

.UK Expiring domains implementation review

Background

On the 13th September 2022, the longstanding process by which .UK domains expired and became available for re-registration changed.

Historically, an expired domain name would drop at a random unknown time throughout a particular day. When a customer (or registrar) wanted to register a domain that was becoming available for re-registration a registrar would have to **regularly query Nominet's** system to detect the "drop" of the domain before then requesting the registration of the domain for their customer. This placed significant and ongoing load across critical systems operating the .UK registry for many years.

The new process introduced a daily list of domains with the exact known drop times, enabling registrars to focus on the re-registration element and not spend many hours monitoring for the domain becoming available. The intent was to reduce load on the systems but also provide some clarity and predictability to the market of when re-registration would be possible.

Historically, when we have analysed behaviours across our systems, we worked with our raw log files which made investigative work extremely time consuming and at times challenging. As part of the expiring domains project, we have re-designed our approach and we have started digesting our raw logs into a new data lake to enable ongoing analysis of behaviours across our systems. We still have much work to do in this area, but we have a range of statistics to understand what is happening in the registry since the change in expiring domains. Over the last year our Insights team have been building and testing the first elements with real world data to ensure accuracy in any analysis we carry out.

In this paper we will cover the following areas:

1. How the new drop system works and system behaviours
2. Real time DAC statistics
3. Time-delay DAC statistics
4. WHOIS query statistics
5. RDAP lookup statistics
6. EPP check command statistics
7. EPP CREATE failed command statistics
8. Drop caught domains
9. Drop catching registrars
10. Registrar statistics
11. Summary

1. How the new drop system works and system behaviours.

It is important to understand the detail of the way the new drop system functions to understand some aspects of what is seen externally.

- Nominet generates a drop list which includes domains and their known drop times and the EPP Domain check command also provides the exact drop time of upcoming drops.
- There are two methods by which a domain name can drop:
 - The lifecycle process runs to find all domains that should now be purged from the registry, because their drop time has been reached or exceeded.
 - A new CREATE command comes in at or after the drop time, but before the lifecycle process has purged the domain; in this case the CREATE command process triggers the purge of the old domain.
- When a registrar sends a CREATE command for a domain, the EPP server connects to the registry database and checks if the domain is currently registered and if it is, whether the drop time has passed.
 - If it is registered and the drop time has not passed (or it has already passed and been re-registered) the command fails.
 - If it is registered and the drop time has passed, then:
 - The CREATE command attempts to purge the old domain and CREATE the new domain in a single atomic transaction – which takes longer than if the command were to only need to create the new domain. While multiple registrars' CREATE commands may start an attempt at an atomic transaction on the database only one command will succeed resulting in a new domain create.

On the most highly contested domains we have regularly seen multiple registrars' commands pass through EPP and reach the database processing stage to attempt both the purge of the old and create of the new domain in one atomic transaction. The database determines which transaction completes first and therefore which command receives the successful response.

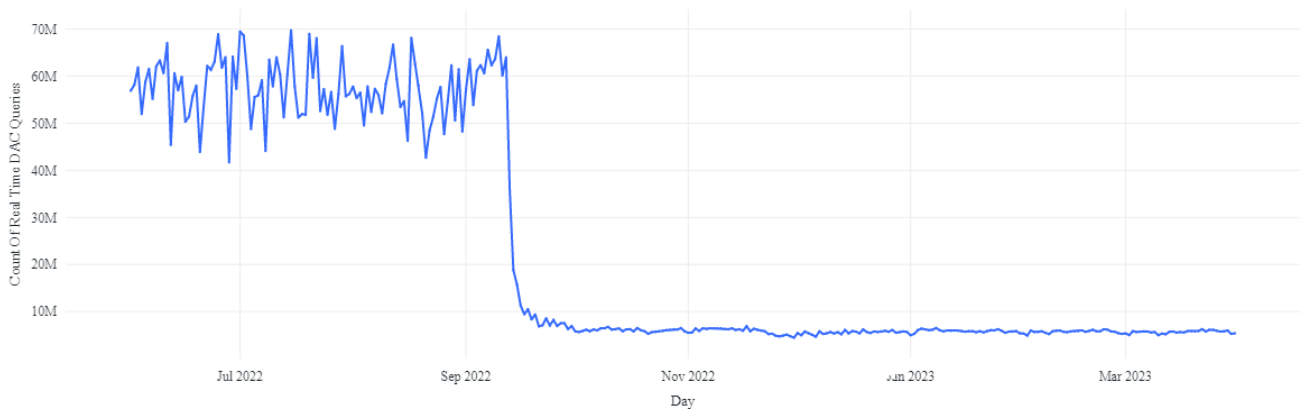
What are some of the types of impact this might have on externally visible data?

- New CREATEs will have different running times for domains that have already been purged from those that still need to be purged as part of the CREATE process. Those domains that are being purged at this point will result in a longer run time for the CREATE command and thus a slower response time of the CREATE command.
- Individual domains may have varying levels of purge time depending on the current configuration of the domain and inter-related objects such as sub-ordinate host objects thus impacting the new CREATE time and response time of the command. Some elements of the historic implementation of storing and managing host objects in .UK that pre-dates EPP and originates from Nominet's original automaton registration system adds variable levels of processing time here depending on the particular host objects.

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There has been speculation that the CREATE timestamp and response time show our systems to be under significant load for some drops on our systems. While there remains some unnecessary load being applied to the registry systems by some registrars we have seen significantly reduced load across our systems in comparison with recent years.

