



## Transforming with Google Cloud Platform NIH Commons Cloud Credits Model Pilot

August 31, 2017

For the past 15 years, Google has been building the world's fastest, most powerful, highest quality cloud infrastructure on the planet.



1B+ Searches/Month



1B+ active monthly users



1B+ downloads;  
200M+ mobile; 10M+ activations on iOS



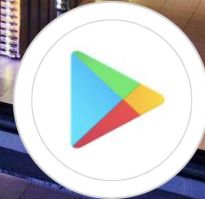
1B+ mobile,  
800M+ desktop



1.5M+ activ. per day  
900+ M devices



100 hours of video  
uploaded per minute



1B+ downloads, 1B+ apps, and 50B+ app downloads

# How is GCP Different?



Infrastructure and  
Networking



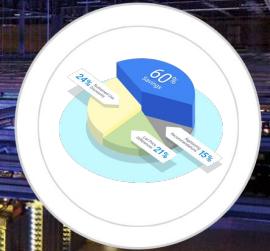
Security



Big Data &  
Machine Learning

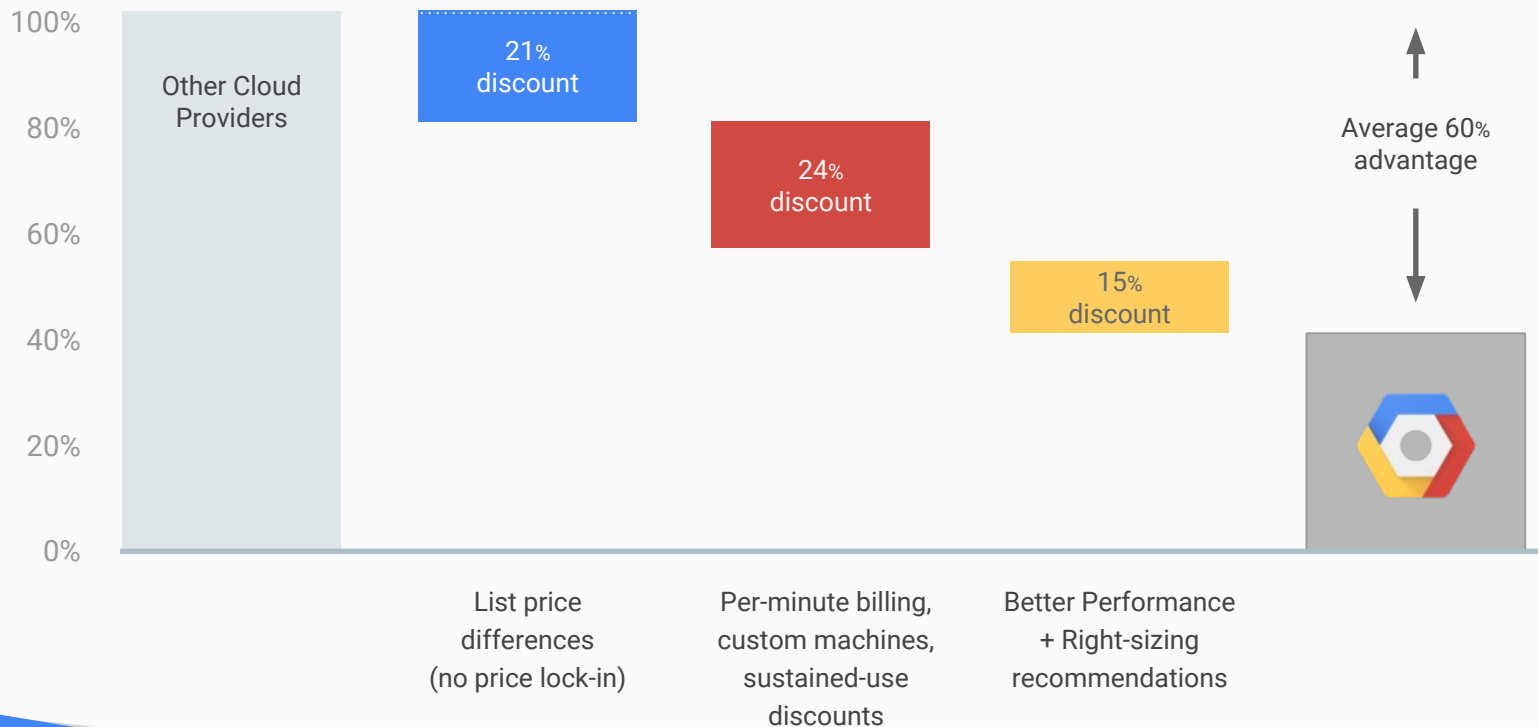


Open Source

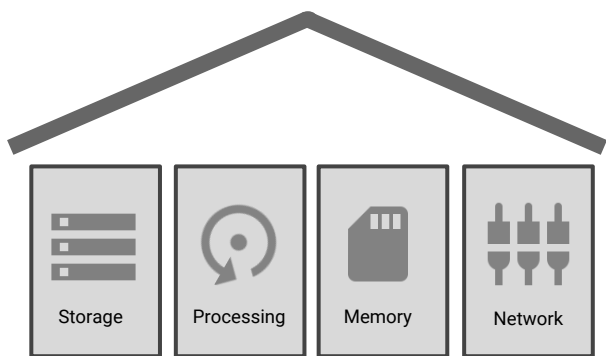


Performance &  
Price Advantage

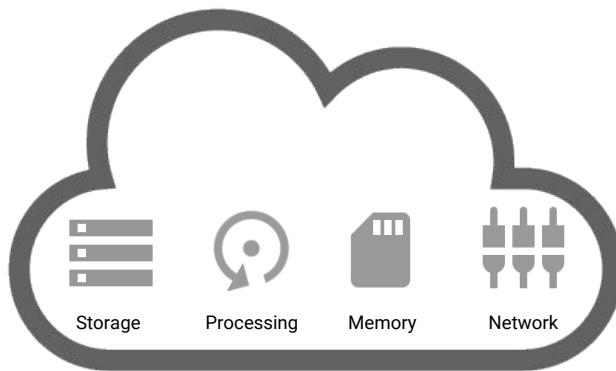
# Best Technology at Best Price



# The Journey to a Web-Scale Cloud



Physical/Colo



Virtualized



Serverless/No-ops

# Leading open source communities



Kubernetes

#1

Highest Engagement  
on Github

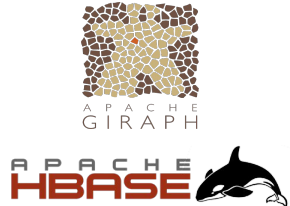
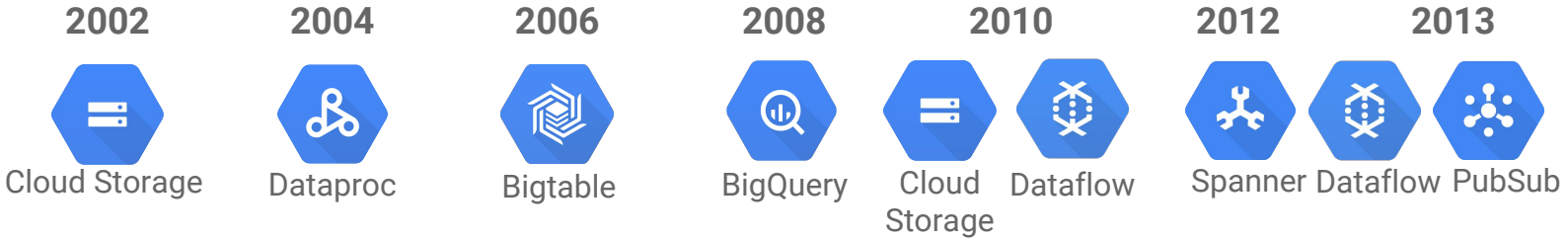
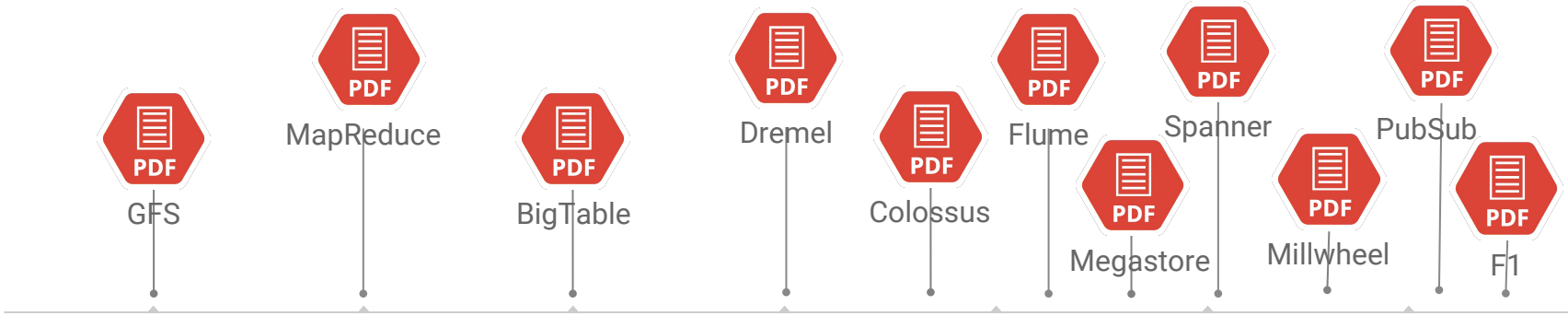


Tensorflow

#2

Highest Engagement  
on Github

# Google Loves Publishing Things



# Building for Multi-Cloud World



Public Cloud



