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Proposal for implementation of Google Charts in Gratia Web
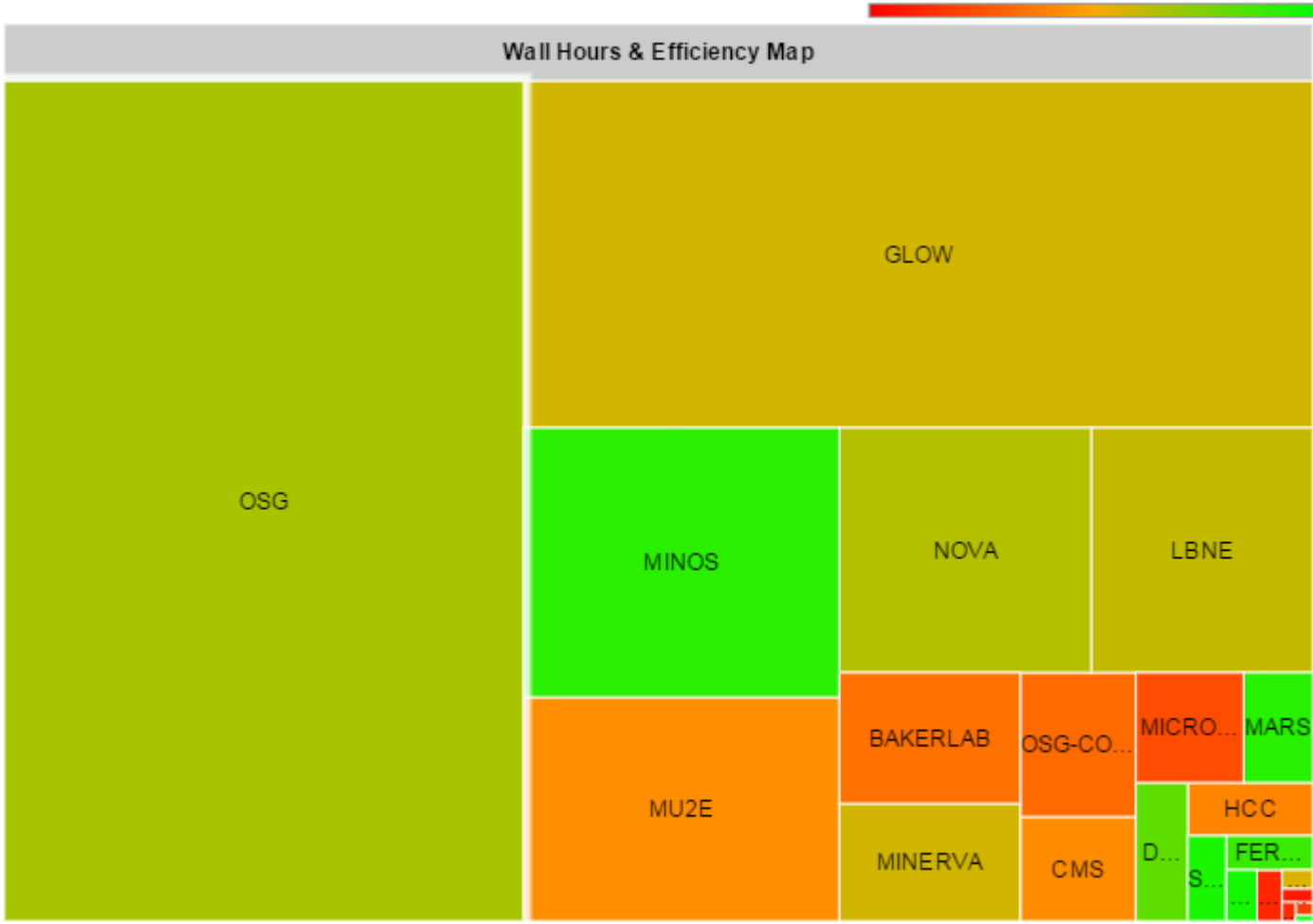
Juan F. Mosquera

22 07 2015

Current Status

- 6 Different types of plots available with Mathplotlib
  - Horizontal Bar
  - Stacked Bar
  - Stacked Line
  - Cumulative
  - Pie
  - Quality Map

- 1 type of plot available with Google Charts
  - Tree Map

- Plots are generated on the server side

- An instance of a plot can be defined with an xml configuration that defines the SQL, the query parameters and the plot type configuration

- 230 Predefined plot instances available

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Matplotlib Limitations

- Plots are created on the server side and served as a file through the web server

- Changes in the plot would require the browser to reload the image via AJAX or an HTTP request

- Tooltips for the plots could be implemented, however it would require a large additional development per each type of plot

- Dynamic functionalities could also be implemented, however it would also require additional development, and also it would require a good network connection between client and server to provide a good user experience

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Google Tree Map on Gratia Web

Google Tree Map on Gratia Web

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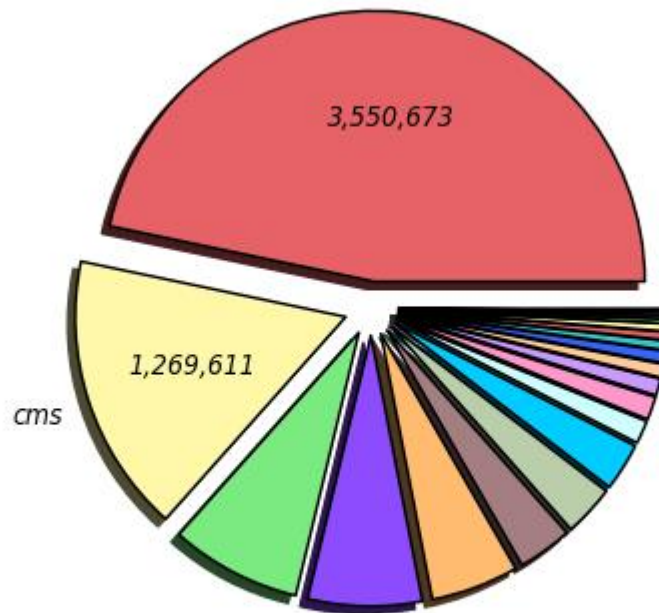
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Motivation

