TAS Big Data Use Cases presentation

Assure transverse synergies, choices & capitalization
02/01/2017

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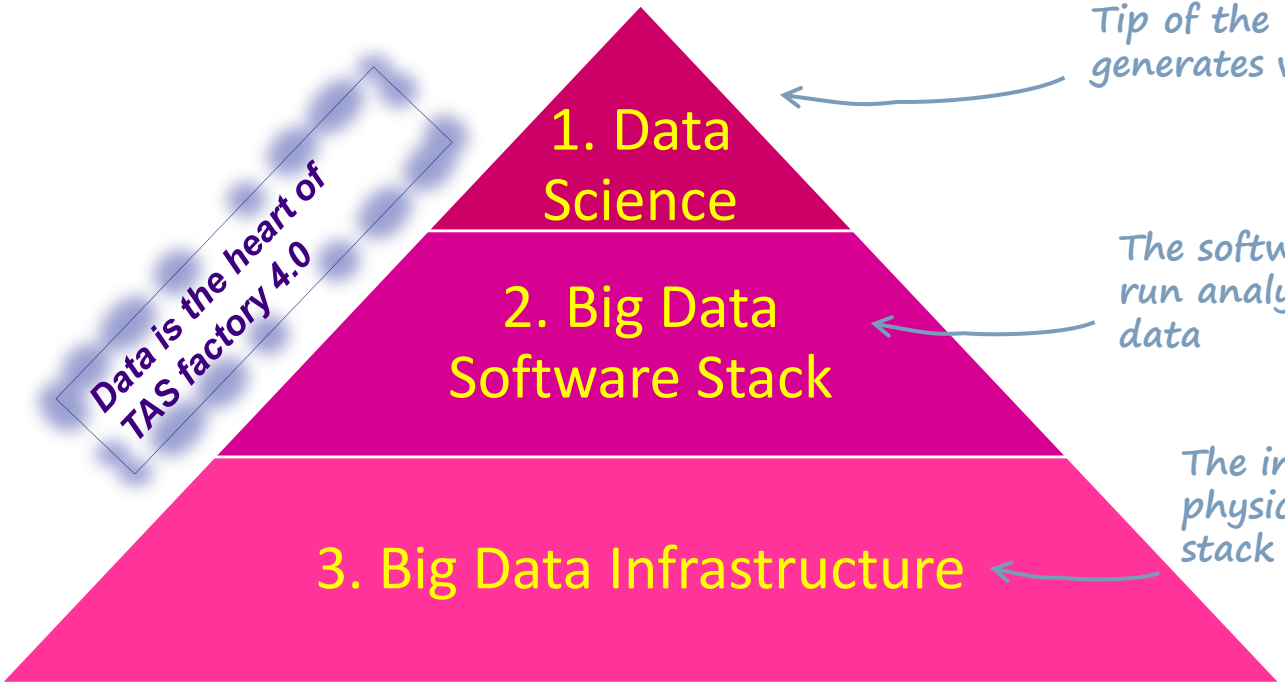
a Thales / Leonardo company

Big Data Roadmap introduction : 3 key level adressed



Tip of the iceberg : data science, which generates value from the data

The software stack makes it possible to run analytics on a vast amount of data

The infrastructure provides the physical means to run the software stack at scale

1. Data Science

Data is the heart of TAS factory 4.0

Data

- IVV
- AIT
- Config
- CAD
- Operations

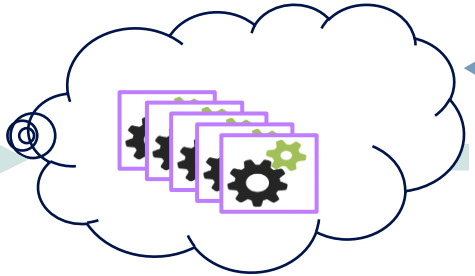
XML

XML

LOG

Data exploration and analysis
Algos created by **data scientists**

=> Training question to adress (ex SCS academies / initial & prof trainings)



Analytics

Reports

Main output

- Statistical analysis
- Trend analysis
- Data and textual correlation / mining
- Decrease over-specification
- Predictions
- …

