pactera EDGE

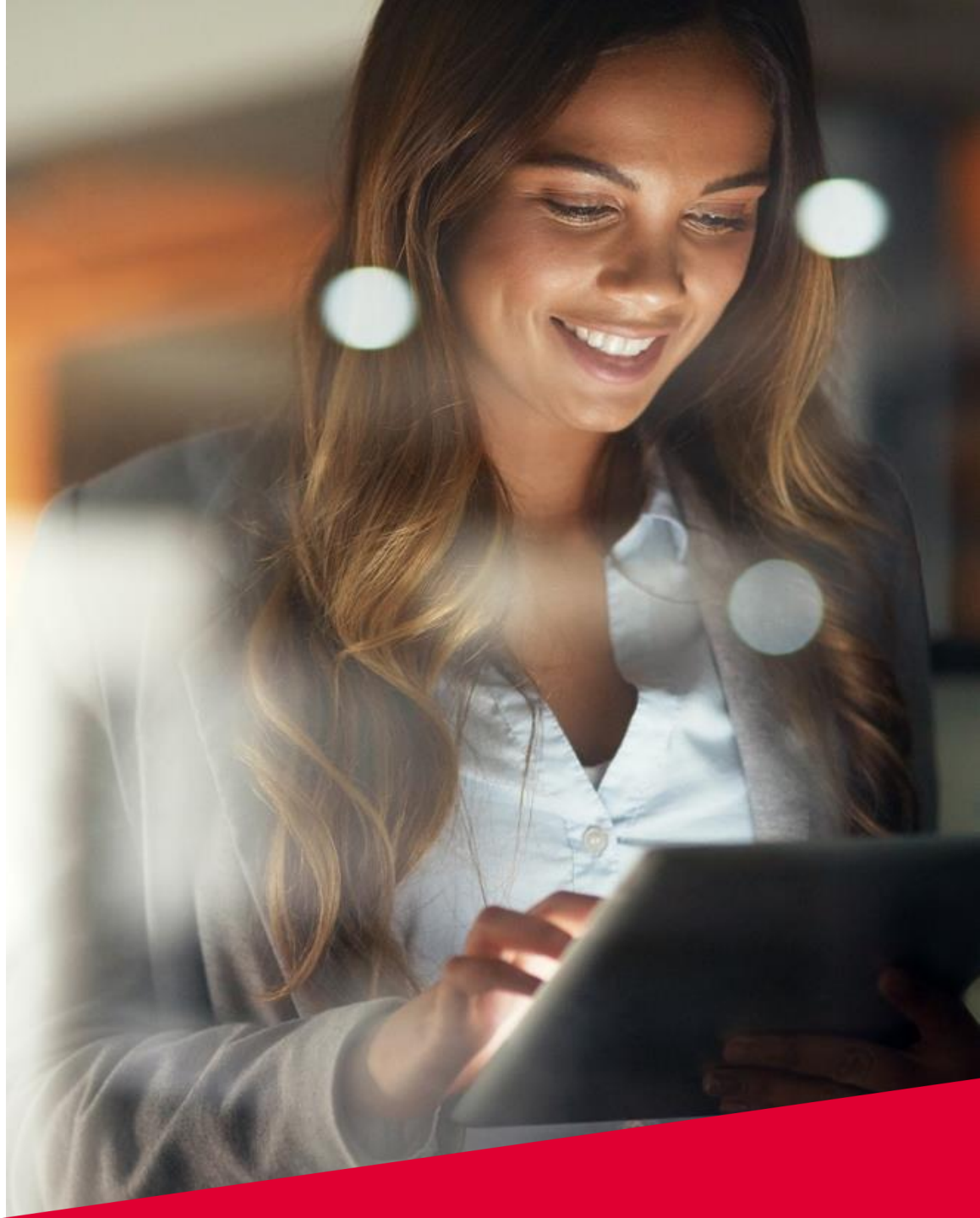
INDUSTRY 4.0

09 September 2019

AGENDA

- Pactera’s PoV Industry 4.0
- Pactera’s Solution Set for Implementation of I4.0
- Edge Solution Demo

Thank you!



