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OSGi Service Platform for the Development of the Mobile and Embedded Applications

Pavlin Dobrev
Research and Development Manager

Agenda

- OSGi Overview
- OSGi R4 Extensions
- OSGi Products
- Resources
- Examples

Driving Market Challenges

Device evolution
- Extended connectivity
- Shorter life cycles
- Higher complexity
- Dynamic deployment

Development
- Shorter development cycles
- Scalable platforms
- Aftermarket device access
- Feature complexity

Service Provider
- New services and apps
- Content provider
- User portals
- CRM, Billing

Infrastructure
- Telecommunication
- Administration
- Deployment

OSGi Overview
Mission

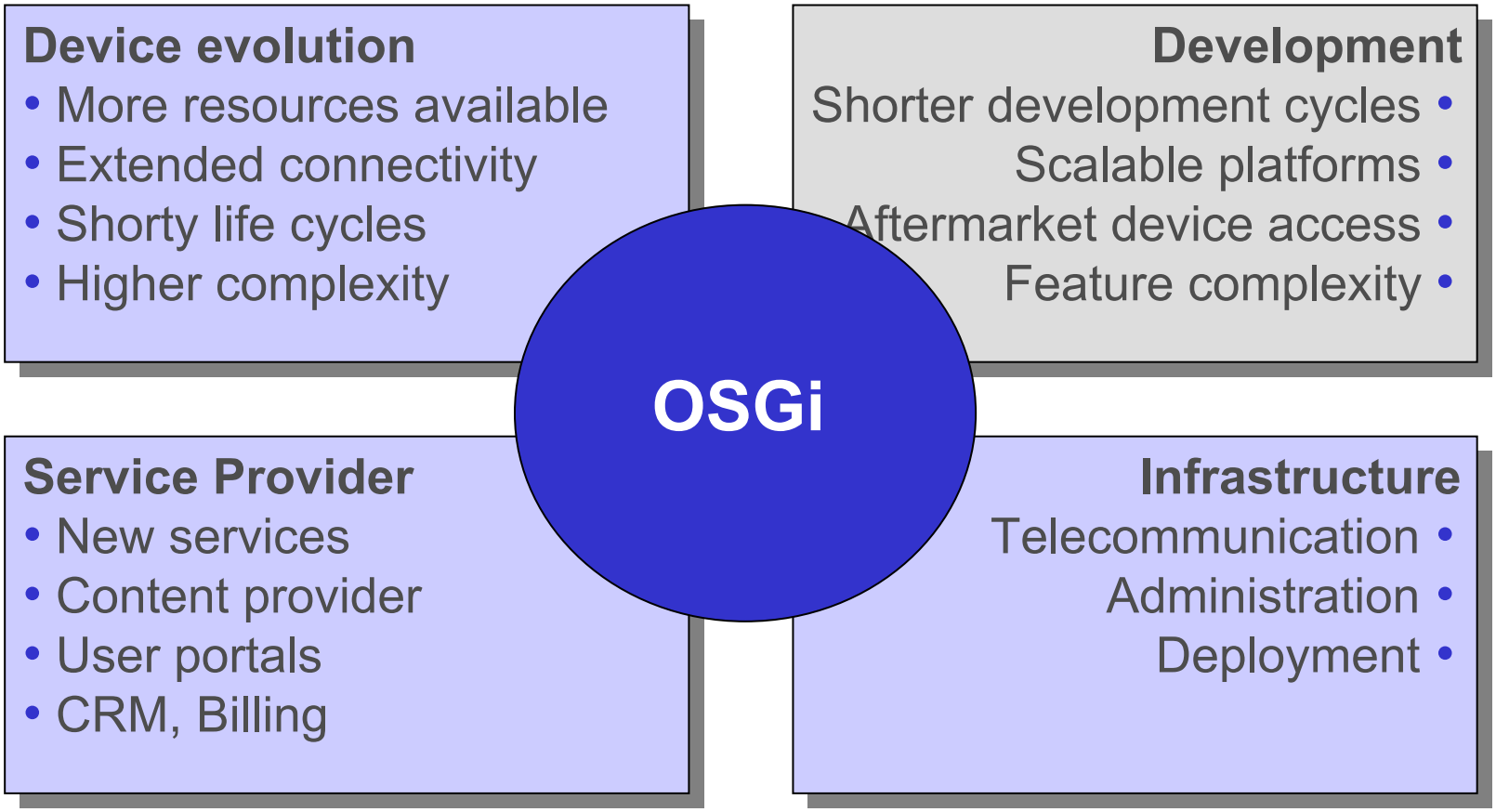
OSGi – The Mission

"Our mission is to specify, create, advance, and promote an open service platform for the delivery and management of multiple applications and services to all types of networked devices in home, vehicle, mobile and other environments".

„The OSGi Alliance serves as the focal point for a collaborative ecosystem of service provider, technology, industrial, consumer and automotive electronics communities".

