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DUTCH DATA CENTER ASSOCIATION

e-Quest

Stijn Grove
Managing Director
Dutch Data Center Association

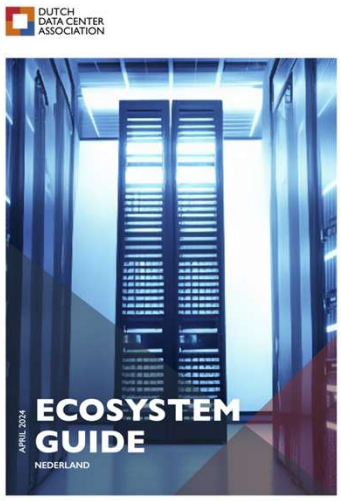
www.dutchdatacenters.nl

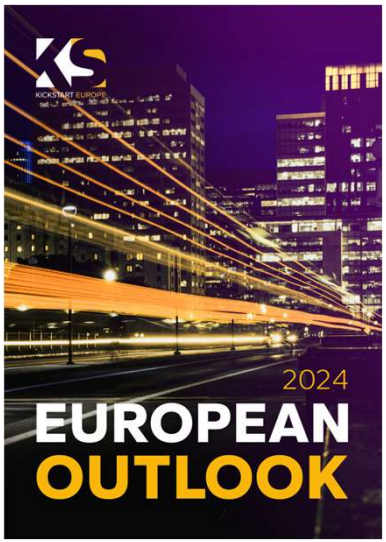
DDA : National Trade organisation for Data Centers

We represent 90+% of the national data center capacity
Activities: Public Affairs work and Promotion & Marketing
Focus: Energy & Sustainability, Education & Employment, Digital Economy and Resilience
Established: 2014, 10 FTE
Member of EUDCA
Member of EU & National Working Group on DC Standards
KickStart Europe, Green Data Center Conference, Touch Down
Datacentered magazine, Data Center Platform
2022: Start of BDIA in Belgium, DigitalX

"Our mission is to grow the sector in a sustainable, healthy, and stable manner"

DDA : National Trade organisation for Data Centers





www.dutchdatacenters.nl

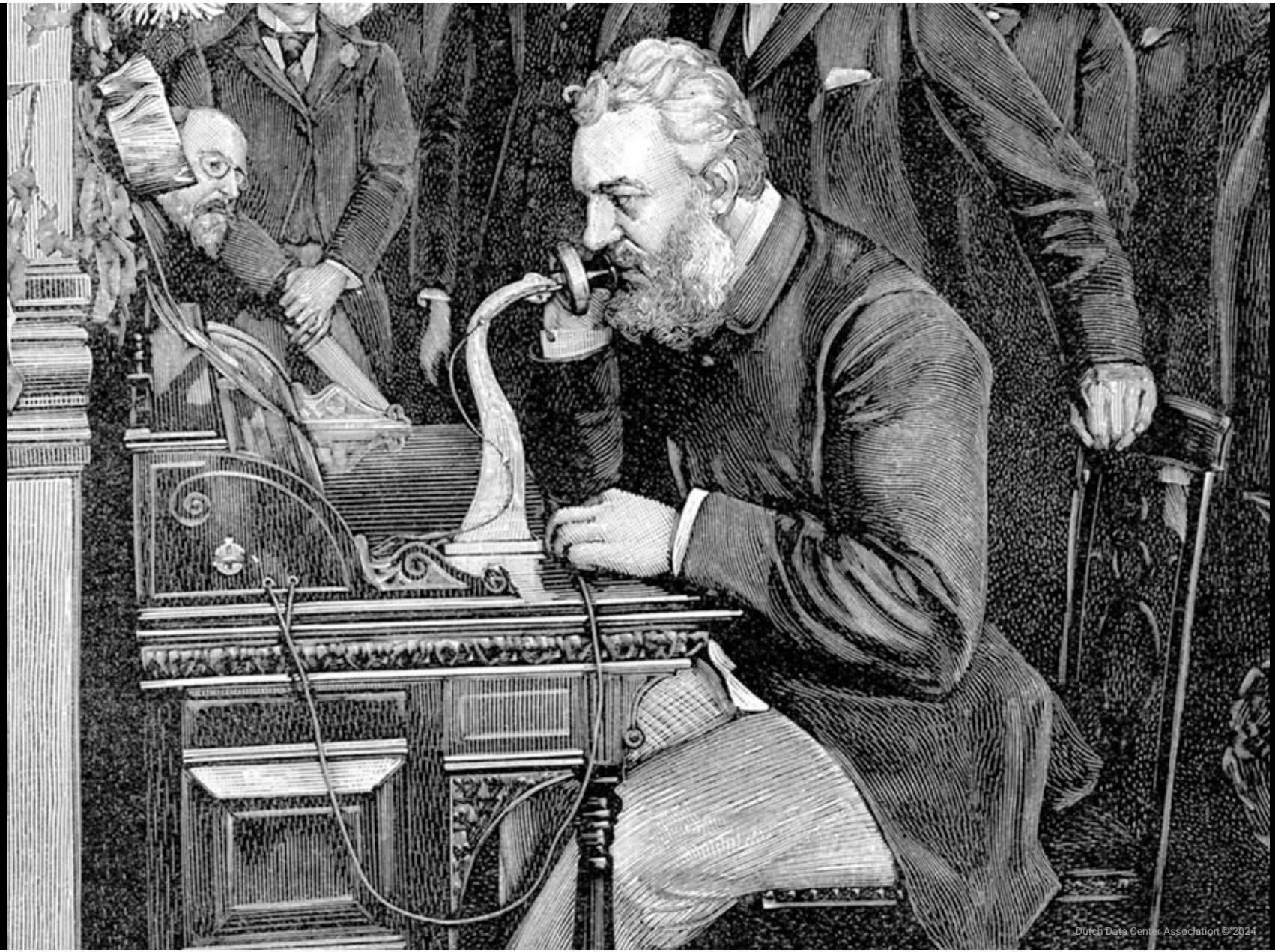
Every minute…

Users now submit 6,944 ChatGPT prompts

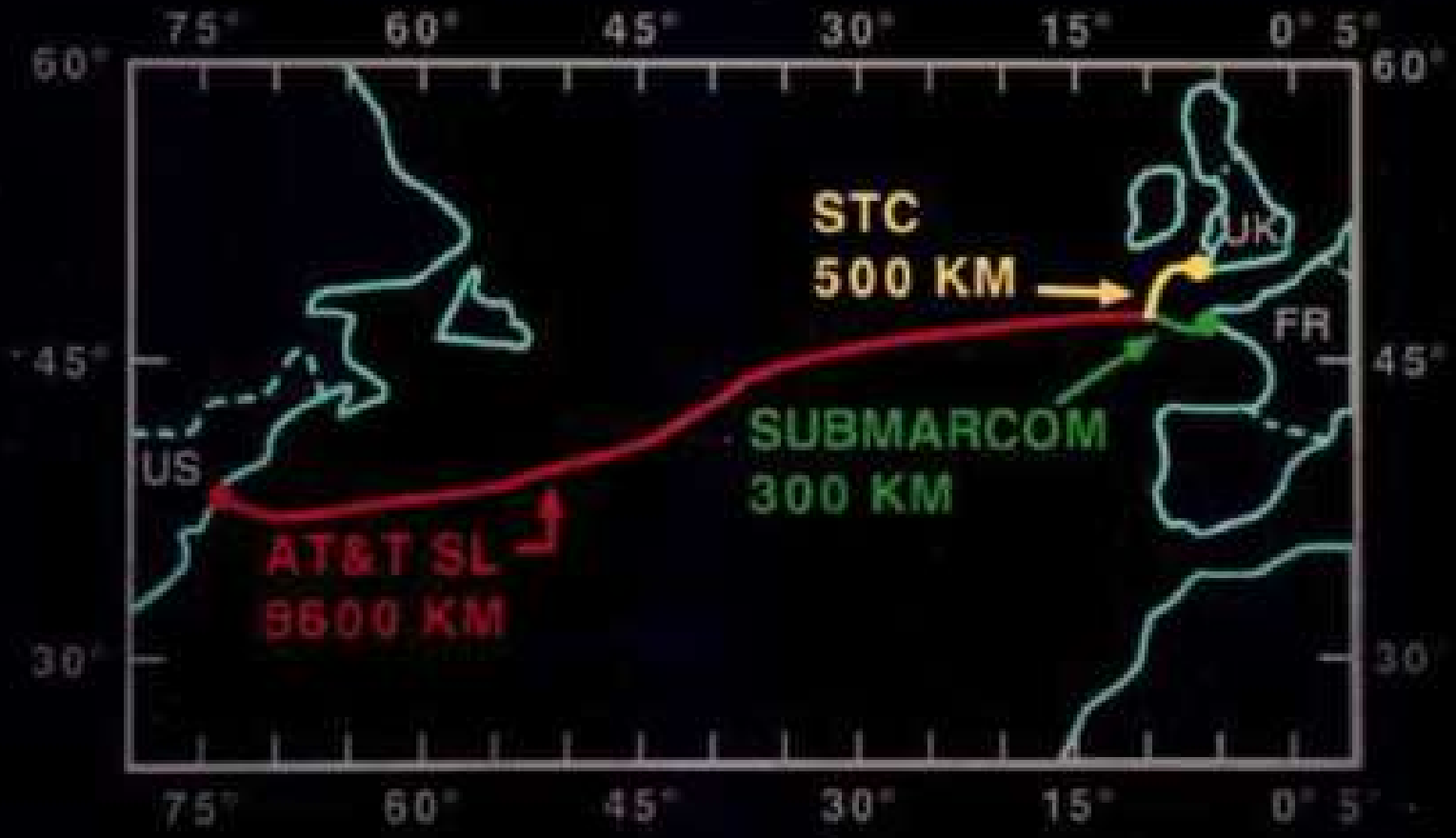
for 526.600 minutes a year

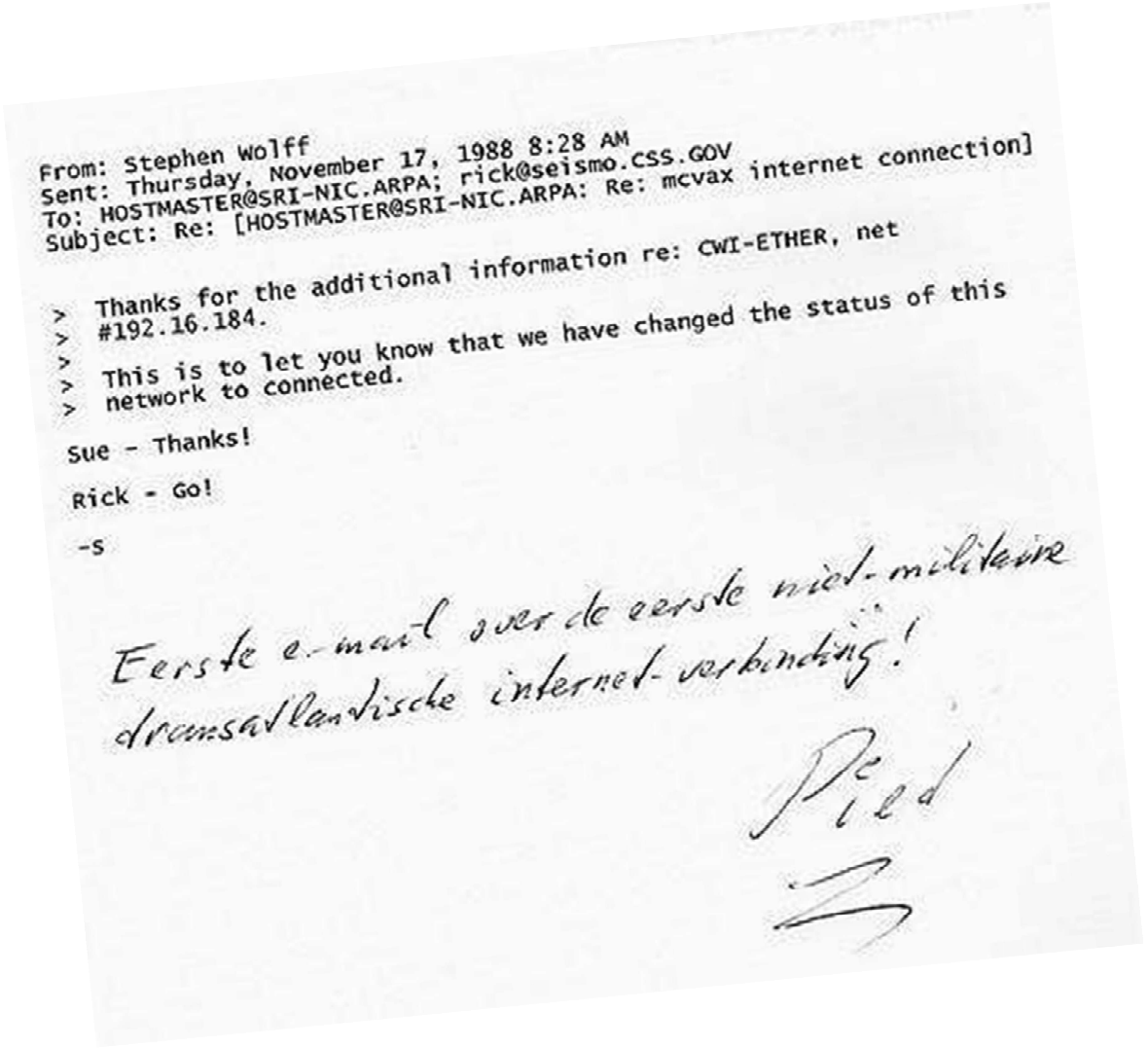
By 2025, it's estimated that 463 exabytes of data will be created each day globally – that's the equivalent of 212,765,957 DVDs per day!

This is 181 zettabytes per year!



