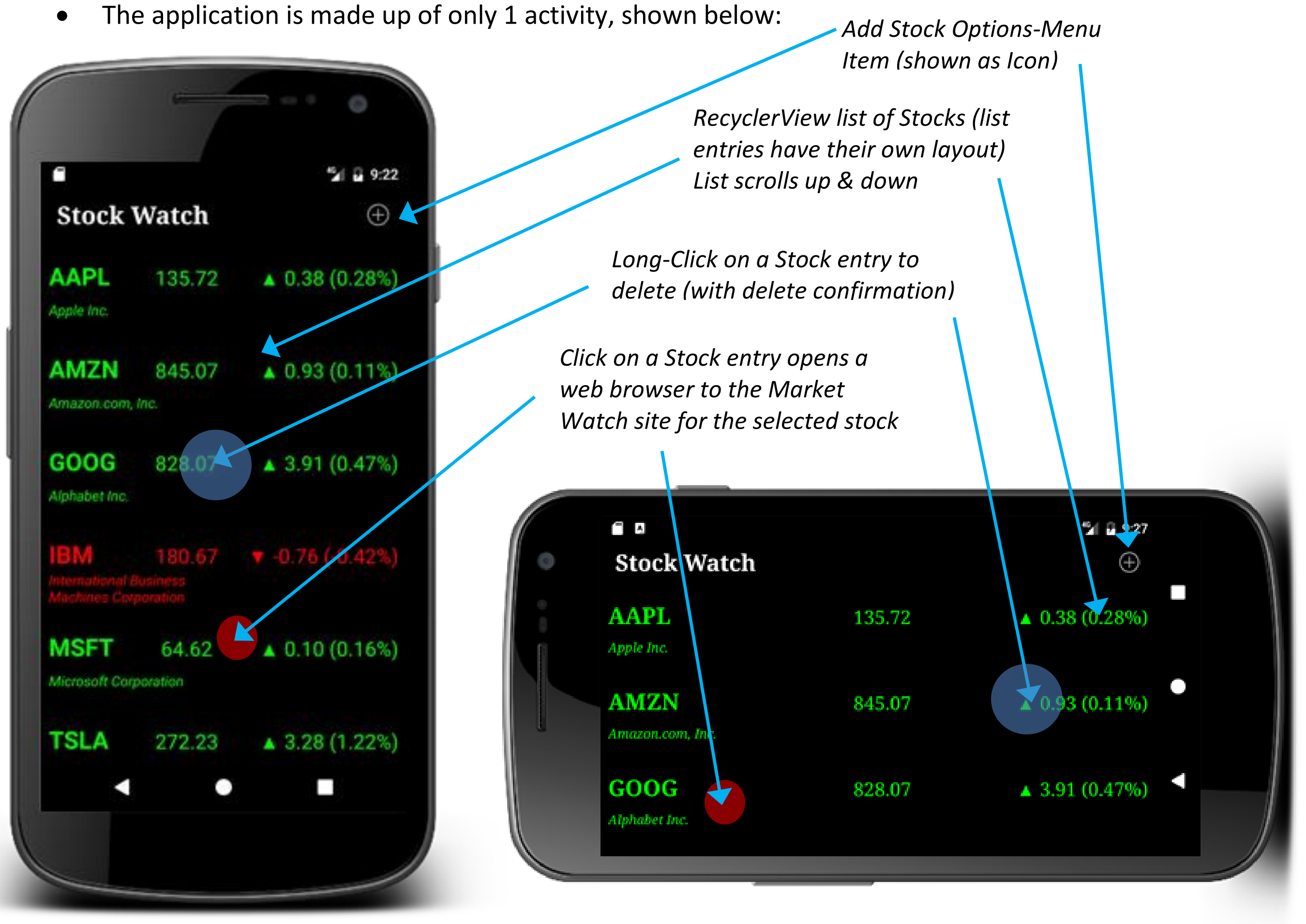
CSC 372/472: Mobile Applications Development for Android

Assignment 3 – Stock Watch *(300 pts)*

Uses: Internet, RecyclerView, Option-Menus, Multiple Runnables, JSON Data, Swipe-Refresh, Dialogs, Implied Intents

App Highlights:

- This app allows the user to display a sorted list of selected stocks. List entries include the stock symbol, company name, the current price, the daily price change amount and price percent change.
- There is no need to use a different layout for landscape orientation in this application – the same layout should work in any orientation.
- Selected stock symbols and the related names should be stored in a JSON file on the device.
- A Stock class should be created to represent each individual stock in the application. Required data includes: Stock Symbol (String), Company Name (String), Price (double), Price Change (double), and Change Percentage (double).
- Clicking on a stock entry opens a browser displaying the *Market Watch* web page for the selected stock
- Swipe-Refresh (pull-down) refreshes stock data
- The application is made up of only 1 activity, shown below:


Add Stock Options-Menu Item (shown as Icon)
RecyclerView list of Stocks (list entries have their own layout) List scrolls up & down
Long-Click on a Stock entry to delete (with delete confirmation)
Click on a Stock entry opens a web browser to the Market Watch site for the selected stock
Stock Watch
9:22
9:27

AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA	272.23	▲ 3.28 (1.22%)

A) Internet Data:

Downloading data for a stock symbol requires 2 downloads – one download to acquire the full set of supported stock symbol and company names, and a second download to acquire the financial data for an individual stock.

Download 1: Stock Symbol & Company Data

When started, your app should initiate a download of the full set of supported stock **symbol** and **company names**. This data is saved, and then used whenever the user adds a new stock.

Download Source URL: https://api.iextrading.com/1.0/ref-data/symbols

Download Results Example:

Results are returned in JSON format, as a JSONArray of JSONObjects containing the results of the query. The data we are interested in is the stock “symbol” and “name”. Below is a small sample of the JSON you will download:

```
[{
    "symbol": "A",
    "name": "Agilent Technologies Inc.",
    "date": "2018-09-21",
    "isEnabled": true,
    "type": "cs",
    "iexId": "2"
}, {
    "symbol": "AA",
    "name": "Alcoa Corporation",
    "date": "2018-09-21",
    "isEnabled": true,
    "type": "cs",
    "iexId": "12042"
}, {
    "symbol": "AAAU",
    "name": "Perth Mint Physical Gold",
    "date": "2018-09-21",
    "isEnabled": true,
    "type": "N/A",
    "iexId": "14924"
}, {
    "symbol": "AABA",
    "name": "Altaba Inc.",
    "date": "2018-09-21",
    "isEnabled": true,
    "type": "cs",
    "iexId": "7653"
}, {
    "symbol": "AAC",
    "name": "AAC Holdings Inc.",
    "date": "2018-09-21",
    "isEnabled": true,
    "type": "cs",
    "iexId": "9169"
}, {

. . .
```

```
    }, {
        "symbol": "ICXUSDT",
        "name": "ICON USD",
        "date": "2018-09-21",
        "isEnabled": true,
        "type": "crypto",
        "iexId": 10000013
    }, {
        "symbol": "NEOUSDT",
        "name": "NEO USD",
        "date": "2018-09-21",
        "isEnabled": true,
        "type": "crypto",
        "iexId": 10000014
    }, {
        "symbol": "VENUSDT",
        "name": "VeChain USD",
        "date": "2018-09-21",
        "isEnabled": true,
        "type": "crypto",
        "iexId": 10000015
    }, {
        "symbol": "XLMUSDT",
        "name": "Stellar Lumens USD",
        "date": "2018-09-21",
        "isEnabled": true,
        "type": "crypto",
        "iexId": 10000016
    }, {
        "symbol": "QTUMUSDT",
        "name": "Qtum USD",
        "date": "2018-09-21",
        "isEnabled": true,
        "type": "crypto",
        "iexId": 10000017
}
```

Download 2: Stock Financial Data

When you have the desired stock symbol (and company name), you use the *stock symbol* to download financial data for that stock. *For this you will need an API key.* You can get this by registering at:

https://iexcloud.io/cloud-login#/register

- Go to: https://iexcloud.io/cloud-login#/register
- Select "Individual"
- Enter your name, email address, and select a password.
- Click the terms checkbox and click "Create acount"
- Select the "START" plan (0/mo) - click Select Start
- Go to your email - look for message with Subject "IEX Cloud Email Verification"
- Click the iexcloud.io link in the email.
- From the page that link opens, click 'API Tokens" in the upper-left (under Home)

