International
Telecommunication
Union

Advanced Multimedia System (AMS)

Project Description

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1 Summary

The Advanced Multimedia System (AMS) project will drive the development of a third generation multimedia terminal and system architectures able to support emerging, media rich applications that fall outside the bounds of traditional call-based communication platforms. These applications include highly converged media applications involving multiple personal and public devices, enterprise systems and network services in support of communications, collaboration and entertainment. Specifications arising from this project will enable the development of the terminals and systems, and also inter-communication between systems so applications involving multiple devices and mobile systems can be supported. This document describes the elements of the AMS project and the methods that will be employed to achieve the goals.

2 Scope

AMS specifications will define terminals and network system architectures in line with the goals of this project as detailed in Section 4. AMS will take advantage of emerging technologies, as well as advances in and deeper understanding of existing and proven technologies, in an effort to enable new and better forms of communication capabilities for end users. The project aims to introduce a third-generation system that enables users to utilize multiple modes of communication.

The work will entail the creation of multiple new ITU-T Recommendations that will specify system architecture, system components, and one or more protocols at the service and application layer. The primary objective is to deliver a new advanced multimedia system that operates on NGN, taking advantage of its features, and will also operate on non-NGN packet-switched networks. It is expected that AMS will be able to take advantage of NGN features, such as QoS in transport, security, admission and resource control. It is expected that this effort will result in one or more H-Series Recommendations. SG16 management has reserved the Recommendation number H.325 for core aspects of this project. Where appropriate existing standards or Recommendations will be used to meet the objectives of the project so that not all aspects need to be newly defined.

3 Goals

The goal of the AMS project is to create a new multimedia terminal and systems architecture that supports distributed and media rich collaboration environments. Earlier interactive multimedia protocols added media to call-based communication establishment protocols enabling multimedia telephony. In contrast, AMS is envisaged as an environment in which a user has many AMS-enabled devices including portable wireless, home entertainment and computer-based devices and is offered many applications and services that are either peer-to-peer or network-provided. The user coordinates activities across all of these environments using the modes that best fit their personal and business situation and needs or desires.

The AMS architectural development process has several important functional goals:

- AMS will have a diverse application support model, such that many different types of applications can utilize the architecture. Separation of base signalling architecture and applications will ensure that application developers do not have to be concerned with the underlying signalling details. A goal of AMS is to support a dynamic community of application developers and innovators.
- Security and privacy will be built into AMS, not an afterthought. Security and privacy architectures will be both policy-aware so that they can be effectively managed, and inter-domain aware so that they can function in a diverse, global environment.
- Network boundary awareness will be built into AMS, so that AMS systems function well between networks using different addressing universes, such as NAT, IPv4/v6 and the PSTN.
- Strong versioning, tight vocabularies and efficient signal coding methods will be employed to ensure that interoperability problems and coding errors are minimised.
- Location awareness will be included as a core application functionality of AMS. This will support emergency management requirements, but will also enable presence applications and new applications take advantage of location information.

4 Working Methods

AMS development will be led by ITU-T Study Group 16 in Question 12. Liaisons with Study Groups 11, 12 and 13 will be required. It is expected that further Liaisons with IETF, ETSI (TISPAN), 3GPP, 3GPP2 and the IMTC will be required. It is anticipated that AMS development will draw upon the work of OASIS, MPEG, IETF, ISO and IEEE.

The work on AMS will be progressed in Q.12 during SG16 meetings, and additional Rapporteur's meetings will be requested to further the work when such additional meetings are necessary. Additionally, the work will be progressed using electronic methods such as email and teleconferencing for correspondence where possible. An email reflector will be established to facilitate email discussions.

Participation is open to ITU Member States, ITU-T Sector Members and Associates. Further, participation at Rapporteur's meetings and email reflectors is open to non-ITU members, a long-standing tradition of Working Party 2 of SG16. A list of participants for each meeting is to be maintained for reference purposes.

5 Work Items

Contributions will be directed into specific areas of work, so called work items. These work items are detailed below and are intended to help structure discussions and advance the work of this project. These work items are not exclusive and other aspects will be discussed if contributed. Additional work items may be introduced at the group's discretion.