TAT 8 TRANSATLANTIC SYSTEM





From: Stephen Wolff
Sent: Thursday, November 17, 1988 8:28 AM
To: HOSTMASTER@SRI-NIC.ARPA; rick@seismo.CSS.GOV
Subject: Re: [HOSTMASTER@SRI-NIC.ARPA: Re: mcvax internet connection]

> Thanks for the additional information re: CWI-ETHER, net
> #192.16.184.
>
> This is to let you know that we have changed the status of this
> network to connected.

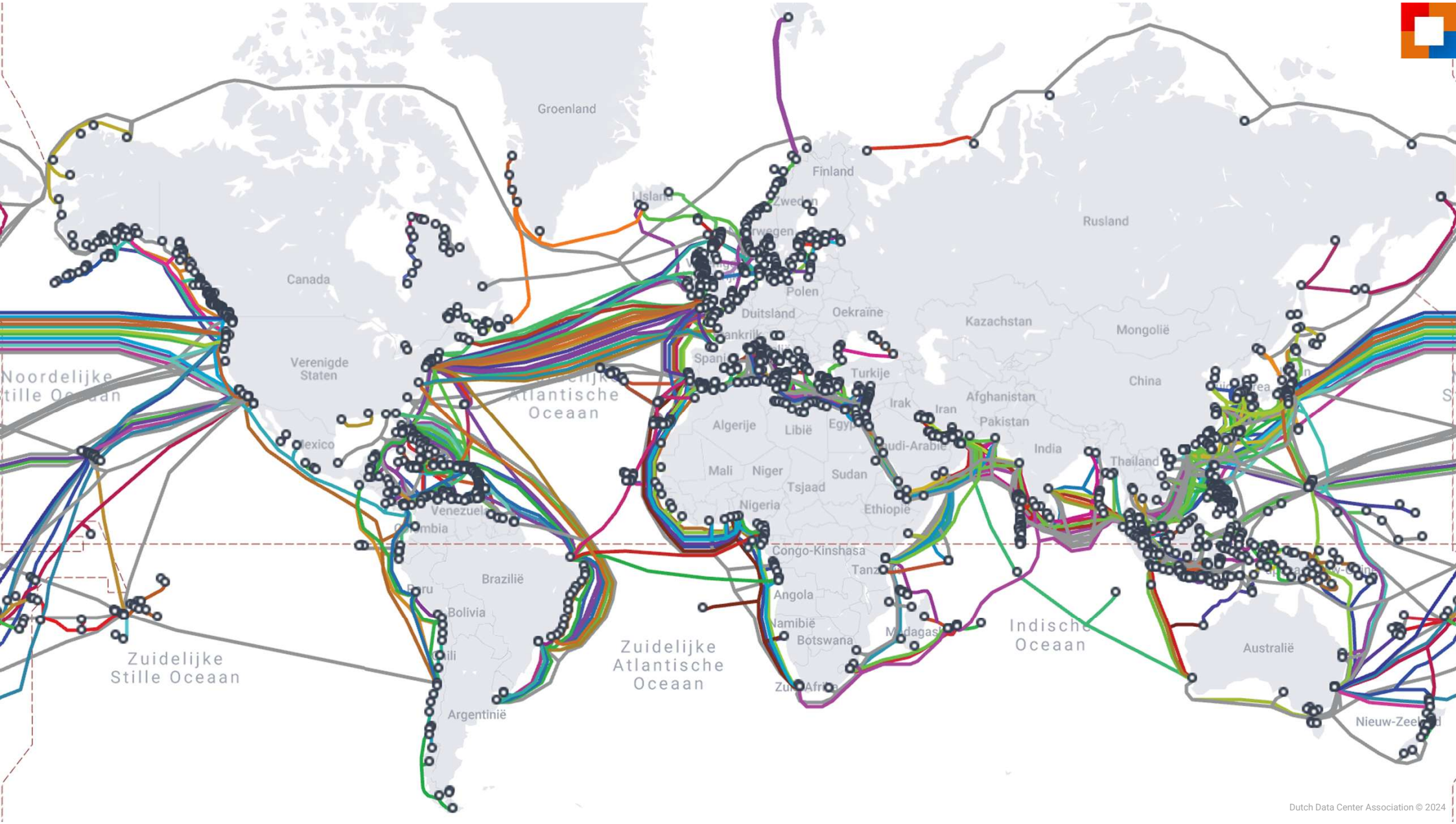
Sue - Thanks!

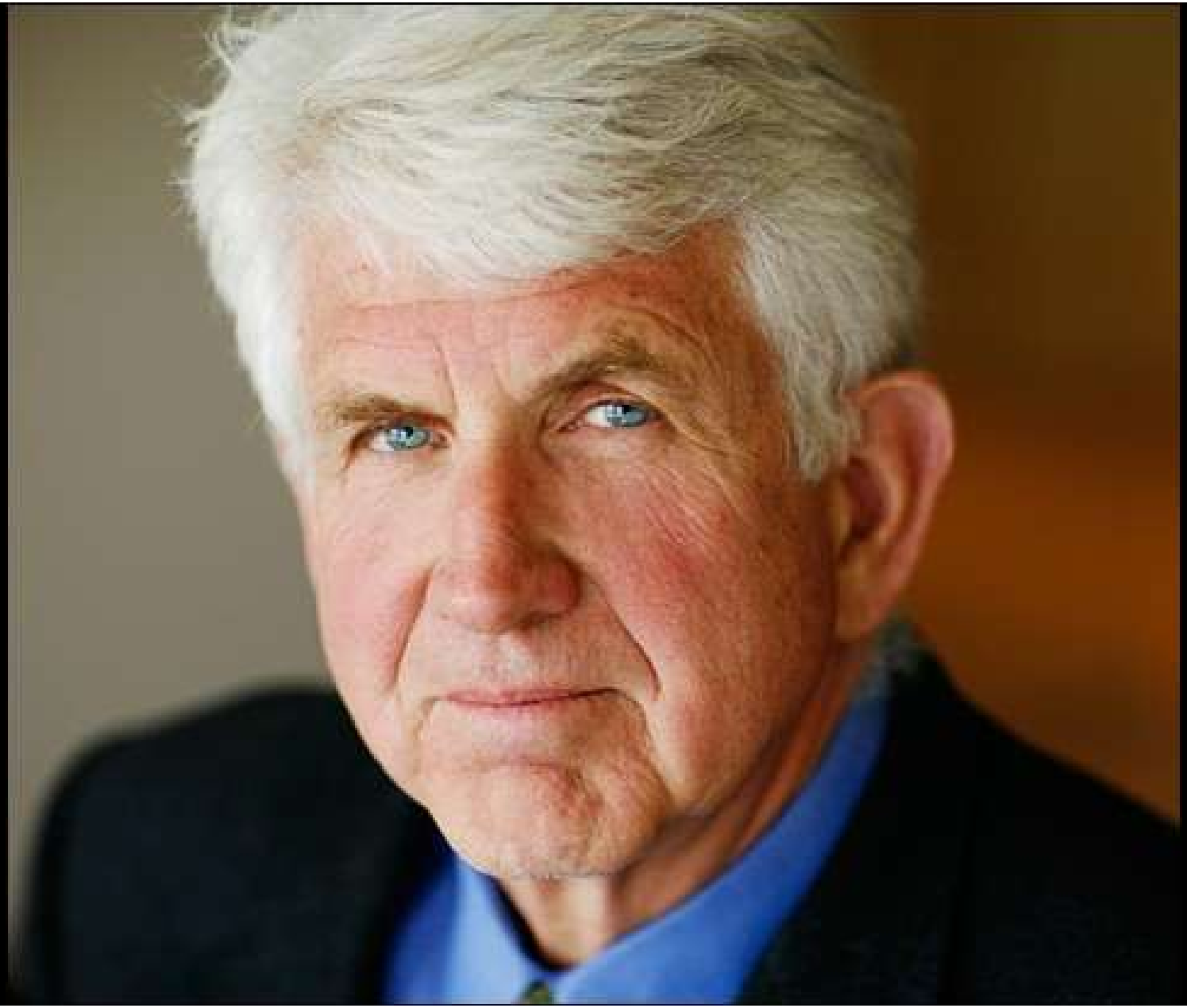
Rick - Go!

-S

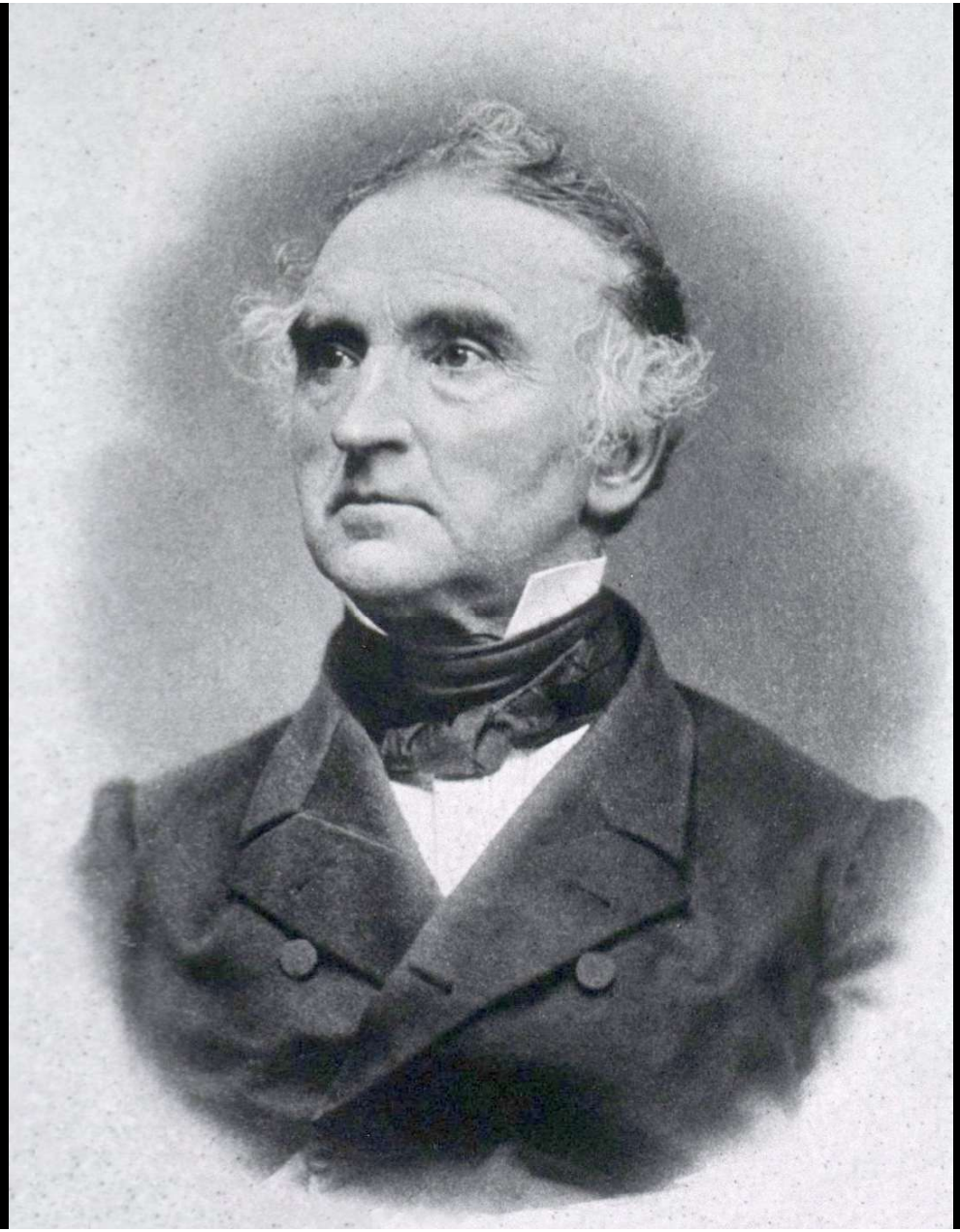
Eerste e-mail over de eerste niet-militaire
transatlantische internet-verbinding!

