DELL Technologies

SMART FACTORY

USE CASE

intel

Quality Control & Defect Tracking

Quality Control & Defect Tracking

Quality management is an important aspect in the production of goods of all kinds. The manufacturer wants to ensure that the products meet the requirements of the customers. The production process may consist of many steps, and each step may include a possible source of error and thus negatively influence the entire process. The amount of rejects and defective products should be as small as possible. Therefore it is important that the individual steps and the product at the end of the production process are subject to strict controls. As soon as deviations from the desired target are detected, sources of error can be eliminated. Consequently, the production chain can be optimized.

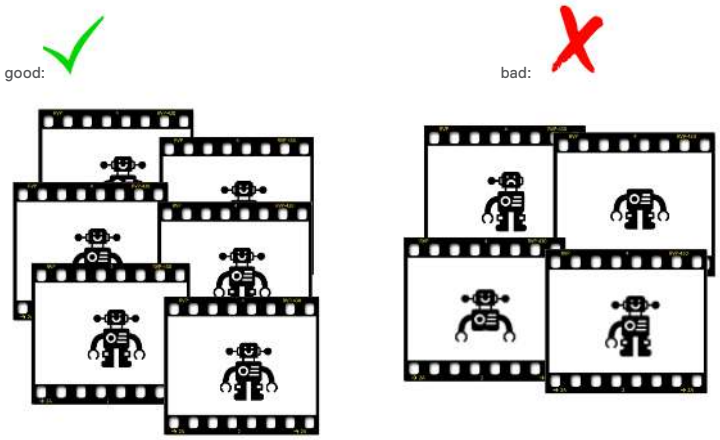
Why Defect Tracking? Why Artificial Intelligence?

People make mistakes, are temporarily inattentive and distracted. Artificial intelligence, on the other hand, can work 24 hours a day and seven days a week and do the work many times faster and with consistent quality. The evaluation of optical images in terms of errors is strongly dependent on speed and quality. Since the scope of activities is also rather low, artificial intelligence is an ideal use case.

Phase 1: People rate optical images

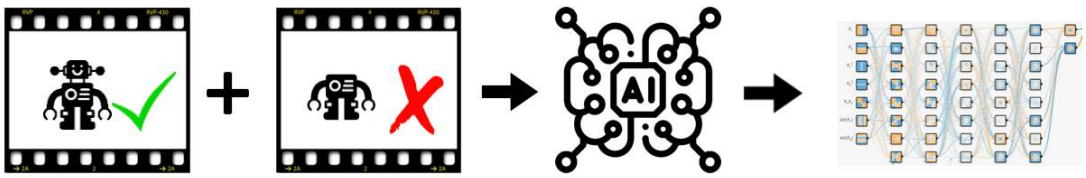
In the first phase, people apply their experience and view optical images of, for example, produced goods. These are evaluated as „good“ and „bad“. The „good“ go into further processing or sale. The“bad“ do not meet the quality requirements and are therefore not suitable. The reasons for this can be manifold: color, shape, consistency, or appearance.

These images, qualified by humans, are separated logically, e.g. moved to different categories. Human experience is the decisive factor for the evaluation at this point.



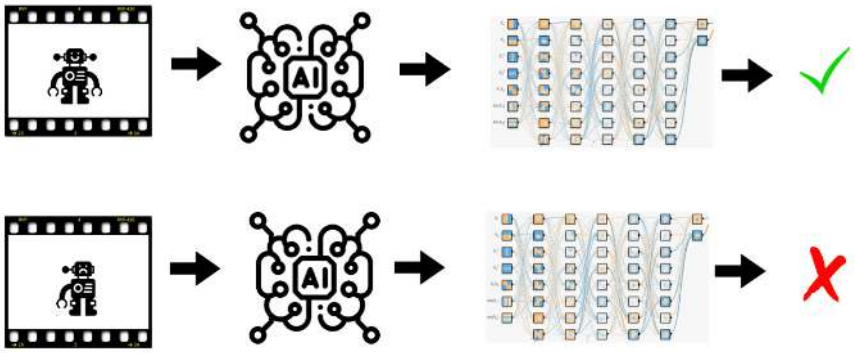
Phase 2: Training the Artificial Network

In phase 2, the pre-qualified images are now called „labeled data“. An artificial neural network is „trained“ to to learn and save similarities and differences of the images. Algorithms for the digital representation of images are used, because neural networks can only process 1s and 0s. These values and the corresponding category („good“ and „bad“) are then determined using other algorithms. When the neural network has completed this stage, it can distinguish these images with at least human accuracy.



