



Emerging Technologies



Lightning  Round

Presenters

Jamey Capers, RCNET - *Nuclear*

Steve Kane, SpaceTEC - *Aerospace*

Andrew Hoff, SCME - *MEMS*

Ernie Friend, CTC - *Information Technologies*

Chrys Panayiotou - *Lasers*

Marilyn Barger, FLATE - *Advanced Manufacturing*



James Capers

Nuclear Power Technology



Bringing the power of the atom *into human hands*

Tomorrow's Ideas

Nuclear Medicine

Nuclear Manufacturing

Nuclear Remediation

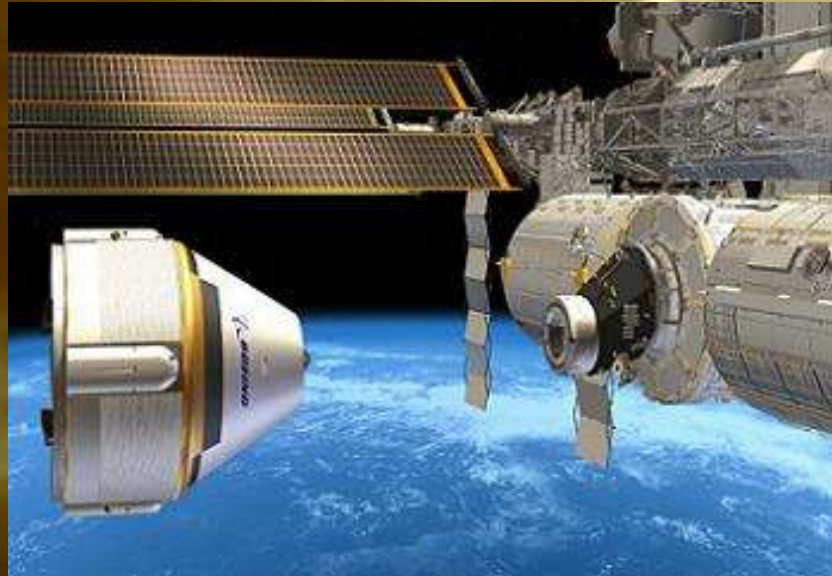
Modular Nuclear Reactors

Simulated Training Platforms



Steven Kane
Aerospace

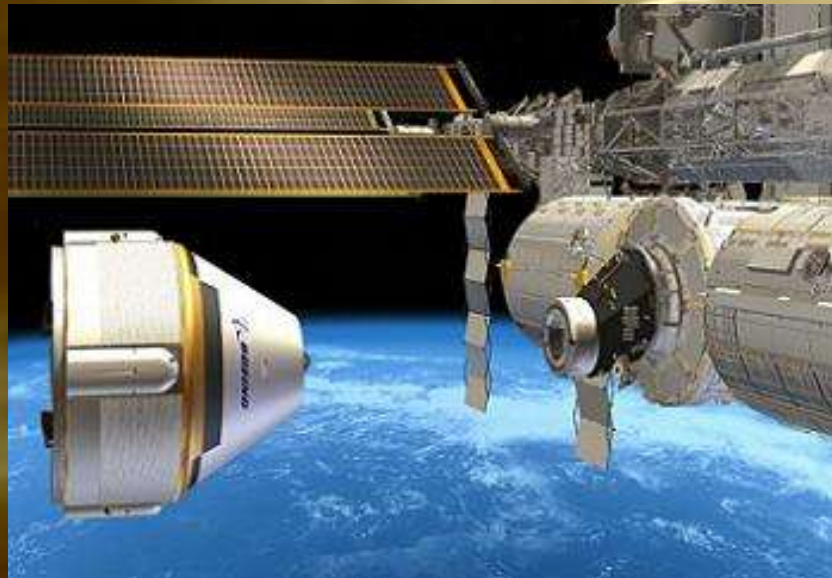




CCtCap follows CCDEV 1, CCDEV 2 and Commercial Crew Integrated Capability (CCiCap) rounds of the CCDev multi-phase space technology development program

Boeing and SpaceX share of NASA's Commercial Crew Transportation Capability (**CCtCap**) award:





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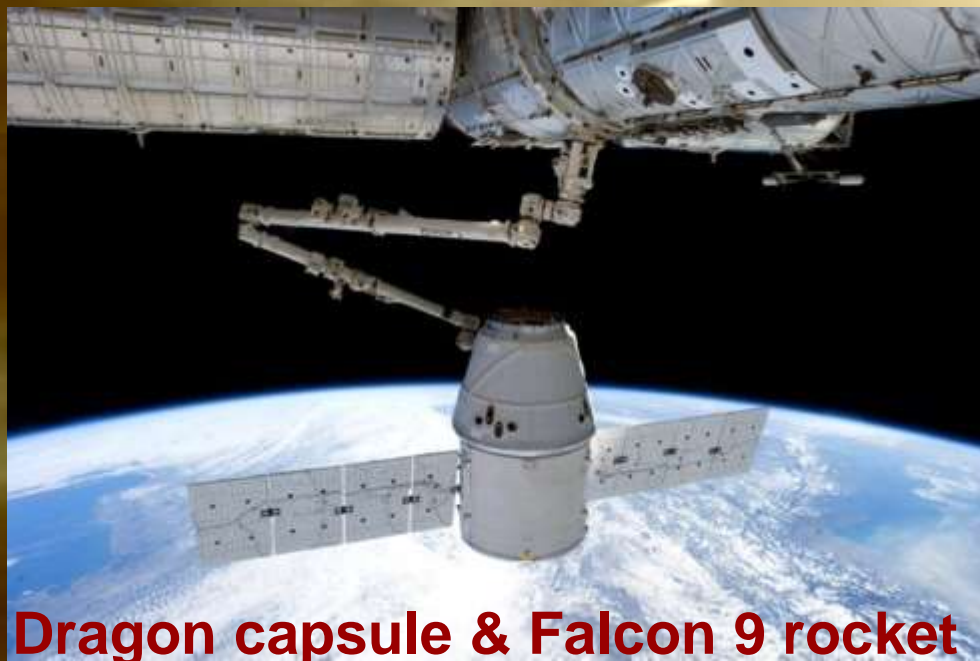
Boeing develop CST-100 capsule, move up to seven people to/from International Space Station (ISS) and the planned Bigelow Aerospace Orbital Space Complex in Low Earth Orbit (LEO) atop a Lockheed Martin Atlas V launch vehicle.

First launch is set for 2017.

SpaceX will develop the Dragon 2 spacecraft in parallel, to deliver crew of seven to LEO atop a Falcon 9 launcher.

First launch is still TBD.





Dragon capsule & Falcon 9 rocket

Both share \$3.5 billion NASA contract to fly twenty unmanned resupply missions to the International Space Station (ISS).



Cygnus Spacecraft and Antares Rocket

Manufacturing is already in space!

On Sept. 21st, the first zero-G 3D-printer was delivered to the International Space Station aboard a SpaceX Dragon spacecraft thereby reducing the need for astronauts to load up with every tool or spare part they might conceivably need.



Made In Space, Inc. www.madeinspace.us



Boeing CST-100 capsule uses tablet technology and is designed to be reused up to ten times.



first unmanned orbital test flight is scheduled for November 2016.



Sierra Nevada Corporation's Dream Chaser® spacecraft

will launch aboard a Lockheed Martin Atlas V rocket or an Ariane rocket and land on the same runway as the Space Shuttle orbiters once did.

Re-useable Space Craft

SpaceX uses 100% 3D printed Super-Draco engines.

First vehicle with an additive manufactured rocket engine to go to space.





Habitat in Space

The International Space Station (ISS) is one of the greatest endeavors in the history of engineering, science, and technology. It is the only facility available to investigate the physiological and psychological effects of long duration spaceflight on humans in preparation for deep space endeavors.