Piet



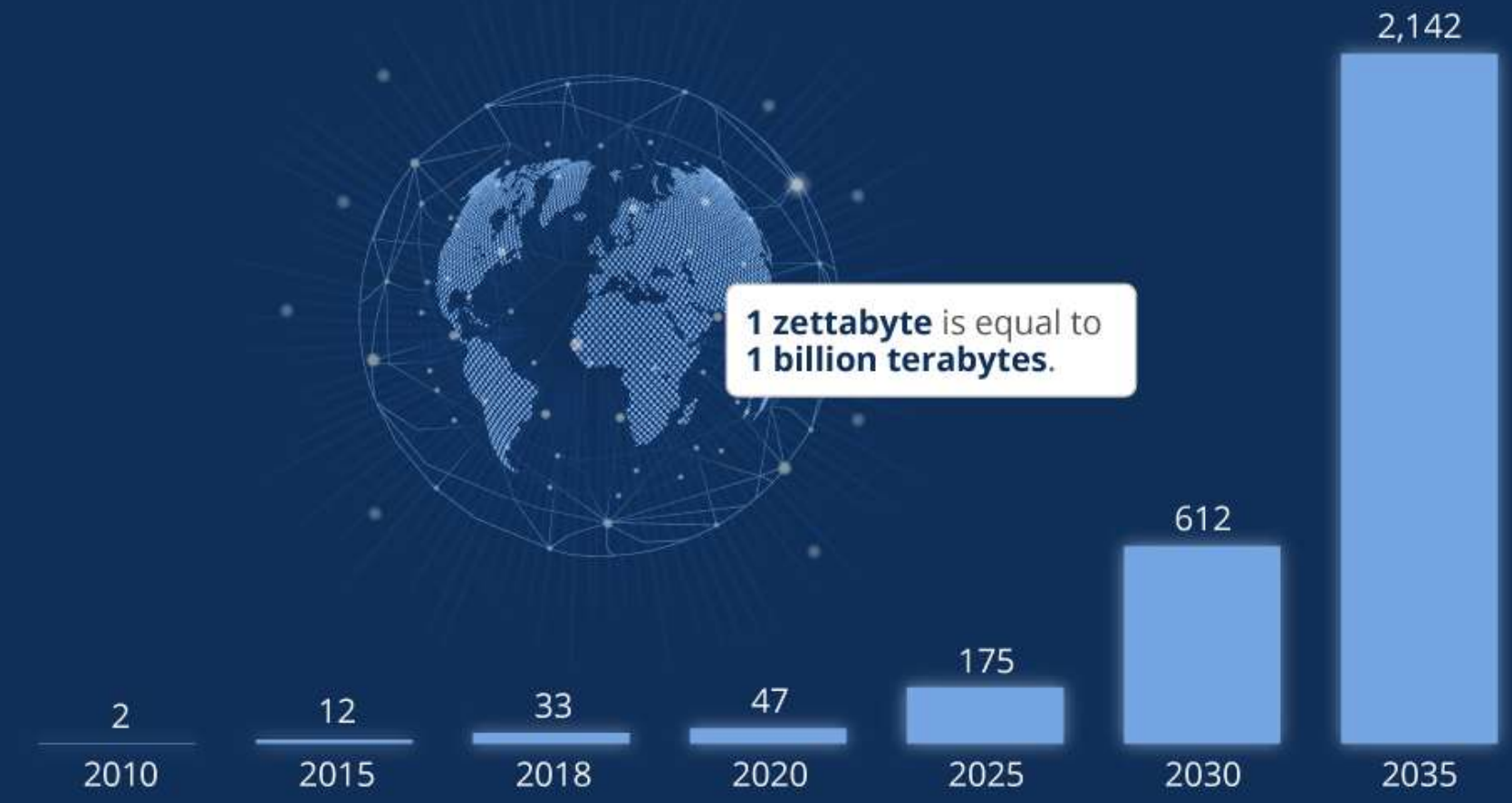



Dutch Data Center Association © 2024

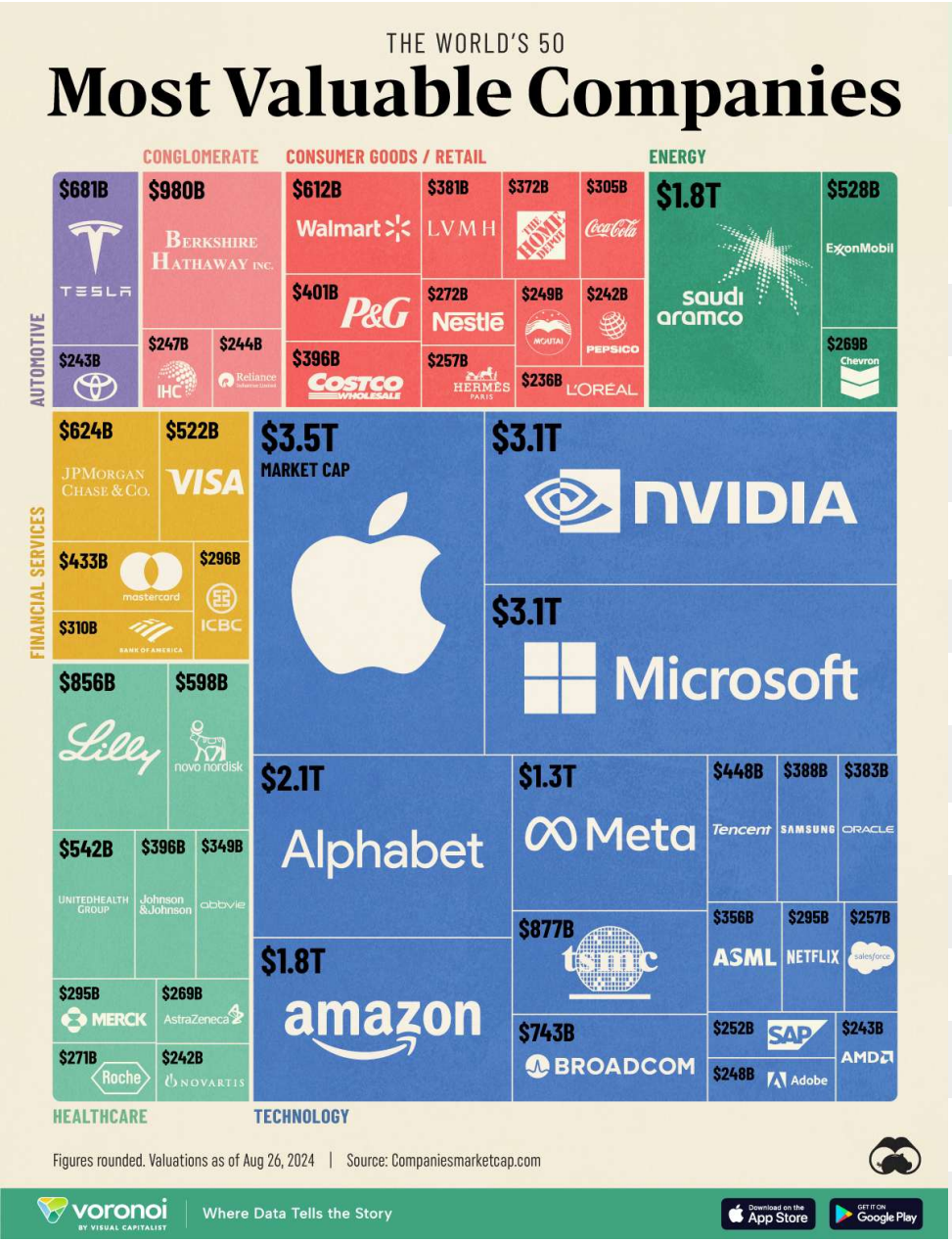


Global Data Creation is About to Explode

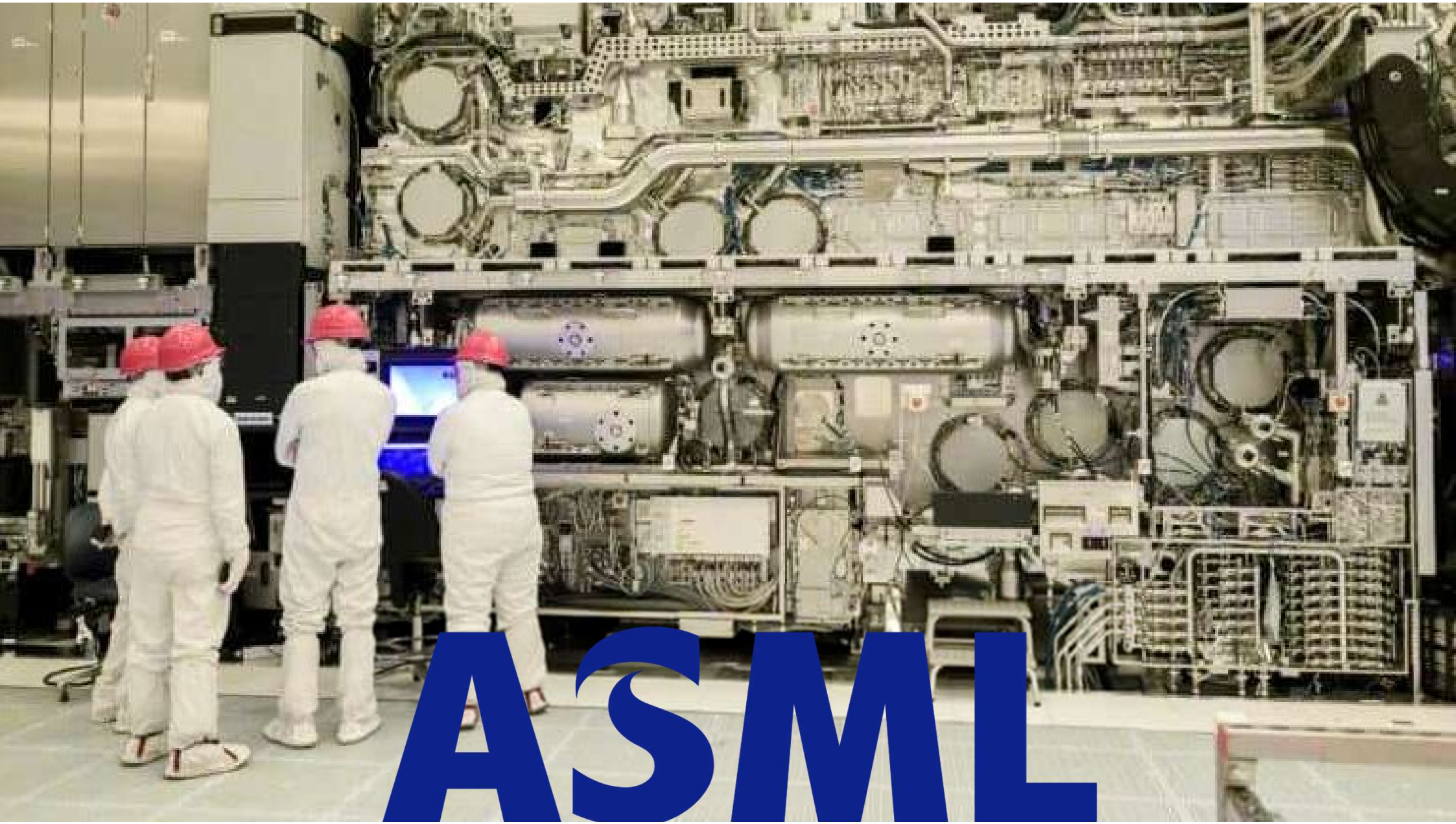
Actual and forecast amount of data created worldwide 2010-2035 (in zettabytes)



Source: Statista Digital Economy Compass 2019



Rank	Company	Industry	Market Cap ($B)
1	US Apple	Technology	$3,454
2	US NVIDIA	Technology	$3,111
3	US Microsoft	Technology	$3,073
4	US Alphabet	Technology	$2,055
5	US Amazon	Technology	$1,842
6	SA Saudi Aramco	Energy	$1,803
7	US Meta	Technology	$1,318
8	US Berkshire Hathaway	Conglomerate	$980
9	TW TSMC	Technology	$877
10	US Eli Lilly	Healthcare	$856
11	US Broadcom	Technology	$743
12	US Tesla	Automotive	$681
13	US JPMorgan Chase	Financial Services	$624
14	US Walmart	Consumer Goods	$612
15	DK Novo Nordisk	Healthcare	$598


ASML

	Rank	Name	Market Cap	Price	Today	Price (30 days)	Country
☆	1	Novo Nordisk NVO	$499.24 B	$109.72	1.98%		Denmark
☆	2	LVMH MC.PA	$330.22 B	$657.00	0.64%		France
☆	3	SAP SAP	$272.71 B	$232.83	0.12%		Germany
☆	4	ASML ASML	$268.37 B	$671.16	0.53%		Netherlands
☆	5	Hermès RMS.PA	$237.32 B	$2,253	0.19%		France
☆	6	Accenture ACN	$214.88 B	$343.90	0.51%		Ireland
☆	7	L'Oréal OR.PA	$202.37 B	$376.89	0.41%		France
☆	8	Prosus PRX.AS	$188.58 B	$43.16	1.51%		Netherlands
☆	9	Inditex IDEXY	$176.32 B	$28.32	0.35%		Spain
☆	10	Siemens SIE.DE	$156.37 B	$199.65	1.04%		Germany

Draghi report

Innovation, Decarbonization, Competitiveness, and Security


FACTS

Our **new economy** is impossible without **new foundation**

New Economy = Open, Inclusive, Socially Conscious, Sustainable & Digital

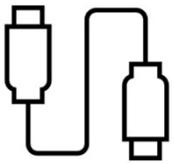
Over the past 20 years, digitization has become the main driver of progress and growth. This role is becoming increasingly important.

IDC expects that this year about 65% of the global economy (the GDP) will be digitized.

A strong digital infrastructure is essential for continued competitiveness, innovation and growth of our economy.

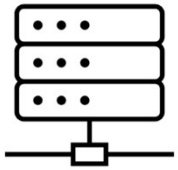
The more we digitize, the more digital infrastructure we need.