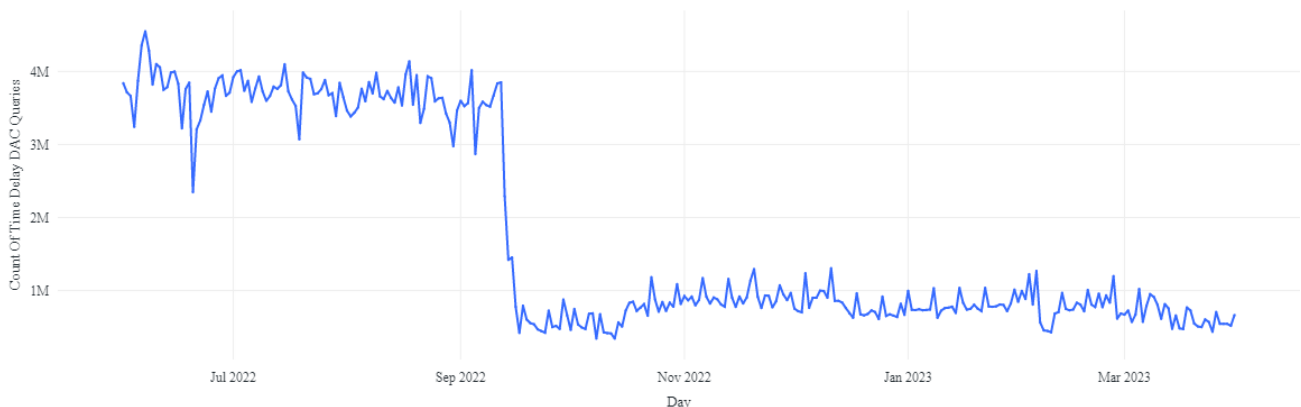
2. Real Time Domain Availability Checker statistics.



Prior to the change in drops process, the .UK Real Time Domain Availability Checker (DAC) was used by drop catchers to determine the drop time of domain names. When the change to the drops process was introduced, there was an overnight decrease in queries from close to 70 million queries per day to around 6 million queries per day, substantially reducing the load placed upon the registry.

The change has had the desired and expected impact on the real time DAC service.

3. Time Delay DAC statistics.

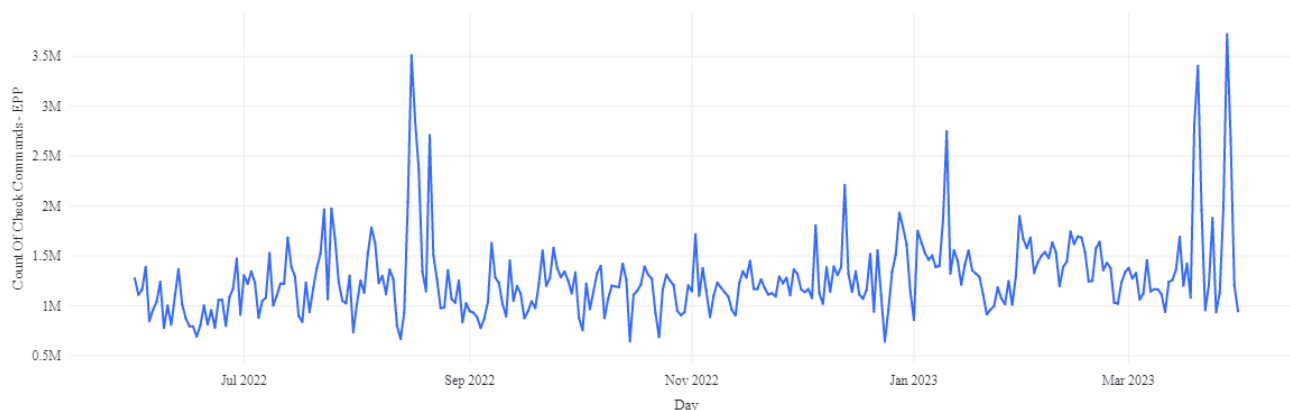


The time delay DAC was less useful for the purposes of drop catching due to the time delay but was still substantially used given the limitations placed on other mechanisms.

When the drop process was changed, overnight there was a decrease from around 4 million queries a day to just under 1 million queries a day, substantially reducing the load placed upon the registry.

The change has had the desired and expected impact on the time delay DAC service.

4. EPP Check command queries



While there were always fluctuations on the use of the EPP Check availability command there has not been a hugely significant change. There have been a few instances where a single registrar is querying the same domain multiple times and sometimes at scale, despite the EPP check response itself informing the registrar of the drop time and the command providing the registrar no additional benefit.

While in the longer term we plan to address unnecessary overuse of the EPP Check command for the purposes of drop catching where it adds no additional value to any party, at present the levels are substantially lower per day than experienced historically on the DAC. As part of our work on .UK EPP standardisation we will review the rules around the usage of the EPP check command in the coming months.

5. WHOIS query statistics.

WHOIS for .UK allows public lookup of domain registration details but with a time delay on domains showing as available for re-registration.

We are not yet digesting all of our data from WHOIS queries into our new tool set to be able to graph the data, but we have seen a decrease of WHOIS queries from around 20 million queries per day to around 15 million queries per day.

The change has had the desired and expected impact on the WHOIS service.

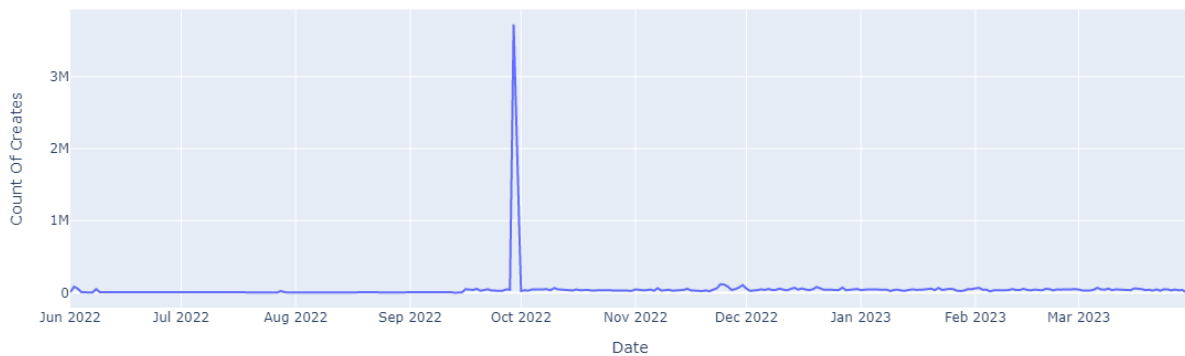
6. RDAP query statistics.

RDAP is a new tool to replace WHOIS but it has not yet had significant uptake in usage for .UK.

