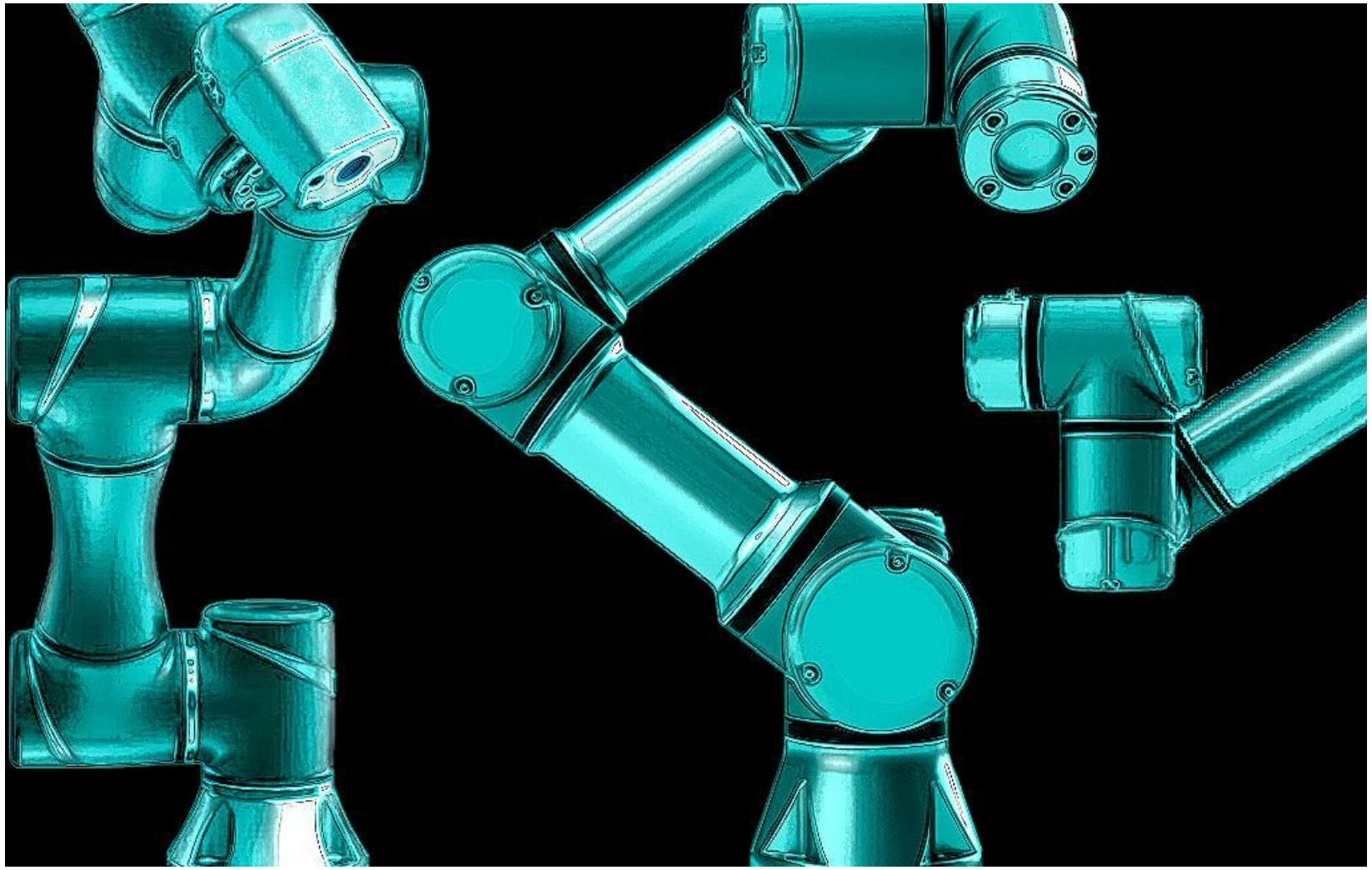
Dan Kara

Vice President, Robotics & Intelligent Systems

WTWH Media

Robotics Solutions for Manufacturers: Where Are We Now, Where Are We Going?



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Mandates often at odds with resources, capabilities…

