



# Introduction and Overview

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# What is it?



1. A draft standard specification under development in the ISO/IEC JTC1 Joint Ad Hoc Group for MAR Reference Model
2. A conceptual model for describing the delivery and presentation of Mixed and Augmented Reality experiences
3. The specification includes
  - a. Terminology (a glossary)
  - b. A system architecture
  - c. Three viewpoints and
  - d. Classification systems using the conceptual model

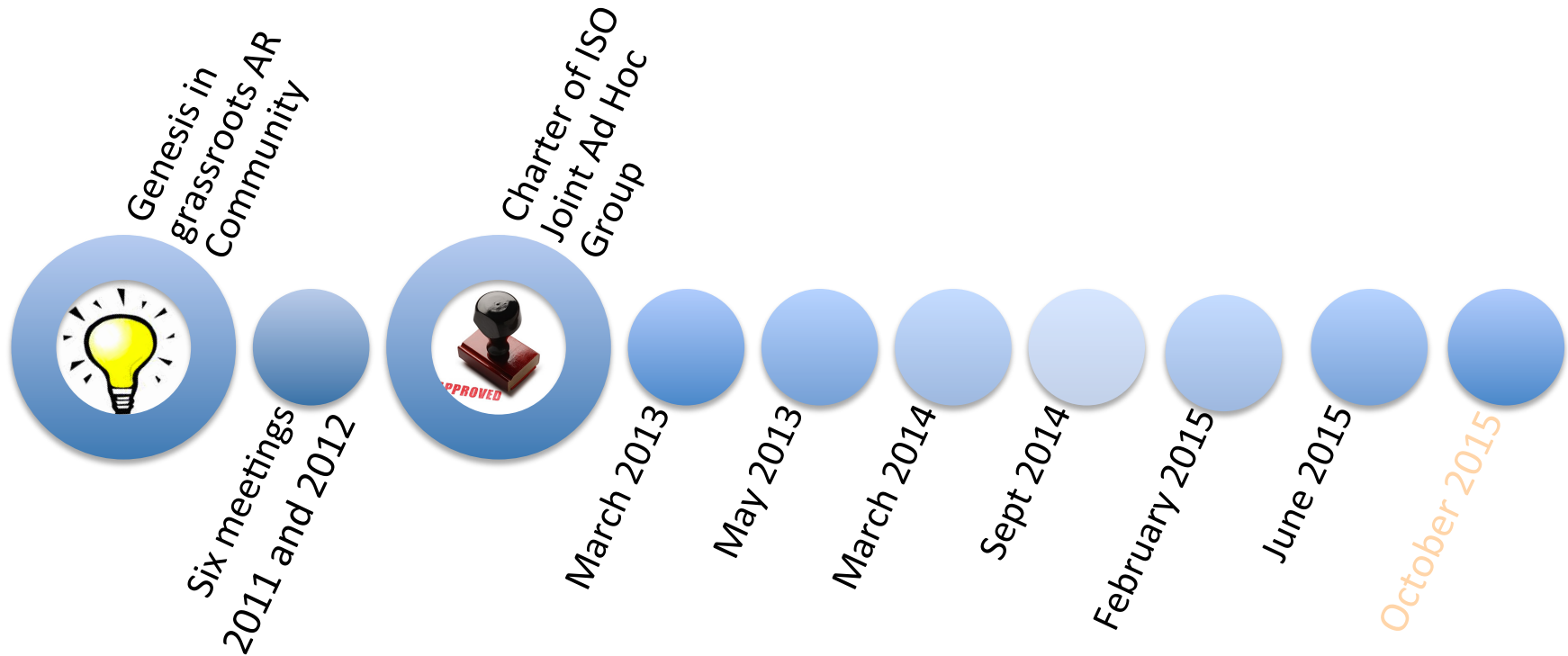
# After This Presentation You Can

- Request access to the draft specification
- Provide feedback to specification editors