Source: OSGi Homepage

OSGi – The Mission



OSGi – The Mission

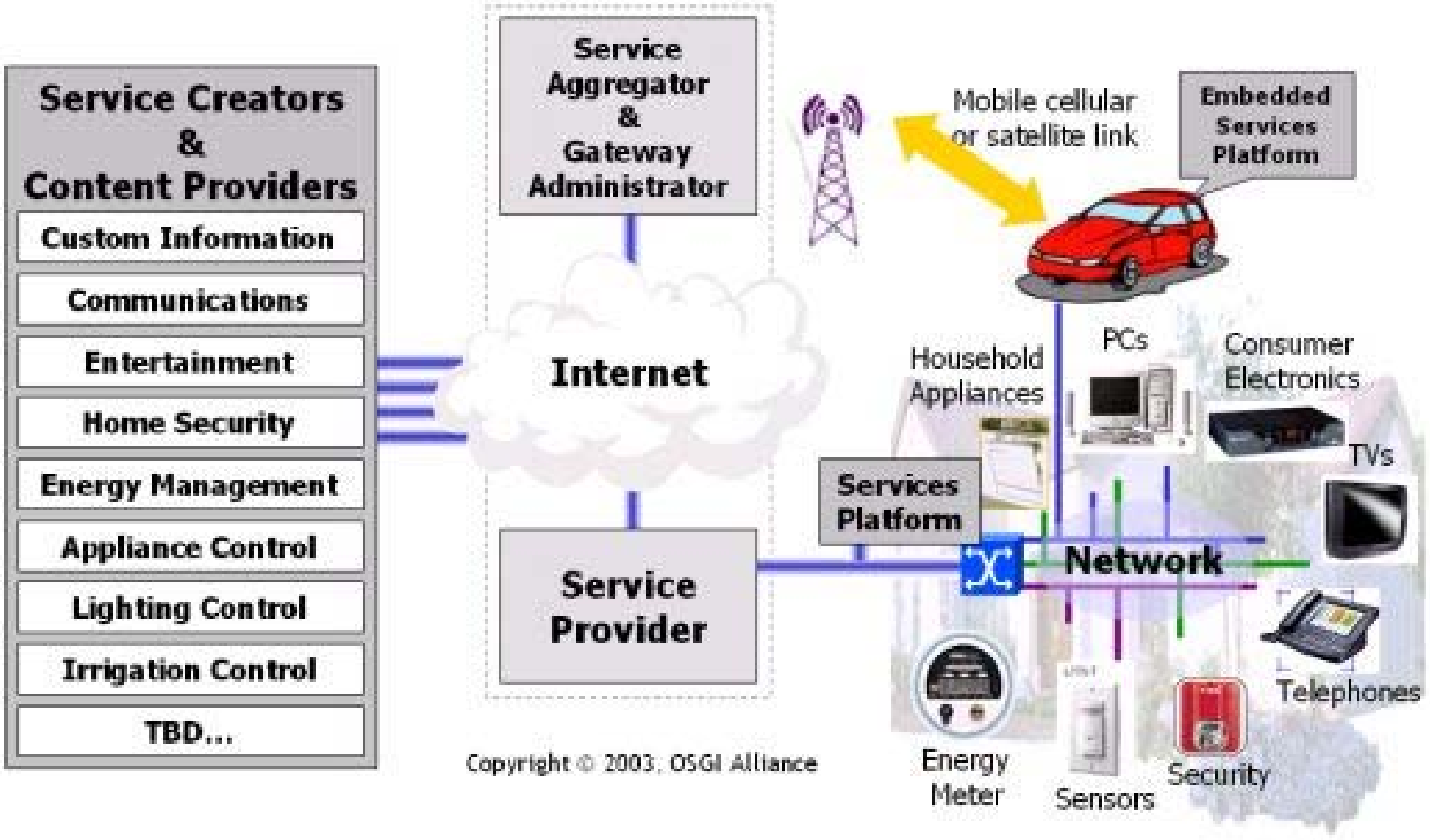


Image Source: OSGi Homepage

OSGi Overview
Alliance

History of the OSGi Alliance

- ➔The OSGi Alliance is an open organization
  - Established in 1999, currently 44+ members
  - Membership spans many industries
  - Voting members treated equally
  - Membership information available at www.osgi.org
- ➔Companies start work on Java Embedded Server in 1998
- ➔Open Services Gateway Initiative launched in March 1999
- ➔First Member Meeting: London – May 1999
- ➔Specification Releases:
  - R1 – May 2000 (JES Framework)
  - R2 – October 2001 (Gateway Management)
  - R3 – March 2003 (Automotive)
  - **R4 - October 2005 (Core + Mobile + Vehicle)**

OSGi Members

Alpine Electronics Europe Gmbh
AMI-C
Aplix Corporation
Atinav Inc. *
Belgacom
BMW Group
Cablevision Systems
Computer Associates
Deutsche Telekom AG
Echelon Corporation
Electricité de France (EDF)
Ericsson Mobile Platforms AB
Esmertec
Espial Group, Inc. *
ETRI Electronics and Telecommunications Research Institute
France Telecom
Fraunhofer Inst. for Integrated Circuits IIS *
Gatespace Telematics AB *
Gemplus
IBM Corporation
Insignia Solutions *
Intel Corporation
KDDI R&D Laboratories, Inc.
KT Corporation
Mitsubishi Electric Corporation
Motorola, Inc.
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Nokia Corporation
NTT
Oracle Corporation
Panasonic Technologies, Inc.
Philips Consumer Electronics
ProSyst Software GmbH
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OSGi Members

Samsung Electronics Co., Ltd.
SavaJe Technologies, Inc. *
Sharp Corporation
Siemens AG
Sun Microsystems, Inc.
Telcordia Technologies, Inc.
Telefonica I+D
TeliaSonera
Toshiba Corporation

coming soon: Vodafone

* Contributor Level Members

Working Committees

- Marketing Working Committee
- Market Requirement Working Committee

Expert Groups

- Core Platform Expert Group
- Vehicle Expert Group
- Architecture Expert Group
- Mobile Expert Group

