More than Particles

HOW ACCELERATORS CAN SPEED UP ADVANCED MANUFACTURING … AND WHAT'S NEXT

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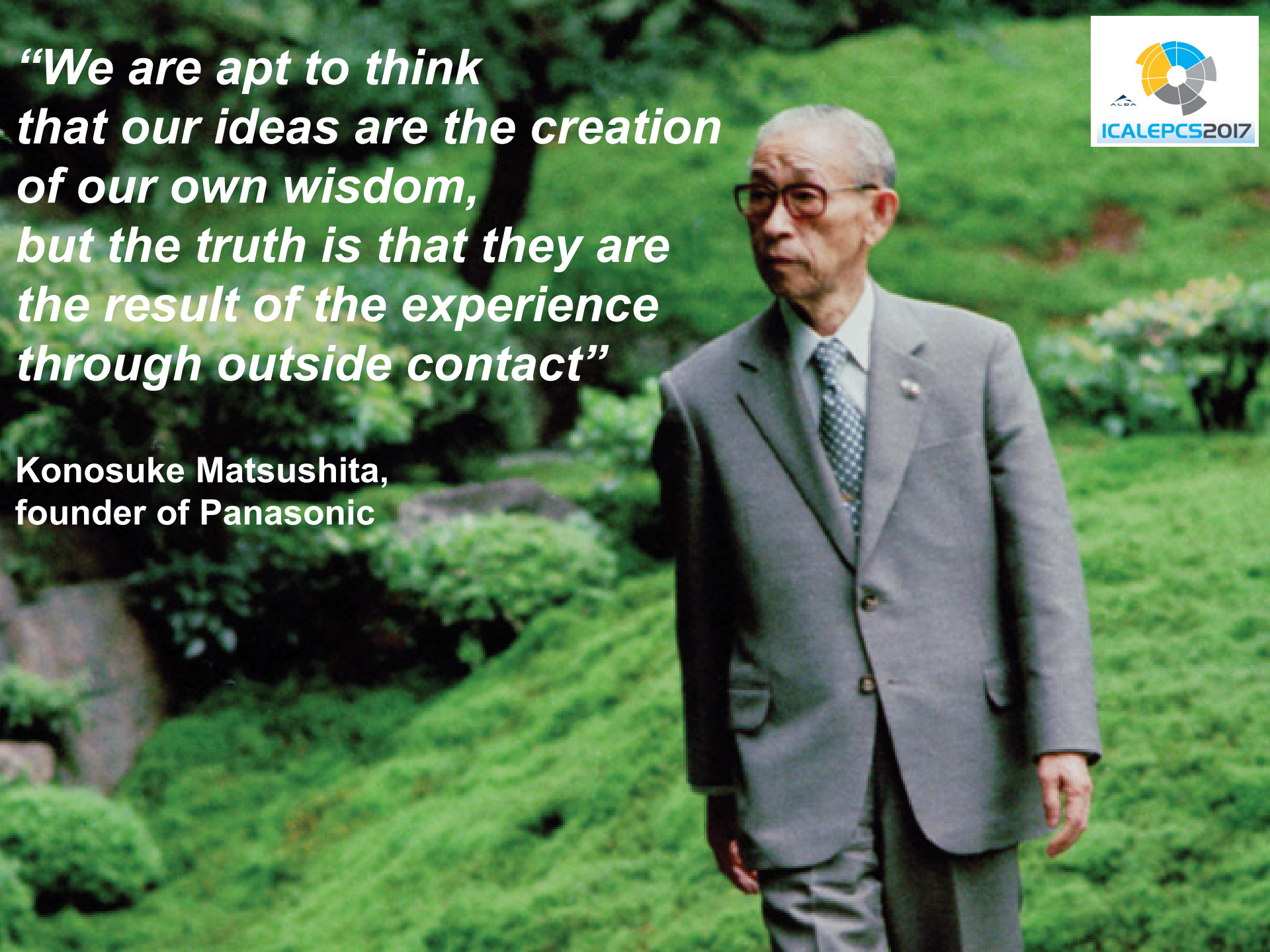
Paris-Saclay

