

INTRODUCING THE NEW GENERATION OF NAO ROBOT

NAO⁶



01



INTRODUCTION OF **NAO⁶**

02



NAO⁶ VALUE PROPOSITION & BENEFITS




03

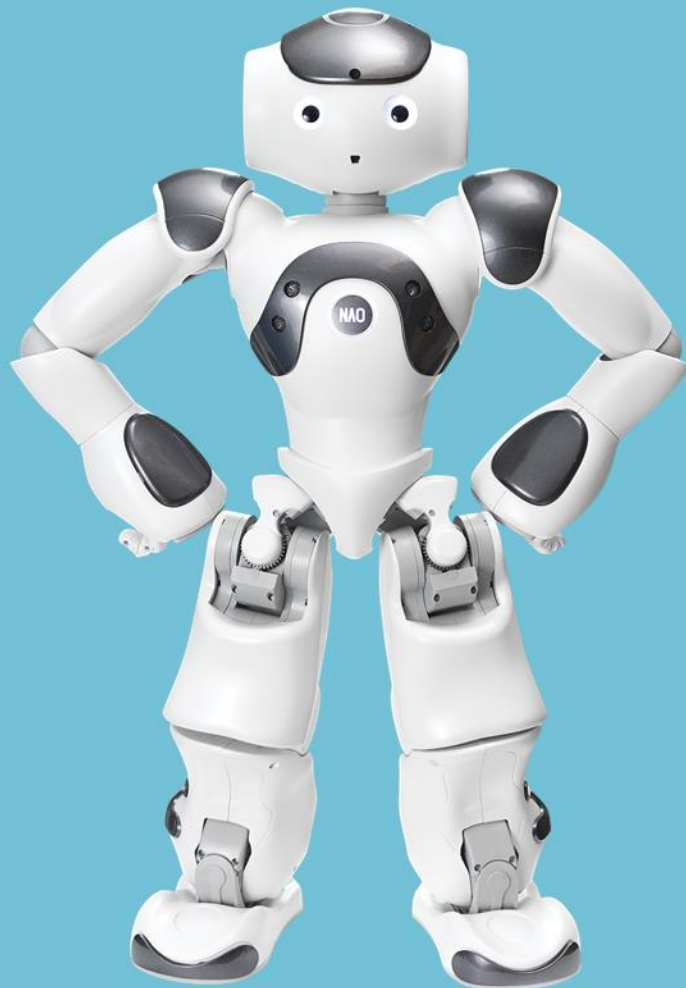


SOFTBANK ROBOTICS QUICK VIEW

NAO⁶

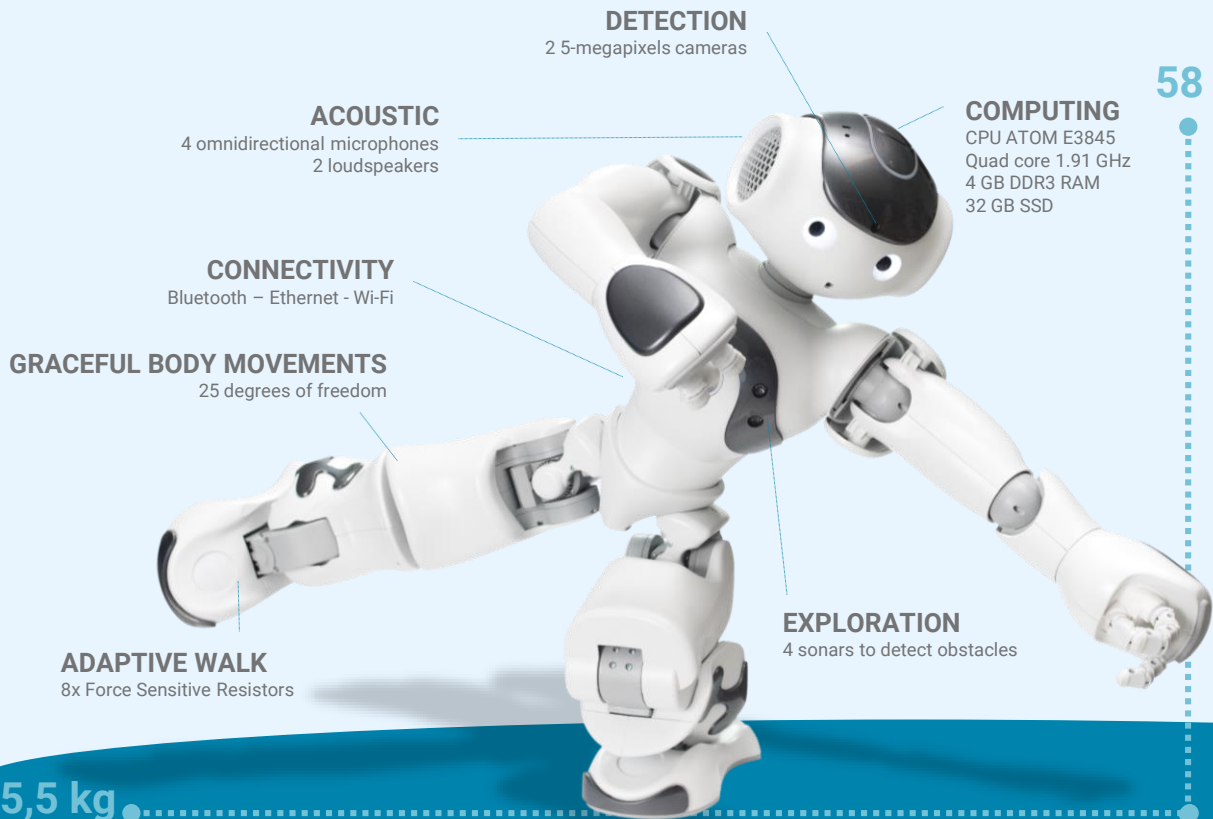
INTRODUCTION

-  NAO⁶ INTRODUCTION
-  NAO⁶ IMPROVEMENTS
-  MARKET SECTORS



THE 6TH GENERATION OF HUMANOID ROBOT NAO

|| **Attractive programmable platform:** create a unique human-robot interaction experience and leverage it to a new level ||



NAO⁶

SPEECH RECOGNITION

More than 20 Languages

FALL MANAGER

Detects falls & trigger the protection

FALL RECOVERY

Able to stand up alone

NAO⁶, 6 MAJOR AREAS OF HARDWARE IMPROVEMENT

|| A continuous augmentation of robot performance: enriched package for a greater product ||

1 - POWER

CPU - ATOM Z530 → E3845
Memory: 8GB SDCard → 32GB SSD

2 - VISION

Camera - Aptina MT114 1.3Mpix →
Omnivision 5640 5Mpix

4 - MOTION

Motors - PortEscape 16 GT →
PortEscape 16 GT MP

6 - CONNECTIVITY

Bluetooth
New Wi-Fi
Better Ethernet



3 - AUDIO

Cardioid mic →
Omnidirectional mic
+ Audio codec

5 - ROBUSTNESS

Finger - Robustness Improvement

NAO⁶



1 - POWER

NAO⁶ benefits from the progress made on [Pepper](#) which makes it more powerful.



2 - VISION

With its new cameras, NAO⁶ better detects people. Dual stream of the top and bottom cameras is now supported.



3 - AUDIO

NAO⁶ hears and understands a lot better making dialog a full part of the interactions.



4 - MOTION

Thanks to its new motors, NAO⁶ can move longer without overheating.



5 - ROBUSTNESS

NAO⁶ benefits from many robustness improvements on motors and fingers providing an extended lifetime.