The Robotics Automation Imperative

Increase Productivity

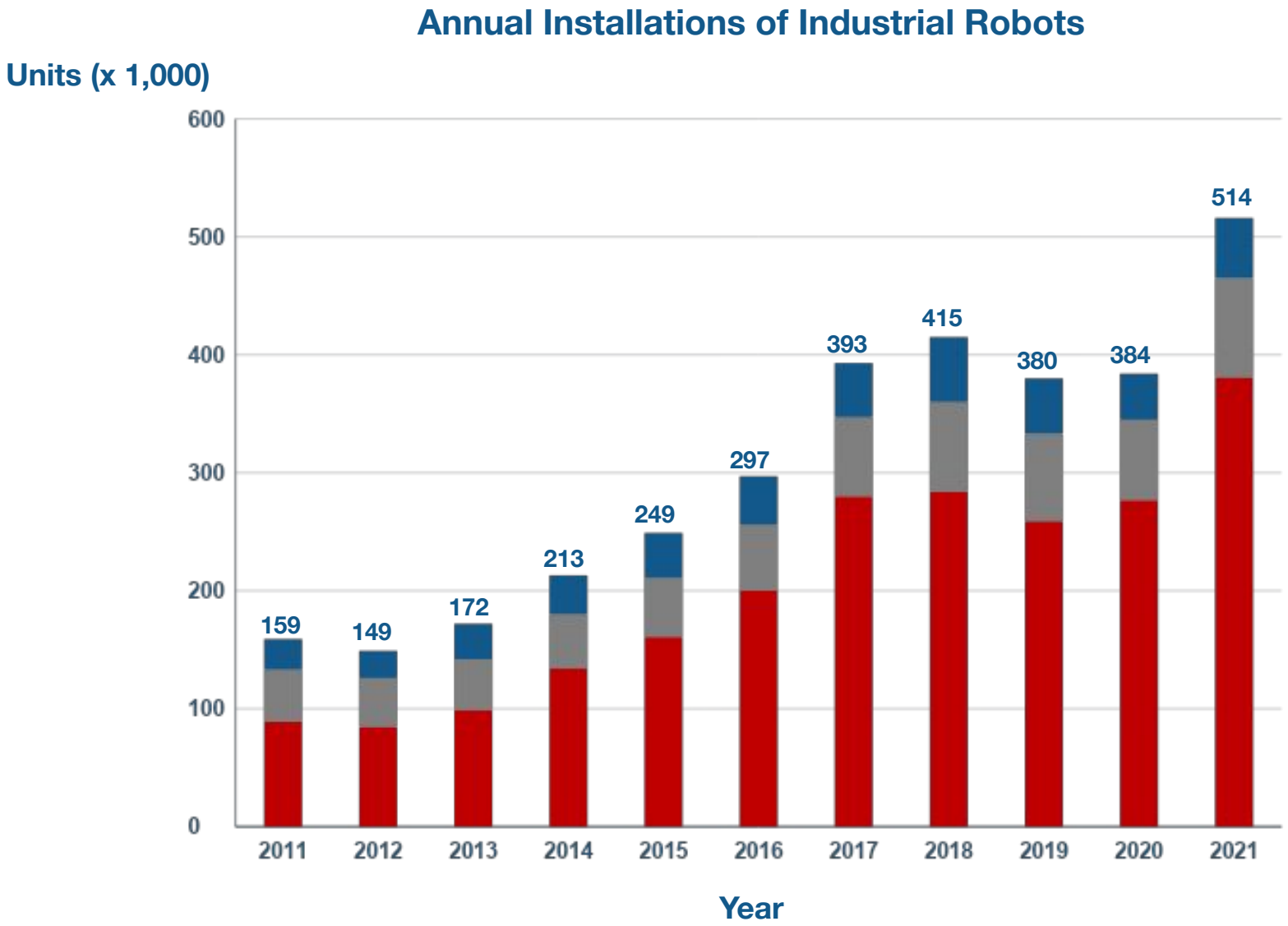
Improve Quality

Address Labor Variability

Reduce Costs

Enhance Agility

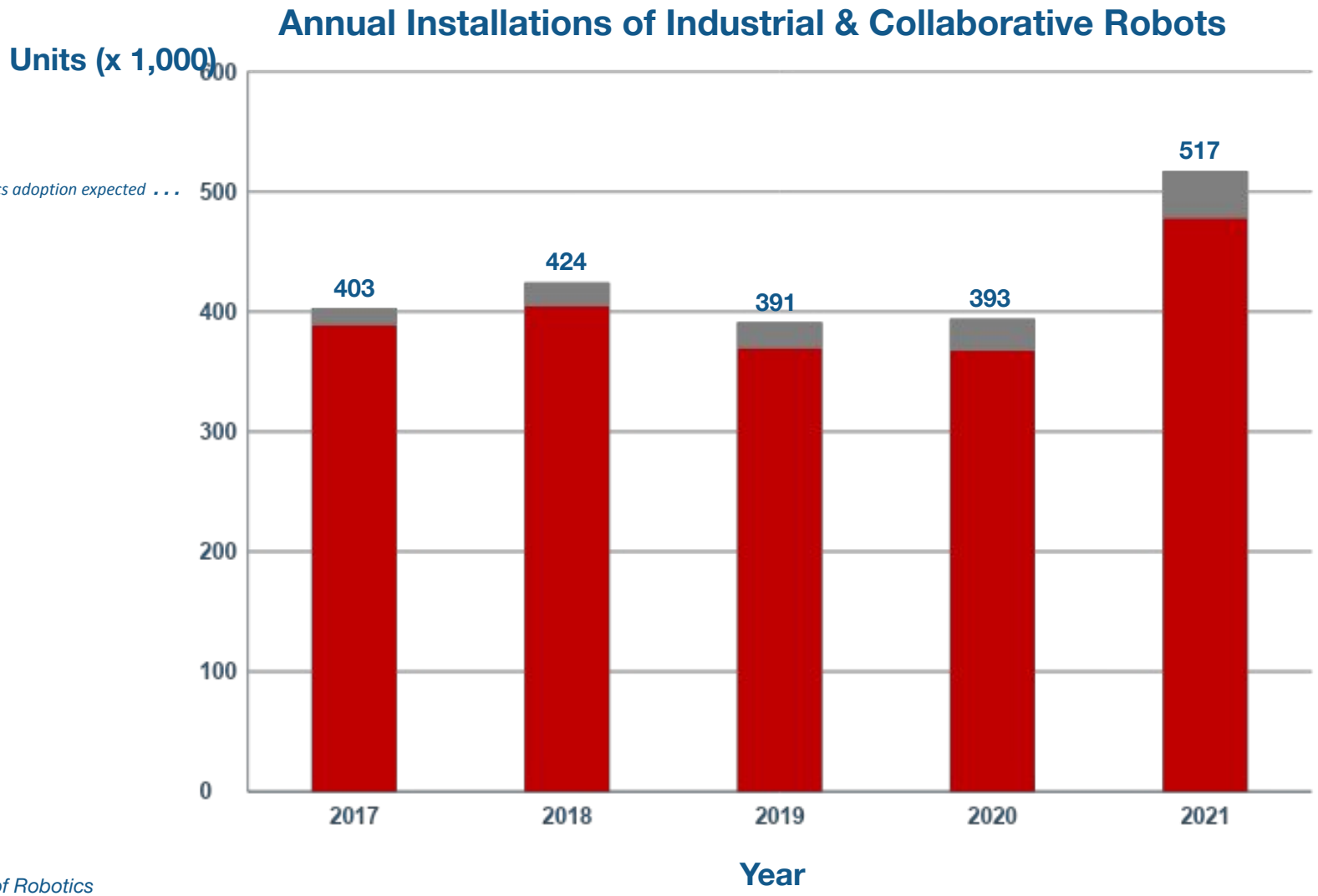
Installations of Industrial Robotics - Worldwide



Source: International Federation of Robotics

Installations of Industrial & Collaborative Robots - Worldwide

Strong growth for collaborative robotics adoption expected . . .



Source: International Federation of Robotics

VC and Private Sector Robotics Investment

Robotics investments substantial (startups and acquisitions, too), with no sign of diminishment.

246 Investments

VB

Why John Deere Just Spent $305 Million on a Lettuce-Farming Robot

THE WALL STREET JOURNAL.

Robots Get a Makeover in Factories

Next-Generation Droids May Work Closely With Humans, Perform Delicate Tasks and Even Resemble WALL-E

Robots Are Preparing to Fill 200,000 Vacant Construction Jobs

The revolution is well underway.

