Cloud and Industry 4

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INSTRUMENTED & INTERCONNECTED WORLD

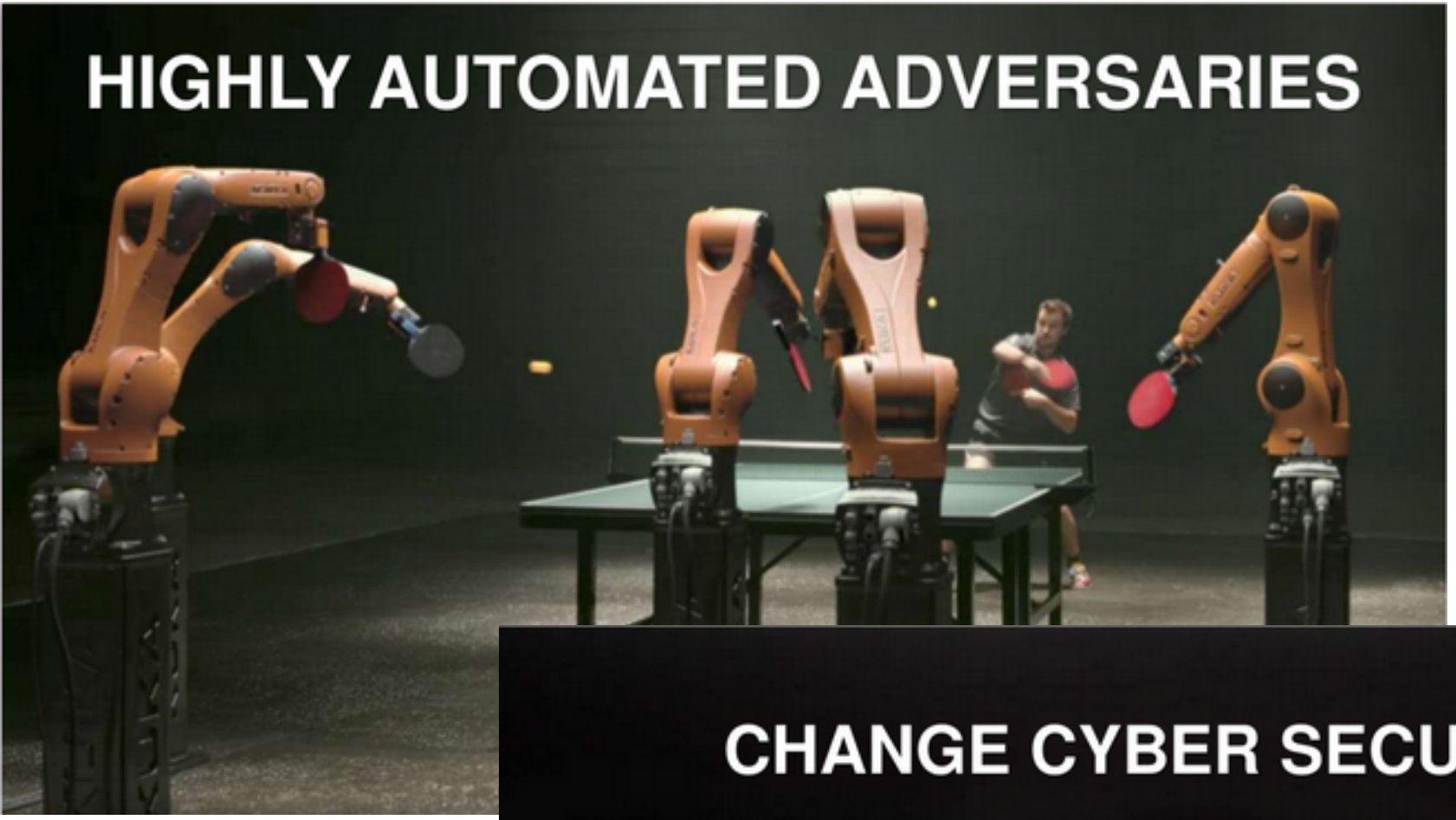

The Challenges of today's world
Slides credit:
Fred Streefland
Cyber Security Strategist EMEA
Paloalto Networks
ganeshniyer.com