Industry 4.0: Pactera’s PoV

THE FOURTH INDUSTRIAL REVOLUTION IS IN FULL SWING

Customers say their experiences are being transformed by…

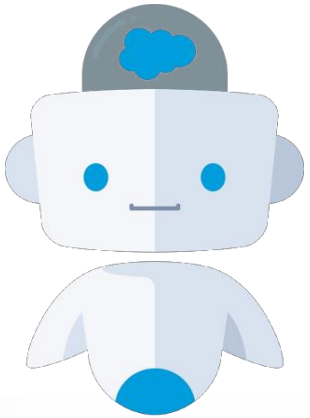
Mobile apps 77%

IoT 60%

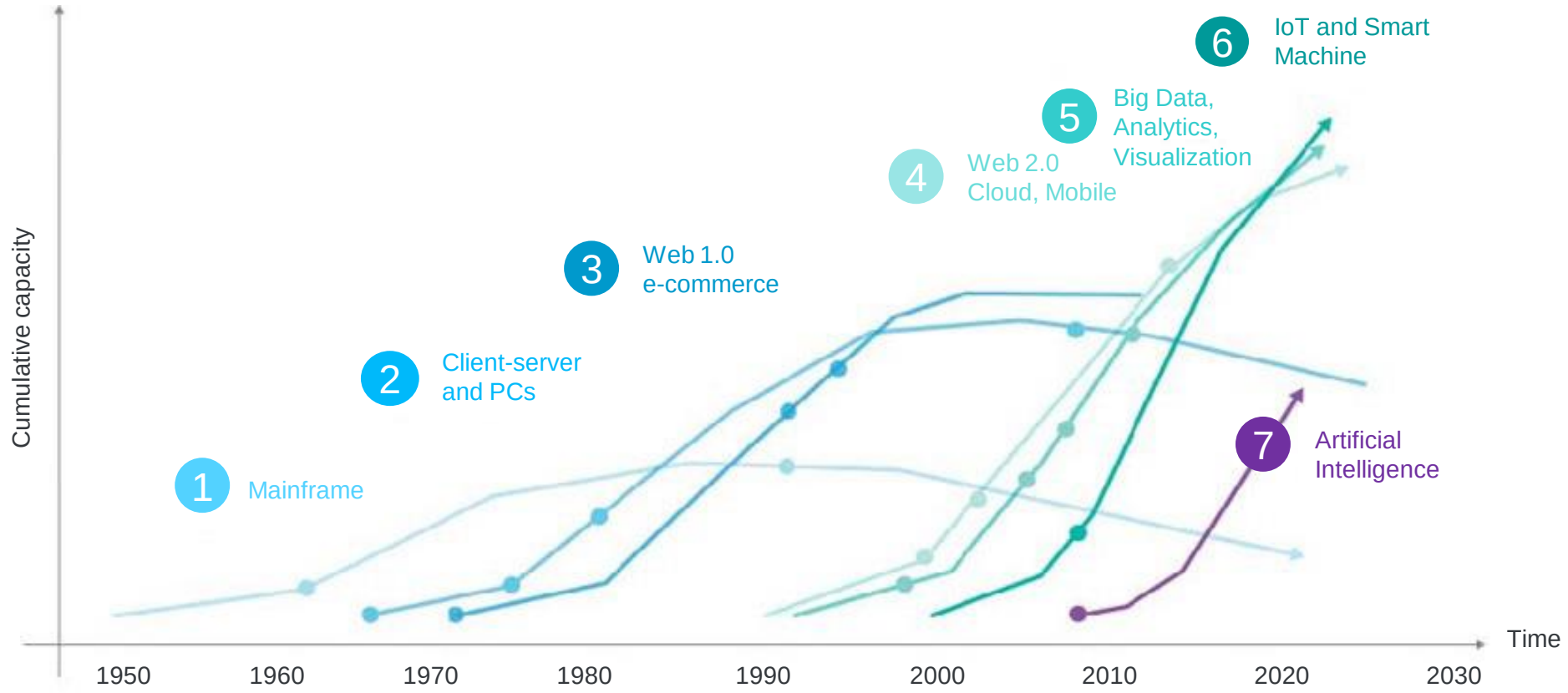
Cloud 68%

Voice 59%

Chatbots 50%



TECHNOLOGY REVOLUTIONS: ACCELERATING THE PACE OF CHANGE



CONNECTED PRODUCTS & SERVICES

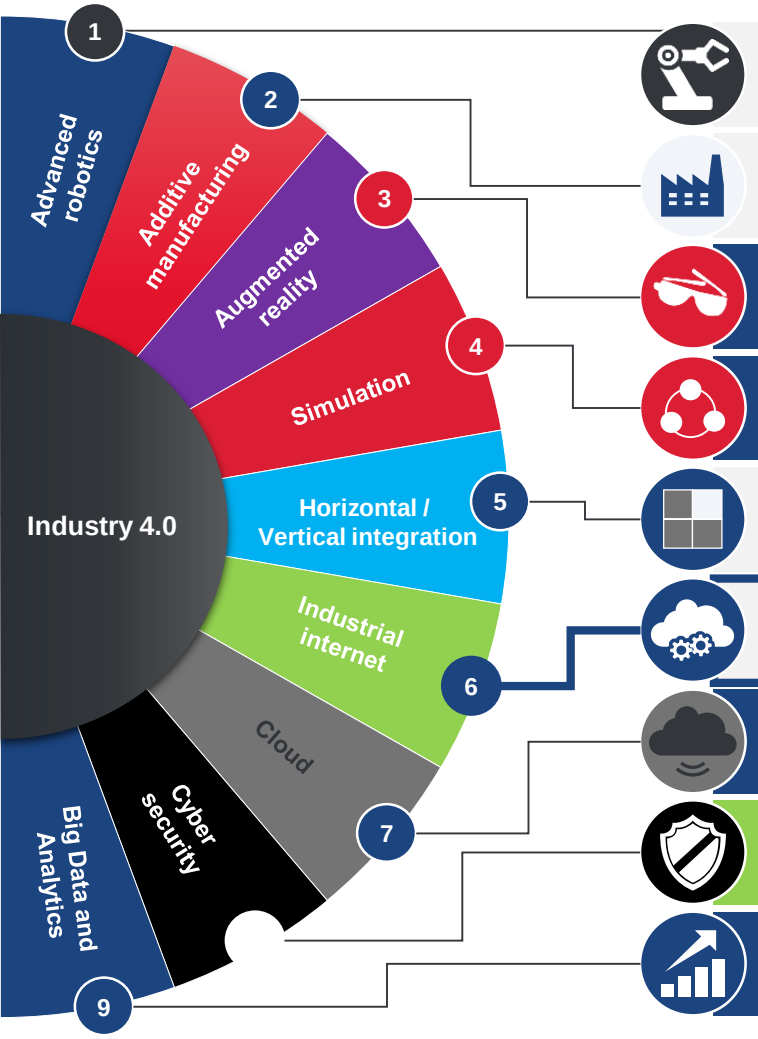
Manufacturing organisations are developing innovative solutions based on new data creation, integration and analytics models which create possibilities of new business and revenue streams such as Connected Products.

End products are IoT-enabled and deliver insight about condition, usage, location, and other key factors enabling manufacturers to move from a traditional CAPEX model to an OPEX model based on SLA's to their clients supported via IoT Remote Monitoring & Control sensors and platforms.

Operational Recommendation

Failure Prediction

WHAT IS INTELLIGENT MANUFACTURING



- Autonomous, cooperating industrial robots
- Numerous integrated sensors and standardized interfaces

- 3D printing, particularly for spare parts and prototypes
- Decentralized 3D facilities to reduce transport distance and inventory

Augmented reality for maintenance, logistics and all kinds of SOP
Display of supporting information, e.g., through glasses

Simulation of value networks
Optimization based on real-time data from intelligent systems

- Cross-company data integration based on data transfer standards
- Precondition for a fully automated value chain (from supplier 2 customer, from management 2 shop floor)

- Network of machines and products
- Multidirectional communication between networked objects

Management of huge data volumes in open systems
Real-time communication for production systems

- Operation in networks and open systems
- High level of networking between intelligent machines, products and systems

Full evaluation of available data (e.g., from ERP, SCM, MES, CRM and machine data)
Real-time decision-making support and optimization

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MARKET DYNAMICS : KEY FACTORS

Key Factors driving the adoption of IOT & Industry 4.0

Gain Competitive Advantage	Growth	Agility	Compliance	Reduced Costs
57%	36%	13%	11%	6%

Current State of IIOT and its Future Outlook – Research by Mind Bowser & IOT Magazine

