

DeveloperWeek 2020



The convergence of blockchain and trusted compute in the development of AI

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15 years in distributed computing



iExec - background

15 years in distributed computing

ICO in April 2017 - 10 000 BTC



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26 employees



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International projects



IBM **Cloud**





iExec - focuses

Offchain compute: connecting IT infrastructures to blockchain technologies



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Offchain compute: connecting IT infrastructures to blockchain technologies

Decentralized cloud computing: leveraging blockchain technologies to decentralize the sharing and trading of computing resources



iExec - focuses

Offchain compute: connecting IT infrastructures to blockchain technologies

Decentralized cloud computing: leveraging blockchain technologies to decentralize the sharing and trading of computing resources

Trusted compute: leveraging Trusted Execution Environment and blockchain technologies to provide new industrial use cases

Agenda

AI

Blockchain

AI & Blockchain

Use cases

Forecasts



Artificial Intelligence

AI & data

Data = digital gold

Data \neq Information

AI & data

Data = digital gold

Data \neq Information

Big data = data analysis to find **patterns**

AI & data

Data = digital gold

Data \neq Information

Big data = data analysis to find **patterns**

IA = creating **digital behaviors** from data (for now)

AI in 2020

Edge processing of the data

AI in 2020

Edge processing of the data

Maturity of soft AI - in production or close to

Yann LeCun - Turing Award: “We’ve only climbed the first mountain.
Maybe the second.”

AI in 2020

Edge processing of the data

Maturity of soft AI - in production or close to

Yann LeCun - Turing Award: “We’ve only climbed the first mountain.
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Maturity of hard AI - mostly R&D

A dark background featuring a complex network of interconnected nodes and lines, representing a blockchain or distributed ledger technology. The nodes are small circles, and the lines are thin, creating a web-like structure that recedes into the distance.

 **Blockchain**

Blockchain - key ideas

Digital record of events working thanks to

- Computing science
- Game theory

Blockchain - key ideas

Digital register of events working thanks to

- Computing science
- Game theory

Need of

Trust

Proof

Blockchain - 2020 trends

Scalability - consensus, side chain, off-chain compute

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Scalability - consensus, side chain, off-chain compute

Blockchain competition

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In production or close to

Standardization - need for industrial standards



Blockchain - 2020 trends

Scalability - consensus, side chain, off-chain compute

Blockchain competition

In production or close to

Standardization - need for industrial standards

Stable coin - need to relate to classic financial system



 **AI & Blockchain**

AI & Blockchain - common points

AI for AI

Blockchain for Blockchain

AI & Blockchain - common points

AI for AI

Blockchain for Blockchain

Transversal technologies for industrial purposes

AI & Blockchain - common points

AI for AI

Blockchain for Blockchain

Transversal technologies for industrial purposes

AI & blockchain teams inside corporates are changing

Blockchain for AI

Decentralization and scaling of **providers** :

- Data - digital gold

Blockchain for AI

Decentralization and scaling of **providers** :

- Data - digital gold
- Computing resources

Blockchain for AI

Decentralization and scaling of **providers** :

- Data - digital gold
- Computing resources
- Reinforcement

Blockchain for AI

Decentralization and scaling of **providers** :

- Data - digital gold
- Computing resources
- Reinforcement
- Control regarding the use of models

Blockchain for AI

Decentralization and scaling of **providers** :

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Tracking of providers - **trust & reputation** through a transparent economy

Blockchain for AI

Decentralization and scaling of **providers** :

- Data - digital gold
- Computing resources
- Reinforcement
- Control regarding the use of models

Tracking of providers - **trust & reputation** through a transparent economy

Oracle (decentralized)



