



# Future Technologies and Concepts:

**Robotics, Artificial Intelligence, Exoskeletons and Sensors; what Future Role will they have in our Armament systems.**

Presented by  
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US Army ARDEC, RDAR-WSF-M



PAO Log # TBD **TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

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# Mortars Through Time



Mortar

Ammunition

15-16<sup>th</sup>  
(Iron)

Fire Control

REF:

- <http://www.riv.co.nz/mza/hist/mc>
- <http://www.cannonsuperstore.co>
- <http://www.militaryfactory.com/s>
- <http://www.iwm.org.uk/collection>
- <http://wiki.fibis.org/index.php/His>
- [http://silverhawkauthor.com/artillery-preserved-in-portugal\\_403.html](http://silverhawkauthor.com/artillery-preserved-in-portugal_403.html)
- <http://janeaustenslondon.com/category/prince-regent/>
- <http://wordhistories.com/2014/03/09/point-blank/>
- <http://keyboardsforchrist.com/train2.html>
- <http://www.britishmuseum.org>
- <http://suptg.thisisnotatrueending.com/archive/30654661/>
- <https://www.liveauctioneers.com/catalog>



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# Challenging Trends - 2050

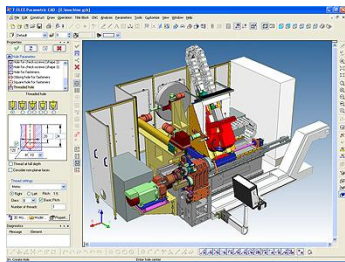


- Slow Dissolution of Nation States
  - Global Capitalist Economy
  - Global Frictionless Connectivity
  - Free flow of Information and Knowledge
- Climate Change
- Population Growth Urbanization
- Radicalization vs. Communication
- Ideology and Religion vs. Secularism and Modernism
  - Increase division on social ideas
- Age of Unrest
- Rapid Innovation
- Multi Polar World (No dominant military power)
- Finite Natural Resources (Food & Water)
- Declining Gene Pool
- Digital/Connected
- End of Privacy





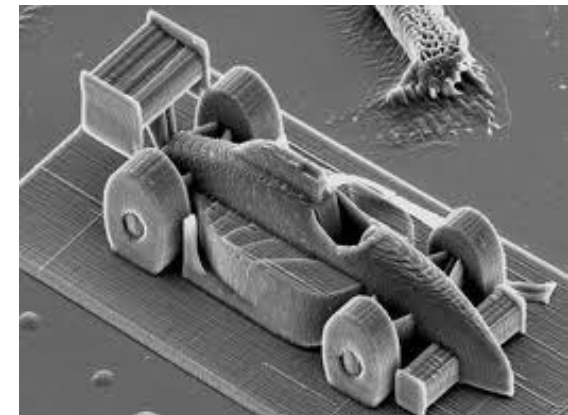
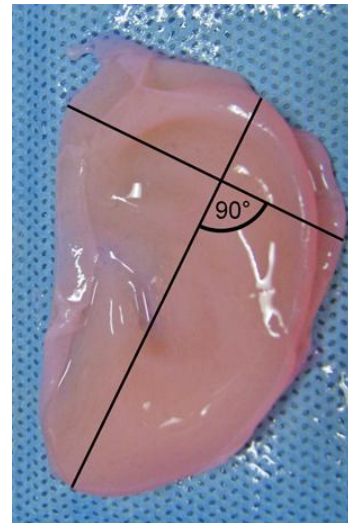
- Ubiquitous Computing (IoT, Big Data...)
- Human 3.0 (Augmented)
- Online Social (and Socialist!) Super-Cloud
- Automation of Knowledge and Skill
- Cloud Technology
- Advanced Robotics
- Autonomous Vehicles
- Personalized Medicine (Genomics, Grown Organs...)
- Synthetic Biology
- 3D Printing and Additive Manufacturing
- Advanced Materials (Ubiquitous Nanotechnology)
- Renewable Energy and Energy Storage
- Commercial Space
- UAVs





1. 3D Printing (Robotics, Materials) - \$11T
2. AI / Automation of Knowledge Work (Algorithmics) - \$9T
3. The Internet of Things (Billion Sensors, RF, Nets) - \$8T
4. Next Gen Genomics (Sensors) - \$6.5T
5. Advanced Robotics (Controls, Reliability, Actuators, Algorithmics) - \$6T
6. Autonomous Vehicles (Sensors, Nets, MIPS, Actuators) - \$6T
7. Renewable Energy (Materials, Infrastructure) - \$3.5T
8. Energy Storage (Chemistry, MEMS, MicroFluidics) - \$2.5T
9. Mobile Technology (RF, Low Power, High MIPS) - \$1.7T
10. Cloud and Fog (CISCO) Technology (Redundancy, Storage) - \$1.7T
11. Advanced Materials (Metastructures, Ceramics, Nanotech) - \$1.2T

