# clustering

July 8, 2016

In [2]:
```
%matplotlib inline
import pickle
import numpy
import matplotlib.pyplot as plt
import sys
sys.path.append("./tools/")
from feature_format import featureFormat, targetFeatureSplit
```

In [3]:
```
def Draw(pred, features, poi, mark_poi=False, name="image.png", f1_name="feature 1", f2_name="f
    """ some plotting code designed to help you visualize your clusters """

    ### plot each cluster with a different color--add more colors for
    ### drawing more than five clusters
    colors = ["b", "c", "k", "m", "g", "y", "n", "o"]
    for ii, pp in enumerate(pred):
        plt.scatter(features[ii][0], features[ii][1], color = colors[pred[ii]])

    ### if you like, place red stars over points that are POIs (just for funsies)
    if mark_poi:
        for ii, pp in enumerate(pred):
            if poi[ii]:
                plt.scatter(features[ii][0], features[ii][1], color="r", marker="*")
    plt.xlabel(f1_name)
    plt.ylabel(f2_name)
    plt.savefig(name)
    plt.show()
```

In [4]:
```
### load in the dict of dicts containing all the data on each person in the dataset
data_dict = pickle.load( open("final_project_dataset.pkl", "r") )
### there's an outlier--remove it!
data_dict.pop("TOTAL", 0)
```

Out[4]:
```
{'bonus': 97343619,
 'deferral_payments': 32083396,
 'deferred_income': -27992891,
 'director_fees': 1398517,
 'email_address': 'NaN',
 'exercised_stock_options': 311764000,
 'expenses': 5235198,
 'from_messages': 'NaN',
 'from_poi_to_this_person': 'NaN',
 'from_this_person_to_poi': 'NaN',
 'loan_advances': 83925000,
 'long_term_incentive': 48521928,
```

```
 'other': 42667589,
 'poi': False,
 'restricted_stock': 130322299,
 'restricted_stock_deferred': -7576788,
 'salary': 26704229,
 'shared_receipt_with_poi': 'NaN',
 'to_messages': 'NaN',
 'total_payments': 309886585,
 'total_stock_value': 434509511}
```

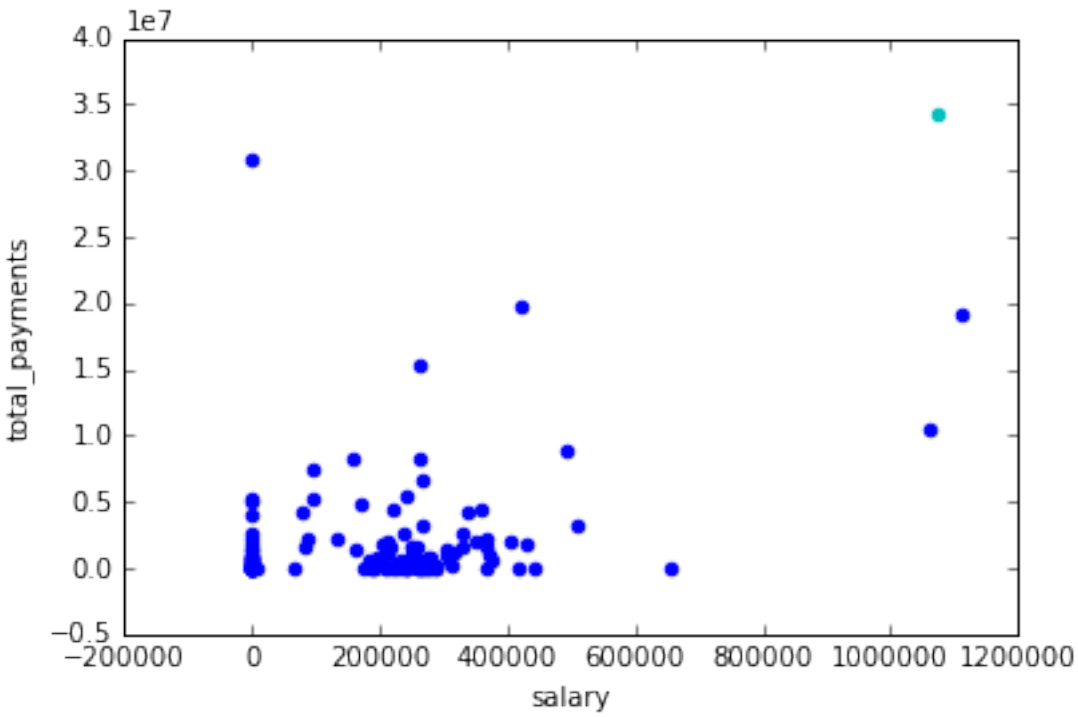
In [5]:
```
### the input features we want to use
### can be any key in the person-level dictionary (salary, director_fees, etc.)
feature_1 = "salary"
feature_2 = "exercised_stock_options"
feature_3 = "total_payments"
poi  = "poi"
features_list = [poi, feature_1, feature_2, feature_3]
data = featureFormat(data_dict, features_list )
poi, finance_features = targetFeatureSplit( data )


### in the "clustering with 3 features" part of the mini-project,
### you'll want to change this line to
### for f1, f2, _ in finance_features:
### (as it's currently written, the line below assumes 2 features)
# for f1, f2, _ in finance_features:
#     plt.scatter( f2, _ )
# plt.show()
### cluster here; create predictions of the cluster labels
### for the data and store them to a list called pred
d=[y for y in [x[1] for x in data] if y > 0]
print min(d)
print max(d)
```

```
477.0
1111258.0
```

In [6]:
```
from sklearn.cluster import KMeans
clusterer = KMeans(n_clusters=2)
clusterer.fit(finance_features, poi)
pred = clusterer.predict(finance_features)
```

In [7]:
```
### rename the "name" parameter when you change the number of features
### so that the figure gets saved to a different file
try:
    Draw(pred, finance_features, poi, mark_poi=False, name="clusters.pdf", f1_name=feature_1, f
except NameError:
    print "no predictions object named pred found, no clusters to plot"
```




```
In [8]: from sklearn.preprocessing import MinMaxScaler
        import numpy as np

        weights = np.array([115, 140, 175]).reshape(-1, 1).astype(float)
        weights
        scaler = MinMaxScaler()
        scaler.fit_transform(weights)
```

```
Out[8]: array([[ 0.        ],
               [ 0.41666667],
               [ 1.        ]])
```

```
In [ ]:
```