ITU Kaleidoscope 2011
The fully networked human?
Innovations for future networks and services

A Virtualized Infrastructure for IVR Applications as Services

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Outeline

- Introduction
- Proposed architecture
- Case study
- Related work
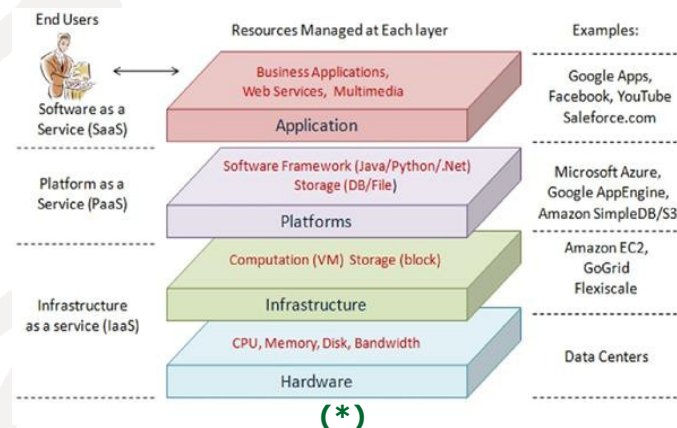- Summary and future work

Introduction

❑ **I**nteractive **V**oice **R**esponse (IVR)

   ❑ Enables interactions with automated information systems

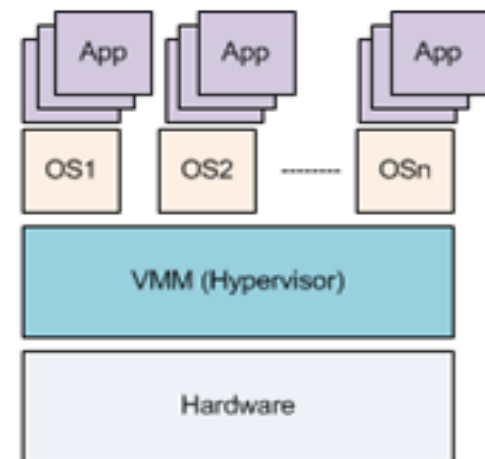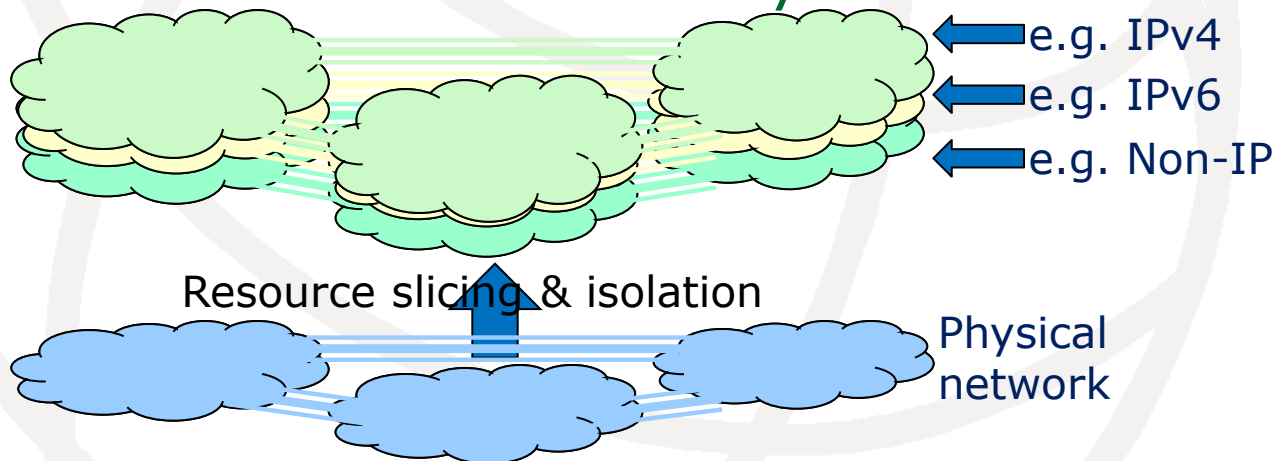   ❑ Ex: IVR banking, automated surveys, automated attendant

❑ **Cloud Computing**

   ❑ The most critical facets include

      ❑ Software as a Service (SaaS)

      ❑ Platform as a Service (PaaS)