Private Cloud



Open Source  
& APIs



# Machine Learning on GCP



# “AI First” Datacenters

## Tools for everyone

The impact of AI will be most powerful when everyone can use it.



Announcing Cloud  
TPUs on GCE

# Different ways Google Cloud can help you Benefit from Machine Learning

## Use your own data to train models



TensorFlow



Cloud Machine Learning Engine

## Ready to use Machine Learning models



Cloud Vision API



Cloud Speech API



Cloud Jobs API



Cloud Translation API



Cloud Natural Language API



Cloud Video Intelligence

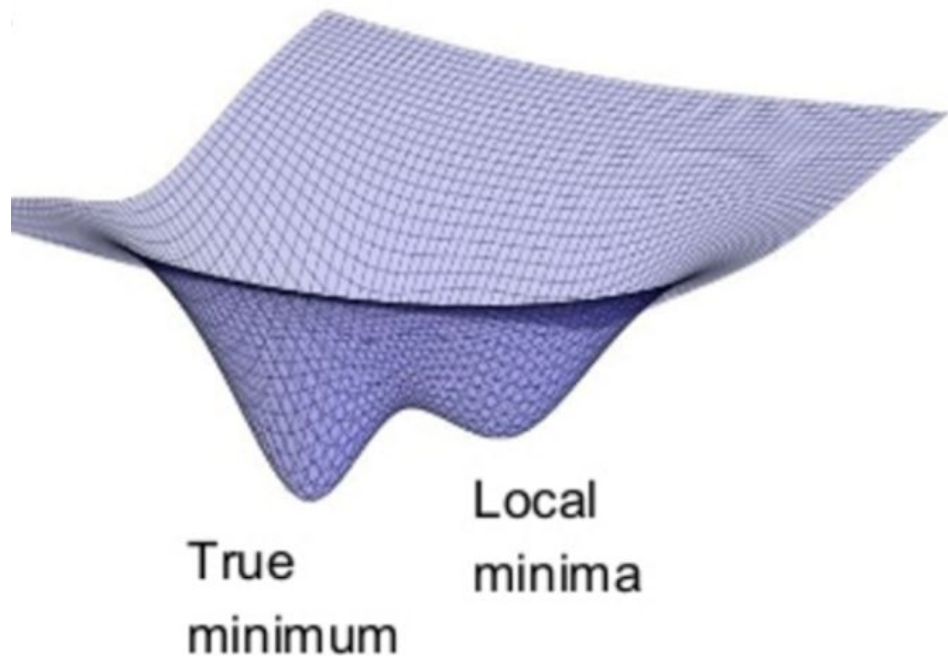
# Introducing Cloud Machine Learning Engine

