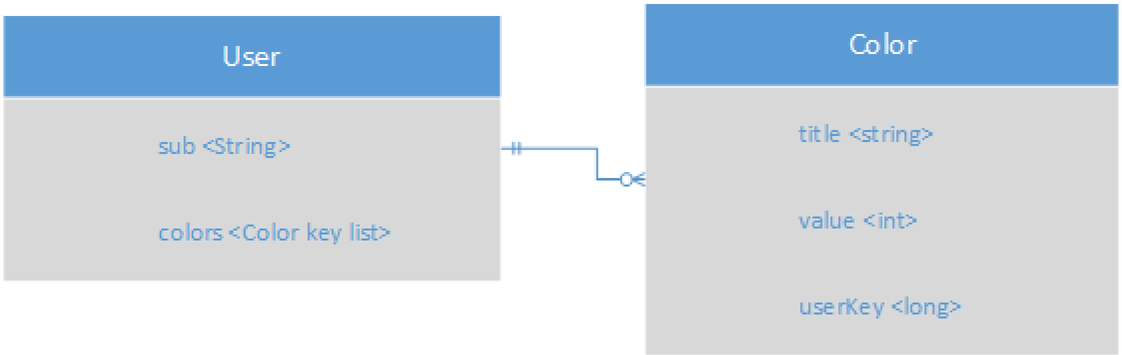
Final Project: Mobile Development

Video Link

http://web.engr.oregonstate.edu/~poolj/CS496/CS496_-_FinalProject.mp4

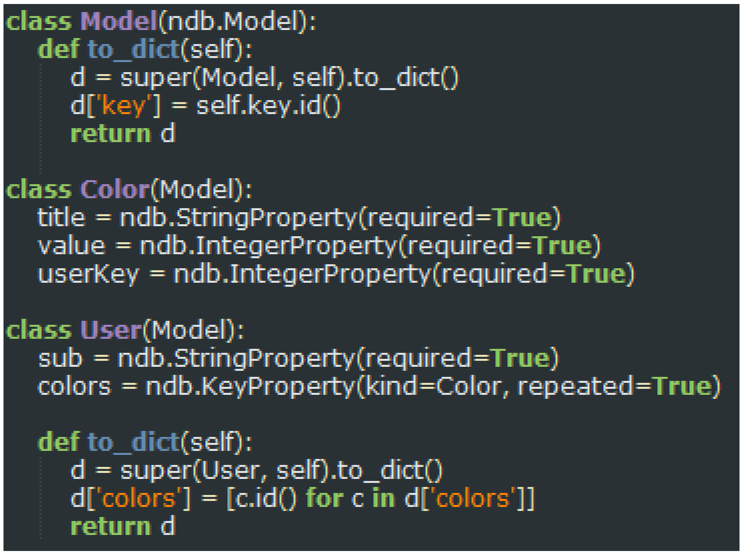
Note: The recording volume is low, but there is sound that should accompany the video

Database Structure



The database was developed using Python and Google App Engine, while being rather simplistic, it is more than adequate to demonstrate all of the components of a RESTful API. Another reason for the minimal amount of information in the User table is due to the developed Android application using Google sign-in, which already has access to most of the standard user information. The sub field contains the Google sub identifier that is unique to all Google accounts.

Below is the Python code used to generate the non-relational database:



```
class Model(ndb.Model):
    def to_dict(self):
        d = super(Model, self).to_dict()
        d['key'] = self.key.id()
        return d

class Color(Model):
    title = ndb.StringProperty(required=True)
    value = ndb.IntegerProperty(required=True)
    userKey = ndb.IntegerProperty(required=True)

class User(Model):
    sub = ndb.StringProperty(required=True)
    colors = ndb.KeyProperty(kind=Color, repeated=True)

    def to_dict(self):
        d = super(User, self).to_dict()
        d['colors'] = [c.id() for c in d['colors']]
        return d
```

RESTful API Calls

Both of the tables in the database fully support all 4 different RESTful calls: GET, POST, PUT, and DELETE. All of the URIs are designed to accommodate a trailing forward slash.