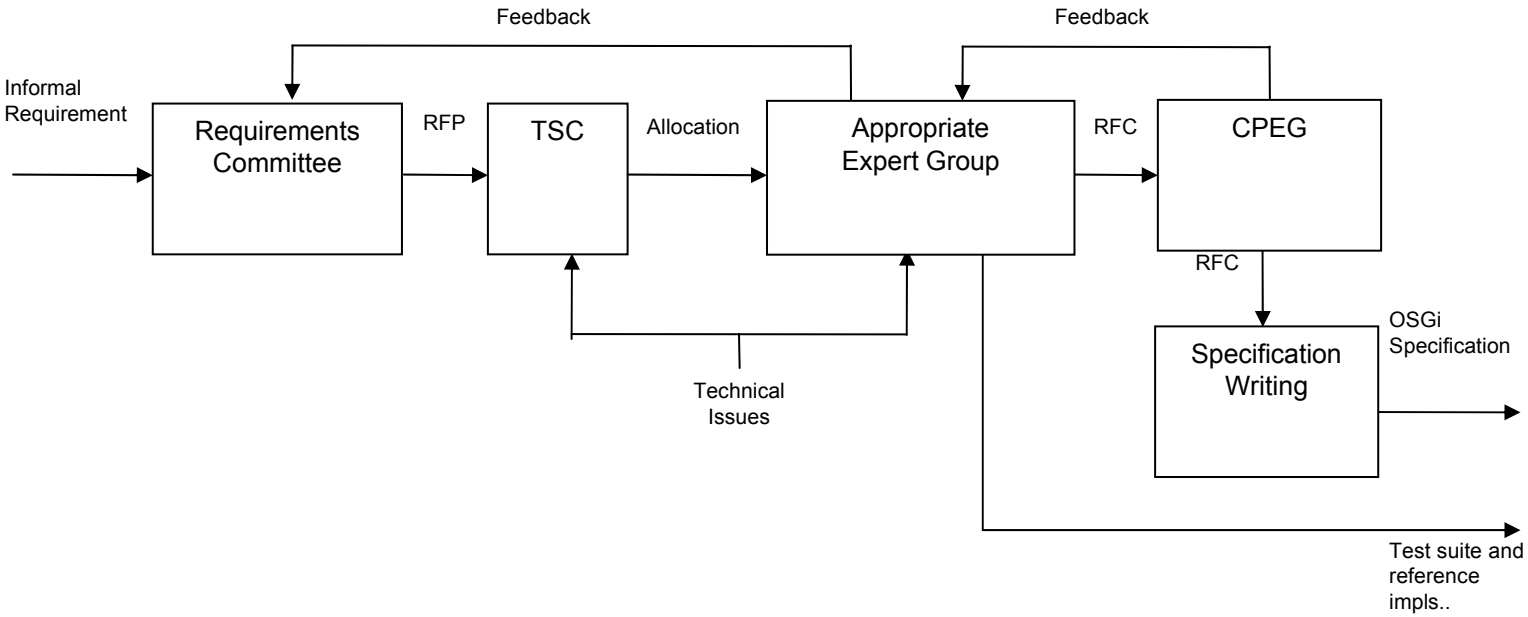
OSGi Markets: All !!

- Automotive
- Smart Home
- Mobile Phones
- Facility Management
- Consumer Electronics
- Health Care
- Industry Automation
- .....

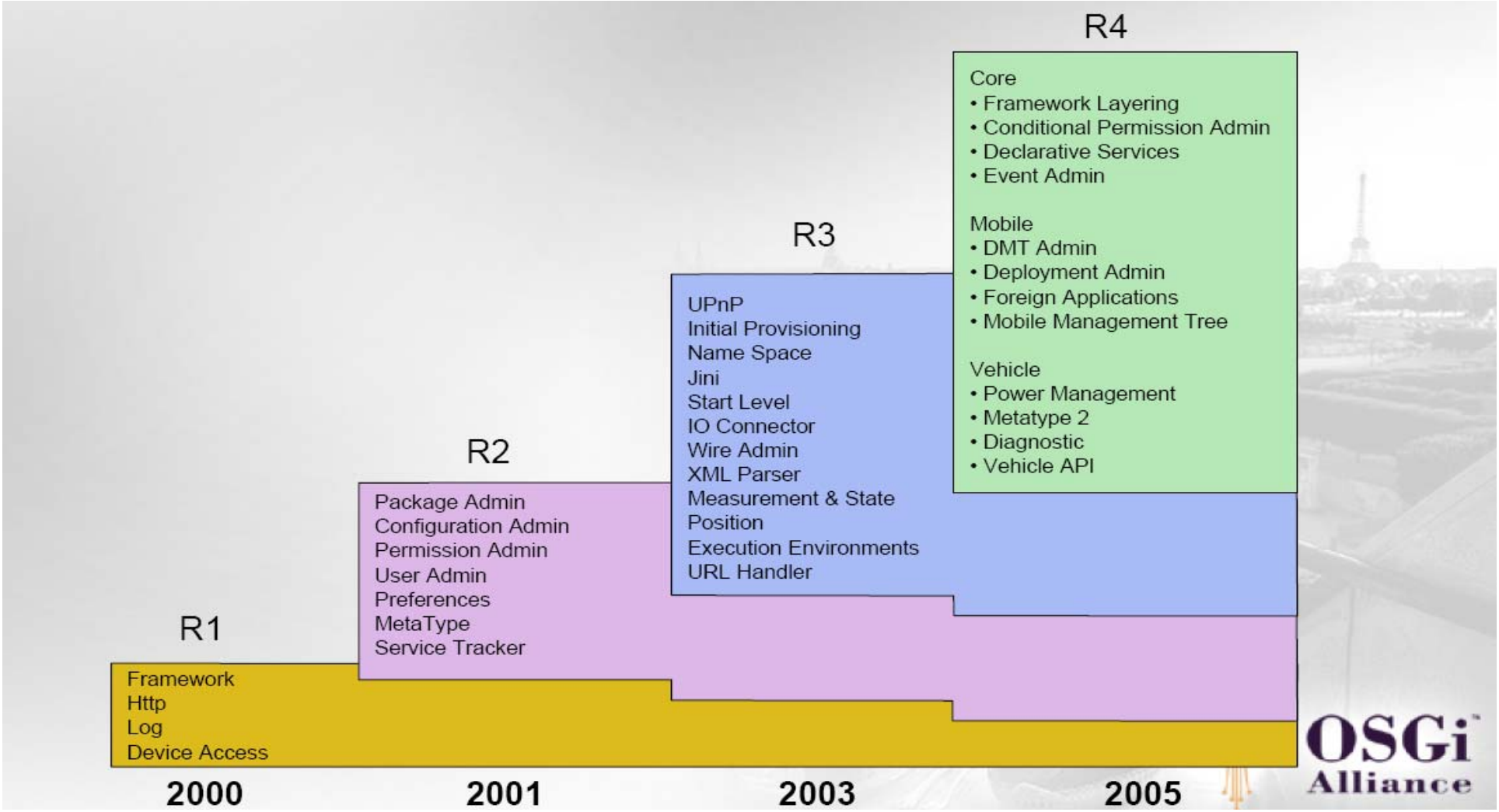
Vertical market positioning reflected in with R4