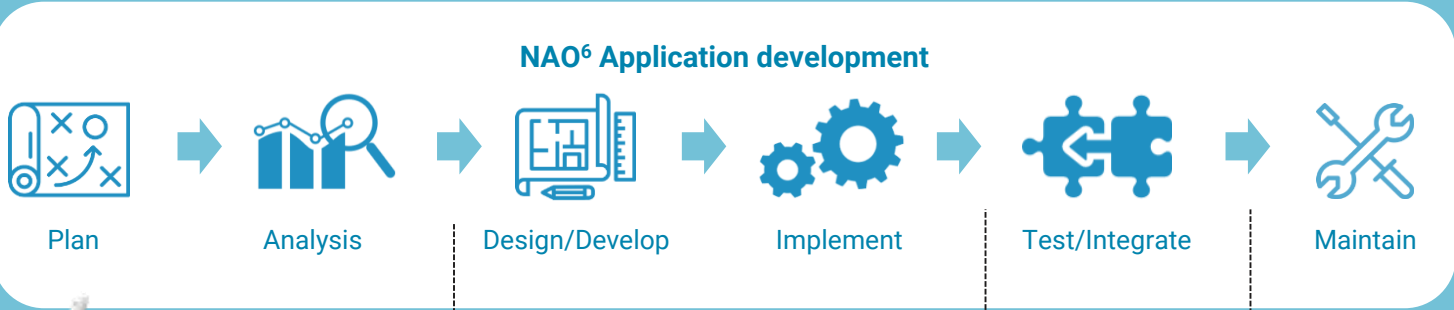
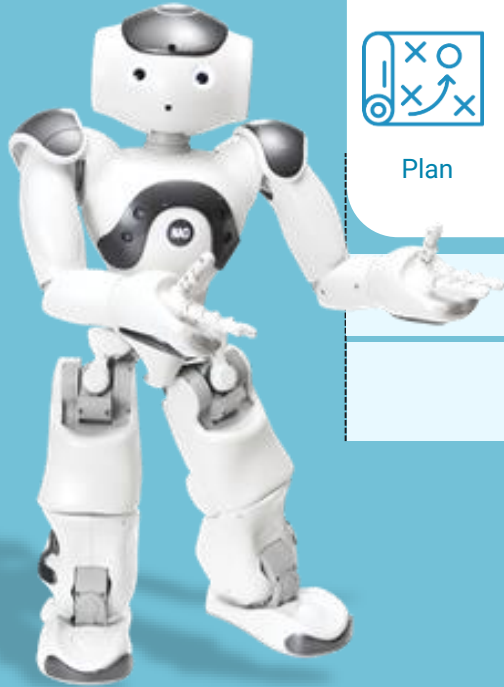
6 - CONNECTIVITY

NAO⁶ is more connected than ever with Bluetooth and a more efficient and faster Wi-Fi.

OUR OFFER

|| We bring value in each step of your application development ||

SoftBank Robotics Support



Consult & Support

Trainings & Tutorials
Documentations

Choregraphe (App development tool)
NAOqi (Robot operational system) APIs & SDK
ADE (Robot App mgmt. store)

Monitor (Robot feedback tool)
Customer service

NOTE: See Annex for more detailed Software and Tools improvement

NAO⁶ CAN BE USED IN VARIOUS SECTORS

|| An innovative and advanced interface of communication, interaction and education ||



EDUCATION

🎓 Any type of school from kindergarten to University



Coding & programming



Literature & learning



Special education



Laboratory & Research



HEALTHCARE

🎓 Adapted solution for caregiver and patient, for any type of facility



Hospital



Nursing home



Specialized facility



Pharmacy



CUSTOMER FACING ENVIRONMENT

🎓 Any physical places for innovative assistance & dynamic communication



Retail



Travel & Hospitality



Bank & Assurance






Company & coworking space



Public service

NAO⁶ VALUE PROPOSITION & BENEFITS



-  NAO⁶ VALUE PROPOSITION
-  NAO⁶ USE CASE
-  NAO⁶ BENEFITS



VALUE PROPOSITION FOR EDUCATION

|| **Educational robot:** Improve knowledge dissemination, augment student engagement & broaden window for future talents ||



OPTIMIZED TEACHING-AID TOOL

- 🤖 New & innovative **pedagogical topics** - sharpen **concentration & focus**
- 🤖 **Tailored and flexible** teaching programs - motivate **STEM** subjects & **encourage creativity** (eg: [Open Roberta](#))
- 🤖 Enable remoted education - **virtual presence & distance learning**



ADVANCED DEVELOPMENT PLATFORM

- 🤖 **Innovative platform** allows development from simple concepts to complex algorithms
- 🤖 **Visual & intuitive** programming interface
- 🤖 **Problem solving & analytical skills** development



EFFICIENT SOLUTION TO INCLUSIVE EDUCATION

- 🤖 **Promote inclusivity** – engage special education e.g. *autism** & students with disabilities
- 🤖 **Barrier-free communication** (*Reduce shyness, reluctance, confidence and frustration**)
- 🤖 Various **ready-to-use applications** are available by our partners – **accessible & upgradable**

NAO robot has been selected to be the standard platform for [RoboCup Soccer](#).





