

Service Platform and Applications in Smart Cities

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Outline

- **Development Trends of Smart Cities & System Architecture**
- **Smart Cities Service Platform of BUPT**
 - **EDSOA Based Service Development Platform**
 - **Resource Management Platform**
 - **Service Execution Platform**
- **Deployed Applications**



Development Trends of Smart Cities & System Architecture



Global smart city construction in full swing

European Union:

- Amsterdam started the **construction of smart city** in 2000.
- Germany made the e-European broadband strategy i2010
- **“City with a Brain”** is a smart city project of Spain, it monitors city energy usage through sensors.



加勒比海

United States:

- Austin, Seattle, Atlanta, Boston, Las Vegas, Los Angeles, San Francisco, Philadelphia, Cleveland, Marion, Pittsburgh, Milwaukee are building their smart cities.

Asia:

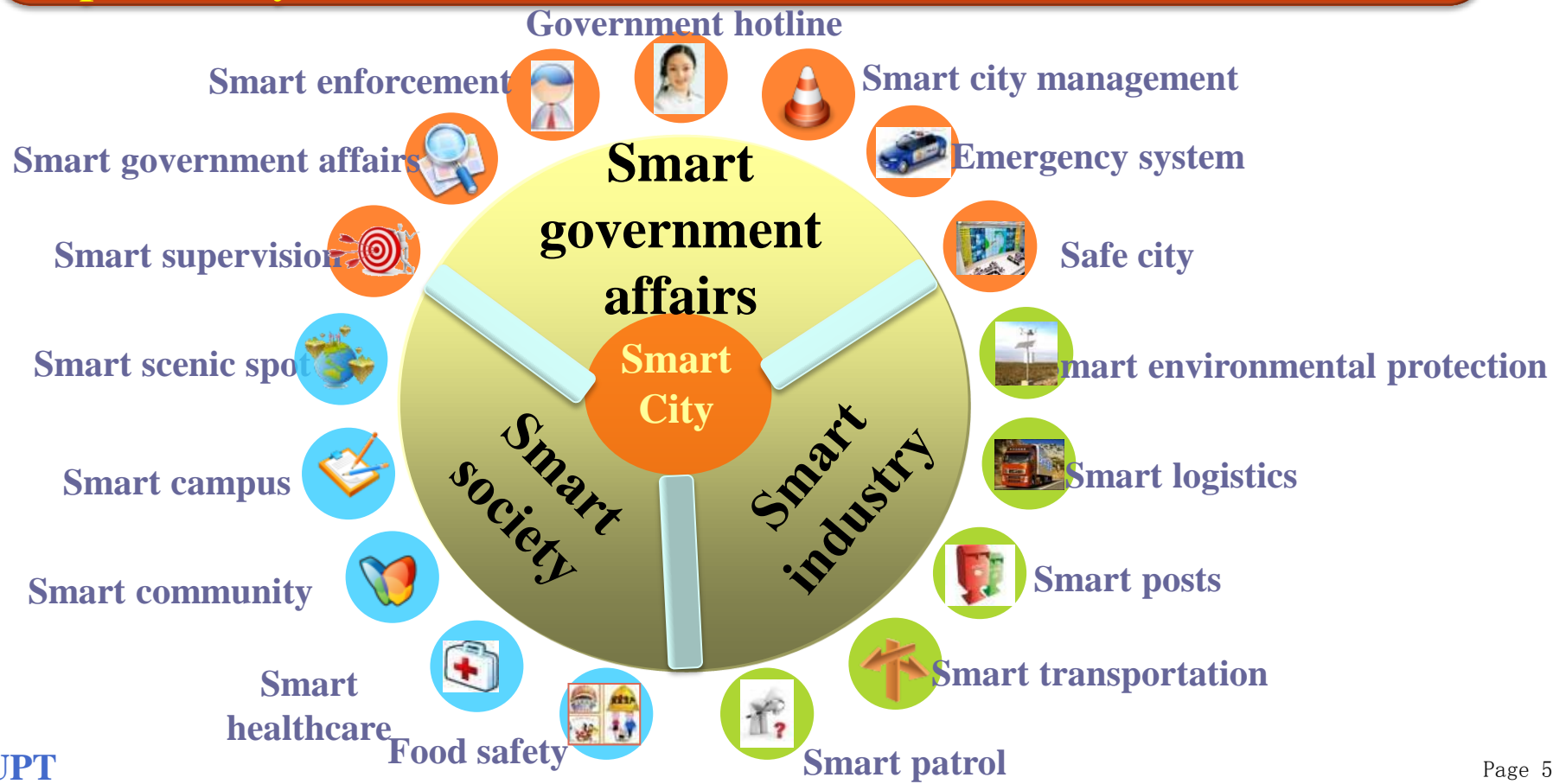
- In 2009, the Japanese government introduced **“Digital Japan Creation Project”**. In 2010, Japan launched pilot projects in cities including Yokohama, Toyota City, Kyoto and Kitakyushu.
- In 2006, Singapore launched the **“intelligent Nation 2015 Plan”**
- In South Korea, six cities such as Seoul, Busan and Incheon have become u-city demonstration area.

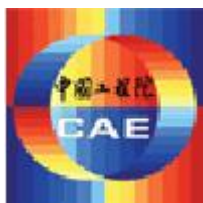




National needs: Smart city construction

Smart city is a new height of city informatization, it is the next stage of the urbanization process, the intelligent service is an important symbol.





China's Smart City Project of the Twelfth Five-Year Plan

“The tentative measures for the administration of pilot smart cities”

- The construction of smart city is implementing the idea of CPC Central Committee and the State Council about the innovation-driven development, promoting new urbanization, comprehensive building of well-off society in an important measure.
- Smart city is a brand new city form under a new generation of information technology support, knowledge society, and the next generation of innovation (innovation 2).



The first batch of 90 cities in the smart city pilot project

- In January 29, 2013, the housing administration identified the first batch of national "smart city" pilot cities of a total of 90, of which 37 prefecture-level cities, 50 districts (counties) , 3 towns.
 - ✓ first-tier cities : Beijing, Shanghai, Tianjin.
 - ✓ second-tier cities : Taiyuan, Changzhi, Shijiazhuang, Wuxi, etc.
 - ✓ 3 towns: Zhangpu of Kunshan, Baijia of Liuyang, Lecong of Fuoshan.



System Architecture of Smart Cities

Application Layer

Emergency Rescue	Safe City	Intelligent Agriculture	Smart Community	Intelligent Health	Environment Monitoring	Intelligent Transportation	Smart Logistics

Platform Layer

Middleware Service Platform	Communication Service Platform	Cloud Computing Platform	Data Center

Network Layer

Communication Network	Internet	Internet of Things

Terminal/Sensing Layer
BUPT

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The Main Problems in China's Smart City Construction

■ Lack of effective planning, redundant construction

- Lack of effective plan in the overall process of informatization, causing redundant even waste construction.

■ Decentralized system construction, causing the problem of information islands

- Various departments and industries are implementing their informatization process; however, they could not combine their effort together to play a bigger role.
 - e.g. City emergency rescue command system
- Multiple infrastructure and support system construction caused a lot of waste of resources and manpower
- It's hard to coordinate these services dynamically cross organizations or domains.



