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Using dynamic deadline in the volunteer computing project SAT@home

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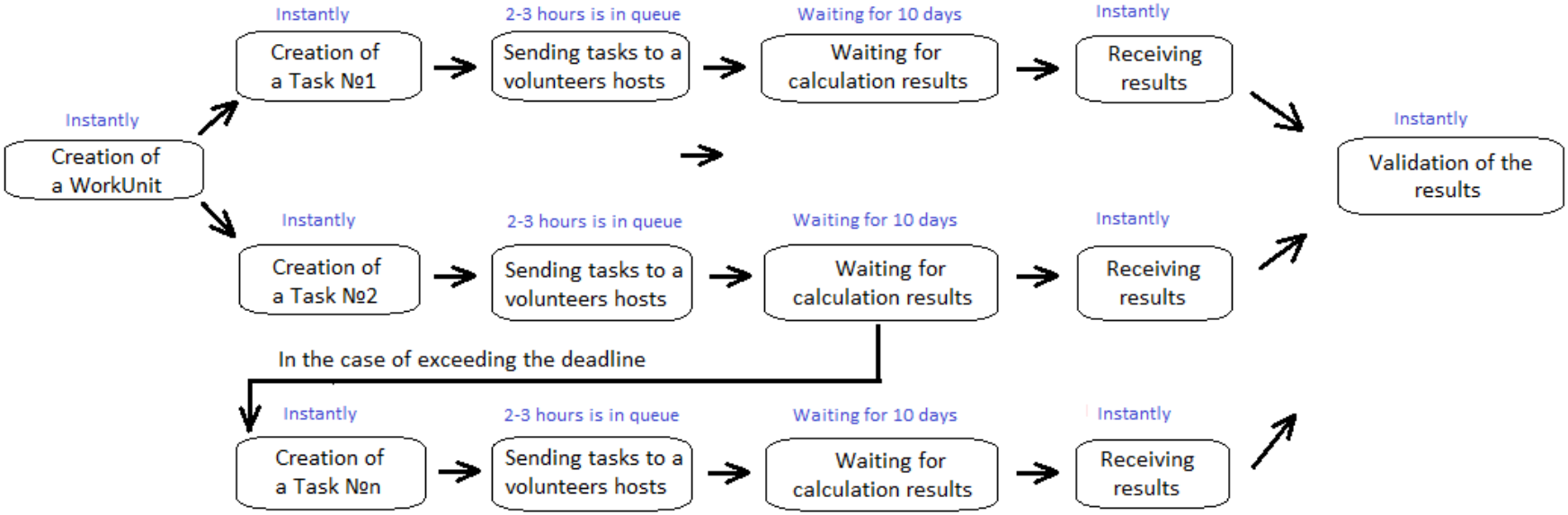
Overview of job processing mechanism on the BOINC platform

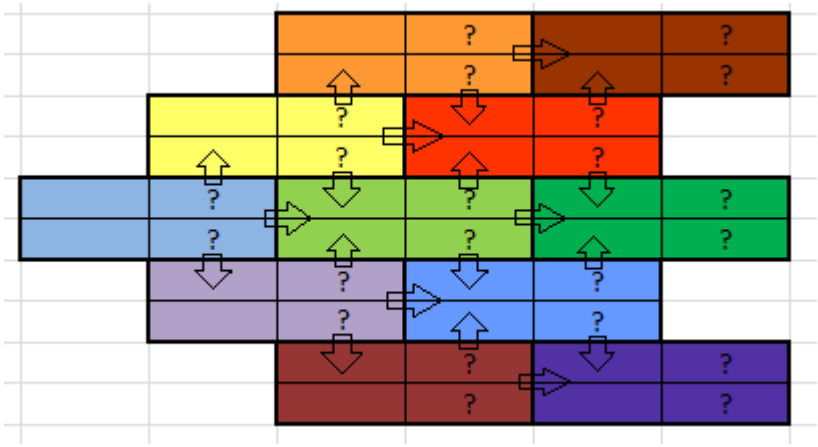
- The generation and processing of tasks on an example of one workunit with quorum=2
- 1. Creation of a workunit
- 2. Creation of tasks
- 3. Sending tasks to a volunteers hosts
- 4. Waiting for calculation results
- 5. Receiving results
- 6. Validation of the results, adding correct results to the database