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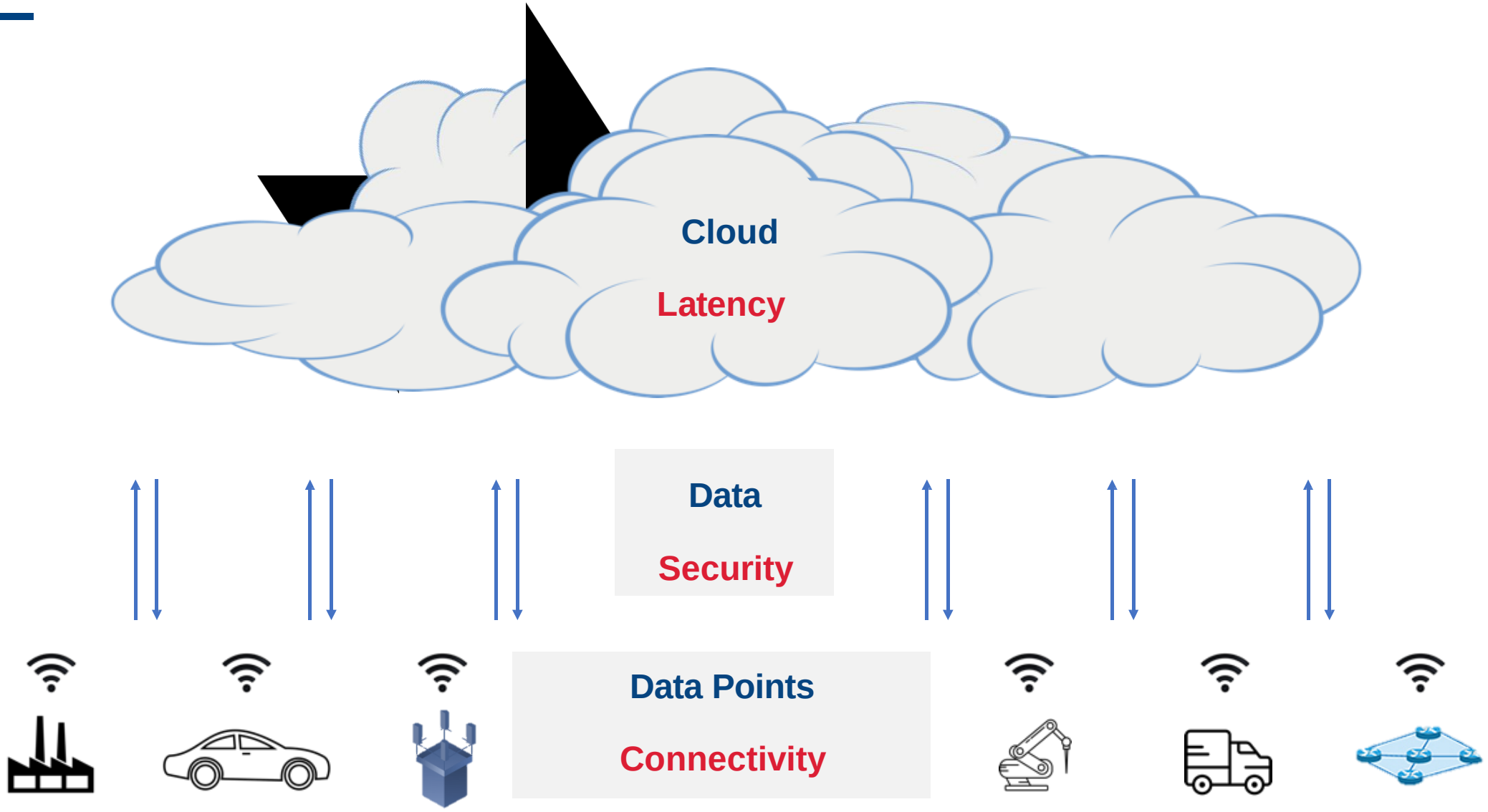
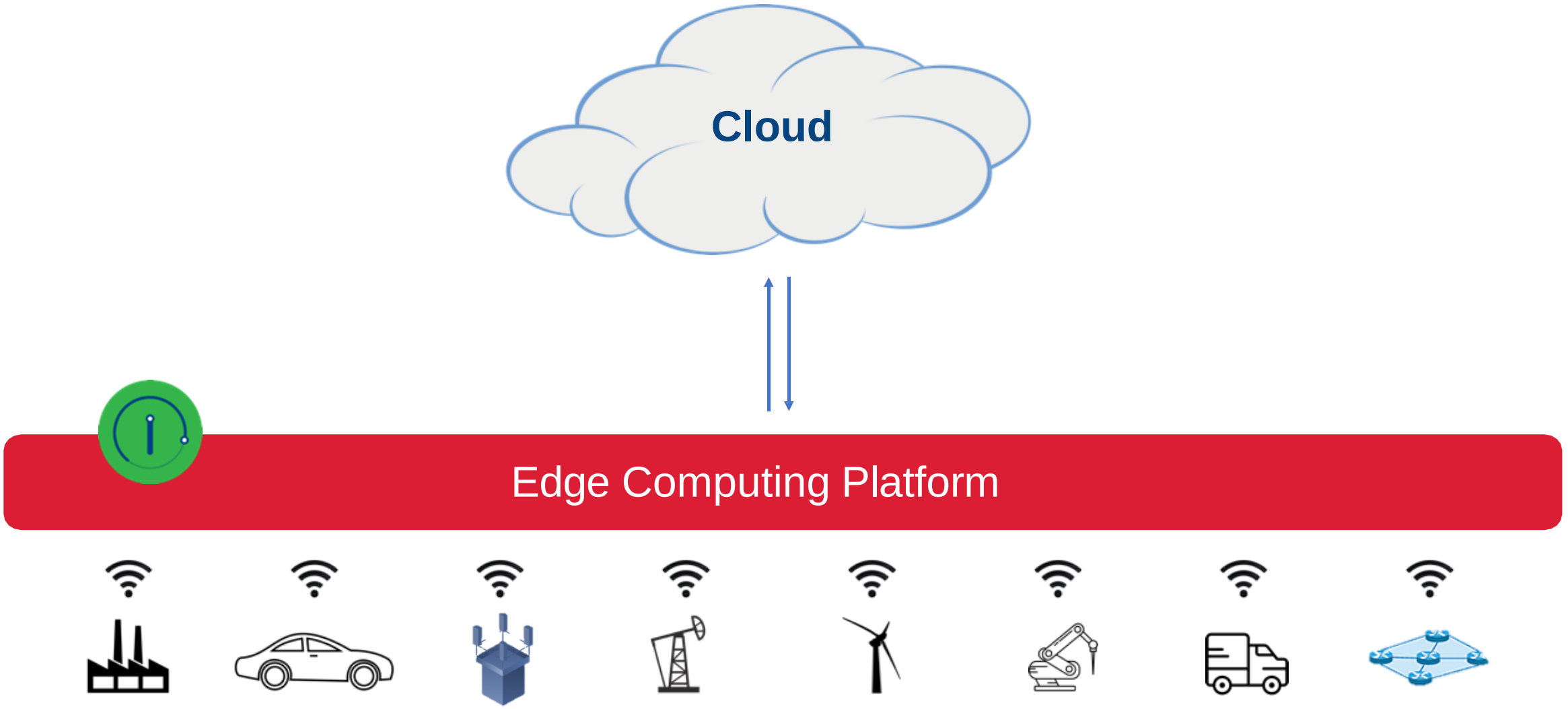
“Our Manufacturing Challenges” - Customers

We need a leading ‘Edge’ to transform to ‘Smart':



SOLUTION STATEMENT:



WHAT IS INTERACTOR®

- Modular Scalable Edge Computing and Automation Platform,
- Easy integration into any network device and application, handles any interface and data model, transport protocols and much more,
- On-demand Field-Scalable, to accommodate new technologies, policy change, solution update and different business models,
- Very light and fast solution (only 70 MB footprint), simple deployment, no dependency.
- Easy maintenance, advanced user interface, no (or very minimum coding) for custom interfaces and solutions.

