BV-BRC

Bacterial and Viral (BV) -
Bioinformatics Resource Center (BRC)

Monthly Usage Metrics Report

Performance Period: February 1, 2022 – February 28, 2022

Issued to:

National Institute of Allergy and Infectious Diseases
National Institute of Health

Contract No.: 75N93019C00076
Contract Title: Bioinformatics Resource Centers for Infectious Diseases

Submission Date:
March 10, 2022

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BV-BRC Usage Metrics Report

Note: As per the recent request from NIAID, we are working with the other BRC to provide jointly agreed plots showing accumulative usage data over time. We will start including them in the monthly reports, starting with the next monthly report.

This monthly usage metrics report provides a summary of the BV-BRC usage for the current reporting period in accordance with the Joint-BRC Common Usage Metrics Plan developed by the BRCs and subsequently approved by NIAID.

As per the plan, each BRC will aggregate and report usage metrics for their constituent parts, *i.e.,* PATRIC and IRD/ViPR for BV-BRC. These metrics will serve as a basis for collecting quantitative measures of usage of the BRC resources to identify trends, areas that are performing well, and areas for improvement. Usage metrics will be reported to NIAID individually by each BRC monthly, and in combination on the BRC Gateway website once this is publicly available. In addition, annual summaries will be included in the Annual Progress Reports.

It is important to note that usage metrics across the two BRCs are highly dependent on the relative sizes of the respective research communities, the associated quantities, and types of available public data, and how each of the resources delivers the data and tools to the user. Thus, cross-BRC comparisons of individual metrics are not necessarily indicative of relative usage or performance.

Common usage metrics covering both BRCs (note that this list is subject to modification, based on feasibility of collection, changes in availability technologies, BRC website development, suggestions from NIAID program and other stakeholders, *etc.*):

Website Usage Metrics

Website usage is a key measure for evaluating use of the resource by the research communities. The number of website sessions unique users in a given period provide insights into trends, such as increased traffic resulting from outreach activities and prominent research topics and endeavors. Both the BRCs will use **AWStats** to monitor and track website usage by and report the number of unique visitors, visits, page views, pages/visit and visits/visitors for a given reporting period, aggregated across all constituent BRC websites, as summarized in the table below. In addition, we will also provide links to the live website usage statistics pages generated by AWStats from respective BRC websites, which will provide more detailed usage statistics by day of the week/month, country, browser / operating system, and more.

- **Total visits**
  - *Definition* - Number of visits made by all visitors. Think "session" here, say a unique IP accesses a page, and then requests three other pages within an hour. All of the "pages" are included in the visit, therefore you should expect multiple pages per visit and multiple visits per unique visitor (assuming that some of the unique IPs are logged with more than an hour between requests)
  - *Measurement mechanism* - AWStats.
  - *Measure* - Total number of visits per month.
- **Total unique visitors**
  - *Definition* - A unique visitor is a person or computer (host) that has made at least 1 hit on 1 page of your web site during the current period shown by the report. If this user makes several visits during this period, it is counted only once. Visitors are tracked by IP address, so if multiple users are accessing your site from the same IP (such as a home or office network), they will be counted as a single unique visitor
  - *Measurement mechanism* - AWStats.

- *Measure* - Total number of unique visitors per month.

- **Total page views**
  - *Definition* - The number of "pages" viewed by visitors. Pages are usually HTML, PHP or ASP files, not images or other files requested as a result of loading a "Page" (like js,css... files).
  - *Measurement mechanism* - AWStats.
  - *Measure* - Total pageviews per month.
- **Average pages per visit**
  - *Definition* - The average number of pages viewed during a visit. Repeated views of a single page are counted.
  - *Measurement mechanism* - AWStats.
  - *Measure* - Average number of pages per visit per month.
- **Average visits per visitor**
  - *Definition* - The average number of visits per visitor.
  - *Measurement mechanism* - AWStats.
  - *Measure* - Average number of visits per visitor per month.
- **Average visit duration**
  - *Definition* - The average time a visitor spent on the site for each visit, measured in seconds.
  - *Measurement mechanism* - AWStats.
  - *Measure* - Average visit duration per month.
- **Total bandwidth**
  - *Definition* - Total number of bytes for pages, images and files downloaded by web browsing. This number includes traffic for web only (or mail only, or ftp only depending on value of LogType). This number does not include technical header data size used inside the HTTP or HTTPS protocol or by protocols at a lower level (TCP, IP...). Note that this number is often lower than the bandwidth usually reported by internet providers as it is counted at a lower level and includes all IP and UDP traffic.
  - *Measurement mechanism* - AWStats.
  - *Measure* - Total bandwidth per month.
- **Registered users that run a service**
  - *Definition* – Total number of unique registered users that run an analysis service (requiring login) during the month.
  - *Measurement mechanism* – Service logs.
  - *Measure* - Total unique registered users per month.