HEALTHCARE ADVOCACY

- 👤 Ambassador to **arise public awareness** on prevention care
- 👤 **Unique and optimized patient experience** for better engagement
- 👤 Interactive & intellectual interface for **patient adherence** enhancement



INTERGRATED CARE CONTRIBUTOR

- 👤 Integrated & connected solution to **expand more value-based care**
- 👤 Remote-monitoring capabilities to **expand reach of care-giving**
- 👤 A **learning & training** tool to develop patient's **functional ability & intrinsic capacity**



INVESTMENT VALORIZATION: RAAS (Robot As A Service)

- 👤 The differentiator – **a distinctive & attractive digital offer**
- 👤 Scalable platform to **expand** business with other **value-chain players**
- 👤 Service-orientated models to **realise monetisation of value**





SINGLE VIEW OF CUSTOMER

- 👤 A **powerful touch point** to omnichannel;
- 👤 A single but comprehensive **view of each individual customer**



MARKETING & ENGAGEMENT

- 👤 Interact with customers using **relevant messages & offers**
- 👤 Treated them **specially, personally** and **individually**



COMMERCE & SERVICES

- 👤 **Guide and assist** the customers to **sell the product** or **improve awareness** by **providing services**, based on their **needs & requirements**



NAO⁶ ASSISTS IN DIFFERENT MISSIONS

|| Flexible & multi-functional - Easily & accurately switch to another mission with effectiveness ||



Education



Knowledge distributor



Programming tool

Education & Healthcare



Assistant

Education, Healthcare & Consumer facing environment



Receptionist



Brand ambassador



Advisor



Service provider



Survey conductor



Entertainer



Healthcare



Coach / Trainer



Communicator



Consumer facing environment



Sales associate

HOW NAO⁶ DOES IT DIFFERENTLY?

|| Competence & Abilities: provide a worth-to-share and worth-to-repeat experience ||



PROACTIVE ENGAGEMENT

Detect & attract people with animated expression



MULTI LANGUAGE

Easily speak & switch languages



INFORMATION PRESENTATION

Accurately deliver brands, products & service information



REALTIME COMMUNICATION

Update speech & deliver messages with real-time data



COGNITIVE COMPUTING

Capture demographic data & emotions of the user



CUSTOMISED INTERACTION

Adapt the interaction content based on user profile



PRODUCT RECOMMENDATION

Introduce relevant products & services based on preference



IDENTITY RECOGNITION

Identify people via code-scanning, Booking #, faces, etc....



SERVICE OFFERING

Provide added-value service & realize upselling, cross-selling



DATA COLLECTION

Collect info, generate leads & insights, learn from data



IN-GAME ADVERTISING

Advertise brands & services via interactive robot games



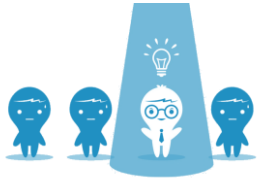
ENTERTAINMENT

Entertain people with the 'worth-to-share NAO⁶ experience'



NAO⁶ ADDED VALUE & BENEFITS

|| A new channel to transform user experience & achieve cross-functional needs ||



Stand out & Raise
awareness



Improve UX & attract
undivided attention



Enhance stakeholder
relationship



Cost-Effectiveness &
higher efficiency



Relieve workload & unlock
people's potential for more
valuable tasks



Collect comprehensive
data to generate valuable
insight



Bring beneficial add-ons &
inspire creativities



SOFTBANK ROBOTICS

- 🤖 LEADER OF HUMANOID ROBOT'S MARKET
- 🤖 WHY HUMANOID ROBOT?
- 🤖 REFERENCES



SOFTBANK ROBOTICS, THE LEADER IN HUMANOID ROBOTS' MARKET

|| 13 years of **expertise**, we continuously improve **our know-how**... ||

TO DATE, WORLDWIDE:

+25,000 Pepper & Nao robots deployed

+500 Employees

+150 [partners](#) in our ecosystem

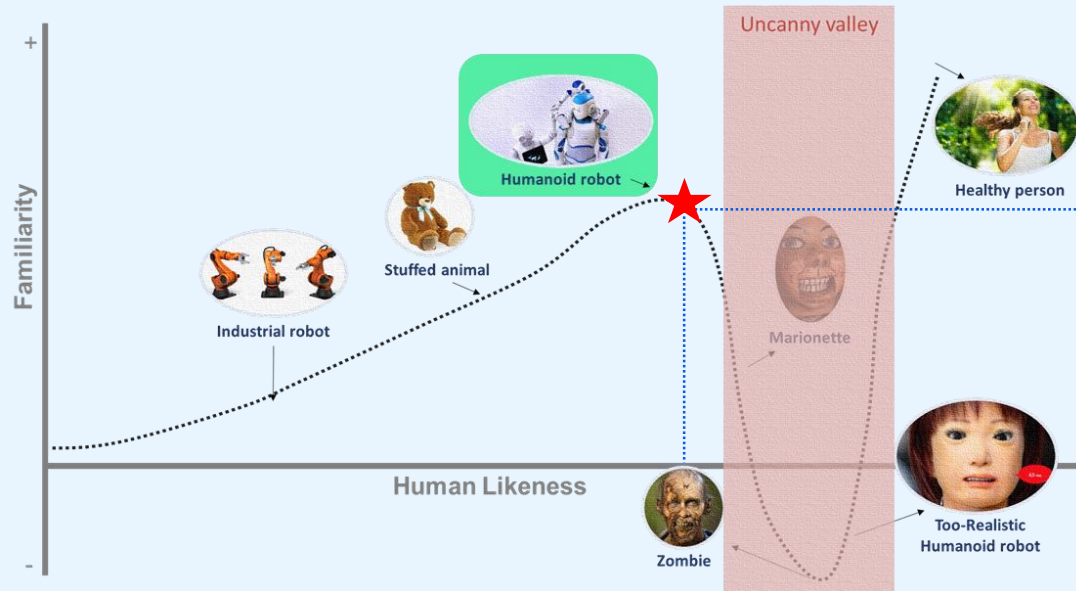


Shareholders:  SoftBank  Alibaba Group 阿里巴巴集团  FOXCONN

WHY HUMANOID ROBOT?

|| We make best-in-class robots to **meet the highest human acceptance** ||

Uncanny valley – A hypothesized relationship between the degree of an object's **resemblance to a human being** and **the emotional response** to it.



Before reaching this point, the objects became more human-like, people would find them to be **more acceptable and appealing than** their mechanical counterparts.

When human-likeness increases below this point, when they are close to, but not quite, human, people **develop a sense of unease and discomfort** until it close to a real health human beings.

WHY HUMANOID ROBOT?

|| Our robots build **strong emotional attachment** ||



ATTRACTIVE APPEARANCE

- Designed without ambiguity, the eye-catching outlook attracts **undivided attention**



NATURAL BODY LANGUAGE

- Fluid and expressive body language together with voice & visual images, which **enhance the communication**



EMOTIONAL EMPATHY

- Build an **empathic & emotional** relationship between human & robot
- Adapted robot behavior & perfect ergonomic size → **Embraced-by-all**



PROACTIVE ENGAGEMENT

- Being perceived as '**no danger**', '**no judgement**' & '**in-control**'
- Proactively engage in **icebreaking conversations**

WHY HUMANOID ROBOT?