Runtime Requirements
Linux, Windows, MAC arm v7, x86_64
Memory 100M
(Image size 50MB)

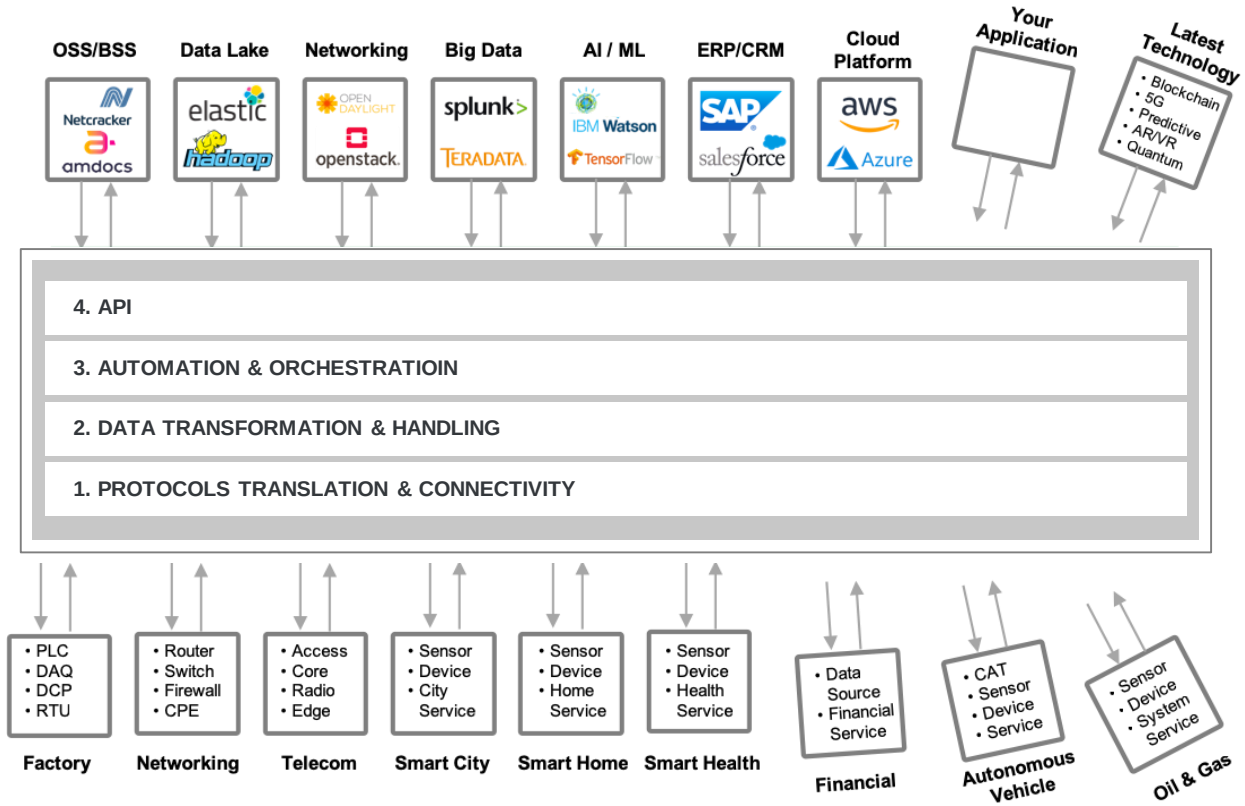
Protocol/Service Types
MQTT Broker / Client SSH, MODBUS, CoAP
HTTP(S), WS(S), TCP, SSL, UDP
(TBD) OneM2M, DDS, AMQP, OPC
Custom Service Types

Data formats
JSON, XML, Text, Binary,
Byte, Bit, Hex, Custom Data Format

Security
ENCRYPTION: AES, DES, RSA, BLOWFISH, TWOFISH(TBD)
Custom Encryption
HASHING: MD5, RIPEMD, SHA
Custom Hashing

Note that support for other protocols and data formats is configured into Interactor in a timeframe of a few weeks to months.

Tech Stacking: Traditional Data consumption process



Looking at all the use cases, it was very clear that they all shared a few things in common.
First, since the devices spoke different languages, a protocol translation had to take place. After that, the data needed to be transformed to be used by other applications. Third, actions required to be taken based on the ingested data. And finally, all the data and control had to be made available for other applications.

INTERNET OF THINGS EDGE PLATFORM

Industrial 4.0, smart factory and more

- Do you have a problem interfacing with a lot of devices and protocols?
- Do you have high volumes of streaming data to process and handle?
- Do you need to create an enterprise-grade application on-premise?

What is Interactor?

Some refer to it as an Application Infrastructure & Middleware while others as a robust Backend Application Server. Whatever the categorization it best fits under, Interactor is a software that is used on-premise or at the edge to process, analyze and orchestrate high volumes of data and events at ultra-high speeds.

Interactor® Uniqueness

- **Protocol Flexibility**
  - Many built-in standard protocols
  - Easy to configure new custom protocols
- **Ultra-fast processing speed**
  - Microsecond processing of data and logic
  - Low latency compatible with 5G
- **Small Footprint (~ 50MB)**
  - Self-containerized with no dependencies
  - No additional controller or cloud needed
- **Enterprise Grade**
  - Security and reliability comes as part of the product
  - Solution debuggability and visibility built-in

How Interactor® works.

Interactor provides a simple and intuitive way to configure edge blocks. Interactor can save up to 50% in development.

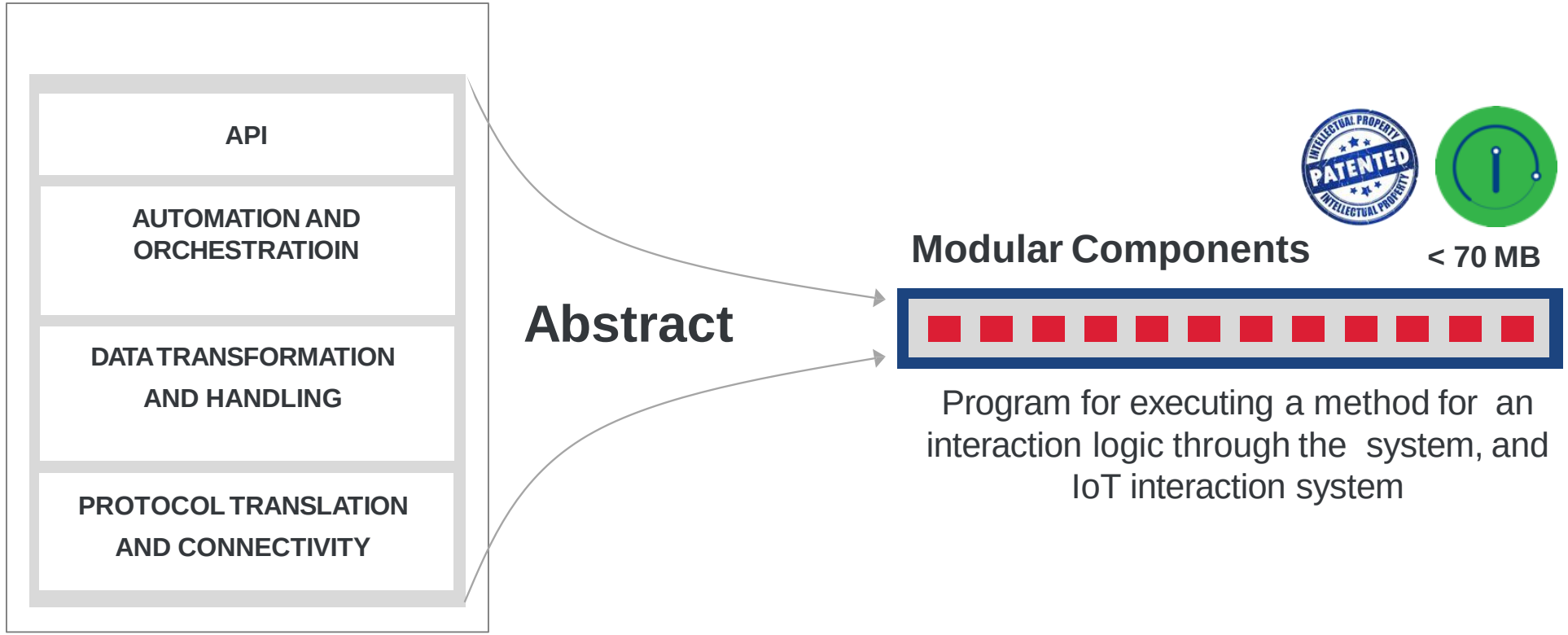
Where is it used? Typically, Interactor is installed in on-premise servers or gateways.

