Combient Smart Production Forum

Side member Solution Ferruform Luleå

PISA-DL

Manufacturing execution systems (MES)

Arrowhead in practical use!

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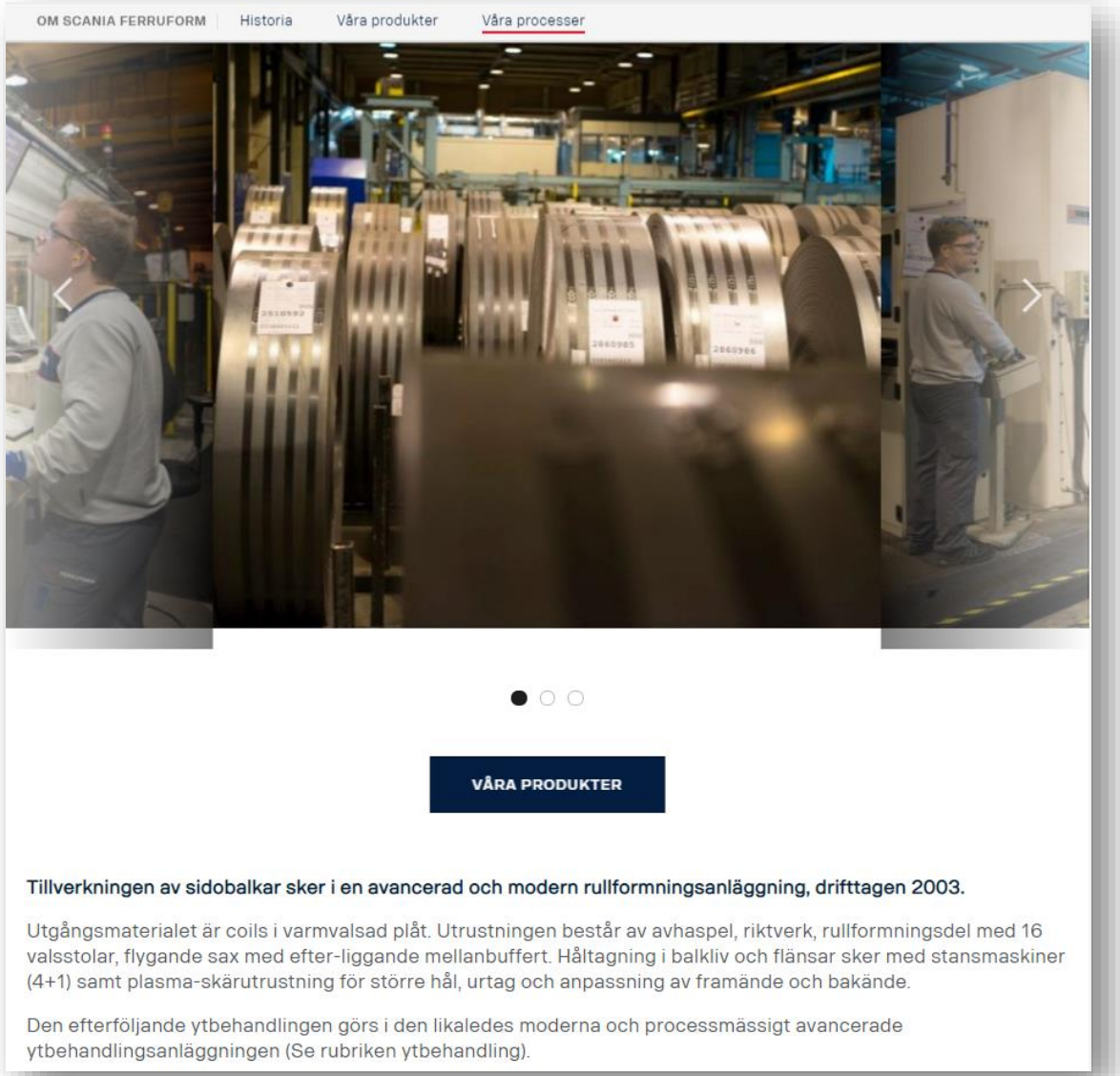
Product