Models of tasks generation

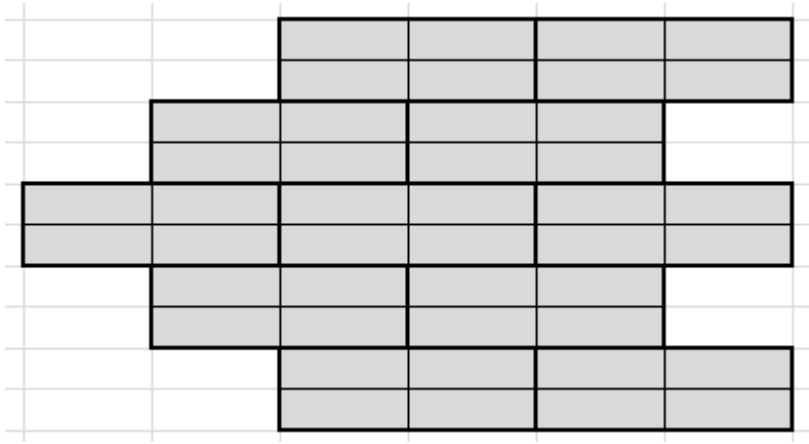
- Possible models

1. Sequential



Here we need the results of previous calculations to determine the following search space.

2. Parallel



Here we **DON'T** need the results of previous calculations to determine the following search space.

Possible problems

- Depending on the generation model the following problems are possible

1. Sequential

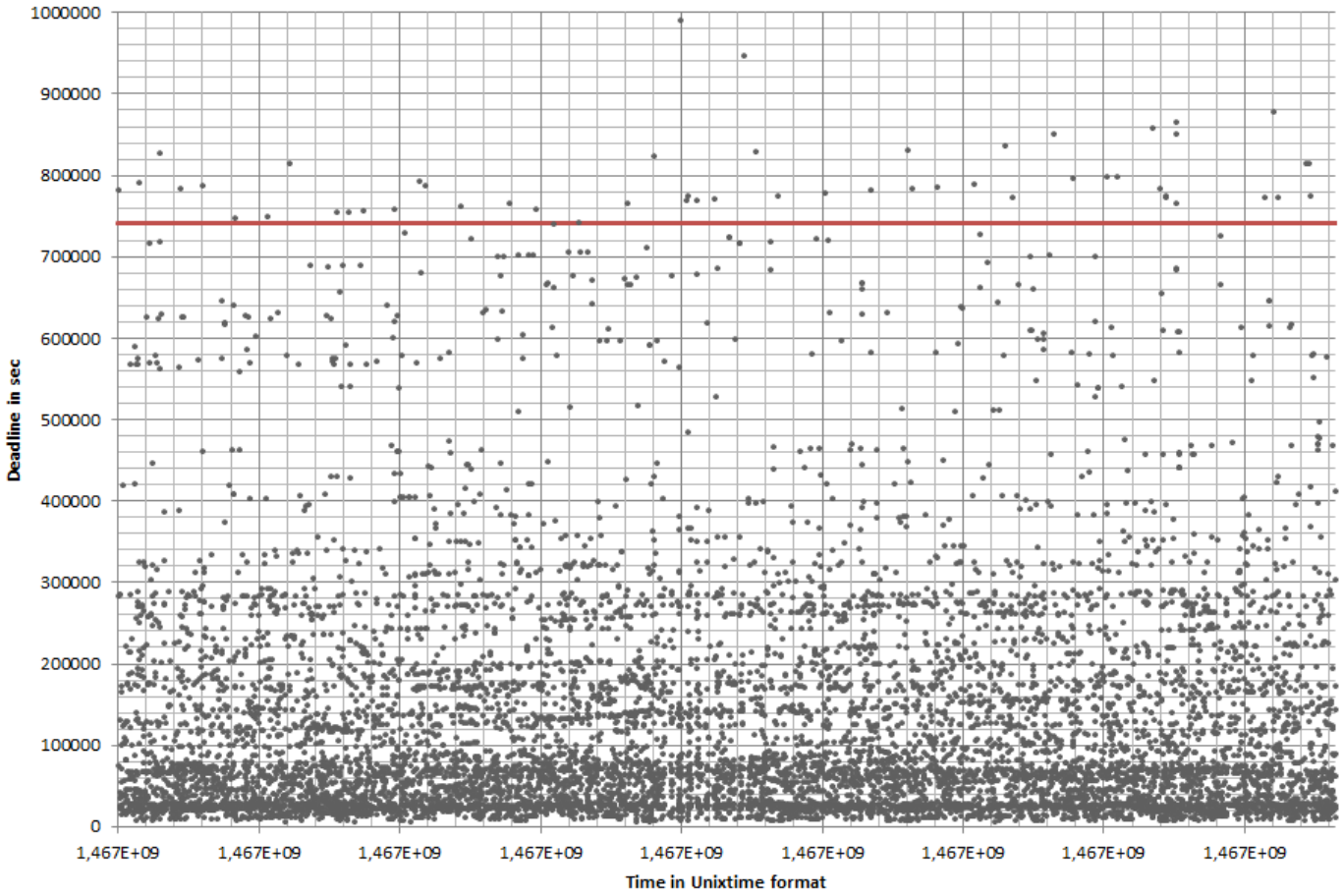
- Long waiting for the tasks validation.
- Long waiting for completion of all tasks to generate the new ones.