DEMANDING CITIZENS


COMPLEX ORGANIZATIONS


DIVERSE, EVOLVING AND
SOPHISTICATED THREAT

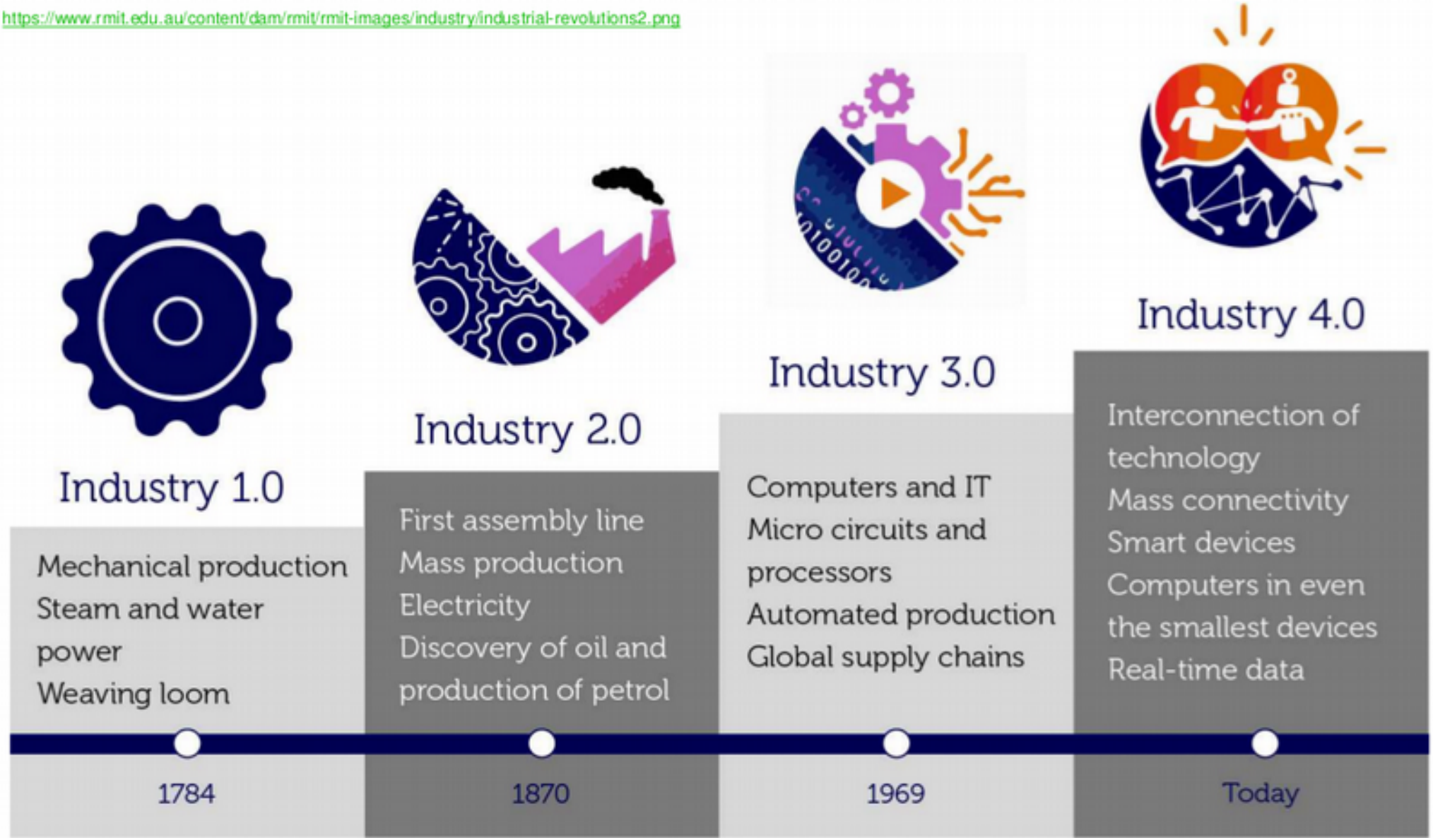

COMPLIANCE & REGULATIONS

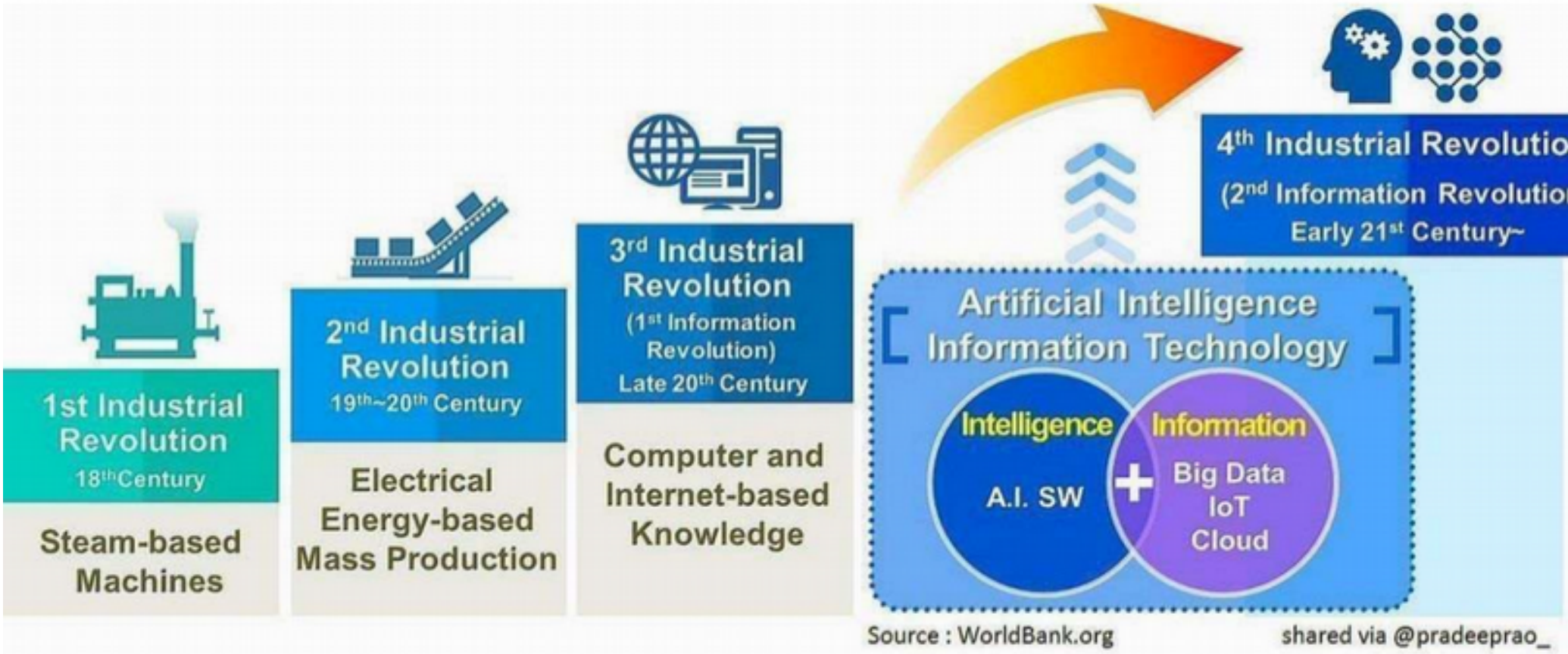

HIGHLY AUTOMATED ADVERSARIES


CHANGE CYBER SECURITY


Industry 4.0

https://www.rmit.edu.au/content/dam/rmit/rmit-images/industry/industrial-revolutions2.png




1st Industrial Revolution
18th Century
Steam-based Machines
2nd Industrial Revolution
19th~20th Century
Electrical Energy-based Mass Production
3rd Industrial Revolution
(1st Information Revolution)
Late 20th Century
Computer and Internet-based Knowledge
4th Industrial Revolution
(2nd Information Revolution)
Early 21st Century~
Artificial Intelligence
Information Technology
Intelligence
A.I. SW
Information
Big Data
IoT
Cloud
Source : WorldBank.org
shared via @pradeeprao_

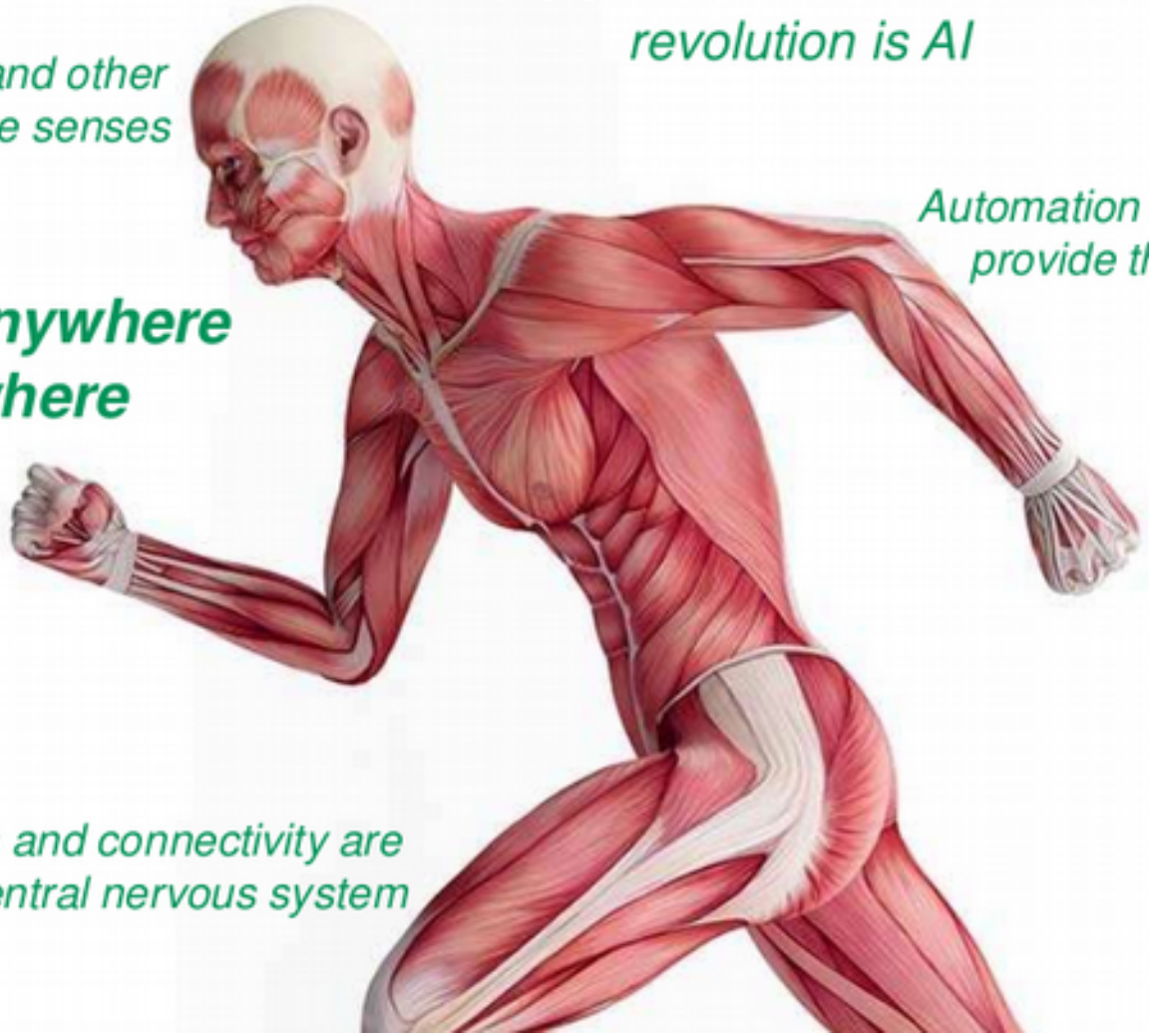

Technologies in Industry 4.0
Additive Manufacturing
Simulation
Autonomous Robots
Augmented Reality
System Integration
Big Data Analytics
Industry 4.0
IIoTS
Cloud Data
Cyber Security
nikunjbhoraniya.com
smart knowledge for your growth
https://www.nikunjbhoraniya.com/2019/03/industry-40-industrial-revolution.html

