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University of Applied Sciences

Energieverbrauch von Live-Migrationen in OpenStack-basierten Private-Cloud-Umgebungen

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Dipl.-Inf. Christian Pape
Dipl.-Inf.(HS) Ronny Trommer

Kontext

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Forschungsprojekt: eneRZet - Improving energy efficiency in data centers by using SDN technologies, renewable energy and power management

TU Clausthal: Prof. Dr. Harald Richter
Hochschule Darmstadt: Prof. Dr. Thomas Glotzbach
Hochschule Fulda: Prof. Dr. Sebastian Rieger

Forschungsprojekt enRZet: http://www.hs-fulda.de/?id=215&L=1

Kontext

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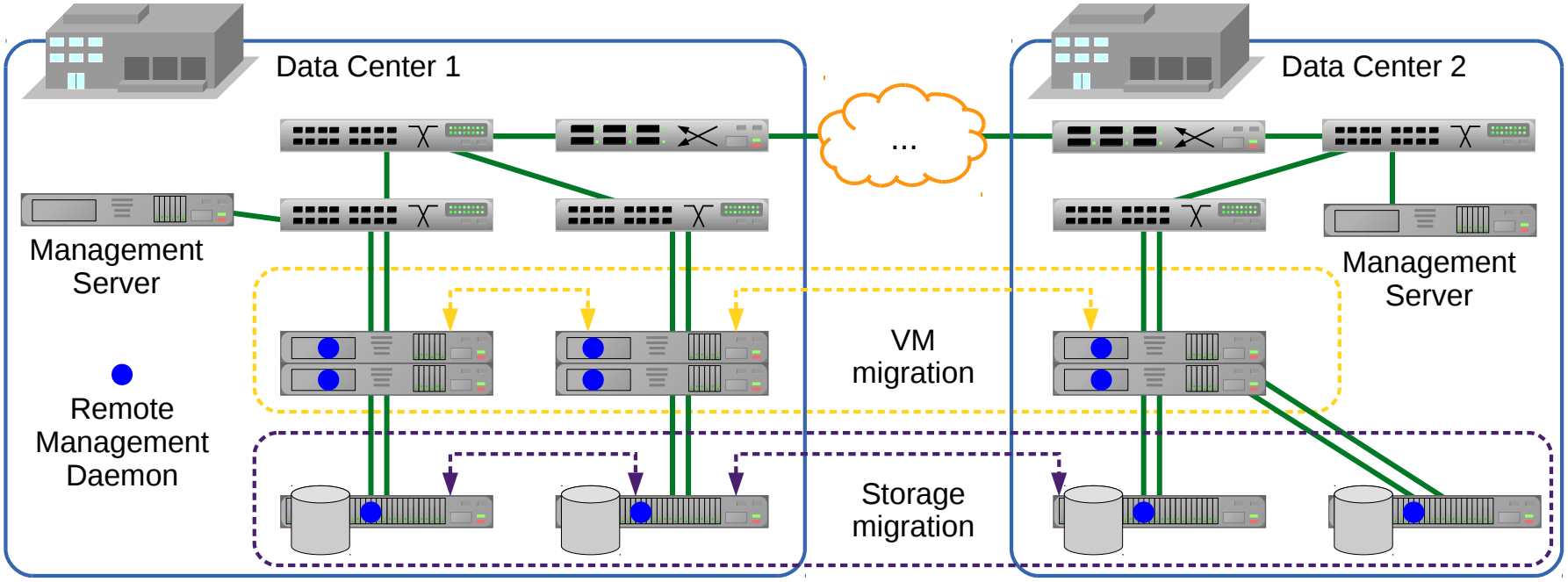

Figure 1: K. Spindler, S. Reissmann, and S. Rieger, “Enhancing the energy efficiency in enterprise clouds using compute and network power management functions,” in ICIW 2014, The Ninth International Conference on Internet and Web Applications and Services, 2014

