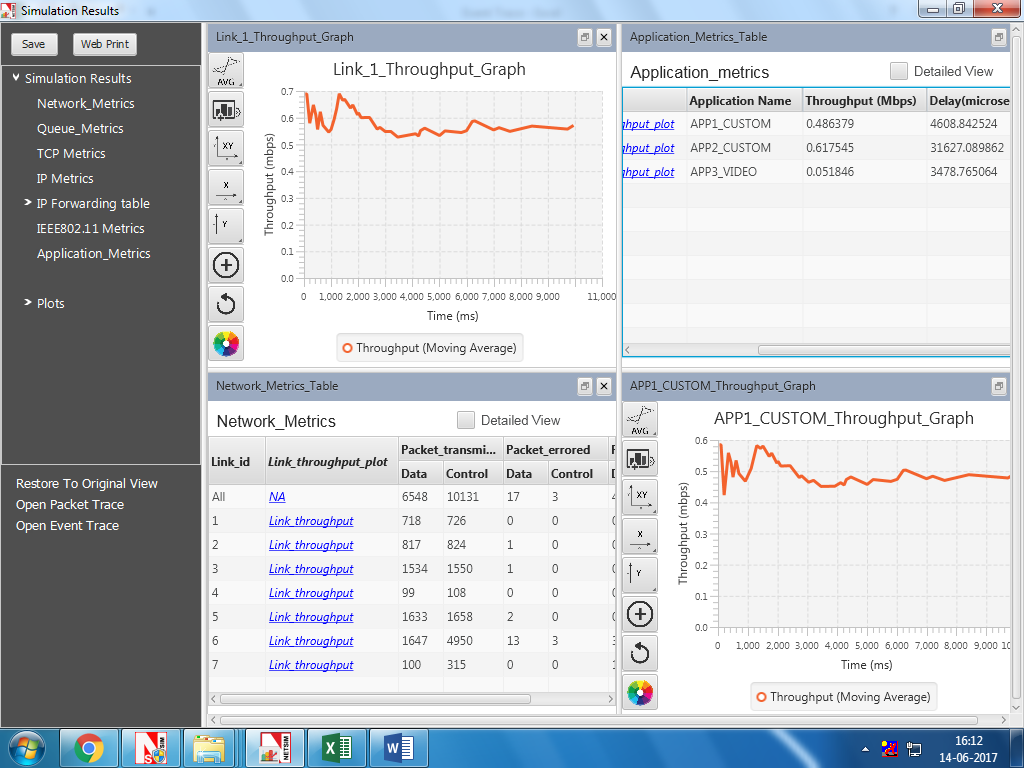
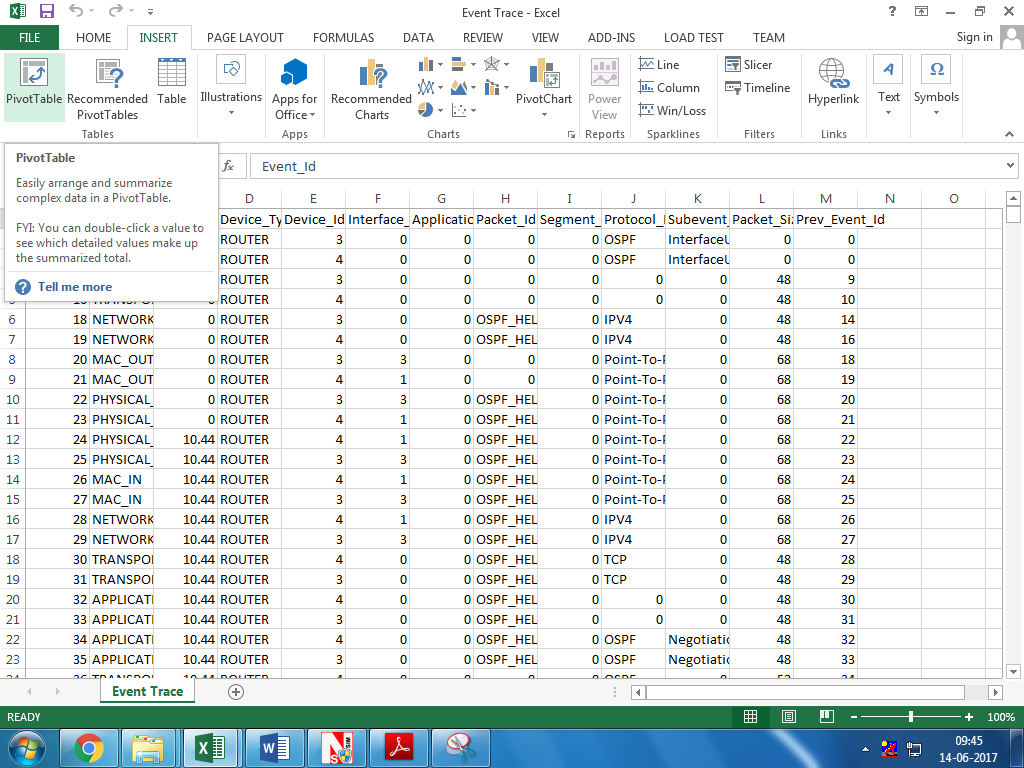
**CALCULATION OF DELAY, JITTER AND APPLICATION THROUGHPUT USING PIVOT TABLES IN EVENT TRACE FILE**

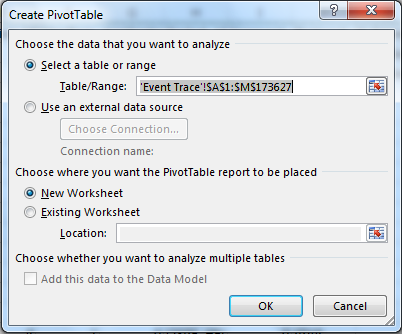
1. Enable Event trace and after simulation select Event Trace in the Simulation results window. Event tracing is available only in NetSim standard and Pro versions as of v10.



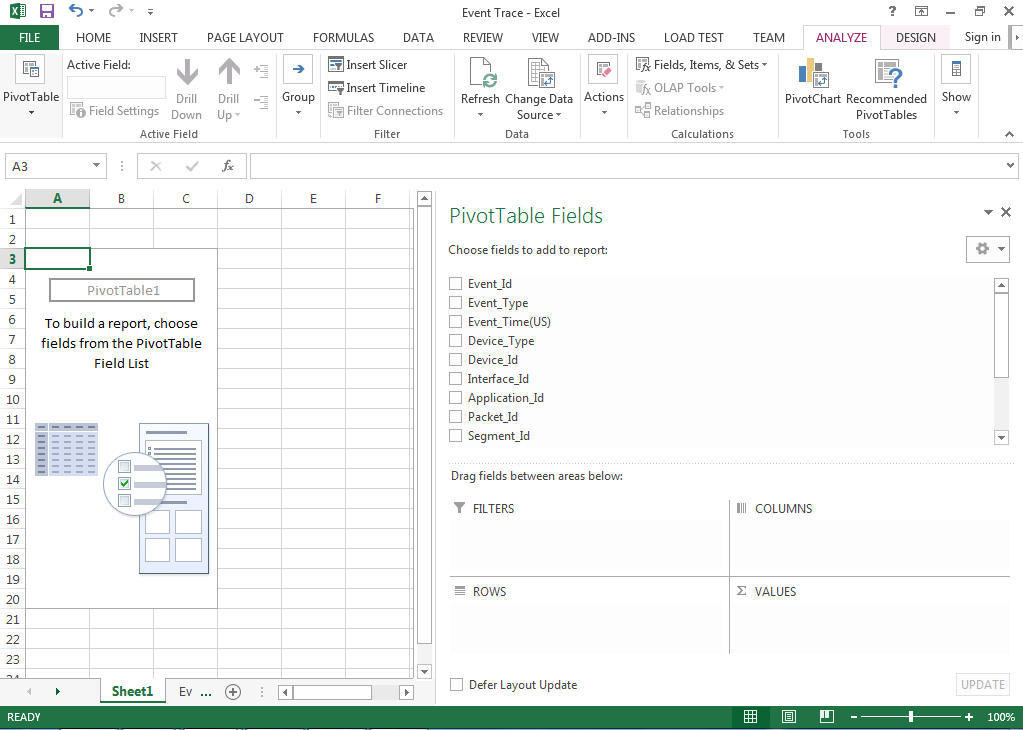
1. Click on **Pivot Table** in **INSERT** tab



1. Then a window named **Create Pivot Table** pops up which automatically selects the entire table, then click **OK** button. In case the entire table isn’t selected please enter the range such that all rows are selected.