SEA CABLES & OPTICAL FIBER



TELECOM

DATA CENTERS



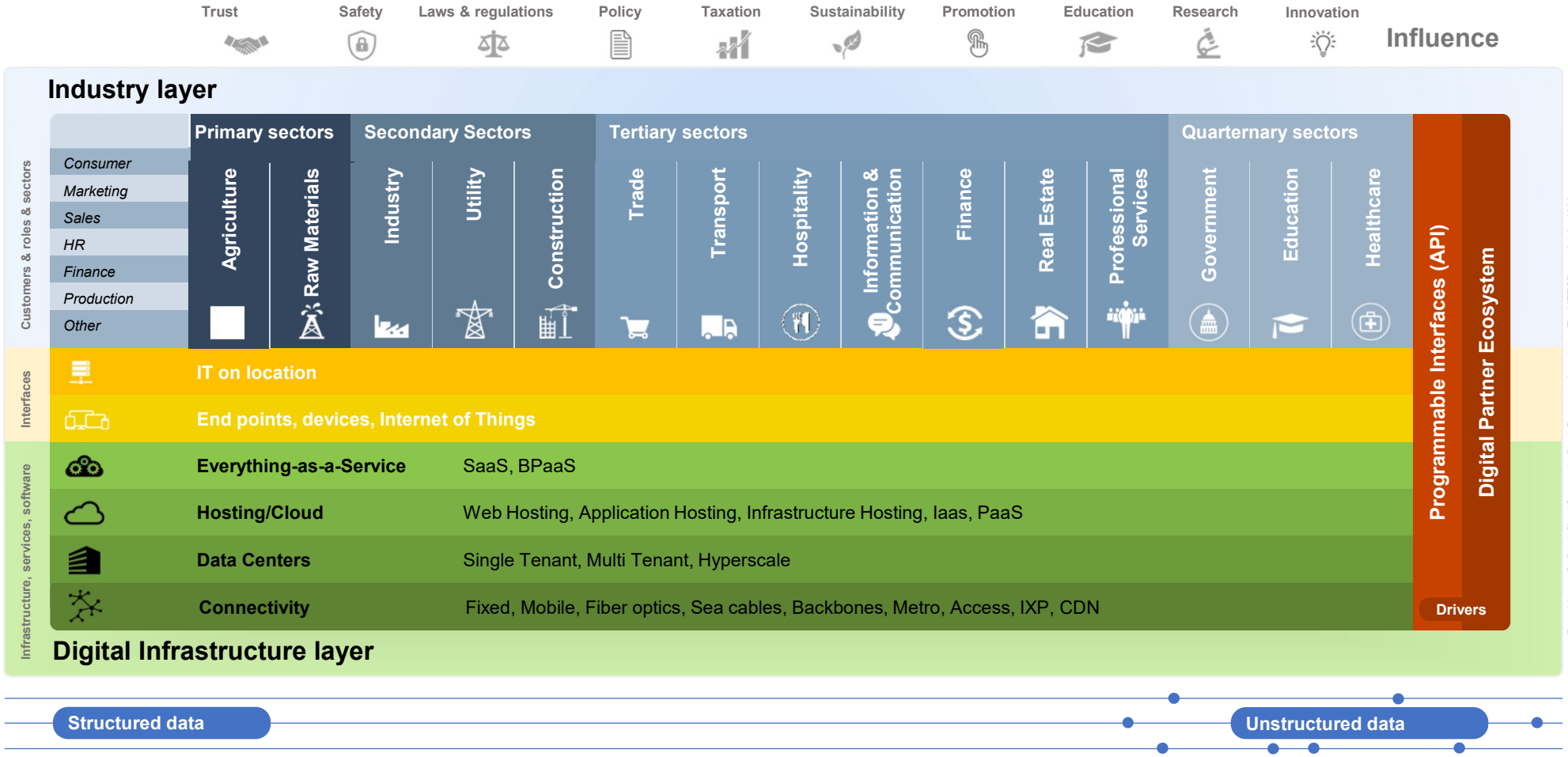
HOSTING & CLOUD PROVIDERS

INTERNET CONNECTIONS

DEVICES

The **Digital Economy** Model

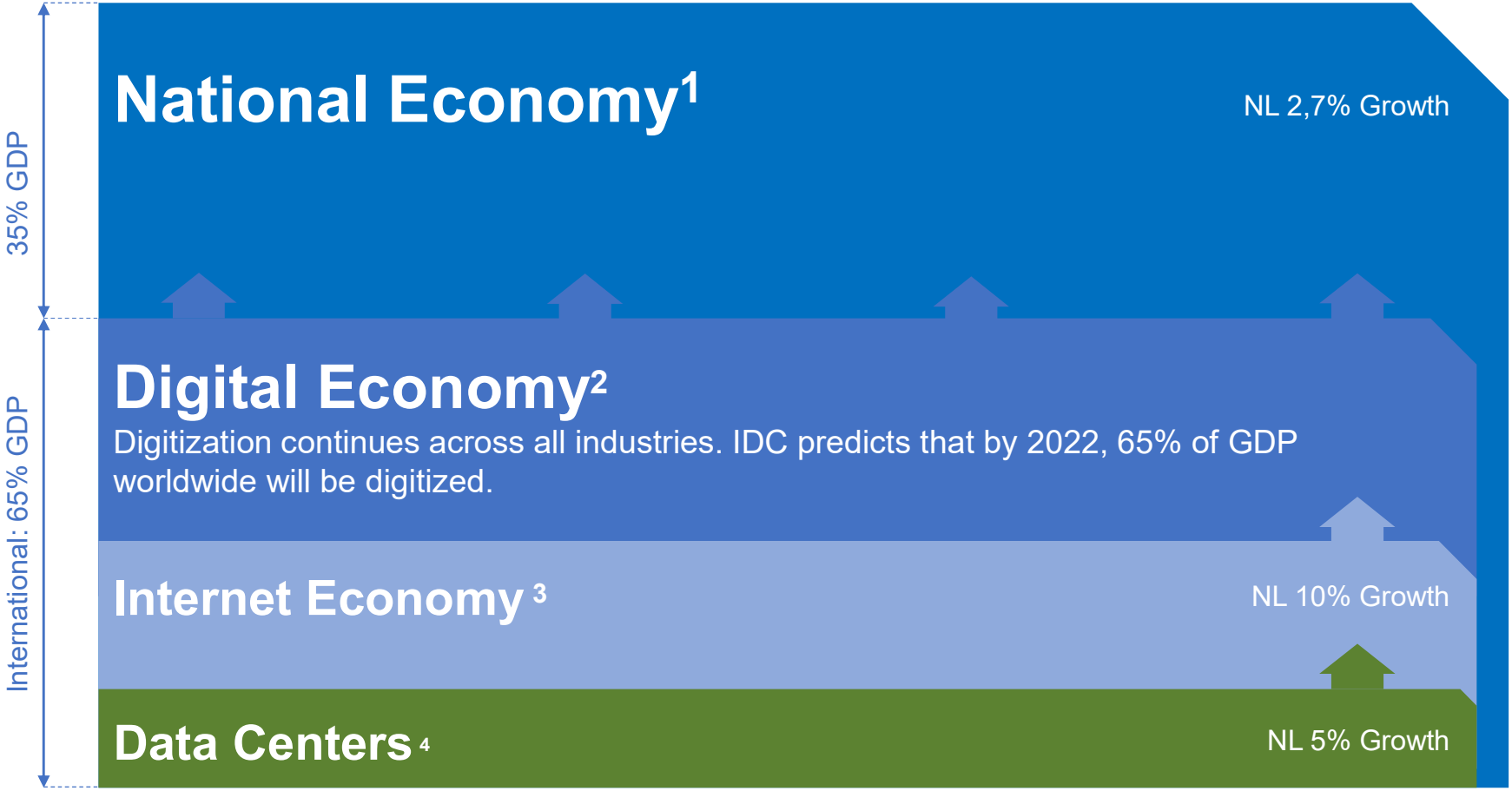
Digital infrastructure as the foundation of all economic activity



Model: Digital Economy Model created by Dutch Data Center Association, Dutch Cloud Community, The METISfiles

No earning capacity without data centers

Digitization's impact on the economy continues to grow



Netherlands

€ 738 B. BNP [1]

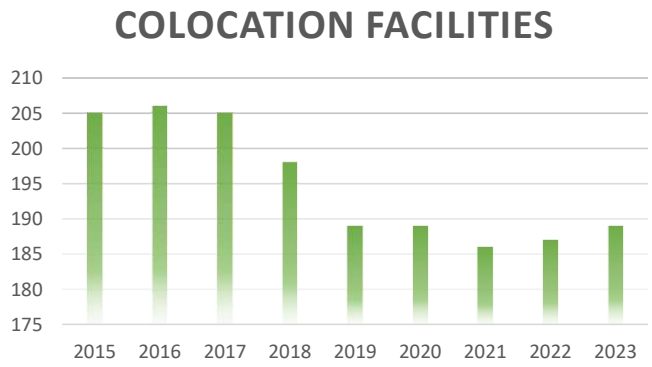
€ 104 B. BNP [3]

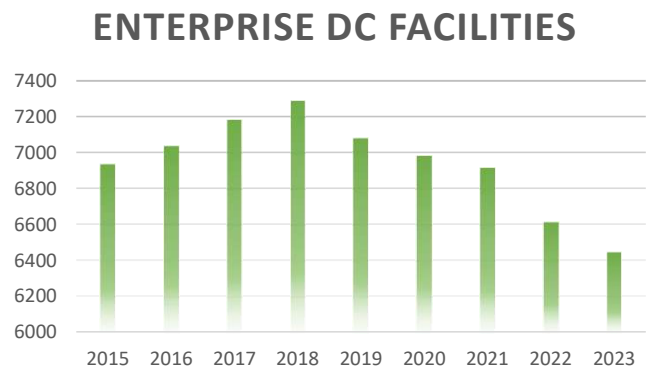
€ 1,5 B. BNP [4]

Source: [1] CPB 2019, [2] IDC Futurescape 2021, [3] CBS 'Measuring the Internet Economy' 2017, [4] PB7 Economical impact data centers 2019

Number of data centers in The Netherlands

Most recent figures from research

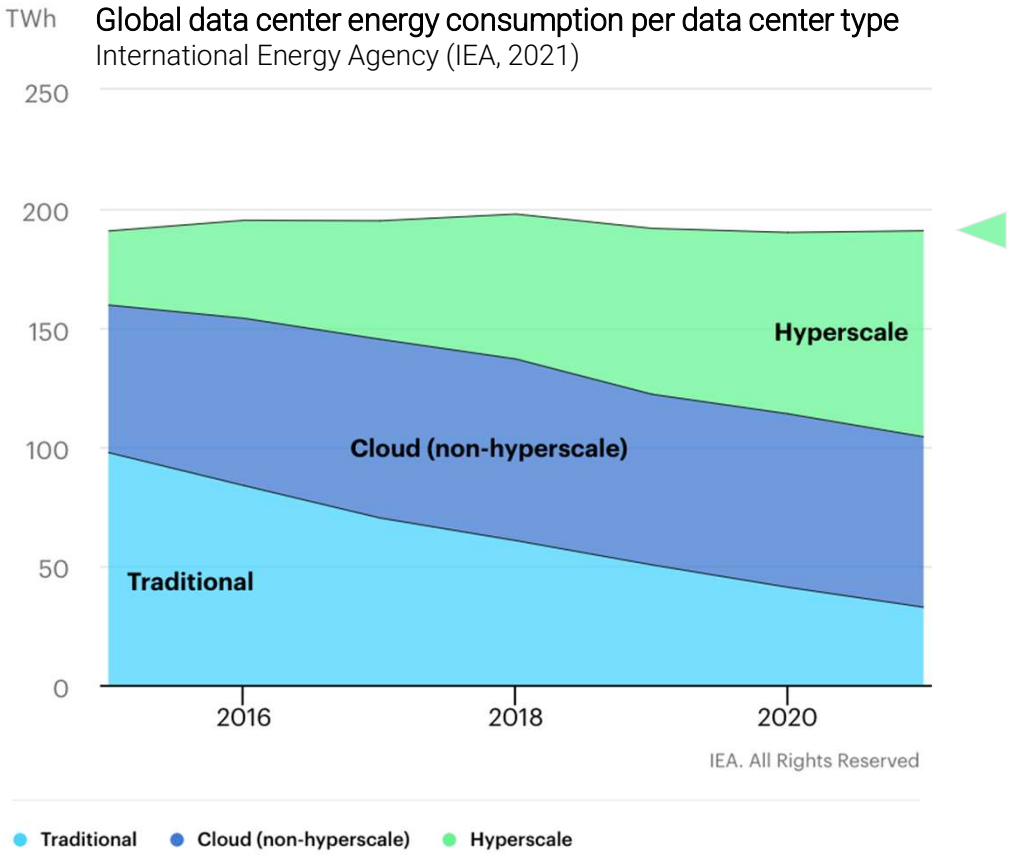




Bron: DDA PB7

The larger the data center, the more energy-efficient

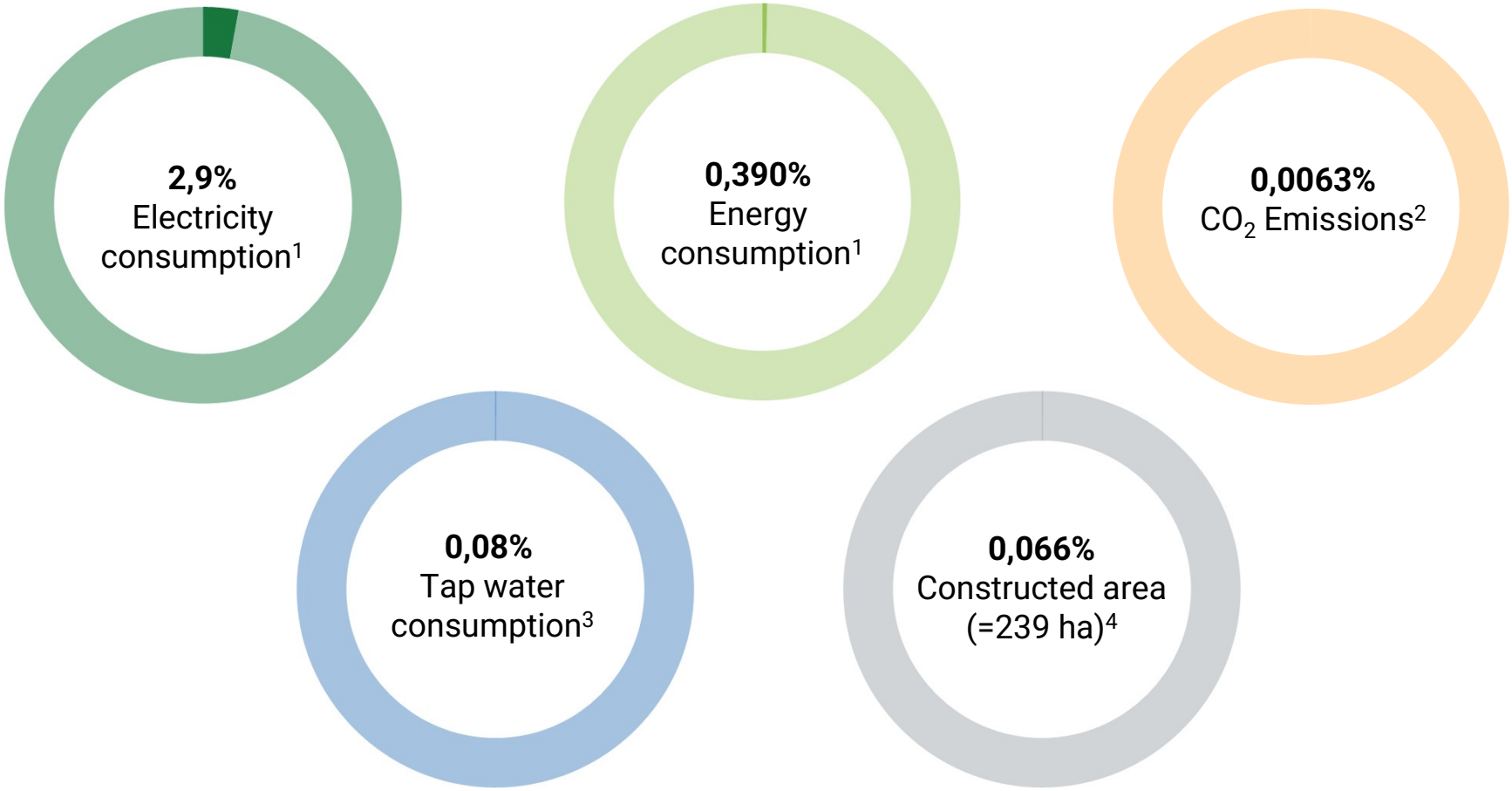
- Outsourcing and growth of hyperscale cloud solutions have kept global energy consumption stable for more than 10 years.
- Migrating to professional data centers and the public cloud saves energy
- Dutch government consolidated from 64 data centers to 5, as a result halving its energy consumption.