Kontext

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- Optimierung Energie-Effizienz von Rechenzentren
- Schwerpunkt auf alternative Energien
- Ermitteln von Migrationskosten
- Projektumgebung basierend auf OpenStack
- Live-Migration von virtuellen Maschinen

Migration Strategien

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- Non-Live Migration
- Shared storage-based live migration
- Block live migration
- Volume-backed live migration

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Testaufbau

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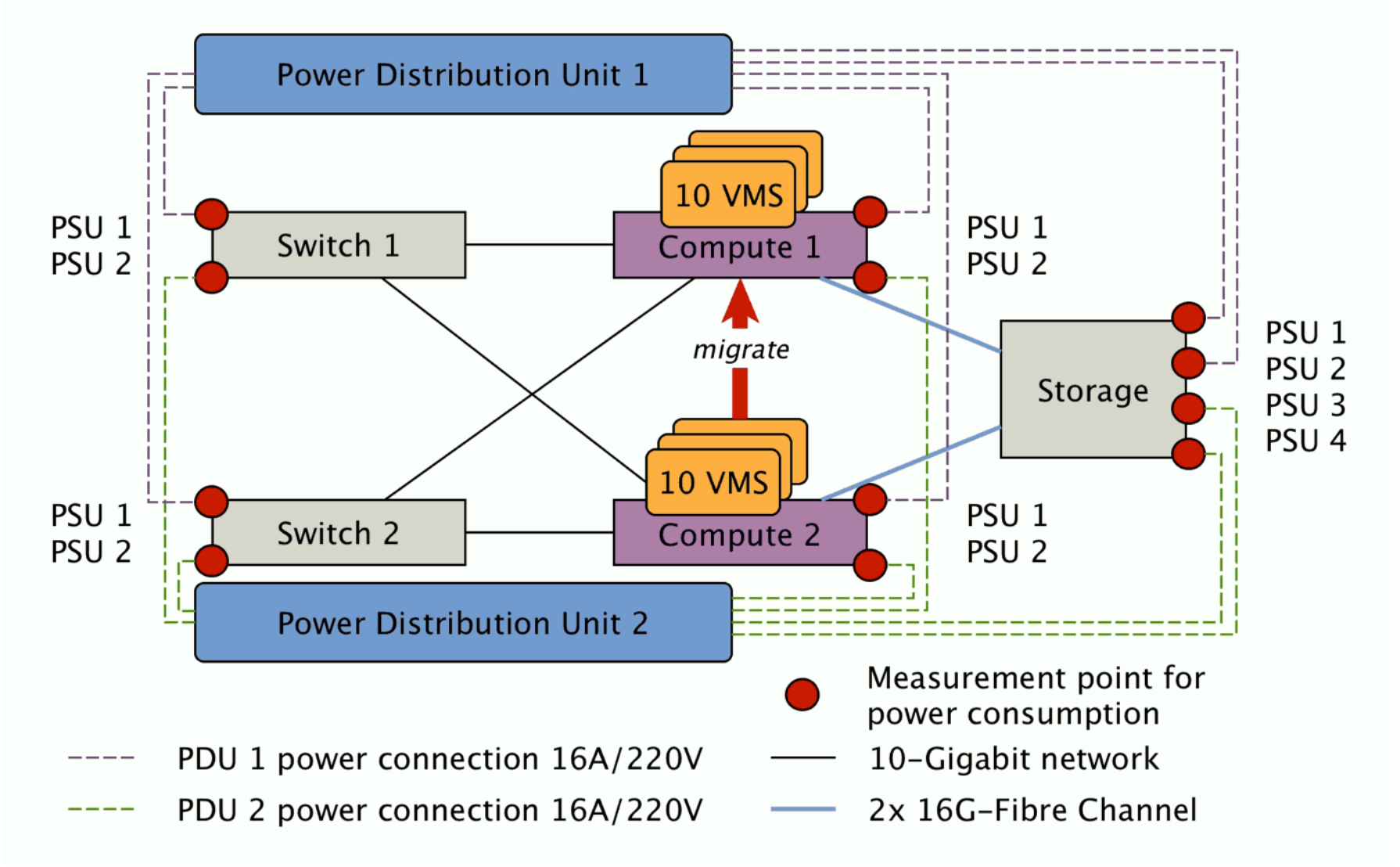