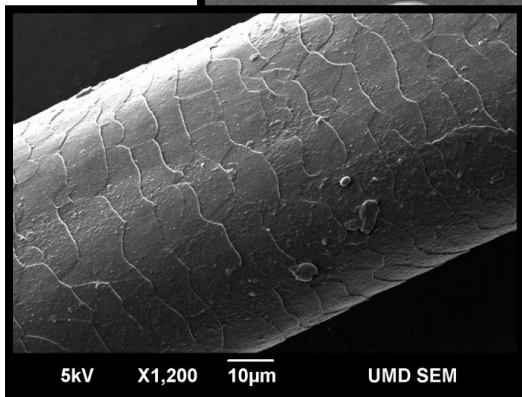
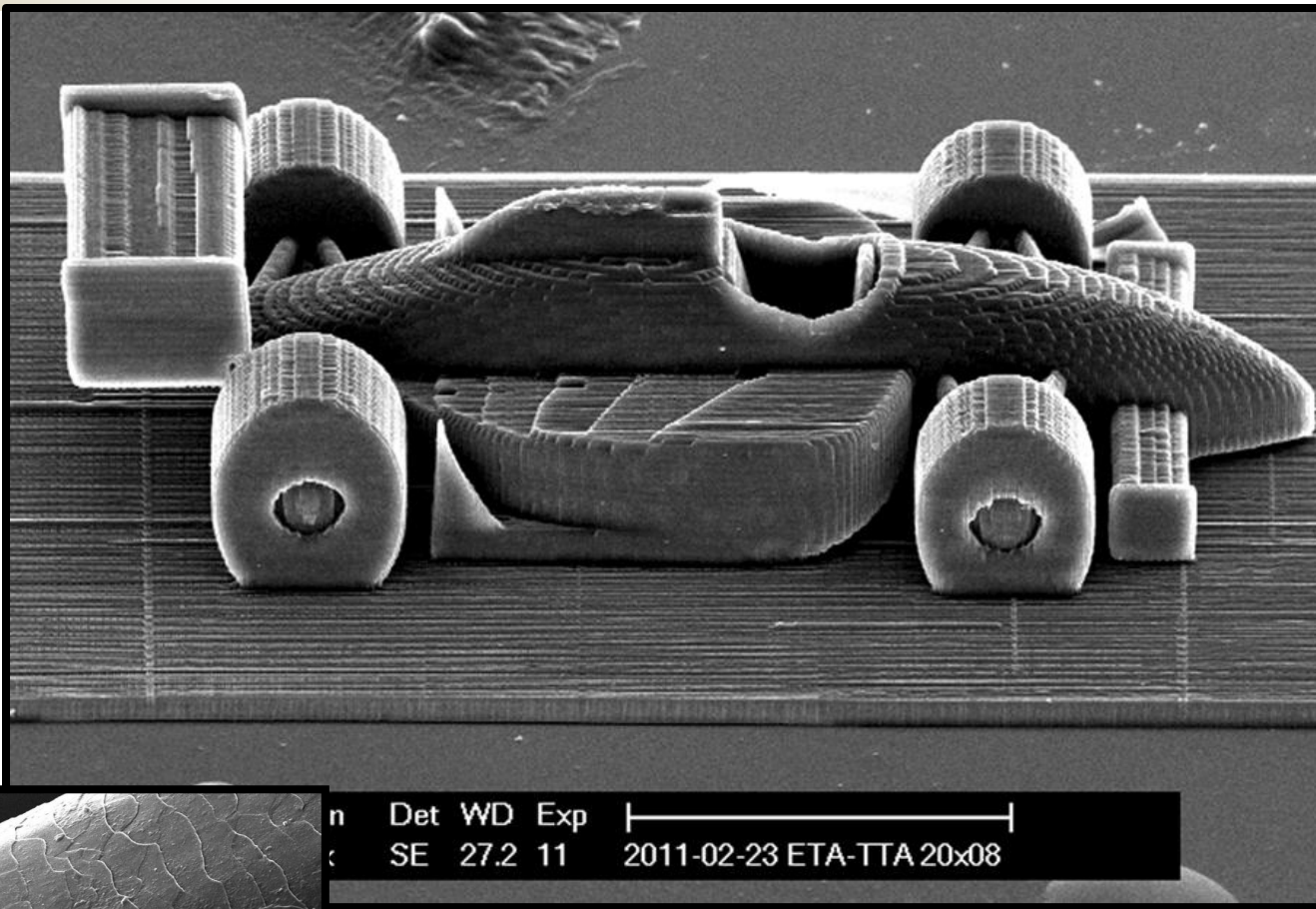
# Additive Manufacturing (AM)



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# Additive Manufacturing (AM)



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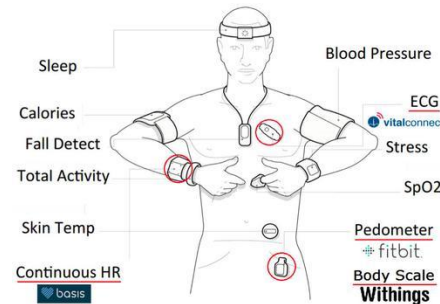




# Internet of Things (IoT)

## Internet-connected machines and sensors

- Cheaper Sensors
- Mass Data to Big Data
- AI & Robot Diversity



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# Players

## Platforms & Enablement (Horizontal)

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## Applications (Vertical)

<b>Quantified Self</b> Wearable Computing: GLASS, Pe	<b>Fitness</b> Withings, JAWBON	<b>Health</b> BASIS, HAPI, wahoo	<b>Family</b> Liv, REST, Good Wi
---------------------------------------------------------	------------------------------------	-------------------------------------	-------------------------------------

<b>Internet</b> Double Robotics, irware, ROBOTEX, botics	<b>Belly</b> Axeda, enlightened, IDMOBILITY	<b>SYSTEMS</b> MezzoMIL, tratasy, formlabs, peways, Boc, RepRap
-------------------------------------------------------------	------------------------------------------------	--------------------------------------------------------------------

## Building Blocks

<b>Connection Protocols</b> ZigBee, RFID, NFC, WiFi, Bluetooth, M-BUS, MQTT 2G 3G 4G	<b>Telecom</b> at&t, verizon, T-Mobile, boost	<b>M2M</b> Jasper, gemalto, Telit, ERICSSON
<b>Software</b> amazon, Parse	<b>Mobile</b> iOS, Android	<b>Hardware</b> spengate, ARDUINO, raspberrypi.org, spark
<b>Parts / Kits</b> MAKE: MAKE, TinkerForge, Arduino, MOSORO	<b>Services</b> DRAGON, makey: makey, CIRCUIT LAB	<b>Incubators</b> BOLT, LEMNOS Labs, springboard
<b>Funding</b> KICKSTARTER, indiegogo	<b>Distribution</b> Arvill	

