
Hyperspace and Cyber-I

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Cyber & Cyber Space

- **Cyber**

- **Cyber** first appeared in the word **cybernetics**, coined by Norbert Wiener in his book of that name in 1948. Wiener derived it from the Greek for steersman and the idea of control is central to it

- **Cyber Space**

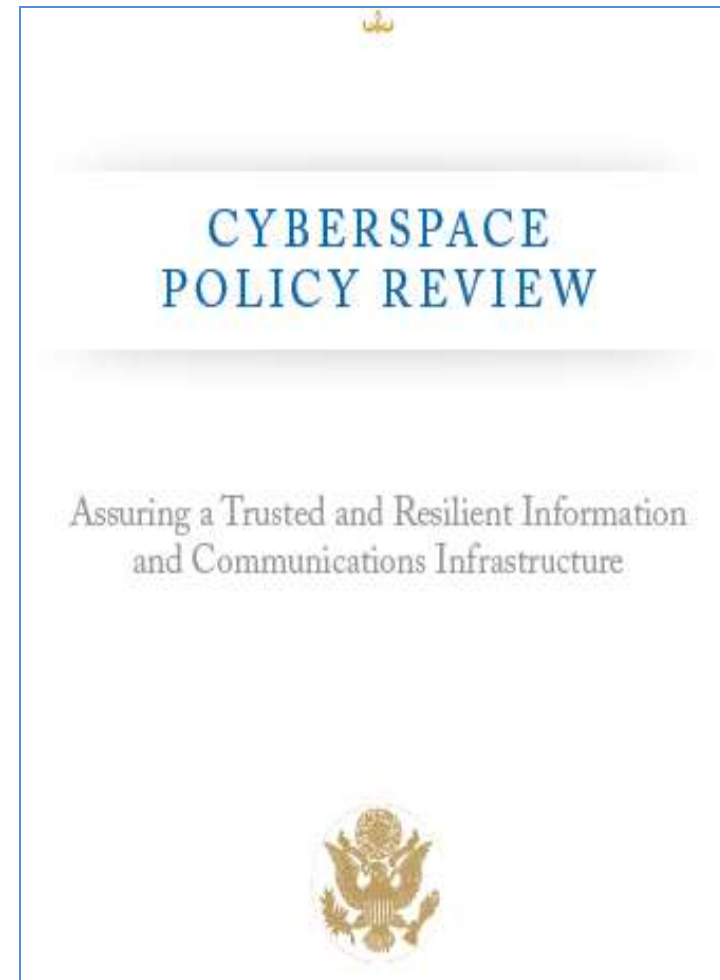
- William Gibson is best known for using it in his 1984 novel *Neuromancer*, but actually invented it two years previously in a short story in *Omni*
- Its original sense in *Neuromancer* was of electronic space as perceived by what we would now call virtual reality: the brain and senses were directly linked with the world of computers and communications and so could experience it as an actual landscape

Cyber & Cyber Space (cont.)

– (Obama, 2009) The globally-interconnected digital information and communications infrastructure known as “cyberspace” underpins almost every facet of modern society and provides critical support for the economy, civil infrastructure, public safety, and national security

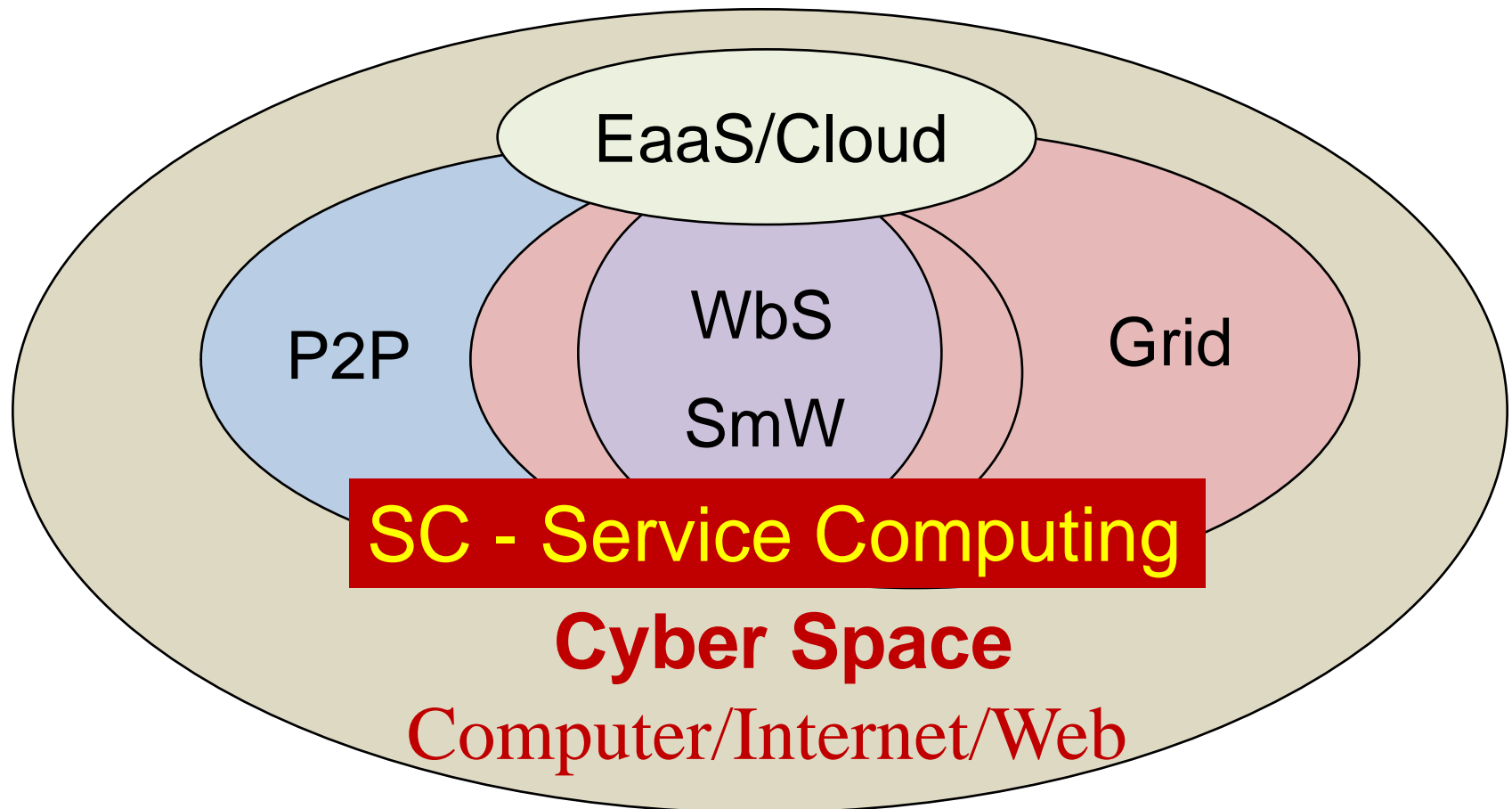
- Cyber Space (General IT-related definition)

– A **global** domain within the information environment consisting of the interdependent networks of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers common to global control and communications



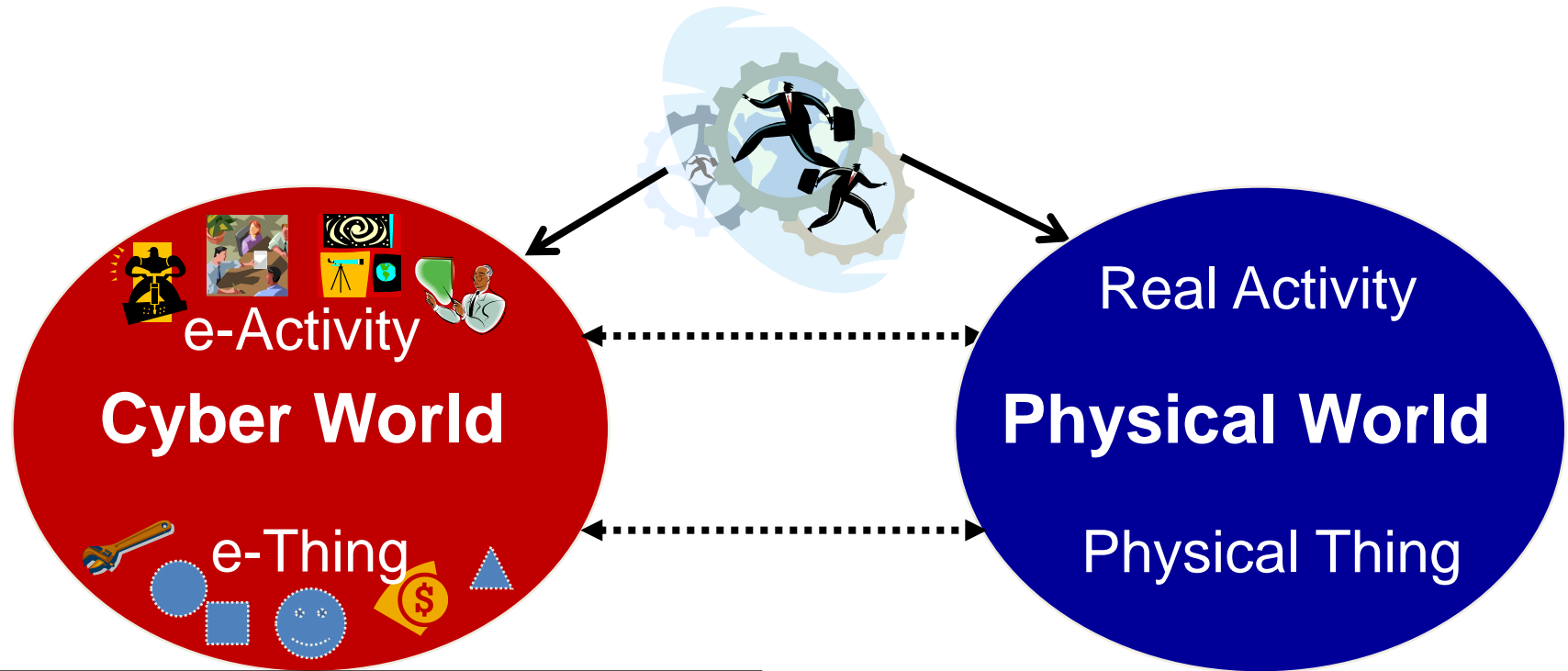
Computing on Cyber Space

- Internet/Web/Cyber Computing, Service Computing (SC)
 - Cross/Intersection of WbS, SmWeb, P2P, Grid, EaaS, Cloud, etc.



e-Thing & e-Activity in Cyber World

Cyber World on web/cyber space in digital/virtual form



Web, WbS, SmW, Grid, P2P, EaaS, Cloud

Computers/Networks/Internet

Cyber Space

Technology Trends and u-Things

◆ Two Fundamental Technology Trends

- Continuing miniaturization of devices (Moore's law, new material, nanotech., ...)
- Available interconnections by ubiquitous/pervasive wired and wireless networks

u-Things: Physical things with some kind of **Attachment**, **Embedment**, **Blending**
– **AEB** of computers, sensors, tags, networks, and/or other devices