BloombergBusinessweek Global Economics

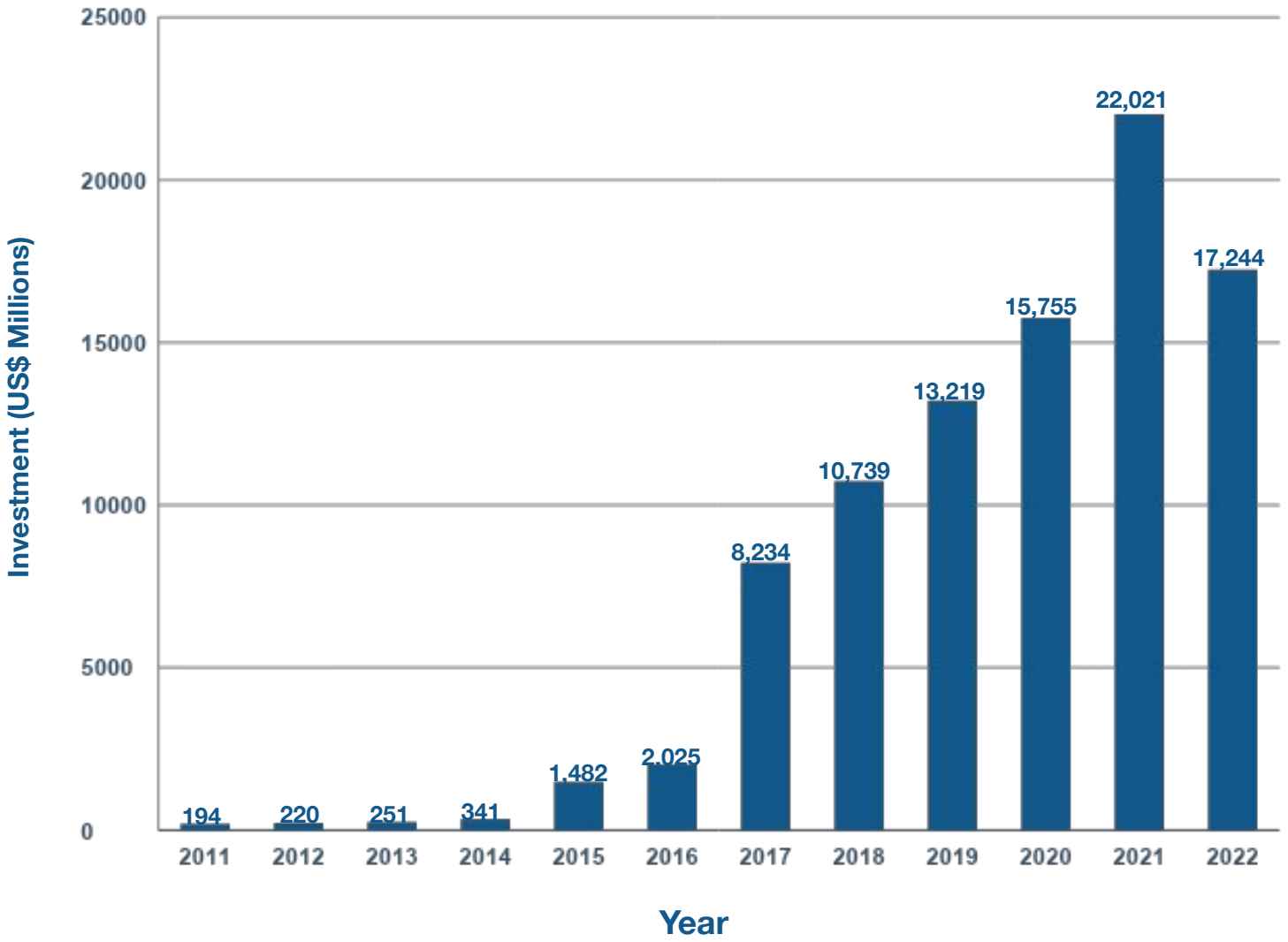
Robots: The Future of the Oil Industry

THE ROBOTREPORT

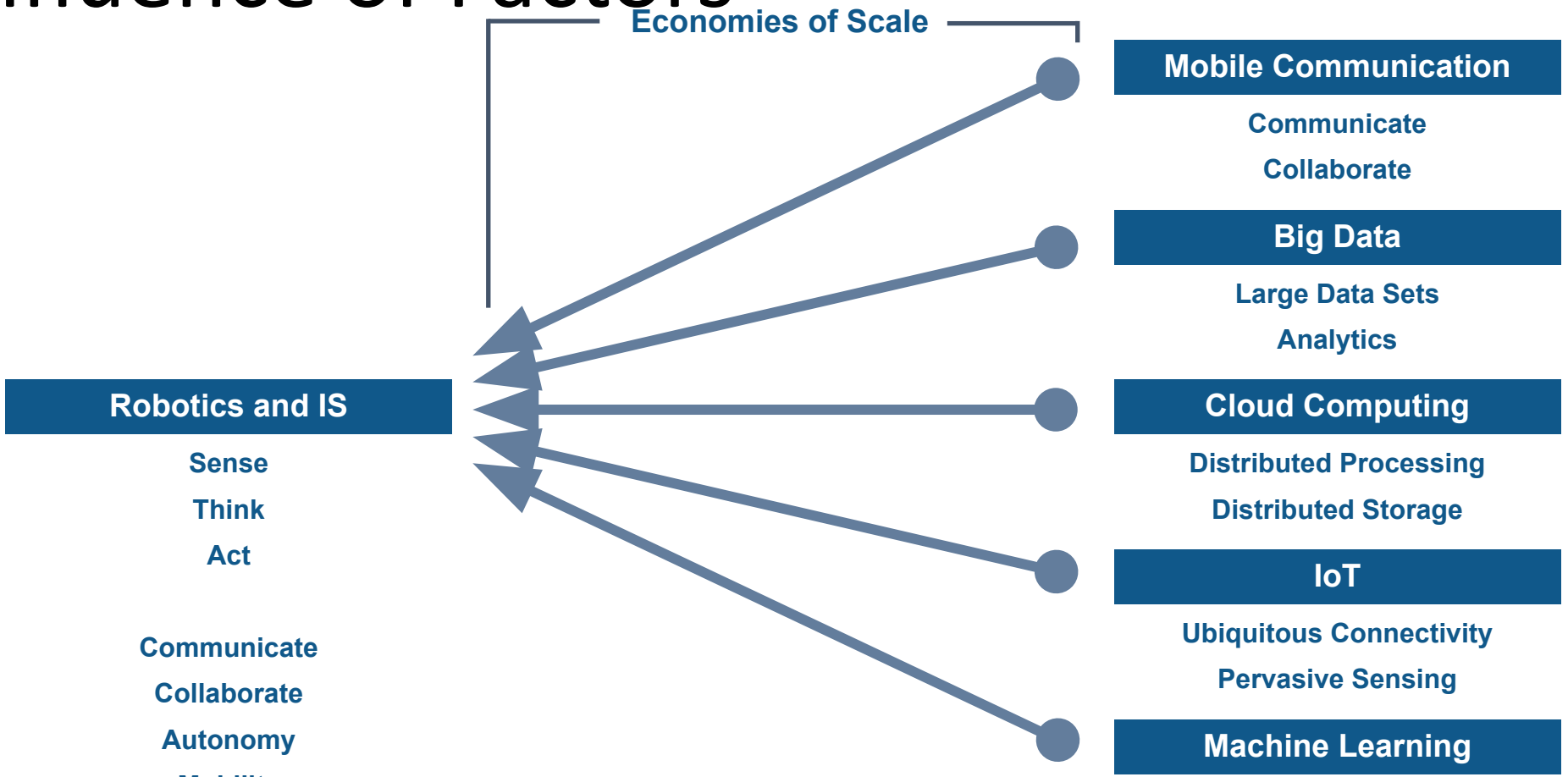
CloudMinds files for $500M IPO for cloud-based service robots

Forbes

A New Series: The Future of Robotics, The Next 20 Years

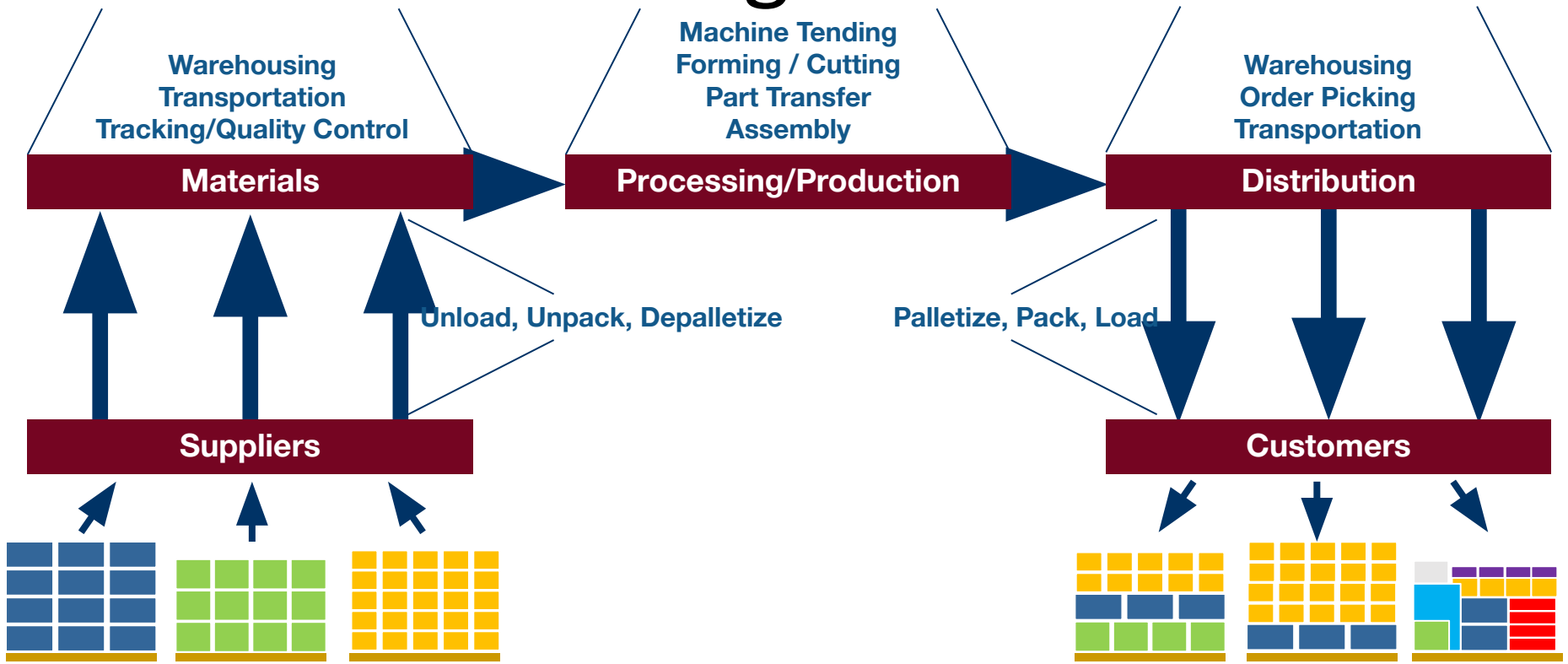


Confluence of Factors



Robotic automation for all manufacturing processes...

