LET US USE PIG TO DO SOME REAL LIFE DATA MANIPULATION

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SUPPOSE WE ARE GIVEN LOGS FROM A SERVER

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```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123  module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125  module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
[2016-04-01 T 00:02:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-3 error-message-4
[2016-04-01 T 00:02:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-5
[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
```

THE LOGS LOOK LIKE THIS

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```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
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[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
```

IT'S COMPLETELY UNSTRUCTURED... OR IS IT?

IF YOU LOOK CLOSELY, YOU CAN SEE SOME PATTERNS

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
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[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
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[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
```
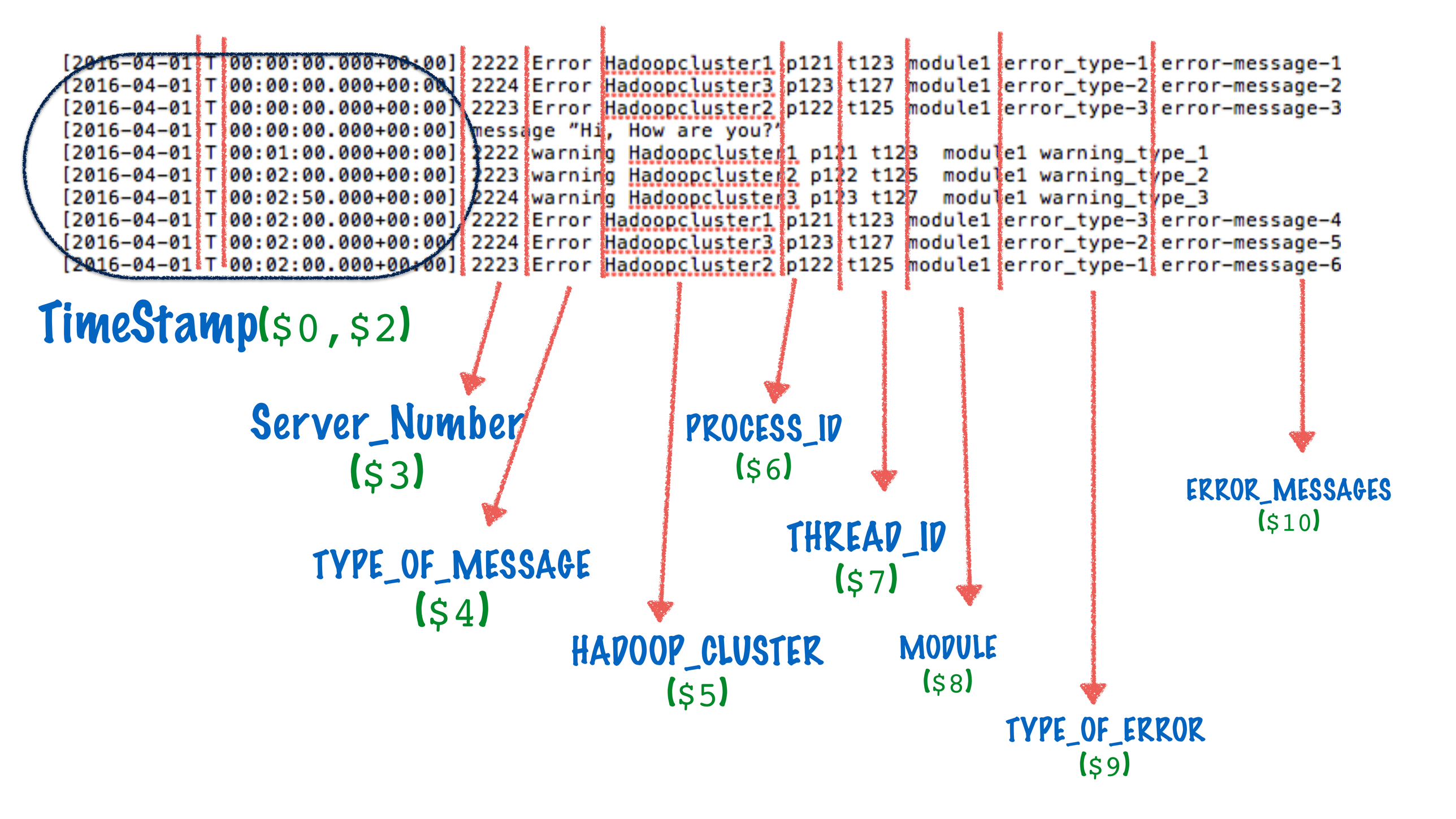

IF YOU LOOK CLOSELY, YOU CAN SEE SOME PATTERNS