Deploy first then develop: Isn't it the other way around? Develop and deploy? Since Interactor is a software "product" you install the product first and configure.

How is it configured? Using the technology building blocks provided, a user can easily define the interfaces and services for the application.

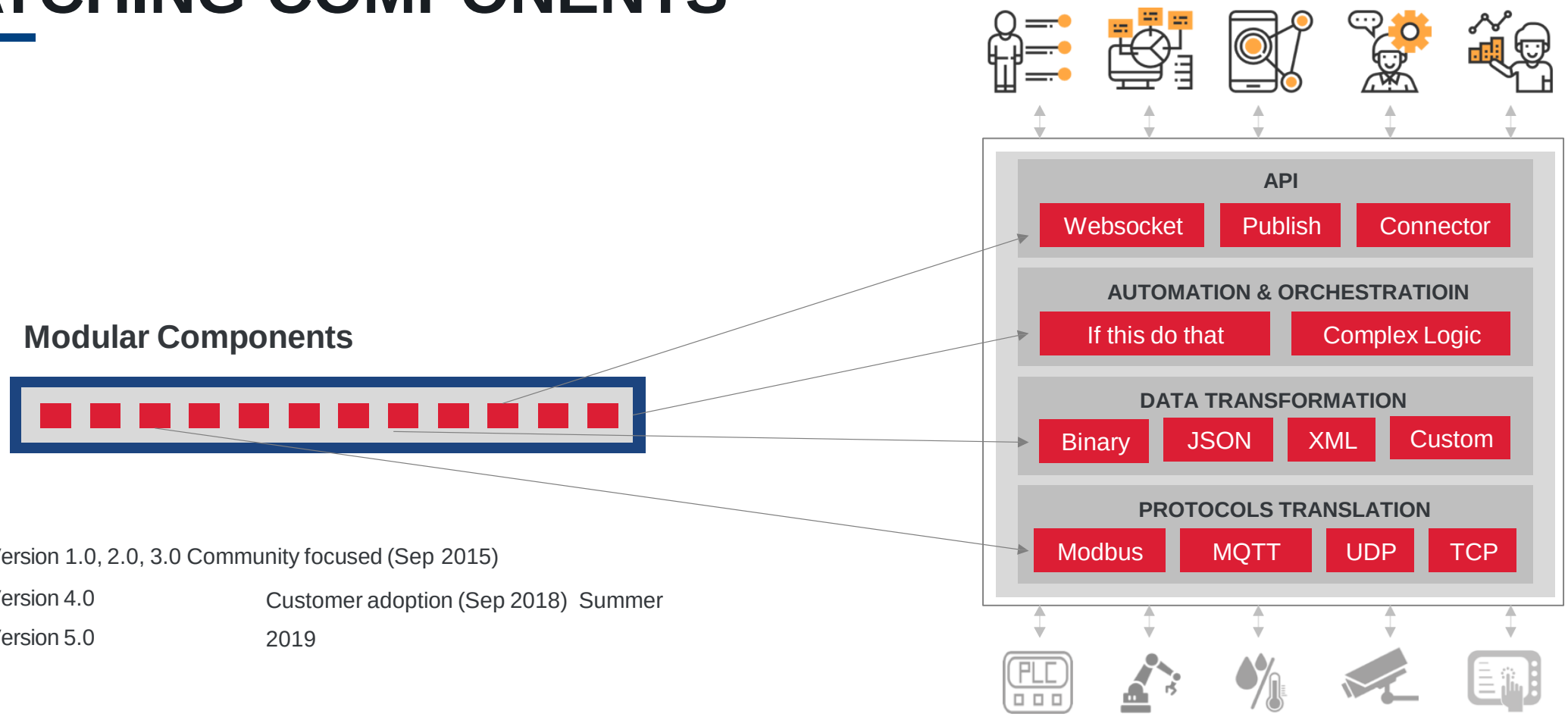
Category	Interactor	AWS Green Grass	Azure IoT Edge	Others
Architecture	**Standalone executable**	Cloud Controller + Agent	Cloud Controller + Agent	Controller + Agent
Dependencies	**None**	AWS Cloud Lambda	Docker, Python, Azure Cloud	Docker, MongoDB
Memory footprint	**50MB**	128 MB	128 MB + Container Modules	2.5 ~ 4GB (Full deployment)
Installation	**File download**	ore software, Security resources	Azure config, pip install	Edge Software, Docker, MongoDB
Runtime Environment	**Erlang VM**	Core software + SDK	Python, Container	Container
Protocol Support	**List of Built-in***	QTT, HTTP, Websocket over MQTT	Container based modules	Container based microservices
Custom protocol build	**Configuration**	Develop	Develop	Develop
Inter services communicatio	**Process message**	MQTT	MQTT, AMQP	HTTP, zeroMQ
Messaging	**process queue**	MQTT	MQTT/AMQP	zeroMQ
Data Handling	**Built-in**	Cloud Lambda + Develop	Develop Module	Develop
Interface event handling	**Built-in**	AWS IoT console	Develop Module	N
Installable protocols	**Built-in**	Develop	Develop Module	Develop
Installable protocols at runti e	**Built-in**	ly one implementation of OPC-UA	Develop Module	N

IP INFO: Science of interaction logic abstraction and modelling



Interactor technology is about abstracting the common and repeatable components into reusable modules

FAST AND EASY TO CREATE SOLUTIONS BY MIX AND MATCHING COMPONENTS



Version 1.0, 2.0, 3.0 Community focused (Sep 2015)

Version 4.0 Customer adoption (Sep 2018) Summer

Version 5.0 2019

When the modules are put together, a solution is created in a very short period of time. Above image shows industrial IoT related module comping together to create a factory edge computing solution in a matter of hours. Interactor has many pre-configured modules and connection methods. But what sets Interactor apart is its ability to create modules quickly and easily.

COMPETITIVE ADVANTAGE:

Interactor is playing key role in the transformation of the industry driven by 5G, AI and IoT.

