IP Protection, Licensing And Product Life Cycle Tracking Of Additive Manufactured Products

IP Protection, Licensing And Product Life Cycle Tracking Of Additive Manufactured Products

PROSTEP

- **PROSTEP AG**

- **Challenges 3D Printing**

- **Solutions**

- **The SAMPL Projekt: The License to Print and Life Cycle Tracking**
  Overview and Live Demonstration

Dr. Martin Holland;
Project Manager SAMPL

PROSTEP AG:
VP Business Development & Strategie
Tel.: +49 511 540 58-0
Email: holland@prostep.com

PROSTEP - 100% PLM

Who we are – What we offer

PROSTEP is

- an expert for PLM processes and solutions
- the leading vendor-independent PLM consultant for the discrete manufacturing industry
- 25+ years of industry background - 230 PLM experts - 200 customers - 12 locations
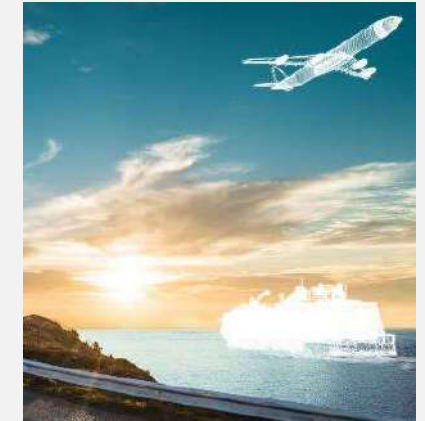- partner of leading PLM vendors

Selected reference customers

PROSTEP offers

- PLM strategy consulting
- PLM concepts & solution architecture
- PLM implementation
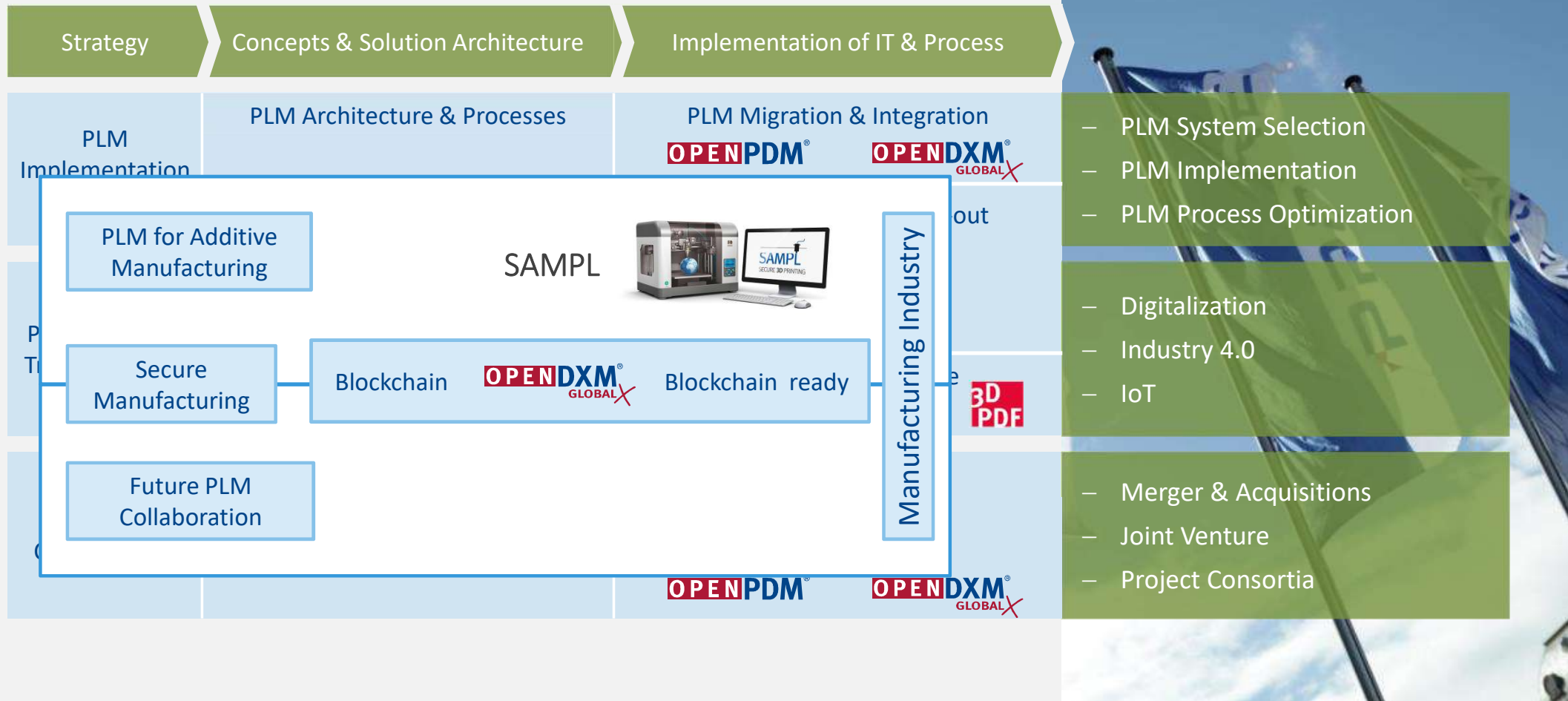- own products to build PLM integration & collaboration solutions

PROSTEP - 100% PLM

Consulting and Solution Portfolio

PROSTEP

Strategy	Concepts & Solution Architecture	Implementation of IT & Process	
PLM Implementation Strategy	**PLM Architecture & Processes** Benchmark & ROI-Analysis PLM Landscape & Complexity Management Product Structure and Variant Management	**PLM Migration & Integration** OPENPDM® OPENDXM® GLOBALX	– PLM System Selection – PLM Implementation – PLM Process Optimization
PLM for Digital Transformation	**PLM for IoT/I 4.0 Solutions** Digital Master / Digital Twin	**PLM Realization and Roll-out** Bill of Material & Change Management Variant & Configuration Management Digital Master / Digital Twin	– Digitalization – Industry 4.0 – IoT
	Model Based Enterprise 3D Master / Systems-Engineering	**Technical Data Package** Paper-less Processes 3D PDF	
PLM for Collaboration	**Cross-company PLM** PLM for Merger & Acquisitions PLM for Joint Ventures Partner & Supply Chain Integration	**PLM Collaboration** Automated PLM Data Supply PDM & CAx Data Exchange OPENPDM® OPENDXM® GLOBALX	– Merger & Acquisitions – Joint Venture – Project Consortia

PROSTEP - 100% PLM

Consulting and Solution Portfolio

Strategy	Concepts & Solution Architecture	Implementation of IT & Process

| PLM Implementation | PLM Architecture & Processes | PLM Migration & Integration **OPENPDM** **OPENDXM GLOBAL** |

- PLM for Additive Manufacturing
- Secure Manufacturing — Blockchain **OPENDXM GLOBAL** — Blockchain ready
- Future PLM Collaboration

SAMPL

Manufacturing Industry

3D PDF

OPENPDM **OPENDXM GLOBAL**

- − PLM System Selection
- − PLM Implementation
- − PLM Process Optimization

- − Digitalization
- − Industry 4.0
- − IoT

- − Merger & Acquisitions
- − Joint Venture
- − Project Consortia

IP Protection, Licensing And Product Life Cycle Tracking Of Additive Manufactured Products
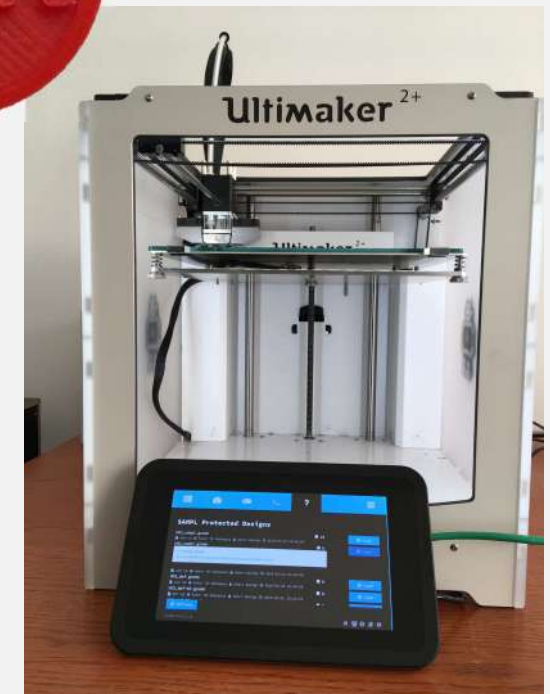
- PROSTEP AG

- **Challenges 3D Printing**

- Solubtions
- The SAMPL Projekt: The License to Print and Life Cycle Tracking
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Project Manager SAMPL

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Challenges 3D-Printing

PROSTEP

|	
Copyright	**Protection of intellectual property; protection against pirated copies/counterfeits; encryption of print data**
Original vs. Counterfeit	**Distinction between original and counterfeit; enforcement of copyrights**
Liability	**Warranty and product liability; defense of unjustified claims**
Security	**Only authorized access; secure identification and authorization**
Safety	**No unapproved changes of product data; no changes of product features**

The Bad News

There is no 100% Security:

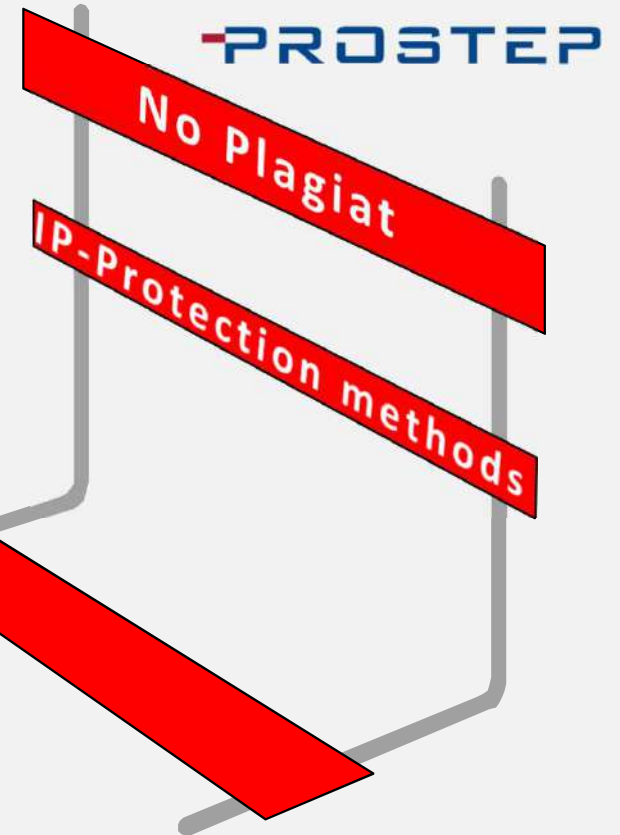**Plagiateurs take every barrier**
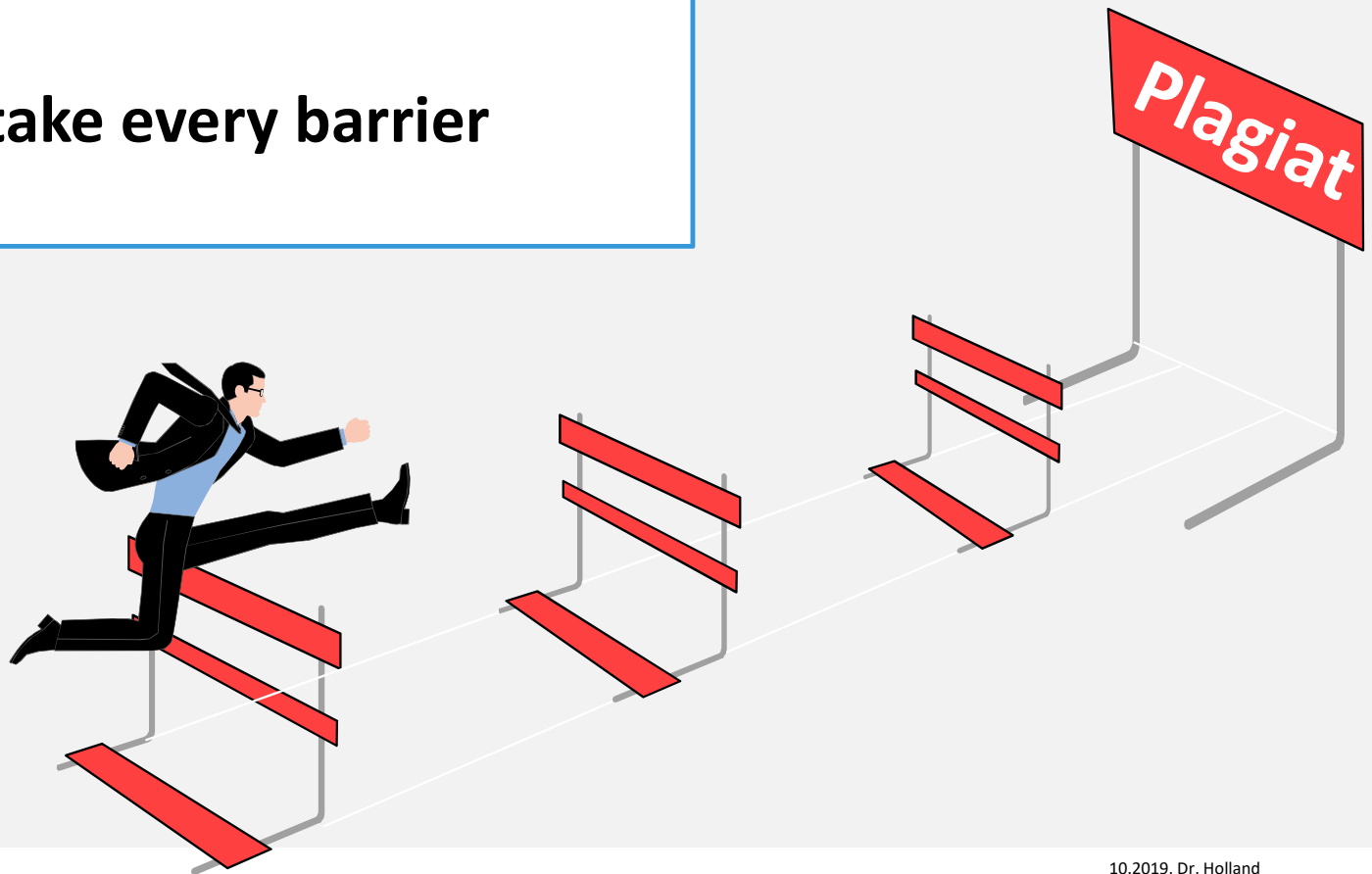
Plagiat

The good News!

Live can be made hard for Plagiateurs!

- The barriers must be high!
  - as high as possible!
  - as high as necessary!

- Plagiateurs`s effort must be so high,
  that plagiarism does not make sense!

IP Protection, Licensing And Product Life Cycle Tracking Of Additive Manufactured Products

- PROSTEP AG

- Challenges 3D Printing

- **Solutions**

- The SAMPL Projekt: The License to Print
  and Life Cycle Tracking
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Project Manager SAMPL	VP Business Development & Strategie
	Tel.: +49 511 540 58-0
	Email: holland@prostep.com

Options for IP-Protection

Internal Security

- Increase awareness of employees.
- Access rights
- Rights Management
- ISO 27001….
  (Labelling of the print file)

External Security

- Unique serial number
- Unchangeability of the data
- Secure and encrypted data transfer
- Licensing of the printing process

Product Markings

- Visible
- Invisible
- During the printing process
- Within the post printing treatment

Legal Aspects

- Contract Management
- Copyright
- Patent protection
- Trademark protection

Product Labeling for traceability

Security labels,… holograms etc.
optional combined with RFID technology….

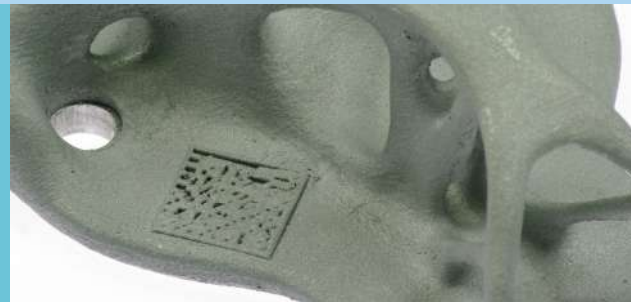(Picture: Hologramm Company RAKO GmbH)

(Bild: Schreiner ProTech)

RFIDs can be placed in the product during the printing process.

SAMPL RFID contains: unique product id and link to the blockchain

Special surface treatment for visible
or unvisible fingerprints.
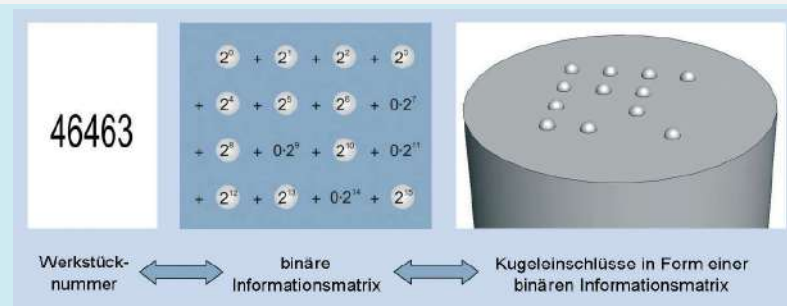
E.G. BarCodes printed on the product

Additive Marking
www.additive-marking.de

Invisible Product Labels

Invisible by, e.g., insertion / placement of „specific elements"

Source: Institute for Forming Technology and Forming Machines (IFUM); Hanover
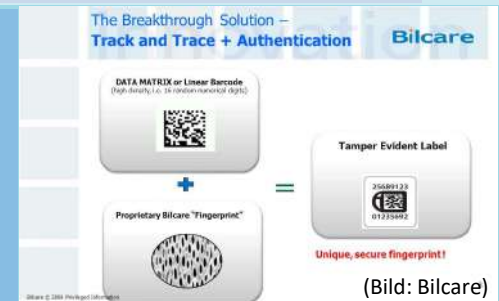
➢ a unique pattern appears

$$2^0 + 2^1 + 2^2 + 2^3$$
$$+ 2^4 + 2^5 + 2^6 + 0 \cdot 2^7$$
$$+ 2^8 + 0 \cdot 2^9 + 2^{10} + 0 \cdot 2^{11}$$
$$+ 2^{12} + 2^{13} + 0 \cdot 2^{14} + 2^{15}$$

Werkstück-nummer ⟷ binäre Informationsmatrix ⟷ Kugeleinschlüsse in Form einer binären Informationsmatrix

Scanning of determined surface areas
if required in combination with barcodes.
Creates an individual surface pattern as fingerprint
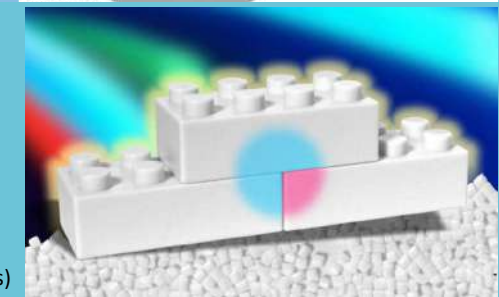Track&Trace -Fingerprint of Fraunhofer IPM

(Picture: Fraunhofer IPM)

The Breakthrough Solution –
Track and Trace + Authentication   **Bilcare**

DATA MATRIX or Linear Barcode

Proprietary Bilcare "Fingerprint"

Tamper Evident Label

Unique, secure fingerprint!

(Bild: Bilcare)

Insertion of specific pigments

which can be made visible by special light.

(Picture: BARLOG plastics)

10.2019, Dr. Holland   **13**

Legal Aspects

PROSTEP

- Who owns the idea?

"An idea is a good idea when it is counterfeited"

Siegfried Wache, technical drawer, aircraft technician and author

- Who is the owner?

- Who holds the rights?