      ❑ Infrastructure as a Service (IaaS)

(*)

(*) Q. Zhang, L. Cheng, and R. Boutaba, "Cloud Computing: State of the Art and Research Challenges", Journal of Internet Services and Applications, Springer, Vol. 1, no. 1, 2010

Introduction

❑ **Virtualization**

  ❑ Enables the co-existence of entities on the same substrates

  ❑ Benefits:

    ❑ Maximize utilization

    ❑ Increase efficiency

e.g. IPv4

e.g. IPv6

e.g. Non-IP

Resource slicing & isolation

Physical network

App   App   App

OS1   OS2 ------- OSn

VMM (Hypervisor)

Hardware

Introduction

- ## **Objective**
  - Proposes a novel architecture for a virtualized IVR infrastructure (as a first step towards the deployment of full fledged IVR applications in cloud settings)

- ## **Motivations**
  - Enable quick, easy, low-cost and on the fly composed and assembled IVR in the cloud settings
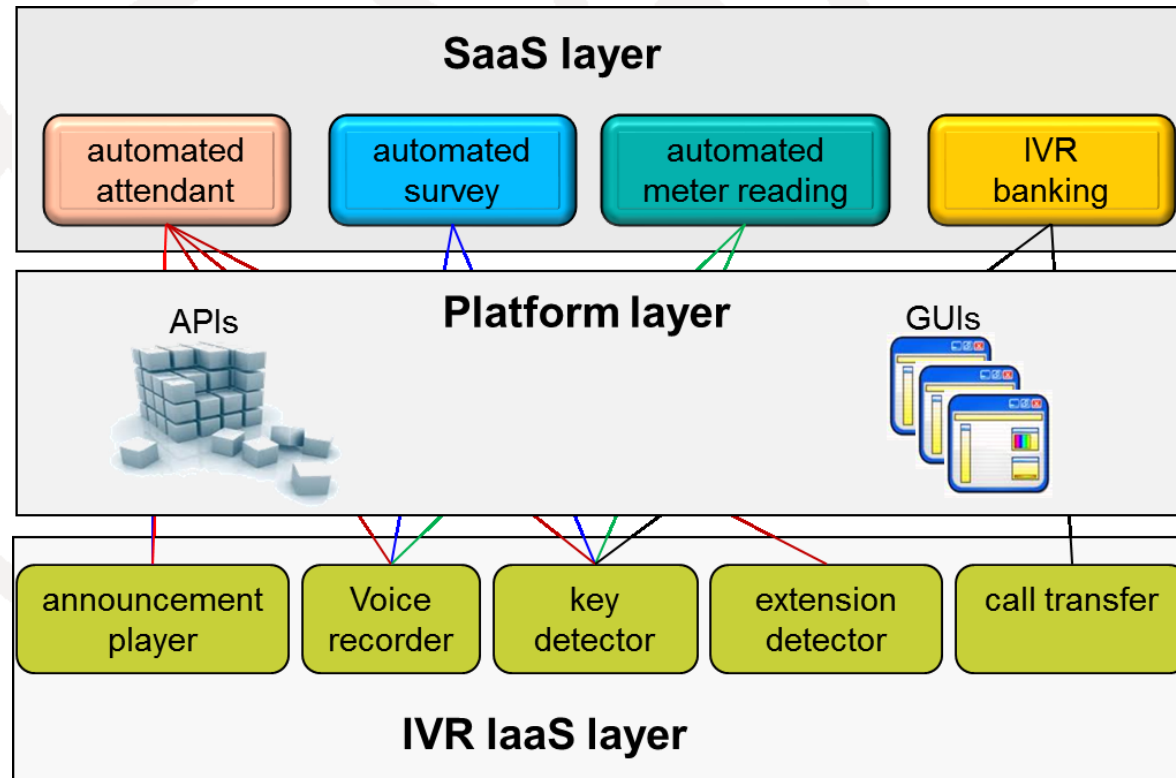 - Enable novel value-added services for IVR application service providers

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Proposed architecture

❑ Our vision:

   ❑ Different services can share the same substrates

   ❑ The same service can use many substrates
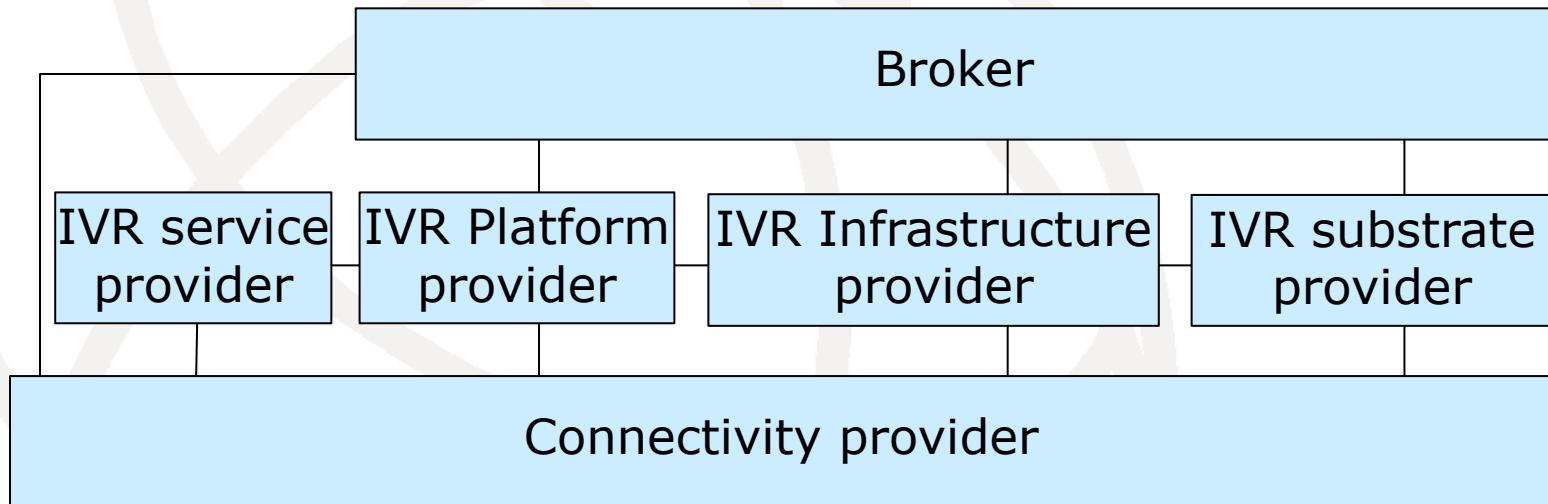
Proposed architecture