- Fully managed service
- Train using a custom TensorFlow graph for any ML use cases with CPUs/GPUs
- Training at scale to shorten dev cycle
- Automatically maximize predictive accuracy with HyperTune
- High throughput batch predictions
- Low latency online predictions (Beta)
- Integrated Datalab experience



# HyperTune

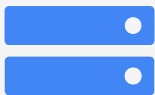
- Automatic hyperparameter tuning service
- Build better performing models faster and save many hours of manual tuning
- Google-developed search algorithm efficiently finds better hyperparameters for your model/dataset



Google Genomics



# Google Genomics: what it does



## Store

- **industry standard** APIs by the Global Alliance for Genomics and Health
- backed by **Bigtable** and **Spanner**
- supports petabytes today



## Process

- data-processing pipelines
- **verily DeepVariant**
- **Broad Institute GATK**
- **Compute Engine** VMs and **Docker**



## Explore

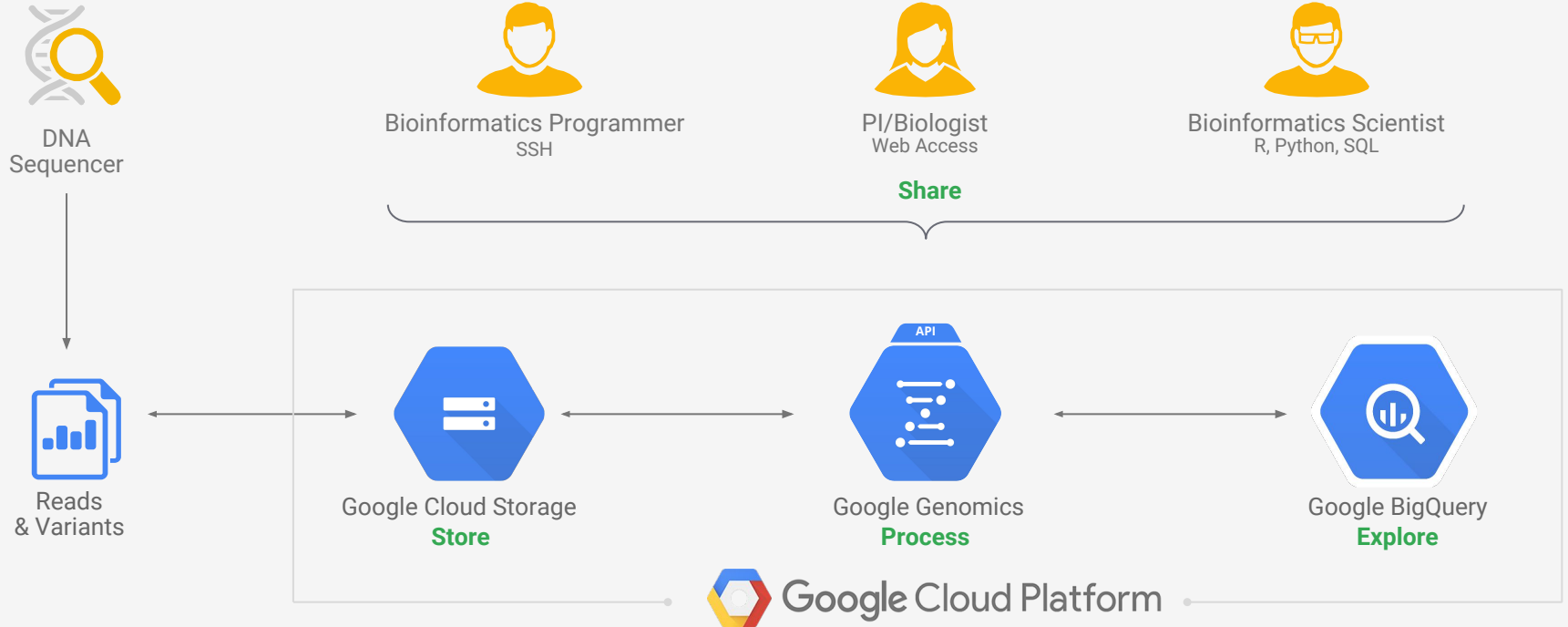
- data analysis and mining
- built on Google-scale tools
- **BigQuery**
- **Cloud Dataflow**
- **Apache Spark** and **Hadoop**