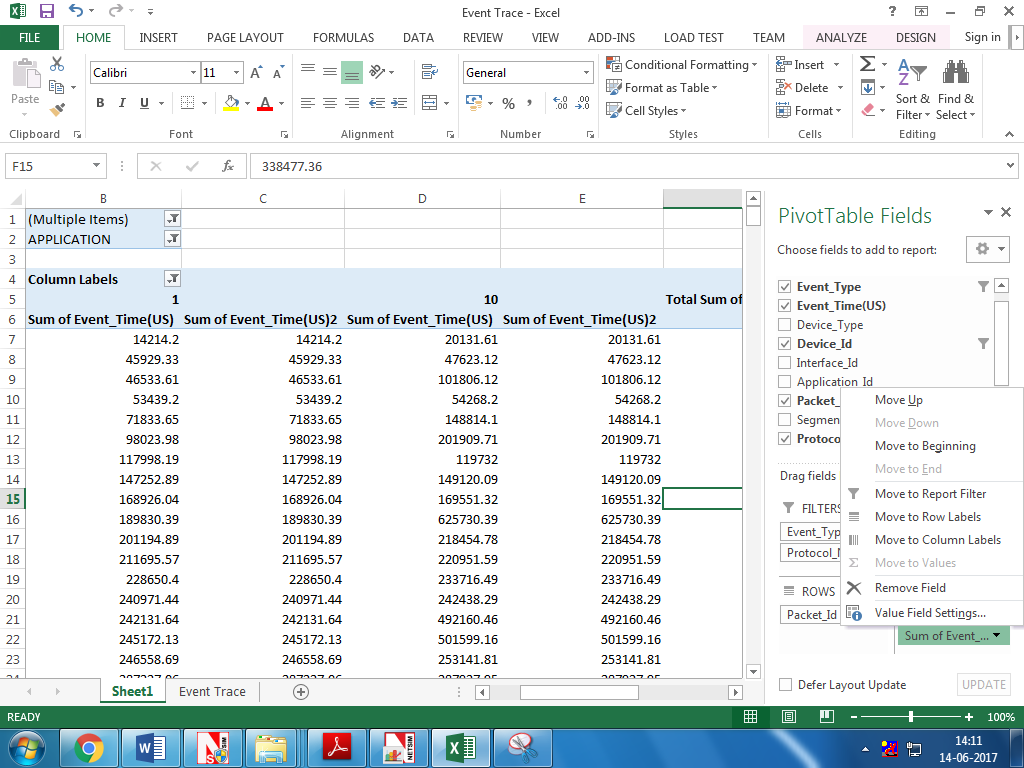
1. A blank **PivotTable** and **Field List** will appear on a new worksheet.



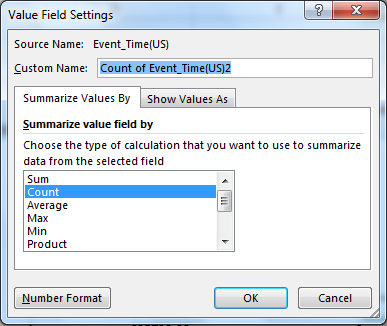
1. Once you create a PivotTable, you'll need to decide which **fields** to add. Each field is simply a **column header** from the source data. In the **PivotTable Field List**, check the box for each field you want to add.

**Application Delay Analysis:**

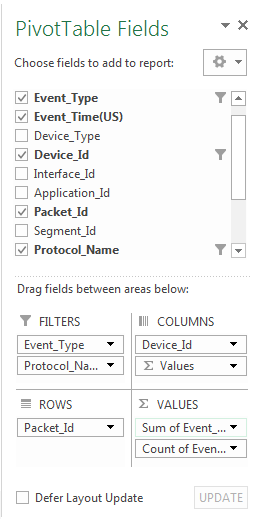
1. Drag and drop the **Event\_Type**, **Protocol\_Name** Fields into **FILTERS,** **Packet\_Id** into **ROWS** and **Device\_Id** into **COLUMNS**.
2. Drag and Drop **Event\_Time** Field into **VALUES** **twice**, then both will show Sum of Event\_Time. Recheck that you have dropped the Event\_Time field twice.
3. Click on the **second Event\_Time** field in the VALUES and select the **Value Field Settings.**



