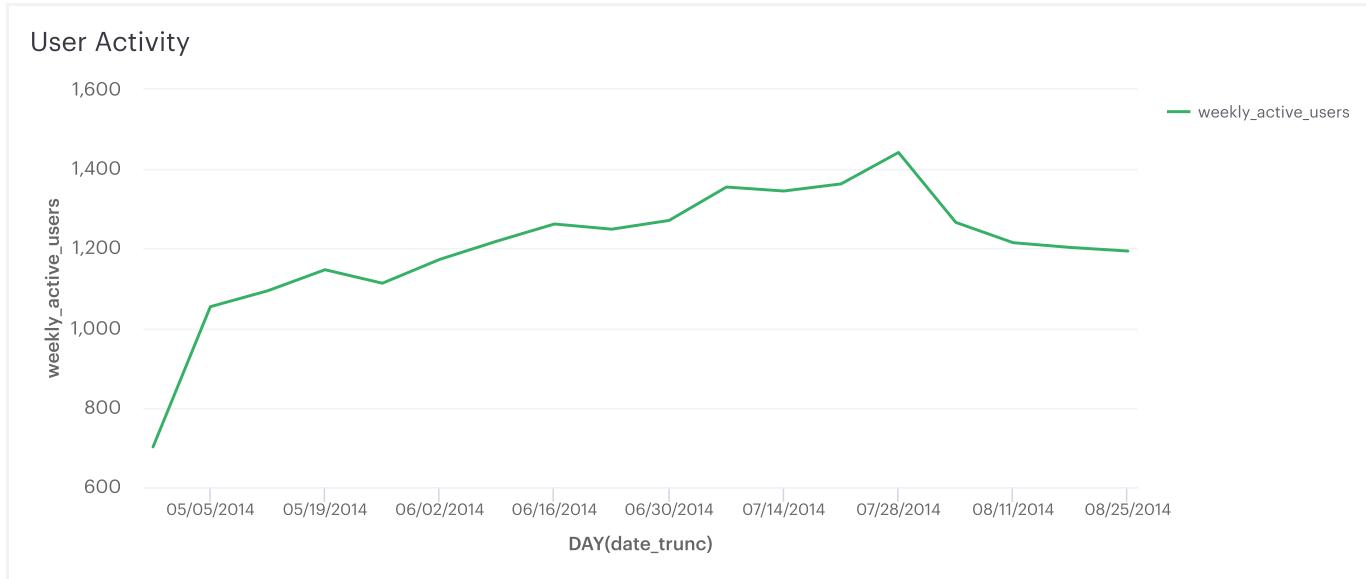


# Investigating a Drop in User Engagement

## The problem

You show up to work Tuesday morning, September 2, 2014. The head of the Product team walks over to your desk and asks you what you think about the latest activity on the user engagement dashboards. You fire them up, and something immediately jumps out:



The above chart shows the number of engaged users each week. Yammer defines engagement as having made some type of server call by interacting with the product (shown in the data as events of type "engagement"). Any point in this chart can be interpreted as "the number of users who logged at least one engagement event during the week starting on that date."

You are responsible for determining what caused the dip at the end of the chart shown above and, if appropriate, recommending solutions for the problem.