Robotic Manufacturing Automation



The Usual Suspects…			
↑ Productivity	↑ Accuracy	↑ Quality	↓ Costs
↑ Safety	↑ Flexibility	↑ Floor Space	↓ Damage
↑ Reliability	↑ Speed		↓ Injury

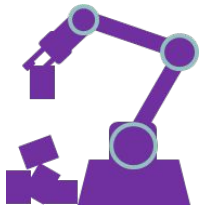
Supporting Flexible Automation

"Flexibility is the new productivity…

Task Flexibility

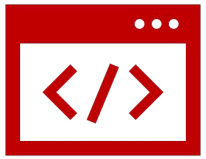
End-user Flexibility

Application Flexibility

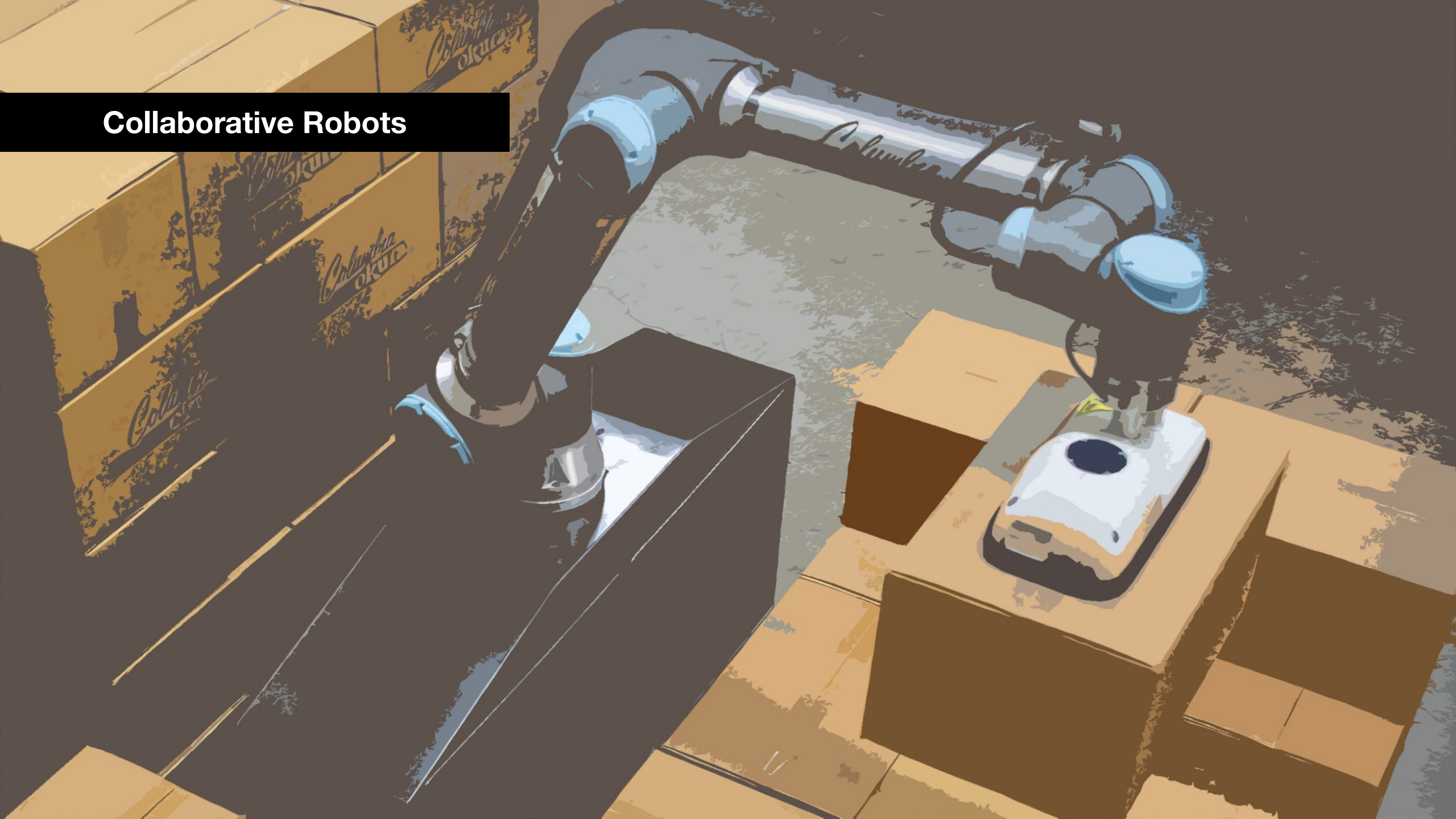


Location Flexibility

Programming Flexibility



Collaborative Robots



Collaborative robotics have 'evolved' over time…

Collaborative Robots (Continued)

Key Markets / Capabilities	Key Tasks
Supporting Small-to-Medium Manufacturers	Material Handling Machine Tending
Supporting Flexible / "Agile" Manufacturing	
Specialization	Light Assembly Dispensing
Expansion of Capabilities	Welding and Soldering Cutting, Forming, Bending Finishing and Inspection Palletizing / Depalletizing Bin Picking, More…
Enablers / Platforms / Ecosystems	Additional Vertical Markets • Food • Healthcare • Agriculture • Retail • More…

Time

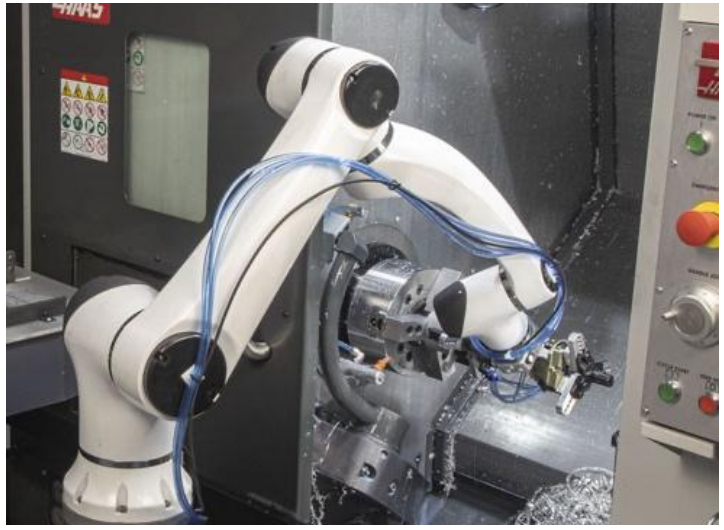
More Collaborative Robot Options, New Models