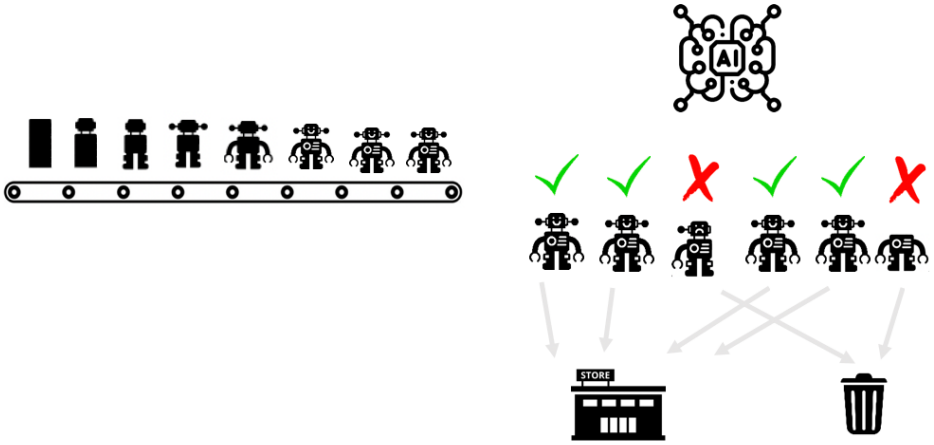
Phase 3: Inference

In phase 3, new images are exposed to the previously trained neural network. Based on the training, the network can decide whether the unknown image should be classified as „good“ and „bad“. This phase is also called „Inference“. The experience acquired in the training is applied and used for categorization decisions. The network works with an evaluation of probabilities, whether an image can be assigned to a given category or not.

