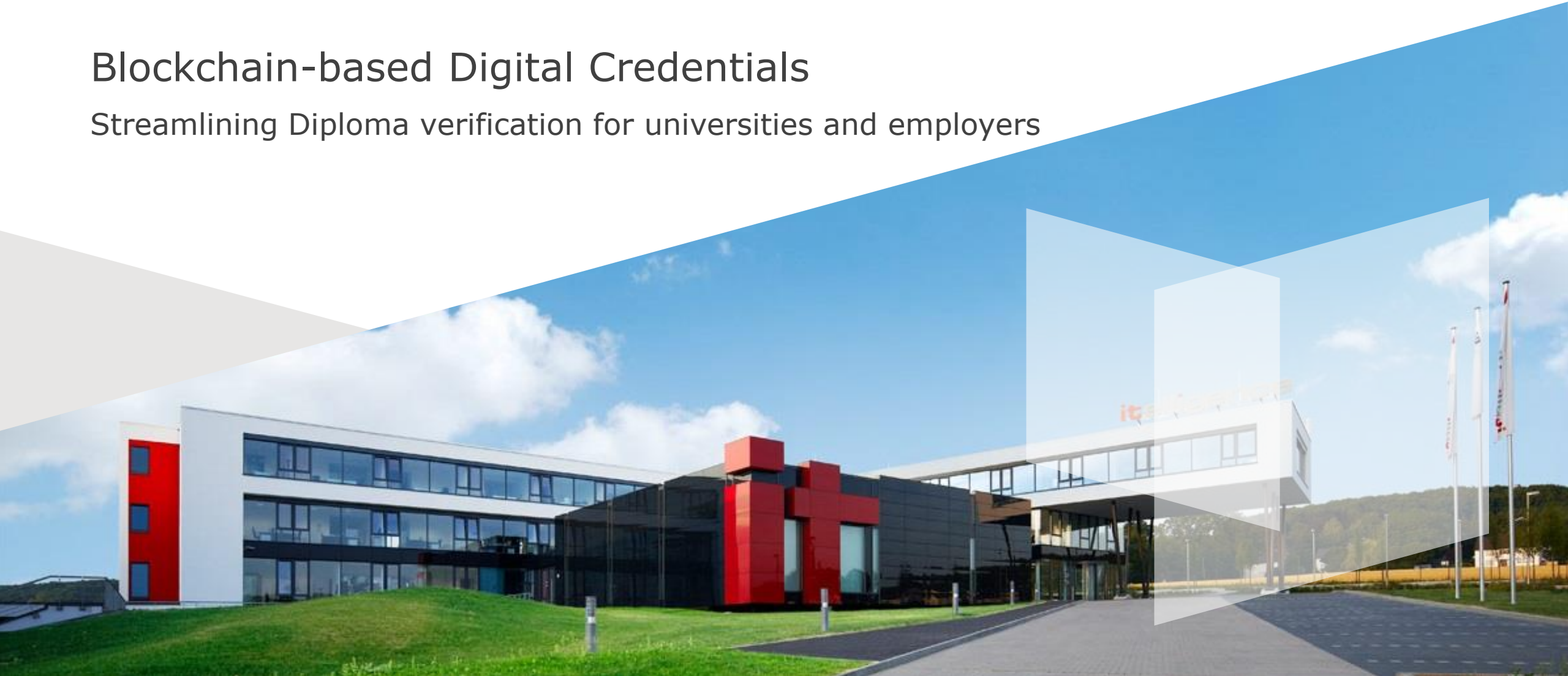


Tom Saeys & Hayato Okamoto, itelligence

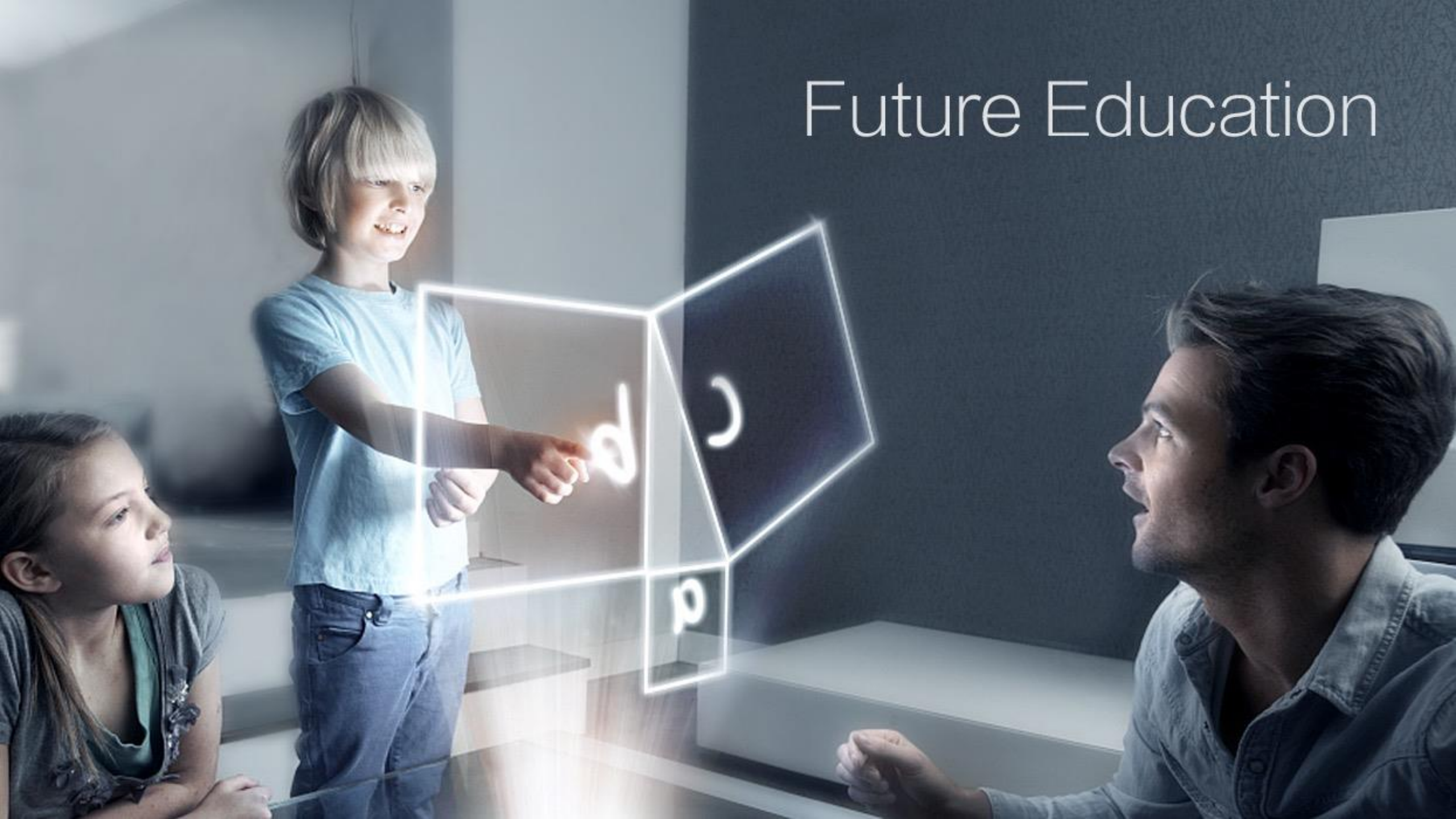
Rob Jonkers, SAP

Blockchain-based Digital Credentials

Streamlining Diploma verification for universities and employers



Future Education





World University Rankings 2019

The *Times Higher Education* World University Rankings 2019 includes more than 1,250 universities, making it the biggest international league table to date.

It is the only global university performance table to judge research-intensive universities across all of their missions: teaching, research, knowledge transfer and international outlook. We use 13 carefully calibrated performance indicators to provide the most comprehensive and balanced comparisons, trusted by students, academics, university leaders, industry and governments.