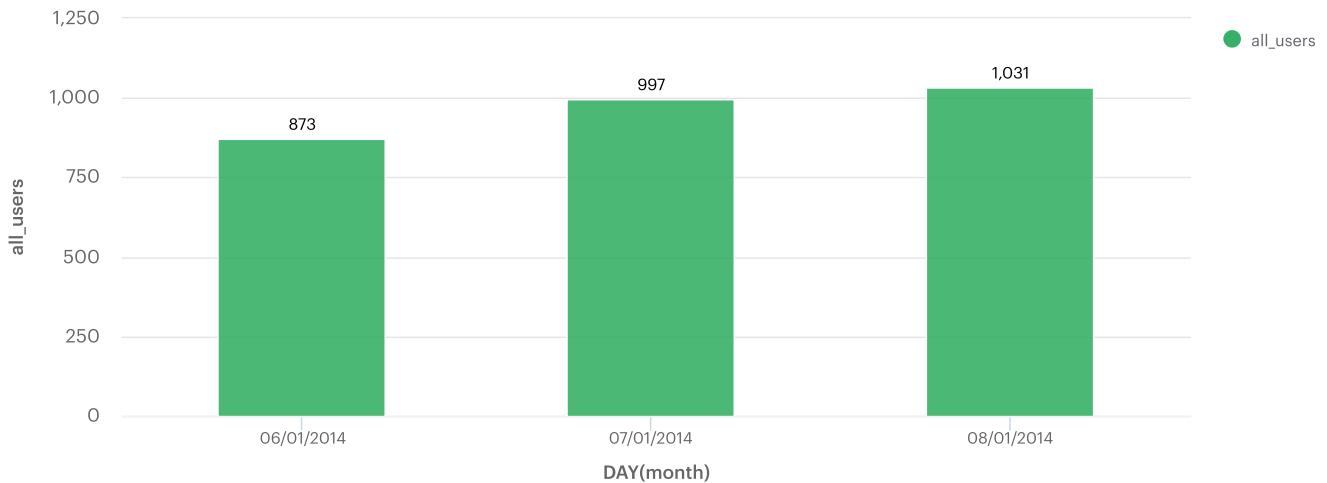
## The Solution

### Hypotheses

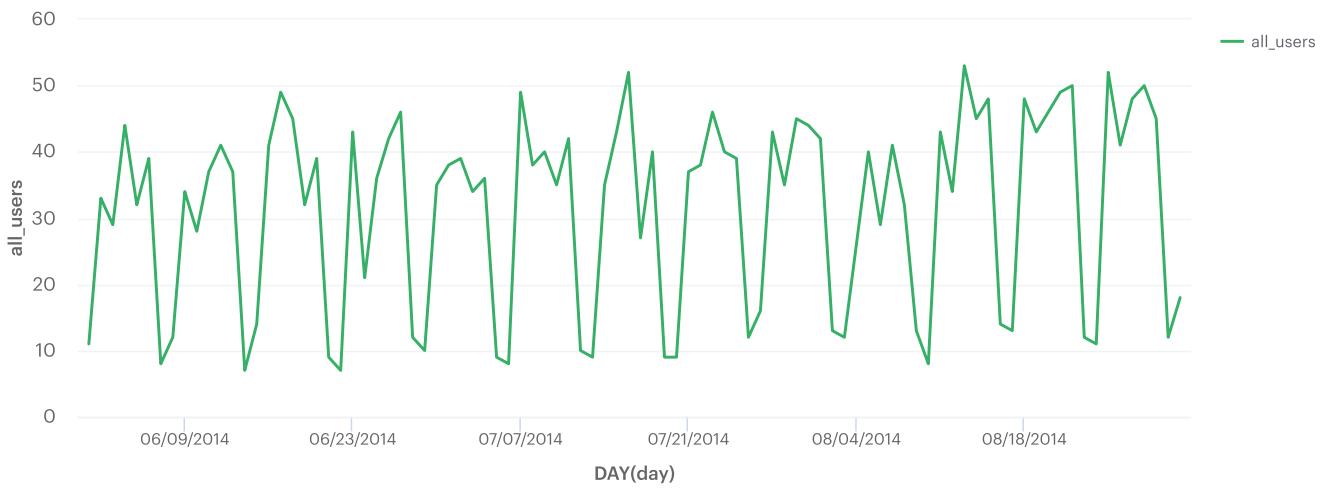
1. traffic (too many people on website, etc.)
2. big event (holiday or something special like super bowl)
3. broken feature on web or app
4. bad data

Let us first check on our users to see if people suddenly left or there was some kind of shift in our growth patterns.

