



MPEG 기반 AR 표준화 현황

건국대학교 컴퓨터공학부

윤경로 (yoonk_at_konkuk.ac.kr)

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BACKGROUND W.R.T. AR

- ISO/IEC 14496 (Coding of audio-visual objects) part 1 (Systems)
- ISO/IEC 14496 (Coding of audio-visual objects) part 11 (Scene Description and Application Engine)
- 시간에 따라 변화하는 합성 (아바타와 같은) 객체와 자연 (비디오와 같은) 영상의 합성으로 이루어진 씬의 압축된 표현을 지원



MPEG PROVIDES

- Compact representations of natural (audio-visual) and synthetic (3D graphics) content
- Simple yet effective 2D composition technologies
- Rich metadata standards for multimedia applications
- ISO/IEC 14496 Coding of Audio-Visual Objects (MPEG-4) part 10 (Advanced Video Coding)
- part 16 (Animation Framework eXtension)
- part 20 (Lightweight Application Scene Representation)
- ISO/IEC 15938 Multimedia Content Description Interface (MPEG-7).



NEW MPEG STANDARDS

- Suite of standards for sensors and control devices, spatial audio objects, multi-resolution 3D graphics in its ISO/IEC 23005 Media Context and Control (MPEG-V).
- It is expected that the standard will enable the industry to provide of new immersive applications with support for a range of new standard interfaces with sensor and sensory devices.



IN PROGRESS

- “Compact Descriptors for Visual Search Technologies”:
 - robust matching of images of objects
 - landmarks, artworks, and text-based documents
 - Additional mean to enable augmentation of views of objects in physical world with graphics and other multimedia information.
 - WD 2.0 (Oct. 2012)



APPLICATION OF CDVS



Visual search, the target of a new standard for which a Call for Proposals has been issued in July 2011) will allow the recognition of objects, which can be in turn overlaid with supplemental data using standard MPEG technologies.



STATUS OF MPEG-AR (ARAF)

- ISO/IEC 23000-13 (MPEG-A) Augmented Reality Application Format
 - Dec. 2011 Geneva Meeting – WD
 - April 2012 Geneva Meeting – CD
 - Oct. 2012 Shanghai Meeting – DIS
 - April 2013 Incheon Meeting – FDIS
 - Mid 2013 – IS ?