❑ Our vision

    ❑ Substrates and substrate instances can be published and discovered

    ❑ IVR service providers can compose existing substrates into powerful IVR applications
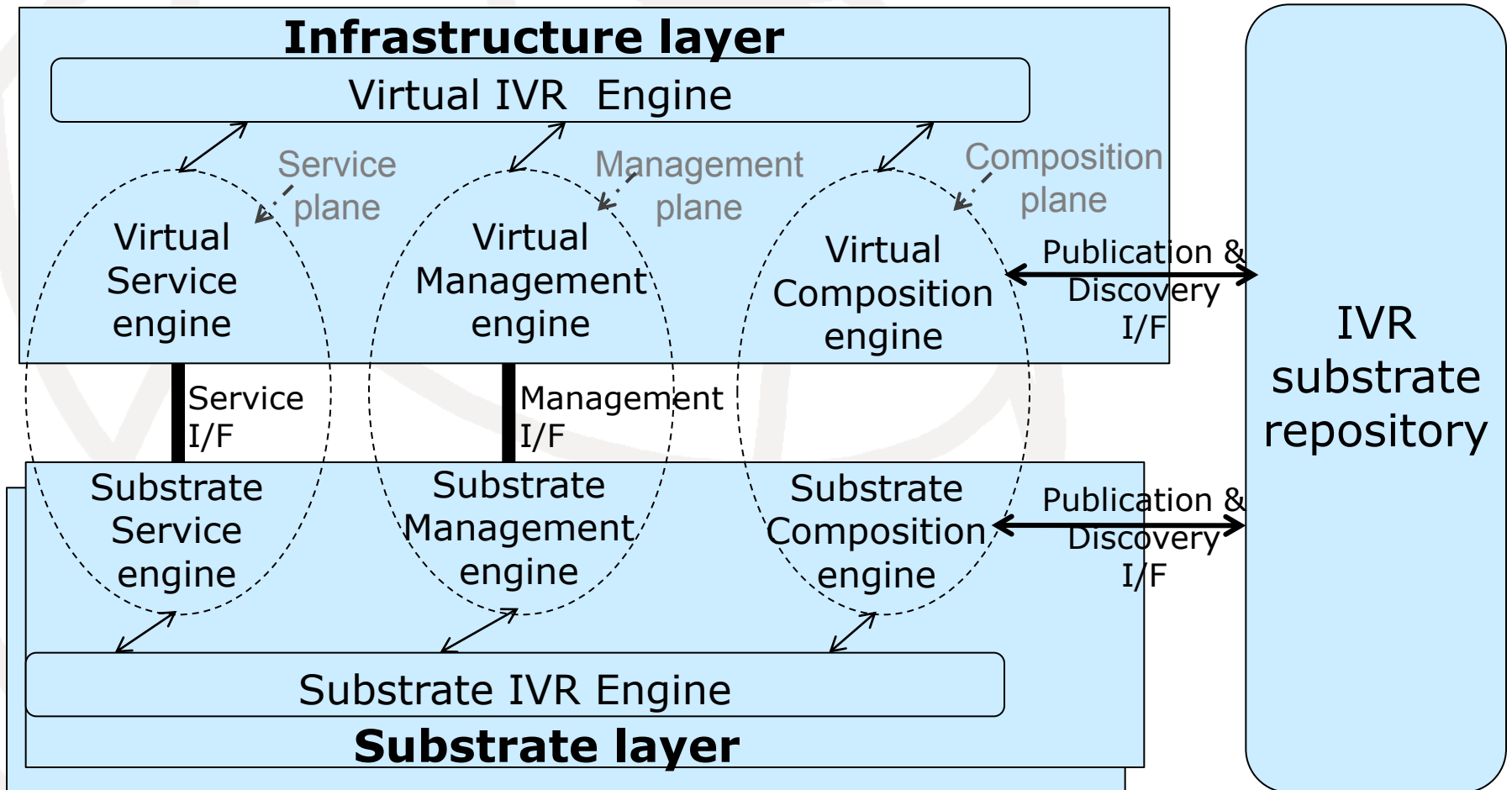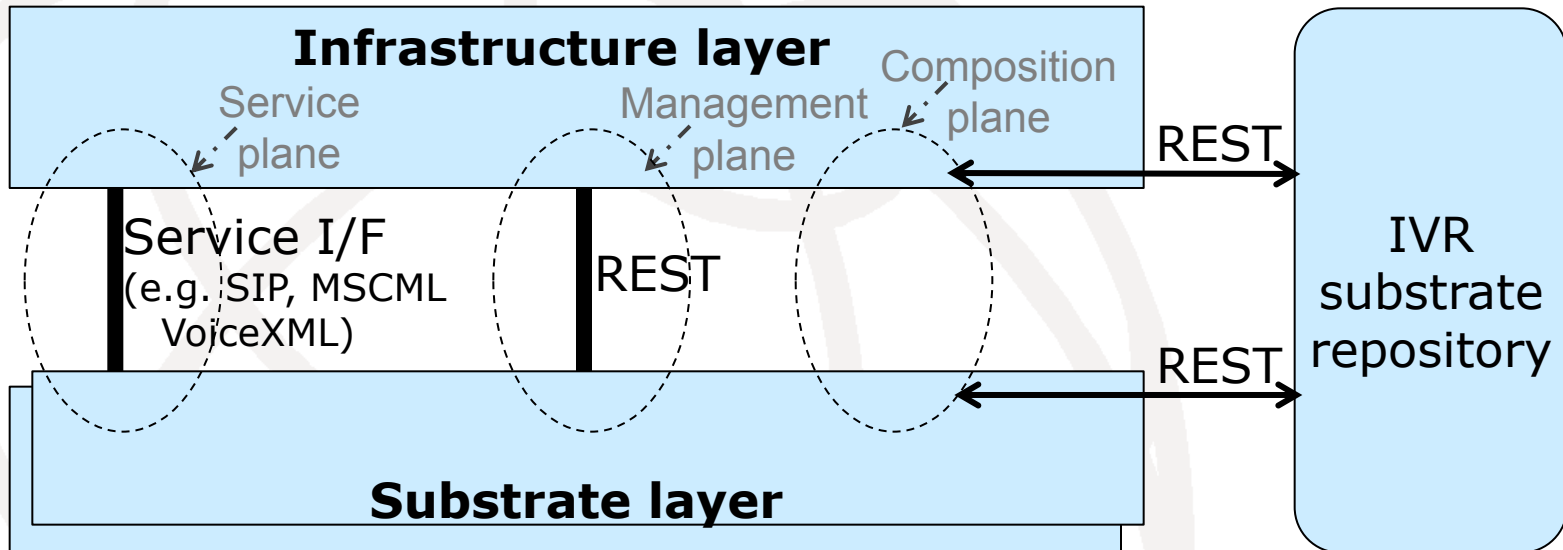
Proposed architecture