12 October, 2017

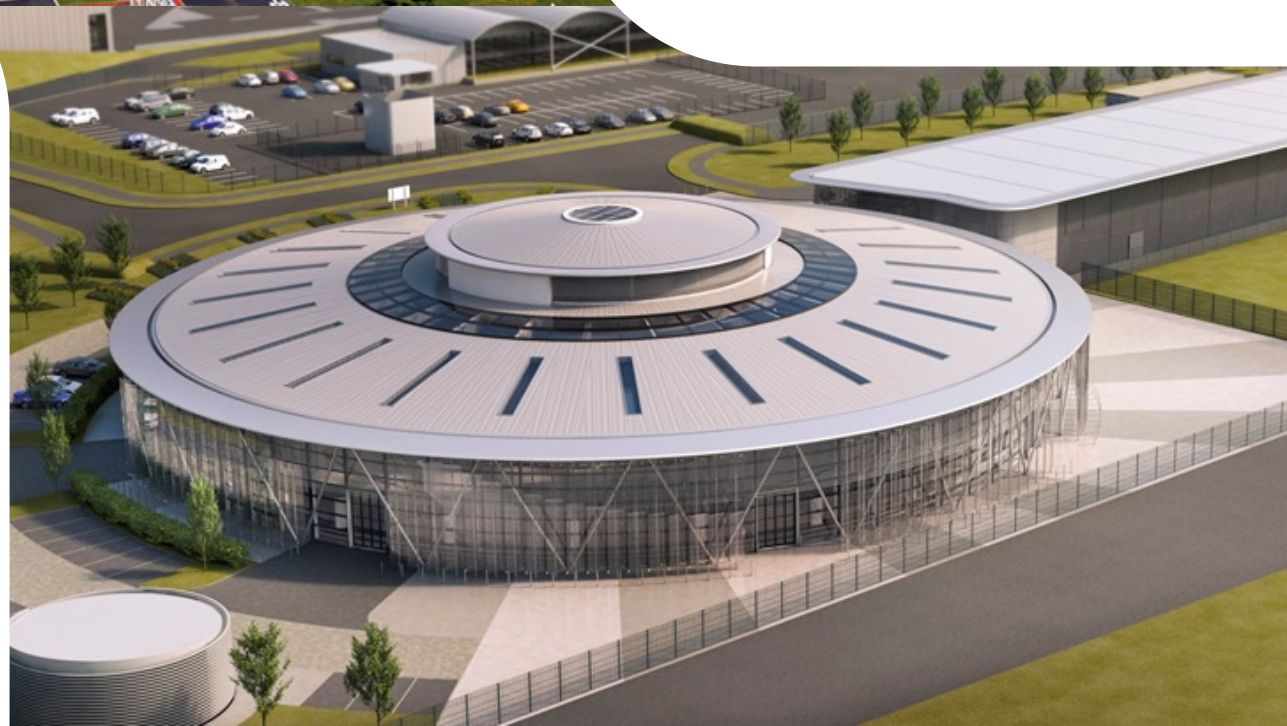
ICALEPCS2017


“We are apt to think
that our ideas are the creation
of our own wisdom,
but the truth is that they are
the result of the experience
through outside contact”
Konosuke Matsushita,
founder of Panasonic
ALBA
ICALEPCS2017

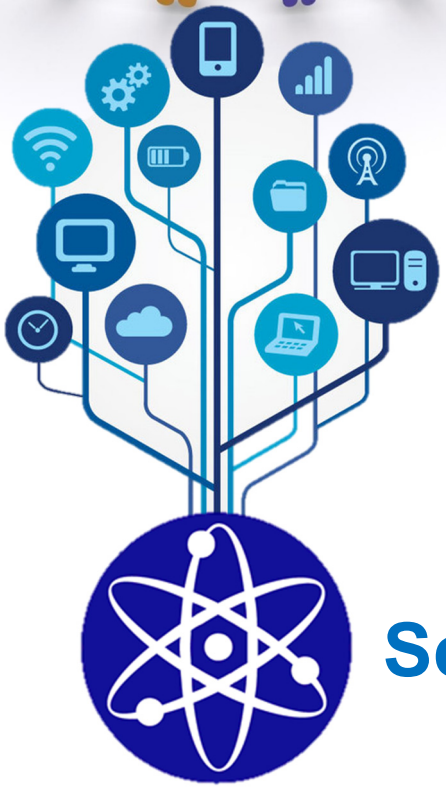
ICALEPCS2017

Particle accelerators and Advanced Manufacturing testbeds

… no connection?



