



The Mobile Linpack Ranking: General Trends

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Abstract

The Linpack performance test, which is based on the solution of a system of linear algebraic equations, is widely known for its extensive history of application in the field of supercomputer systems. So, on its principled basis, since 1993, the World Top500 Ranking has been formed, since 2004 - the Top50 Ranking of the most productive systems in Russia and the CIS, and a number of other regional ratings. Despite all the shortcomings currently available, first of all, weak compliance with the algorithms inherent in most real applications, the results of the test, expressed in floating point operations per second (Flop/s), remain the generally accepted measurement standard for producer- of computer systems, which is the main advantage of the test at the moment.

Modern mobile platforms inherited the same principles of parallel processing of data that were used and used in the construction of high-performance systems: multicore and multithreading, the use of specialized accelerators and so on.

In 2014, the team of authors proposed the first implementation of the Linpack test for mobile platforms in order to determine the trends and features of this segment with respect to performance and efficiency in the same units as for traditional computing platforms. At the first stage, a parallel version for the Android OS was implemented. For the second most common mobile OS iOS, a basic sequential implementation was developed. Since 2015, mobile applications are available in the application stores of the respective platforms. For 4 years of the project existence, a rich database with results has been accumulated with more than 18,000 entries, each of which corresponds to the successful launch of the Linpack test on some mobile device.

In the framework of this paper, the results of the analysis of accumulated data are presented to determine the main trends in the segment of mobile devices, as well as to determine the prospects for the development of the rating itself. The initial data is under the control of the MySQL DBMS, the analysis was based on the formation of appropriate SQL queries and their subsequent processing for convenience of perception - the choice of diagrams, etc.

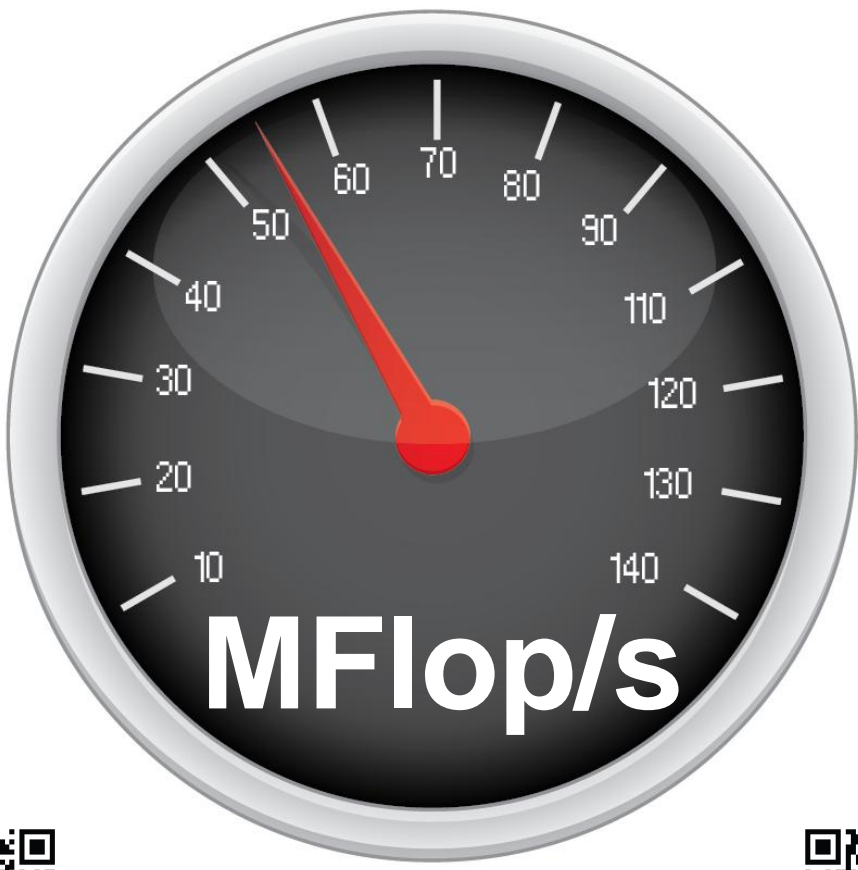
At the first stage of the analysis, an assessment was made of the suitability of the data for constructing the trials, during which some insignificant artifacts were identified that did not affect the feasibility of the analysis, such as some inaccuracies in the versions of the OS used.

The analysis of the accumulated data was carried out in a number of directions and showed the following...

The Mobile Linpack in the Stores

RANK YOUR DEVICE!

Compare your device with historical or modern HPC systems
by Linpack benchmark



The Mobile Linpack
for Android

<http://linpack.hpc.msu.ru>



The Mobile Linpack
for iOS

Outlook

NUMBER AND REGULARITY OF TEST RUNS

Since the first presentation of the rating at the largest in Europe conference series ISC (International Supercomputing Conference) in 2015, a fairly constant rate of launch has been established - from 400 to 600 per month without obvious failures. There are periods of increased activity, corresponding to the periods of supercomputer conferences and events, in which the audience was invited to participate in the ranking. All this allows continuing data study.

MOBILE PLATFORMS

The dominating majority of runs are made on Android platforms. In many respects this is determined by the availability of just a serial implementation for iOS. At the same time, this also corresponds to the hypothesis that the target audience prefers more flexible devices. This also determines that we should exclude iOS devices from the further statistics analysis until we have a reasonable parallel implementation.

PERFORMANCE GROWTH

The rate of performance growth itself is characteristic for the entire computing area. Attention is paid to the low value of the worst results (mins), which is determined by a significant number of launches without optimizing the launch parameters for the device features. More, affirming this, we can see median values much below averages.