The brains behind this industrial revolution is AI

AR/VR, cameras and other sensors provide the senses

Automation and robotics provide the muscle

Cloud is anywhere everywhere



Data and connectivity are its central nervous system


Cloud and Industry 4.0

Cloud and Industry 4.0

- *No matter what industry you're in, cloud technology is a critical enabler of the next Industrial Revolution, by providing the means for businesses to innovate around these technologies*
  - Pascal Giraud, Oracle EMEA

- *The Cloud is the connective tissue of Industrie 4.0, the key element that makes it possible to develop a production strategy that is innovative, more effective and effcient by leveraging sensors, artificial intelligence and robotics*
  - Reply Red, Consultants, UK

Cloud Manufacturing

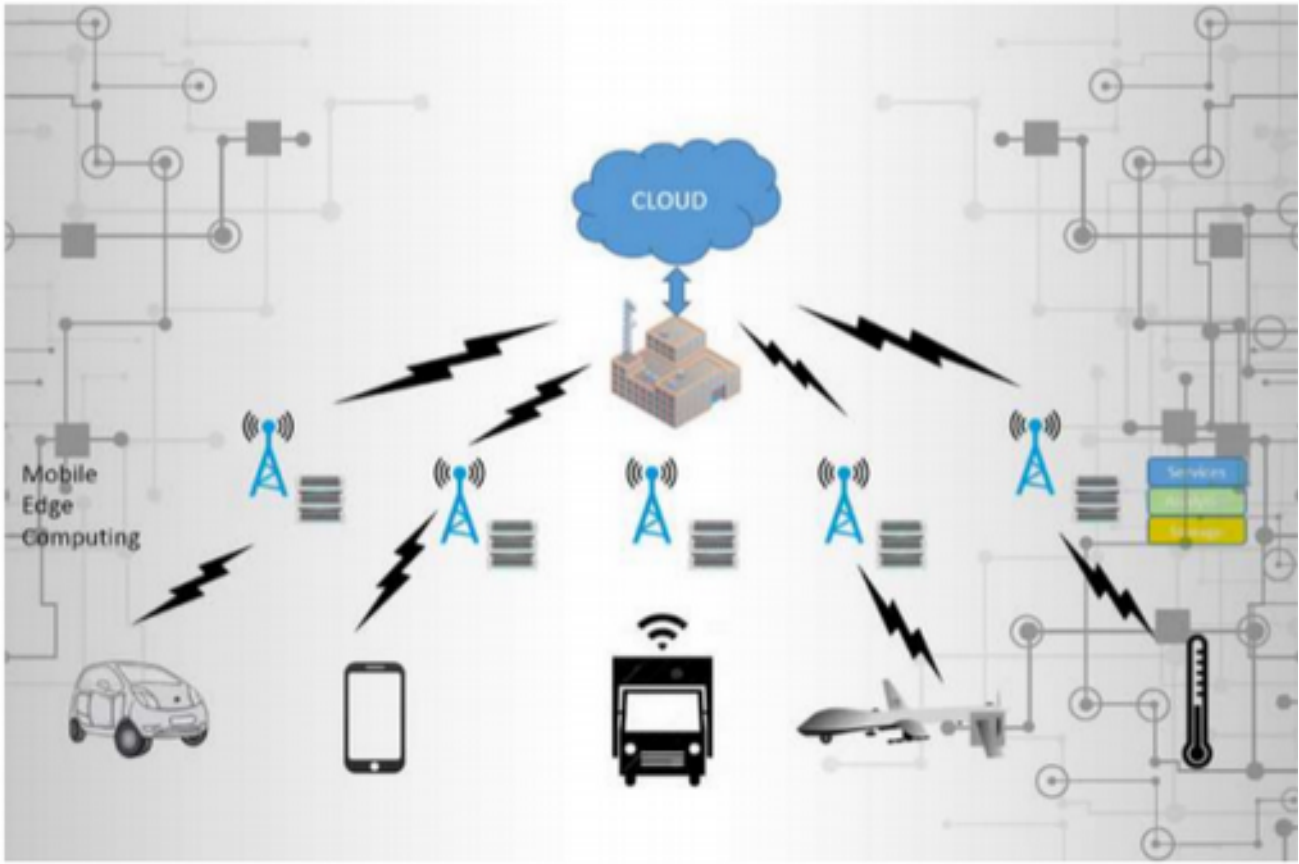
- process of utilizing well established manufacturing resources, such as Enterprise Resource Planning (ERP), through the cloud
- This way, the information can be viewed, updated and applied at any time or place
- Cloud manufacturing was intended to handle “big manufacturing” which means it follows the whole manufacturing process from the designing stage to production to maintenance
- It incorporates other key technologies such as Industrial IoT (IIoT), CPS etc

Cloud Manufacturing

- Companies can already begin to envision production not as a process, but as a genuine service
- in the not too distant future, it will be possible to use
  - virtual plants (simple 3D printers or new generation numerical control machines),
  - located strategically close to the target consumers (thereby reducing investments in inventory) and
  - reducing the production capacity to capitalise on sales results quickly and to adapt to changing market conditions with flexibility

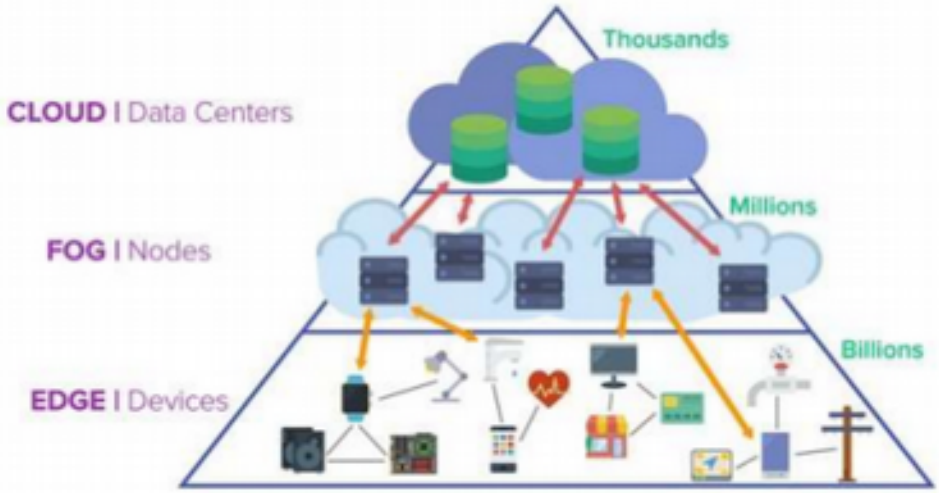
Edge Computing

- Edge computing is a method of optimizing cloud computing systems "by taking the control of computing applications, data, and services away from some central nodes (the "core") to the other logical extreme (the "edge") of the Internet" which makes contact with the physical world - Wikipedia