[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
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[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123 module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125 module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127 module1 warning_type_3
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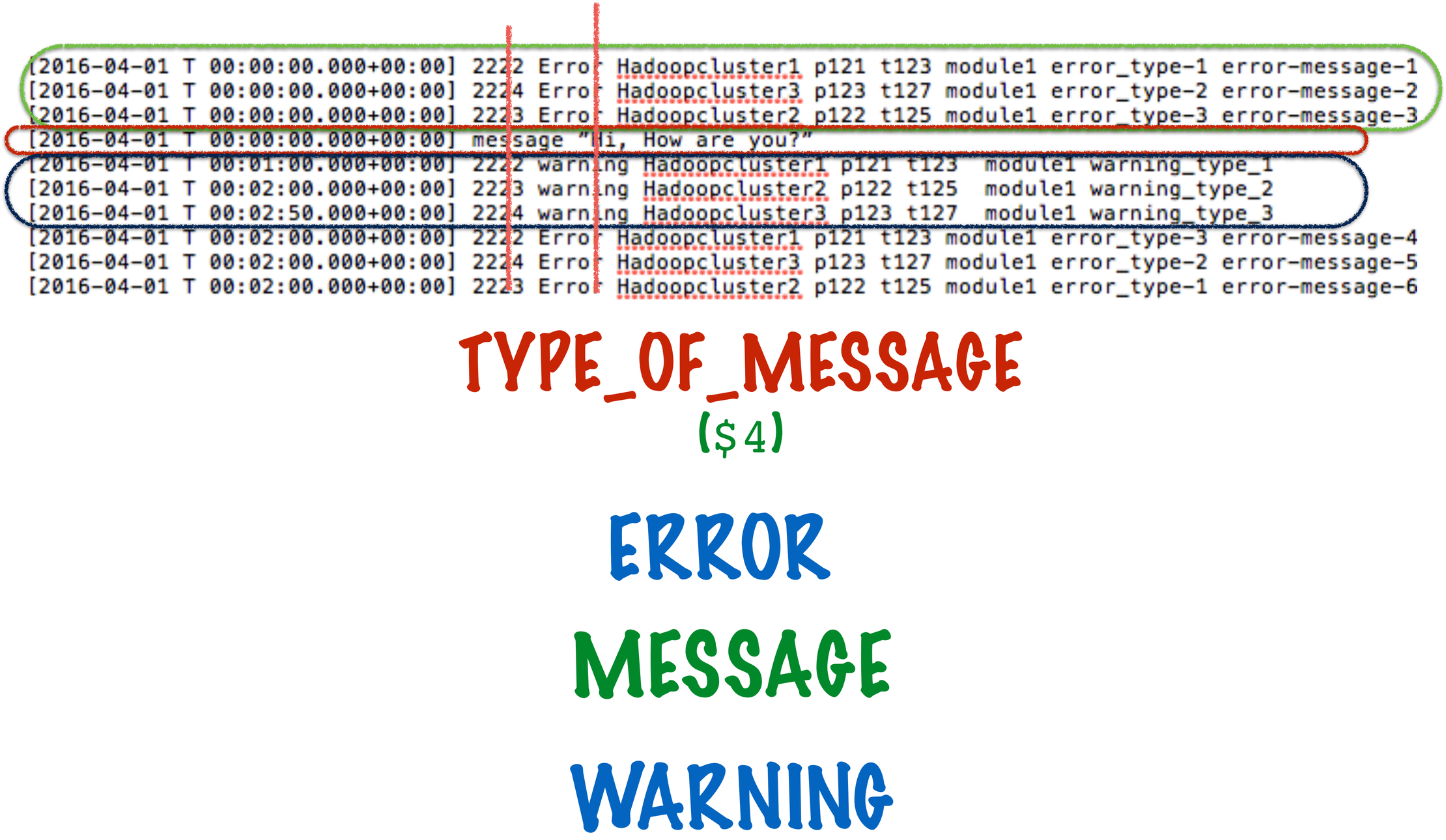
[2016-04-01 T 00:02:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-5
[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
TimeStamp($0,$2)
Server_Number ($3)
TYPE_OF_MESSAGE ($4)
HADOOP_CLUSTER ($5)
PROCESS_ID ($6)
THREAD_ID ($7)
MODULE ($8)
TYPE_OF_ERROR ($9)
ERROR_MESSAGES ($10)


[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123 module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125 module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127 module1 warning_type_3
[2016-04-01 T 00:02:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-3 error-message-4
[2016-04-01 T 00:02:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-5
[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
TYPE_OF_MESSAGE
($4)
ERROR
MESSAGE
WARNING

LOGS CONTAIN THREE TYPES OF MESSAGES

ERROR

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
```