Bigelow Aerospace's expandable habitats launch in compact form and inflate upon reaching space. The "private space stations" will be available for many purposes, from research to tourism and eventually the moon and Mars.



Space Launch System (SLS) Multi-Purpose Crew Vehicle (MPCV) Orion spacecraft atop a United Launch Alliance (ULA) Delta IV Heavy is set for it's first flight in December 2014



Deep Space

Work on Orion continues today, renamed SLS.



XCOR® Lynx®, a piloted, two-seat, fully reusable liquid rocket-powered spacecraft that takes off and lands horizontally, will rocket customers to space and back.

Lynx®'s lightweight and strong all-composite airframe will allow it to depart a standard runway, obtain suborbital flight and return safely to the same runway.



Virgin Galactic's SpaceShipTwo (SS2), designed for a crew of two and six passengers, expects the first manned flight in early 2015. Virgin has more than 700 reservations — including those from notables such as Lady Gaga, Stephen Hawking and Angelina Jolie. Each have paid as much as \$250,000 for the 20-minute ride.



Photo by MarsScientific.com and Clay Center Observatory

XCOR® Lynx®, a piloted, two-seat, fully reusable liquid rocket-powered spacecraft



Lynx®'s lightweight and strong all-composite airframe will allow it to depart a standard runway, obtain suborbital flight and return safely to the same runway.

Suborbital Rocket Planes



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Photo by MarsScientific.com and Clay Center Observatory

XCOR® Lynx®, a piloted, two-seat, fully reusable liquid rocket-powered spacecraft



And for the really adventurous...

Suborbital Rocket Planes





Drew Hoff

Micro/MEMS/Nano Technology

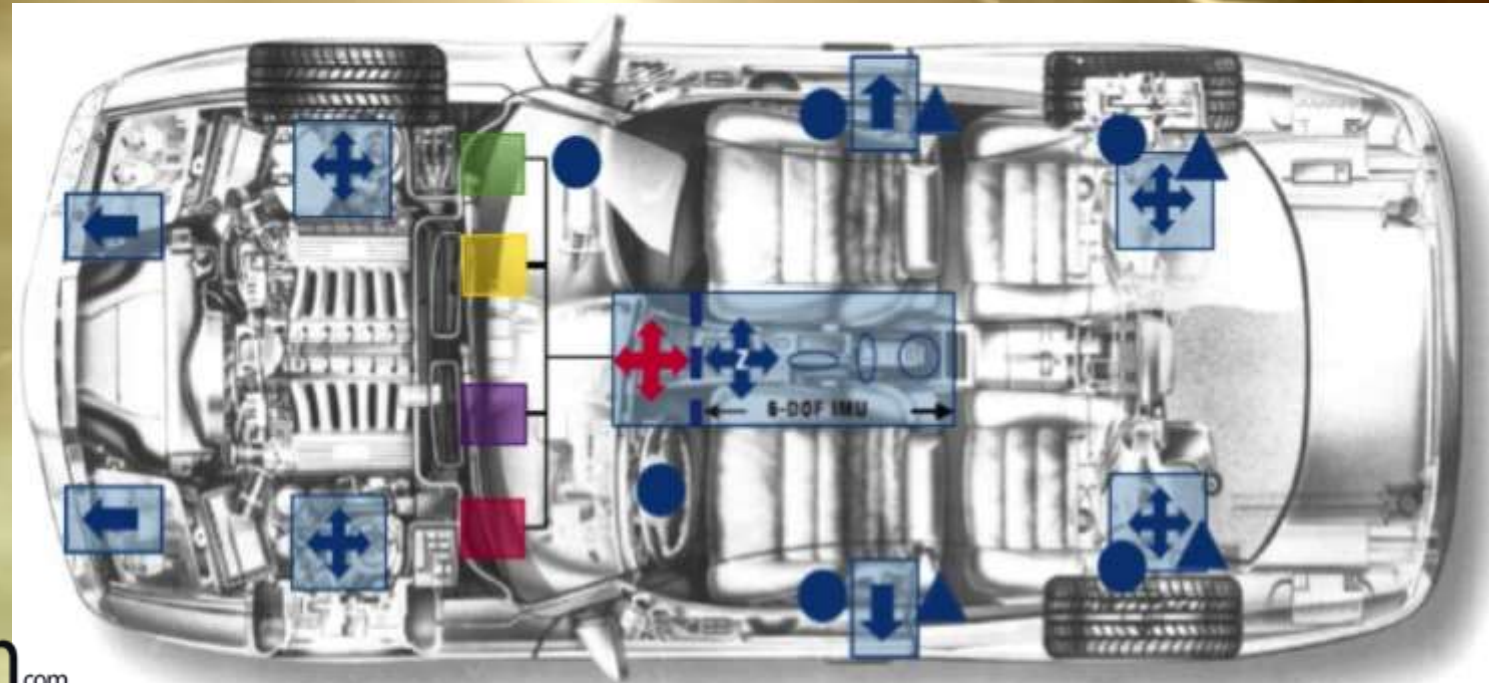


Bringing thing to scale

Small scale systems are all around us



teardown.com



- Crash Detection System
- VEHICLE DYNAMIC CONTROL SYSTEM
- NAVIGATION/DRIVER INFORMATION SYSTEM
- Body/Chassis Control System