Fog Computing

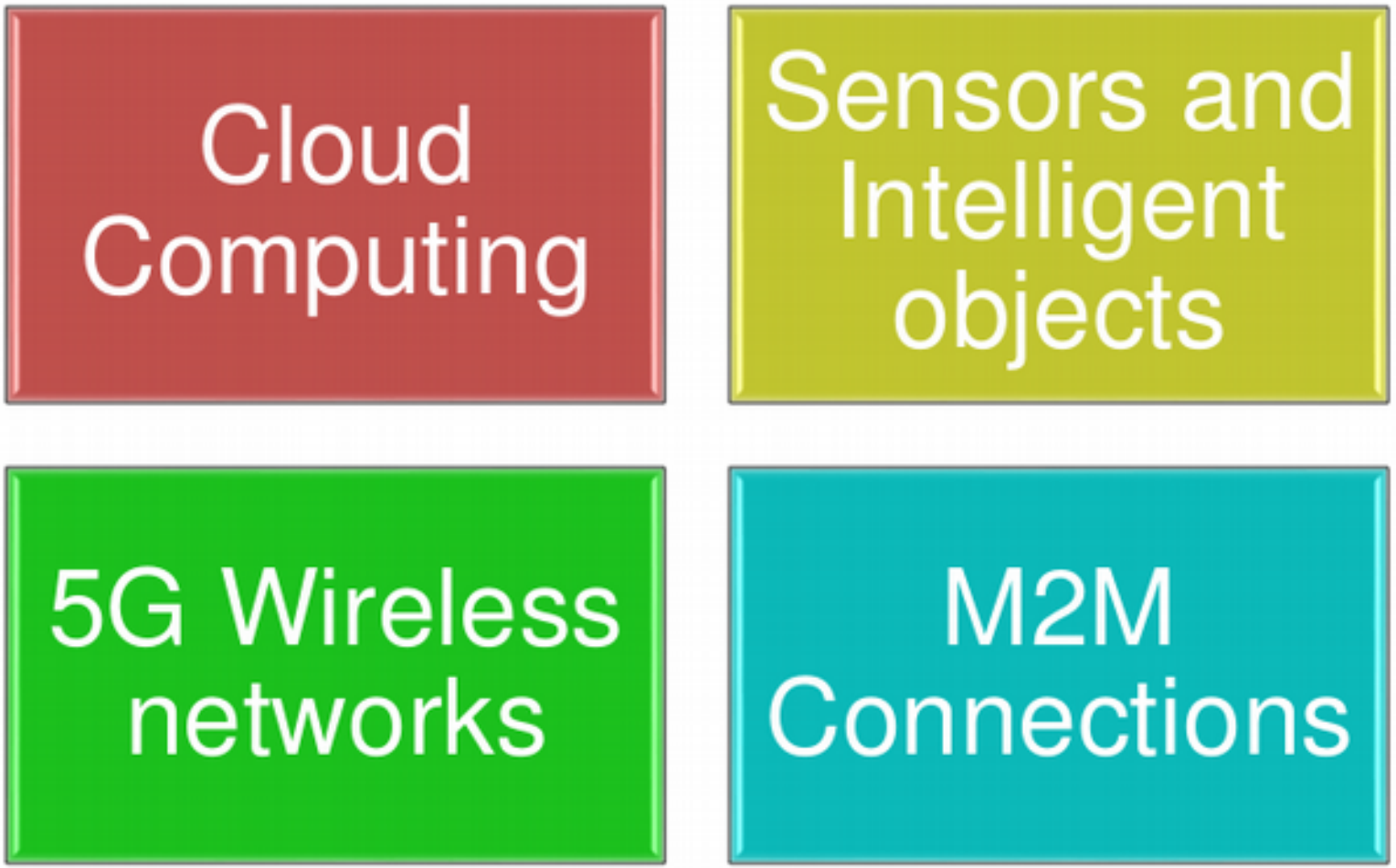
- **Fog computing** pushes intelligence down to the local area network (LAN) level of network architecture, processing data in a fog node or IoT gateway
- **Edge computing** pushes the intelligence, processing power, and communication capabilities of an edge gateway or appliance directly into devices
- Cisco created the term fog computing years ago to describe a layer of computing at the edge ofthe network that could allow pre-processed data to be quickly and securely transported to the cloud.



Need for FOG/EDGE

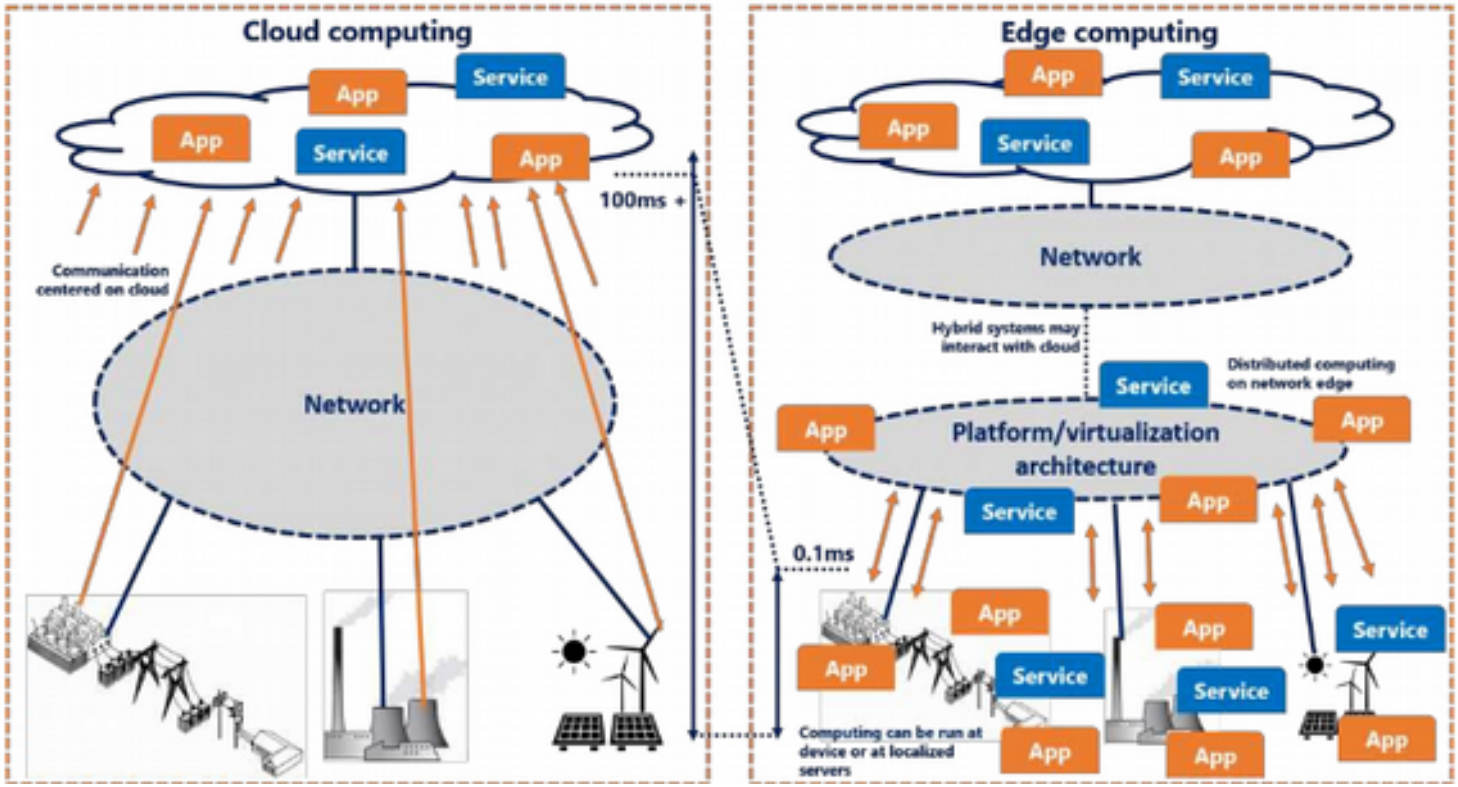
- The shop floor and the assembly line are becoming increasingly more connected
- The number of devices, such as 3D cameras, new-generation numerical control machines and various kinds of sensors that generate data in real time to ensure a more efficient productive process, are actively increasing
- Internet networks are increasingly more congested and it is impossible to reprocess salient information in a short period of time