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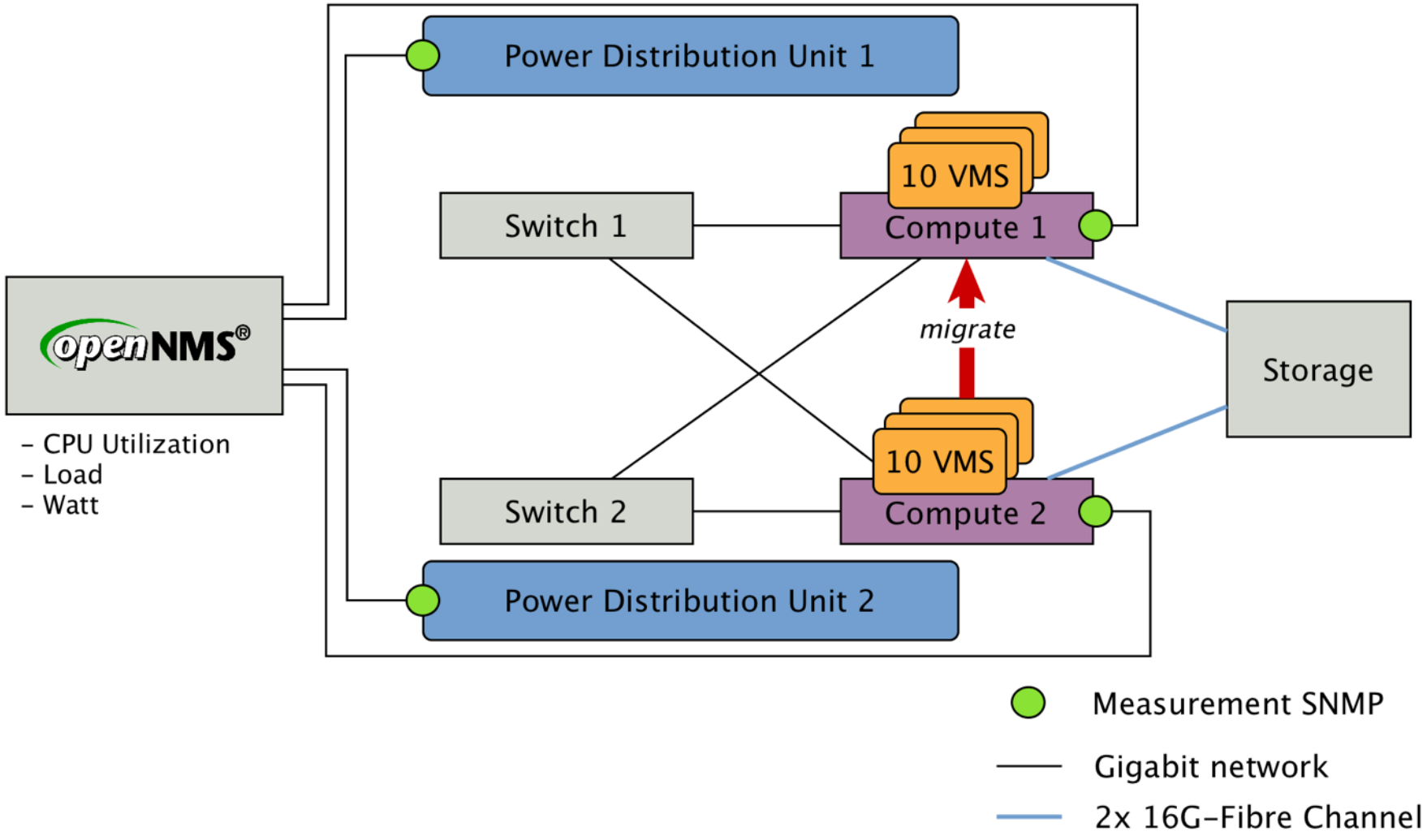