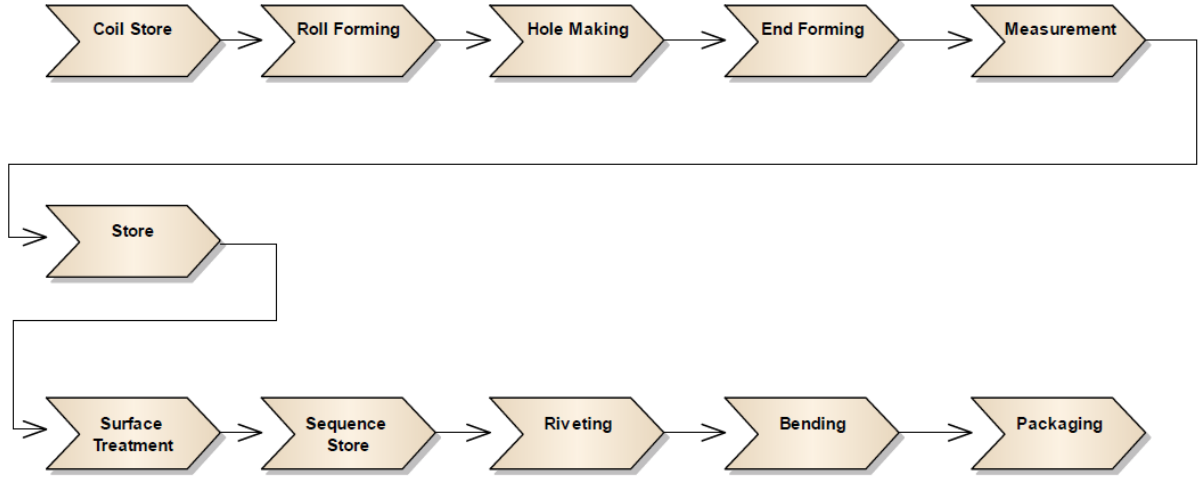
Verksamheten i Luleå etablerades ursprungligen för tillverkning av sidobalkar. Under 2003 skedde ett genomgripande teknikskifte för tillverkning av dessa balkar.

Rullformning ersatte pressning och den tekniken i kombination med stansmaskiner för håltagning I balkliv och flänsar gjorde det möjligt att i direkt serieproduktion tillverka kundspecifika balkar.

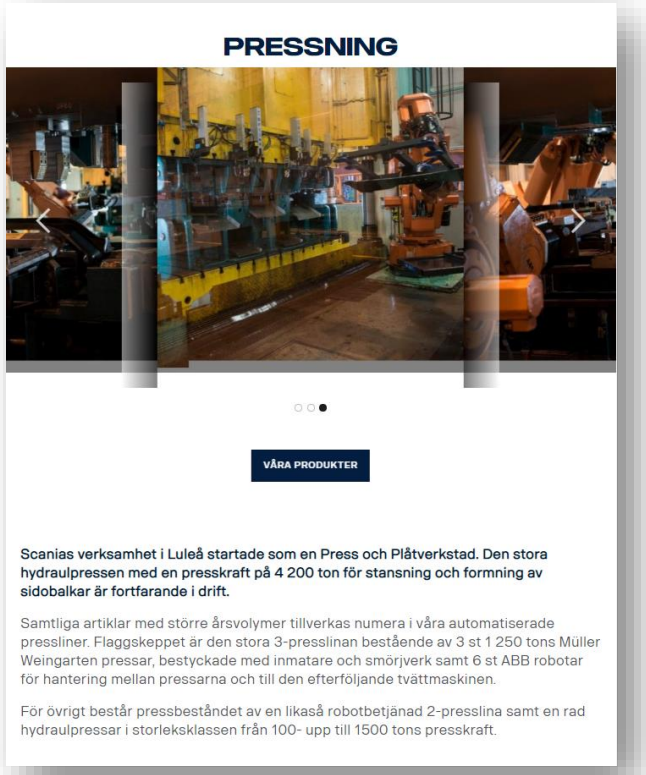
Samtliga balkar som tillverkas är unika. Tillverkningen startas först när en lastbil är såld och specificerad för en slutkund. Med hjälp av ett avancerat planeringssystem omvandlas bilspecifikationen automatiskt till NC-program som styr maskinerna i tillverkningen. På det sättet blir ledtiden mellan kundorder och tillverkning/leverans av balkar endast 10-13 dagar.