- An initial development to allow javascript plotting libraries has already been done

- Client side plotting can provide new functionalities for plots:
  - Plot style customization
  - Animations
  - Tooltips
  - Dynamic exploration of data

- Most of the existing types of plots can be replaced with a single Google Chart type of plot

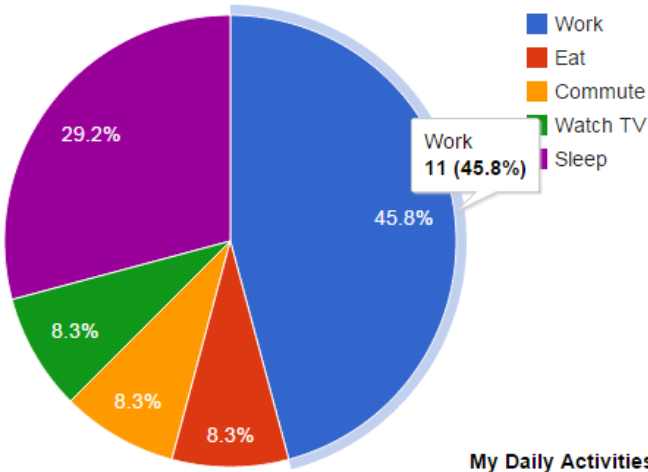- Google Charts offers additional types of visualizations that could be useful for additional analysis

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Pie

Job Count by VO (Sum: 7,601,443)
14 Days from 2015-02-06 to 2015-02-20

atlas 3,550,673

cms 1,269,611

- atlas (3,550,674)
- minos (248,091)
- alice (75,711)
- mu2e (33,883)
- cms (1,269,611)
- glow (232,616)
- sbgrid (60,176)
- mars (18,770)
- cdf (595,161)
- dosar (217,710)
- Other (53,549)
- des (15,916)
- osg (517,390)
- minerva (105,054)
- accelerator (41,212)
- fermilab (14,221)
- nova (398,842)
- lbne (104,545)
- microboone (35,989)
- darkside (12,322)