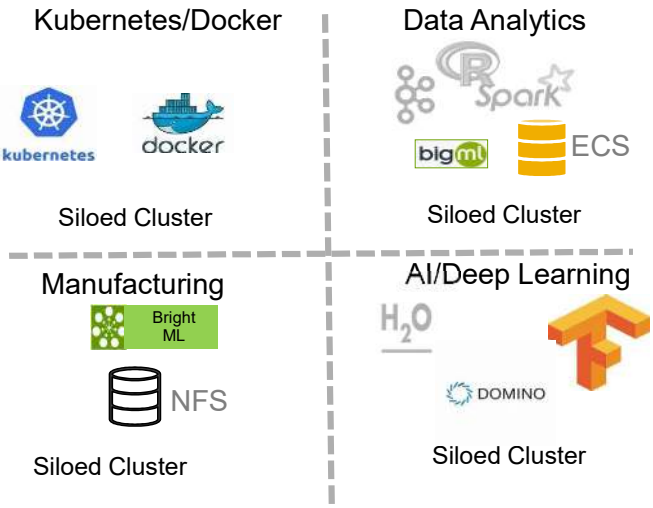


Phase 4: Maintenance

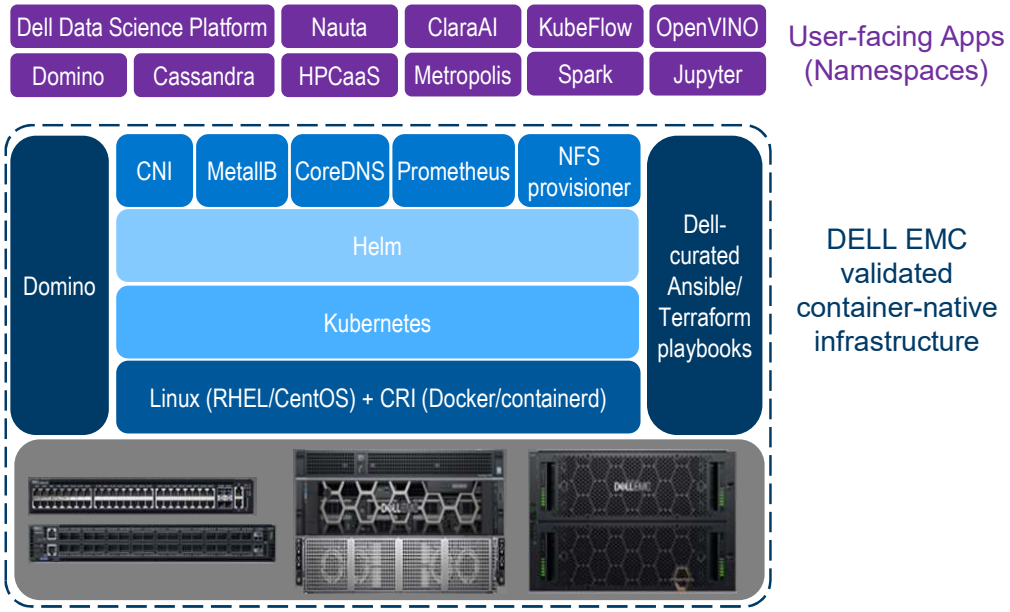
It is advisable to check the decisions of the network on a random basis. It may occur that a network has used its own wrong decisions as a basis for subsequent decisions and thus „errors creep in“. The images correctly classified by humans can then be used for another training cycle.



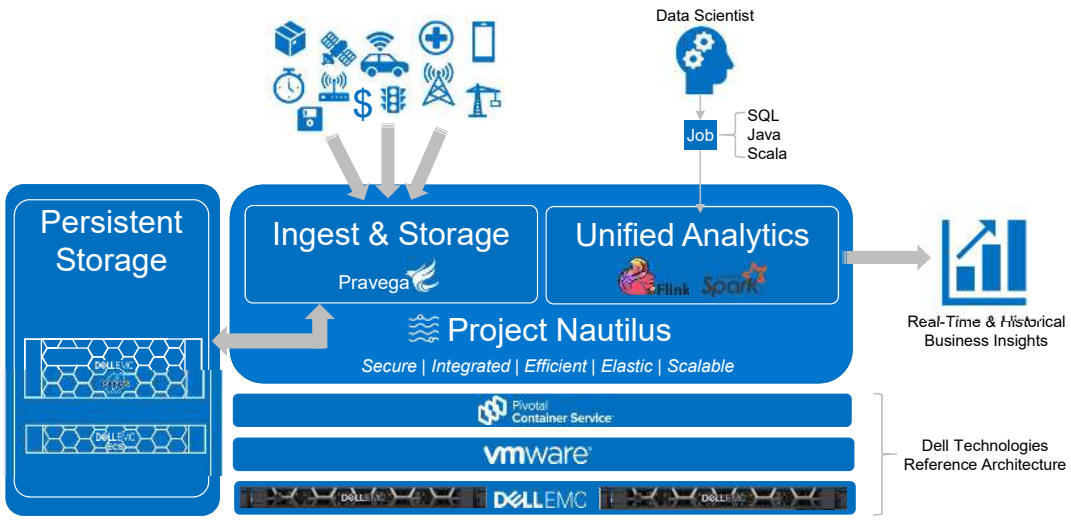
When companies begin to examine data, they usually do so with an infrastructure that consists low-cost components. This minimizes the risk of a bad investment. Should the project fail or not have the desired success, the financial loss is justifiable. Open source software is often used. In many cases the infrastructure has an experimental character, because the direct benefit for the company cannot be planned and therefore no business case exists.



However, the maintenance effort is often unmanageably large. Many interlocking dependencies must be taken into account so that the whole construct is functional. This can be very costly and time-consuming and thus counterproductive. Furthermore the Administrator depends on outside help as there are no support contracts.