Table 1. BV-BRC Website Usage Metrics[1]

Metric	PATRIC	IRD	ViPR	BV-BRC	All Combined
Total visits	316,904	6,420	13,158	5,002	338,083
Total unique visitors	14,408	4,004	8,392	1,814	25,308
Total pageviews	2,383,772	568,192	387,152	15,675	3,355,515
Avg. pages / visit	7.52	88.5	29.42	3.13	9.92
Avg. visits / visitor	21.99	1.6	1.56	2.75	13.35
Avg. visit duration (seconds)	1,206	649	451	429	1,169

Bandwidth (GB)	115.28	7.69	223.90	3.56	350.47
Registered users that run a service[2,3]	861	59	59	861	920

Notes:

1. *A link to the BV-BRC summary AWStats page is available from the BV-BRC About page (https://www.bv-brc.org/about)*
2. *Note: This measure This will only be a fraction of the total usage by registered users because they may be doing other types of work on the site, either logged in or not.*
3. *PATRIC and BV-BRC Production are the same because both resources use the same computational services infrastructure. Similarly, IRD and ViPR use the same computational infrastructure, so those numbers are the same as well.*

Figure 1. Selected BV-BRC website usage metrics.

Website Usage by Taxa

BRCs support a variety of organism taxa containing human pathogens and their vectors, along with related genomic and other omics data types. These taxa vary widely in the number of species and genomes they contain, availability of omics data, as well as the size of the research communities studying them. Measuring the BRC website usage by taxa allows us to understand how BRC resources are used by various organism communities. We will report the number of pageviews by taxa, which will be measured by querying the website usage statistics in Google Analytics by taxa name.

Table 2. BV-BRC Website Usage by Taxa

Taxa	Domain	Species	Genomes	Page Views
Acinetobacter	Bacteria	692	11948	1,295
Bacillus	Bacteria	873	7279	5,106
Bartonella	Bacteria	77	224	1,109
Borreliella	Bacteria	18	868	32
Brucella	Bacteria	87	1182	2,710
Burkholderia	Bacteria	316	5052	488
Campylobacter	Bacteria	267	7198	963
Chlamydia	Bacteria	22	597	439
Clostridium	Bacteria	439	3761	608
Coxiella	Bacteria	12	122	274
Ehrlichia	Bacteria	7	43	487
Escherichia	Bacteria	193	39891	5,150
Francisella	Bacteria	29	1082	156
Helicobacter	Bacteria	89	2902	834
Listeria	Bacteria	44	5801	493
Mycobacterium	Bacteria	311	31117	1,621
Pseudomonas	Bacteria	1874	15719	2,748
Rickettsia	Bacteria	52	197	828
Salmonella	Bacteria	305	28749	2,061
Shigella	Bacteria	112	4367	883
Staphylococcus	Bacteria	579	24166	2,454
Streptococcus	Bacteria	423	37415	4,127
Vibrio	Bacteria	391	6343	1,382
Yersinia	Bacteria	29	1509	299
Bunyavirales	Virus	611	16,648	1,543
Caliciviridae	Virus	241	64,423	375
Coronaviridae	Virus	1,205	4,104,680	4,586

Filoviridae	Virus	27	4,315	720
Flaviviridae	Virus	485	370,503	6,994
Hepeviridae	Virus	51	21,019	298
Herpesviridae	Virus	864	64,803	3,646
Influenza	Virus	4	5,212	33,287
Paramyxoviridae	Virus	742	86,495	949
Picornaviridae	Virus	1,151	152,342	1,422
Pneumoviridae	Virus	19	46,318	825
Poxviridae	Virus	300	11,496	694
Reoviridae	Virus	413	136,901	3,469
Rhabdoviridae	Virus	712	38,061	367
SARS-CoV-2	Virus	1	4,343,491	853
Togaviridae	Virus	68	14,770	1,235
SARS-CoV-2 (BV-BRC)	Virus	1	3,969,021	667

Website Usage by Data Types

BRCs support genomic and a variety of other omics data types, providing an integrated view of these multi-omics data and related analysis tools. Tracking the website usage by primary data types allows us to understand how these data types are us. We will report the number of website pageviews by primary data types, which will be measured by querying the website usage statistics in Google Analytics by data type. VIPR/IRD pages views are combined (added together) based on data type.