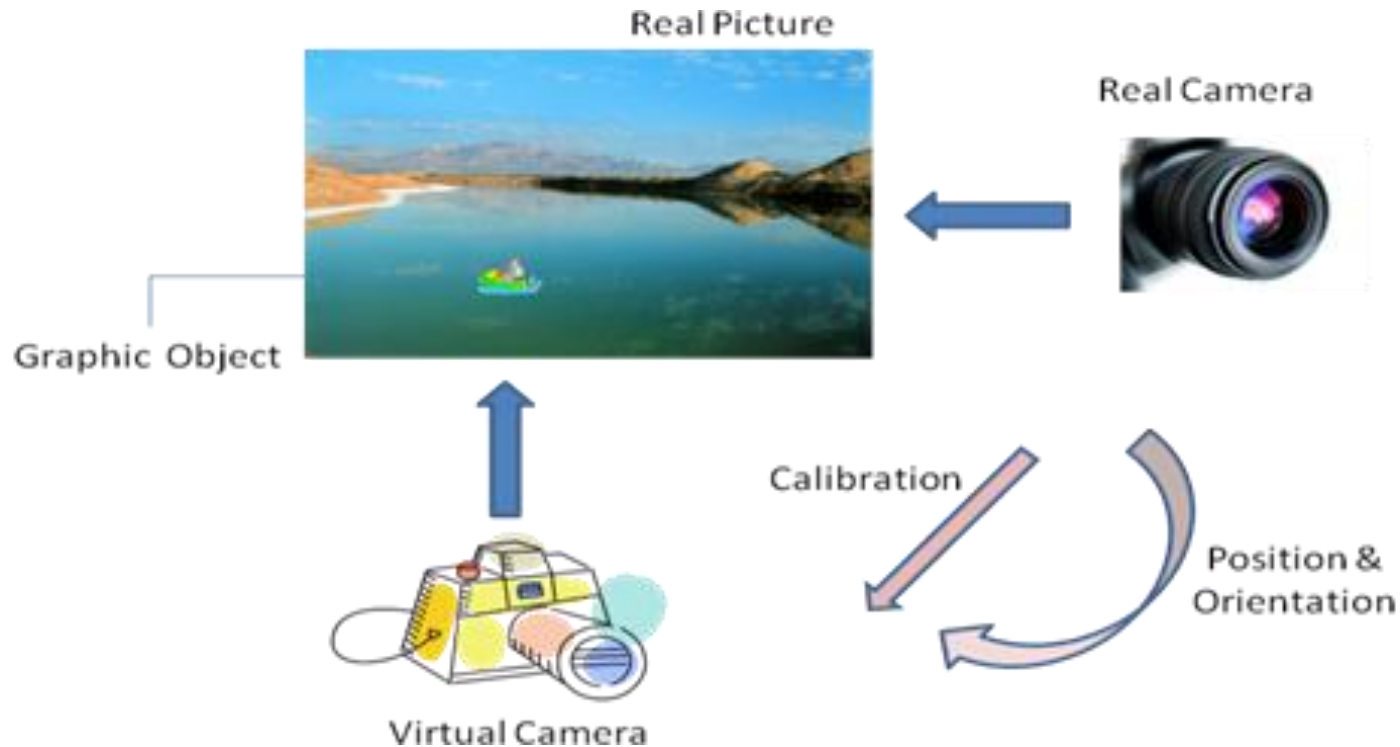


STATUS OF MPEG-AR (ARRM)

- ISO/IEC 23000-14 (MPEG-A) Augmented Reality Reference Model (Technical Report)
 - April 2012 Geneva Meeting – WD
 - Nov. 2013 Shanghai Meeting - DTR
 - April 2013 Incheon Meeting – TR?
- Requests ITTF to allow Khronos Consortium and Open Geographic Consortium to publish the ARRM.



