

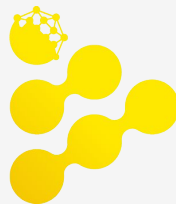


**iExec**

# **iExec and Confidential Computing**

Avinash PATHARE

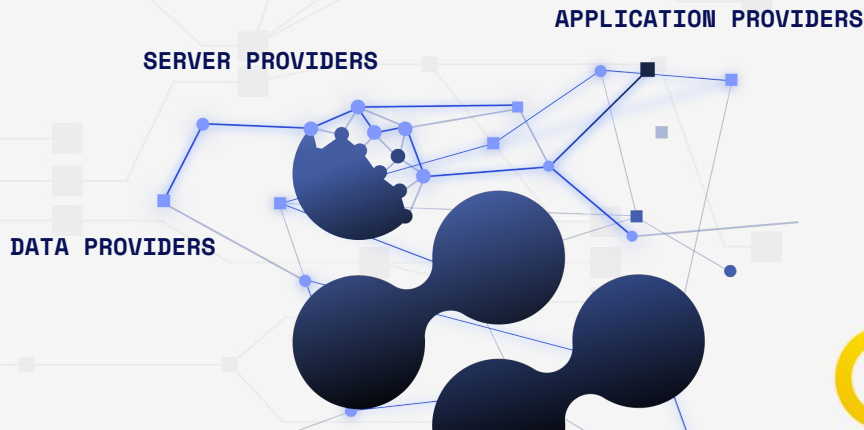
# Blockchain-based Decentralized Cloud Computing



**iExec**

- **Decentralized marketplace** for computing resources (servers, applications, datasets)
- Providers can interact in a P2P way, without central authority

**Solution for off-chain computing:**  
Addresses the issues of scalability,  
privacy and connectivity



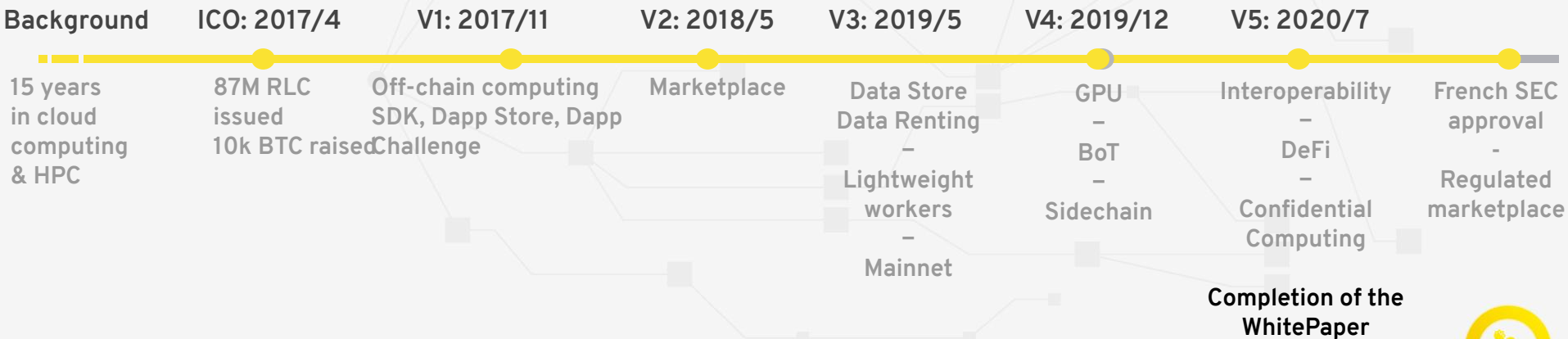
# iExec - Timeline and key info

Founded in **2016** by Gilles Fedak (Inria) & Haiwu He (Chinese Academy of Sciences)