Variations on a common theme…

Kinova Link 6

Hanwha Techwin's HCR-12A

Comau Racer-5 COBOT



Applied Cobotics Elfin 5

NEURA Robotics MAiRA

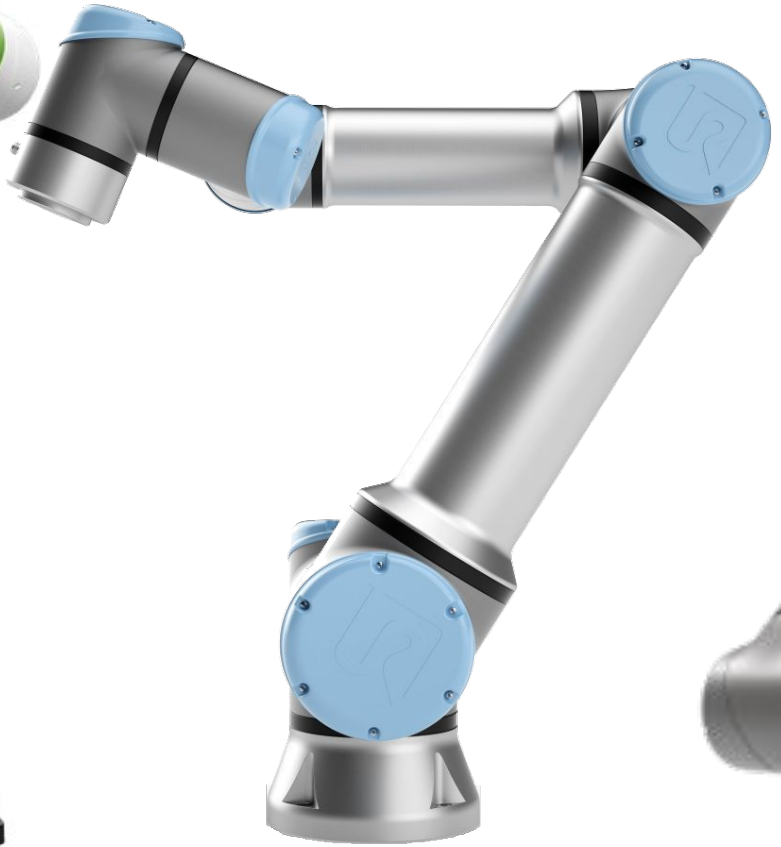
Key Trend - Heavier Payloads

Also higher precision and more…

Doosan Robotics' H2515

Yaskawa Motoman HC20XP

Fanuc CRX-25iA



Universal Robots' UR20

OMRON (Techman) TM20

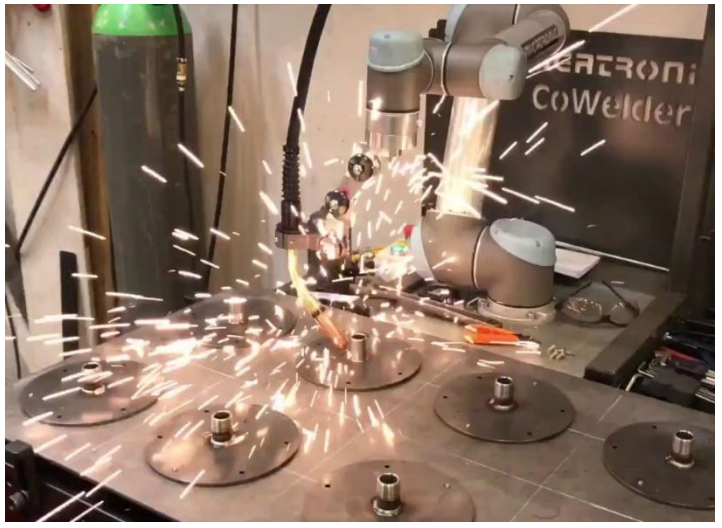
Key Trend - New Application Classes

Beyond pick-and-place and machine tending…

Ergonit Palletizer

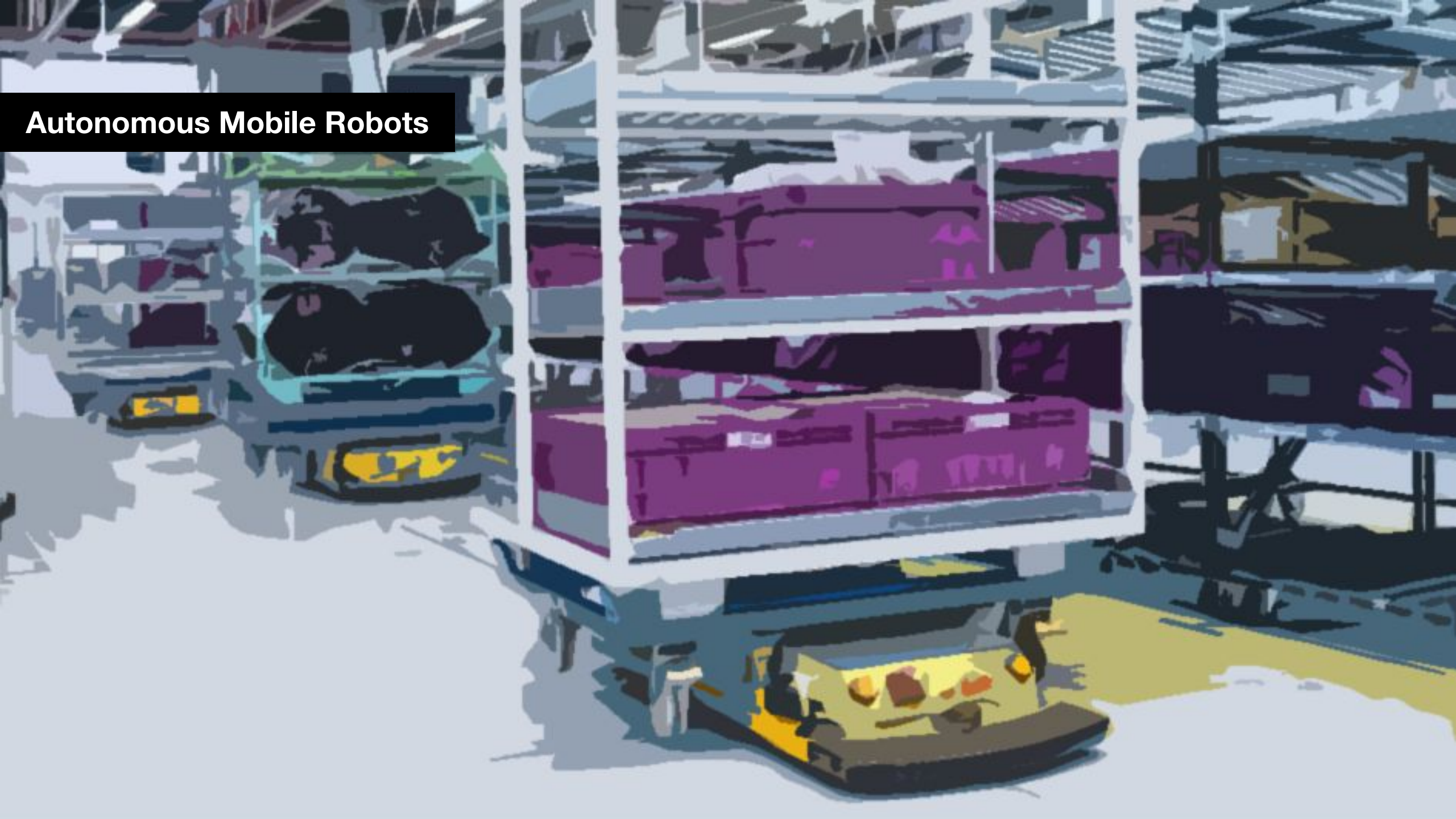
Rocketfarm's Palletizer

Gray Matter Robotics' Sander



Migatronic CoWelder

Assembly at CSVW


Autonomous Mobile Robots

Low profile systems for heavy payloads and autonomous transportation…

Autonomous Mobile Robots – Heavy Payloads

Comau Agile 1500

Gideon Brothers' Logistics Robot

Mobile Industrial Robots' MiR1350

Otto Motors Otto 1500

Fetch Robotics PalletTransport1500

Lift truck provide heavy lifting and autonomous transportation…

Autonomous Mobile Robots – Lift Trucks

Seegrid Palion Lift AMR

Vecna Robotics VRSB 3000

Agilox OCF

Linde / Balyo T-MATIC

Yale Material Handling / Balyo MPE080-VG

Autonomous Mobile Robots –Tugs

Traditional, long haul 'tuggers' now autonomous…

Seegrid Palion Tow Tractor Series 8

Toyota Core Tow Tractor Automated Forklift

Mobile Industrial Robots MiR100 w/ MiRHook

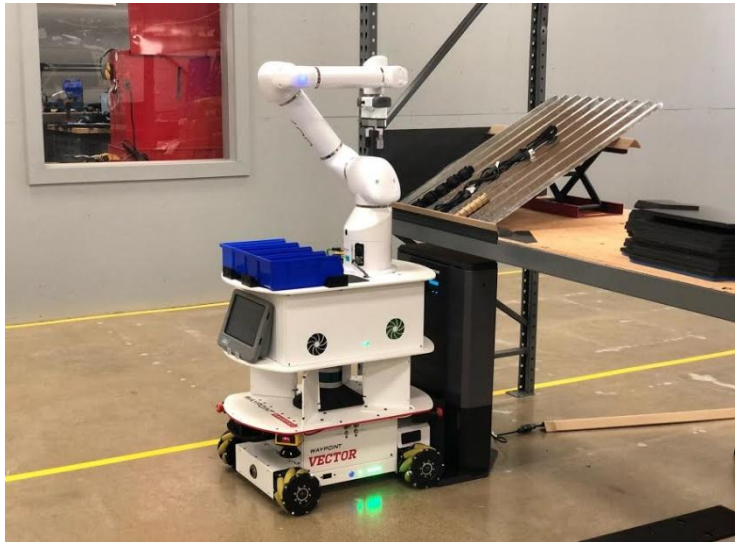
AutoGuide MAX N10

Key Trend - Mobile Manipulation

Goal is location and task flexibility…

Comau Mobile Robotic Arm

Neura Robotics



Waypoint Robotics / Productive Robotics

Clearpath Robotics / Franka Emika

Desmasa MCR

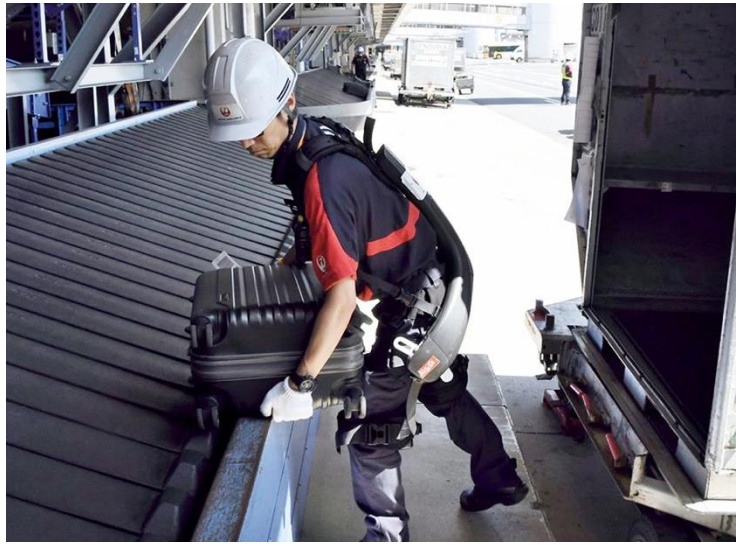
Exoskeletons

Key Trend - Industrial Exoskeletons

Exploiting the intelligence and flexibility of human operators, and the strength and endurance of robots…