5.1 Architecture

The concept for the AMS architecture is one wherein applications can operate on a multiplicity of devices in order to deliver rich, multimedia communication functionality for the user. Applications communicate with a user's terminal, while the terminal communicates with various network elements in order to enable communication with remote users or services. While application intelligence and call control have historically been co-located on a single physical device, with some instances of physical or logical separation through proprietary interfaces, AMS places a focus on intelligent applications and the interfaces to those applications, with a view that every application, ranging from traditional voice applications to alerting the user to transferring a file, may exist as a distinct application that may be physically separated from the user's terminal. By taking this approach, application developers are empowered to create a multitude of new, innovative applications that are able to interface with the user's terminal, enabling new functionality that would otherwise be impossible or very slow to bring to the market.

The user's terminal will communicate on behalf of the various applications in order to enable end-to-end communication between two or more users. In most cases, it is envisaged that application data will be transmitted directly between peer communicating applications, while the user's terminal will handle more traditional establishment and tear-down of communication between any two or more users. Additionally, the user's terminal will coordinate with network elements and applications in order to ensure proper transport of application data through various network boundaries and ensure that media flows and signalling channels are adequately secured.

Entities in the network may handle device registration, resolve addresses, coordinate with resource control and reservation functions, and facilitate the transport of signalling and media. Further, it is envisaged that special network-based application servers may be utilized in order to provide enhanced communication functionalities and services. Some of these are existing services, such as multipoint communications, but others represent new application and service opportunities to bring personalized and media rich offerings from service providers directly to a user's AMS terminal.

5.2 Applications

AMS will be organized as an underlying framework that can support multiple applications. Applications sitting on top of the AMS framework may include traditional functions such as telephony, video conferencing and paging, or emerging applications such as collaborations through immersive environments or the coordination of applications across multiple device platforms. AMS is envisaged as a rich concert of “micro-applications” running on a common secure and robust network connectivity layer.

5.2.1 Application Types

Different applications may have very different expectations of behaviour. For example, a voice over IP application might have the expectation of handling calls, while a presentation-sharing application might expect the notion of user mark-up. For this reason, applications will be categorized so that relevant protocol elements for them can be developed, while a common underlying architecture ensures proper communication and coordination between different applications.

The development of application types in AMS will include case studies, a strong vocabulary for identifying each application type, application to application interfaces and interfaces to the underlying framework for inter-application communication.

A goal of the application structure within AMS is that the underlying network signalling processes are handled by the base framework and applications are only exposed to a well defined interface to that framework. This will simplify application development by freeing it from the constraint of having to be aware of the underlying network signalling. Application development should be free to focus on application-specific logic, rules and protocols. Strict application-typing will ensure that individual applications do not have to be aware of the universe of applications. This will foster an environment in which dynamic niche application ecosystems can develop.

5.2.2 Case Studies

Case studies and use scenarios will be captured for applications to inform development and ensure that architectural directions fully encompass user requirements. The following scenarios illustrate the type of functionality that is envisaged for AMS. Note that all names and institutions described below are fictional and intended for illustration purposes only. Any resemblance to actual individuals or organizations is purely coincidental.

Après Telecom is a telecommunications carrier specializing in public communications services. They offer a wireless IPv6 multimedia dial tone service that enables customers to engage a range of voice, video, presentation sharing and data collaboration services. Après provides their own authentication, media processing and network peering services in addition to customer support for terminal operation.

Uli is an environmental engineer engaged in stream restoration projects. In the field, he uses an AMS-enabled portable wireless device with service from Après to connect back to support staff in his office. He narrates to his staff in real time while walking around a damaged wetland using his device as a video recorder. Après provides his voice service and a device with built-in GPS. A custom application that his engineering firm wrote reads the GPS data from the Location Services interface in his device and transmits that data in real time back to his office where the wetland images and location data are mapped into a database for future analysis.

