



# PERFORMANCE TESTING

US 001, 002, 007, 008 and 012

Manuel Cañizares Juan  
mancanjua@alum.us.es

The user stories of the project assigned to me were:

- US-001 Vet adds a new medicine
- US-002 Vet lists medicines
- US-007 Vet prescribes medicines to a pet
- US-008 Pet type's medicine checking
- US-012 Adoption procedure

The US-007 and US-008 are indivisible, so I have done the performance testing of both at the same time due to US-008 is a business rule of the US-007.

Keeping this in mind, I have run 4 stress tests and 4 load tests (one of each per user story). The number of users in any case is as it follows:

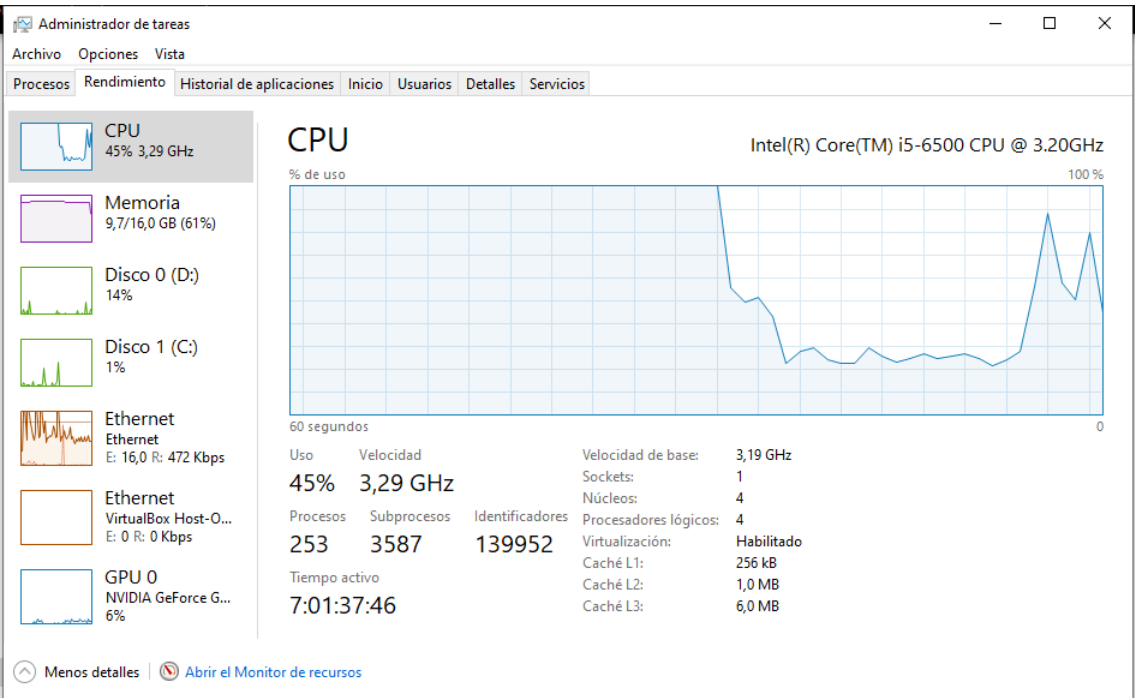
User story	Stress test	Load test (*) (**)
US-001 Vet adds a new medicine	80000	2000
US-002 Vet lists medicines	90000	2200 – 2500
US-007 & US-008 Vet prescribes medicines to a pet	80000	2000 – 2250
US-012 Adoption procedure	85000	3000 – 3200

(\*) The number of users is loaded in a period of 100 seconds.

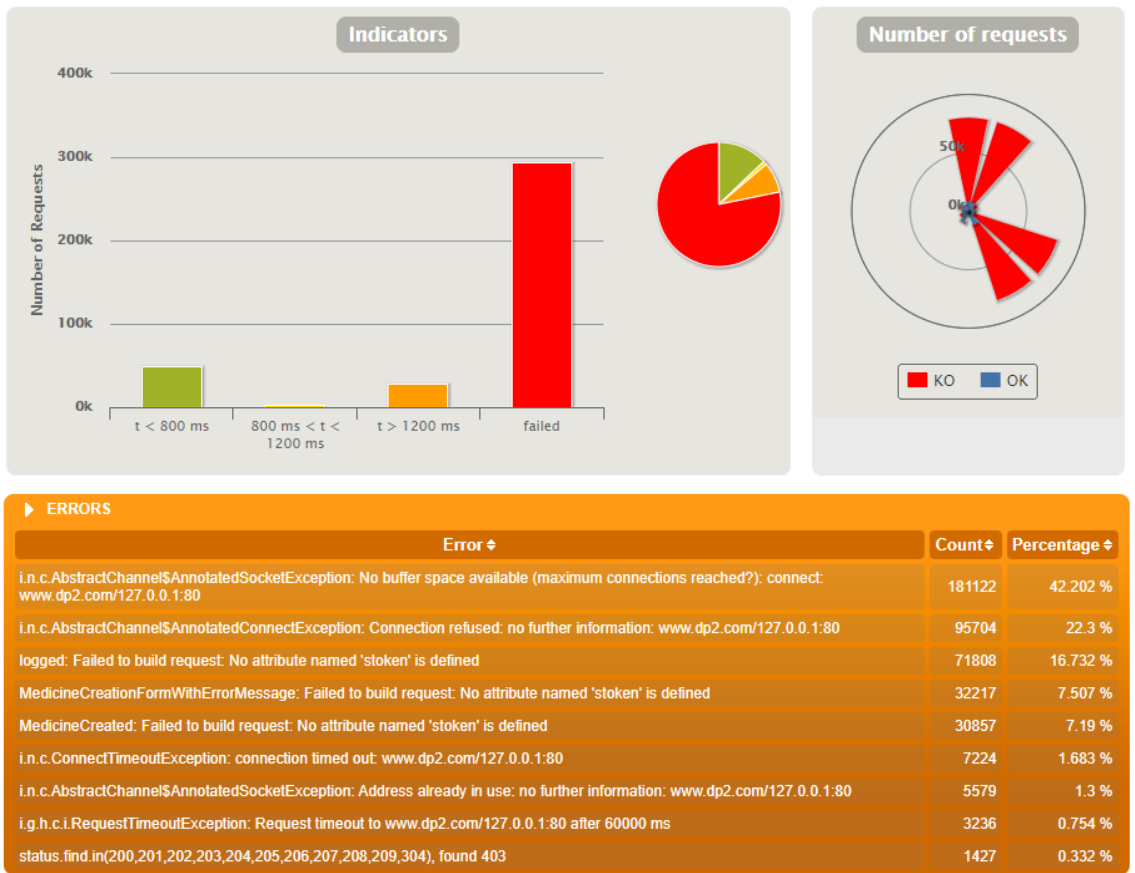
(\*\*) When a range is given, it means that the maximum number of users with acceptable behavior is between the two numbers.