## Use MAR Reference Model when

- Designing new business models
- Looking for or selecting AR-enabling products or services
- Writing new AR functionality into existing systems or developing new AR-assisted systems
- Conducting research
- Developing new standards
- Teaching others about Augmented Reality

# Timeline



# Four Target Audiences



Business Developer



Engineer



Researcher

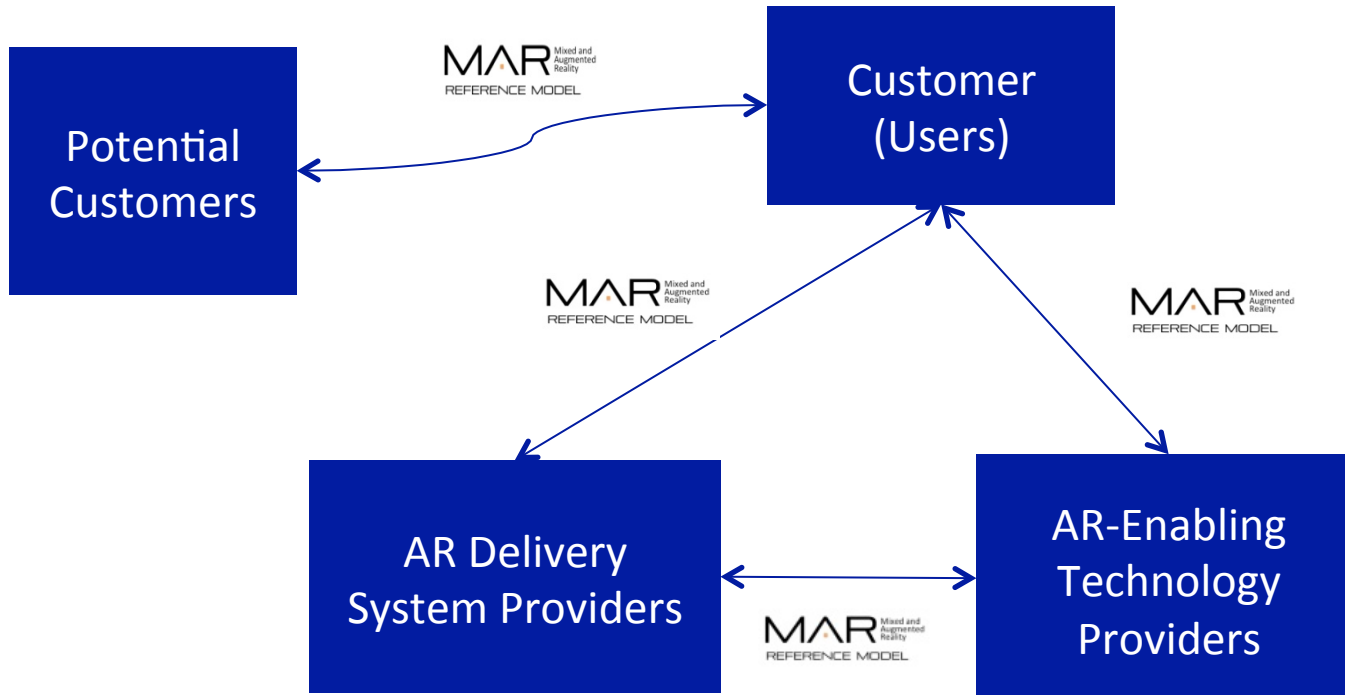


Educator/Trainer

# Have You Ever...

- Tried to specify the product or functionality you need for an AR-enabled system?
- Searched the Web looking for a new rendering or display module for your next generation Augmented Reality display system?
- Tried to integrate one or more AR-enabling technologies into an existing enterprise IT system?
- Developed a user interface for an Augmented Reality-assisted workflow or application?
- Taught a university level engineering course about Augmented Reality?

# Proposed Uses



# Business Developers

I am a business developer working with process engineering in EdF.