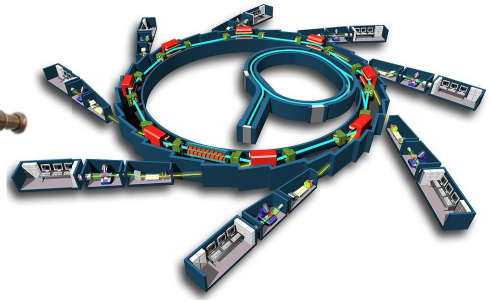
New infrastructures, instruments and tools enable scientific discoveries… but also progress in other areas



Technology

Instruments

Science



Industry 4.0

The fourth industrial revolution is being enabled by a digital revolution

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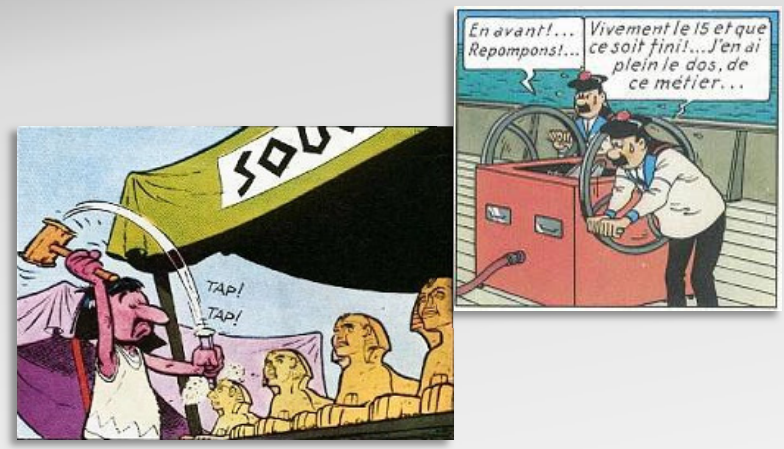
The fourth industrial revolution is being enabled by a digital revolution

1st industrial revolution
1775 - Vapour



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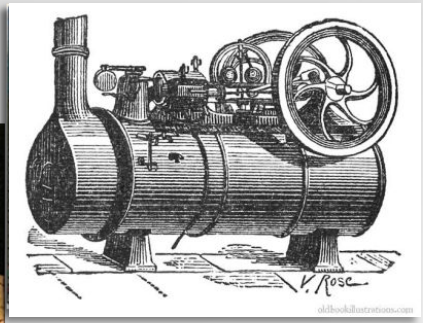

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The fourth industrial revolution is being enabled by a digital revolution

1st industrial revolution
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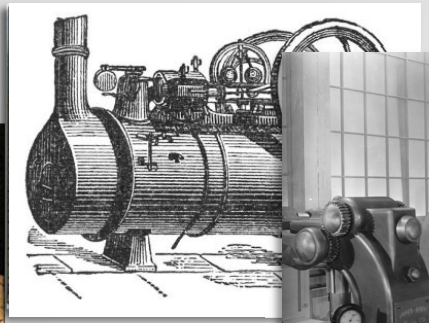
2nd industrial revolution
1900s - electricity



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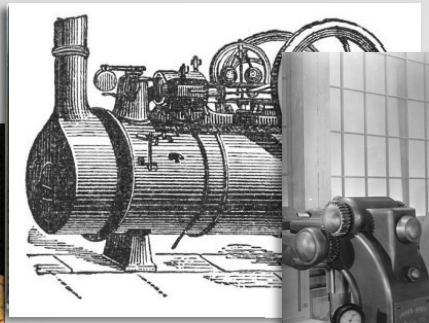
2nd industrial revolution
1900s - electricity

3rd industrial revolution
1960s - robotics



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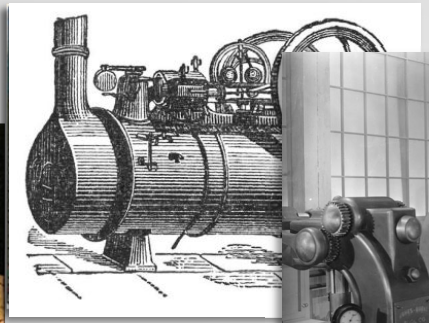
The fourth industrial revolution is being enabled by a digital revolution