April 2017: ICO raised 10,000 Bitcoins within 3 hours

4-year roadmap completed in 2020

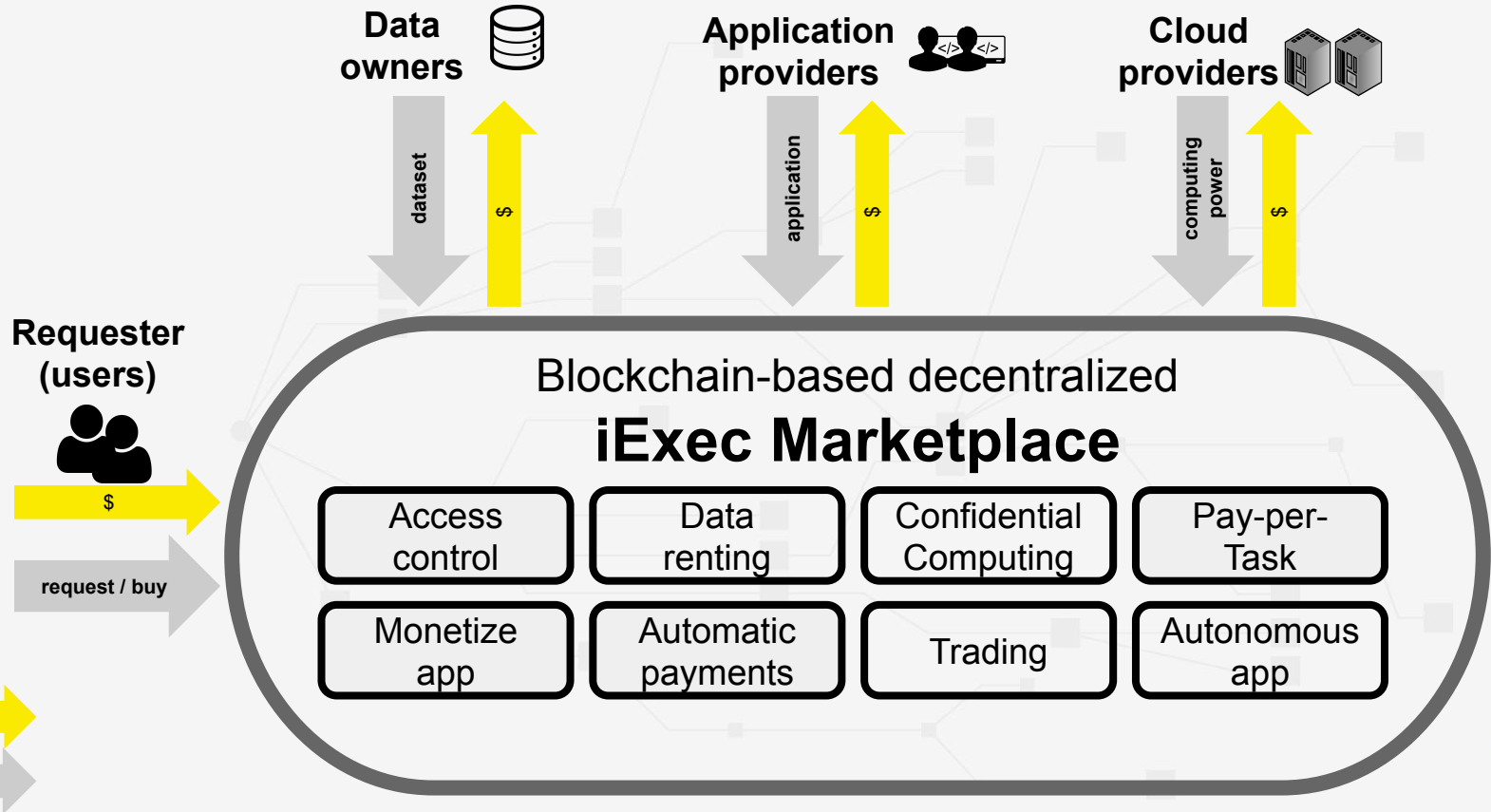
~25 employees





# **Decentralized Cloud Computing**

# iExec has developed the first decentralized marketplace for everything digital



# iExec use-cases (providers)

Open new streams of revenue by **monetizing the resources** you already have, get paid on the blockchain