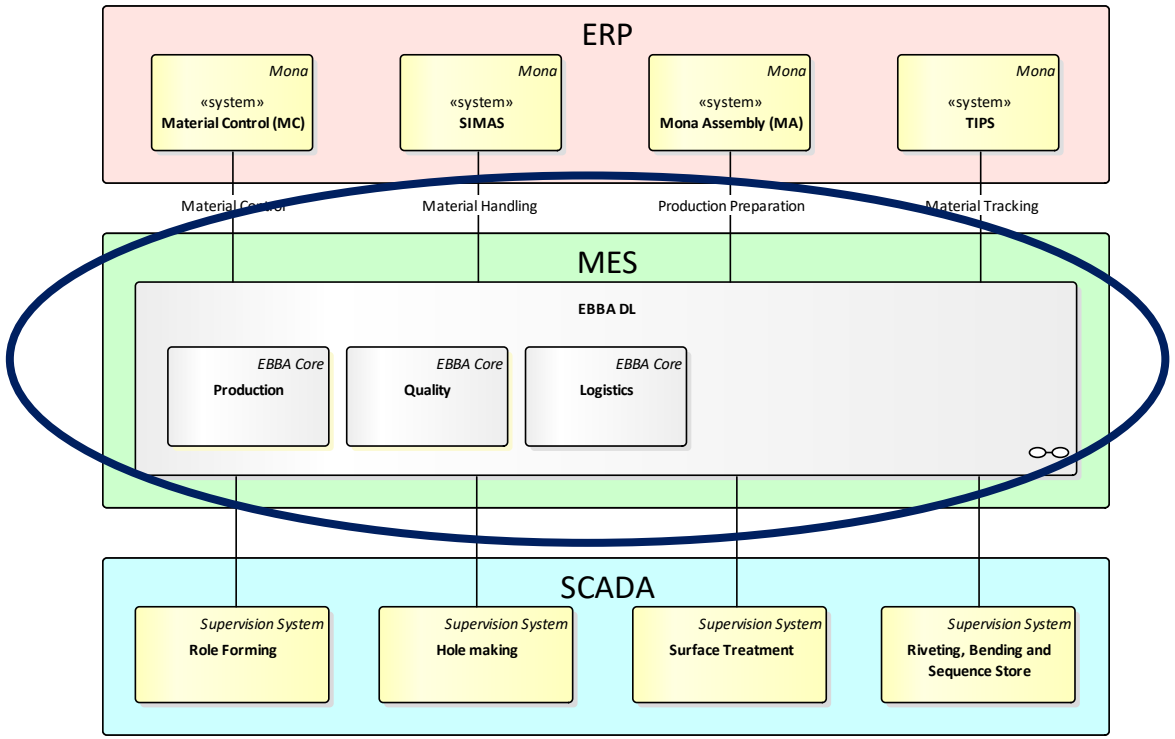
Processes


Coil Store
Roll Forming
Hole Making
End Forming
Measurement
Store
Surface Treatment
Sequence Store
Riveting
Bending
Packaging


PROCESSER FÖR TILLVERKNING AV SIDOBALKAR
RULLFORMNING
Tillverkningen av sidobalkar sker i en avancerad och modern rullformningsanläggning, drifttagen 2003. Utgångsmaterialet är coils i varmvalsad plåt.
YTBEHANDLING
Scania Ferruform har två separata ytbehandlingsanläggningar, en för sidobalkar och en för ram- och chassikomponenter.


PRESSNING
VÅRA PRODUKTER
Scanias verksamhet i Luleå startade som en Press och Plåtverkstad. Den stora hydraulpressen med en presskraft på 4 200 ton för stansning och formning av sidobalkar är fortfarande i drift.
Samtliga artiklar med större årsvolymer tillverkas numera i våra automatiserade pressliner. Flaggskeppet är den stora 3-presslinan bestående av 3 st 1 250 tons Müller Weingarten pressar, bestyckade med inmatare och smörjverk samt 6 st ABB robotar för hantering mellan pressarna och till den efterföljande tvättmaskinen.
För övrigt består pressbeståndet av en likaså robotbetjänad 2-presslina samt en rad hydraulpressar i storleksklassen från 100- upp till 1500 tons presskraft.

Scope PISA-DL – The Scania MES System



Computerized systems used in manufacturing, to track and document the transformation of raw materials to finished goods.