1st industrial revolution
1775 - Vapour

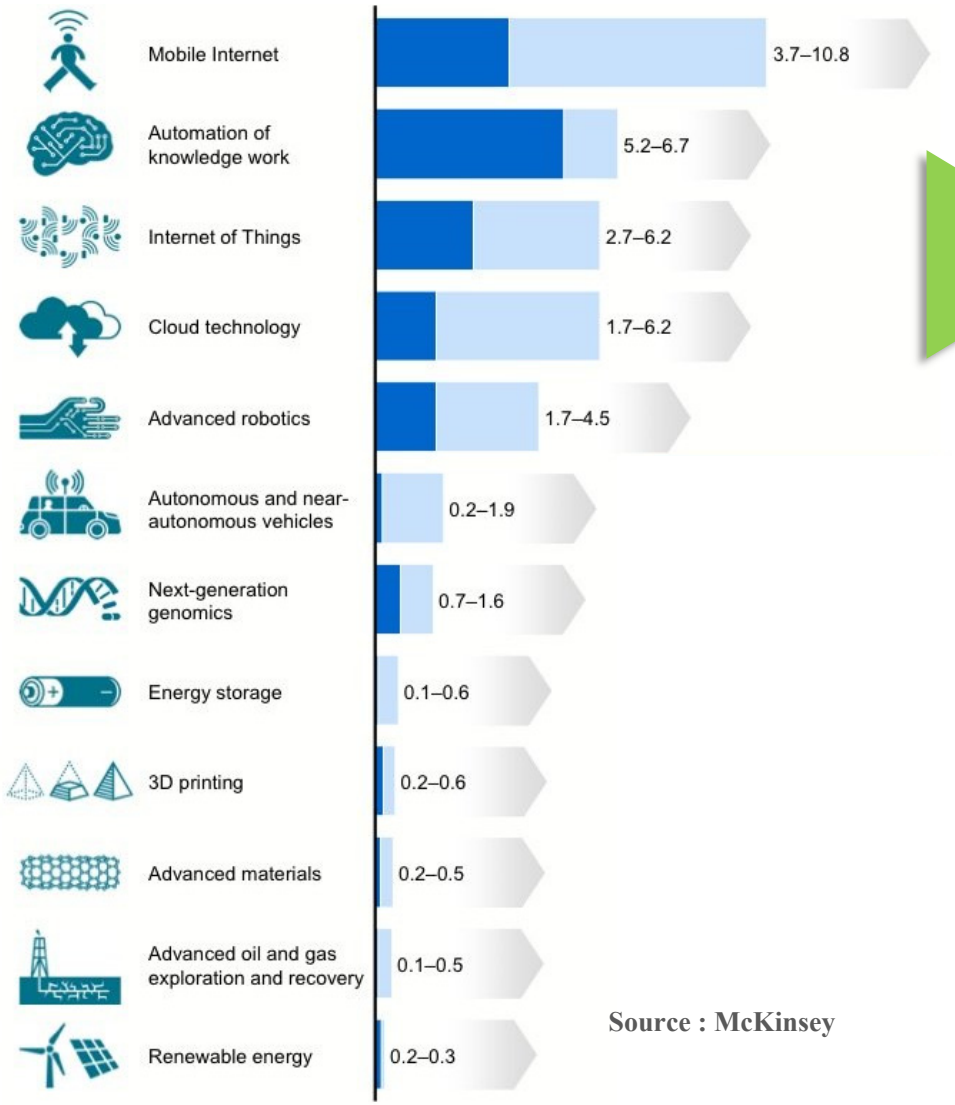
2nd industrial revolution
1900s - electricity

3rd industrial revolution
1960s - robotics

4th industrial revolution
2010s – Connected cyberphysical systems



Advanced Manufacturing: economic impact measured in $trillion by 2025



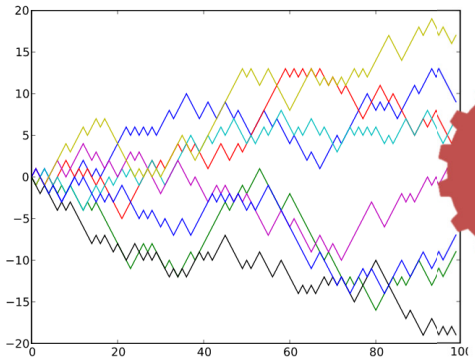
Source : McKinsey

More flexible, agile, robust manufacturing systems

What's in it for us?

Industry 4.0 What's in it for us?

Market changes → Product → supply chain → manufacturing networks → **reaction**



In our hyperconnected world, market preferences change fast … and companies struggle to adapt

Industry 4.0 What's in it for us?