Italian Institute of Technology's XoTrunk

Cyberdyne's HAL for Labor Support



Atoun's Model Y

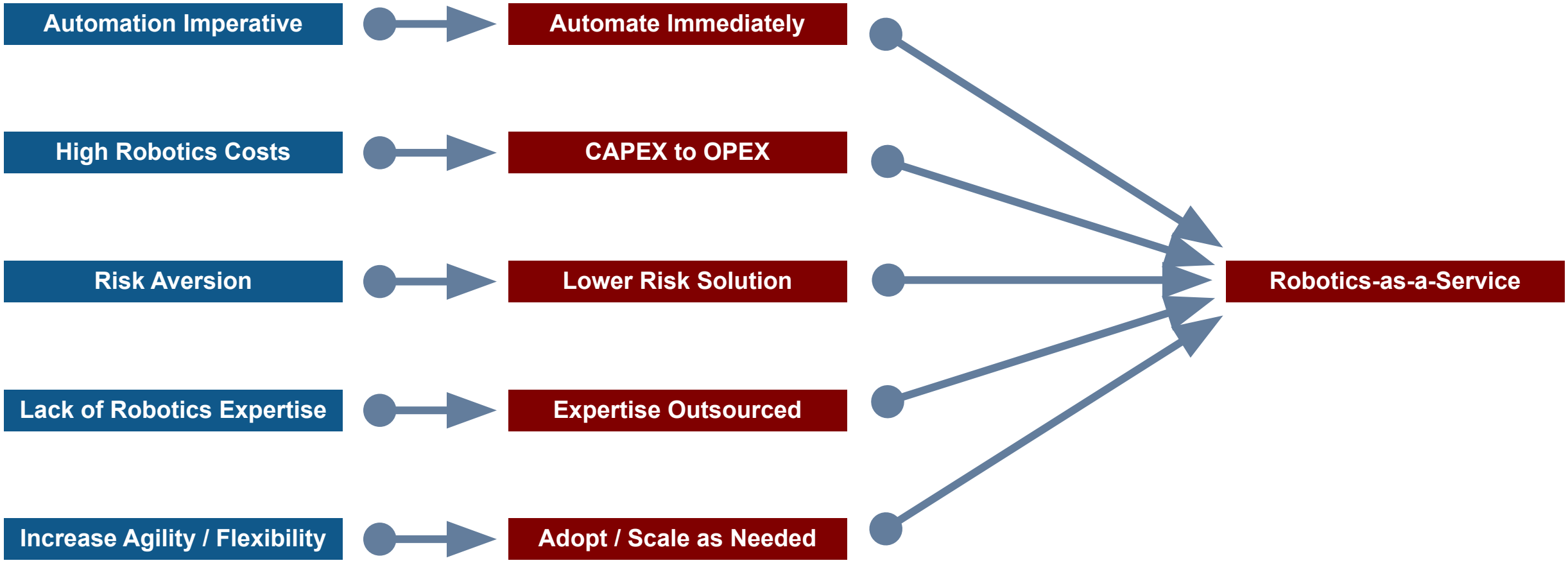
Comau's MATE

Esko Bionics' EksoVest

Robotics-as-a-Service

Challenges address by RaaS solutions . . .