### monthly growth

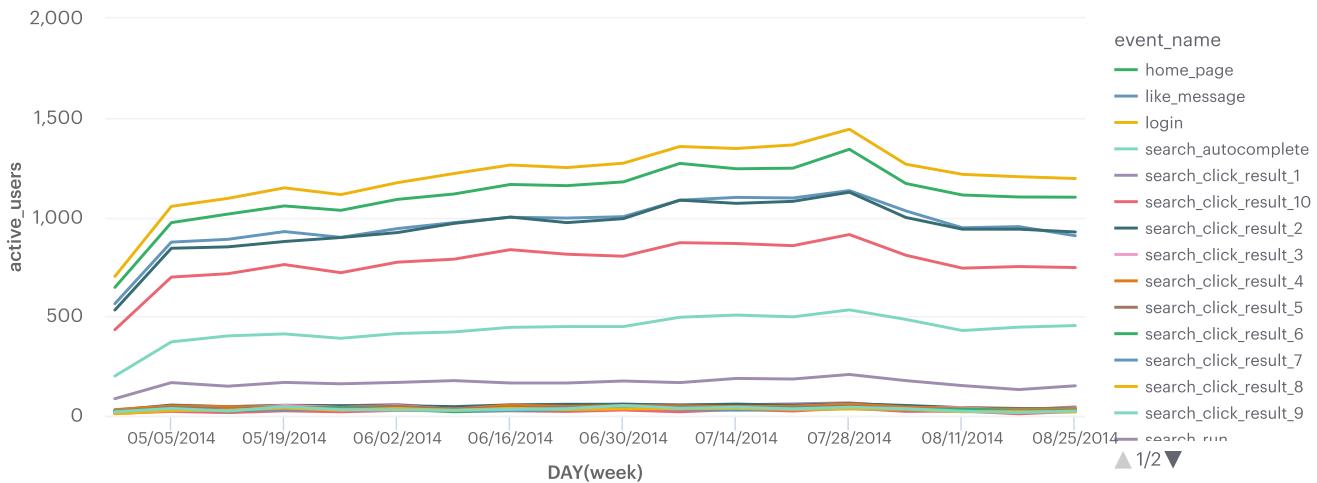


### daily growth



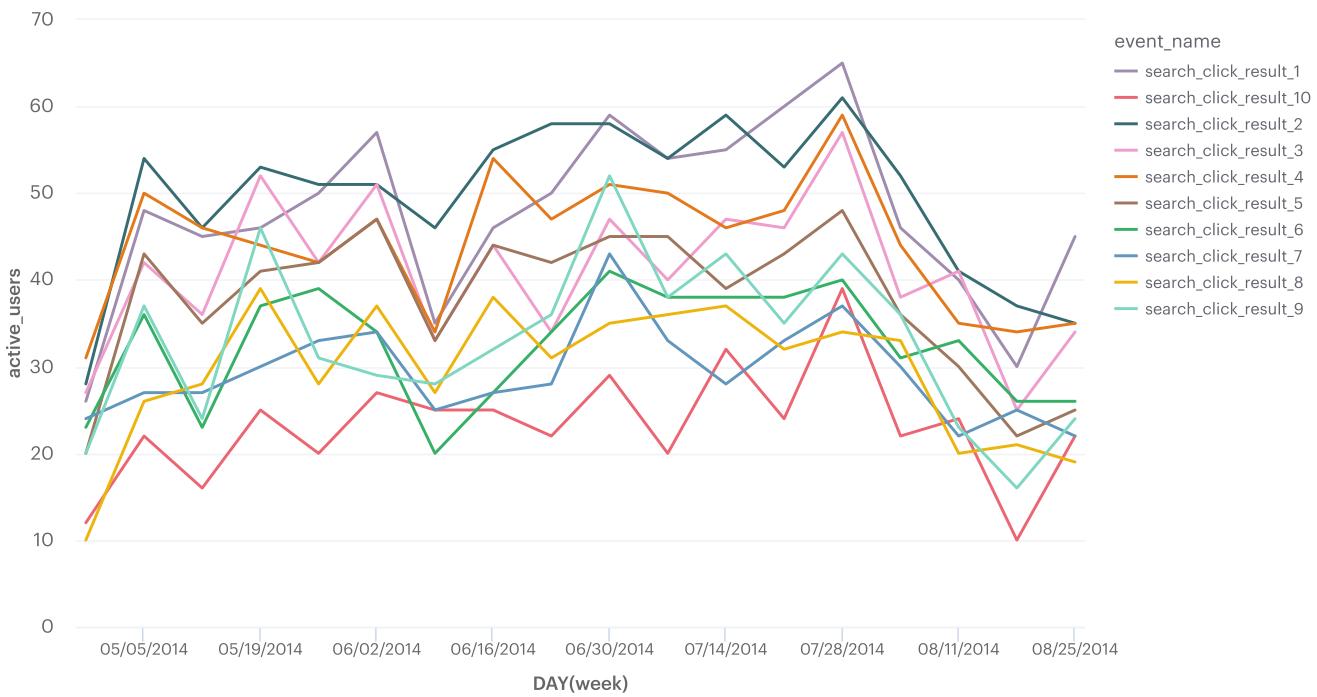
Nothing out of the ordinary here. Looks like a steady growth. The issue then must lie within our existing users. Let's do a pulse check on their activities.