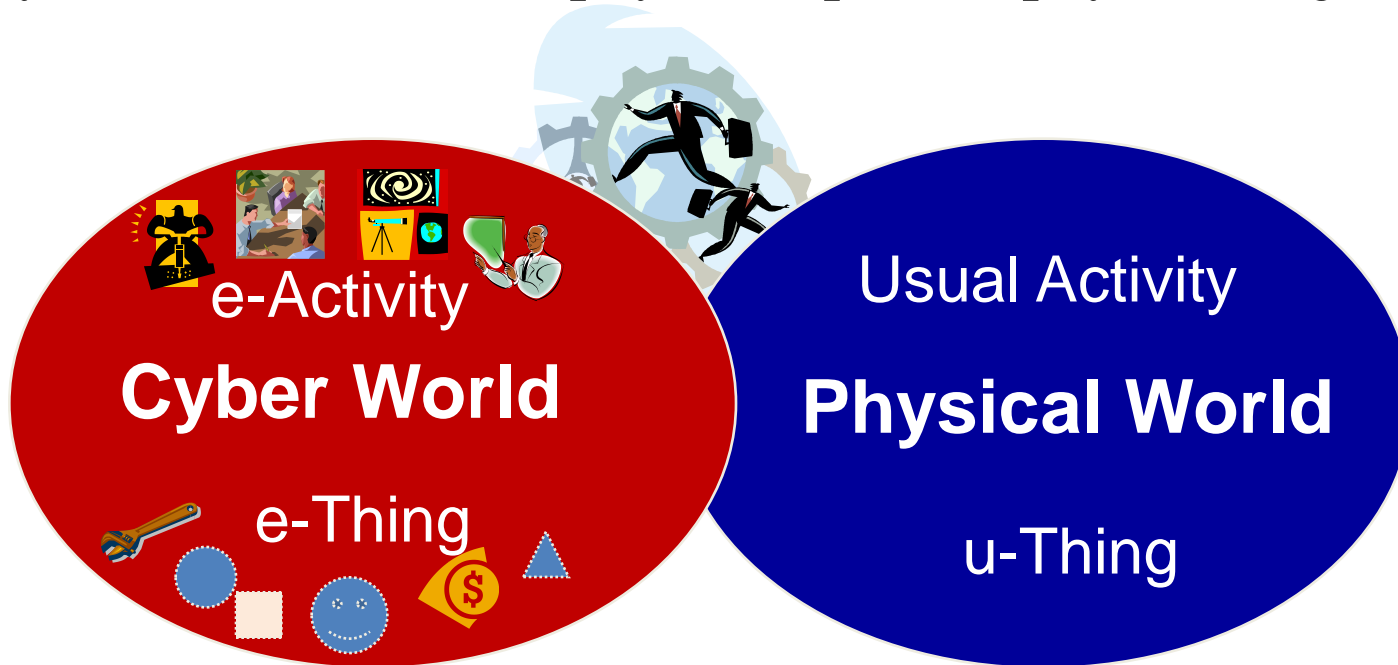


0.15x0.15 mm, Hitachi/06



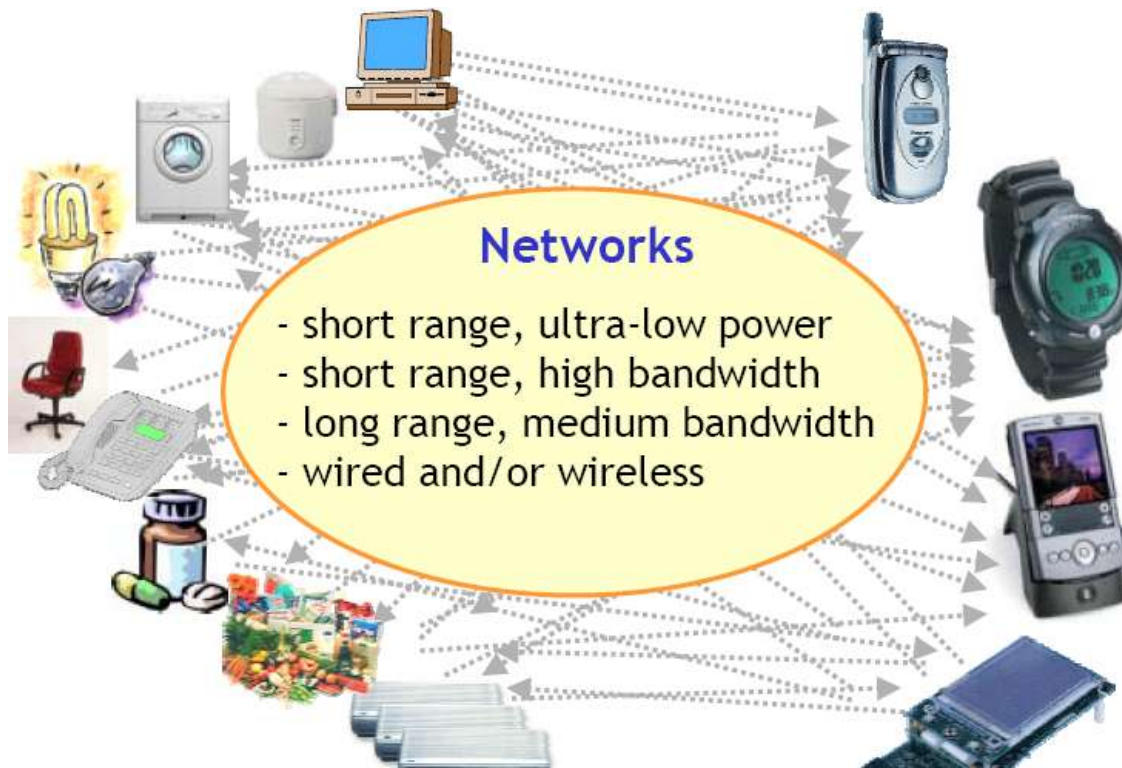
u-Things in Physical/Real World

In Physical/Real World on physical space in physical-digital form



WbS, SmW, Grid, P2P, EaaS, Cloud	UC, ID, Context, Emb. Sys., etc.
Computers & Networks/Internet Cyber Space	Sensor/M/NEMS, Comps & Per. Nets Physical Space

Computable and Networked u-Things



u-Things → Internet/Web of Things (IoT/WoT)

Smart u-Things in Physical World → Smart World

- **Smart Object** (Smart u-Object, Smartifact) [*Plant talks, IEEE Spectrum, May/09*](#)
 - A physical object with AEB devices and some smartness/intelligence
 - *Handheld, card, label, sensor, artifact, appliance, goods, furniture, textile, robot, ...*
- **Smart Environment** (Smart u-Environment)
 - A physical spatial environment/site integrating smart u-objects &/ devices
 - Smart u-Services via these objects/devices and their commun./cooperation
- **Smart System** (Smart u-System) [*Smart Grid, IEEE Spectrum, July/09*](#)
 - May be a real system/network for management, monitoring, emergence, ...
 - May be a platform or middleware for smart u-objects/environments/services

Ubicomp/Percomp/AmI/CPS → Computing of Smart u-Things

[Towards a Smart World and Ubiquitous Intelligence, JPCC, 1\(1\) March 2005.](#)

[Smart u-Things – Challenging Real World Complexity, IPSJ Symp-S, No.19, 2005](#)

[1st Int'l Workshop on Ubiquitous Smart World \(USW-05, Taiwan, March 2005\)](#)

[2nd Int'l Sym on Ubiquitous Intelligence & Smart World \(UISW-05, JP, Dec. 2005\)](#)

[3rd Int'l Conf on Ubiquitous Intelligence & Computing \(UIC06, China\)](#)

[UIC07 \(HK\)](#) [UIC08 \(Norway\)](#), [UIC09 \(Australia\)](#), [UIC10 \(Xi'an\)](#)

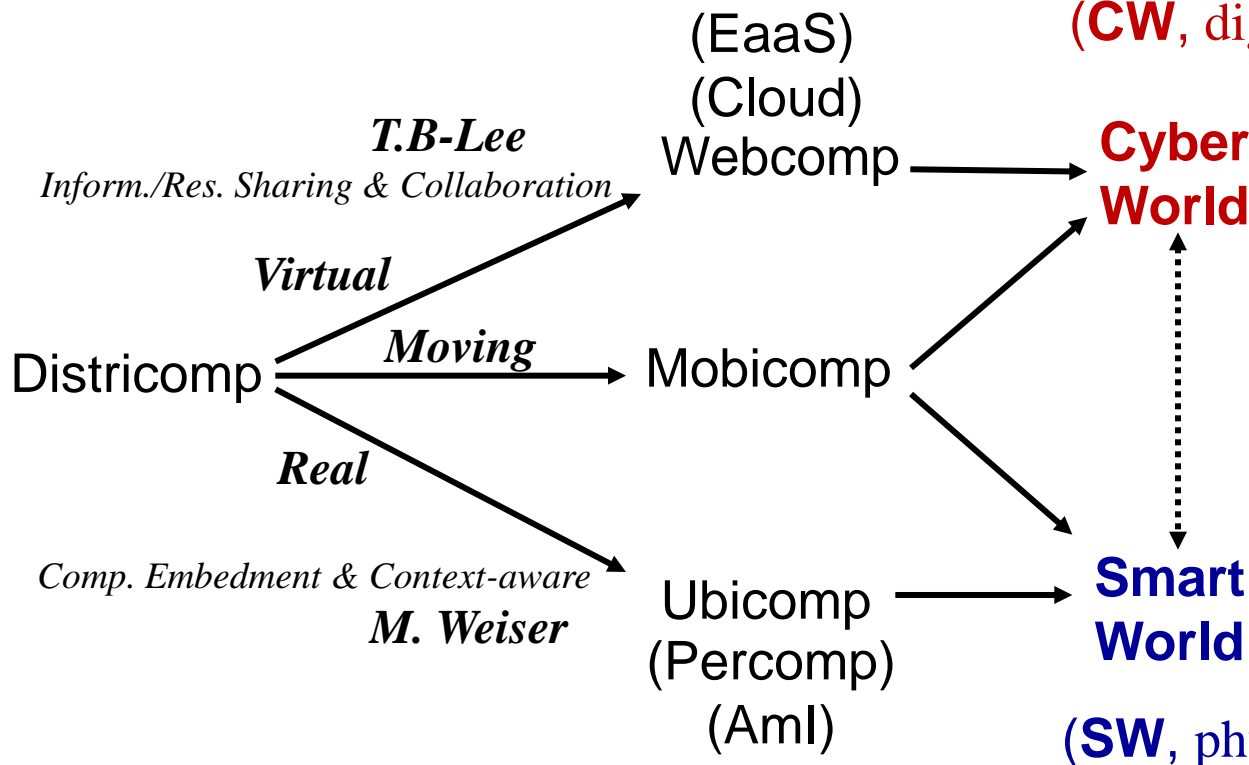


Relations of Computing and Worlds

Co-found Int'l Conference on Cyber Worlds in 2002

→ Smart e-Things

(**CW**, digital/virtual)



(**SW**, physical/real)

→ Smart u-Things

Smart Planet, IBM (2008)

Smart Ubiquitous Society (2009)

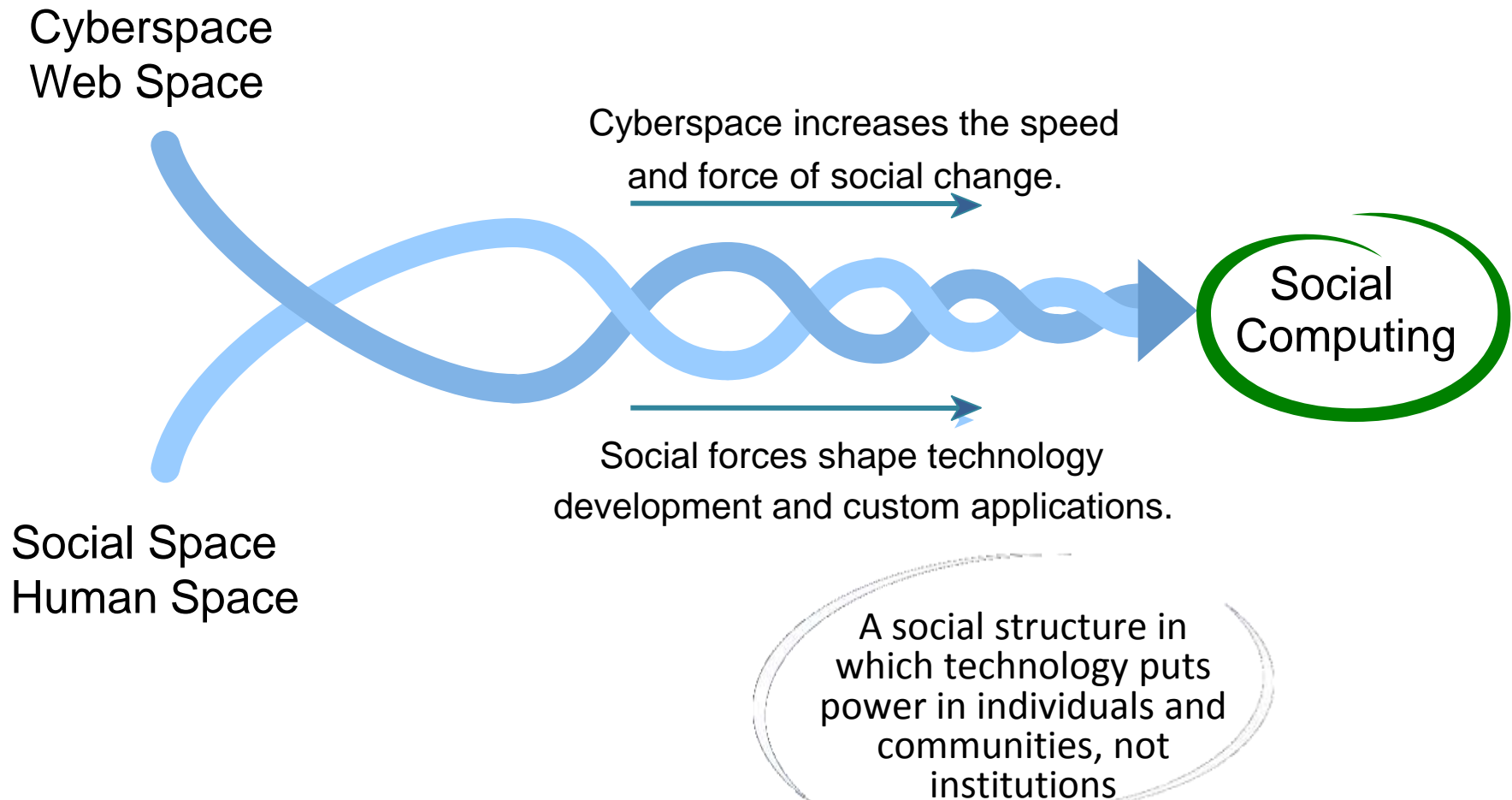
Found Workshop on Ubiquitous Smart Worlds in 2004

Novel Social Space on Cyber/Web

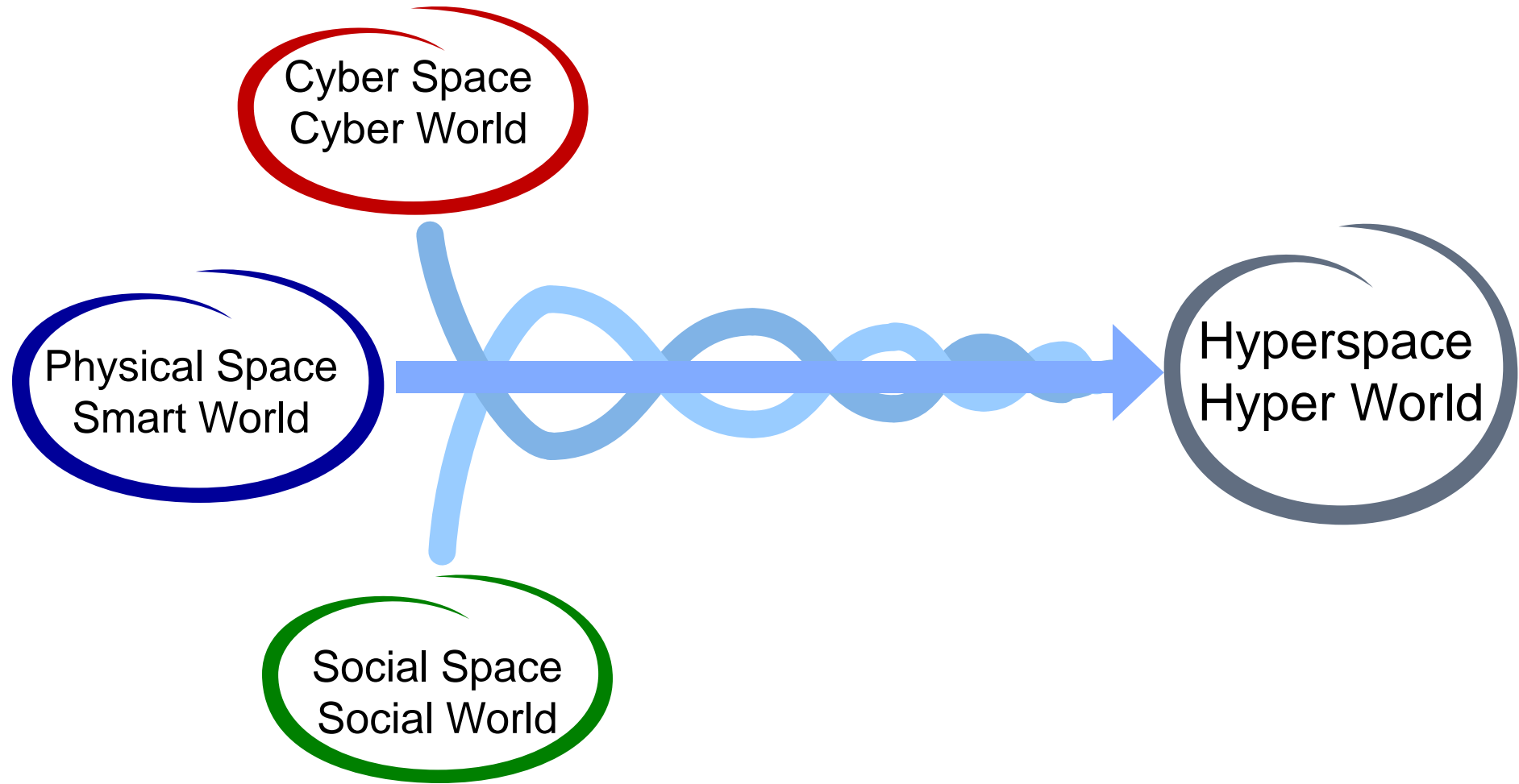
Social Media Landscape



Cyber Space & Social Space Converge



Cyber, Physical, Social Spaces → Hyperspace



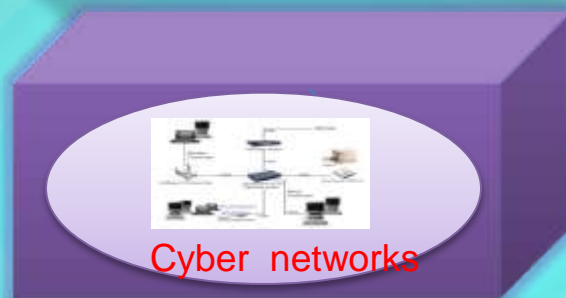
Cyber, Physical & Social Worlds → Hyper World

Hyperspace

Hyperspace = Cyber Space + Physical Space + Social Space

- **Cyber** – computation, communication, and control that are discrete, logical, and switched
- **Physical** – natural and human-made systems governed by the laws of physics and operating in continuous time
- **Social** – socially produced space, serves as a tool of thoughts, action, mind, sense, interaction, communications, etc.

