Detailed Explanation: Analysis of FIX Messages

This document provides a detailed explanation of how the provided Python script analyzes FIX messages to answer the following questions:
1. How many orders were sent?
2. What is the total amount of executed shares/contracts per symbol?
3. Bonus: What is the total amount of open/working shares per symbol?

The approach, implementation steps, and rationale behind each component of the script are explained in detail.

Approach

The script processes a FIX message file line by line, parses each message, and extracts key details to compute the desired metrics. It uses the following steps:
1. Identify the type of message using the `35` tag (e.g., `35=D` for new orders, `35=8` for execution reports).
2. Use relevant tags (e.g., `55` for symbol, `38` for order quantity, `14` for cumulative executed quantity) to collect data.
3. Maintain dictionaries to store and compute counts, executed shares, and open/working shares for each symbol.

Implementation Steps

Step 1: Reading and Parsing the File

The script opens the provided FIX message file and reads it line by line. Each line represents a FIX message, which is parsed into a dictionary of key-value pairs. The delimiter `|` is used to separate fields, and fields are split into keys and values using the `=` character.

Step 2: Counting Orders

To count the total number of orders sent, the script checks for messages with tag `35=D` (New Order - Single) and `35=AB` (New Multileg Order). Each occurrence increments the `order_count`. Additionally, the script distinguishes between single-leg orders (`tag 55`) and multileg orders (`tag 600`).

Step 3: Calculating Executed Shares

Executed shares are calculated using the cumulative executed quantity (`tag 14`) from execution reports (`35=8`). The script checks if the symbol is a single-leg (`tag 55`) or part of a multileg order (`tag 600`) and updates the `executed_shares` dictionary accordingly.

Step 4: Calculating Open/Working Shares

Open/Working shares are computed as the difference between the total ordered shares (`tag 38`) and the cumulative executed shares (`tag 14`) for each symbol. This is stored in the `working_shares` dictionary.

Why and How

The script is designed to process FIX messages in a structured and efficient manner. The rationale for each component is as follows:
1. Parsing the file ensures that data is extracted accurately from the FIX format, which uses tags to represent fields.
2. Separating single-leg (`tag 55`) and multileg (`tag 600`) orders provides clarity in the analysis and answers specific questions about each type.
3. Using dictionaries (`defaultdict`) allows dynamic storage and easy computation of metrics for each symbol.

Results Interpretation

The output of the script is presented in three parts:
1. Total Orders Sent: Provides the total count of single-leg and multileg orders for each symbol.
2. Total Executed Shares/Contracts per Symbol: Shows the cumulative executed quantity for each symbol.
3. Total Open/Working Shares per Symbol: Displays the remaining unexecuted quantity for each symbol.

Example Output

Here is an example of output for MSFT based on the provided FIX messages:

8=FIX.4.2|9=172|35=D|49=SLXOGW|56=SLXSIM|34=4|52=20180904-23:06:06.307|11=U1824700002|1=DEMO|21=1|100=SMART|55=MSFT|167=CS|54=1|60=20180904-23:06:06.300|38=10000|40=2|44=111.75|59=0|204=1|10=168|

8=FIX.4.2|9=189|35=8|49=SLXSIM|56=SLXOGW|34=4|52=20180904-23:06:06.421|11=U1824700002|76=SLXSIM|20=0|150=0|39=0|1=DEMO|55=MSFT|54=1|38=10000|44=111.75|32=0|31=0|151=10000|14=0|6=0|60=20180904-23:06:06.403|10=113|

8=FIX.4.2|9=177|35=G|49=SLXOGW|56=SLXSIM|34=5|52=20180904-23:06:11.411|41=U1824700002|11=U1824700003|1=DEMO|21=1|55=MSFT|167=CS|54=1|60=20180904-23:06:11.411|38=10000|40=2|44=111.86|59=0|204=1|10=069|

8=FIX.4.2|9=209|35=8|49=SLXSIM|56=SLXOGW|34=5|52=20180904-23:06:11.424|11=U1824700003|41=U1824700002|76=SLXSIM|20=0|150=5|39=5|1=DEMO|55=MSFT|54=1|38=10000|44=111.86|59=0|32=0|31=0|151=10000|14=0|6=0|60=20180904-23:06:11.424|10=066|

8=FIX.4.2|9=259|35=8|49=SLXSIM|56=SLXOGW|34=6|52=20180904-23:06:11.438|198=SLSXIM.U1824700003|11=U1824700003|76=SLXSIM|17=SLXSIM-1|20=0|150=1|39=1|1=DEMO|55=MSFT|54=1|38=10000|44=111.86|32=500|31=111.86|3