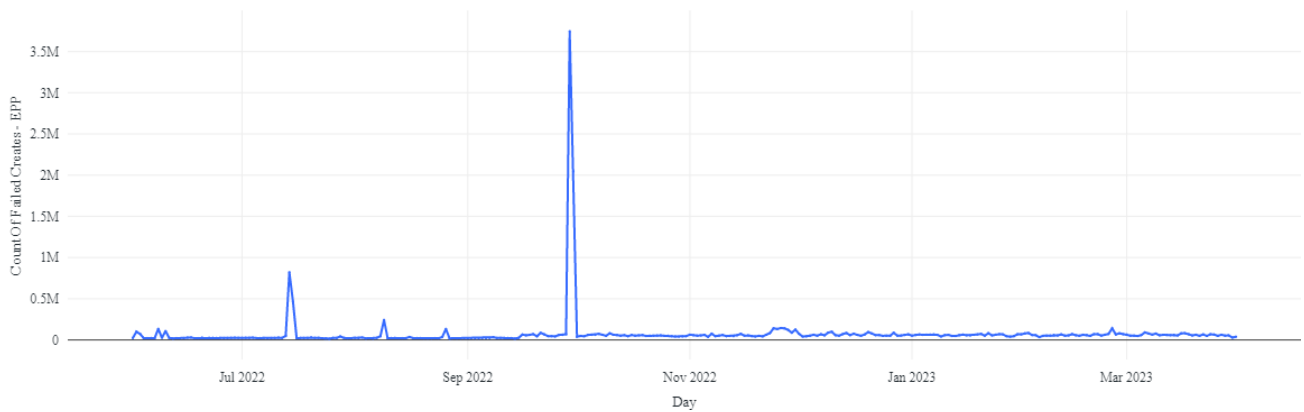
We are not yet digesting all of our data from RDAP queries into our new tool set but generally we see around 200,000 queries per day.

7. Number of CREATE commands targetting dropping domains.

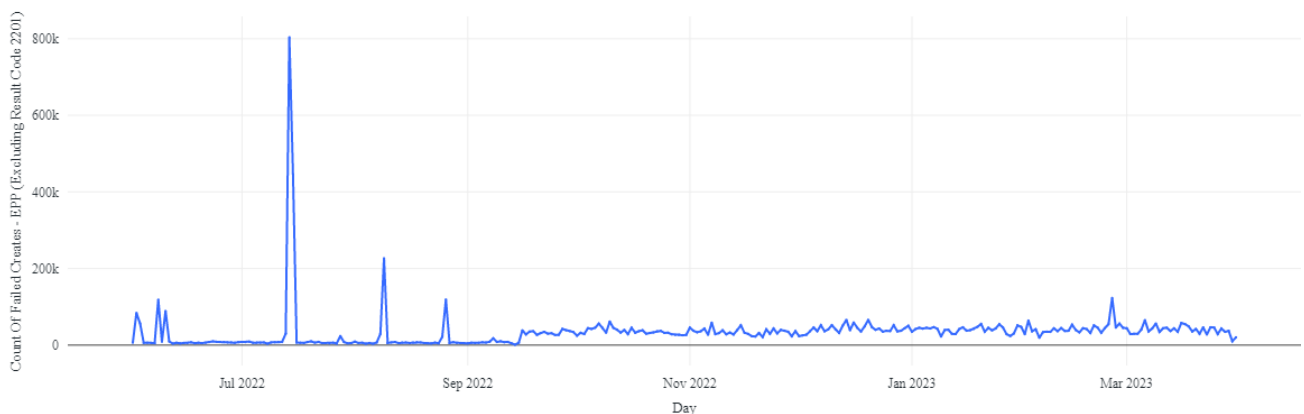
Create Commands Sent 1 Day Around A Drop



The number of CREATE commands sent around 1 day of a drop shows a single unusual spike.

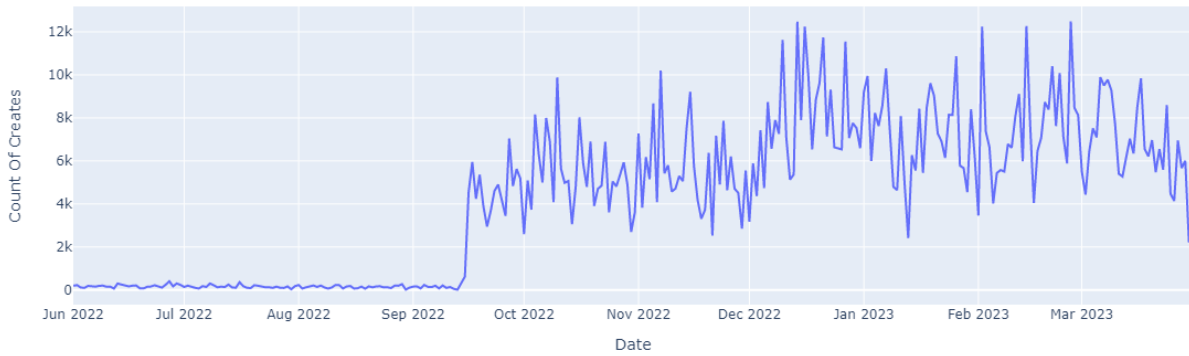


If we exclude successful CREATES and look just at failed CREATES we see the spike still exists so it was not a large number of re-registrations. That spike is a single tag that has breached an Acceptable Use Policy and locked themselves out and is receiving a blocking response each time that they issue the command.



