.4 and act as KVM servers to host the various tools used inside the network.