That evening Uli is scheduled to teach a class at the university. As he walks into the classroom, his portable device asks if he wants to connect to the campus wireless IP network. His device warns him that this is a public network that does not support encrypted data and asks if he wishes to continue. He confirms and is authenticated against the campus identity management system as a faculty member. Immediately, the computer at the instructor's podium turns on with a web page displaying today's lesson and the students in the classroom whose presence it detects as guests and records their presence into the automated attendance roster. Uli welcomes the class, and seeing that his portable device has detected the classroom audio-visual system as an official university resource, clicks on his device to stream the day's wetland videos to the projection screen on the wall. His students use AMS-enabled software provided by the university but they obtain service from a variety of different service providers in the community. Two students even participate remotely from the neighbouring province. After class, these students use their respective service providers to access the server at Uli's engineering firm, recording their own observations about the health of the wetland.

At home Uli watches a movie on his television but receives a call from his mother. The television displays her picture in the corner and displays text asking if Uli would like to take the call. He uses his portable phone to click 'yes,' the movie pauses and they speak.

Uli's mother is not interested in technology and uses only an analogue telephone. However, she does have a digital picture frame onto which Uli regularly puts pictures of her grandchildren. The picture frame has Internet connectivity from a local service provider, who includes a small wireless router and NAT device as a part of their package. The picture frame also supports an inventory program that Uli hosts from his home server that lets him check if his mother has remembered to take all of her *medication. Because Uli operates his own personal home network, he ensures that all of his communications with his mother are fully encrypted, especially for her sake. She does not subscribe to any AMS service-provider, so Uli connects to her digital picture frame in peer to peer mode. The picture frame has a red HELP button which will immediately connect to the nearest public safety centre and provide them with accurate location in an emergency.*

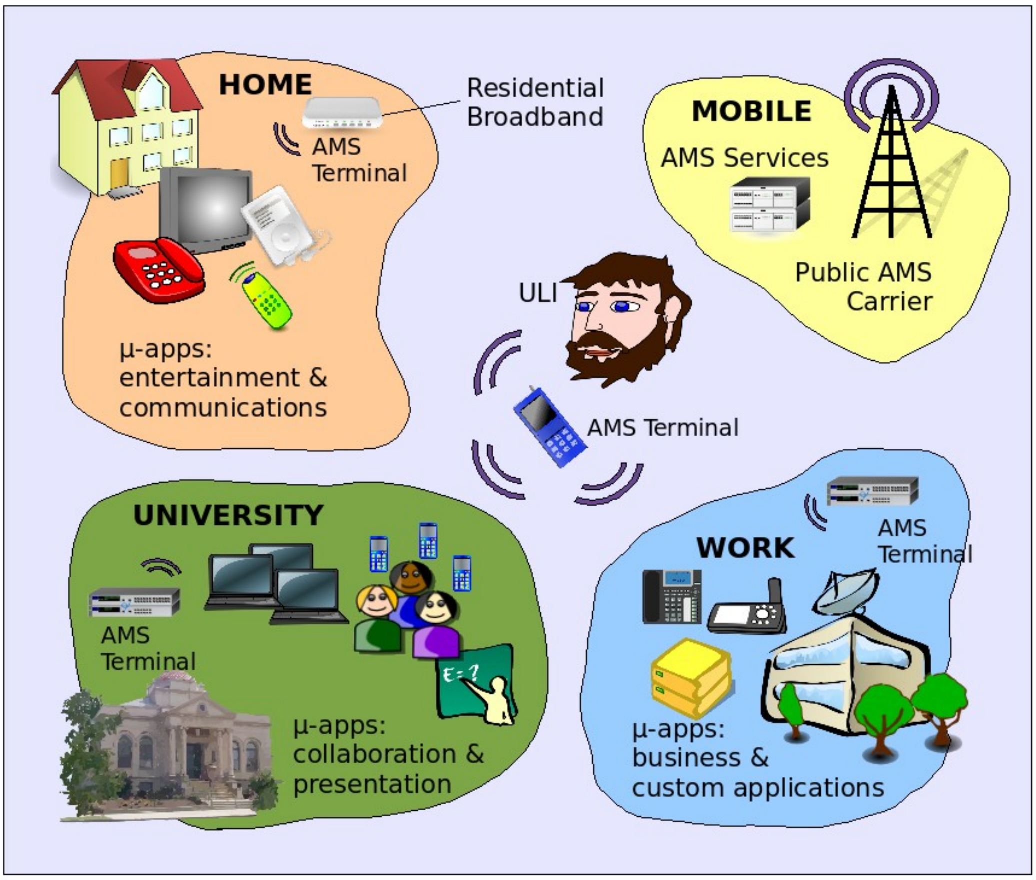

Figure 1: AMS Scenarios

Figure 1 illustrates this scenario, which is meant to illustrate a number of key design targets for AMS, including:

- The ability to operate with or without a service provider.
- The ability to coordinate sessions across multiple devices.
- The ability to easily traverse NAT and IPv4/v6 boundaries.
- End to end and inter-domain authentication and authorization features.
- Service advertisement.
- An open development environment in which many applications originate

from a variety of sources.

- A clean interface between the network and application layers to allow for coherent policy and policy enforcement.
- Location services for supporting emergency services.

AMS is envisaged a decomposed terminal. This decomposition is illustrated in Figure 2.

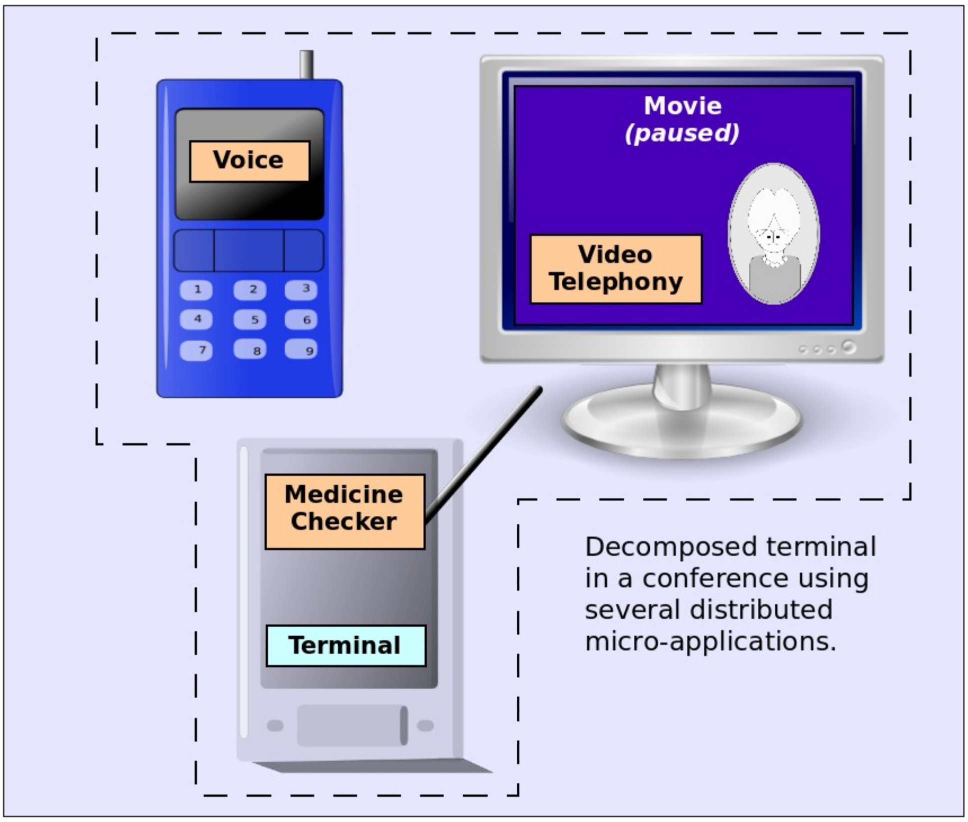

Figure 2: Decomposed Terminal (from use case)

5.3 Security

Security will be included as a fundamental architectural feature throughout all levels of the system, rather than as add-on functionality. Security considerations will be an expected aspect of all contributions.