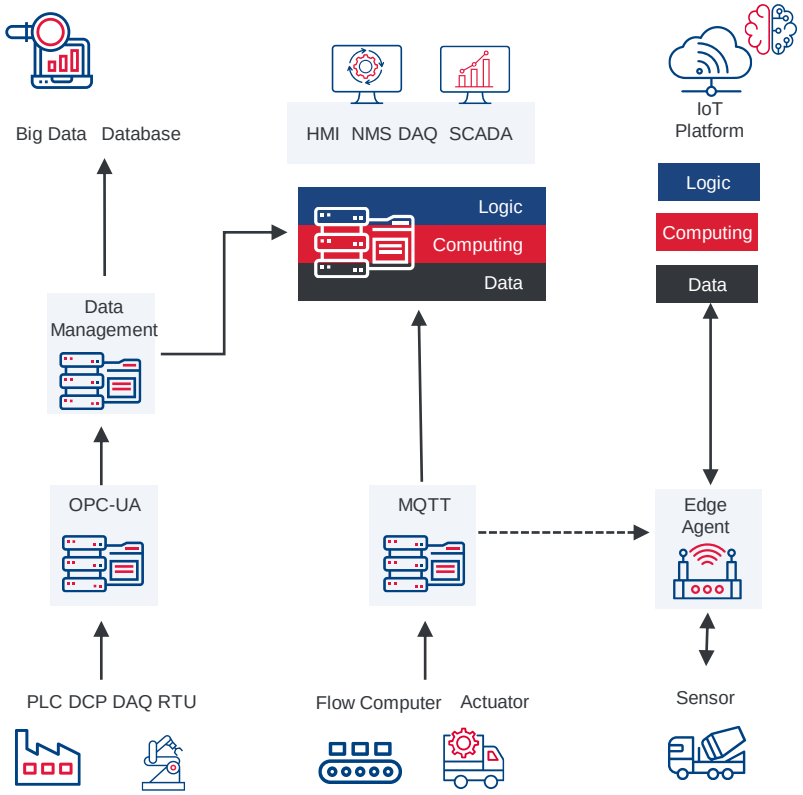
With 5G and IoT, 20 Billion connected devices is expected to come online by 2020.

Unique Market Position

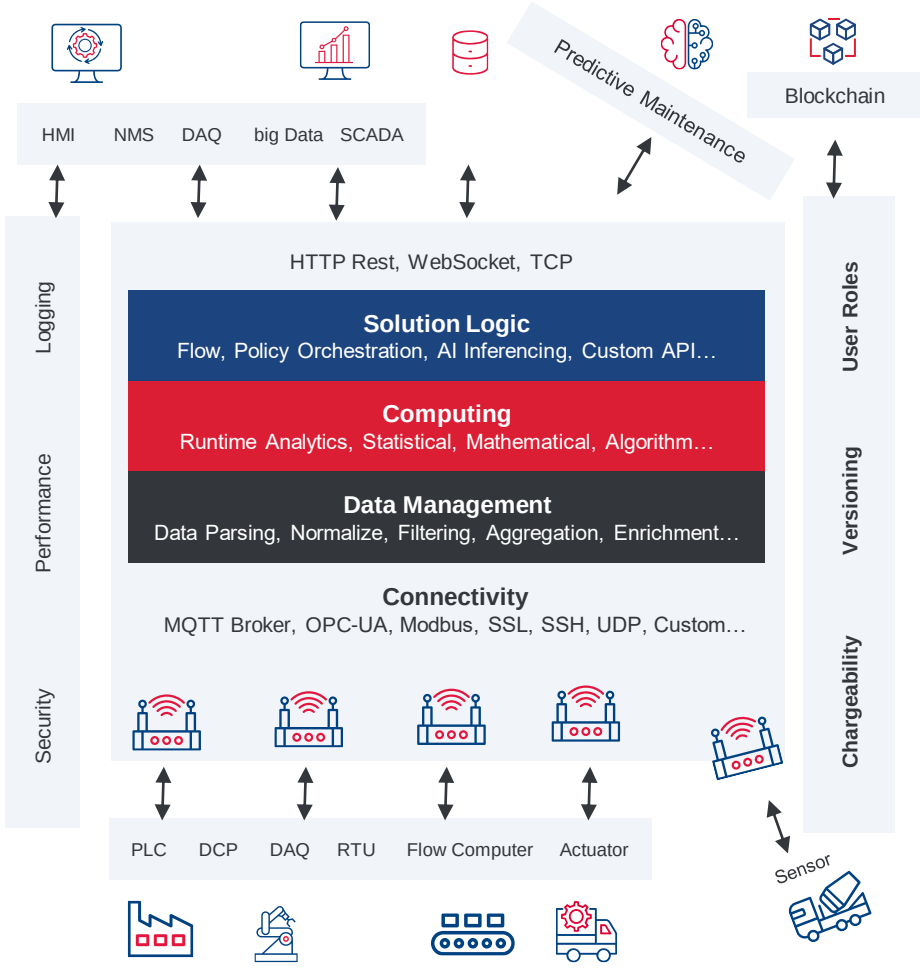
Capabilities, Already included the product:

- Realtime Processing,
- Handling Data Intensive Applications/Solutions,
- Small Footprint (Less than 70 MB),
- Scalability,
- High Availability,
- Security,
- Reliability,
- Performance and Maintainability,
- Flexibility, Development Simplicity and User Interface,
- Simple Deployment and Operation,

De-Coupled Architecture for Real-time analysis



Digital Transformation



Customer Success Stories

CUSTOMER ENGAGEMENTTELECOM OPERATOR NETWORK MANAGEMENT

Interactor® Roles: Protocol Translation, Data Transformation

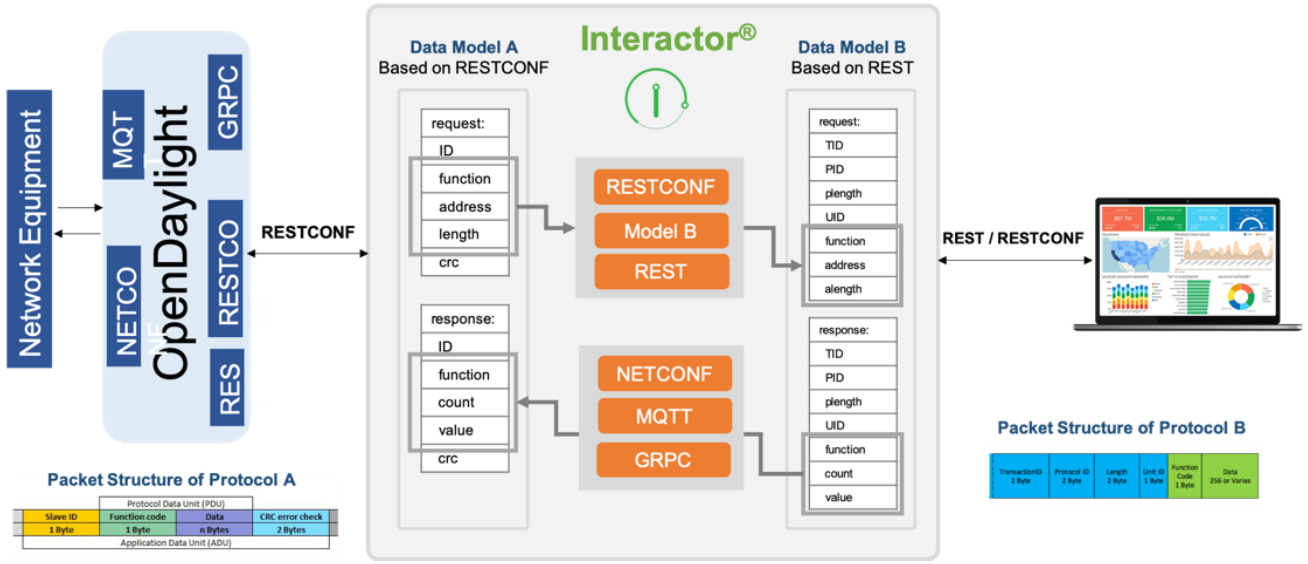
Scale: 8 Interactors used for POC

Type: POC Complete **Start Date:** 2019.1

Duration: On Going **Customer:** Telecom Operator

Status: Transform high volumes of network equipment
log data in many protocols and formats
unto a unified rest / RESTCONF

Status: Successfully completed the POC.
Pending deployment discussion.



