



HPC Ranking Based on Real Applications

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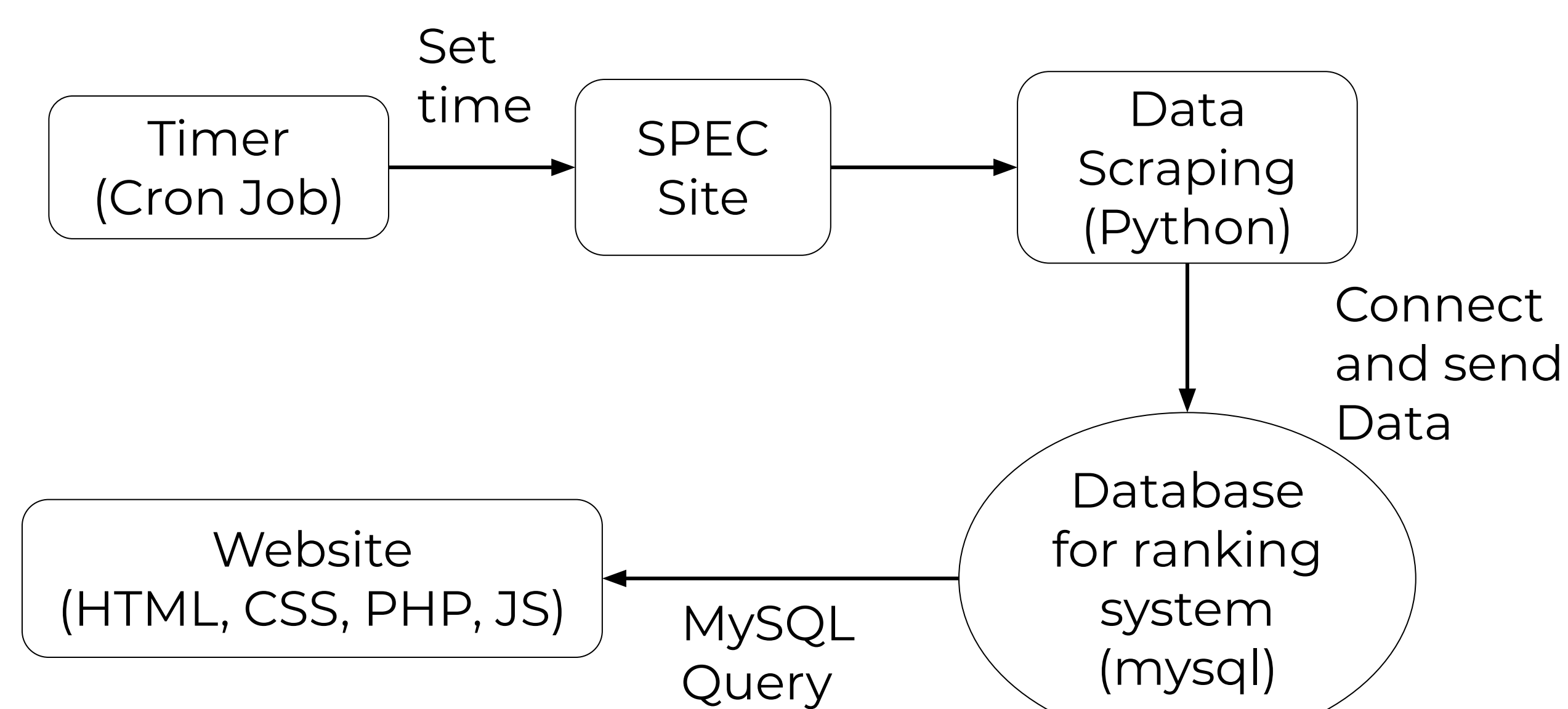
Introduction

Performance benchmarks are used to stress test hardware and software of large scale computing systems. A corporation known as **SPEC** has developed a benchmark suite, SPEC ACCEL, consisting of test codes representative of kernels in large applications. This project ranks the published results from ACCEL based on different criteria. The goal is to prepare a ranking website for the work-in-progress real-world SPEC HPC benchmark suite, **HPC2021** that is soon to be released.

Project Goals

- Organize and display HPC systems based on SPEC ACCEL benchmarks suite
- Compare HPC systems more holistically
- Enable visualization of the differences between each HPC system, most importantly:
 - Base & Peak score:** Denotes the default benchmark output and optimized benchmark output. Each vendor can optimize individual benchmarks, producing peak score but must adhere to a set of rules set by SPEC.
 - Hardware speed and size:** Shows their impact on benchmark performance.
 - Developers:** Vendors such as Intel, NVIDIA, AMD, etc., which allows the end-user to see who they may choose to buy parts from.

Approach



Architecture diagram showing data flow

Cron Job:

- Runs web-scrapers periodically.