## Application providers

**Monetize** apps, dapps, functions, algorithms packaged as **Docker Containers**.

**Price set per execution**

**No vendor lock-in:** runs the same on multiple providers.



## Data providers

**Monetize** trained AI models, private data and valuable knowledge.

**Arbitrary files & data types supported**

**Price set per execution**

**End-to-end encryption with TEE:** prevent copy & ensure confidentiality.



## Computing providers

**Monetize** servers and workstations (CPUs, GPUs) when they are not in use.

**Instant new revenue stream**

**Isolated workload with Docker & TEE.**



# iExec use-cases (requesters)

Run complex code & DOracles, get a **proof of correct execution**



## Users

**Run your code** on resources from multiple providers with **no vendor lock-in**.

**Run you own apps:** not limited to the marketplace

**The marketplace** gets you the best price

**Custom level of confidence** for each task



## Web 2 applications

**Trusted executions** prove to you and to others that a result is valid.

**Confidential execution** keeps data private with TEE enclaves, plus result signature.

**Connect any application** to the platform with our SDK



## Smart Contracts

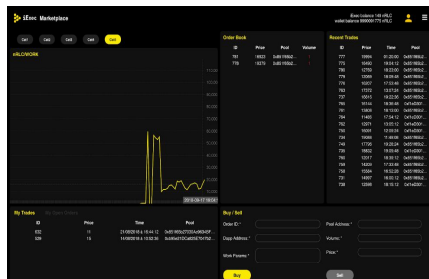
**Program complex oracles**, AI-based oracle, multi-source aggregation, etc.

**Trigger off-chain tasks** directly from your smart contract



# iExec's Products

## Marketplace



## Enterprise Ready Marketplace

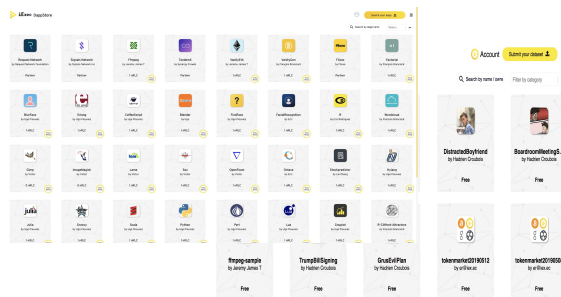
Compliant with financial regulations: KYC, KYB, AML compliant

token eRLC

<=>

Token RLC + KYC+...

## Dapps and Data Store



## Explorer

**Task details**

Task ID: 0e0446a637096136075f7c2719145380942148b6bc699a6563249c2f1

Deal ID: 0d89c697734354575943421486a517ba10a52072010300670d1a5d53961

Requester: 0xCh8Dx4873772D782DF071634F64265472E21

Beneficiary: 0xCh8Dx4873772D782DF071634F64265472E21

Status: COMPLETED

Contributors: 0x15486E5FCD5F3b8A739437948408a644E13

Results: ["storage": "ipfs", "location": "ipfs/QmSAmmYDkxwvSc8S2yVA7wvWkCjM5LmFPHEvX7A21"] download result.mzbx

Results callback: 0x

Result digest: 0x39342b76342643126130f6e5743b64c5548d8d310e9434c8c6579f5e1a

Update Block Number: 8145433

Update Block Time: 2 hours ago (Mon Jan 25 2021 10:18:10 GMT+0100)

Initialize TxHash: 0x265051a90c90439d9e721a5350a05954e2c28f875d5f7983ccad5f32c

Initialize Block Number: 8145376

Initialize Block Time: 2 hours ago (Mon Jan 25 2021 10:13:25 GMT+0100)

Consensus TxHash: 0xe82103c05a23713e340345c08b45e50e9697492b8c1724a8069e96433

Consensus Block Number: 8145428

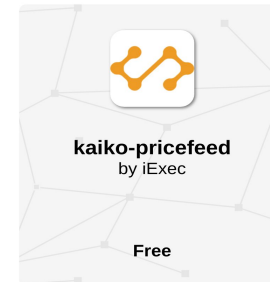
Consensus Block Time: 2 hours ago (Mon Jan 25 2021 10:17:45 GMT+0100)

Finalize TxHash: 0x265051a90c90439d9e721a5350a05954e2c28f875d5f7983ccad5f32c

Finalize Block Number: 8145433

Finalize Block Time: 2 hours ago (Mon Jan 25 2021 10:18:10 GMT+0100)

## Oracle



## iExec SDK

The iExec SDK is a CLI and a JS library that allows easy interactions with iExec decentralized Marketplace in order to run off-chain computations.

