Panel:

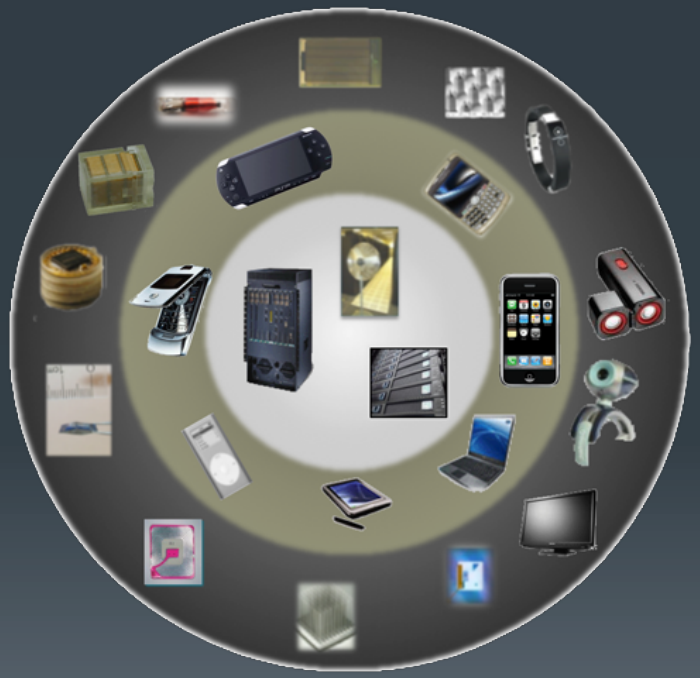
Enabling the Swarm: What are the obstacles in the way?

Second Workshop on the Swarm at the Edge of the Cloud

The Swarm

A new cover for an old thing?

- Ubiquitious computing
- Pervasive computing
- Internet-of-Things
- Internet-of-Everything
- **The Swarm**



Industries already deploying IoT

Smart Grid

- Smart Metering
- Established standards
- Encouraged by regulators
- Huge opportunities

Automotive

- In-car smartphones support drivers
- OBD ecosystem
- OEM APIs (OnStar)
- W3C Automotive Web Standard

➢ **Utility surpasses concerns**

➢ **Few global players have a high impact**

Industries facing hurdles

Healthcare

- Privacy concerns
- Industry fragmentation
- Legal frameworks
- Human-Machine Interface
  - **Operation in silos**
  - **Global scope requires incremental advances**

Manufacturing

- Slower transformation, longer life cycle
- Security
- Difference in enterprise and manufacturing systems