## US-001 Vet adds a new medicine

In this snapshot we can see the system performance (CPU + RAM) at the end of the execution of the stress test with 80000 concurrent users:

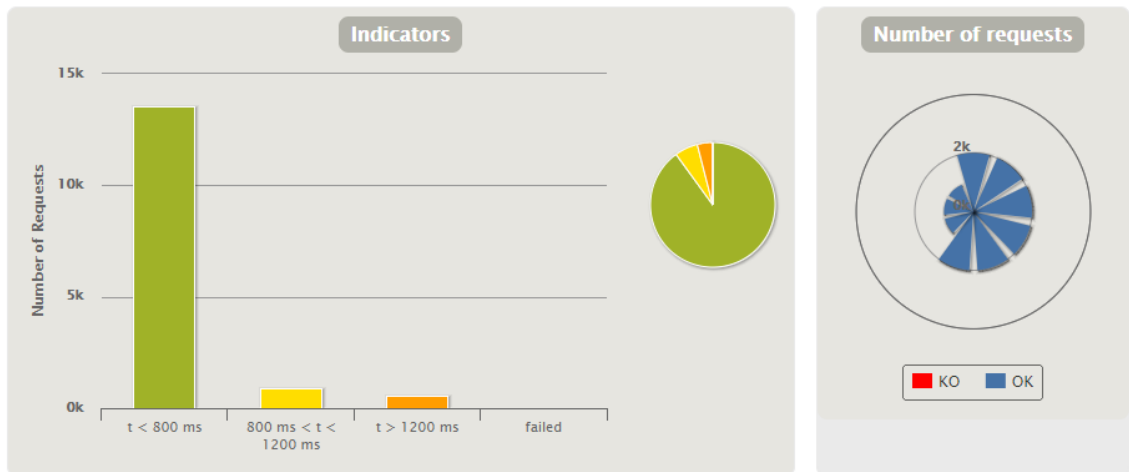


And here we can see the Gatling report for this test:



STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	374314	80022	294292	79%	1290.738	0	2761	4498	17070	62747	86014	4957	9750
Home	80000	8192	71808	90%	275.862	173	4219	5053	13278	14801	62621	5847	4674
Login	80000	8192	71808	90%	275.862	0	328	2324	3400	4965	6615	1106	1310
logged	8192	4916	3276	40%	28.248	2	4111	5013	19113	24652	24840	4737	5822
logged Redirect 1	4916	4916	0	0%	16.952	1	14	1785	15697	20872	22016	2566	5212
MedicineListing	80000	5183	74817	94%	275.862	0	3727	5413	21050	78774	86014	7429	14142
MedicineForm	80000	12276	67724	85%	275.862	0	2884	5239	22883	76877	85995	6660	11433
Medicine...direct 1	2685	2685	0	0%	9.259	0	273	460	652	28802	28814	1162	4963
Medicine...direct 1	10055	9926	129	1%	34.672	0	116	343	54612	60002	71762	6346	16624
Medicine...rMessage	7783	5751	2032	26%	26.838	0	361	2111	3566	51798	81949	2069	7891
Medicine...direct 1	5094	5094	0	0%	17.566	0	12	178	581	47134	62634	1278	7065
MedicineCreated	9143	6446	2697	29%	31.528	1	753	2195	4176	51794	81950	2328	7904
Medicine...direct 1	6446	6445	1	0%	22.228	0	17	232	7108	47707	62719	1554	7326

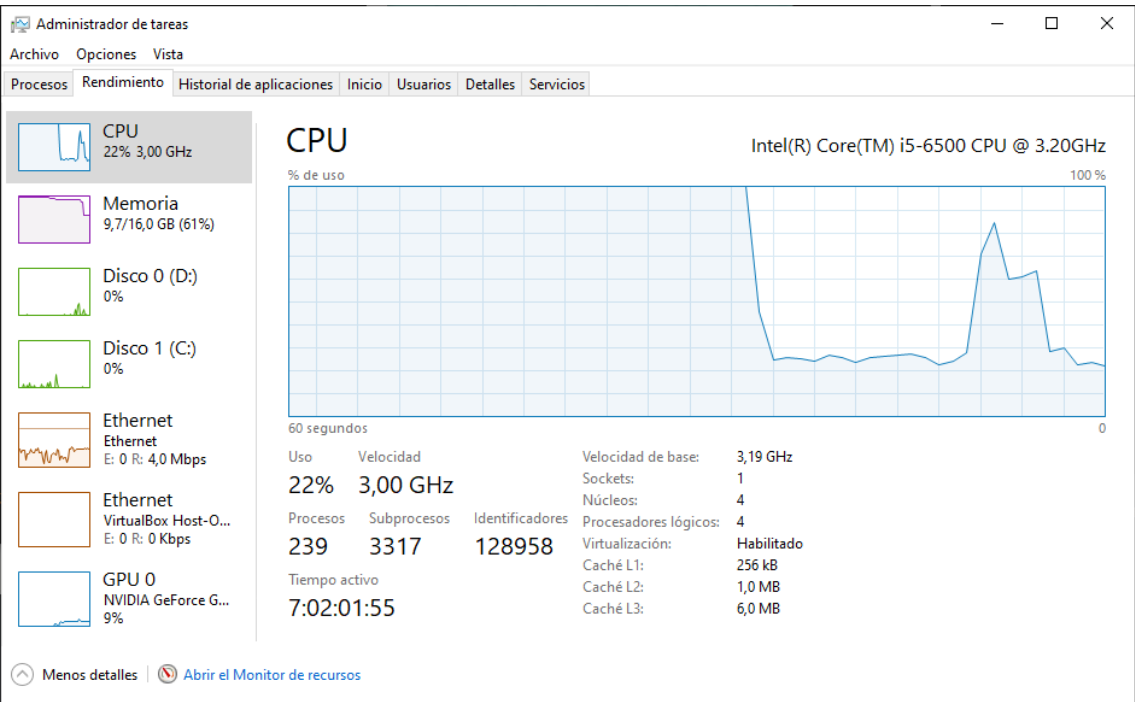
Regarding to the load test, we can see in this charts that with 2000 users in 100 seconds, approximately the 90% of the petitions were resolved in less than 800ms:



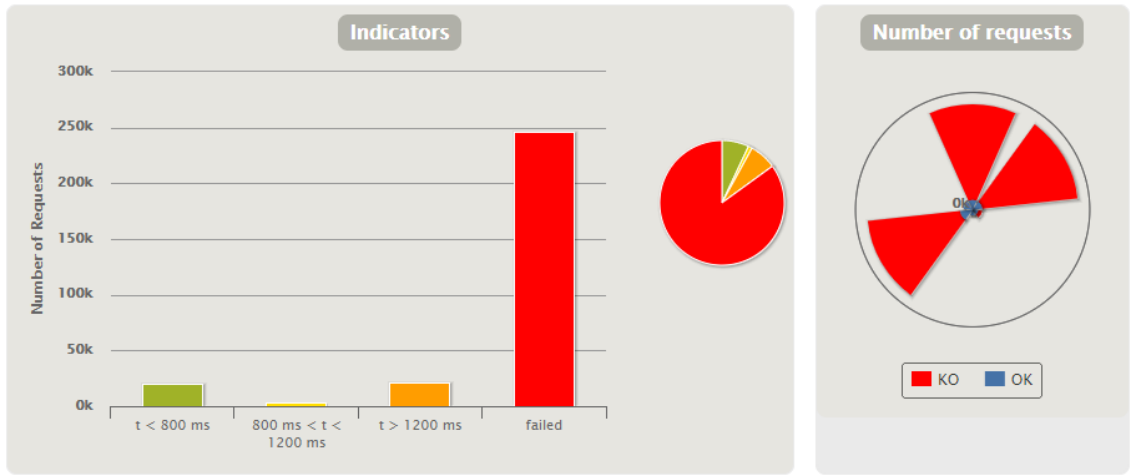
STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	15000	15000	0	0%	70.093	0	5	331	1075	1710	4199	232	399
Home	2000	2000	0	0%	9.346	1	2	3	272	999	2222	47	184
Login	2000	2000	0	0%	9.346	0	1	6	272	716	1546	48	146
logged	2000	2000	0	0%	9.346	1	157	504	1145	1664	3032	313	407
logged Redirect 1	2000	2000	0	0%	9.346	0	2	6	153	757	1534	30	113
MedicineListing	2000	2000	0	0%	9.346	82	629	954	1606	2210	4199	714	479
MedicineForm	2000	2000	0	0%	9.346	2	124	514	1144	1779	3072	309	420
Medicine...rMessage	1000	1000	0	0%	4.673	3	5	308	1019	1687	2407	219	375
MedicineCreated	1000	1000	0	0%	4.673	3	5	337	1090	1733	3058	237	409
Medicine...direct 1	1000	1000	0	0%	4.673	2	4	13	652	1449	2851	102	286

## US-002 Vet lists medicines

In this snapshot we can see the system performance (CPU + RAM) at the end of the execution of the stress test with 90000 concurrent users:



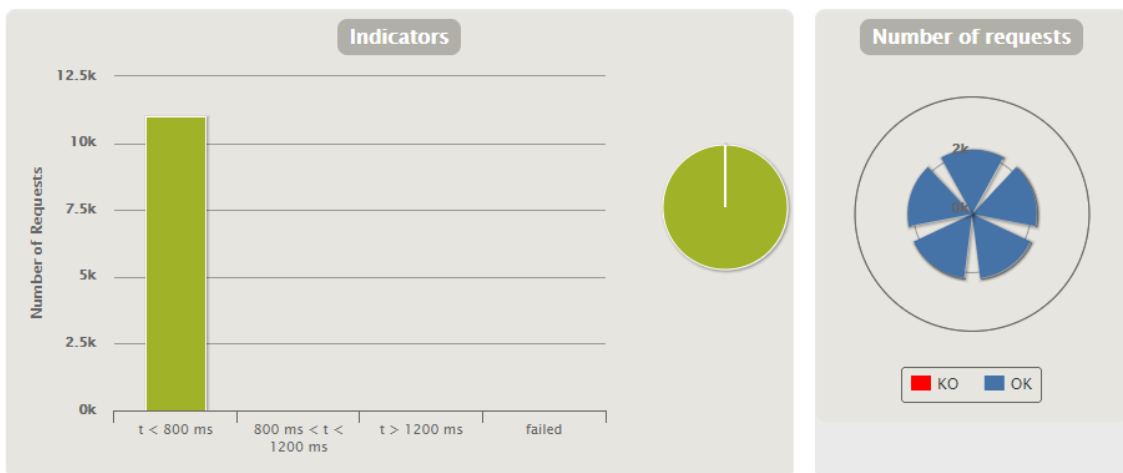
And here we can see the Gatling report for this test:



STATISTICS						Expand all groups   Collapse all groups							
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	290417	43934	246483	85%	1357.089	0	2662	5232	24427	47044	83950	5192	8588
Home	90000	8192	81808	91%	420.561	202	5118	6360	13335	14331	63042	6457	4098
Login	90000	8196	81804	91%	420.561	0	454	2142	3184	4107	48600	1037	1216
logged	8196	4729	3467	42%	38.299	0	129	9692	44982	51913	60306	8969	15261
logged Redirect 1	4729	4729	0	0%	22.098	1	7	26	4673	31129	58872	1412	5782
MedicineListing	90000	10596	79404	88%	420.561	0	2313	8758	35973	57963	83950	7988	12681
Medicine...direct 1	7492	7492	0	0%	35.009	0	1477	4447	27659	46160	62666	4553	9291

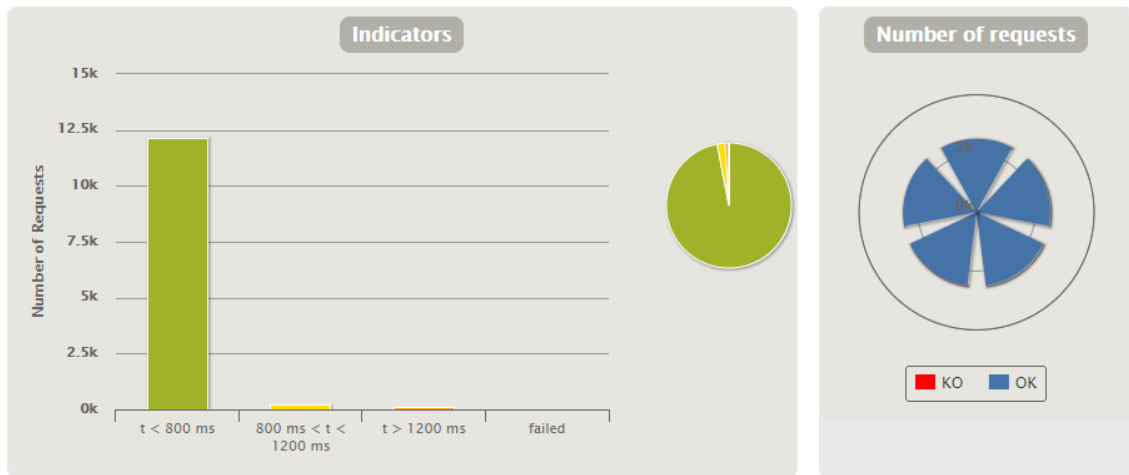
ERRORS		
Error	Count	Percentage
l.n.c.AbstractChannel\$AnnotatedSocketException: No buffer space available (maximum connections reached?): connect: www.dp2.com/127.0.0.1:80	115782	35.269 %
l.n.c.AbstractChannel\$AnnotatedConnectException: Connection refused: no further information: www.dp2.com/127.0.0.1:80	83398	25.404 %
logged: Failed to build request: No attribute named 'token' is defined	81804	24.918 %
l.n.c.AbstractChannel\$AnnotatedSocketException: Address already in use: no further information: www.dp2.com/127.0.0.1:80	44351	13.51 %
l.n.c.ConnectTimeoutException: connection timed out: www.dp2.com/127.0.0.1:80	1826	0.556 %
j.i.IOException: Premature close	750	0.228 %
i.g.h.c.i.RequestTimeoutException: Request timeout to www.dp2.com/127.0.0.1:80 after 60000 ms	376	0.115 %