Query Format: https://cloud.iexapis.com/stable/stock/**STOCK_SYMBOL**/quote?token=**API_KEY**

For example, if the selected stock symbol was TSLA and your API token was pk_123abc, then your full URL would be: **https://cloud.iexapis.com/stable/stock/TSLA/quote?token=pk_123abc**

Download Results:

Results are returned in JSON format, as a JSONObject containing the results data from the query. The data we are interested in is highlighted below (Example using search text "TSLA"):

```
{
"symbol": "TGT",
"companyName": "Target Corp.",
"primaryExchange": "New York Stock Exchange",
"calculationPrice": "previousclose",
"open": null,
"openTime": null,
"close": null,
"closeTime": null,
"high": null,
"low": null,
"latestPrice": 116.63,
"latestSource": "Previous close",
"latestTime": "February 14, 2020",
"latestUpdate": 1581656400000,
"latestVolume": null,
"iexRealtimePrice": null,
"iexRealtimeSize": null,
"iexLastUpdated": null,
"delayedPrice": null,
"delayedPriceTime": null,
"oddLotDelayedPrice": null,
"oddLotDelayedPriceTime": null,
"extendedPrice": null,
"extendedChange": null,
"extendedChangePercent": null,
"extendedPriceTime": null,
"previousClose": 116.63,
"previousVolume": 3289074,
"change": 0,
"changePercent": 0,
"volume": null,
"iexMarketPercent": null,
"iexVolume": null,
"avgTotalVolume": 5489347,
"iexBidPrice": null,
"iexBidSize": null,
"iexAskPrice": null,
"iexAskSize": null,
"marketCap": 59100736310,
"peRatio": 18.48,
"week52High": 130.24,
"week52Low": 70.03,
"ytdChange": -0.0941,
"lastTradeTime": 1581714000046,
"isUSMarketOpen": false
}
```

Note – it is possible that the values for "latestPrice", "change", and "changePercent" could be null. If you encounter these null values in your data download, use the value "0.0" for the purposes of our app.

Application Behavior Diagrams

EXTRA CREDIT: All references to the behavior of tapping a stock in the list to open the MarketWatch.com website for the stock are optional and can be done for extra credit (25 points). Instructions related to this extra credit are printed in red.

Each stock entry contains the Stock Symbol (AAPL), the company name (Apple Inc.), the Last Trade Price (135.72), the price change direction (▲ for positive Price Change Amount, ▼ for negative Price Change Amount), the Price Change Amount (0.38), and the Price Change Percentage (0.28%) in parentheses.

If the stock's Price Change Amount is a positive value, then entire entry should use a green font. If the Price Change Amount is a negative value, then entire entry should use a red font.

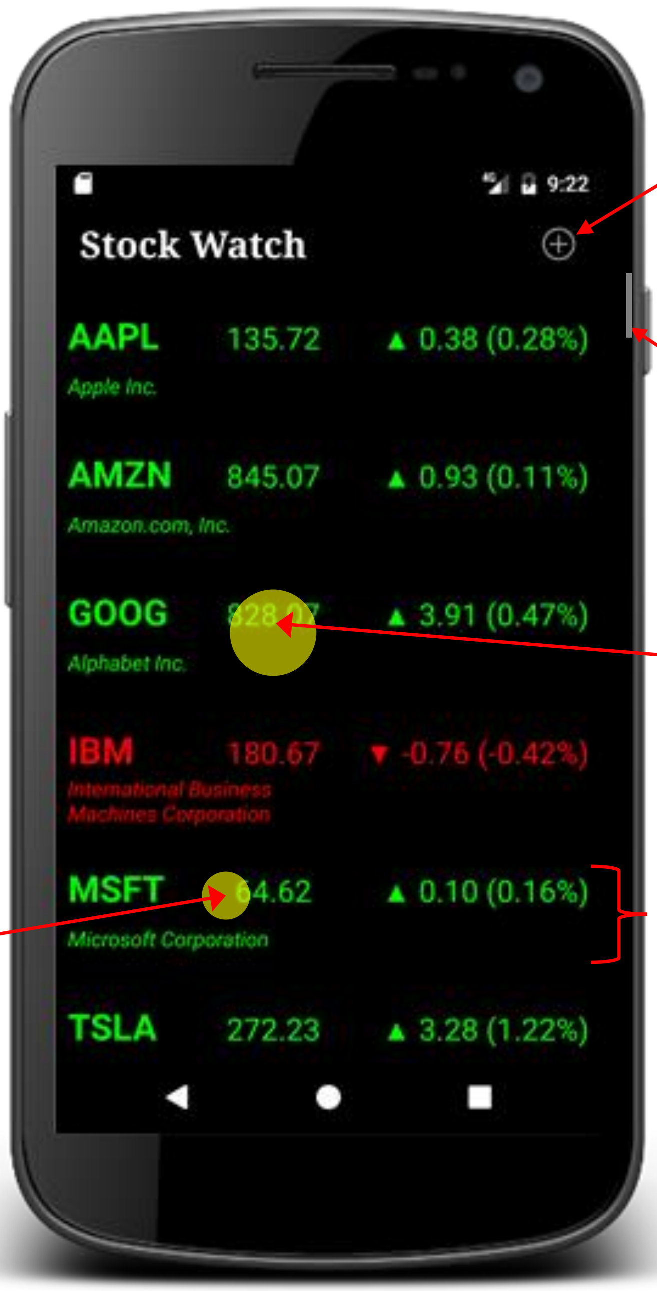
Clicking on a Stock entry opens a web browser to the Market Watch site for the selected stock

"Add Stock" action is an Options-Menu with a single item (shown as Icon)

A scrollbar should be present along the right-hand side

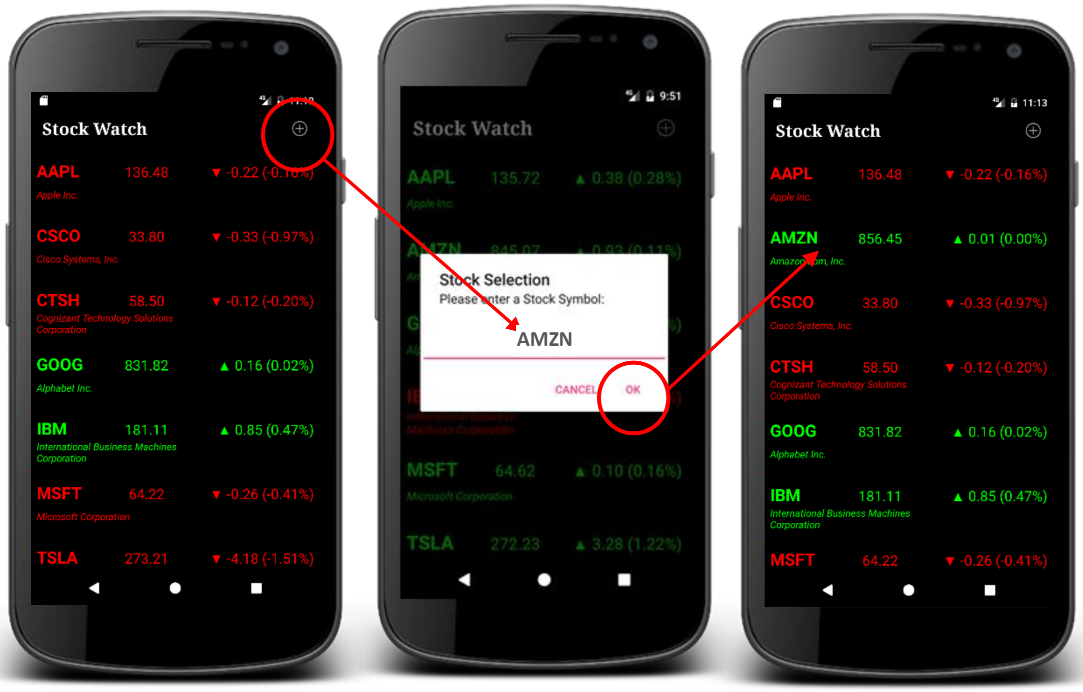
Long-Click on a Stock entry to delete (with delete confirmation)