2. Parallel

- Long waiting for the tasks validation.

Approach for determining the optimal deadline

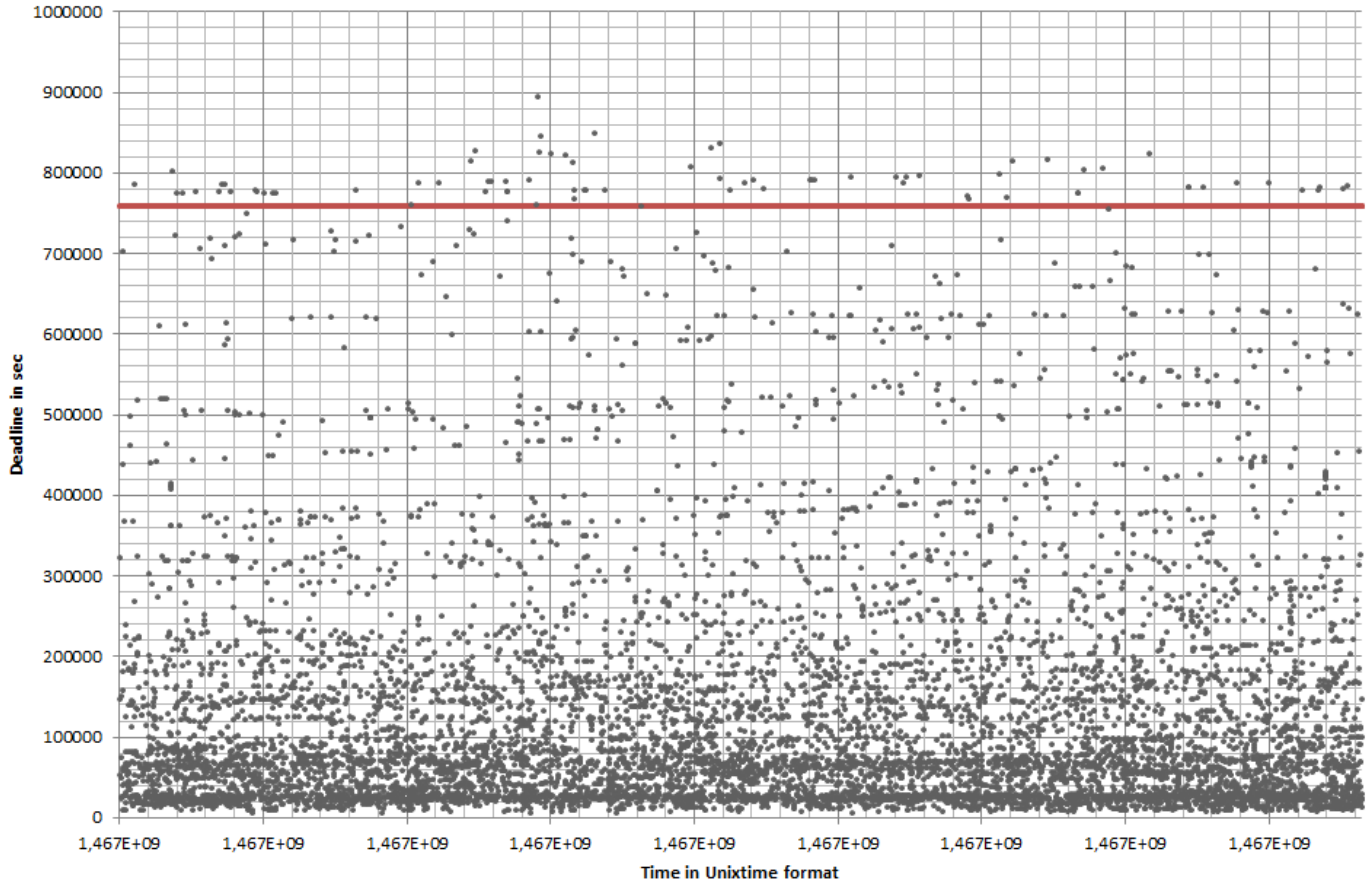
1. Determining the value of deadline which is enough to process the fixed percentage of tasks for the first day.