|| The aggregator of connected services and AI technologies ||



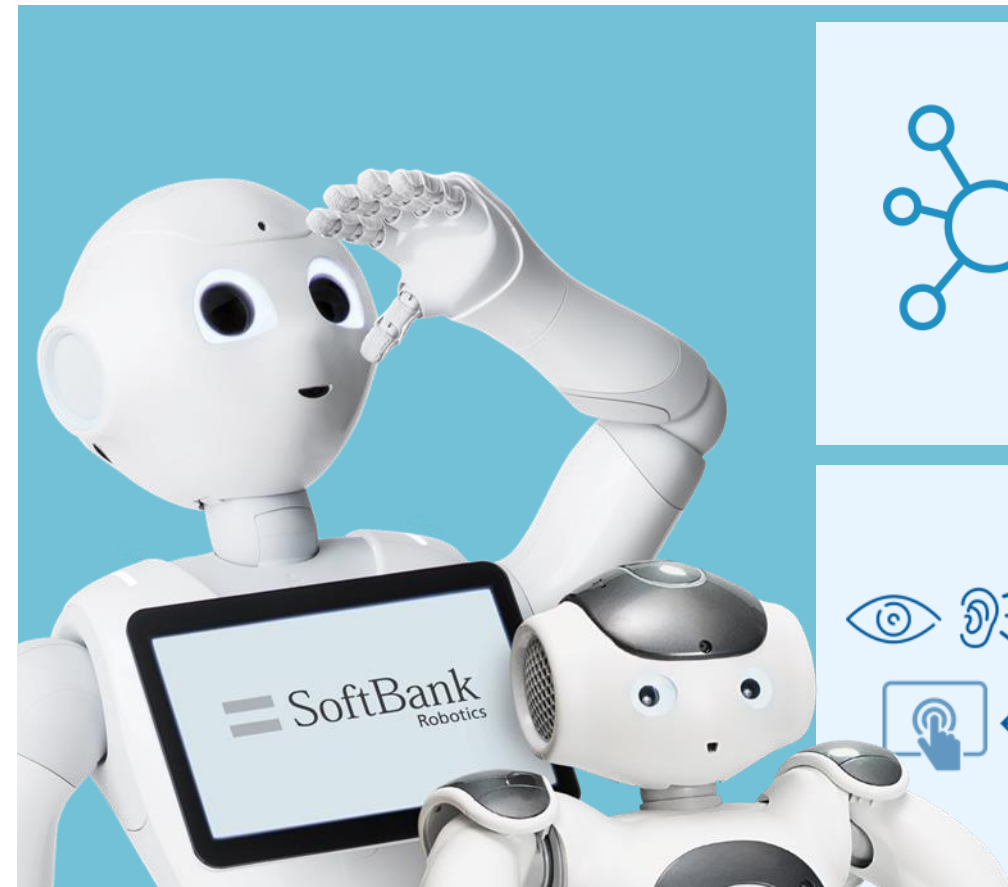
CONNECTIVITY

- Assemble **disconnected services**
- Collect **comprehensive data**
- **Integrate** other solutions which **expand its capacities**



MULTI-FUNCTIONALITIES

- Contain multi-functional components, sensors which **enable & augment AI technologies**



NAO⁶

ANNEX



NAO

NAO⁶



Motherboard

- ATOM Z530 **1.6 GHz**
- CPU **Bi core**
- **1 GB** RAM
- **2 GB** Flash memory + 8 GB Micro SDHC

- ATOM E3845 **1.91 GHz**
- CPU **Quad core**
- **4 GB** DDR3 RAM
- **32 GB** SSD



Camera

- Field of view : 72.6°DFOV (60.9°HFOV,47.6°VFOV)
- Focus range: 30cm ~ infinity
- Focus type : **Fixed focus**

- Field of view : **68.2°**DFOV (57.2°HFOV,44.3°VFOV)
- Focus range : 30cm ~ infinity
- Focus type : **Autofocus**



Audio

- Cardioid microphones (-12dB)
- Loudspeakers: Foxconn Amato

- Omnidirectional microphones (-12dB) + Audio codec
- Loudspeakers: Seltech 40S19 custom



Motor

- New motors with a lifetime improvement



Color

- Red, blue, light grey

- Dark grey

NAO6 vs. NAO Evolution (1/2)

