

BaseSpace® Sequence Hub

Genomics cloud computing expands opportunities for biological discovery, making analysis and storage of next-generation sequencing data accessible to any scientist.

Highlights

- **Sample and Run Management**
Prepare and manage biological samples, libraries, pools, and sequencing runs directly in BaseSpace Sequence Hub
- **Real-Time Data Upload and Run Monitoring**
View run progress as data uploads to the data repository, and begin analysis immediately after run completes
- **One-Click Analysis with over 70 Bioinformatics Tools**
Easily access and launch a growing collection of bioinformatics tools with BaseSpace Apps
- **Global Collaboration and Data Sharing**
Configure options to disseminate your data to peers, create working groups, or engage the scientific community

Introduction

Next-generation sequencing (NGS) has revolutionized the way and rate at which biomedical research is conducted. As the cost of sequencing decreases, the volume of NGS-generated data increases, presenting researchers with progress-hindering problems. Secure

data storage and management, complex data analysis, and sharing results with collaborators are challenges that can result in nonuniform methods within institutions and labs, conflicting results, and increased operational overhead. BaseSpace Sequence Hub is a genomics cloud computing platform, designed to bring simplified data management and analytical sequencing tools directly to investigators in a user-friendly format (Figure 1). BaseSpace Sequence Hub provides flexibility and convenience with an array of tools, significantly expanding the possibilities of yielding meaningful results from NGS data.

Scalable Bioinformatics Infrastructure

Labs pursuing next-generation sequencing traditionally required the services of a highly trained bioinformatician and dedicated infrastructure to perform data management, analysis, and storage. BaseSpace Sequence Hub helps automate bioinformatic analysis using cloud-based software applications. Scalable storage grows with your research needs, starting with 1 TB of free storage. Designed with the biologist in mind, BaseSpace Sequence Hub push-button bioinformatics applications are simple to use and produce biologically relevant results from raw data. BaseSpace Sequence Hub output files are industry standards that use open formats. These results can be imported into downstream scientific software tools for further analysis. All necessary operations occur in one place.

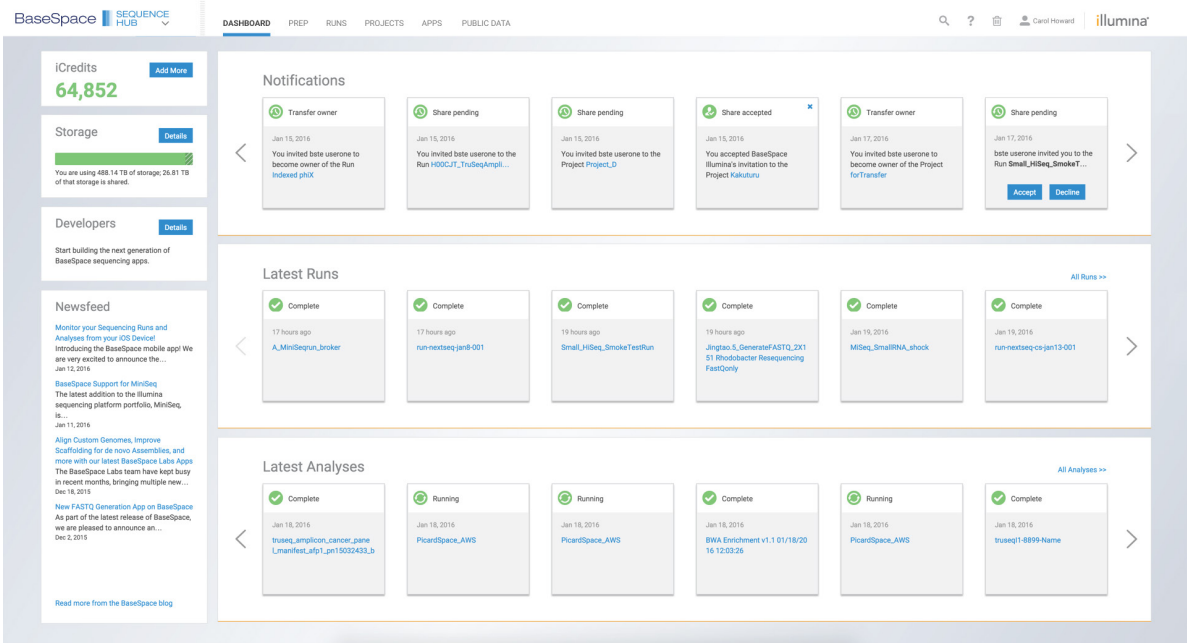


Figure 1: Intuitive BaseSpace Sequence Hub Dashboard—The Notifications panel has widgets that highlight your latest sharing, ownership transfer activities, occasional alerts on new features, bugs, etc. The Latest Runs panel has widgets that provide real-time status of your sequencing run. The Latest Analyses panel has widgets that show the status of your app sessions.