## Share

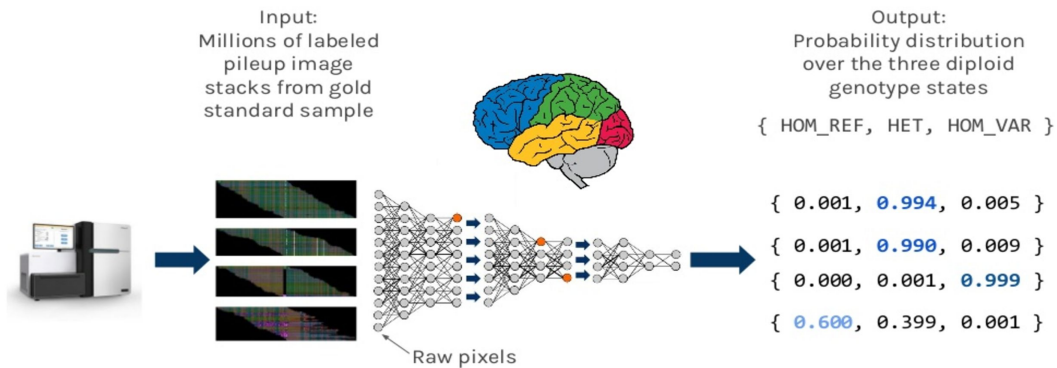
- **private by default**
- easy access for collaborators
- security and control

# Google Genomics: how it works



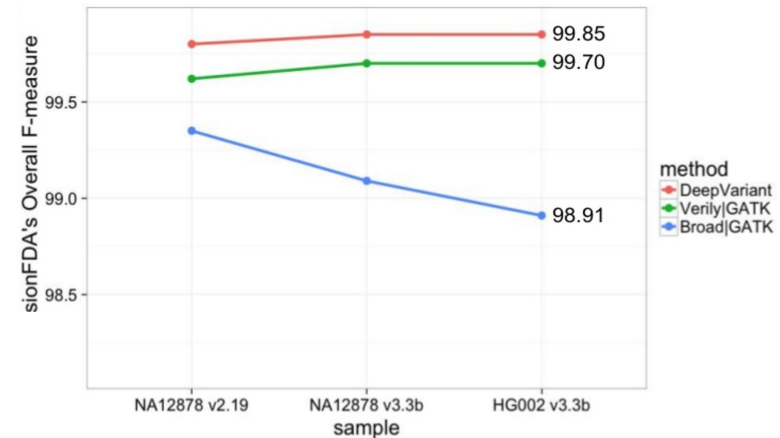
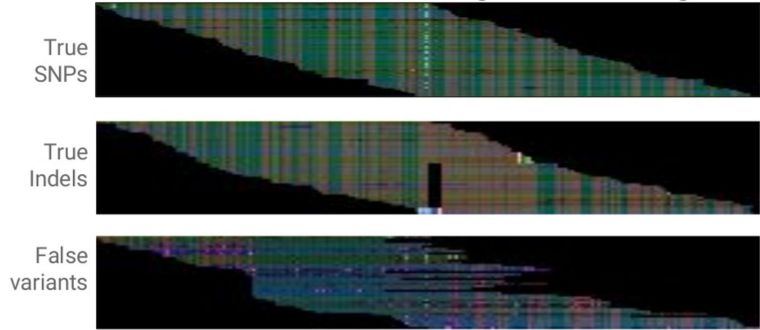