SIMPLE ILLUSTRATION OF AR PRINCIPLE

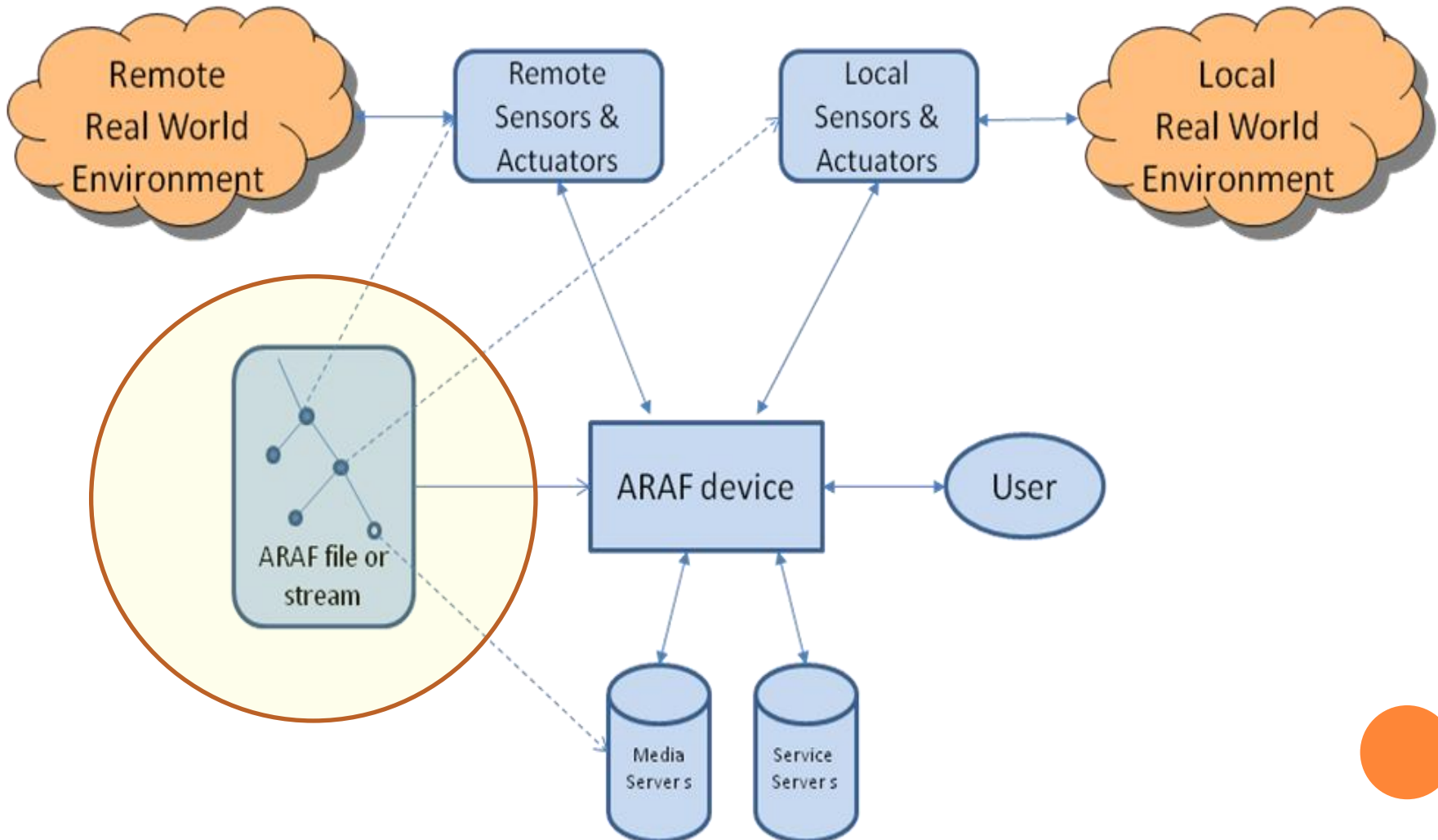


AR is a view of a real-world environment whose elements are augmented by content, such as graphics or sound, in a computer driven process



ARAF CONTEXT

(AUGMENTED REALITY APPLICATION FORMAT)



ARAF CONTEXT

(AUGMENTED REALITY APPLICATION FORMAT)

- An extension of a subset of the MPEG-4 part 11 Scene Description and Application Engine standard (based on ISO/IEC 14772-1:1997 (VRML97)), combined with other relevant MPEG standards (MPEG-4, MPEG-V), designed to enable the consumption of 2D/3D multimedia content.
- The nodes of the ARAF scene point to different sources of multimedia content such as 2D/3D image, 2D/3D audio, 2D/3D video, 2D/3D graphics and sensor/sensory information sources/sinks that are either remote or/and local.



ARAF SCENE

- Nodes expose a set of parameters: appearance and behavior can be controlled
- The structure of BIFS nodes is not necessarily static
 - Nodes can be added or removed from the scene graph arbitrarily
 - Sensors (e.g., TimeSensor, TouchSensor) can interact with users and generate appropriate triggers
 - the *Script* node: By routing mechanism to Event In *valueIn* attribute of Script node, the associated function (defined in its URL attribute) with the same name Event In *valueIn* () will be triggered
 - the Field: *field* attribute can refer to any node in the scene; through this link, all attributes of the contacted node will be exposed to direct setting and modifying operators within the *Script* node (using ECMAScript script language)
- MPEG-4 PROTO: Provides reusability of complex objects
 - The PROTO statement creates its own nodes by defining a configurable object prototype;
 - it can integrate any other node from the scene graph.



AR RM PURPOSE

- The purposes of the Augmented Reality Reference Model include:
 - Basis for coordinating activities and understanding of the AR community and technology
 - Provide insight into current state of AR
 - Communications between acquirers and developers of technology
 - Input to component design and development
 - Resource for defining application specific architectures.
 - Allow coordinated development of standards relevant to AR



AR RM

- The Augmented Reality Reference Model
 - defines an authoritative basis that outlines the set of principles, terms and their precise definitions, a generic model of mixed/augmented reality system and its components and interfaces.
 - provides the basis for deriving the contents model, its proper abstraction level and required components.



AR RM

- The Augmented Reality Reference Model is
 - Independent from algorithms such as
 - Recognition/tracking, Rendering, ...
 - Independent from sensors used such as
 - Camera, RFID, Kinect, Marker based, Image patch based, ...
 - Independent from terminals and infrastructure used such as
 - Desktop, mobile,
 - Projection, HDM, holography

