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Considerations on Datacenter Sustainability

Chris Adams, EMEA Principal Architect

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- Sustainability as a critical element for any organization
- ICT sector dual responsibility
- Cisco sustainability: strategic direction, programs and initiatives
- Cisco compute sustainability
- Cisco cloud networking sustainability





Sustainability

Moving up the boardroom agenda

- Limiting global warming to 1.5 °C calls for world CO₂ emissions to be reduced by 43% before 2030 and achieve net-zero by 2050 ¹
- Many companies now embracing a net-zero strategy, and this is often reflected in CEO bonus²
- ICT sector (datacenters, networks, user devices) generates 4% of global GHG emissions, 2x aviation sector, on a different trend ³
- ICT sector has a dual responsibility: decrease its own emissions and overcompensate by delivering incremental savings elsewhere ⁴
- Global e-waste of 74 Mt by 2030, 2x from 2014. Only 17.4 per cent recycled. Disposed high-value raw materials valued at \$57B+ 5
- Sustainability and Circular Economy: two faces of the same coin.
- Visibility, measurement, actions: it is now or never!
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- 1- source: IPCC report, April 2022
- 2- source: Perillon blog, April 2021
- 3- source: BCG, June 2021
- 4- source: Sciencedirect, 2021
- 5- source: Global e-waste monitor, 2020



Why Now?

	Urgent global problem How can ICT help?	"Transitioning to a is one of the grea	80% Companies now reporting on sustainability	
i	Customer, investor & employee pressure	humankind has fa		
	Legislation, reporting standards, scrutiny	131 countries with a Net Zero target	Important purchasing factor for consumers	Hiring criteria for 40% of millennials
\$	Business efficiencies & new opportunities		6/%	Ø





How To Change The Status Quo



- International agreements and regulations Climate Change Conference in Paris 2015, focus on 1.5 °C pathway ...COP26 (Glasgow), COP27 (Egypt)... Impose limits by law
- Proposals from experts

Make those polluting the environment pay Move taxation from income to CO2 emissions The "Ville du quart d'heure"

 Grass-roots citizen movements Global Citizen's Climate Action Now, Fridays for Future, Greenpeace, climate quitters, individual commitment

Actions on a different timescale:

- Lifestyle change, save energy, reduce waste
- Improve energy efficiency of products, incorporate circular design principles
- Change the way we produce energy, abandon fossil fuel





Green IT: Real or Fake?

- Endless hunting for environmentally sustainable computing solutions
- Use of renewable energy
- Digital transformation, global sustainability and healthy economy



User Devices

37%

Networks 14%

Putting ICT In Perspective

Global GHG emissions 60 Billion tonnes

Digital = ICT + Entertainment & Media 1.4 Billion tonnes CO2e (~2.5% Total)



Source: Berners-Lee (2020), Malmodin (2018), Andrae (2019)





ICT Dual Responsibility

A Negative Calories "Food" for Sustainability



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Energy Consumption Now A Key Concern

Energy consumption can represent up to 30% of IT datacenter costs





https://www.arcserve.com/blog/data-centers-what-are-costs-ownership https://newsroom.cisco.com/c/r/newsroom/en/us/a/y2023/m06/at-cisco-live-a-journey-to-sustainability.html Numbers vary depending on datacenter location, mixed building vs pure datacenter, year and cost of energy

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The Four Pillars of IT Operational Efficiency

$$IT_{energy_eff} = \frac{IT \ work}{Energy}$$

Key contributors:

- Product energy efficiency
- Product utilization level
- Energy proportionality
- Service uptime







Sustainability Is Not Just Energy Efficiency



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Cisco 5S Development Strategy

Digital transformation requires a new and modern approach to innovation



Sustainability is one of Cisco top development strategies



Cisco's Targets: Continued Journey To Net Zero





Cisco Sustainable Product Design Guidelines



Double down on power efficiency



Modularity, reliability, repairability and extended lifetime



Incorporate circularity principles in product design (100% by 2025)

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Compliance and eco-certifications



Committed to 100% product return, no e-waste



Software-driven IT assets optimizations



Data-driven sustainability approach and tooling



Partner enablement, certifications and sales programs around sustainability



Rethinking recycling: plastic reduction in products and packaging, recycled plastic



Sustainable Computing Makes An Impact





https://www.gartner.com/en/newsroom/press-releases/2022-12-06-how-to-make-the-data-center-eco-friendly