MESSAGE

```
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
```

WARNING

```
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123  module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125  module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
```

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
```

MESSAGE

```
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
```

WARNING

```
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123  module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125  module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
```

DUMP OF ERROR DATA

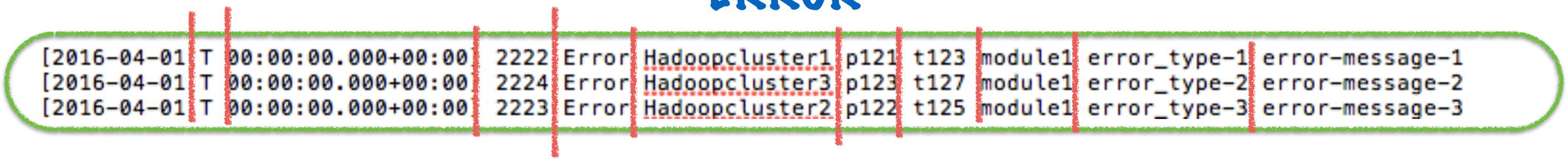
SUMMARY OF ERROR DATA

DUMP OF WARNING DATA

WE WILL GET RID OF MESSAGES

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR



DUMP OF ERROR DATA

SIMPLY DUMPS ALL THE ERROR DATA

Time Stamp	Month	Day	Server_Numbe r	Error_Typ e	Hadoop_Cluster	Process ID	Thread ID	Module	Type of Error	Error_Messages
2016-01-01T00:00:00.000+05:30	1	1	2222	Error	Hadoopcluster1	p121	t123	module1	error_type-1	error-message-1
2016-01-01T00:00:00.000+05:30	1	1	2224	Error	Hadoopcluster3	p123	t127	module1	error_type-2	error-message-2
2016-01-01T00:00:00.000+05:30	1	1	2223	Error	Hadoopcluster2	p122	t125	module1	error_type-3	error-message-3
2016-01-01T00:02:00.000+05:30	1	1	2222	Error	Hadoopcluster1	p121	t123	module1	error_type-3	error-message-4
2016-01-01T00:02:00.000+05:30	1	1	2224	Error	Hadoopcluster3	p123	t127	module1	error_type-2	error-message-5
2016-01-01T00:02:00.000+05:30	1	1	2223	Error	Hadoopcluster2	p122	t125	module1	error_type-1	error-message-6

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
```

MESSAGES

```
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
```

WARNING

```
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123  module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125  module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
```