 **Use cases**



Use Case 1
Renting AI trained model

Renting AI model in computer vision

Input data



make a prediction

run an application

trained model = dataset



get the result

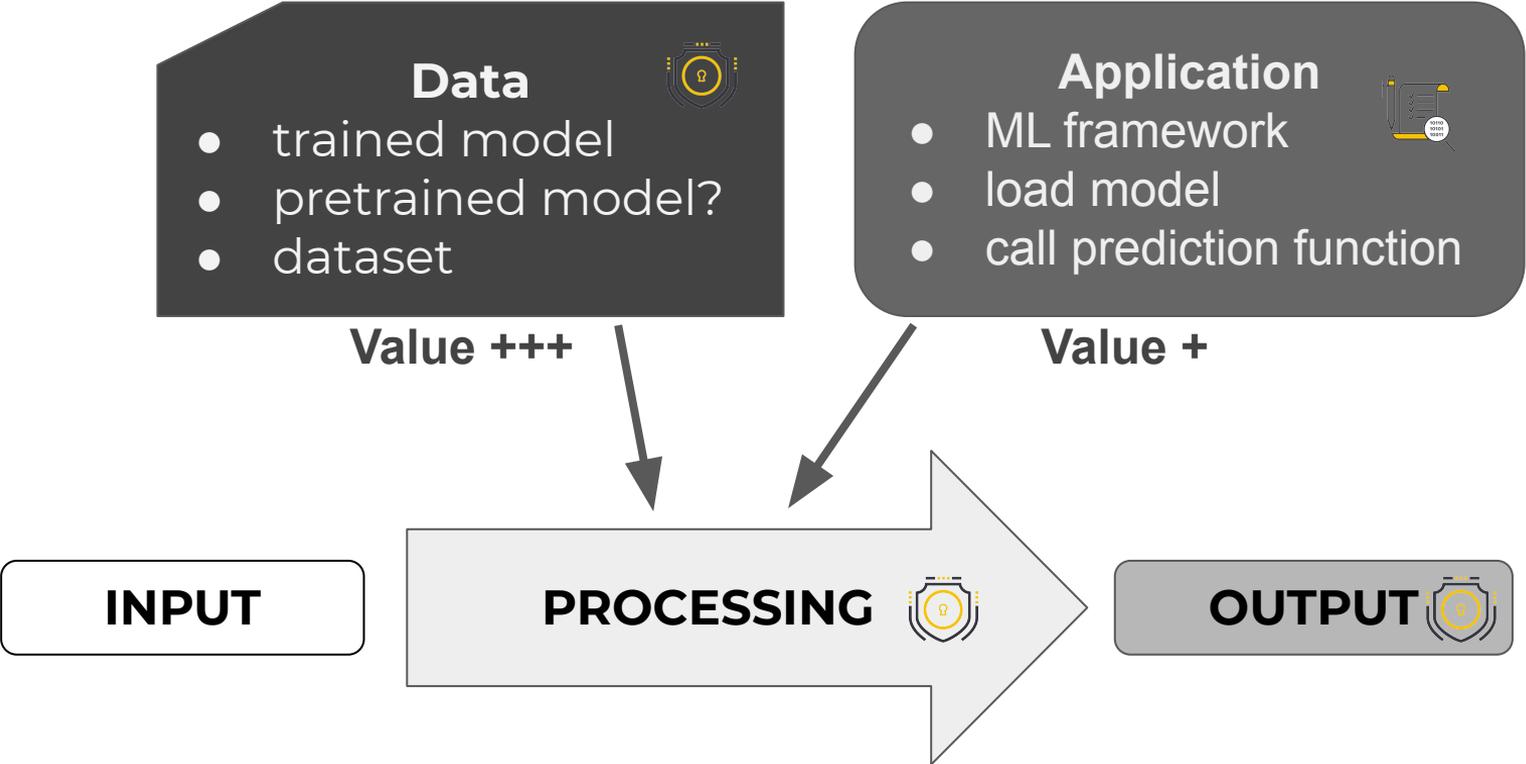
- classification
- score
- object detection
- ...

<https://nsfw.app.iex.ec>



Caffe

The data renting concept



Trusted Execution Environment

Secure area inside processors

Protection of code & data

- confidentiality
- integrity





Specifications

RISC-V SPECIFICATIONS

- **User-Level ISA Specification**
- **Privileged ISA Specification**
- **Debug Specification**

RISC-V SOFTWARE

- **Software Status**

RISC-V CORES

- **RISC-V Cores**

*Please note, RISC-V ISA and related specifications are developed, ratified and maintained by RISC-V Foundation contributing members within the RISC-V Foundation Technical Committee. Operating details of the Technical Committee can be found in the **RISC-V Foundation Workspace**. Work on the specification is **performed on GitHub** and the GitHub issue mechanism can be used to provide input into the specification.*

*The specifications shown below reflect the last official release. The most current version of the draft specification, which is in development within the Technical Committee, can be found here on **GitHub**.*