RecyclerView list entries have their own layout



AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (-0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA	272.23	▲ 3.28 (1.22%)

1) Adding a stock – when only ***one* stock matched** the search symbol/name search string *(NOTE: The Stock Selection dialog should only allow capital letters):*



Stock Watch

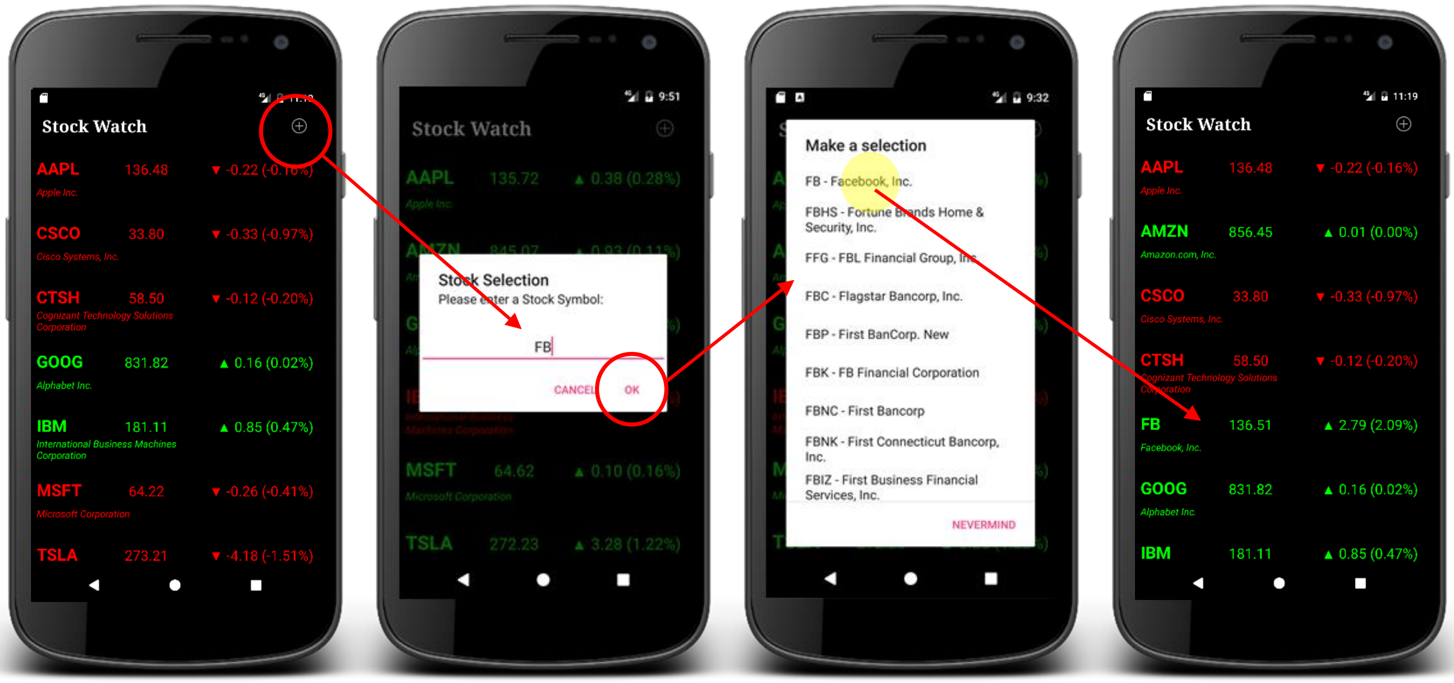
AAPL Apple Inc.	136.48	▼ -0.22 (-0.16%)
CSCO Cisco Systems, Inc.	33.80	▼ -0.33 (-0.97%)
CTSH Cognizant Technology Solutions Corporation	58.50	▼ -0.12 (-0.20%)
GOOG Alphabet Inc.	831.82	▲ 0.16 (0.02%)
IBM International Business Machines Corporation	181.11	▲ 0.85 (0.47%)
MSFT Microsoft Corporation	64.22	▼ -0.26 (-0.41%)
TSLA	273.21	▼ -4.18 (-1.51%)

Stock Selection
Please enter a Stock Symbol:
AMZN
CANCEL OK

Stock Watch

AAPL Apple Inc.	136.48	▼ -0.22 (-0.16%)
AMZN Amazon.com, Inc.	856.45	▲ 0.01 (0.00%)
CSCO Cisco Systems, Inc.	33.80	▼ -0.33 (-0.97%)
CTSH Cognizant Technology Solutions Corporation	58.50	▼ -0.12 (-0.20%)
GOOG Alphabet Inc.	831.82	▲ 0.16 (0.02%)
IBM International Business Machines Corporation	181.11	▲ 0.85 (0.47%)
MSFT	64.22	▼ -0.26 (-0.41%)

2) Adding a stock – **multiple stocks matched** the search string *(Stock Selection dialog should only allow capital letters, stock selection dialog should display the stock symbol and company name):*



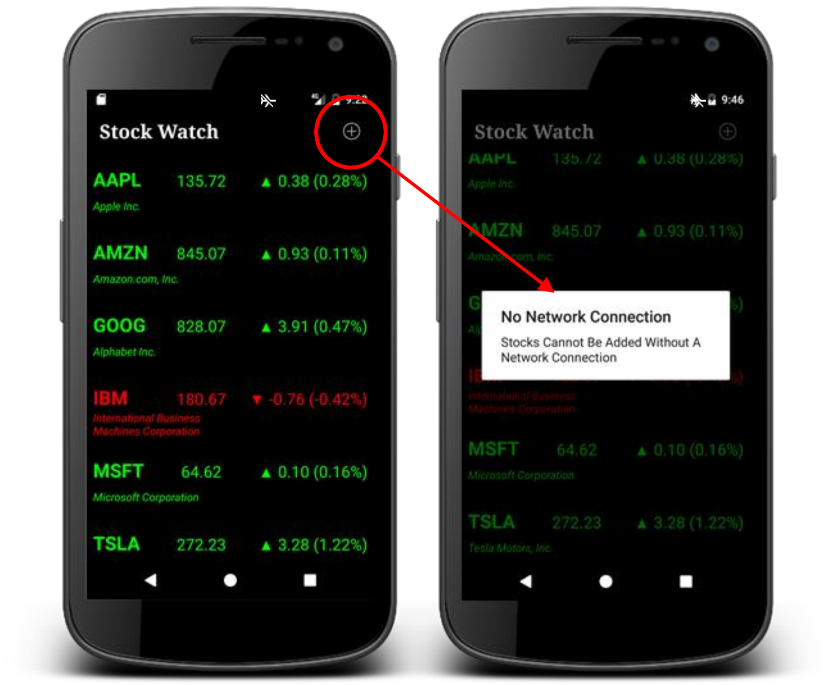
Stock Selection
Please enter a Stock Symbol:
FB
CANCEL OK

Make a selection
FB - Facebook, Inc.
FBHS - Fortune Brands Home & Security, Inc.
FFG - FBL Financial Group, Inc.
FBC - Flagstar Bancorp, Inc.
FBP - First BanCorp. New
FBK - FB Financial Corporation
FBNC - First Bancorp
FBNK - First Connecticut Bancorp, Inc.
FBIZ - First Business Financial Services, Inc.
NEVERMIND

Stock Watch

AAPL Apple Inc.	136.48	▼ -0.22 (-0.16%)
AMZN Amazon.com, Inc.	856.45	▲ 0.01 (0.00%)
CSCO Cisco Systems, Inc.	33.80	▼ -0.33 (-0.97%)
CTSH Cognizant Technology Solutions Corporation	58.50	▼ -0.12 (-0.20%)
FB Facebook, Inc.	136.51	▲ 2.79 (2.09%)
GOOG Alphabet Inc.	831.82	▲ 0.16 (0.02%)
IBM	181.11	▲ 0.85 (0.47%)