Smart Cities Service Platform of BUPT



Smart Cities Service Platform of BUPT

Application Layer



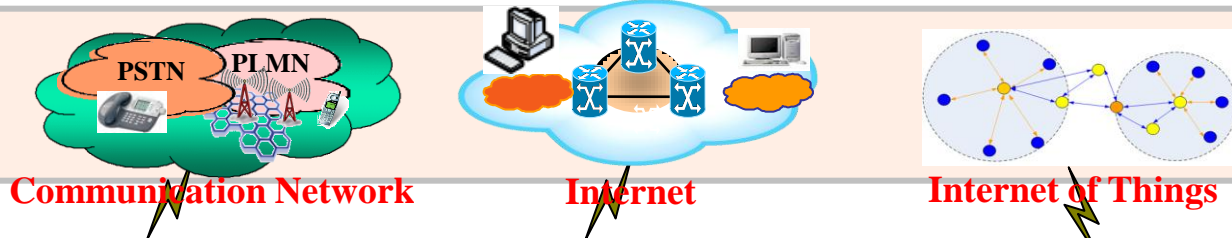
Service Execution Platform

Smart Cities Service Platform of BUPT

Service Development Platform

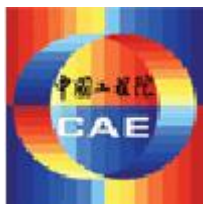
Resource Management Platform

Network Layer

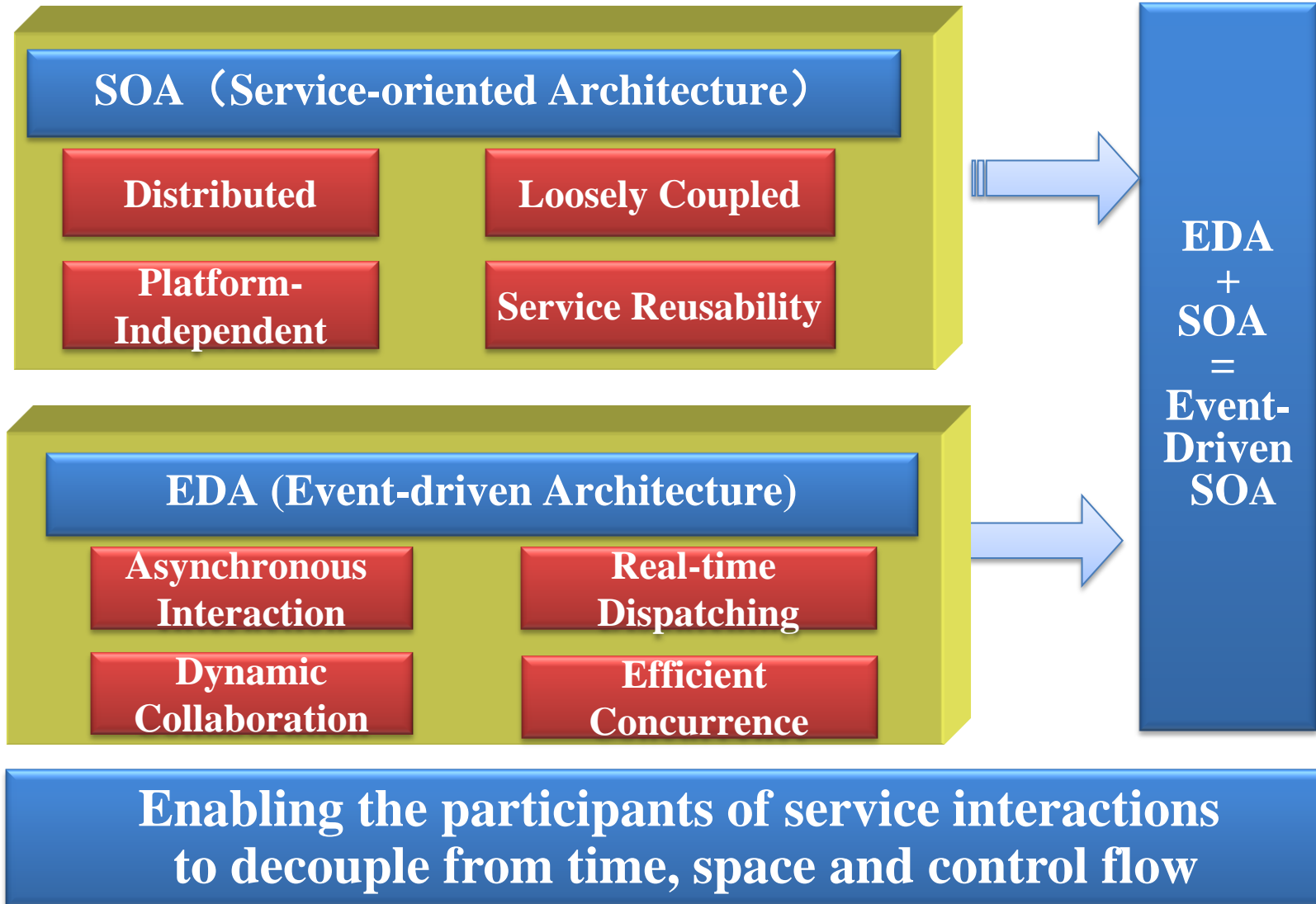


Terminal/Sensing Layer BUPT



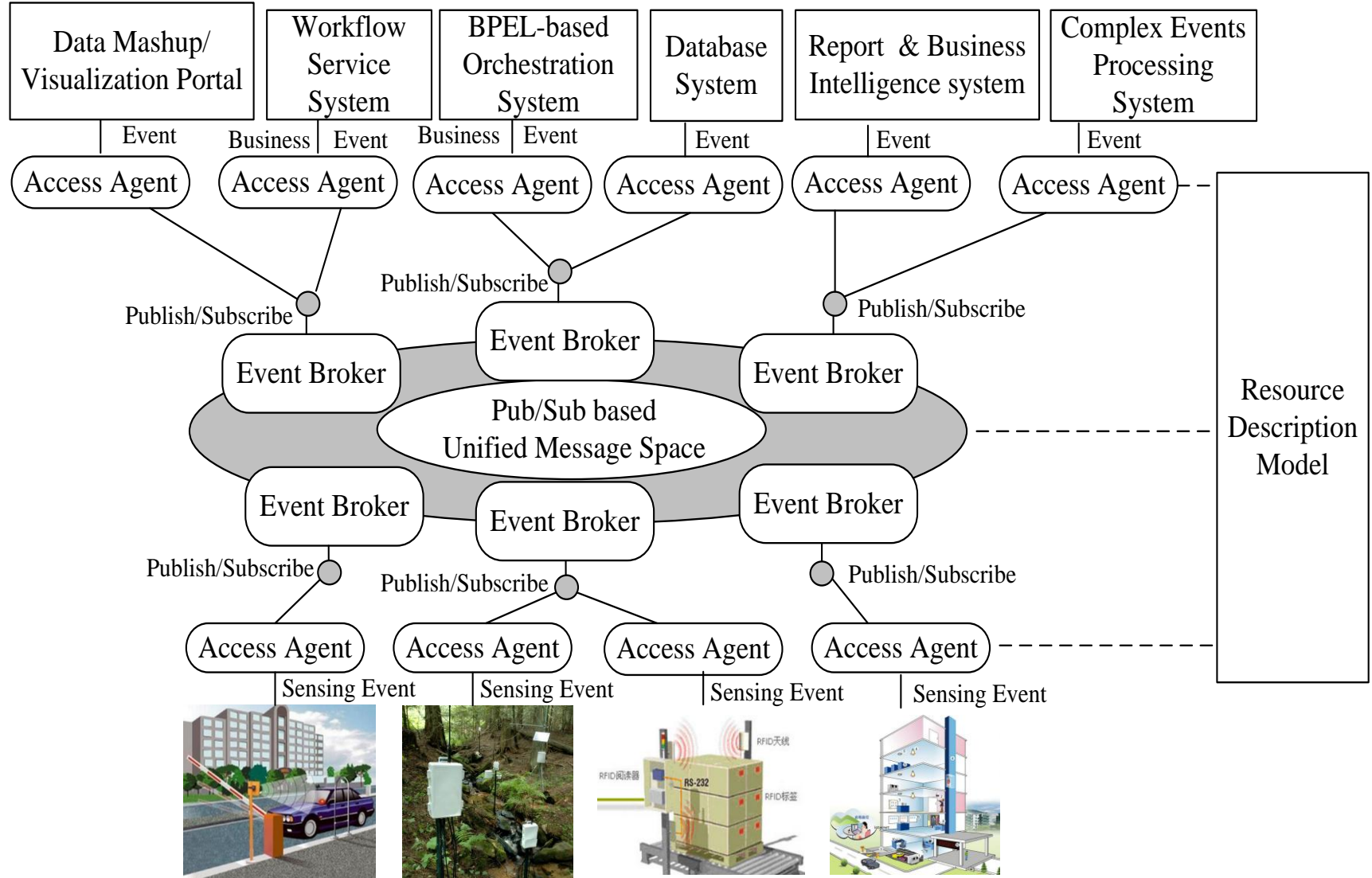


Basic Ideas of BUPT Service Platform



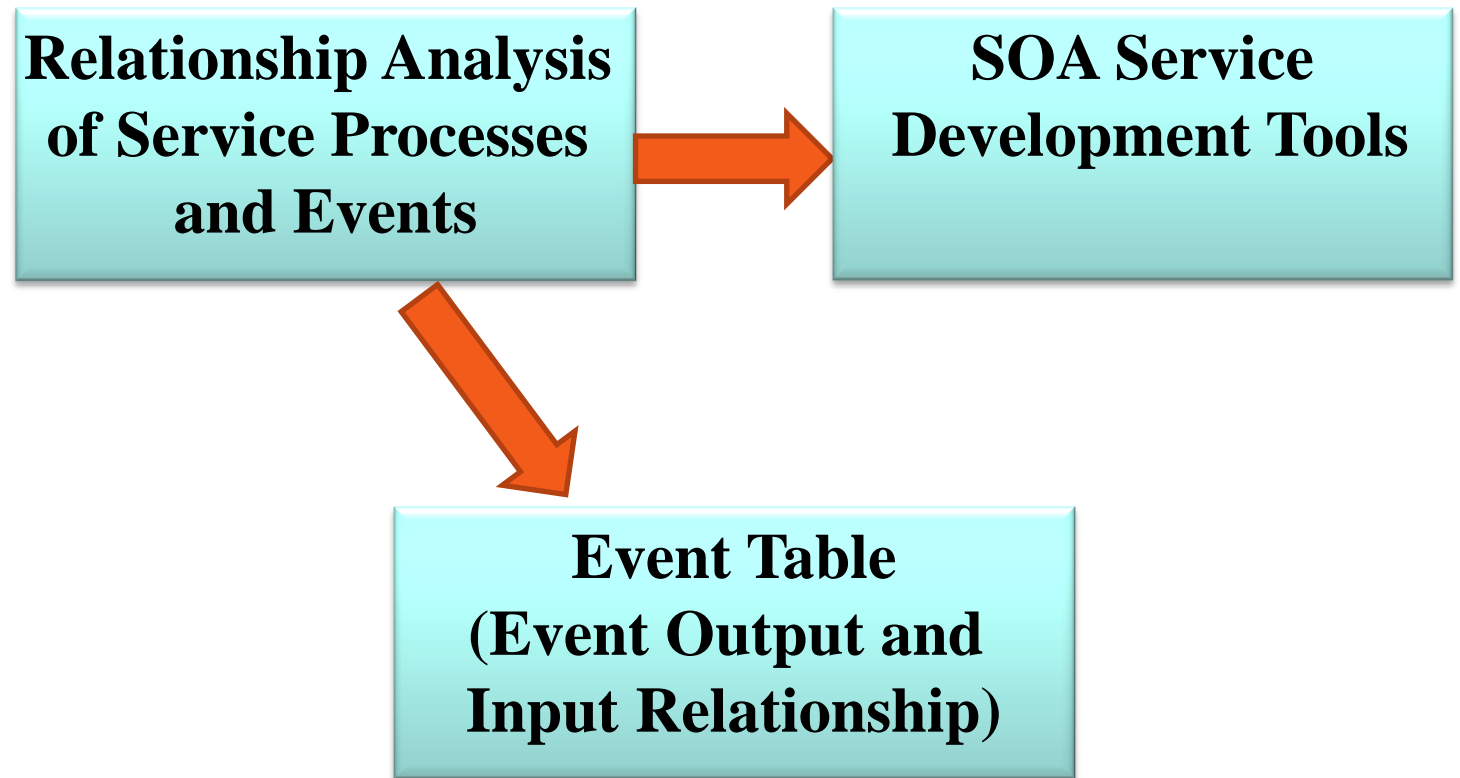


EDSOA Based Smart Cities Service Platform





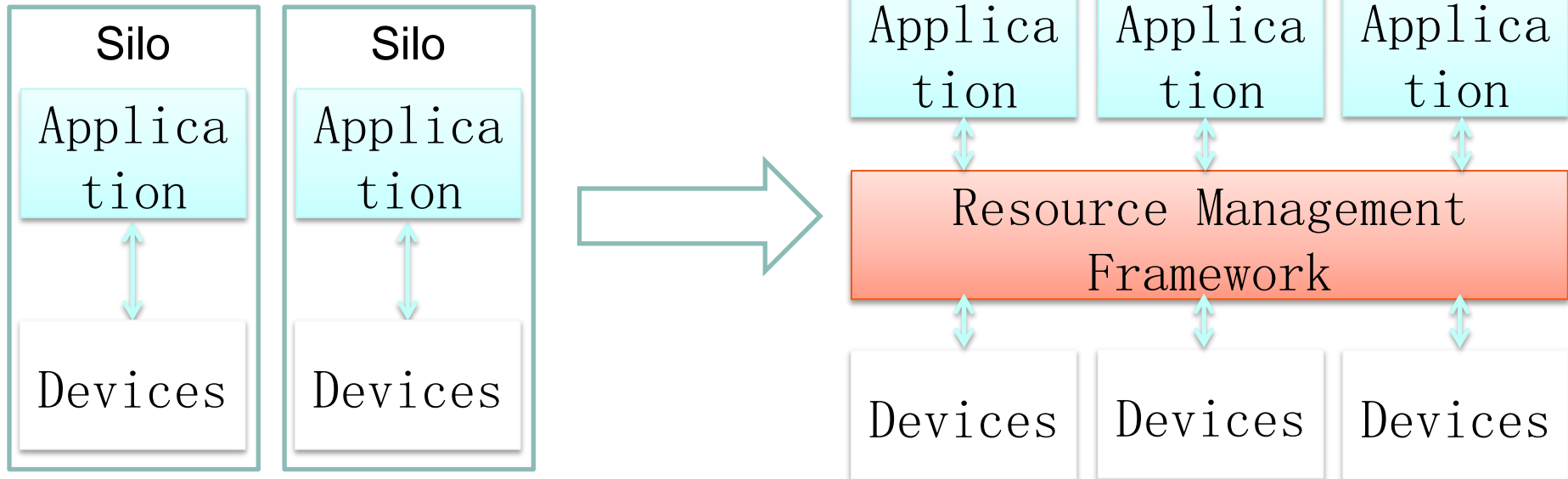
EDSOA Based Service Development





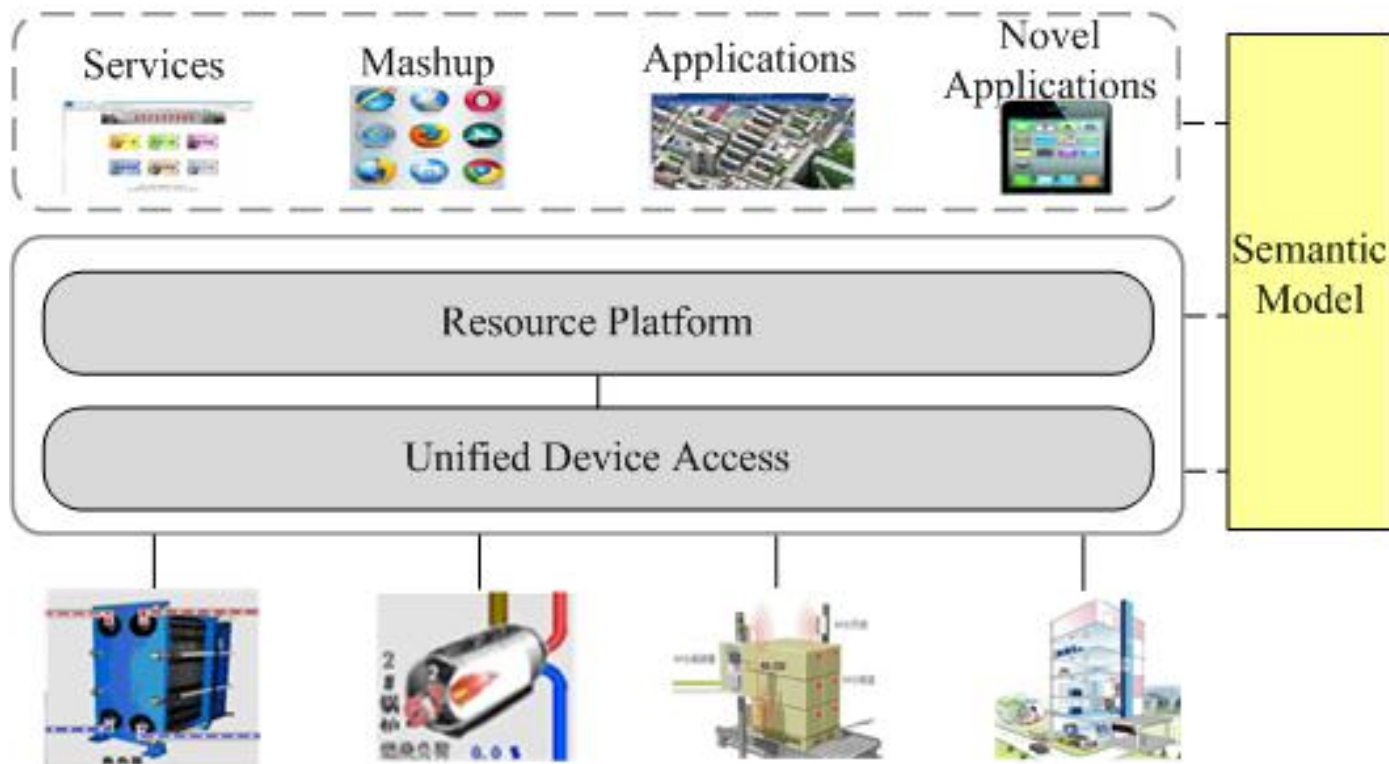
Resource Management Platform

- Existing IoT application modes are focus on single application and “silos” solutions. There is a tight-coupling between the devices and the applications and they are characterized by "proprietary devices for one specific application".
- The data and resources are typically locked into closed systems without cross-system sharing, reusing, and interaction.