99%
740646 sec

Approach for determining the optimal deadline

Determining the value of deadline which is enough to process the fixed percentage of tasks for the 2nd day and the following n days.



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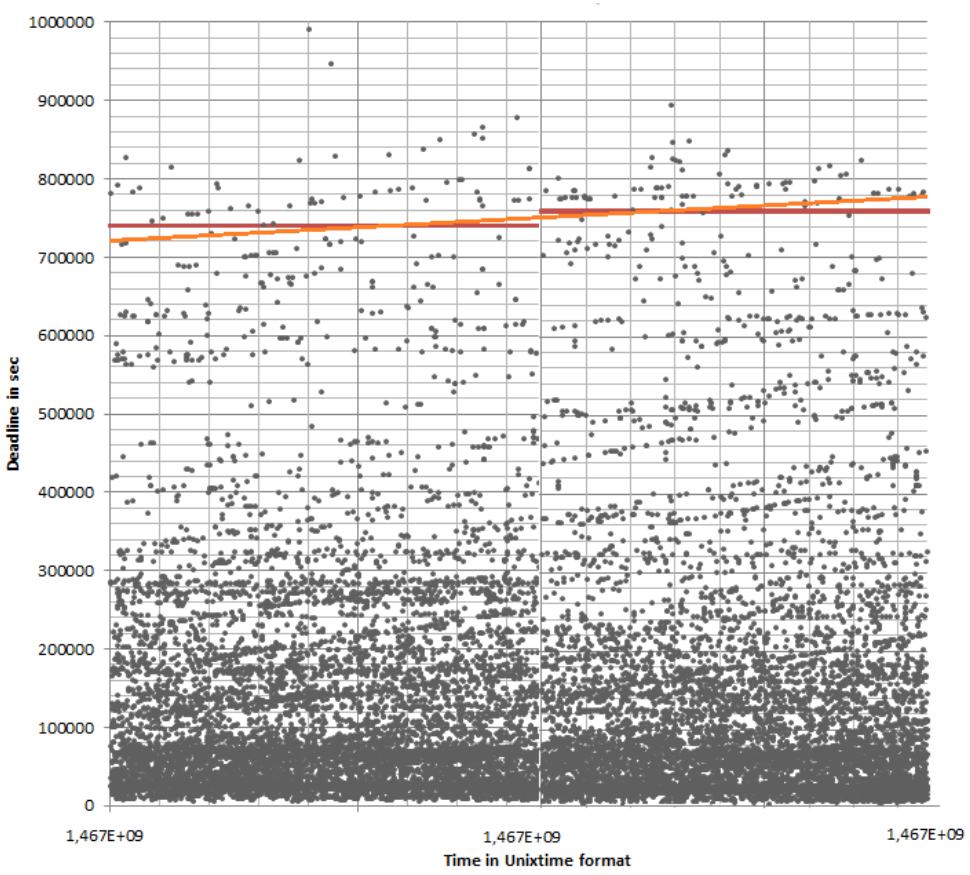
Approach for determining the optimal deadline

2. Calculation of the trend using recent data regarding deadlines. Determining of the deadline for the next day.



Approach for determining the optimal deadline

3. Calculation of the average time required for CPU to process a task.

Calculation of the correlation coefficient between the measured deadline value and average time required for CPU to process a task

Take into consideration the speed of changing of the considered values due to the fixed percent.

4. Adding the final optimal deadline value to the special table in the database.

5*. Launching of software for updating the configuration file on the project server.

*Isn’t a part of the approach.