Hyper Space



Hyper Space



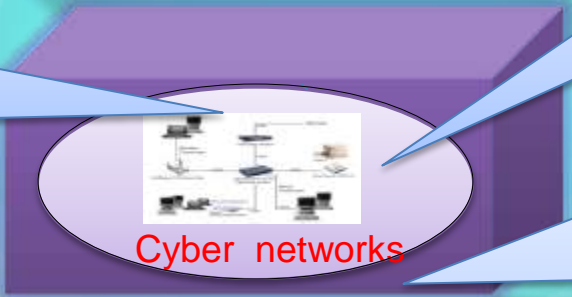
Social Space

Social Computing
Internet of People (IoP)
Cyber Individuals




A collection of small, colorful icons representing various social media and communication platforms, including YouTube, Flickr, Facebook, and others.

Pervasive/Ubi Intelligence (UI)
Web/Cyber Intelligence
Cyber Science & Sociology



Cyber Space

u-Things
(Internet/Web of Things)
u-systems / u-services

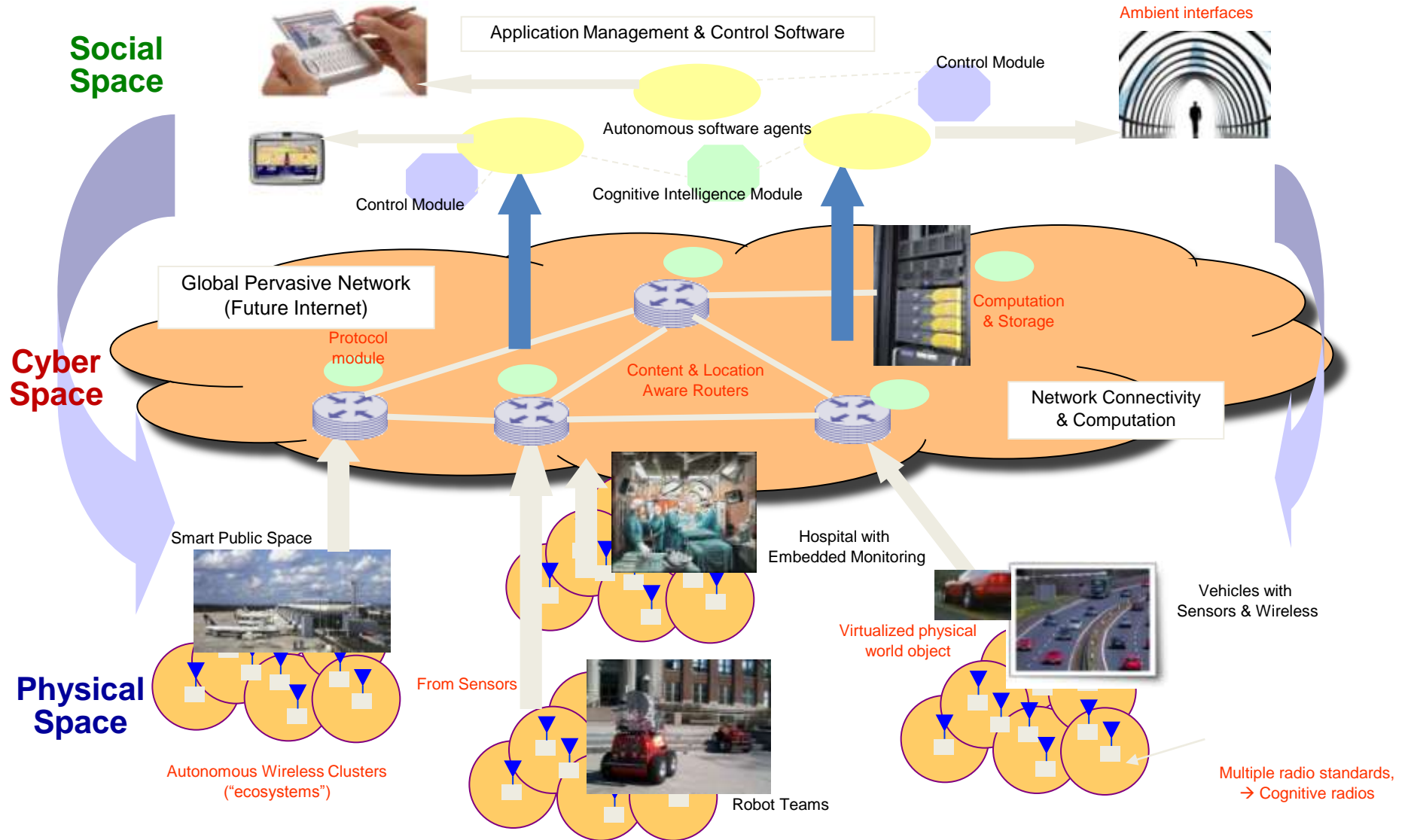


A diagram showing a central node connected to various peripheral nodes, representing the Internet of Things (u-Things) and associated services.



Physical Space

Hyperspace

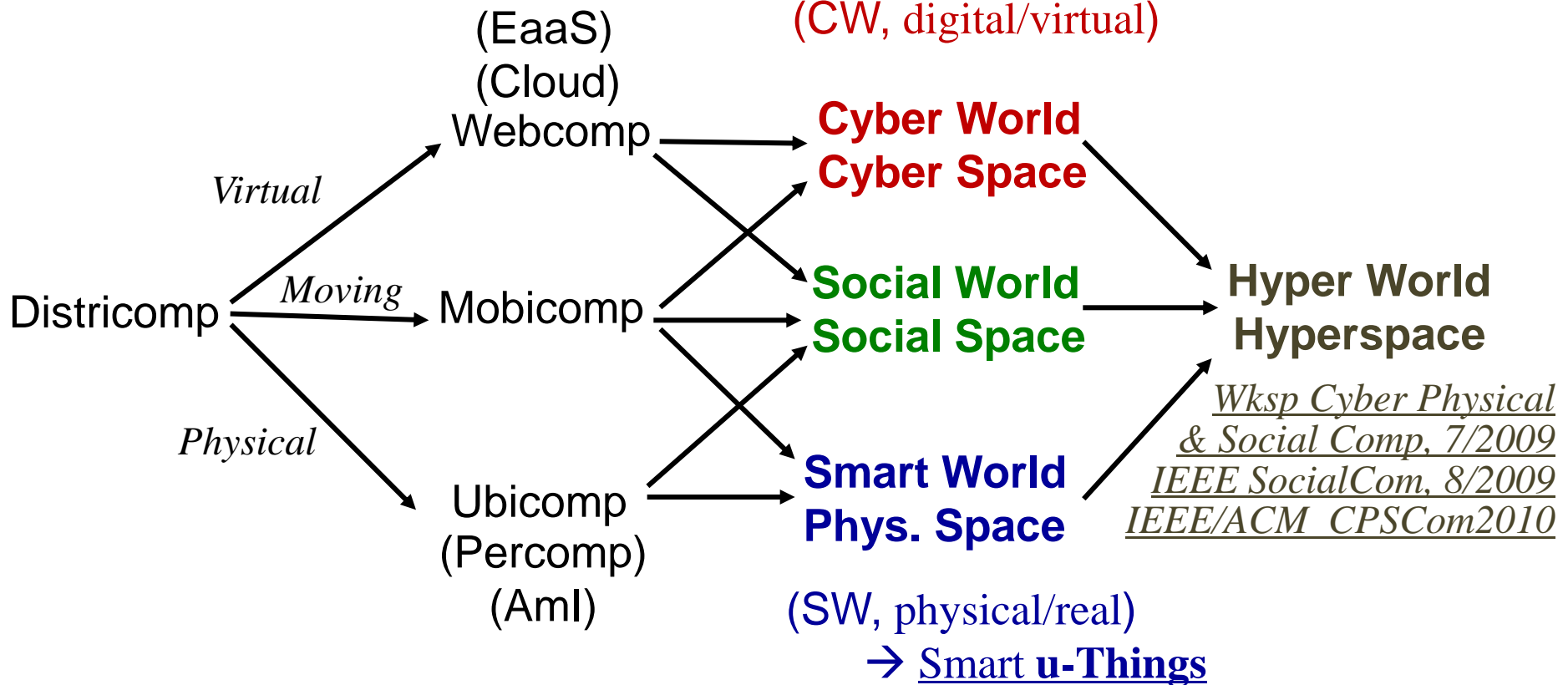


Relations of Computing and Worlds

Co-found Int'l Conference on Cyber Worlds in 2002

→ Smart e-Things

(CW, digital/virtual)



Found Workshop on Ubiquitous Smart Worlds in 2004

→ Ubiquitous Intelligence & Computing (UIC) from 2006

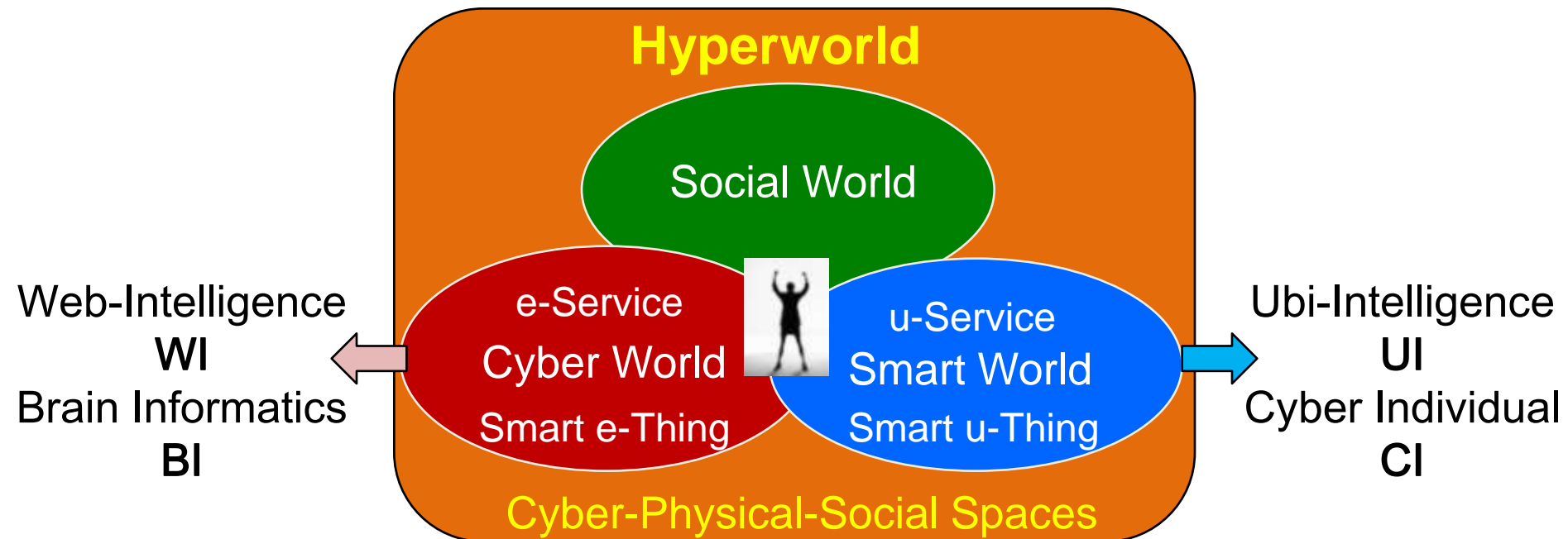
Hyper World and Human

➤ Hyperworld (1995)

- "Hyperworld Modeling", Keynote in VIS, Melbourne, Feb. 1996 (Kunii, Ma, Huang)
- "Its basic characteristic is direct mapping between virtual and real worlds via active devices including sensors, actuators, micro-machines, robots, etc." - 1996
 - "A Study on a Hyperworld System of One-to-Many Interaction", ICAI'97 (Weiser's 1-to-m relationship)
 - "Towards Direct Mapping between Information Worlds and Real Worlds", LNCS1306, 1997

➤ Hyper World = Cyber World + Physical World + Social World

Q: How about human and human's existence in the hyper world?



Terms related to Human's Forms

All possible term combinations, and each may have special meaning(s)

	Human	Person	Individual	People	Citizen	Brain/Mind	Life	Actor/Robot
Cyber			●					
Web								
e-								
Networked								
Digital								
Virtual								
Artificial (Synthetic)								

Natural Individual (Body+Mind) \leftrightarrow Cyber Individual (Cyber-I)²⁰

AGENDA

- What is Cyber-I?
- Why I need Cyber-I?
- Design for Cyber-I
- Issues

Who knows Bob best? ..Bob



If Bob wants to lead a happy life, ...

Cyber-Bob?