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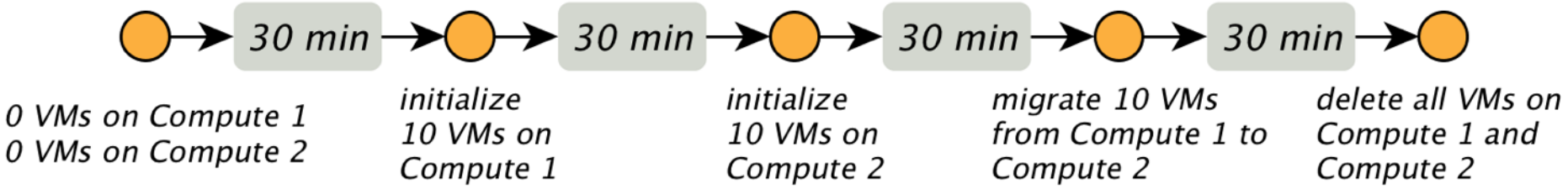

VM Profile

- m1.xsmall
- 1GB RAM
- 1 VCPU
- 10.0GB Disk

- Last Simulation
- `stress`
  I/O, Mem, CPU
- Ziellast ~80%
  CPU Utilization

Testablauf

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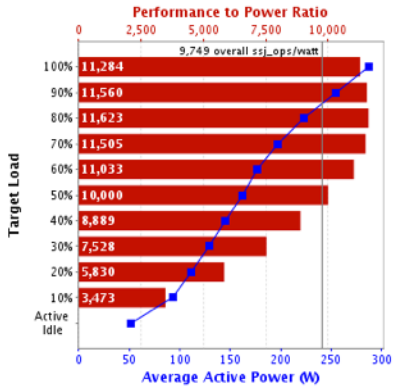
SPECpower_ssj2008

Dell Inc. PowerEdge R630 (Intel Xeon E5-2699 v3 2.30 GHz)					SPECpower_ssj2008 = 9,749 overall ssj_ops/watt
Test Sponsor:	Dell Inc.	SPEC License #:	55	Test Method:	Single Node
Tested By:	Dell Inc.	Test Location:	Round Rock, TX, USA	Test Date:	Mar 13, 2015
Hardware Availability:	Apr-2015	Software Availability:	Jun-2013	Publication:	Apr 1, 2015
System Source:	Single Supplier	System Designation:	Server	Power Provisioning:	Line-powered

Benchmark Results Summary

Performance			Power	Performance to Power Ratio
Target Load	Actual Load	ssj_ops	Average Active Power (W)	
100%	100.1%	3,240,418	287	11,284
90%	91.0%	2,946,465	255	11,560
80%	80.2%	2,594,563	223	11,623
70%	69.9%	2,261,881	197	11,505
60%	60.2%	1,947,214	176	11,033
50%	49.9%	1,615,345	162	10,000
40%	40.0%	1,294,673	146	8,889
30%	30.0%	970,456	129	7,528
20%	20.0%	648,195	111	5,830
10%	10.0%	324,418	93.4	3,473
	Active Idle	0	51.2	0
			Σssj_ops / Σpower =	9,749



SPECpower_ssj2008: https://www.spec.org/power_ssj2008/results/res2015q2/power_ssj2008-20150317-00691.html