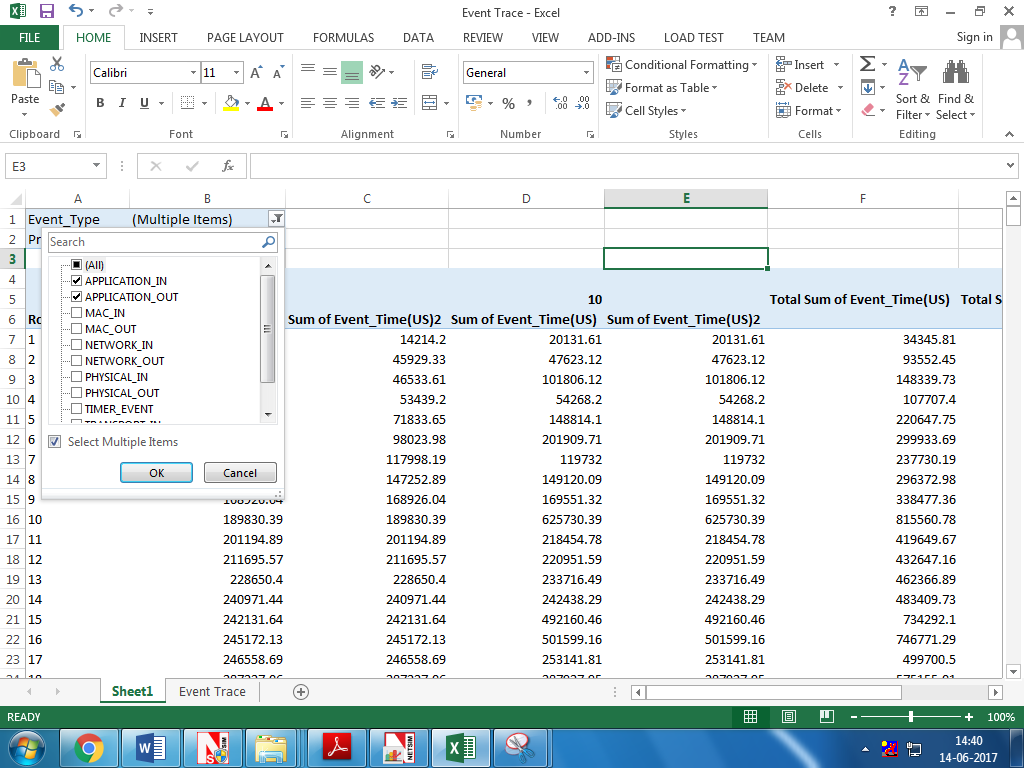
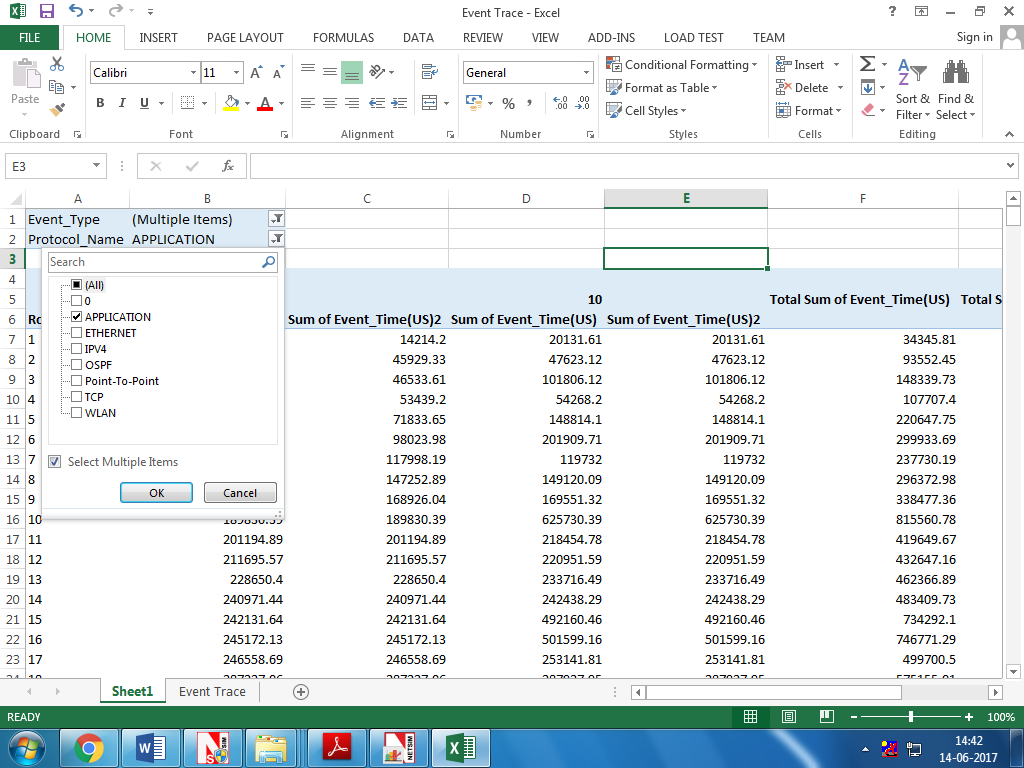
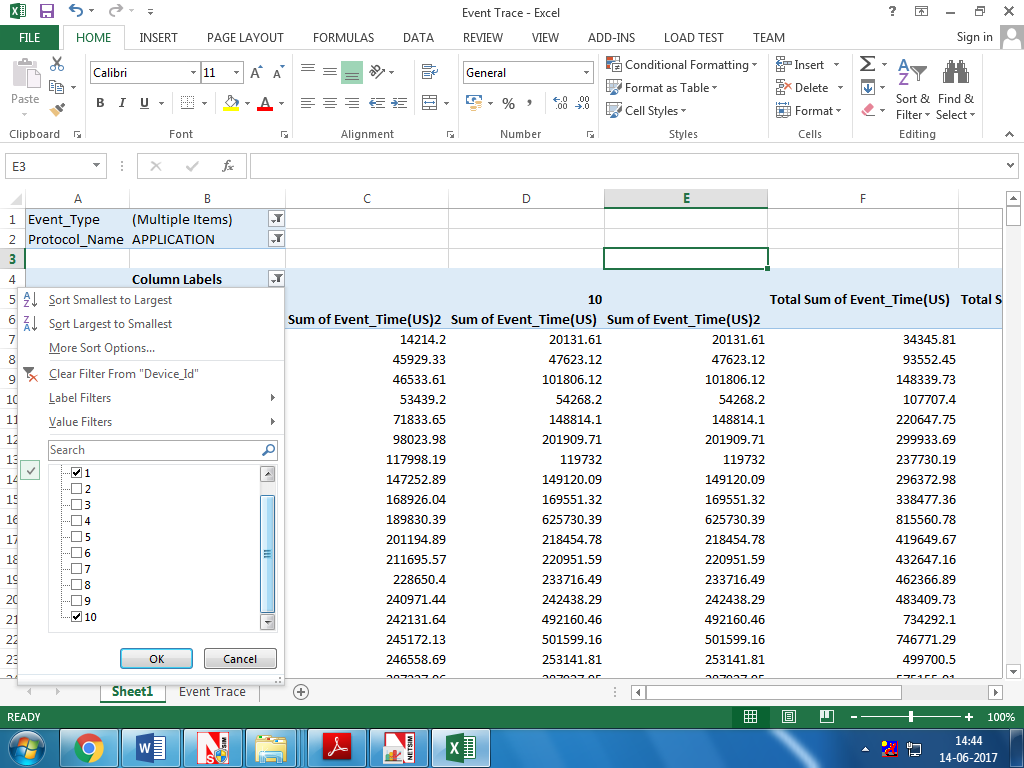
1. A window named **Value Field Settings** opens then select **Count** option and click **OK** button



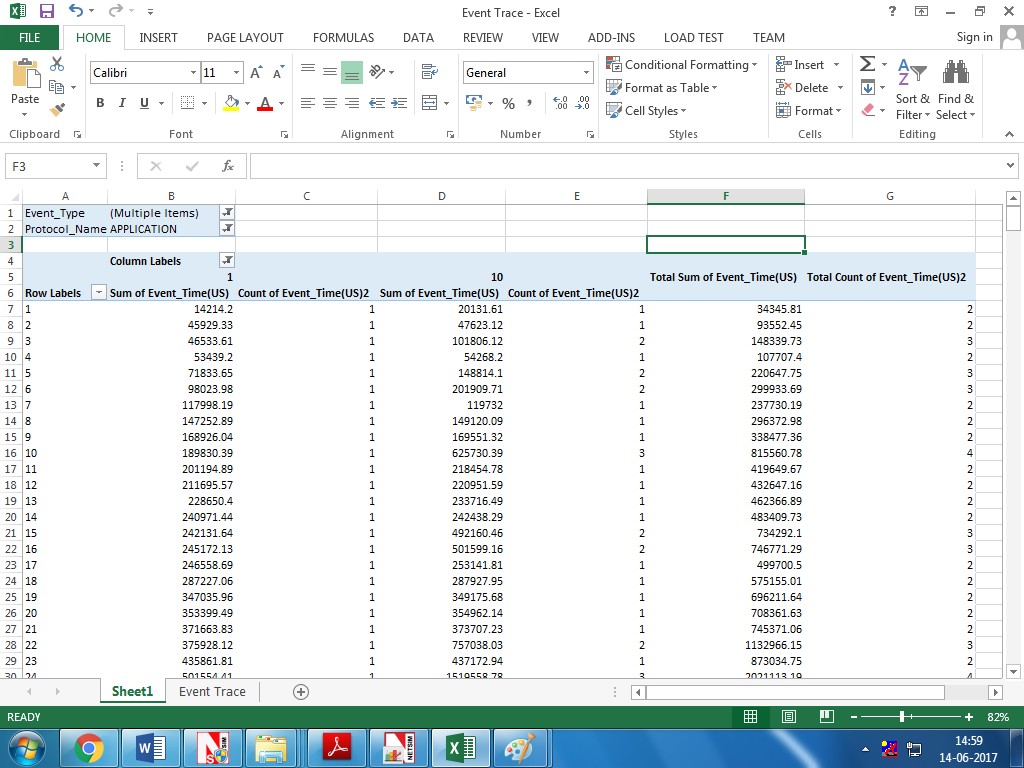
1. Then finally the **Pivot Table Fields** will be as shown below.