*MES provide the **right information at the right time** and show the manufacturing **decision maker** "how the current conditions on the plant floor can be optimized to **improve production output**."*

***MES work in real time** to enable the control of **multiple elements of the manufacturing process** (e.g. inputs, personnel, machines and support services).*

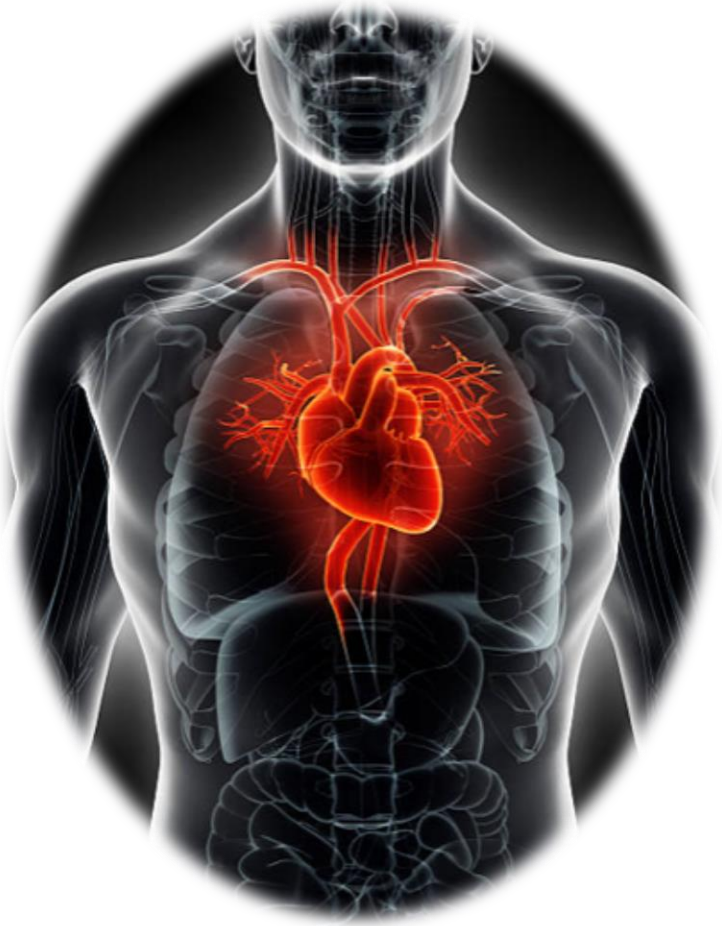
Project PISA-DL

OBJECTIVE

- Replace the present **RF-MES** system with the **Scania EBBA system** which enables Scania to reach the goals in the existing production of side members.

ENABLE

- A flexible and agile adoption to future requirements. The solution leverages the concept of service oriented and event-driven architecture to assure a future proof solution by todays best knowledge.



RF-MES (2003-2019)

- **Old hardware**
  No support and difficult to find spare parts.
- **Source code**
  Cannot replace and update existing functionality for current situation and needs.
- **Time-consuming maintenance**
  The different roles and groups use it-operations personnel for support and hands-on interaction with the system due to lack of needed functionality.
- **New needs, meet today’s requirements**
  It is hard to expand and adapt existing systems, change for new needs and the information within the current MES has hard dependencies with the data storage and has impact on the entire system.
- **Future-proof**
  There is a goal to enable possibilities of system customization and information exchange between existing and future functionality over time in long-term aspects.

PISA-DL Business goals

- **Faster** and more **flexible** support of **new needs**
- **Better** and **clearer requirements** that can be used for example new **acquisition**
- **Re-use of investments** (systems, hardware and software)

Small *and* ***clear components*** *have* ***fewer*** *requirements,* ***easier*** *to describe,* ***easier*** *to verify and can* ***easily*** *be deployed, in a* ***seamless*** *way,* ***possible*** *direct into production. A small component require* ***less*** *economic and personnel* ***resources****.* ***Small*** *changes and improvements can fit within small and* ***limited budgets*** *and used for the* ***current*** *and* ***actual need*** *at the* ***time****.*

PISA-DL Technical goals

- **Easier** to **maintain**
- **Well defined** boundaries which lead to better/higher **dynamics**, **flexibility** and **modularity**
- Faster (**cheaper**) development
- System **support** that is adopted to **current business processes**
- **Reduced personnel**
- **Reduced supplier**-dependent, **technology**-dependent and **product**-dependent