CORES AND MEMORY

Just as in the whole computing, there is an increase in the number of processor cores. Modern devices have about 8 cores per CPU. With this, as the analysis show, the increase in the amount of RAM per core grows noticeably faster, then the growth rate of performance per core.

TOP DEVICES BY PERFORMANCE

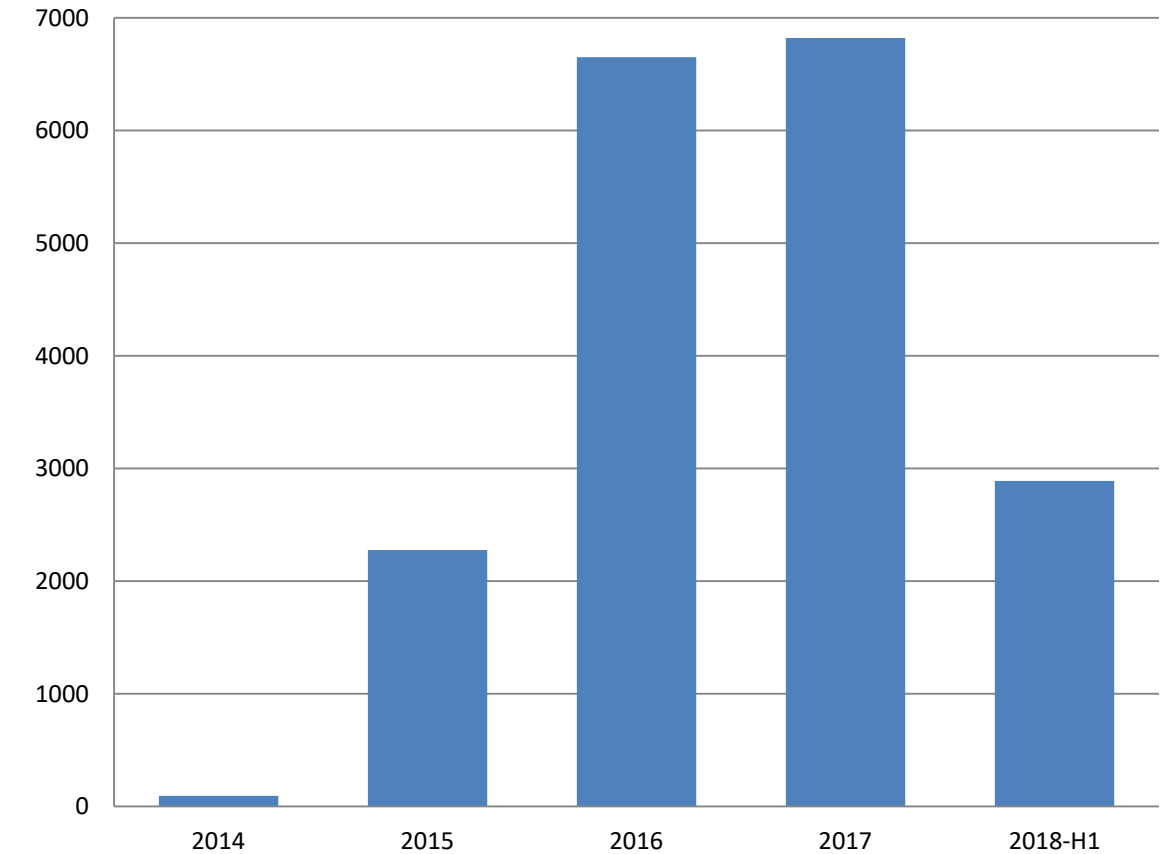
At this time, we see a variety of Samsung devices demonstrating performance that is enough to get into the top, showing from 2,1 and up to 4,9 GFlop/s that is just 12 times slower then Top500 #1 system in the first world ranking (1993, Los Alamos SuperSparc-based CM-5/1024 having 59,7GFlop/s).