Testablauf

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Ergebnisse

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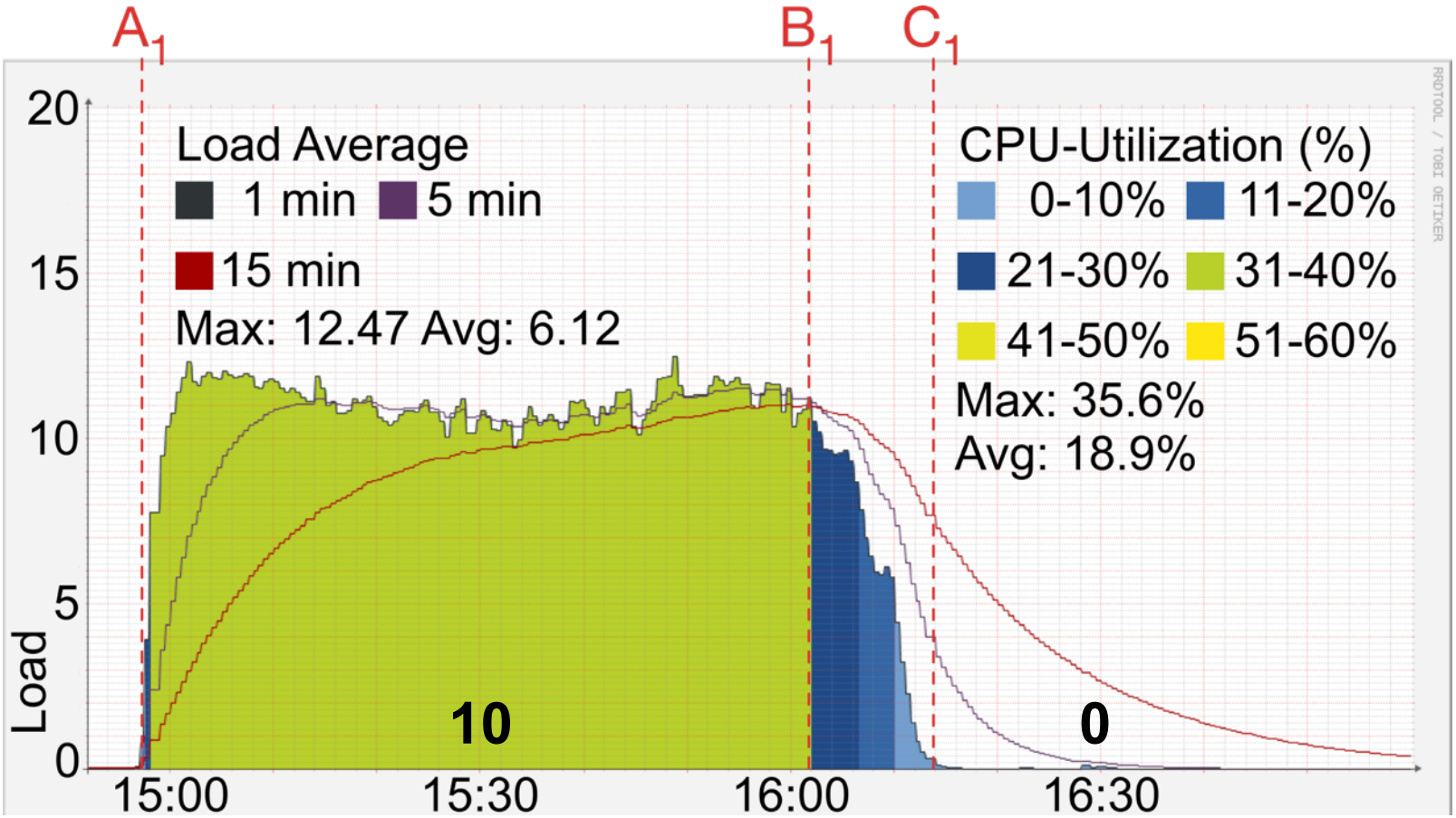