Table 3. BRC Website Usage by Data Type (BV-BRC)

Data Type	BRC Domain	Page Views
Taxonomy	PATRIC	22,111
Genome	PATRIC	74,203
Genome sequence	PATRIC	2,247
Feature (Genes/Proteins)	PATRIC	49,250
Specialty gene	PATRIC	6,909
Protein families	PATRIC	3,331
Pathway	PATRIC	8,308
Subsystems	PATRIC	2,570
Transcriptomics	PATRIC	1,357

Interactions	PATRIC	787
Phylogeny	PATRIC	1,928
Antibiotic	PATRIC	47
Workspace (User Data)	PATRIC	78,282
Genome	IRD/ViPR	15,550
Gene/Protein	IRD/ViPR	10,737
Strain	IRD/ViPR	7,722
Immune epitopes	IRD/ViPR	601
Ortholog groups	IRD/ViPR	121
Antiviral drugs	IRD/ViPR	239
Host factors	IRD/ViPR	265
Protein structures	IRD/ViPR	469
Protein domains and motifs	IRD/ViPR	41
Plasmids	IRD/ViPR	241
SFVT	IRD/ViPR	76
Surveillance	IRD/ViPR	454
Serology	IRD/ViPR	33
Phenotypes	IRD/ViPR	31
PCR Primers	IRD/ViPR	255
SARS-CoV-2 Variant Tracker	BV-BRC	667

Service/Tool Usage

Both BRC analysis services and tools allow users to analyze data pulled from the respective BRC databases and their own private data, compare to other datasets, and save the results in their private workspaces. Since the types of tools vary across the BRCs, we will report aggregated usage of all tools in each BRC, and also a breakdown by service/tool. We will also report the total amount of storage used for user data. VIPR/IRD tools/services are combined (added together) that are common in both systems.

- **Total number of analysis tasks submitted and completed successfully by users**
  - *Definition* - The total number of analysis tasks submitted and completed successfully by users for a given month. An analysis task usually involves users providing input data/search terms and/or parameters to initiate a search or analysis task, which may perform one or more searches, data transformations, or data analysis steps, generate results that provide additional insights into the data and present it back to the user in structured view and/or file formats via web interface and/or user workspace.
  - *Measurement mechanism* - Analysis tasks are recorded via website and server logs, which are used to tally the number.
  - *Measure* - Analysis tasks submitted and completed successfully per month.

- **Analysis tasks submitted and successfully completed by service/tool**
  - *Definition* - A breakdown of total number of analysis tasks (see metric above), summarized by service/tool during the specified date range.
  - *Measurement mechanism* - Analysis tasks submitted by users and successfully completed are captured via website and server logs, which are used to tally the number.
  - *Measure* - Jobs per month, tallied by service/tool.

Table 4. BRC Tools/Services Usage Metrics

Tool/Service	BRC Domain	Submitted	Completed
Codon Tree	PATRIC	533	504
Comprehensive Genome Analysis	PATRIC	2,333	2,186
Differential Expression	PATRIC	3	1
FastqUtils	PATRIC	84	72
Genome Alignment	PATRIC	147	137
Genome Annotation	PATRIC	5,660	5,525
Genome Assembly	PATRIC	2,576	2,375
Genome Comparison	PATRIC	275	257
Metagenome Binning	PATRIC	289	264
Metagenomic Read Mapping	PATRIC	56	56
RNASeq Analysis	PATRIC	46	25
Taxonomic Classification	PATRIC	368	365
TnSeq Analysis	PATRIC	17	2
Variation Analysis	PATRIC	147	133
Alignment Viewer	IRD/ViPR	22	22
Antiviral-Resistance-Risk	IRD/ViPR	6	6
BLAST	IRD/ViPR	357	349
Enrichment	IRD/ViPR	1	1
Genotype-Recombination	IRD/ViPR	9	7
H1-Clade Classifier	IRD only	89	89
H1N1-classifier	IRD only	8	8
H5N1-classifier	IRD only	58	56
Ha Numbering	IRD only	115	115
MGC	IRD/ViPR	20	17