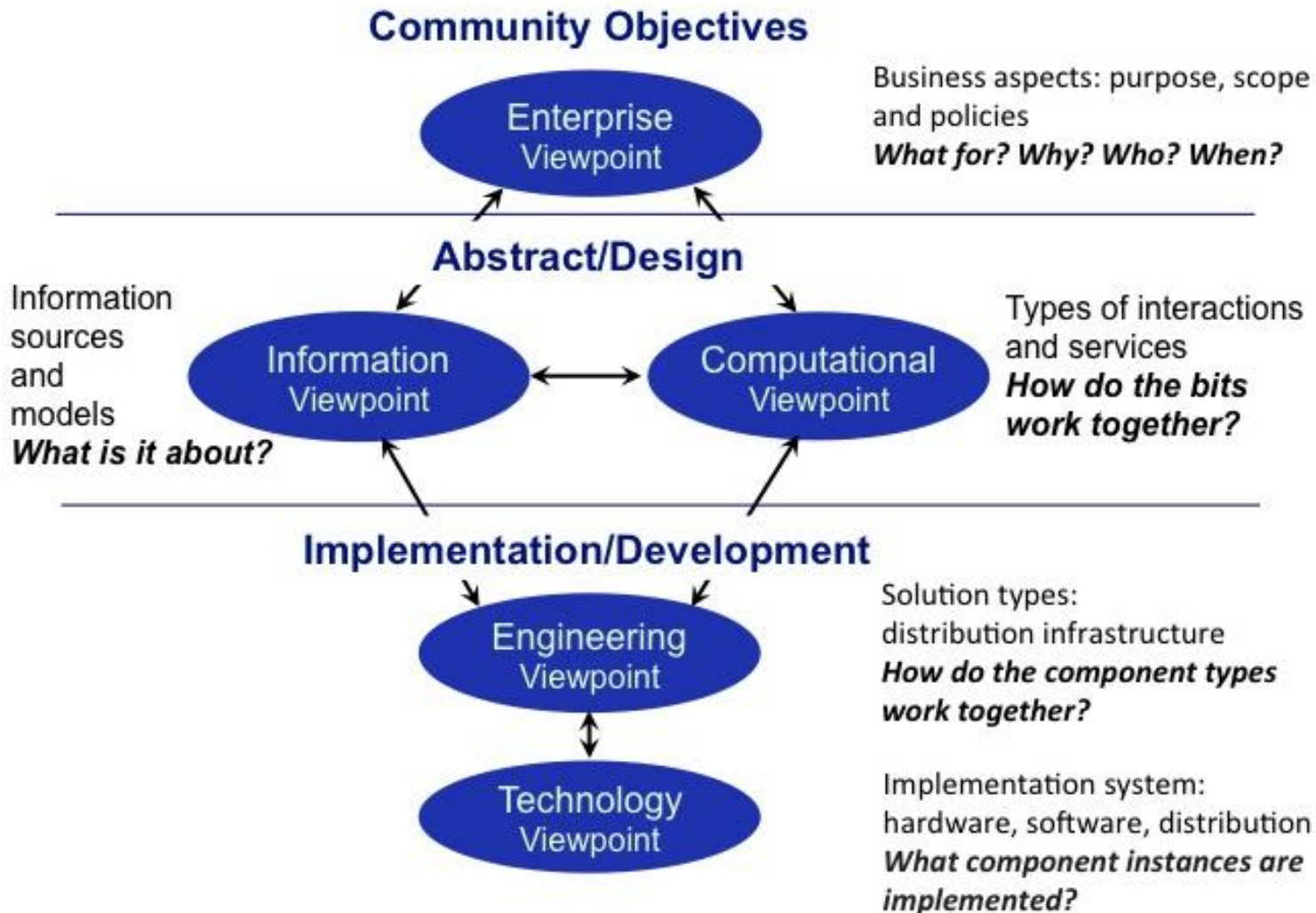


AR RM


- Defined based on the ISO/IEC 10746-1 standards for Open Distributed Processing (RM-ODP)
 - The model specifically calls for separation of concerns into 5 viewpoints
 - enterprise, information, computational, engineering, technology.



RM-ODP VIEWPOINTS



AR RM VIEWPOINTS

Viewpoint	Viewpoint Definition	Topics in ARRM
Enterprise	<ul style="list-style-type: none"> • Articulates a “business model” that should be understandable by all stakeholders • Focuses on purpose, scope, and policies • Community Objectives • Business aspects: purpose, scope and policies 	<ul style="list-style-type: none"> • Actors • Components defined for enterprise objectives • Desirable Characteristics (top-level requirements)
Information	<ul style="list-style-type: none"> • Semantics of information and information processing • Describes the structure and content types of supporting data • Information sources and models • What is AR content about? 	<ul style="list-style-type: none"> • Spatial Registration • Information Content of Virtual Objects • Context Dependent Viewing
Computational	<ul style="list-style-type: none"> • Identify interfaces that allow for distribution • Types of services and protocols • How do the bits work together and apart? 	<ul style="list-style-type: none"> • Use cases • Identify services and interfaces
Engineering	<ul style="list-style-type: none"> • Identification of component types • To support distributed interaction between the components • How do the components work together? 	<ul style="list-style-type: none"> • Engineering Components • Interfaces between components • Device Internal Interfaces • Encoding Formats 