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Solutions



Why Arm



Support &
Training



Resources



Company

arm

TECHNOLOGIES

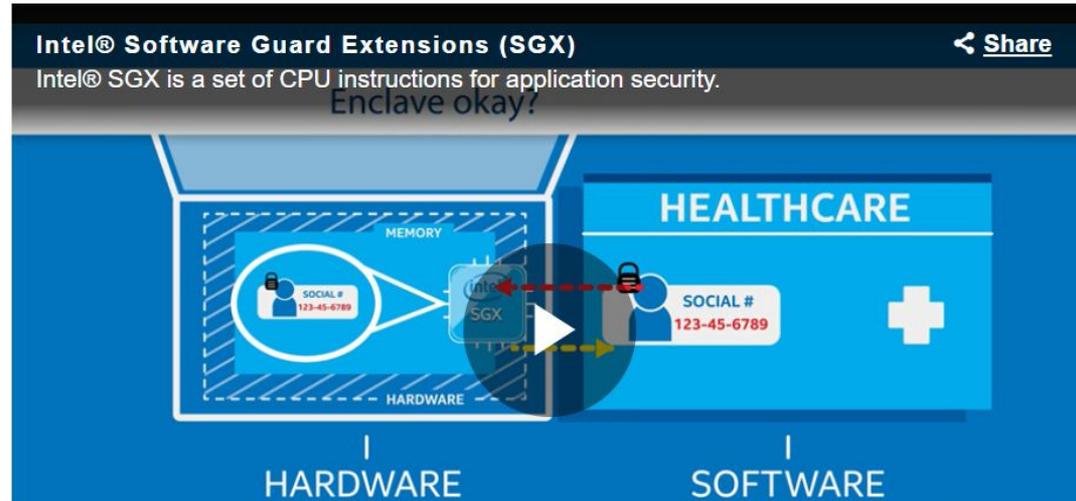
TRUSTZONE FOR CORTEX-A

Development of TEE and Secure Monitor Code

Intel® Software Guard Extensions (Intel® SGX)

An Intel® architecture extension designed to increase the security of application code and data.

A New Approach



Overview >

Details

Resources Library >

Training >

Academic Research >

Commercial License Request >

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English >

iExec End-to-End Trusted Execution with Intel SGX



Enclaves:

- Confines execution and data within a encrypted environment
- No one can access/tamper the execution

AI training & monetization

Business cycles:

- Data **renting** for AI training
- AI renting
- AI reinforcement
- ...

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IA needs Blockchain + TEE + On/off-chain consensus + Distributed compute



Use Case 2
Autonomous delivery robots



Haiwu HE
@hehaiwu

Abonné

We are demonstrating our 5G smart city services based on blockchain tech on [@Intel](#) booth at [#MWC2019](#) , come to meet [@iEx_ec](#) team.