[Read more...](#)

Show me universities best for overall ▾ in any country / region

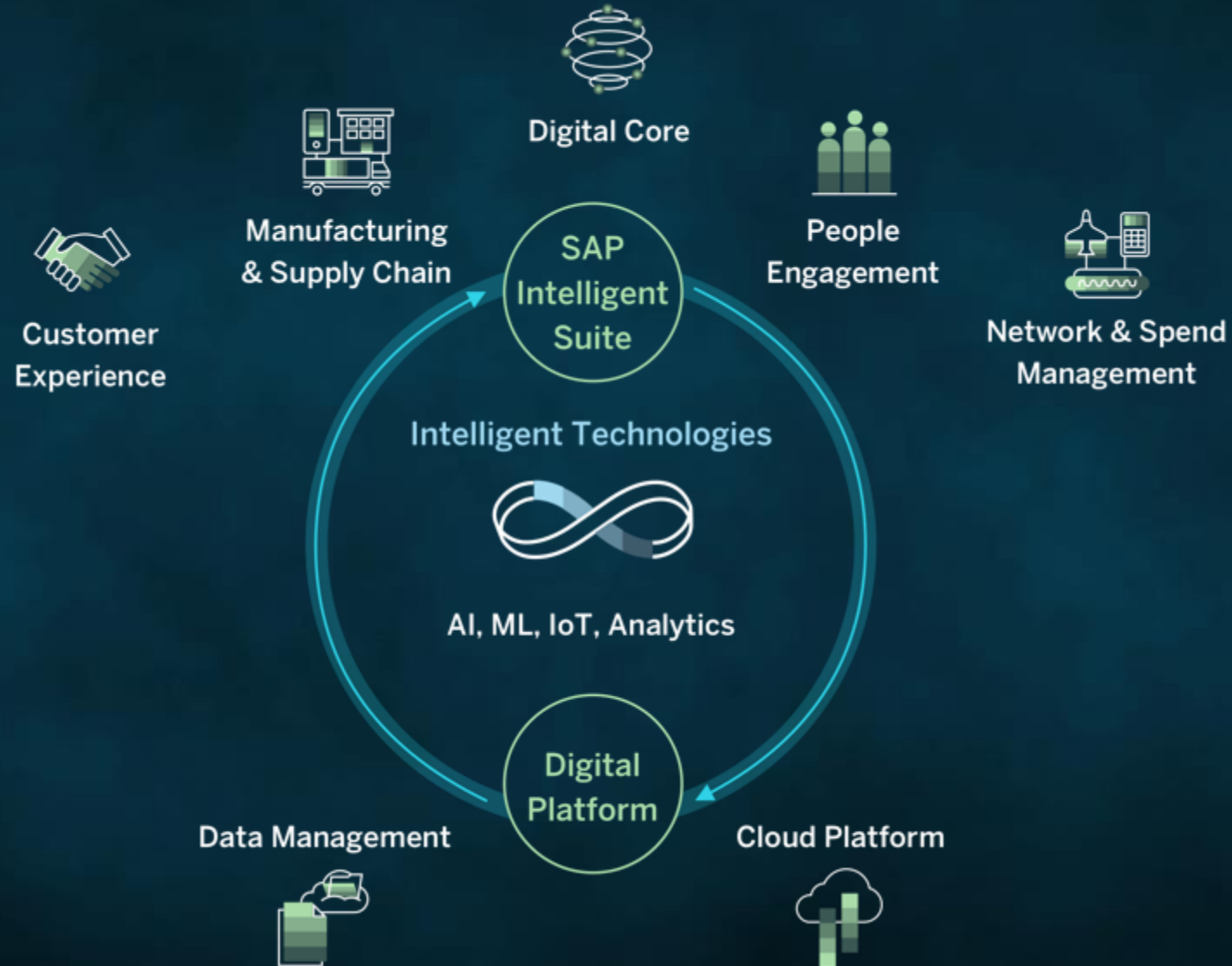
Or, find specific universities by name

RANKING		SCORES					
Rank	Name	Overall	Teaching	Research	Citations	Industry Income	International Outlook
1	University of Oxford United Kingdom	96.0	91.8	99.5	99.1	67.0	96.3
2	University of Cambridge United Kingdom	94.8	92.1	98.8	97.1	52.9	94.3
3	Stanford University United States Explore	94.7	93.6	96.8	99.9	64.6	79.3
4	Massachusetts Institute of Technology United States	94.2	91.9	92.7	99.9	87.6	89.0
5	California Institute of Technology United States	94.1	94.5	97.2	99.2	88.2	62.3