****

1. In the **Event\_Type** select **APPLICATION\_IN** and **APPLICATION\_OUT**, **Protocol\_Name** select **APPLICATION** and in **Column Labels** select the **Source\_Id** and **Destination\_Id**. In our example source node ID is 1 and destination node ID is 10

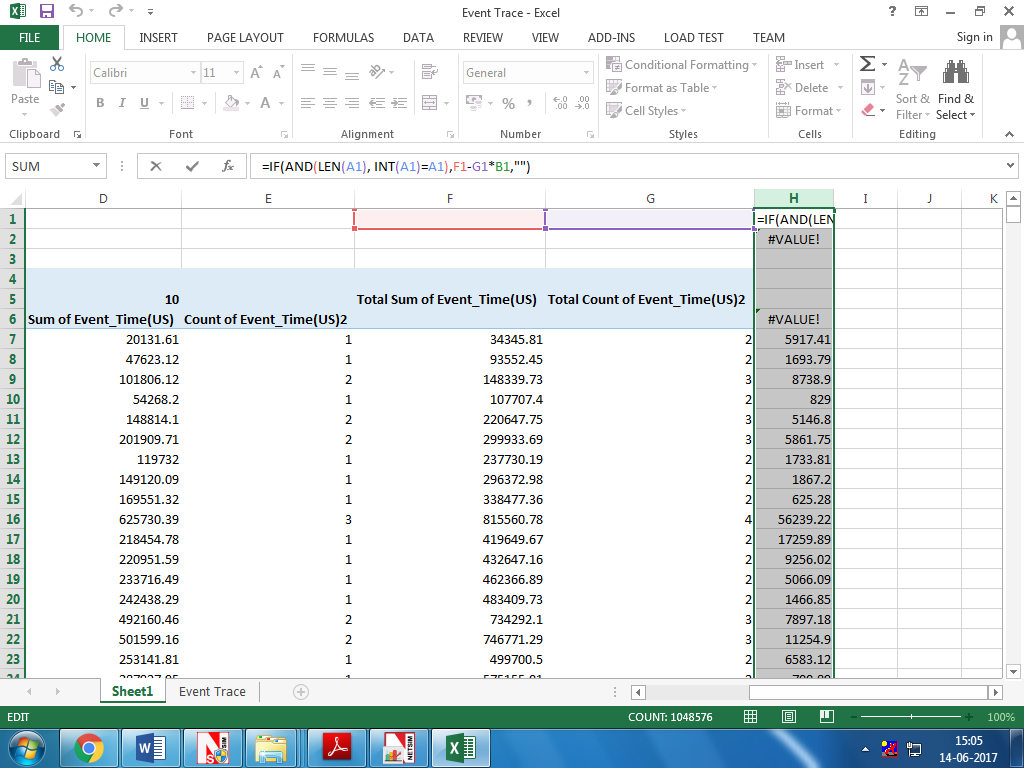


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And the Pivot Table created will be as shown (1 in the table is Source\_Id and 10 is the Destination\_Id)

1. Select the entire empty column H then and enter the formular **=IF(AND(LEN(A1), INT(A1)=A1),F1-G1\*B1)** in function and press **CTRL+ENTER**

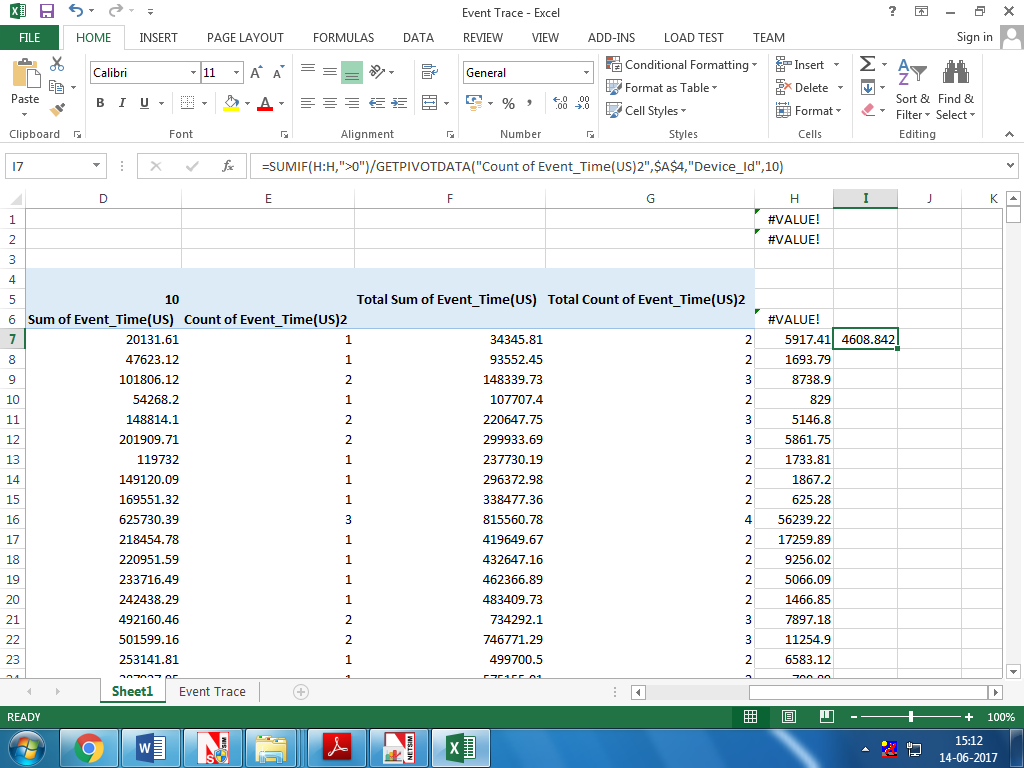
F column is Total Sum of Event\_Time, G Column is Total Count of Event\_Time, B Column is Sum of Event\_time(µs) of the Source.

App Delay =

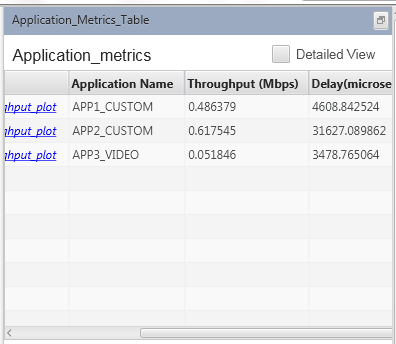
**Note**: If the packet size is > 1500 then fragmentation occurs and the packet is received as multiple segments. In NetSim the destination counts each segment as different packet.

Then in an empty cell enter  
 **=SUMIF(H:H,">0")/GETPIVOTDATA("Count of Event\_Time(US)2",$A$4,"Device\_Id",10)**where

**GETPIVOTDATA ("Count of Event\_Time(US)2",$A$4,"Device\_Id",10)** gives the total number of packets received by the destination(in this case 10).

This will give the exact Application Delay

Compare with the Delay in Application\_Metrics\_Tables and it would exactly match. There might be slight difference in the decimals due to Excel’s round offs.

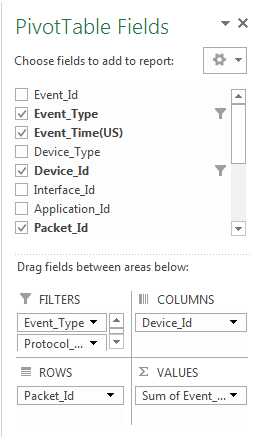


**Application Jitter Analysis**

In NetSim ‘jitter’ is defined as the variance of delay. Variance is statistically defined as the square of deviation from the mean.