Source: IEA 2021, https://www.iea.org/commentaries/data-centres-and-energy-from-global-headlines-to-local-headaches
RijksCloud, https://www.agconnect.nl/artikel/datacenterconsolidatie-rijk-nu-op-tweederde

Impact data centers in The Netherlands

Most recent figures from publicly available sources



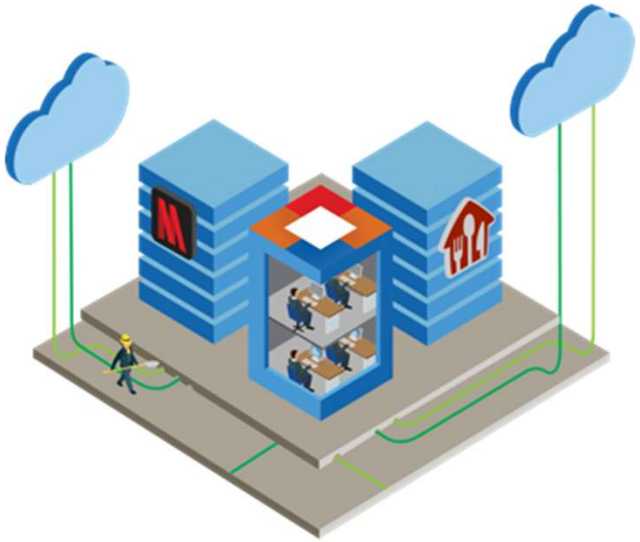
Bron: [1]CBS 2021, [2]NEA 2021, [3]CBS 2021 , [4]CBS 2020, DDA 2021, MJA RVO ,- See all sources at https://www.dutchdatacenters.nl/dashboard/

Data centers create **significant employment** opportunities

Employment impact of digital infrastructure on the digital economy

11.000 FTE

In & around data centers



109.000 FTE

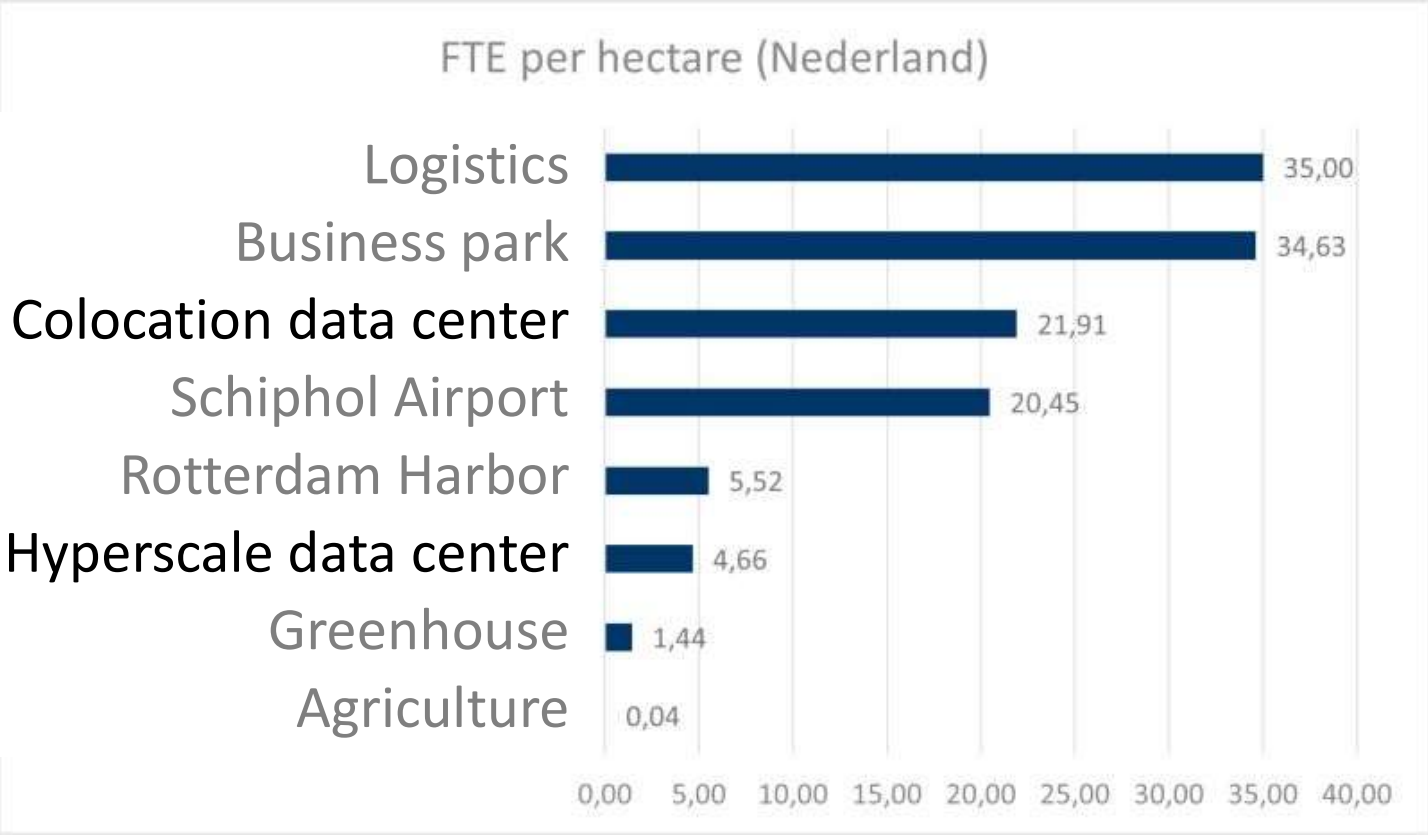
In & around tech companies

2,1 MLN FTE

Employees work digitally

Data centers create **significant employment** opportunities

FTE impact of digital infrastructure on the digital economy per hectare



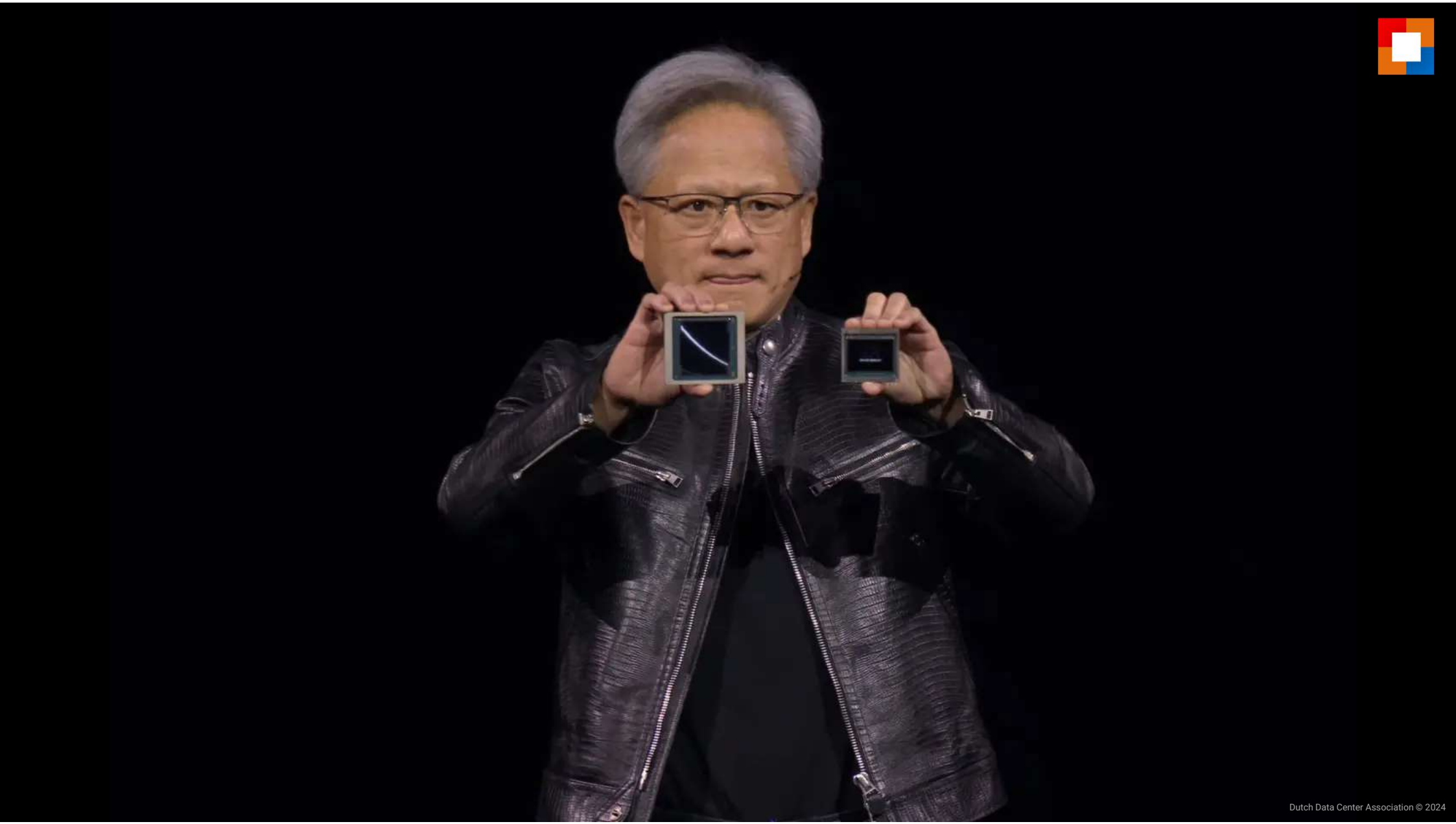
FACT:

The Hyperscale data center of Google is the biggest employer of Noord Groningen


CHANGE

AI

'This is a once-in-a-generation moment'



Sam Altman’s latest essay, The Intelligence Age

It is possible that we will have superintelligence in a few thousand days (!); it may take longer, but I’m confident we’ll get there.

> https://ia.samaltman.com/ - Sam Altman, September 24 2024

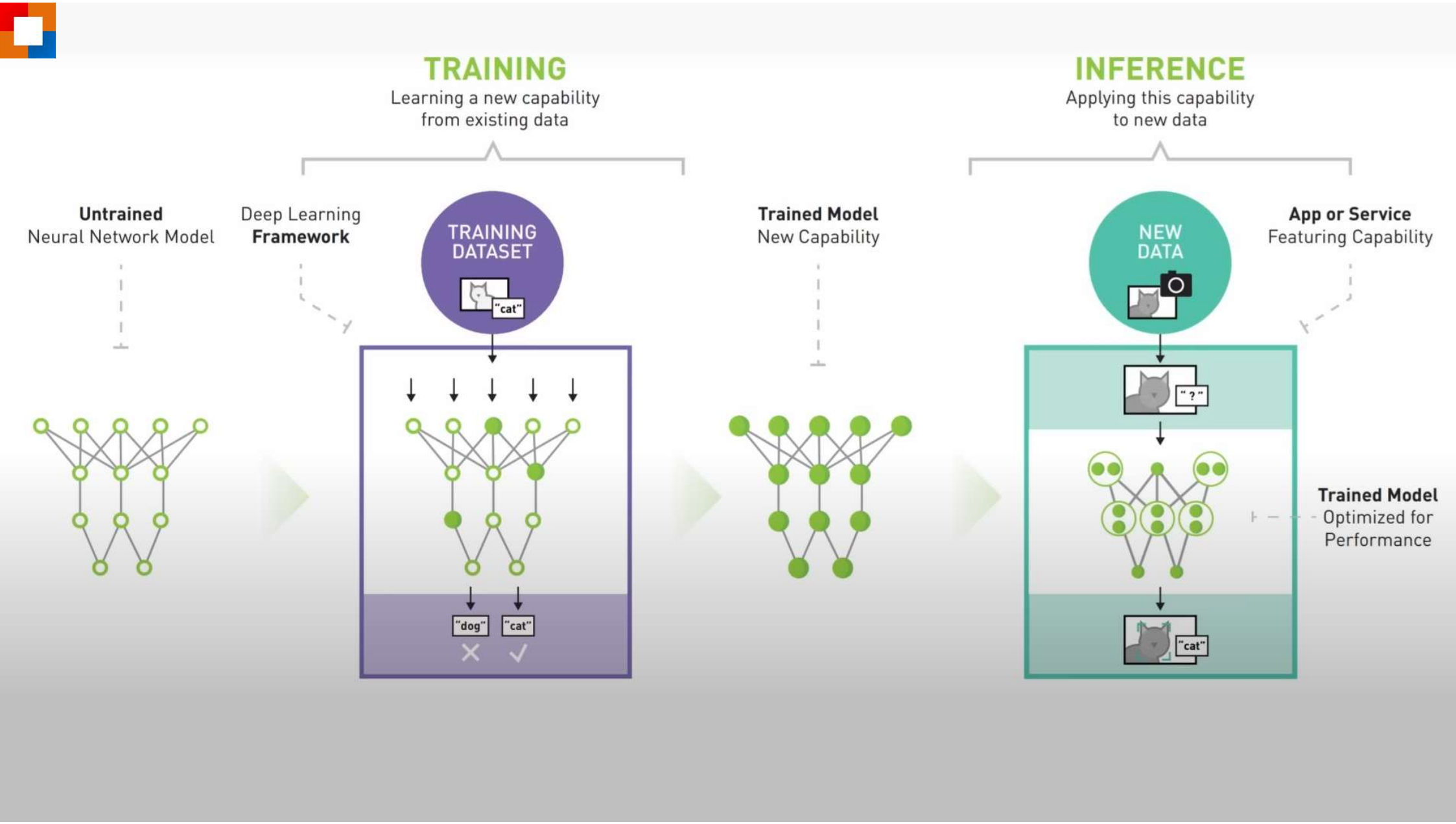
Understanding the Accelerating Rate of Change

"We’re entering an age of acceleration."