AR RM FOCI

- Enterprise view – Business roles
 - Identify major actors and roles
 - User Scenarios
- Information view – Registration
 - Coordinate Reference Systems
 - Geometry, Symbols, Feature types
- Computational view – Behavior
 - Use cases
- Engineering view – Software
 - Device stack/APIs
 - External networks: Internet, NFC



ENTERPRISE VIEWPOINT OF AR RM

- **AR Tools Creator:** a software platform provider of the tool used to create the AR application / AR service. The output of the AR tool is called **AR Document**.
- **AR Experience Creator:** a person that design and implements the AR application / AR service behavior,
- **Assets creator:** a designer (person or organization) that creates multimedia content (scenes, objects, ...)
- **Assets aggregator:** an organization aggregating, storing, processing and serving the assets
- **Telecommunication operator:** an organization that commercially manages the communication of information between the other actors
- **Device manufacturer:** an organization that created the device used as end-user terminal, in charge of enabling the augmentation



ENTERPRISE VIEWPOINT OF AR RM

- **Middleware/component provider:** Hardware/software middleware for the augmentation device
 - Multimedia player/browser engine provider (rendering, interaction engine, execution, ...)
 - Context knowledge provider (satellites, ...)
 - Sensors manufacturers (inertial, geomagnetic, camera, microphone)
- **Online middleware/component provider:** Hardware/software middleware for the processing servers
 - Context knowledge provider (network based location services, image databases, , ...)
- **End-user:** a person who uses services in order to satisfy information access and communication needs
- **AR Service provider:** an organization that discovery/delivery the services
- **Xxx:** an organization that commercially exploit the services (it can be one from the list above).



INFORMATION VIEWPOINT OF AR RM

- Defines the semantics of information and information processing.
 - Categorization (separation into discreet categories) of information types.
- Defines the information processing
 - Stages of possible “treatment” of the information, such as the extraction of natural features from the data that is streaming from the camera, the microphone, or another source of real time observations.
- Describes the structure and types of data found in AR
 - Defines terminology for the information sources (sensors, users interaction such as touch or movements?) and models that the other viewpoints use for computation.
- Facilitates the communication of concepts about
 - Content used in AR experiences,
 - Content that is the target (focus of user attention and the context),
 - Reference which is the extraction of all unique characteristics of the target,
 - the augmentation (digital object that is anchored to the target).



COMPUTATIONAL VIEWPOINT OF AR RM

- Deals with Authoring / Consumption of AR Contents
- Not much detail, yet.



ENGINEERING VIEWPOINT OF AR RM

- Internal components and interfaces
 - Camera and Display
 - Location and orientation determination
 - Local physical environment sensing
 - Persistent storage of content
 - External communications including cellular, WiFi, Near-field
 - AR content management software components



USE CASES



Virtual Advertisements



AR Education



USE CASES



(Simple broadcasting)



(Augmentation region define)



(AR broadcasting)

AR Broadcasting



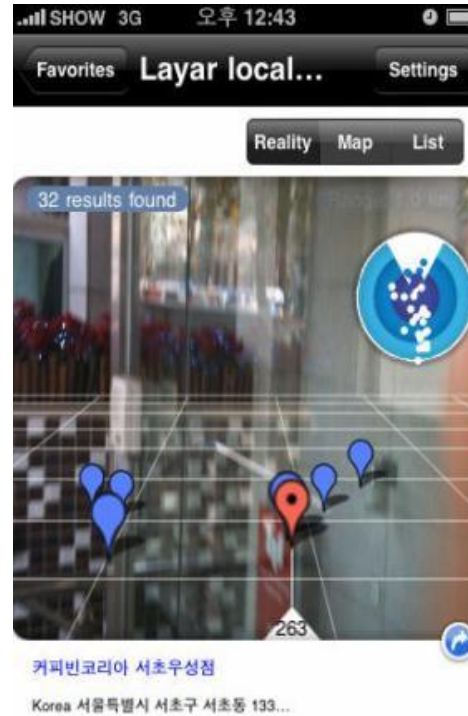
AR 3D Manipulation



USE CASES



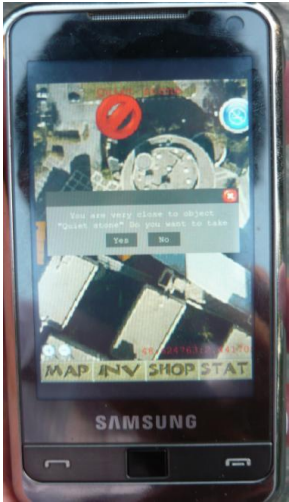
Layar Application



Medical Application



USE CASES



AR Games



Q & A

감사합니다.