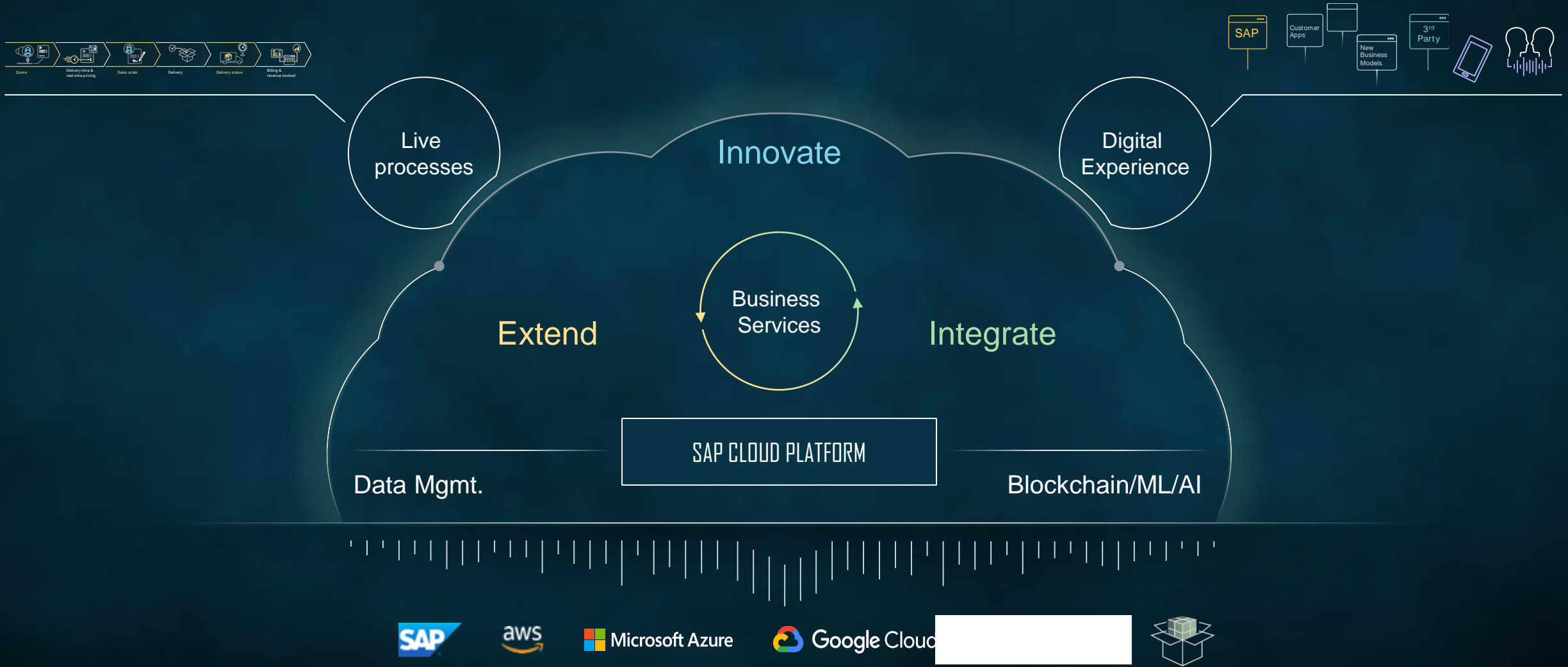


Smart Campus

The Intelligent University



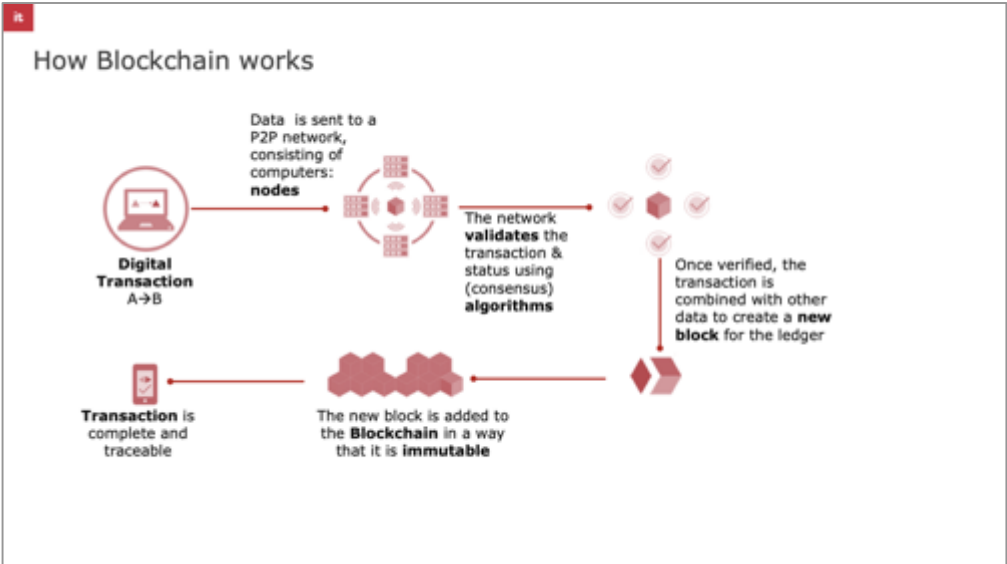
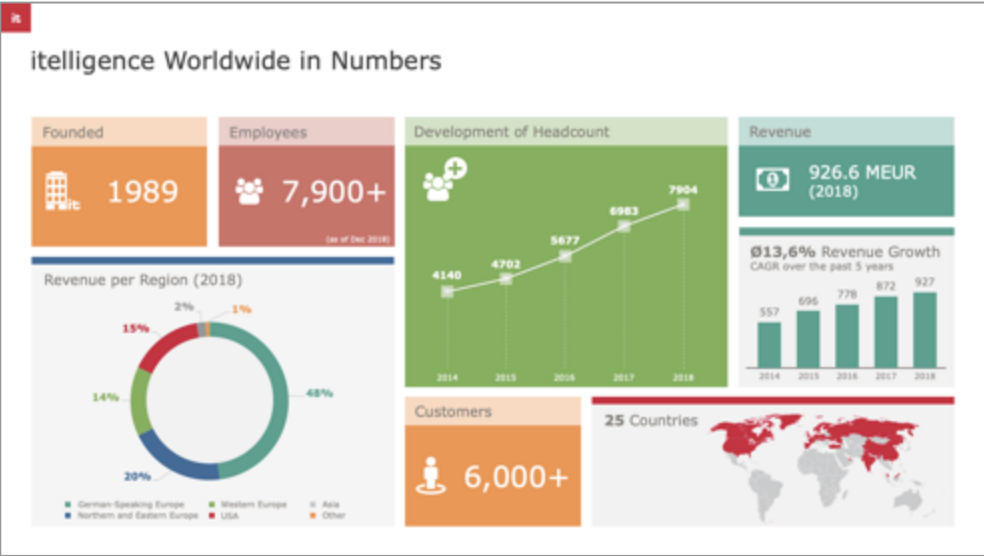
The Business Platform for the Intelligent University



Customer stories



Outside the Block



Provisioning & verifying certificates and diplomas through the KU Leuven student self-service and through SAP blockchain services

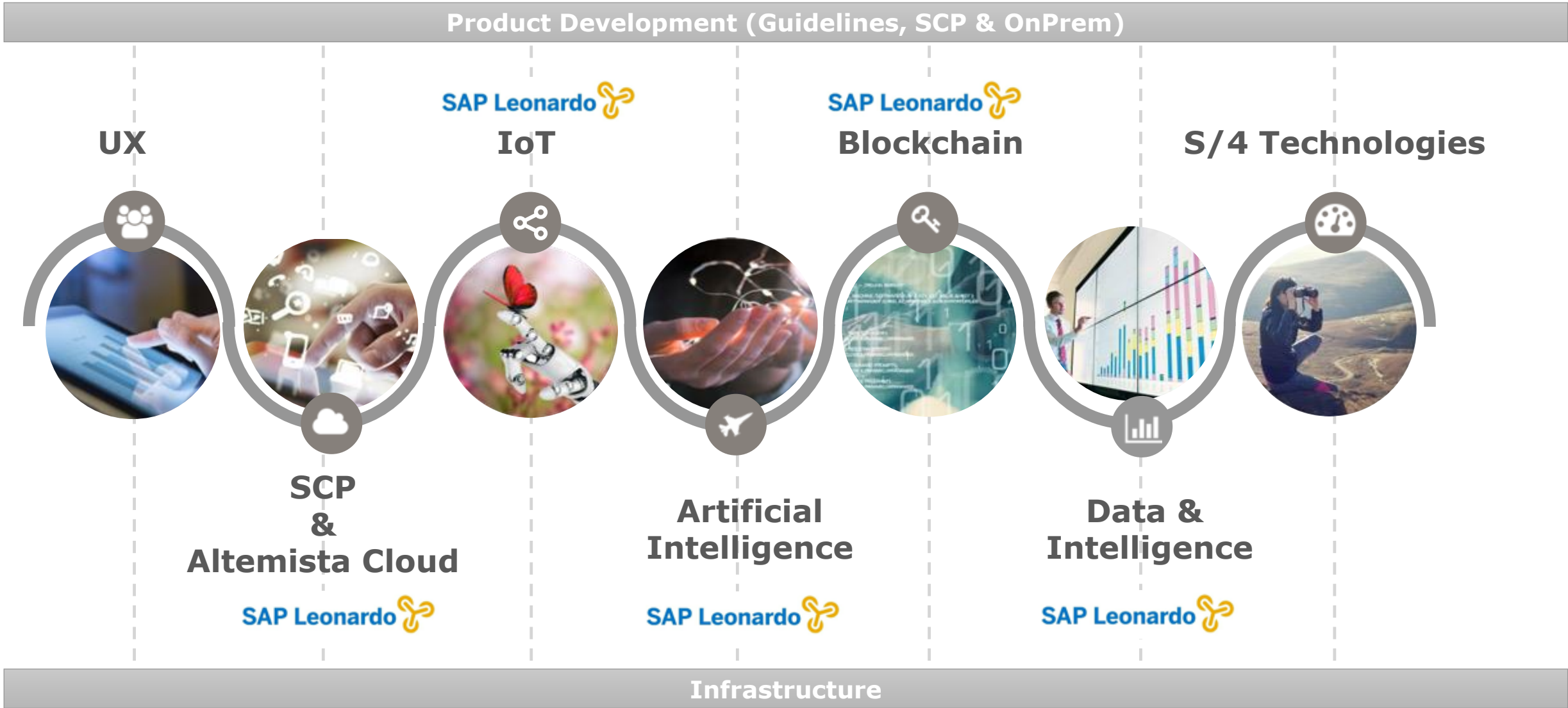
Ellen Lerouge – KU Leuven University
Lut Willems – KU Leuven University
Rob Jonkers – Solution Director SAP Higher Education