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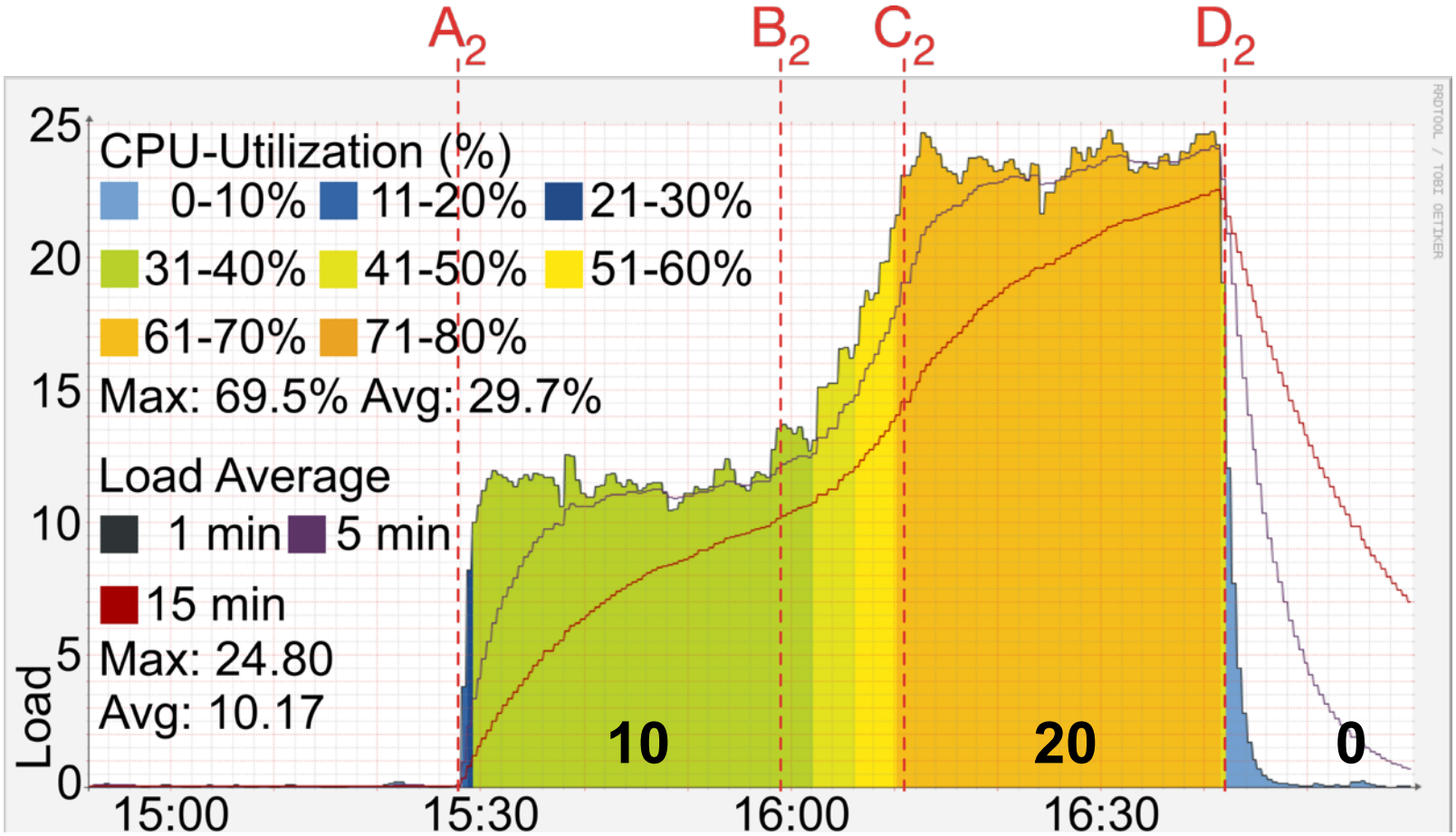