Bob



Real
World

- **Knows Bob well**
 - **Bob's Lifelog on Cyberspace**
 - **Bob's Personality, Mind, ...**

Cyber-Bob



Cyber
World

Cyber-Individual(Cyber-I)

- A real individual's counterpart in cyber world
- Human existence & essential in CPS Hyperworld

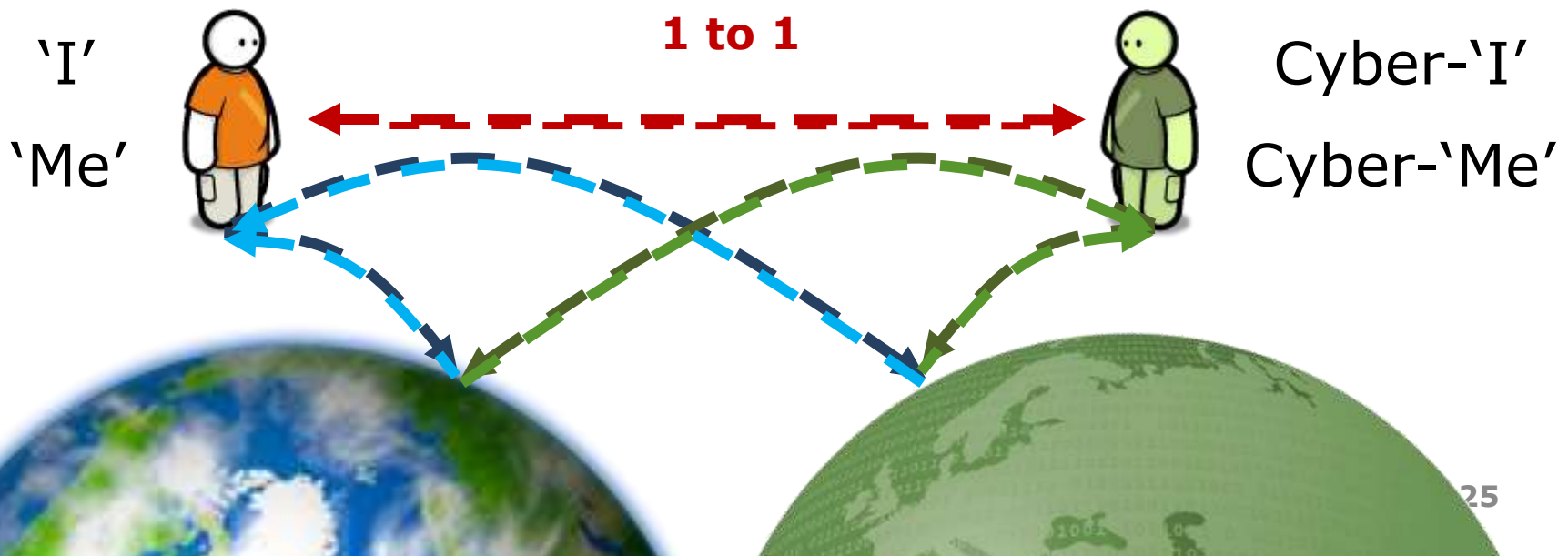
- Generally

- The most comprehensive digital description of “I”
- “I”-based comp and accurate personalized services
- From Web, IoT/WoT , SN to Digital Real Individual
- A User with/without Cyber-I
- A society of individuals with different Cyber-Is

Cyber-Individual(Cyber-I)

Cyber-I is a real individual's counterpart in cyber world.

- Specifically
 - 'I' – Individual (One, Unique)
 - 'I' – Pronoun (Ego)



Cyber-Individual (Cyber-I)

Cyber-I is a real individual's counterpart in cyber world.

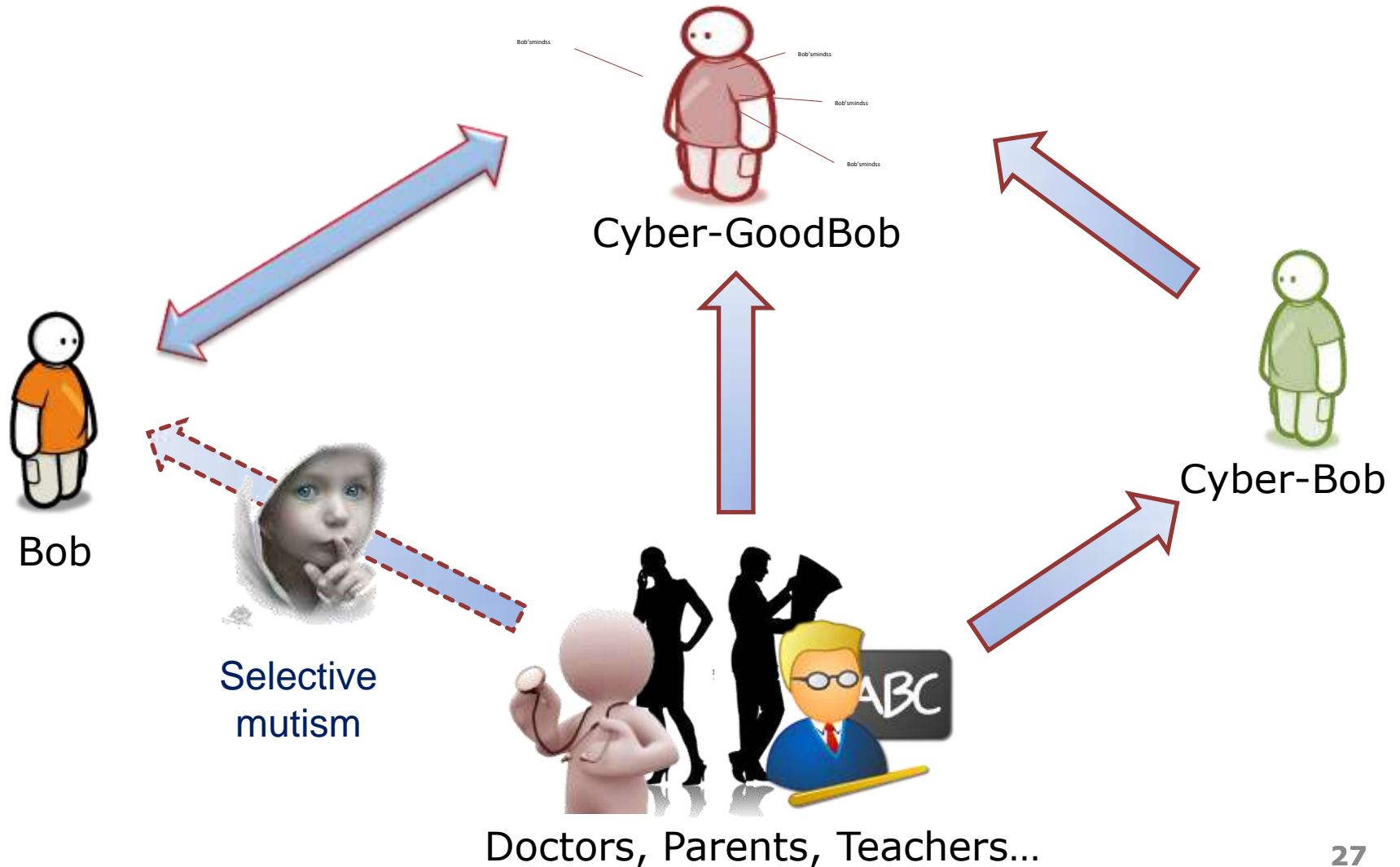
- What is it Not
 - Inconspicuous
 - Unchangeable
 - Unsuspicious



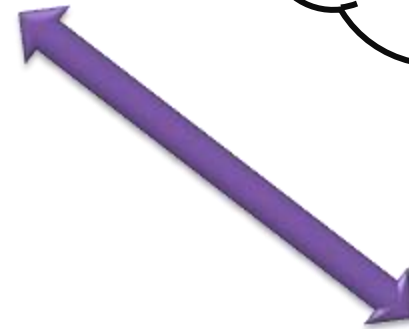
Core Problem:

Who/How can control Cyber I

Cyber-Individual (Cyber-I)



Cyber-I Scenarios - Extending



Android – Robotic Copy of Himself

IEEE Spectrum, April, 2010

[Hiroshi Ishiguro: The Man Who Made a Copy of Himself](#)

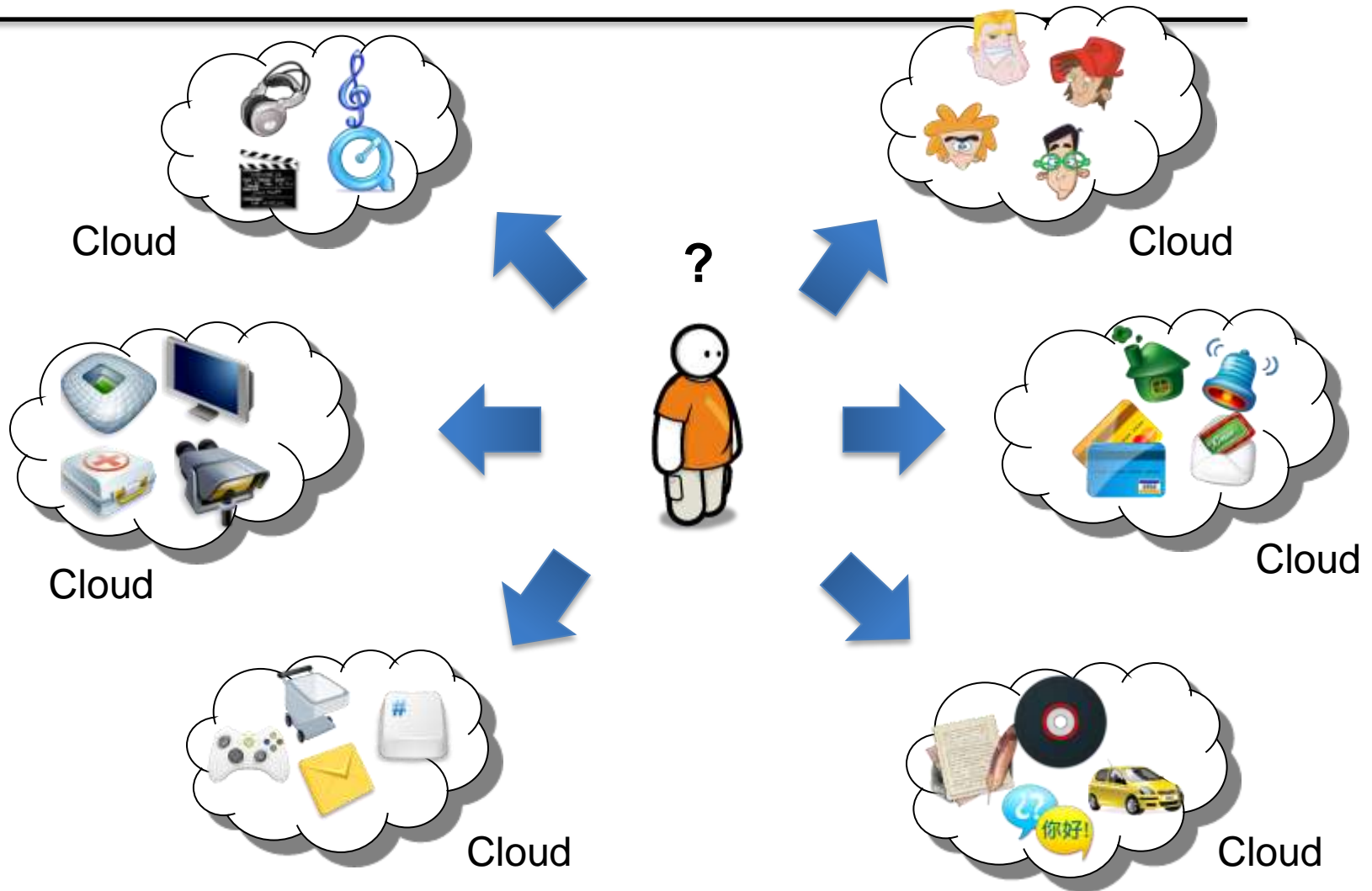
- Building androids to understand humans--starting with himself
- "My research question is to know what is a human"



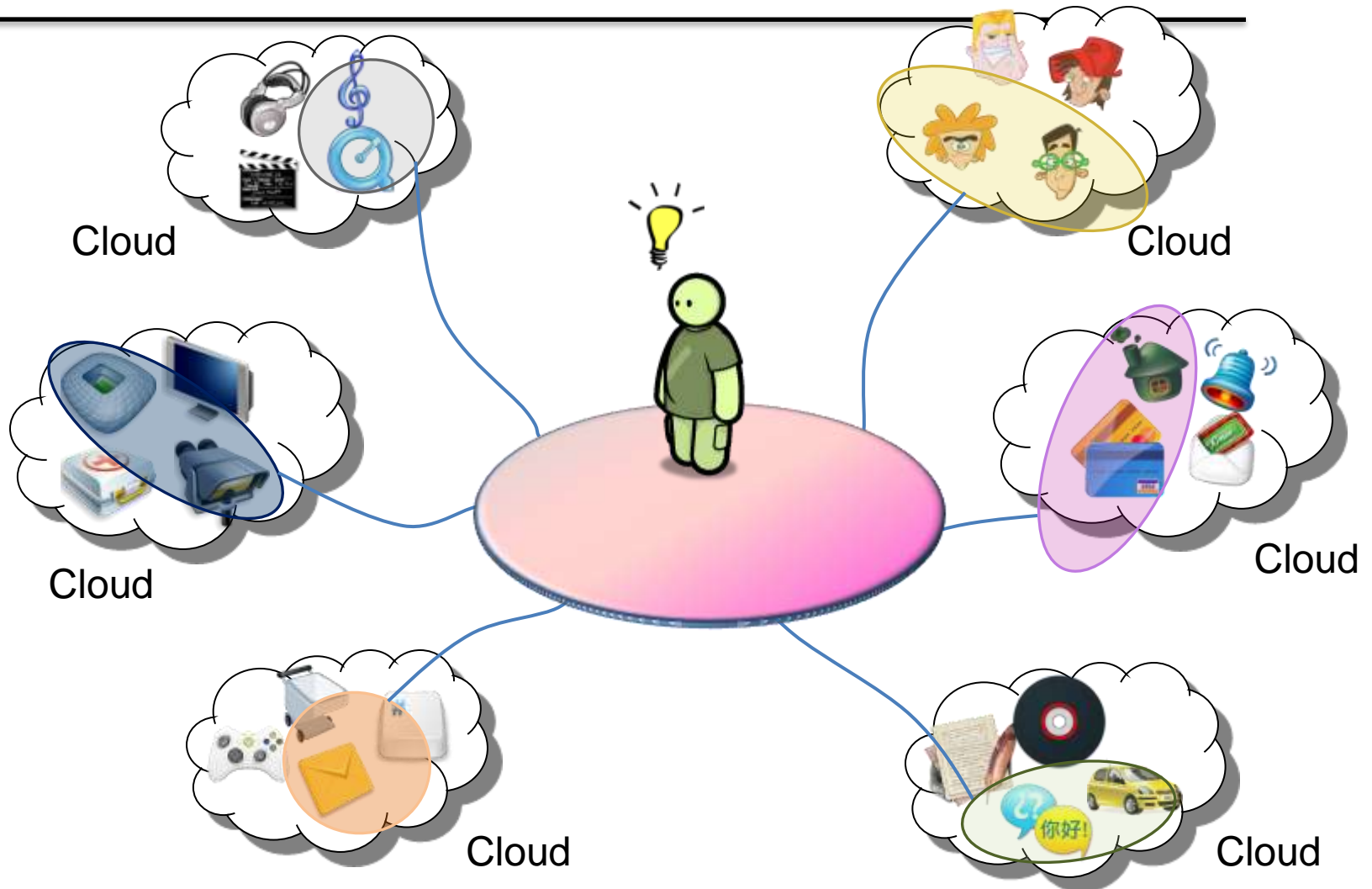
AGENDA

- What is Cyber-I?
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- Issues

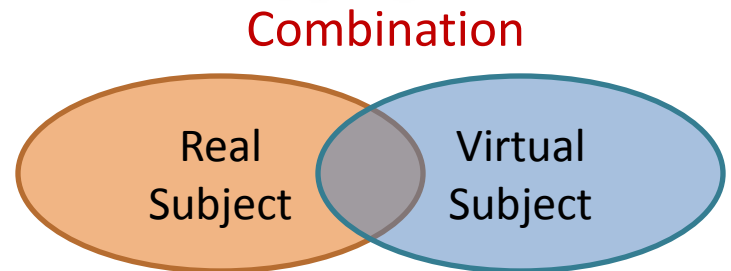
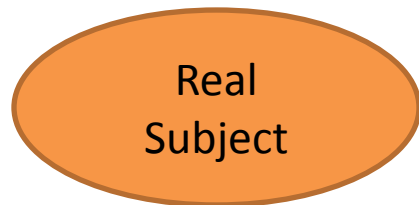
Which services Bob needs?