<https://github.com/iExecBlockchainComputing/iexec-sdk>





# iExec deployments

## Public Marketplace



- Ethereum mainnet
- Goerli testnet
  
- Proof-of-Work
- **Expensive gas cost**
- Slow (15 to 30 s. per block)
- **Up to 250 workers in production**

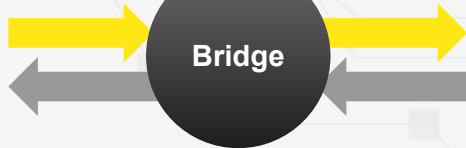
## Sidechain



- “Bellecour” (bridged w. mainnet)
  
- Proof-of-Authority
- **No gas**
- Fast (5 s. per block)
- **Up to 60 tx/sec**

## Consortium and private blockchain

- iExec products  
=> third party
- Native or dedicated tokens
- **Plug or build digital asset marketplace**



# Off-chain Computing and Confidential Computing



**Trusted Execution Environment (TEE)** confine execution and data within a encrypted environment: no one can access/tamper with the execution.

iExec activities around TEE & CC

- EEA Off-chain Trusted Compute Specification
- Confidential Computing Consortium



# Privacy in the data life cycle

Protecting data  
at **rest and in transit**



**Encryption** (e.g. RSA, DES)  
and secure communication  
channels with TLS protocol.

Secure data during  
**its processing**



**Trusted Execution Environments**

**Data ownership Management**

Strict control on its usage

Governance rules.

Auditable transactions



**Blockchain**



# Use Case: decentralized marketplace for delivery companies

(from a non public collaboration with a TelCo)

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Business requirement: possibility of sharing some business information between potential competitors, without sharing key business information.