↑ SATELLITE SENSOR

+ Dual-Axis Airbag Sensor

+ LOW g CHASSIS CONTROL SENSOR

● AIRBAG

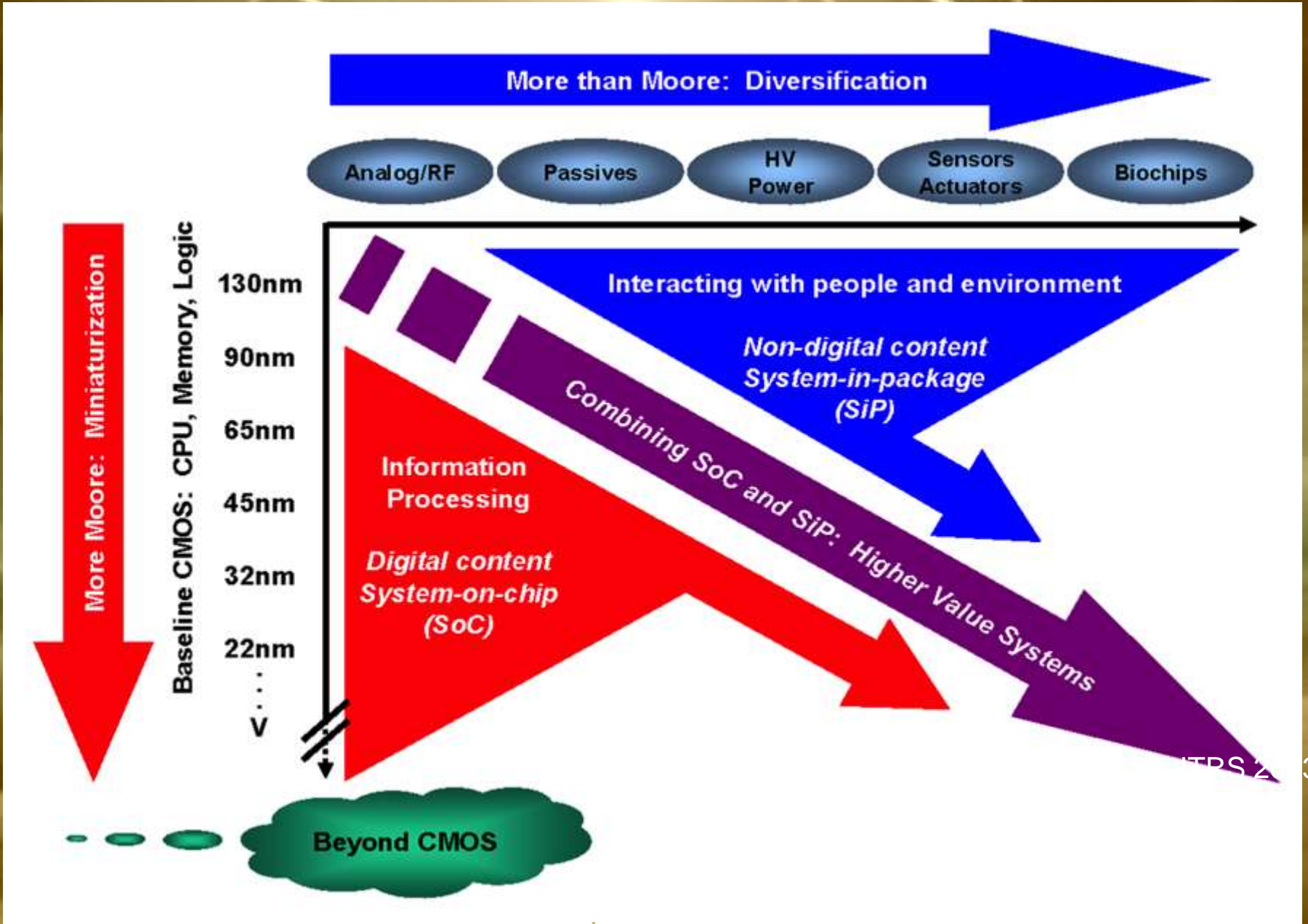
▲ SEATBELT PRETENSIONER

○ Dual-Axis Airbag Sensor

ITRS 2013, MEMS



Technology Drivers for Manufacture



Challenges for Engineering Technology Educators



ET-Electronics Systems Integration

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Skill sets required

- Specifications
- Fabrication
- Assembly
- Packaging
- Test



Manufactured by companies with locations in Florida.



Florida Department of Education
 Curriculum Framework -July 2010
 Program Title: Engineering Technology
 Specialization Tract: Advanced Technology
Demonstrate proficiency-
 Soldering & basic laboratory practices
 Surface mount soldering
 Fiber optics terminations
 Instrumentation Fundamentals
 Destructive & non Destructive Testing
 Composite Fundamentals

Wearable Technologies

Devices		Applications
Accelerometers		Caloric Consumption
Gyroscopes		Exercise Intensity
Magnetometers		Exercise Safety
Pressure Sensor		Sleep Patterns
Microphone		Heart Rate
Temperature Sensor		Blood Pressure
Conductivity Sensor		Walking Directions
Camera/Optical Sensor		Gas Monitor
Micro Speakers		Altitude
eNose		Motion
pH Sensor	Shock	
Humidity Sensor	Messaging	
Galvanic Skin Response		Emergency Response

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ELTEQ – Largo Florida

Educator Resources Supporting the STEM Practice Educational Community

SCME-NM.ORG
 Southwest Center for Microsystems
 Education

Order Kit
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Educational Materials
Partners
SCME Events
Careers
About Us
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NUE Grant

Search...

Educational Materials
 Materials_Catalogue
 Hands-on_Kits
 SCME_YouTube
 Dr. Pleil's YouTube

SCME Home ▶ Educational Materials

Washington Monthly has just released its college rankings list, SIPI is ranked 35th among the US top 50 colleges list! See: [Community College Rankings 2010 | Washington Monthly](#)

Login Form

User Name



Ernie Friend

Information Technology



Cloud Computing

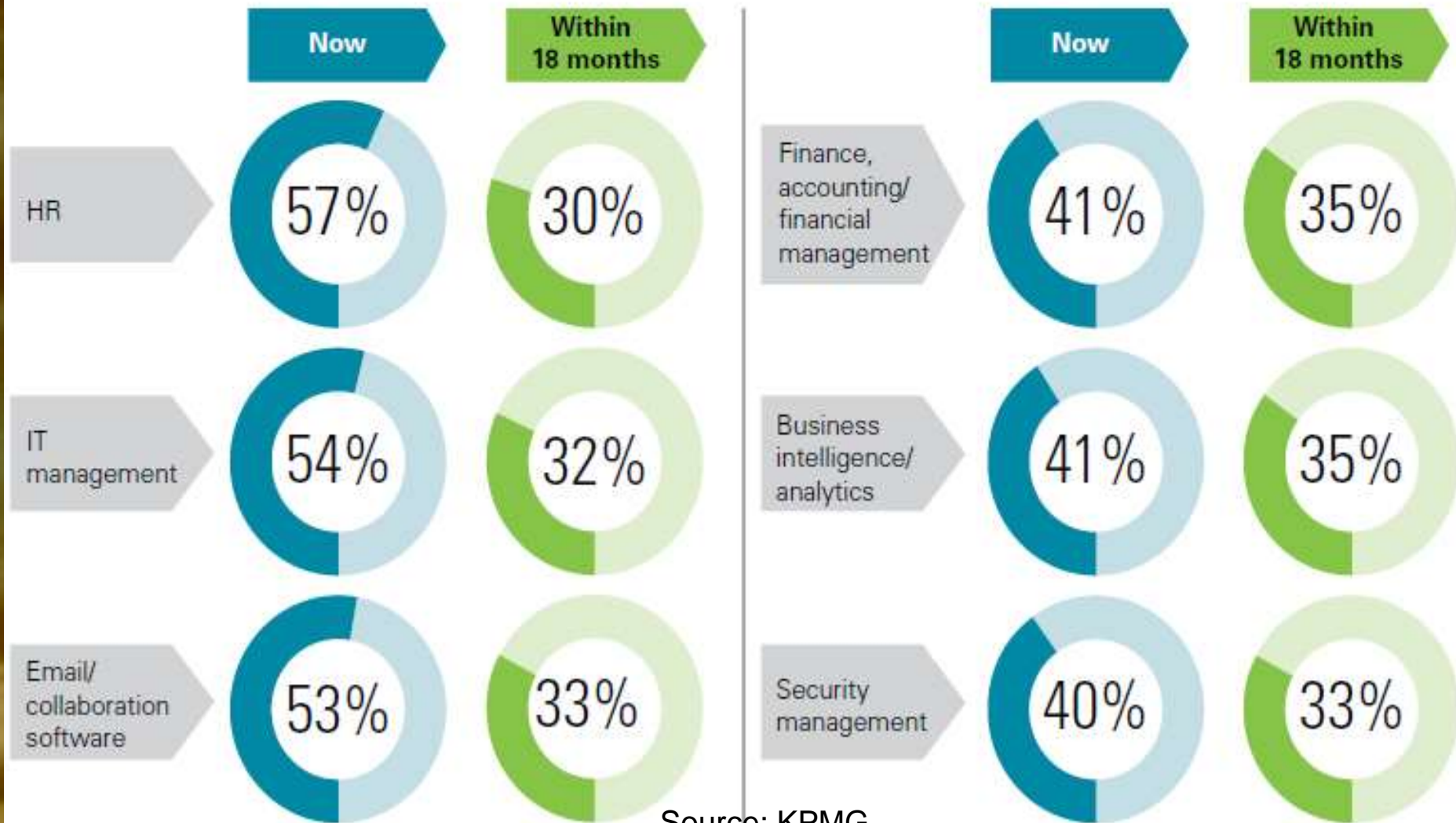


There is no longer any doubt that, as a critical set of enabling technologies, cloud can significantly impact how any organization begins to become more mainstream within the business environment, we are seeing organizations move from the “when and why” of the cloud adoption to instead focus on the “how”

(source:KPMG)



In which functional area of your business are you using cloud-enabled services today, and which are you likely to adopt within the next 18 months