Enabling technologies for EDGE



Edge + Cloud

- An integrated system to run different applications very close to production
- Also connected to cloud for management of applications, remote updates



https://www.cleantech.com/energy-power-shifts-from-iot-cloud-to-edge-computing/

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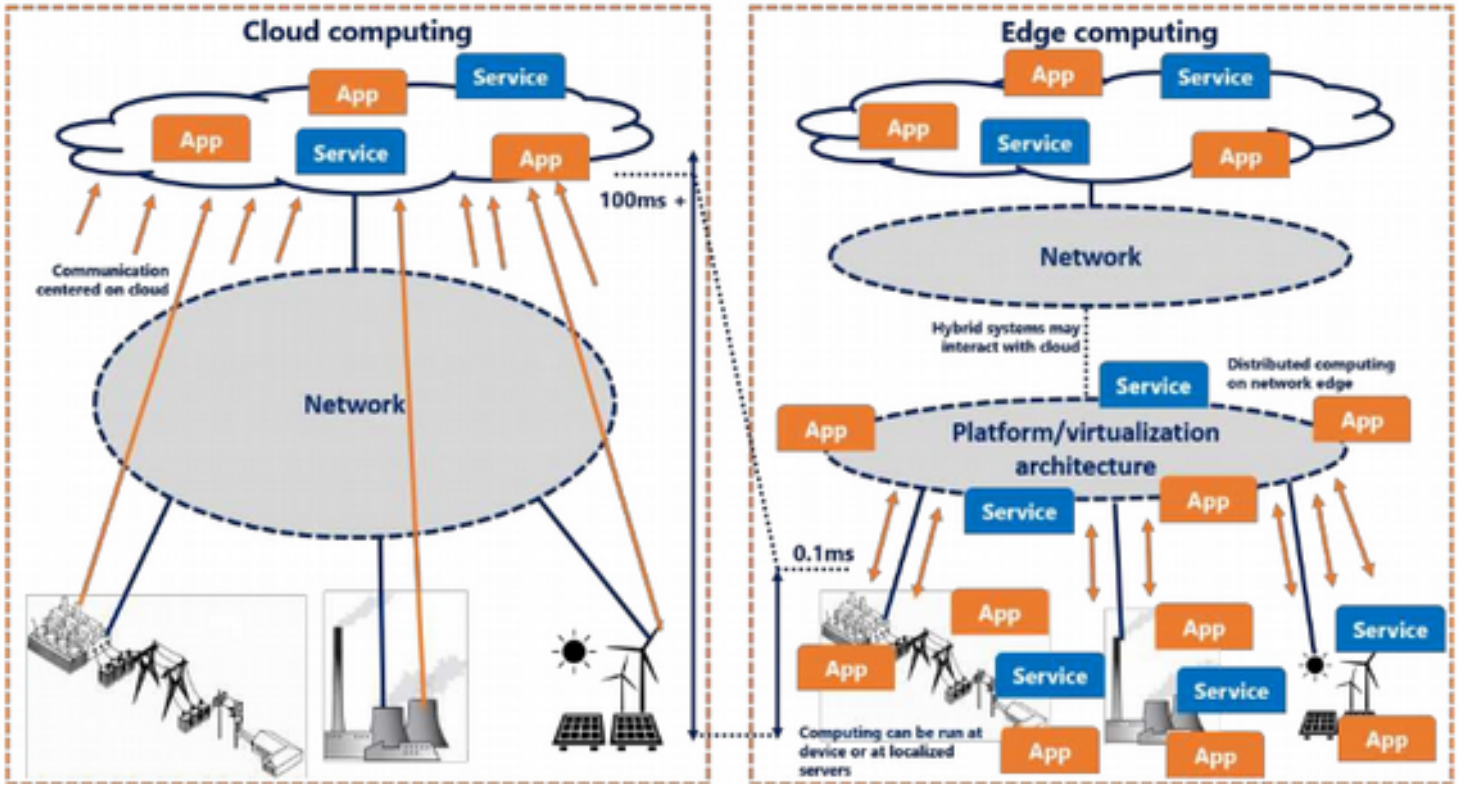

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Edge Computing and its relevance to Industry 4.0

Edge computing will keep you safe

- Industry 4.0 is all about connecting machines, so your manufacturing processes can react more quickly and intelligently to changing factory floor conditions

Edge computing will make your Big Data small

- Bringing intelligence to your manufacturing operations means collecting data from sensors in your equipment and analyzing data to make real-time decisions and predictive maintenance

Edge computing will give you ultra-low latency

- With edge computing, you can easily connect machines from different manufacturers with an independent and resilient logic layer running local triggers ultra-fast

Edge computing can be the integration layer between your factory floor data and your ERP system

- Edge computing can be the real-time, event-driven integration layer between your factory floor data and your enterprise systems that will help you speed up and automate business processes and digital insights