NAO

NAO⁶

NAO⁶ Performance *

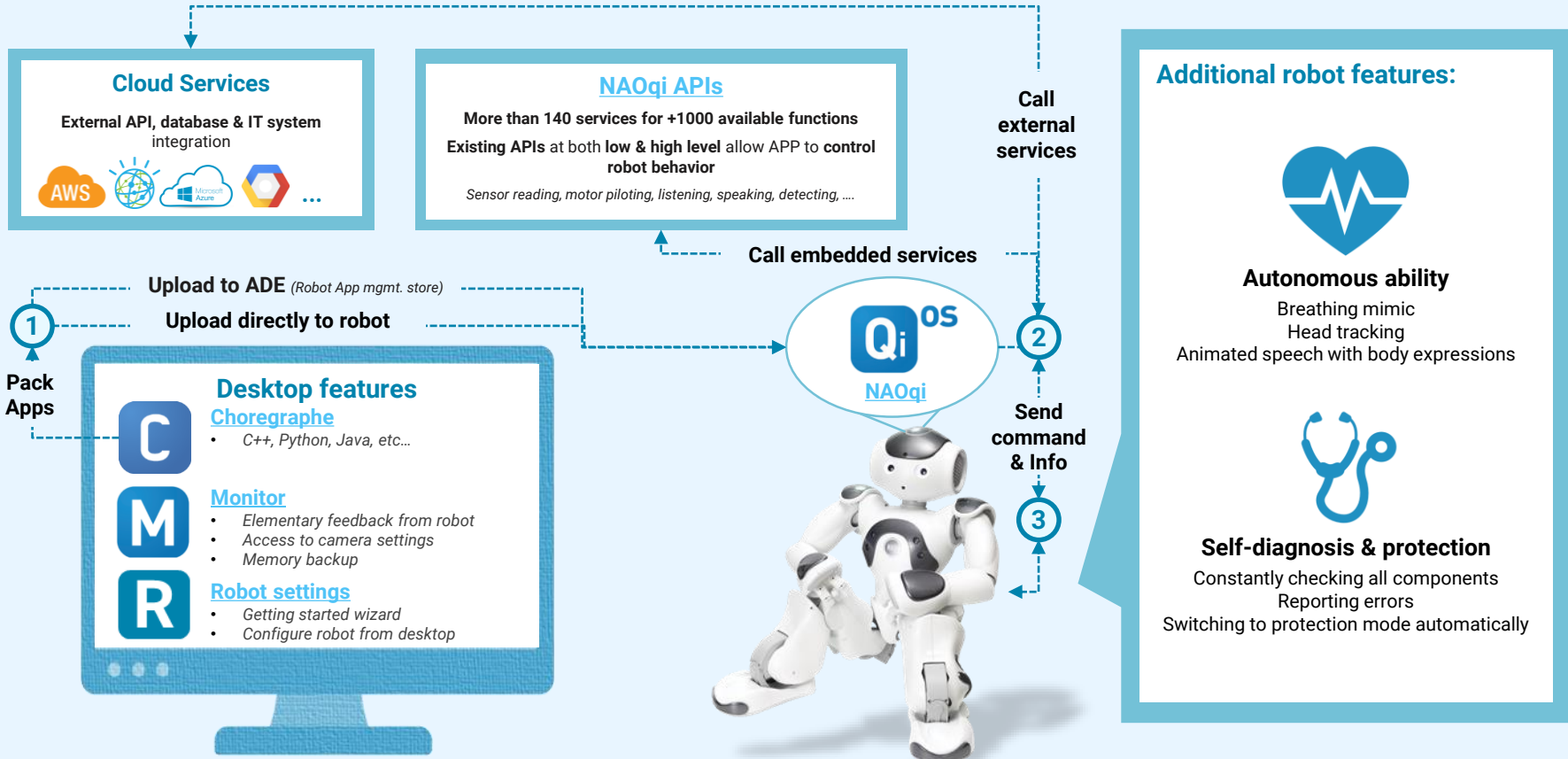
Boot time	131.7 s	51 s	~3x faster
System upgrade time	22' min	4'24" min	~5x faster
Ethernet performance	Download 162 Mbit/s Upload 138 Mbit/s	Download 657.54 Mbit/s Upload 652.01 Mbit/s	~4x faster ~4x faster
Wi-Fi performance	Download 13 Mbit/s Upload 15.5 Mbit/s	Download 124.45 Mbit/s Upload 83.90 Mbit/s	~10x faster ~5x faster
Disk memory	Read speed 4.6 MB/s Write speed 1.9 MB/s Effective user dedicated space 15 GB	Read speed 73 MB/s Write speed 67 MB/s Effective user dedicated space 23 GB	~16x faster ~35x faster ~2x better
CPU	Effective user dedicated CPU 33%	Effective user dedicated CPU 58%	~2x more effective
RAM	Effective user dedicated RAM 600 MB	Effective user dedicated RAM 2.8 GB	~5x more effective

* May 2018 tests results - Confidential

NAO	NAO ⁶	NAO ⁶ Performance *	
Fan Noise @ 1m (100% / 60%)	40,7 dB(a) / 38,8 dB(a)	50 dB(a) / 36 dB(a)	Better cooling performance
Worst case CPU temp (fan 100%)	84°C	74°C	Better cooling performance
WER in quiet environment : → ambient 50dB / voice 70dB	90%	10%	~9x understanding
WER in public environment : → ambient 73dB / voice 76dB	80%	30%	~2.5x understanding
Speaker volume	80dB(c)	89dB(c)	~2x louder
Microphone saturation (from speakers in %)	N/A	74 %	Allow Acoustic Echo Cancellation
Camera resolution	Top : 1280 x 960 @ 5fps Bottom : 1280 x 960 @ 5fps	Top : 2560x1920 @15fps Bottom : 1280x960 @ 15fps	~2x on Top camera / similar on bottom
Dual Mode Camera	Not stable	Yes	⇒ New feature
Camera Auto-focus	Not available	Yes	⇒ New feature