DUMP OF ERROR DATA

SUMMARY OF ERROR DATA

DUMP OF WARNING DATA

WE WILL GET RID OF MESSAGES

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
```

SUMMARY OF ERROR DATA

IS A SUMMARY OF ERRORS ON SERVERS

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

WE USE THIS TABLE TO GENERATE VARIOUS ERROR STATISTICS FOR SERVERS

USING GROUP BY

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

THESE THREE COLUMNS ARE SIMPLY TAKEN FROM THE

ERROR_DATA

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

THIS IS THE COLUMN THAT CAPTURES THE LAST TIME STAMP OF AN ERROR ON A SERVER

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

THESE TWO COLUMNS ARE GENERATED USING AGGREGATE FUNCTIONS

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

THIS COLUMN TELLS US THE NUMBER OF TIMES A PARTICULAR ERROR OCCURRED ON EACH SERVERS

SUMMARY OF ERROR DATA

IS A SUMMARY OF SERVER_NUMBER AND ERRORS ON THEM

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module 1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module 1	1	error-message-4
2223	error_type-1	2016-01-01T00:02:00.000+05:30	p122	t125	module 1	1	error-message-6
2223	error_type-3	2016-01-01T00:00:00.000+05:30	p122	t125	module 1	1	error-message-3
2224	error_type-2	2016-01-01T00:02:00.000+05:30	p123	t127	module 1	2	error-message-5,error-message-2

THIS COLUMN AGGREGATES ALL THE ERROR MESSAGES IN A SINGLE FIELD

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
```

MESSAGES

```
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
```

WARNING

```
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123  module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125  module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127  module1 warning_type_3
```

DUMP OF ERROR DATA

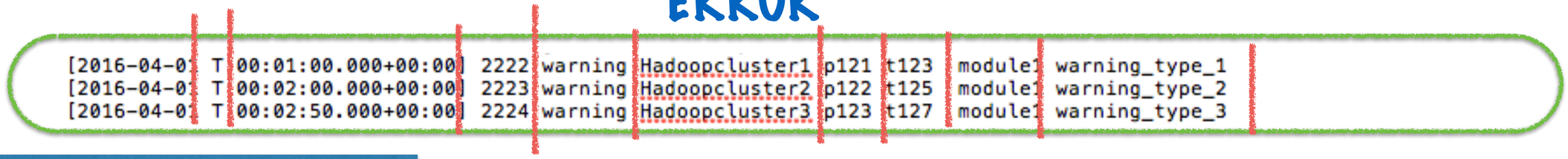
SUMMARY OF ERROR DATA

DUMP OF WARNING DATA

WE WILL GET RID OF MESSAGES

WHAT IF WE WANT SOME USEFUL SUMMARY INFORMATION?

ERROR



DUMP OF WARNING DATA

IS A DUMP OF WARNING DATA

Time Stamp	Month	Day	Server_Number	Error_Type	Hadoop_Cluster	Process ID	Thread ID	Module	Type of Error	Error_Messages
2016-01-01T00:01:00.000+05:30	1	1	2222	warning	Hadoopcluster1	p121	t123	module1	warning_type_1	
2016-01-01T00:02:00.000+05:30	1	1	2223	warning	Hadoopcluster2	p122	t125	module1	warning_type_2	
2016-01-01T00:02:50.000+05:30	1	1	2224	warning	Hadoopcluster3	p123	t127	module1	warning_type_3	