UCS X-Series Sustainable Architecture Reducing materials, innovating with cooling and power distribution



Cloud-based MaaS





Cisco M7 Energy Efficiency Optimizations

- Higher workload consolidation leads to energy, footprint and TCO savings
 - Technological improvements, higher core count, scalable GPU support, PCIe 5.0
- Optimized heat sinks and overall airflow design
 - Supports top bin CPUs with no memory limitations
 - Postpone liquid cooling adoption with air cooling efficiency
- DDR5 memory enhanced performance and power efficiency
 - Higher bandwidth facilitates consolidation, 30% higher power efficiency
- Intel 4th Gen Xeon Scalable Processors improved energy profile
 - Application accelerators: boost performance at the same power level for selected workloads
- New BIOS-level power saving mode, configurable by policy with Intersight or UCSM
 - Leverage Optimized Power Mode: tangible power savings with minimal performance impact



Sustainable Computing w/ Optimized Power Mode

- OPM is a new BIOS-level capability that can be enabled on UCS M7 servers
- Saves significant power where it matters the most (low to medium utilization level)
- Easy button within UCSM and Intersight



Source: E6 at intel.com/processorclaims

Select workloads: SpecJBB, SPECINT and NGINX key handshake



Consolidation to M7: Impact on Sustainability



Assumed 50% load on both old and new hardware



Server Node Quantity

856,921 kWh of energy reduced

Avoiding 317 MtCO₂e

Up to 15x less hardware vs competing rack servers Significant reduction in weight and raw materials

Source: UCS power calculator and EPA conversions





The Sustainability Benefits of System Modularity Material Impact in Rack Mount Servers Lifecycle vs. Compute Nodes



Modular systems use ~40% less production raw materials:

- Assume a server lifecycle of 48 months
- Assume 3 cycles for 8 servers
- 24 rack servers require 565 Kg of raw materials
- 24 compute server nodes require 344 Kg of raw materials (infrastructure items unchanged)



Server disaggregation helps extend lifetime of modular systems and reduce **up to 66%** the annual contribution from embodied carbon

- Compute, storage, GPU, PMEM, accelerators
- Host virtually any workload
- Adapt to evolving application needs
- Better circularity and repairability



*Server weight maximums from published technical specs





Intersight Energy and Power Metrics

Now available in Intersight

- Entire Infrastructure view of power usage and history
- Default view of widgets and collected data
- More enhancements planned

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My Dashboard									
Energy & Power New Monitoring Fabric Interconnects New Monitoring Servers New Fabric Interconnects Servers HyperFlex Clusters Workload Optimizer FlexPod +									
T Add Fitter									
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Visibility & Trending Server Power Utilization

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UCS X-Series Wins The SEAL Sustainable Product Award

UCS X-Series: category winner for innovative and impactful products that are literally "purpose-built" for a sustainable future

One of the best servers in the market for customers making purchasing and deployment decisions based on sustainability benefits.

First Cisco product to receive an award for sustainability



Seal_business_sustainability_awards_2023





Selected models only

The Only Power Efficient Cloud Networking Portfolio

10%

20%

50%

100%

80.00%

80.00%

80.00%



Cisco Nexus 9000 and MDS 9000 portfolio of modular directors and fixed fabric switches

	80 PLUS	80 PLUS BRONZE	80 PLUS SILVER	80 PLUS GOLD	80 PLUS ⁻ PLATINUM	80 PLUS TITANUM
Efficiency						
ł	80 plus basic	Bronze	Silver	Gold	Platinum	Titanium
	-	-	-	-	-	90.00%

88.00%

92.00%

88.00%

85.00%

89.00%

85.00%



81.00%

85.00%

81.00%

Power efficiency by design

94.00%

96.00%

91.00%

90.00%

94.00%

91.00%





Cisco Cloud Networking

Generational improvement in efficiency

C9336C-FX2 - 36x100GE



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Silicon Photonics



QDD-**400G**-FR4-S QDD-**4X100G**-FR-S



400GE optics vs 4x100GE ports (port level consumption on silicon one with FR optics)



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Cisco Nexus Dashboard - Operate

Leverage the power of telemetry and analytics



Understand the carbon footprint of managed devices Learn about the energy sources your sites consume Get historical views and progress, including kWh and cost Integrate to Panduit and Vertiv PDUs for increased visibility¹