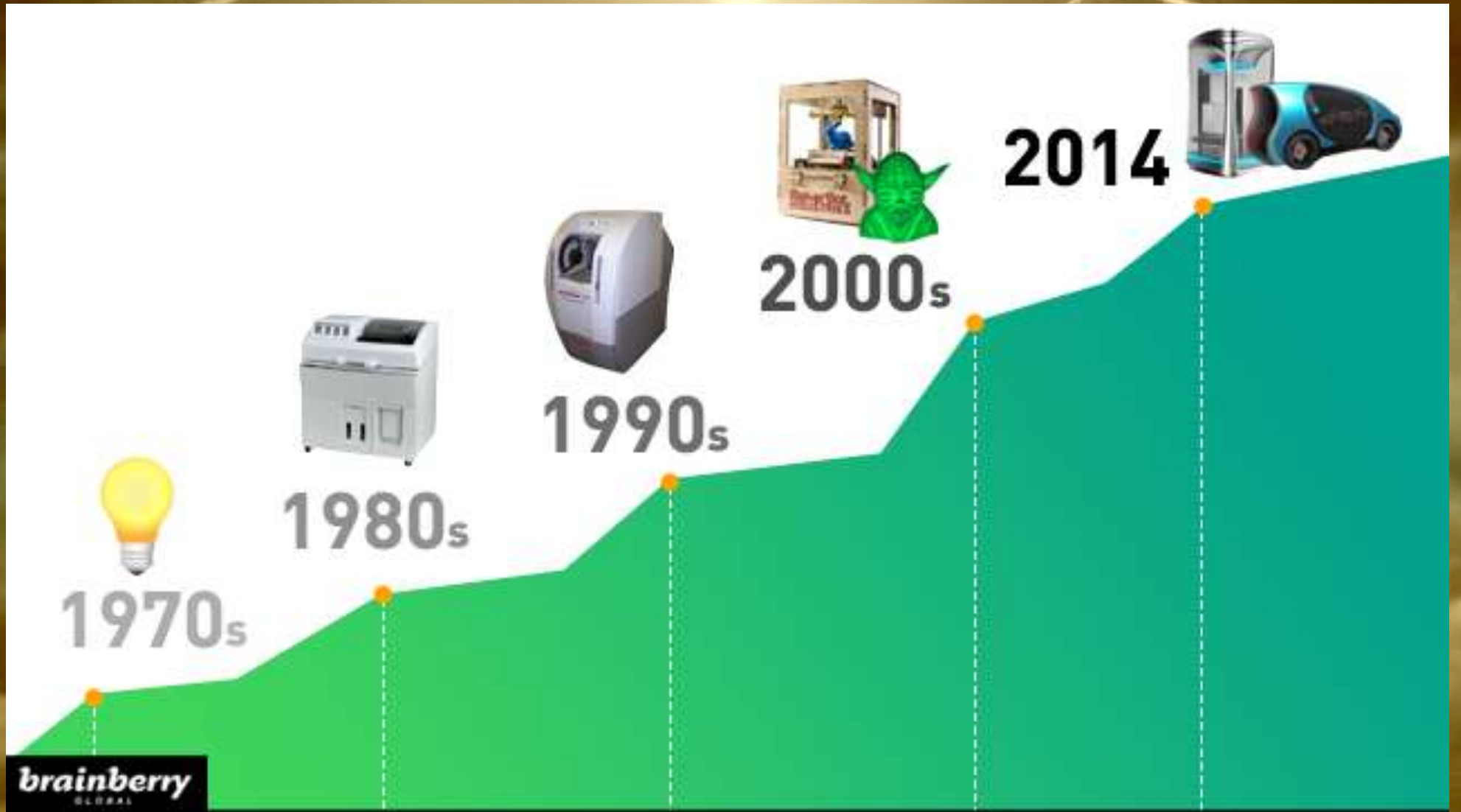


Source: KPMG



3D Printing






brainberry
GLOBAL



The size of the global market, including 3-D printer sales, materials and associated services, is predicted to reach \$16.2 billion by 2018, according to independent research company Canalys. Its estimates show the sector stood at \$2.5 billion globally in 2013 and will rise to \$3.8 billion in 2014. And in five years the company believes the market will grow by over 500 percent with a year-over-year growth rate of 45.7 percent.

Source: Matt Clinch CNBC



A dramatic landscape featuring a large, leafy tree in the center of a field. A bright lightning bolt strikes the tree from above, illuminating the scene. The sky is dark and cloudy, with other faint lightning bolts visible. The overall color palette is dominated by dark greens, browns, and bright yellows from the lightning.

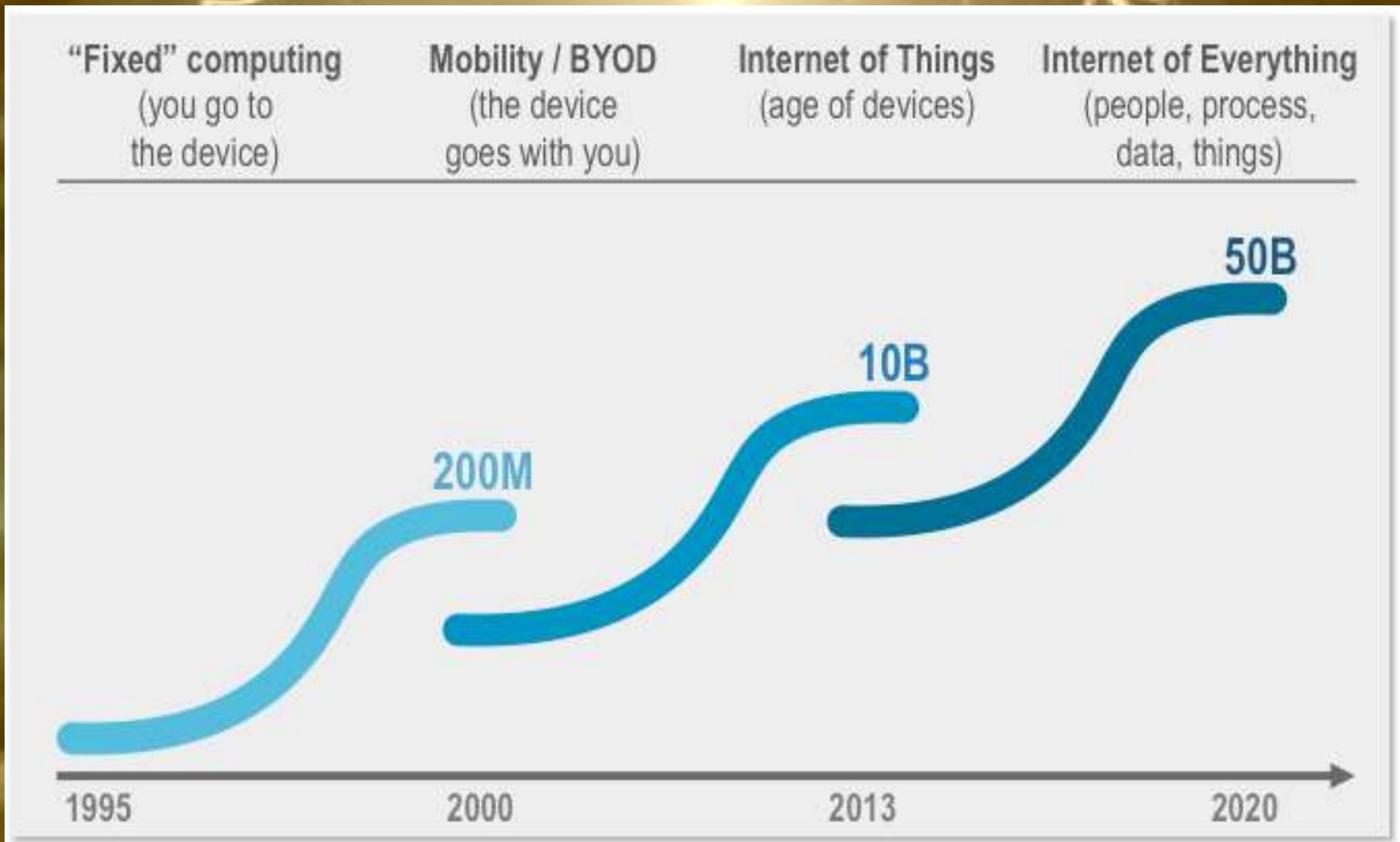
Internet of Everything

Cisco estimates that 99.4 percent of physical objects are still unconnected. Conversely, this means that only about 10 billion of the 1.5 trillion things globally are connected.