HERUG 2018

SAP

KATHOLIEKE UNIVERSITEIT LEUVEN

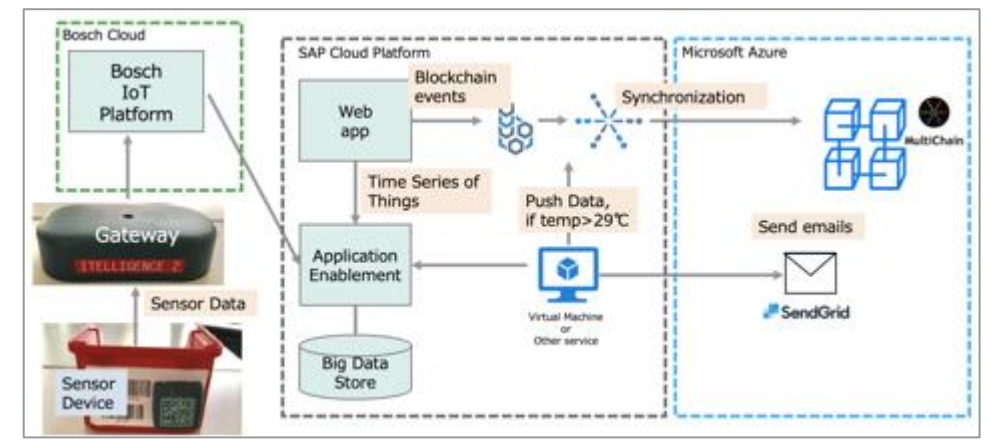
Innovation Technologies at itelligence



Blockchain related Innovation projects

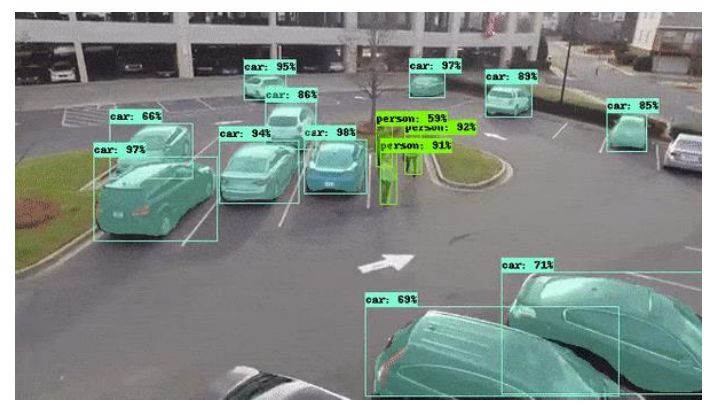
1. Track & Trace solution: IoT + Blockchain integration

- Sensor data (Temperature)
- Tracking Exceptions on Blockchain



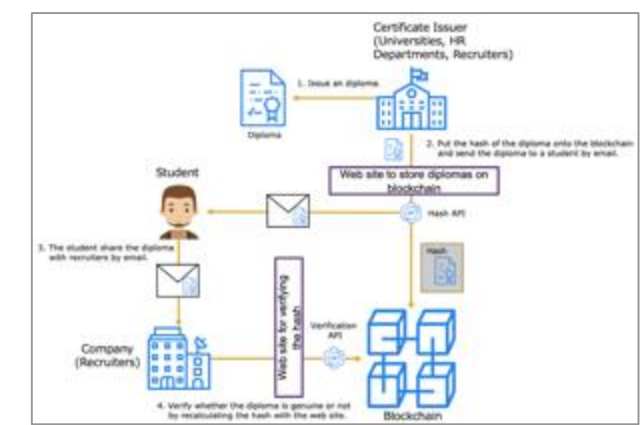
2. Automatic Car Damage detection

- Image Recognition (IR) + (AR)
- Convolutional Neural Networks (ML)
- Blockchain

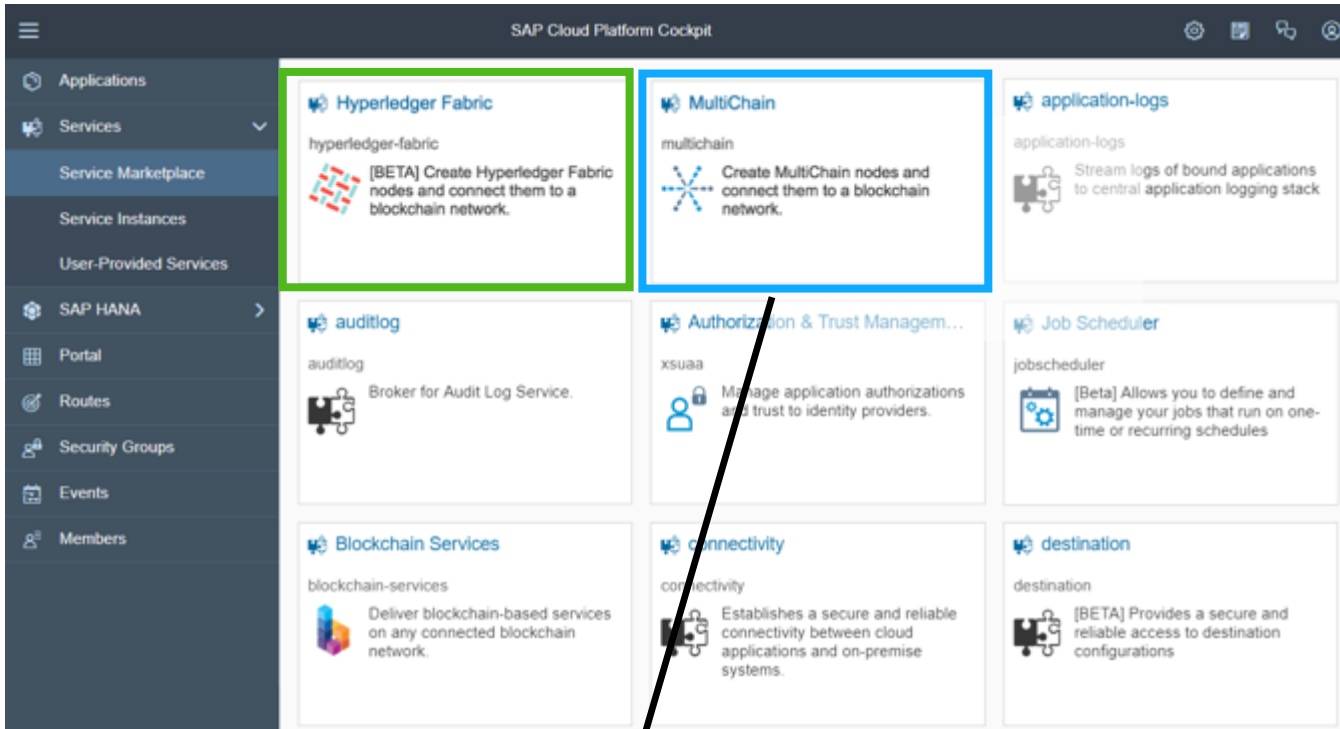


3. Digital Credentials

- Proof of Credentials
- SAP SLcM – SuccessFactors Learning – Blockchain



Blockchain on SAP Cloud Platform (BaaS)