□ Business model

Proposed architecture

□ Overall Architecture

Proposed architecture

❑ Interfaces

❑ REST is a network architectural style for distributed hypermedia systems
  ❑ Resources identified by unique URIs
  ❑ Uses the HTTP methods:
    ❑ GET, PUT, POST, DELETE
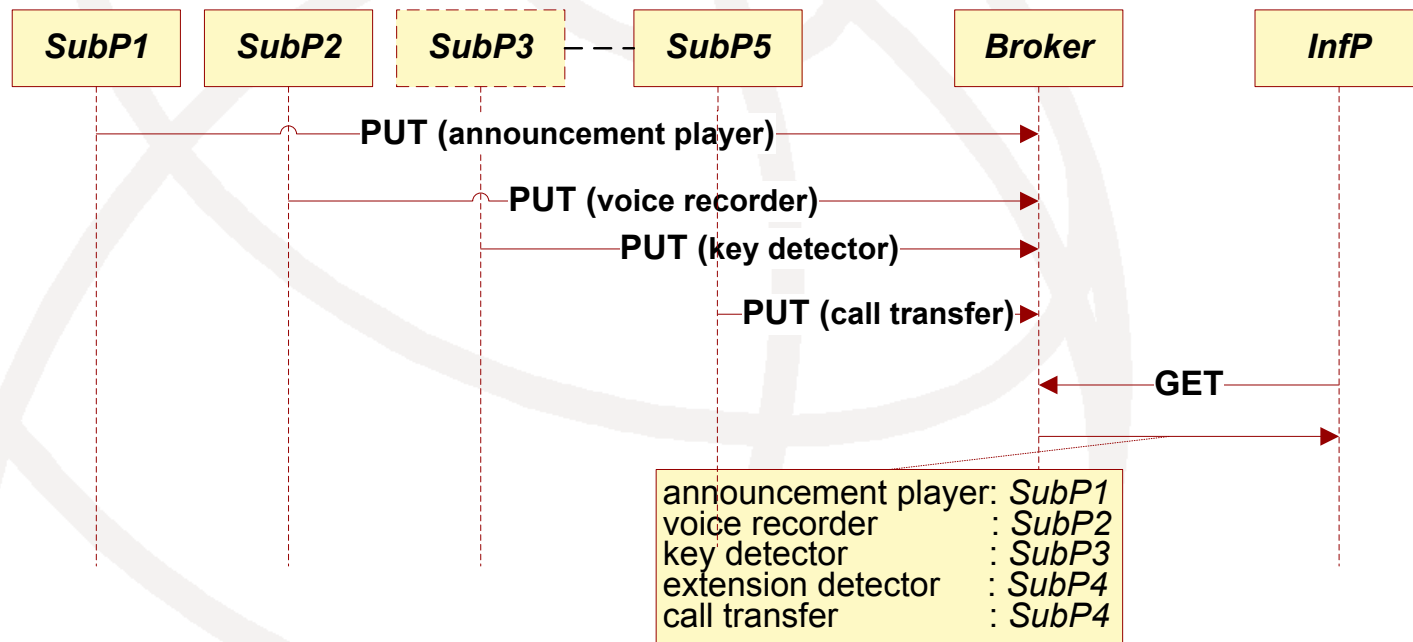
Case study

❑ Assumptions

    ❑ Assume an infrastructure composed of **five substrates**, provided by different providers