"The 21st century will be equivalent to 20,000 years of progress at today’s rate of progress; organizations have to be able to redefine themselves at a faster and faster pace."

> https://www.thekurzweillibrary.com/understanding-the-accelerating-rate-of-change – Ray Kurzweil, May 2 2003

> https://www.youtube.com/watch?v=bmA4z24I7Xc&t=938s – Daily Show, September 24 2024


TRAINING
Learning a new capability
from existing data
INFERENCE
Applying this capability
to new data
Untrained
Neural Network Model
Deep Learning
Framework
TRAINING
DATASET
"cat"
"dog"
"cat"
Trained Model
New Capability
NEW
DATA
"?"
"cat"
App or Service
Featuring Capability
Trained Model
Optimized for
Performance

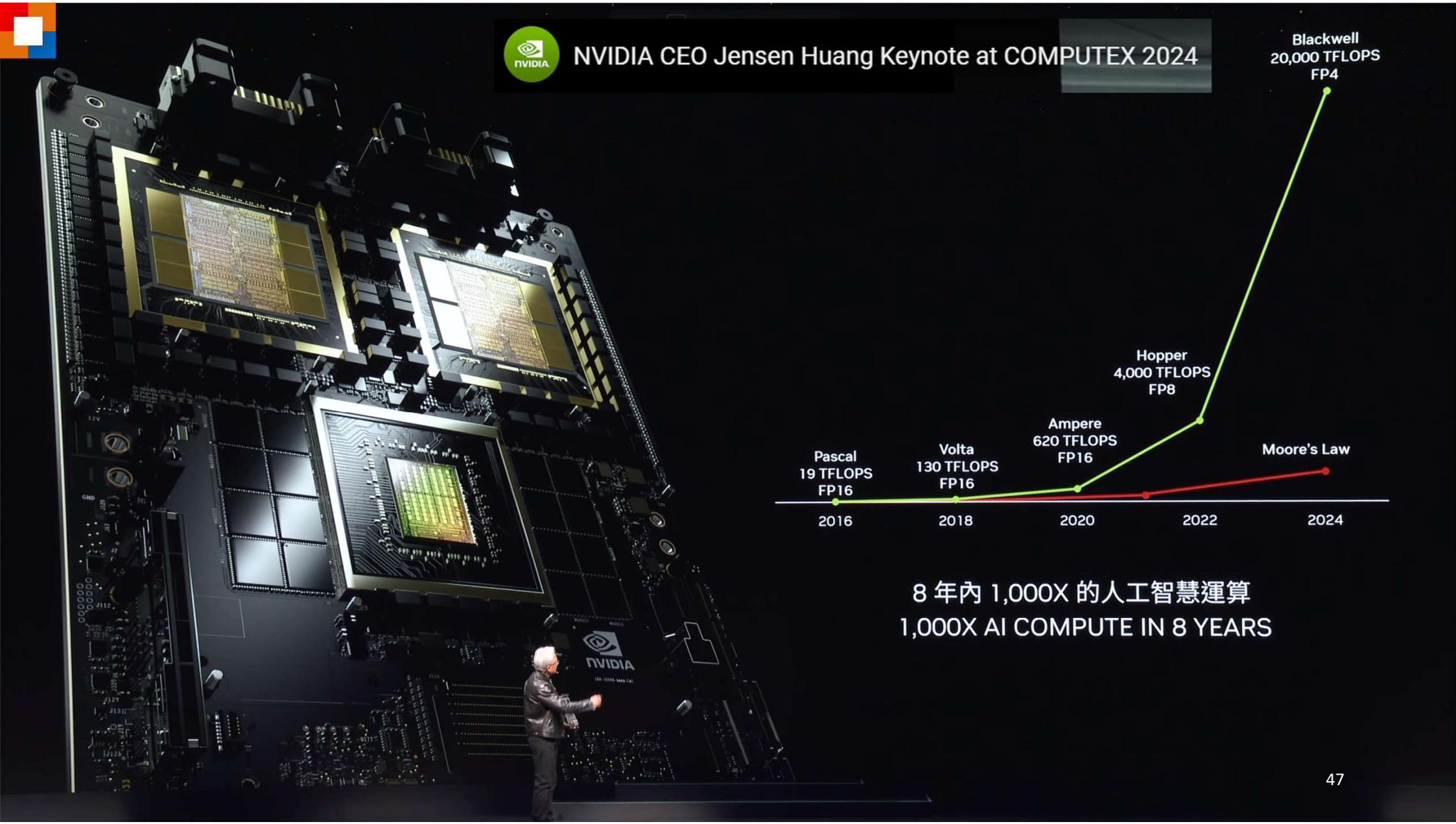
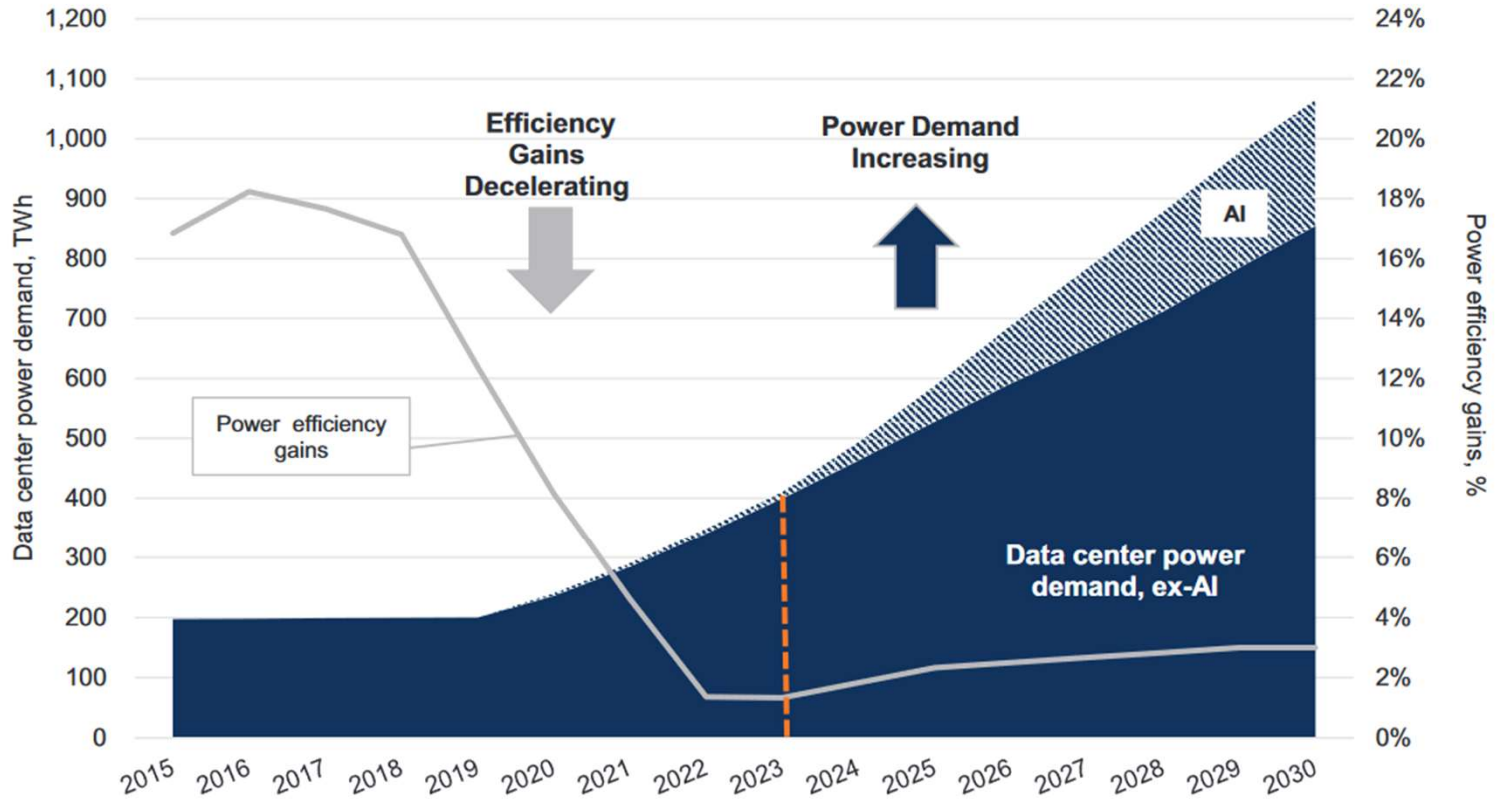

NVIDIA CEO Jensen Huang Keynote at COMPUTEX 2024
Blackwell
20,000 TFLOPS
FP4
Hopper
4,000 TFLOPS
FP8
Ampere
620 TFLOPS
FP16
Volta
130 TFLOPS
FP16
Pascal
19 TFLOPS
FP16
Moore's Law
2016
2018
2020
2022
2024
8 年內 1,000X 的人工智慧運算
1,000X AI COMPUTE IN 8 YEARS

Exhibit 1: As efficiency gains have decelerated, data demand growth is driving a surge in data center power use, with an AI kicker on the way

Data center electricity consumption, TWh (LHS) and power efficiency gains ex-AI, % (RHS)



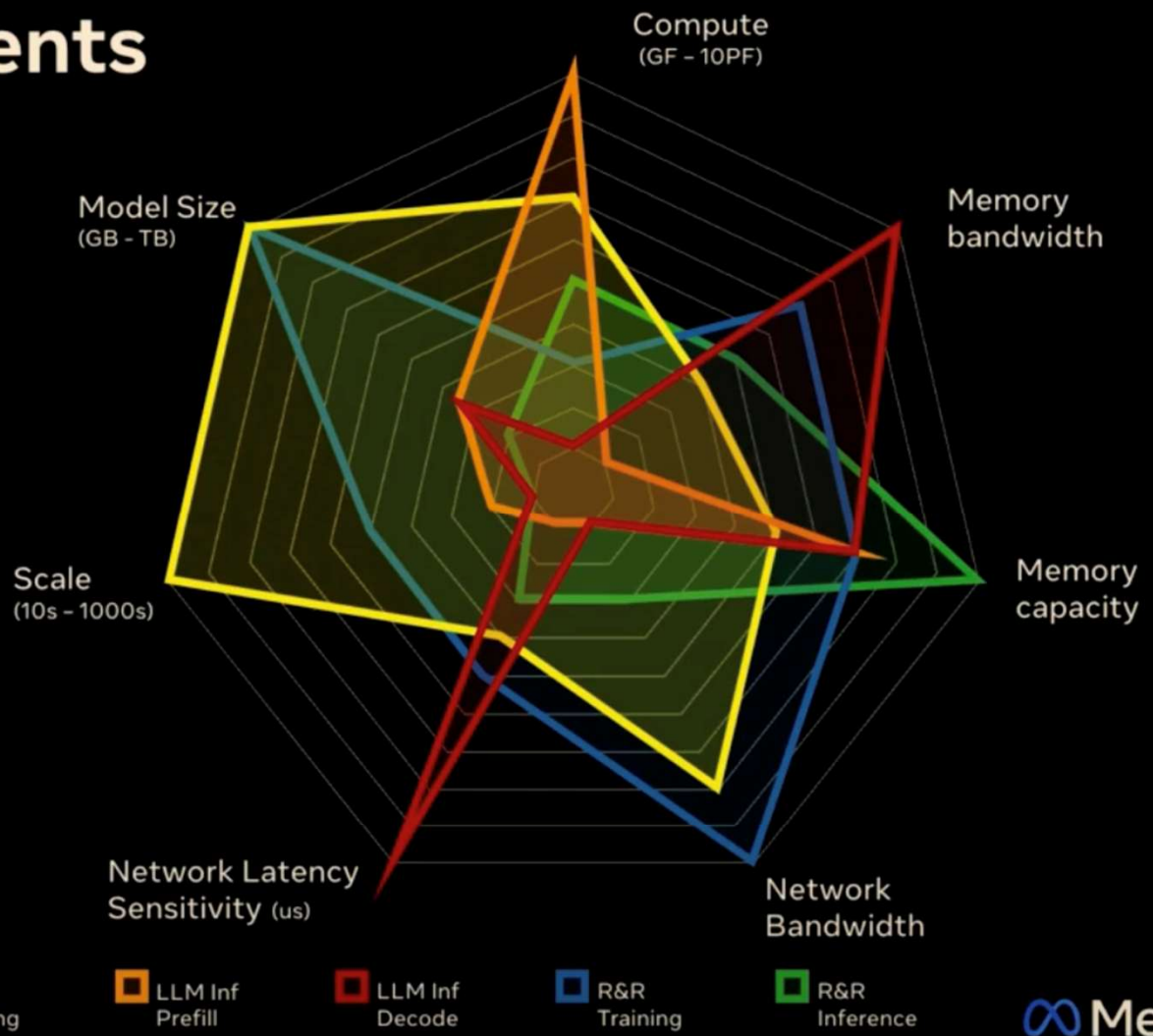
Source: Masanet et al. (2020), IEA, Cisco, Goldman Sachs Global Investment Research

Diverse requirements

Differences

- Large language models (LLMs) vs. ranking & recommendation (R&R)
- Training vs. inference (even different stages!)