# Verily DeepVariant



## Recasting variant calling for deep learning

Encode reads and reference genome as images



# Onix Introduction



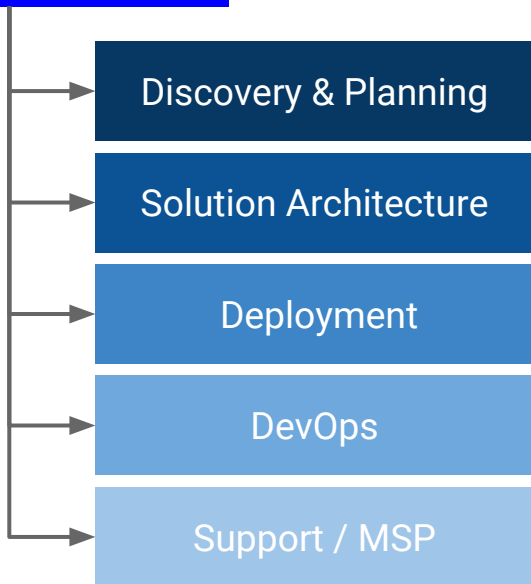
## Our Role

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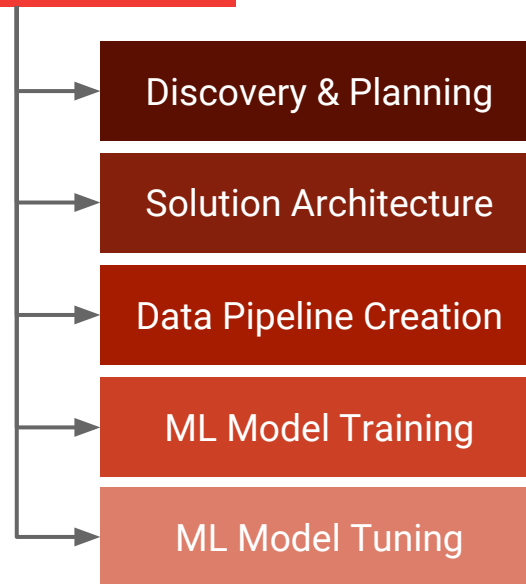
- Making GCP accessible to researchers
- Onboarding, training & best practices
- Grant assistance
- Consulting services & support
- OnSpend by Onix cost monitoring