Strong horizontal positioning

OSGi Alliance Technical Process



OSGi Roadmap



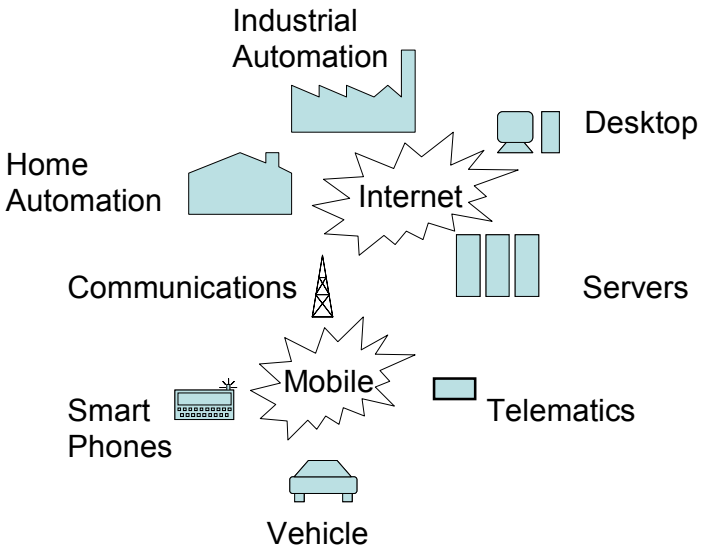
Soon to be released for R4

- OSGi Service Platform, Mobile Specification Submitted to JCP for adoption as JSR-232 “Mobile Operational Management”
  - Jon Bostrom, Nokia, and Venkat Amirisetty, Motorola, are co-specification leads for JSR-232.
  - Early Draft Review started 7 October 2005
  - Target Release Date: 1Q2006
- OSGi Service Platform, Vehicle Specification
  - Hans-Ulrich Michel, BMW, and Olivier Pave, Siemens AG, are co-chairs of the Vehicle Expert Group
  - Liaison with ERTICO Global System Telematics (GST) Project
  - Target Release Date: 2Q2006

OSGi Overview
Market situation

Target Markets

- **Mobile Devices**
  - 180M handsets/ year
  - Starting in 2005, first OSGi – enabled handsets will be shipped
  - Most interesting market due to size and short life cycle
- **Automotive Infotainment/ Telematics**
  - 60M cars/ year
  - OSGi already selected by BMW, Ford, GM, VW, Renault, Hyundai
  - Commercial applications shipping 2 years to mass deployment
- **Home Networking**
  - 190M white goods, 40M DSL Modem/ STB devices per year
  - OSGi selected by Siemens, Miele, V-Zug, Motorola, Philips, Samsung, …
  - Various products shipping, long lifecycles



Is OSGi accepted from the market?

Telematics

yes deployed in BMW 5series, 6series
yes deployed in various fleet management systems
yes deployed in Bombardier trains
yes to be deployed in upcoming series cars

Residential

yes deployed in Shell/Motorola Home Genie package
yes deployed in various White Goods applications
yes deployed in Philips remote controller iPronto

Is OSGi accepted from the market?

Other markets

yes deployed in spanish ADSL router
yes deployed as facility mgmt. system at Microsoft (!)
yes deployed as airport parking lot control system
yes to be deployed in German Health Care system
yes to be deployed in various other real world setups

Mobile

yes Nokia, Motorola actively develop mobile specification

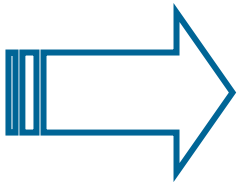
OSGi Overview
Terms and basic functions

Open Service Gateway Specification

Open Open and dynamic platform

Service Run-time environment for services and apps

Gateway Gateway for connecting local devices and networks with wide area networks



Specified by a heterogeneous standardization consortium

OSGi Actors

Service Gateway (SG)

- (Embedded) Platform hosting an OSGi framework
- Runtime environment for services and applications

Gateway Operator (GO)

- Runs and administers Service Gateways
- Deployment and supervision of services and data