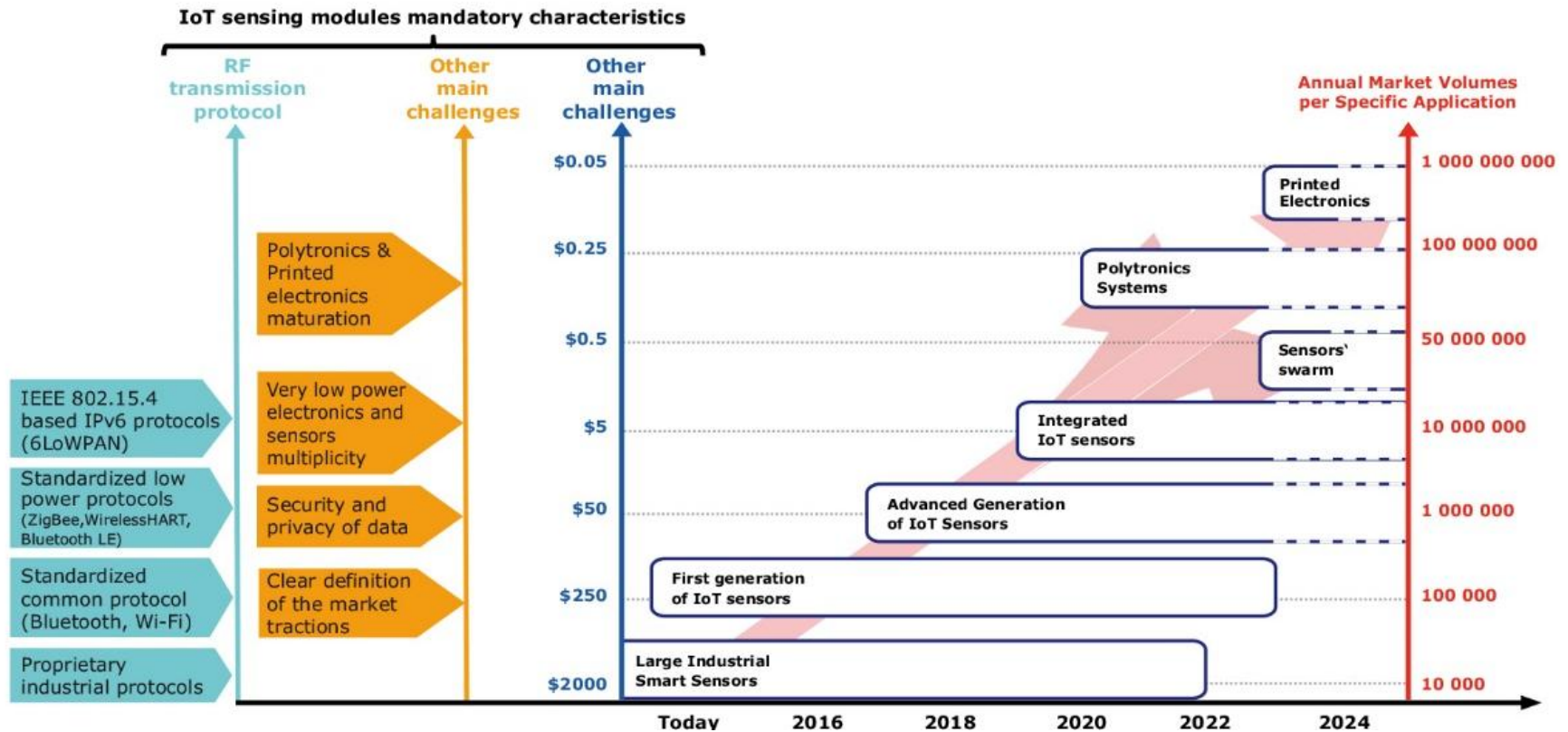


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## The Internet of Things roadmap

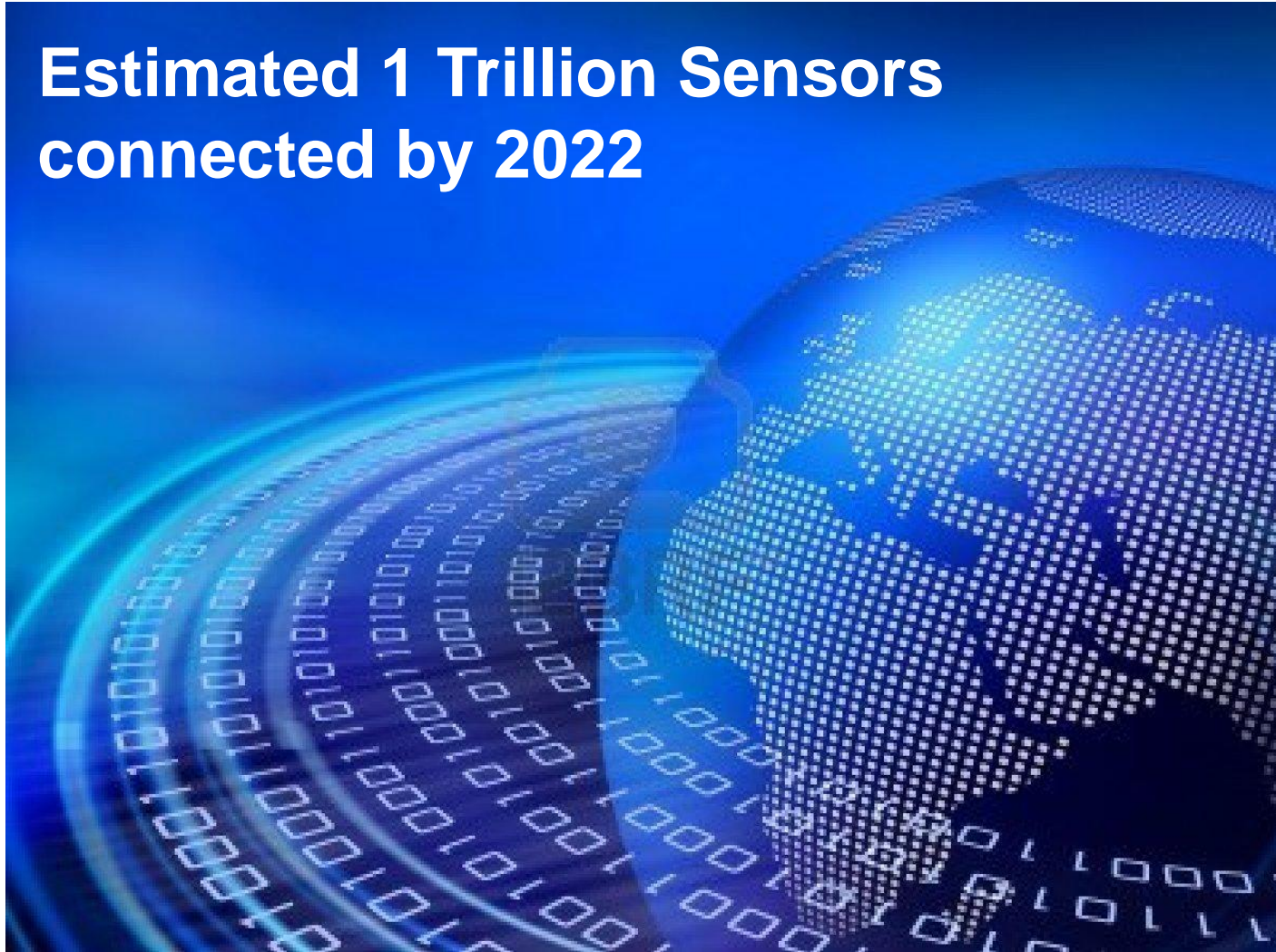
(Source : Technologies & Sensors for the Internet of Things, Yole Développement, June 2014)