MSA	IRD/ViPR	595	490
Mutation-analysis	IRD/ViPR	58	58
Primer3	IRD/ViPR	49	49
Read-seq	IRD/ViPR	24	23
Rva Genotyper	IRD/ViPR	1,203	1,197
Short-seqsearch	IRD/ViPR	28	21
SNP-analysis	IRD/ViPR	621	429
Surveillance-data-mapping	IRD/ViPR	3	3
Tbl-formatter	IRD/ViPR	5	1
Tree	IRD/ViPR	482	446
VIGOR Annotator	IRD/ViPR	92	91
SARS-2 Genome Assembly and Annotation	BV-BRC	39	34

Publications and Citations

Publications and citations provide insights into how the BRC is moving science and technology forward and how the resources are serving their respective research communities. Lists of BRC-generated publications (including publications supported by the BRC program in collaboration with various partners) are updated when new manuscripts are accepted and published. Citations to BRC resources are measured using Google Scholar and augmented using PubMed and custom queries as needed to identify citations to the resource that do not cite the official reference publication(s).

- **Citations to BRC publications**
  - *Definition* - Citations to the BRC as measured by citations to key BRC publications, which describe the overall BRC resources, new data and/or analysis tools, or novel use cases supported by them.
  - *Measurement mechanism* - Set up a common Google Scholar profile covering key BRC resource publications (grouped by BRC) and show aggregated citations for each group. The use of Google Scholar profile makes it easier to view the list of publications used to track citations, update the list with new publications, and provide citation counts for individual publications as well as aggregated counts for each resource. Below is the link to the common BRC Google Scholar Profile.
    - https://scholar.google.com/citations?user=kXLGwkYAAAAJ
  - *Measure* - Cumulative number of citations.
- **Citations to BRC resources**
  - *Definition* - Citations to the BRC resource as measured Google Scholar searches using predetermined set of keywords based on name and/or acronym of each of the BRC resources, and additional keywords to filter out any false positive or negative results to the extent possible. This is complementary to the citations to the BRC publications described above and necessary because, often, users cite BRC resources by mentioning the resource name or URL in the manuscript text, instead of citing relevant publications.
  - *Measurement mechanism* - Define set of keywords based on name and/or acronym of each of the BRC resources and additional keywords to filter out any false positive or negative

results to the extent possible. Using these keywords as search terms, create Google Scholar URLs for each of the BRC resources, which will be checked every month to report a cumulative number of citations for each resource. Because of the limitations of the logical and advanced query operations supported by Google Scholar search interface, we are dividing BV-BRC query into three distinct sub queries as shown below.

- VEuPathDB (merged DB, including legacy VectorBase, FungiDB & parasite resources): https://scholar.google.com/scholar?q=OrthoMCL+OR+PlasmoDB+OR+ToxoDB+OR+CryptoDB+OR+TrichDB+OR+GiardiaDB+OR+TriTrypDB+OR+AmoebaDB+OR+MicrosporidiaDB+OR+%22FungiDB%22+OR+PiroplasmaDB+OR+%22vectorbase%22+OR+veupathdb+OR+ApiDB+OR+EuPathDB+-encrypt+-cryptography+-hymenoptera
- BV-BRC:
  - PATRIC BRC: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C39&q=%28PATRIC+AND+Wattam%29+OR+%E2%80%9Cpatricbrc%22+OR+%22pathosystems+resource+integration+center%22
  - RAST/RASTtk: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C39&q=%28RAST+AND+overbeek%29+OR+%22rast.nmpdr.org%22
  - IRD/ViPR: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C39&q=%22viprbrc%22+OR+%22virus+pathogen+resource%22+OR+%E2%80%9Cfludb%22+OR+%22influenza+research+database%22

- *Measure* - Cumulative number of citations, cumulative.