Change is hardest for small companies: in Europe, 2/3 of private sector jobs and 85% of job growth

Need knowledge, money and ability to take risks

It is easier to move bits than atoms – a physical manufacturing footprint is a source of wealth

Industry 4.0

Our efforts at

- RESEARCH AND TECHNOLOGY INSTITUTE
- ROBOTICS, CYBERPHYSICAL SYSTEMS AND ARTIFICIAL INTELLIGENCE
- 200 INDUSTRIAL PARTNERSHIPS
- NEXT TO SOLEIL IN PARIS-SACLAY CAMPUS

FACTORYLAB
PLATEFORME POUR L'INDUSTRIE DU FUTUR

FUTURE FACTORY @ LORRAINE

INDUSTRIE DU FUTUR

EFFRA
EUROPEAN FACTORIES OF THE FUTURE RESEARCH ASSOCIATION

MANUFUTURE-EU

+20 PILOT PROJECTS IN FRENCH FACTORIES

TECHNOLOGIES IN SERVICE IN OVER 40 COUNTRIES

ALL INDUSTRIAL SECTORS

Industry 4.0

What are we trying to accomplish?

- Accelerate deployment of new technologies
- Involve value chains, not individual companies
- Develop and demonstrate flexible, agile production systems
- Reduce time and cost to change production line
  - Product
  - Rate

FUTURE FACTORY @ LORRAINE




Industry 4.0

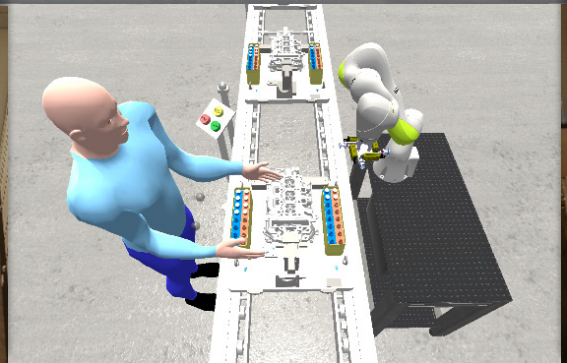
The FLOR story

FUTURE FACTORY @ LORRAINE

Industry 4.0 The FFLOR story

The FFLOR concept:

- Access to new technologies
- Working in value-chain ecosystems
- Agile methodologies



Industry 4.0 The FLOR story

FUTURE FACTORY @ LORRAINE

- Inaugurated Jan 2017
- 12 partners from across Europe
- SMEs and large industrial groups
- Defining together concrete agile, flexible manufacturing processes
- Building pilot lines

ABB
GRUNDFOS
thyssenkrupp
PSA GROUPE
Schneider Electric
socomec Innovative Power Solutions
fives
ER INGENIERIE Equipement Réalisation
asti
SEW USOCOME
OPTEAMUM
WM 88




We have similar problems

FUTURE FACTORY @ LORRAINE

- Cyberphysical systems for manufacturing experiments
- Digital supervision to configure pilot cells and lines
- Systems modularity, service-based approach to reconfigure processes quickly

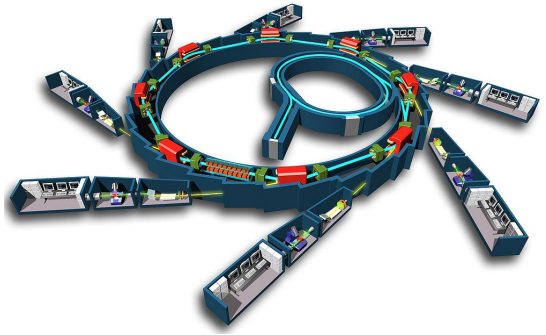
SOLEIL SYNCHROTRON

- Cyberphysical systems for scientific experiments
- Digital supervision to monitor operations and experiments
- Systems modularity, service-based approach to reconfigure processes quickly