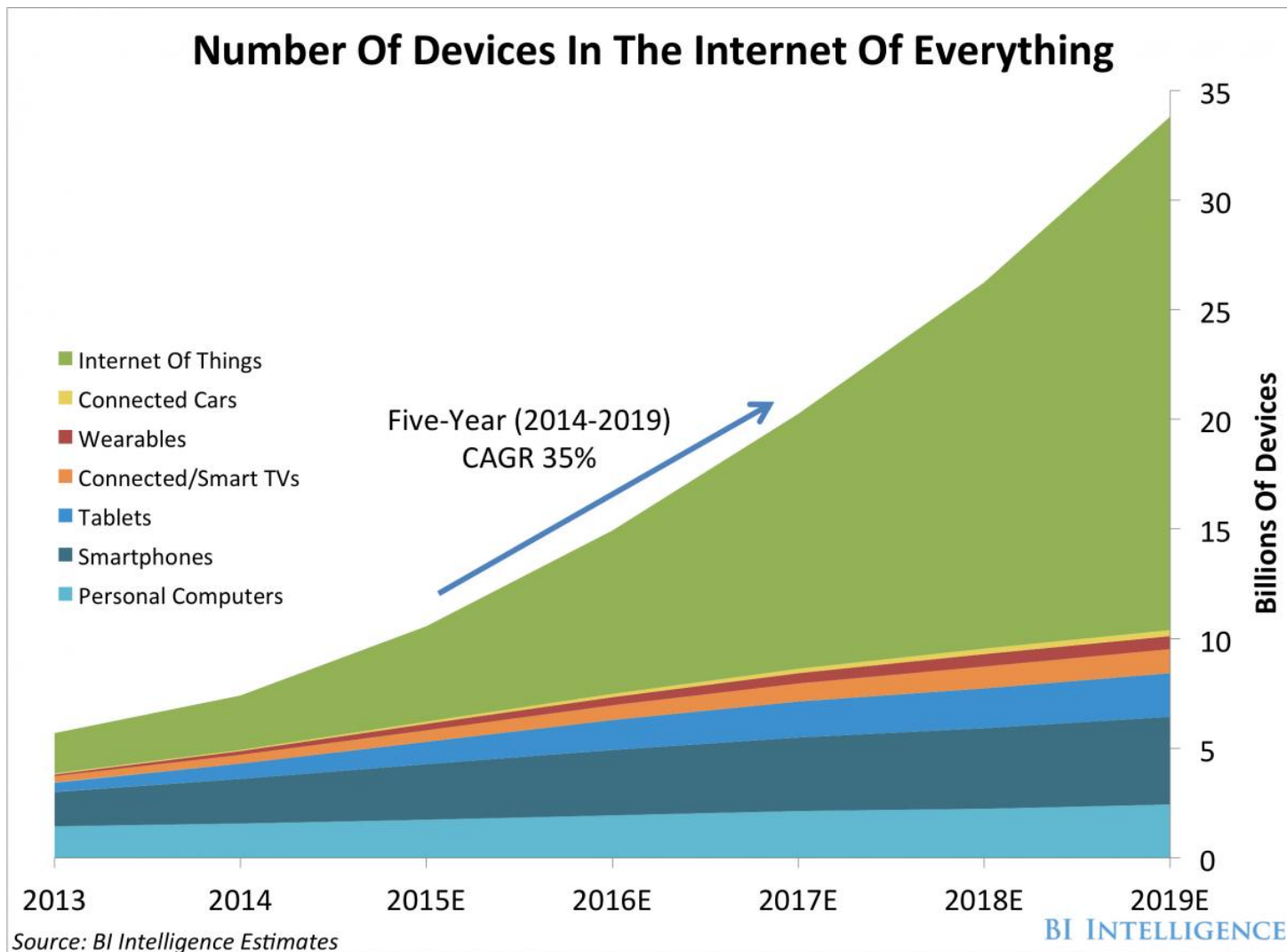
## Estimated 1 Trillion Sensors connected by 2022



REF: BI Report, 2015, 21 Technology Tipping Points



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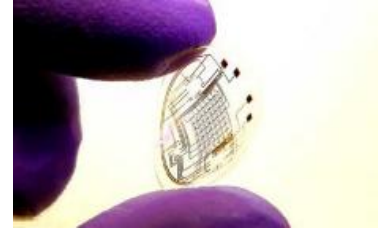
# IoT Enablers Heads Up Displays (HUD)