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Google Charts Pie

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Horizontal Bar

Average Job Runtimes

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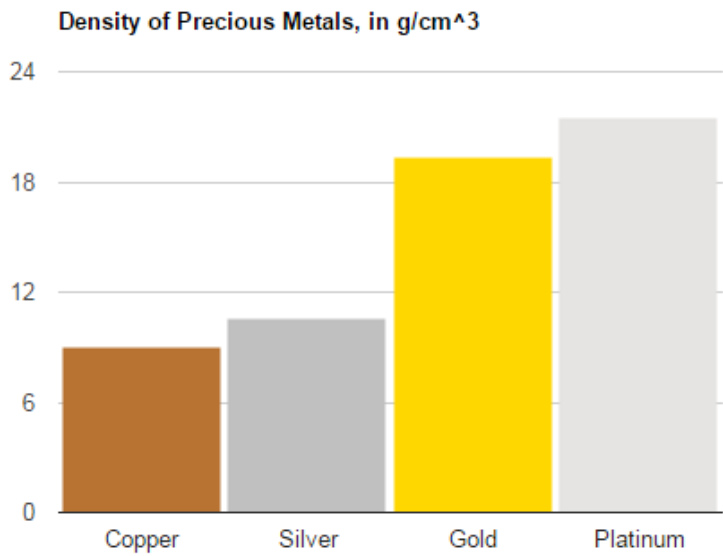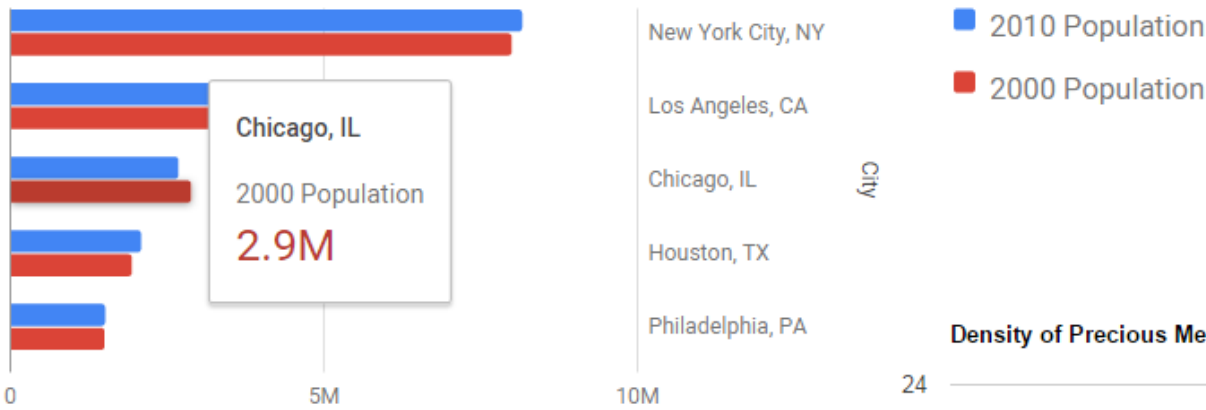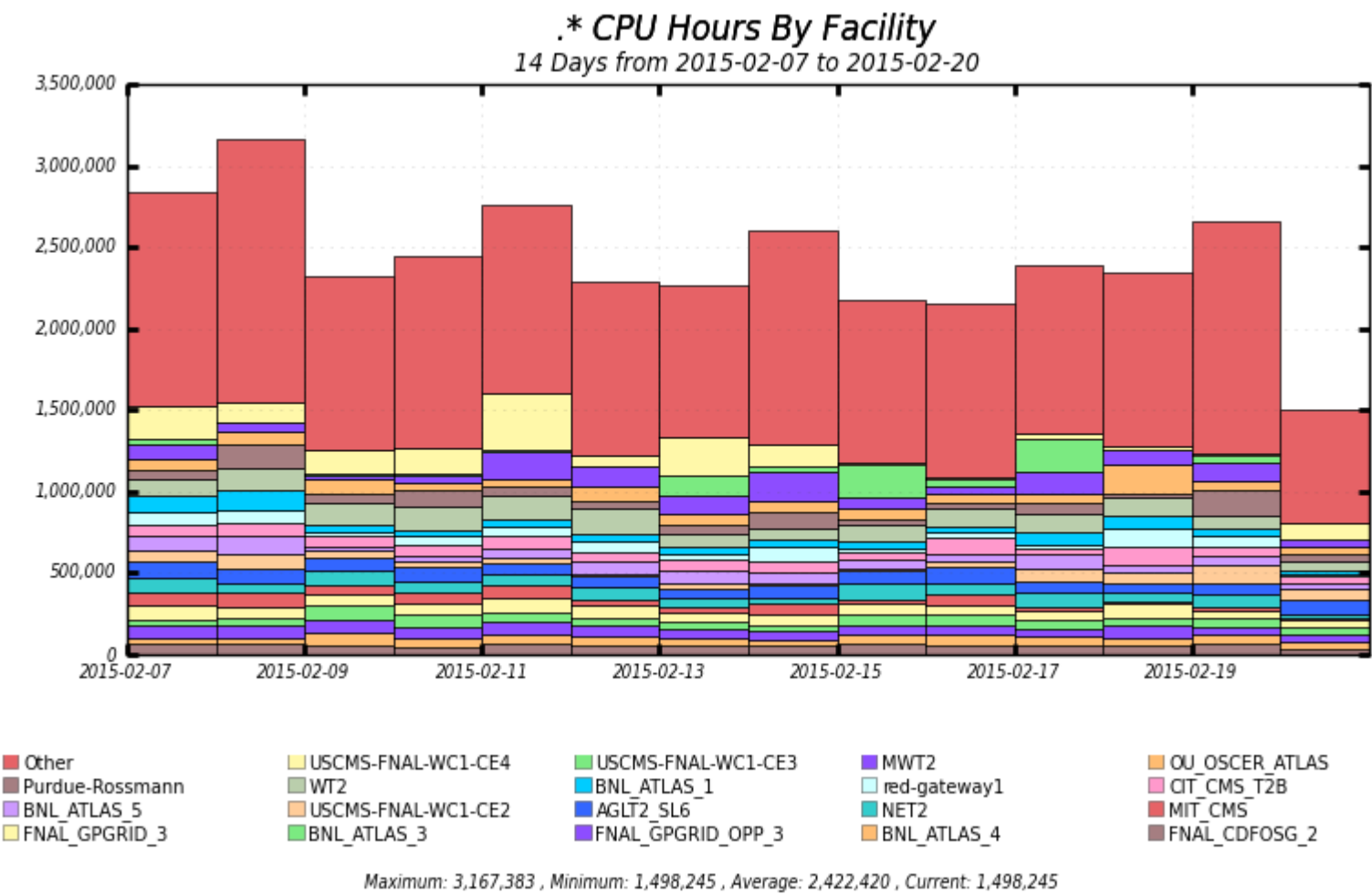
Google Charts Bar/Column Charts

Population of Largest U.S. Cities
Based on most recent and previous census data

Chicago, IL

2000 Population

2.9M

New York City, NY

Los Angeles, CA

Chicago, IL

Houston, TX

Philadelphia, PA

City

0   5M   10M

■ 2010 Population

■ 2000 Population

Density of Precious Metals, in g/cm^3

24

18

12

6

0

Copper   Silver   Gold   Platinum

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Stacked Bar

.* CPU Hours By Facility
14 Days from 2015-02-07 to 2015-02-20

Legend:
- Other
- Purdue-Rossmann
- BNL_ATLAS_5
- FNAL_GPGRID_3
- USCMS-FNAL-WC1-CE4
- WT2
- USCMS-FNAL-WC1-CE2
- BNL_ATLAS_3
- USCMS-FNAL-WC1-CE3
- BNL_ATLAS_1
- AGLT2_SL6
- FNAL_GPGRID_OPP_3
- MWT2
- red-gateway1
- NET2
- BNL_ATLAS_4
- OU_OSCER_ATLAS
- CIT_CMS_T2B
- MIT_CMS
- FNAL_CDFOSG_2