**Business layer**

Dapp of the consortium

**IT layer managing**

iExec's decentralized marketplace

**Blockchain layer**

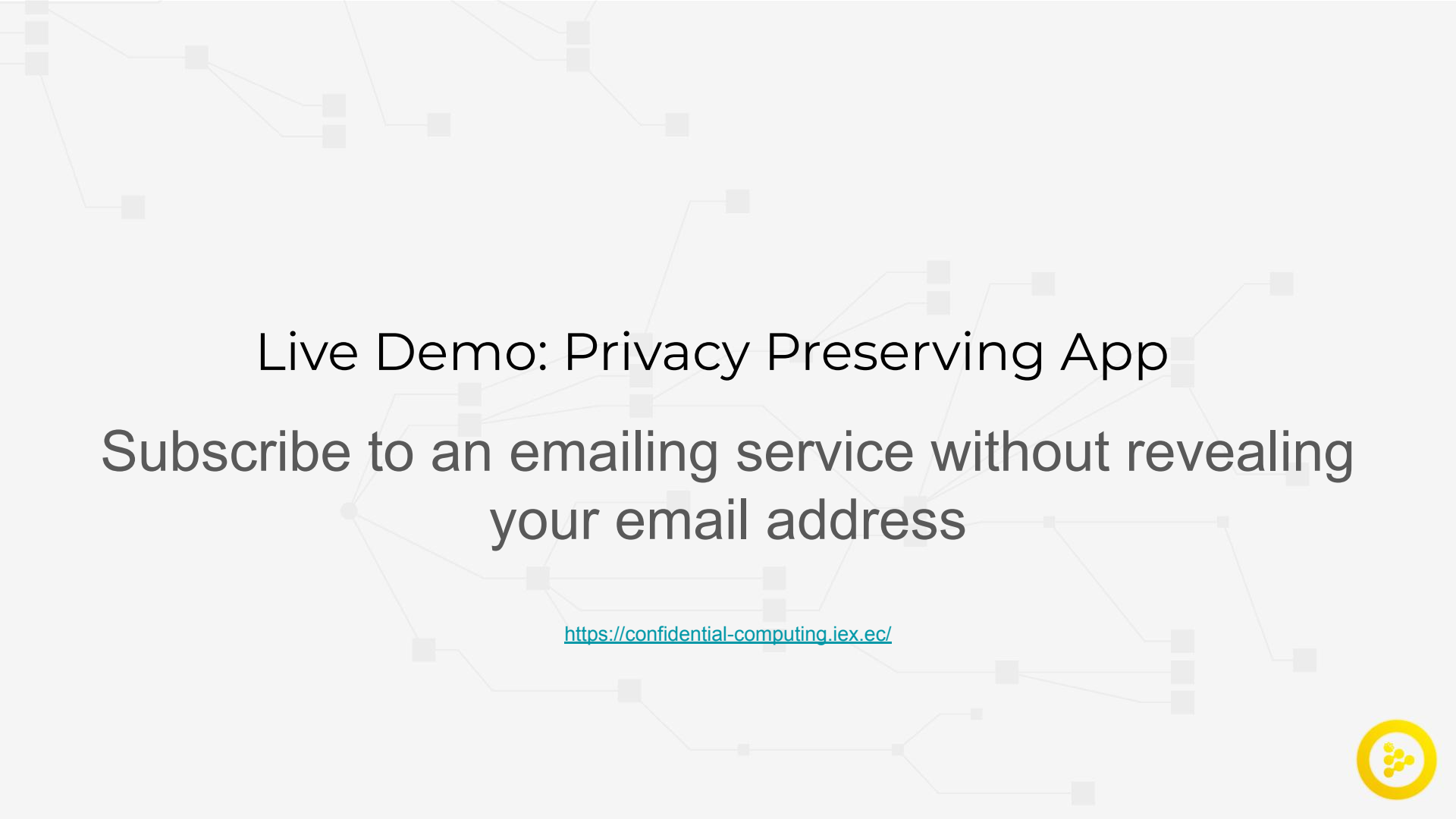
Ethereum Mainnet & Side chain

**Governance**

**Trust**

**Privacy**





# Live Demo: Privacy Preserving App

## Subscribe to an emailing service without revealing your email address

<https://confidential-computing.iex.ec/>



# Next step: Dev Playground

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## Democratize confidential computing

Share my app in use, keep my recipe secret.

Making a developer's journey as delightful as possible when interacting with our marketplace

### **Solution:**

Empower the order management with restriction, enclaves hardware and encrypted dataset.

Data is never leaked outside the enclaves.

- Requester has the guarantee of “correct” execution.
- Recipe is kept secret.
- Pay-per use possible or simply manage the access to your app.



# Next step: Dev Playground

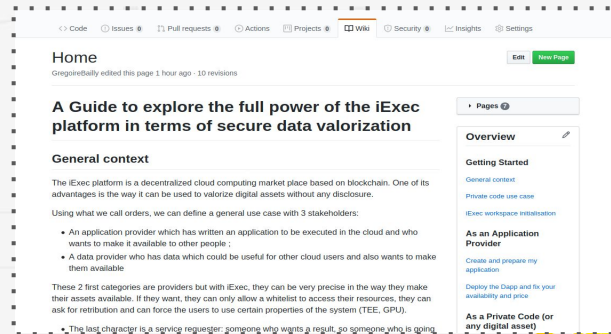
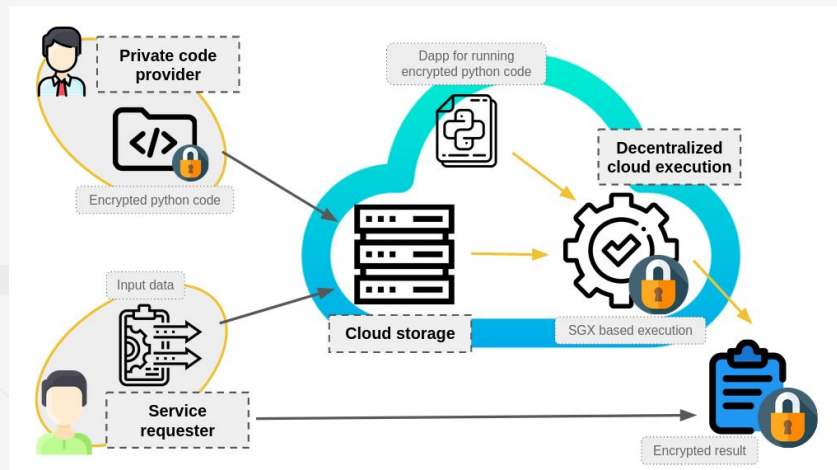
## Democratize confidential computing