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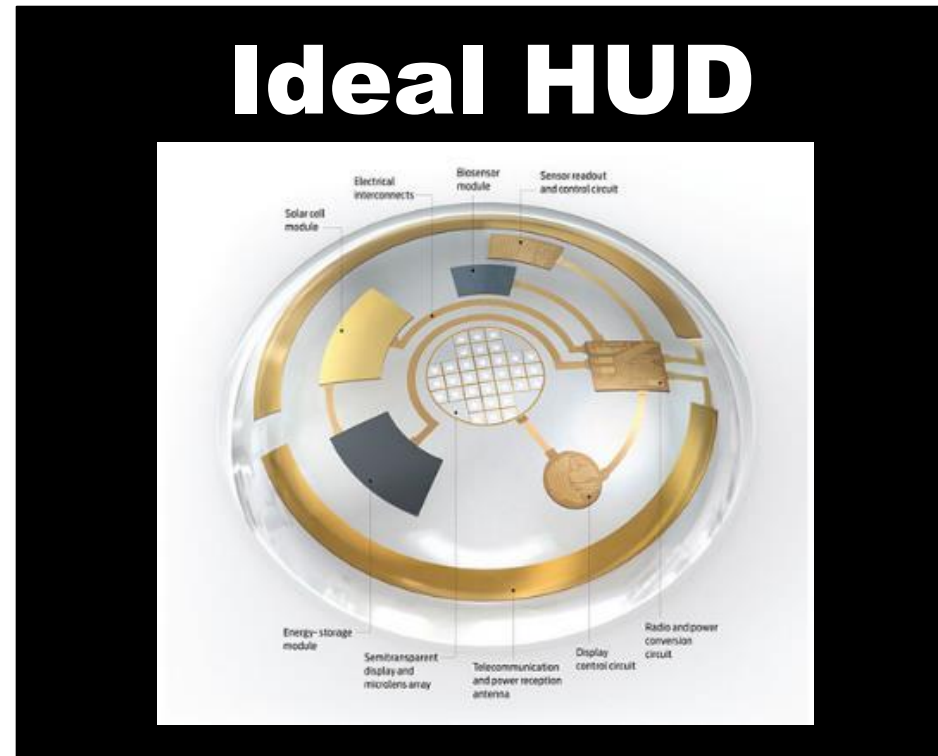
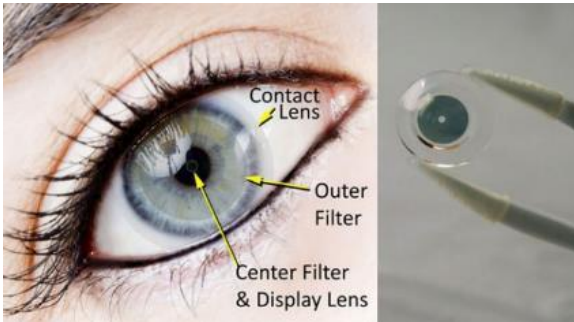


## Washington University



**Google Smart Contact**

Near/Far Contact  
IoT  
Mobile Phones  
Remotes



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## Sensor Integration

### On Platform

- Self contained situational awareness
- Automation of meteorological data
- Round detection and inventory
- Tube wear monitoring and tracking
- Error tracking
- Real time aiming corrections
- System status and feedback



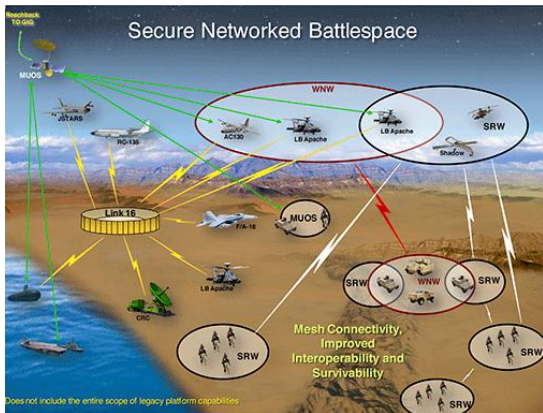
### Warfighter System of Systems

- Health monitoring and reporting
- Environmental monitoring
- Friend vs Foe
- Weapon status
- UAC Integration
- Access to multiple battle field views  
(video / sensor / platform)

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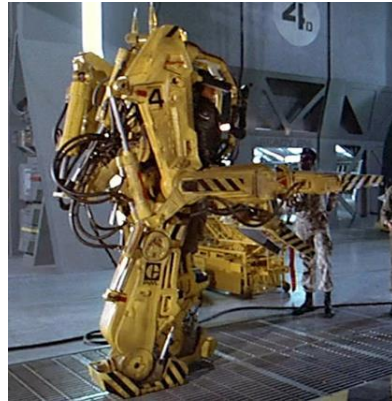
# UAV Integration



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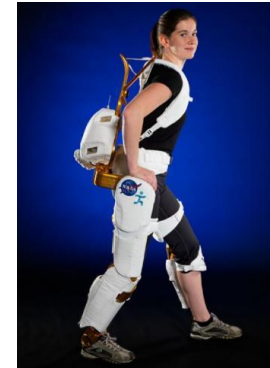


# Exoskeleton as Mortar Enabler



### Possible Benefits

- Logistics
- Weapon / Ammo Transport
- Weapon Operation



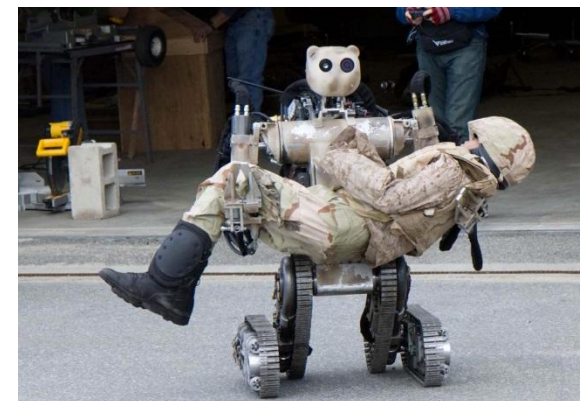


## Integration of Artificial Intelligence

- Target Identification / Classification / Prioritization
- Conducting pattern recognition and extrapolation