## all event behaviors

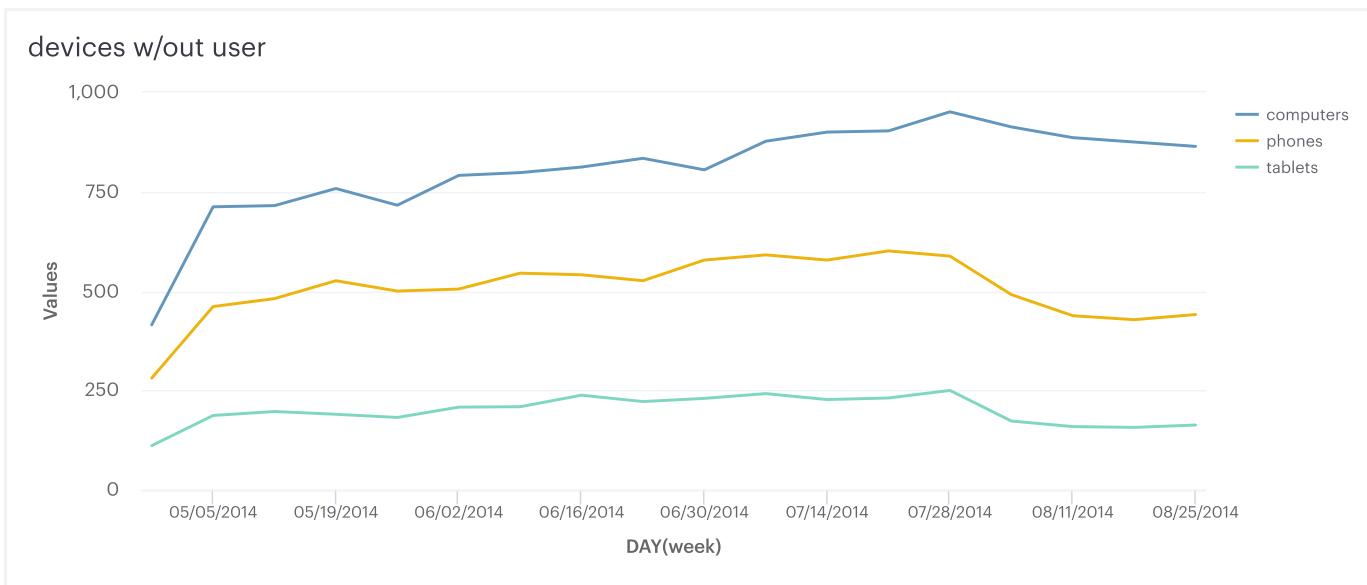


Clearly there is a big dip in different functions from 7/28 to 8/11 and more from the email functions to home page. The clickthrough rates are hard to tell, let's try zooming into them only. We will probably see a decline along the same dates.

## Clickthroughs only



Messy, but gets to the point. With a decrease in email and clickthrough activity, there must be a bug or some kind of poor implementation somewhere. Let's check on the devices and see how they are functioning.



Looks like the problem is more localized with the phones.

## Recommendation to Product Team

Check on the codes related to email digest and the mobile application and see if there are any bugs or poor implementation.

## Side: Query Results

Query 1		
	month	all_users
1	2014-06-01 00:00:00	873
2	2014-07-01 00:00:00	997
3	2014-08-01 00:00:00	1031

Query 2		
	day	all_users
1	2014-06-01 00:00:00	11
2	2014-06-02 00:00:00	33
3	2014-06-03 00:00:00	29
4	2014-06-04 00:00:00	44
5	2014-06-05 00:00:00	32
6	2014-06-06 00:00:00	39
7	2014-06-07 00:00:00	8
8	2014-06-08 00:00:00	12
9	2014-06-09 00:00:00	34
10	2014-06-10 00:00:00	28

11	2014-06-11 00:00:00	37
12	2014-06-12 00:00:00	41
13	2014-06-13 00:00:00	37
14	2014-06-14 00:00:00	7
15	2014-06-15 00:00:00	14
16	2014-06-16 00:00:00	41
17	2014-06-17 00:00:00	49
18	2014-06-18 00:00:00	45
19	2014-06-19 00:00:00	32
20	2014-06-20 00:00:00	39
21	2014-06-21 00:00:00	9
22	2014-06-22 00:00:00	7
23	2014-06-23 00:00:00	43
24	2014-06-24 00:00:00	21
25	2014-06-25 00:00:00	36
26	2014-06-26 00:00:00	42
27	2014-06-27 00:00:00	46
28	2014-06-28 00:00:00	12
29	2014-06-29 00:00:00	10
30	2014-06-30 00:00:00	35
31	2014-07-01 00:00:00	38
32	2014-07-02 00:00:00	39
33	2014-07-03 00:00:00	34
34	2014-07-04 00:00:00	36
35	2014-07-05 00:00:00	9
36	2014-07-06 00:00:00	8
37	2014-07-07 00:00:00	49
38	2014-07-08 00:00:00	38
39	2014-07-09 00:00:00	40
40	2014-07-10 00:00:00	35
41	2014-07-11 00:00:00	42
42	2014-07-12 00:00:00	10
43	2014-07-13 00:00:00	9
44	2014-07-14 00:00:00	35
45	2014-07-15 00:00:00	43
46	2014-07-16 00:00:00	52
47	2014-07-17 00:00:00	27
48	2014-07-18 00:00:00	40
49	2014-07-19 00:00:00	9
50	2014-07-20 00:00:00	9
51	2014-07-21 00:00:00	37
52	2014-07-22 00:00:00	38
53	2014-07-23 00:00:00	46
54	2014-07-24 00:00:00	40
55	2014-07-25 00:00:00	39
56	2014-07-26 00:00:00	12

57	2014-07-27 00:00:00		16
58	2014-07-28 00:00:00		43
59	2014-07-29 00:00:00		35
60	2014-07-30 00:00:00		45
61	2014-07-31 00:00:00		44
62	2014-08-01 00:00:00		42
63	2014-08-02 00:00:00		13
64	2014-08-03 00:00:00		12
65	2014-08-04 00:00:00		26
66	2014-08-05 00:00:00		40
67	2014-08-06 00:00:00		29
68	2014-08-07 00:00:00		41
69	2014-08-08 00:00:00		32
70	2014-08-09 00:00:00		13
71	2014-08-10 00:00:00		8
72	2014-08-11 00:00:00		43
73	2014-08-12 00:00:00		34
74	2014-08-13 00:00:00		53
75	2014-08-14 00:00:00		45
76	2014-08-15 00:00:00		48
77	2014-08-16 00:00:00		14
78	2014-08-17 00:00:00		13
79	2014-08-18 00:00:00		48
80	2014-08-19 00:00:00		43
81	2014-08-20 00:00:00		46
82	2014-08-21 00:00:00		49
83	2014-08-22 00:00:00		50
84	2014-08-23 00:00:00		12
85	2014-08-24 00:00:00		11
86	2014-08-25 00:00:00		52
87	2014-08-26 00:00:00		41
88	2014-08-27 00:00:00		48
89	2014-08-28 00:00:00		50
90	2014-08-29 00:00:00		45
91	2014-08-30 00:00:00		12
92	2014-08-31 00:00:00		18