THIS COLUMN WILL BE BLANK, THERE ARE NO WARNING MESSAGES

WE NEED A SCRIPT THAT WILL GENERATE THESE THREE RELATIONS

DUMP OF ERROR DATA

SUMMARY OF ERROR DATA

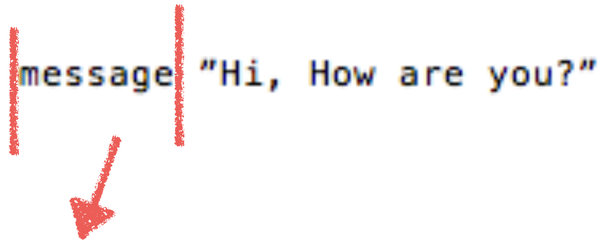
DUMP OF WARNING DATA

THE SCRIPT THAT WILL GENERATE THESE THREE RELATIONS

```
grunt> log_data = load 'log_data.txt' using PigStorage(' ');
grunt> log_data_1 = filter log_data by not $3 == 'message';
grunt> log_data_2= foreach log_data_1 generate SUBSTRING($0,1,11),$1,SUBSTRING($2,0,8),$3,$4,$5,$6,$7,$8,$9,$10;
grunt> log_data_3 = foreach log_data_2 generate CONCAT($0,' '),$2,$3,$4,$5,$6,$7,$8,$9,$10;
grunt> log_data_4 = foreach log_data_3 generate CONCAT($0,$1),$2,$3,$4,$5,$6,$7,$8,$9;
grunt> log_data_5 = foreach log_data_4 generate ToDate($0,'yyyy-mm-dd HH:mm:ss'),$1,$2,$3,$4,$5,$6,$7,$8;
grunt> log_data_6 = foreach log_data_5 generate $0 as Time_Stamp,GetMonth($0) as Month,GetDay($0) as Day,$1 as
server_number,$2 as type_of_message,$3 as cluster_name,$4 as process_ID,$5 as thread_ID ,$6 as module,$7 as error_type
,$8 as error_message;

grunt> split log_data_6 into warnings_data if type_of_message == 'warning', error_data if type_of_message == 'Error';
grunt> groupd = group error_data by (server_number,error_type);

grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type, Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

```
grunt> log_data = load 'log_data.txt' using PigStorage(' ');
grunt> log_data_1 = filter log_data by not $3 == 'message';
```

THIS WILL HELP US IN FILTERING OUT MESSAGE LOGS




```
$3 == 'message'
```

```
grunt> log_data_2 = foreach log_data_1 generate SUBSTRING($0,1,11),
$1,SUBSTRING($2,0,8),$3,$4,$5,$6,$7,$8,$9,$10;
```

WE GET RID OF OPENING BRACKET AND CLOSING BRACKET FROM FIELD 1 AND FIELD 3

```
[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-
```

```
grunt> log_data_2 = foreach log_data_1 generate SUBSTRING($0,1,11),
$1,SUBSTRING($2,0,8),$3,$4,$5,$6,$7,$8,$9,$10;
```

THE DATA LOOKS LIKE THIS AFTER THIS COMMAND

```
(2016-04-01,T,00:00:00,2222,Error,Hadoopcluster1,p121,t123,module1,error_type-1,error-message-1)
(2016-04-01,T,00:00:00,2224,Error,Hadoopcluster3,p123,t127,module1,error_type-2,error-message-2)
(2016-04-01,T,00:00:00,2223,Error,Hadoopcluster2,p122,t125,module1,error_type-3,error-message-3)
(2016-04-01,T,00:01:00,2222,warning,Hadoopcluster1,p121,t123,module1,warning_type_1,)
(2016-04-01,T,00:02:00,2223,warning,Hadoopcluster2,p122,t125,module1,warning_type_2,)
```

```
grunt> log_data_3 = foreach log_data_2 generate CONCAT($0,' '),
$2,$3,$4,$5,$6,$7,$8,$9,$10;
grunt> log_data_4 = foreach log_data_3 generate CONCAT($0,$1),
$2,$3,$4,$5,$6,$7,$8,$9;
```

THESE TWO STATEMENTS ARE USED TO CONCATENATE FIELD 0 AND FIELD 2 WITH ' ' IN BETWEEN

```
(2016-04-01T00:00:00,2222,Error,Hadoopcluster1,p121,t123,module1,error_type-1,error-mess
(2016-04-01T00:00:00,2224,Error,Hadoopcluster3,p123,t127,module1,error_type-2,error-mess
(2016-04-01T00:00:00,2223,Error,Hadoopcluster2,p122,t125,module1,error_type-3,error-mess
(2016-04-01T00:01:00,2222,warning,Hadoopcluster1,p121,t123,module1,warning_type_1,)
(2016-04-01T00:02:00,2223,warning,Hadoopcluster2,p122,t125,module1,warning_type_2,)
```

THE SCRIPT THAT WILL GENERATE THESE THREE TABLES IS

```
grunt> log_data_3 = foreach log_data_2 generate CONCAT($0,' '),
$2,$3,$4,$5,$6,$7,$8,$9,$10;
grunt> log_data_4 = foreach log_data_3 generate CONCAT($0,$1),
$2,$3,$4,$5,$6,$7,$8,$9;
```

log_data LOOKS CLEANER NOW