3) Adding a stock with no Network Connection – test using "Airplane Mode" *(You can show no buttons on the error dialog, or an "Ok" button – either is fine):*



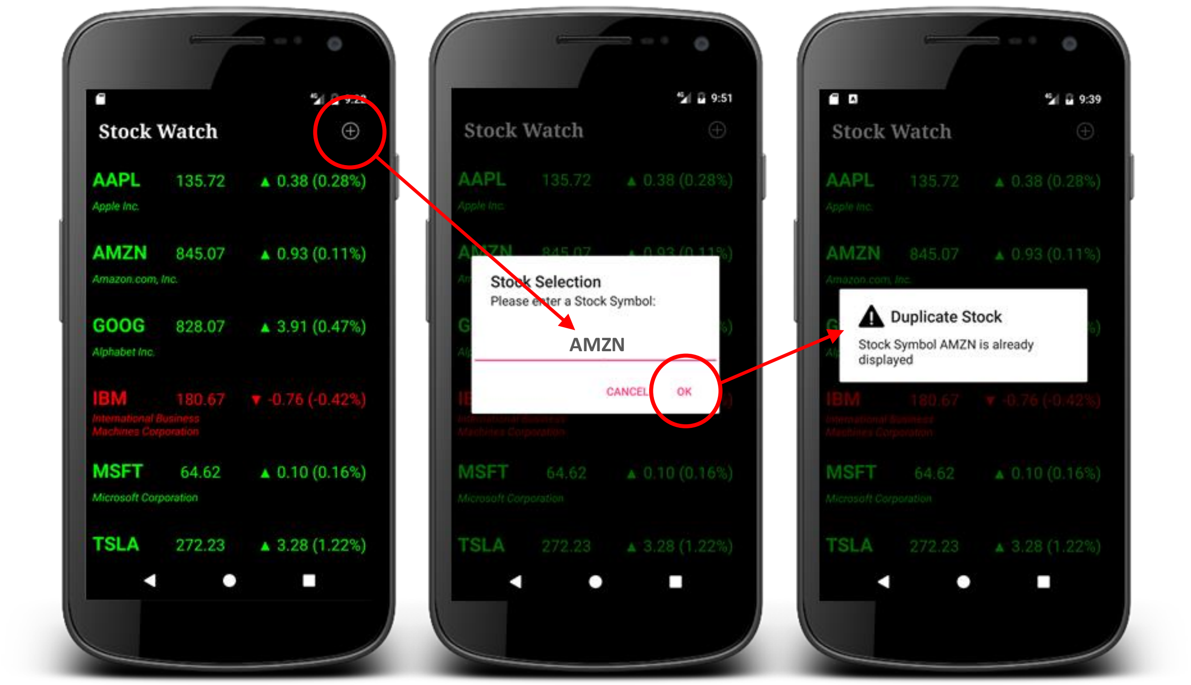
Stock Watch

AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (-0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA Tesla Motors, Inc.	272.23	▲ 3.28 (1.22%)

No Network Connection

Stocks Cannot Be Added Without A Network Connection

4) Adding a stock – specified stock is a duplicate *(Stock Selection dialog should only allow capital letters, You can show no buttons on the error dialog, or an "Ok" button – either is fine):*



Stock Selection

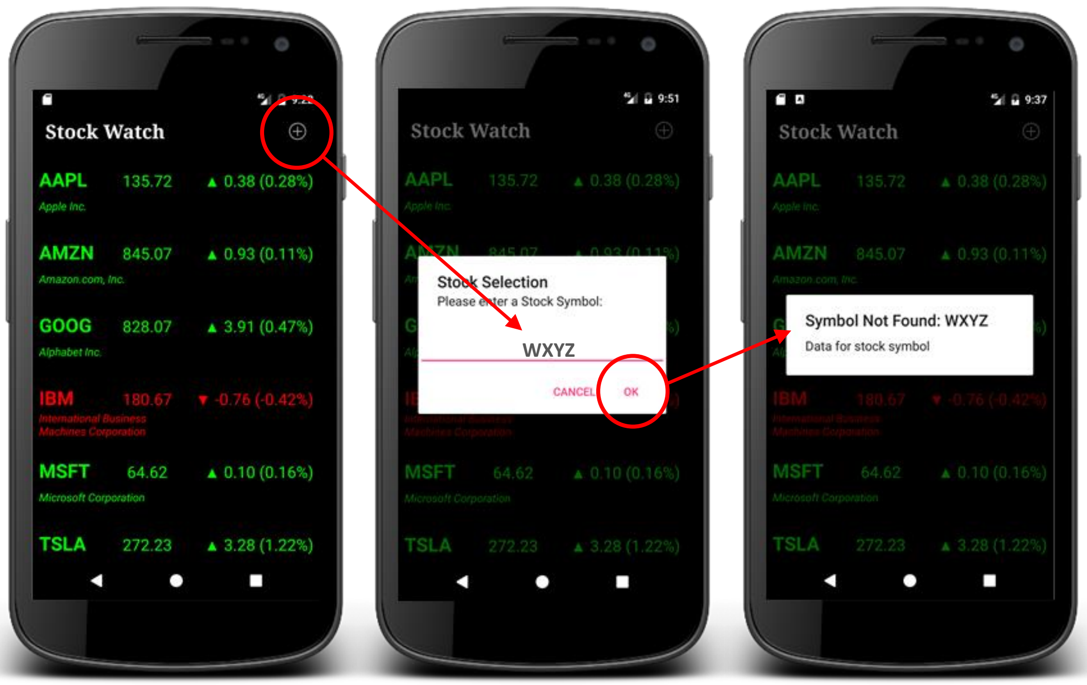
Please enter a Stock Symbol:

AMZN

Duplicate Stock

Stock Symbol AMZN is already displayed

5) Adding a stock – specified stock is not found *(Stock Selection dialog should only allow capital letters, You can show no buttons on the error dialog, or an "Ok" button – either is fine):*



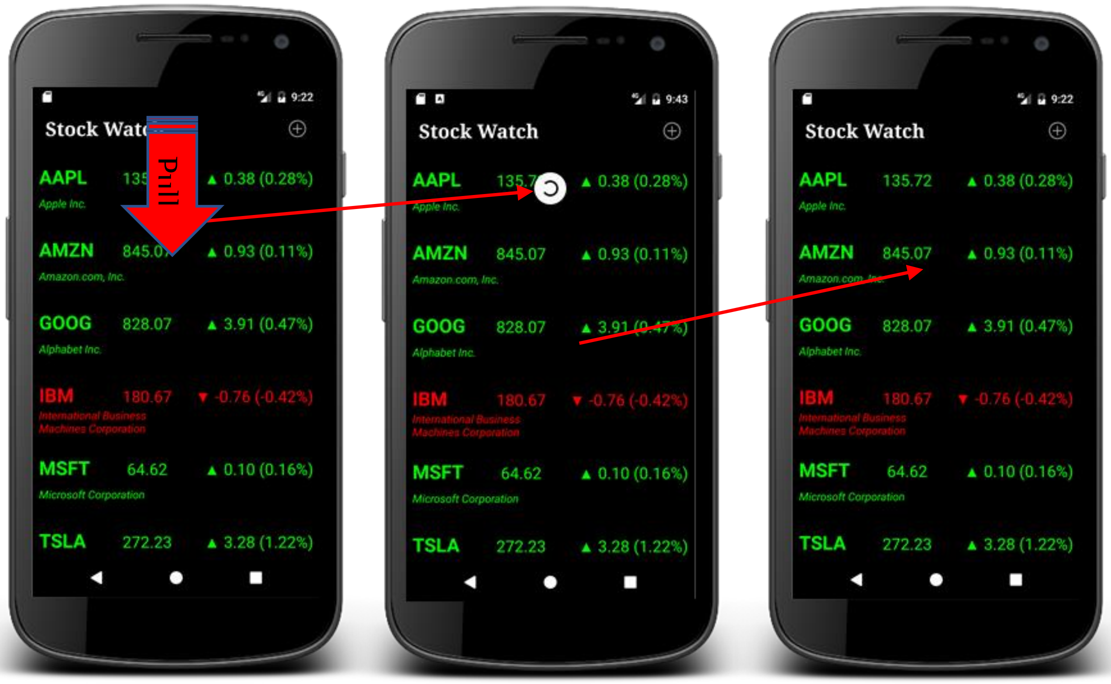
Stock Watch

AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (-0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA	272.23	▲ 3.28 (1.22%)