RaaS Benefits for End-user Companies

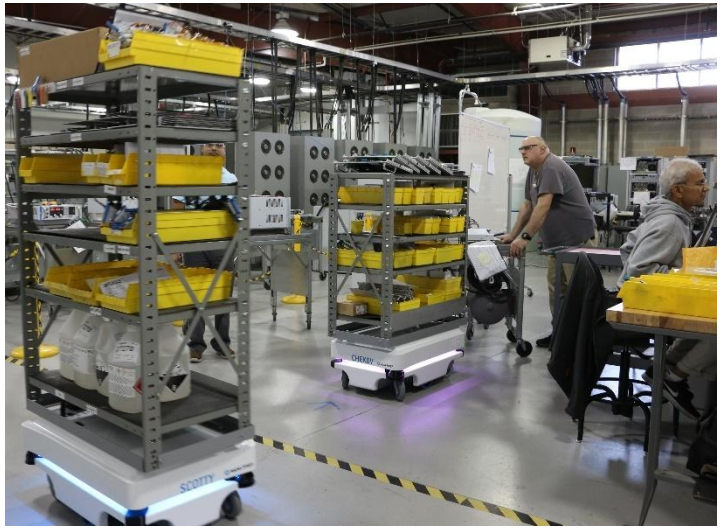


Collaborative Robots and AMRs…

RaaS Solutions

York Exponential

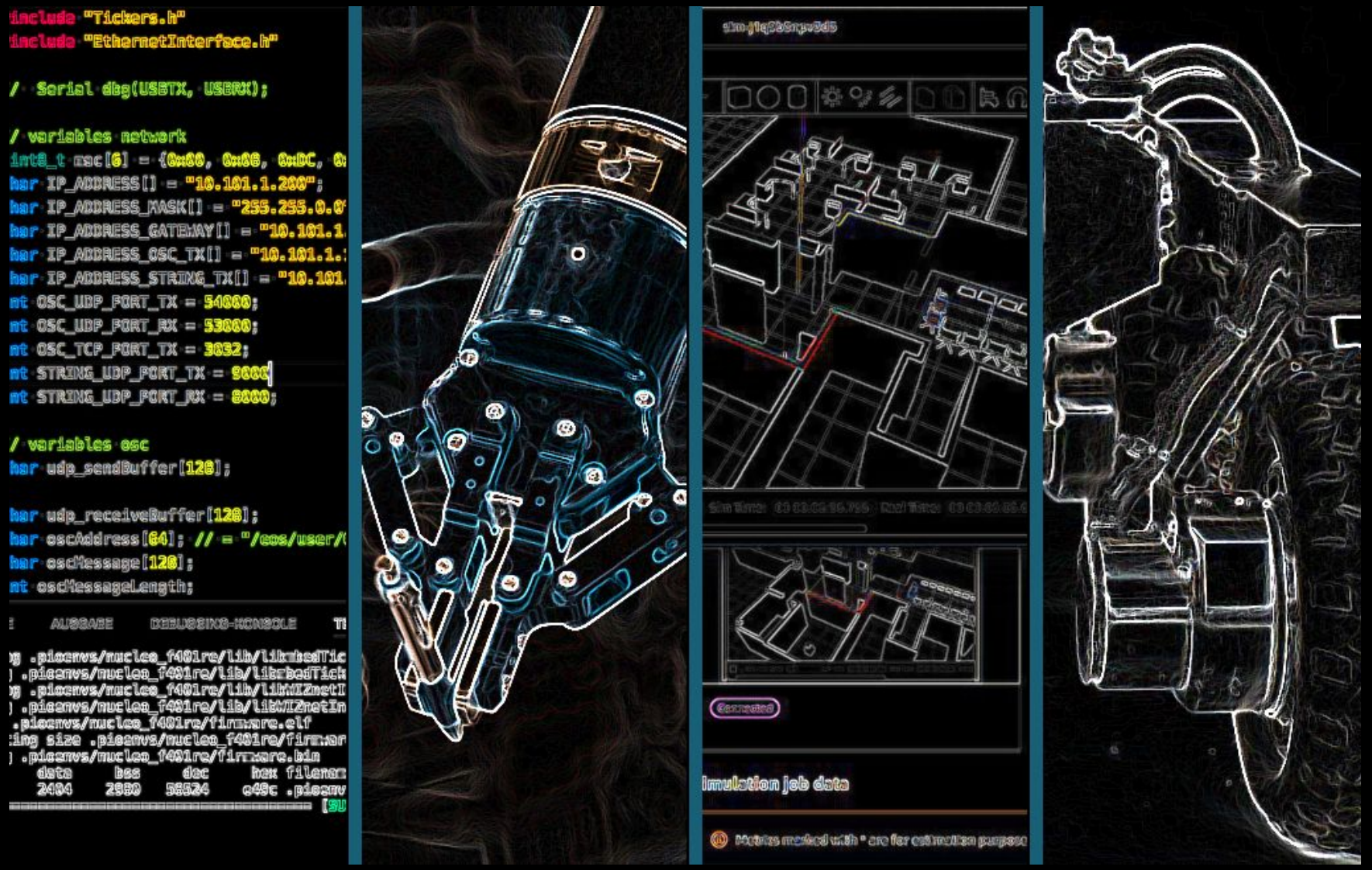
Hirebotics



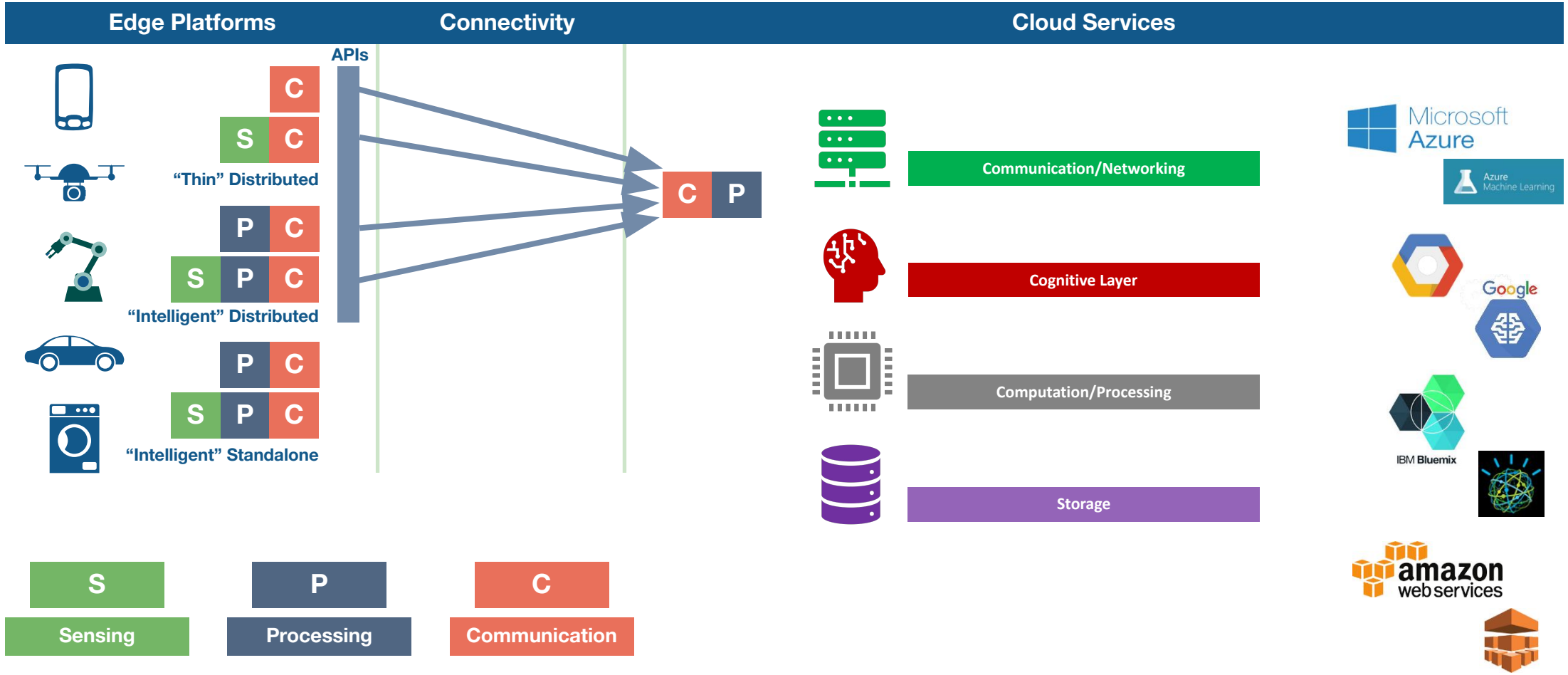
Mobile Industrial Robots' MiR200

Fetch Robotics Freight500

Ready Robotics' Forge Station R5


#include "Tickers.h"
#include "EthernetInterface.h"
// Serial dbg(USBTX, USBRX);
// variables network
int8_t mac[6] = {0x00, 0x08, 0xDC,
char IP_ADDRESS[] = "10.101.1.200";
char IP_ADDRESS_MASK[] = "255.255.0.0
char IP_ADDRESS_GATEWAY[] = "10.101.1
char IP_ADDRESS_OSC_TX[] = "10.101.1.
char IP_ADDRESS_STRING_TX[] = "10.101
int OSC_UDP_PORT_TX = 54000;
int OSC_UDP_PORT_RX = 53000;
int OSC_TCP_PORT_TX = 3032;
int STRING_UDP_PORT_TX = 9001;
int STRING_UDP_PORT_RX = 8888;
// variables osc
char udp_sendBuffer[128];
char udp_receiveBuffer[128];
char oscAddress[64]; // = "/ems/user/
char oscMessage[128];
int oscMessageLength;
AUSGABE
DEBUGGING-KONSOLE
.pioenvs/nucleo_f401re/lib/libmbedTic
.pioenvs/nucleo_f401re/lib/libmbedTick
.pioenvs/nucleo_f401re/lib/libWIZnetI
.pioenvs/nucleo_f401re/lib/libWIZnetIn
.pioenvs/nucleo_f401re/firmware.elf
ing size .pioenvs/nucleo_f401re/firmwar
.pioenvs/nucleo_f401re/firmware.bin
data bss dec hex filenam
2484 2580 56524 e49c .pioenv
Connected
imulation job data

Platform and Cognition Services



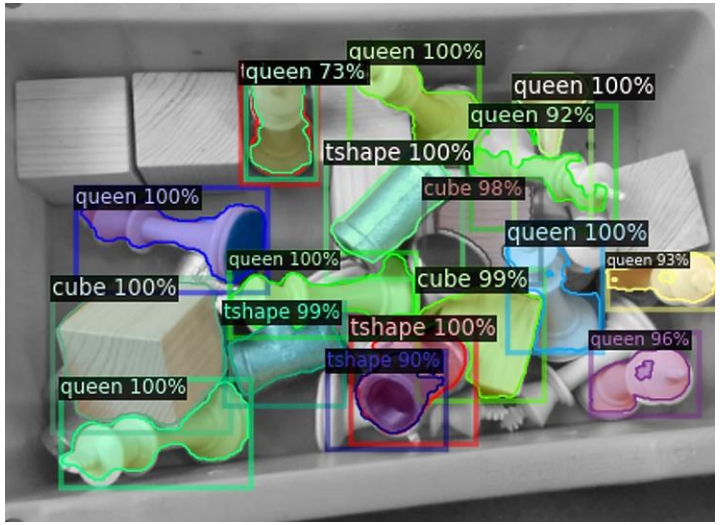
Vision, ML, and robots typically for grasping and manipulation…