        ❑ Announcement player

        ❑ Voice recorder

        ❑ Key detector

        ❑ Extension detector

        ❑ Call transfer

    ❑ Assume a **service provider**, willing to offer an *automated attendant* service
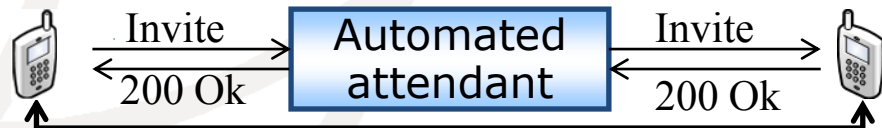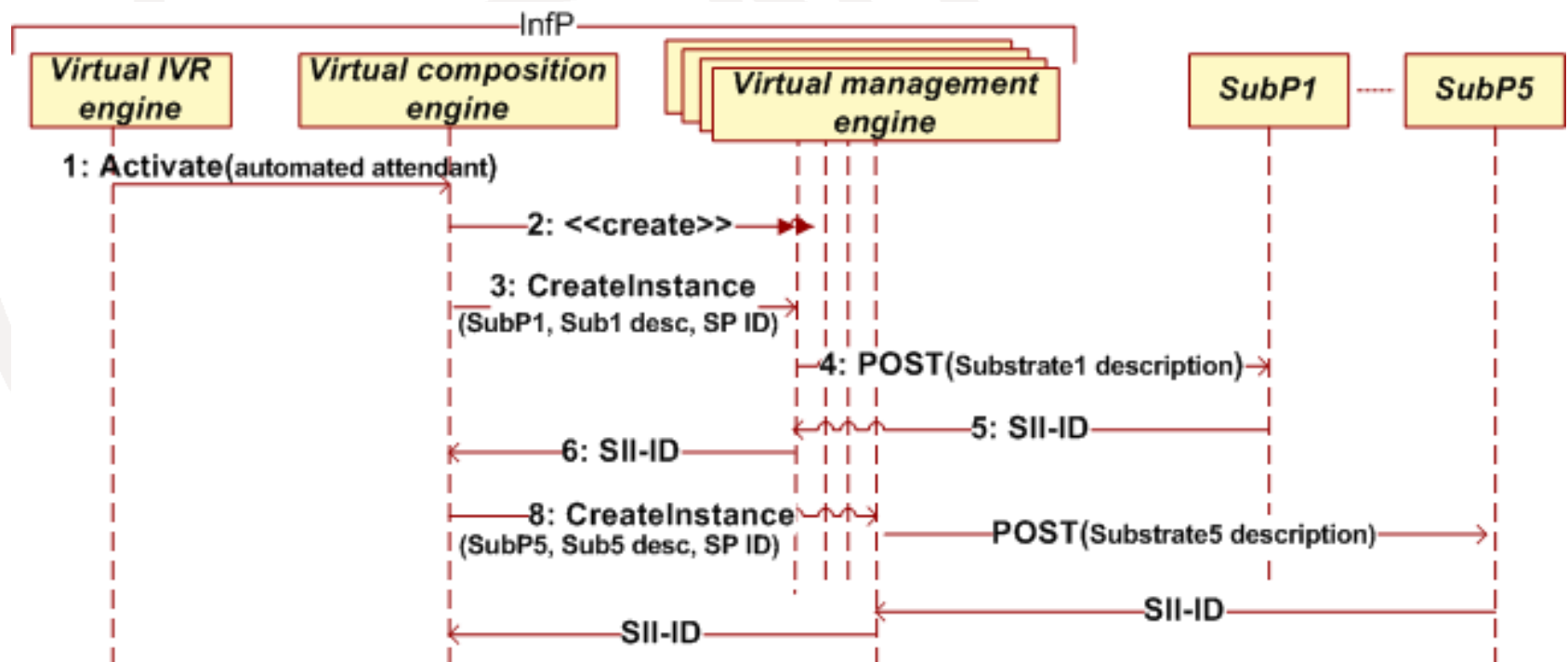
Case study