TANGO

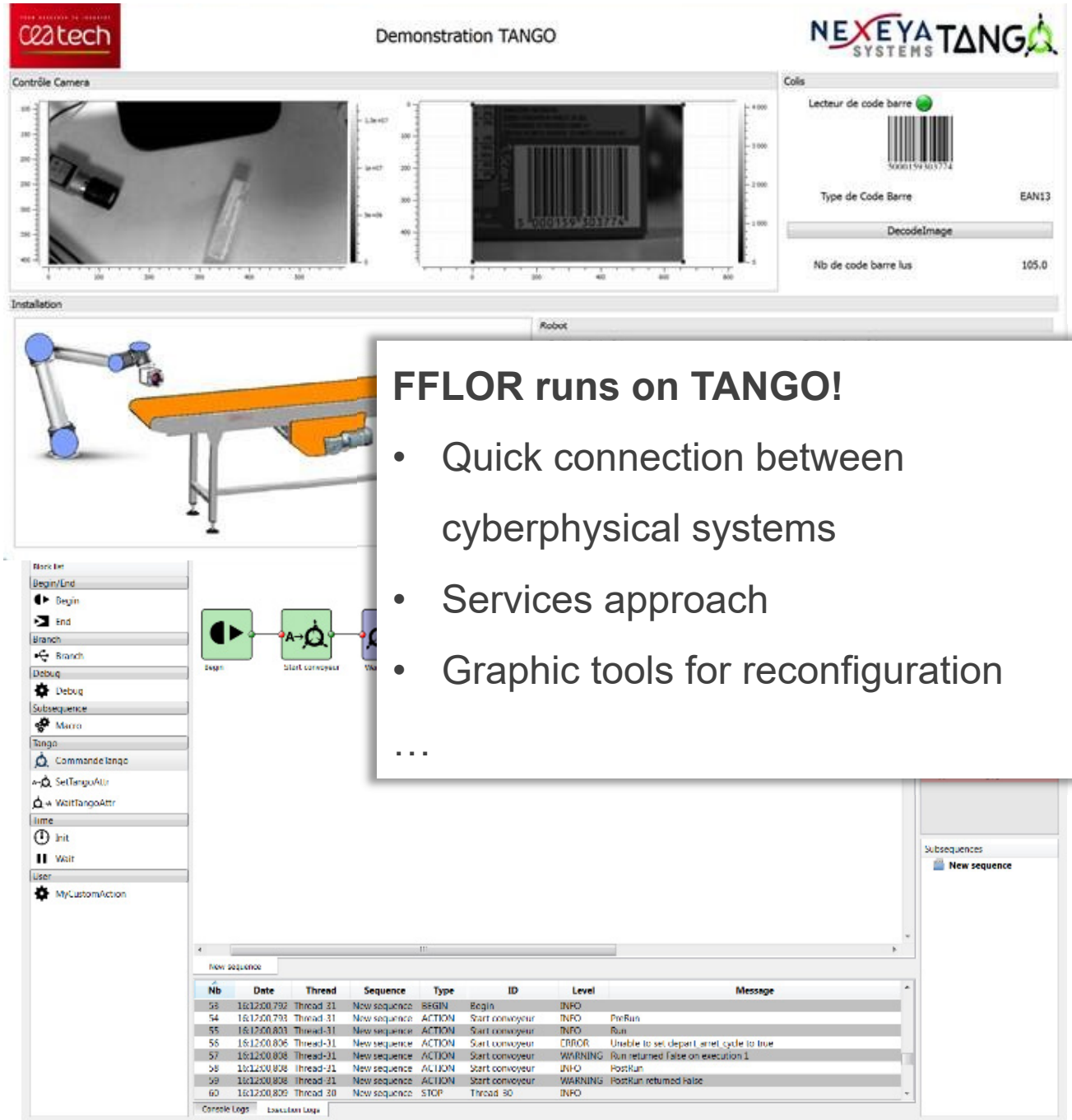
SIEMENS

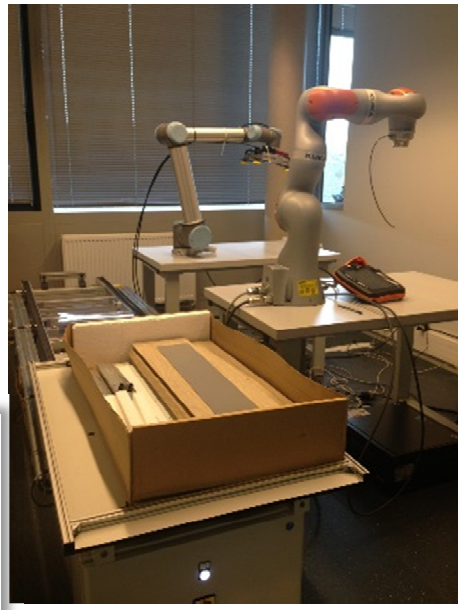
PLCs



It always comes down to the people…


Demonstration TANGO
NEXEYA SYSTEMS TANGO
Contrôle Camera
Colis
Lecteur de code barre
Type de Code Barre
EAN13
DecodeImage
Nb de code barre lus
105.0
Installation
Robot
Position Articulaire
Position Articulaire
Vitesse / Accélération
Begin
End
Branch
Debug
Macro
Commande tango
SetTangoAttr
WaitTangoAttr
Init
Wait
MyCustomAction
Start convoyeur
Wait_colis_au_poste
StartRobot
Wait
StopRobot
Libere palette
Property
Value
BlockID
Properties
Parameters
Extra
Subsequences
New sequence
Nb
Date
Thread
Sequence
Type
ID
Level
Message
Console Logs