Ask Cyber-Bob



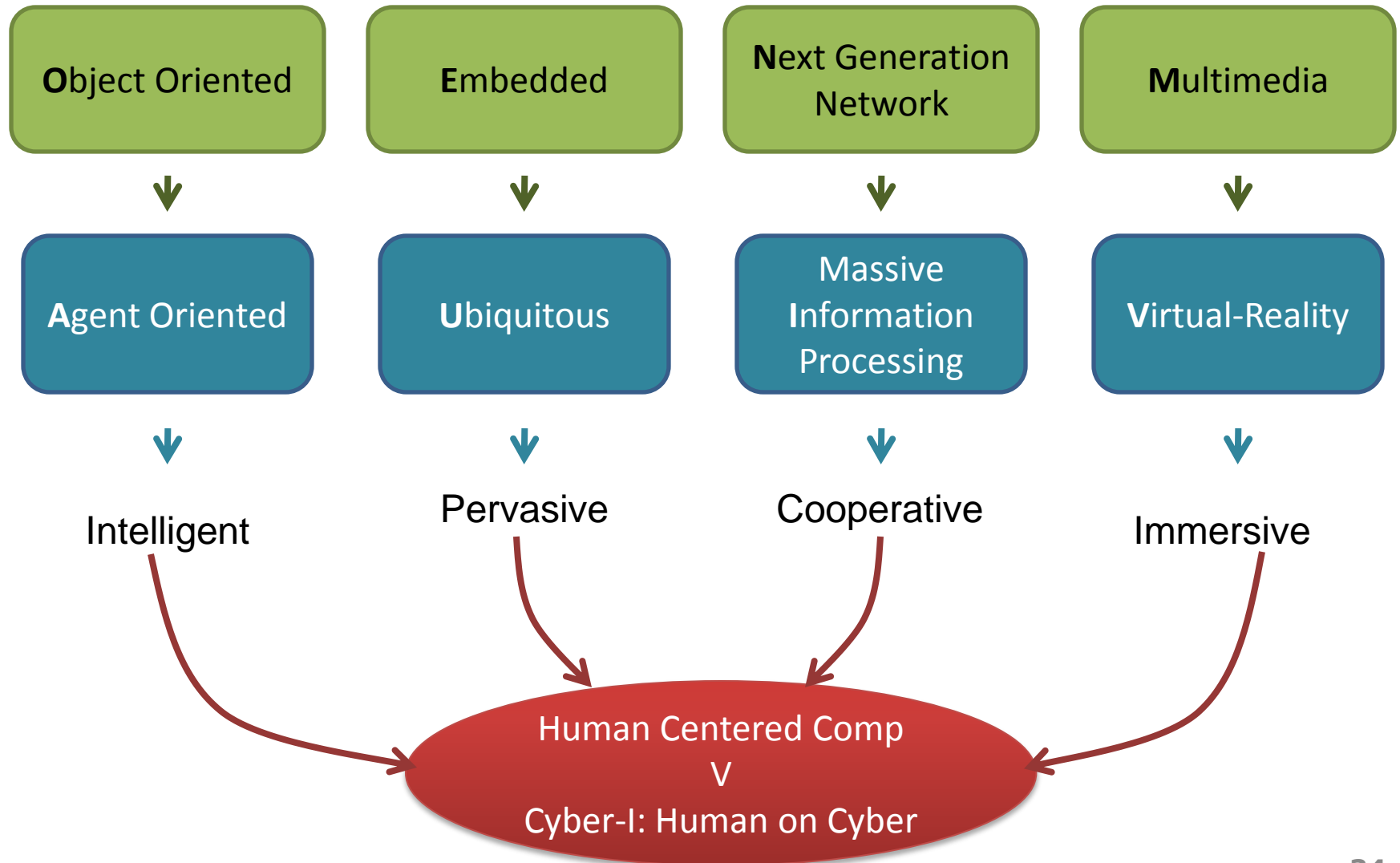
Human Revolution



Combination

Complement

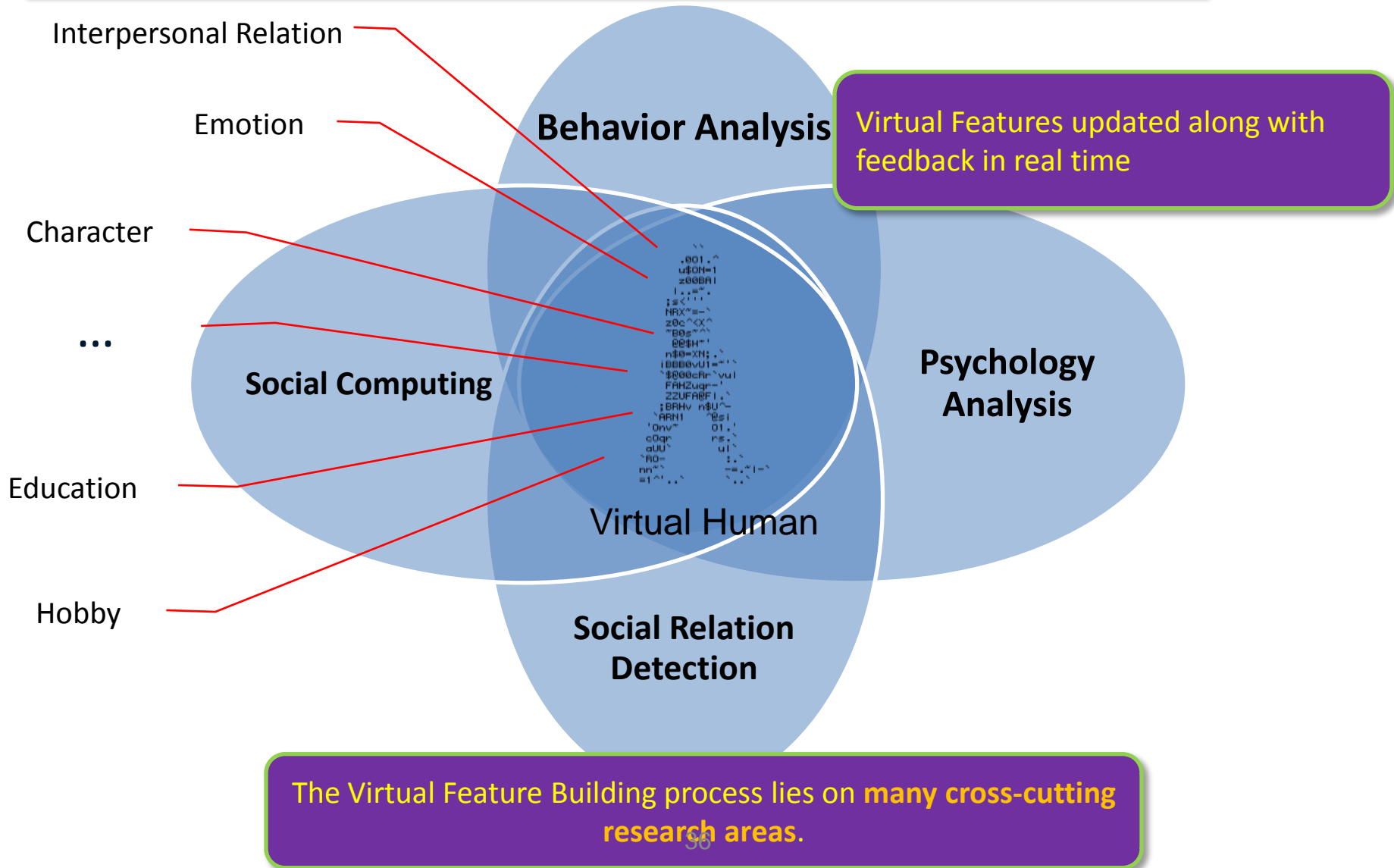
Cyber-I and Human Centered Computing



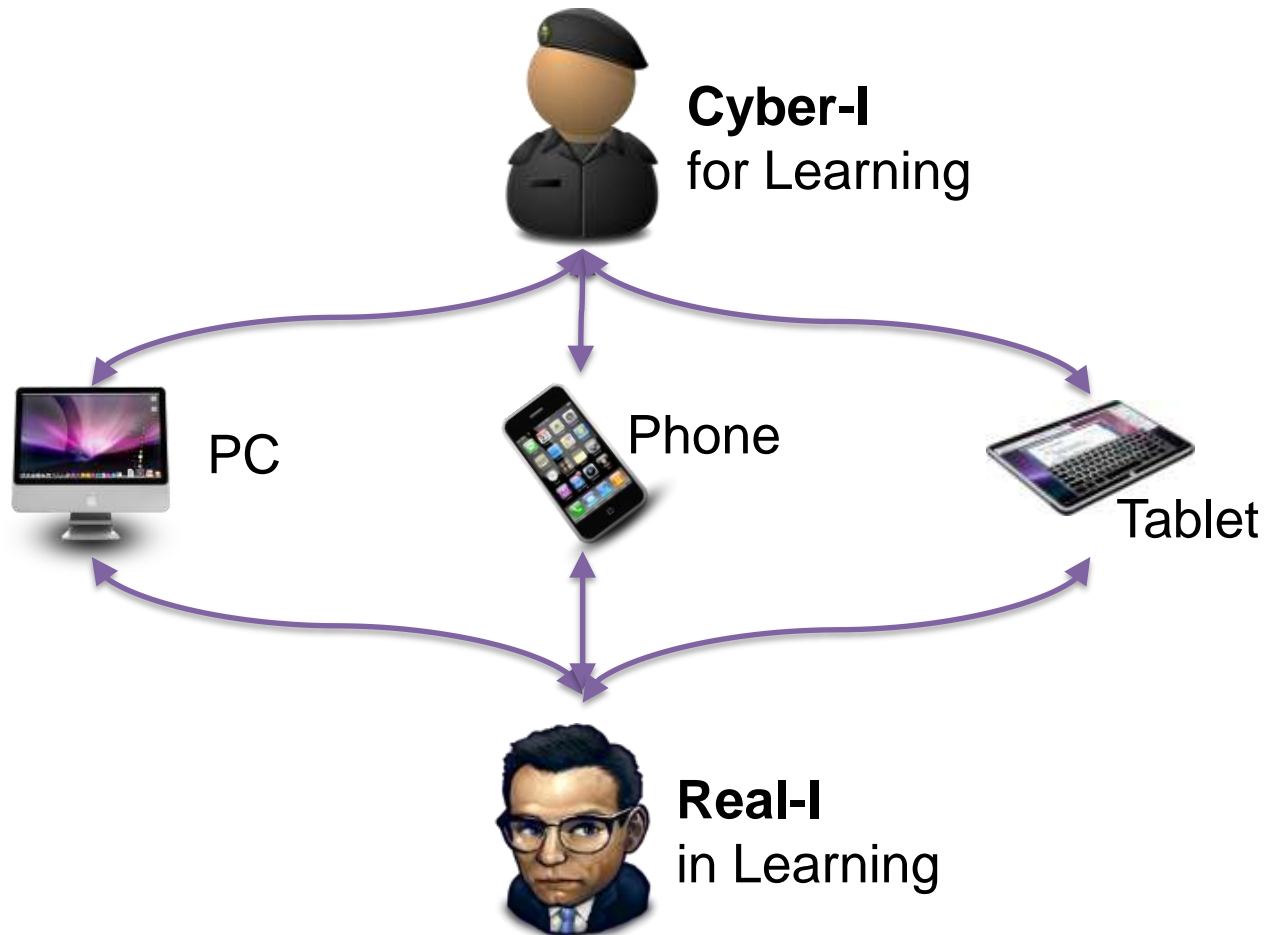
AGENDA

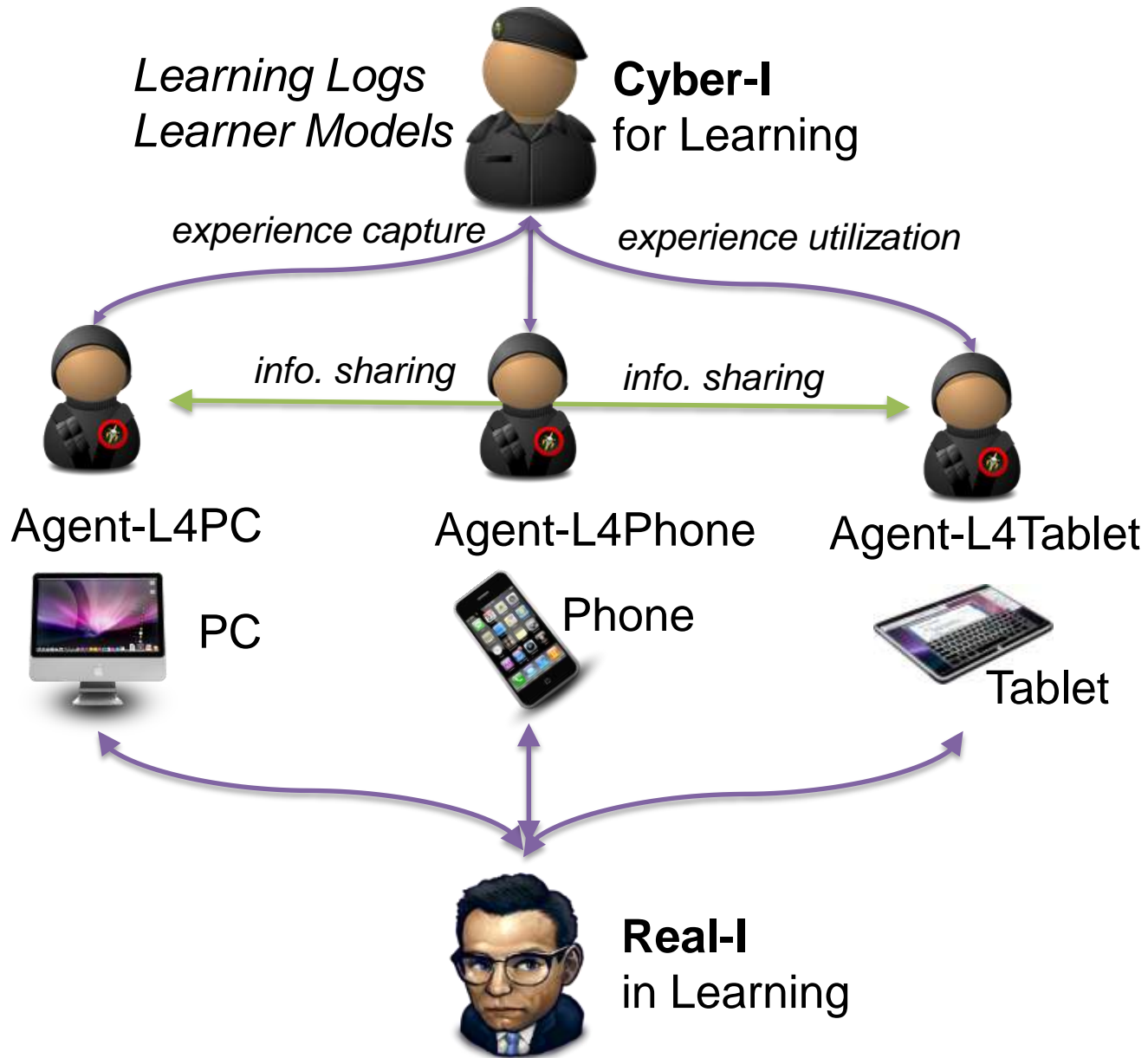
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Multi-Facets/Aspects of Cyber-I

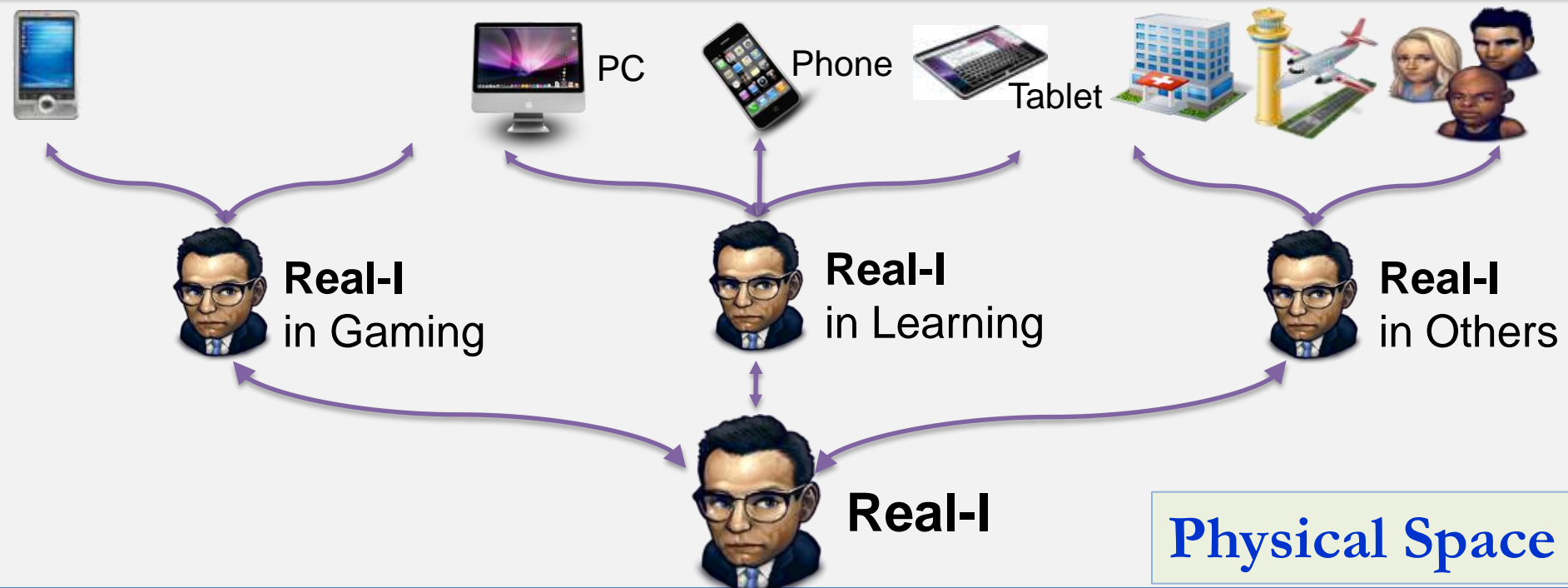
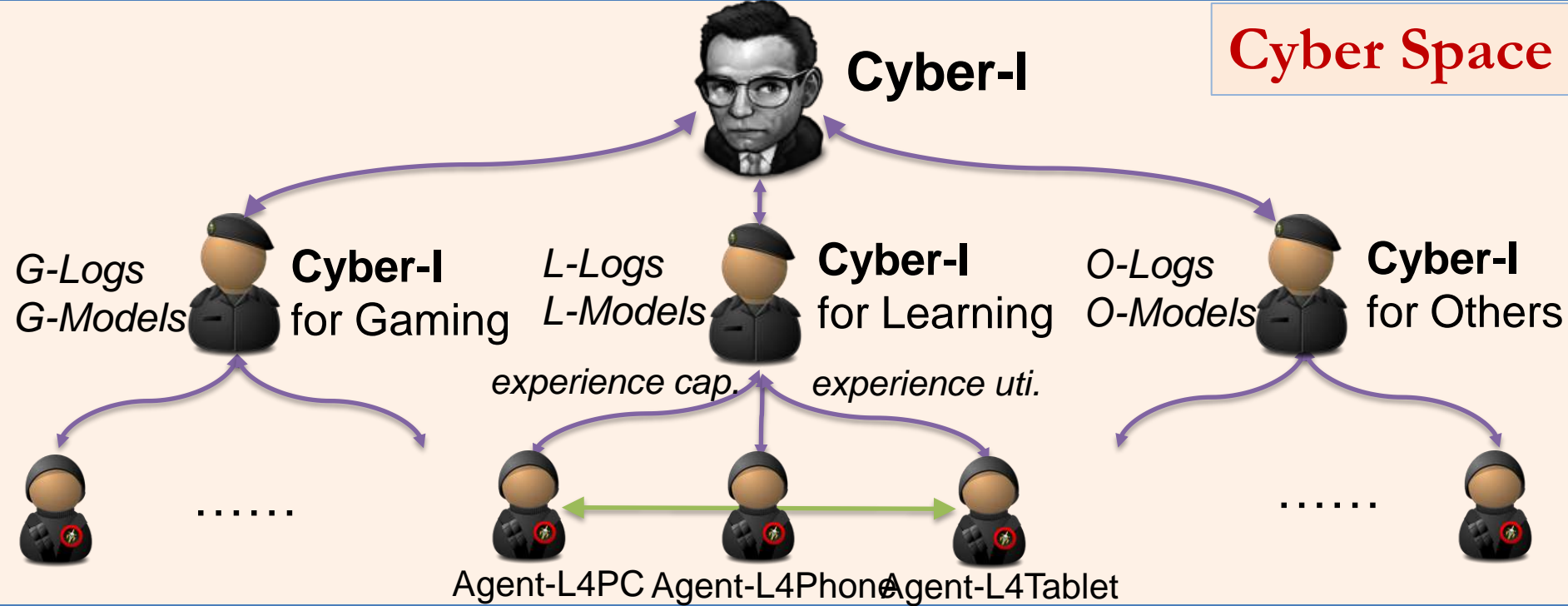


Case Study – eLearning with Cyber-I



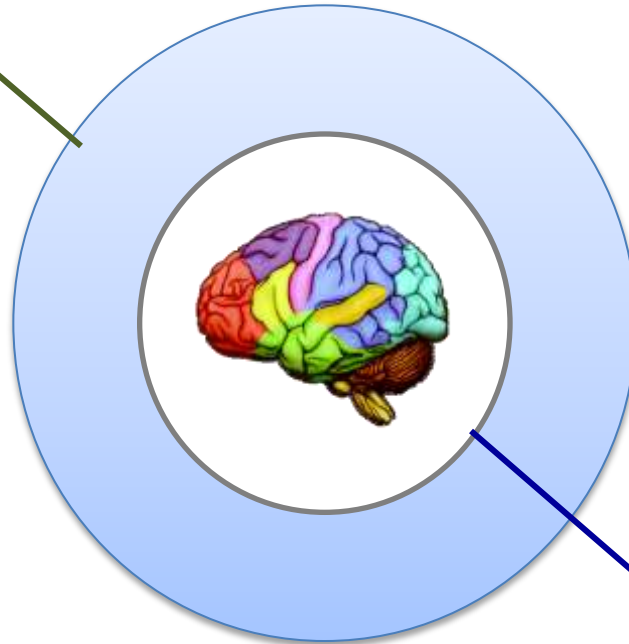


Cyber Space



Layers

Peripheral Layer