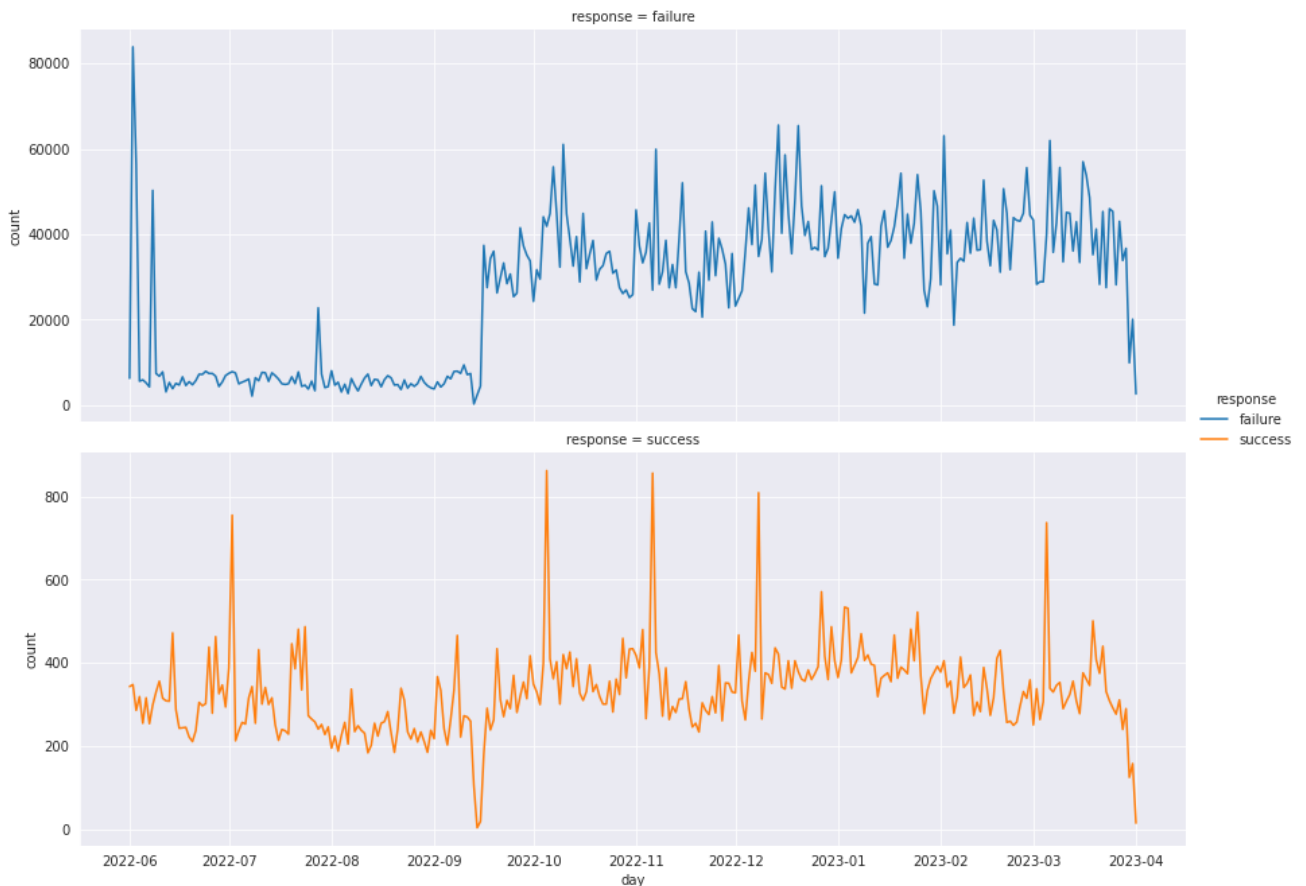
When we remove the data that are simple breaches of the AUP receiving a blocking response, we see a number of lesser spikes; the major spikes show commands with invalid parameters which are not impacting the database but are being processed by EPP.

Create Commands Sent 1 Second Around A Drop



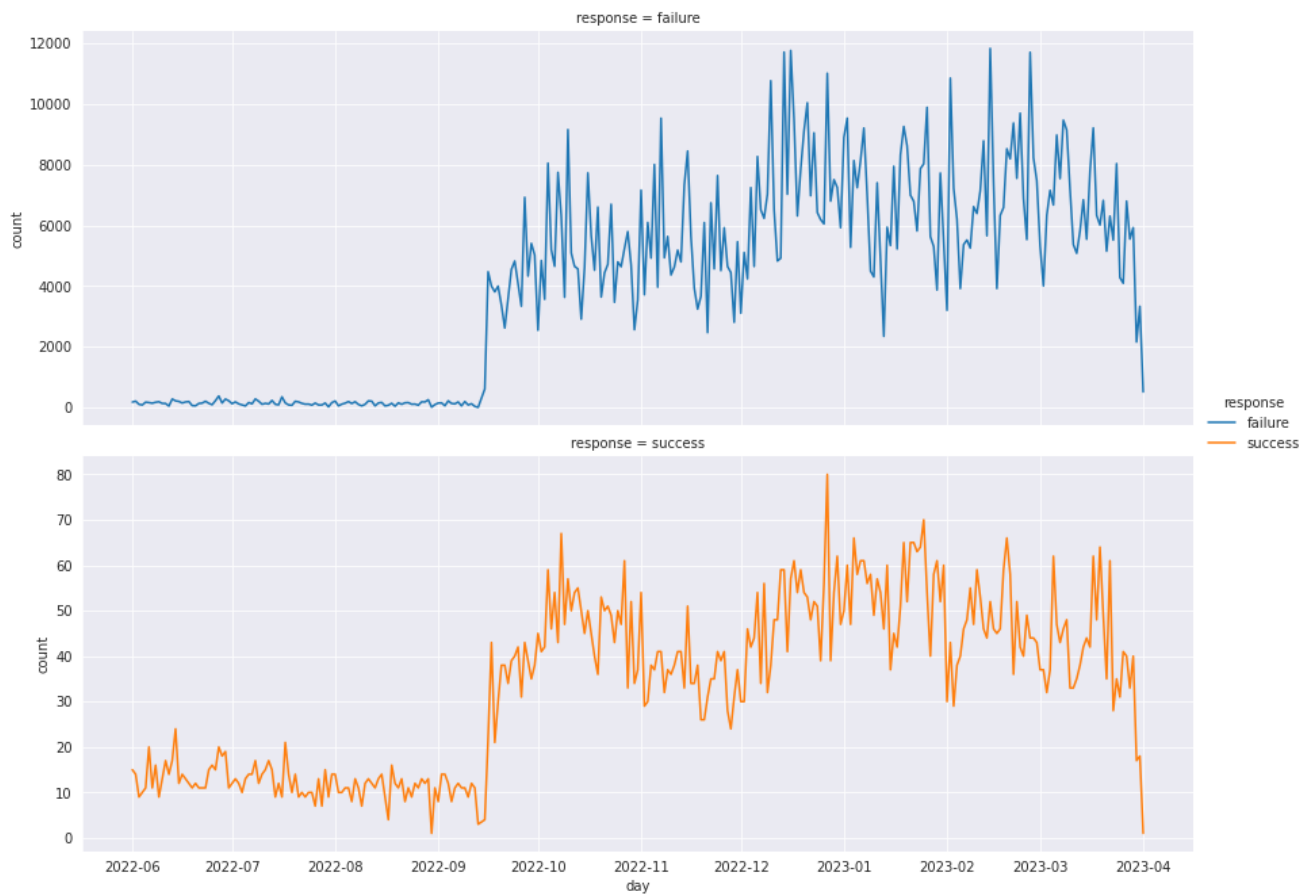
When we look at the number of CREATE commands sent 1 second around a drop we do see an increased number compared to before this change was made, however in comparison to the millions of public queries we no longer receive to the query tools, we now have a smaller but more concentrated increase of up to around 12,000 CREATES over a day.