```
(2016-04-01 00:00:00,2222,Error,Hadoopcluster1,p121,t123,module1,error_type-1,error-message-1)
(2016-04-01 00:00:00,2224,Error,Hadoopcluster3,p123,t127,module1,error_type-2,error-message-2)
(2016-04-01 00:00:00,2223,Error,Hadoopcluster2,p122,t125,module1,error_type-3,error-message-3)
(2016-04-01 00:01:00,2222,warning,Hadoopcluster1,p121,t123,module1,warning_type_1,)
(2016-04-01 00:02:00,2223,warning,Hadoopcluster2,p122,t125,module1,warning_type_2,)
```

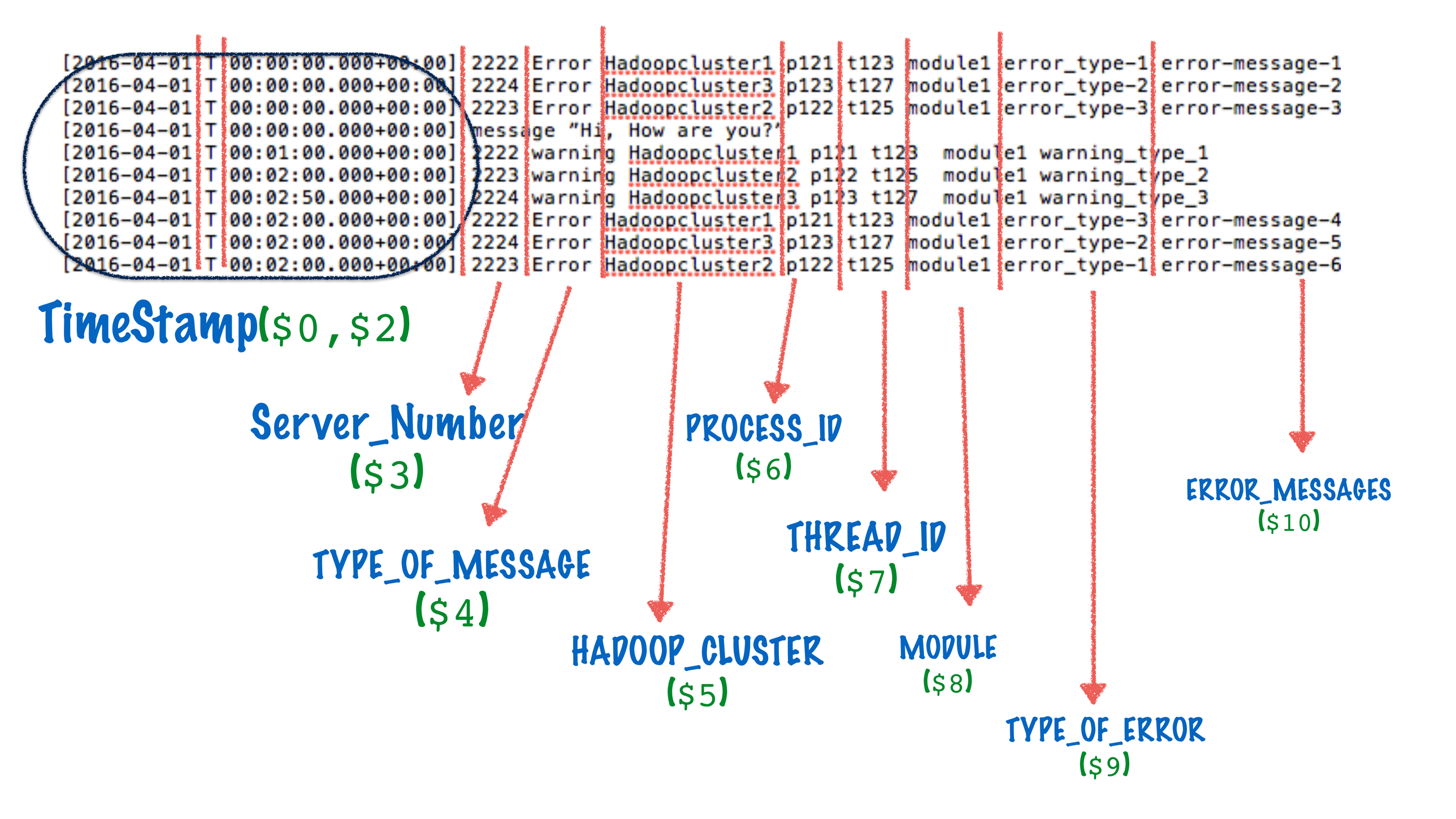
```
grunt> log_data_5 = foreach log_data_4 generate ToDate($0,'yyyy-mm-dd HH:mm:ss'),$1,$2,$3,$4,$5,$6,$7,$8;
```

WE CAST THE FIRST FIELD INTO DATETIME DATA TYPE