Source: Cisco IBSG, 2013



Rapid Growth of the Number of Things Connected to the Internet.



Source: Cisco IBSG, 2013



The Convergence College Network (CCN) is a select cohort of community colleges and universities from across the country that connects IT educators with a wealth of resources to enhance their programs. Any school that either offers an IT/convergence degree and certificate program - or is considering offering one - can join the CCN.



Chrys Panayiotou

Lasers



LASERS and Optics

Fueling innovation in the 21st century

In the same way electronics, the microchip, computing power, and the Internet fuelled the amazing technological achievements of the latter half of the 20th century, lasers and optics or photonics are fueling the 21st century innovations we experience in medicine, health sciences, computing, information technology and manufacturing.



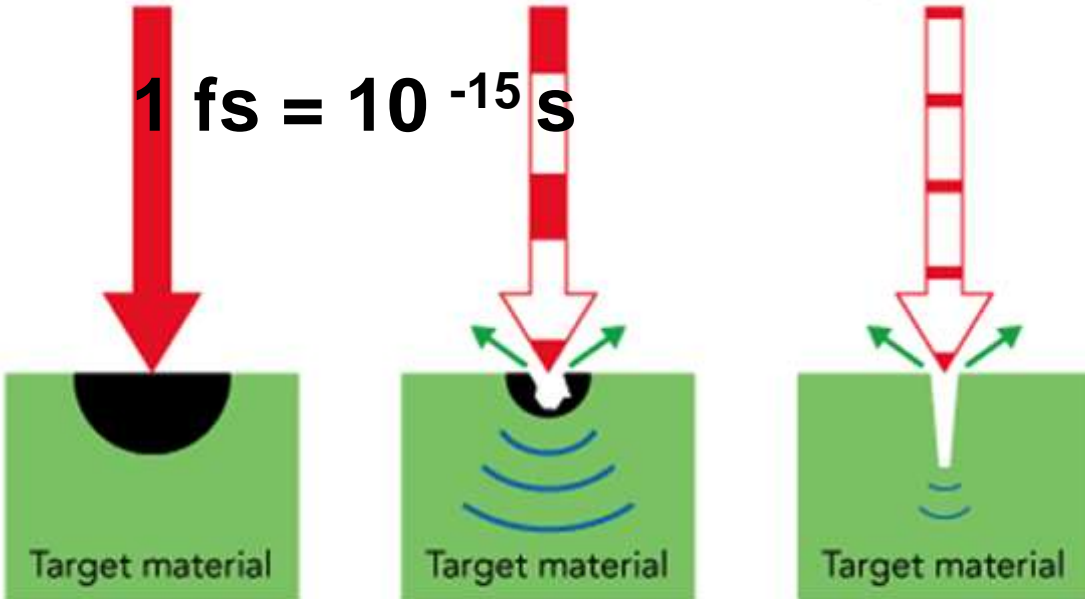
What is a femtosecond LASER?