- We propose a resource management framework to open up or break the current application silos and move to a horizontal and open application mode.

- The resource management framework provides an infrastructure for accessing heterogeneous devices, formally describing resources and entities, and publishing their output in well-understood, machine-processible formats on the Web.
- It shields the heterogeneity and technical detail of devices, and exposes them in a well-defined resource way. The resources and information are represented in a self-description and semantic manner.
- It decouples the upper applications from the underneath devices, and ensures the expandability of upper and underneath layers. It enables the cross-system sharing and reusing of resources, and interaction between applications.



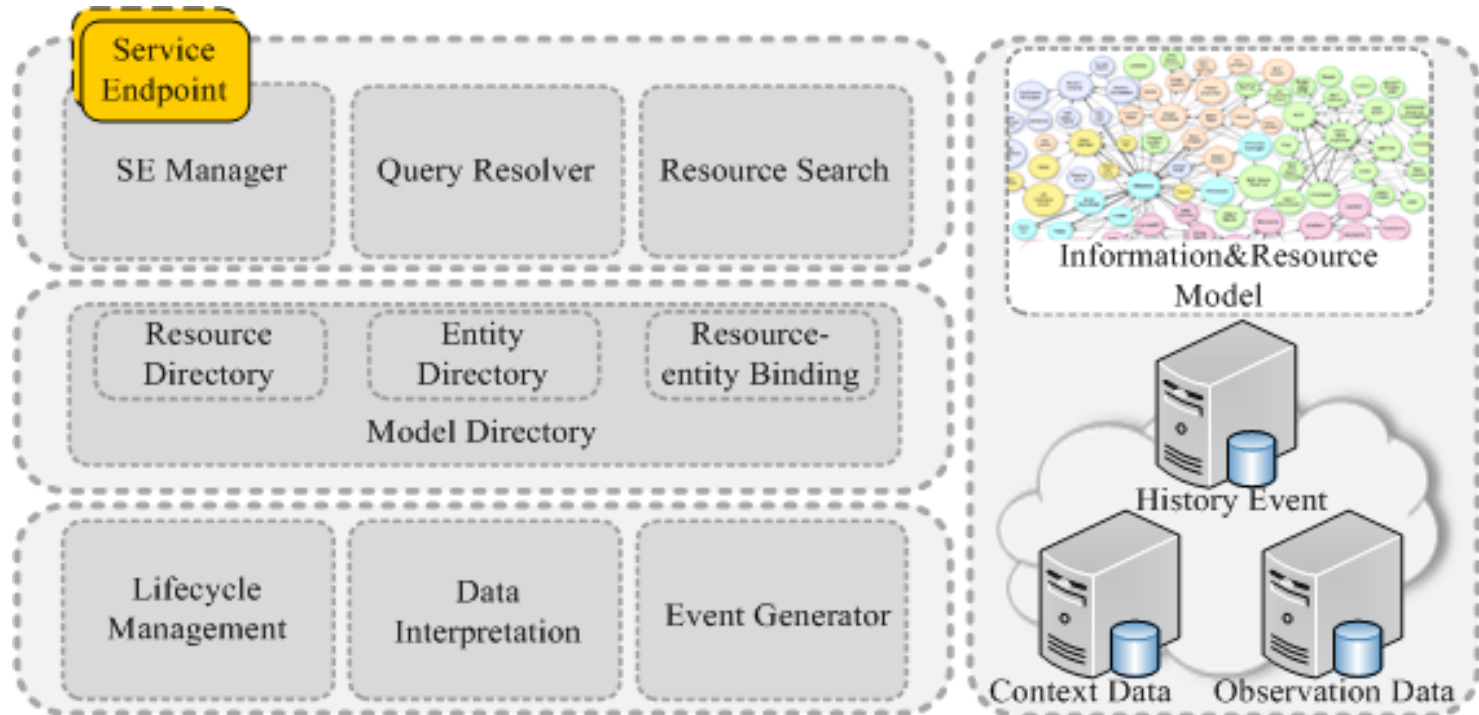


Resource Management Platform

- Expose the capabilities of resources to upper applications in the way of REST service.

- Monitor the state of resources and synchronize the information of Model Directory.
- Search required resources by Model Directory.

- Interpret the outputs of resources and generate events according to model and resource-entity binding.