Stock Selection
Please enter a Stock Symbol:
WXYZ

Symbol Not Found: WXYZ
Data for stock symbol

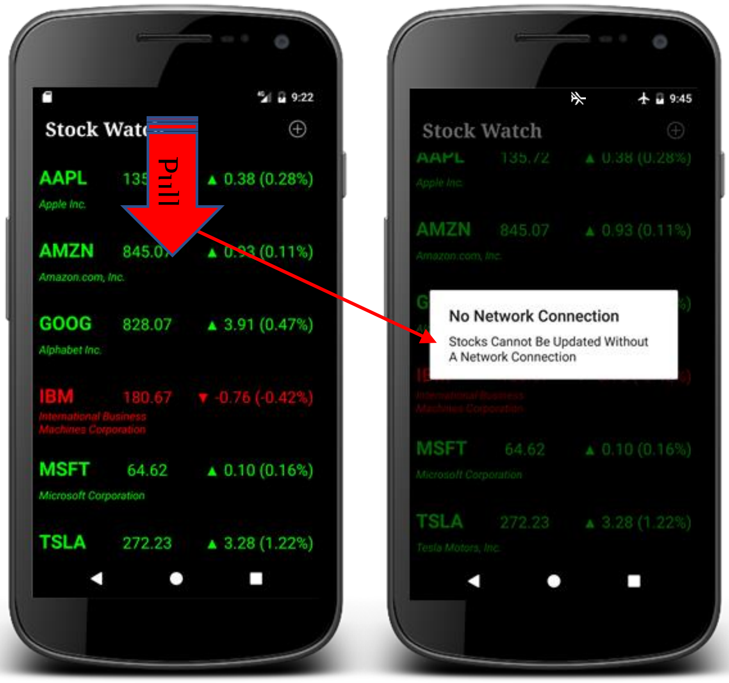
6) Swipe-Refresh (pull-down) reloads (re-downloads) all stock financial data:



Stock Watch

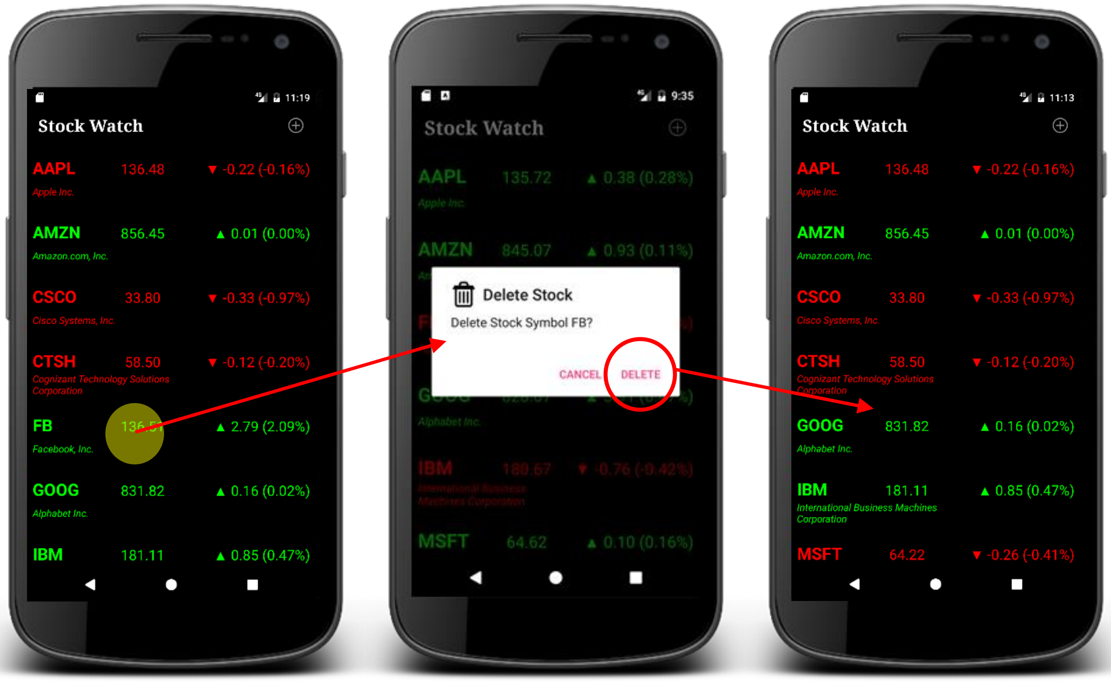
AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (-0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA	272.23	▲ 3.28 (1.22%)

7) Swipe-Refresh attempt with no network connection *(You can show no buttons on the error dialog, or an "Ok" button – either is fine):*


9:22
Stock Watch
Pull
AAPL 135 ▲ 0.38 (0.28%)
Apple Inc.
AMZN 845.07 ▲ 0.93 (0.11%)
Amazon.com, Inc.
GOOG 828.07 ▲ 3.91 (0.47%)
Alphabet Inc.
IBM 180.67 ▼ -0.76 (-0.42%)
International Business Machines Corporation
MSFT 64.62 ▲ 0.10 (0.16%)
Microsoft Corporation
TSLA 272.23 ▲ 3.28 (1.22%)
9:45
Stock Watch
TSLA 272.23 ▲ 3.28 (1.22%)
Tesla Motors, Inc.

No Network Connection
Stocks Cannot Be Updated Without A Network Connection

8) Long-Press on a stock to delete it:

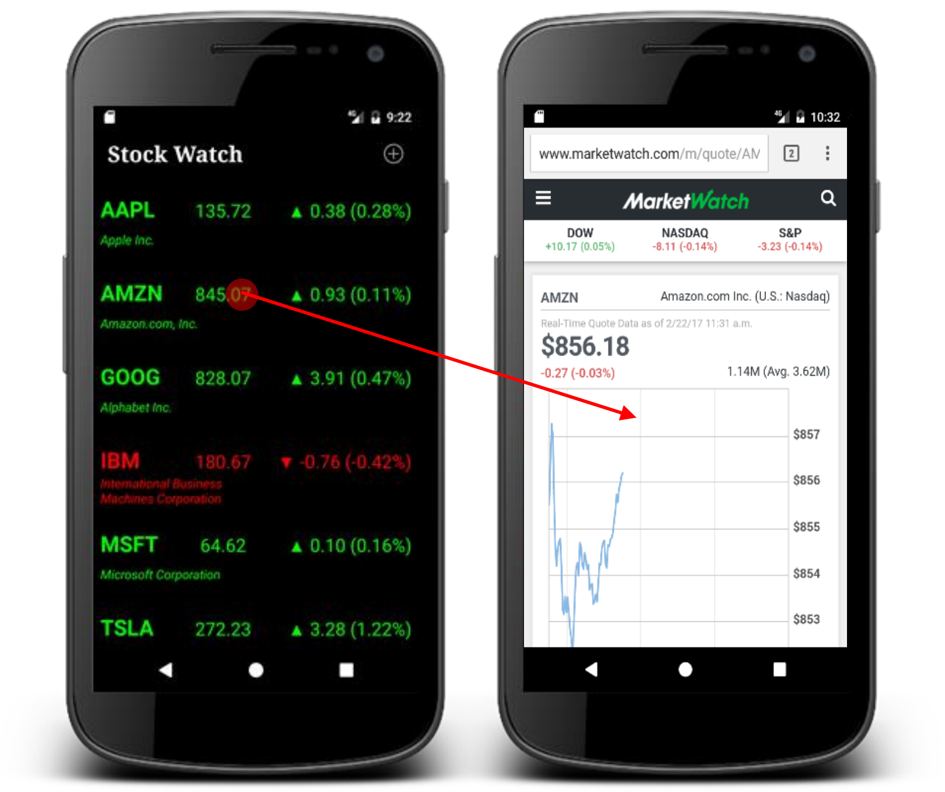

11:19
Stock Watch
AAPL 136.48 ▼ -0.22 (-0.16%)
Apple Inc.
AMZN 856.45 ▲ 0.01 (0.00%)
Amazon.com, Inc.
CSCO 33.80 ▼ -0.33 (-0.97%)
Cisco Systems, Inc.
CTSH 58.50 ▼ -0.12 (-0.20%)
Cognizant Technology Solutions Corporation
FB 136.5 ▲ 2.79 (2.09%)
Facebook, Inc.
GOOG 831.82 ▲ 0.16 (0.02%)
Alphabet Inc.
IBM 181.11 ▲ 0.85 (0.47%)
9:35
Stock Watch
CANCEL
DELETE
11:13
Stock Watch
AAPL 136.48 ▼ -0.22 (-0.16%)
AMZN 856.45 ▲ 0.01 (0.00%)
CSCO 33.80 ▼ -0.33 (-0.97%)
CTSH 58.50 ▼ -0.12 (-0.20%)
GOOG 831.82 ▲ 0.16 (0.02%)
IBM 181.11 ▲ 0.85 (0.47%)
MSFT 64.22 ▼ -0.26 (-0.41%)

Delete Stock
Delete Stock Symbol FB?

9) Extra Credit: Tap on a stock to open the *MarketWatch.com* website entry for the selected stock:

MarketWatch URL's are in the form: http://www.marketwatch.com/investing/stock/***some_stock***

For example: [http://www.marketwatch.com/investing/stock/**TSLA**](http://www.marketwatch.com/investing/stock/TSLA)



Stock Watch

AAPL Apple Inc.	135.72	▲ 0.38 (0.28%)
AMZN Amazon.com, Inc.	845.07	▲ 0.93 (0.11%)
GOOG Alphabet Inc.	828.07	▲ 3.91 (0.47%)
IBM International Business Machines Corporation	180.67	▼ -0.76 (-0.42%)
MSFT Microsoft Corporation	64.62	▲ 0.10 (0.16%)
TSLA	272.23	▲ 3.28 (1.22%)

www.marketwatch.com/m/quote/AM

MarketWatch

DOW	NASDAQ	S&P
+10.17 (0.05%)	-8.11 (-0.14%)	-3.23 (-0.14%)

AMZN Amazon.com Inc. (U.S.: Nasdaq)

Real-Time Quote Data as of 2/22/17 11:31 a.m.

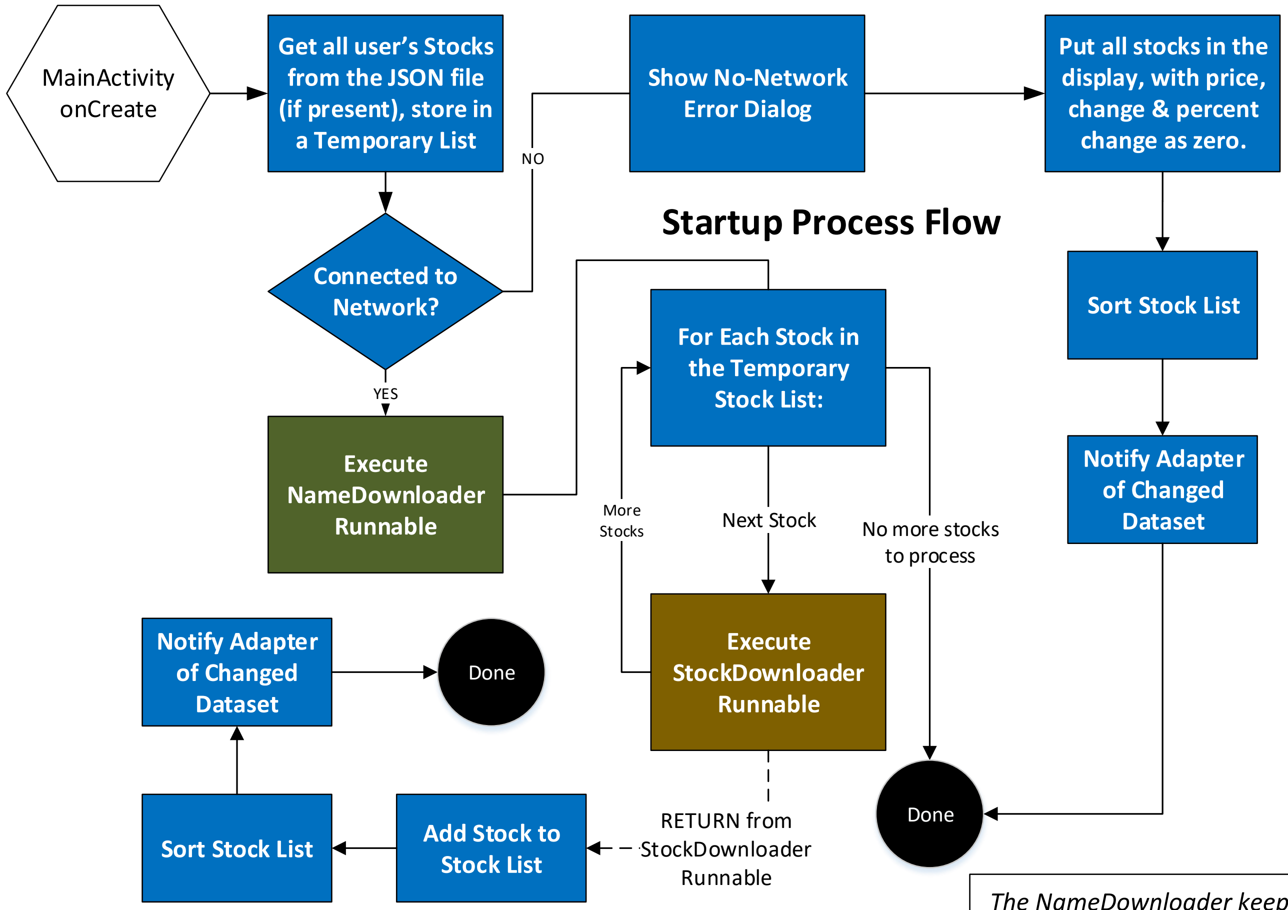
$856.18

-0.27 (-0.03%) 1.14M (Avg. 3.62M)

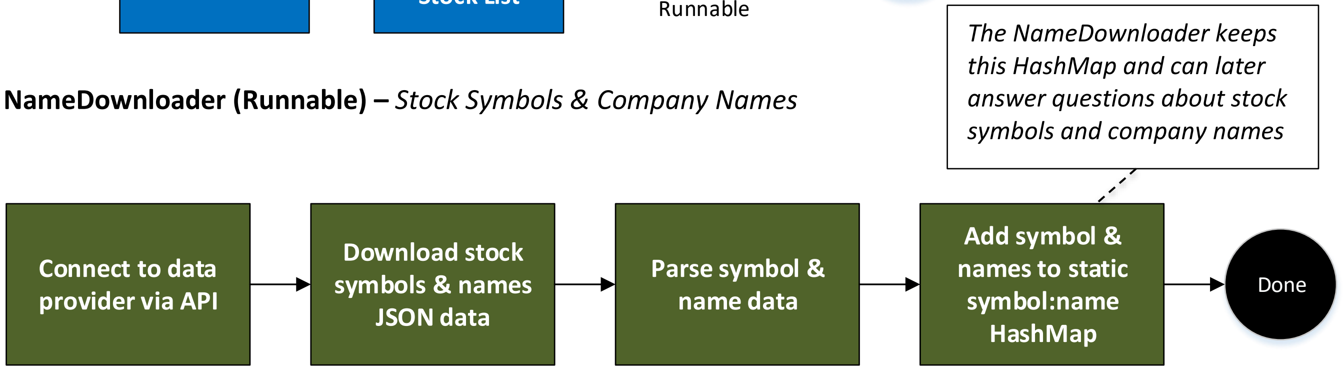
EXTRA CREDIT: All references to the behavior of tapping a stock in the list to open the MarketWatch.com website for the stock are optional and can be done for extra credit (25 points). Instructions related to this extra credit are printed in red.