$\Rightarrow$ There are many aspects:

European Parliament
2014-2019

MOTION FOR A EUROPEAN PARLIAMENT RESOLUTION

on three-dimensional printing, a challenge in the fields of intellectual property rights and civil liability (2017/2007(INI))

P8_TA(2018)0274

Three-dimensional printing: intellectual property rights and civil liability
European Parliament resolution of 3 July 2018 on three-dimensional printing, a challenge in the fields of intellectual property rights and civil liability (2017/2007(INI))

The European Parliament,

Copyright

Registered Design

Contractual Framework

Patent

Product Design

Deception of Origin

Trademark

3D-Trademark

Injunctive Relief

3D-Trademark

3D-Trademark includes 3-D shape
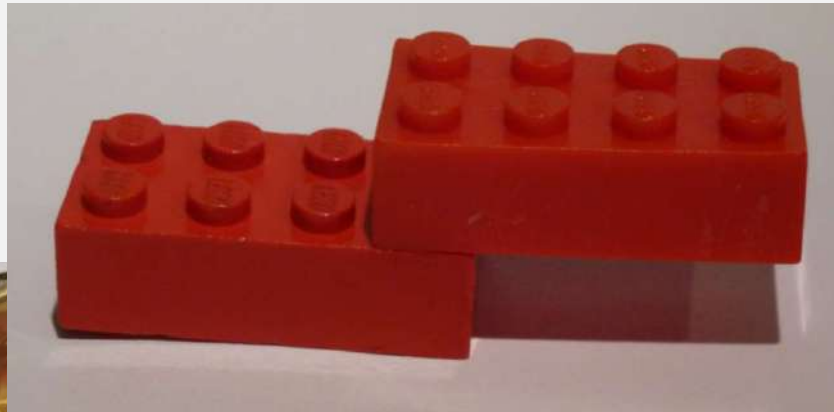
Disruptive IT-Innovations

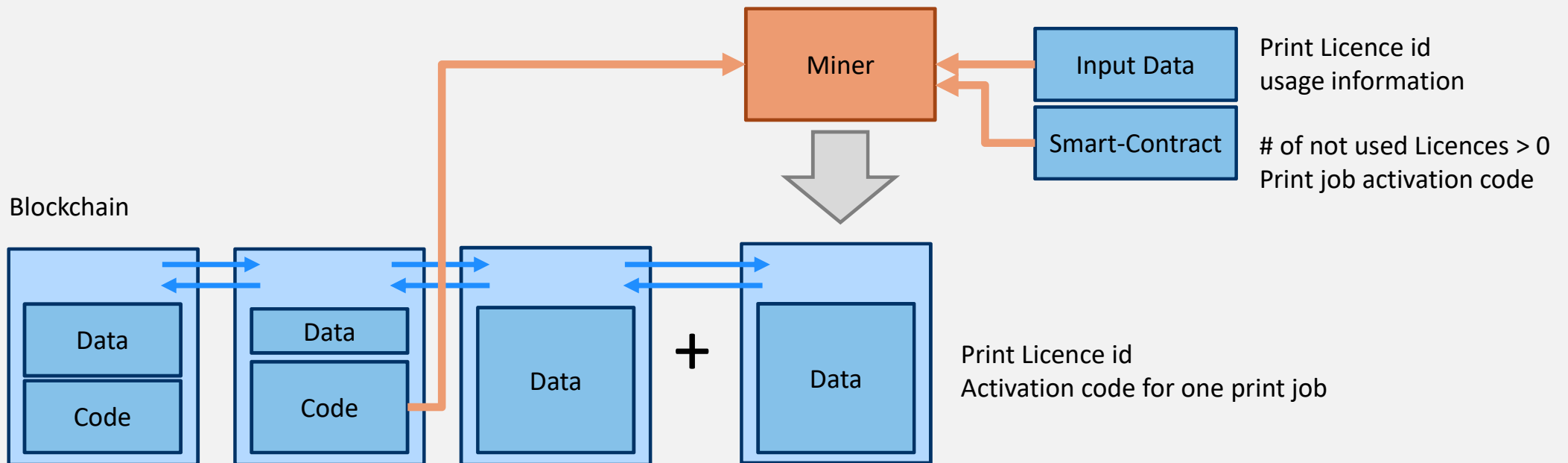| Internet	**Decentralisation** and **Transfer** of **Information** Easy to manipulate Which information is correct? Which information belongs to whom? Business models based on Information

Blockchain DLT	**Decentralisation** and **Transfer** of **Values** Immutability of information/values Implementation of business processes business models based on values/transactions

Further concepts: Smart Contracts

- **Complex Rules** can bei documented in the Blockchain by means of **Smart Contracts**.

- In the Blockchain not only transactin data but also **program code is documented**

- This program code can be executed in order to convert input data into Transaction Data

  - E.g. a lease car can only be moved, if the last rate was paid

  - E.g. a print job can only be started if a licence is available

Miner

Input Data

Print Licence id
usage information

Smart-Contract

# of not used Licences > 0
Print job activation code

Blockchain

Data

Code

Data

Code

Data

+

Data

Print Licence id
Activation code for one print job

Significant Aspects of the Blockchain

PROSTEP

Transactions are documented unchangeable with time stamp in the distributed network**;**
Supports legal proof

Consensus mechanism on status and content.
PoX, BFT

51% of Attack: Changes are possible

Intermediary is not required
Direct connection between the contracting parties (P2P)

Business processes can be automated via smart contracts
and thus are substantially faster

Basic infrastructure is available:
fast implementation of applications;
reduced harmonization effort

Wallet id Maker: 0x01f488F7CEA28e02F1B357D78C5518cBa69**24085**

Participants are pseudonymised (not anonymous)

With the extreme effort, transaction partners and, thus, information can be identified in the network.

Information and participants can be hided

Information is stored decentrally
All members use the same database

Information can be seen by the users

The transaction volume itself is still small
Bitcoin: 7 Tx/sec vs. VISA 10.000 Tx/sec, paypal 450Tx /s

Presentable volume of data is low (Avg. block 30 KB Eth)
High data quantity can be linked with blockchain via hashcode

Hash printfile:356507570211021920311595324346422989421191774316447717400213509105022395 0**5610**

Change of Business Models

- „Earn as you ride" Continental   „Earn as you drive" Jaguar
    - Customer releases information to OEM/platform (weather, parking place data, road condition)
    - Customer directly receives credits in form of virtual coins for the information exchange
    - Coins can be used for service offers or tools

Austausch von Fahrzeugdaten

Continental zeigt neue Blockchain-Plattform

27. August 2019 | Autor: Claas Berlin | Geschätzte Lesezeit: 2 Minuten

- https://www.jaguarlandrover.com/news/2019/04/money-earn-you-drive-jaguar-land-rover
- https://www.car-it.com/continental-zeigt-neue-blockchain-plattform/id-0064837

German Goverment releases Blockchain Strategy
18. September 2019

PROSTEP

- Die Bundesregierung wird bis Ende 2021 Maßnahmen in folgenden fünf Handlungsfeldern ergreifen, um die Chancen der Blockchain-Technologie zu nutzen und ihre Potenziale zu mobilisieren.

- **Stabilität sichern und Innovationen stimulieren: Blockchain im Finanzsektor**
  Die Bundesregierung will das deutsche Recht für elektronische Wertpapiere öffnen

- **Innovationen ausreifen: Förderung von Projekten und Reallaboren**
  …. Die Bundesregierung untersucht, ob und wie der Einsatz von Blockchain-Technologie zur Transparenz in Liefer- und Wertschöpfungsketten beitragen kann …… **SAMPL Projekt**

- **Investitionen ermöglichen: Klare, verlässliche Rahmenbedingungen**
  Die Bundesregierung wird einen Round Table zum Thema Blockchain und Datenschutz durchführen.

- **Technologie anwenden: Digitale Verwaltungsdienstleistungen**
  Die Bundesregierung pilotiert Blockchain-basierte digitale Identitäten und evaluiert geeignete weitere Anwendungen.

- **Informationen verbreiten: Wissen, Vernetzung und Zusammenarbeit**
  Die Bundesregierung wird eine Dialogreihe zur Blockchain-Technologie durchführen.

- **44 Actions were defined**

Bundesministerium für Wirtschaft und Energie   Bundesministerium der Finanzen

Blockchain-Strategie der Bundesregierung

Wir stellen die Weichen für die Token-Ökonomie

10.2019, Dr. Holland;

Hype Cycle for Blockchain Business, 2019
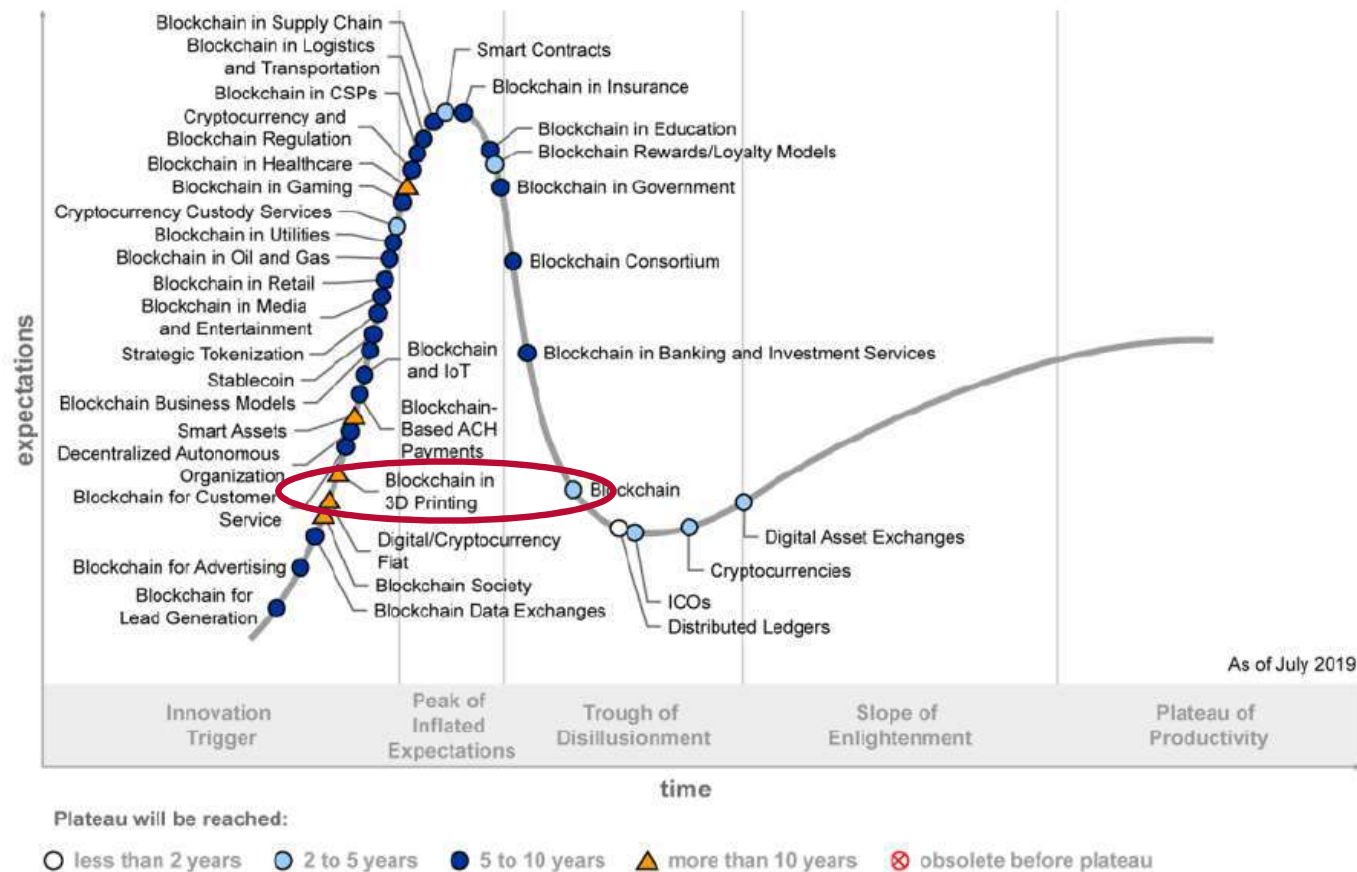
Gartner:

Blockchain will have a transformational impact across industries in five to ten years

When does Blockchain makes sense? 5 out of 7 for 3D Printing

Multiple Parties share Data	**Multiple participants need views on common information**
Multiple parties update data	**Multiple participants perform actions (change, update,...) that need to be recorded**
Decentralized network	**A centralised data storage is not required/desired**
Requirement for verification	**Participants need to trust that the transactions are valid, unchanged and transactions are documented**
Transactions interact	**Processes/transactions created by different participants depend on each other. (Smart Contracts support these concepts)**
Interactions are time sensitive	**Reduced transaction time benefits business process**
Intermediaries add complexity	**Removal of intermediaries can reduce cost and complexity. A trusted intermediary is not required.**

10.2019, Dr. Holland;

OPENDXM®**GLOBAL***X*   Blockchain Ready

PROSTEP

OpenDXMGlobalX: Blockchain-Integration

bringing together the best of two worlds:

High Secure Transfer of large files

&

Secure documentation and smart contracts

OpenDXM GlobalX on a page

Secure data exchange for all B2B processes in all divisions

PROSTEP

Managed-File-Transfer (MFT) solution

All types & sizes of documents

All divisions

All-over data security

Real end to end encryption

Enforcement of corporate compliance
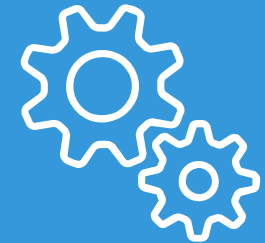
Integrated process engine

Fully automated file processing

Application-to-application (A2A)

OpenDXM GlobalX

Main features

PROSTEP

Flexibility	**Security**	**Data transfer**	**Processing**	**Automation**
Versatile user interfaces & flexible software	Adjustable security levels	High volume, robust, high performance	Process engine for data processing	Robots and Gateways for transfer automation

Integration	**Communication**	**Documentation**	**Reports**	**Scalability**
Back-end system integration	Status notifications and E-Mail body	Documentation for users & administrators	Research, KPI's, automated reports	Flexible software & license model

Client Applications

Versatile user interfaces

PDM Integrations

Robot/GateWay/OFTP

iOS App

Web Browser

OPTIONS

BASE MODUL

Outlook Integration

Windows Explorer

"Send to"
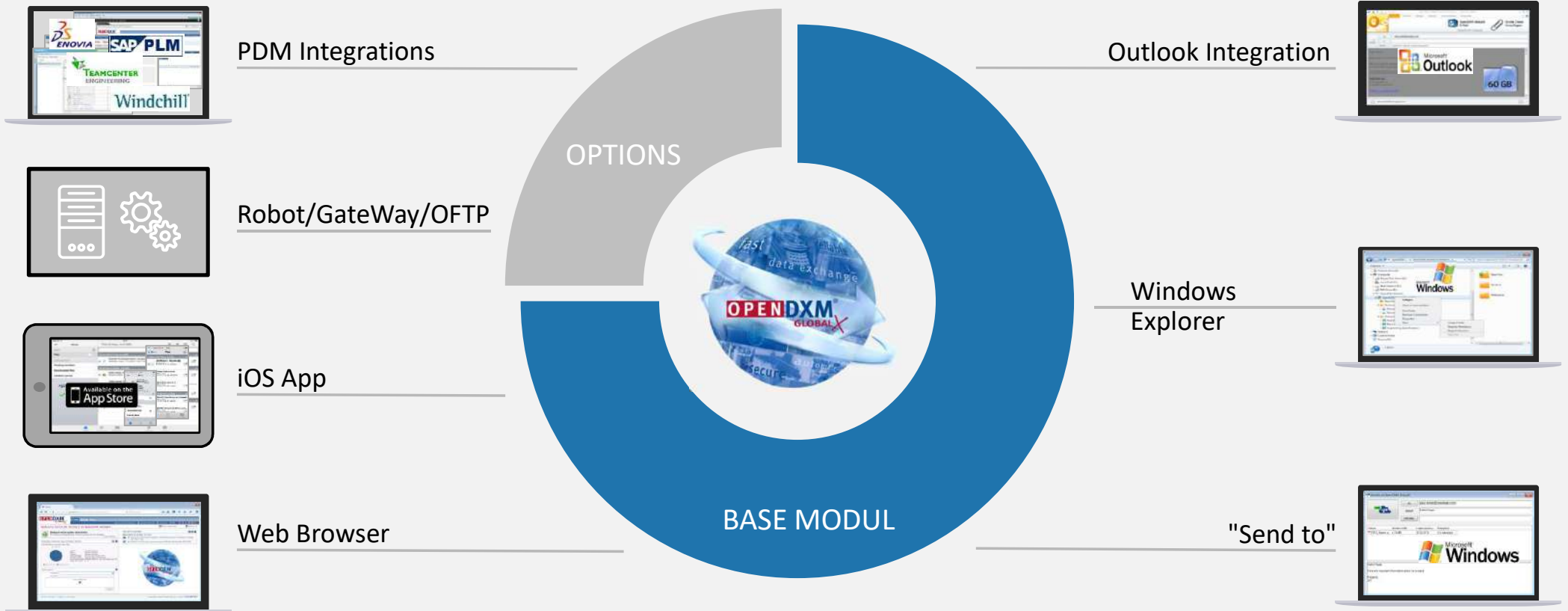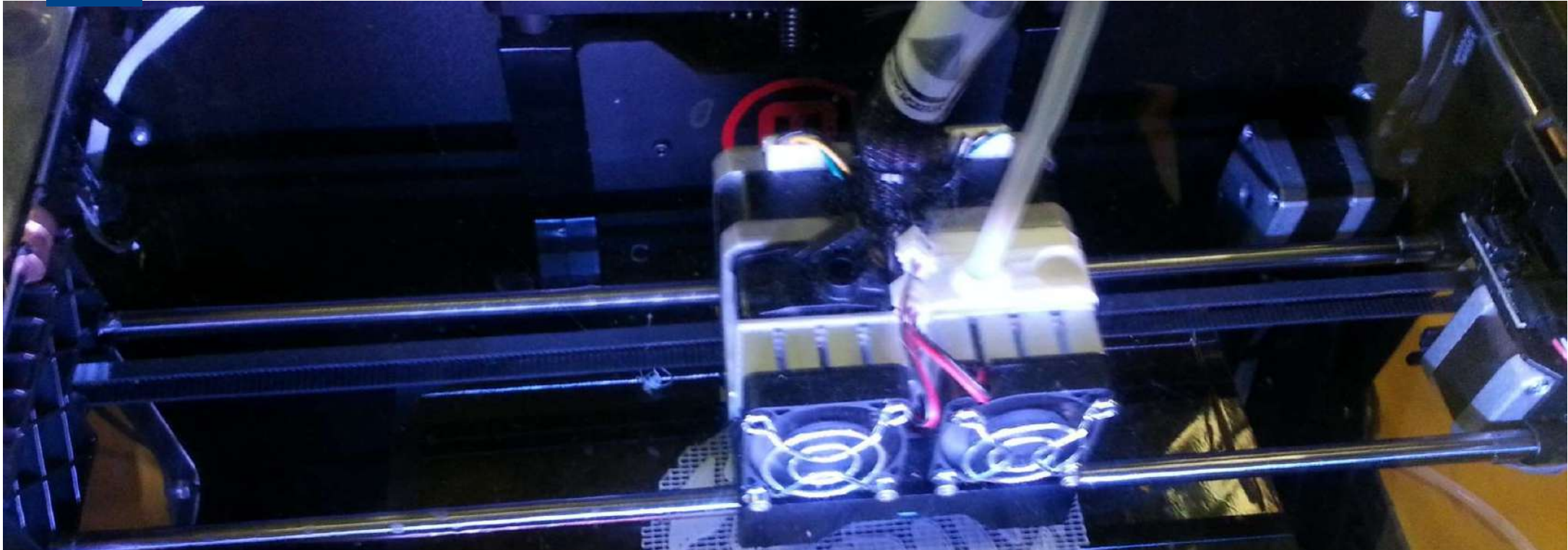
S A M P L
THE LICENSE TO PRINT
SECURE ADDITIVE MANUFACTURING PLATFORM

SAMPL Project on a page
Secure Additive Manufacturing Platform (www.SAMPL-3D.de)

Challenges

- Copy- and product liability law
- Distinction of original parts from counterfeits
- Support licensing and printing rights
- Support of new value added and business models

Objectives

- Trusted 3D printers and Chain of Trust
- Marking and traceability by RFID-chips
- Development of a reference platform
- Blockchain-Technology for the supply of licence information

Partner

3D micro PRINT TUHH Technische Universität Hamburg Universität Hamburg DER FORSCHUNG I DER LEHRE I DER BILDUNG universität uulm

NXP DAIMLER EvoBus GmbH dwf Fraunhofer ENAS

AIRBUS consider it PROSTEP

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

Term: Nov 1st, 2016 - Oct 31th, 2019   Volume: ca. 4 mio €   Project leader: PROSTEP AG:
Contact Person: Dr. Martin Holland; holland@prostep.com; 0511-54058100

Airbus Spares and the SAMPL Process
Sell the Right to print a spare part local to required destination