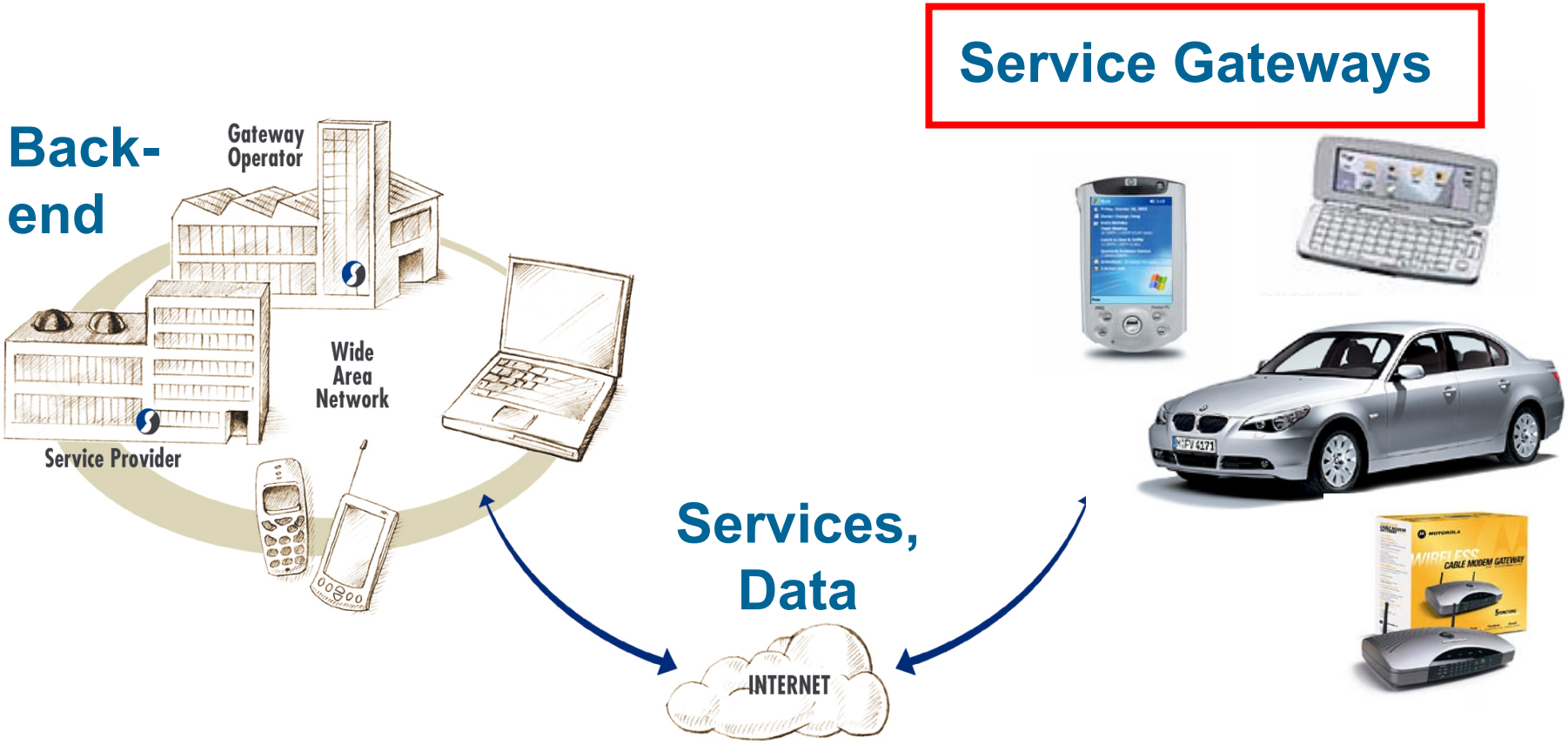
Service Provider (SP)

- Creates and provides new services to Gateway Operator
- Example: MP3 application

Content Provider (CP)

- Provides or receives data from Service Gateways (over GO)
- Example: MP3 files for MP3 service

OSGi Actors

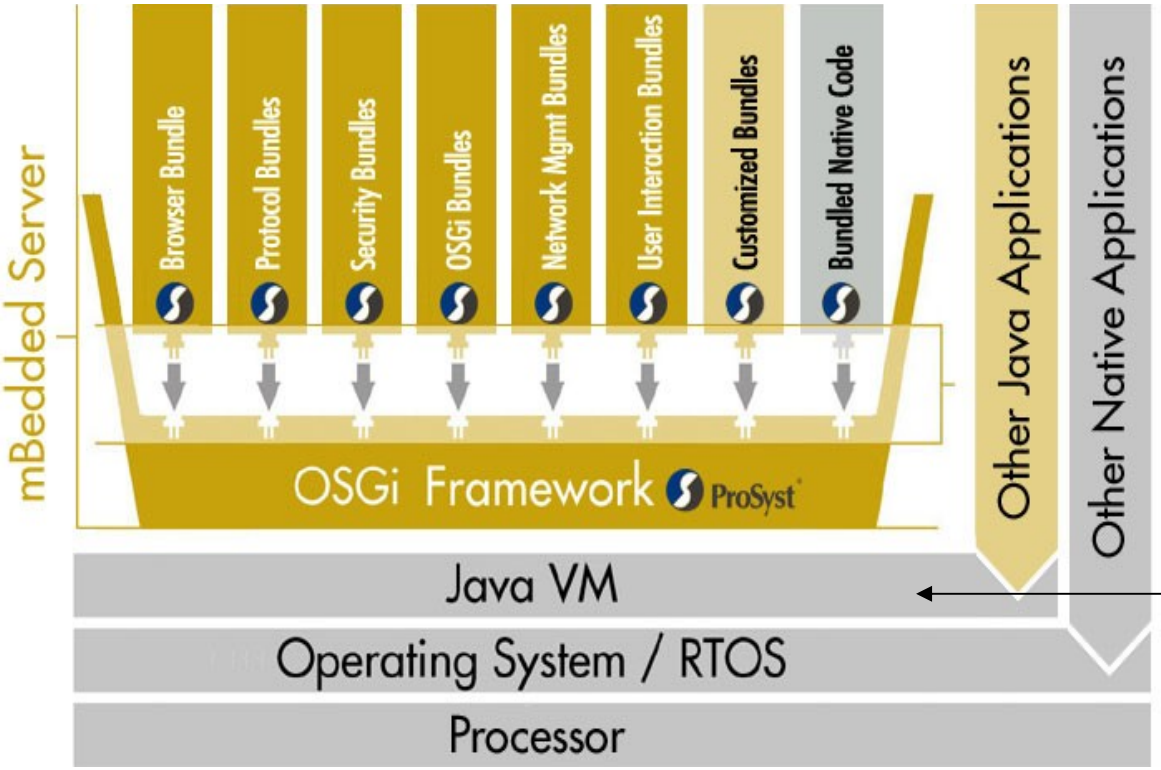

Back-end
Gateway Operator
Wide Area Network
Service Provider
Service Gateways
Services, Data
INTERNET

Service Gateway Architecture

Service Gateway = Device + OSGi Framework + Services

OSGi Framework = Mini Application Server

Service Gateway Architecture



OSGi Framework: key facts

- Java based runtime environment for services & apps
- Primarily focused on needs of embedded systems
- Dynamic nature: installation, updates, removals of services at runtime (Life Cycle Management)!
- Dynamic Service Registry
- Open for remote management and administration
- Dynamic resolving of package dependencies
- Requires J2ME CDC/FP based runtime