B) Application Behavior Flowcharts:

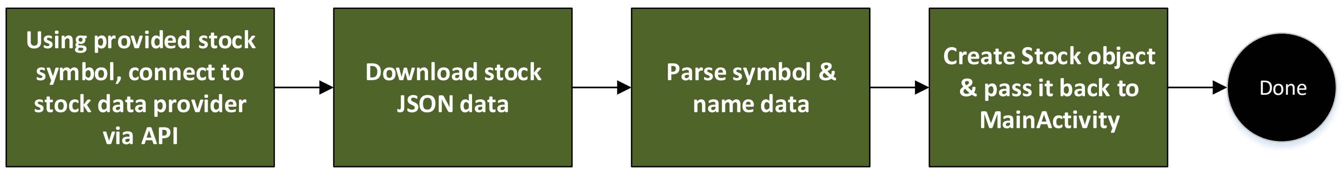
a) App Startup


Startup Process Flow
MainActivity onCreate
Get all user's Stocks from the JSON file (if present), store in a Temporary List
Connected to Network?
NO
YES
Show No-Network Error Dialog
Put all stocks in the display, with price, change & percent change as zero.
Sort Stock List
Notify Adapter of Changed Dataset
Execute NameDownloader Runnable
For Each Stock in the Temporary Stock List:
More Stocks
Next Stock
No more stocks to process
Execute StockDownloader Runnable
RETURN from StockDownloader Runnable
Add Stock to Stock List
Sort Stock List
Notify Adapter of Changed Dataset
Done
Done

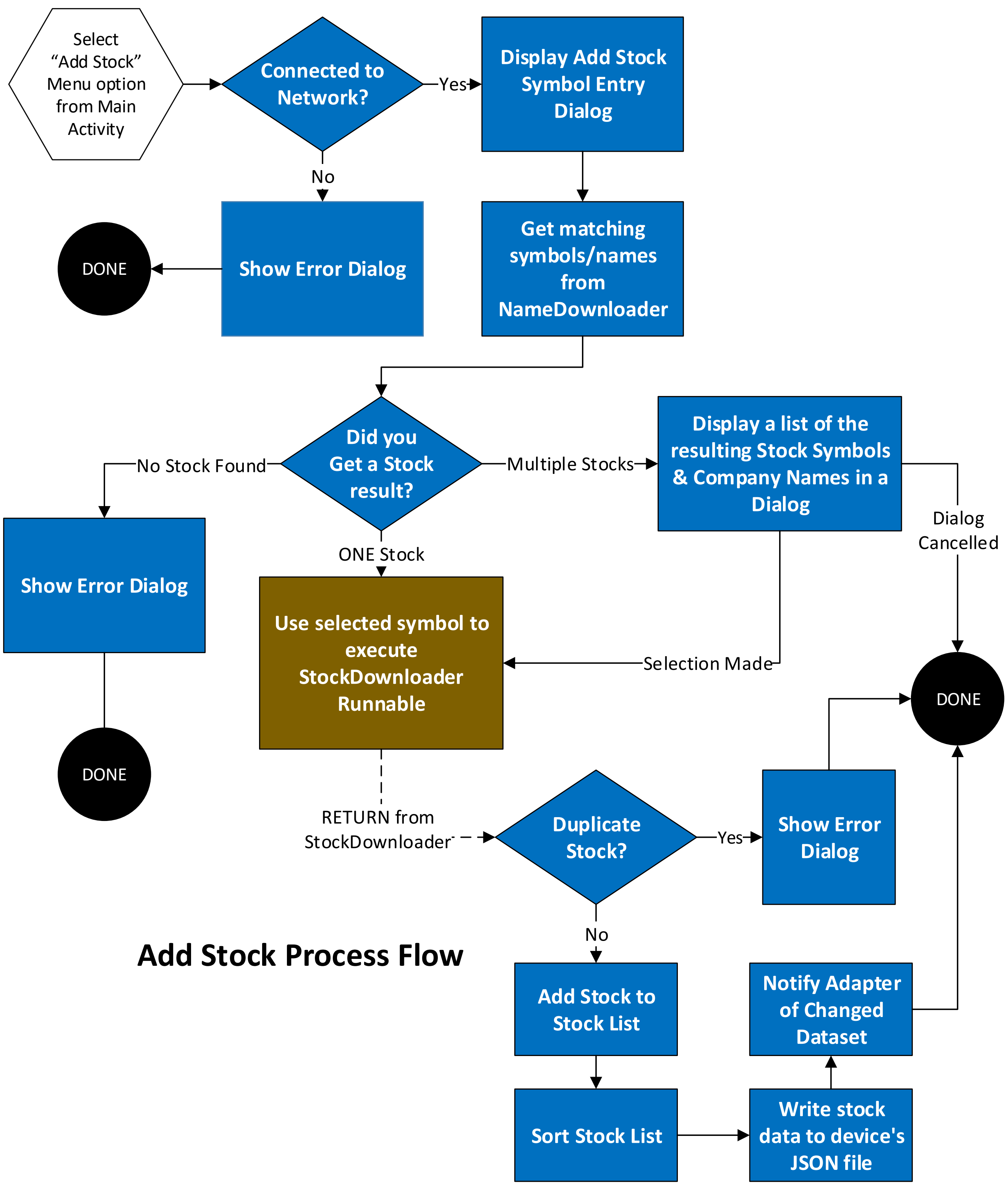
b) NameDownloader (Runnable) – *Stock Symbols & Company Names*


The NameDownloader keeps this HashMap and can later answer questions about stock symbols and company names
Connect to data provider via API
Download stock symbols & names JSON data
Parse symbol & name data
Add symbol & names to static symbol:name HashMap
Done