Airbus PLM

3D Printfile

② Right to print **one** part

③ Print

① Airline Request for Spare Part

④ Replace

⑤ Payment
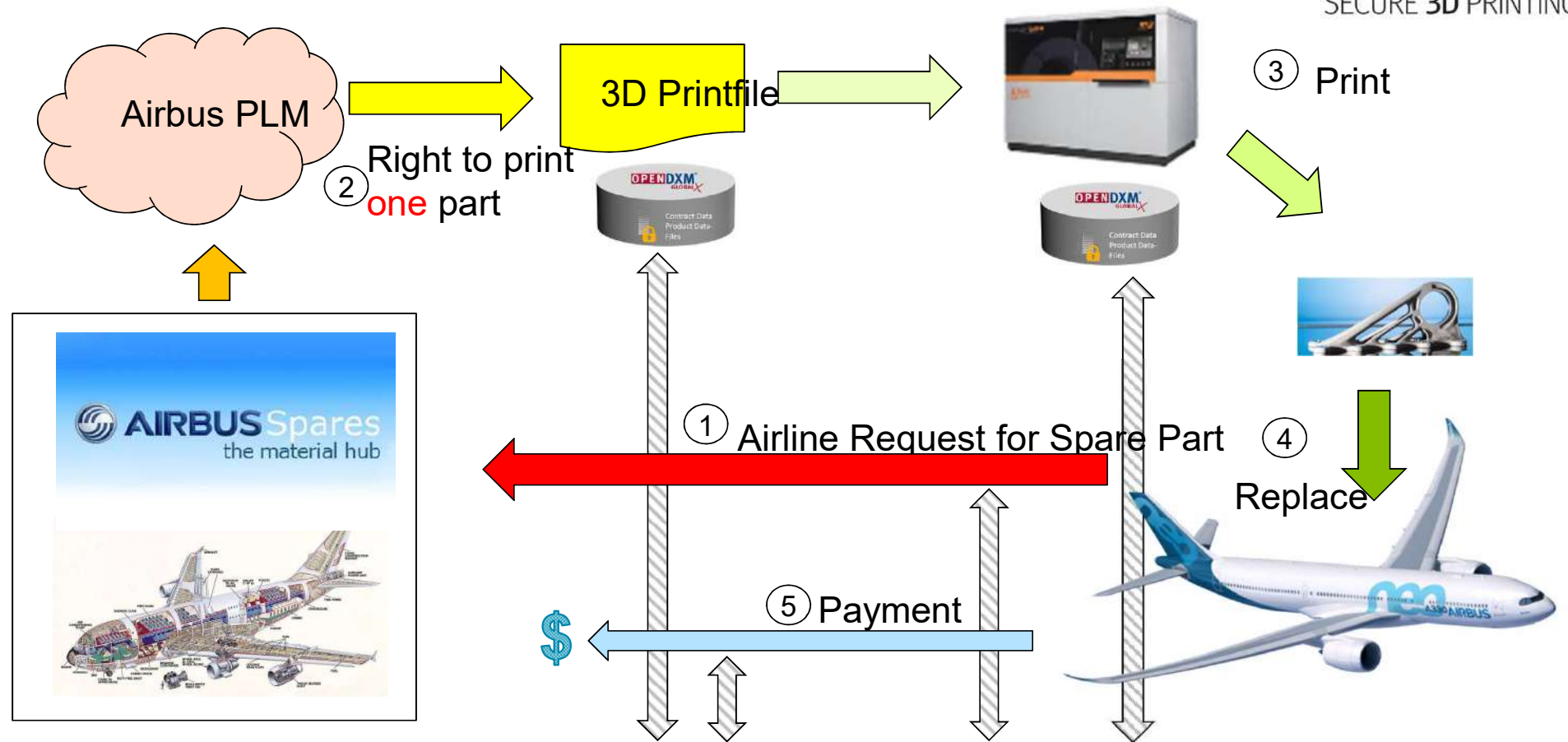
3D Blockchain Licence Data / Smart Contracts

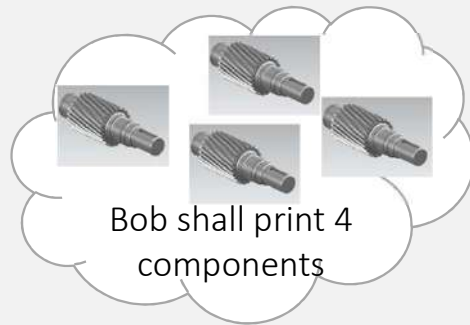# Variant 1: **OPEN DXM®** GLOBAL X Blockchain ready! Cloud Platform

SAMPL
SECURE 3D PRINTING

Manufacturer/ Copyright Owner

(Airbus/Evobus)

supply of product data

Initiates print job

Contract Data Product Data-Files

OPEN DXM® GLOBAL X

Contract Data Product Data-Files

Secure
SaaS
Platform

Contract Data Product Data-Files

Service provider or in-house production with trusted 3D printer

Control with Secure Element

Print Process

Printed Product 1 — RFID 1

Printed Product …. — RFID …

Printed Product n — RFID n

Licence Data

Licence Data

Licence Data

3D Blockchain Licence Data / Smart Contracts

Variant 2: OPEN**DXM** GLOBAL**X** Blockchain ready! Private Platform

SAMPL
SECURE 3D PRINTING

Private
Data Exchange
Platforms

**Manufacturer/
Copyright Owner (Evobus)**
Supply of
Product Data

Initiates
Print Job

OPEN**DXM** GLOBAL**X**

Contract Data
Product Data
Files

Contract Data
Product Data-
Files

**Service provider or in-house
production with
trusted 3D printer**

**Control with
Secure
Element**

Print Process

**Manufacturer/
Copyright Owner (Airbus)**
Supply of
Product Data

Initiates
Print Job

OPEN**DXM** GLOBAL**X**

Contract Data
Product Data
Files

Contract Data
Product Data-
Files

Printed Product 1 | RFID 1

Printed Product …. | RFID …

Printed Product n | RFID n

Licence Data

Licence Data

Licence Data

3D Blockchain Licence Data / Smart Contracts

Alice
OEM
Airbus

Bob shall print 4 components

Part001.prn

Bob/ Print Service Provider

SAMPL
SECURE 3D PRINTING

Licence: ID Alice Bob Part001.prn 4

Licence number (created by Alice)

4711-A4-58572

Wallet-Address of Alice (Public Key)

Jc045218w23ßKXuyztr8ldf42db66c8d84269d4b7157b92a4

Wallet-Address of Bob (Public Key)

We8ßcvxxüy9u34PH9ivJc045218w23ßKXuyztröldf42db66

Hash-Key of Part001.prn

144thdf4sfgf2db66fn6hncrggfc8d84269d4b7157b92a87be7

Number of licensed components

4

Licence created by Alice
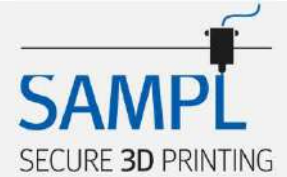
Smart Contract

3D-Print Licence
4711-A4-58572
pvinoiM3498vmv945dmc8u39s98vp8w349fa98938uz587b
4
NzudjJK%VBt5hJc045218w23ßKXuyztr8ldf42db66c8d842

Licence Database

Blockchain

Confirmed Transactions
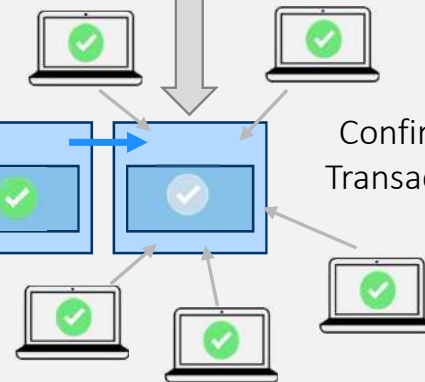
Smart Contract for Licence availability

- *

```
    * Use one license for one item to print.
    * This is a transcational method.
    * The method checks if at least one licence is available for the combination of
    * (address_of_caller, id, fileHash). If yes, then the count of available licences is decremented.
    *
    * id: license id
    * fileHash: SHA-256 hash of the file to print
    */
function useLicense(uint256 id, uint256 fileHash) public {
            _useLicense(id, fileHash);   }

    /*
    * Check the file hash for the given license id.
    * This is a constant method.
    *
    * id: license id
    * fileHash: SHA-256 hash of the file to print
    * returns: true if fileHash matches the hash stored in the contract.
    */
```

SAMPL Demonstrator @ HMI 2017, 2018 and 2019
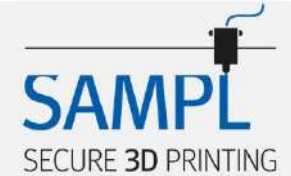
- Demonstration along the process chain:
  - 1. Version (HMI 2017) : Blockchain Licensing; central wallets
  - 2. Version (HMI 2018): distributed Wallets, imprintment of NFC Chips
  - 3. Version (HMI 2019): Increased security by Hardware Wallets and additional encryption, improved User-Interface

- Results:
  - A clear milestone provided a clear goal for the team
  - additional customer insights and interest to participate
  - good media coverage

- Further Steps:
  - Integration of additional Partners
  - Development of a Demonstrator 2.0 with new functionality
  - Set up of a „SAMPL „consortium" Blockchain (based on Ethereum)
  - Set up of an interest Group: Interfaces for additive manufacturing

SAMPL Demonstrator @ HMI 2017, 2019 and 2019

SAMPL
SECURE 3D PRINTING

- D...

- R...

- good media coverage

- Further Steps:
  - Integration of additional Partners
  - Development of a Demonstrator 2.0 with new functionality
  - Set up of a „SAMPL „consortium" Blockchain (based on Ethereum)
  - Set up of an interest Group: Interfaces for additive manufacturing

We are looking for Implementation Partner

OPEN DXM GLOBAL X

VDMA - Gemeinschaftsstand
Digital Factory, Halle 7 E26
01. – 05.04.2019, Hannover

HANNOVER MESSE

SAMPL
SECURE 3D PRINTING

Mars Rover Use Case based on OPENDXM GLOBALX Blockchain ready!