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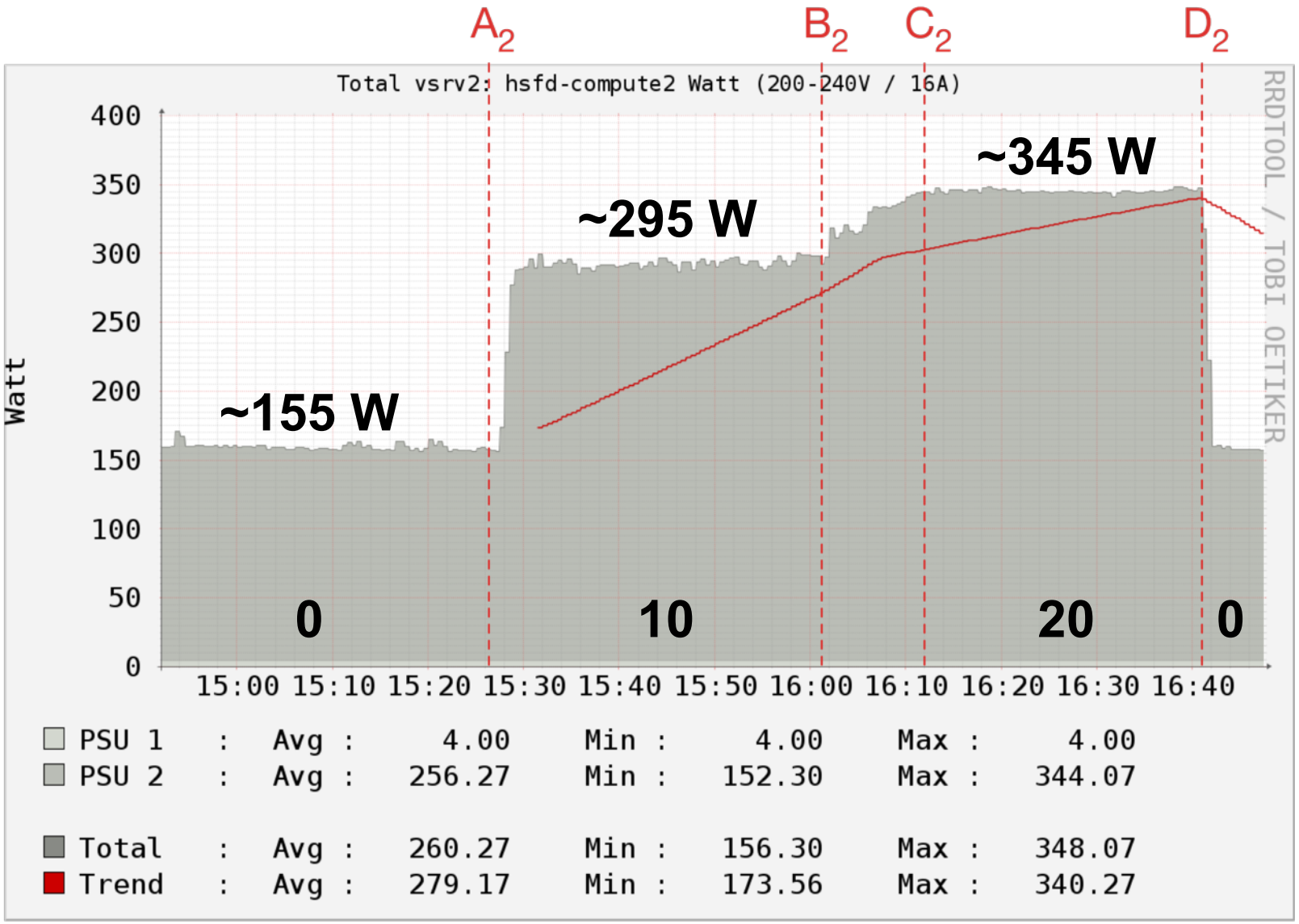