## Integration of Autonomous Sensor Platforms

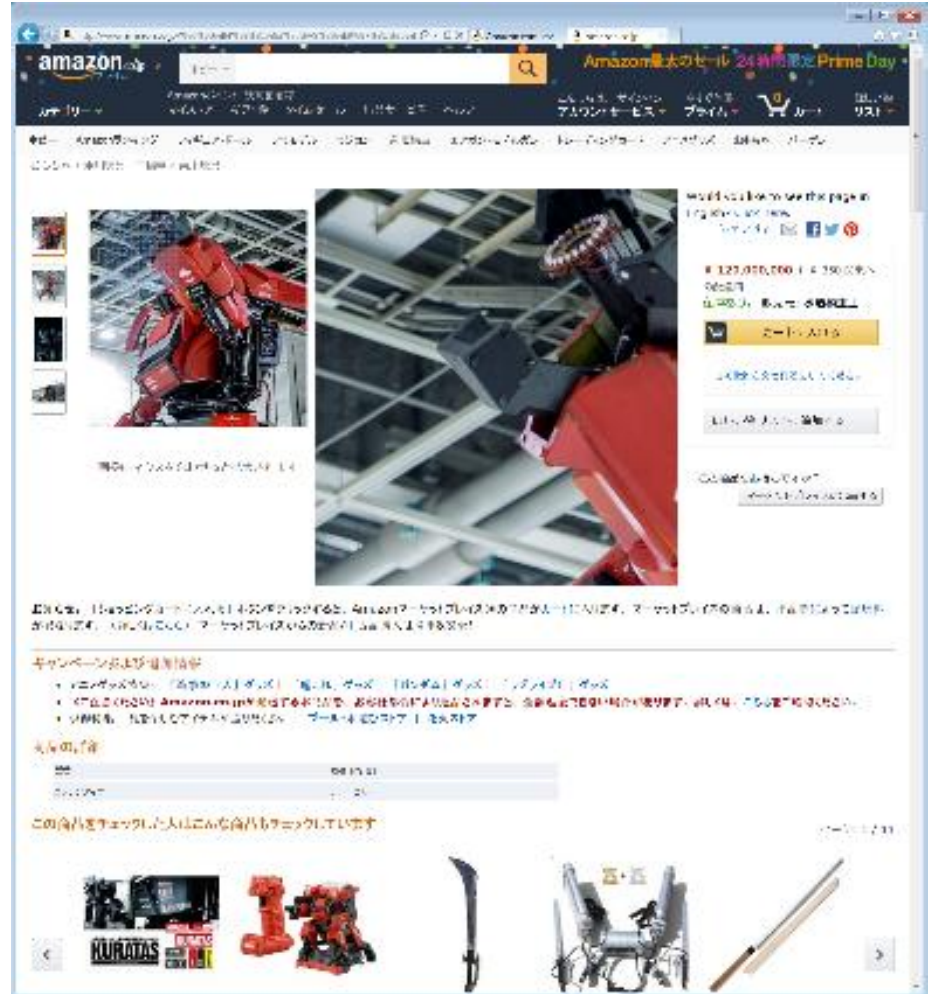
- Unmanned Vehicles
- Ground Sensors
- Autonomous Robotic Platforms







# Mega-Robots

amazon.jp

Amazon 最大のセール 24時間限定 Prime Day

検索

Amazon.co.jp

World's 1st to use the page in 10 days of 2016

¥129,000,000 ( ¥1,390,000/1000個 )

在庫: 1000個

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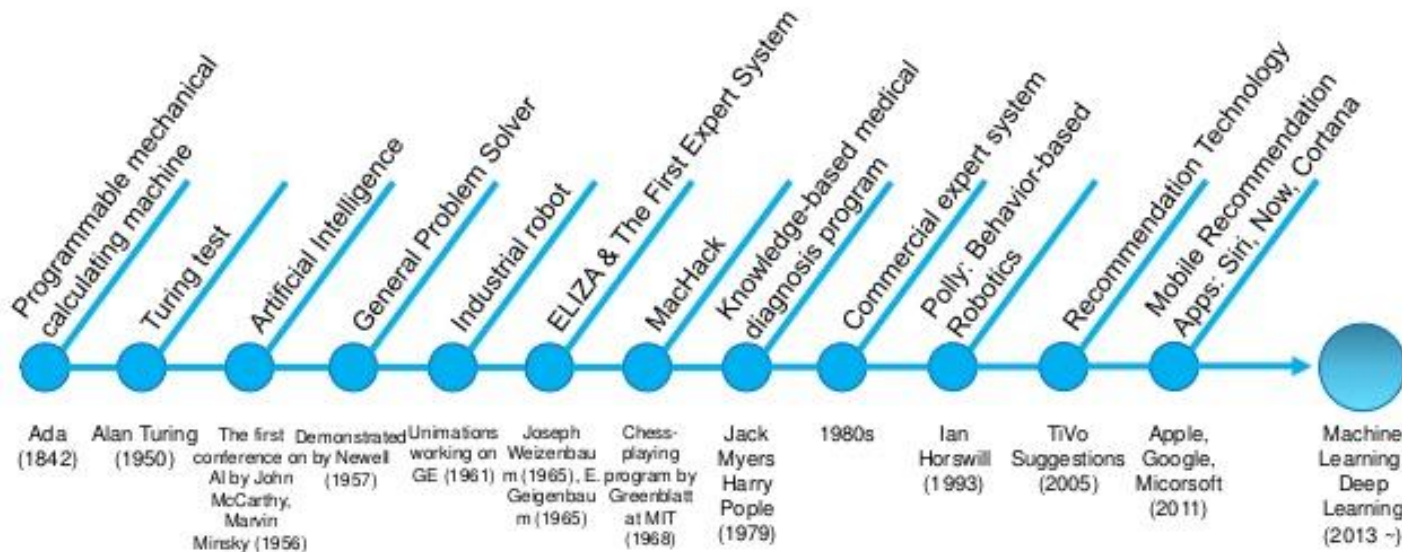
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## Integration of Artificial Intelligence

- Advanced Algorithms
- Conducting pattern recognition and extrapolation
- Real time strategy
- Cloud Based Data / Learning
- Target Identification / Classification / Prioritization