Method	GET
URI Syntax	http://poolj-cs496-colors.appspot.com/user
Headers	accept: application/json
Payload	(none)
Description	This method gets a list of all of the database keys for the user entities.

Method	GET
URI Syntax	http://poolj-cs496-colors.appspot.com/user/*{user_key}*
Headers	accept: application/json
Payload	(none)
Description	This method gets a list of all of the fields associated with the specified {user_key}.

Method	POST
URI Syntax	http://poolj-cs496-colors.appspot.com/user
Headers	accept: application/json
Payload	sub – Google sub identifier (required) [string]
Description	This method creates a new User entity based on the passed parameters.

Method	PUT
URI Syntax	http://poolj-cs496-colors.appspot.com/user
Headers	accept: application/json
Payload	key – NDB Key (required) [int] sub – Google sub identifier (required) [string]
Description	This method updates a User entity based on the passed parameters.

Method	DELETE
URI Syntax	http://poolj-cs496-colors.appspot.com/user/*{user_key}*
Headers	accept: application/json
Payload	(none)
Description	This method deletes a User entity associated with the specified {user_key}. It also deletes associated Color entities.

Method	POST
URI Syntax	http://poolj-cs496-colors.appspot.com/user/search
Headers	accept: application/json
Payload	sub – Google sub identifier (required) [string]
Description	This method searches for a User entity that matches the specified parameters.

Method	GET
URI Syntax	http://poolj-cs496-colors.appspot.com/color
Headers	accept: application/json
Payload	(none)
Description	This method gets a list of all of the database keys for the color entities.

Method	GET
URI Syntax	http://poolj-cs496-colors.appspot.com/user/*{color_key}*
Headers	accept: application/json
Payload	(none)
Description	This method gets a list of all of the fields associated with the specified {color_key}.

Method	POST
URI Syntax	http://poolj-cs496-colors.appspot.com/color
Headers	accept: application/json
Payload	title - Color Title (required) [string] value - Color Value (required) [int] userKey – Associated User Entity Key (required) [int]
Description	This method creates a new Color entity based on the passed parameters.

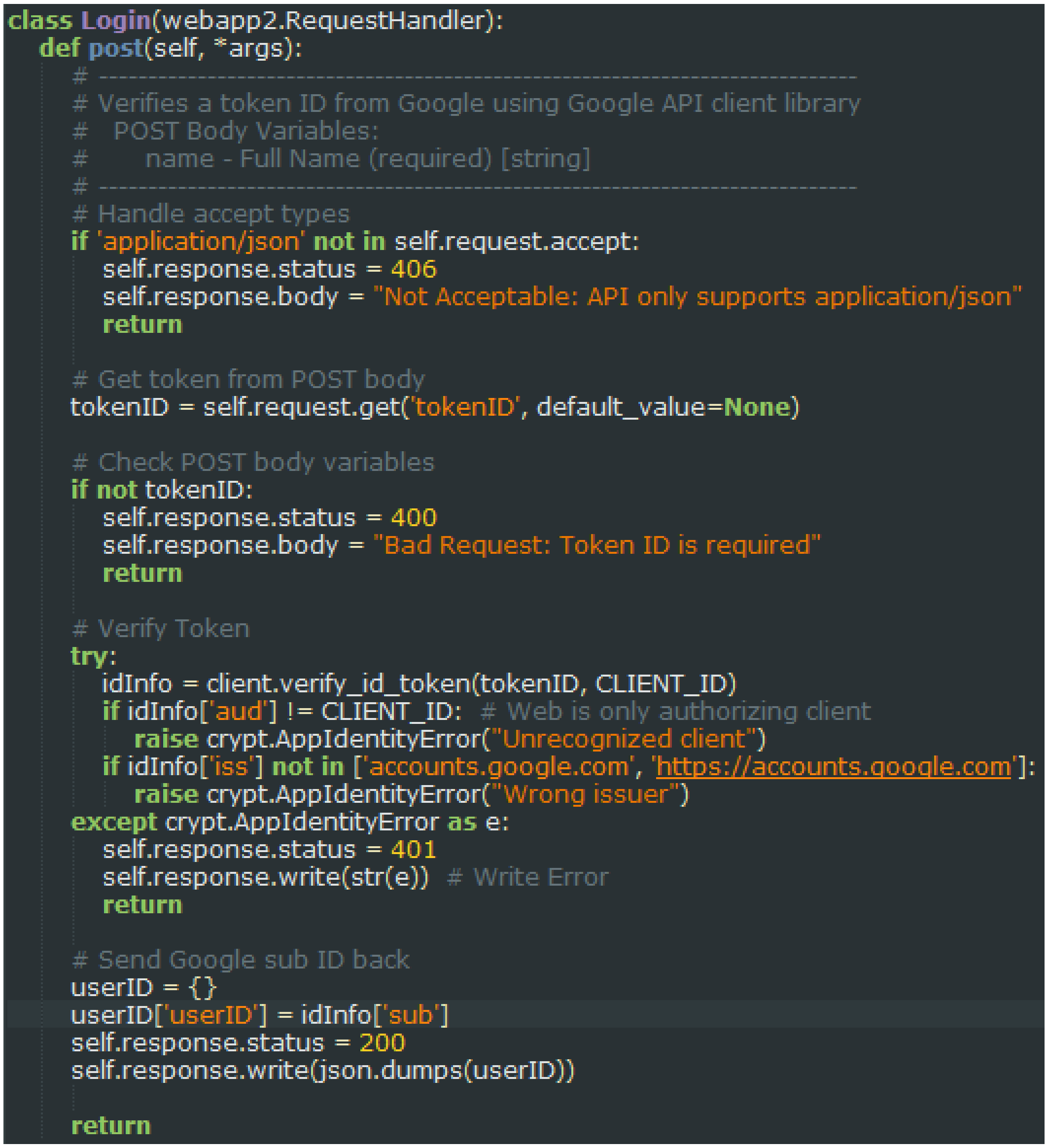
Method	PUT
URI Syntax	http://poolj-cs496-colors.appspot.com/color
Headers	accept: application/json
Payload	title - Color Title (optional) [string] value - Color Value (optional) [int] userKey – Associated User Entity Key (required) [int]
Description	This method updates a Color entity based on the passed parameters.