TOP VENDORS

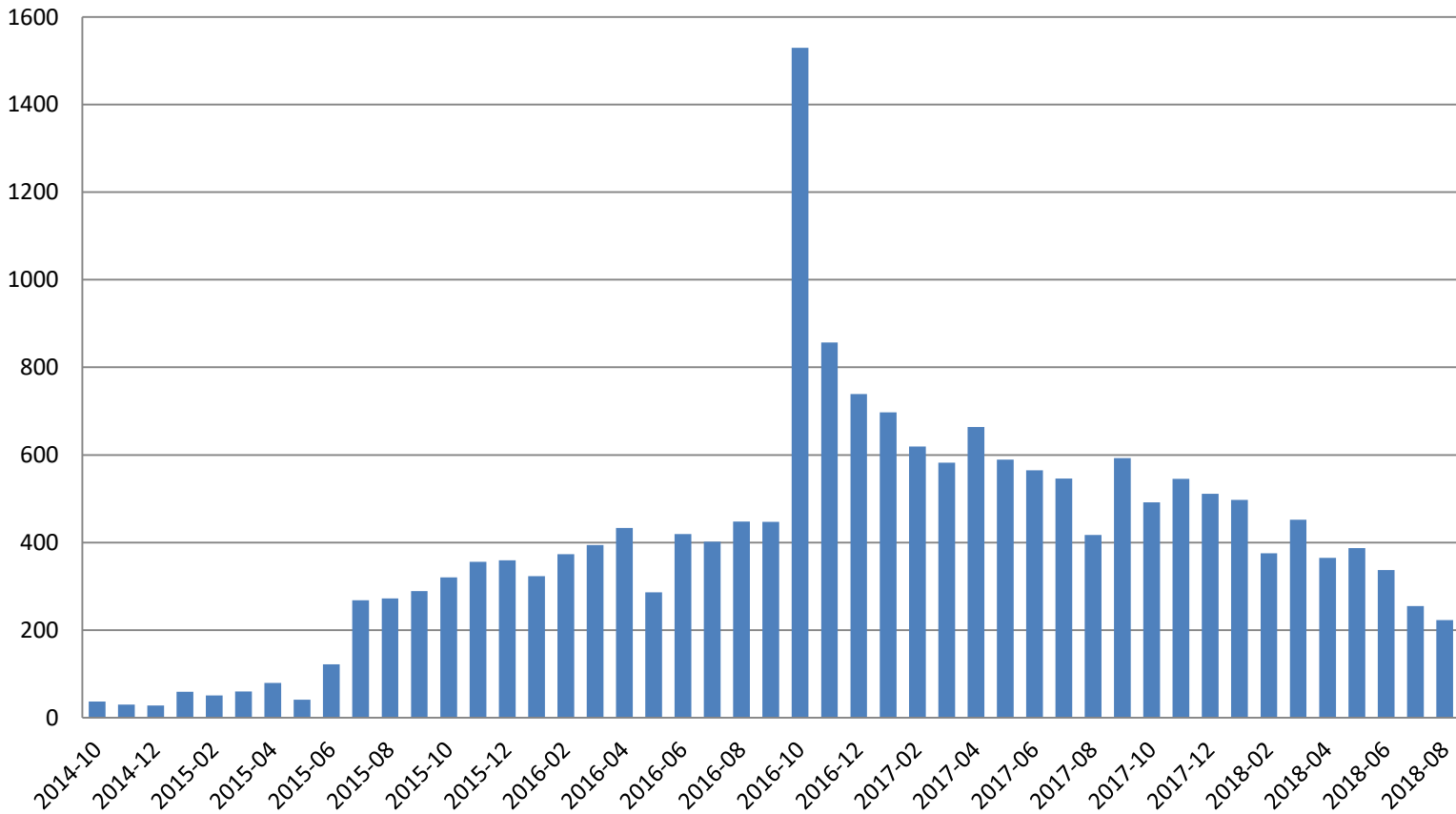
Excluding virtual machines from consideration, as well as Apple devices on iOS due to inaccessibility of the serial version of the test, thus limiting the Android OS, there is Samsung's leadership in the both in the number of test runs and in total performance, but slightly giving its share away. The second place since 2016 is taken by Xiaomi by a jump. A steady increase in the number of launches is observed on Huawei devices while LGE drops its share from 14% to 5%. We can see also that Samsung has a better share regarding performance in 4 of 5 half year periods.