OSGi Overview
Bundles & Services

Bundles

Description

- Container for Services, applications and libraries
- Archive file (Java jar format)
- Dynamically loadable, resolvable and runnable by OSGi framework

Content of Bundles:

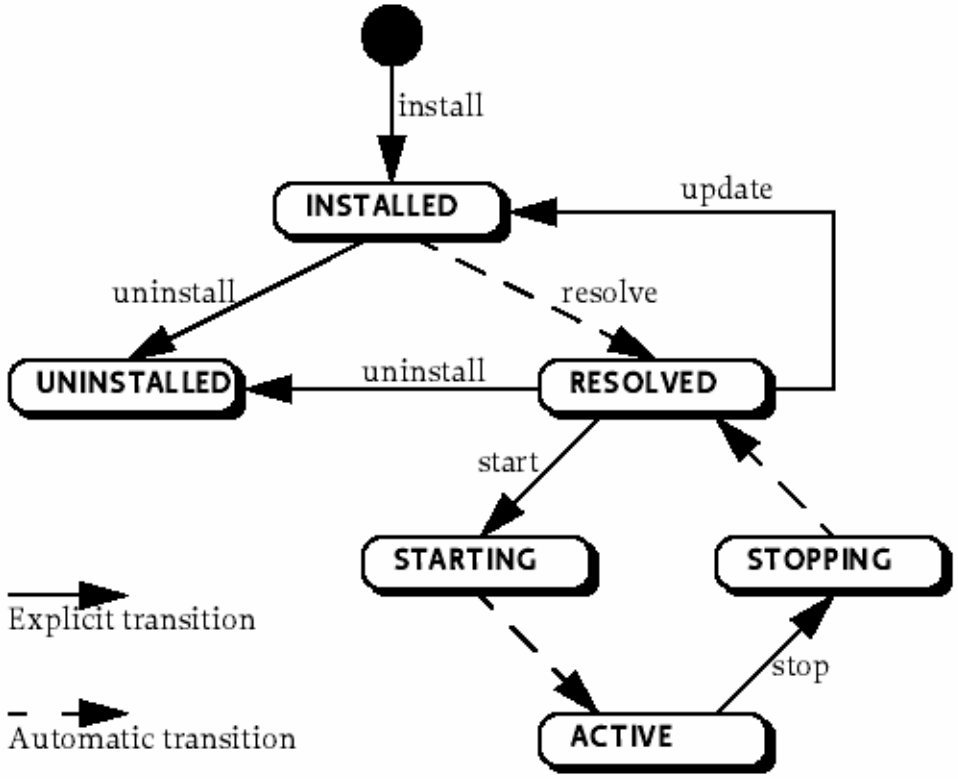
- Java Bytecode
- Native Code (eg. shared lib)
- Resouces (eg. XML files, images, language texts, etc.)
- any files possible

OSGi Bundle

- A bundle registers 0 to N services in the framework
- The fw itself is represented as the System Bundle
- Manifest file: definition of bundle interface (Import, Export, Services, Version, Activator, …)
- Interfaces between bundles: services and shared libs
- Each bundle is loaded in a separate Class Loader!
- The fw is responsible to support the bundle's life cycle (incl. resolution of dependencies).

Bundle Life Cycle

Figure 18 *State diagram Bundle*



From:
OSGi Service-Platform
Release 3, Chapter
4.8.3, Page 58

OSGi Bundle: Native Code

- A bundle can contain native libraries
- Framework checks the OS, CPU, language, etc.
- The life-cycle of the native libraries related to the life cycle of the corresponding bundle
- Java Code can access the native libraries by using JNI (Java Native Interface)

The two meanings of the word “service”

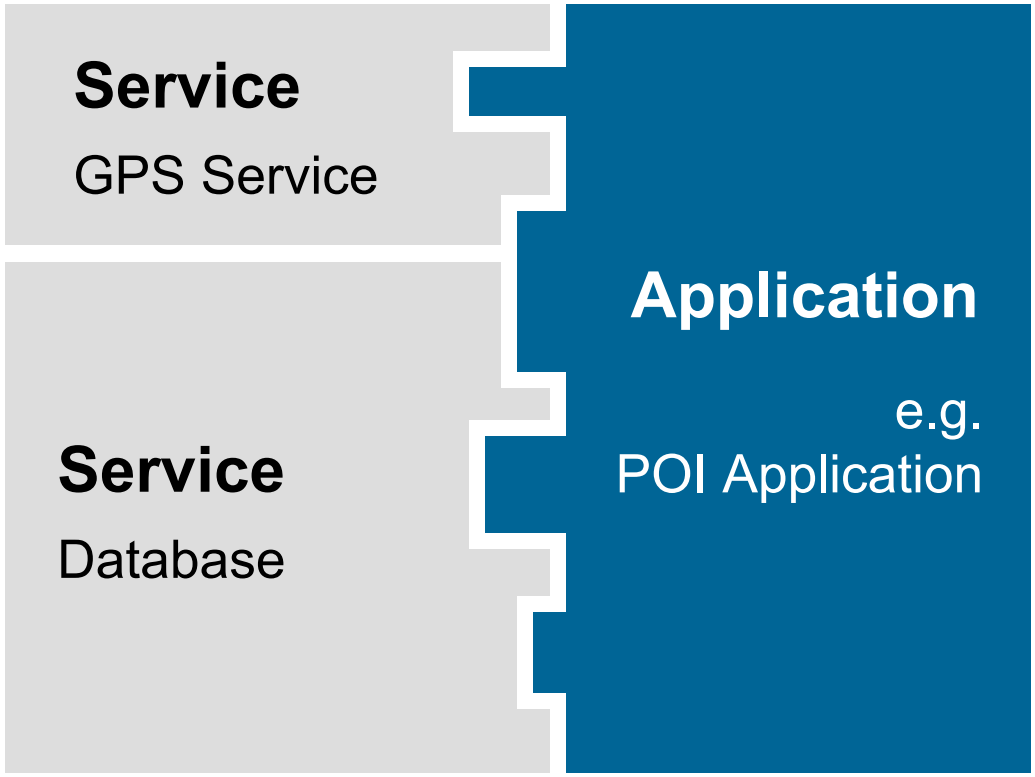
Service in terms of application qualifier

- ➔ A service may contain 0 to N software compontents (installed on fw and on backend)
- ➔ Example: Mobile Sales Support Tool

Service in terms of a registered interface in fw

- ➔ A software component with 1 or more Java interfaces that has been registered as a “Service” within the service registry of the framework.