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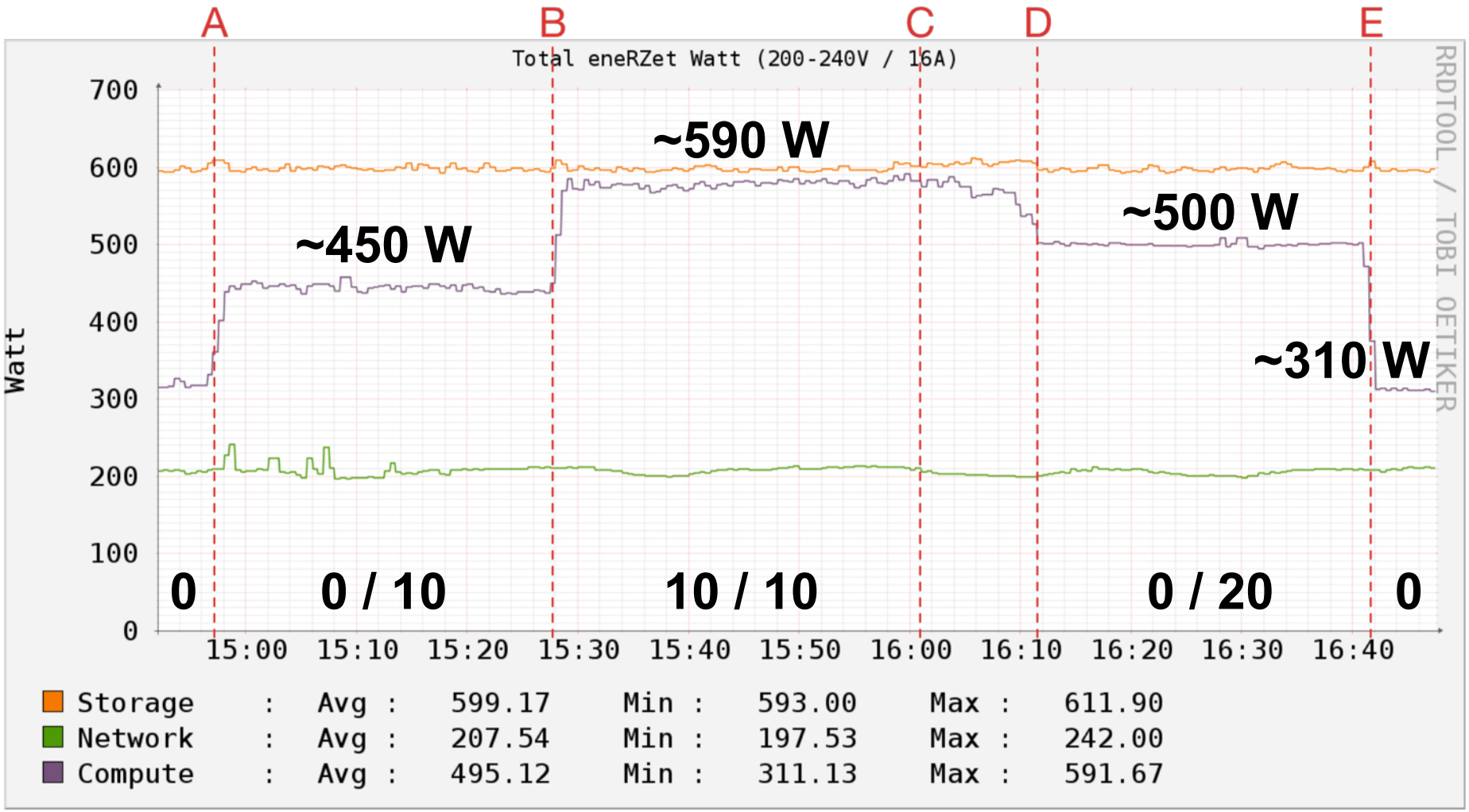

Fazit

- Server: Leistungsaufnahme lastabhängig
- Netzwerk: Leistungsaufnahme nicht lastabhängig
- Storage: Leistungsaufnahme nicht lastabhängig
- Während der Migration keine erhöhte CPU Last / Load, keine höhere Leistungsaufnahme bei Netz- und Storage-Komponenten

Ausblick

- Ersetzen der Last-Simulation von stress mit echtem Service
- Erweiterung der Tests im Hinblick auf der Dienstgüte
    - Anzahl Anfragen pro Sekunde
    - Antwortzeit eines Dienstes
- Gegenüberstellung VM / LXC