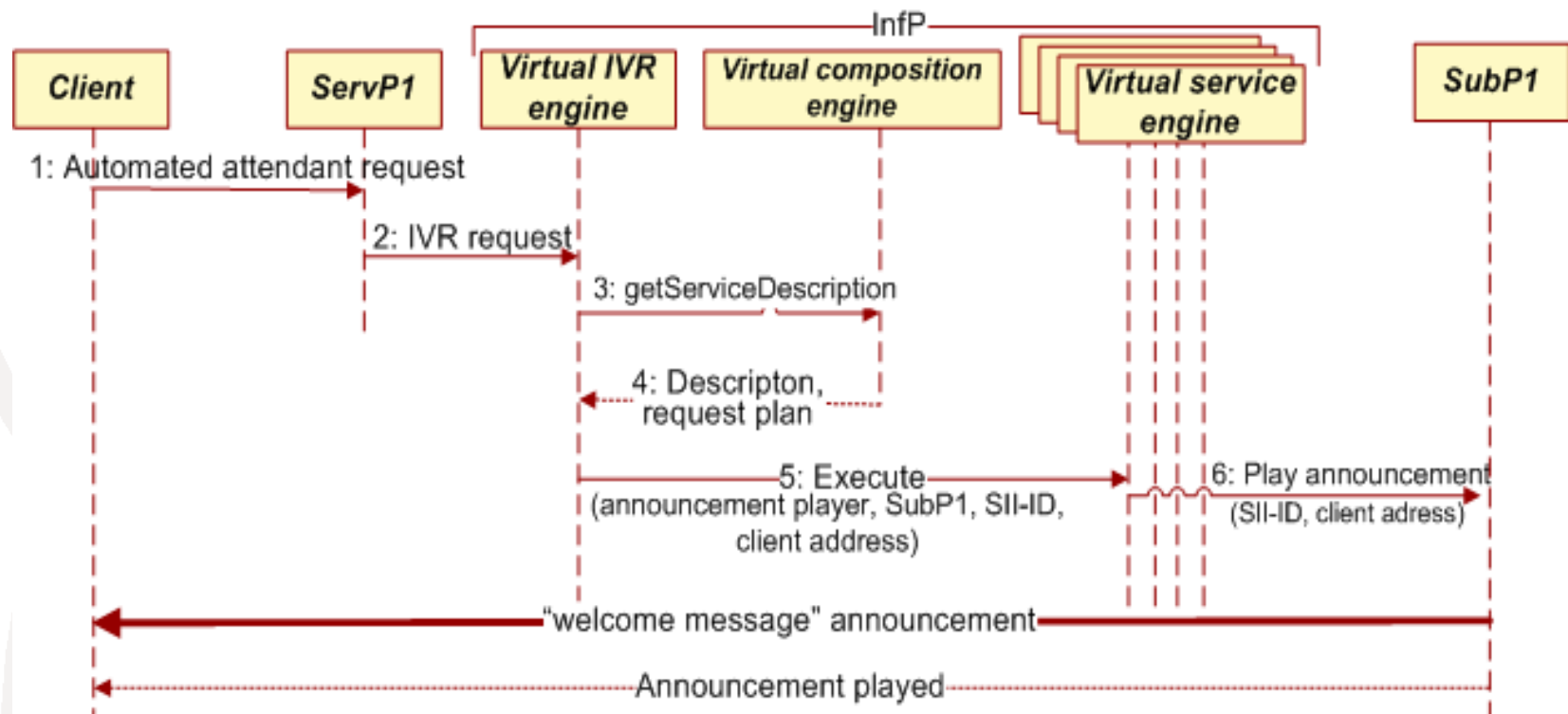□ First step: Substrates publication and discovery

Case study

☐ Second step: Service creation and activation

Case study

□ Third step: Service execution

Case study

- ❑ Prototype
  - ❑ 'Automated attendant' creation and provisioning
    - ❑ All the substrates are offered by the same provider

- ❑ Software Tools
  - ❑ IVR substrates
    - ❑ Deployed on SEMS http://iptel.org

  - ❑ Virtualization
    - a Cloud-proven virtualization platform

  - ❑ REST Interfaces and Repository
    - ❑ Implemented using jersey APIs (JSR 311)