CW laser

ns laser

ps/fs laser

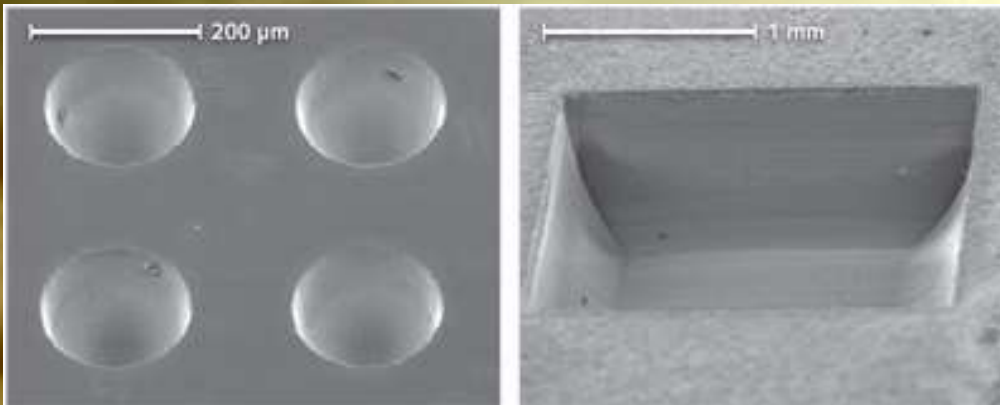
1 fs = 10^{-15} s



■ Dark area: Heat affected zone ~ Blue line: Shock waves

Applications

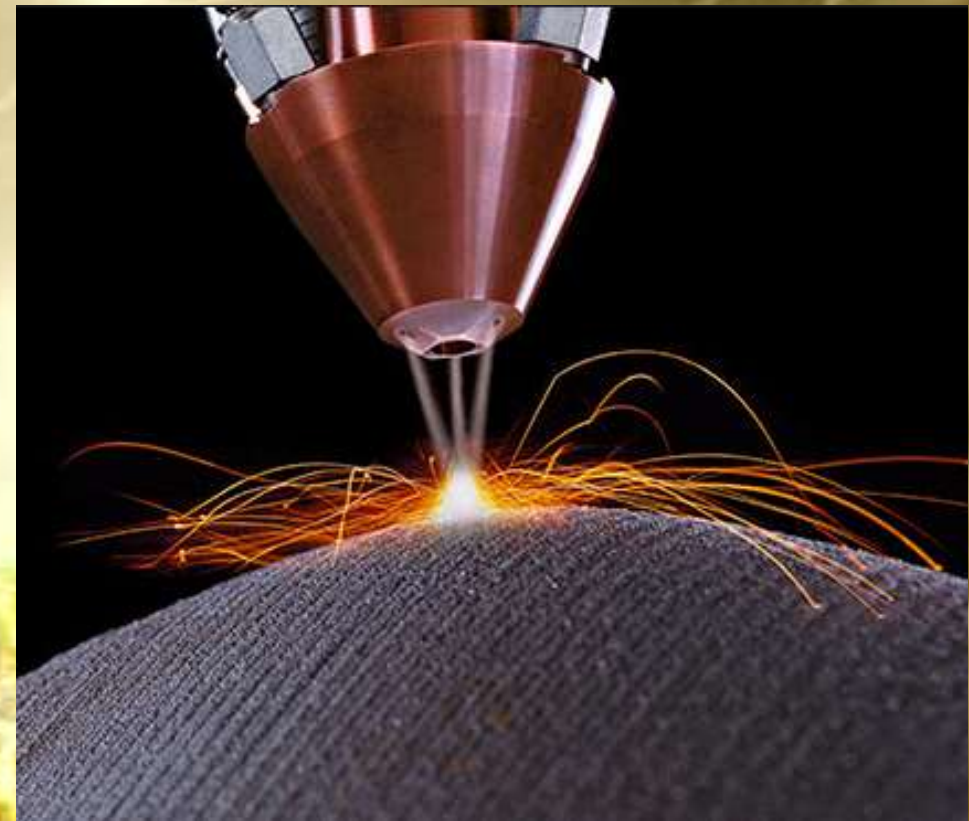
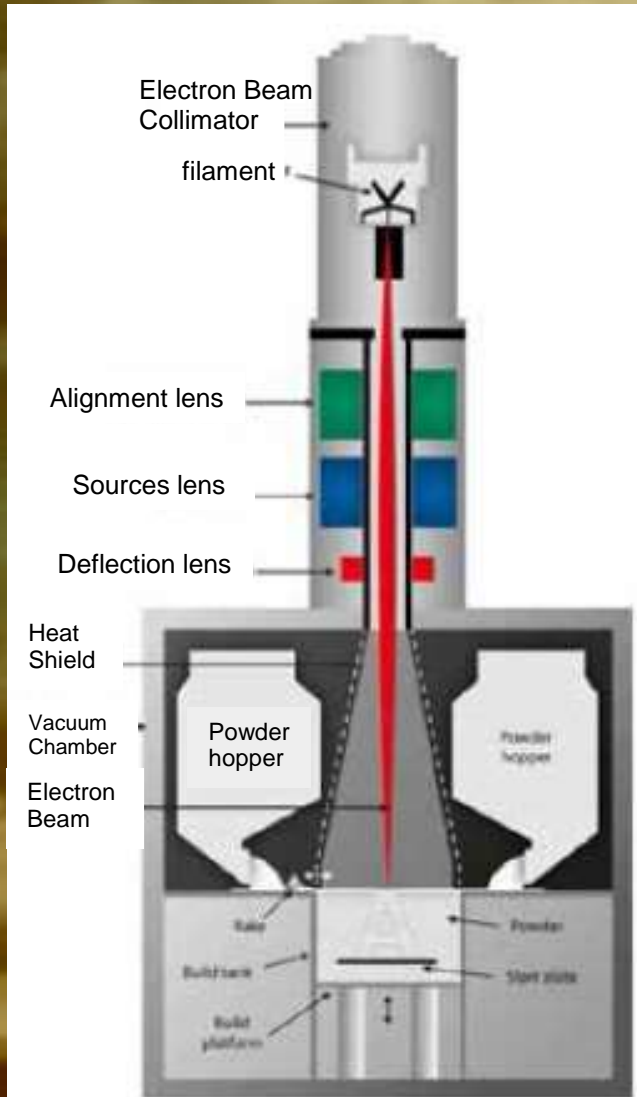
- cold ablation
- high speed micromachining
- semiconductor processing
- thin film solar cell structuring
- glass scribing
- pulsed laser deposition
- high harmonic generation
- high energy physics
- material research



Medical Applications



Selective Laser Melting or Laser Additive Manufacturing or Laser Cladding



Medical Parts

- Knee joints
- Material: CoCr



Source: EOS

- Hip joints
- Material: Ti / TiAl6V4
- Special surface structure



- Dentistry
- Individualised mass production



Jet Engine Fuel Nozzle

GEA Leap Fuel Nozzle: 1st GE DMLM Production Part

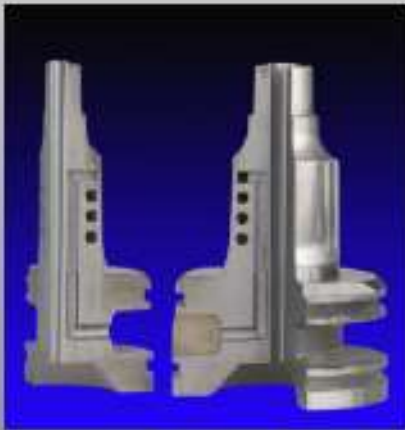


- Combine 20 parts into 1 monolithic body
- 5x Life improvement
- 25% weight reduction



Manufacturing - Tooling

- Tooling
- Conformal cooling
- Shorter production cycle times



Source: Braun

- Tool-free production for small series
- Flexible production of special parts
- Example:
Al-die casting



Source: Festo

- Post-processing with all conventional methods possible (milling, etc.)



Source: EADS

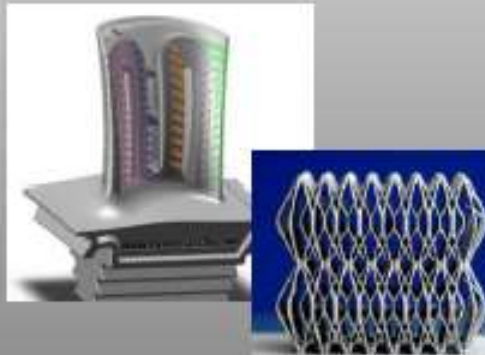


Automotive - Aviation

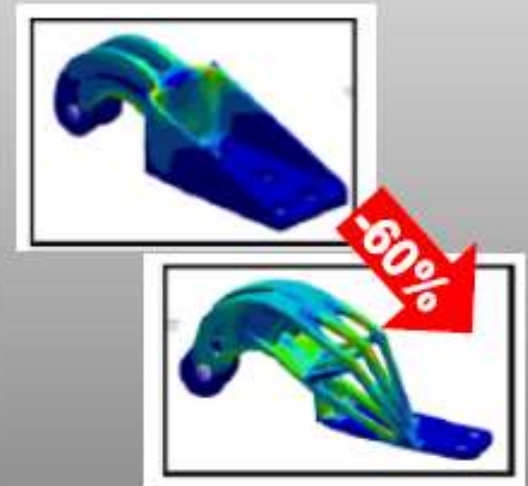
- Fast availability of functional prototypes for product development
- Example: automotive



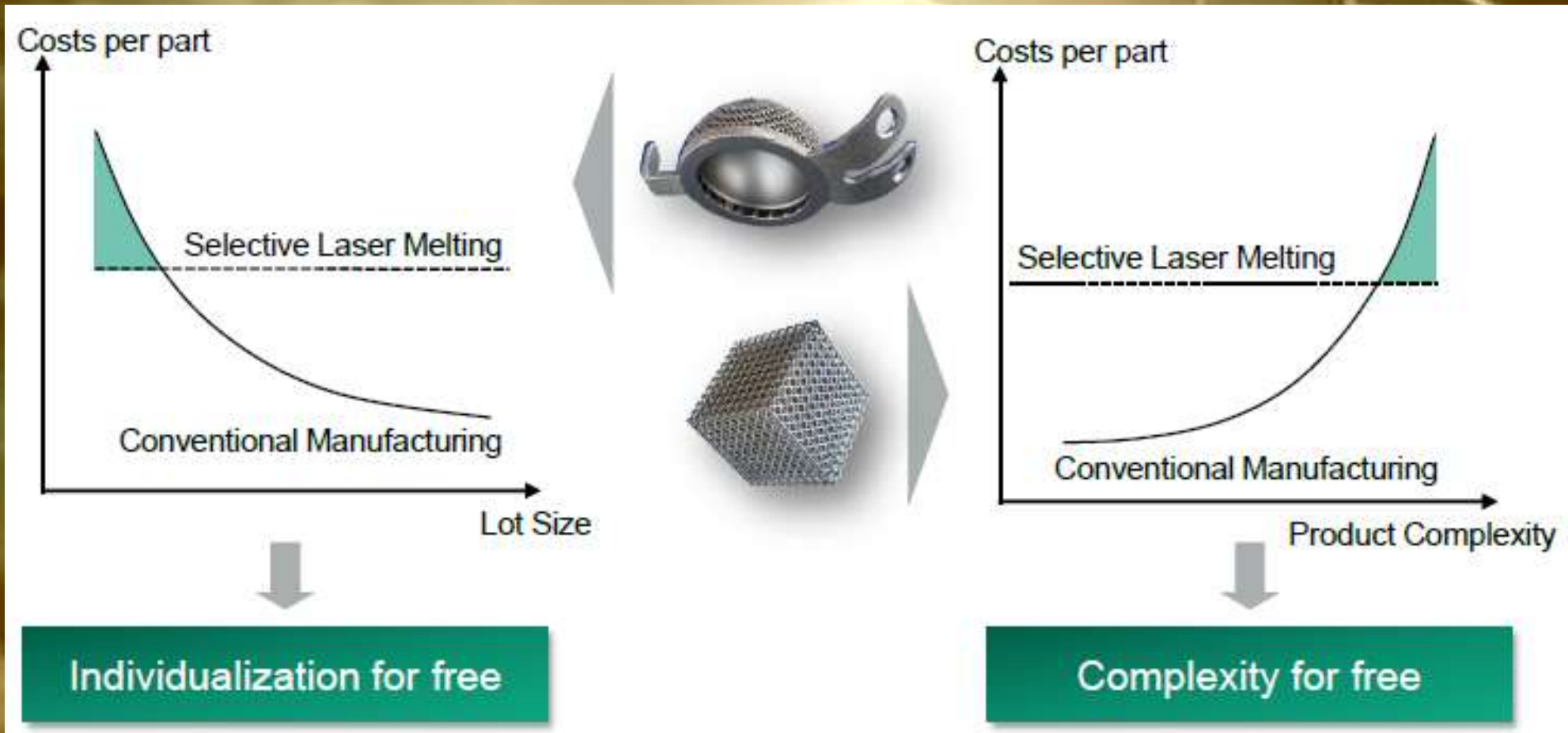
- Design for optimised functionality
- Improvement of part efficiency during life cycle
- Example: turbo machinery



