CTNDCI: Identifying the Challenges Towards a distributed Nano Data Center Infrastructure

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ABSTRACT

In this report, we present our achievements since the last report and describe our plan for concluding the project. We started grouping the issues by categories, conducted the interview with an expert on data centers from the Leibniz Supercomputing Centre and elaboratet the issues themselves. We proceeded our work as planned. From now on, we finalize the ideas and issues.

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Authors: Team effort

KEYWORDS

Green IT; Nano data center; Energy consumption; Security; Availability; Scalability; Data distribution

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Progress Report II

ACHIEVEMENTS

We stopped our research into new papers and started analysing our available information. Hence, we separated the papers up and every team member had to read and summarize one to two papers. We used this method to produce an expert for every paper and also to inform the other team members about the important facts. The resulting summaries are the basis for some chapters in the final paper. This working part was mainly done in independent work by each team member. Since not all papers explicitly provide information about nano data centers but also about related issues, we started grouping the found issues and also began to merge the information. There is very little research available for nano data centers so that combining and drawing conclusions should be well thought out.
According to our modified project plan from the last report we conducted the interview with an expert on data centers from the Leibniz Supercomputing Center. Our drafted questionnaire was used for this task, but in the course of the interview we had to adjust the questions to the situation and answers of the expert. The interview was recorded, so there is an audio file available. A transcript is in production. We also planned and organised our final paper. This included creating a table of contents and finding important chapters and topics for chapters. We also began to write the chapter about related work and similar issues.

Authors: Team effort

NEXT STEPS

Authors: Team effort

DEVIATION FROM PLAN

After the deviations presented in the last report, we proceeded our adjusted research plan. Solely, the interview plan changed somewhat, as we adapted the questionnaire to the course of the interview. Some questions didn't fit the course and we thus neglected them. Contrariwise, some questions emerged from the answers and were hence included.

Authors: Team effort

REFERENCES

[1] Inc. Cisco Systems. 2017. The Zettabyte Era: Trends and Analysis - Cisco. (07 2017). https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html#_Toc484556821 (Accessed on 11/05/2017).

[2] D. Dumitriu, E. Knightly, A. Kuzmanovic, I. Stoica, and W. Zwaenepoel. 2005. Denial-of-Service Resilience in Peer-to-Peer File Sharing Systems, Vol. 33. ACM. https://doi.org/10.1145/1071690.1064218

[3] S. Eum, Y. Shoji, M. Murata, and N. Nishinaga. 2015. Design and Implementation of ICN-enabled IEEE 802.11 Access Points As Nano Data Centers. *J. Netw. Comput. Appl.* 50, C (April 2015), 159–167. https://doi.org/10.1016/j.jnca.2014.07.031

[4] Jiayue He, Augustin Chaintreau, and Christophe Diot. 2009. A performance evaluation of scalable live video streaming with nano data centers. *Computer Networks* 53, 2 (2009), 153–167.

[5] Fatemeh Jalali, Robert Ayre, Arun Vishwanath, Kerry Hinton, Tansu Alpcan, and Rodney S. Tucker. 2014. Energy Consumption of Content Distribution from Nano Data Centers versus Centralized Data Centers. *SIGMETRICS Performance Evaluation Review* 42 (2014), 49–54.

[6] Nikolaos Laoutaris, Pablo Rodriguez, and Laurent Massoulie. 2008. ECHOS: Edge Capacity Hosting Overlays of Nano Data Centers. *SIGCOMM Comput. Commun. Rev.* 38 (Jan. 2008), 51–54. https://doi.org/10.1145/1341431.1341442

[7] Leibniz-Rechenzentrum. 2014. Green IT at Leibniz Supercomputing Centre. (02 2014). https://www.lrz.de/wir/green-it_en/ (Accessed on 11/19/2017).

[8] Darshan Mhapasekar. 2011. Accomplishing anonymity in peer to peer network. ACM. https://doi.org/10.1145/1947940.1948055

[9] Vytautas Valancius, Nikolaos Laoutaris, Laurent Massoulié, Christophe Diot, and Pablo Rodriguez. 2009. Greening the internet with nano data centers. In *CoNEXT*. ACM, 37–48.

Appendices

Questionnaire

(1) On the website of the LRZ it can be read that *Green IT* is important [7]. What has been achieved or improved so far?

(2) In 2012, the LRZ was awarded the German Data Center Award for *energy and resource efficient data centers* [7]. What makes the LRZ better on *Green IT* than other data centers?

(3) What does the LRZ offer its customers? Are there any special *Green IT* services available? Does the customer have an influence on more environmentally conscious use?
(4) Today's use of Internet services has changed massively [1]. How has the LRZ adapted accordingly?
(5) Why are the big data centers still so popular? What are the reasons/advantages? Are these political, economic or technical?
(6) Are there any disadvantages with monolithic data centers?
(7) Have you heard of an alternative solution to monolithic data centers? There are, among others, some research on nano data centers. Does the LRZ also work with these approaches? What is your opinion?
(8) In your opinion, what are the advantages and disadvantages of nano data centers?
(9) How does the LRZ see the data centers of the future? What could be possible? Is it realistic that monolithic data centers could be replaced by special peer-to-peer networks?
(10) Do you think there are any difficulties or special challenges that need to be solved in order to implement nano data centers suitable for the mass or as new state of the art? What are the difficulties oder challenges in your opinion?
(11) Do you have any idea or approach how to solve these difficulties or challenges?
(12) Would you have an idea for other alternative systems?