Testing of the proposed approach

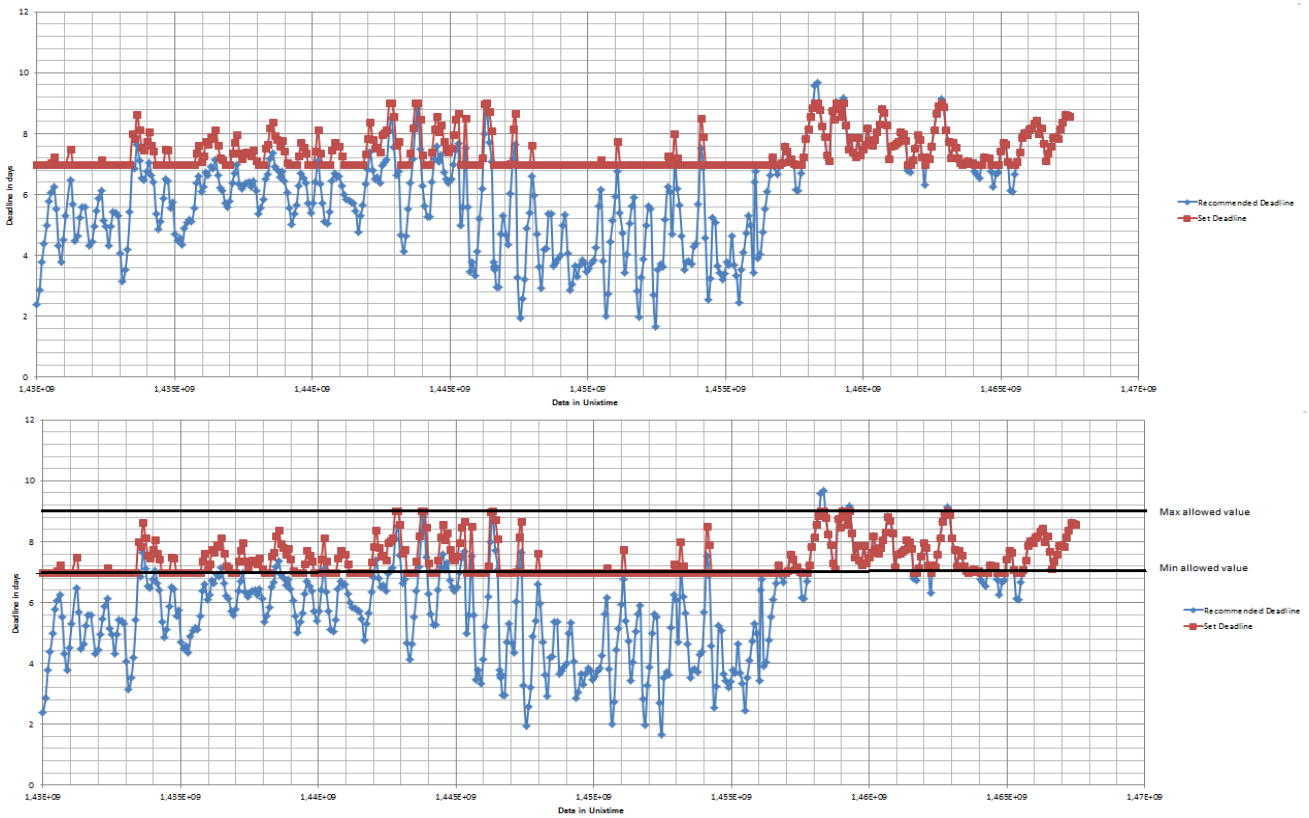
- Experimental results were obtained for the following methods:
- 1) Statical default value set by the administrator.
- 2) Value obtained from analyzing of the distribution, accuracy in days, CPU_Times is taken into consideration.
- 3) Value estimated by the ordinary least squares method, accuracy in seconds.
- 4) Value estimated by the ordinary least squares method, extended by analysis of CPU_Time, accuracy in seconds.

Final results

Time	Measured value of deadline	Method №1	Method №2	Method №3	Method №4	Difference 1	Difference 2	Difference 3	Difference 4
17 Nov 2014	637306	864000	604800	650751	647403	226694	32506	13445	10097
18 Nov 2014	627233	864000	604800	640901	641799	236767	22433	13668	14566
19 Nov 2014	618599	864000	604800	628297	628145	245401	13799	9698	9546
20 Nov 2014	609610	864000	604800	615245	613662	254390	4810	5635	4052
20 Nov 2014	599587	864000	604800	602158	593408	264413	5213	2571	6179
21 Nov 2014	588762	864000	604800	590254	580549	275238	16038	1492	8213
22 Nov 2014	607163	864000	604800	584451	573899	256837	2363	22712	33264
23 Nov 2014	601980	864000	604800	587896	606270	262020	2820	14084	4290
24 Nov 2014	580728	864000	604800	590494	585453	283272	24072	9766	4725
25 Nov 2014	555111	864000	604800	583590	562987	308889	49689	28479	7876
Summary						2613921	173743	121550	102808

From the table it follows that method №4 gives the lowest error (in seconds) in comparison with the measured value. This method will be used in SAT@home to increase its effectiveness.

Practical results of 2015-2016 years



These charts of recommended values by developed mechanism and set values since 25.04.2015 to 01.07.2016 allow to evaluate the operation of the mechanism in the real exploitation. You can see that the deadline for the tasks increases to the allowed boundaries only when users need to complete the calculations on their computers.

Thank you for your attention!