Create commands sent within one day of drop time



If we separate the CREATES into failed CREATES and successful CREATES, we see a sharp increase in failed CREATES in a day around a drop.

Create commands sent within 1 second of drop time



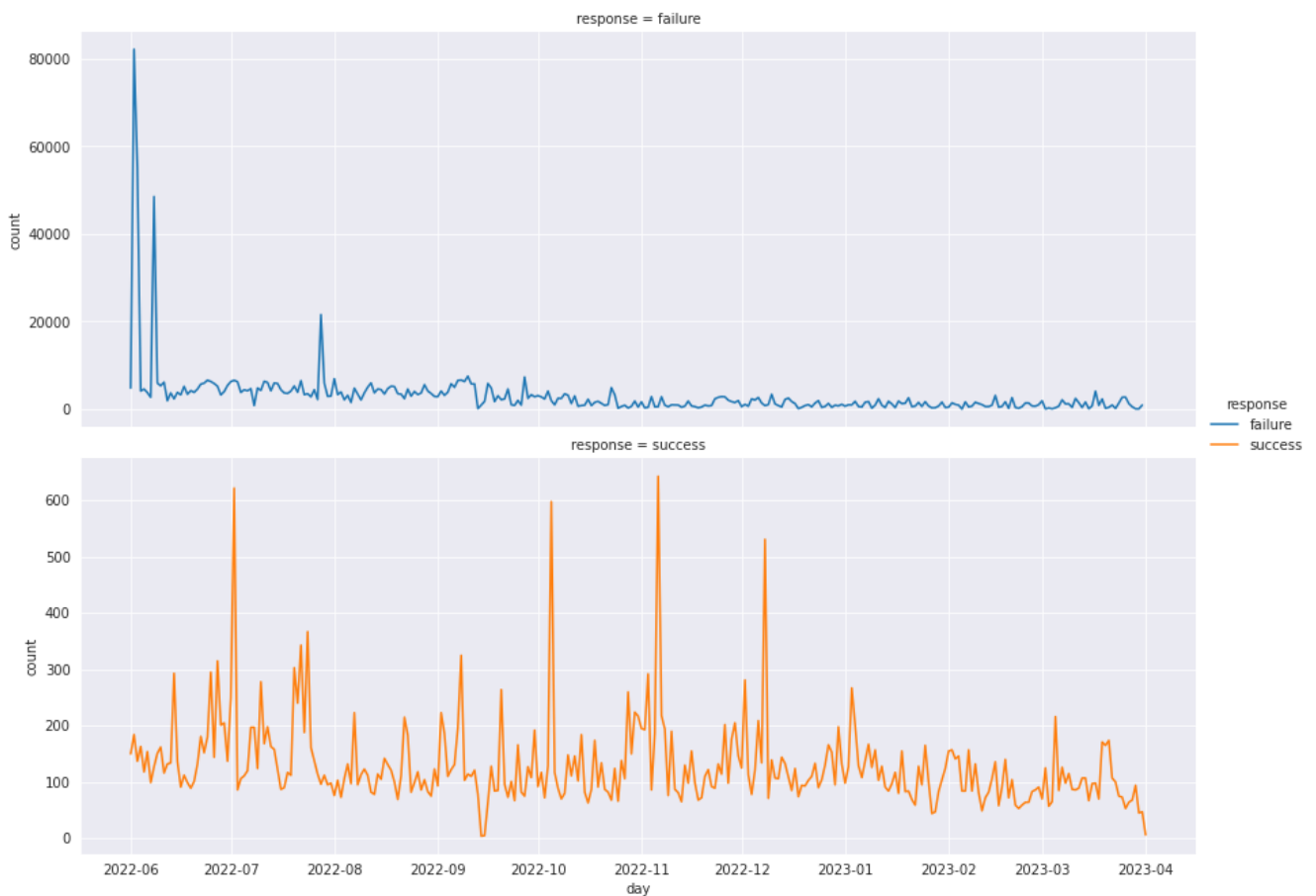
If we separate the CREATEs into failed CREATEs and successful CREATEs, we see a sharp increase in failed CREATEs in the second either side of a drop.

Median difference in seconds between create command sent and drop time



However, if we look at the median difference in seconds between the sending of a CREATE command and either the failed CREATEs or the successful CREATEs, we see a sharp decline in the timeframes for failed CREATEs and no obvious difference for successful CREATEs.

Create commands sent more than 10 seconds either side of drop time

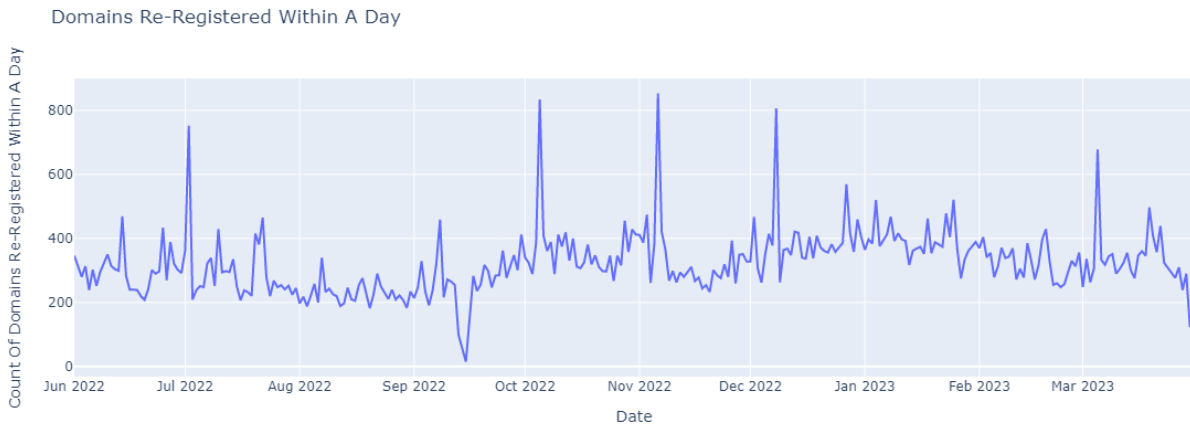


Reviewing the sending of CREATE commands outside of the window 10 seconds either side of a drop we see the number of failed CREATES has largely reduced.