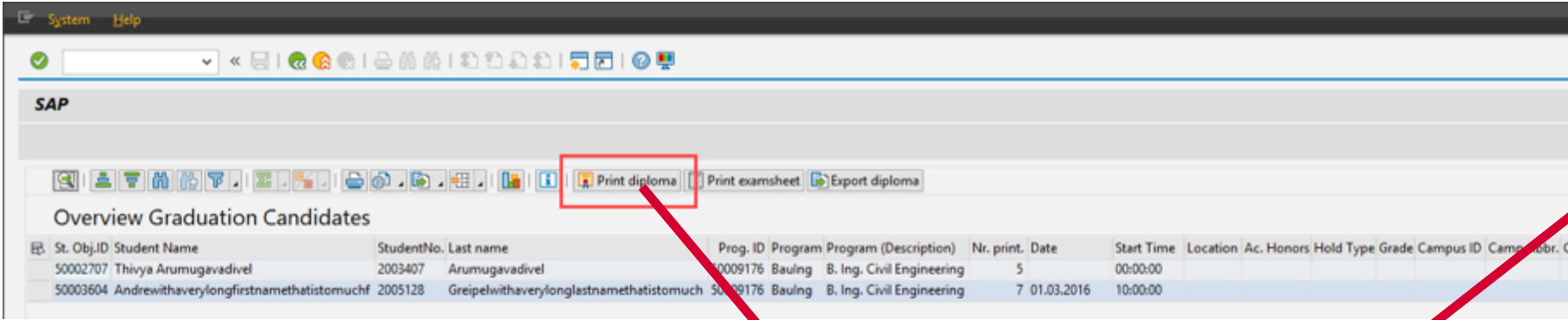
MultiChain and Hyperledger Fabric on SAP Cloud Platform:

- **Create** a Blockchain **node** and **connect** to it
- Build **Blockchain extensions** for existing applications
- **Integrate** into existing blockchain platforms.
 - **SAP Blockchain service**
- Blockchain as a common and shared data layer (Integration)

- SAP manages **instances and applications**. We can use it in a few steps

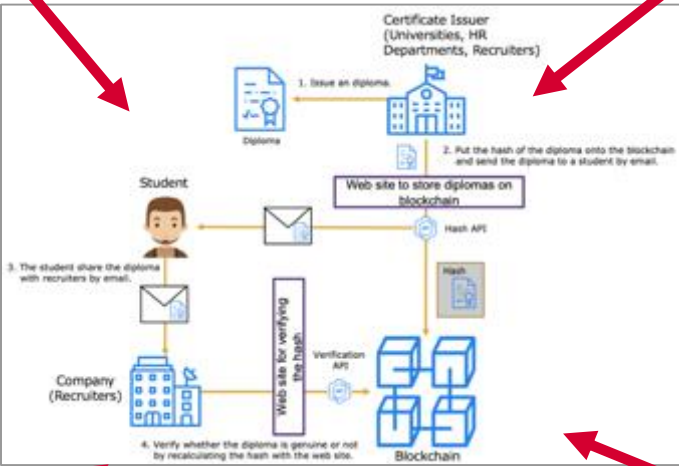
Core SAP SLcM processes are kept intact and innovation has been driven via SAP Cloud Platform

Integration scenario's



SAP SLCM (it.education)
University Degree

SuccessFactors Learning
certificate



The risk and cost of (fake) diplomas

Three categories of **Fake diplomas**:

1. A diploma that **seems to be issued** by an **accredited institution**, but the **diploma** is in fact **produced illegally**
 - The person who **bought** the document has never studied at the institution
2. Diplomas that are issued by accredited institutions, but the holder of the **diploma** has **changed information** in the document (grades).
3. Fake diplomas issued by **Diploma mills** (fake universities).
 - Diploma mills grant 'degrees' to people who pay for this service, but do not offer any educational training.

Current cost of diploma verification:

- 200\$/applicant
- 3-6 weeks/applicant



 **2,615**
Estimated number of diploma mills in the world.



	Associate Degree	\$140
	Bachelor Degree	\$150
	Master Degree	\$175
	Doctorate Degree	\$190
	Professorship	\$210

How Blockchain Can Stamp Out China's Fake Diplomas



Sharon Lamb Forbes Staff



CHENGDU, CHINA - FEBRUARY 20: (CHINA OUT) A policeman displays fake exams, diplomas and other certificates they seized from illegal producers at a building on February 20, 2015 in Chengdu of Sichuan Province, China. Police have arrested three people suspected of counterfeiting certificates after days of investigation. (Photo by China Photos/Getty Images)

Issuing Digital, Blockchain-verifiable diplomas

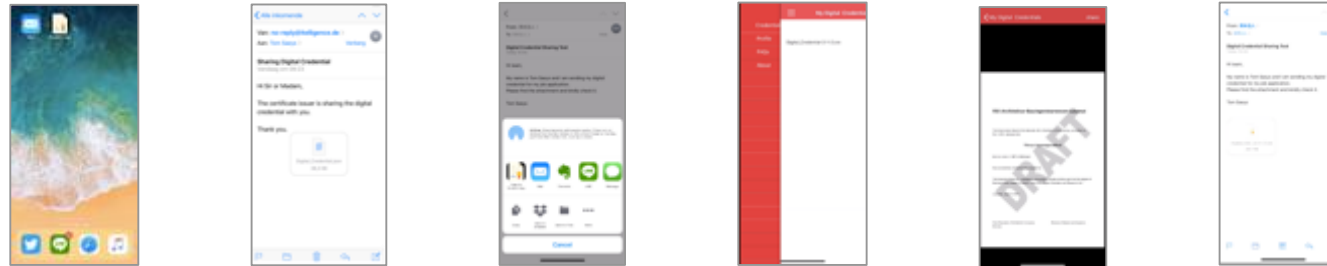
- **Blockchain** has at the core the following key attributes:
 - Self-sovereignty
 - Identity
 - Trust
 - **Transparency**
 - **Provenance**
 - **Immutability**
 - Disintermediation

Blockchain as the Foundation of a New Digital Credentials Infrastructure

The most **promising** of all **use cases** for higher education centers around transforming the “**record keeping**” of **degrees**, certificates and diplomas. In essence, it is about making these **credentials digital and self-sovereign** (see Note 2). That means that it places the **credentials under the learner’s control without** the need for an **intermediary** to prove or verify the credential.



Blockchain-based Digital Credentials



“Blockchain-based **digital credentials eliminates** the **need for a central authority** (intermediary) to prove or **verify** the diploma and **streamlines** the process of **recruiting**”