PROSTEP

MARS Rover Use Case

Mars Rover has sensors which are IOT devices

Sensors register eg. stress

Sensor data is monitored by the controll center based on thingworx

When data is above a specific level a spare part ordering process is initiated

thingworx copies the print file with additional order information in a folder which is controlled by a GlobalX robot

GlobalX uploads the file and generates the Licence data in the blockchain
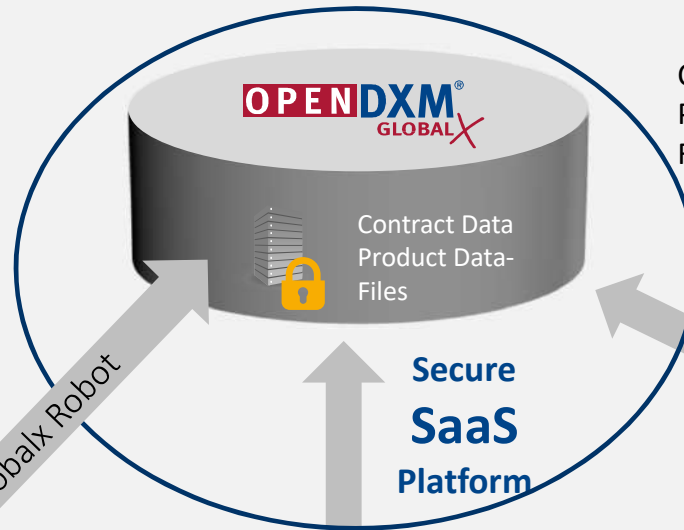
OPENDXM GLOBALX

Contract Data
Product Data-
Files

**Secure
SaaS
Platform**

Globalx Robot

Contract Data
Product Data-
Files

**Service provider or in-house
production with
trusted 3D printer**

**Control
with Secure
Element**

Print Process

Printed Product 1   RFID 1

Printed Product ….   RFID …

Printed Product n   RFID n

Licence Data

Licence Data

3D Blockchain Licence Data / Smart Contracts

SAMPL Blockchain Status

Blockscout

https://goerli.etherscan.io/tx/0xd47f1ad8a97a7a9ca5d99b221fbe7b4536d132636c428698cef658d7f63a9cc7

Blockscout

SAMPL
SECURE 3D PRINTING

|	
⑦ To:	Contract 0x18ebdec8184193730e0bb38a0f4fddcc010acaf4 ✓ ⧉
⑦ Value:	0 Ether ($0.00)
⑦ Transaction Fee:	0.002475942 Ether ($0.000000)
⑦ Gas Limit:	940,000
⑦ Gas Used by Transaction:	117,902 (12.54%)
⑦ Gas Price:	0.000000021 Ether (21 Gwei)
⑦ Nonce Position	318 1

⑦ Input Data:

```
Function: grantLicense(uint256 id, address from, address to, uint256 fileHash, uint64 count)

MethodID: 0x7df86031
[0]:    00000000000000000000000000000000008c7f181d1da42428f683de2ea9e9711
[1]:    000000000000000000000008a3d90c1764b111c5af2161aab33072c55d71747
[2]:    0000000000000000000000001f488f7cea28e02f1b357d78c5518cba6924085
[3]:    4ed19d08317f669d721afa573c39a613cb46057c18eb914b5dc027919ea48cca
[4]:    0000000000000000000000000000000000000000000000000000000000000001
```

Licence id
Licensor
Liceencee / Print Farm
File hash
# of Licences

Process on the printer side
List of all available print jobs
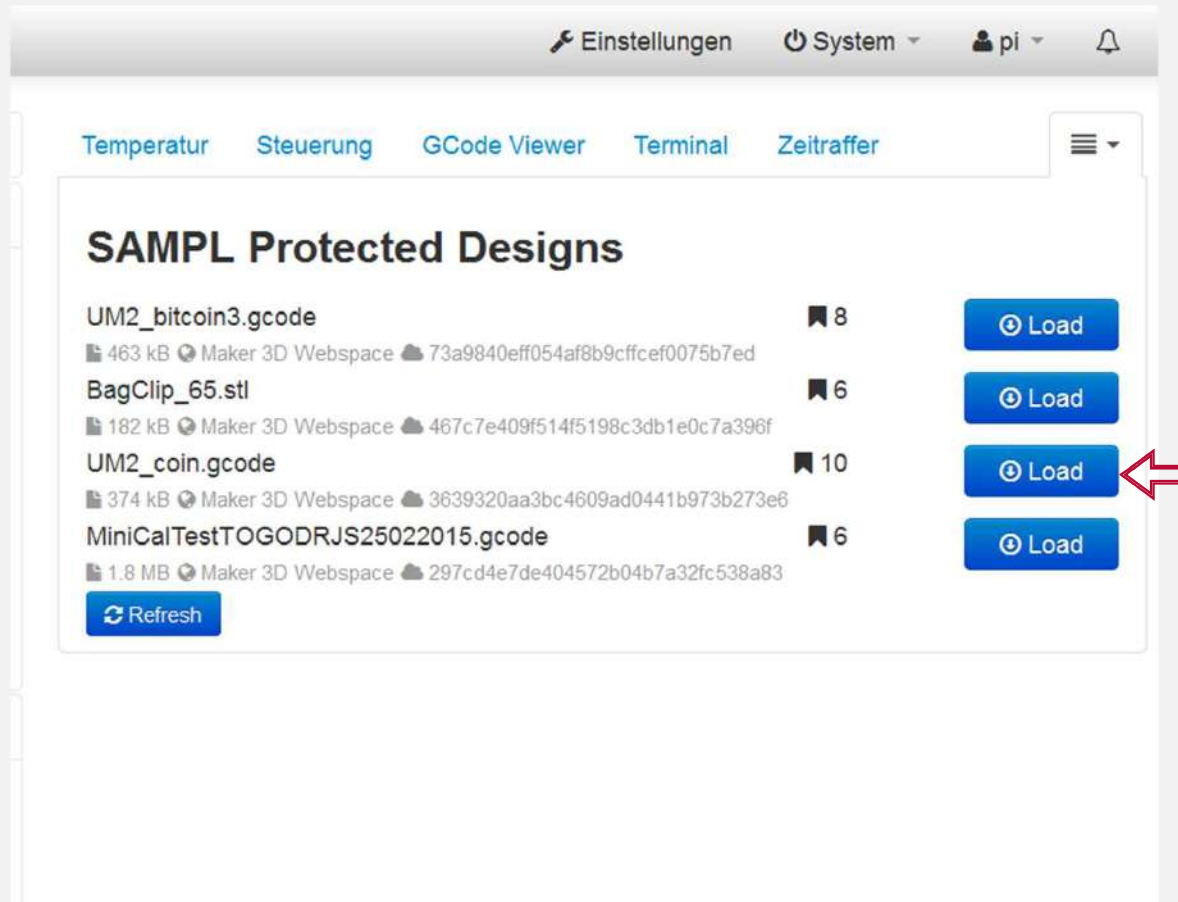
- The printer server (here Octoprint) shows all in Maker 3D's Webspace available file which have at least one unused licence.
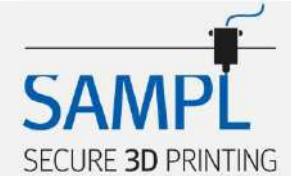
- Operator selects the print file.

Process on the printer side
Loading the print file
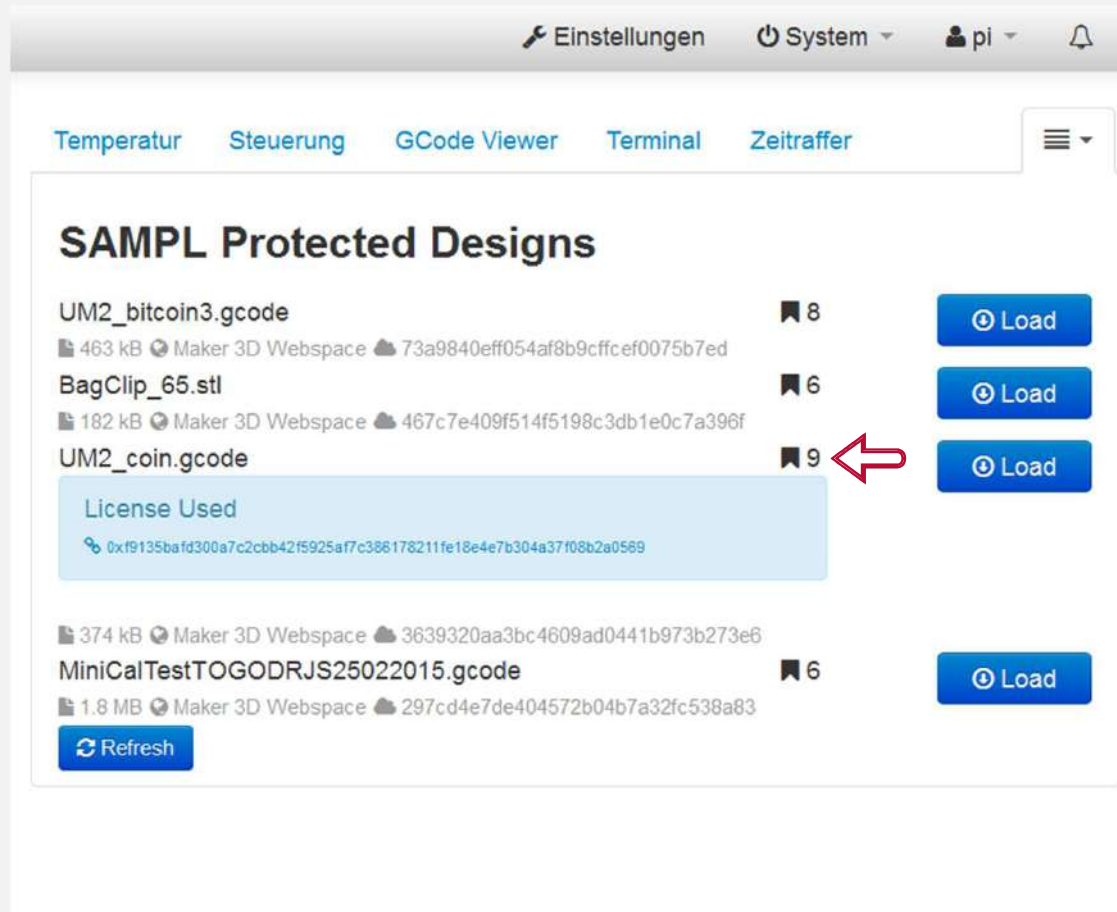
- Octoprint downloads the file from GlobalX.

- The correctness of the print file is checked by recalculating the SHA-256 Hash code.

- After initiating the print process one licence is used and documented as a transaction in the Blockchain.