Table 5. Citations to BRC Publications and Resources

	Number of Citations (YTD)	Number of Citations (Cumulative)
Citations to BV-BRC publications	397	15,429
Citations to BV-BRC resources	447	16,600

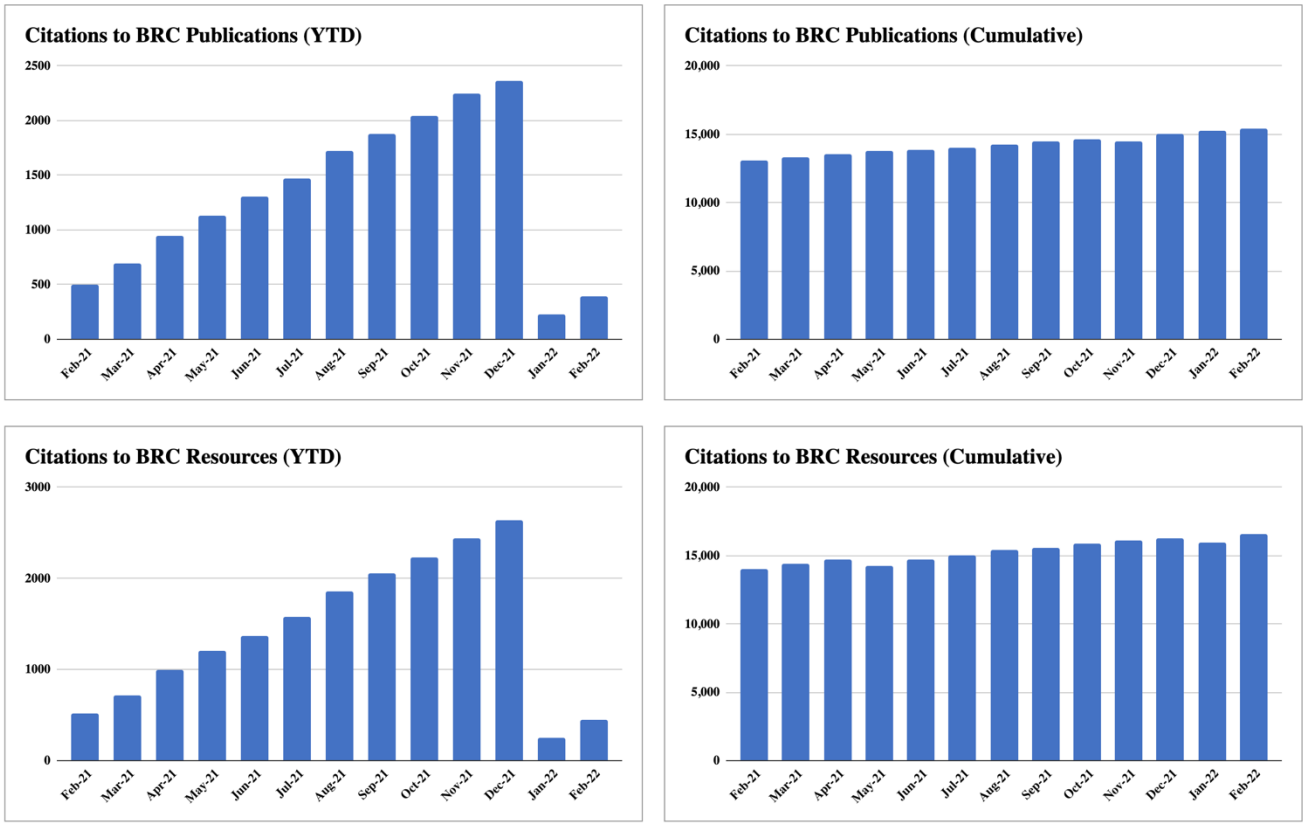

Figure 2. Citations to BV-BRC resources and publications. The January and February 2022 (Jan-22, Feb-22) YTD citations to BRC publications and resources reflect the start of the new year (2022), thus the drop in monthly citations.

User Activities

Outreach activities provide additional channels to engage users. User requests for help typically come in through the help desk functionality available from both BRC websites and are tracked using ticketing software tools. Webinar and workshop participants are counted at the time of registration and participation at the event. Counts of access to recorded webinars may be used to augment the total. Followers on social media (Twitter, Facebook, YouTube) are counted using the built-in mechanisms those platforms provide.

- **Total registered users**
  - *Definition* - Total cumulative number of users who have registered with the BRC via the website registration mechanism, from inception to the specified date.
  - *Measurement mechanism* - The registration process creates an entry in the registered user database for each BRC. Total number of registered users is queried from the database at the specified date.
  - *Measure* - Total number of registered users (cumulative).
- **Total storage used for user data**
  - *Definition* - Total amount of disk storage in use to host user data at the specified date. This metric provides an additional indication of resource usage that may not be reflected by website traffic or analysis jobs.
  - *Measurement mechanism* - Inspection of disk usage via query or automated script.
  - *Measure* - Total terabytes (TB) currently in use.
- **User requests for help**

- *Definition* - Total number of user-initiated contacts to the BRC to request help or information during the specified date range. In addition to summarizing total user requests, we will also summarize them by the following categories: Requests for help, Bug reports, and New features / enhancements.
- *Measurement mechanism* - Manual tally of the auto-generated helpdesk tickets triggered by user requests. Tallies may be augmented with manual counts of interactions where the user bypassed the helpdesk system, *e.g.* via direct email or messaging to BRC team members.
- *Measure* - Requests per month.