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2. Big Data Software Stack

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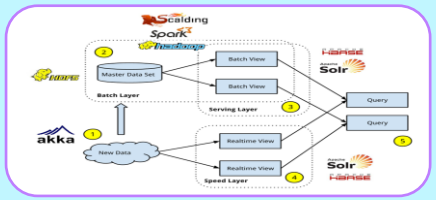
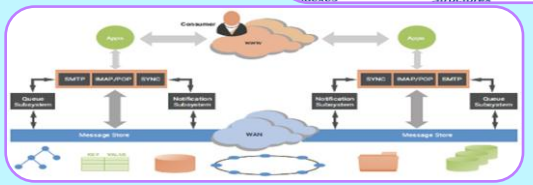
Architectures Repository





- *Off-the-shelf architectures reuse*
- *Short release cycles*
- *Easy to deploy*

=> Experience in Big Data SW technology to adress (ex of SCS partners experiences)

Optimized Architecture

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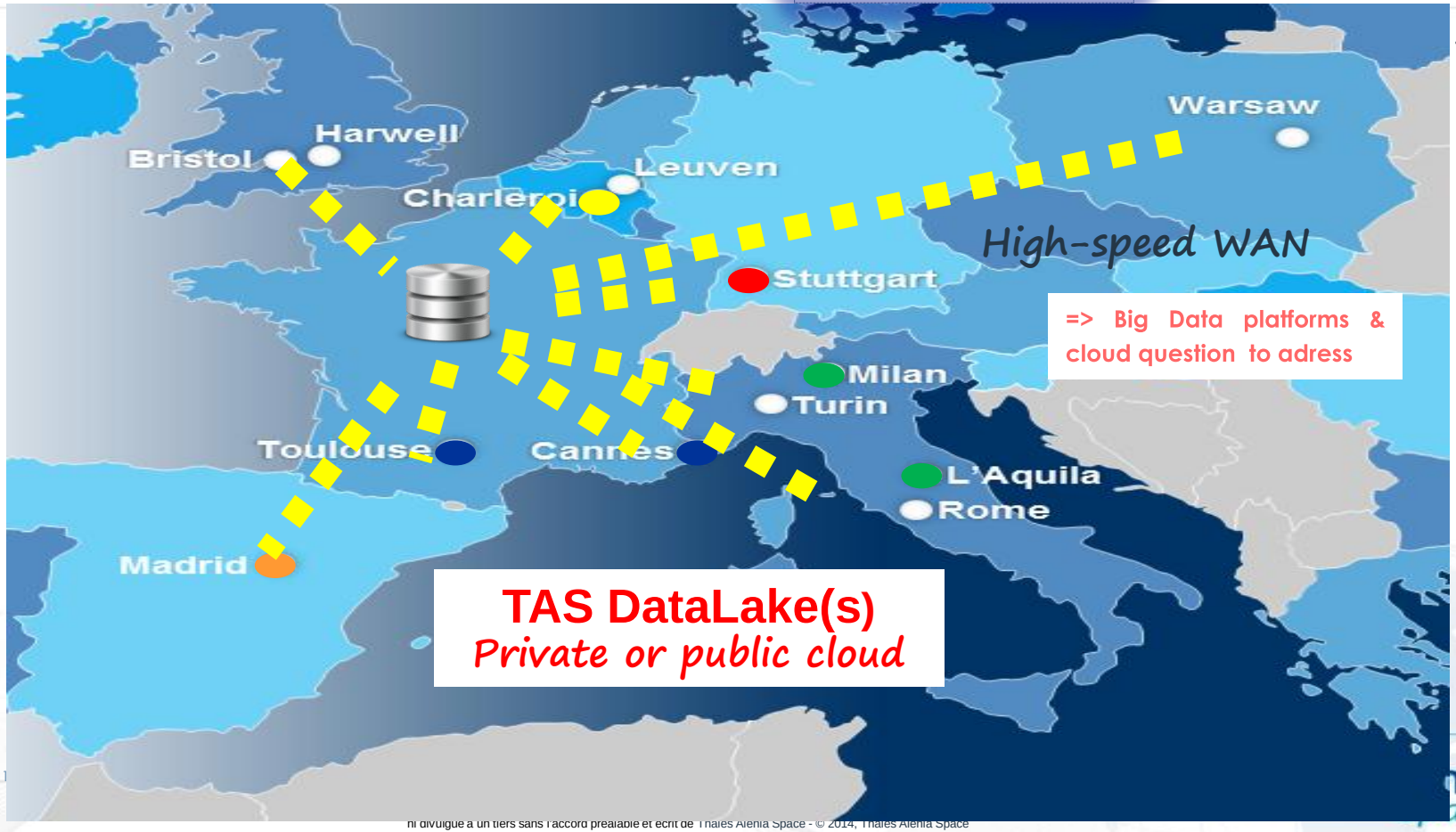
3. Big Data Infrastructure