TRENDS IN FIGURES

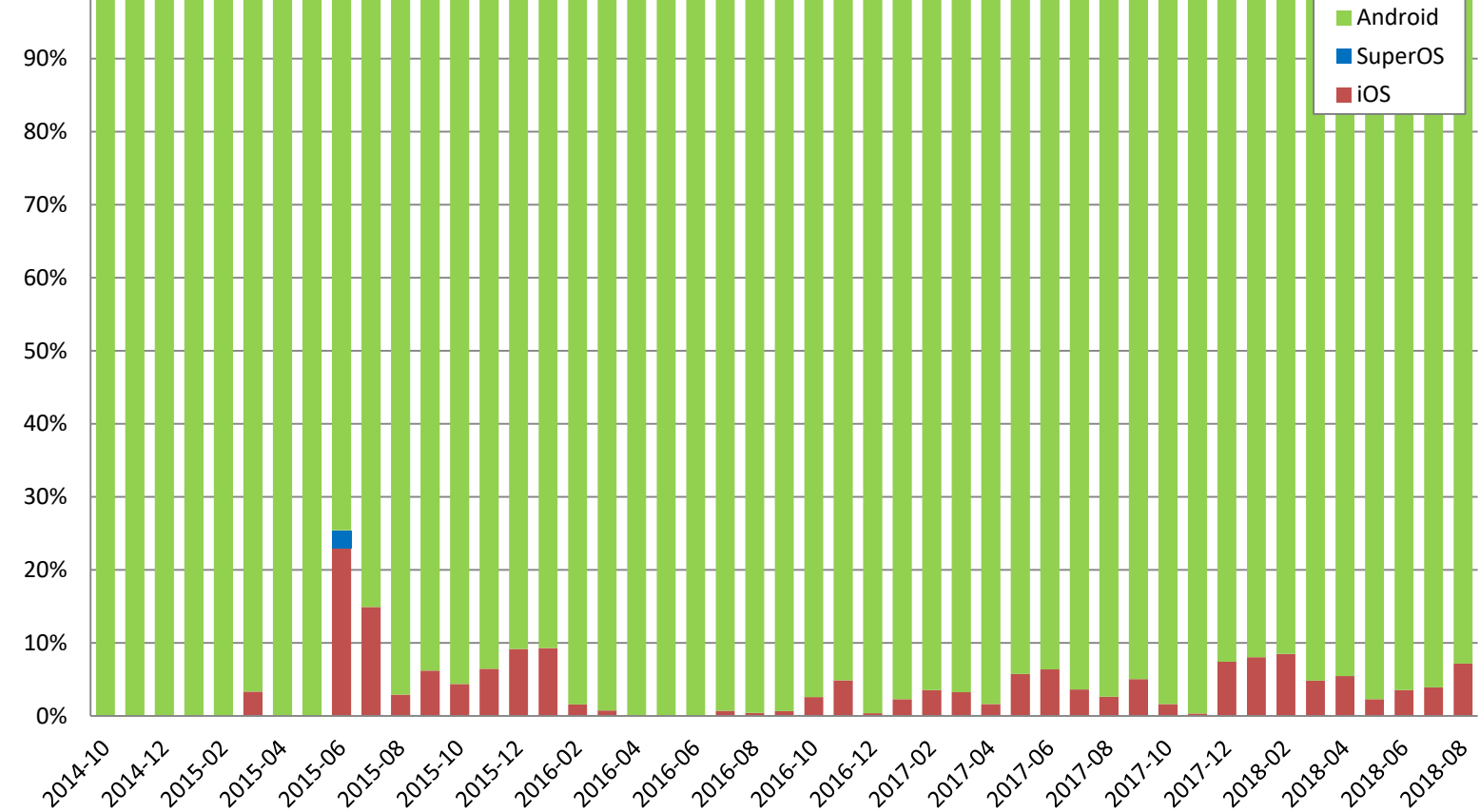
Number of Runs by Year



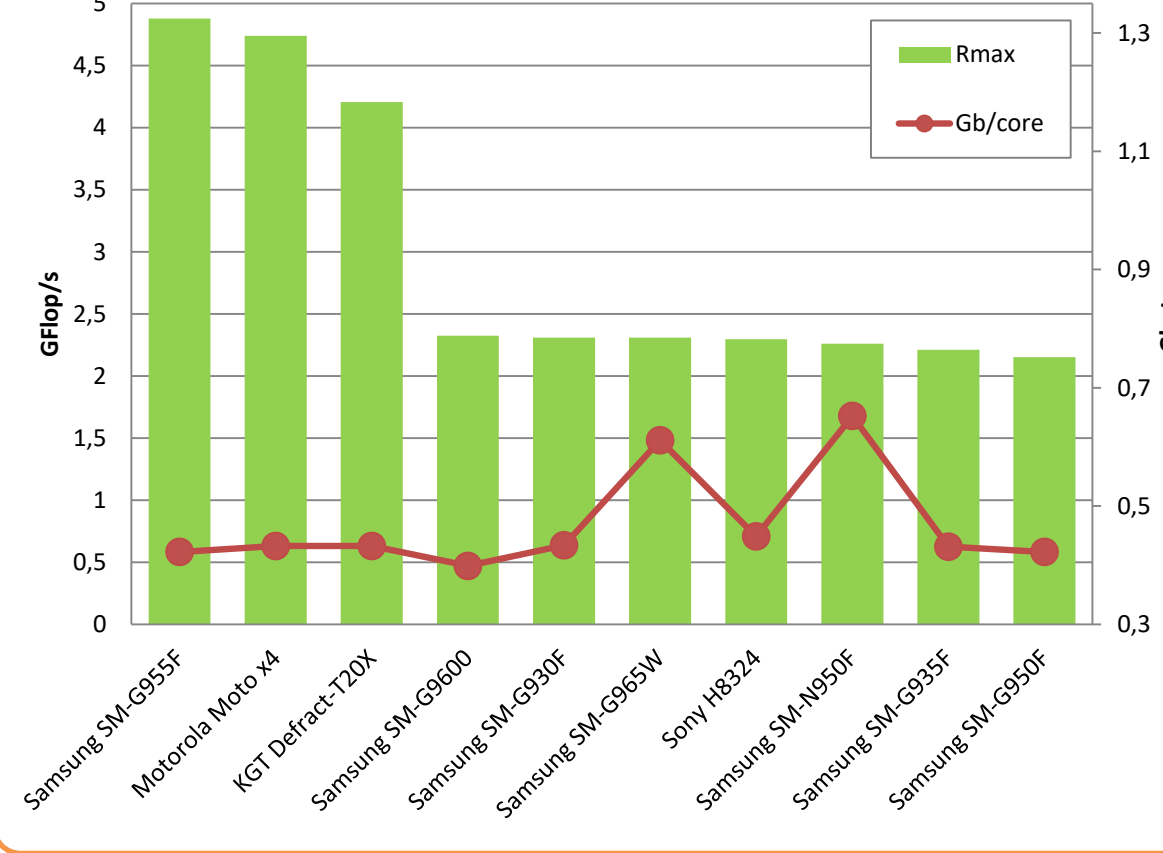
Number of Runs by Month