An enormous amount of system data are created by tens and thousands of network devices. Again, the customer needs are in protocol translation and data transformation. Interactor created modules for each protocol and data model. Mapping modules were created to map protocols and data format into a one single Rest / RESTCONF.

CUSTOMER ENGAGEMENT MANUFACTURING | INDUSTRIAL 4.0

Interactor® Roles: Data Transformation, Protocol Translation

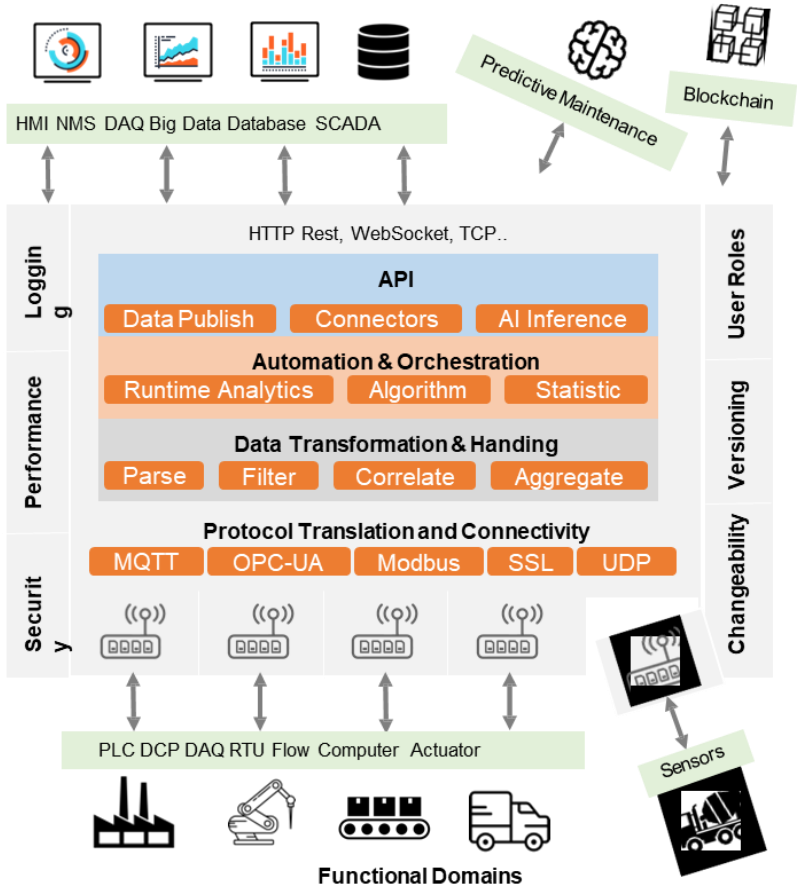
Scale: Developing to deploy in 3,000 factories

Type: Production **Start Date:** 2018.10

Duration: Ongoing **Customer:** LS Industrial Systems (LSIS)

Use Case: Edge computing hardware developed with Interactor. Focused on processing diverse protocols and processing data for big data and OSS/BSS

Status: LSIS and Pulzze is jointly developing an edge computing product based on Interactor® to deploy in 3,000 factories managed by LSIS



Moving onto real customer engagements. We are currently working with one of Korea's largest factory operators to create an edge computing HW/SW solution based on Interactor. You will notice that this solution is a simple combination of modules for data transformation and protocol translation. Now that Interactor has the modules for Industrial 4.0, it has started working with other factory operators to provide the same modules.

CUSTOMER ENGAGEMENT SMART CITY | SMART FACTORY

Interactor® Roles: Orchestration & Automation, Data Transformation Protocol Translation

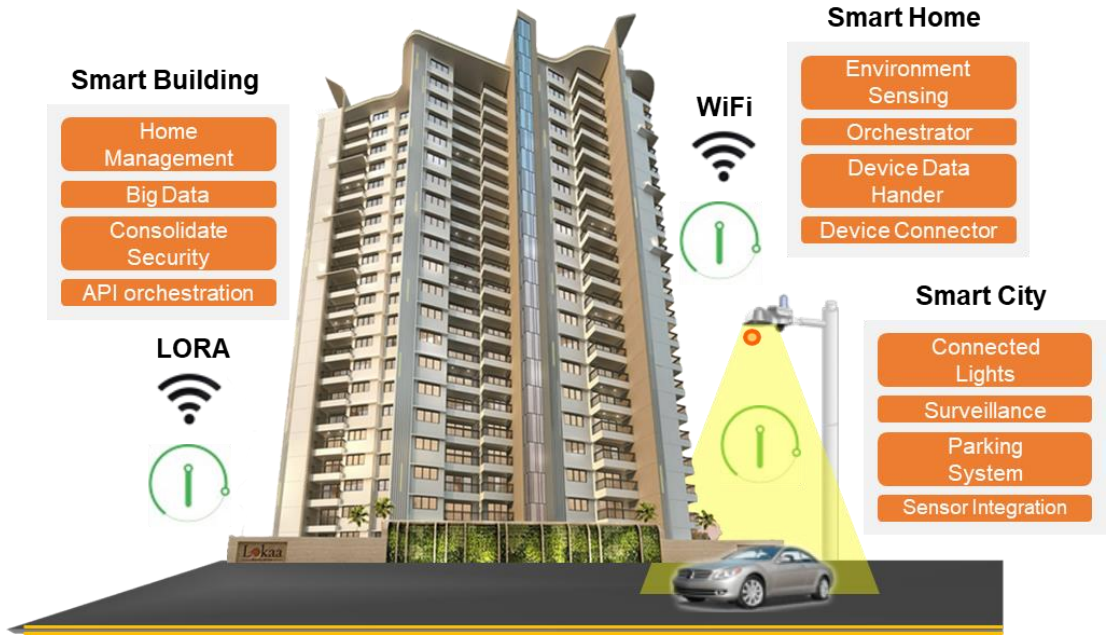
Scale: 200 houses for testing. Expand to more buildings

Type: Production **Start Date:** 2019.5

Duration: Ongoing **Customer:** City of Daegu

Use Case: Smart home for elderly and disabled residents.
Smart building solution for managing the homes.
Smart city using LORA network for connecting devices and systems throughout the city.

Contract awarded to create smart city and smart building edge computing solution.



Interactor is used to create a smart home hub that will connect the devices and provide basic automation. The hub will be connected to the smart building management system that also runs Interactor. The smart building utilizes big data and AI to provide comfort and safety for the residents. Finally, Smart building system connects with the smart city platform also running Interactor. For a smart city, it is more a core functionality.