Traduire le Tweet

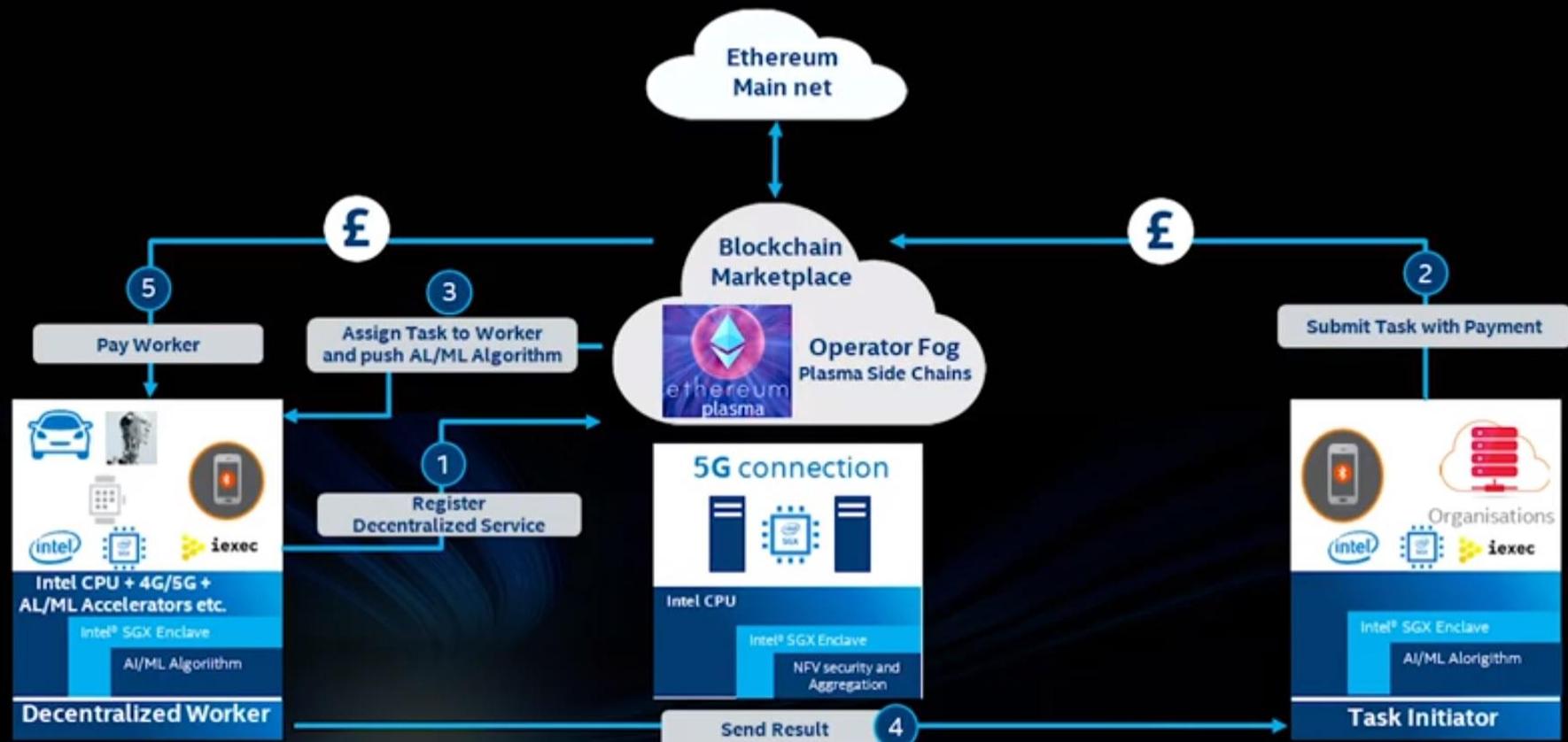


11:44 - 25 févr. 2019 depuis Hall 3.10

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🗨️ 22 ❤️ 44 📧

DECENTRALIZED SERVICE ON DEMAND FLOW



Networks of connected devices in Smart cities

5G = communication layer

Networks of connected devices in Smart cities

5G = communication layer

Intel® SGX = security layer

Networks of connected devices in Smart cities

5G = communication layer

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Blockchain = **interoperability layer**

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Blockchain = **interoperability layer**

- authentication

Networks of connected devices in Smart cities

5G = communication layer

Intel® SGX = security layer

Blockchain = **interoperability layer**

- authentication
- proof of contribution

Networks of connected devices in Smart cities

5G = communication layer

Intel® SGX = security layer

Blockchain = **interoperability layer**

- authentication
- proof of contribution
- payments/rewards



Forecasts

Forecast 1

Emergence of soft AI: **need for trusted inputs**

Oracles, reputation of data providers, reputation of providers for reinforcement

Forecast 1

Emergence of soft AI: **need for trusted inputs**

Oracles, reputation of data providers, reputation of providers for reinforcement

New economy

Forecast 2

Emergence of hard AI: **need for trusted behavior records**

Hard AI will have interactions with people and devices

Forecast 2

Emergence of hard AI: **need for trusted behavior records**

Hard AI will have interactions with people and devices

Record of behavior for technical and legal purpose = **blockchain based behavior tracking**

Forecast 3

Emergence of hard AI: **emulation of living being**

Hard AI will have feed from direct feedbacks (sensors) **AND** also from decentralized devices

Forecast 3

Emergence of hard AI: **emulation of living being**

Hard AI will have feed from direct feedbacks (sensors) **AND** also from decentralized devices

Need to track the contribution of the internal and external sensors = **blockchain based behavior tracking**

Forecast 4

TEE everywhere

Zero trust will lead the next technical specification

Forecast 4

TEE everywhere

Zero trust will lead the next technical specification

From trust based on legal engagement to **trust by design**

Forecast 5

Smart cities is not just about connected devices providing urban seamless services

Forecast 5

Smart cities is not just about connected devices providing seamless services

Smart cities will be made of AI based dynamic networks collaborating together to create **collective digital intelligence**



 **Conclusion**

Sharing & Decentralized Economies

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Stack of new tech = AI + Blockchain + TEE

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Stack of new tech = AI + Blockchain + TEE

New industrial paradigms & business models

Sharing & Decentralized Economies

Stack of new tech = AI + Blockchain + TEE

New industrial paradigms & business models

**Need for technical infrastructures
with new tech convergence**





iExec

Thank you

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