I do not know who to partner with, who to hire for developing projects or purchase technology from to reduce service time (work order execution, service on unusual part) and increase safety with AR.

I use MAR RM to identify potential providers, describe my project requirements and desired outcomes.





# Business Developers

I am a business developer selling software for AR experience authoring to large enterprises.



I use MAR RM to describe my product/services and how they can be integrated into customer's existing systems.

# Engineers

I am a software engineer and need to integrate a new AR-enabling module into my existing products.



I use MAR RM to describe the component I need, specify the desired data formats and interfaces to the enabling component providers.

# Engineers

I am a hardware engineer and need to improve the tracking module in my existing products for a higher level of performance.

I use MAR RM to describe the target signal the tracker will be optimized for and the output events.



# Researchers

I am a user interface researcher studying ways to accelerate workflow in construction industry by visualizing the next step in a procedure.



I use MAR RM to describe the components and inputs and outputs of the system on which I'm working.

# Educator/Trainer

I am teaching a computer science course on acceleration of 3D graphics rendering. Students need to understand the principles of the system that will display the results.

I use MAR RM to describe delivery of 3D Augmented Reality experiences in stereo smartglasses.



# The MAR Reference Model Does *NOT*

- Specify how a particular experience, application, component, system, service, or specification shall be designed, developed, or implemented
- Specify the bindings of designs and concepts to programming languages
- Specify the encoding of MAR scenes or experiences through any coding technique or interchange format

# The MAR Reference Model...

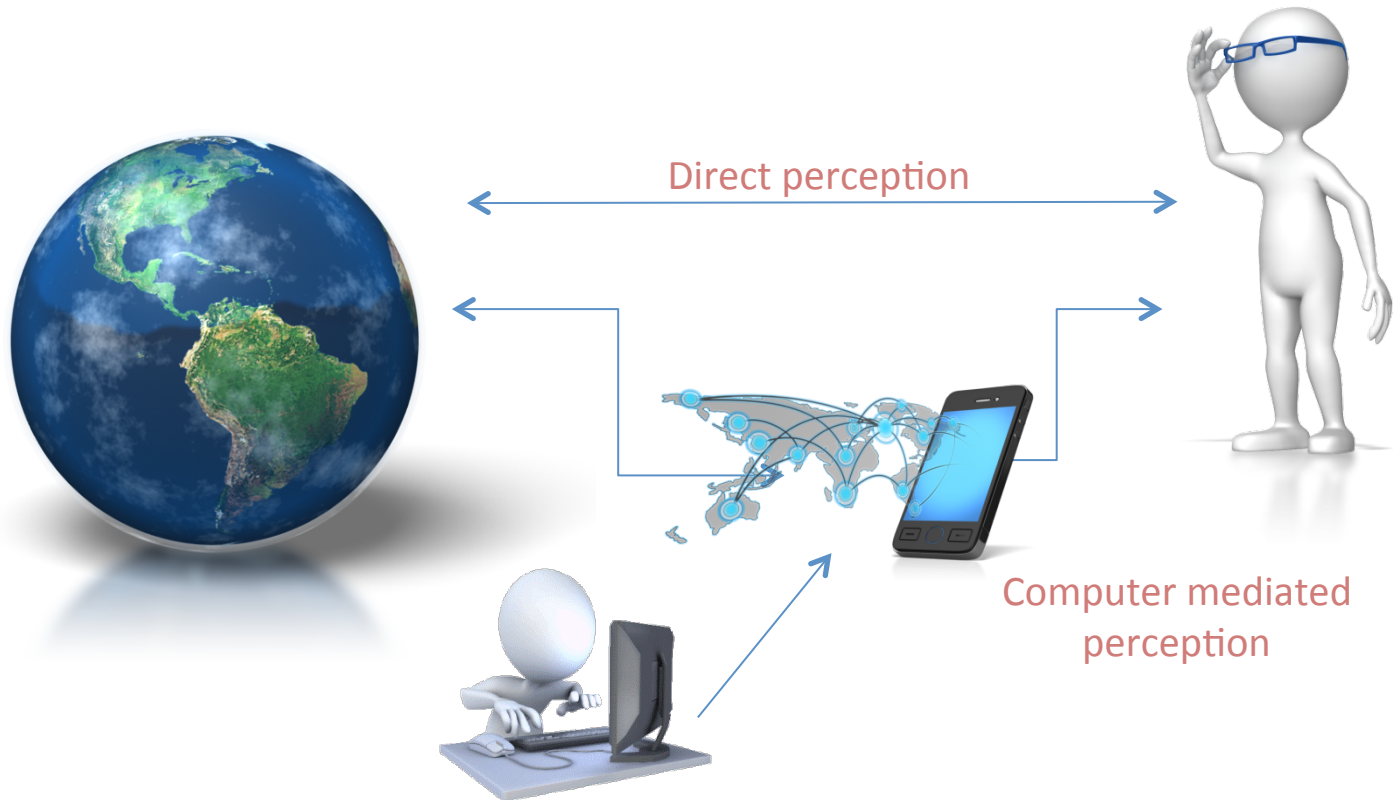
- **Terminology/glossary** offers a set of terms used to describe what you need and/or what you provide
- **System architecture** offers a way to describe what I have already or what you want to build/add in the future.
- **Three viewpoints**
  - **Enterprise viewpoint** offers a way to evaluate skills, benefits of partnership and new business models
  - **Computational viewpoint** offers a description of components desired or provided/offered
  - **Informational viewpoint** provides ways to specify data formats and interfaces between components
- **Frameworks** for component, system and experience classifications