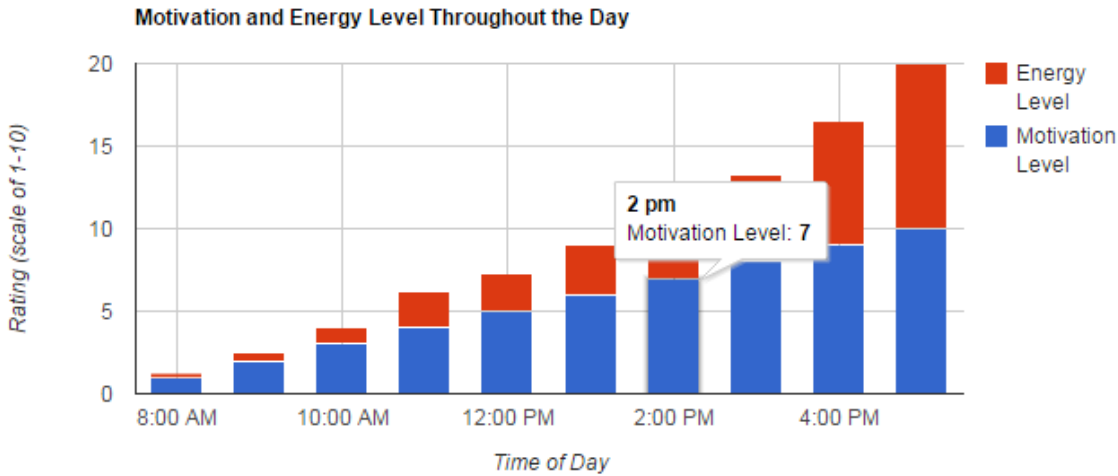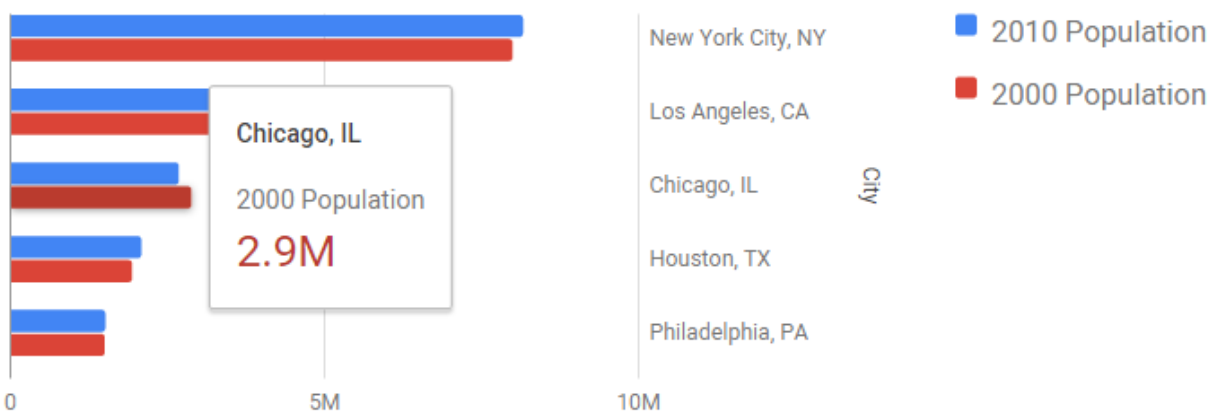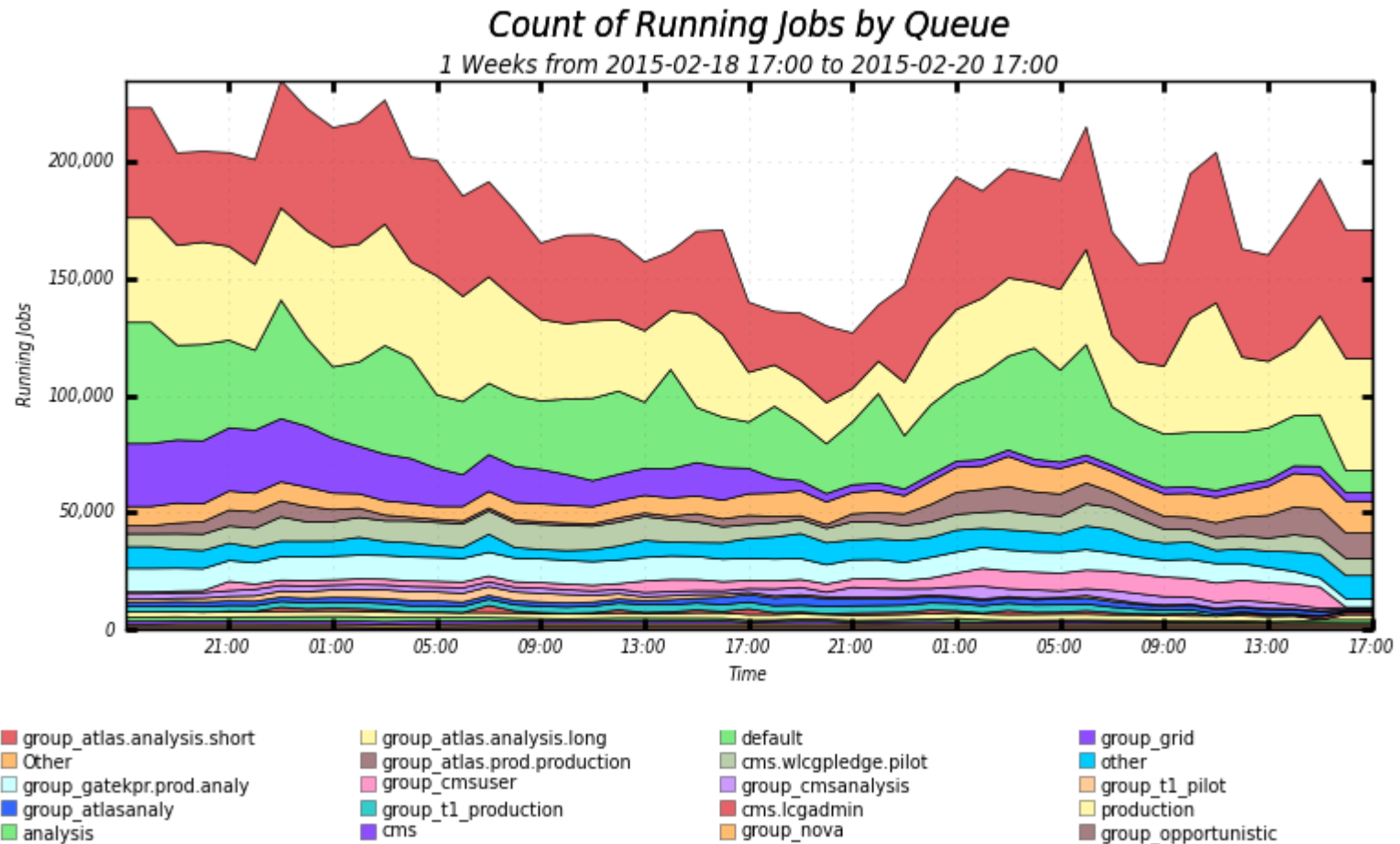Maximum: 3,167,383 , Minimum: 1,498,245 , Average: 2,422,420 , Current: 1,498,245