CUSTOMER ENGAGEMENT SDWAN OVER LTE + EMS

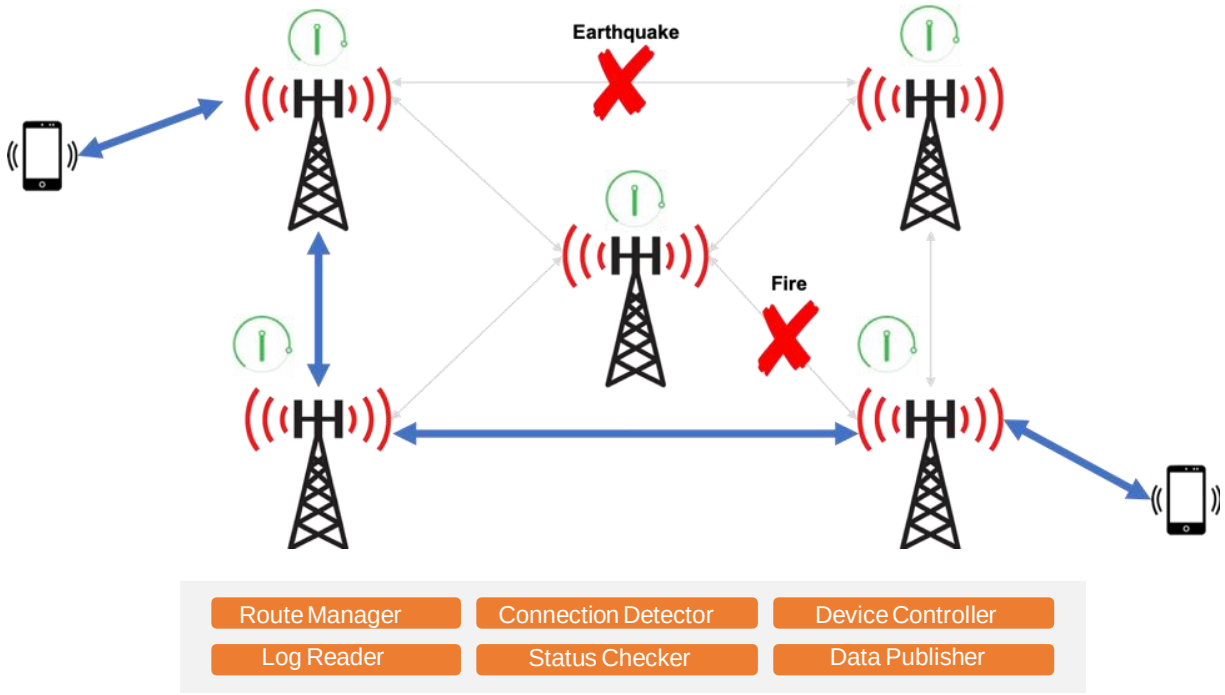
Interactor® Roles: Orchestration & Automation, Data Transformation

Scale: 6 Interactors for POC -> EMS offered to LTE customers

Type: Production **Start Date:** 2018.10

Duration: Ongoing **Customer:** Japan Radio Corp (JRC)

Status: After successfully completing the POC for the edge based SDN solution, JRC, one of world's largest maritime communication company is in the process of productizing the solution for their customers



Customer engagement for creating a unique SDWAN over edge LTE is also about data transformation and automation. The modules were created to control the router, manage the systems and apply an algorithm to re- route within 1 second during disasters. The modules are used by other private LTE companies for various applications.

CUSTOMER ENGAGEMENT CYBERSECURITY | LOG MANAGEMENT

Interactor® Roles: Protocol, acquire traffic logs, Data Transformation

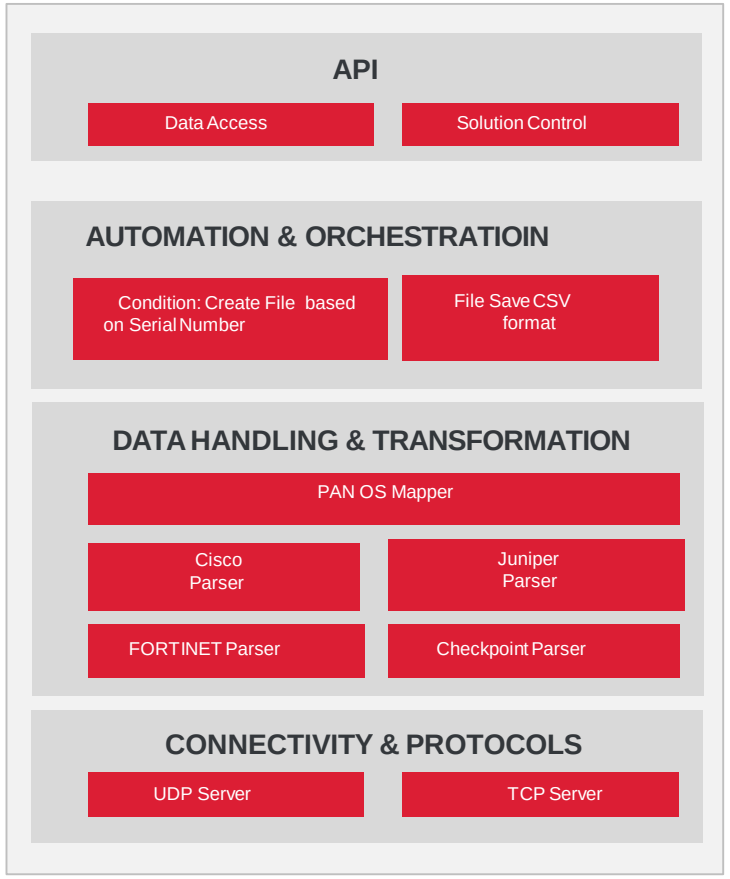
Scale: 1 Interactor for POC -> Product will be offered to Palo Alto Network customers

Type: Production **Start Date:** 2019.4

Duration: Ongoing **Customer:** Palo Alto Network customers

Use case: Large customers centralize traffic logs archiving in Splunk. Exporting from Splunk simplifies the acquisition of the traffic logs

Status: After successfully completing the POC, two companies are working toward creating a log ingester solution for the above use case.



Log management solution is jointly created with Palo Alto Networks. The cybersecurity and log management solution requires protocol translation and data transformation. The modules are created to handle incoming data over UDP server. Modules for API calls to Splunk and other database application are also created. Module to parse logs from various firewalls are created. The same modules will be used for other network solutions.

INDUSTRIAL 4.0 SERIES FACTORY EDGE COMPUTING DIGITAL TRANSFORMATION STORY OF A LEADING MANUFACTURER (1/2)

“One of the biggest challenges in factories today is the ability to quickly change and adapt”

Factory Manager

The manufacturing is fast evolving. A lot more devices are being added, and adopting new technologies is no longer a choice.

The Challenges

- New technology is hard to implement
- Devices take a lot of effort to integrate
- Shortage of engineers and relevant skills

The Opportunities

- Support all the standard & non-standard devices
- Easily adopt new technologies
- Empower current development & operation teams

INDUSTRIAL 4.0 SERIES FACTORY EDGE COMPUTING DIGITAL TRANSFORMATION STORY OF A LEADING MANUFACTURER (2/2)

Interactor® Solution

Edge computing is a next generation IoT technology that provides a new way of computing closer to the actual data source. In a factory, Interactor® edge computing performs the protocol translation, data normalization, runtime analytics, algorithmic compute, and execution on a flow of logic.

The Result

- **Easily changeable** to add devices and technologies
- **Cost and time saving** for developers and operators
- **Consolidated** view, management and control

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