Build your confidential computing app

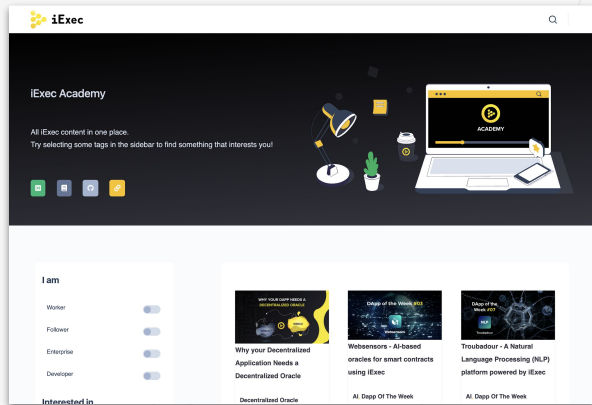
Making a developer's journey as delightful as possible when interacting with our marketplace.



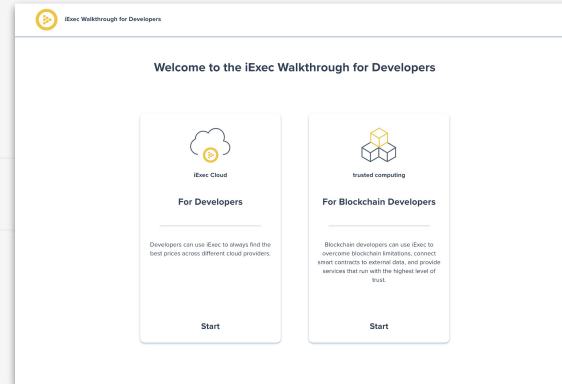
<https://medium.com/iex-ec/how-to-build-a-data-privacy-preserving-app-in-under-1-hour-fb323e7458b>



# Resources



**iExec Academy**  
<https://academy.iex.ec/>



**Developer Walkthrough**  
<https://developers.iex.ec/>





# iExec services for Entreprises

## IDEATION & CONSULTING



- One-day ideation workshop.
- Dedicated advices on how you can leverage Blockchain to create value for your business.
- Scaling up your team's skills on how reshape your business with Blockchain technologies.

## DEVELOPMENT & DEPLOYMENT



- Turning ideas into POCs.
- Our developers build and deploy your new product, service or platform (on-premise or on a cloud infrastructure).
- Benchmarks & extensive tests to guarantee you an optimal quality of service.

## MAINTENANCE & GROWTH **Ongoing or according to your contract**



- Ongoing technical support for your deployed solution.
- Possibility to implement new features.



# Industrial collaborations & partnerships

## Technical partnerships



## Expertise



## Startups



## Standardisation



## Blockchain advisor



# Topics

- 1: Blockchain Interoperability:- Cross-chain solutions (oracles, transaction). Current problem? Solution? process? impacts?
- 2: Blockchain with IoT:- use cases? What added value? processes? What technological barriers? What impact?
- 3: Privacy and confidentiality of data (iExec TEE solutions) new use cases? implementation and which industry has a demand for it?





**iExec**

**Thank you**

Avinash PATHARE

<https://iex.ec>