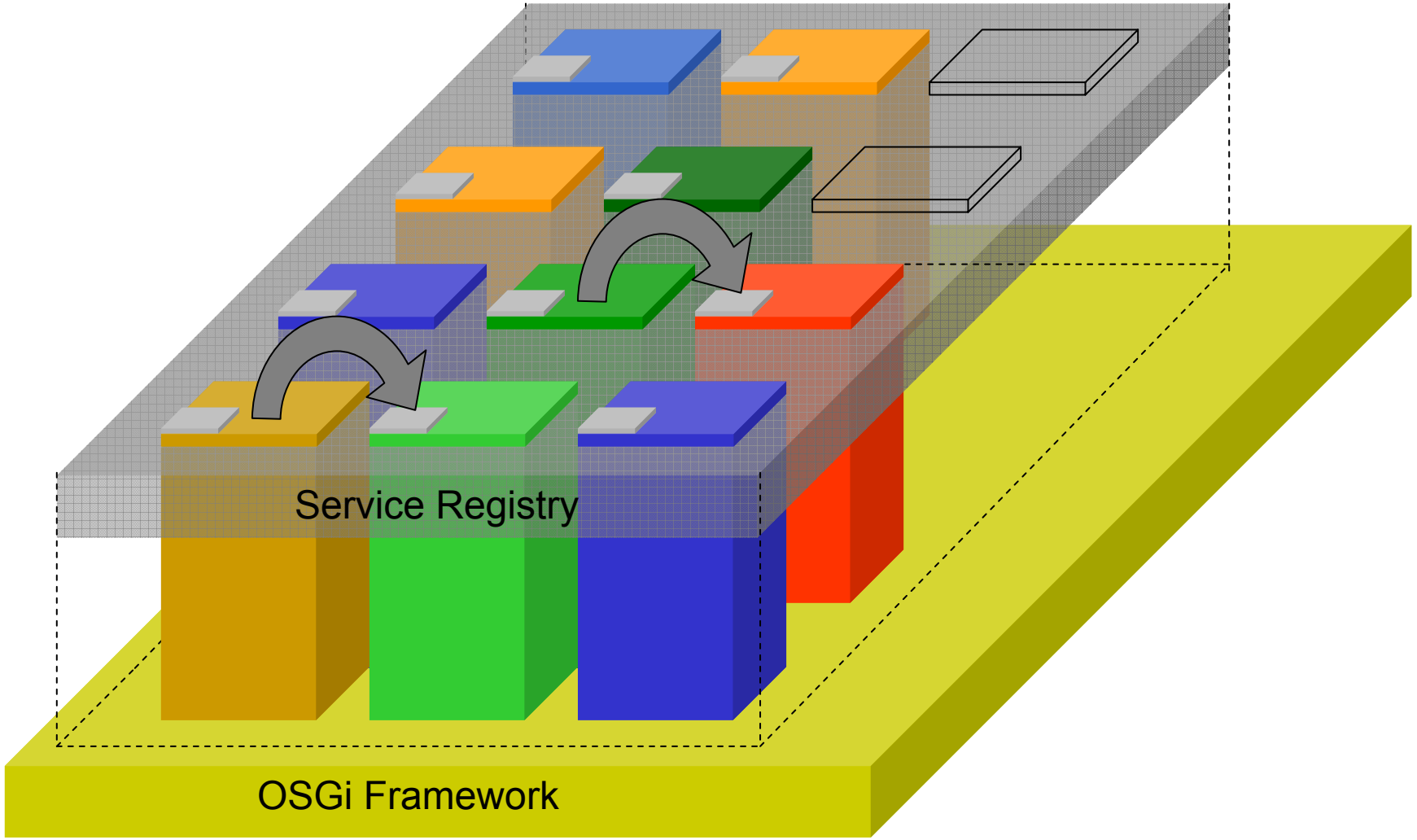
Services Example



Service

- A service may come and go and runtime !!!!
- Consequently, services need to be tracked
- A service may have 1 to N interfaces
- A service might be registered multiple times with a different set of properties
- A service might be instantiated multiple times
- Service must be acquired from the Service Registry

OSGi – Bundles & Services

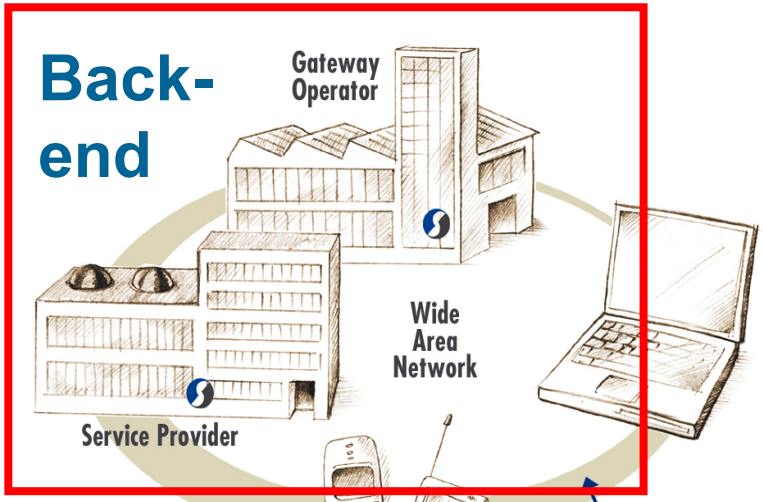


Service Registry

- Dynamic database holding all service references
- A service can only be obtained from the registry
- Support of Filter of service object search
- Provides service object references to the client
- Support of ServiceFactory for multiple service instanciation
- Contains ranking algorithm for identification of service that fit's best to a client's request.