Data is the heart of TAS factory 4.0



Organization & partnership

TAS-JV operational user teams

Thales group initiatives

TAS-JV Big Data project team

TAS local ecosystems

BLs strategic customers

- Project functional organization **gathering key TAS involvements** :
  - Use Case sponsors
  - TAS-JV expert teams (European teams)
- **Link with Thales group** initiatives :
  - Research teams (TRT, CENTAI,…)
  - Joined initiatives (ex HUMS Land systems)
- **Open Innovation with TAS local ecosystems** :
  - SCS GT Big Data & IoT,..

TAS Big Data Use Cases Theme examples

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Use Case Theme N° 25 : Big Data for test data

Description	Techno & Competence need	Success criteria
Use Big Data technologies to extract value from test data : • AIT • IVV	• NoSQL • Data Science • Machine Learning • Deep Learning	• Early detection of defaults via trends analysis of tests results in order to reduce non-quality costs • Quality & systematic anomaly tracking • Engineering process improvement: margin assessment, robustness analysis, model elaboration based on actual behaviours • Statistical control of products performances using Trend Analysis of all recorded test data

Use Case Theme N° 24: Avionic

Description	Techno & Competence need	Success criteria
Use virtual machines for simulations	• Cloud Computing	• Increase in speed to perform simulations • Save hours of engineering time • Easiness of access to engineering teams, easiness of programmation & results collection

Use Case Theme N° 23: Ground stations improvement

Description	Techno & Competence need	Success criteria
• Telecom QoE optimization • Enhancing SLA Analytics for Space Gate • Semantic GEOINT System • Export Satellite images interpretations • Image land cover classification • Quality image performance using deep learning • Exploitation of EO open data sources • Data science for ground segment	• Data ingestion & storage • Data Science • Deep Learning	• Improve engineering practices

Use Case Theme N° 22: TM & operations analysis

Description	Techno & Competence need	Success criteria
Use NoSQL database to store and query TM/TC	• NoSQL • Visualization tools	• Long term trends (on satellite hardware equipment) • TM and DP preview through a HTML/CSS Web interface • Storage of yearly report results for system comparison • Include others data (TC, docs) inside yearly reports

Use Case Theme N° 21: Log analysis

Description	Techno & Competence need	Success criteria
Exploitation and analysis of the ground system logs	• NoSQL • Distributed processing • Data Science	• Improvement of the performance of the maintance team in terms of anomalies analysis time. • Reduction of the number of raised anomalies by catching some problems before they constitute a real issue • Improvement of the operationnal ground system by integration of the concept and technology validated first in back office in the future version

Use Case Theme N° 20 : Defect detection

Description	Techno & Competence need	Success criteria
Using deep learning to automatically detect defaults on images in production	• Deep Learning on images	• Robotic inspection in AIT for SA panels, PCBs, others (for instance: soldering check) • Automatic detection of defaults in hybrid circuits manufacturing

Use Case Theme N° 19 : Equipement data analysis

Description	Techno & Competence need	Success criteria
Store and exploit all digitalized data available during production.	• NoSQL • Datalake • Data Science • Machine Learning	• To be able to get statistical process control from production data. • Understand root cause(s) of process variations.