# Onix cloud consulting (OnCloud) focus

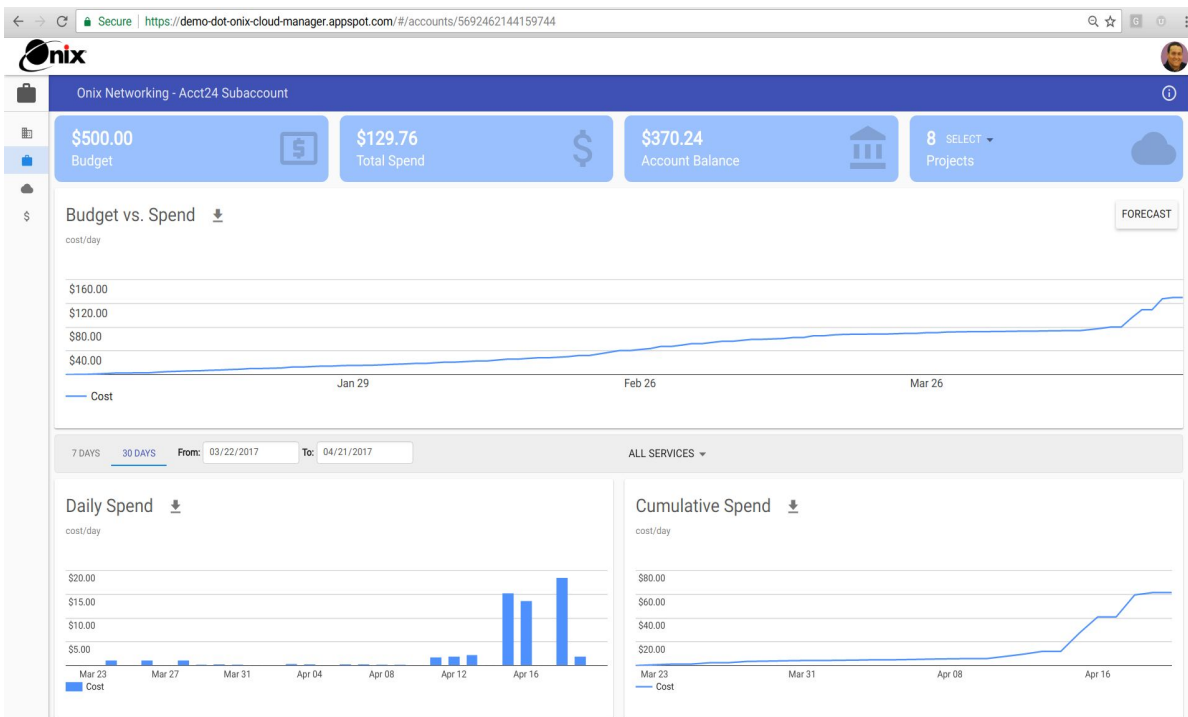
## Infrastructure Evolution



## Big Data & Machine Learning



# OnSpend by Onix



## Visualize

- An accurate visual representation of GCP spend across Accounts, Groups & Projects