Perception, Grasping, Manipulation Solutions

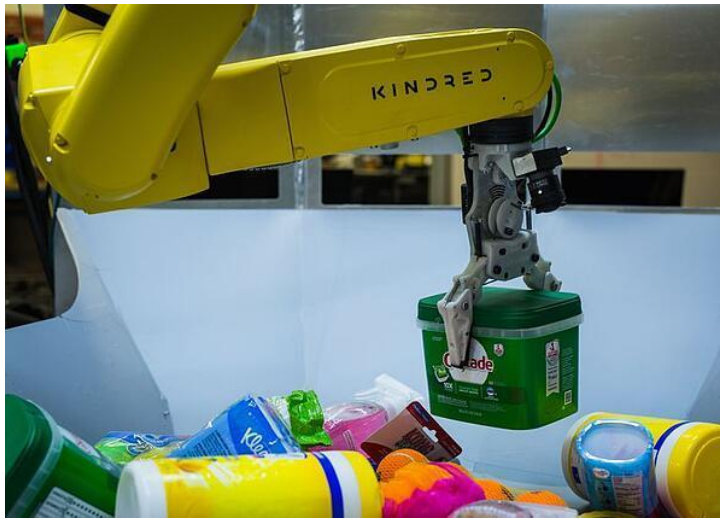
Ambi Robotics

Right Hand Robotics

Osaro Robotics



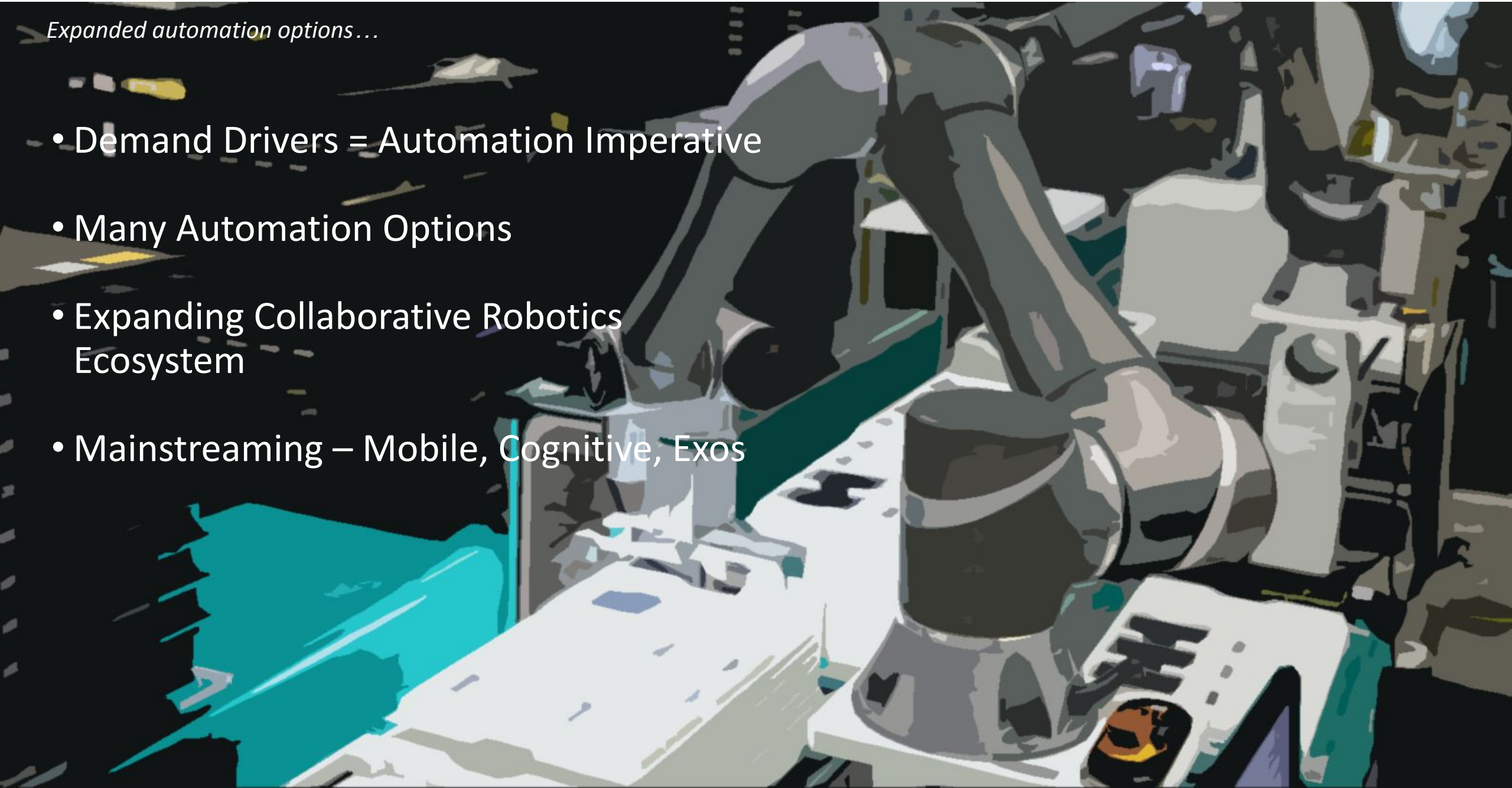
CMES Robotics



Kindred

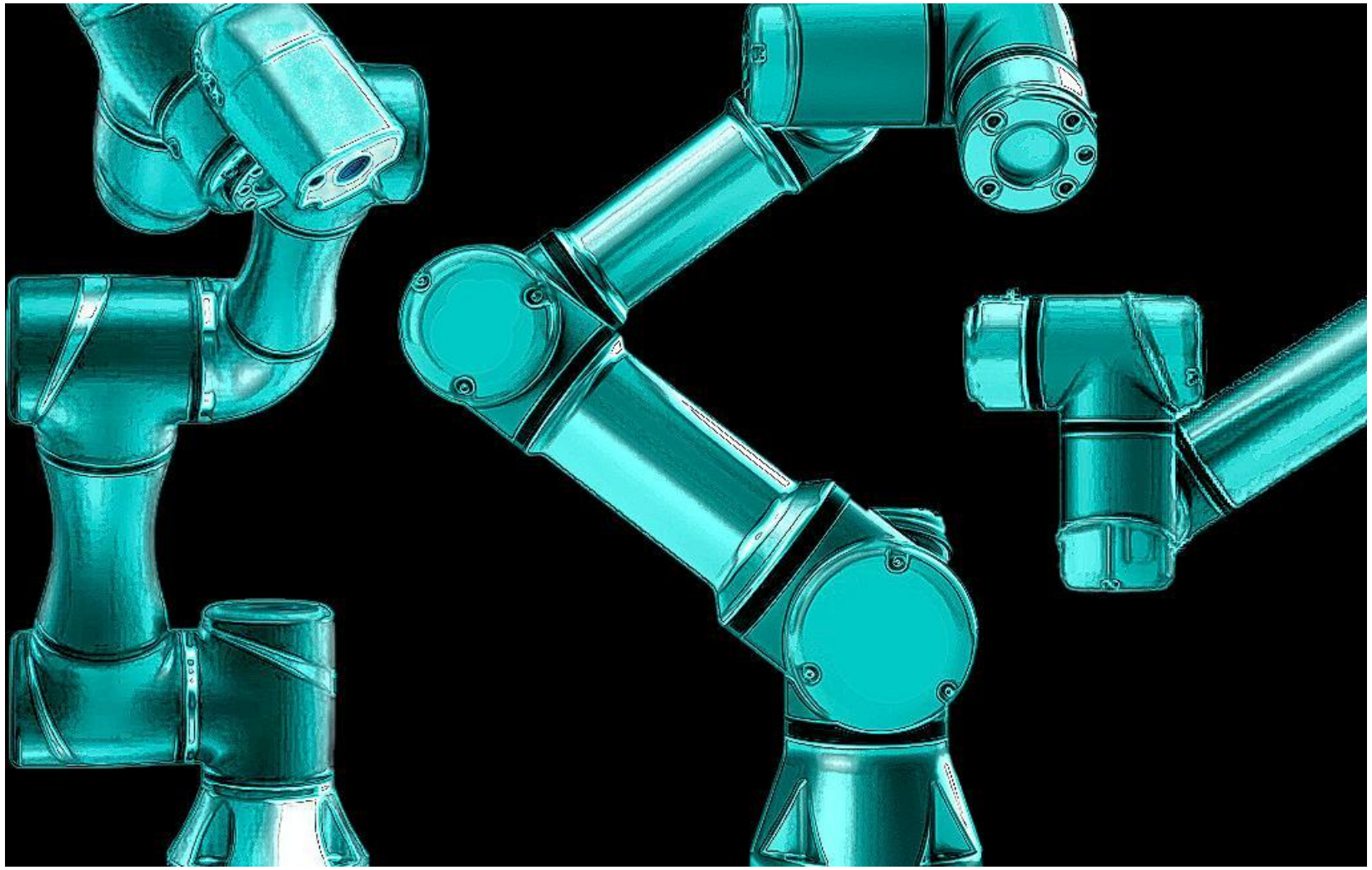
Observations

Expanded automation options…



- Demand Drivers = Automation Imperative
- Many Automation Options
- Expanding Collaborative Robotics Ecosystem
- Mainstreaming – Mobile, Cognitive, Exos

Robotics Solutions for Manufacturers: Where Are We Now, Where Are We Going?



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Thank You!