### Query 3

	event_name	week	active_users
1	home_page	2014-04-28 00:00:00	646
2	home_page	2014-05-05 00:00:00	972
3	home_page	2014-05-12 00:00:00	1015
4	home_page	2014-05-19 00:00:00	1056
5	home_page	2014-05-26 00:00:00	1034
6	home_page	2014-06-02 00:00:00	1089

7	home_page	2014-06-09 00:00:00	1116
8	home_page	2014-06-16 00:00:00	1164
9	home_page	2014-06-23 00:00:00	1158
10	home_page	2014-06-30 00:00:00	1177
11	home_page	2014-07-07 00:00:00	1270
12	home_page	2014-07-14 00:00:00	1243
13	home_page	2014-07-21 00:00:00	1246
14	home_page	2014-07-28 00:00:00	1341
15	home_page	2014-08-04 00:00:00	1169
16	home_page	2014-08-11 00:00:00	1111
17	home_page	2014-08-18 00:00:00	1101
18	home_page	2014-08-25 00:00:00	1100
19	like_message	2014-04-28 00:00:00	564
20	like_message	2014-05-05 00:00:00	874
21	like_message	2014-05-12 00:00:00	888
22	like_message	2014-05-19 00:00:00	927
23	like_message	2014-05-26 00:00:00	898
24	like_message	2014-06-02 00:00:00	942
25	like_message	2014-06-09 00:00:00	972
26	like_message	2014-06-16 00:00:00	999
27	like_message	2014-06-23 00:00:00	995
28	like_message	2014-06-30 00:00:00	1002
29	like_message	2014-07-07 00:00:00	1085
30	like_message	2014-07-14 00:00:00	1099
31	like_message	2014-07-21 00:00:00	1096
32	like_message	2014-07-28 00:00:00	1133
33	like_message	2014-08-04 00:00:00	1031
34	like_message	2014-08-11 00:00:00	946
35	like_message	2014-08-18 00:00:00	952
36	like_message	2014-08-25 00:00:00	906
37	login	2014-04-28 00:00:00	701
38	login	2014-05-05 00:00:00	1054
39	login	2014-05-12 00:00:00	1094
40	login	2014-05-19 00:00:00	1147
41	login	2014-05-26 00:00:00	1113
42	login	2014-06-02 00:00:00	1173
43	login	2014-06-09 00:00:00	1219
44	login	2014-06-16 00:00:00	1262
45	login	2014-06-23 00:00:00	1249
46	login	2014-06-30 00:00:00	1271
47	login	2014-07-07 00:00:00	1355
48	login	2014-07-14 00:00:00	1345
49	login	2014-07-21 00:00:00	1363
50	login	2014-07-28 00:00:00	1442
51	login	2014-08-04 00:00:00	1266
52	login	2014-08-11 00:00:00	1215

53	login	2014-08-18 00:00:00	1203
54	login	2014-08-25 00:00:00	1194
55	search_autocomplete	2014-04-28 00:00:00	200
56	search_autocomplete	2014-05-05 00:00:00	372
57	search_autocomplete	2014-05-12 00:00:00	402
58	search_autocomplete	2014-05-19 00:00:00	412
59	search_autocomplete	2014-05-26 00:00:00	390
60	search_autocomplete	2014-06-02 00:00:00	414
61	search_autocomplete	2014-06-09 00:00:00	422
62	search_autocomplete	2014-06-16 00:00:00	445
63	search_autocomplete	2014-06-23 00:00:00	449
64	search_autocomplete	2014-06-30 00:00:00	449
65	search_autocomplete	2014-07-07 00:00:00	496
66	search_autocomplete	2014-07-14 00:00:00	507
67	search_autocomplete	2014-07-21 00:00:00	498
68	search_autocomplete	2014-07-28 00:00:00	533
69	search_autocomplete	2014-08-04 00:00:00	485
70	search_autocomplete	2014-08-11 00:00:00	429
71	search_autocomplete	2014-08-18 00:00:00	446
72	search_autocomplete	2014-08-25 00:00:00	454
73	search_click_result_1	2014-04-28 00:00:00	26
74	search_click_result_1	2014-05-05 00:00:00	48
75	search_click_result_1	2014-05-12 00:00:00	45
76	search_click_result_1	2014-05-19 00:00:00	46
77	search_click_result_1	2014-05-26 00:00:00	50
78	search_click_result_1	2014-06-02 00:00:00	57
79	search_click_result_1	2014-06-09 00:00:00	35
80	search_click_result_1	2014-06-16 00:00:00	46
81	search_click_result_1	2014-06-23 00:00:00	50
82	search_click_result_1	2014-06-30 00:00:00	59
83	search_click_result_1	2014-07-07 00:00:00	54
84	search_click_result_1	2014-07-14 00:00:00	55
85	search_click_result_1	2014-07-21 00:00:00	60
86	search_click_result_1	2014-07-28 00:00:00	65
87	search_click_result_1	2014-08-04 00:00:00	46
88	search_click_result_1	2014-08-11 00:00:00	40
89	search_click_result_1	2014-08-18 00:00:00	30
90	search_click_result_1	2014-08-25 00:00:00	45
91	search_click_result_10	2014-04-28 00:00:00	12
92	search_click_result_10	2014-05-05 00:00:00	22
93	search_click_result_10	2014-05-12 00:00:00	16
94	search_click_result_10	2014-05-19 00:00:00	25
95	search_click_result_10	2014-05-26 00:00:00	20
96	search_click_result_10	2014-06-02 00:00:00	27
97	search_click_result_10	2014-06-09 00:00:00	25
98	search_click_result_10	2014-06-16 00:00:00	25