Web-Scraper:

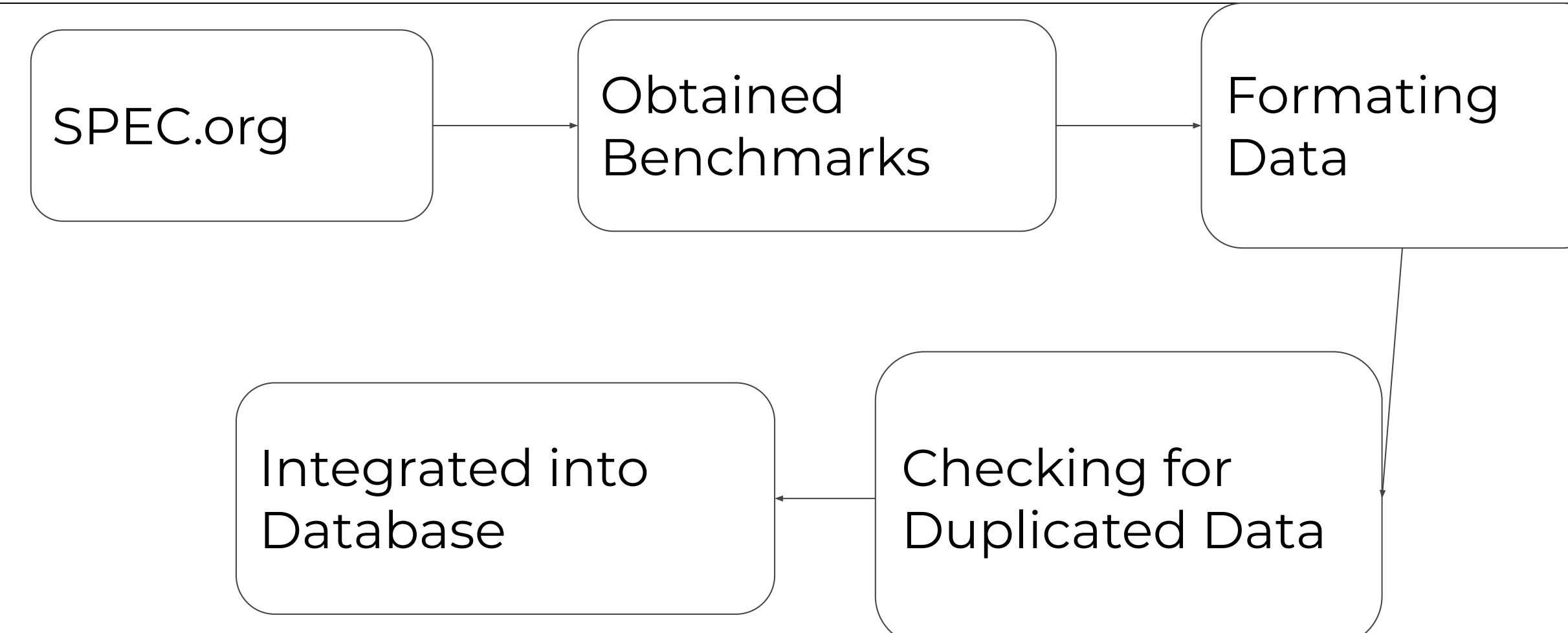
- Takes data from SPEC.org website.
- Organizes and formats data.
- Inputs benchmark data into database.

MySQL Database:

- Easy-to-use.
- Large documentation for use with websites.

Data is taken from the SPEC.org website, condensed and formatted, and transferred into the database.

Data Flow



- Visualization of the data movement within the web-scrapers.
- Cron job** triggers the **web-scrapers** to move necessary data from SPEC.org to the database.

All ACCEL Results Published by SPEC
These results have been submitted to SPEC; see the disclaimer before studying any results.
Last update: Thursday, 21 May 2020, 10:55
OpenACC | OpenCL | OpenMP

Test Sponsor	System Name	HTML	CSV	Test	PDF	PS	Cred
Indiana University	Lenovo NeXtScale nx360 M5						
Indiana University	HP Z820 Workstation						
Indiana University	Cray XC30						
Indiana University	Cray XK7						
Indiana University	Cray XK7						
Indiana University	Cray XK7						
Indiana University	Cray XK7						
Indiana University	Cray XK7						
Indiana University	PowerEdge C4140 Server (KVM virtual machine)						
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Indiana University	PowerEdge C4140 Server						

Partial image of the original benchmarks organized on **SPEC.org**.

- All the results are located within different locations CSV, text, and other files.
- The scraper looks into each CSV file and takes the appropriate benchmark to copy into a table.

index	Hardware Model:	Tested by:	CPU Name	CPU Characteristics
1	Lenovo NeXtScale nx360 M5	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,

Index	Hardware Model	Tested by	CPU Name	CPU Characteristics
1	Lenovo NeXtScale nx360 M5	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
2	HP Z820 Workstation	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
3	Cray XC30	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
4	Cray XK7	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
5	Cray XK7	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
6	Cray XK7	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
7	Cray XK7	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,
8	Cray XK7	Indiana University	Intel Xeon E5-2680 v3	Intel Turbo Boost Technology on,

- After being scraped the benchmarks are organized and inserted into a **MySQL database** which is shown above.
- This visual is from **PHPPAdmin**, which allows for the data to be easily accessed to display on the website.