# What's Required for Augmented Reality?

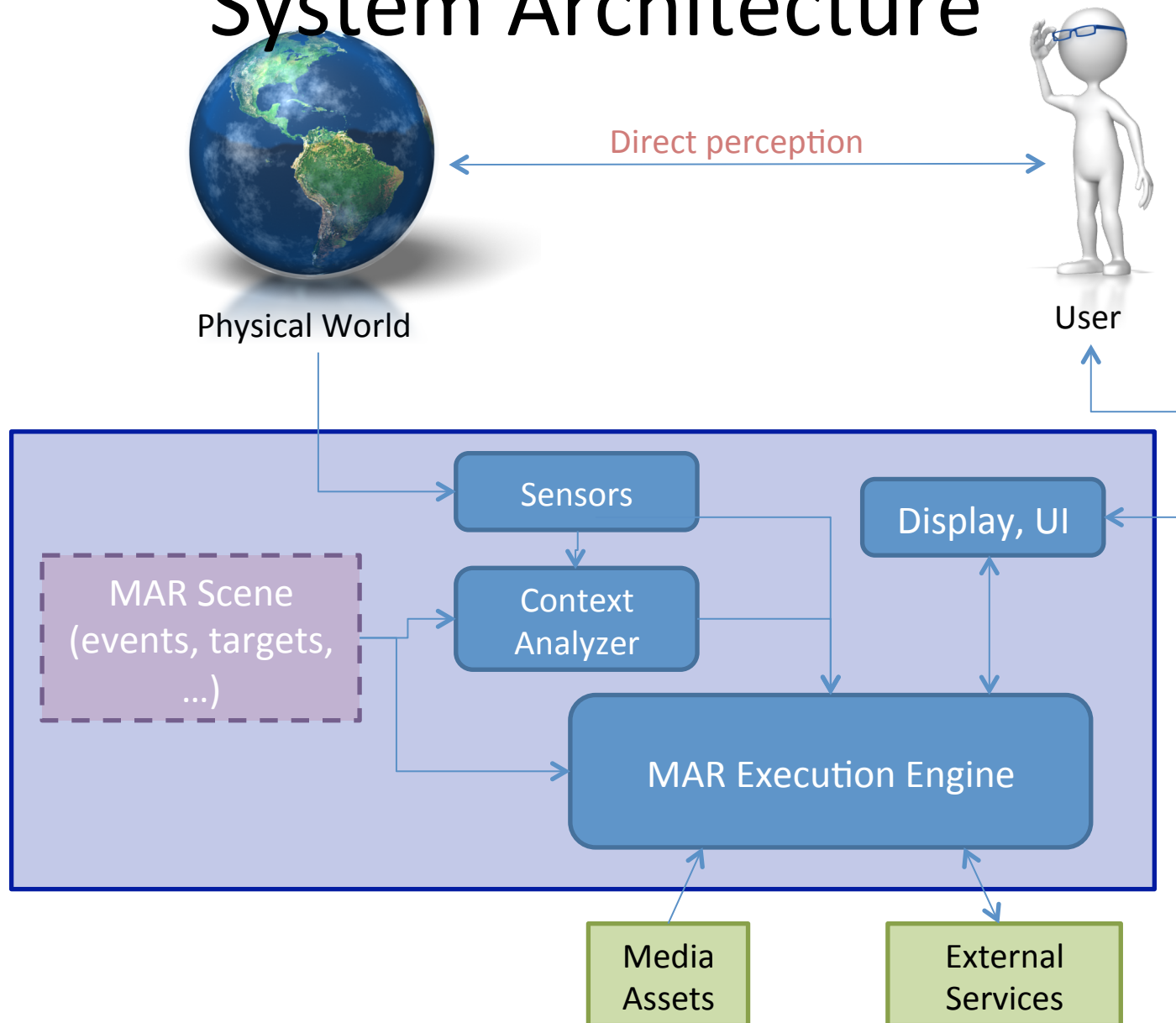
Text in section 6.1	Content	Software	Hardware
Real time recognition of the physical world context	Digital representation of the physical world	Analysis and matching	Sensors to capture physical world
Registration of target physical objects with their corresponding virtual objects	Data or pre-encoded virtual objects in AR augmentations	Analysis and matching	Acceleration of computationally complex tasks
Display (output) of digital content		Rendering	Display, speakers, actuators
User Interaction handling	Events encoded in AR augmentations	Interpret events	User input (mic, camera, tactile)