5.3.1 Authentication

Authentication methods will address the need for many different actors in the AMS environment to ensure identity. These actors include the user, the application, the device, the network, and the service provider. Each of these actors has different reasons for needing to establish identity and AMS seeks to address these needs in a more granular fashion than previous protocols.

Authentication methods will ensure that authentication can occur across multiple domains and devices. The architecture of AMS will be layered such that authentication services can be provided by the core infrastructure where appropriate, so that application layers have a lower burden and do not need to duplicate authentication steps.

5.3.2 Authorization

The same actors that have an interest in authentication may also have an interest in making choices about what services can be accessed based on the results of the authentication process. Work in this area will ensure that individuals, network operators, and regulatory authorities have flexible control over system operation. In order for AMS to support flexible and granular policies, there must be clear activity detection points and clear policy enforcement points.

5.3.3 Encryption

Encryption will be supported for all levels of the architecture, including low level signalling as well as application level privacy. Some encryption services may be provided by the base architecture but some, especially media-specific and application-specific encryption will occur at the application layer. Encryption techniques will be extensible to allow for future development such as digital rights management.

5.4 Identity Management and Resource Discovery

Work in this area will ensure that users, resources and network entities can be managed on the network. This includes the ability to find individuals, organizations and functions. It also includes resource discovery functions to query for system capabilities in order to determine application possibilities.

Identity management functions will ensure that enterprises and carriers can coordinate provisioning and authentication functions with existing identity management infrastructures in order to yield efficient, highly scalable and easy to use services. However, identity management functions will also support the existence of large scale independent usage that is not tied to carrier or enterprise-provided identity management services. These two modes of operation will be coordinated and interoperable.

Resource discovery functions will ensure that devices, applications and users can be found on the network with sufficient information to contact them. This function includes the ability to statically search for entities about which some information is known, and also the ability for entities to advertise their existence on the network.

Identity management and resource discovery may be coordinated with presence information provided by the application layer.

5.5 End-to-End Network Transparency

AMS is expected to run on a large variety of heterogeneous networks with significantly different characteristics and border behaviours. In order to ensure that application options and capabilities are not unduly limited by the inter-operation between and through several network types, the applications and terminals should be able to communicate between each other without regard to the underlying networks. That is, end-to-end transparency of the network is expected for the applications.

Contributions to this work items will ensure that communication signalling operates efficiently in secure network environments and environments that have nested private networks including both firewall/NAT traversal, crossing multiple IPv4/v6 boundaries. Consideration may also have to be made of other techniques likely to be used in the networks to ensure end-to-end communications retain transparency, for example IP header compression for spectrum efficiency in mobile network hops and similar.

5.6 Addressing and Address Resolution

Address resolution will be a key function provided by the base infrastructure. As AMS is conceived of as an environment which is highly mobile and in which many devices and applications come and go, address resolution will be an extremely dynamic process. Address resolution will be implemented in such a way as public address advertisement can be accomplished in a highly scalable manner without the need for complex addressing systems in the core of the network. This design goal is to ensure that the deployment of AMS can occur with minimal capital investment, especially from individuals and small groups, in support of large-scale, user-driven deployments.

Work in addressing will be strongly typed to accommodate the need for multiple addressing formats. Addressing will be modelled discretely from identity management and signalling elements to ensure proper modelling in middleware.

5.7 Interfaces

Work in the area of interfaces focuses on the signalling and vocabulary requirements for various system elements to ensure they interact. Interfaces are to be broken down into specific functions in AMS so that the overall system can model realistic usage scenarios.

5.7.1 User-to-Application Interfaces

This work area describes ways that users (or non-human agents) interact with applications, especially to support security, mobility and roaming profiles. It describes ways that users access applications, enter security credentials, select options and are presented with information from the application. AMS is envisaged as an environment that supports quick context switching for devices, in which a user can approach a public device and present identification and the device will assume the personality and preferences of the user. Such behaviour requires standardization of certain elements of the User-to-Application Interface.

5.7.2 Application-to-Network Interfaces

This work area describes ways that applications signal the network for authorization, network management, accounting and QoS requirements. It details ways in which the network or other authorized elements obtain a view into activity on the AMS network and use that view to establish QoS, put terminals into appropriate VLANs, grant or deny access, generate alarms or account for activity for subsequent billing.