## Budget

- Set custom budgets to efficiently manage GCP spend

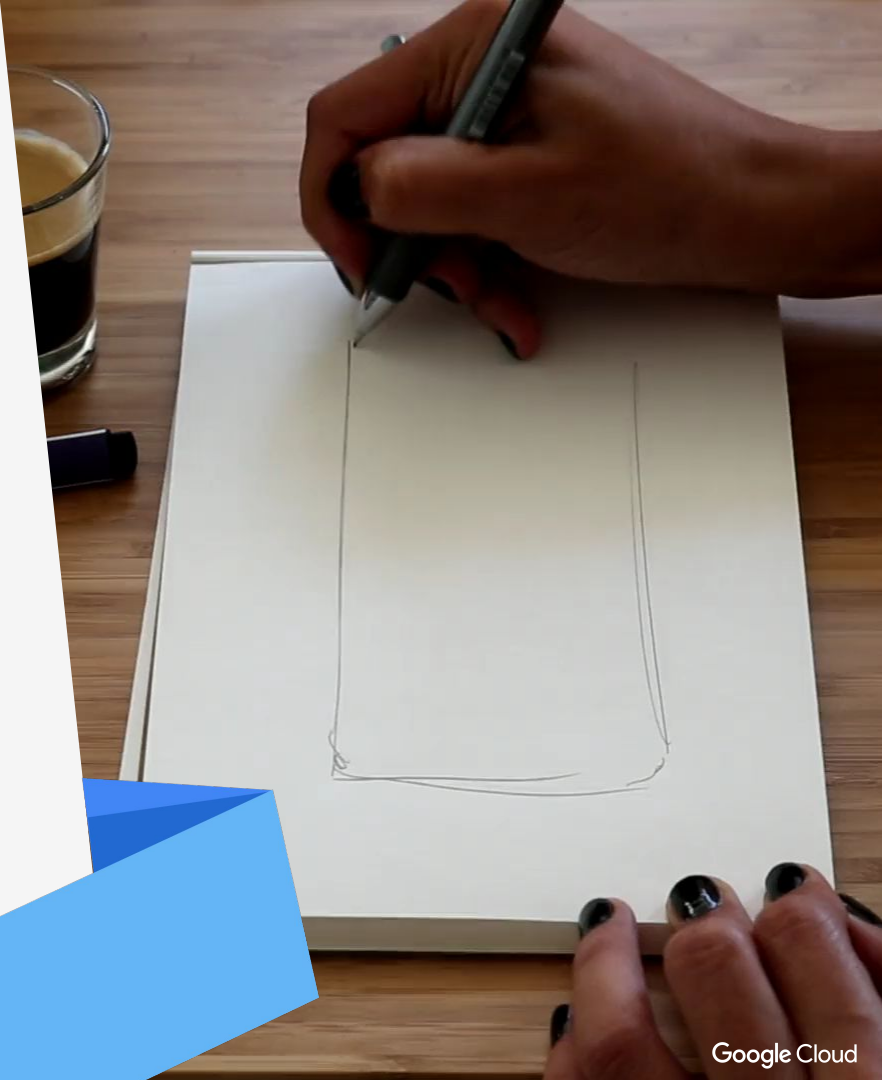
## Forecast

- Estimate future spend to determine when a budget will be met

## Alert

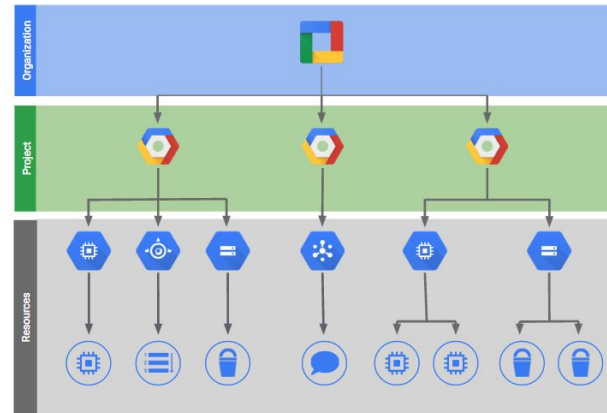
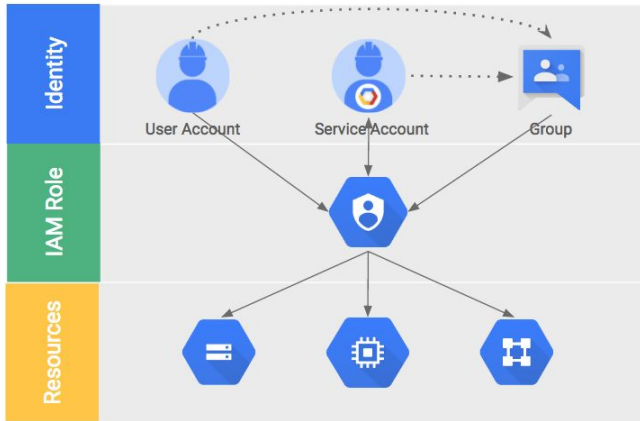
- Get alerted when a project is approaching a budget

# Case Studies



# Case Study: Cancer Research

Scalable compute & storage capacity  
Security, Identity & Audit controls  
Complex accounting & billing attribution



**YaleCtrResearchComp**  
@YaleCRC

computational support provided to researchers.

[research.computing.yale.edu](https://research.computing.yale.edu)

Joined March 2015

81 Photos and videos



**YaleCtrResearchComp**  
@YaleCRC

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Thank you [@googlecloud](#) & [@OnixNetworking](#) for coming to Yale and teaching a workshop on GCP for research!



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Thank you!