- **Webinar/workshop events and participants**
  - *Definition* - Total number of outreach events (i.e. BRC webinars, workshops, and online courses) held per month and total number of participants who attended those events.
  - *Measurement mechanism* - Manual tally of participants in attendance at the time of the webinar or workshop, summed over all of the events held per month.
  - *Measure* - Cumulative number of participants per month
- **Followers on social media**
  - *Definition* - Total number of followers, by social media outlet, at the specified date. Current active BRC social media outlets are Twitter, Facebook, and YouTube.
  - *Measurement mechanism* - Inspection of the number of followers reported by the media outlet at the specified date.
  - *Measure* - Total number of followers, by media outlet.

	PATRIC	**IRD/ViPR**	**BV-BRC (new)**	**Total**
Total registered users	33,364[1]	11,884	33,364[1]	33,364[1]
Total storage used for user data (TB)	185.1	0.56	185.1	185.66
User requests: • Request for help • Report bug • Suggest improvement	60 100% 0% 0%	5 60% 40% 0%	0 0% 0% 0%	65 97% 3% 0%
Webinar/workshop events	0	0	1	1
Total webinar/workshop participants	0	0	23	23
Total MOOC registrants (cumulative)	5,295	NA	NA	5,295
Twitter followers	571	388	25	984
Facebook followers	247	1,753	418	2,418
YouTube subscribers	328	186	6	520
YouTube views	1,062	127	49	1238
BRC Subreddit members	NA	NA	NA	79
BRC Subreddit viewers	NA	NA	NA	631

1. *The number of total PATRIC registered users had an apparent large increase due to the merger of IRD/ViPR and PATRIC user databases. The Total (BV-BRC) is an accurate count of both resources combined*

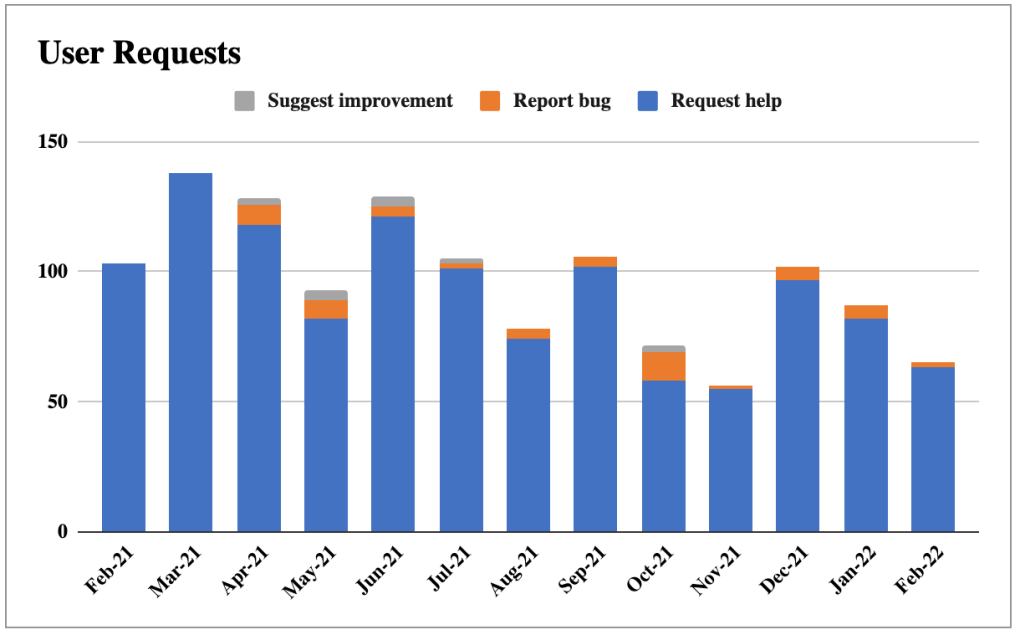

Figure 3. Requests by users, sorted by type.