5.7.3 Application-to-Application Interfaces

This work area describes ways that applications communicate with each other in order to coordinate functions. AMS is envisaged as an environment in which applications can co-exist and take advantage of other components. For example, a mapping application might take advantage of data provided by a location services application.

A specific case where applications will be expected to communicate with each other is in the case of application handover whereby an application is replaced by an alternative instance of the same application usually on a different device (e.g. watching a movie on an HD screen and having the movie transferred to a mobile smartphone when leaving home).

5.7.4 User-to-User Interfaces

This work area describes end to end interfaces to ensure that users can interact confidently and securely with other users. It encompasses work that describes ways that end users authenticate each other as individuals, as opposed to authenticating devices or applications. It describes ways that users can exchange encryption keys and other tokens necessary for secure operation over untrusted networks.

5.7.5 Service Advertisement

Components in the network or in a terminal may wish to make themselves known so that those services can be accessed by other applications or network elements. Examples include the ability to mix media for collaborative conferencing, gateway elements, or application specific services. Some application sets will be strongly typed and others will represent proprietary extensions. Both should coexist on the AMS platform.

5.8 Encoding

Work in this area will determine information coding techniques to be used in specific areas of the protocols. Each aspect of the system must be rigidly defined in order to ensure proper interoperability between the user's terminal, the terminal and various applications, network entities, and the remote user and associated applications.

5.8.1 Communication and Control Signalling

An important area of study for AMS will be the specification of the communication protocol between the user's terminal, the applications, and the network entities. These various communication interfaces must be rigidly defined, not susceptible to misinterpretation, and not encumbered with a multitude of options that impede interoperability. The encoding of messages must be efficient and able to support large-scale deployments operating in both wireless and wired environments. As much as possible, the interfaces between all communicating entities should share a common design with both encoding and processing efficiencies considered.

5.8.2 Codecs

Since audio and video applications will quite likely be widely used with AMS, it will be important to study the existing codecs in use in current systems and consider which codecs should form the basis of any ITU-specific audio/video applications that work in conjunction with AMS. Further, consideration should be given to requirements for any new codecs and such requirements should be given to the appropriate experts within ITU-T SG16 for consideration. As one example, AMS applications such as voice applications may be specified such that only one or a very small number of voice codecs are required for compliance with the voice application. In order to introduce additional codecs to AMS systems, encoding logic and packetisation procedures for codecs might be transmitted as instructions over the network from an application server or peer voice applications. Such functionality might necessitate the design of a new kind of codec unlike the traditional voice codecs employed today.

5.8.3 Application-Level Encoding

Given the wide variety of applications that might exist for AMS, it will be important to define an application framework to provide guidance to application developers to ensure the highest degree of interoperability possible and to ensure proper operation in a wide range of network environments, including narrowband and broadband wireless and wired networks. As an area of study, some fundamental applications will be developed in parallel with the AMS system that will follow the guidance specified in the framework and serve as examples for application developers.

5.9 Location Services

AMS location services efforts describe architectures for determining and communicating physical and virtual locations in support of emergency services and location aware applications. AMS will include support for location services applications and signalling from the project outset. Location services architectures will be coordinated with presence functionality. Location services signalling will be strongly typed so that network elements can make decisions based upon methods and sources for the location data, such as whether the location has been provided directly by or on behalf of the terminal, and the quality of the location assertion (e.g. resolution and confidence factors). AMS anticipates that many location aware applications will be proximity based and as such applications will rely on location data to offer services to nearby actors. Thus, well-defined signalling requirements for location services are a primary design goal.

6 Versioning

The expected lifetime for AMS will be substantial and as such it can be expected that several revisions to various aspects will be produced in response to new applications, services or system requirements and also in response to issues identified through interoperability testing and system deployments.

AMS will include well-defined versioning to allow for extensible development and system revision while maintaining complete compatibility with older and newer system implementations.

Versioning will apply to the interface protocols as well as to the applications. The version indications are expected to be separate but may employ common methods for version encoding, signalling and resolution.

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