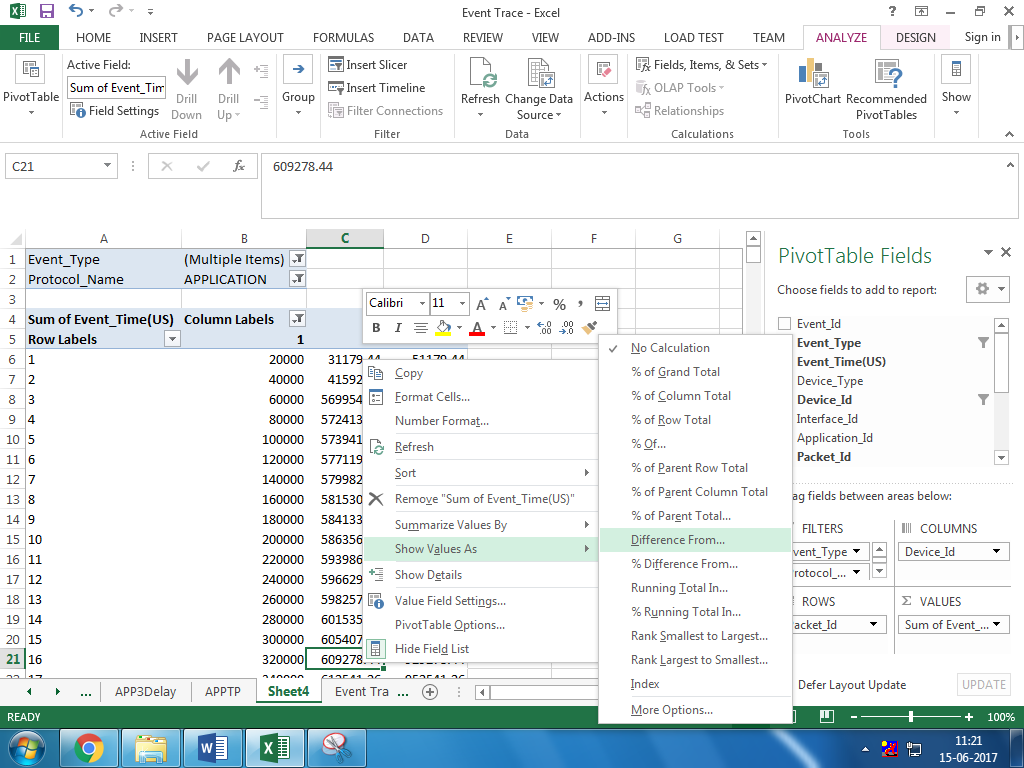
(Note: This calculation is only valid only when there is with no packet segmentation. This means that all Packet Sizes should be less than 1500B)

1. For Jitter Calculation Pivot table Fields should be as shown below

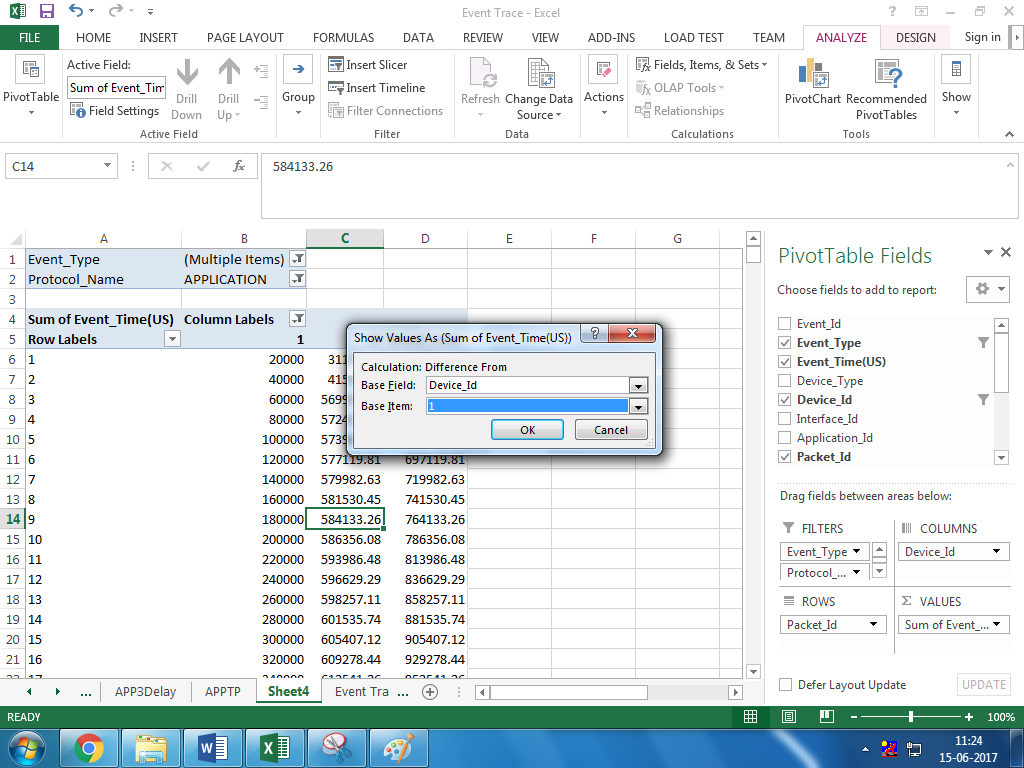


FILTERS to have of **Event\_Type**, **Protocol\_Name**, COLUMNS to have **Device\_Id**, ROWS to have **Packet\_Id** and VALUES to have **Event\_Time** (Note that **Event\_Time** is added only once and not twice as was done for delay calculation)

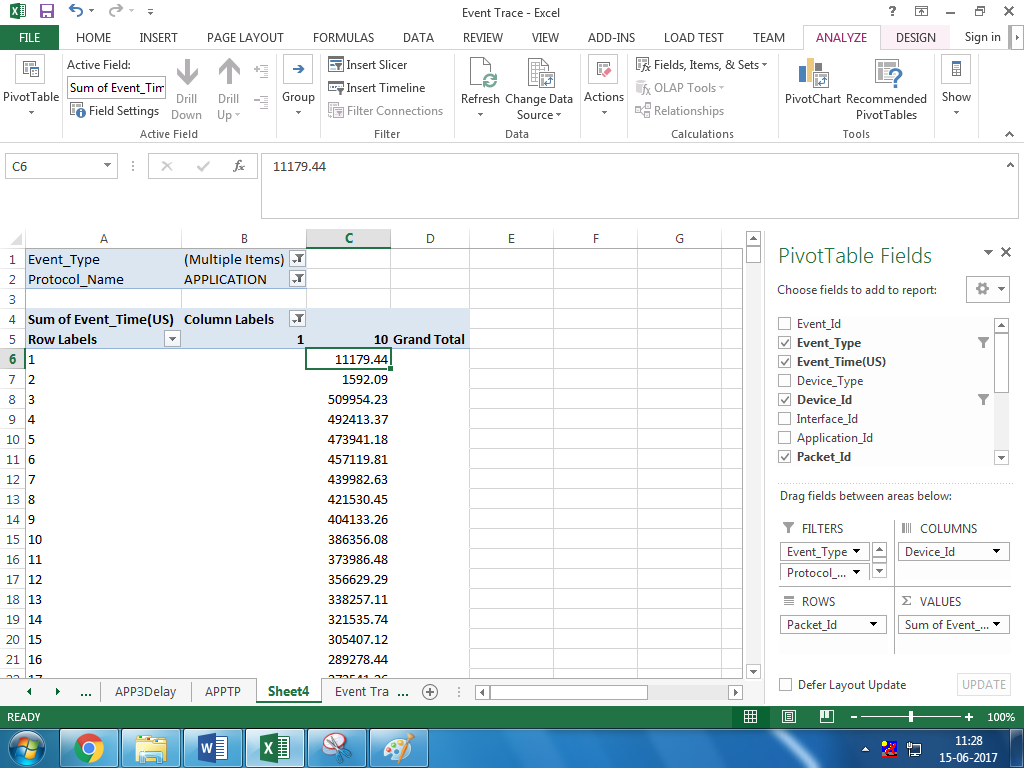
1. Then select any cell of **Destination** **node** column and **right click** and select **Show Values As** option, it dropdown a list in which you select **Difference From** option.