Difficult to cover all requirements with single solutions



Meta

Last week (1) AI news

- MGX 100 Billion AI Fund announced
- Microsoft Three Mile Island Nuclear reactor restart
- Bain report: Market for AI services could reach up to $990B by 2027
- EU, US and UK sign landmark AI safety treaty
- Biden warns about AI’s ‘risks,’ forces of ‘retreat’ in final UN address

> AI news search - September 30th 2024

Meta stelt AI-modellen open voor Amerikaanse leger

Deze kunstenares geeft elkaar het jawoord en geeft haar A.I. Hologram-vriendje het jawoord in een Nederlands museum

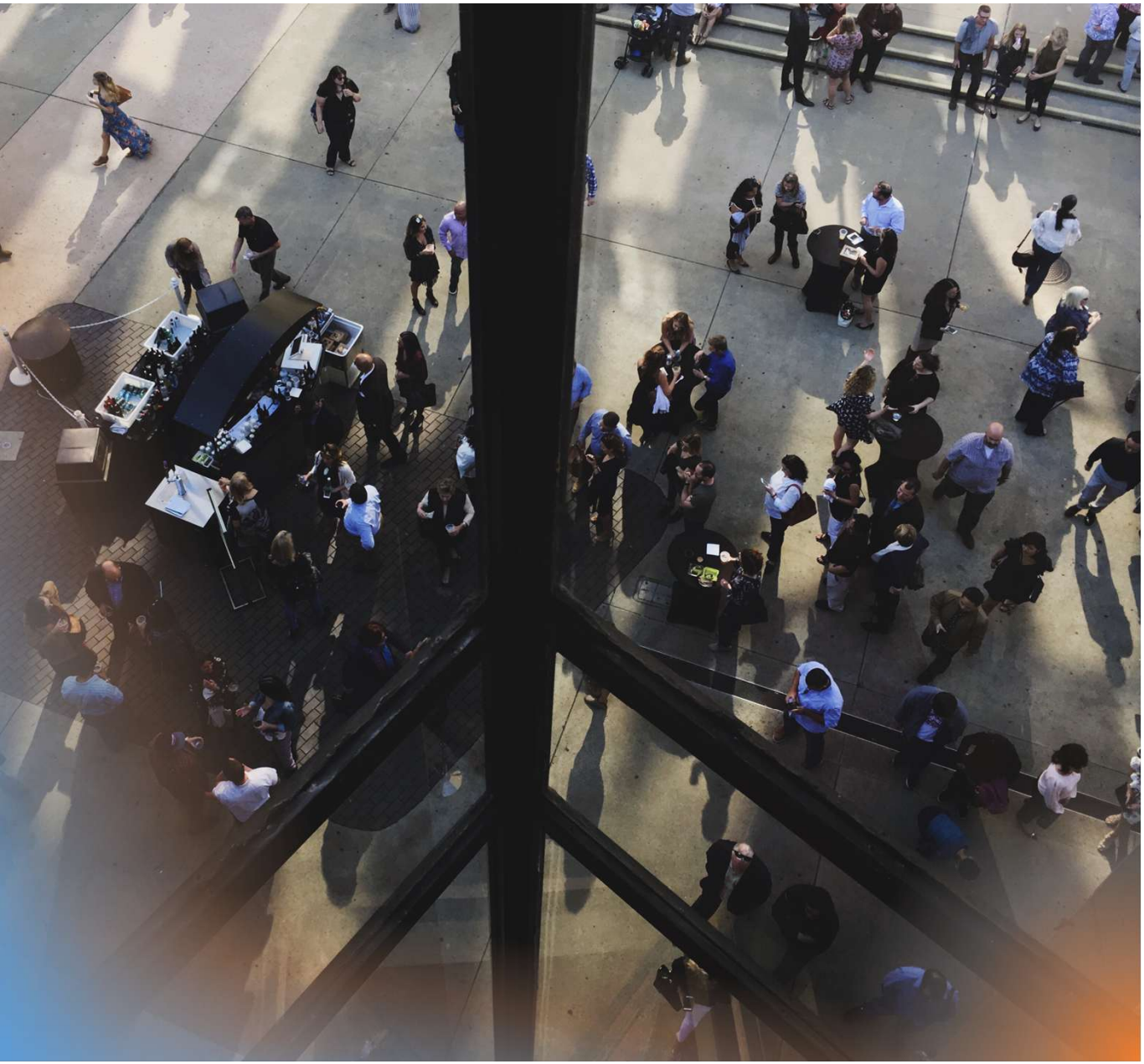
Virale deepfake-advertentie van beroemdheden waarschuwt voor AI die je niet wil laten stemmen

In het verslag-Draghi wordt gewezen op een kritieke lacune in het vermogen van de EU om op wereldschaal te concurreren, met name bij de ontwikkeling en toepassing van geavanceerde AI-technologieën.

New technologies require additional digital infrastructure

- The emergence of AI and Quantum Computing requires a stronger digital infrastructure

- Resources for additional infrastructure are scarce:
  - Full electricity grid
  - Limited available space
  - Not In My Backyard (NIMBY) attitude toward data centers



Our new economy is impossible without data centers

- New Economy = Open, Inclusive, Socially Conscious, Sustainable & Digital

- We have to change, act, and take responsibility.

- Politics and governments want and need to act. And therefore, we see more and more regulation.

- For the young tech sector regulation has major consequences.


ACTION

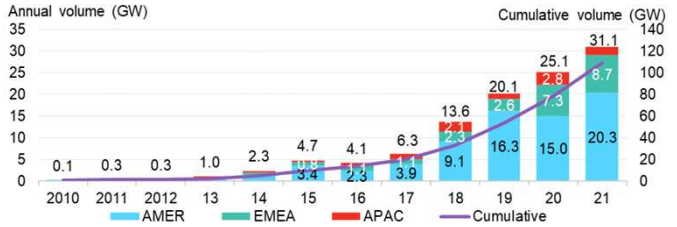
The sector’s next steps concerning climate crisis

More initiatives to reduce and green energy consumption

Data centers on their way to 100% green power

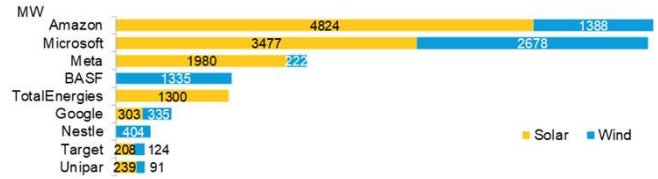
- About 99% of data centers in the Netherlands now purchase their electricity from sustainable sources.
- Data centers lead in the use of renewable energy compared to almost all other industries.
- There is a trend towards more electricity generated in the Netherlands, from offshore wind farms and an increasing number of 'hourly-based' solutions
- With the 'Climate Neutral Data Centre Pact', the European data center sector has jointly and on its own initiative advocated being climate neutral by 2030.
- Data centers are drivers of green energy projects through PPAs
- 50% of the global share in PPAs, promoting additional sustainable generation, are related to data centers

Figure 1: Global corporate PPA volumes, 2010-2021

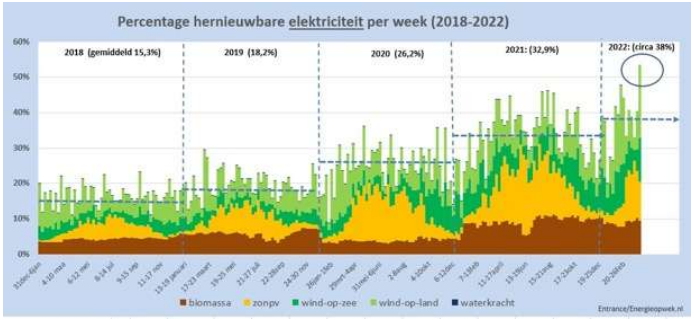


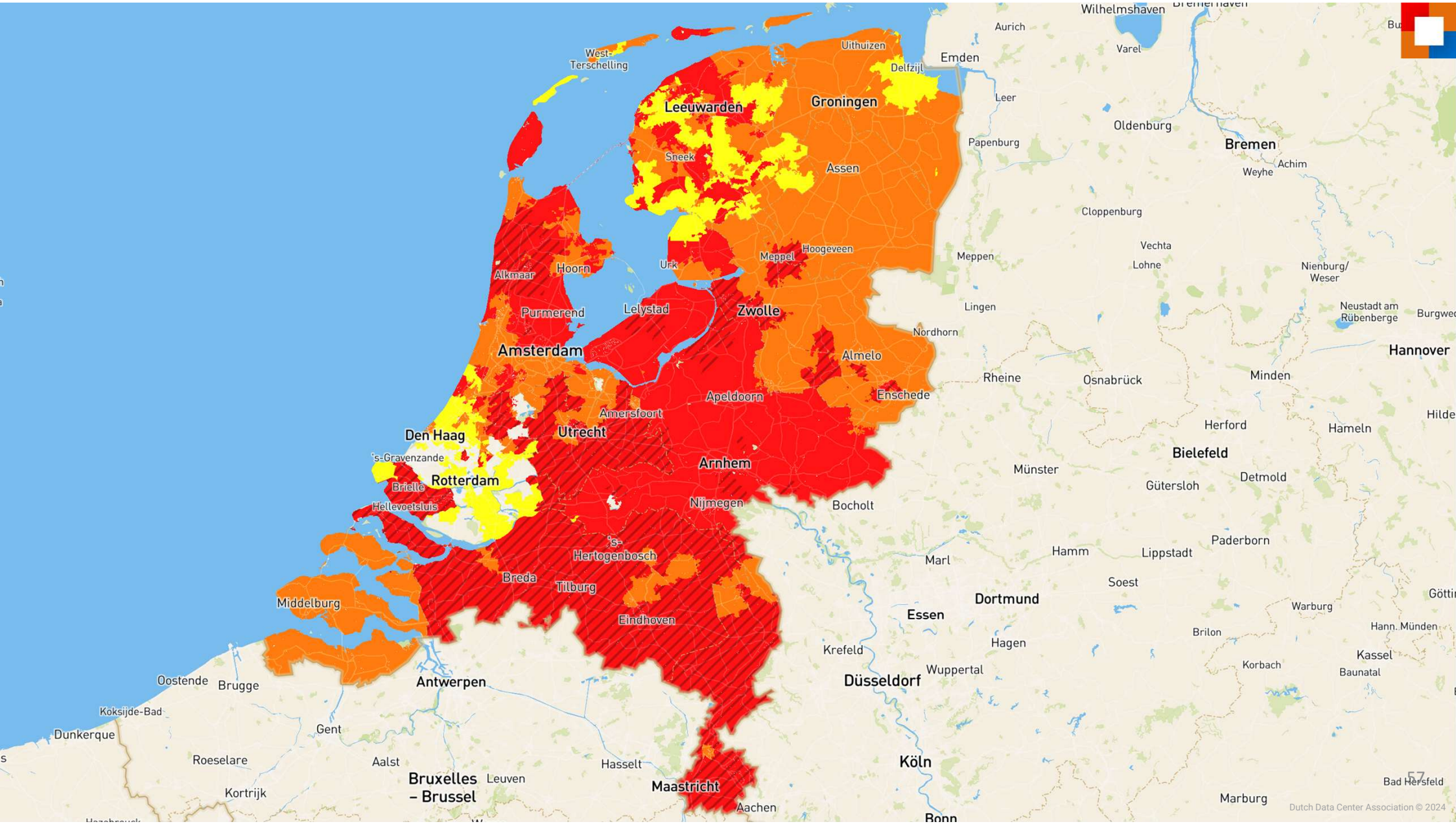
Source: BloombergNEF. Note: Onsite PPAs excluded. APAC volume is an estimate. Pre-reform PPAs in Mexico and sleeved PPAs in Australia are excluded. Capacity is in MW DC.

Figure 2: Top corporate buyers of clean energy in 2021



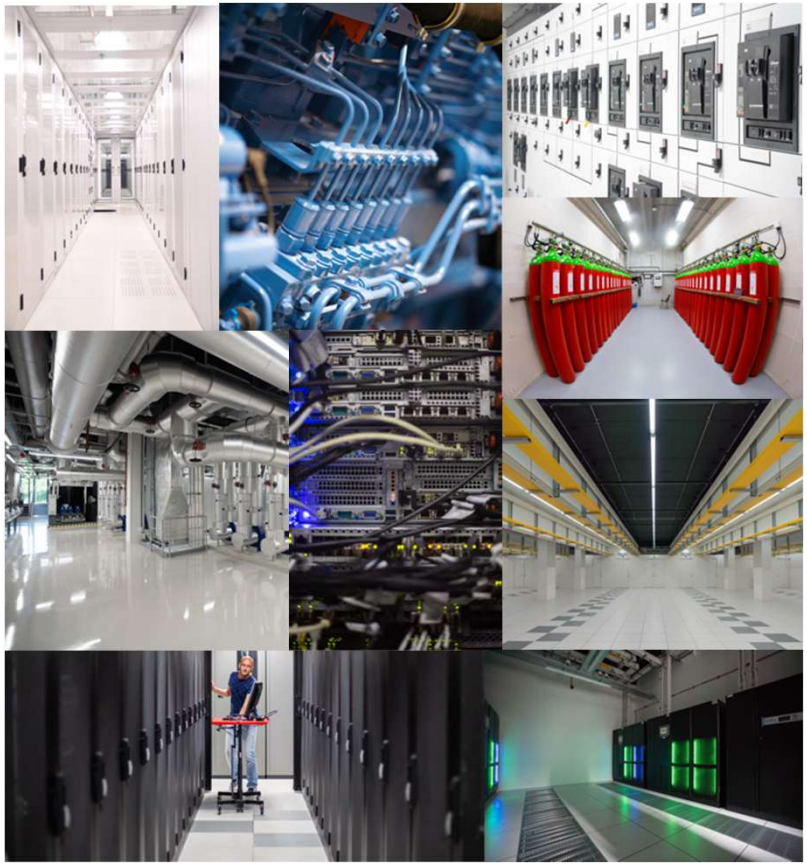
Source: BloombergNEF. Note: Onsite PPAs excluded. Data is based on publicly available information.