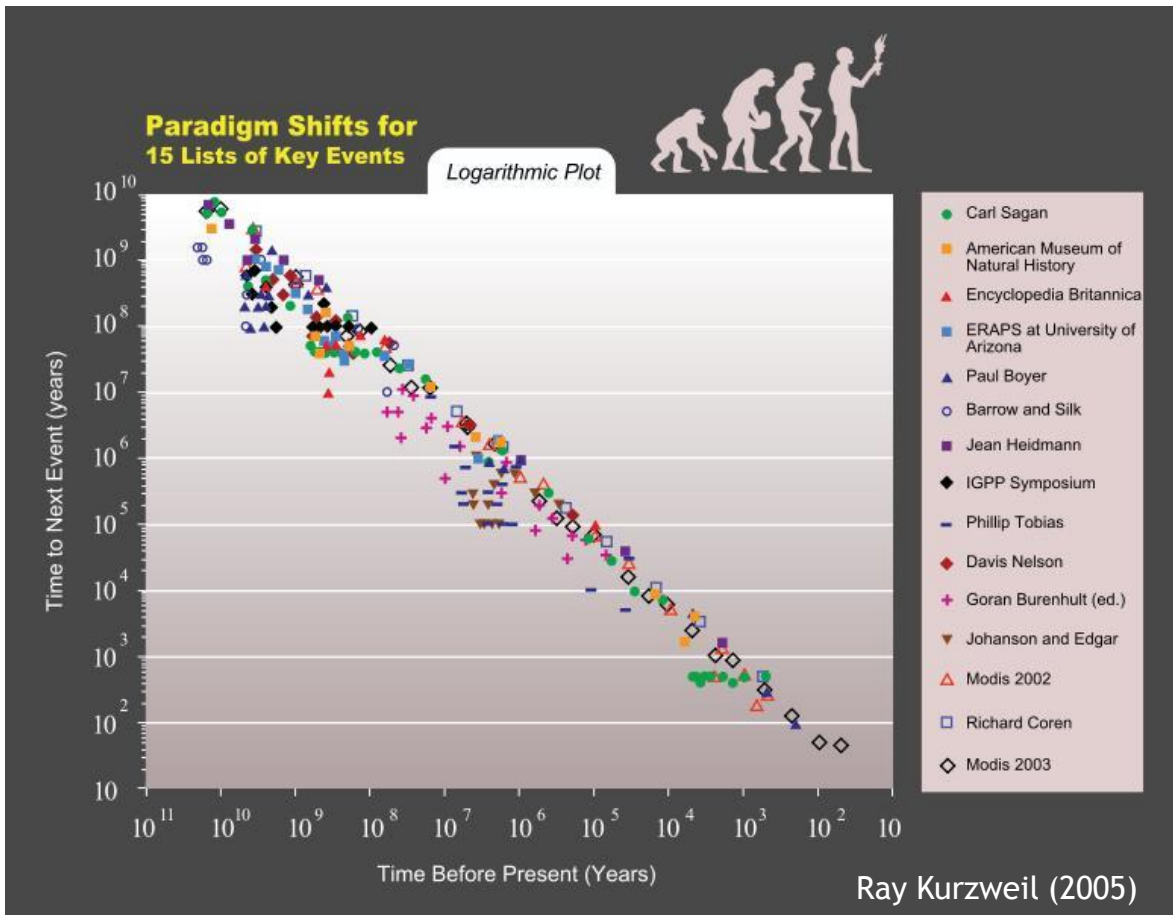
2014  
**Chatbot – Eugene Goostman**  
 Passes Turing Test

### AI Timeline



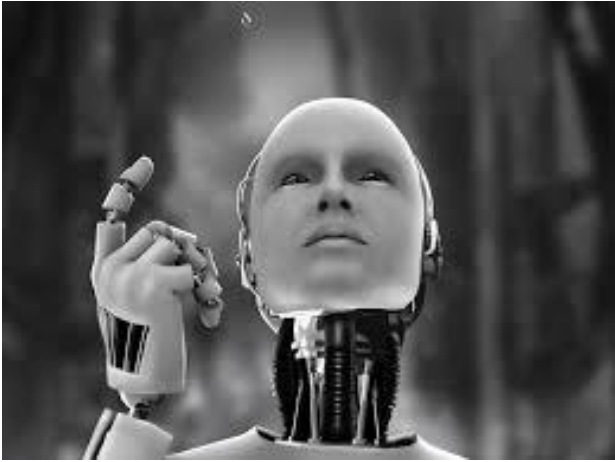
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# AI & Singularity



Year of Singularity	% of 2009 World GDP Subject to Impact of Computing		
	1	1.5	2
6	2075	2068	2063
7	2066	2060	2056
8	2059	2054	2050

2060-65 ± 10 years  
(The Futurist, 2009)



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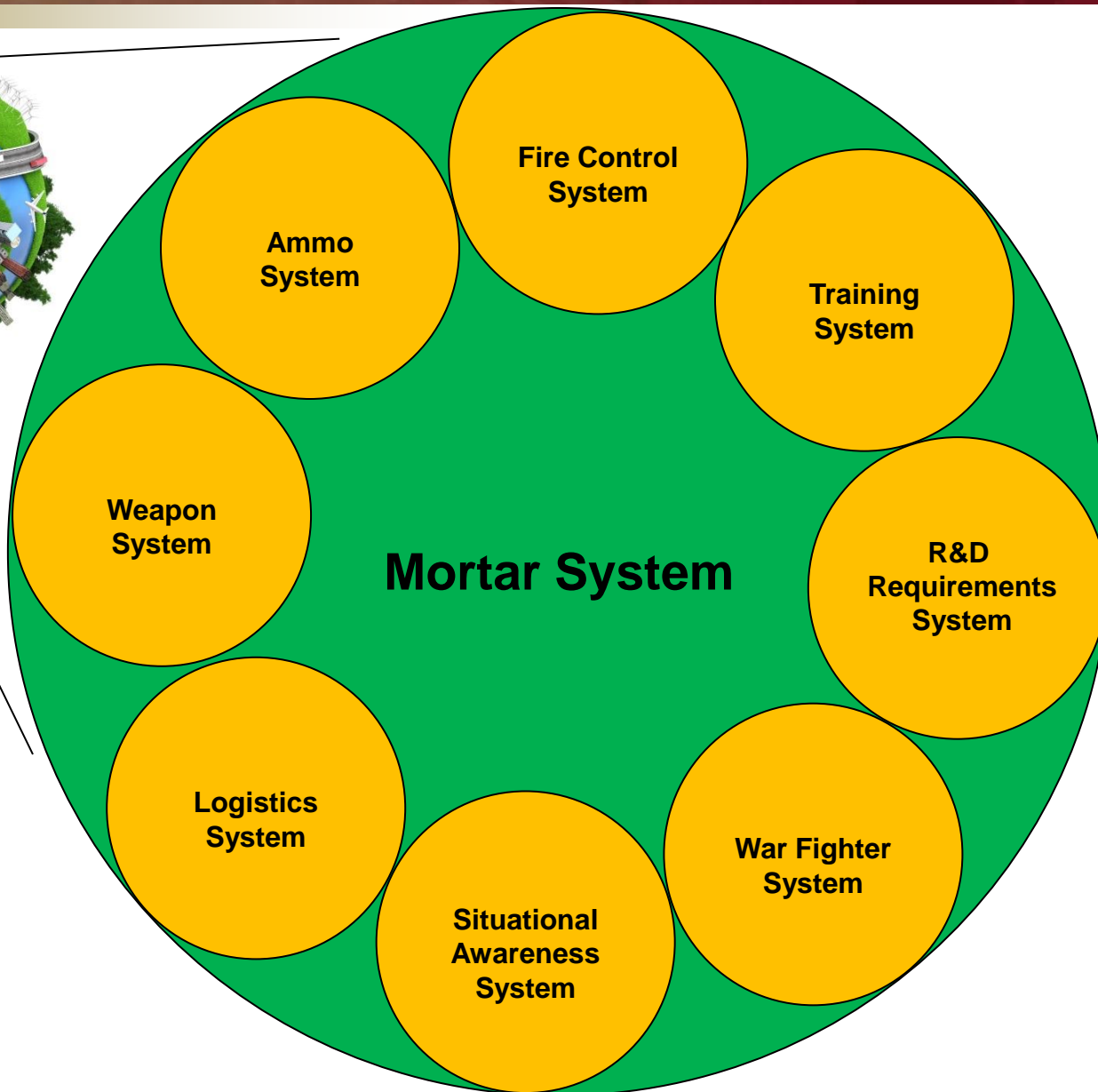
# Systems of Systems