c) StockDownloader (Runnable) – *Financial data for one stock*

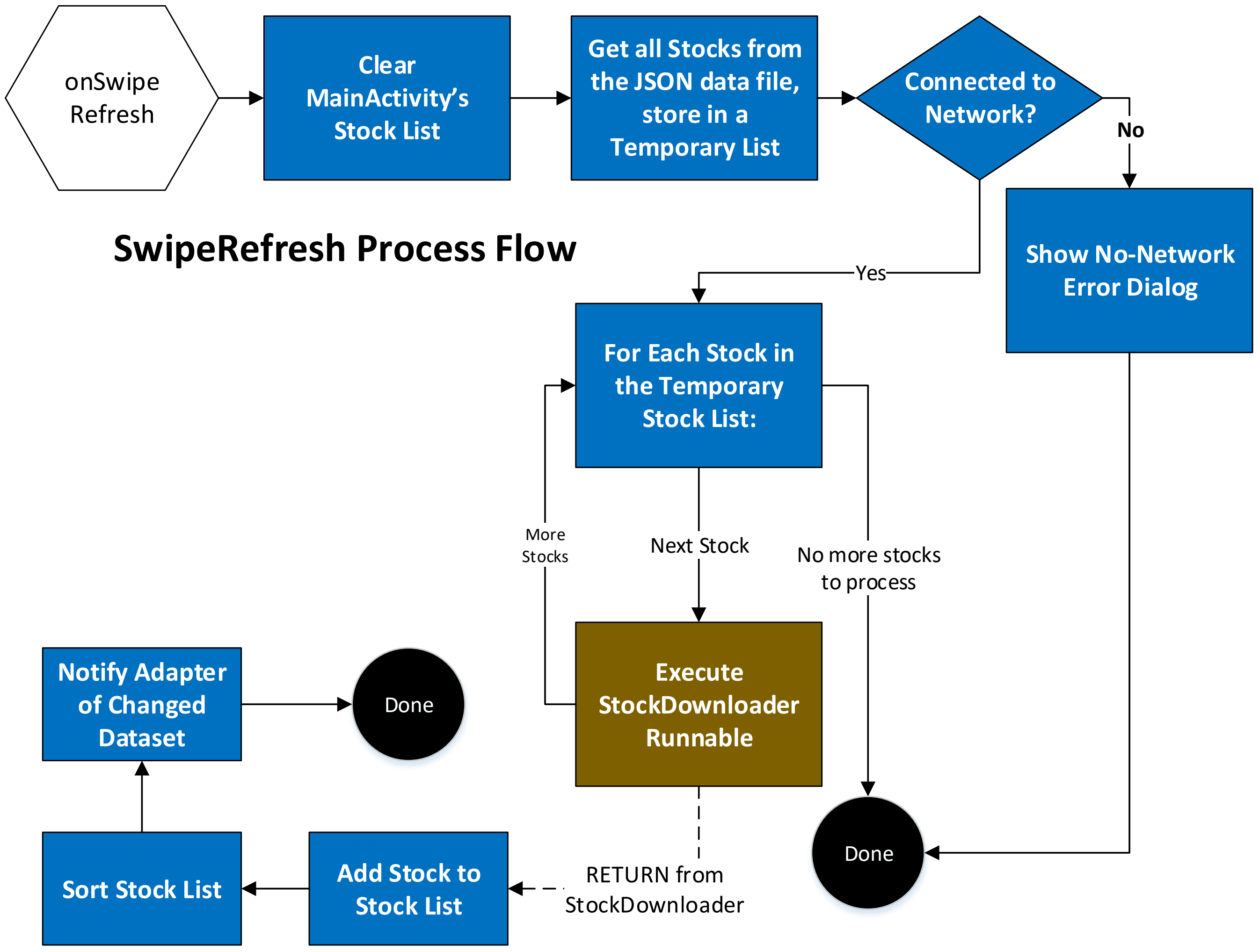

Using provided stock symbol, connect to stock data provider via API
Download stock JSON data
Parse symbol & name data
Create Stock object & pass it back to MainActivity
Done

d) Add New Stock Process

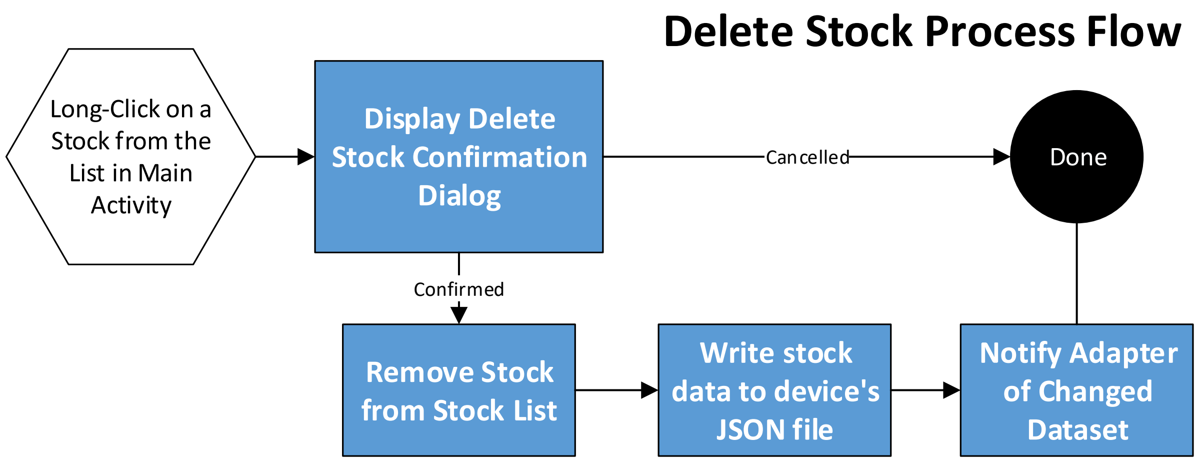

Select “Add Stock” Menu option from Main Activity
Connected to Network?
Yes
Display Add Stock Symbol Entry Dialog
No
Show Error Dialog
DONE
Get matching symbols/names from NameDownloader
Did you Get a Stock result?
No Stock Found
Multiple Stocks
Display a list of the resulting Stock Symbols & Company Names in a Dialog
Dialog Cancelled
ONE Stock
Show Error Dialog
Use selected symbol to execute StockDownloader Runnable
Selection Made
DONE
DONE
RETURN from StockDownloader
Duplicate Stock?
Yes
Show Error Dialog
No
Add Stock to Stock List
Notify Adapter of Changed Dataset
Sort Stock List
Write stock data to device's JSON file

Add Stock Process Flow

e) Swipe-Refresh (pull-down) List:


onSwipe Refresh
Clear MainActivity's Stock List
Get all Stocks from the JSON data file, store in a Temporary List
Connected to Network?
No
Show No-Network Error Dialog
SwipeRefresh Process Flow
Yes
For Each Stock in the Temporary Stock List:
More Stocks
Next Stock
No more stocks to process
Execute StockDownloader Runnable
Notify Adapter of Changed Dataset
Done
Done
RETURN from StockDownloader
Sort Stock List
Add Stock to Stock List

f) Long-Press Delete Stock:


Delete Stock Process Flow
Long-Click on a Stock from the List in Main Activity
Display Delete Stock Confirmation Dialog
Cancelled
Done
Confirmed
Remove Stock from Stock List
Write stock data to device's JSON file
Notify Adapter of Changed Dataset

C) Potential Development Plan

1) Create the base app:
    a. MainActivity with RecyclerView & SwipeRefreshLayout
    b. Create Stock Class
    c. Create RecyclerView Adapter
    d. Create RecyclerView ViewHolder
    e. Create fake “dummy” stocks to populate the list in the MainActivity onCreate.
    f. Add the onClick method. The onClick can open a Toast message for now.
    g. Add the onLongClick methods. The onLongClick should delete the selected entry.
    h. Add the “add” options-menu that opens dialog and accepts user input. On confirmation you can open a Toast message for now.
    i. SwipeRefresh callback method can open a Toast message for now.

2) Add the data storage elements:
    a. Create code to use the list of stocks to write user’s stocks and company names to a JSON file. This is used in the MainActivity when the user adds a stock.
    b. Create code to read the stocks and company names from the JSON file and use those to fill the list of stocks. This is used in the MainActivity’s onCreate method.
    c. Code the MainActivity’s onClick method to open the browser to the stock’s Market Watch site.

3) Add the internet elements and final integration:
    a. Create the Stock Symbol/Company Name downloader/parser Runnable. This class should maintain a static HashMap of symbols and company names. Create a public method that accepts a String parameter and returns a list of all symbols/names that match that string parameter. Nothing needs to be returned back to the Activity from this.
    b. Create the Stock Financial Data downloader/parser Runnable. Add a method to MainActivity that allows the Stock Financial Data downloader/parser Runnable to send the financial data for the selected Stock back to MainActivity.
    c. Implement the Add Stock feature (this uses the results of the above tasks)
    d. Implement the SwipeRefresh callback to re-download the Stock Financial Data for the loaded stocks
    e. Add alerts when startup, add, & refresh are attempted when no internet connection is available.

Assignment Assistance

If you are stuck on an assignment problem that you have exhaustively researched and/or debugged yourself, you can email me a ZIP file of your entire project so that I can examine the problem. All emailed assistance requests must include a detailed description of the problem, and the details of what steps you have already taken in trying to determine the source of the problem.

Note: To make your submission zip file smaller, before zipping your project file, you can remove the ".gradle" folder (found in your project's root directory), and remove the "build" folder (found in the "app" folder in your project's root directory).

Submissions & Grading

1) Submissions must consist of your zipped project folder *(please execute Build =>Clean Project before generating the zip file*).

2) Submissions should reflect the concepts and practices we cover in class, and the requirements specified in this document.

3) Late submissions will be penalized by 10% per class late. (i.e., from one second late to 1 class late: 10% penalty, from one class plus one second late to 2 classes late: 20% penalty, etc.).

4) Grading will be based upon the presence and proper functionality of *all features and behaviors* described in this document.

NOTE

This assignment is worth 300 points. This means (for example) that if you get 89% on this assignment, your recorded score will be:

(89% * 300 points = 267 points)

Note that this also means that the 10% late submission penalty will be 10% * 300 points = 30 points.

If you do not understand anything in this handout, please ask.

Otherwise the assumption is that you understand the content.

Unsure? Ask!