Huge Potential

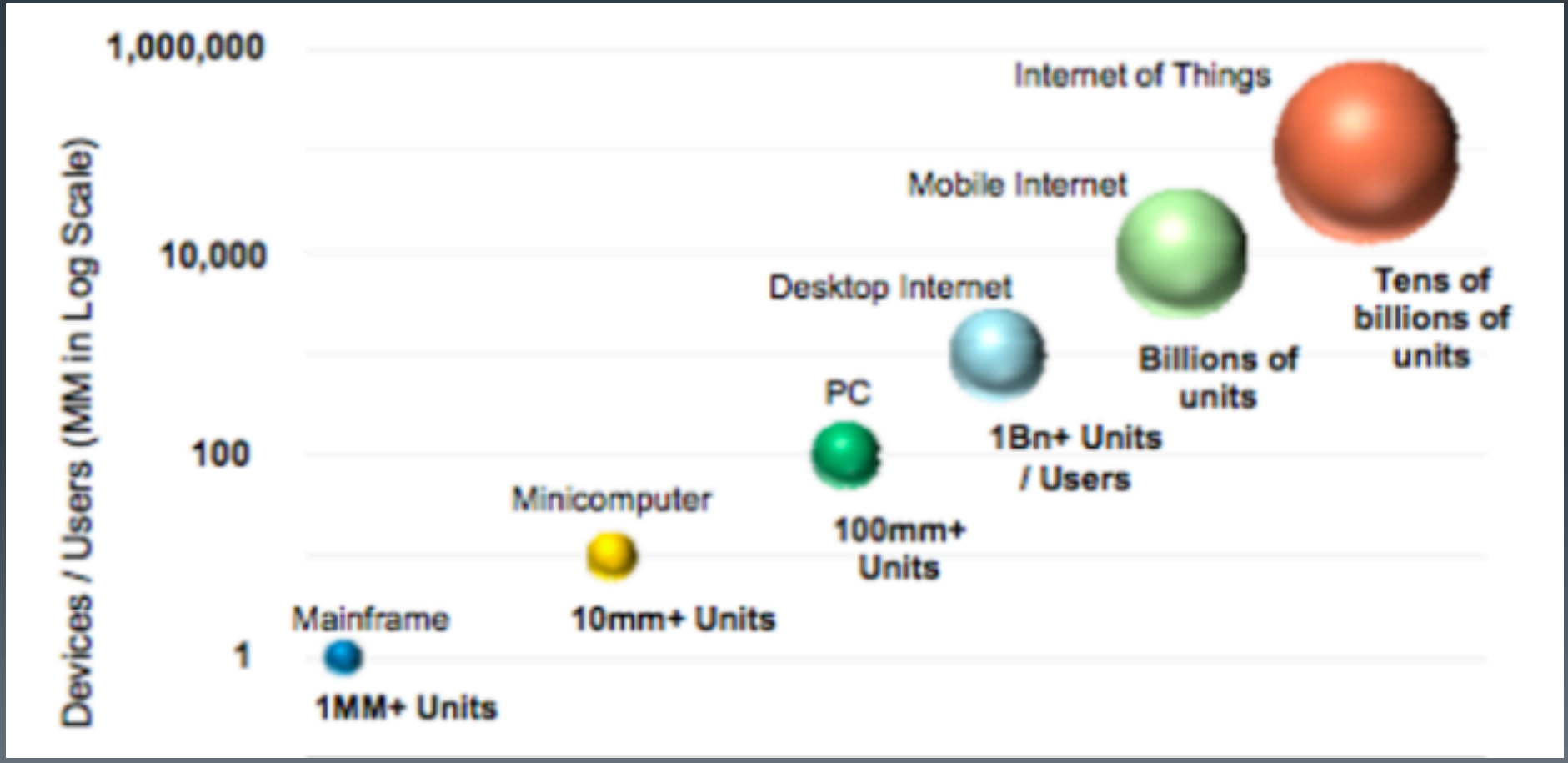