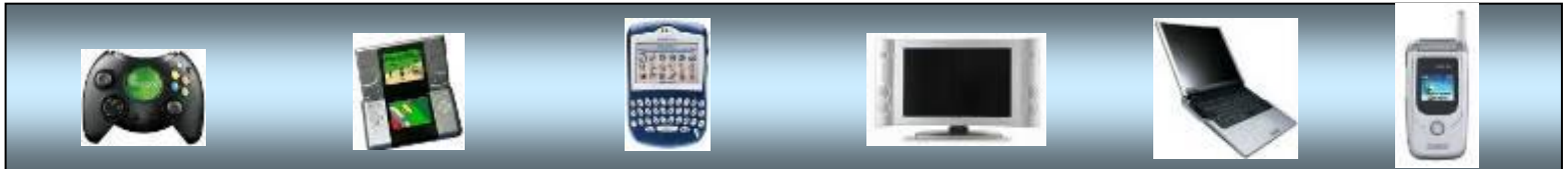


Single Process Service Development

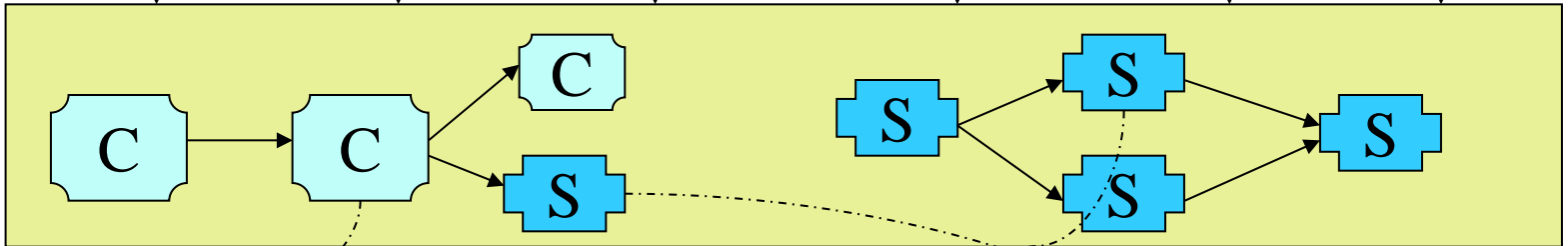


Basic Ideas of Service Development

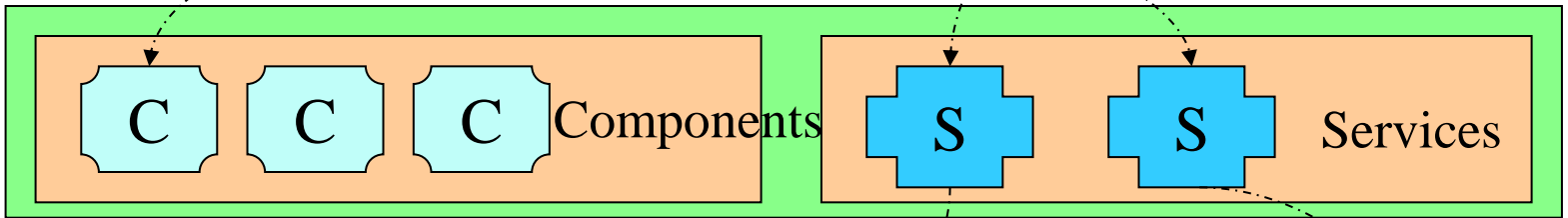
Presentation Layer



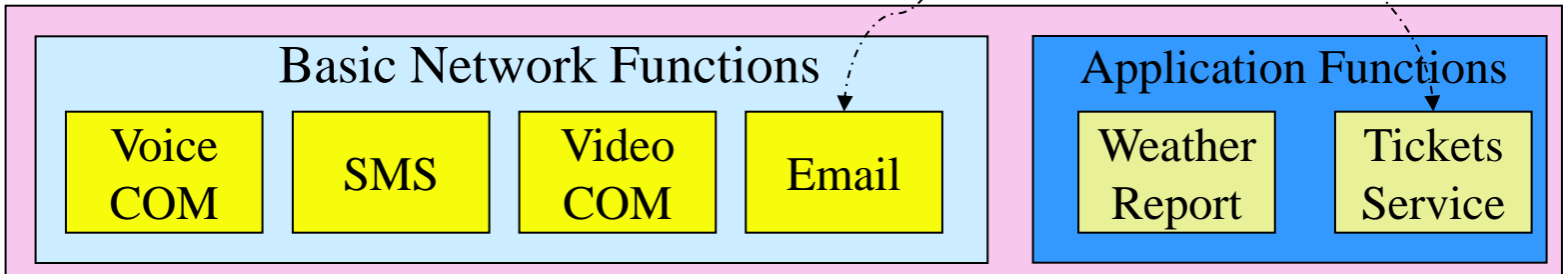
Service Composition Layer



Component s/Services layer



Resource Layer



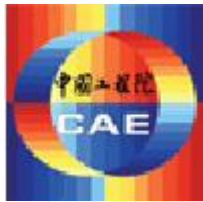


SOA Development Tools

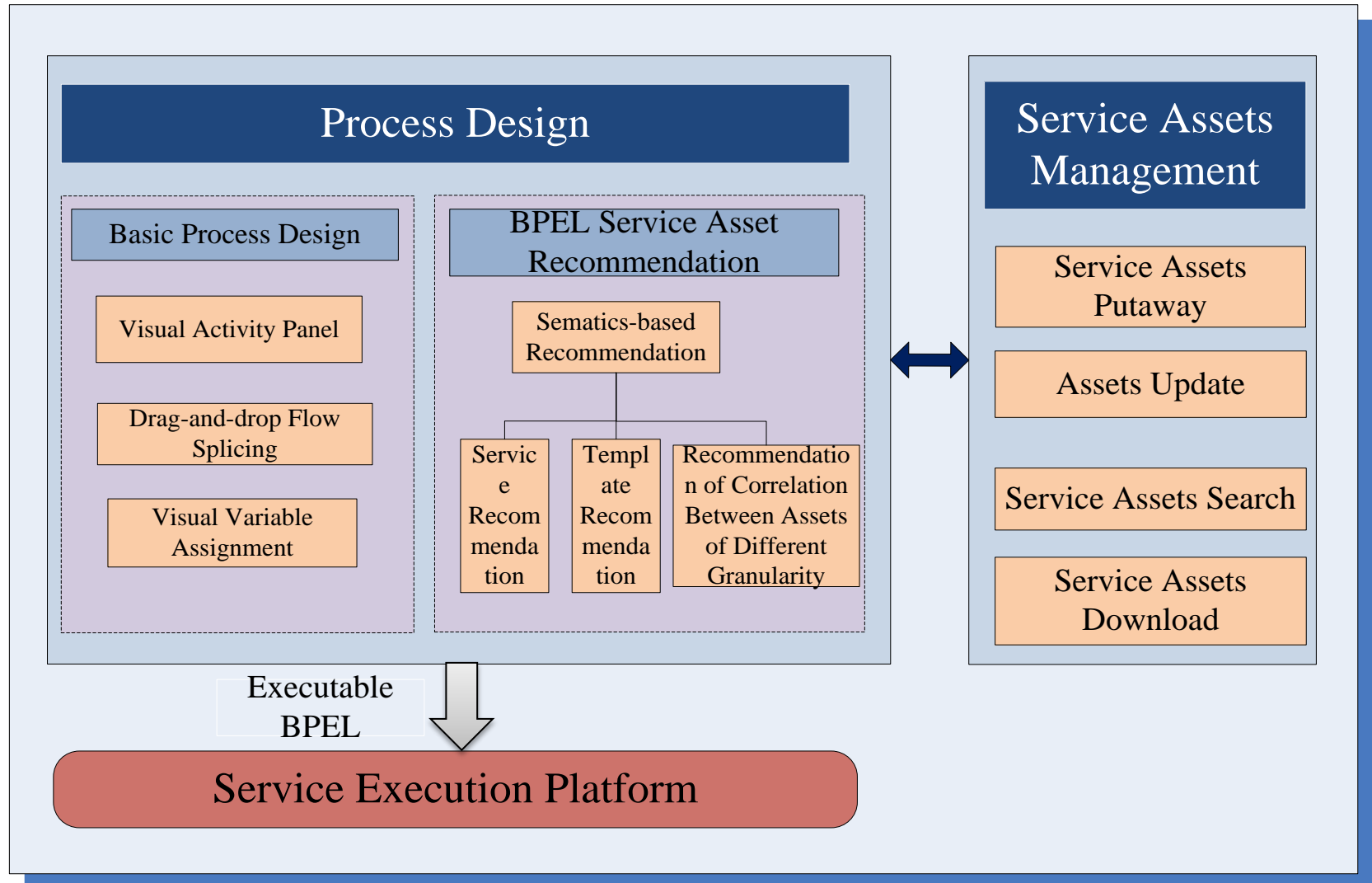
- **BPEL Based Service Development Tool**
- **JBPM Based Human Interaction Workflow Development Tool**
- **Mobile Terminal Service Development Tool**

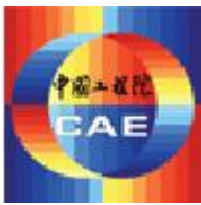


BPEL Based Service Development Tool



Function & Structure Chart of BPEL Generating Kit





Visual Web Service Development Based on BPEL

Drag-and-drop flow designer

Service Assets panel

Java - BPEL test/Main.bpel - Eclipse SDK

File Edit Navigate Search Project Run Window Help

Package Ex Hierarchy

*Main.bpel

Palette

- Selection Tool
- Marquee Tool
- Application O...
- MultiMediaConference
- Collaboration...
- Application Ontology
- Service Ontology
 - ApplyChangeCha...
 - ApplyJoin
 - ApplyQuit
 - ApplySpeak
 - AwokeUser
 - ChangeChairman
- Actions
- Control2
- Faults
- Zoom in
- Zoom out

createConf

- Partner Links
 - createConnection
 - getSupportMediaInfo
 - setUserMediaInfo
 - getUserStatus
 - getConfStatus
 - play
 - disconnectUser
 - changeChairman
 - applyQuit
 - applyChangeChairman
 - applySpeak
 - applyJoin
 - endConference
 - inviteUser
 - ChooseSpeakerPLT
 - startRecord
 - enforceEnd
 - informRecord
 - createConference
 - warnChairman
 - informChairmanPLT
 - informUserPLT
 - distract
 - endRecordPLT
 - PhoneApplyServicePLT
 - setSpecialUserMedi...
 - changeTerminal
 - continueDTMF
 - awokeUser