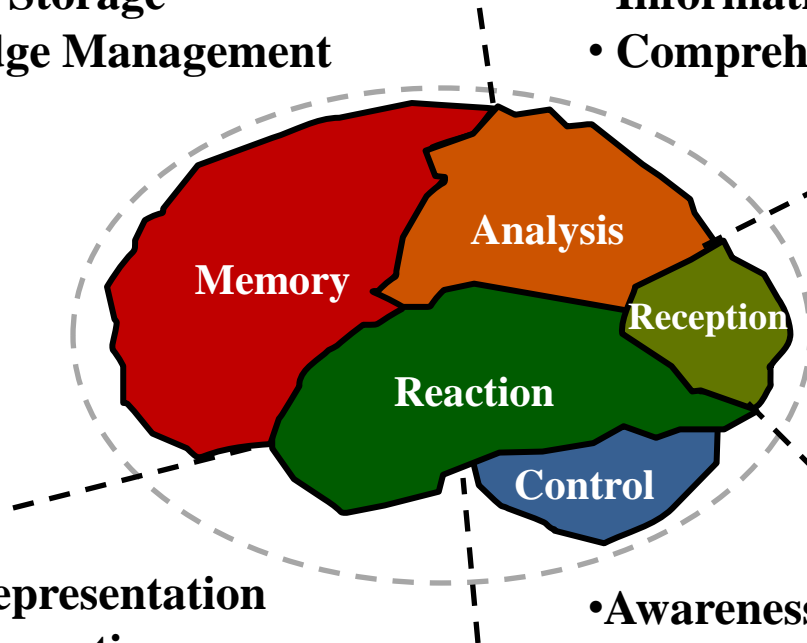
Core Layer

Cyber-I
Structure

Core Layers

- **Memory Storage**
- **Knowledge Management**

- **Information Processing**
- **Comprehension / Association**



- **Context awareness**
- **Transport**

- **Representation**
- **Interaction**

- **Awareness level**
- **Self regulation / Self-discipline**

From a Modeling View

- **Instant Refresh**

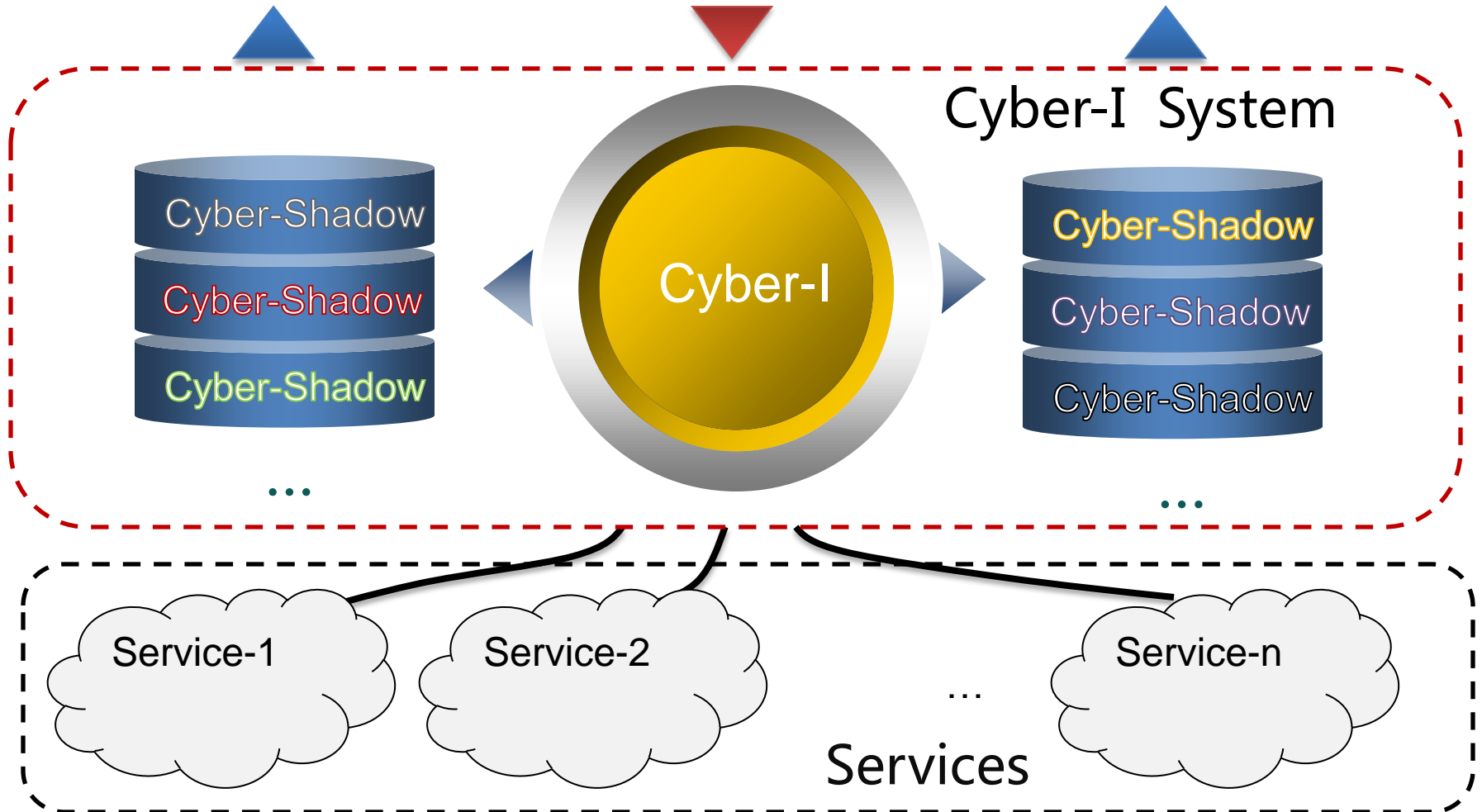
- Psychological Emotion
 - happy, sad, angry, shy, ...
- Physical Status
 - walk, run, Jump, ...
 - laugh, cry, grimace, ...
- ...