Google Charts Bar/Column Charts

Population of Largest U.S. Cities
Based on most recent and previous census data

Chicago, IL

2000 Population

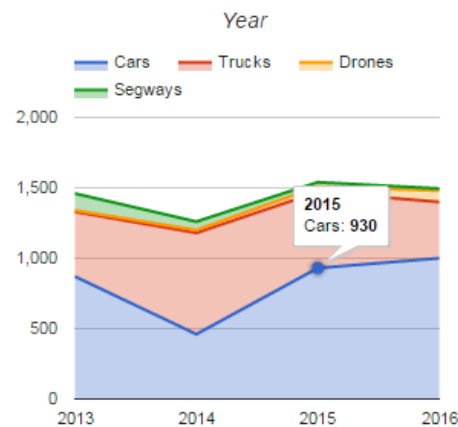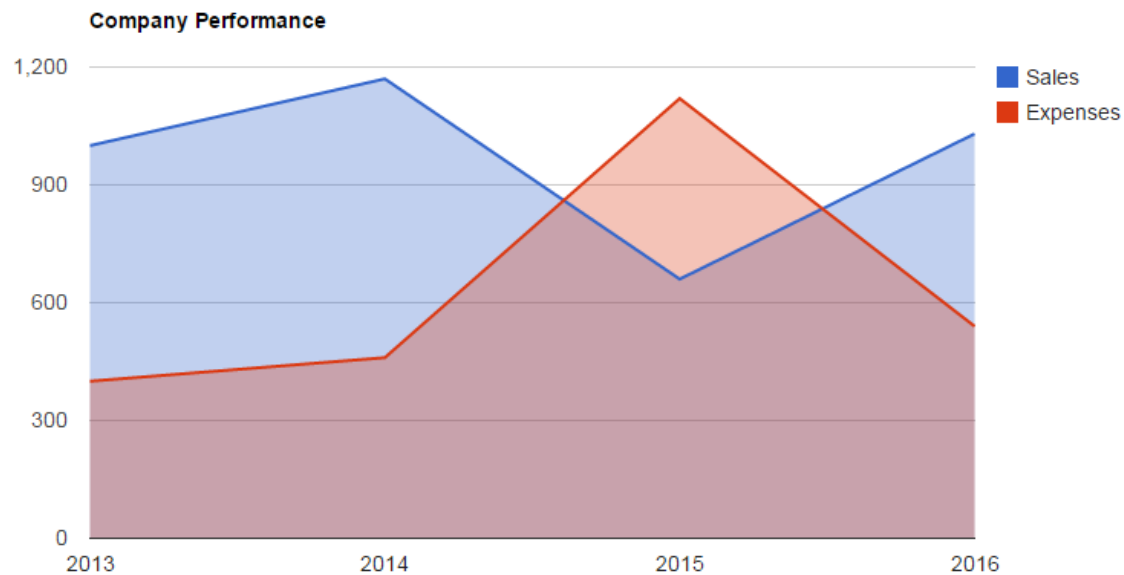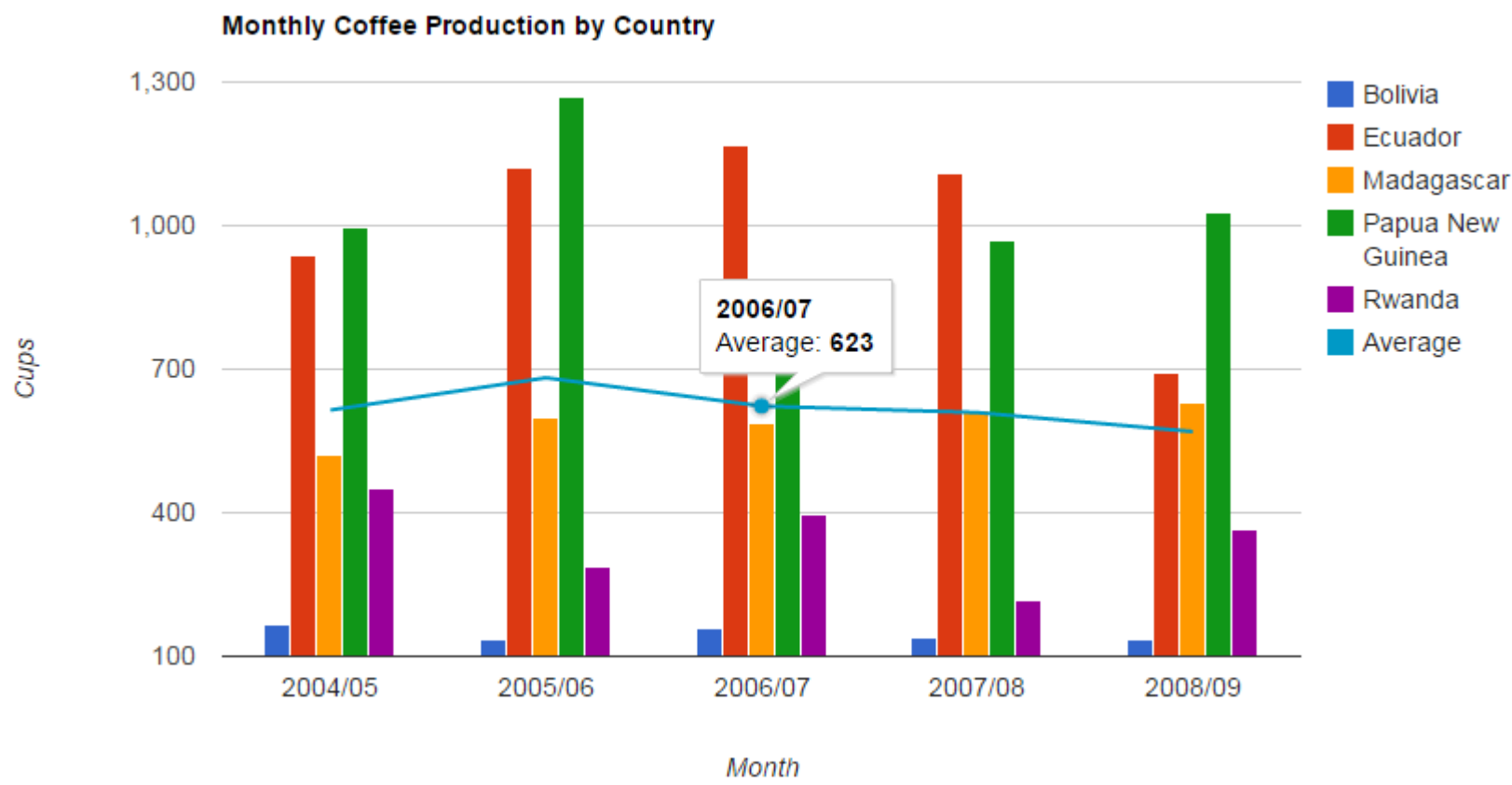2.9M