99	search_click_result_10	2014-06-23 00:00:00	22
100	search_click_result_10	2014-06-30 00:00:00	29
101	search_click_result_10	2014-07-07 00:00:00	20
102	search_click_result_10	2014-07-14 00:00:00	32
103	search_click_result_10	2014-07-21 00:00:00	24
104	search_click_result_10	2014-07-28 00:00:00	39
105	search_click_result_10	2014-08-04 00:00:00	22
106	search_click_result_10	2014-08-11 00:00:00	24
107	search_click_result_10	2014-08-18 00:00:00	10
108	search_click_result_10	2014-08-25 00:00:00	22
109	search_click_result_2	2014-04-28 00:00:00	28
110	search_click_result_2	2014-05-05 00:00:00	54
111	search_click_result_2	2014-05-12 00:00:00	46
112	search_click_result_2	2014-05-19 00:00:00	53
113	search_click_result_2	2014-05-26 00:00:00	51
114	search_click_result_2	2014-06-02 00:00:00	51
115	search_click_result_2	2014-06-09 00:00:00	46
116	search_click_result_2	2014-06-16 00:00:00	55
117	search_click_result_2	2014-06-23 00:00:00	58
118	search_click_result_2	2014-06-30 00:00:00	58
119	search_click_result_2	2014-07-07 00:00:00	54
120	search_click_result_2	2014-07-14 00:00:00	59
121	search_click_result_2	2014-07-21 00:00:00	53
122	search_click_result_2	2014-07-28 00:00:00	61
123	search_click_result_2	2014-08-04 00:00:00	52
124	search_click_result_2	2014-08-11 00:00:00	41
125	search_click_result_2	2014-08-18 00:00:00	37
126	search_click_result_2	2014-08-25 00:00:00	35
127	search_click_result_3	2014-04-28 00:00:00	27
128	search_click_result_3	2014-05-05 00:00:00	42
129	search_click_result_3	2014-05-12 00:00:00	36
130	search_click_result_3	2014-05-19 00:00:00	52
131	search_click_result_3	2014-05-26 00:00:00	42
132	search_click_result_3	2014-06-02 00:00:00	51
133	search_click_result_3	2014-06-09 00:00:00	33
134	search_click_result_3	2014-06-16 00:00:00	44
135	search_click_result_3	2014-06-23 00:00:00	34
136	search_click_result_3	2014-06-30 00:00:00	47
137	search_click_result_3	2014-07-07 00:00:00	40
138	search_click_result_3	2014-07-14 00:00:00	47
139	search_click_result_3	2014-07-21 00:00:00	46
140	search_click_result_3	2014-07-28 00:00:00	57
141	search_click_result_3	2014-08-04 00:00:00	38
142	search_click_result_3	2014-08-11 00:00:00	41
143	search_click_result_3	2014-08-18 00:00:00	25