```
(2016-04-01 00:00:00,2222,Error,Hadoopcluster1,p121,t123,module1,error_type-1,error-message-1)
(2016-04-01 00:00:00,2224,Error,Hadoopcluster3,p123,t127,module1,error_type-2,error-message-2)
(2016-04-01 00:00:00,2223,Error,Hadoopcluster2,p122,t125,module1,error_type-3,error-message-3)
(2016-04-01 00:01:00,2222,warning,Hadoopcluster1,p121,t123,module1,warning_type_1,)
(2016-04-01 00:02:00,2223,warning,Hadoopcluster2,p122,t125,module1,warning_type_2,)
```

```
grunt> log_data_6 = foreach log_data_5 generate $0 as Time_Stamp,GetMonth($0)
as Month,GetDay($0) as Day,$1 as server_number,$2 as type_of_message,$3 as
cluster_name,$4 as process_ID,$5 as thread_ID ,$6 as module,$7 as error_type ,
$8 as error_message;
```

AT THIS STEP WE NAME VARIOUS FIELDS AND SPECIFY THE SCHEMA


[2016-04-01 T 00:00:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-1 error-message-1
[2016-04-01 T 00:00:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-2
[2016-04-01 T 00:00:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-3 error-message-3
[2016-04-01 T 00:00:00.000+00:00] message "Hi, How are you?"
[2016-04-01 T 00:01:00.000+00:00] 2222 warning Hadoopcluster1 p121 t123 module1 warning_type_1
[2016-04-01 T 00:02:00.000+00:00] 2223 warning Hadoopcluster2 p122 t125 module1 warning_type_2
[2016-04-01 T 00:02:50.000+00:00] 2224 warning Hadoopcluster3 p123 t127 module1 warning_type_3
[2016-04-01 T 00:02:00.000+00:00] 2222 Error Hadoopcluster1 p121 t123 module1 error_type-3 error-message-4
[2016-04-01 T 00:02:00.000+00:00] 2224 Error Hadoopcluster3 p123 t127 module1 error_type-2 error-message-5
[2016-04-01 T 00:02:00.000+00:00] 2223 Error Hadoopcluster2 p122 t125 module1 error_type-1 error-message-6
TimeStamp($0,$2)
Server_Number ($3)
TYPE_OF_MESSAGE ($4)
HADOOP_CLUSTER ($5)
PROCESS_ID ($6)
THREAD_ID ($7)
MODULE ($8)
TYPE_OF_ERROR ($9)
ERROR_MESSAGES ($10)

```
grunt> split log_data_6 into warnings_data if type_of_message ==
'warning', error_data if type_of_message == 'Error';
```

NOW WE SPLIT DATA INTO TWO RELATIONS USING type_of_message

```
grunt> split log_data_6 into warnings_data if type_of_message ==
'warning',
```

warnings_data WILL HAVE

DUMP OF WARNING DATA

Time Stamp	Month	Day	Server_Number	Error_Type	Hadoop_Cluster	Process ID	Thread ID	Module	Type of Error	Error_Messages
2016-01-01T00:01:00.000+05:30	1	1	2222	warning	Hadoopcluster1	p121	t123	module1	warning_type_1	
2016-01-01T00:02:00.000+05:30	1	1	2223	warning	Hadoopcluster2	p122	t125	module1	warning_type_2	
2016-01-01T00:02:50.000+05:30	1	1	2224	warning	Hadoopcluster3	p123	t127	module1	warning_type_3	