***System design**, based on service oriented architecture, **handled properly**, brings above stated **benefits/features**.*

PISA-DL Main objectives

- **Increase compatibility**
  Exchange information with **minimal integration needs.**
- **Increase coordination**
  Coordinate resources and applications. Ultimate leads support of increased coordination (Federation) into a naturally coordinated environment.
- **Increase collaboration**
  Increase interaction between business and technology. The technology can be easily and flexibly adapted to new, changing business requirements.
- **Reduce dependence**
  Increased flexibility in choice of supplier / manufacturer / technology ("Provider independence"). Increased ability to choose ("best-of-breed") business and technology solutions.

The solution and architecture meet above stated main objectives.

PISA-DL Key Benefits using Arrowhead framework concept and mindset

- **Increased re-use**
  Increase service life for existing invested system solutions. Lifecycles are governed by the service life.
- **Increased adaptability**
  Increase the ability to efficiently adapt technology after organizational changes
- **Reduced IT load**
  Reduce overall load and limited / limiting system solutions. Increase the ability of strategic goals with fast and flexible adoption of the IT-landscape.

*Service oriented based system solutions have **decoupled life cycles** for each of the **components**. It is **easier** to **govern** and **maintain** a **modern**, **long-term** and **effective integration**. This leads to **reduced resistance** to developing a system solution. System architecture **reduces** system solution **maintenance costs** and **maintenance needs** can be focused on the **necessary features**. The **flexibility** of service based oriented system solutions **allows adjustments** to **new situations** to be done **without** the **need** for **changing** the **existing** building blocks (**components**).*

*With interoperable system solutions, participants **can choose which rate to adapt their system to changing needs.***

*Because the architecture is naturally federative, you can **decide how much resources and at what rate** you should be interoperable.*

*In addition, participants **can choose which parts** of a federal system solution that **fits the individual needs**.*

Central PISA - Production Infrastructure Systems Architecture

Roll out strategy

- Shall be implemented for all new production installations
- Existing production facilities use pay off calculation for decision
- Replacement of existing systems use pay off calculation for decision

Common approach

- EBBA (Apriso) announced as Common system for assembly and Body in White processes
- Prestudy for machining processes

Governance

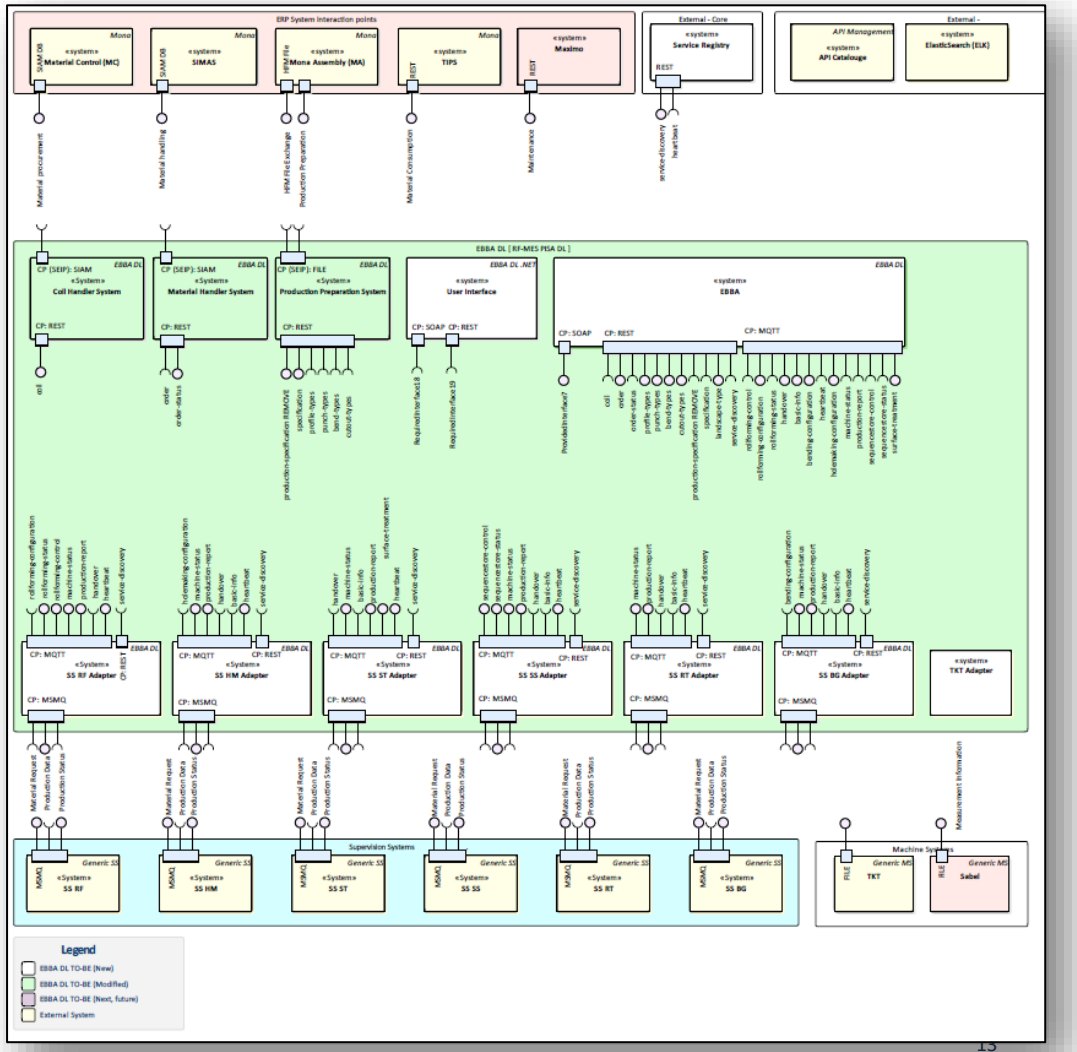
- PISA Steering group is appointed to govern the concept
  - Assure alignment between functionality and way of working
  - Prioritizations and budget