144	search_click_result_3	2014-08-25 00:00:00	34
145	search_click_result_4	2014-04-28 00:00:00	31
146	search_click_result_4	2014-05-05 00:00:00	50
147	search_click_result_4	2014-05-12 00:00:00	46
148	search_click_result_4	2014-05-19 00:00:00	44
149	search_click_result_4	2014-05-26 00:00:00	42
150	search_click_result_4	2014-06-02 00:00:00	47
151	search_click_result_4	2014-06-09 00:00:00	34
152	search_click_result_4	2014-06-16 00:00:00	54
153	search_click_result_4	2014-06-23 00:00:00	47
154	search_click_result_4	2014-06-30 00:00:00	51
155	search_click_result_4	2014-07-07 00:00:00	50
156	search_click_result_4	2014-07-14 00:00:00	46
157	search_click_result_4	2014-07-21 00:00:00	48
158	search_click_result_4	2014-07-28 00:00:00	59
159	search_click_result_4	2014-08-04 00:00:00	44
160	search_click_result_4	2014-08-11 00:00:00	35
161	search_click_result_4	2014-08-18 00:00:00	34
162	search_click_result_4	2014-08-25 00:00:00	35
163	search_click_result_5	2014-04-28 00:00:00	20
164	search_click_result_5	2014-05-05 00:00:00	43
165	search_click_result_5	2014-05-12 00:00:00	35
166	search_click_result_5	2014-05-19 00:00:00	41
167	search_click_result_5	2014-05-26 00:00:00	42
168	search_click_result_5	2014-06-02 00:00:00	47
169	search_click_result_5	2014-06-09 00:00:00	33
170	search_click_result_5	2014-06-16 00:00:00	44
171	search_click_result_5	2014-06-23 00:00:00	42
172	search_click_result_5	2014-06-30 00:00:00	45
173	search_click_result_5	2014-07-07 00:00:00	45
174	search_click_result_5	2014-07-14 00:00:00	39
175	search_click_result_5	2014-07-21 00:00:00	43
176	search_click_result_5	2014-07-28 00:00:00	48
177	search_click_result_5	2014-08-04 00:00:00	36
178	search_click_result_5	2014-08-11 00:00:00	30
179	search_click_result_5	2014-08-18 00:00:00	22
180	search_click_result_5	2014-08-25 00:00:00	25
181	search_click_result_6	2014-04-28 00:00:00	23
182	search_click_result_6	2014-05-05 00:00:00	36
183	search_click_result_6	2014-05-12 00:00:00	23
184	search_click_result_6	2014-05-19 00:00:00	37
185	search_click_result_6	2014-05-26 00:00:00	39
186	search_click_result_6	2014-06-02 00:00:00	34
187	search_click_result_6	2014-06-09 00:00:00	20
188	search_click_result_6	2014-06-16 00:00:00	27
189	search_click_result_6	2014-06-23 00:00:00	34

190	search_click_result_6	2014-06-30 00:00:00	41
191	search_click_result_6	2014-07-07 00:00:00	38
192	search_click_result_6	2014-07-14 00:00:00	38
193	search_click_result_6	2014-07-21 00:00:00	38
194	search_click_result_6	2014-07-28 00:00:00	40
195	search_click_result_6	2014-08-04 00:00:00	31
196	search_click_result_6	2014-08-11 00:00:00	33
197	search_click_result_6	2014-08-18 00:00:00	26
198	search_click_result_6	2014-08-25 00:00:00	26
199	search_click_result_7	2014-04-28 00:00:00	24
200	search_click_result_7	2014-05-05 00:00:00	27
201	search_click_result_7	2014-05-12 00:00:00	27
202	search_click_result_7	2014-05-19 00:00:00	30
203	search_click_result_7	2014-05-26 00:00:00	33
204	search_click_result_7	2014-06-02 00:00:00	34
205	search_click_result_7	2014-06-09 00:00:00	25
206	search_click_result_7	2014-06-16 00:00:00	27
207	search_click_result_7	2014-06-23 00:00:00	28
208	search_click_result_7	2014-06-30 00:00:00	43
209	search_click_result_7	2014-07-07 00:00:00	33
210	search_click_result_7	2014-07-14 00:00:00	28
211	search_click_result_7	2014-07-21 00:00:00	33
212	search_click_result_7	2014-07-28 00:00:00	37
213	search_click_result_7	2014-08-04 00:00:00	30
214	search_click_result_7	2014-08-11 00:00:00	22
215	search_click_result_7	2014-08-18 00:00:00	25
216	search_click_result_7	2014-08-25 00:00:00	22
217	search_click_result_8	2014-04-28 00:00:00	10
218	search_click_result_8	2014-05-05 00:00:00	26
219	search_click_result_8	2014-05-12 00:00:00	28
220	search_click_result_8	2014-05-19 00:00:00	39
221	search_click_result_8	2014-05-26 00:00:00	28
222	search_click_result_8	2014-06-02 00:00:00	37
223	search_click_result_8	2014-06-09 00:00:00	27
224	search_click_result_8	2014-06-16 00:00:00	38
225	search_click_result_8	2014-06-23 00:00:00	31
226	search_click_result_8	2014-06-30 00:00:00	35
227	search_click_result_8	2014-07-07 00:00:00	36
228	search_click_result_8	2014-07-14 00:00:00	37
229	search_click_result_8	2014-07-21 00:00:00	32
230	search_click_result_8	2014-07-28 00:00:00	34
231	search_click_result_8	2014-08-04 00:00:00	33
232	search_click_result_8	2014-08-11 00:00:00	20
233	search_click_result_8	2014-08-18 00:00:00	21
234	search_click_result_8	2014-08-25 00:00:00	19