Regarding to the load test, we can see in this charts that with 2200 users in 100 seconds (the left side of the interval), the 100% of the petitions were resolved in less than 800ms:



STATISTICS													
Requests ^	Executions					Response Time (ms)							
	Total	OK	KO	% KO	Cnt/s	Min	50th pct	75th pct	95th pct	99th pct	Max	Mean	Std Dev
Global Information	11000	11000	0	0%	62.147	0	2	9	104	216	658	23	49
Home	2200	2200	0	0%	12.429	1	2	2	4	40	340	4	18
Login	2200	2200	0	0%	12.429	0	1	1	12	30	549	4	22
logged	2200	2200	0	0%	12.429	0	2	3	14	66	490	6	24
logged Redirect 1	2200	2200	0	0%	12.429	0	1	2	4	17	251	2	8
MedicineListing	2200	2200	0	0%	12.429	65	81	100	189	377	658	100	54

In the next ones, we can see that with 2500 users in 100 seconds (the right side of the interval), the 97% of the petitions were resolved in less than 800ms:

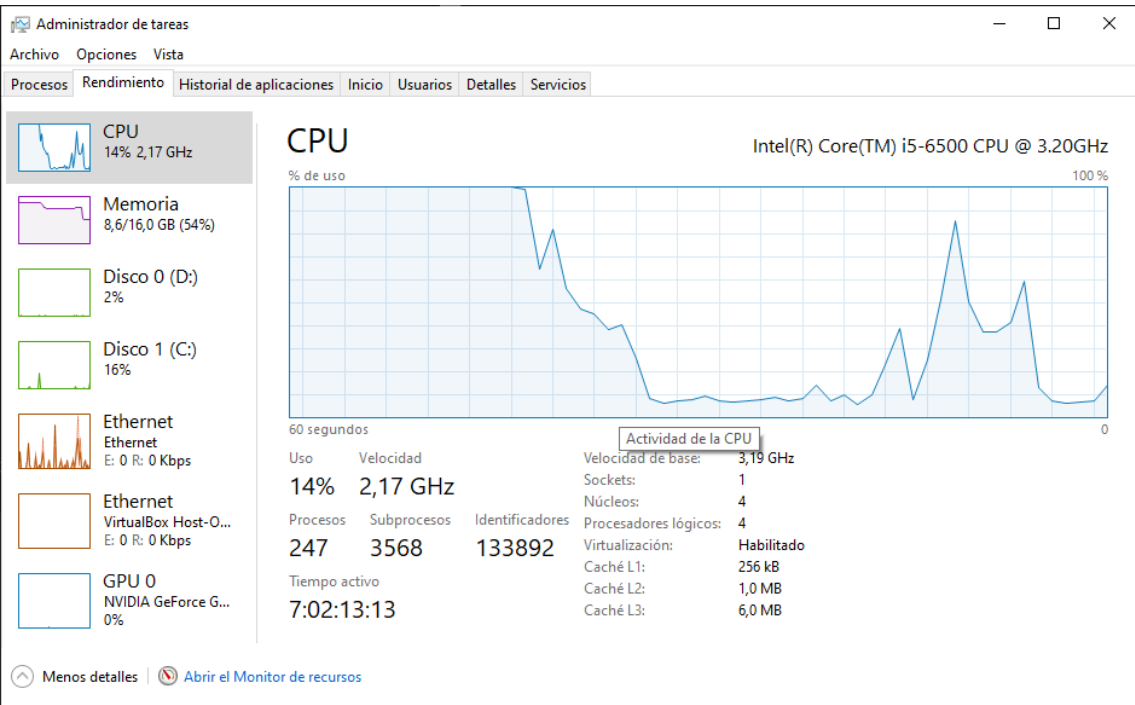


STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions				Response Time (ms)								
	Total	OK	KO	% KO	Cnt/s	Min	50th pct	75th pct	95th pct	99th pct	Max	Mean	Std Dev
Global Information	12500	12500	0	0%	70.621	0	2	139	609	1254	6442	121	273
Home	2500	2500	0	0%	14.124	1	2	3	200	606	994	29	107
Login	2500	2500	0	0%	14.124	0	1	2	192	465	952	26	85
logged	2500	2500	0	0%	14.124	0	3	166	718	1684	6442	155	363
logged Redirect 1	2500	2500	0	0%	14.124	0	2	3	84	267	873	15	56
MedicineListing	2500	2500	0	0%	14.124	65	272	469	999	1709	4506	380	348

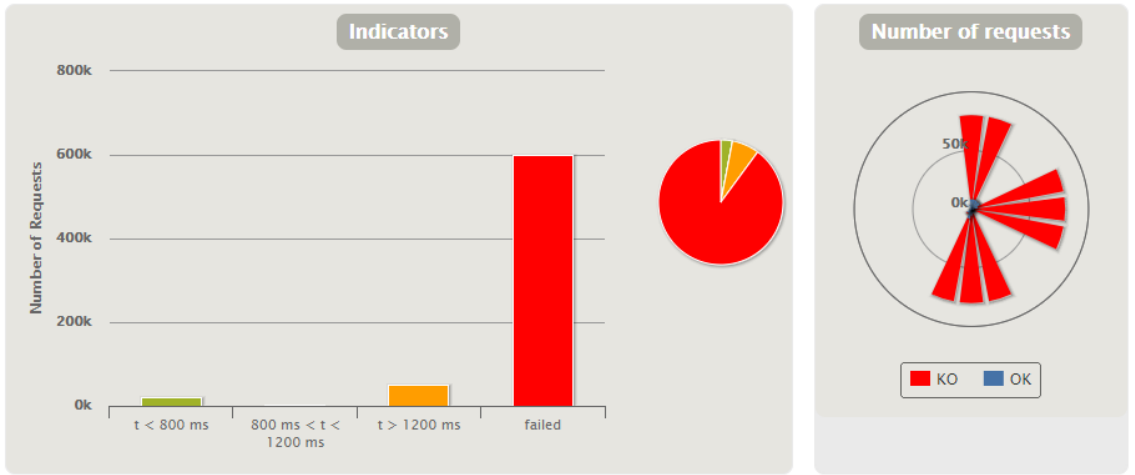
97% of the petitions resolved in less than 800ms is a more than acceptable percentage, but at this point, the response time of some petitions started to increase fast, so I kept this value as the end of the interval.