# System Architecture



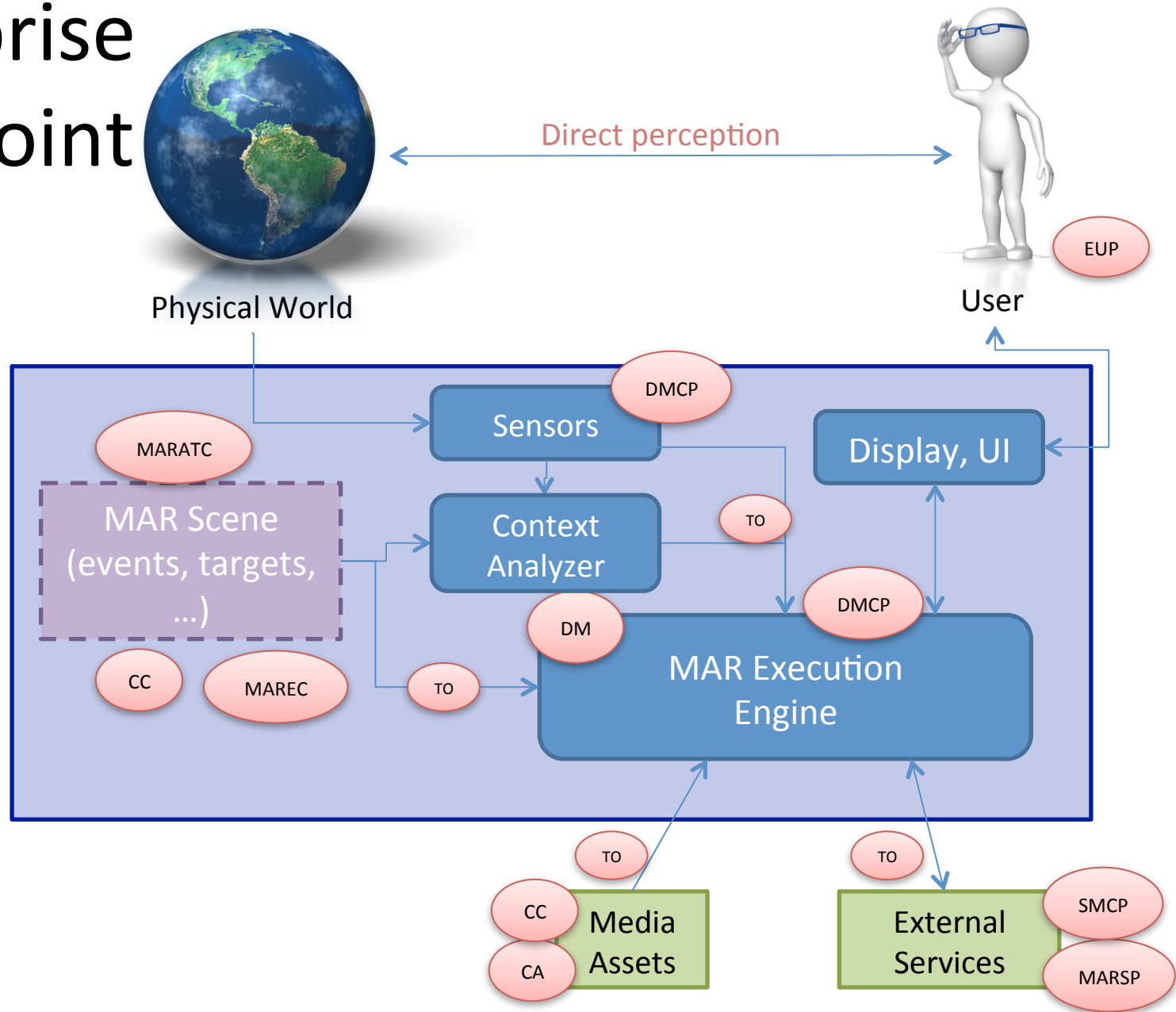
# System Architecture



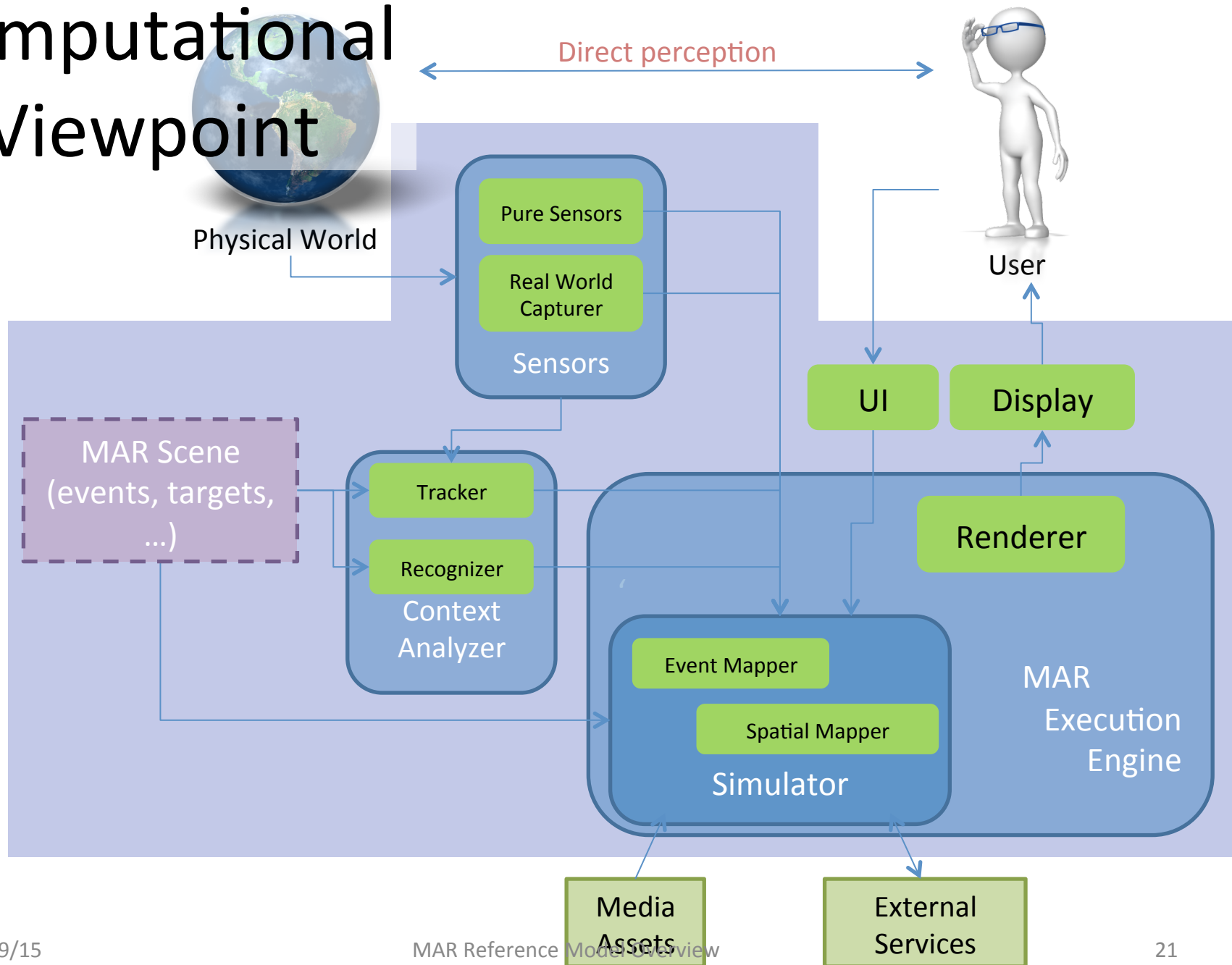
# Three Viewpoints

Viewpoint	Viewpoint Definition	Topics covered by MAR-RM
<b>Enterprise</b>	Articulates the <b>business entities</b> in the system that should be understandable by all stakeholders. This focuses on <b>purpose, scope, and policies</b> and introduces the objectives of different actors involved in the field.	<ul style="list-style-type: none"> <li>▪ Actors and their roles</li> <li>▪ Potential business models for each actor</li> <li>▪ Desirable characteristics for the actors at both ends of the value chain (creators and users)</li> </ul>
<b>Computational</b>	Identifies the <b>functionalities of system components and their interfaces</b> . It specifies the services and protocols that each component exposes to the environment.	<ul style="list-style-type: none"> <li>▪ Services provided by each AR main component</li> <li>▪ Interface description for some use cases</li> </ul>
<b>Informational</b>	Provides <b>the semantics of information</b> in the different components in the views, the overall structure and abstract <b>content type</b> as well as <b>information sources</b> . It also describes how the information is processed in each component. This view does not provide a full semantic and syntax of data but only a minimum of functional elements and should be used to guide the application developer or standard creator for creating their own information structures.	<ul style="list-style-type: none"> <li>▪ Context information such as spatial registration, captured video and audio, etc</li> <li>▪ Content information such as virtual objects, application behavior and user interaction management</li> <li>▪ Service information such as remote processing of context data.</li> </ul>