235	search_click_result_9	2014-04-28 00:00:00	20
236	search_click_result_9	2014-05-05 00:00:00	37
237	search_click_result_9	2014-05-12 00:00:00	24
238	search_click_result_9	2014-05-19 00:00:00	46
239	search_click_result_9	2014-05-26 00:00:00	31
240	search_click_result_9	2014-06-02 00:00:00	29
241	search_click_result_9	2014-06-09 00:00:00	28
242	search_click_result_9	2014-06-16 00:00:00	32
243	search_click_result_9	2014-06-23 00:00:00	36
244	search_click_result_9	2014-06-30 00:00:00	52
245	search_click_result_9	2014-07-07 00:00:00	38
246	search_click_result_9	2014-07-14 00:00:00	43
247	search_click_result_9	2014-07-21 00:00:00	35
248	search_click_result_9	2014-07-28 00:00:00	43
249	search_click_result_9	2014-08-04 00:00:00	36
250	search_click_result_9	2014-08-11 00:00:00	23
251	search_click_result_9	2014-08-18 00:00:00	16
252	search_click_result_9	2014-08-25 00:00:00	24
253	search_run	2014-04-28 00:00:00	86
254	search_run	2014-05-05 00:00:00	167
255	search_run	2014-05-12 00:00:00	149
256	search_run	2014-05-19 00:00:00	168
257	search_run	2014-05-26 00:00:00	161
258	search_run	2014-06-02 00:00:00	168
259	search_run	2014-06-09 00:00:00	177
260	search_run	2014-06-16 00:00:00	165
261	search_run	2014-06-23 00:00:00	165
262	search_run	2014-06-30 00:00:00	175
263	search_run	2014-07-07 00:00:00	167
264	search_run	2014-07-14 00:00:00	188
265	search_run	2014-07-21 00:00:00	185
266	search_run	2014-07-28 00:00:00	208
267	search_run	2014-08-04 00:00:00	177
268	search_run	2014-08-11 00:00:00	152
269	search_run	2014-08-18 00:00:00	132
270	search_run	2014-08-25 00:00:00	151
271	send_message	2014-04-28 00:00:00	433
272	send_message	2014-05-05 00:00:00	698
273	send_message	2014-05-12 00:00:00	715
274	send_message	2014-05-19 00:00:00	761
275	send_message	2014-05-26 00:00:00	720
276	send_message	2014-06-02 00:00:00	773
277	send_message	2014-06-09 00:00:00	788
278	send_message	2014-06-16 00:00:00	836
279	send_message	2014-06-23 00:00:00	813
280	send_message	2014-06-30 00:00:00	803

281	send_message	2014-07-07 00:00:00	871
282	send_message	2014-07-14 00:00:00	867
283	send_message	2014-07-21 00:00:00	856
284	send_message	2014-07-28 00:00:00	912
285	send_message	2014-08-04 00:00:00	808
286	send_message	2014-08-11 00:00:00	743
287	send_message	2014-08-18 00:00:00	751
288	send_message	2014-08-25 00:00:00	746
289	view_inbox	2014-04-28 00:00:00	532
290	view_inbox	2014-05-05 00:00:00	843
291	view_inbox	2014-05-12 00:00:00	850
292	view_inbox	2014-05-19 00:00:00	877
293	view_inbox	2014-05-26 00:00:00	897
294	view_inbox	2014-06-02 00:00:00	922
295	view_inbox	2014-06-09 00:00:00	968
296	view_inbox	2014-06-16 00:00:00	1000
297	view_inbox	2014-06-23 00:00:00	972
298	view_inbox	2014-06-30 00:00:00	992
299	view_inbox	2014-07-07 00:00:00	1085
300	view_inbox	2014-07-14 00:00:00	1069
301	view_inbox	2014-07-21 00:00:00	1079
302	view_inbox	2014-07-28 00:00:00	1125
303	view_inbox	2014-08-04 00:00:00	998
304	view_inbox	2014-08-11 00:00:00	939
305	view_inbox	2014-08-18 00:00:00	939

## Query 5

	date_trunc	weekly_active_users
1	2014-04-28 00:00:00	701
2	2014-05-05 00:00:00	1054
3	2014-05-12 00:00:00	1094
4	2014-05-19 00:00:00	1147
5	2014-05-26 00:00:00	1113
6	2014-06-02 00:00:00	1173
7	2014-06-09 00:00:00	1219
8	2014-06-16 00:00:00	1262
9	2014-06-23 00:00:00	1249
10	2014-06-30 00:00:00	1271
11	2014-07-07 00:00:00	1355
12	2014-07-14 00:00:00	1345
13	2014-07-21 00:00:00	1363
14	2014-07-28 00:00:00	1442
15	2014-08-04 00:00:00	1266
16	2014-08-11 00:00:00	1215
17	2014-08-18 00:00:00	1203
18	2014-08-25 00:00:00	1194