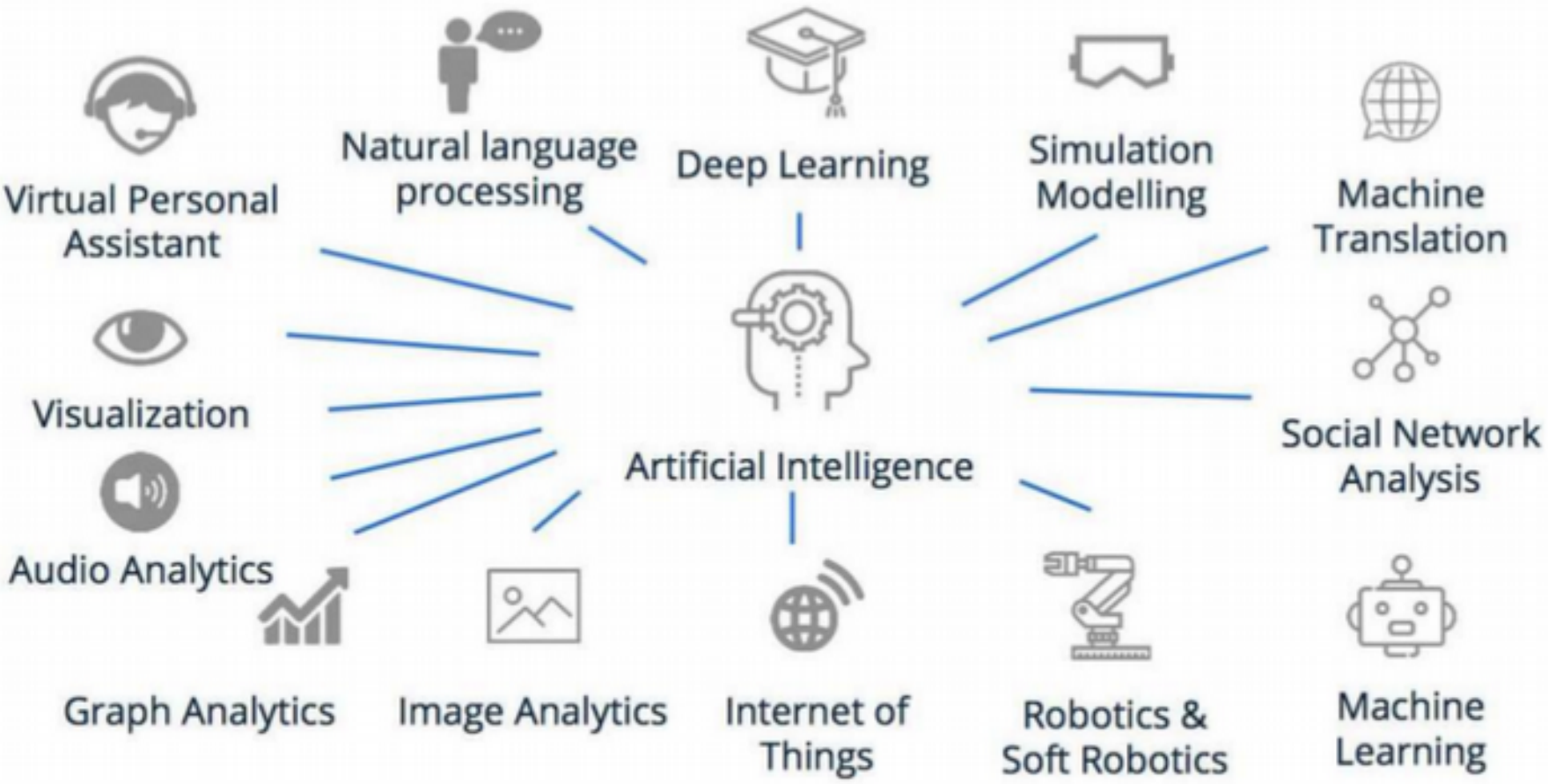
Building The Intelligent Supply Chain

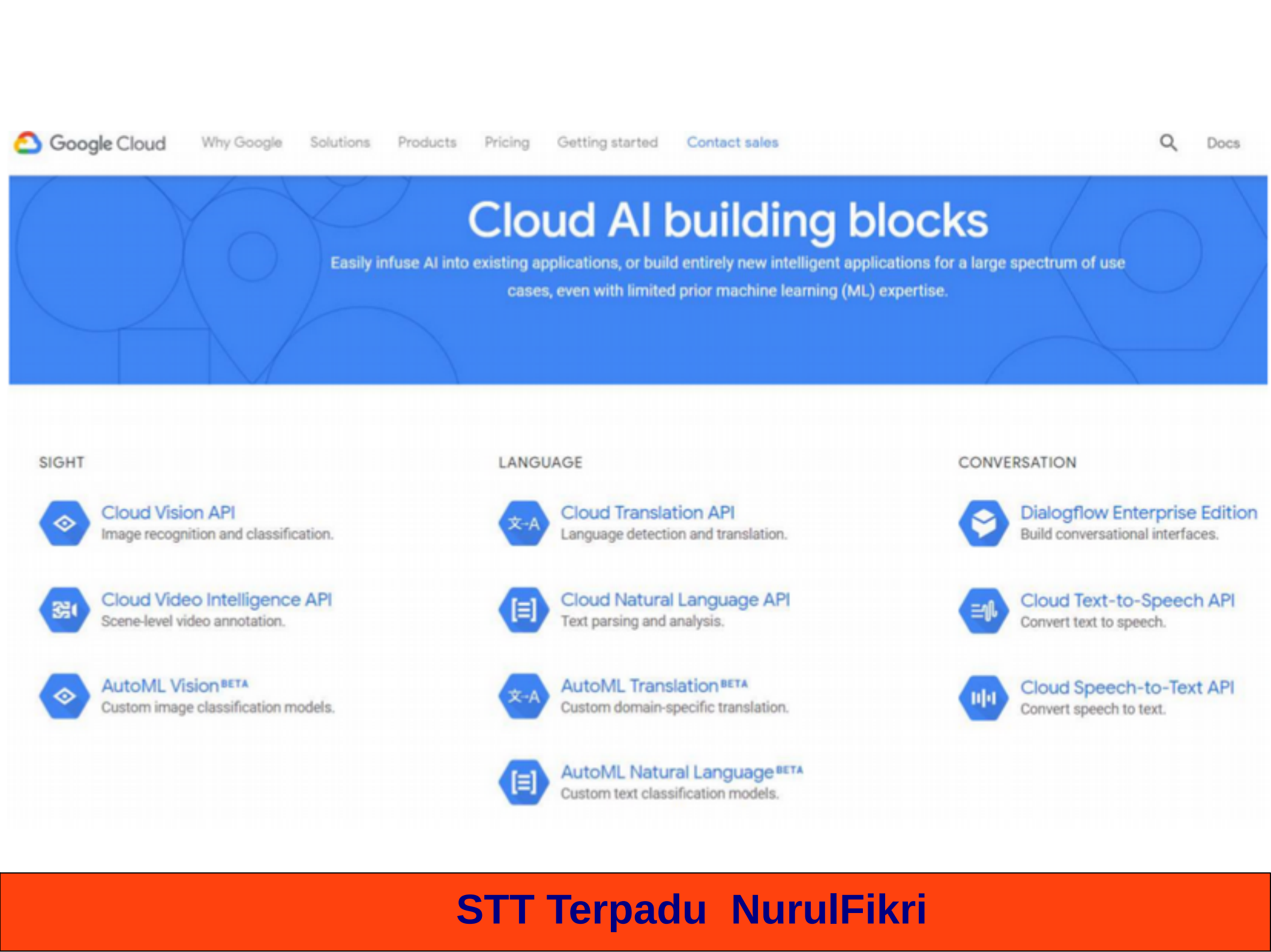
- The Internet of Things (IoT) makes business applications interact with the physical world
- Big Data makes large data sets accessible for advanced analytics and intelligence
- Machine learning (ML) and artificial intelligence (AI) automate repetitive processes and learn from human exception handling and decision-making
- Advanced analytics finds data patterns to support decisions and predict the future
- Blockchain distributes collaborative processes across the entire value network
- Data intelligence finds new value in data assets for new business models

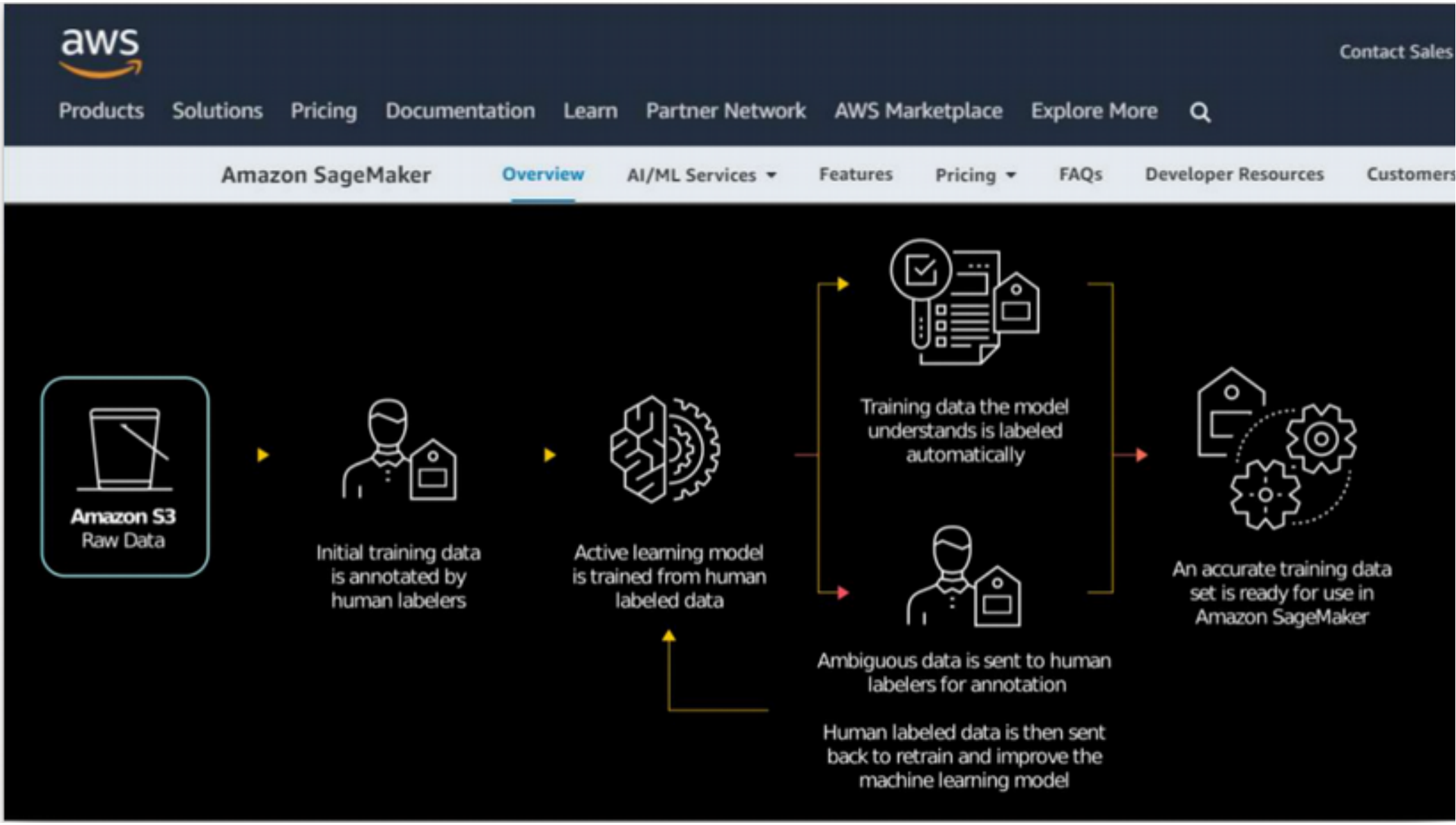
Enablers of Industry 4.0 and role of Cloud