Then it opens a window named **Show Values As** in that select **Base Field** as **Device\_Id** Base Item as the **Source\_Id (1 in this case)** and click **OK** button.

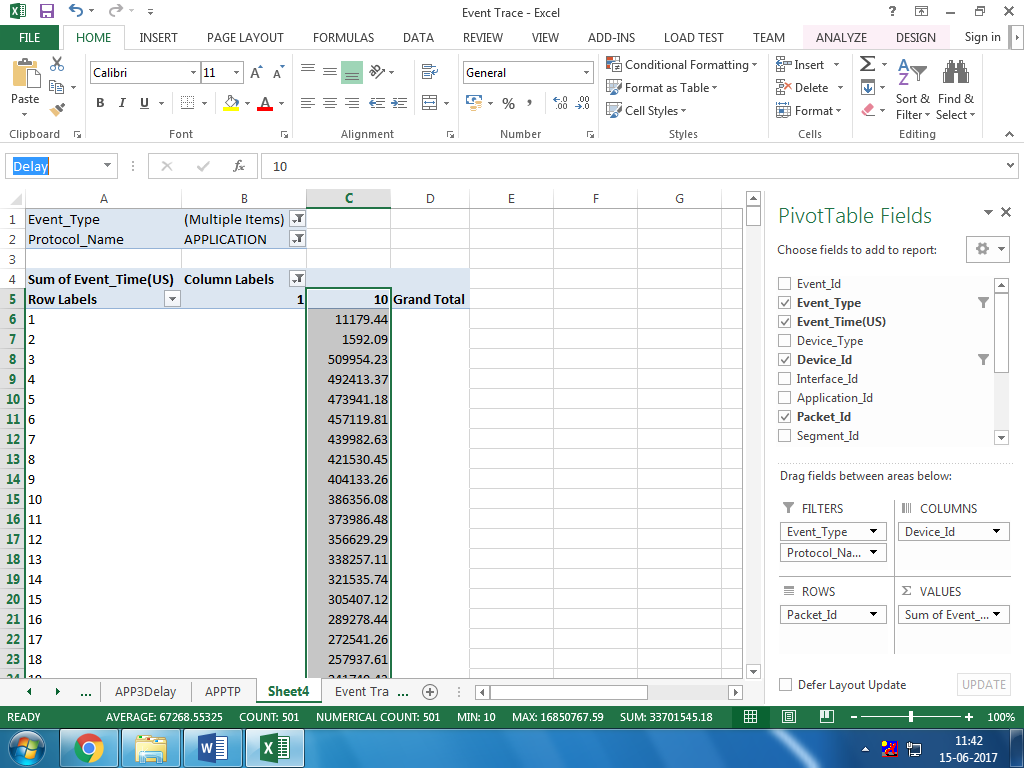


Then the Pivot Table will look like this



And the destination node column shows the delay of each packet.

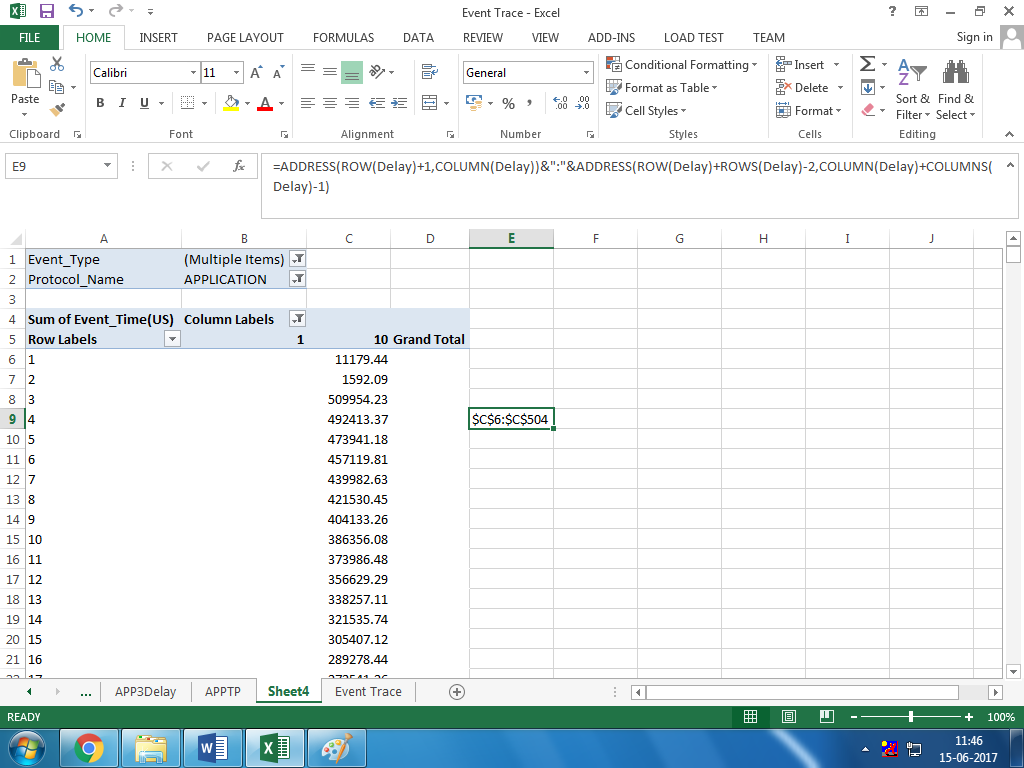
1. Place the mouse cursor on the top of Destination Id then left click it will automatically selects the rows of the destination Id, then select the Name Box and name the row.



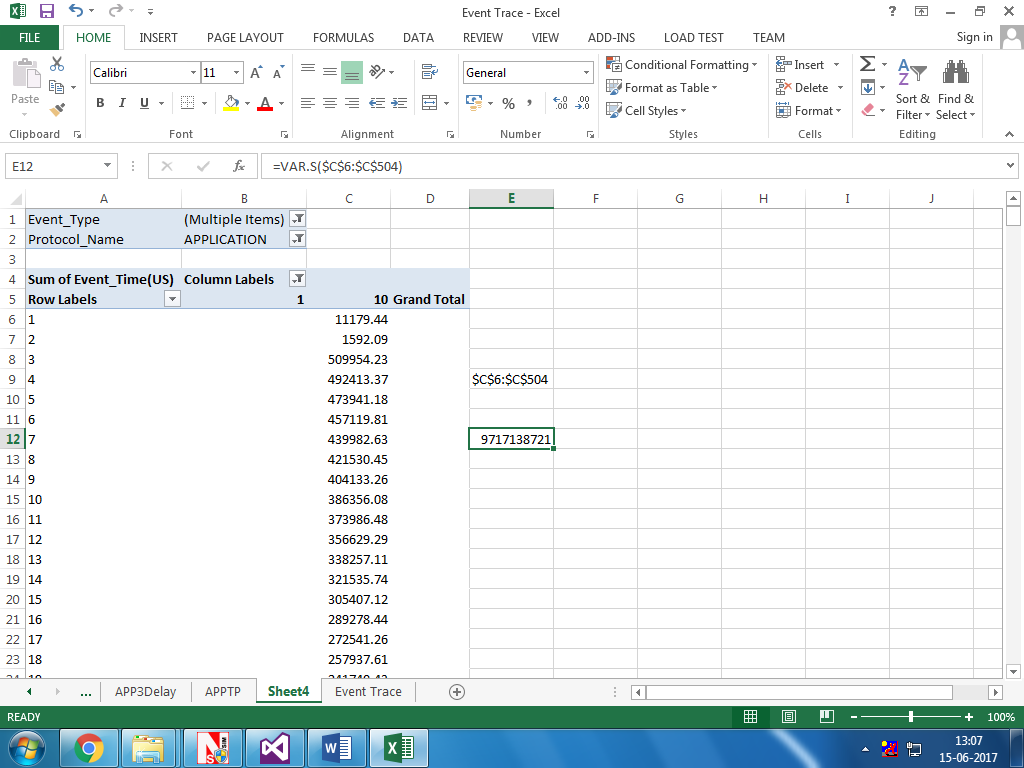
Then in an empty cell type the following formula and press enter