- Light weight design
- Example: hinges for aerospace applications

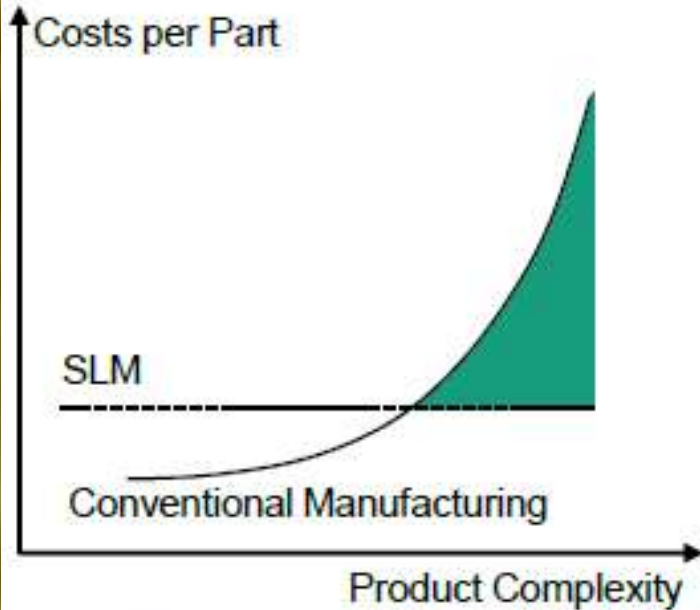


Selective Laser Melting (SLM) Vs Conventional Manufacturing

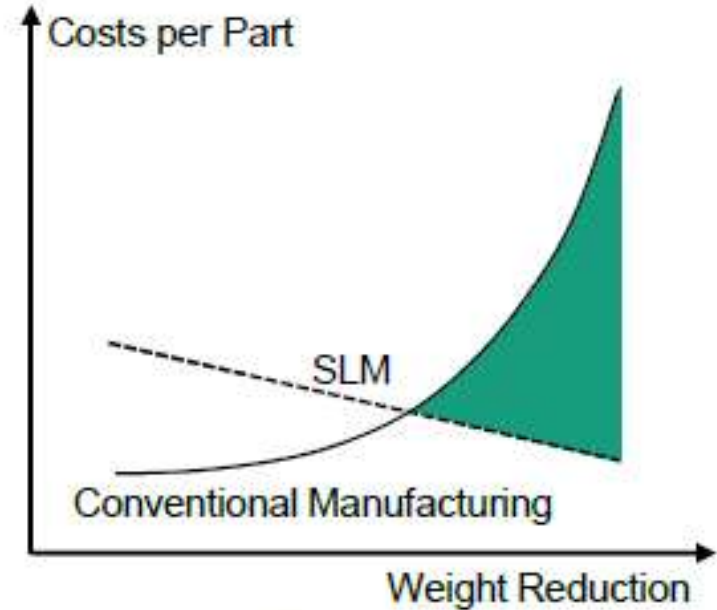


Advantages of Selective Laser Melting

Complexity for free



Weight Reduction for free



Laser Cladding



Atomizer Shaft as Received



Atomizer Shaft with Laser Deposit



Atomizer Shaft Final Machining



Pre machined



Cladding



Result

LASER-TEC Services

- Assist colleges K-12 schools with Laser and Fiber Optics curriculum
- Provides professional development for college professors and K-12 teachers.
- Provides LFO awareness and outreach
- Provides training to industry's incumbent workers