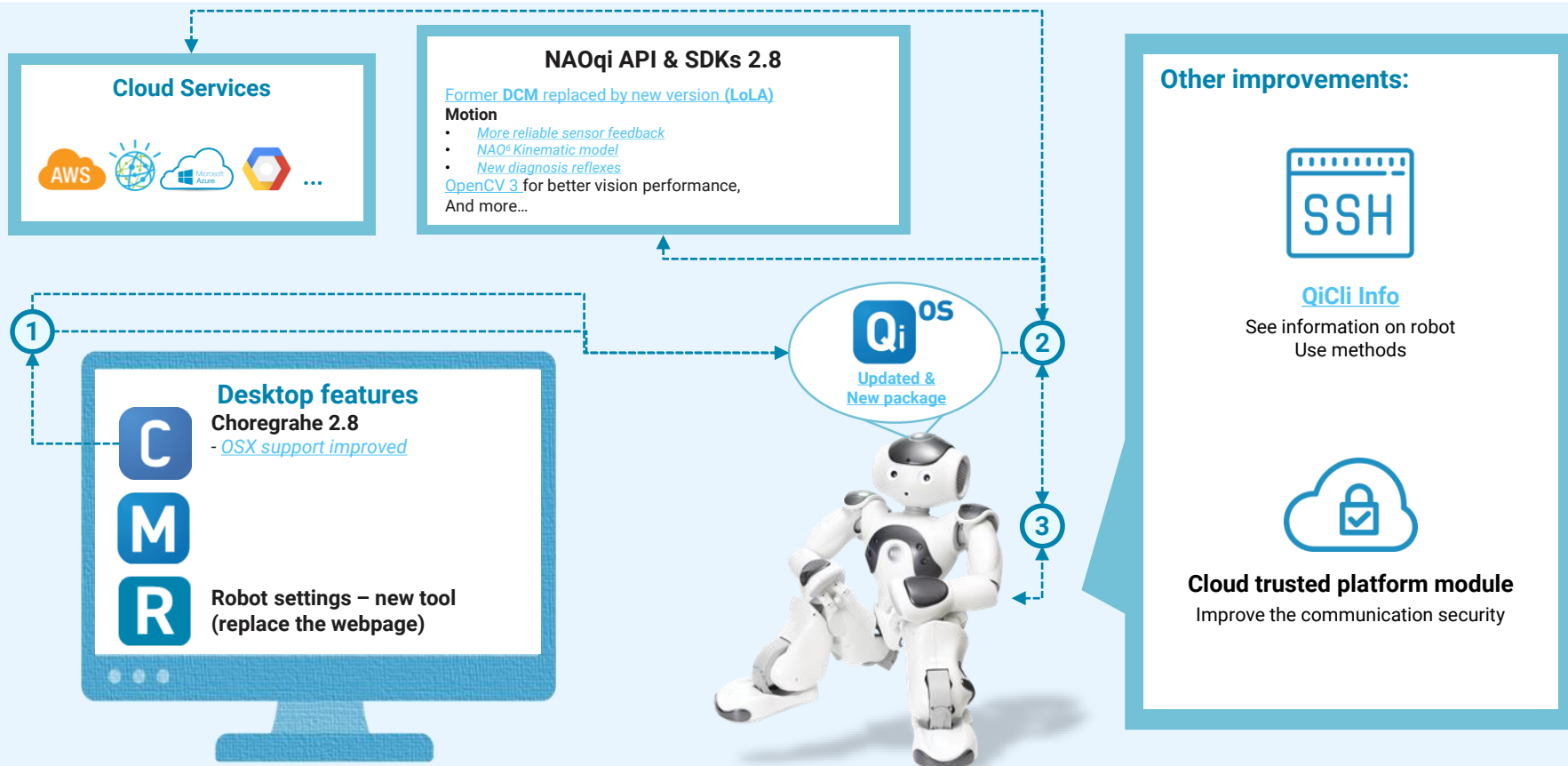
OPEN AND DEDICATED SOFTWARE & RESOURCES

|| A programmable robotic platform: easy-to-code & backed up with SBR expertise' support ||



OPEN AND DEDICATED SOFTWARE & RESOURCES

II Improvements & New features II





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