- **Gradual Update**

- Social Relationship
 - friendship, kindred, ...
- History Experience(Log)
 - place , people, Website...
- Physiological Attribute
 - face, height , sexuality...
- Personal Feature
 - habit, personality, religion...
- ...

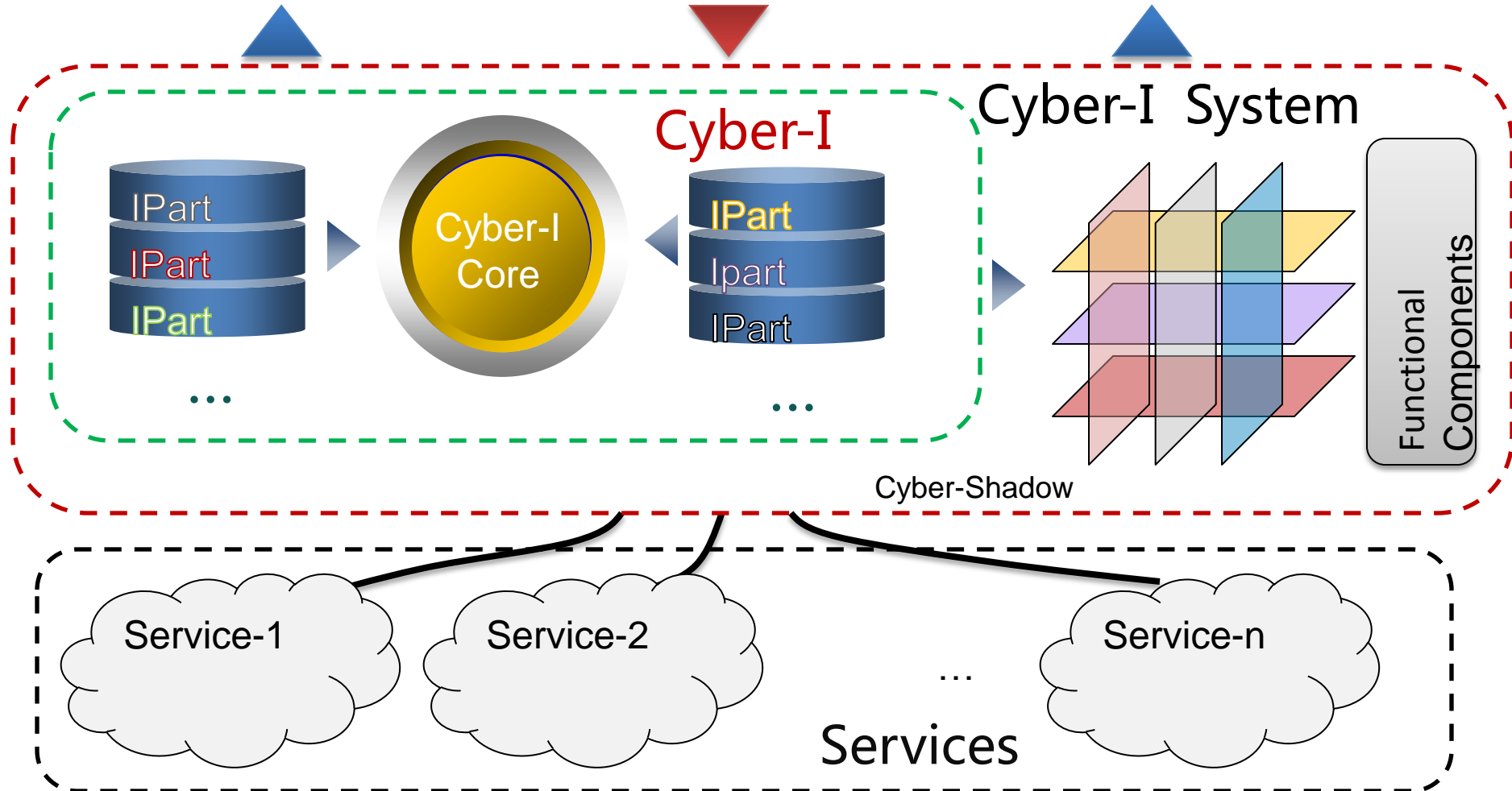
Service

Context < Interaction > Human



Service

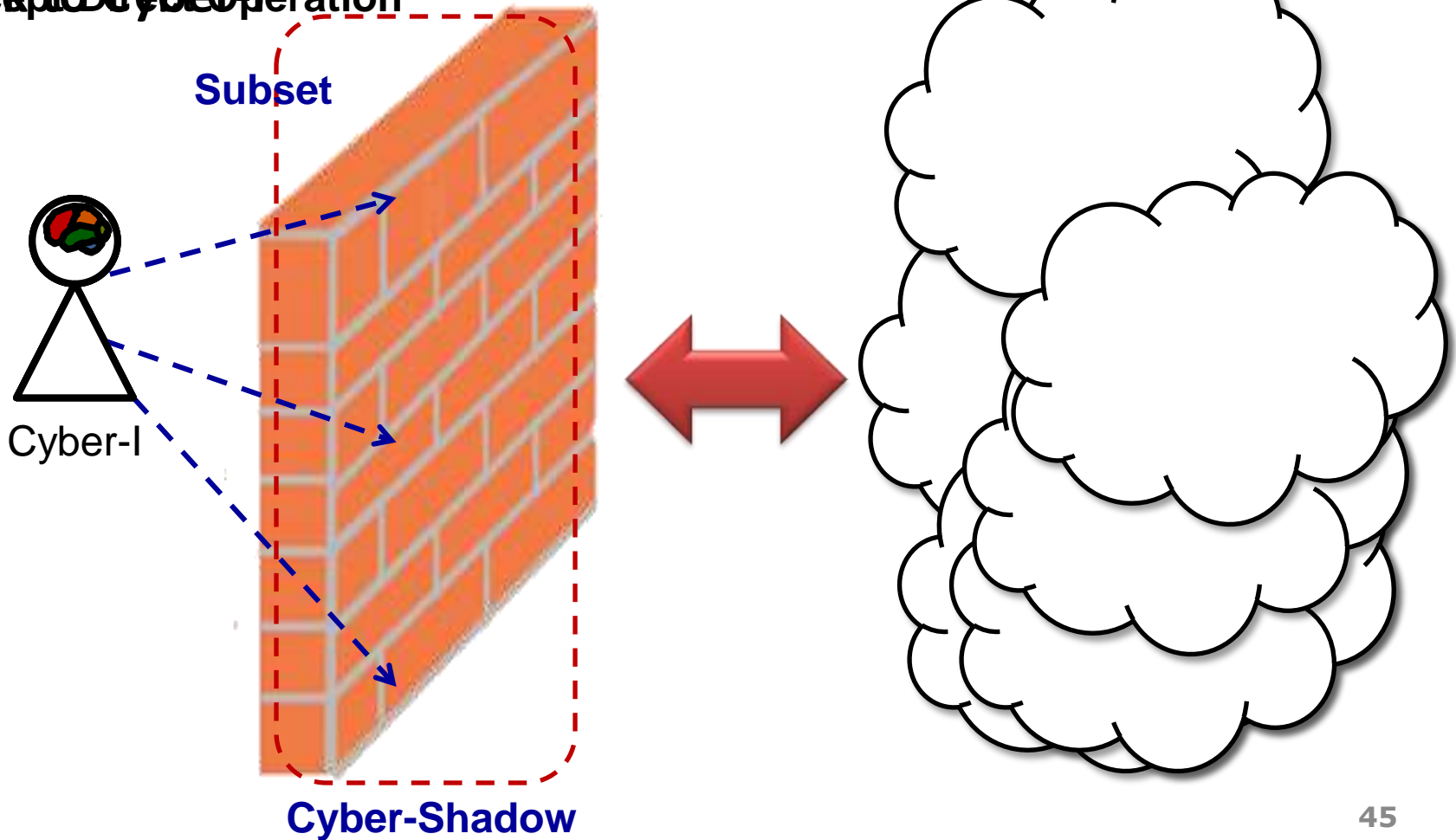
Context < Interaction > Human



Working Mode

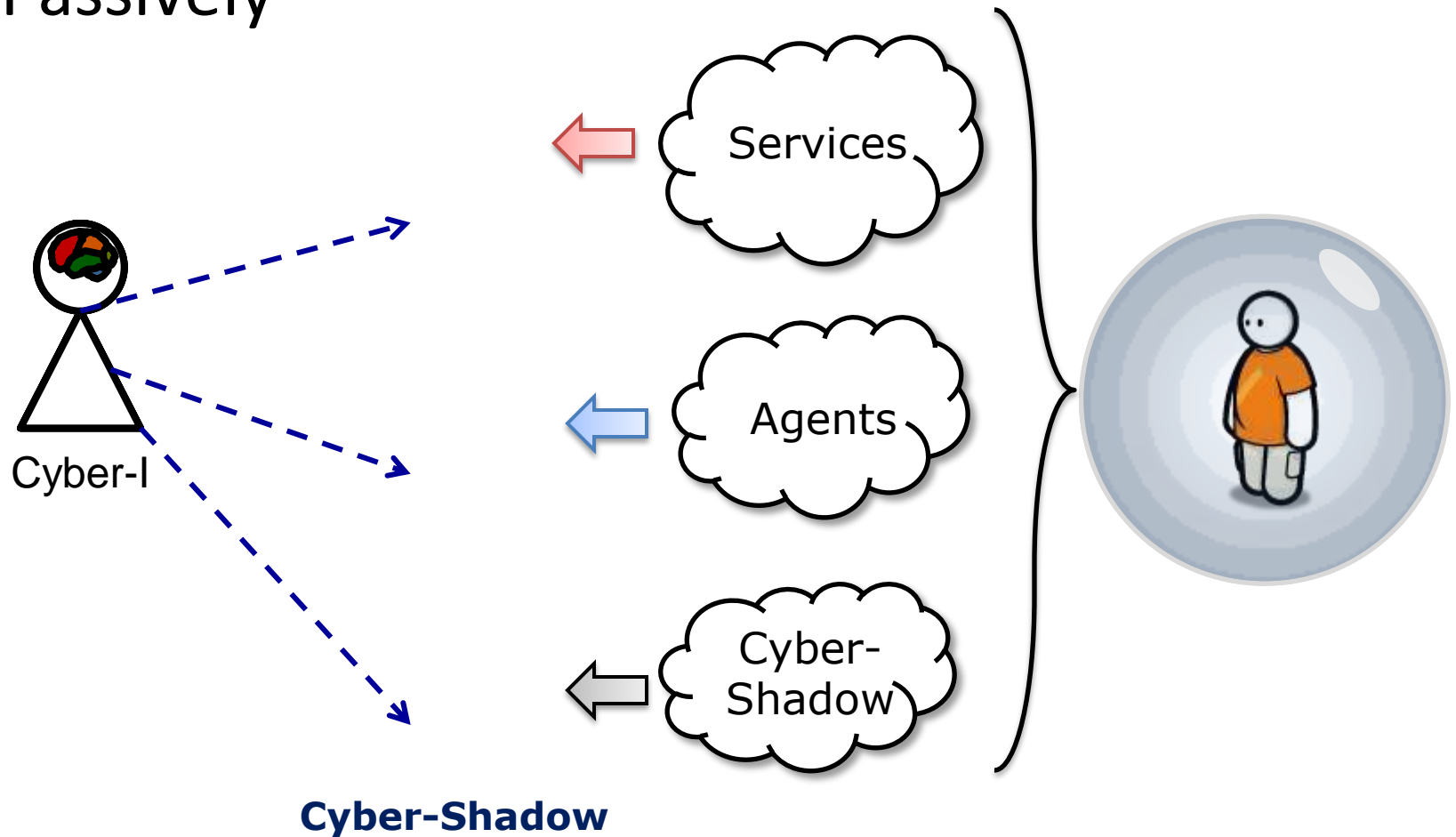
Cyber-Shadow is a subset derived from corresponding Cyber-I.