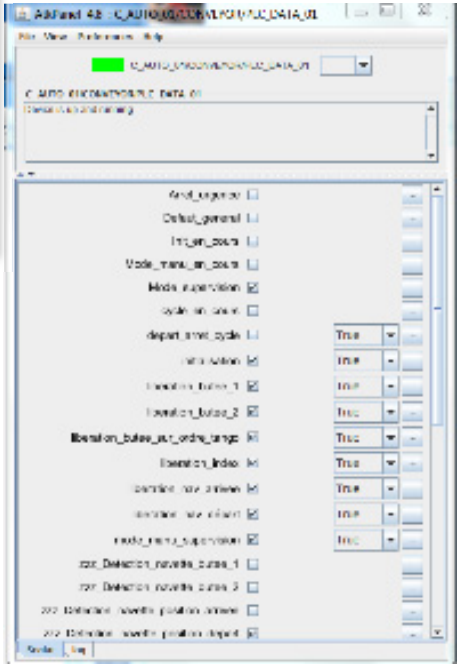




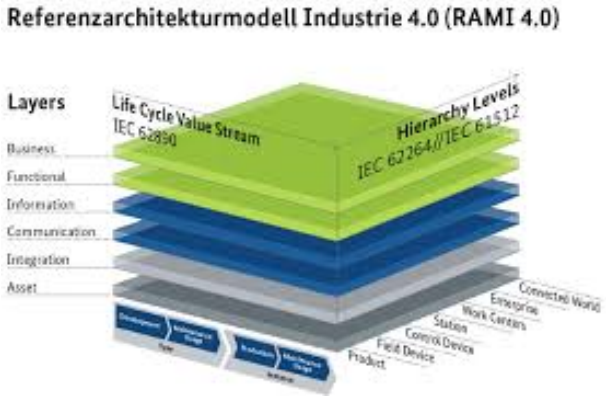
FFLOR runs on TANGO!

- Quick connection between cyberphysical systems
- Services approach
- Graphic tools for reconfiguration

…



Beyond FFLOR?



OPC UA

ROS

...

Industry 4.0 standards emerging but not yet stable

Direct application or « borrowing » concepts: the benefits are still there

Two examples: #1

Improve productivity

Machine workshop

Existing process:

- Manual loading / unloading of machines
- Small margins, impossible to compete internationally

New process:

- Automatic loading and unloading
- Plug and play!
- Machinery left running overnight
- Productivity > +50%

Two examples: #2 – furniture industry

Reconfigure line quickly

Packaging line

TANGO controls

Existing process:

- Easy tasks already automated
- Manual packaging
- Low productivity on manual line
- Low flexibility on auto line

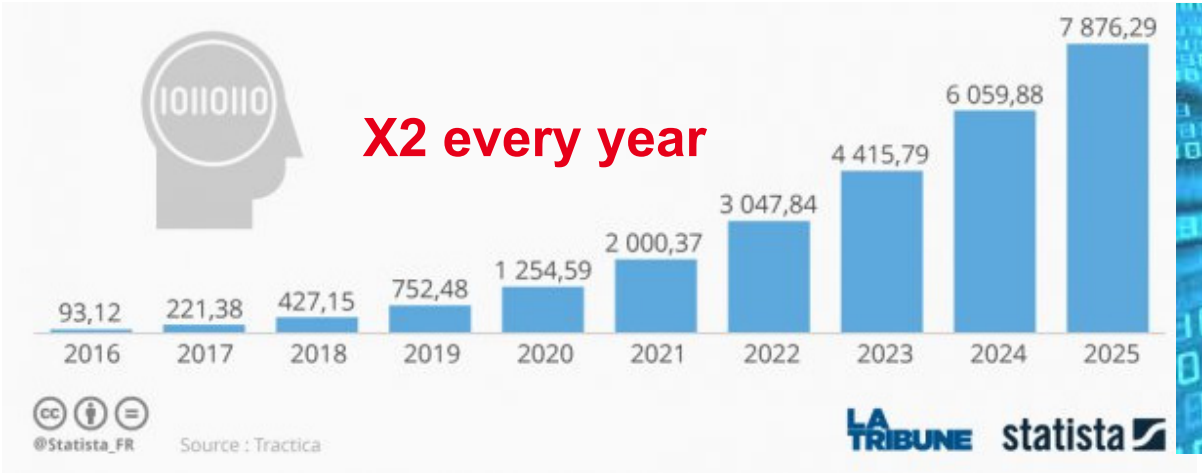
New process:

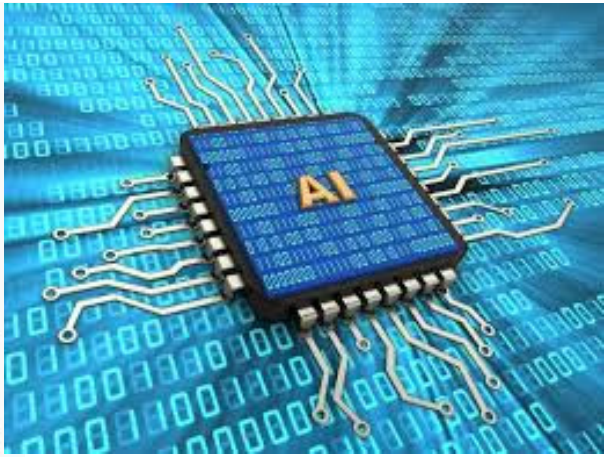
- On-demand automation
- Easy to reprogram
- Flexible, productive hybrid line

Industry 4.0 … what's next?

- Artificial Intelligence → **More flexible, robust automation, decision support**

Impact of AI in Europe





- **5-year plan**
- >1000 m € for R&D
- 250m€ for startups
- First initiative:

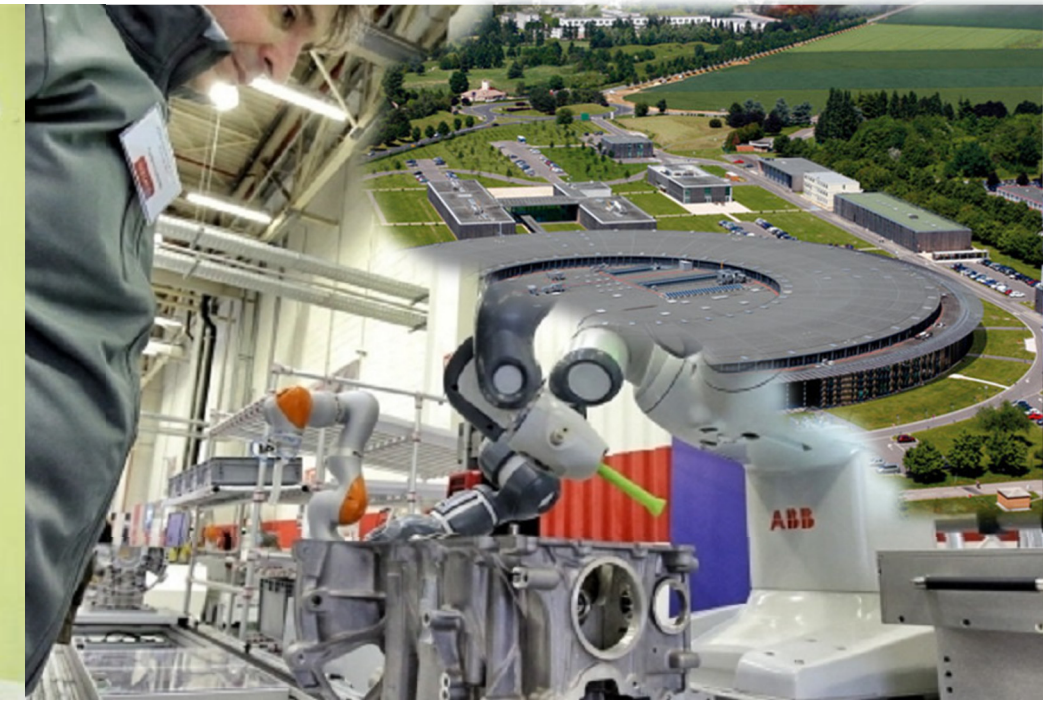
  DigiHall – Paris-Saclay

Industry 4.0 – connectivity, artificial intelligence, agile value networks, flexible systems, collaborative robotics…

What's in it for **humans** ?

Leave robot jobs to robots
→ more human jobs for humans

We are wired to explore, experiment, build, imagine and create…



No activity is more human than looking for solutions to difficult problems in unexpected places… or looking for unexpected problems that our solutions could solve.

Thank you!