# US-007 & US-008 Vet prescribes medicines to a pet

In this snapshot we can see the system performance (CPU + RAM) at the end of the execution of the stress test with 80000 concurrent users:



And here we can see the Gatling report for this test:

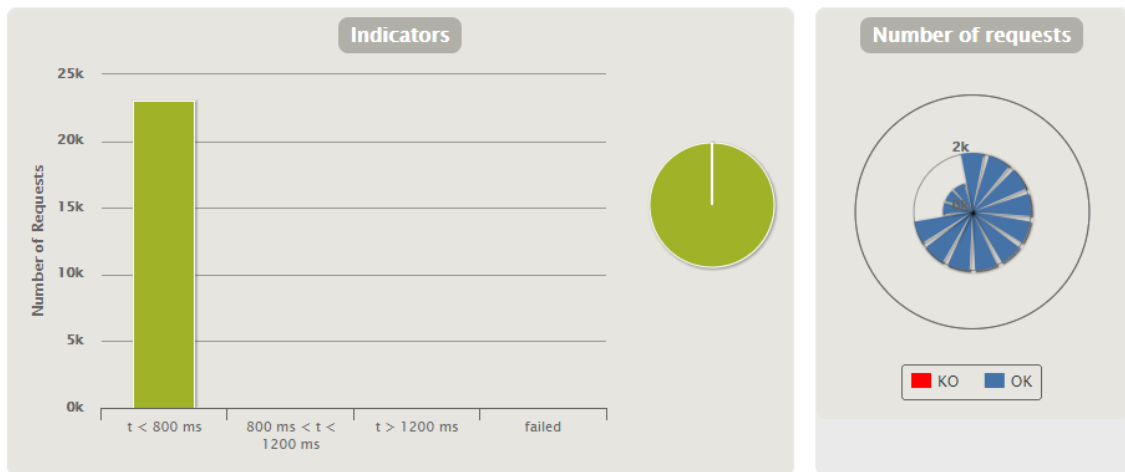




STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	673608	74438	599170	89%	1358.081	0	2328	3431	30547	60001	62923	4929	9868
Home	80000	8192	71808	90%	161.29	326	5372	7109	10931	11615	61649	6195	2806
Login	80000	8192	71808	90%	161.29	0	461	1409	3661	3994	4599	1055	1264
logged	8192	7996	196	2%	16.516	1	7	1035	5577	10028	43166	1295	3888
logged Redirect 1	7996	7932	64	1%	16.121	1	8	15	2406	4229	60003	853	5527
OwnerList	80000	5291	74709	93%	161.29	0	2371	3324	39323	62118	62923	5880	12557
OwnerListing	80000	2140	77860	97%	161.29	0	2530	3399	49196	60719	62326	6166	13159
OwnerSelection	80000	2153	77847	97%	161.29	0	2243	2529	4846	56170	62821	3307	7666
OwnerLis...direct 1	19	19	0	0%	0.038	1	10	24925	25110	25257	25294	10517	12325
OwnerLis...direct 1	26	25	1	4%	0.052	1	25166	35826	40196	55051	60001	25929	13897
MedicalR...dListing	80000	3961	76039	95%	161.29	0	2266	2390	23503	38366	60007	3390	7799
MedicalR...election	80000	5181	74819	94%	161.29	0	2281	2392	29799	41007	60016	3995	8614
PrescriptionForm	80000	7942	72058	90%	161.29	0	2288	2388	34774	41339	60279	5287	10255
Prescrip...rMessage	4490	3662	828	18%	9.052	0	28361	37962	43414	60000	60002	27480	13115
PrescriptionCreated	5281	4187	1094	21%	10.647	0	31473	37151	45568	60000	60007	27275	14288
Prescrip...direct 1	1639	1639	0	0%	3.304	0	25206	26779	38504	41085	41418	26412	7592
MedicalR...direct 1	611	611	0	0%	1.232	0	25221	36262	38256	39223	40062	27871	8112
MedicalR...direct 1	265	265	0	0%	0.534	0	23468	25690	35416	37527	41102	24332	5458
OwnerSel...direct 1	55	55	0	0%	0.111	3	25276	39617	40111	40889	41215	29406	8804
Prescrip...direct 1	851	851	0	0%	1.716	0	37552	38935	39776	40077	40185	29965	12851
Prescrip...direct 1	4183	4144	39	1%	8.433	0	31671	38845	42157	58504	60003	28401	13080

ERRORS		
Error ↕	Count ↕	Percentage ↕
i.n.c.AbstractChannel\$AnnotatedConnectException: Connection refused: no further information: www.dp2.com/127.0.0.1:80	283688	38.274 %
i.n.c.AbstractChannel\$AnnotatedSocketException: No buffer space available (maximum connections reached?): connect: www.dp2.com/127.0.0.1:80	272210	36.725 %
logged: Failed to build request: No attribute named 'token' is defined	71808	9.688 %
PrescriptionCreationFormWithErrorMessage: Failed to build request: No attribute named 'token' is defined	35510	4.791 %
PrescriptionCreated: Failed to build request: No attribute named 'token' is defined	34719	4.684 %
i.n.c.AbstractChannel\$AnnotatedSocketException: Address already in use: no further information: www.dp2.com/127.0.0.1:80	32636	4.403 %
i.g.h.c.i.RequestTimeoutException: Request timeout to www.dp2.com/127.0.0.1:80 after 60000 ms	7819	1.055 %
i.n.c.ConnectTimeoutException: connection timed out: www.dp2.com/127.0.0.1:80	1830	0.247 %
status.find.in(200,201,202,203,204,205,206,207,208,209,304), found 403	488	0.066 %
j.i.IOException: Premature close	483	0.065 %
css((input[name=__csrf],Some(value))).find.exists, found nothing	16	0.002 %

Regarding to the load test, we can see in this charts that with 2000 users in 100 seconds (the left side of the interval), the 100% of the petitions were resolved in less than 800ms:

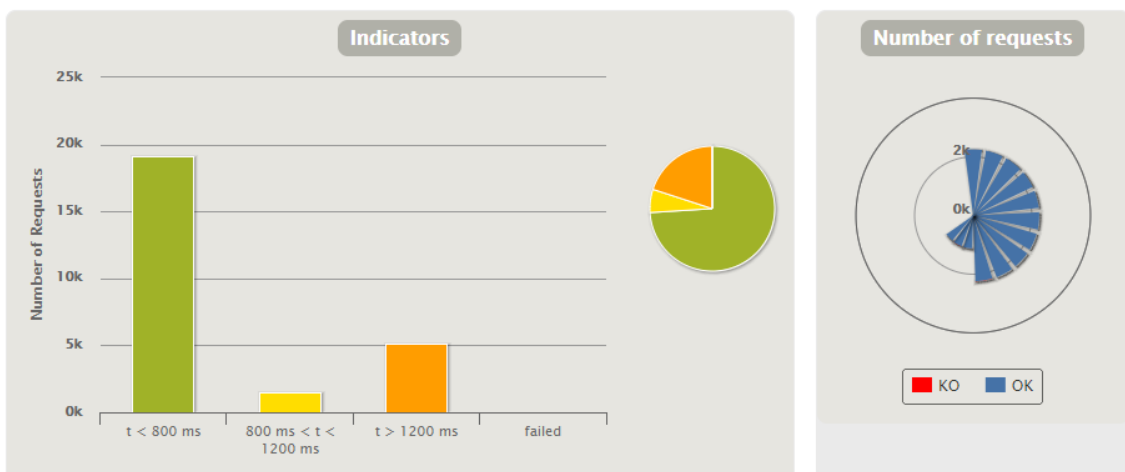


▶ STATISTICS

Expand all groups | Collapse all groups

Requests ^	🔄 Executions					🕒 Response Time (ms)								
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕	
Global Information	23000	23000	0	0%	90.909	0	4	10	35	43	127	8	10	
Home	2000	2000	0	0%	7.905	1	2	2	3	6	23	2	1	
Login	2000	2000	0	0%	7.905	0	1	1	2	3	8	1	1	
logged	2000	2000	0	0%	7.905	1	2	2	4	6	12	2	1	
logged Redirect 1	2000	2000	0	0%	7.905	0	2	2	4	6	14	2	1	
OwnerList	2000	2000	0	0%	7.905	1	2	3	5	8	22	2	2	
OwnerListing	2000	2000	0	0%	7.905	6	11	15	24	52	107	13	8	
OwnerSelection	2000	2000	0	0%	7.905	5	9	12	22	49	127	11	8	
MedicalR...dListing	2000	2000	0	0%	7.905	2	5	7	14	31	83	6	5	
MedicalR...election	2000	2000	0	0%	7.905	7	12	14	22	42	88	13	6	
PrescriptionForm	2000	2000	0	0%	7.905	3	5	7	17	32	77	7	6	
Prescrip...rMessage	1000	1000	0	0%	3.953	3	5	6	14	32	107	7	6	
PrescriptionCreated	1000	1000	0	0%	3.953	35	39	41	47	60	98	40	5	
Prescrip...direct 1	1000	1000	0	0%	3.953	7	12	14	17	26	92	13	4	

In the next ones, we can see that with 2250 users in 100 seconds (the right side of the interval), the 74% of the petitions were resolved in less than 800ms:



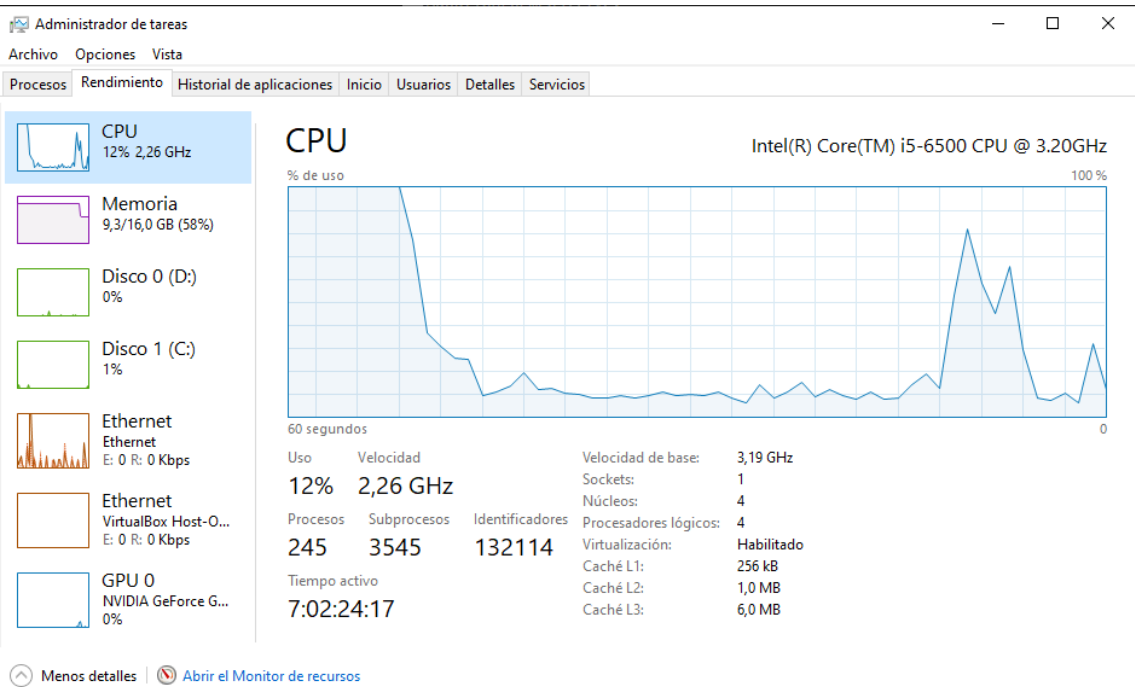
STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	25870	25844	26	0%	90.455	0	10	863	2444	16331	57844	881	2921
Home	2250	2250	0	0%	7.867	1	2	2	4	11	126	2	4
Login	2250	2250	0	0%	7.867	0	1	2	3	8	132	1	5
logged	2250	2250	0	0%	7.867	1	2	3	74	2203	30473	122	1276
logged Redirect 1	2250	2250	0	0%	7.867	0	2	3	6	531	1920	15	108
OwnerList	2250	2250	0	0%	7.867	1	2	3	800	1848	2212	100	347
OwnerListing	2250	2250	0	0%	7.867	6	18	466	2479	16986	33250	846	2883
OwnerSelection	2250	2250	0	0%	7.867	1	55	1568	4873	24101	32651	1413	3894
MedicalR...dListing	2250	2250	0	0%	7.867	1	698	1751	6471	21953	32637	1645	3834
MedicalR...election	2250	2250	0	0%	7.867	0	976	1836	6892	22436	32973	1811	3846
PrescriptionForm	2250	2237	13	1%	7.867	1	863	1718	6110	21986	32628	1663	3771
Prescrip...rMessage	1125	1123	2	0%	3.934	3	807	1755	6299	21118	32106	1641	3578
PrescriptionCreated	1125	1114	11	1%	3.934	1	863	1781	6864	23178	57844	1860	4553
Prescrip...direct 1	1108	1108	0	0%	3.874	0	623	1696	5945	20037	31986	1537	3368
OwnerLis...direct 1	2	2	0	0%	0.007	850	986	1053	1107	1118	1121	986	136
OwnerLis...direct 1	2	2	0	0%	0.007	34	355	516	644	670	676	355	321
OwnerSel...direct 1	2	2	0	0%	0.007	0	1	1	1	1	1	1	1
MedicalR...direct 1	2	2	0	0%	0.007	0	0	0	0	0	0	0	0
MedicalR...direct 1	2	2	0	0%	0.007	1	1	1	1	1	1	1	0
Prescrip...direct 1	2	2	0	0%	0.007	0	1	1	1	1	1	1	1