A coordinated solution, on the other hand, simplifies those tasks. Pre-qualification makes the customer‘s work much easier. The use of components for virtualization and containerization creates opportunities for flexibility and scalability. The interaction of software makes the daily handling of the environment easier for the Administrator. Support for the solution is provided by Dell Technologies. In the event of problems, the manufacturer provides appropriate assistance.
DellEMC‘s Streaming Data Platform (formerly Project Nautilus) is an example of such a solution.



Streaming Data Platform

https://bit.ly/37t9flW

Solution overview

https://bit.ly/37rxsJg

Streaming Data Platform is an overall solution consisting of the following components:

Ingest & Storage of a variety of data streams such as IoT, CCTV, logs etc. via Pravega, a software developed by Dell

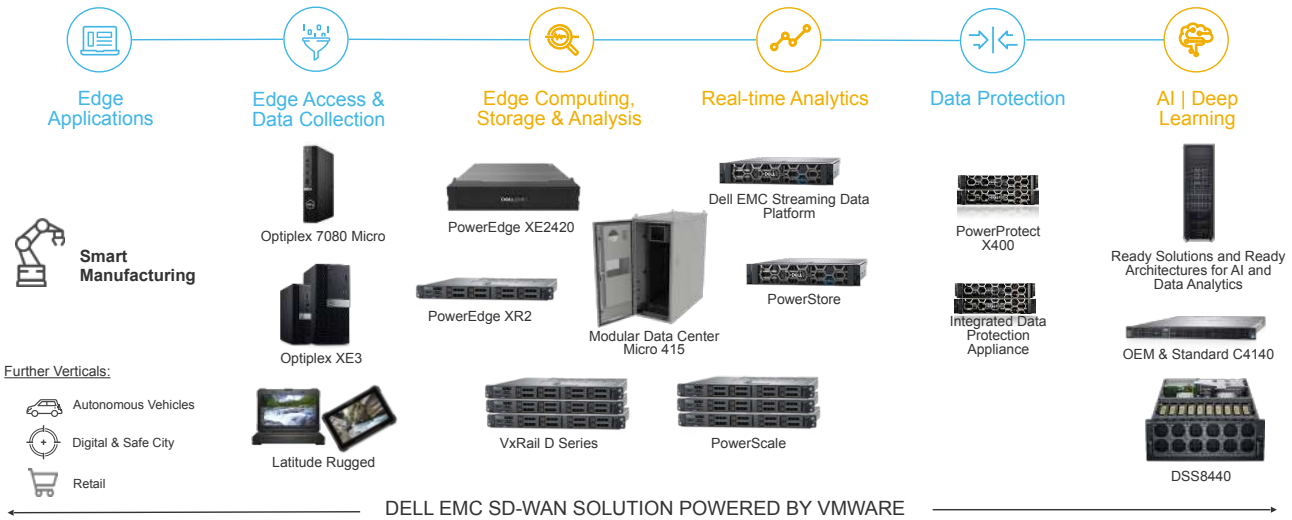
Persistent Storage of data on industry-leading solutions such as PowerScale and Elastic Cloud Storage (ECS)

Unified Analytics examine the secured data. A data scientist can use algorithms and derive results.