**=ADDRESS(ROW(Delay)+1,COLUMN(Delay)) &":"& ADDRESS(ROW(Delay)+ROWS(Delay)-2,COLUMN(Delay)+COLUMNS(Delay)-1)**

This will give you the **Row Address**

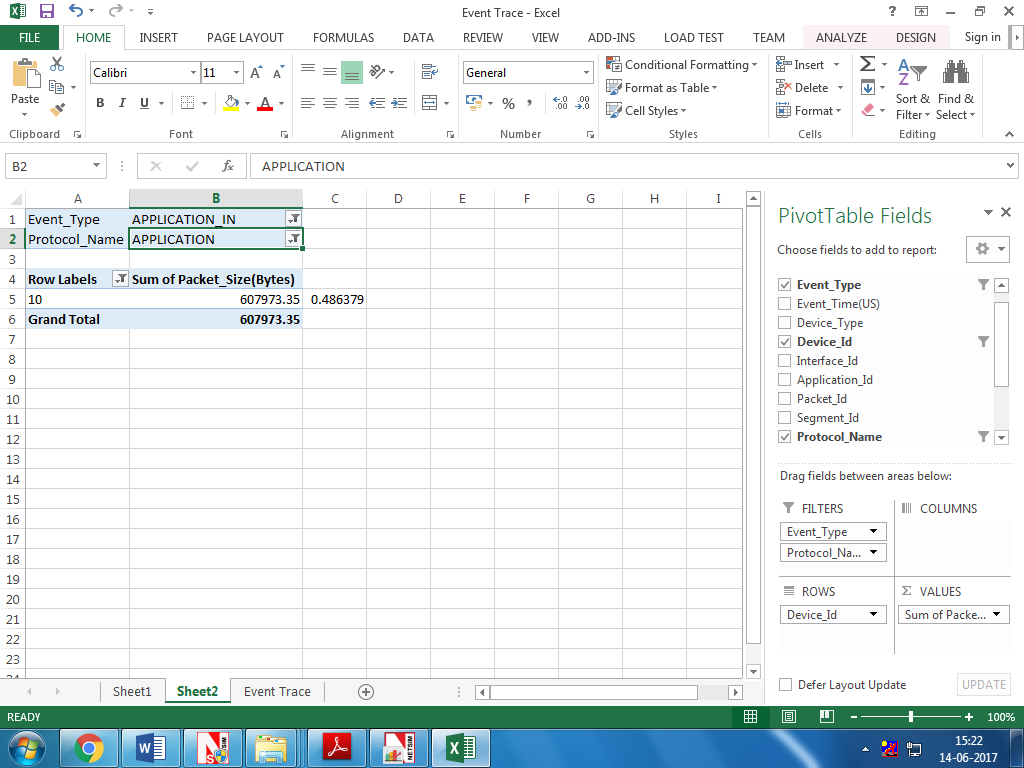


Then enter **=VAR.S(Row Address)**, where the **Row Address** is one that you got in the previous step.  
This will give you the **Application** **Jitter.**