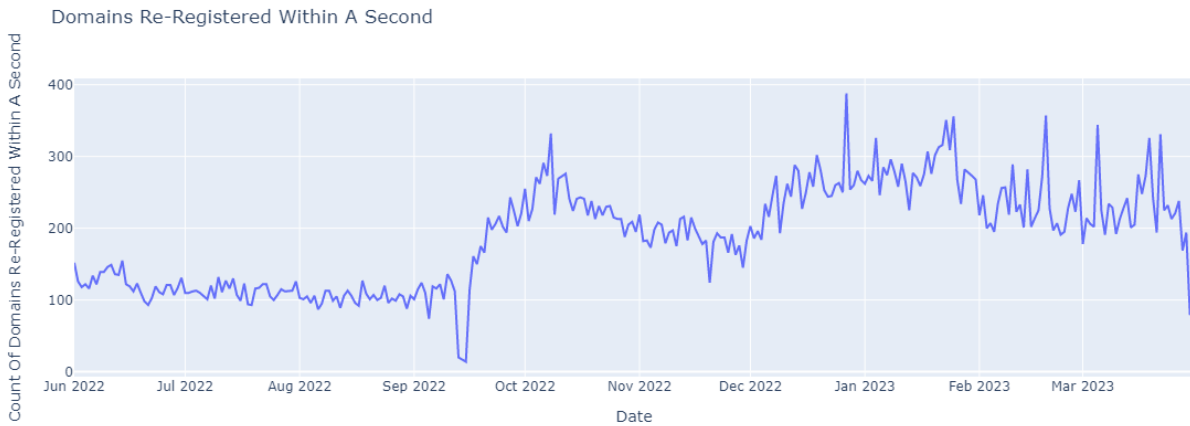
The data shows that at present the window of time where we receive failed CREATE commands has narrowed significantly across the day to be closely tied to the drop time of domains for which there is competition.

The change has had the expected impact on the use of the EPP Create command.

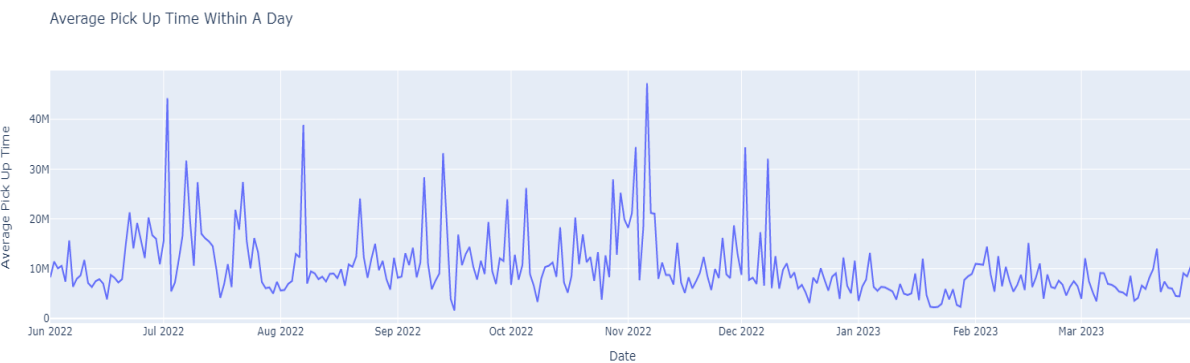
8. Drop Caught domains



It can be useful to understand the number of domains that are re-registered same day to understand the scale of drop catching in .UK and that the change in implementation has not had a significant impact on the number of domains being re-registered.

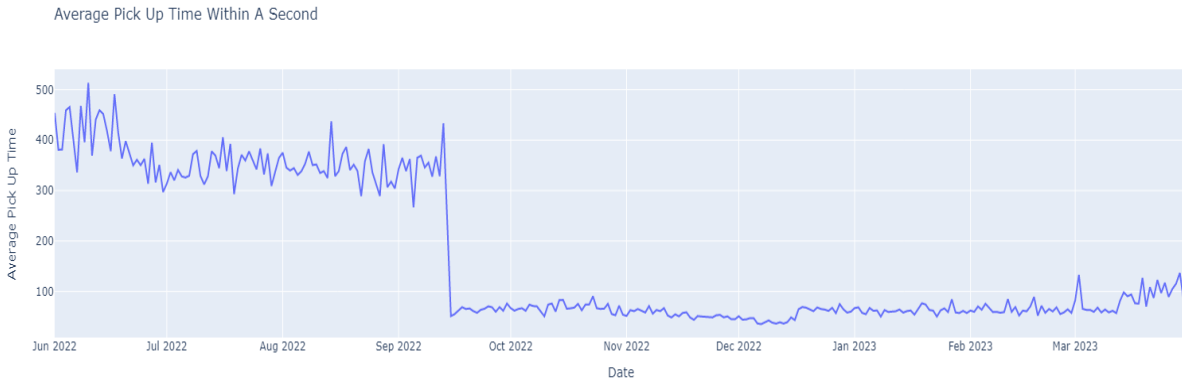


However, we can see that the change in implementation has had a noticeable impact on increasing registrations re-registered within a second.

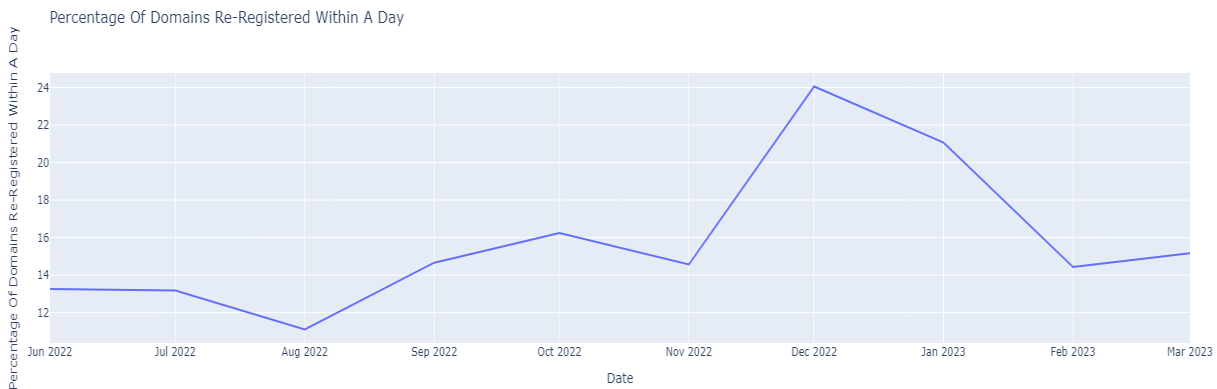


The average speed in seconds of catching a name within a day remains varied although reduced.