New York City, NY

Los Angeles, CA

Chicago, IL

Houston, TX

Philadelphia, PA

City

■ 2010 Population
■ 2000 Population

0   5M   10M

Motivation and Energy Level Throughout the Day

Rating (scale of 1-10)

2 pm
Motivation Level: 7

■ Energy Level
■ Motivation Level

8:00 AM   10:00 AM   12:00 PM   2:00 PM   4:00 PM

Time of Day

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Stacked Line

Count of Running Jobs by Queue
1 Weeks from 2015-02-18 17:00 to 2015-02-20 17:00

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Google Area Chart

Google Combo Chart

Monthly Coffee Production by Country

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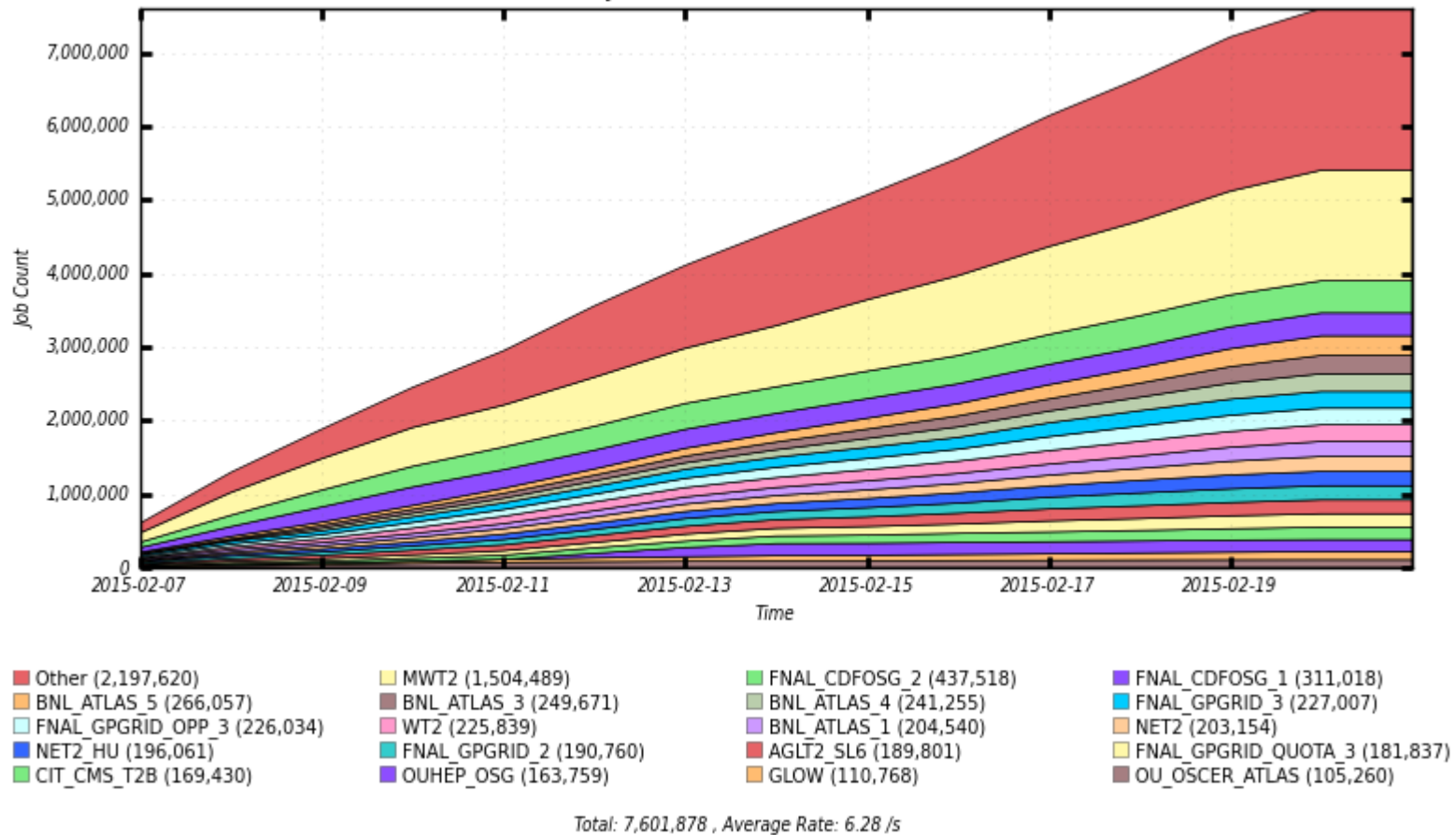
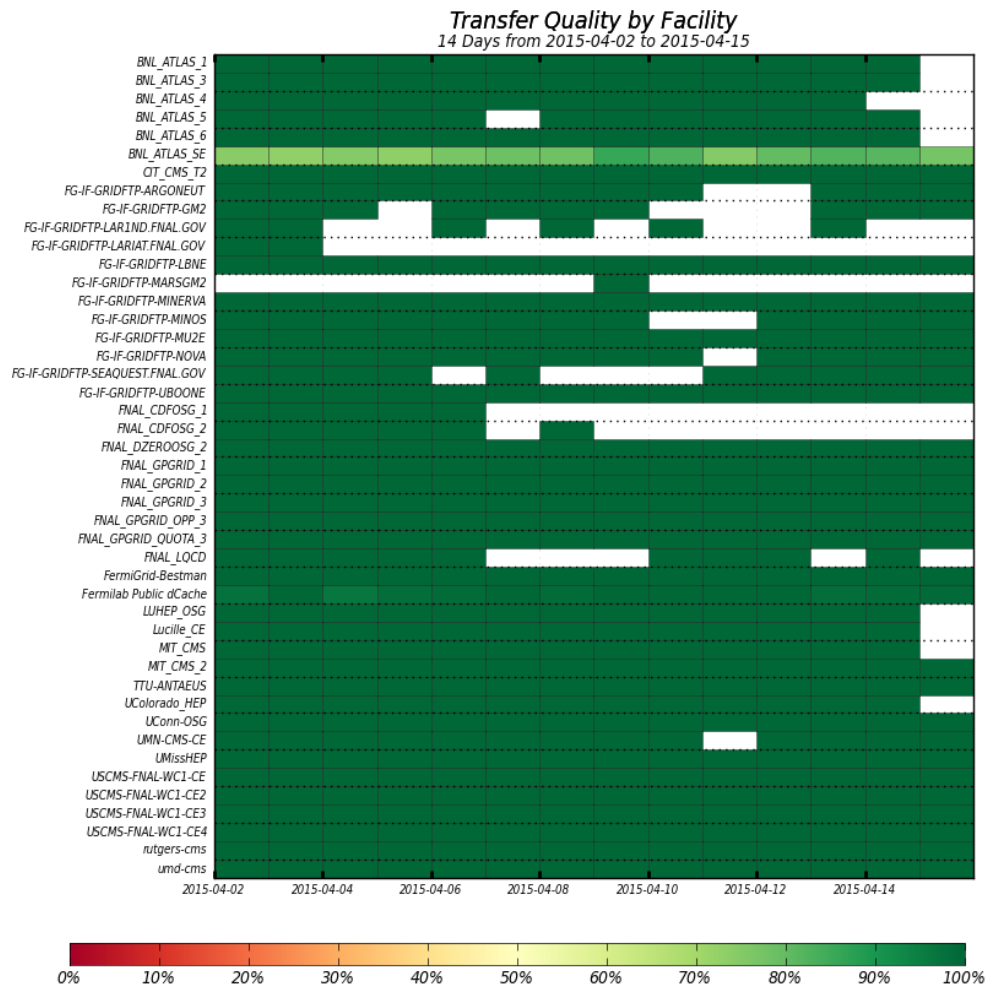# Cumulative

Cumulative Number of Jobs By Facility
14 Days from 2015-02-07 to 2015-02-20

Legend:
- Other (2,197,620)
- MWT2 (1,504,489)
- FNAL_CDFOSG_2 (437,518)
- FNAL_CDFOSG_1 (311,018)
- BNL_ATLAS_5 (266,057)
- BNL_ATLAS_3 (249,671)
- BNL_ATLAS_4 (241,255)
- FNAL_GPGRID_3 (227,007)
- FNAL_GPGRID_OPP_3 (226,034)
- WT2 (225,839)
- BNL_ATLAS_1 (204,540)
- NET2 (203,154)
- NET2_HU (196,061)
- FNAL_GPGRID_2 (190,760)
- AGLT2_SL6 (189,801)
- FNAL_GPGRID_QUOTA_3 (181,837)
- CIT_CMS_T2B (169,430)
- OUHEP_OSG (163,759)
- GLOW (110,768)
- OU_OSCER_ATLAS (105,260)