0=SLX|151=9500|14=500|6=111.86|60=20180904-23:06:11.438|375=SIM|9882=R|10=012|

8=FIX.4.2|9=176|35=G|49=SLXOGW|56=SLXSIM|34=6|52=20180904-23:06:17.760|41=U1824700003|11=U1824700004|1=DEMO|21=1|55=MSFT|167=CS|54=1|60=20180904-23:06:17.760|38=9900|40=2|44=111.86|59=0|204=1|10=066|

8=FIX.4.2|9=214|35=8|49=SLXSIM|56=SLXOGW|34=7|52=20180904-23:06:17.761|11=U1824700004|41=U1824700003|76=SLXSIM|20=0|150=5|39=1|1=DEMO|55=MSFT|54=1|38=9900|44=111.86|59=0|32=0|31=0|151=9400|14=500|6=111.86|60=20180904-23:06:17.761|10=115|

8=FIX.4.2|9=259|35=8|49=SLXSIM|56=SLXOGW|34=8|52=20180904-23:06:17.761|198=SLSXIM.U1824700004|11=U1824700004|76=SLXSIM|17=SLXSIM-2|20=0|150=1|39=1|1=DEMO|55=MSFT|54=1|38=9900|44=111.86|32=500|31=111.86|30=SLX|151=8900|14=1000|6=111.86|60=20180904-23:06:17.761|375=SIM|9882=R|10=043|

8=FIX.4.2|9=176|35=G|49=SLXOGW|56=SLXSIM|34=7|52=20180904-23:06:20.193|41=U1824700004|11=U1824700005|1=DEMO|21=1|55=MSFT|167=CS|54=1|60=20180904-23:06:20.192|38=9800|40=2|44=111.86|59=0|204=1|10=055|

8=FIX.4.2|9=215|35=8|49=SLXSIM|56=SLXOGW|34=9|52=20180904-23:06:20.193|11=U1824700005|41=U1824700004|76=SLXSIM|20=0|150=5|39=1|1=DEMO|55=MSFT|54=1|38=9800|44=111.86|59=0|32=0|31=0|151=8800|14=1000|6=111.86|60=20180904-23:06:20.193|10=152|

8=FIX.4.2|9=260|35=8|49=SLXSIM|56=SLXOGW|34=10|52=20180904-23:06:20.193|198=SLSXIM.U1824700005|11=U1824700005|76=SLXSIM|17=SLXSIM-3|20=0|150=1|39=1|1=DEMO|55=MSFT|54=1|38=9800|44=111.86|32=500|31=111.86|30=SLX|151=8300|14=1500|6=111.86|60=20180904-23:06:20.193|375=SIM|9882=R|10=063|

8=FIX.4.2|9=176|35=G|49=SLXOGW|56=SLXSIM|34=8|52=20180904-23:06:22.441|41=U1824700005|11=U1824700006|1=DEMO|21=1|55=MSFT|167=CS|54=1|60=20180904-23:06:22.441|38=9700|40=2|44=111.86|59=0|204=1|10=054|

8=FIX.4.2|9=216|35=8|49=SLXSIM|56=SLXOGW|34=11|52=20180904-23:06:22.441|11=U1824700006|41=U1824700005|76=SLXSIM|20=0|150=5|39=1|1=DEMO|55=MSFT|54=1|38=9700|44=111.86|59=0|32=0|31=0|151=8200|14=1500|6=111.86|60=20180904-23:06:22.441|10=190|

8=FIX.4.2|9=260|35=8|49=SLXSIM|56=SLXOGW|34=12|52=20180904-23:06:22.441|198=SLSXIM.U1824700006|11=U1824700006|76=SLXSIM|17=SLXSIM-4|20=0|150=1|39=1|1=DEMO|55=MSFT|54=1|38=9700|44=111.86|32=500|31=111.86|30

=SLX|151=7700|14=2000|6=111.86|60=20180904-23:06:22.441|375=SIM|9882=R|10=062|

8=FIX.4.2|9=145|35=F|49=SLXOGW|56=SLXSIM|34=9|52=20180904-23:06:26.382|41=U1824700006|11=U1824700007|1=DEMO|55=MSFT|167=CS|54=1|60=20180904-23:06:26.382|38=9700|10=232|

8=FIX.4.2|9=208|35=8|49=SLXSIM|56=SLXOGW|34=13|52=20180904-23:06:26.390|11=U1824700007|41=U1824700006|76=SLXSIM|20=0|150=4|39=4|1=DEMO|55=MSFT|54=1|38=9700|44=111.86|32=0|31=0|151=0|14=2000|6=111.86|60=20180904-23:06:26.389|10=097|