Artificial Intelligence	• Cloud services for users with no ML knowledge • Cloud platform services for expert ML guys • Cloud Infra for deep learning
Robotics	• Task offloading to cloud – mobile robots • Cloud based robotic services • Knowledge sharing platform for robots via cloud
IoT	• Data processing with Cloud • Extend the processing to the edge • IoT analytics

Possible applications of AI






aws
Contact Sales
Products
Solutions
Pricing
Documentation
Learn
Partner Network
AWS Marketplace
Explore More
Amazon SageMaker
Overview
AI/ML Services
Features
Pricing
FAQs
Developer Resources
Customers
Amazon S3
Raw Data
Initial training data is annotated by human labelers
Active learning model is trained from human labeled data
Training data the model understands is labeled automatically
Ambiguous data is sent to human labelers for annotation
Human labeled data is then sent back to retrain and improve the machine learning model
An accurate training data set is ready for use in Amazon SageMaker

Deep Learning Cloud Service Providers

#	Name	URL
1	Alibaba	https://www.alibabacloud.com
2	AWS EC2	https://aws.amazon.com/machine-learning/amis
3	AWS Sagemaker	https://aws.amazon.com/sagemaker
4	Cirrascale	http://www.cirrascale.com
5	Cogeco Peer 1	https://www.cogecopeer1.com
6	Crestle	https://www.crestle.com
7	Deep Cognition	https://deepcognition.ai
8	Domino	https://www.dominodatalab.com
9	Exoscale	https://www.exoscale.com
10	FloydHub	https://www.floydhub.com/jobs
11	Google Cloud	https://cloud.google.com/products/ai
12	Google Colab	https://colab.research.google.com
13	GPUEater	https://www.gpueater.com
14	Hetzner	https://www.hetzner.com
15	IBM Watson	https://www.ibm.com/watson
16	Kaggle	https://www.kaggle.com

https://towardsdatascience.com/list-of-deep-learning-cloud-service-providers-579f2c769ed6

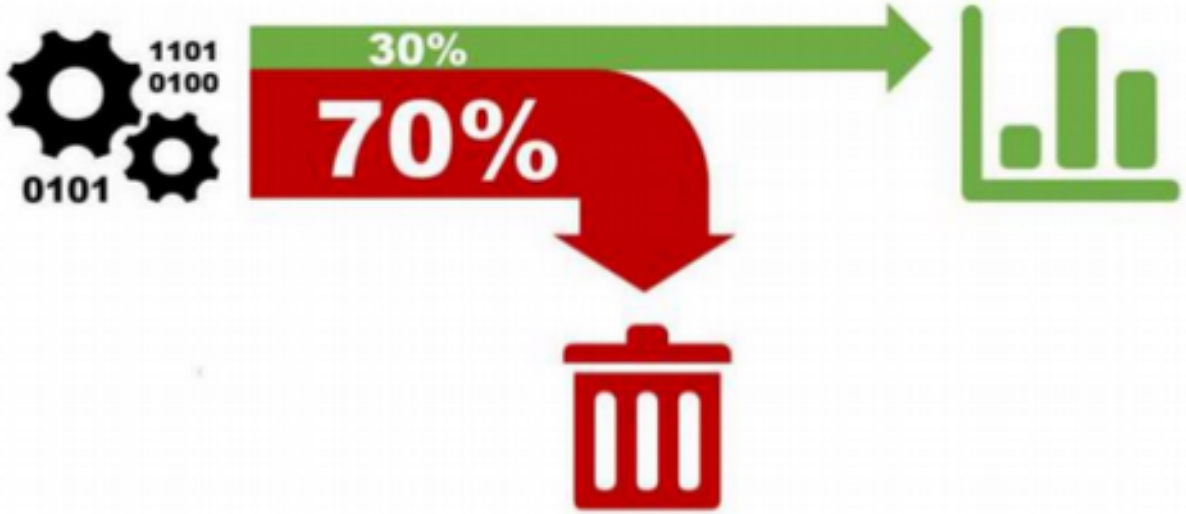
Deep Learning Cloud Service Providers

#	Name	URL
17	Lambda	https://lambdalabs.com
18	LeaderGPU	https://www.leadergpu.com
19	Microsoft Azure	https://azure.microsoft.com
20	Nimbix	https://www.nimbix.net
21	Oracle	https://cloud.oracle.com
22	Outscale	https://en.outscale.com
23	Paperspace	https://www.paperspace.com
24	Penguin Computing	https://www.penguincomputing.com
25	Rapid Switch	https://www.rapidswitch.com
26	Rescale	https://www.rescale.com
27	Salamander	https://salamander.ai
28	Spell	https://spell.run
29	Snark.ai	https://snark.ai
30	Tensorpad	https://www.tensorpad.com
31	Vast.ai	https://vast.ai
32	Vectordash	https://vectordash.com

https://towardsdatascience.com/list-of-deep-learning-cloud-service-providers-57ff2e76fed6

Need for AI in Industry 4.0

- Industrial companies often have large amounts of data without generating any added value from it. According to a study by the World Economics Forum in cooperation with A.T. Kearney is currently 70% of all collected production data is not used




Robotics and
Cloud

Cloud Robotics

- Cloud robotics services that take the pain out of the robot development lifecycle are a vital step forward on the path to increased robot affordability and ease of development

Robots as a service (plus the cloud)

- Low capital expenditures plus mad robot capabilities! Hence the rise of robot rentals—on-location at your business—with cloud-enabled, pay-as-you-go services attached

Robots in the cloud

- Programming a remote physical robot that's accessible over the cloud

Robots as a service

Hirebotics

Hire a Robot

Hire a robot just like you would a human with zero upfront capital investment. Run the robot 14 hours, pay for 14 hours. Run the robot 18 hours, pay for 18 hours. No need to schedule an employee or pay for unproductive time.

Cloud Connected

Our robotic workers are cloud connected! Continuous, real-time monitoring means we can avoid unplanned downtime, offer you real-time data, and push software enhancements over time.

Mobile App

The Hirebotics mobile app allows you to access *your* real-time production and quality data. You can also receive push notifications of events that are important to you, such as low on raw material, stopped billing, etc.

Maintenance Free

When you hire one of our robotic workers, we completely cover preventative maintenance and an upgrade cycle *before* worker is ready to retire.