Method	DELETE
URI Syntax	http://poolj-cs496-colors.appspot.com/color/*{color_key}*
Headers	accept: application/json
Payload	(none)
Description	This method deletes a Color entity associated with the specified {color_key}. It also removes the associated reference from the User entity.

Account System

The account system is handled through use of the Google User API. It allows for using the user's existing google account to provide secure authorization and verification. Since the application was developed for the Android System, any user wanting access is already very likely to already have a Google account. There is also an option for creating a new account, if one is not available.

Once the application receives a Google Token, it is passed to the Google App Engine backend for verification. This is handled using the Python code below:



```
class Login(webapp2.RequestHandler):
    def post(self, *args):
        # ------------------------------------------------------------------------
        # Verifies a token ID from Google using Google API client library
        #   POST Body Variables:
        #       name - Full Name (required) [string]
        # ------------------------------------------------------------------------
        # Handle accept types
        if 'application/json' not in self.request.accept:
            self.response.status = 406
            self.response.body = "Not Acceptable: API only supports application/json"
            return

        # Get token from POST body
        tokenID = self.request.get('tokenID', default_value=None)

        # Check POST body variables
        if not tokenID:
            self.response.status = 400
            self.response.body = "Bad Request: Token ID is required"
            return

        # Verify Token
        try:
            idInfo = client.verify_id_token(tokenID, CLIENT_ID)
            if idInfo['aud'] != CLIENT_ID:  # Web is only authorizing client
                raise crypt.AppIdentityError("Unrecognized client")
            if idInfo['iss'] not in ['accounts.google.com', 'https://accounts.google.com']:
                raise crypt.AppIdentityError("Wrong issuer")
        except crypt.AppIdentityError as e:
            self.response.status = 401
            self.response.write(str(e))  # Write Error
            return

        # Send Google sub ID back
        userID = {}
        userID['userID'] = idInfo['sub']
        self.response.status = 200
        self.response.write(json.dumps(userID))

        return
```

References for the Google User API:
https://developers.google.com/identity/sign-in/android/