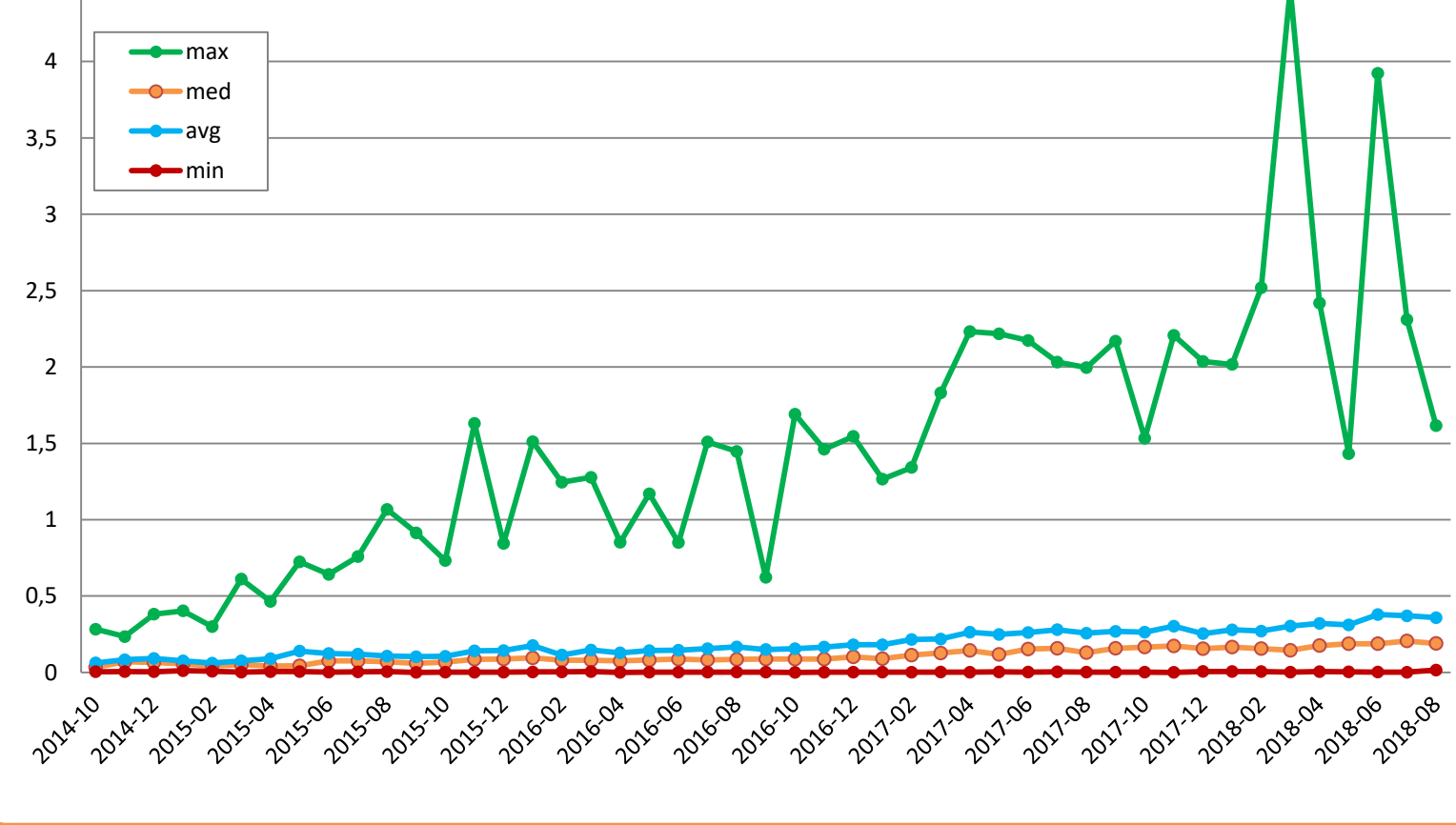
User Device OS Share by Month



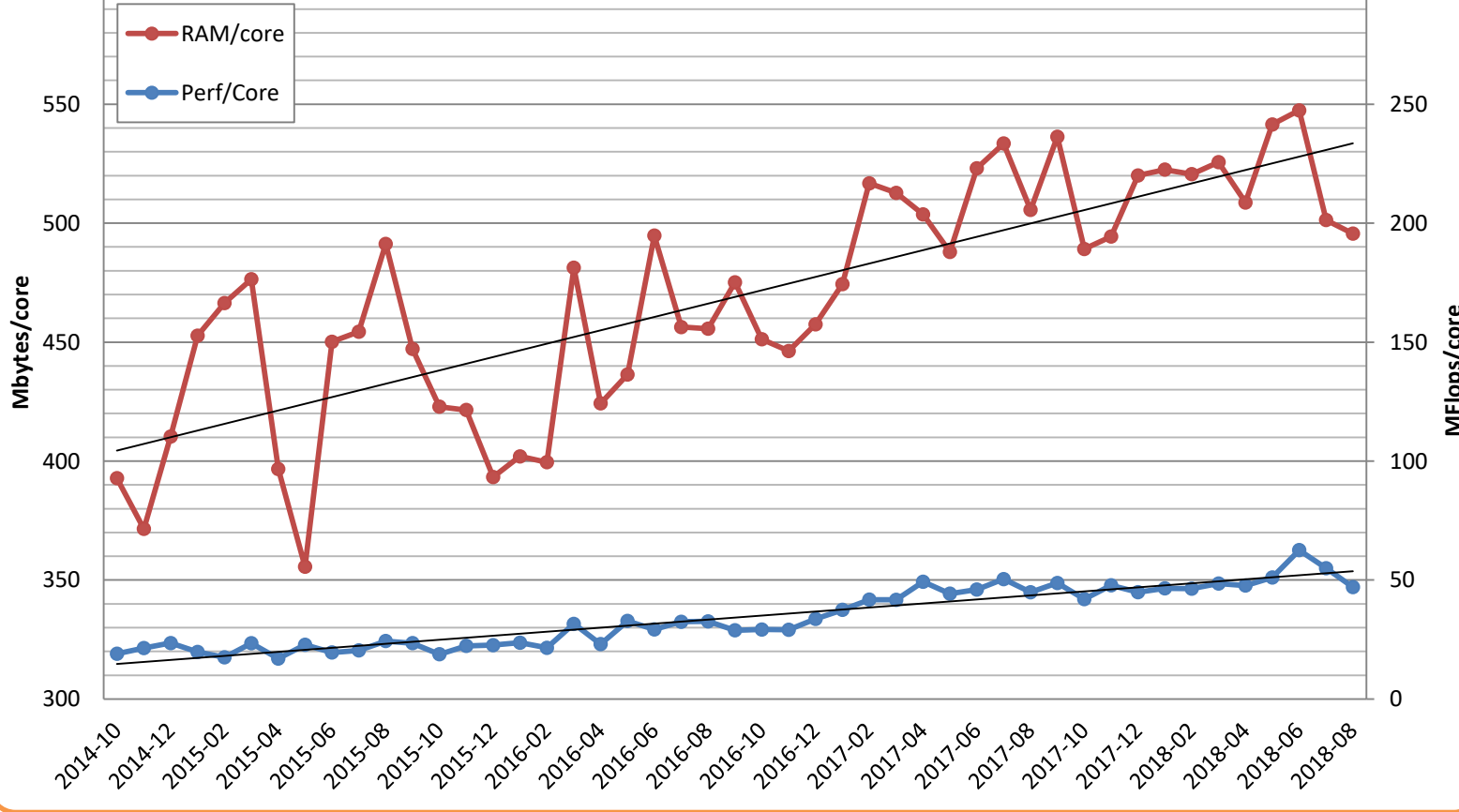
Top10 Android Device Models by Performance