Robots in the cloud

- Democratize robotics by providing remote access to a state-of-the-art multi-robot research facility
- The Robotarium project provides a remotely accessible swarm robotics research platform that remains freely accessible to anyone
- Currently, Robotics research requires significant investments in terms of manpower and resources to competitively participate
- However, we believe that anyone with new, amazing ideas should be able to see their algorithms deployed on real robots, rather than purely simulated
- In order to make this vision a reality, we have created a remote-access, robotics lab where anyone can upload and test their ideas on real robotic hardware

Some newest Cloud Robotics platforms

AWS RoboMaker

- Integration of the open-source ROS framework with Amazon's cloud-based machine learning services

Honda Robotics as a Service Platform

- Software platform (APIs/SDKs) for functions, such as collecting and sharing data, controlling communication, changing states, and robotic cooperation

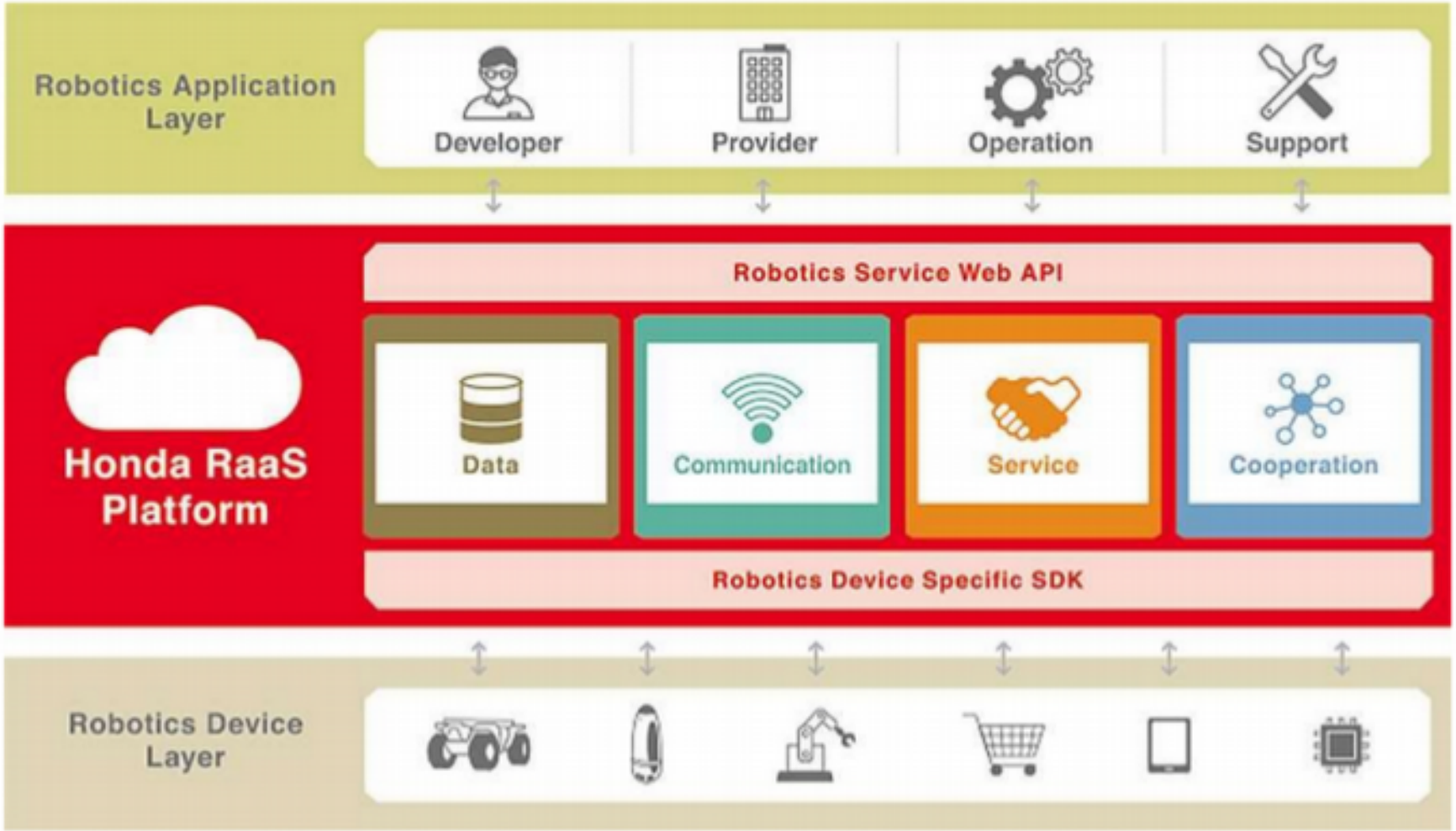
Google Cloud Robotics

- Collaborative robots, Solution for robots working at scale

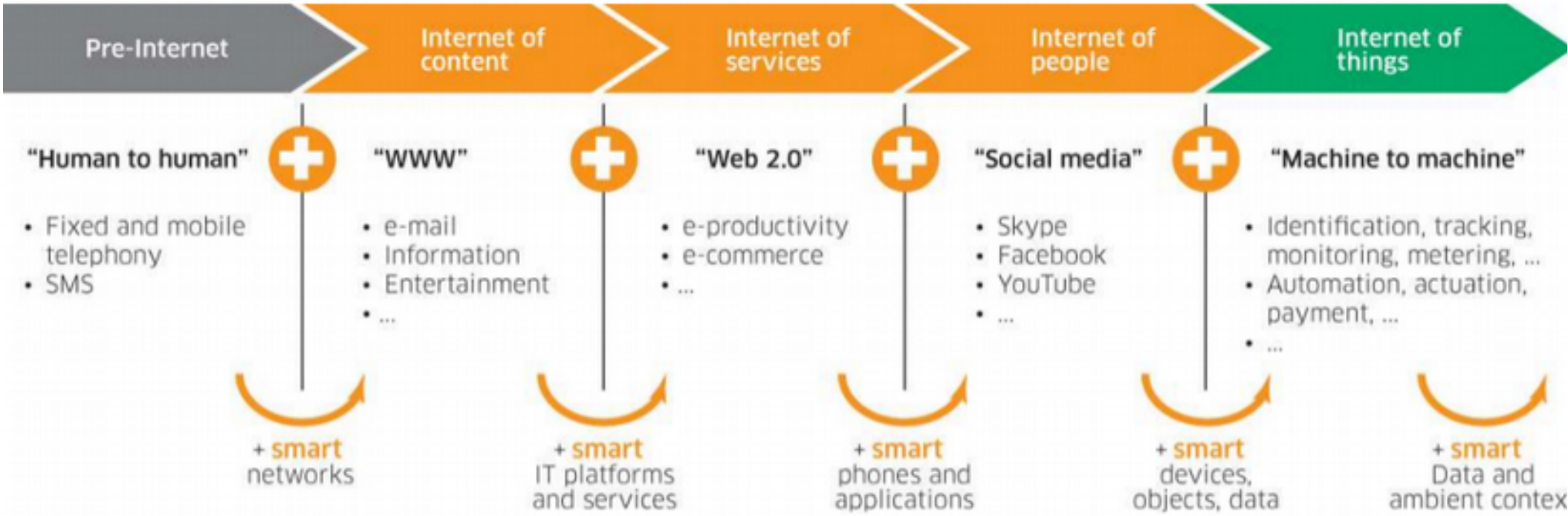
Microsoft ROS for Windows

- The ROS for Windows provides your local robot with the benefits of Microsoft's enterprise expertise (Security, scalability) and cloud-based ML/AI services

Honda RaaS


Robotics Application Layer
Developer
Provider
Operation
Support
Honda RaaS Platform
Robotics Service Web API
Data
Communication
Service
Cooperation
Robotics Device Specific SDK
Robotics Device Layer

Evolution of Internet of Things



How IoT and Cloud complement each other?

Parameter	Internet of things	Cloud computing
Big Data	Acts as a source for big data	Acts as a way or a means to manage big data
Reachability	Very limited	Far spread, wide
Storage	Limited or almost none	Large, virtually never ending
Role of Internet	Acts as a point of convergence	Acts as a means for delivering services
Computing capabilities	Limited	Virtually unlimited
Components	Runs on hardware components	Runs on virtual machines which imitate hardware components

https://blog.resellerclub.com/what-is-the-role-of-cloud-computing-in-iot/