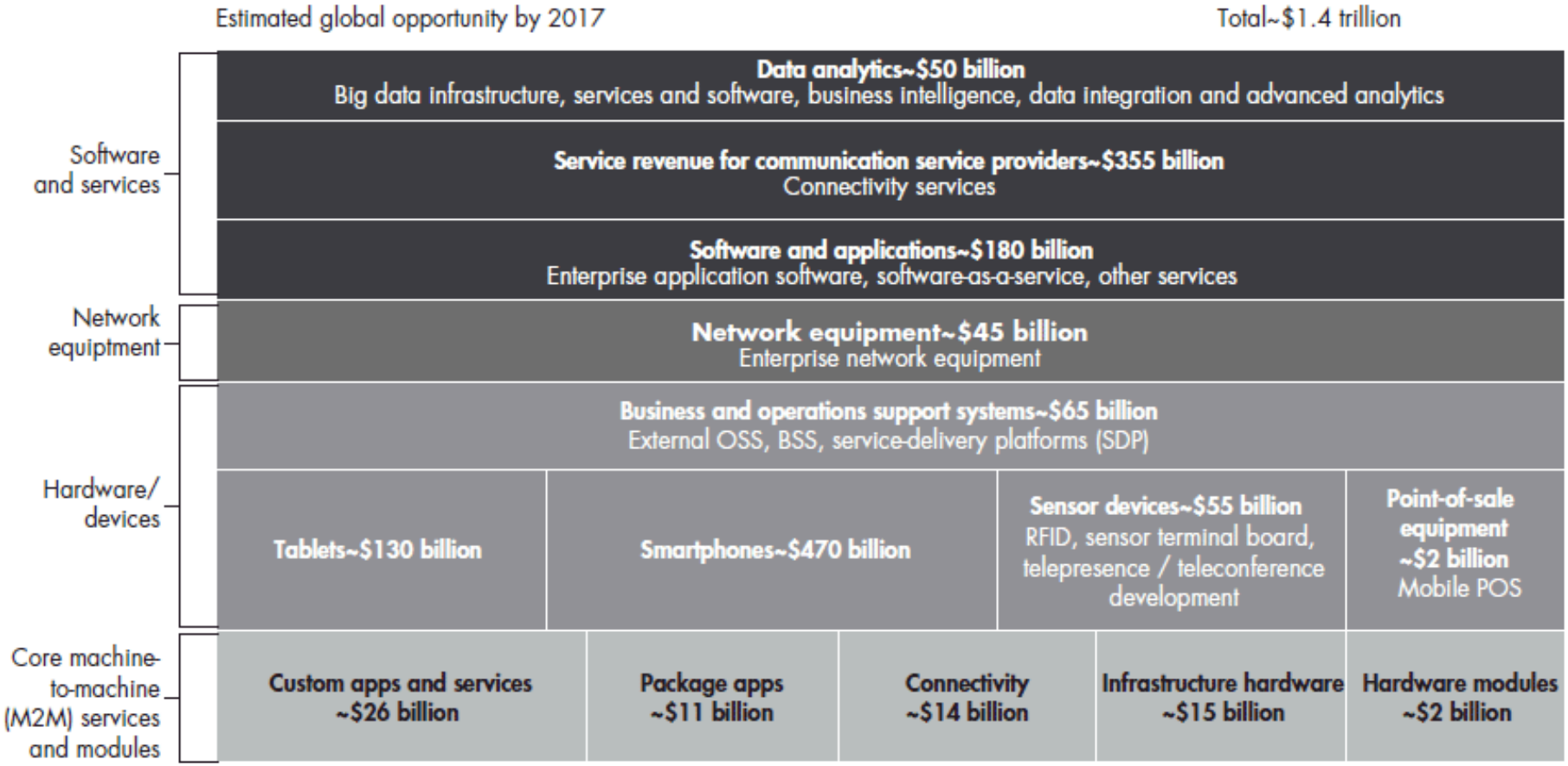
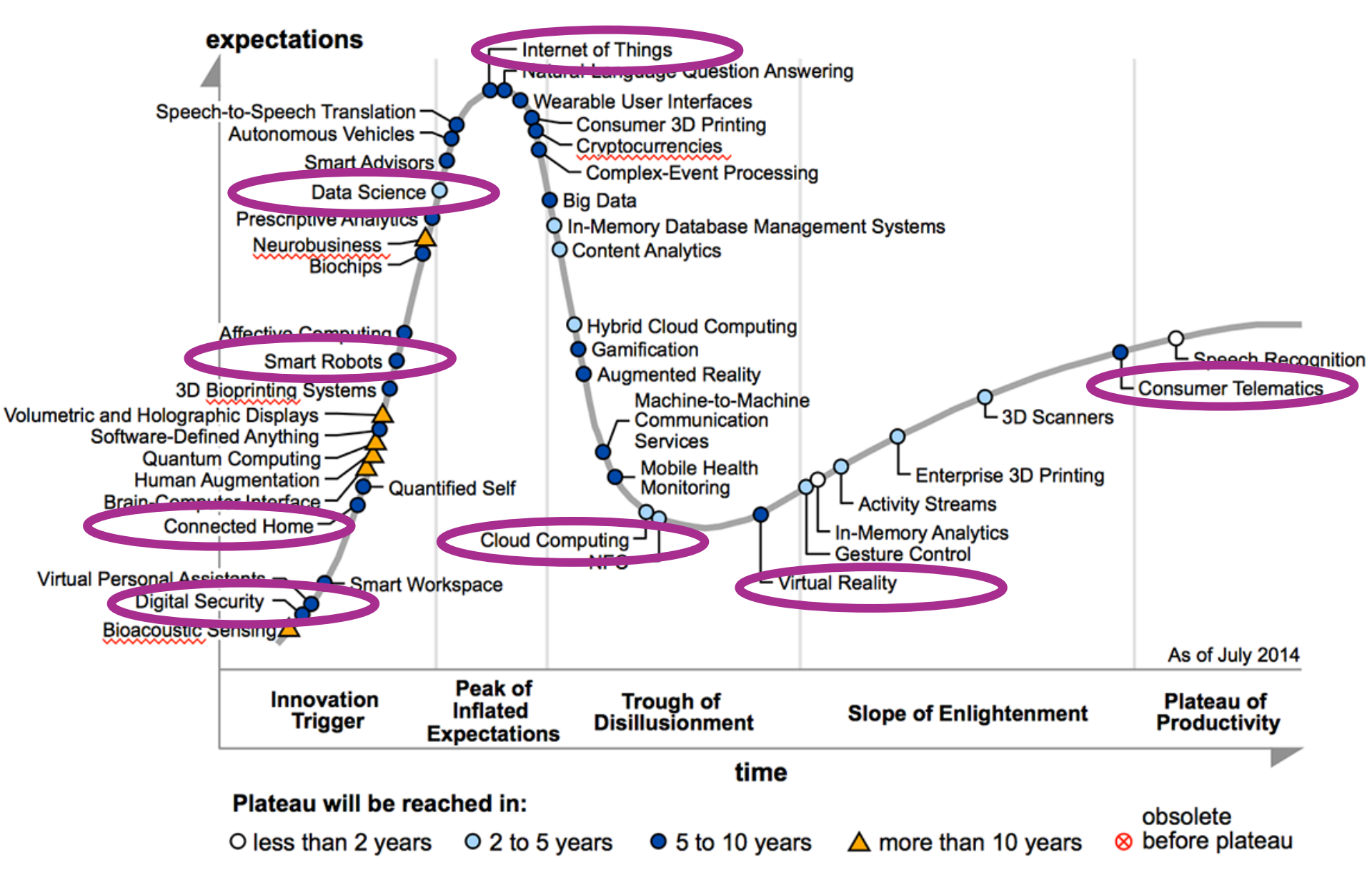