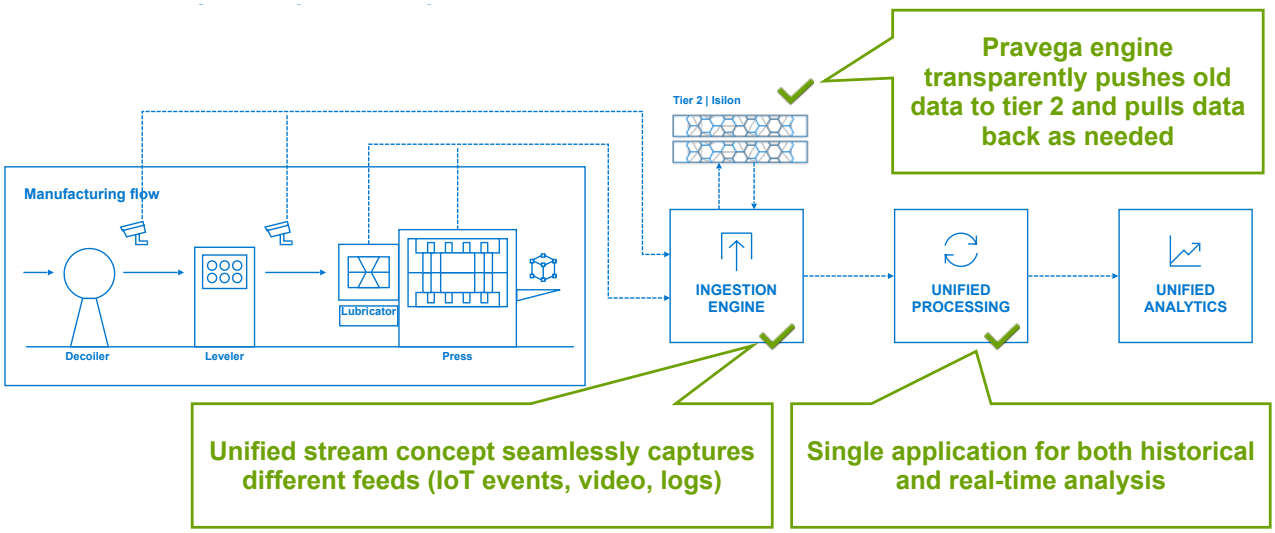
VMware und Pivotal Container Services using virtualization and containerization. This solution is very flexible and scalable. There are no limits to growth and application possibilities.

Dell EMC Hardware – The software components mentioned above are installed on the leading industrial hardware and and offer a solid platform which they can rely.

Dell Technologies Portfolio



STREAMING DATA PLATFORM – SAMPLE SOLUTION



Video and sensor data are recorded and stored centrally in the first step.

Afterwards, this data is processed and can then be used as ,‘‘results“ for the company.

The following questions can be answered automatically:

- Is the quality of a product optically assessed as sufficient?
- Are there sensor data that indicate problems during production?
- Are there deviations from the standard with regard to the many parameters that are measured?

OVERARCHING MANAGEMENT PLATFORM FOR ARTIFICIAL INTELLIGENCE FOR IOT SYSTEMS IN PRODUCTION

The success of integrated IoT platforms in Industry 4.0 significantly depends on the ability to anticipate events and to react by means of artificial intelligence.

The increasingly connected production world more frequently uses various system platforms with many information sources at different locations. The integration of already existing devices, networks and systems is realized with a single vendor-independent management platform. Thereby it is possible to combine also existing systems with the newest technology. The required functions are provided by plugins, which can be used to integrate existing and new components so that a production system can be continuously optimized and extended.

The seamless integration of the IoT systems ensures a highly efficient production - from automatic order processing, via precise quality control including shipment tracking
all the way to the end customer.

With the help of specialists from your specialty field and AI experts, a model is developed by Dell Technologies or our partners, which is instructed on the basis of already existing data and applied to new data. This model (which is based on mathematical algorithms) will then be used to predict the time for maintenance. Intel offers for such Industry 4.0 solutions the necessary edge-to-cloud technologies, to reduce complexity, cut costs and improve productivity.

Intel AI Solutions

https://intel.ly/3qAKtrA

Intel Case Study

https://intel.ly/2Fm1oLz

Whitepaper

https://intel.ly/3k47zmz

Arcelor Mittal Case Study

https://bit.ly/2FH2FNO

ABOUT OUR PARTNER INTEL AG

Intel (NASDAQ: INTC) is a leader in the development of future-oriented technologies that add value create for people around the world. Inspired by that Moore's Law, we are constantly working on further development our semiconductor products to help customers cope with their to support the greatest challenges in the best possible way. We implement intelligent technologies and solutions in the cloud, in the network and in all devices in between. Through this we use the full potential of data, businesses and society improve.

You can find more information on Intel's innovations at:

https://intel.ly/3dsUXFS

Intel's Industrial IoT Solutions

https://intel.ly/2NdftzC

If you want to know more about our partnership with Intel AG and / or want to find out about our solutions, please use this contact form

https://bit.ly/2NIJ5V3

and we will contact you as soon as possible.