- **Prevent** Fraud
- Move away from non **value added** work

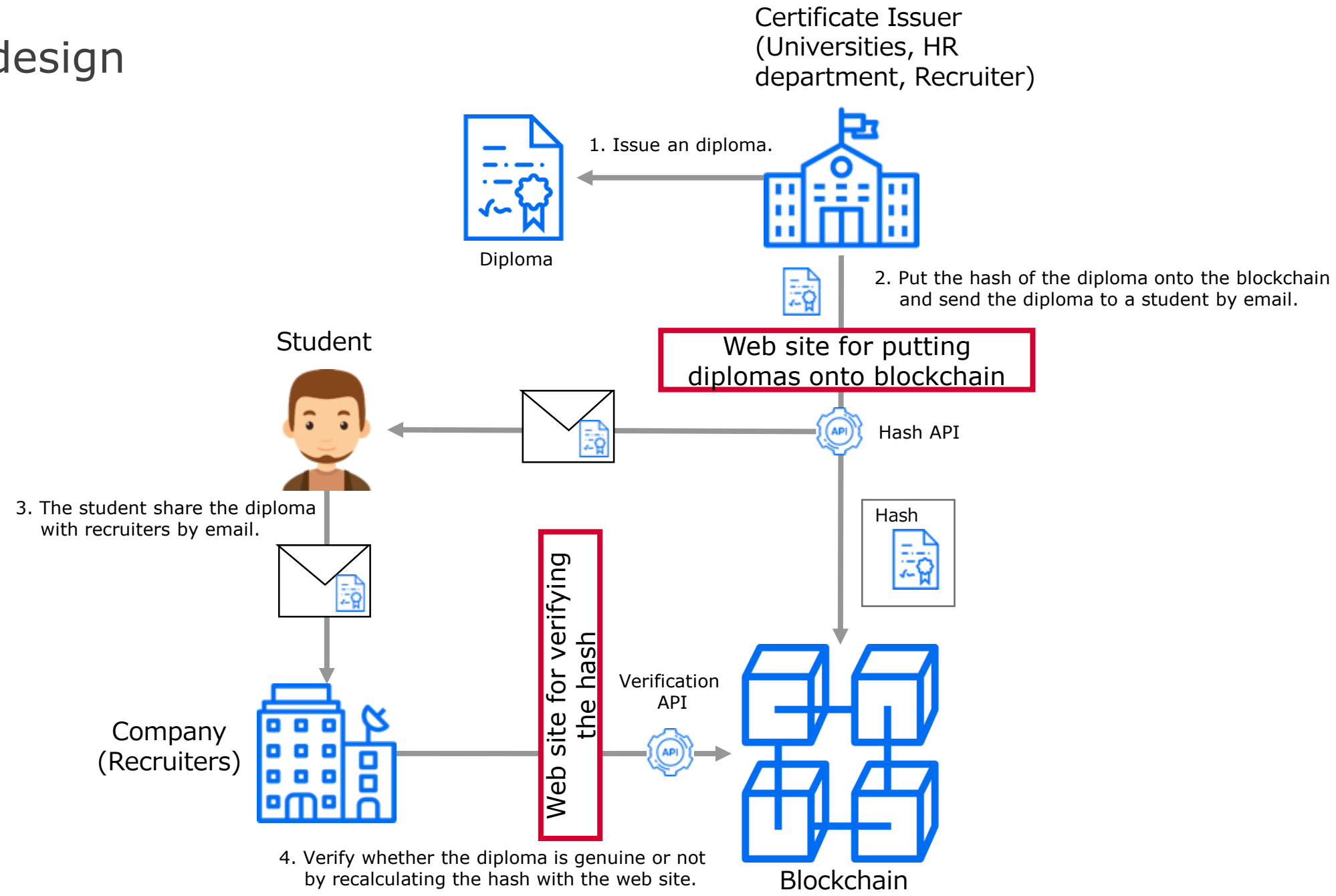


- **Full control** over credentials & Data
- Single place to collect and **manage credentials**

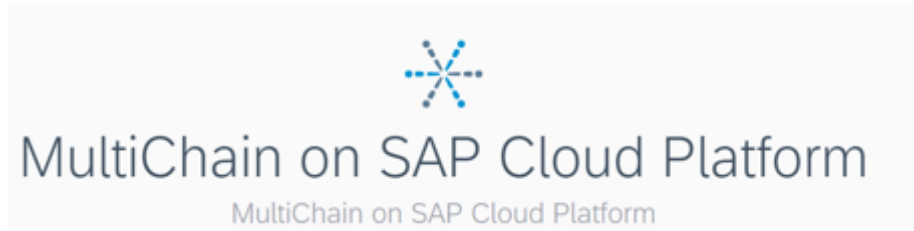


- **Instant verification**

Solution design



Multichain on SAP Cloud Foundry



- SAP manages instances and applications. We can use it in a few steps

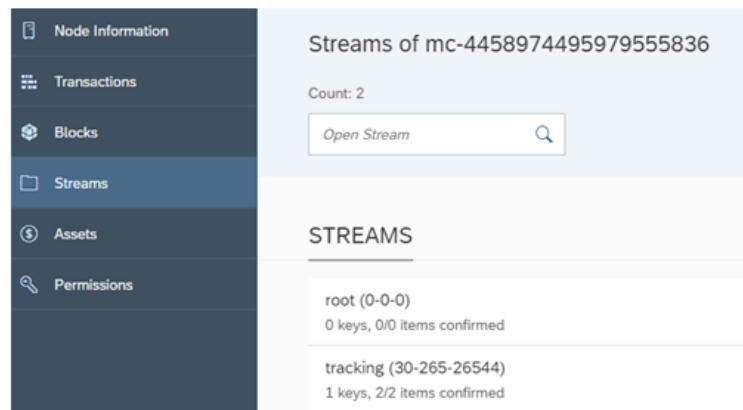
1. Create a new stream

1. The first stage is to create a new stream, which we'll call 'tracking'. This uses a true boolean, indicating that anyor

To do this, execute the following JSON-RPC call to your primary node:

```
POST HTTP/1.1
Host: maas-proxy.cfapps.sap.hana.ondemand.com//rpc
(HEADER) apikey:
(BODY) {"method": "create", "params": ["stream", "tracking", true]}
```

If the request is successful, the new stream will appear in the **Streams** section of your MultiChain dashboard:



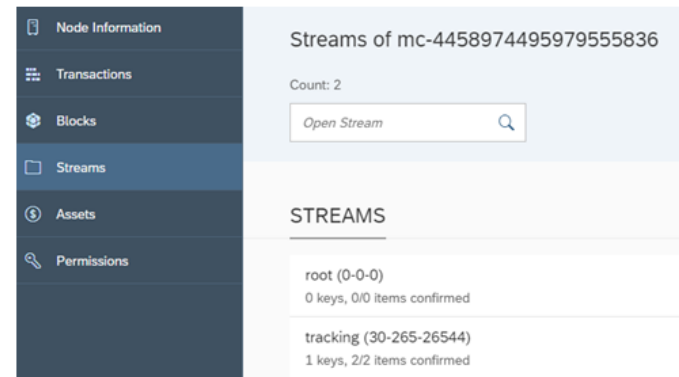
2. Create a stream item

2. The next stage is to create a stream item, which in this case is a sales order with the reference 4711.

To do this, execute the following JSON-RPC call to your primary node:

```
POST HTTP/1.1
Host: maas-proxy.cfapps.sap.hana.ondemand.com//rpc
(HEADER) apikey:
(BODY) {"method": "publish", "params": ["tracking", "4711", "73616c6573206f7226465722063726561746564"]}
```

As you can see, this JSON-RPC command requires three parameters; the stream name, the key, and the value in hex for **Streams** section of your MultiChain dashboard:

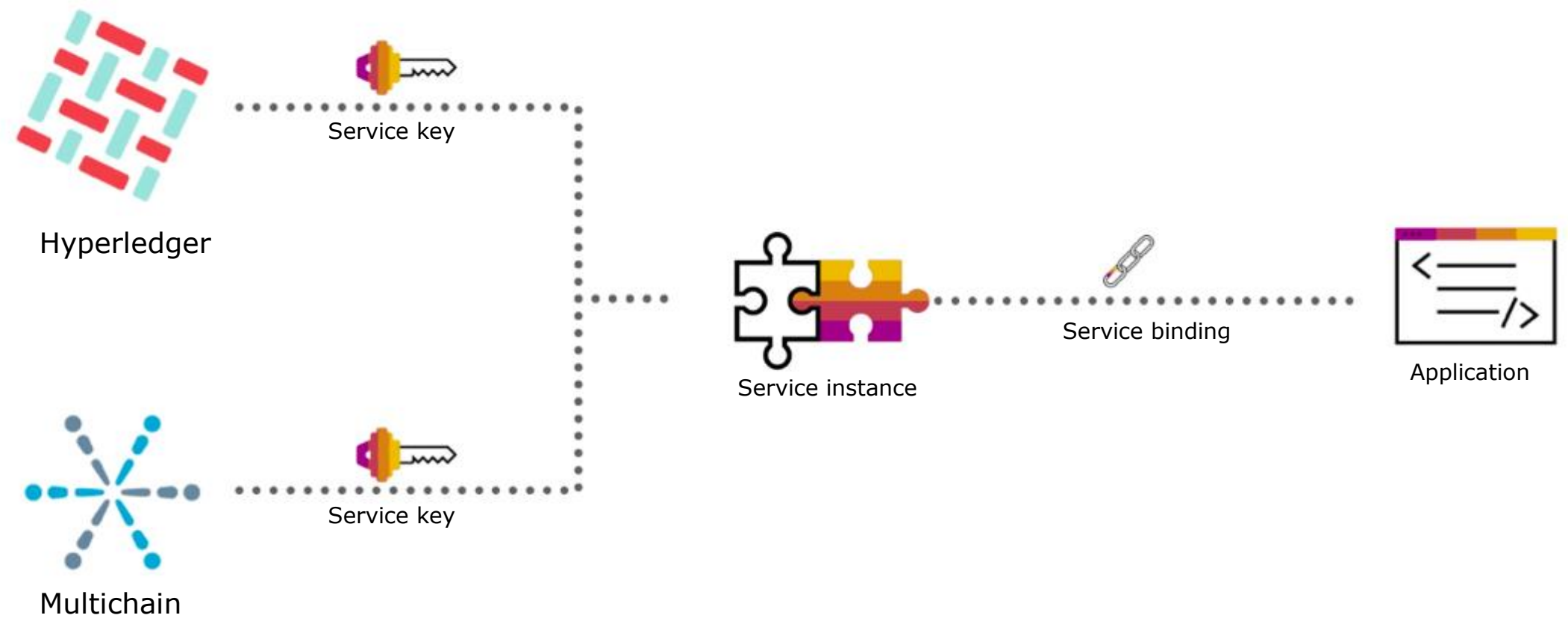


Blockchain Application Enablement

Blockchain Technologies

Blockchain Services

Business Applications

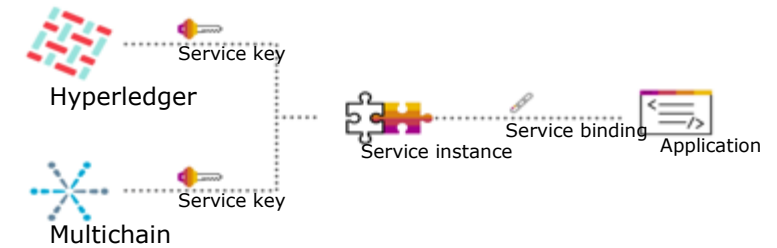


Technology layer

SCP Service layer

SAP Application layer

Services provided by BaaS (SCP)



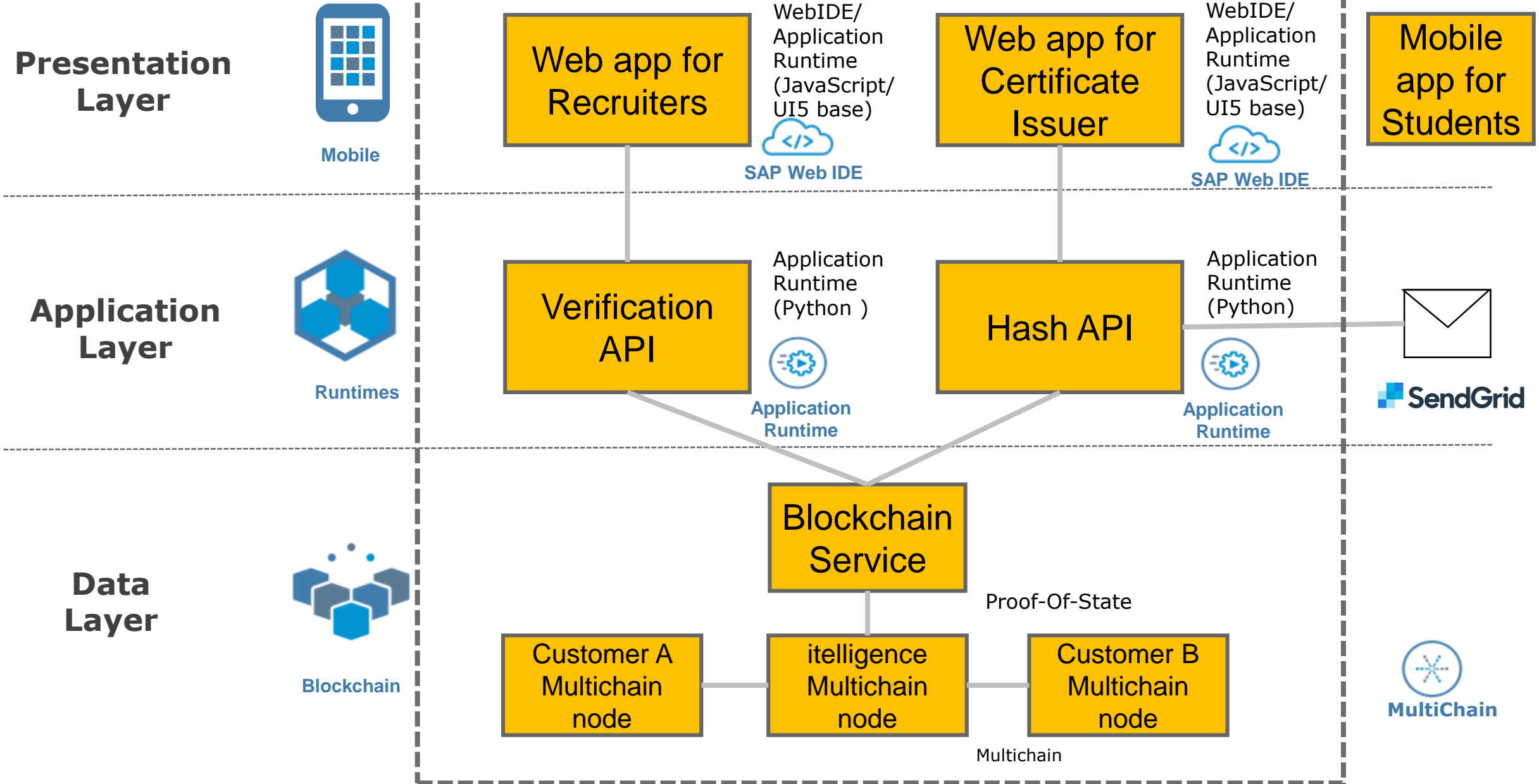
▪ **Blockchain Services:**

- **Timestamping:** The process of securely **keeping track** of the **creation and modification** of a document (date/time).
 - eg: Proves that an **object exists** at a certain date/time (eg. Asset, Material, Document)
- **Proof of state:** Documents the **complete state** of an object, usually once
 - eg: End-year Financial reporting for company and subsidiaries.
- **Proof of history:** Keep track of **delta updates** to an object
 - eg: Manufacturing business uses machines replicated by a digital twin in the cloud. If an attribute changes, the audit trail (details of the revisions) can be retrieved and reviewed

▪ **Blockchain Service Enablement scenarios (Triggers):**

- Calling APIs Using ABAP
- Calling APIs from the API Hub
- Calling APIs from a Standalone Web Page
- Calling APIs from an SCP Business Application
- Calling APIs from a Business Application with own XSUAA (User Account and Authentication)

SAP® Cloud Platform



Digital Credential WebApps powered by SAP Blockchain

Education Certification Blockchain

File Name: [Doorzoeken...](#)

Recipient Email:

Issued Date:

Expire Date:

Type:

Name of Certificate:

Description:

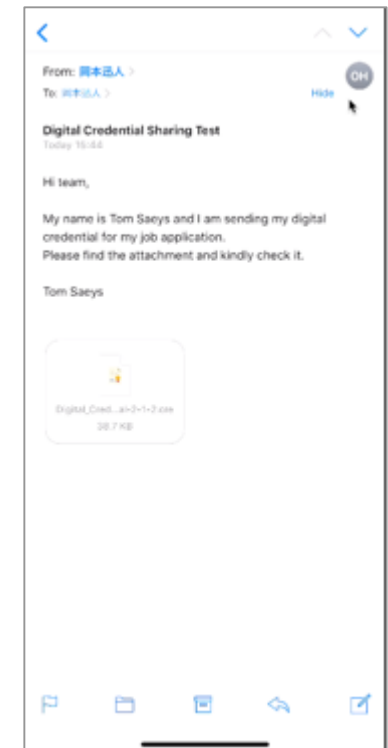
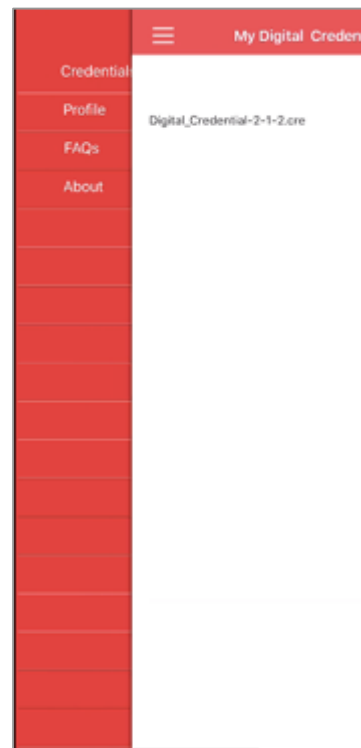
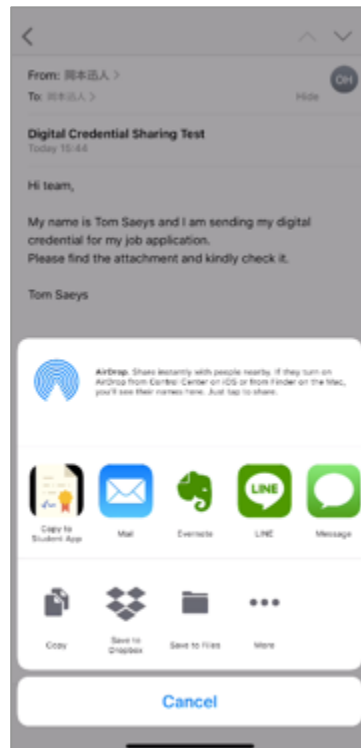
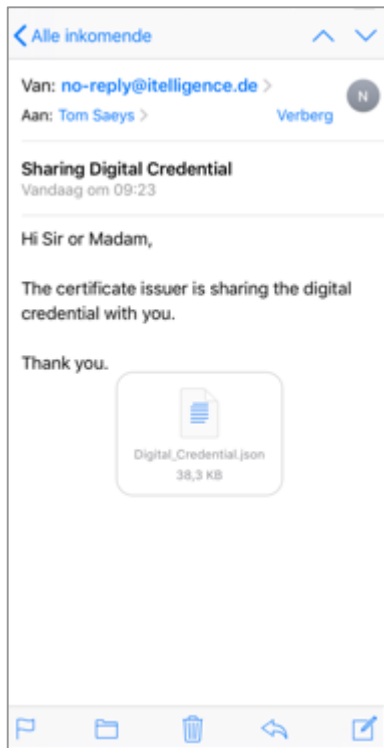
[Calculate Hash and Send Diploma](#)

Education Certification Blockchain

File Name: [Doorzoeken...](#)

[Check Existence of File on Blockhchain](#)

Digital Credentials powered by SAP Blockchain



DEMO

SAP Cloud Platform

SAP Cloud Platform Cockpit

Home [Europe (Rot)] / itelligence AG

Global Account: itelligence AG - Subaccounts
All: 1

Leonardo

Environment: Cloud Foundry
 Provider: Amazon Web Services (AWS)
 Region: Europe (Frankfurt)
 Description: -none-

SAP Cloud Platform Cockpit

Home [Europe (Rot)] / itelligence AG / Leonardo / demo

Space: demo - Service Instances
Filtered: 2 of 12

multichain MC-ED

Name	Service	Plan	Referencing Applications	Service Keys	Last Operation	Actions
MC-ED-01	multichain	small	None	1	Created	
MC-ED-02	multichain	small	None	0	Created	

SAP MultiChain Dashboard

Node Information

Chainname: mc-2034528844188524047 Connections: 1
 Description: MultiChain mc-2034528844188524047 Status: **Running**
 Address: 18fgebj6v7F1Dwc2kYwO2f5mcudbtz6p32chY
 Node Address: mc-2034528844188524047@18.197.66.41:7000
 Last Block: #101 from February 15, 2019 4:05 PM

DETAILS

Peers

18.194.214.54:52616
 Handshake Address: 1VZmTMBfs2jn1W13YP94lrm7N9yge6aiwu5o3
 Connected: February 15, 2019 3:49:06 PM
 Last Pong: March 4, 2019 1:54:31 PM

Blockchain Parameters

chain-protocol = multichain
 chain-description = MultiChain mc-2034528844188524047

SAP MultiChain Dashboard

Blocks of mc-2034528844188524047

BLOCKS

#101
Hash 007fedbc6a1a27b5c388b87fd29abbcd96871c04b158a36a5ed48b6366abab0

#100
Hash 004c1b37dde4e60e892231e6f5ec7728651cc6448a0265234175d46c15950bc

#99
Hash 00e993aba0323aee16981eea449a8cd8ba8650ec31fab43b9440f987a1ba0f

SAP Multichain Dashboard

The image shows two screenshots of the SAP Multichain Dashboard. The top screenshot displays the 'Stream EducationBlockchain-test-01' page, showing a key value and its current state. The bottom screenshot displays the 'Stream 964-266-40786' page, showing the same key value and providing additional details like 'Last Changed' and 'Last Publishers'.

Stream EducationBlockchain-test-01

55f754108646a0563cc98268ebca6eeb8166398500b12bc8a94f8fba659c6e15

Current Value: {"timestamp":"2019-04-25T07:36:15.596Z","id":"55f754108646a0563cc98268ebca6eeb8166398500b12bc8a94f8fba659c6e15","state":{}}

Publisher: 1RudVnirLJuwyyq4WbvKtmjHTK2X6DrmN9gQvK

Block: undefined from

Stream 964-266-40786

Key 55f754108646a0563cc98268ebca6eeb8166398500b12bc8a94f8fba659c6e15 in Stream 964-266-40786

Current Value: {"timestamp":"2019-04-25T07:36:15.596Z","id":"55f754108646a0563cc98268ebca6eeb8166398500b12bc8a94f8fba659c6e15","state":{}}

Last Changed:

Last Publishers: 1RudVnirLJuwyyq4WbvKtmjHTK2X6DrmN9gQvK

VALUES

```
{
  "timestamp": "2019-04-25T07:36:15.596Z",
  "id": "55f754108646a0563cc98268ebca6eeb8166398500b12bc8a94f8fba659c6e15",
  "state": {}
}
```

Publishers: 1RudVnirLJuwyyq4WbvKtmjHTK2X6DrmN9gQvK

Confirmations: 0

Blocktime:

Offchain:

Referenced Keys:

Benefits and Outcomes

Business/Social

- **Credibility and Trust** between Student/Applicant and Company
- **Faster and Easier** Recruitment Procedure
- **Lower administrative** cost by real-time validation and verification
- **Value added service** to improve HR service

IT

- Enhanced **Technologies** in Digital Credential service:
 - SAP Cloud Platform
 - Blockchain
 - Object Storage
 - UX

Human Empowerment

- Enhanced **user experience** through digitization, enhanced technologies in Digital Credentials and Recruitment
- **Transparency** overall
- **Learner is in control** of degrees, certificates and diplomas
- **No need for an intermediary** to prove or verify credentials

Conclusions

- **SAP Cloud Platform** can easily be used to deploy and integrate innovation scenarios
 - Blockchain as a Service (BaaS) allows for **rapid prototyping** by **reducing complexities of managing a Blockchain infrastructure**.
- Organisations (and industries) are **adopting** Blockchain at different rates
 - For adoption and success of blockchain, **we must address the right use cases & scenarios**
- **Technology vs Network:**
 - Joining the stakeholders in a (permissioned) Blockchain network/**Consortium** is the real challenge
- We are open for **co-innovation projects** in **Blockchain** with you !

Questions?



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