Use Case Theme N° 17: AIT exploitation

Description	Techno & Competence need	Success criteria

Innovative IVVQ workflow base on cloud infrastructure :
- a Market Place composed by OCOE6, ECHO10, EGSCC…
- a set of data bases: e.g. InfluxDB, Cassandra, MongoDB…
- a set of visual analytics tools e.g. SHIVA, Grafana, Kibana…
	• Cloud Computing
	• PaaS
	• NoSQL
	• Datalake
	• Visualization tools
		• HW reduction, no HW maintenance or obsolescence
		• Time reduction for
		  • data analysis and retrieval
		  • automatic test reporting
		  • dashboard creation
		  • NCR processing
		• Future extension to novelty detection algorithms
		• Possibility to enlarge the perimeter to operations

Use Case Theme N° 15 : Intelligent Vizualisation

Description	Techno & Competence need	Success criteria
Visual tool to exploit all data from test campaigns from boards to satellite. Both historical and realtime data can be displayed and queried.	• NoSQL • Vizualisation	• Reduce time to elaborate test reports and Data Packages. • Reduce non Quality costs. • Mitigate risks, prevent failure and avoid failure propagation.

Use Case Theme N° 13 : Predictive maintenance of industrial means

Description	Techno & Competence need	Success criteria
Implement a Test Bench design-to-cost driven by flexibility, performances and assets reusability	• NoSQL • Data Science	• Optimize Test Bench design phase • Provide relevant predictions of performances in advance and avoid over sizing. • Predict ground equipments maintenance planning to minimize internal costs and reduce impacts on program schedules.

Use Case Theme N° 12: Data lake sharing

Description	Techno & Competence need	Success criteria
Manage engineering enormous amount of data	• Datalake • Distributed stores • Cloud computing	• Costs reduction in the Programme/Studies • Reduction of time lost in e-mail management, • More efficiency • Less time to search for the right information (user/role oriented e.g. equipment mass)

Use Case Theme N° 10: Planification improvement

Description	Techno & Competence need	Success criteria
Continuous optimization of telecom system planning	• NoSQL • Data Science	• Capacity increase linked to this approach leading either to a more capacitive satellite for the same price or a cheaper one for the same capacity

Use Case Theme N° 9: Enterprise Data Improvement

Description	Techno & Competence need	Success criteria
Analyze and correlate all engineering data: Engineering practices, HR, KPI, skills, project product metrics	• NoSQL • Datalake • Data Science	• Improve engineering practices

Other Use Case Theme example : Space Situation Awareness

Description	Techno & Competence need	Success criteria
Increase of in-orbit debris makes Space Situation Awareness very complex and generates needs for an automatic alert and collision avoidance service	• NoSQL • Machine Learning • Deep Learning	• Real time processing using heterogenous data (radar logs, ground-station tracks, satellite GNSS outputs, etc…) • Collision awareness algorithm on huge number of trajectories

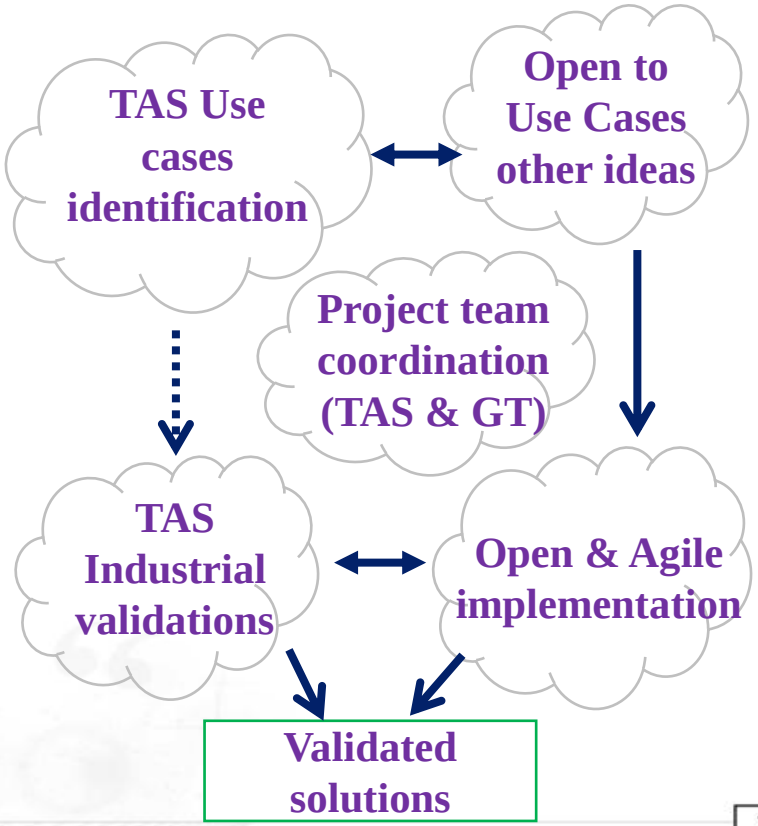
Other Use Case Theme example : Satellites images interpretation