74% of the petitions resolved in less than 800ms is a relative acceptable percentage, but at this point, the response time of some petitions started to increase fast, so I kept this value as the end of the interval.

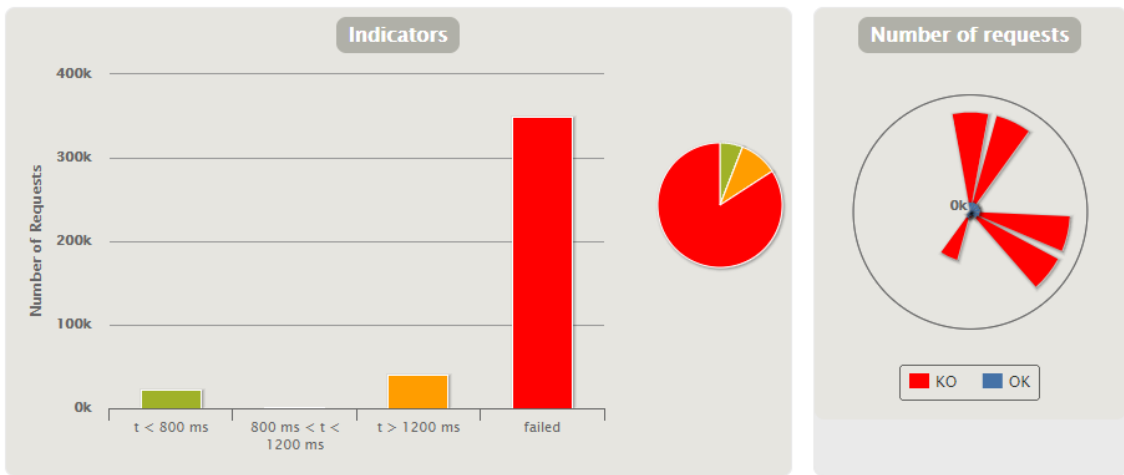
Regardless of this, I would choose a value near to the left side of the interval because of a fast increase of the response time in few users.

## US 12 Adoption procedure

In this snapshot we can see the system performance (CPU + RAM) at the end of the execution of the stress test with 85000 concurrent users:



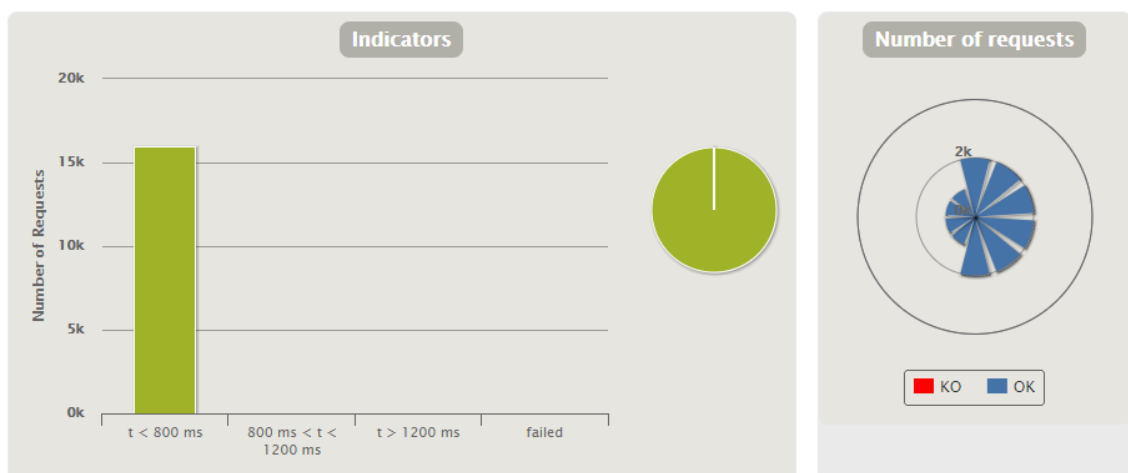
And here we can see the Gatling report for this test



STATISTICS <span>Expand all groups   Collapse all groups</span>													
Requests ^	Executions					Response Time (ms)							
	Total ↕	OK ↕	KO ↕	% KO ↕	Cnt/s ↕	Min ↕	50th pct ↕	75th pct ↕	95th pct ↕	99th pct ↕	Max ↕	Mean ↕	Std Dev ↕
Global Information	412229	63438	348791	85%	934.76	0	2317	3698	43001	53800	61225	5827	11603
Home	85000	8192	76808	90%	192.744	2894	4462	5143	11546	12730	61225	5533	3161
Login	85000	8192	76808	90%	192.744	0	293	2069	2851	3200	3458	862	1059
logged	8192	8192	0	0%	18.576	1	18	831	18018	32330	54480	2673	6797
logged Redirect 1	8192	8139	53	1%	18.576	1	26	295	49204	55171	60002	6298	15407
ListHomelessPets	85000	7899	77101	91%	192.744	0	2302	2391	24569	48202	60518	4358	8462
PetAdoptionForm	85000	6479	78521	92%	192.744	0	2297	2385	48614	60001	60635	6457	13460
PetAdopt...rMessage	3401	2572	829	24%	7.712	41	44157	47903	57471	60002	60014	40128	15790
PetAdopted	4850	3647	1203	25%	10.998	2003	44388	48523	55767	60001	60006	38671	17163
AdoptionHistory	42500	5173	37327	88%	96.372	0	2284	2377	45792	57367	60009	7349	14040
PetAdopt...direct 1	3646	3505	141	4%	8.268	0	45834	47777	58510	60001	60024	45940	7472
PetAdopt...direct 1	139	139	0	0%	0.315	0	44102	49782	50111	50130	50153	43764	11188
Adoption...direct 1	1158	1158	0	0%	2.626	0	47897	49744	50108	50140	50164	43712	14043
ListHome...direct 1	81	81	0	0%	0.184	0	49002	49485	49684	50101	50112	44496	13710
PetAdopt...direct 1	70	70	0	0%	0.159	0	11568	43478	43803	44090	44100	21196	19738