SAMPL: overall Process Chain

SAMPL
SECURE 3D PRINTING

IP Owner/Inbound logistics	Production/Manufacturing Partner	Outbound logistics/End customer

Product Data files   OPEN **DXM**® GLOBAL X   Product Data files

CAD/Print files   Material files   Process files   Contract Data Product Data-Files   Quality data files   Product usage data

Licence data	Material data	Print process data	Printed product ID Quality data	Printed part ID Shipment ID Logistics partner	Customer data Tracking data

Product Lifecycle

License Management

Trusted Devices Registry

3D BLOCKCHAIN Licence Data / Smart Contracts

Licence data is created and published in the blockchain	Autonomously sourced material and services through smart contracts	Hashes of process data files saved in the blockchain	Product is registered in Blockchain and tied to the license	Product is shipped by logistics partner Timestamp and Shipping ID	Hash of usage data saved in the blockchain Customer product id

SAMPL-Industrialisation
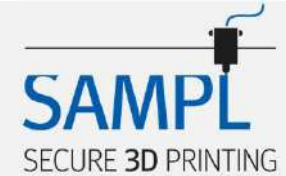
- PLM for the Additive Process Chain

  – For an integrated Process Chain 3D-Druck a
    suitable PLM Solution must be implemented.

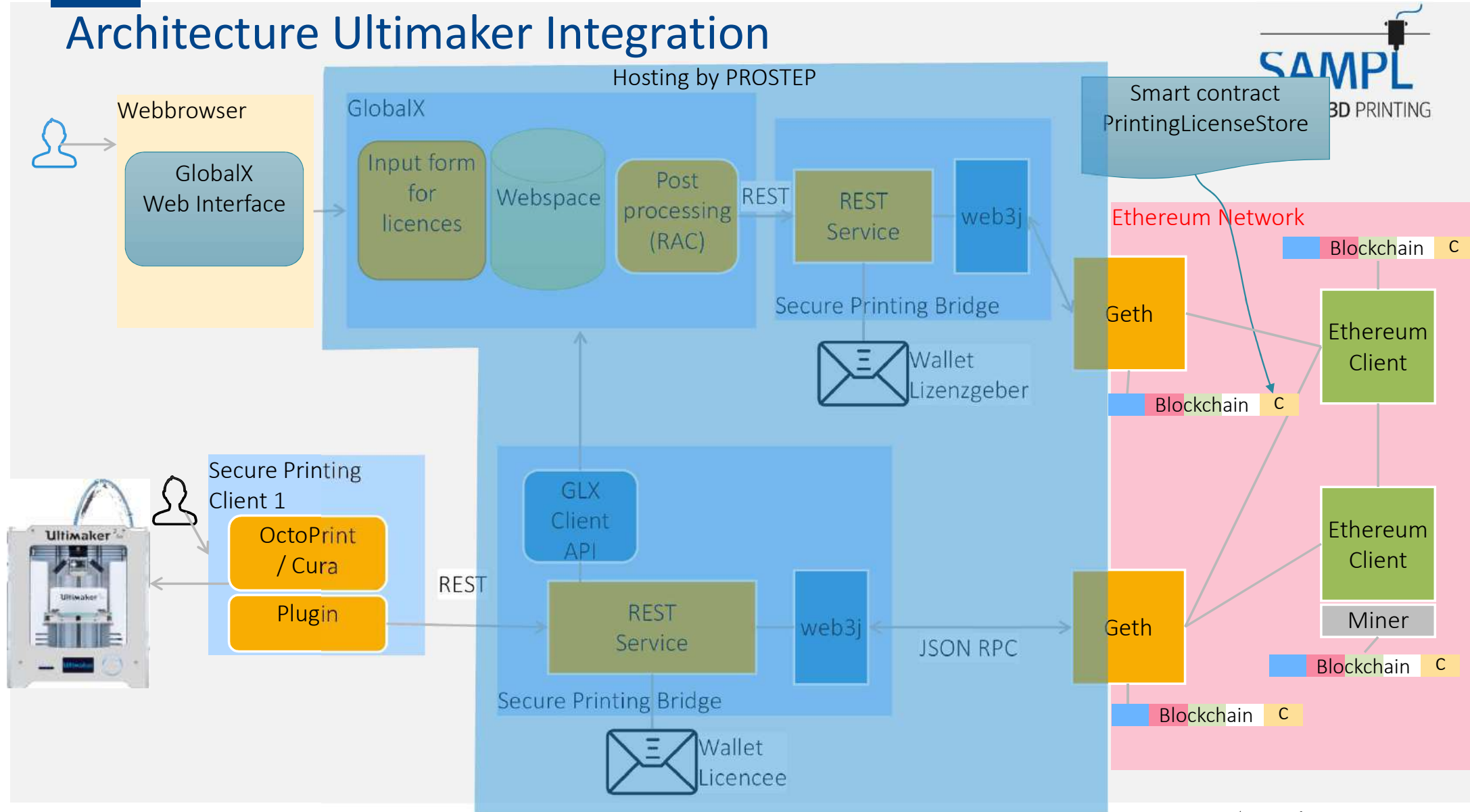 – PROSTEP has more than 20 Years of PLM Experience

- **OPENDXM** GLOBAL X   Blockchain ready!

  – also for other Use Cases; Software update for Cars; CAD-Files with related usage rights ….
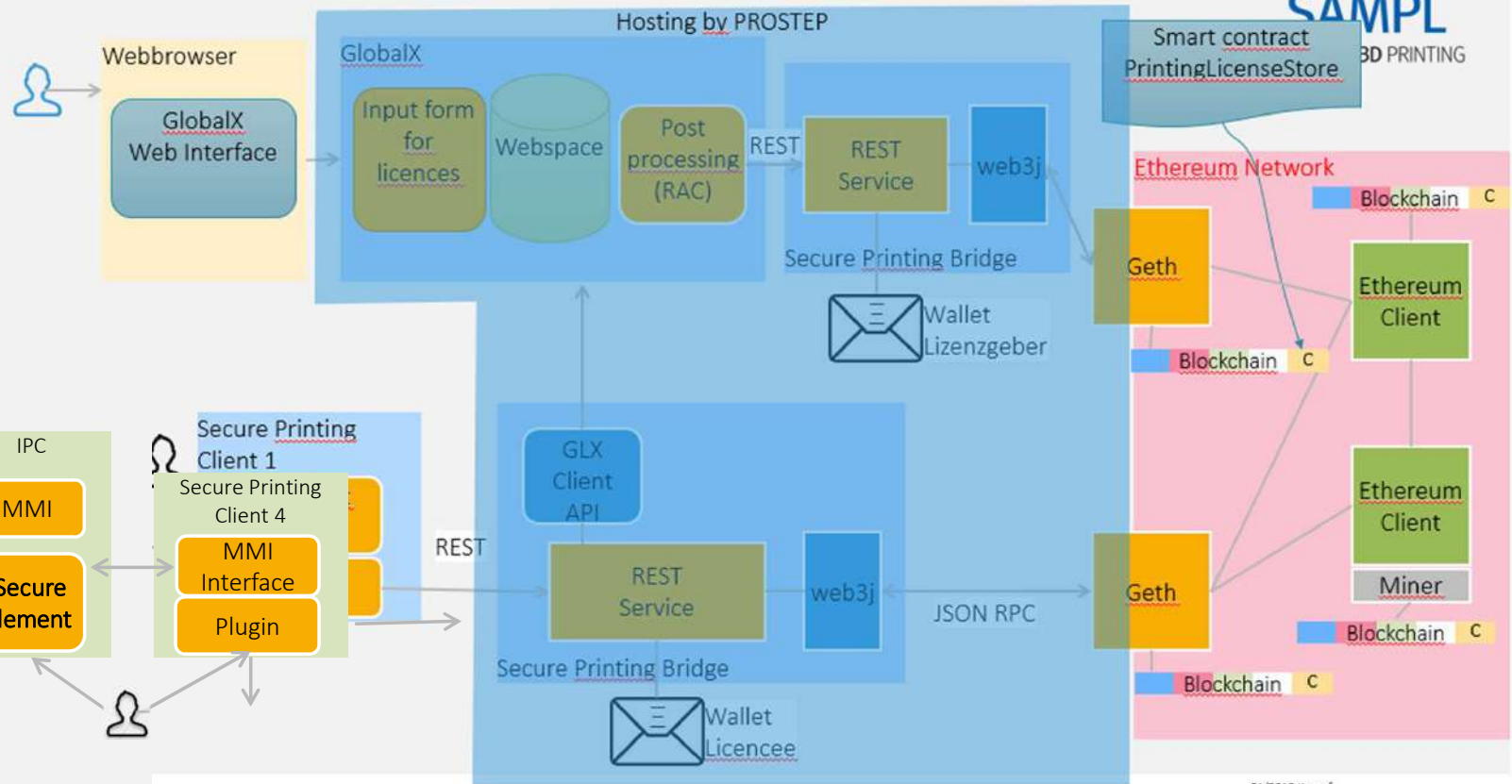
- Blockchain Start-up Workshop
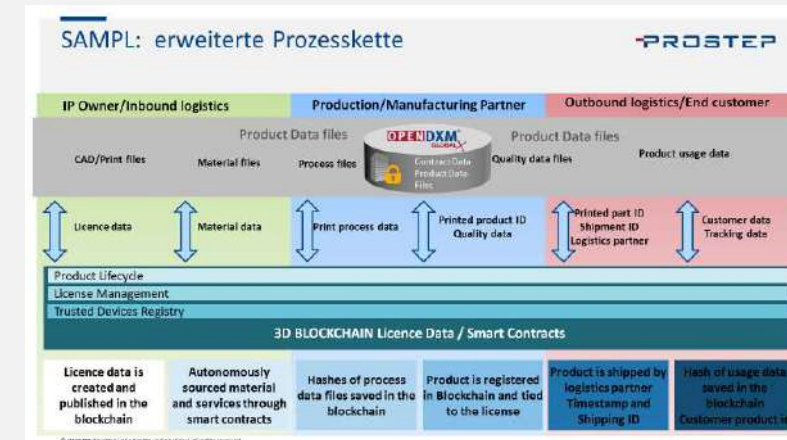
Architecture Ultimaker Integration

Hosting by PROSTEP

SAMPL
3D PRINTING

Webbrowser

GlobalX
Web Interface

GlobalX

Input form for licences

Webspace

Post processing (RAC)