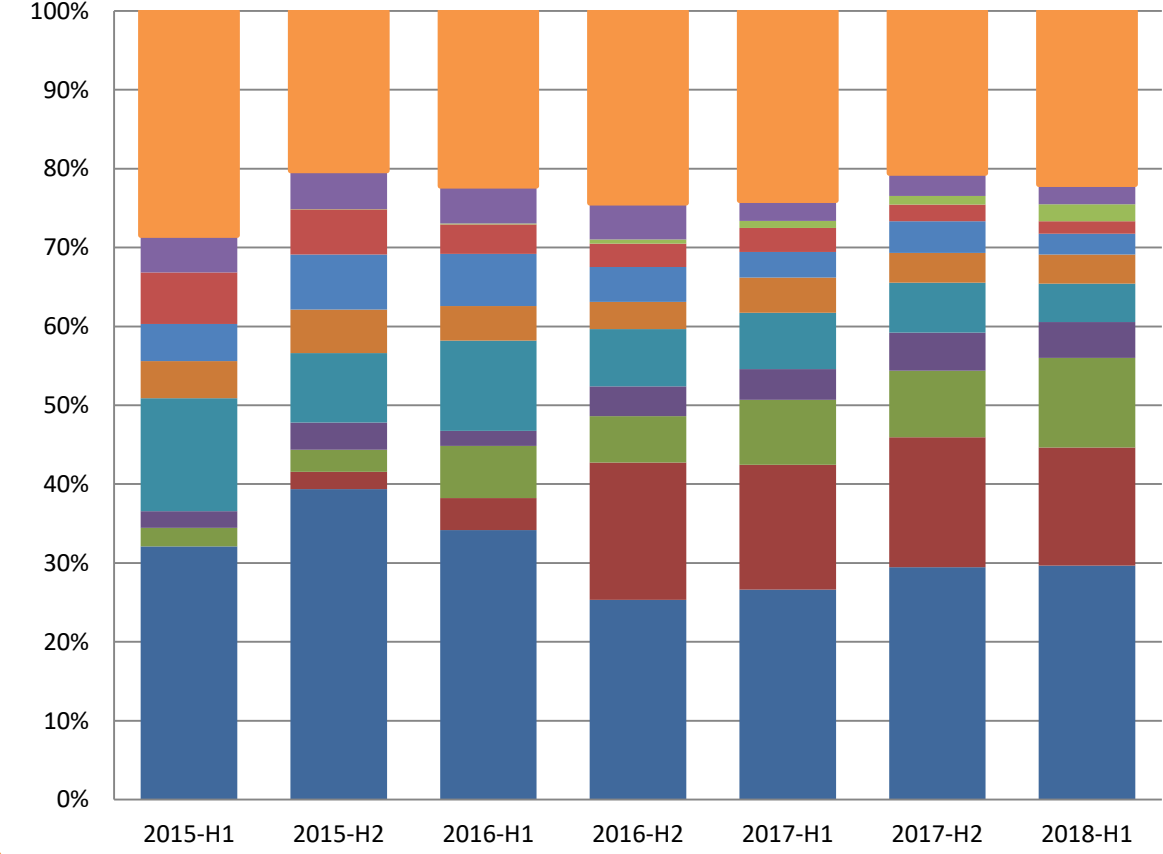
Test Run Performance Evolution, GFlop/s



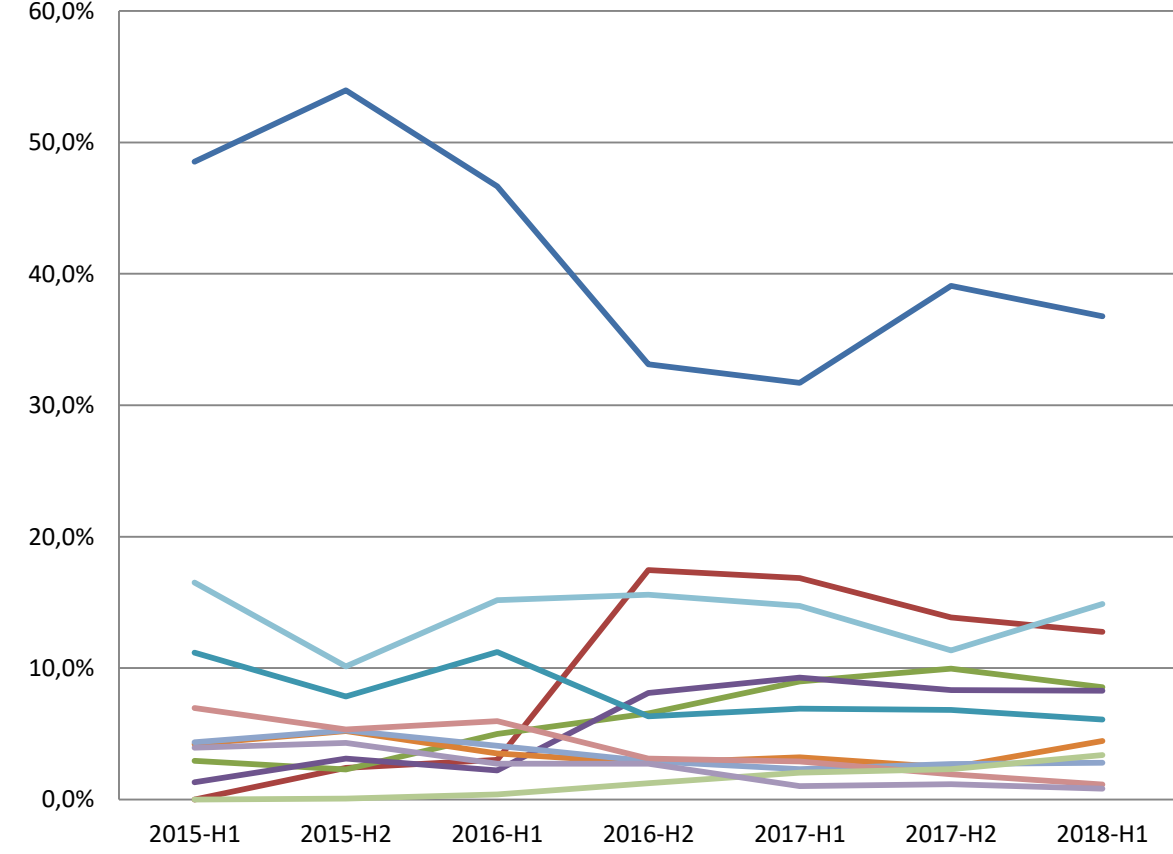
Performance per Core vs RAM per core Evolution