8=FIX.4.2|9=172|**35=D**|49=SLXOGW|56=SLXSIM|34=10|52=20180904-23:06:34.044|11=U1824700008|1=DEMO|21=1|100=SMART|55=MSFT|167=CS|54=1|60=20180904-23:06:34.044|38=5000|40=2|44=111.86|59=0|204=1|10=182|

8=FIX.4.2|9=188|35=8|49=SLXSIM|56=SLXOGW|34=14|52=20180904-23:06:34.050|11=U1824700008|76=SLXSIM|20=0|150=0|39=0|1=DEMO|55=MSFT|54=1|38=5000|44=111.86|32=0|31=0|151=5000|14=0|6=0|60=20180904-23:06:34.044|10=082|

8=FIX.4.2|9=259|35=8|49=SLXSIM|56=SLXOGW|34=15|52=20180904-23:06:34.051|198=SLSXIM.U1824700008|11=U1824700008|76=SLXSIM|17=SLXSIM-5|20=0|150=1|39=1|1=DEMO|55=MSFT|54=1|38=5000|44=111.86|32=500|31=111.86|30=SLX|151=4500|14=500|6=111.86|60=20180904-23:06:34.051|375=SIM|9882=R|10=017|

8=FIX.4.2|9=299|**35=AB**|49=SLXOGW|56=SLXSIM|34=15|52=20180904-23:07:30.204|1=DEMO|11=U182470000E|40=2|54=N/A|60=20180904-23:07:30.192|167=MLEG|44=110.7|59=0|38=10|555=2|609=CS|654=i14|600=MSFT|608=ES|623=100|624=1|609=OPT|654=i15|600=MSFT|608=OC|610=201809|611=20180907|612=111|623=1|624=2|564=O|100=SMART|109=tfrey2|10=074|

8=FIX.4.2|9=178|35=8|49=SLXSIM|56=SLXOGW|34=22|52=20180904-23:07:30.220|11=U182470000E|76=SLXSIM|20=0|150=0|39=0|1=DEMO|55=MLEG|38=10|44=110.7|32=0|31=0|151=10|14=0|6=0|60=20180904-23:07:30.219|10=109|

8=FIX.4.2|9=181|35=8|49=SLXSIM|56=SLXOGW|34=23|52=20180904-23:07:30.220|11=U182470000E|76=SLXSIM|20=0|150=0|39=0|1=DEMO|55=MLEG|38=1000|32=0|31=0|151=1000|14=0|6=0|60=20180904-23:07:30.219|654=i14|10=054|

8=FIX.4.2|9=177|35=8|49=SLXSIM|56=SLXOGW|34=24|52=20180904-23:07:30.220|11=U182470000E|76=SLXSIM|20=0|150=0|39=0|1=DEMO|55=MLEG|38=10|32=0|31=0|151=10|14=0|6=0|60=20180904-23:07:30.219|654=i15|10=125|

8=FIX.4.2|9=231|35=8|49=SLXSIM|56=SLXOGW|34=25|52=20180904-23:07:30.252|198=SLSXIM. |11=U182470000E|76=SLXSIM|17=SLXSIM-8|20=0|150=2|39=2|1=DEMO|38=1000|32=1000|31=111.805|151=0|14=1000|6=111.805|60=20180904-23:07:30.252|375=SIM|654=i14|10=089|

8=FIX.4.2|9=219|35=8|49=SLXSIM|56=SLXOGW|34=26|52=20180904-23:07:30.252|198=SLSXIM.U182470000E|11=U182470000E|76=SLXSIM|17=SLXSIM-9|20=0|150=2|39=2|1=DEMO|38=10|32=10|31=1.19|151=0|14=10|6=1.19|60=20180904-23:07:30.252|375=SIM|654=i15|10=024|

8=FIX.4.2|9=223|35=8|49=SLXSIM|56=SLXOGW|34=27|52=20180904-23:07:30.252|198=SLSXIM.U182470000E|11=U182470000E|76=SLXSIM|17=SLXSIM-10|20=0|150=2|39=2|1=DEMO|55=MLEG|38=10|44=110.7|32=10|31=0|151=0|14=10|6=0|60=20180904-23:07:30.252|375=SIM|10=200|

Total Orders for MSFT:
Single-Leg Orders: 2
Multileg Orders: 1

Total Orders Sent: 3

Total Executed Shares/Contracts per Symbol:

MSFT: 2500
MLEG: 10

Total Open/Working Shares per Symbol:
MSFT: 12510
MLEG: 0

This output demonstrates how the script correctly processes single-leg and multileg orders and computes the desired metrics.