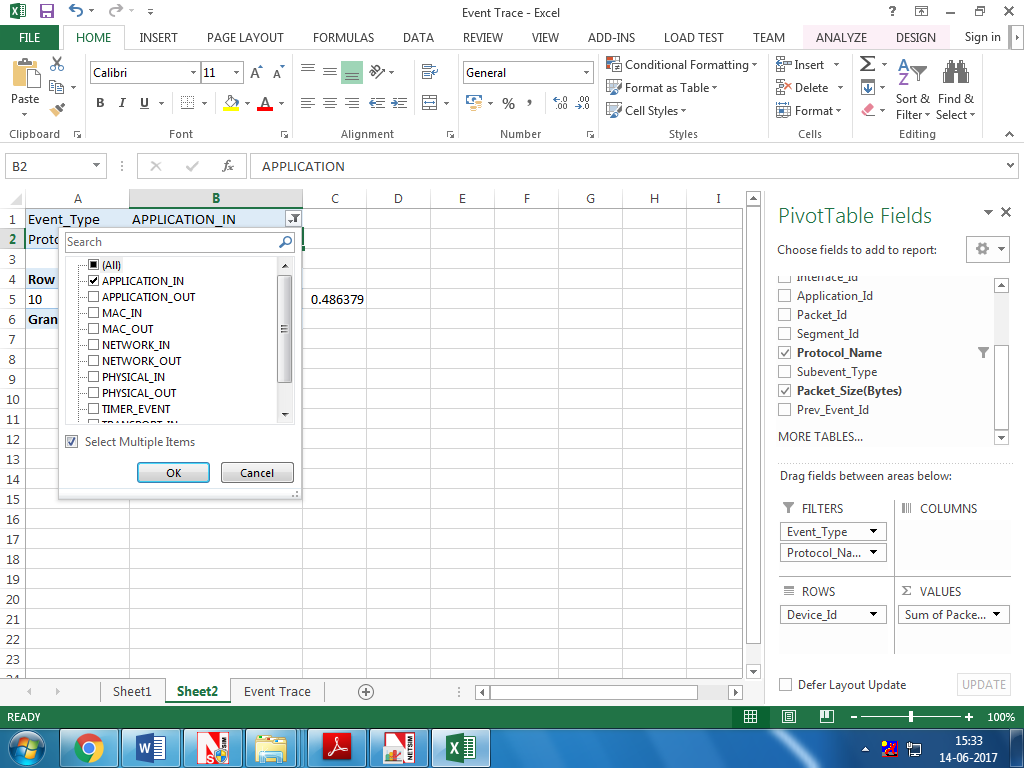
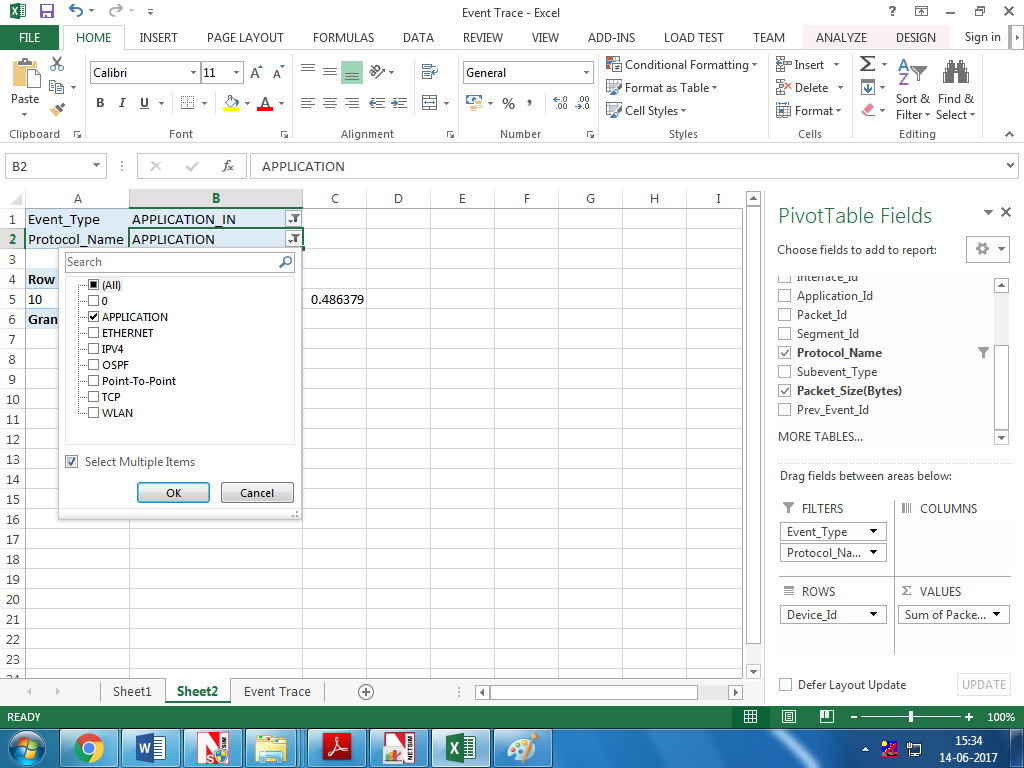
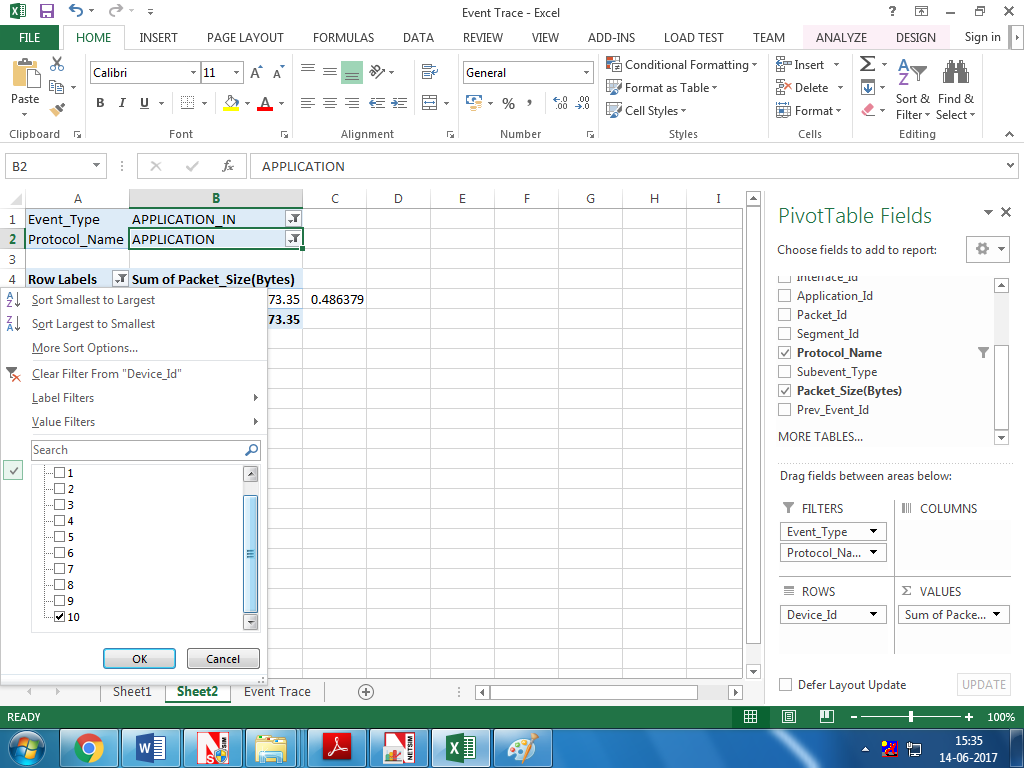


**Application Throughput Analysis:**

1. For Application Throughput drag and drop **Event\_type**, **Protocol\_Name** Fields in **FILTERS**, **Device\_Id** in **ROWS**, **Packet\_Size(Bytes)** into **VALUES.** Change the **Value Field Settings** of **Packets\_Size(Bytes)** to **SUM** as mentioned in Delay Analysis.

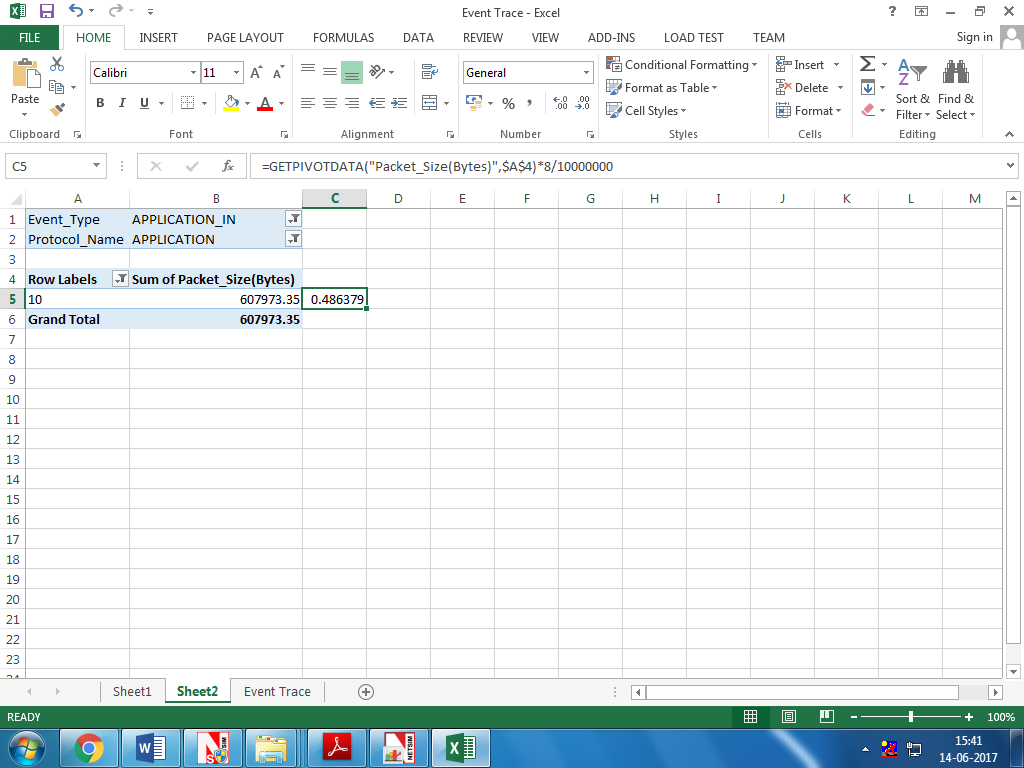


Then Select the **Event\_Type** as **APPLICATION\_IN**, **Protocol\_Name** as **APPLICATION** and **Device\_Id** as the **Destination (in this case 10).**



1. App Throughput =
2. Then in an empty cell type **=GETPIVOTDATA("Packet\_Size(Bytes)",$A$4)\*8/10000000**

This give the Application Throughput in Mbps (Multiplied by 8 to convert Bytes to bits, and divided by 100000 to convert into Mega)



Compare with the Application throughput in the **Application\_Metrics\_Table**