¹ Panduit, Vertiv integrations expected on Cisco Nexus® Dashboard 1HCY24





Innovation Driving Efficiency Gains Over 10 years Storage Networking with MDS 9000 Series

gCO₂e/TB emissions



Reduce CO₂e emissions by approximately 92%* compared to previous solutions

Notable milestones



- 1. Visualize real-time environmental data
- 2. Improve ASIC efficiency at each iteration
- 3. Include energy optimizations by software

*Source: Cisco calculations



Example: MDS 9220i

Sustainability Topic	Reference
Information on product-material-content laws and regulations	<u>Materials</u>
Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
Information on product takeback and reuse program	Cisco Takeback and Reuse Program In FY21, we reused and recycled 99.9% of what was returned to us.
Sustainability Inquiries	Contact: csr inquiries@cisco.com
Product packaging weight and materials	Contact: environment@cisco.com
Size and Weights	Table 2. Product specifications
Power consumption	Table 2. Product specifications

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Sustainable Optical Networking

Extended Reach Optics



- Save raw materials of external optical transport solutions, cutting weight by up to 95%
- Cut power consumption by up to 80% in the optical layer by using DCO
- Backward compatibility with existing switches
- Multiple speeds and distances supported

100G Single Lambda and Breakout



- Split high-speed signals with optical breakout cables, patch panels as alternative to breakout cables
- Upgrade your network when needed, reuse of 100G single lambda optics while connecting to 400G ports
- Reuse of lower speed optics inside 400G switches
- Save 6 watts while going 400G vs 4x 100G



Case Study: ClusterPower



Who

 ClusterPower owns and operates the first Tier III data center in Romania

Challenges

- Establish Romania's first hyperscale data center
- Improve sustainability with green energy
- Support the largest and highest performance digital projects and workloads

Solution

 Cisco UCS X-Series Modular System

About Cisco / Case Studies and Customer Stories /

- Cisco Application Centric Infrastructure (ACI)
- Cisco Intersight cloud operations platform

Results

ClusterPower Advances IT Sustainability Romania's first hyperscale data center is powered by green energy.

- Built Southeastern Europe's first Tier III data center
- Achieved a Power Usage Effectiveness (PUE) rating of 1.1
- Created a blueprint for regional expansion

Source: https://www.cisco.com/c/en/us/about/case-studies-customer-success-stories/clusterpower.html



Datacenter Sustainability with Cisco Technologies

Cloud Infrastructure and Software Group



The why

- We must limit temperature increase at 1.5 °C
- 83% of companies have sustainability as one of top criteria for IT buying decisions
- CIOs rely on infrastructure vendors to help them meet their ESG goals
- High energy cost, scarcity of raw materials

Cisco ambitious sustainability goals

- Net zero by 2040 (SBTi validated)
- 90% reduction for Scope 1 and 2 GHG emissions by 2030
- 50% plastic recycled by 2025
- 98% reuse/recycle of take-back IT assets
- Helping customers decarbonize their supply chain



Sustainability programs

- Cisco Refresh
- Cisco Green Pay
- Send IT back
- Cisco Plus
- Environmental Sustainability Specialization
- Sustainability Black Belt Academy training

Where power goed

Digitization of industries Sustainability programs

UCS X series

Nexus and MDS

Silicon photonics

Nexus Dashboard, Intersight

Meraki sensors for datacenter



Cisco IT sustainability framework

- 100% renewable energy in US, 72% at worldwide level
- Growing on-site solar panels (~1.8MW), planning for 10MW
- 38% less datacenters, 40% reduced monthly power capacity
- 27% power reduction per VM
- 90% patch cables recertified
- 1,813 Cisco UCS servers sold for reuse
- Infrared scanning to identify heat leakages



DCI Platform

DWDM Syste

Short Reach Optic



xWDM Optics





Testimonial

- Cisco on Cisco: Cisco IT sustainability framework
- Partnership: BT and Cisco expand business e-waste takeback service
- Case study: WPP
- Case study: ClusterPower

"Transitioning to a net-zero world is one of the greatest challenges humankind has faced"

"We urgently need every business, investor, city, state and region to walk the talk on their net zero promises. We cannot afford slow movers, fake movers or any form of greenwashing" António Guterres, UN Secretary General

ADDG Bast

Fully utilized

400G port

New Host

4x 100G

Duplex

Single-mode fiber

100G Ports

Each 100G port

fully utilized

Legacy Host

"We expect to see annual energy and $\rm CO_2$ savings between 15% and 50% per year"

Chris Hyder, Enterprise Architect, WPP

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Thank you

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