Description	Techno & Competence need	Success criteria
Fusion of satellites proprietary data with other sources of information (Ground sensors, Web data…)	• Datalake • Data Science • Data Fusion	• Improve engineering practices

Other Use Case Theme example : Surveillance of critical sites by Stratobus

Description	Techno & Competence need	Success criteria
Detect abnormal situations using Stratobus data to monitor critical sites (border surveillance, critical infrastructures)	• Deep Learning	• Exploit a subset of simulated data available to evaluate qualitatively the capacity to track targets with videos from space.

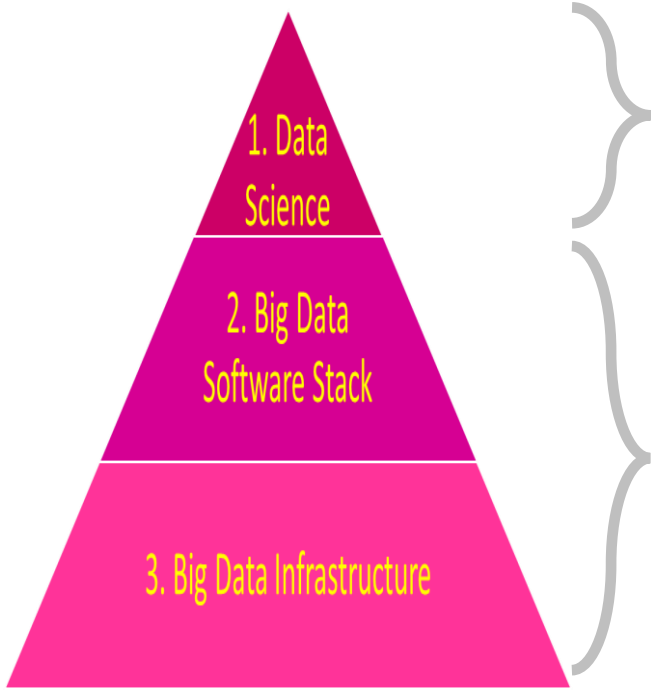
Open innovation with SCS GT participants



- **Open innovation on uses cases process** :
  - 23 FoF Use Cases identified by TAS to share
  - Other potential subjects (ex Stratobus UC, ..)
  - Open to partners ideas (new themes or improvement)
- **Open innovation on implementations** :
  - To find the best solutions for each themes
  - Open to partnership
  - Validation teams available for industrial cases (factory of the future)

⇒ **Obtain validated solutions, ready for market deployment**

Needs & next step



Hiring plan / academy cooperation :

- Find best competencies to increase competency on the long term (TAS & partners)
- Identify PACA university programs & optimize if needed (initial & training)

Implement use cases with needed competencies :

- Data science, Machine Learning, Deep Learning
- Big Data SW stack and databases tools
- Framework / Architectures / Cloud, Open sources integration
- Virtualization + test of new architectures optimized for Big Data

Next step :

- Identify all interested partners from SCS GT
- Organize ½ day Workshop & challenge to detail / discuss corresponding use case
- Start projects with best time to market (first deployments target mid-2017)
- Propose R&D SCS project for complex use cases (SCS Project)

=> Dedicated Workshop with interested partners and Thales Use Case Experts, to organize early April (TBC 7/4)