    - ❑ Deployed on GlassFish server
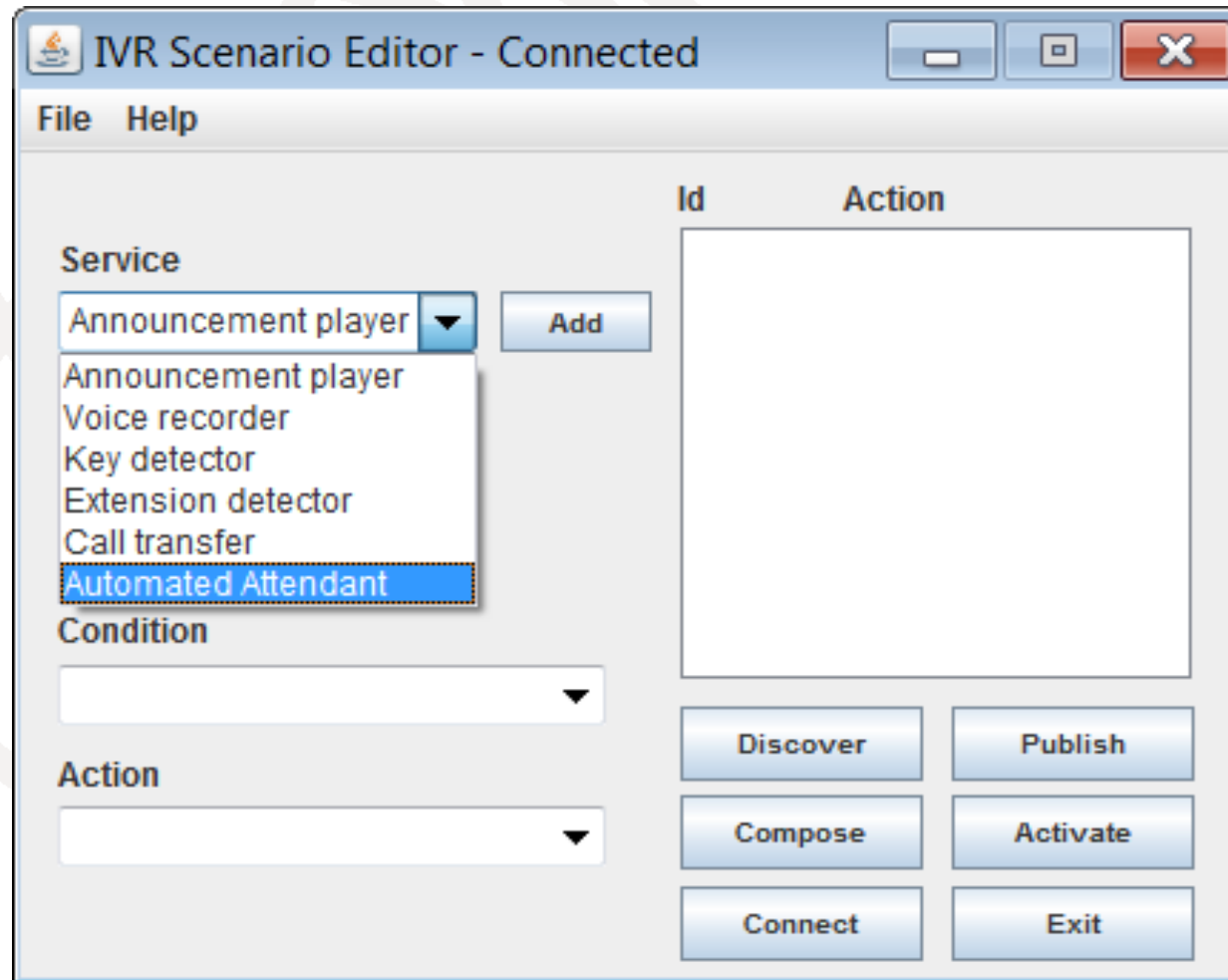
  - ❑ IVR Clients
    - ❑ X-lite, a free SIP client

Case study

❑ Platform GUI

Related work

- Cloud overall approaches
  - **E.g. Audio/Video conference** application as a service

  1. No Infrastructure with substrates that can be **published**, **discovered** and dynamically **shared**
  2. No **IVR** features
  3. No service **composition**

- IaaS approaches
  - Virtualized infrastructure for **Future** Internet
    ⇒ Focus on the **core** infrastructure of the internet
  - Infrastructure proposed for **presence** service
    ⇒ Publication, discovery and composition not addressed
  - Virtualized infrastructure for **music stores**
    ⇒ Deals with **composition,** but no details about publication and discovery

No full-fledged cloud environment that enables the development, management and offering of the full range of IVR applications

Summary and future work

❑ Summary

   ❑ Proposed a novel architecture for a virtualized IVR infrastructure, including:

      ❑ A business model

      ❑ A virtualized IVR infrastructure

      ❑ An overall architecture that enables the re-use of substrates and the rapid development and management of new IVR-based applications

Summary and future work

❑ Future Work

    ❑ Implementation of the activation phase for resource allocation and management

    ❑ Further research for moving applications other than IVR to the cloud

        ❑ Presence

        ❑ Audio video conferencing

Thank You