- ~~Account to Cyber-Operation~~



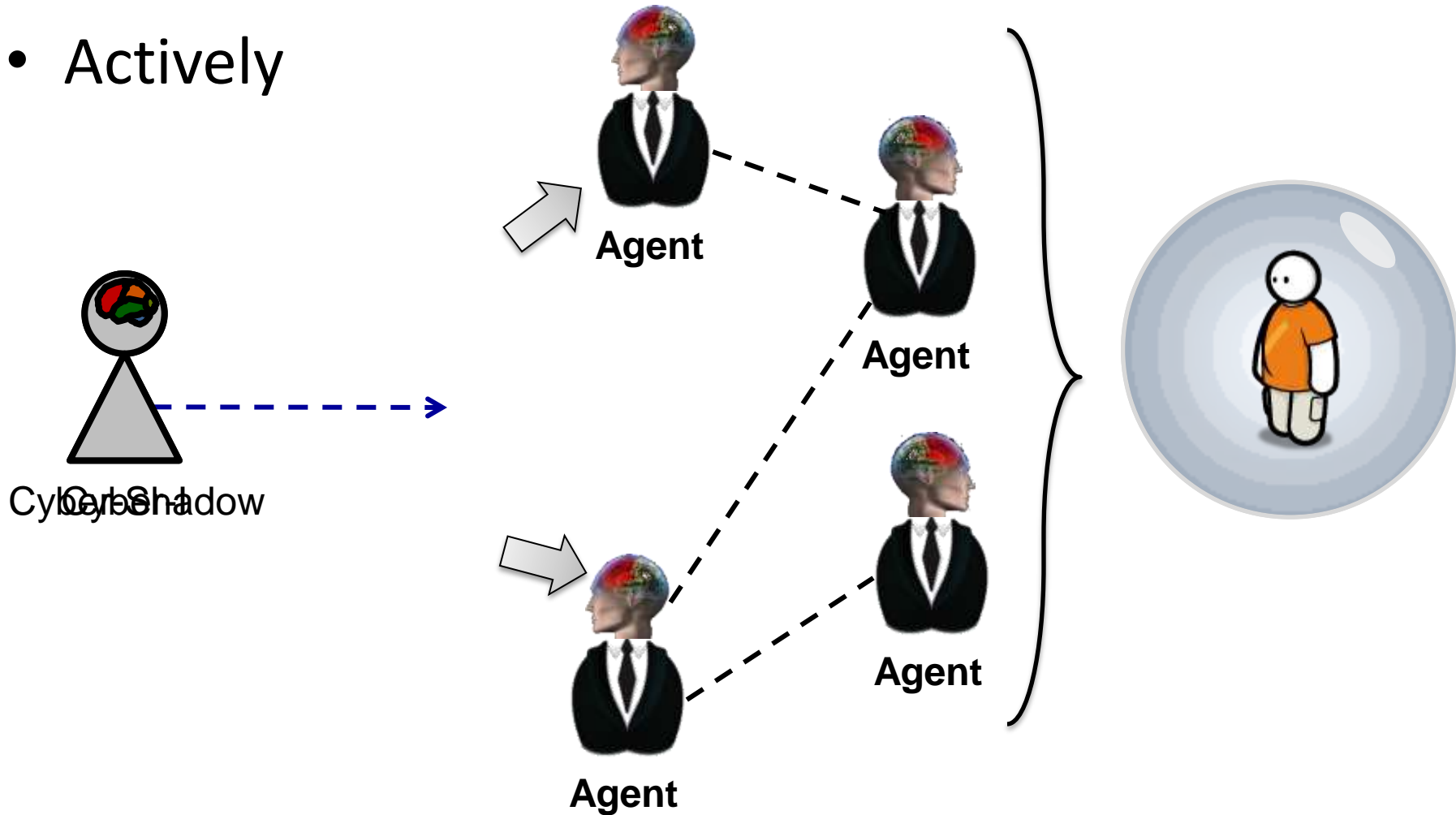
Working Mode I- Shadow Mode

- Passively



Working Mode II- Agent Mode

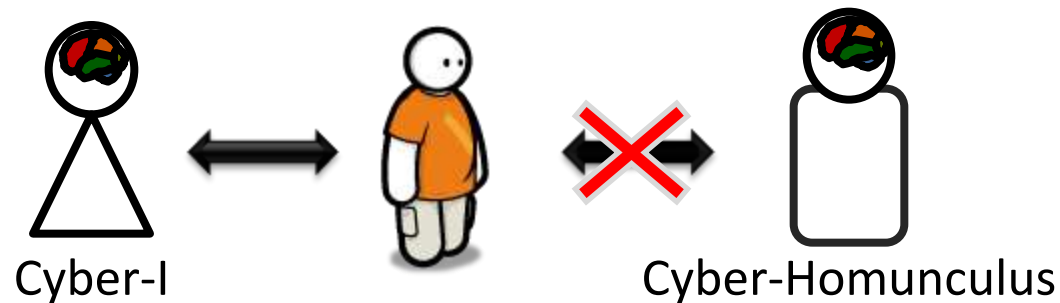
- Actively



Cyber-Homunculus

Cyber-Homunculus is seems like a synthetical Cyber-I.

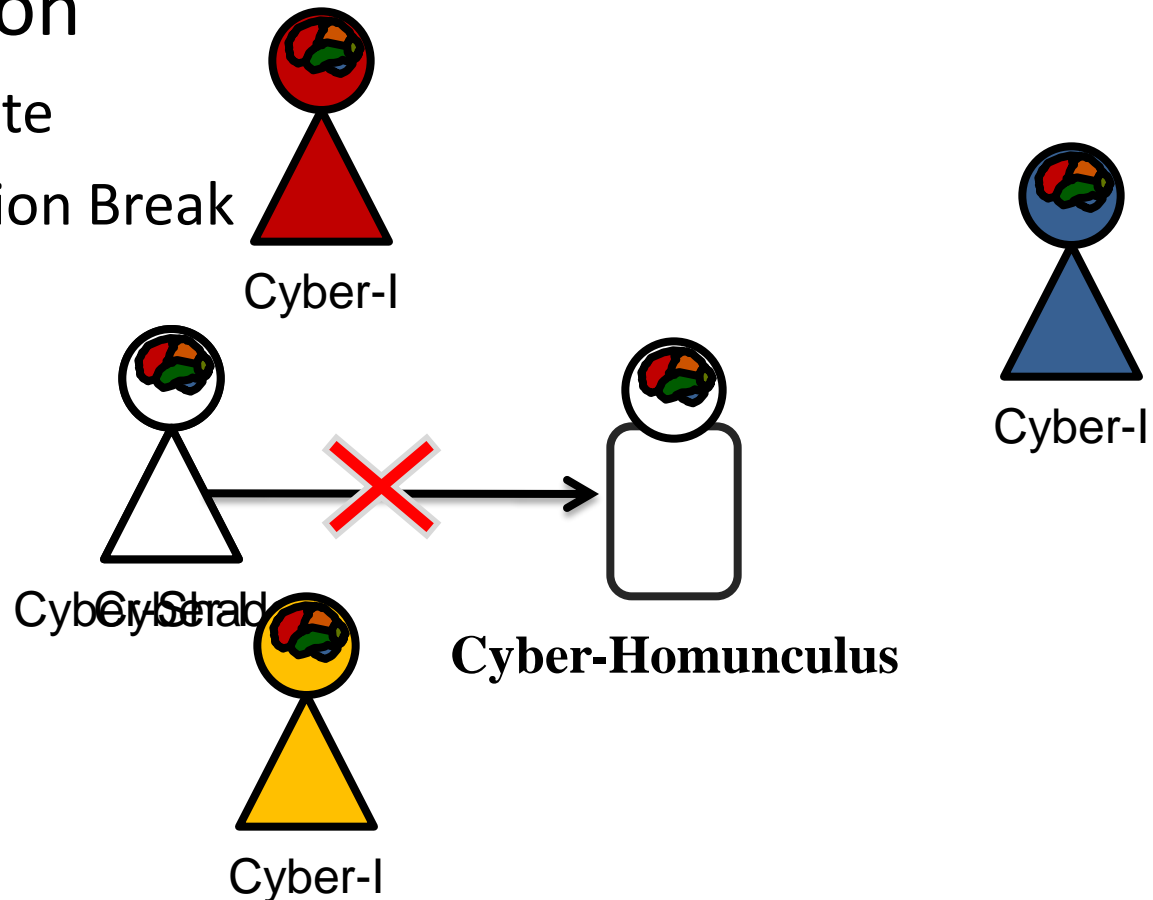
- Compare with Cyber-I
 - Relationship with real individual



Cyber-Homunculus

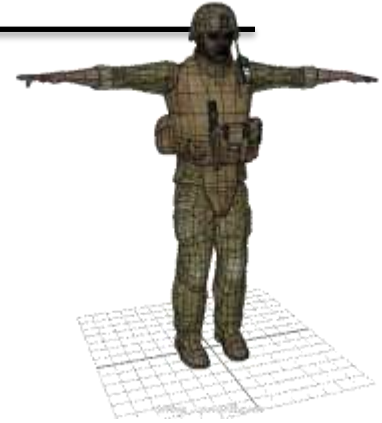
- Generation

- Composite
- Connection Break



Cyber-Homunculus

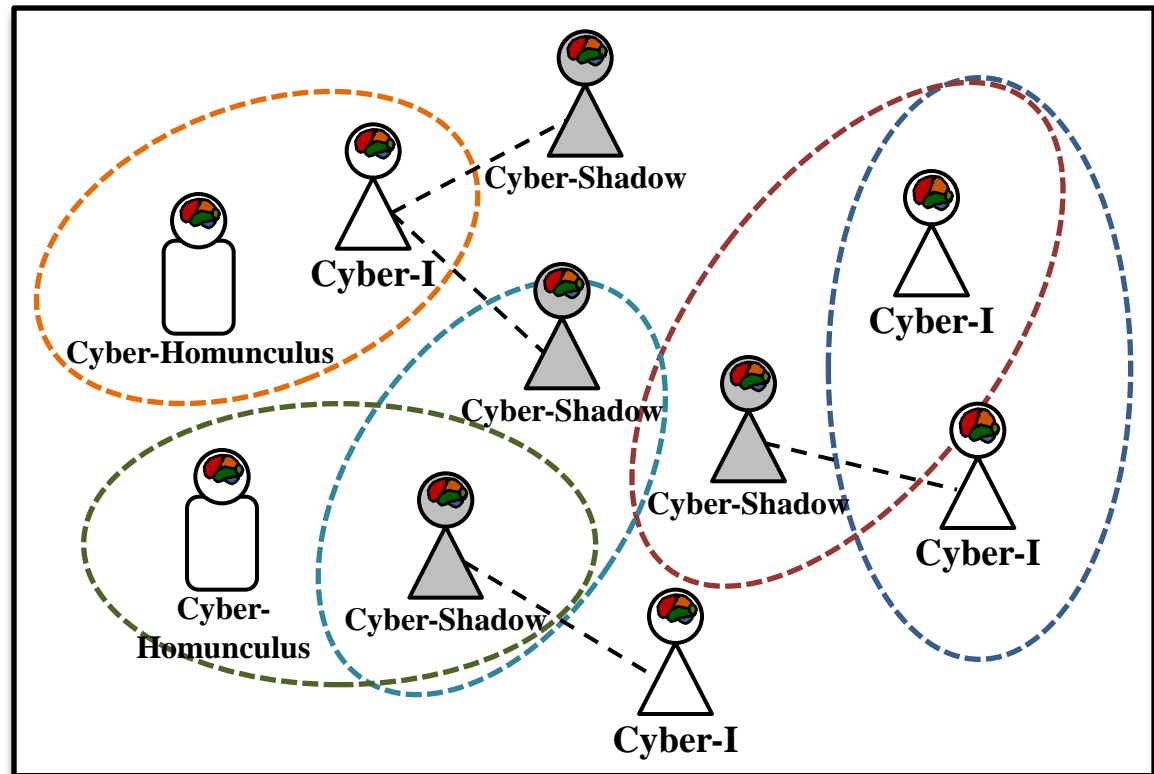
- Application
 - Safe Human Research
 - AI Role
 - Simulation



Cyber-Brood

Cyber-Brood is a place for Cyber-Entities to live in.

- Container
- Management
- Creation/Recycling



AGENDA

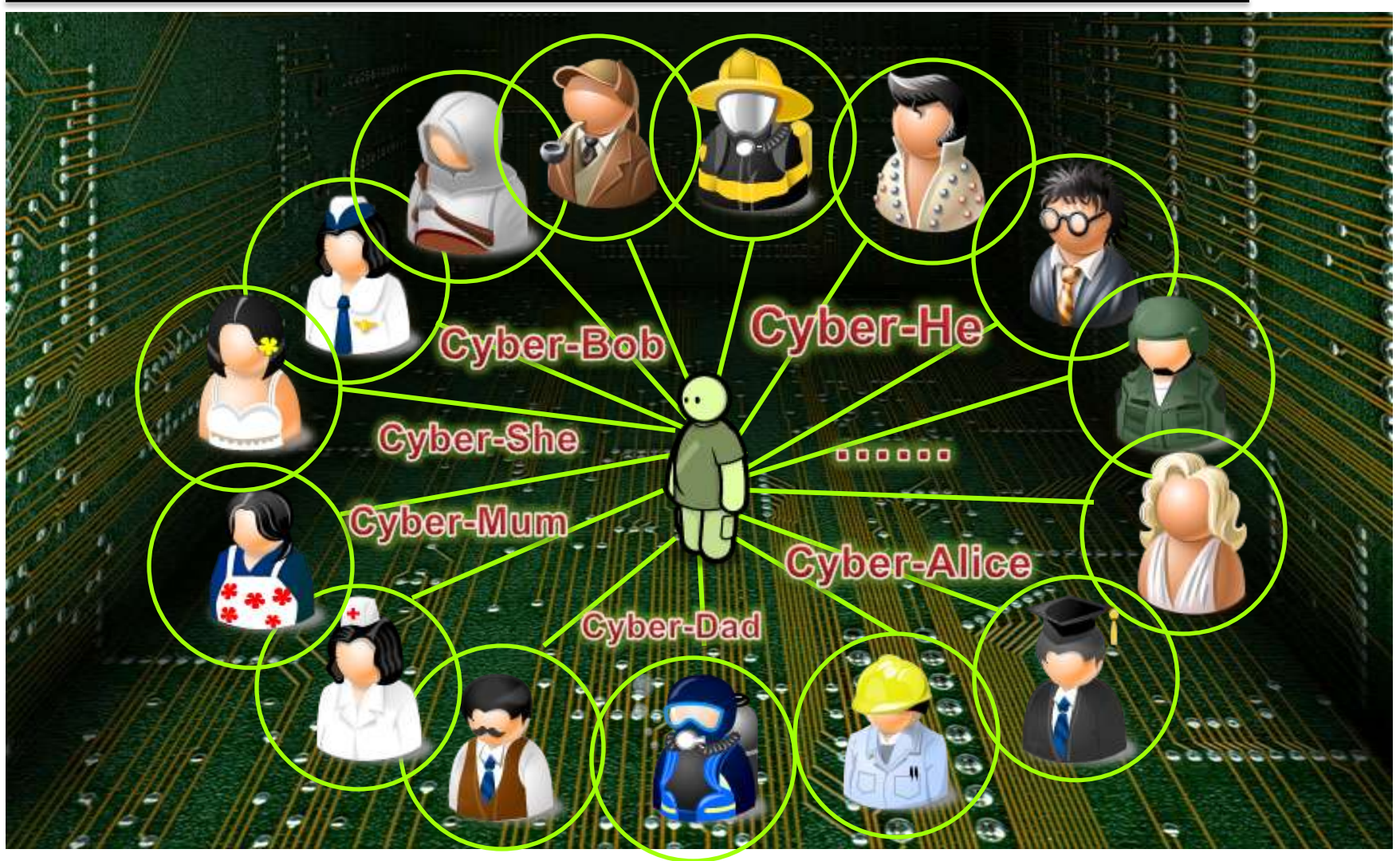
- What is Cyber-I?
- Why is Cyber-I?
- Design of Cyber-I
- Issues

Issues:

- Technique
 - Incomplete Data/Logs
 - Changed/complex Situations
- Threat
 - Security
 - Privacy
 - Control
- Ethic
 - Attitude
 - Digital Clone

So many issues in various aspects !!

Everyone will have a Cyber-I





THANK YOU