Existing processes and architecture

PISA-DL solution and some figures!

- 7 MES-Level systems (one running in 6 instances)
- 26 Services (+60 producers/consumer instances)
- 4 Technologies (MSMQ, MQTT, REST, FILE)
- Integration ERP 5 systems
- Integration SCADA 4 systems
- Service Registry, Orchestration, Authorization

- Two first operational weeks
  - 3 new production days records (600 -> 780)



PISA-DL Solution

- **Digitalisation**
- **Meet requirements**
- **Follow Scania central approach**
- **Identified to follow NOVA approach close** ***(PISA-DL: Already the first real proof of concept?!)***
  An umbrella that will drive and keep together the delivery projects during the entire timeline 2018-2023.
  Not an IT project – Business transformation journey!
  Lead the 'heart- and lung transplantation' while the patient is running a marathon.
  NOVA not only P&L but also R&D and Finance!

- *Utilized with Arrowhead framework and mindset*
  - *Since 2003*
  - *Real applications! (ex. Swedish Defence Administration, ENAV, EDA (MARSUR), SUCBAS, MRM, LVF/SWEDAVIA)*

Findings, lessons learned

- **Distributed** (decentralized) and **centralized** successfully used together!
  - Functions small, fast and easy to manage/govern (buy, requirements, develop, test, verify, deploy and maintain)
  - IT-operations centralized
- Future proof (re-use investments, evolve controlled)
  - **Legacy** (OT) with **new**/future (IT) **systems**
- **Governance** (top-down AND bottom-up)
  - **Discipline**, coordinate services/api:s/technologies between groups for re-use and global success
  - **Definitions** (Service, API, I/F, MicroService, System, Application)
  - **S**ervice **B**ased **A**rchitecture (Loosely coupled, Lookup, Late binding)
  - Service registry, API-catalogue, API-gateway
    NOTE: API's for **ALL** technologies, not only REST/HTTP…

- Possible **traps** to handle
  - Knowledge and common view in the organization
    - Align all, practical examples at all levels, ownership, costs, way of work and more..
  - Vendor **lock-in**
  - Product **dependent/lock-in**
  - Technology **dependent**
  - Distributed **mud** (on all levels in the organization)
  - **Legacy** becomes the **driver** of the future **solution**
  - Solution control(**limit**) our future possibilities
  - Dependence of **critical personnel**/resources
  - End to end **dependencies**

Thank you!

Questions?

COMBIENT

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