Design Source

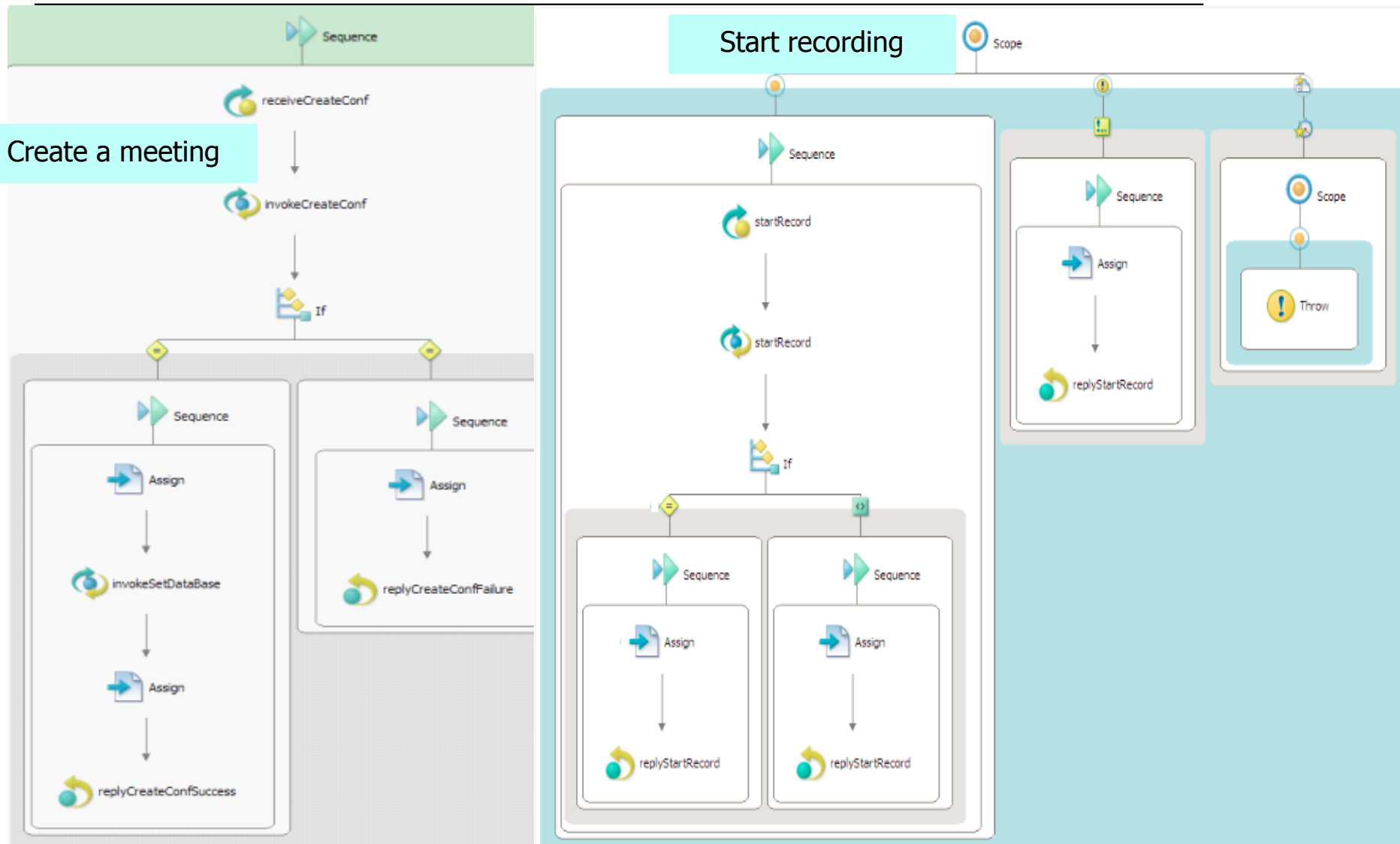
Problems Javadoc Declaration Properties

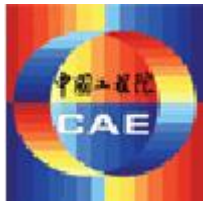
bpel:process

开始 ActiveBPEL Debug... Java - org.eclip... Java - BPEL test... Microsoft PowerP... 10:28



BPEL-based Multimedia Conference Process

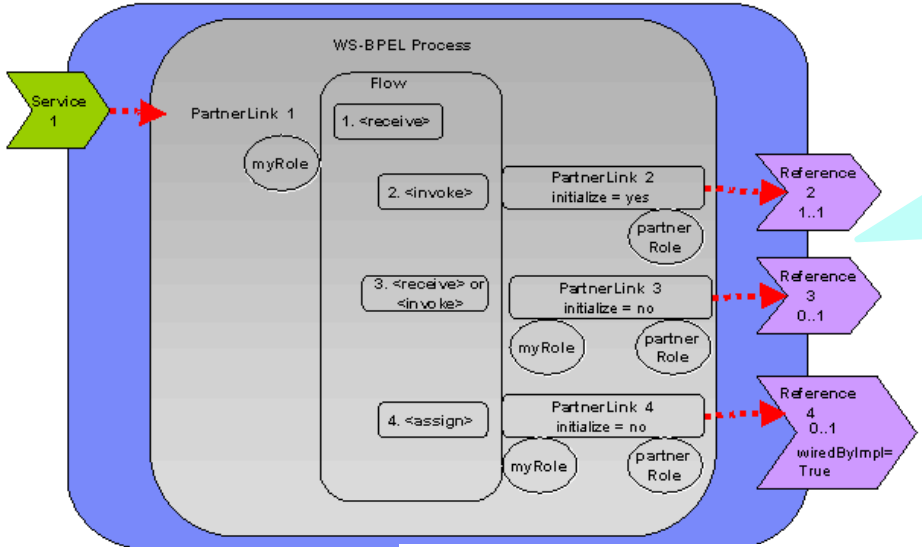




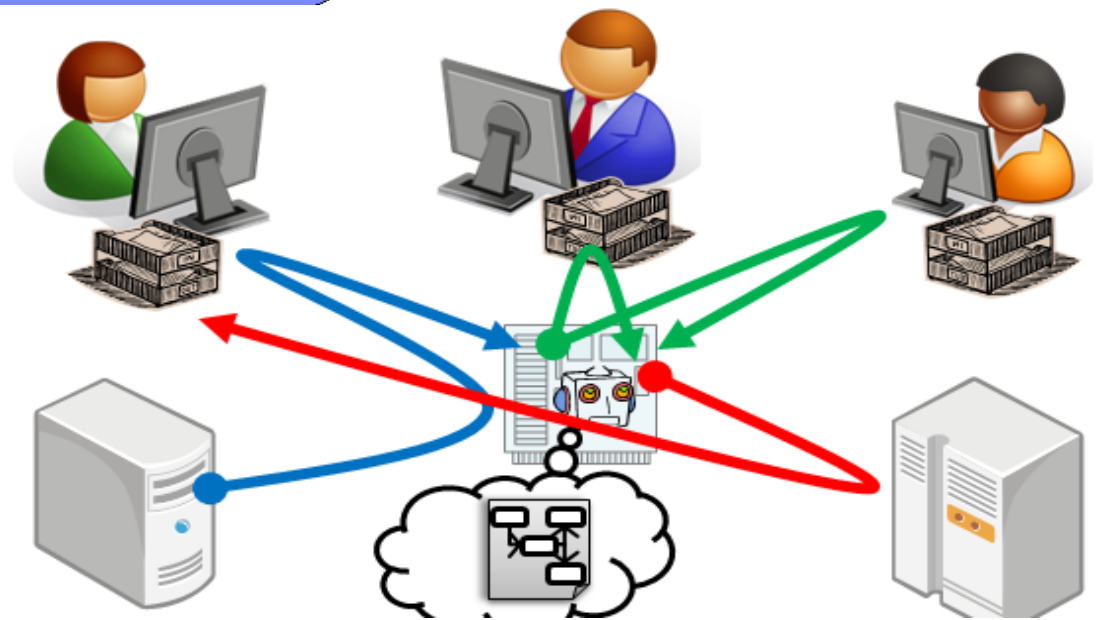
JBPM Based Human Interaction Workflow Development Tool