Contact us - we can help you!
www.laser-tec.org



Marilyn Barger

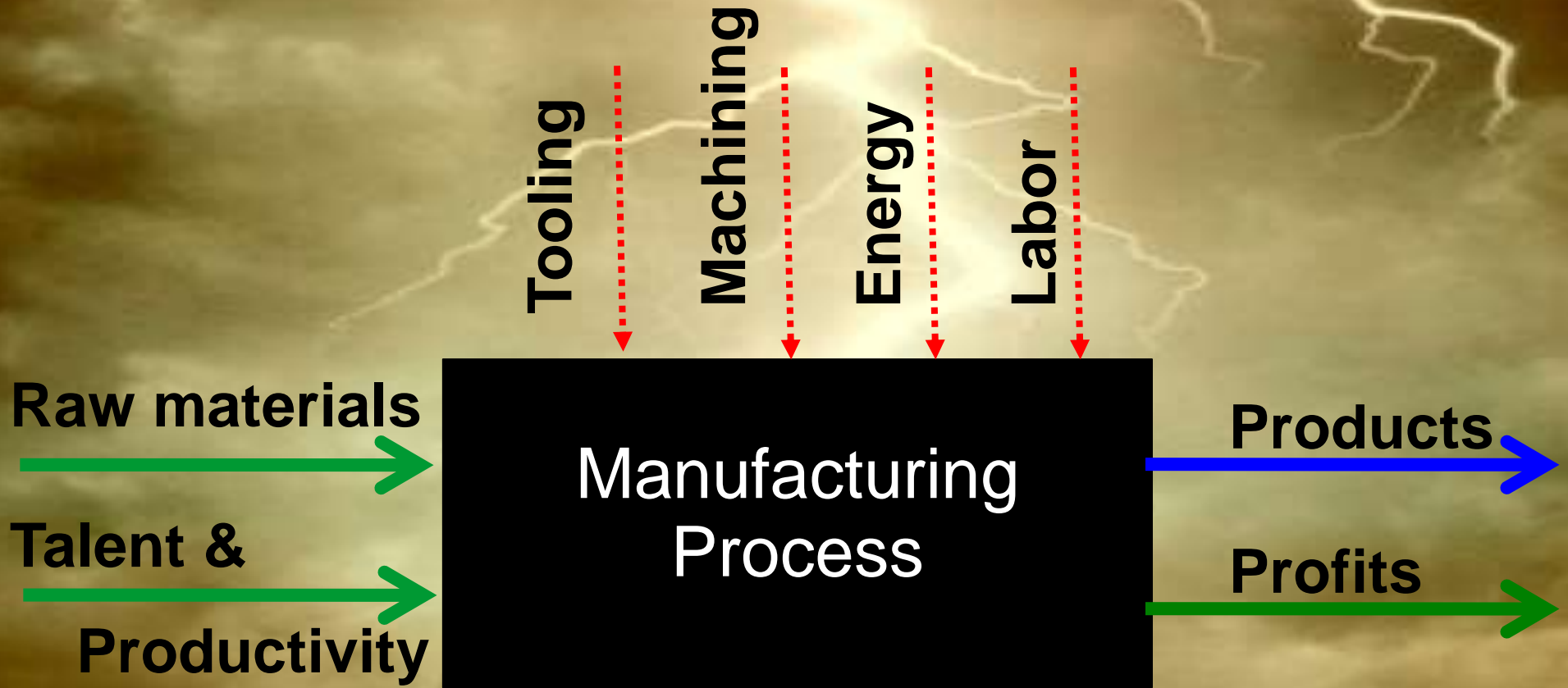
Advanced

Manufacturing



Bringing it all together

Manufacturing



Bringing it all together

Manufacturing



<https://www.youtube.com/watch?v=nd5>

WGLWNIIA

Bringing it all together

Manufacturing



Bringing it all together

Manufacturing

Collaborative Robots

Distributed Controls

Green Automation



Bringing it all together

Manufacturing

Collaborative Robots

Distributed Controls

Green Automation



Bringing it all together

Manufacturing

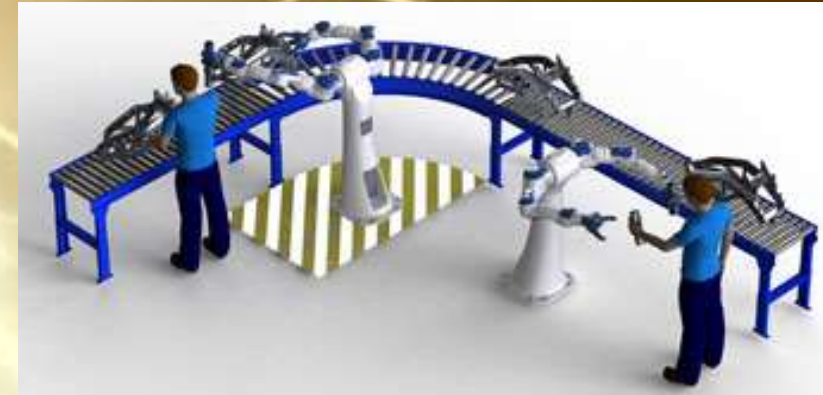
Collaborative Robots



Dual-arm concept robot for collaborative small-part assembly operations (Courtesy of ABB Inc.)



Baxter, a dual-arm collaborative robot, packs plastic parts into boxes on the factory floor (Courtesy of Rethink Robotics, Boston, Massachusetts)



An assembly line model of collaborative robots working with human coworkers (Courtesy of Yaskawa Motoman Robotics, Miamisburg, Ohio)



A dual-arm, 15-axis collaborative robot with human-like flexibility in a small footprint (Courtesy of Yaskawa Motoman Robotics, Miamisburg, Ohio)



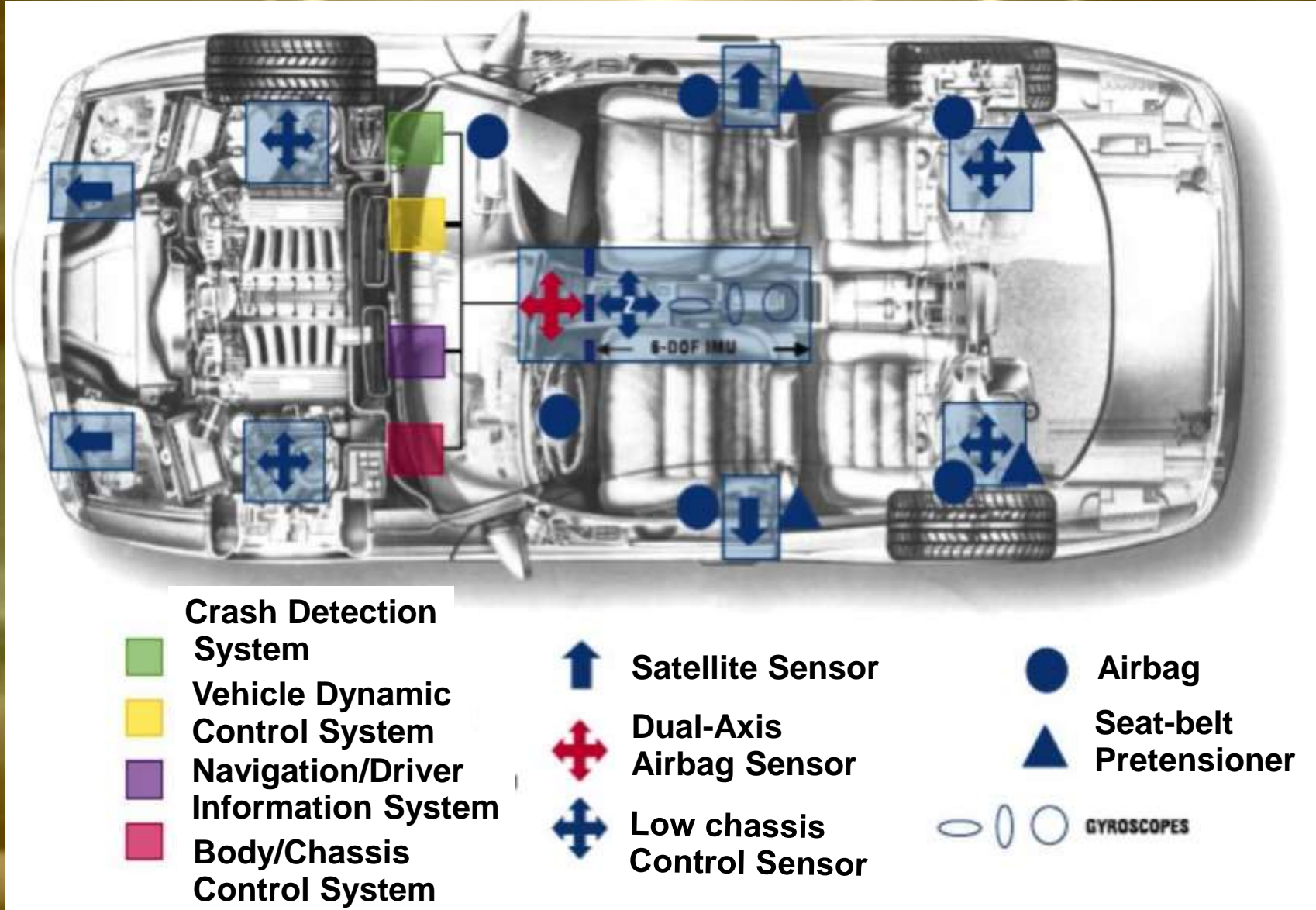
Bringing it all together

Manufacturing

Distributive Controls



Distributed Controls



ITRS 2013, MEMS



Distributed Controls



- 1. Manufacturers will start 3D value chains.**
- 2. Operational, information, and consumer technology converge.**
- 3. Focus on operational supply chain strategies**
- 4. Supply chain technology investment for modernization.**
- 5. B2B commerce backbone becomes investment priority for IT.**
- 6.**



- 6. Product life cycle management (PLM) strategies become more global, multidisciplinary, innovation-based, and customer-focused.**
- 7. PLM initiatives focus on value realization.**
- 8. “Servitization” optimization will be core to future profit and growth.**
- 9. 2014 marks the start of a manufacturing Renaissance.**
- 10. Plant floor IT investments continue to take a higher share of the overall technology investments.**



Thank you!

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