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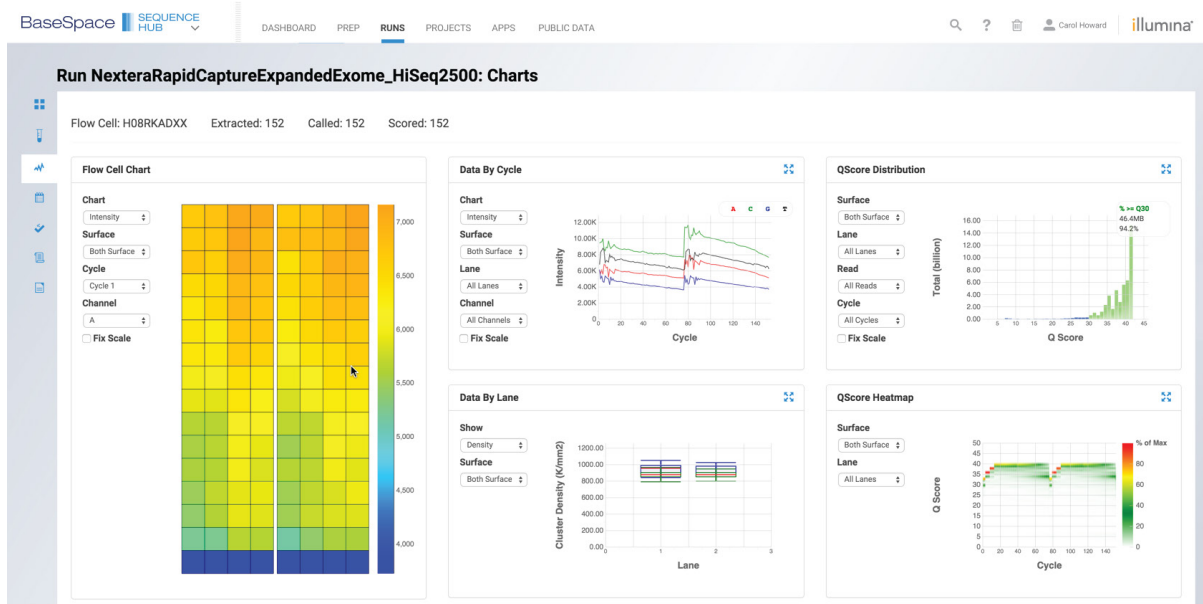


Figure 2: Monitor Run Data in Real Time—(A) The Sequence Analysis Viewer (SAV) capabilities are now built into the BaseSpace Sequence Hub user interface, allowing real-time, cycle-by-cycle monitoring. The Charts view shows data by lane and by cycle, with Q-Score distribution and heat map features. Each graph can be expanded to full size.

Run Set-up and Management

BaseSpace Sequence Hub makes sample and run management easy using the Prep Tab feature: an intuitive, graphical environment for one-stop library and run preparation.

- Prepare and manage biological samples, libraries, pools, and planned sequencing runs directly in BaseSpace Sequence Hub.
- Import biological samples or library information in batch mode for large experiments.

The features available in Prep Tab allow for easy integration of BaseSpace Sequence Hub with library preparation and sequencing platforms. Using the Prep Tab, the entire workflow can be planned, from sample creation and library prep, to pooling and sequencing. This can apply to both manual and NeoPrep library preparations. When a run has been planned and is ready to start, no additional setup is required at the instrument.

- NeoPrep™ runs can be set up from Prep Tab.
- Prep Tab supports all Illumina library prep kits.
- Prep Tab can also be used for custom library kits.
- MiSeq® and HiSeq® instruments (including HiSeq X®) set up in BaseSpace Sequence Hub using sample sheets. Full Prep Tab support for these instruments coming soon.

Real-time Monitoring

BaseSpace Sequence Hub is the only cloud platform directly integrated with Illumina sequencing platforms. The Runs Dashboard enables data monitoring by lane or by cycle, and view quality performance metrics from your browser (Figure 2) or on mobile devices using the BaseSpace Mobile App (Figure 3). Data are seamlessly pushed to BaseSpace Sequence Hub for automatic analysis and storage upon run completion, with the option of retaining data for local hosting and analysis on the instrument.