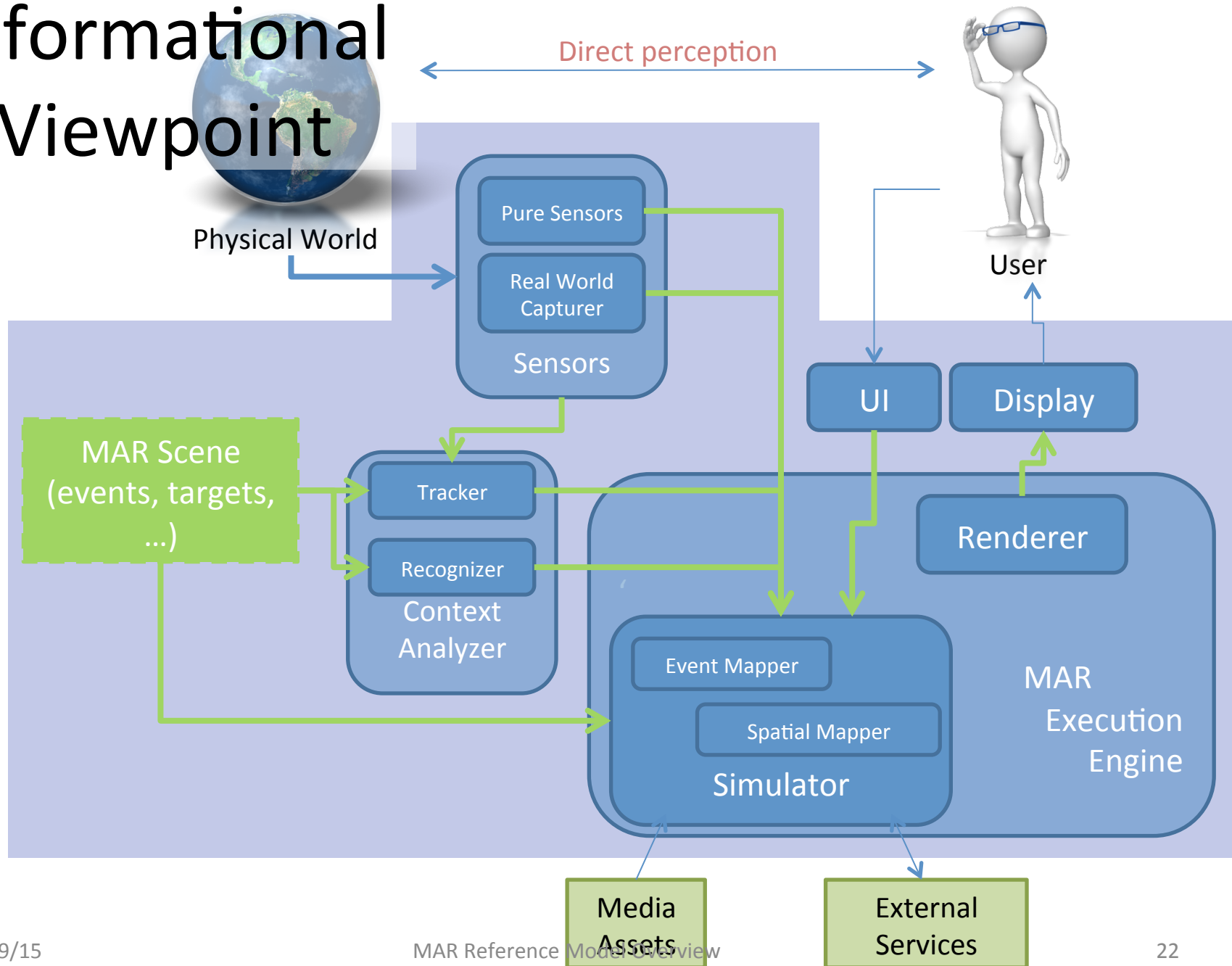
# Enterprise Viewpoint



# Computational Viewpoint



# Informational Viewpoint



# The Legal Stuff

- Document is a committee draft and is copyright-protected by ISO
- Distribution of drafts in any form for use by participants in the ISO standards development process is permitted without prior permission from ISO
- After publication, the MAR RM will be available for royalty-free use

# To Obtain the Committee Draft

- Send an e-mail to [cperey@perey.com](mailto:cperey@perey.com)