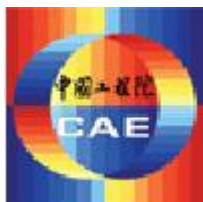


Workflow Service Development Environment Geared to Human Activities

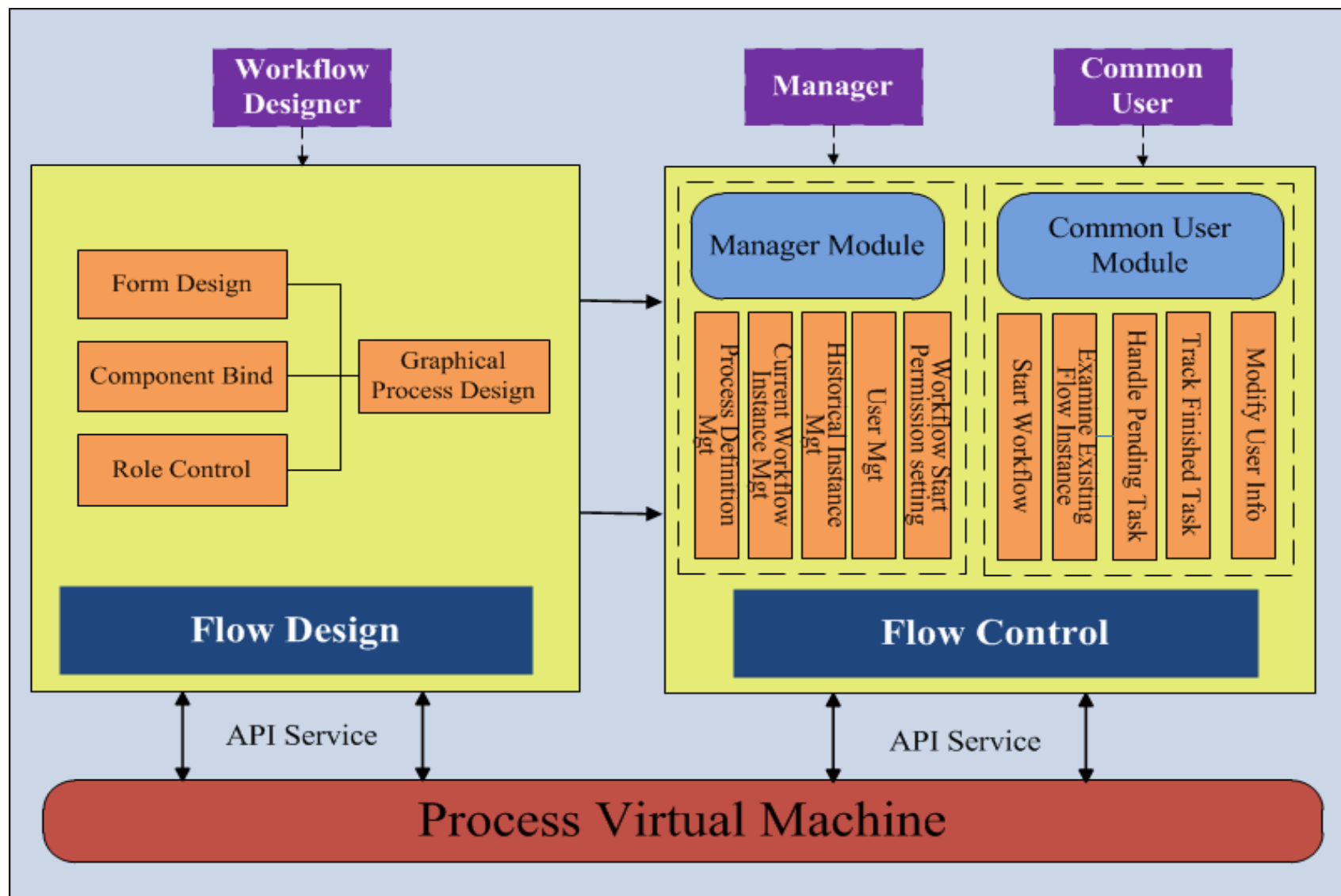


BPEL: Lack of good support of human activities. We developed the JBPM workflow tool in order to support human activity workflow in enterprise informatization.





Function & Structure Chart of BUPT Workflow





Main Interface of Workflow Development Kit

Java EE - complaintProcess/src/complaintprocess.jpdl.xml - Eclipse Platform

File Edit Navigate Search Project CreateForm Run Window Help

Visual Form designer

Visual flow designer

Organizational Structure model

The screenshot displays the Eclipse IDE interface for the Workflow Development Kit. The central workspace shows a BPMN diagram for a complaint process. The flow starts with '初始化' (Initialization) and '案件自动分类分级' (Automatic case classification and grading). It then branches into five categories: '食品' (Food), '药品' (Medicine), '医疗器械' (Medical devices), '保健食品化妆品' (Food and cosmetics), and '保健食品化妆品投诉' (Complaints on food and cosmetics). These lead to '食品投诉' (Food complaint), '药品投诉' (Medicine complaint), '医疗器械投诉' (Medical device complaint), and '保健食品化妆品投诉' (Complaint on food and cosmetics). All these paths converge at a decision node '是' (Yes/No). If '是', it goes to '上报通报' (Report and announce); if '否' (No), it goes to '反馈信息' (Feedback information). The process ends at a final state.

complaintProcess

Resource	Property	Value
complaintProcess	Info	
	derived	false
	editable	true
	last modified	2011年9月13日 上午10:06:07
	linked	false
	location	D:\puyuan_workspace\runtime-New_configuration(1)\complaintProcess
	name	complaintProcess



Workflow Service Runtime System

Workflow implementation and execution

BUPT BPM 北邮 workflow 管理系统

任务

帮助 | 设置 | 论坛 | 注销

功能菜单

- 待办任务
- 回退任务
- 已处理任务
- 已委派任务
- 发起流程

欢迎使用 | 已处理任务 | 待办任务 | 执法人员处理

处理结果表

姓名:	yx1	联系电话:	154613212
邮箱:	bupt1st@bupt.edu.cn	家庭地址:	bupt506
投诉类型:	<input type="radio"/> 食品 <input type="radio"/> 药品 <input checked="" type="radio"/> 医疗器械 <input type="radio"/> 保健食品化妆品		
投诉主题:	医疗器械投诉		
投诉内容:	<div style="border: 1px solid #ccc; padding: 5px;"> 医疗器械投诉内容 </div>		
抽验结果分析:	<div style="border: 1px solid #ccc; padding: 5px;"> 无抽验 </div>		
涉案金额:	<input type="text"/>	是否上报通报:	<input type="radio"/> 否 <input type="radio"/> 是