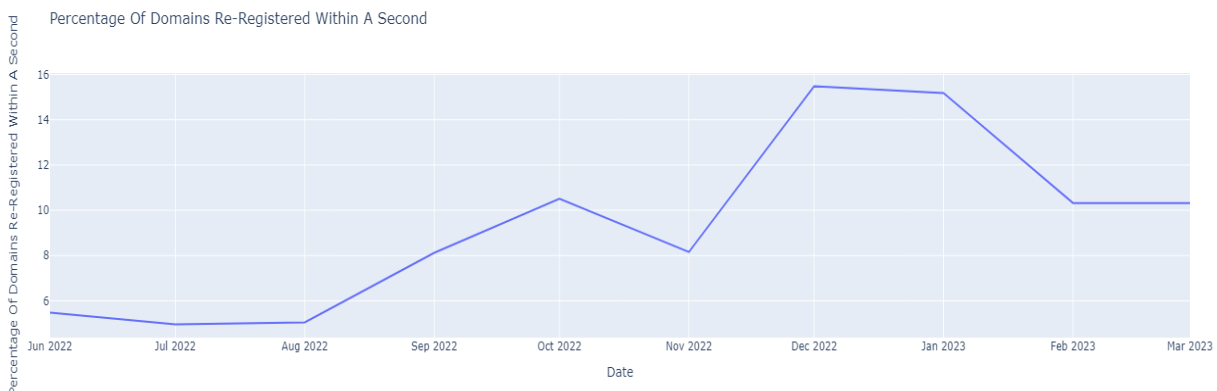
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However, for the domains that are highly contested and have been caught within 1 second of becoming available, we have seen a reduction in the fractions of a second it takes to catch a name. This would have had an impact on the reduction in the 'within a day' average above.



The percentage of domains which have dropped and been re-registered within a day has varied by month. It is difficult to determine if the new implementation has had an impact on the re-registration rate or if that relates more distinctly to the particular domains that were dropping in each month.



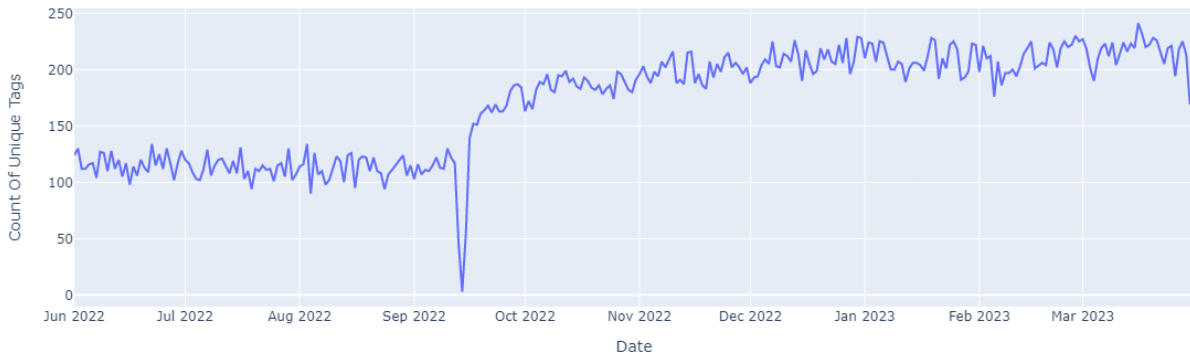
The percentage of domains which have dropped being re-registered within a second appears to have increased which is a logical correlation with registrars not having to first detect the drop time.

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The change has had the expected impact on reducing the time taken to re-register a domain.

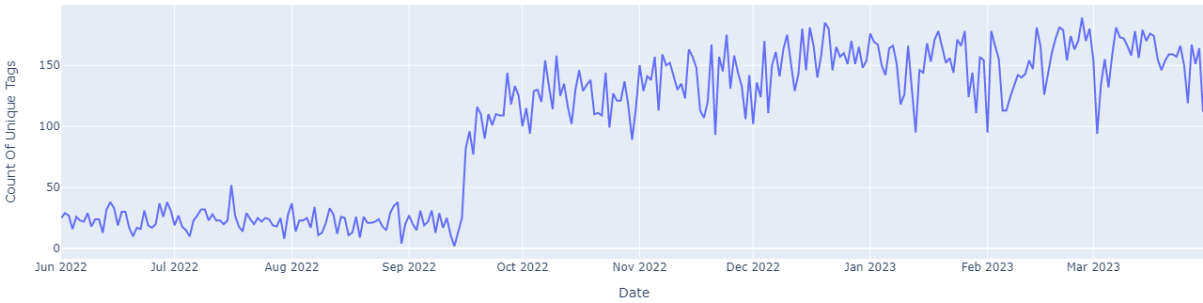
9. Drop Catching registrars

Unique Tags Sending Commands 1 Day Around A Drop



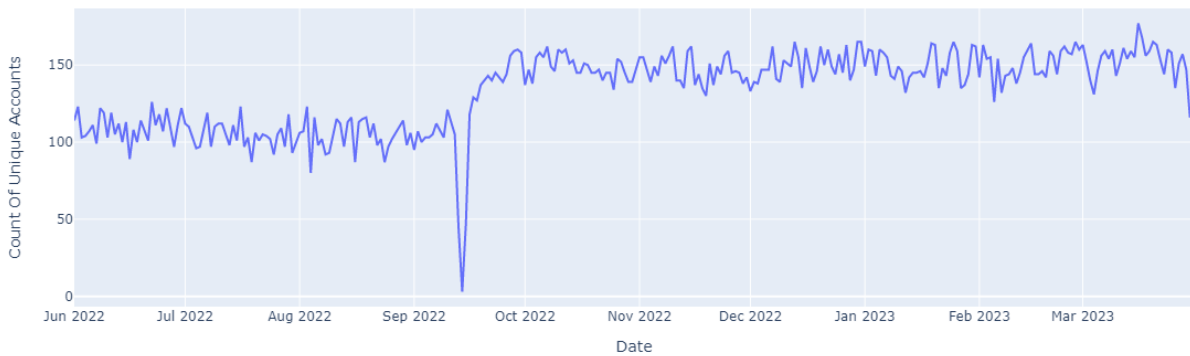
The number of unique tags sending CREATE commands a day around the drop has increased suggesting greater competition in the catching marketplace.