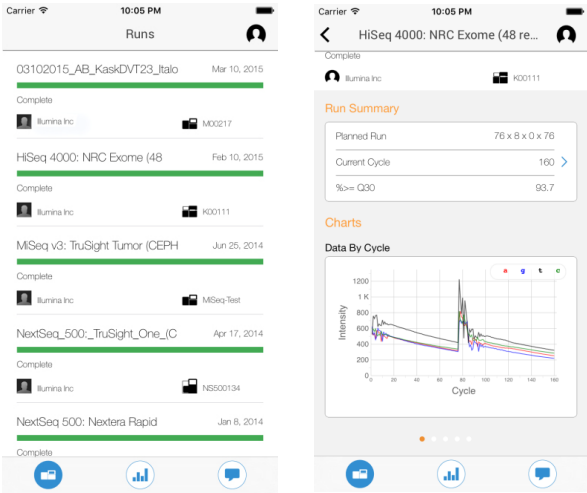


Figure 3: BaseSpace Mobile App—Runs can also be viewed on the Mobile App on any iOS compatible device. The Mobile App also provides status updates on analysis, including push-button notifications when runs and analyses are completed. Download the mobile app for free at the iTunes app store.¹

BaseSpace Apps, the Best Tools for the Job

Analysis of complex sequencing data sets is a challenge at any scale. BaseSpace Sequence Hub provides a continuously growing list of powerful Apps (analysis workflows and tools), allowing researchers to set up and perform complex data analyses. A simple interface links data sets directly to bioinformatics tools. (Figure 4). From visualization and genome browsing to variant calling and annotation, BaseSpace Apps meet the diverse needs of any researcher, regardless of informatics experience, in an expansive analysis ecosystem.²

Develop Custom Apps to Analyze Your Data

Working with customized pipelines and tools within BaseSpace Sequence Hub simplifies bioinformatics processes by allowing sequence data and analysis results to remain within a single analysis environment. BaseSpace Sequence Hub supports third-party software development by providing a robust App development platform. The BaseSpace Native App Engine and extensive APIs support development of Apps to perform analyses or generate complex visualizations and create custom reports.³ Customized Apps can be kept private, shared between collaborators, or made publicly available to all BaseSpace Sequence Hub users.

Workgroup

The ability to form a team through the Workgroup feature is available with an upgrade to a BaseSpace Professional subscription or BaseSpace Enterprise subscription. Each BaseSpace Professional subscription is provided with a single workgroup, while BaseSpace Enterprise tier customers can create any number of workgroups for better management of access to data. This feature enables simplified collaboration on a global scale (Figure 5).

- The team administrator (subscriber) can invite other users to the Workgroup.
- All team members will have access with individual log-in.
- Team members can switch context between individual accounts and Workgroup accounts if they belong to more than one.
- In Workgroup context, team members can access all runs, analyses, and storage usage that belongs to the Workgroup.

In large labs with multiple users, accounts and passwords are often shared between technicians, bioinformaticians, lab managers, etc. The Workgroup feature enables each invited individual to log in with individual passwords. This also mitigates issues that may arise when any user leaves the lab.

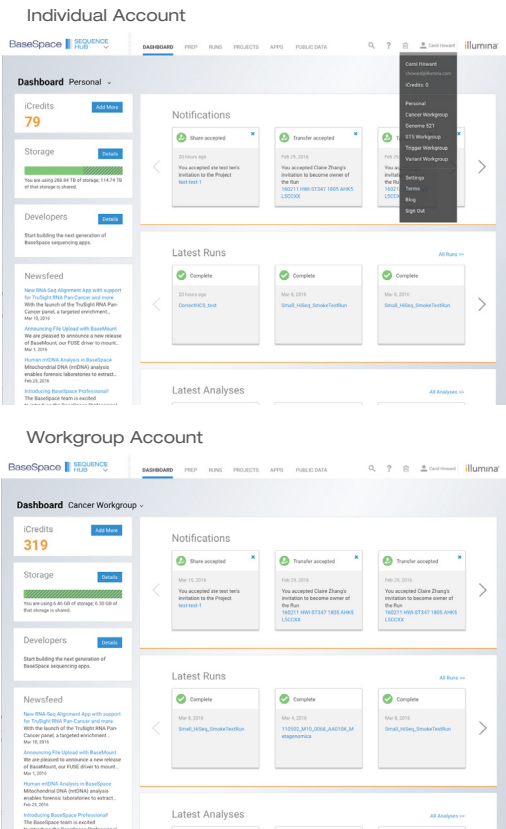


Figure 5: Workgroup Feature—With Workgroup, users can log in with personal credentials, then switch context between individual accounts and Workgroup accounts. In Workgroup context, users can view all runs and analyses common to the Workgroup, as well as use the storage and computation hours purchased by the Workgroup, as shown in the different dashboards.