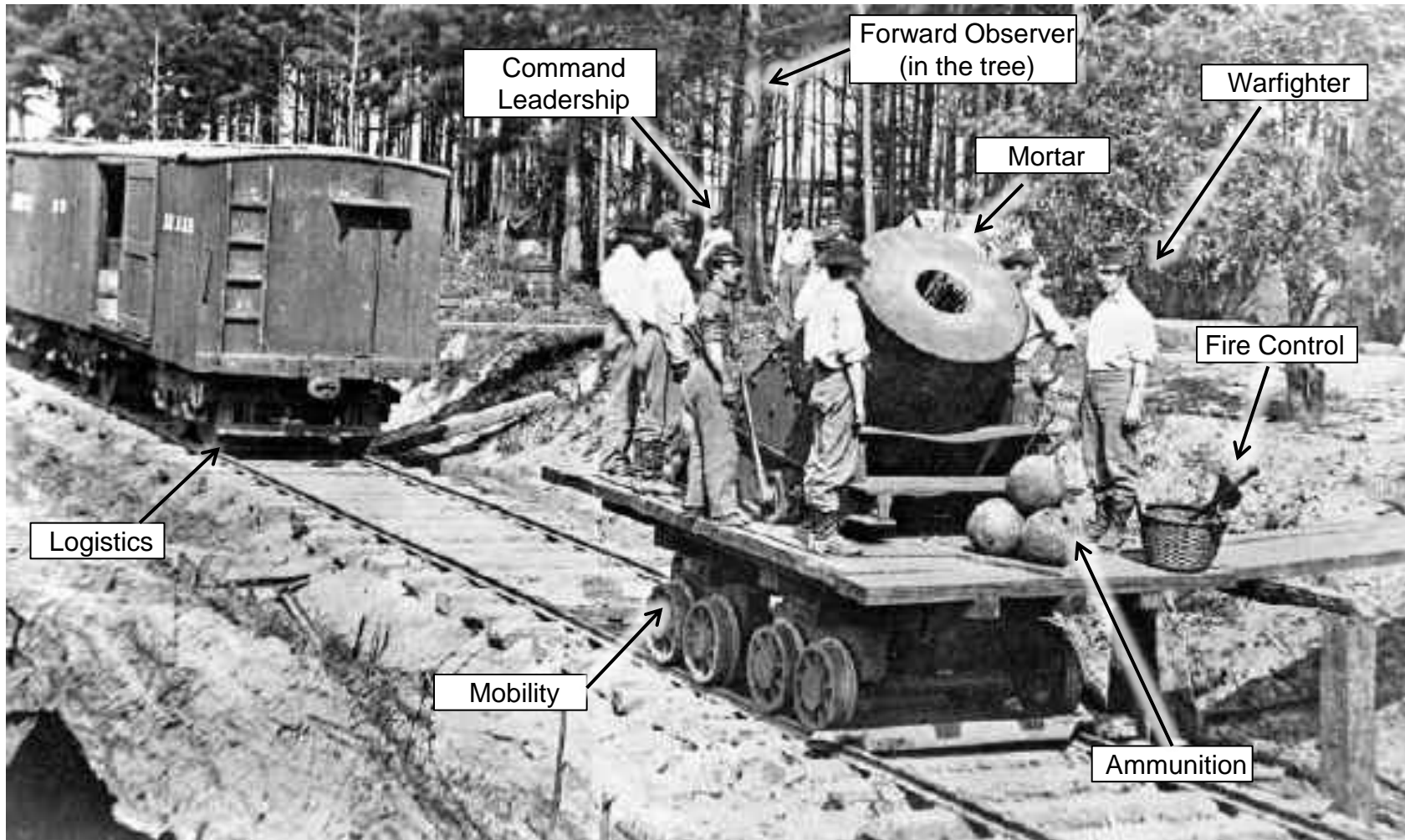
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# Systems of Systems



# Always A System



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# Thoughts...



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*Title:* Future Technologies and Concepts: Robotics, Artificial Intelligence, Exoskeletons and Sensors; what Future Role will they have in our Armament systems.

*Briefing Type:* Oral Presentation/Presentation Charts

*Author:* Ralph Tillinghast

*Abstract:* As the pace of new technologies shows no sign of slowing down, it is logical to wonder how they will impact our future armament systems. This paper looks to review and explore technology trends in a few areas to see how they may be applied or predict how our weapon system may look in the future. A review of robotics, artificial intelligence, exoskeleton, sensor and other enabling technologies will be presented. Overall attendees should gain an insight into these technologies and how they may be applied to our future weapon systems.

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