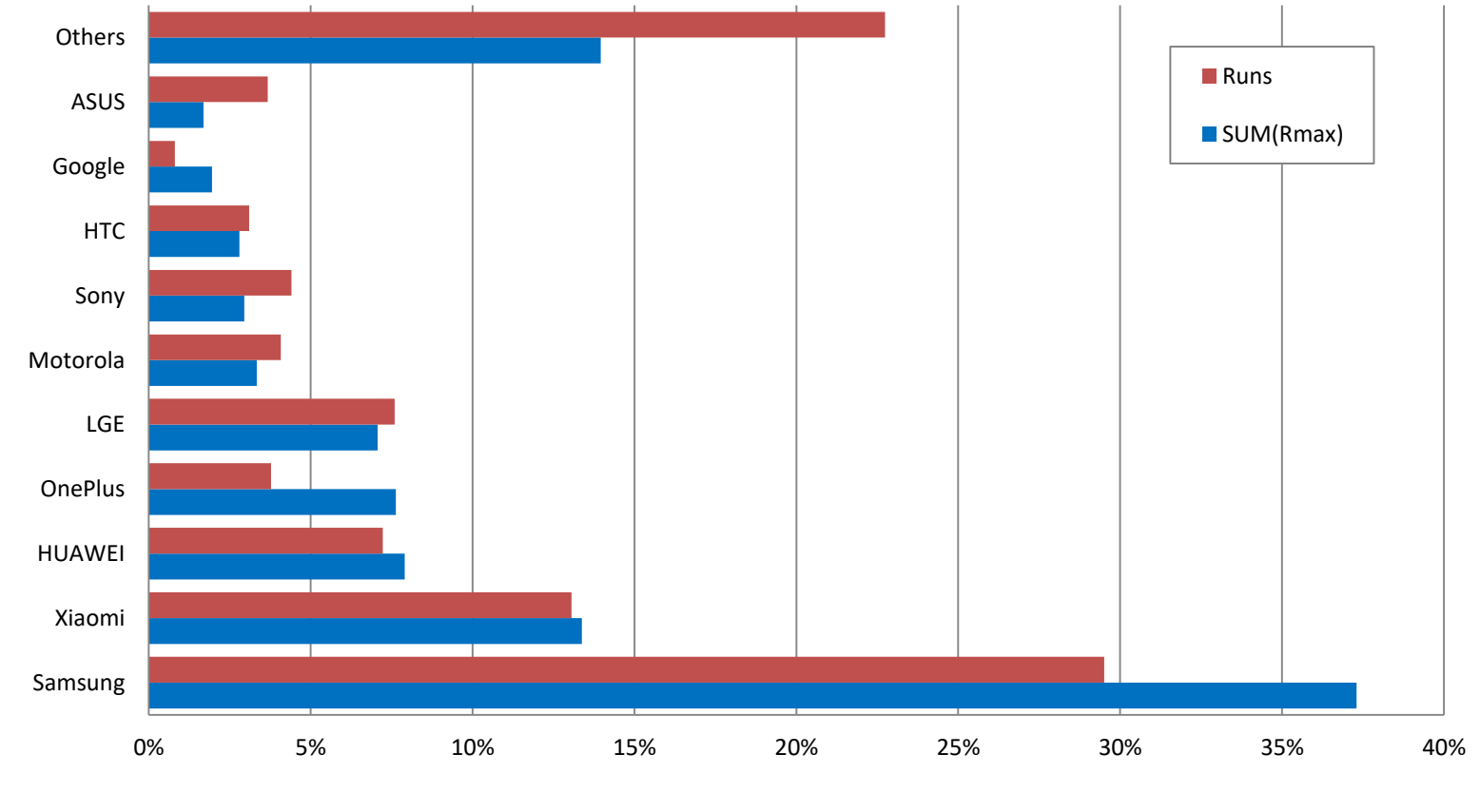
Vendor Performance Share



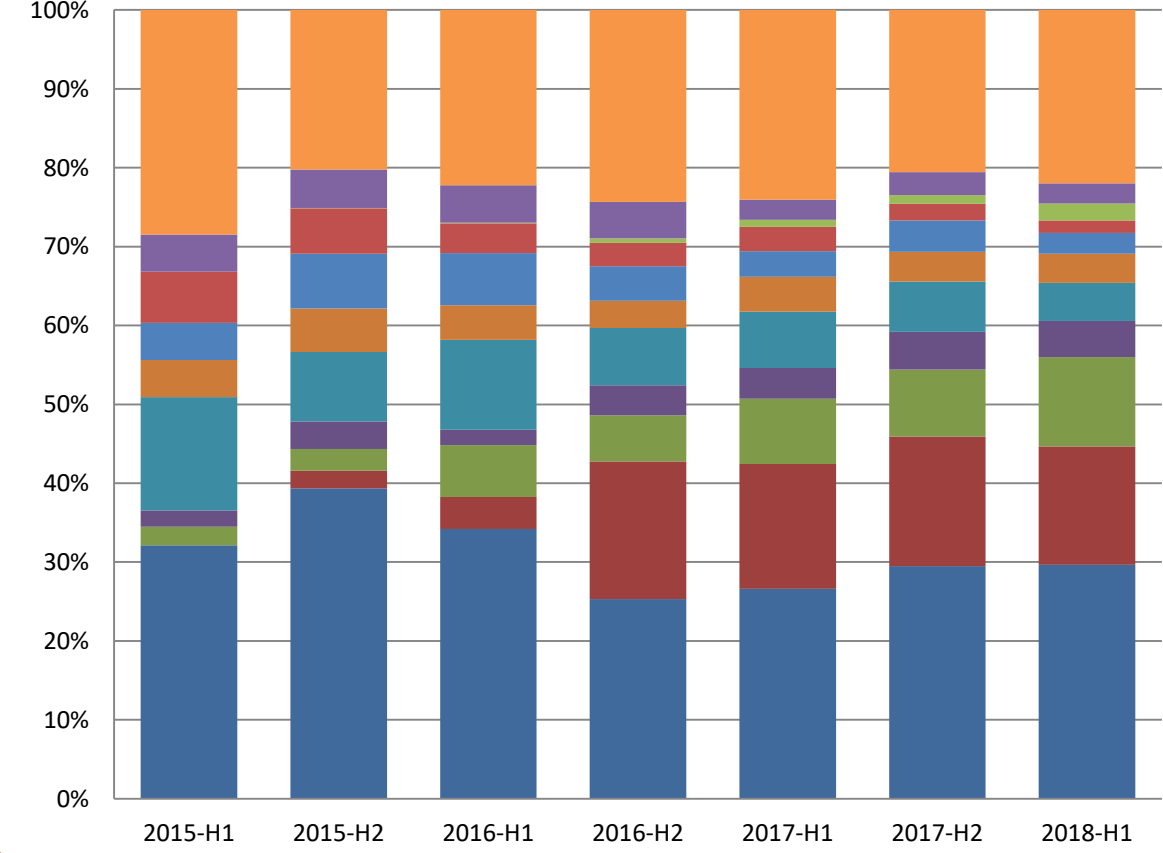
Vendor Performance Share



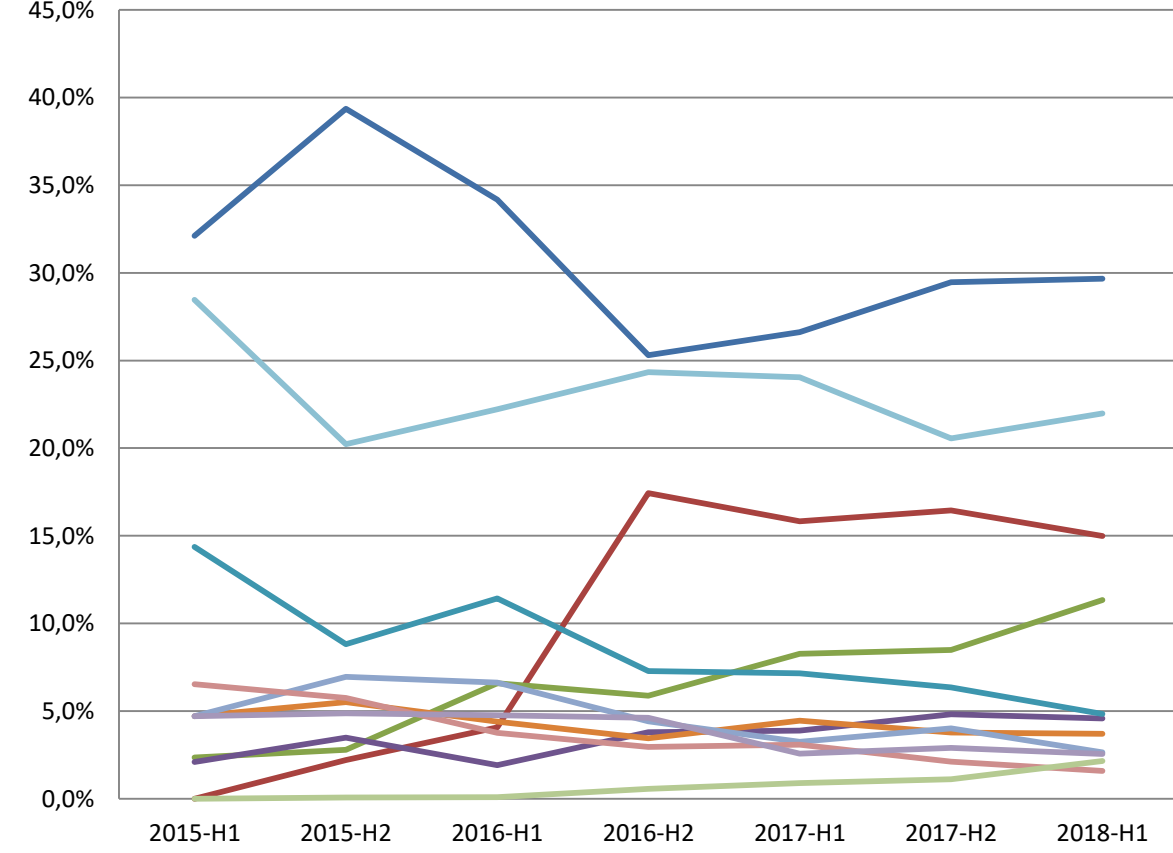
Overall Vendor Performance vs Test Runs Share



Vendor Test Runs Share



Vendor Test Runs Share



Vendor Performance vs Test Runs Share Dynamics