```
error_data if type_of_message == 'Error';
```

error_data WILL HAVE

DUMP OF ERROR DATA

Time Stamp	Month	Day	Server_Numbe r	Error_Typ e	Hadoop_Cluster	Process ID	Thread ID	Module	Type of Error	Error_Messages
2016-01-01T00:00:00.000+05:30	1	1	2222	Error	Hadoopcluster1	p121	t123	module1	error_type-1	error-message-1
2016-01-01T00:00:00.000+05:30	1	1	2224	Error	Hadoopcluster3	p123	t127	module1	error_type-2	error-message-2
2016-01-01T00:00:00.000+05:30	1	1	2223	Error	Hadoopcluster2	p122	t125	module1	error_type-3	error-message-3
2016-01-01T00:02:00.000+05:30	1	1	2222	Error	Hadoopcluster1	p121	t123	module1	error_type-3	error-message-4
2016-01-01T00:02:00.000+05:30	1	1	2224	Error	Hadoopcluster3	p123	t127	module1	error_type-2	error-message-5

THE SCRIPT THAT WILL GENERATE THESE THREE TABLES IS

NEXT WE HAVE TO GENERATE

ERROR_SUMMARY

```
grunt> groupd = group error_data by (server_number,error_type);
```

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

FIRST WE DO A GROUP BY ON

server_number,error_type

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

THIS PART OF THE SCRIPT WILL GENERATE THIS TABLE

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

THIS LINE USES AGGREGATE FUNCTION TO COUNT THE FREQUENCY OF THE ERRORS

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

THIS LINE USES AGGREGATE FUNCTION TO AGGREGATE ALL THE MESSAGES CORRESPONDING TO ONE ERROR MESSAGE

```
grunt> error_summary = foreach groupd{
grunt> error_messages = BagToString(error_data.error_message,',');
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

WE NEED ONLY THESE FIELDS IN THE FINAL OUTPUT

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

WE ORDER THIS RELATION ON TIME_STAMP TO FIND THE LATEST TIME STAMP WHEN AN ERROR OCCURRED

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

WE LIMIT THIS RELATION TO ONLY ONE ROW

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

THIS COMMAND FLATTENS top_item AND GENERATES THESE COLUMNS

```
grunt> error_summary = foreach groupd{
grunt> number_of_occurences = COUNT(error_data);
grunt> error_messages = BagToString(error_data.error_message,',');
grunt> error_data = foreach error_data generate server_number, error_type,
Time_Stamp, process_ID, thread_ID, module;
grunt> sorted_error_messages =  order error_data by Time_Stamp desc;
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };

grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```

FIRST WE DO A GROUP BY ON

server_number,error_type

Server_Number	Error_Type	Last_Time_Stamp	Process ID	Thread ID	Module	Number_of_occurences	Error_Messages
2222	error_type-1	2016-01-01T00:00:00.000+05:30	p121	t123	module1	1	error-message-1
2222	error_type-3	2016-01-01T00:02:00.000+05:30	p121	t123	module1	1	error-message-4

FOR EVERY SERVER NUMBER AND ERROR TYPE

```
grunt> error_summary = foreach groupd{
```

WE'VE GOT THE LAST TIMESTAMP OF THE ERROR AND AN AGGREGATED NUMBER OF ERRORS OF THAT TYPE ON THAT SERVER

```
grunt> top_item =  limit sorted_error_messages 1;
grunt> generate flatten(top_item),number_of_occurences,error_messages;
grunt> };
```

FIRST WE DO A GROUP BY ON

server_number,error_type

STORES THE DATA OF VARIOUS RELATIONS INTO THE HDFS DIRECTORY

```
grunt> store error_summary into 'error_summary';
grunt> store error_data into 'error_data';
grunt> store warnings_data into 'warnings_data';
```