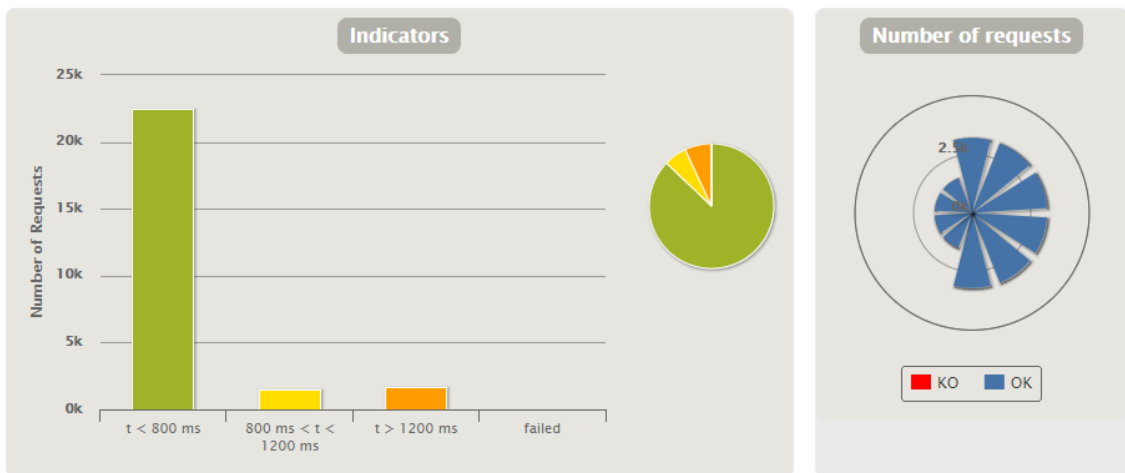
ERRORS		
Error ↕	Count ↕	Percentage ↕
i.n.c.AbstractChannel\$AnnotatedConnectException: Connection refused: no further information: www.dp2.com/127.0.0.1:80	227812	45.349 %
i.n.c.AbstractChannel\$AnnotatedSocketException: No buffer space available (maximum connections reached?): connect: www.dp2.com/127.0.0.1:80	118092	23.508 %
logged: Failed to build request: No attribute named 'token' is defined	76808	15.29 %
PetAdoptionFormWithErrorMessage: Failed to build request: No attribute named 'token' is defined	39099	7.783 %
PetAdopted: Failed to build request: No attribute named 'token' is defined	37650	7.495 %
i.g.h.c.i.RequestTimeoutException: Request timeout to www.dp2.com/127.0.0.1:80 after 60000 ms	2108	0.42 %
status.find.in(200,201,202,203,204,205,206,207,208,209,304), found 403	502	0.1 %
i.n.c.AbstractChannel\$AnnotatedSocketException: Address already in use: no further information: www.dp2.com/127.0.0.1:80	206	0.041 %
css((input[name=__csrf],Some(value))).find exists, found nothing	71	0.014 %

Regarding to the load test, we can see in this charts that with 3200 users in 100 seconds (the left side of the interval), the 100% of the petitions were resolved in less than 800ms:



STATISTICS <span>Expand all groups   Collapse all groups</span>														
Requests ^	Executions					Response Time (ms)								
	Total	OK	KO	% KO	Cnt/s	Min	50th pct	75th pct	95th pct	99th pct	Max	Mean	Std Dev	
Global Information	16000	16000	0	0%	68.085	0	3	11	47	55	202	8	13	
Home	2000	2000	0	0%	8.511	1	2	2	4	10	28	2	2	
Login	2000	2000	0	0%	8.511	0	1	1	2	4	12	1	1	
logged	2000	2000	0	0%	8.511	0	2	2	4	5	9	2	1	
logged Redirect 1	2000	2000	0	0%	8.511	0	2	2	3	5	10	2	1	
ListHomelessPets	2000	2000	0	0%	8.511	2	3	4	7	16	158	4	5	
PetAdoptionForm	2000	2000	0	0%	8.511	5	8	11	18	39	198	10	7	
PetAdopt...rMessage	1000	1000	0	0%	4.255	9	13	15	22	38	202	15	8	
PetAdopted	1000	1000	0	0%	4.255	12	15	18	24	43	189	17	8	
PetAdopt...direct 1	1000	1000	0	0%	4.255	7	11	12	17	29	62	11	4	
AdoptionHistory	1000	1000	0	0%	4.255	44	50	53	57	65	133	51	6	

In the next ones, we can see that with 3000 users in 100 seconds (the right side of the interval), the 88% of the petitions were resolved in less than 800ms:



STATISTICS <span>Expand all groups   Collapse all groups</span>														
Requests ^	Executions					Response Time (ms)								
	Total	OK	KO	% KO	Cnt/s	Min	50th pct	75th pct	95th pct	99th pct	Max	Mean	Std Dev	
Global Information	25600	25600	0	0%	106.667	0	11	479	1420	8003	29377	460	1434	
Home	3200	3200	0	0%	13.333	1	2	3	4	6	87	3	2	
Login	3200	3200	0	0%	13.333	0	1	2	398	629	1544	47	152	
logged	3200	3200	0	0%	13.333	1	3	348	2763	9955	22392	544	1831	
logged Redirect 1	3200	3200	0	0%	13.333	0	3	142	660	881	1667	124	240	
ListHomelessPets	3200	3200	0	0%	13.333	2	7	566	2383	8744	29377	600	1736	
PetAdoptionForm	3200	3200	0	0%	13.333	5	382	729	2672	9628	21820	761	1802	
PetAdopt...rMessage	1600	1600	0	0%	6.667	9	413	753	3149	9323	21879	761	1661	
PetAdopted	1600	1600	0	0%	6.667	13	440	779	2691	9773	20840	782	1677	
PetAdopt...direct 1	1600	1600	0	0%	6.667	8	361	705	2918	10436	21571	780	1875	
AdoptionHistory	1600	1600	0	0%	6.667	73	520	839	2801	9698	21186	878	1646	

88% of the petitions resolved in less than 800ms is a more than acceptable percentage, but at this point, the response time of some petitions started to increase fast, so I kept this value as the end of the interval.