BaseSpace App Categories

DeNovo Assembly	ChIPSeq
Gene Fusion Detection	DifferentialExpression
MethylSeq	Metagenomics
Quality	Proteomics
RNA-Seq	Resequencing
Synthetic Long Reads	Small RNA
Tumor Normal	Targeted Sequencing
	Variant Analysis

Targeted Sequencing Apps

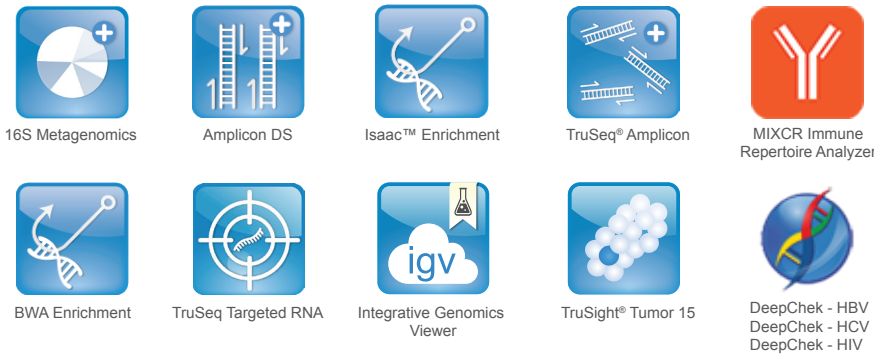


Figure 4: Launch Analytical Tools on Demand—Browse and explore a growing list of apps from the bioinformatics community in the BaseSpace Apps Store, and launch selected Apps with a single click, directly from the data set. For more information, go to www.illumina.com/BaseSpaceApps.

Collaboration on a Global Scale

Researchers frequently need to collaborate and share access to sequencing data and results. BaseSpace Sequence Hub enables users to easily and securely share raw sequencing data and analysis results with collaborators across the globe. Shareable links can be easily created and emailed to partners, allowing instantaneous access to shared data and results. Also, data delivery is simplified with the ability to transfer runs and projects effortlessly to collaborators or customers. BaseSpace Sequence Hub makes big data portable and accessible to the people who need it most (Figure 6).

Share This Project
■ NextSeq 500 v2: RNA-Seq (8plex) 2x75

Invite A Collaborator

alex@illumina.com

Alex, here is the project we discussed.

Add Collaborator

Cancel

Save Settings

Figure 6: Collaboration Tool—Flexible collaboration tools simplify data sharing, enable expansion of collaboration circles, and easily keep track of who shares data.

Bioinformatics Professional Services

To address the challenges associated with managing and analyzing the vast amounts of data generated by NGS, Illumina offers a range of professional services for both bioinformatics analysis and consulting.

Driven by a need for quality data and analysis, Illumina has developed an extensive list of bioinformatics offerings. These cover standard analysis workflows, standard output files, and visualization tools to more application-specific workflows and personalized consultation on topics such as data quality, data analysis, data management, and pipeline analysis.

For each workflow, the offering includes hands on data analysis in BaseSpace Sequence Hub, using example data sets generated with Illumina library-prep kits and instruments while addressing various scientific inquiries. Developed and delivered by professionals with deep domain experience, Bioinformatics Professional Services can be of value to any lab.

Enhanced Security

Security is of paramount importance when making the decision to move genomic data to cloud-based analysis and storage. Data are protected through various physical, electronic, and administrative measures. Data for upload are encrypted using the AES256 standard and protected by SSL. Data within BaseSpace Sequence Hub are hosted on Amazon Web Services (AWS), which is compliant with a wide variety of industry-accepted security standards.⁴ Enterprise subscriptions offer an additional level of security. Enterprise customers are provided their own domain and the ability to use their own SAML 2.0 supported authentication service to manage users and passwords. For more information about security features, read the [BaseSpace Sequence Hub Security and Privacy white paper](#).

Learn More

For more details on BaseSpace Sequence Hub, or to sign up for a free BaseSpace account, visit www.illumina.com/basespace.

Ordering Information

Product	Catalog No.
BaseSpace Sequence Hub Professional Annual Subscription	SW-410-1000
BaseSpace Sequence Hub Enterprise Annual Subscription	SW-411-1003
BaseSpace Sequence Hub Live Storage 1 TB	SW-410-1002
BaseSpace Sequence Hub Live Storage 5 TB	SW-410-1003
BaseSpace Sequence Hub Live Storage 10 TB	SW-411-1001
BaseSpace Sequence Hub Live Storage 50 TB	SW-411-1002

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