Total: 7,601,878 , Average Rate: 6.28 /s
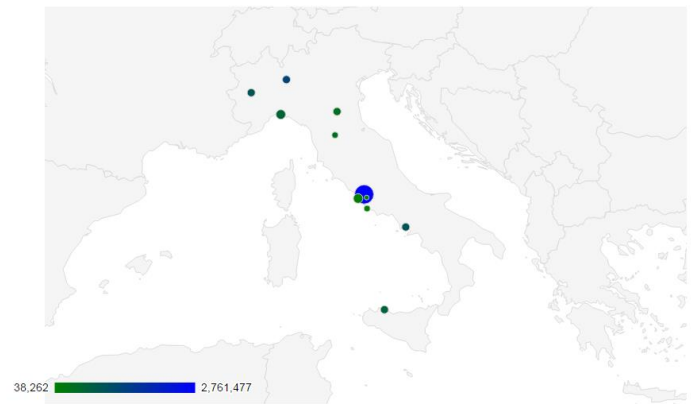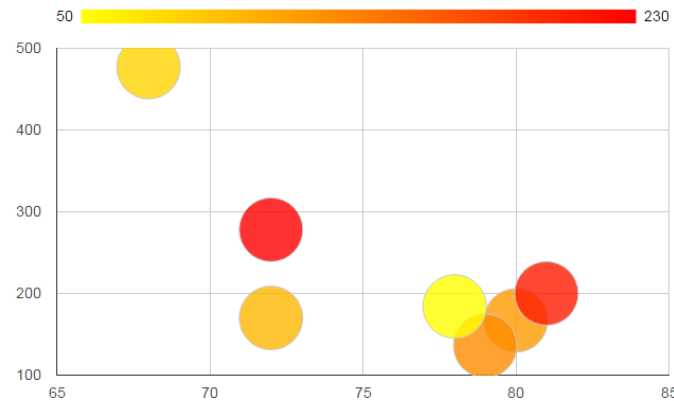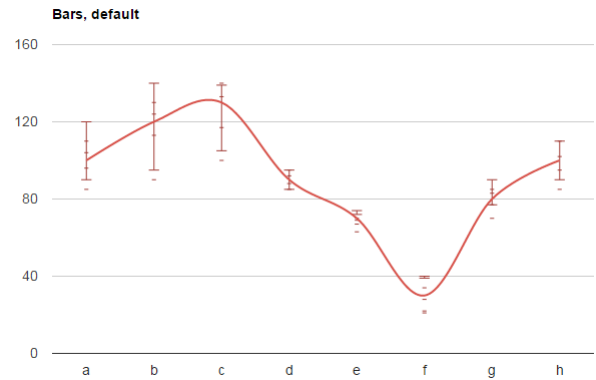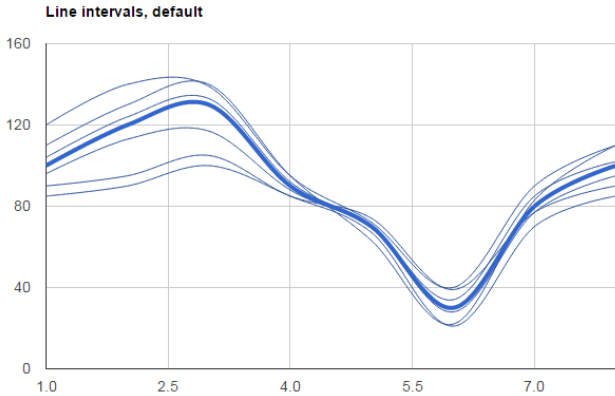
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Quality Map

Workarounds for missing types of plots

- The cumulative and the quality map plots do not have an equivalent in the Google Charts API

- The cumulative plot can be obtained as an Area Chart using a callback function that will cumulate the given data series before the data is plotted by the Google Charts API.

- There are community made Visualizations that can replace be used instead, like the BioHeatMap:

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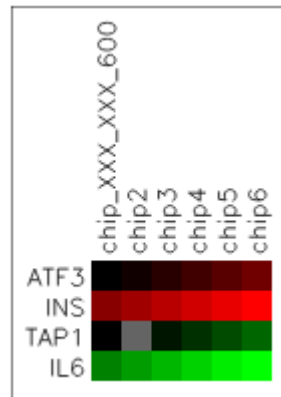
More Google Charts Visualizations

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Advantages

- Existing code for the Google Charts Tree Map can be reused

- Code will be less coupled separating plotting and data retrieving functionalities

- Code will be easier to understand because plotting, and styling functionalities will be provided by the Google Charts API

- Reduce the load on the server side since images are created on the client side

- Code will be designed to avoid re implementing each one of the 230 plot instances already defined. Code engineering and including an additional configuration parameter will determine whether matplotlib or Google Chart should be used

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Costs

- Google Charts API code is licensed and hosted by Google
- Image (PNG) requests for plots would not be supported

  NOTE:

  Users can still generate images from the client browser.

  Server provided static images for dashboards must be generated using tools like Phantom.js or using matplotlib

- 3 Months of estimated time for development

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Migration to Google Charts

Questions?

Thanks!

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