Task processing

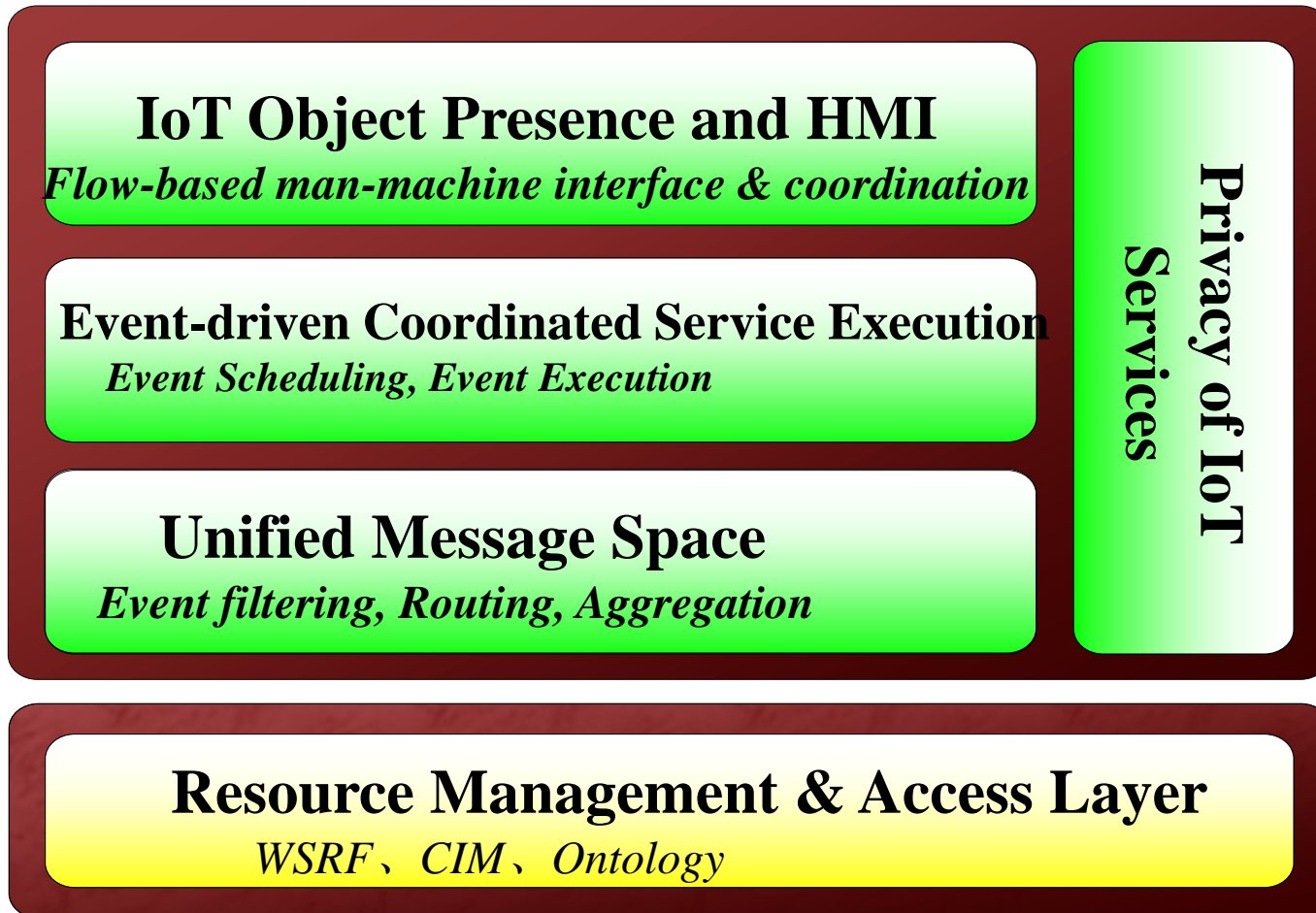
View history



Service Execution Platform

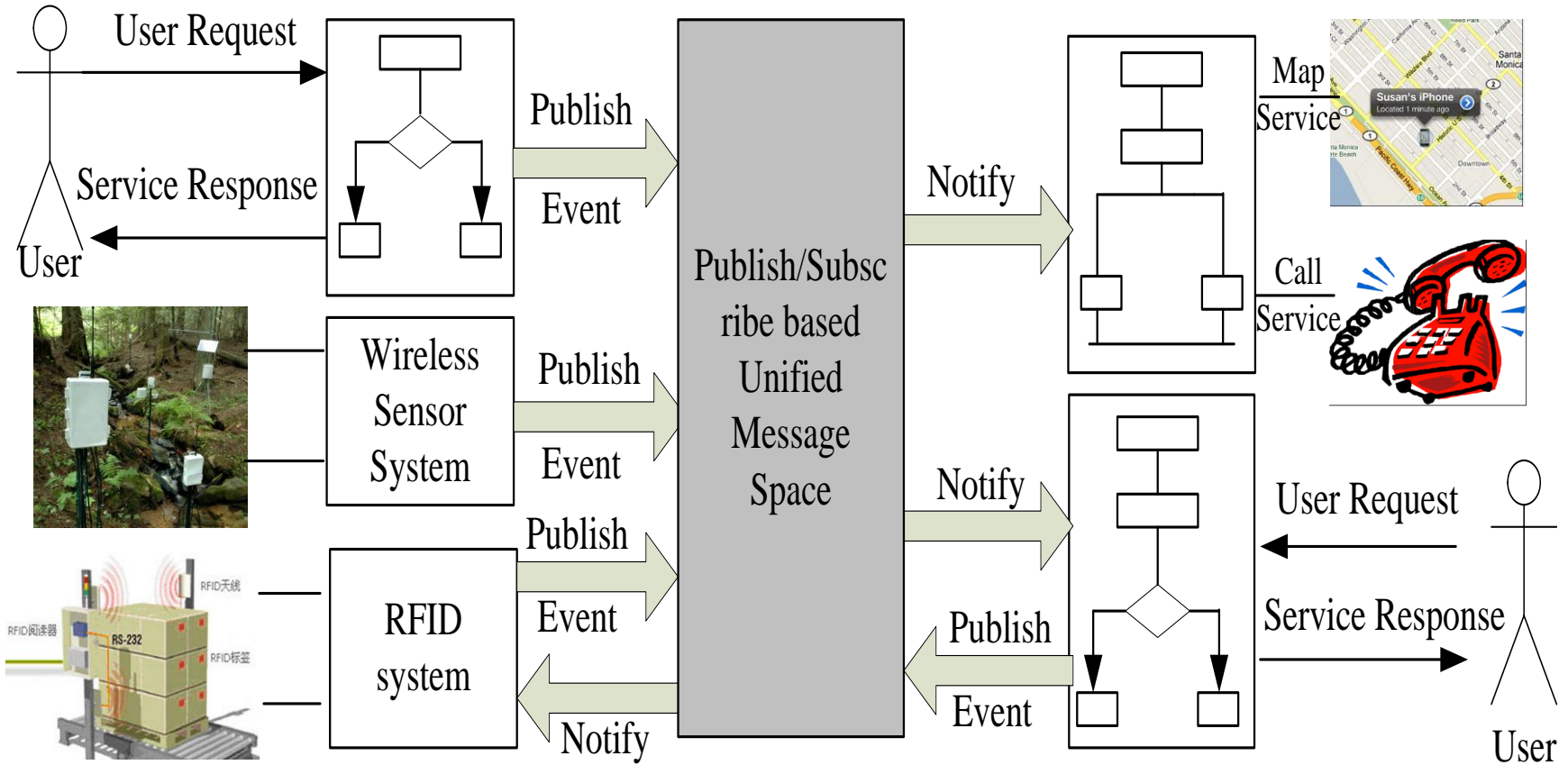


Overall Structure of IoT-oriented Intelligent Service Execution Environment





Unified Message Space

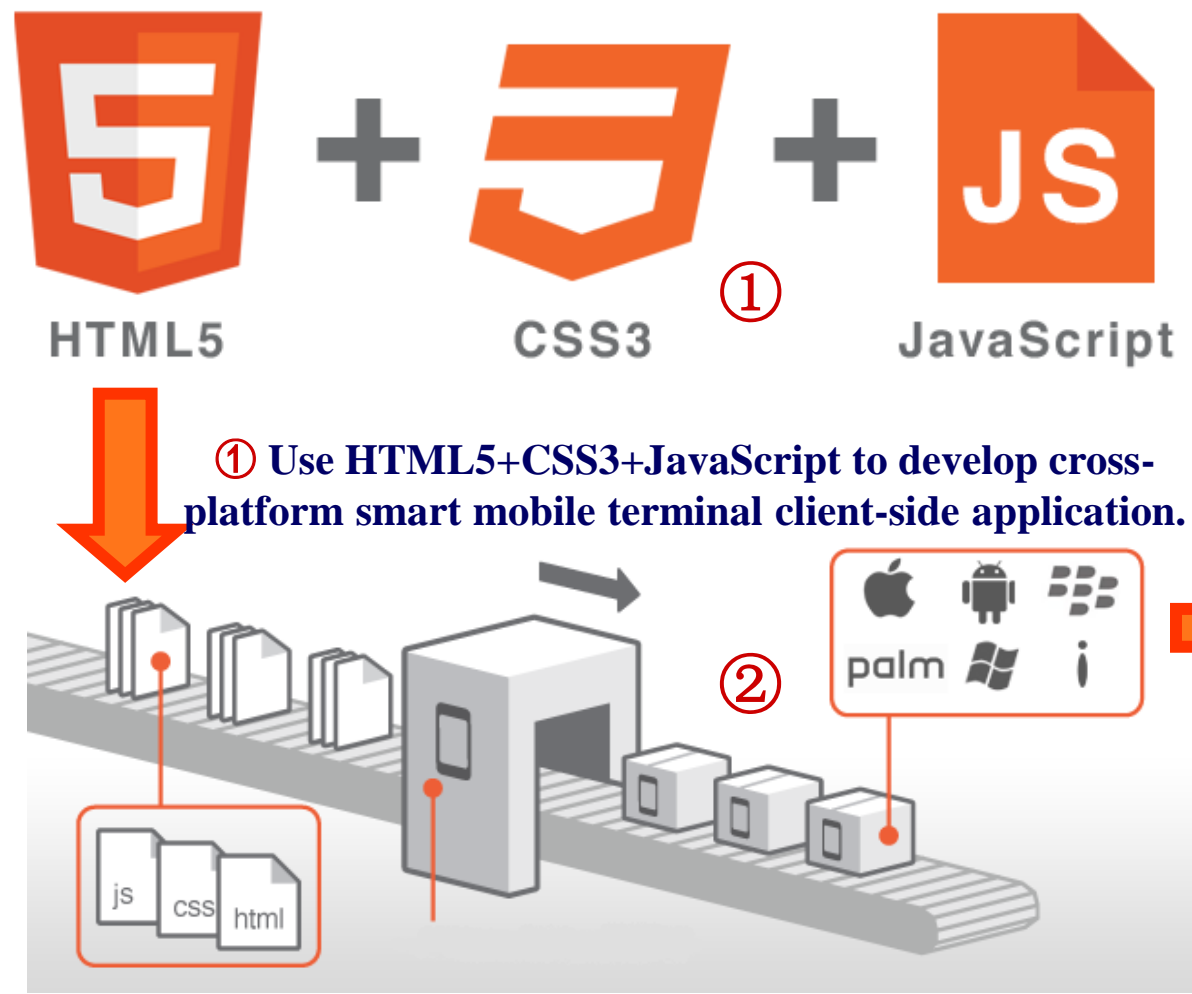




Mobile Terminal Service Development Tool



Principle of Smart Terminal Application Development Platform



Widget A.

Widget B.

SYMBOL	BID	ASK	HIGH	LOW	CHG
EUR/USD	1.3465	1.3468	1.3468	1.3465	
GBP/USD	1.9966	1.9991	1.9991	1.9966	
USD/JPY	123.82	123.85	123.85	123.82	
USD/CHF	1.2292	1.2296	1.2296	1.2292	
USD/CAD	1.0689	1.0694	1.0694	1.0689	
HKD/USD	0.8467	0.8471	0.8471	0.8467	

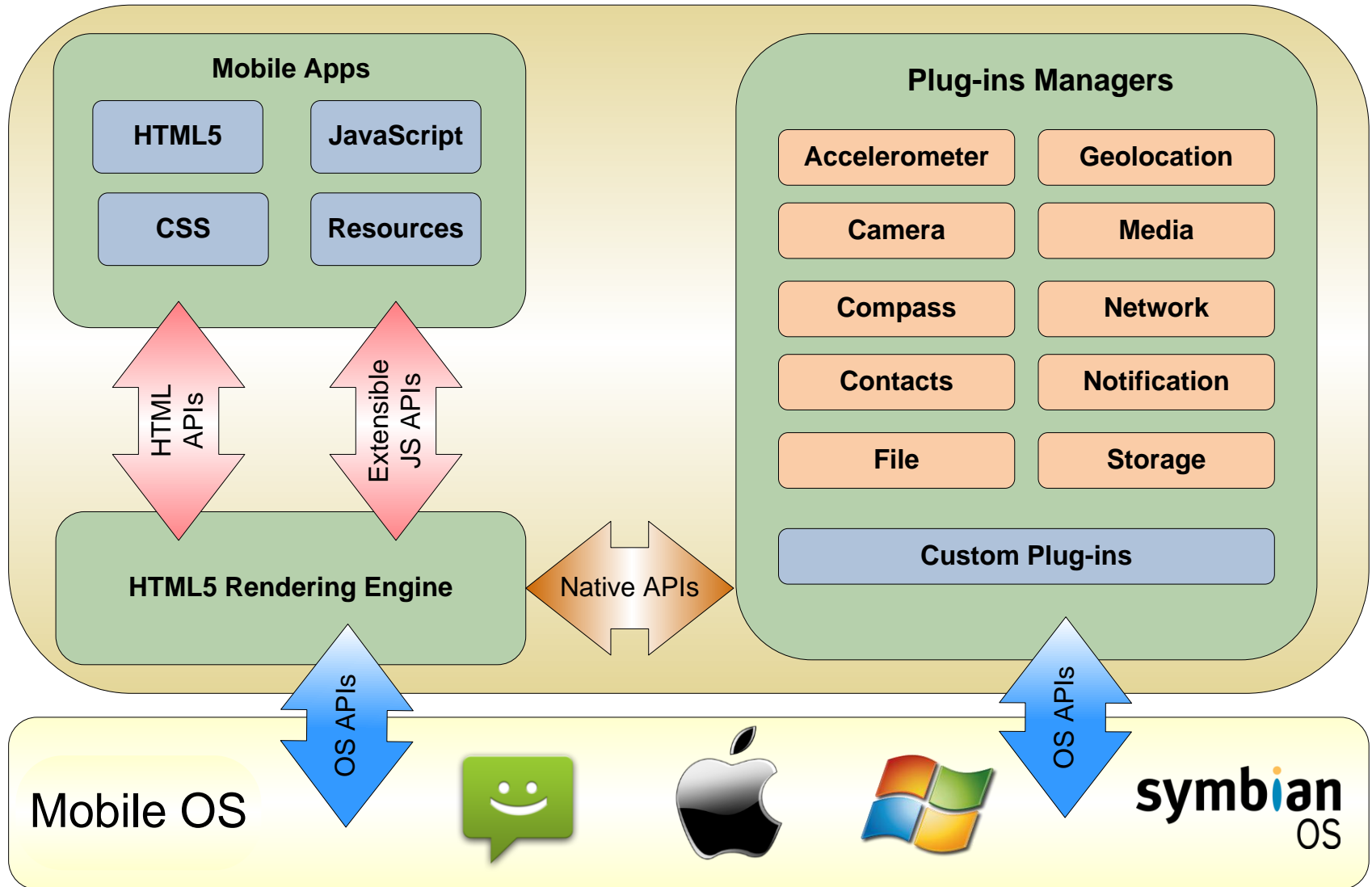
③

② Generate different installation package for different mobile operating system.

③ Multi-deployment with one development process.



Internal Structure of Smart Terminal Application Development Platform





Integrated Environment of Smart Terminal Application Development Platform

The screenshot shows the Mashup Designer IDE interface. The top toolbar contains various icons for file operations and development tools. The central area features a mobile simulator displaying a task management application with a blue header and a list of tasks. To the right, a coding editor shows the HTML and JavaScript code for the application. On the far right, a property setup panel allows for configuring the selected widget. On the left, a widget navigator lists available components like Dojo Containers and HTML. At the bottom left, a project management pane shows the file structure of the current project.