Results

The following design demos a simplistic view:

Base Score	Peak Score	Sponsor
14.411231	Not Run	Lenovo Global Technology
14.384581	Not Run	Lenovo Global Technology
13.341435	Not Run	Indiana University

Key features of the website are as follows:

- A **filter** button, which allows for the changing of which default columns are shown.
- A **search** function, which allows for filtering specific Sponsors, CPUs, etc.
- More information** for each HPC, which is shown by clicking on the sponsor & name. This shows every computer specification.
- A **contact** page, which allows for the user to provide feedback about features or errors on the website.
- A **change benchmark** button, which allows for different SPEC benchmarks to be viewed.

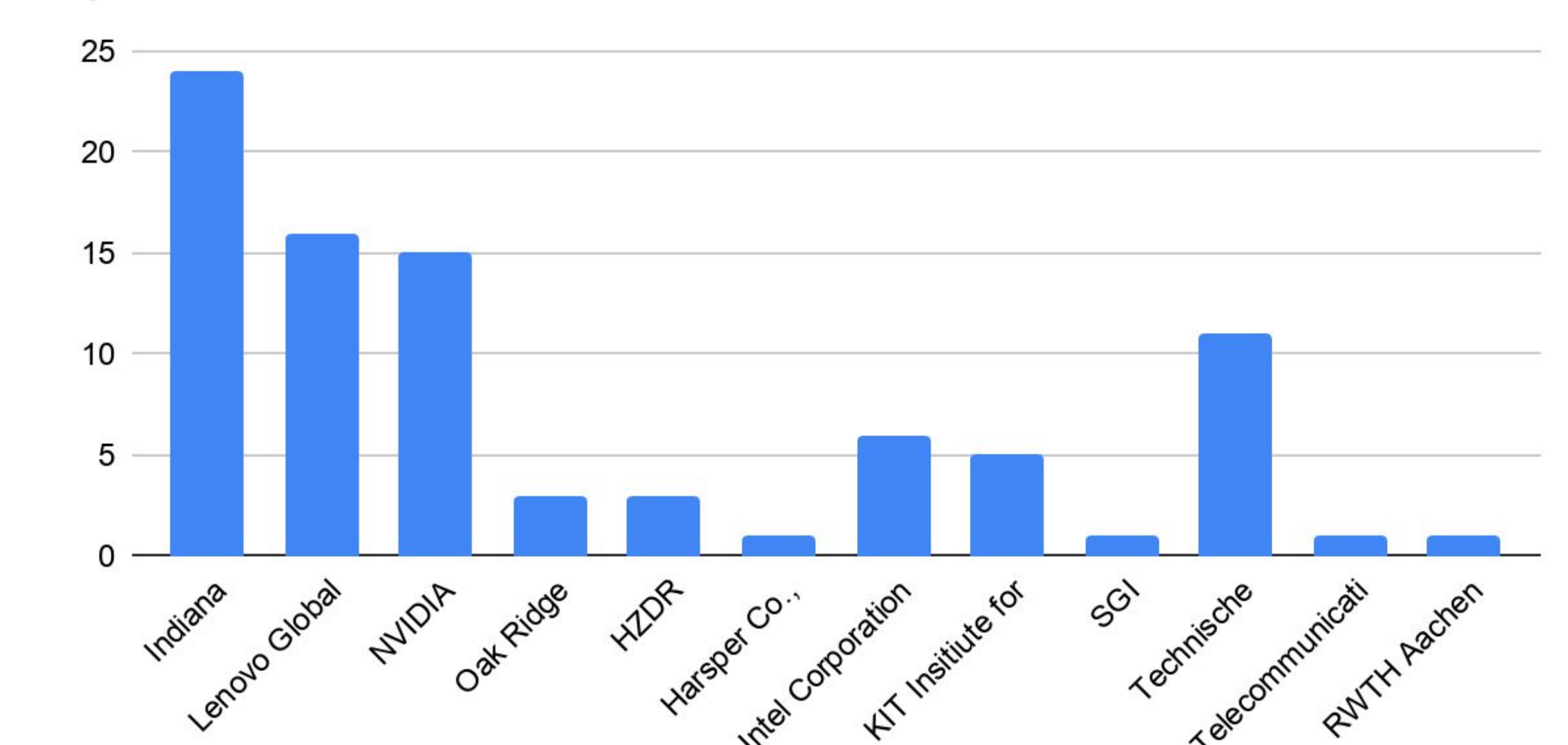
The website shows the **key specifications** of each HPC system while giving the user tools to delve deeper into each one.

Future Work

- The methods and approaches will be applied to the upcoming new benchmark suite from SPEC, i.e. **SPEC HPC2021**.
- When needed, the data can easily be tweaked through PHPPAdmin, as the data output from SPEC is not always standardized.
- More tools** for website management should be added, to allow for the website admin to easily be able to add specifications, such as Location, to each HPC system.

Test Sponsors

Sponsors that Submitted Benchmarks



- Informative graphs** could be added to the website. These graphs would provide another means to visualizing data, allowing for data to be simply compared. For example, the image above shows a graph comparing test sponsors.

Acknowledgements

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