REST

REST Service

web3j

Secure Printing Bridge

Wallet Lizenzgeber

Smart contract PrintingLicenseStore

Ethereum Network

Blockchain C

Geth

Blockchain C

Ethereum Client

Secure Printing Client 1

OctoPrint / Cura

Plugin

REST

GLX Client API

REST Service

web3j

JSON RPC

Geth

Secure Printing Bridge

Wallet Licencee

Ethereum Client

Miner

Blockchain C

Blockchain C

Ultimaker

01/2019 Kompf

Architecture 3D-Microprint Integration

SAMPL Integration with MMI-Plugin

**Download Print File
from GlobalX
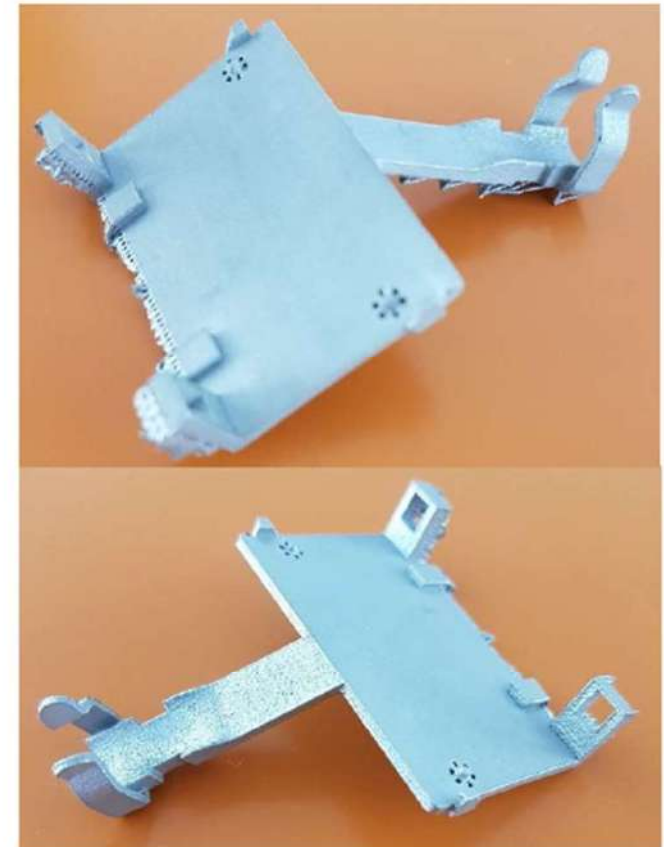MMI SAMPL Plugin**

MMI Plugin on Machine M308:
  – Integration of Secure Elements (Wallet, Keys)
  – Download Job File and Licence Usage
  – Notarisation in the Blockchain
  – Decryption of the job; evaluation of file hash
  – Communicaton with MMI
  – Load Job in controler unit ans start job
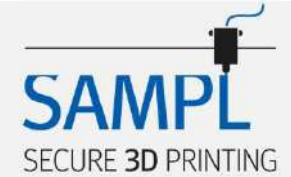 – RFID Integration

Weidmüller Sample for SAMPL
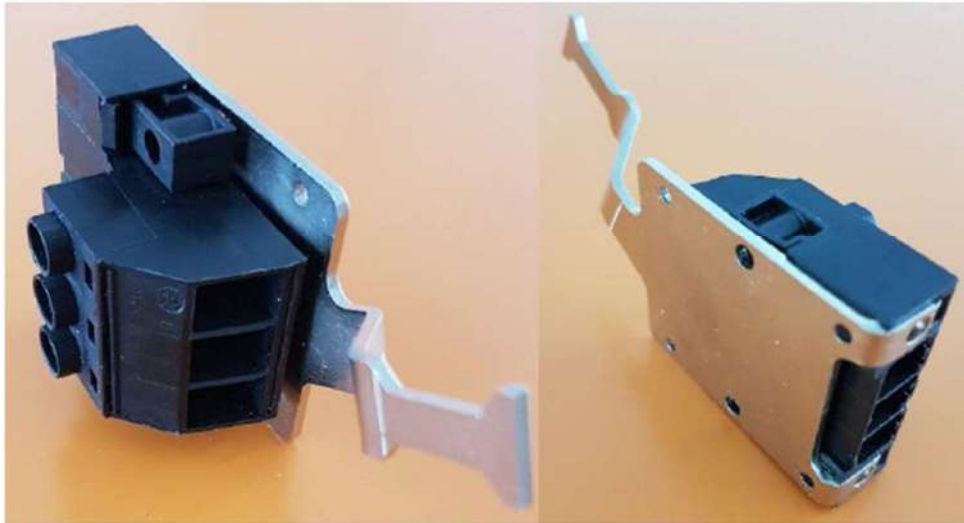
EMC-Shielding for Power Connectors

SAMPL Architecture Variant 1: GlobalX hosted by PROSTEP

SAMPL
SECURE 3D PRINTING

Weidmüller

PLM/ERP exports data to folder

Product Data

Customer initiates order process

CUSTOMER

Controler Interface to SPB (to be develped)

Existing SAMPL Infrastructure

GlobalX robot

OPEN DXM GLOBAL X

Contract Data Product Data-Files

Secure Printing Bridge (SPB) REST services

Printed Product

Licence Data

Licence Data

3D Blockchain Licence Data / Smart Contracts
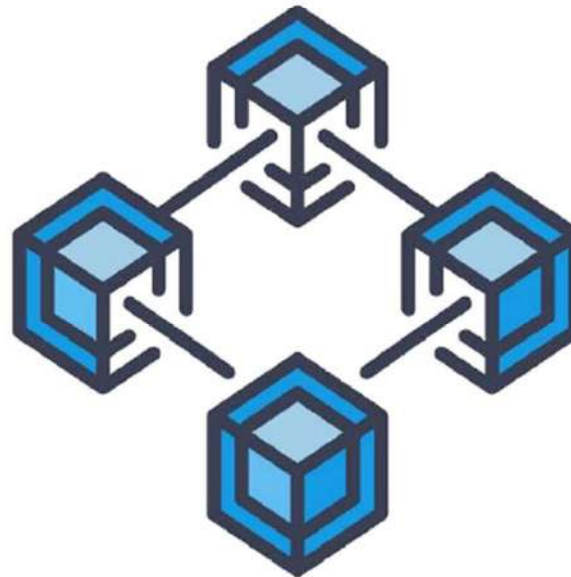
Benefits of the SAMPL Platform

SAMPL
SECURE 3D PRINTING
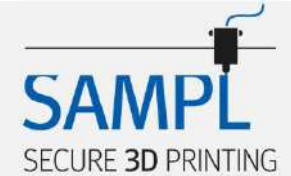
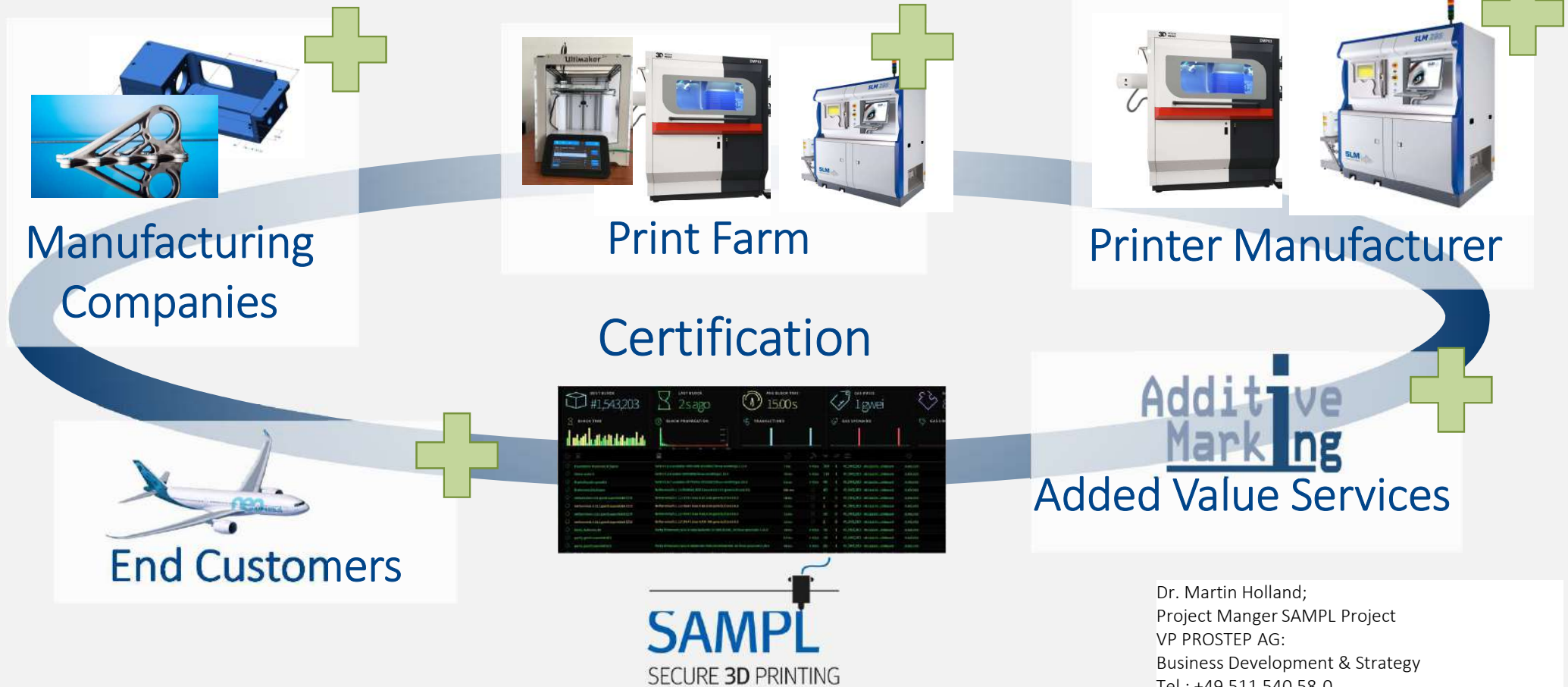| Printer Manufacturer	Key differentiator "trusted" 3D printer; Integration of block chain and Secure Elements; competitive advantage
Owner of IP Rights	IP security, prevention of pirated copies, enforceable rights, traceability of use, pay-by-use billing
OEM	Secure on-demand-production, reduction of storage and transport costs, lower capital investment, insurance of quality, optimized spare parts business
Print Service Provider	"Trusted" Print Center by means of "trusted" 3D-printers, support of quality control, legal certainty and competitive advantage
End User	Verifiable authenticity, protection against design manipulation, precise and secure billing, confidence in the product, advantages in case of warranty claims

SAMPL Ecosystem for secure 3D-Printing
Join Now!   Generate Value Together!

Manufacturing Companies

Print Farm

Printer Manufacturer

Certification

Added Value Services

End Customers

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Project Manger SAMPL Project
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Email: holland@prostep.com

3D Blockchain
Licence Data / Smart Contracts