Figure 1: While direct spending on hardware, software and services could top $70 billion, related opportunities in pervasive computing could reach $1.4 trillion by 2017



Sources: IDATE; IDC; IDTechEx; IHL Group; Gartner; Ovum; Operator M2M Strategy Update 2012; Wall Street research; Bain analysis

http://www.bain.com/publications/articles/is-your-company-ready-for-the-internet-of-things.aspx


expectations
Internet of Things
Natural-Language Question Answering
Wearable User Interfaces
Consumer 3D Printing
Cryptocurrencies
Complex-Event Processing
Big Data
In-Memory Database Management Systems
Content Analytics
Speech-to-Speech Translation
Autonomous Vehicles
Smart Advisors
Data Science
Prescriptive Analytics
Neurobusiness
Biochips
Affective Computing
Smart Robots
3D Bioprinting Systems
Volumetric and Holographic Displays
Software-Defined Anything
Quantum Computing
Human Augmentation
Brain-Computer Interface
Quantified Self
Connected Home
Virtual Personal Assistants
Smart Workspace
Digital Security
Bioacoustic Sensing
Hybrid Cloud Computing
Gamification
Augmented Reality
Machine-to-Machine Communication Services
Mobile Health Monitoring
Cloud Computing
NFC
Virtual Reality
Activity Streams
In-Memory Analytics
Gesture Control
Enterprise 3D Printing
3D Scanners
Speech Recognition
Consumer Telematics
As of July 2014
Innovation Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau of Productivity
time
Plateau will be reached in:
less than 2 years
2 to 5 years
5 to 10 years
more than 10 years
obsolete before plateau

Integration

What will result from integrating the multitude of different technologies?

- Software, system integration
  - Different technologies, social impact
- IoT & Big Data – CPS and Cloud Computing
  - Massive amount of data
- Large-scale, vast number of nodes (trillions!)
  - Dynamic, adaptive
- Validation

Workforce

Who will build the Swarm?

- What kind of expertise will be required?
  - BS, MS in IoT Engineering? Curricula?
  - Hackerspaces
- Are current training efforts sufficient?
- Multi-disciplinary approach required
  - Which of the classic disciplines?

Thank you for your attention and contribution!