Unique Tags Sending Commands 1 Second Around A Drop



There is a much greater change however in the number of tags sending a CREATE command within a second of a drop because everyone knows the time and does not need to detect the drop first.

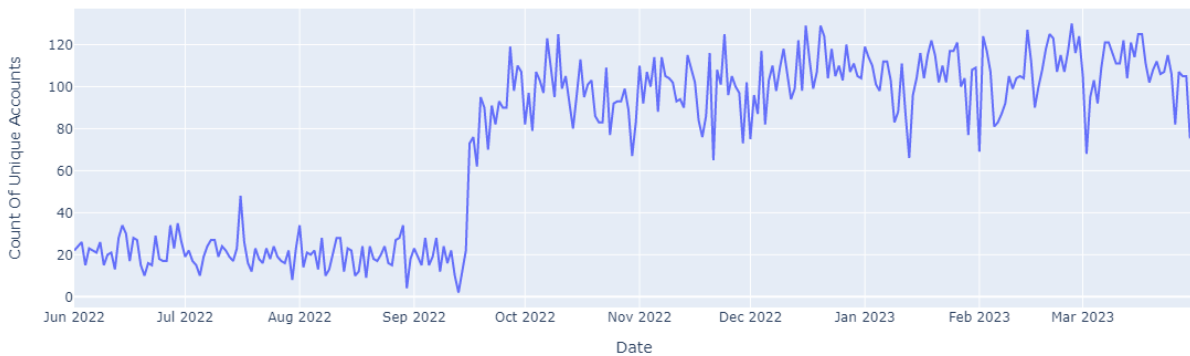
Unique Accounts Sending Commands 1 Day Around A Drop



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Some registrars have more than one tag held within their account, so we reviewed the data in relation to the number of unique accounts and saw an increase in those catching.

Unique Accounts Sending Commands 1 Second Around A Drop



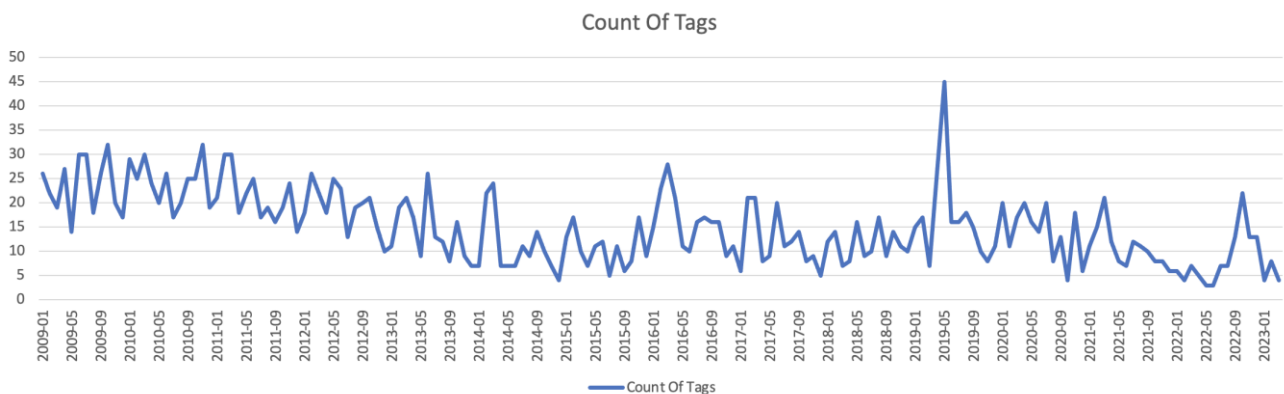
Again, when viewed by account, we see a distinct increase in competition in those sending CREATE commands within 1 second around a drop.

It should be noted that the above data on both tags and accounts drop catching refers to the numbers on any one day. Not all registrars are competing every single day.

Between 1st January 2022 and 13th September 2022, we saw 316 tags attempt to catch domains within a day of drop, of which 59 tags have not been seen attempting to catch between 13th September and 31st March 2023.

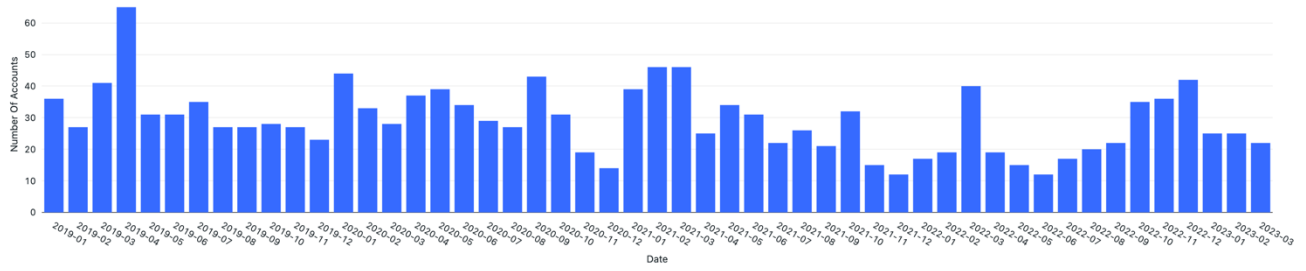
Between 13th September until 31st March 2023 we have seen 461 tags attempt to catch domains within a day of drop, of which 204 had not been seen attempting to catch in the period from 1st January 2022 to 13th September 2022.

10. Registrar statistics



Total count of new .UK accreditations being created on a month-by-month basis.

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Total number of new accounts being created on a month-by-month basis.

11. Summary

Nominet committed to review the implementation of the new expiring domains process six months after introduction. This report provides a range of relevant data points and analysis from the six months post implementation to inform this review and will form the basis of a report to the UKRAC and Nominet's Board.

Our assessment is that the change in the expiring domains process has had a positive impact on the load placed on the critical systems that make up the .UK registry and there has been a marginal increase in the competition for expired domains.