Wilhelmshaven
Aurich
Varel
Emden
Uithuizen
West-Terschelling
Delfzijl
Leeuwarden
Groningen
Leer
Oldenburg
Papenburg
Bremen
Sneek
Assen
Achim
Weyhe
Cloppenburg
Meppen
Vechta
Lohne
Nienburg/Weser
Meppel
Hoogeveen
Urk
Alkmaar
Hoorn
Lingen
Neustadt am Rübenberge
Purmerend
Lelystad
Zwolle
Nordhorn
Amsterdam
Almelo
Hannover
Rheine
Osnabrück
Minden
Apeldoorn
Enschede
Amersfoort
Herford
Hameln
Den Haag
Utrecht
Bielefeld
's-Gravenzande
Arnhem
Münster
Detmold
Rotterdam
Brielle
Gütersloh
Nijmegen
Bocholt
Hellevoetsluis
's-Hertogenbosch
Paderborn
Hamm
Lippstadt
Marl
Breda
Tilburg
Soest
Middelburg
Dortmund
Warburg
Essen
Eindhoven
Hann. Münden
Brilon
Hagen
Krefeld
Kassel
Korbach
Wuppertal
Baunatal
Oostende
Brugge
Antwerpen
Düsseldorf
Koksijde-Bad
Dunkerque
Gent
Roeselare
Aalst
Hasselt
Köln
Bruxelles – Brussel
Leuven
Maastricht
Kortrijk
Aachen
Marburg
Bad Hersfeld
Bonn
57
Dutch Data Center Association © 2024

Creating opportunities for necessary data center growth

- Focus on the broad added value of data centers
  - Essential for economy & society
    - Magnet for start-ups
    - Digital frontrunner
  - Twin transition: Sustainability and digitalization assist one another
  - Implementation of residual heat
  - Help balance the electricity grid
  - Utilize green energy, help achieve sustainability goals
- Bring together relevant parties
  - Local and national government
  - Electricity Grid & Heat Network operators



GRID: Energy transition + Fast digitization + Integration

Use the sector’s unique emergency power potential

Smartly use the sector's potential emergency power that is geographically spread across the whole of the Netherlands. Link and green the capacity with hydrogen distribution.

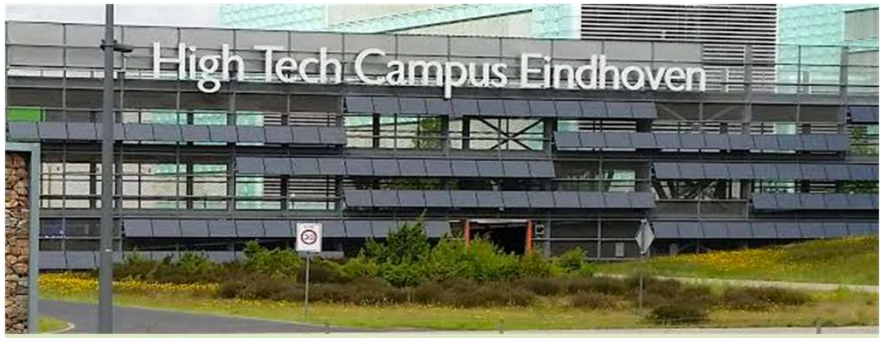
Stimulate direct connections

Make it easier to let data centers interact with the power grid or make direct connections to renewable energy sites to reduce the burden on the power grid.

Smart spatial planning policies

Use smart and national spatial planning, especially for Hyperscales and International Clusters, so that there is clarity regarding expansions of data centers and maximum efficiency in economic ecosystem planning, focused grid investment, and optimal use of residual heat. Limit the amount of data center policies to one central national policy.

Data center residual heat makes Netherlands independent from gas



Eindhoven =
50 offices

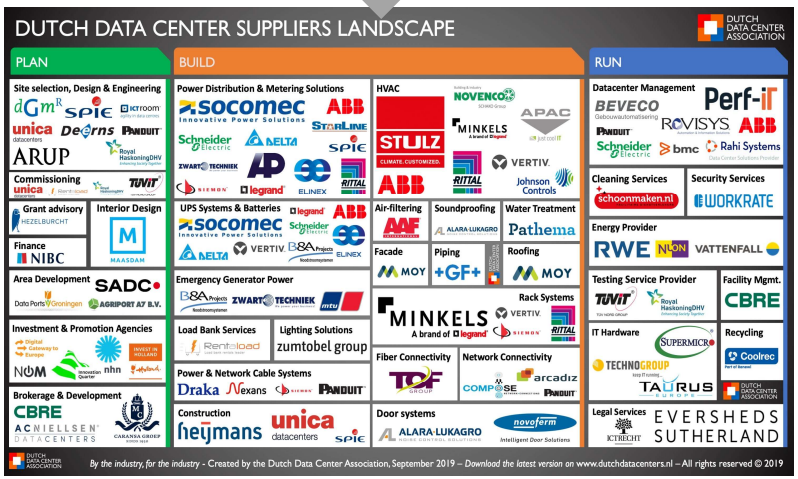
Amsterdam =
1300 apartments

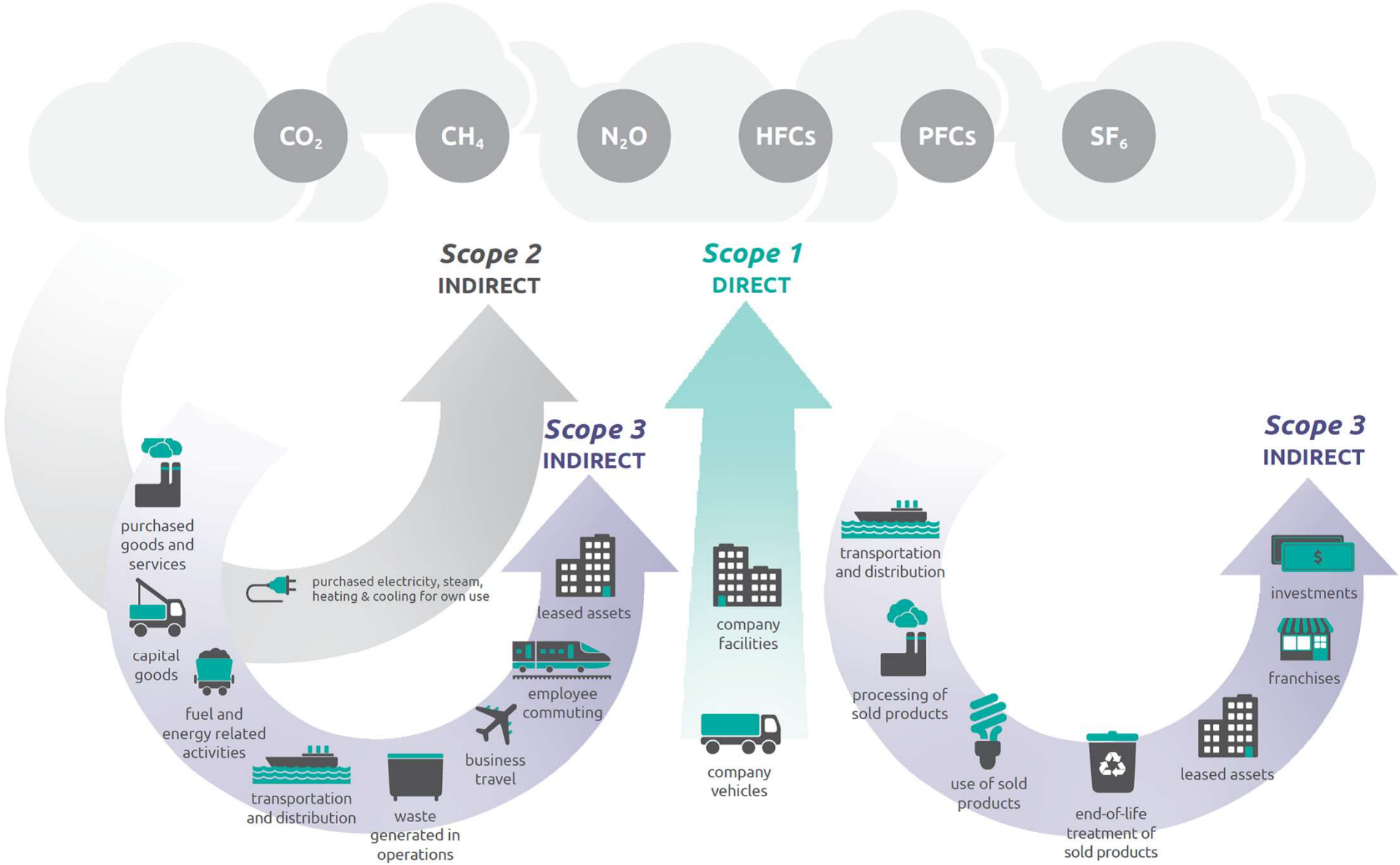
30/35 ^{0}C

Completed and/or ongoing projects:

Aalsmeer	Farm, School, Swimming Pool
Amsterdam	University Campus
Amsterdam	1300 Apartments
Amsterdam	25.000 Residences
Amsterdam	500 Residences
Ede	Event Center
Eindhoven	High Tech Campus
Groningen	5000-10.000 Residences
Haarlem	Business Area
Rotterdam	10.000 Residences
Rotterdam	Van Nelle Factory
Schiphol-Rijk	Business Area

Only solution forward: Working smarter together





"Wait, didn't we rethink what was possible last week?!"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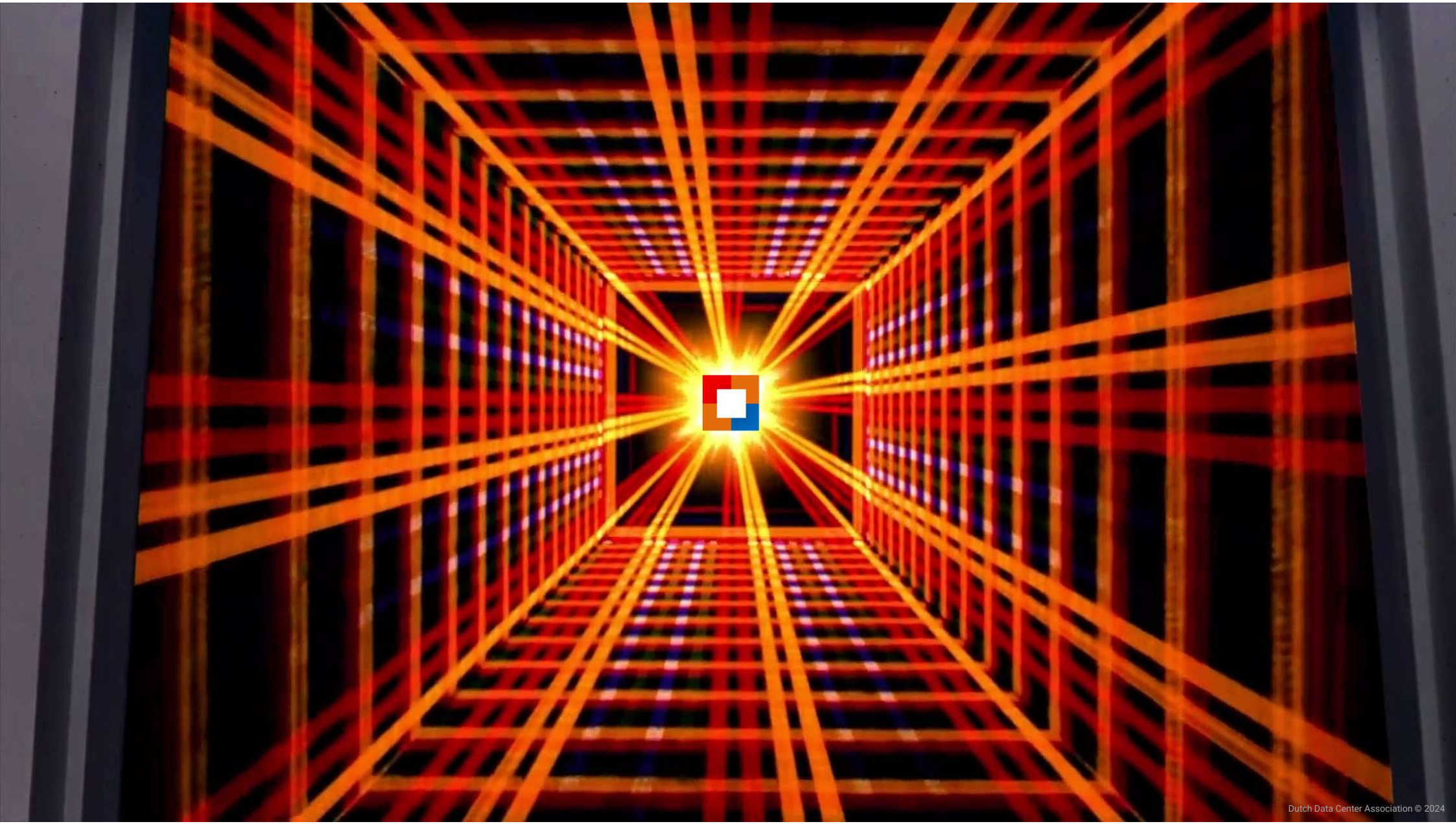
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Dank!

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