Mainstream Smartphone Operating System Supported



■ Our platform supports:

Android **iOS** **WinPhone7**



Deployed Applications



Application1: Information Monitoring Service for District Heating System



Boiler Monitoring System



Heat Exchanger



Video System



Room Temperature Monitoring



Heat Metering System



Billing System



Data Analysis System



Maintenance System

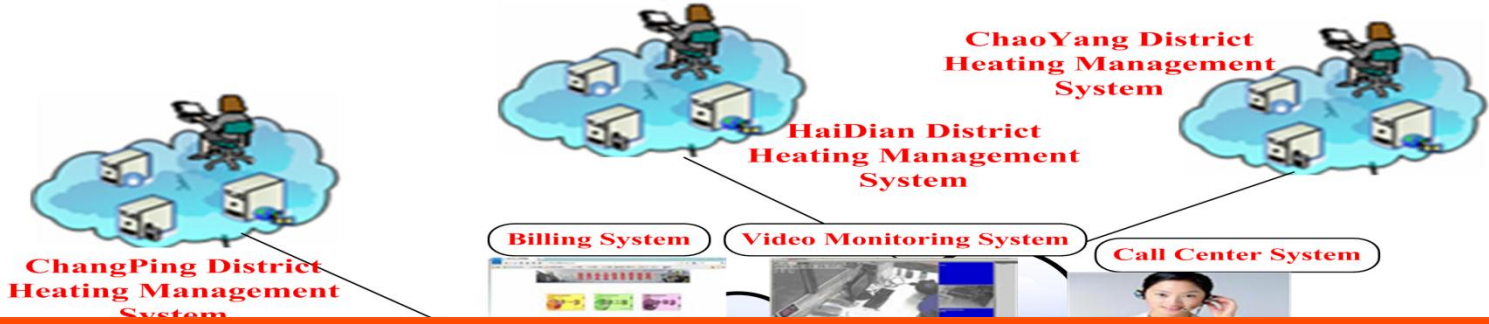


Call Center

a complex service system based on multiple cross-domain, heterogeneous systems

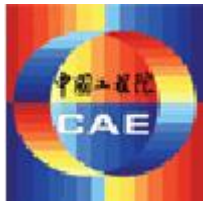


System Deployment Scale and Architecture

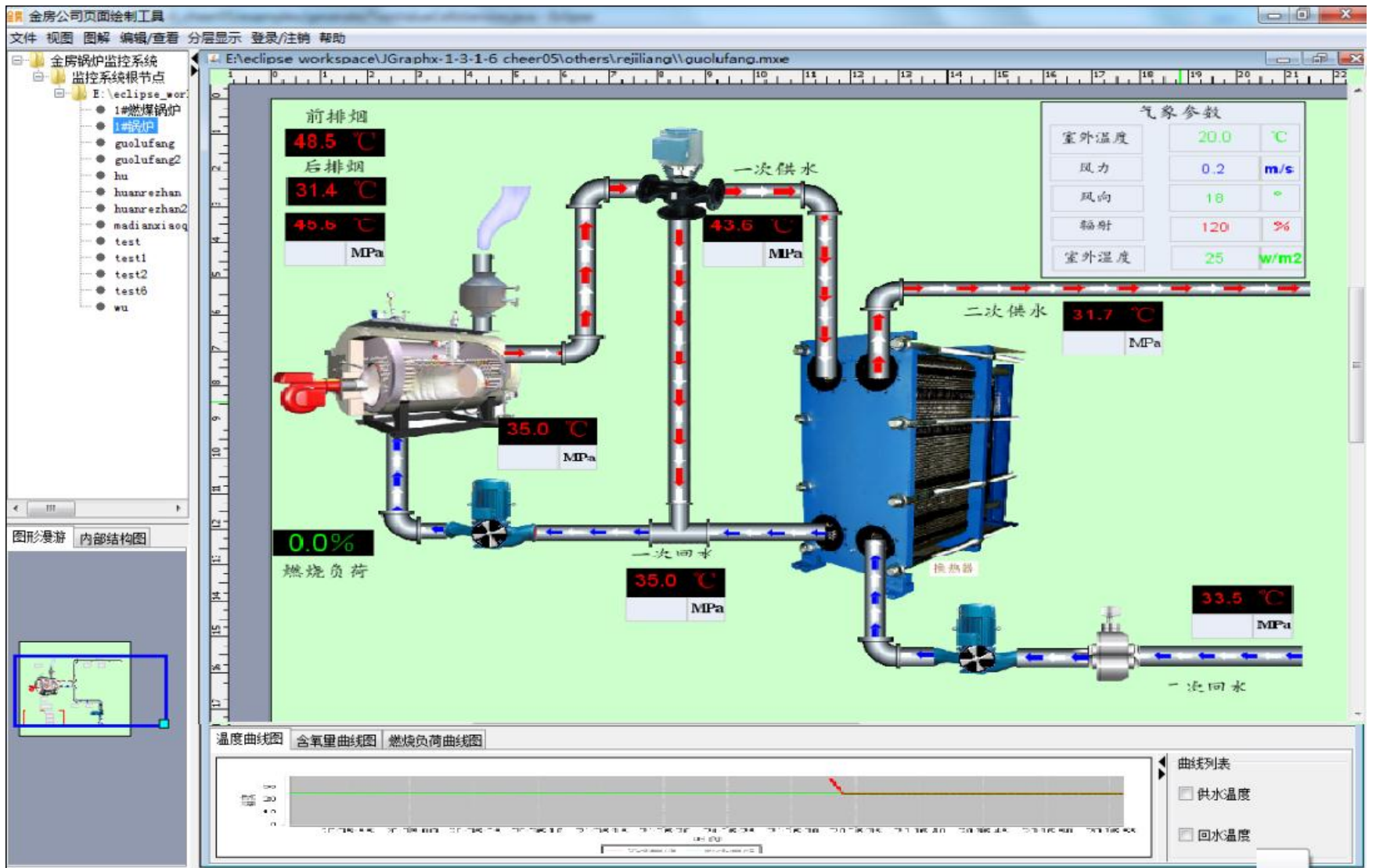


The Deployment Scale
 120 District heating neighborhoods in Beijing, including
 400 remote monitoring boiler rooms and heat exchanger,
 150,000 heat metering users.





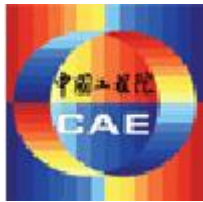
Information Monitoring Service for District Heating System-Gas Boiler Room





Application2: E-Mine Mobile Information System of Jining, Shandong





System Main Interfaces and Remote Video Monitoring

济三煤矿

System icons: Home, Signal, Volume, Mute, OK



安全生产



生产日报



重点工程



人员定位



视频监控



安全隐患



系统设置



帮助说明

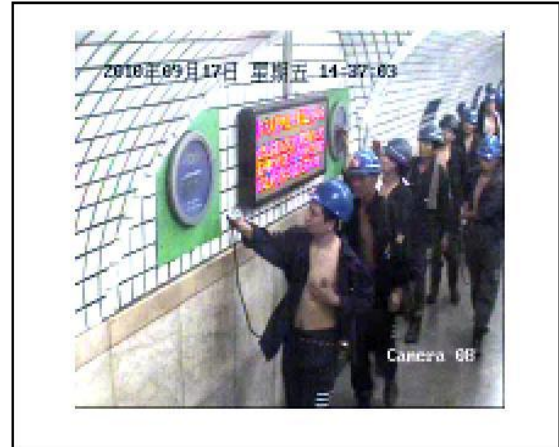


关于

F4 返回

视频监控

System icons: Home, Signal, Volume, Mute, OK



播放

开启云台控制 返回

Downhole video in real time

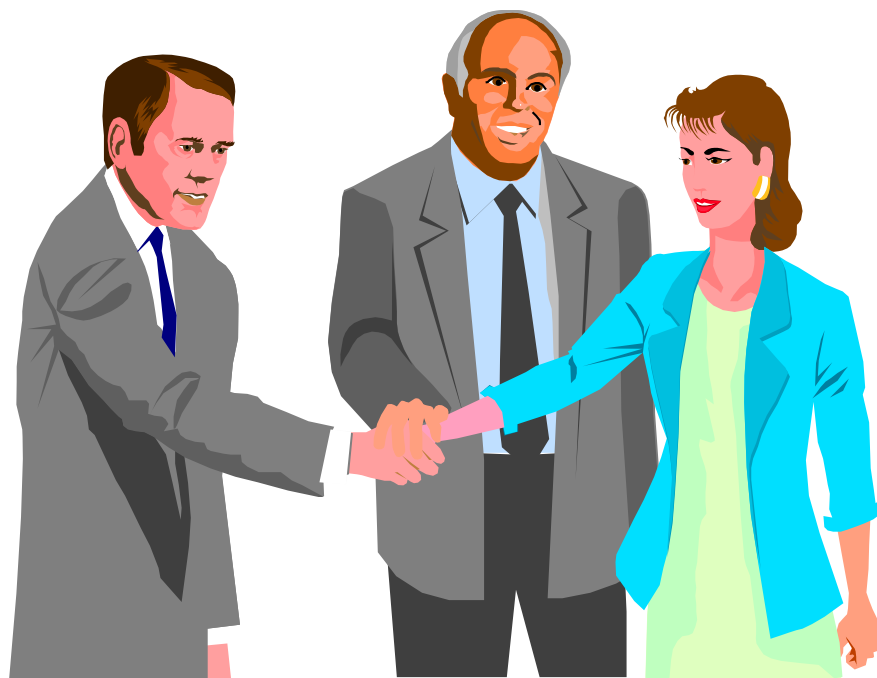
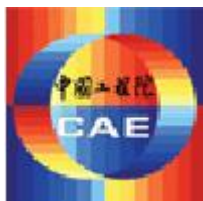
视频监控

System icons: Home, Signal, Volume, Mute, OK

- 停止云台控制
- 还原
- 上仰
- 下俯
- 左转
- 右转
- 焦距变大
- 焦距变小
- 预置点操作

关闭

Cell phone video control



Thanks! Look Forward to Cooperation!