OSGi Overview
Remote Management

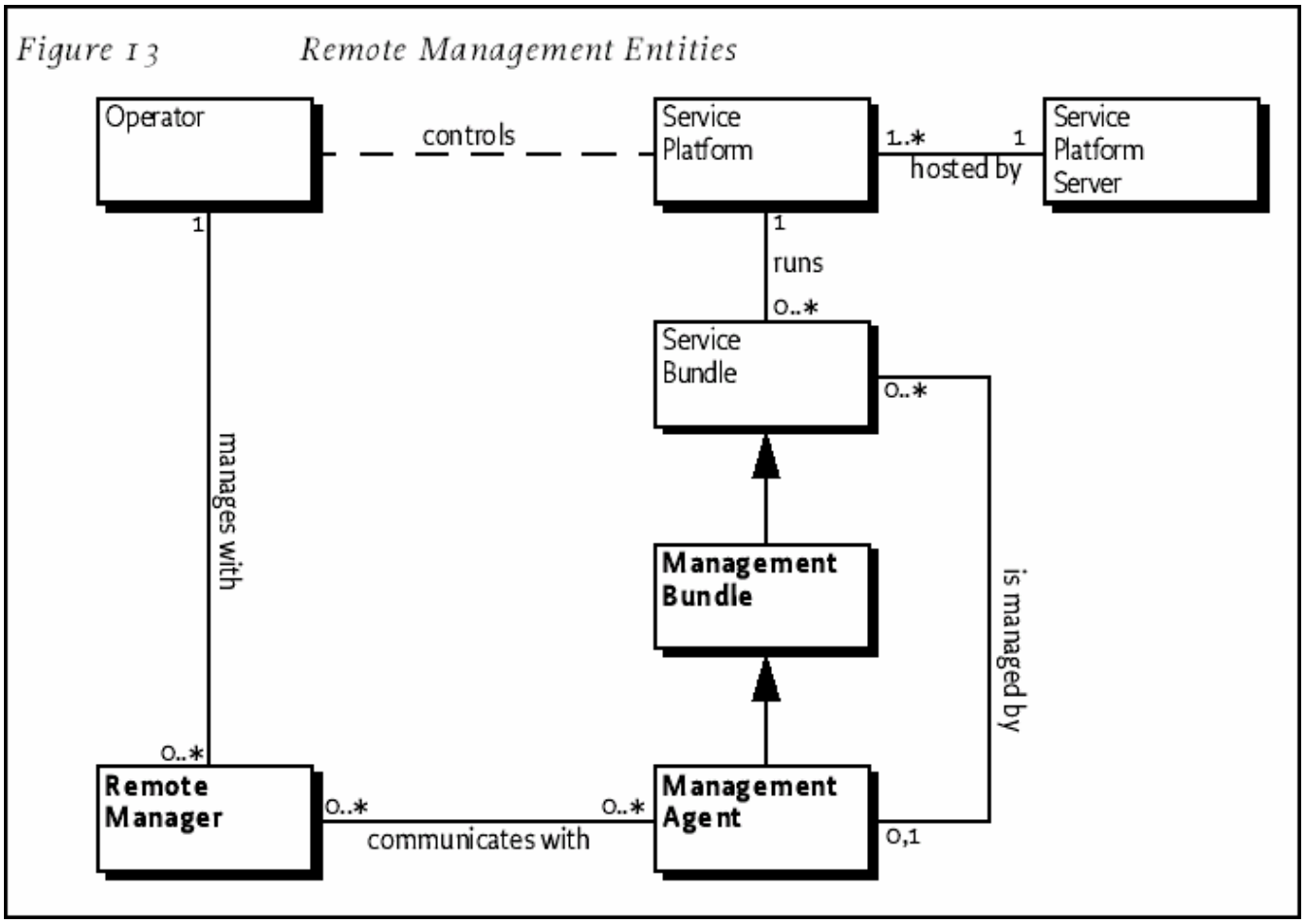
OSGi Actors



Services, Data

Service Gateways

Remote Management Ref. Architecture:



OSGi Service-Platform Release 3.0, chapter 3.1.2, page 22

Defined by OSGi:

- The remote management operations must be performed by a **Management Agent**
- **Initial Provisioning Spec.** (optional) defines the first connection between the backend and the gateway
- **Remote Management Reference Architecture** (fig. on the previous page)
- Management Agent Bundles are defined by the gateway operator

Not defined by OSGi:

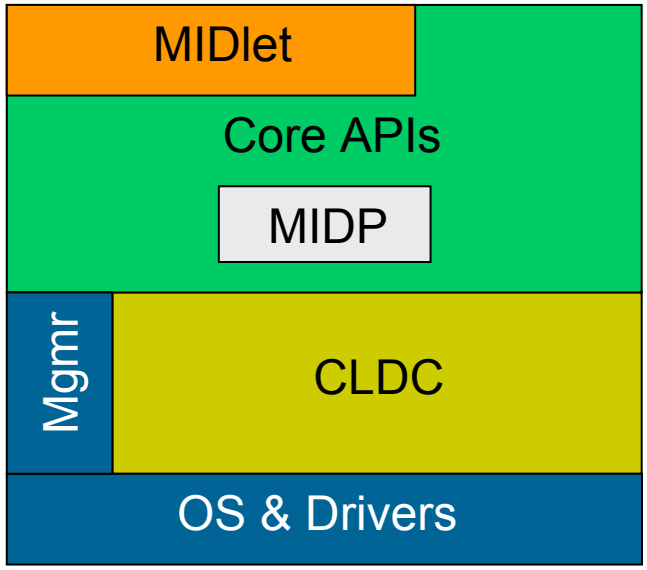
- The protocol(s) between backend and service gateway
- Implementation recommendation for the management agent
- Security architecture
- Goal: Not to restrict the specific needs of the gateway operators und service providers

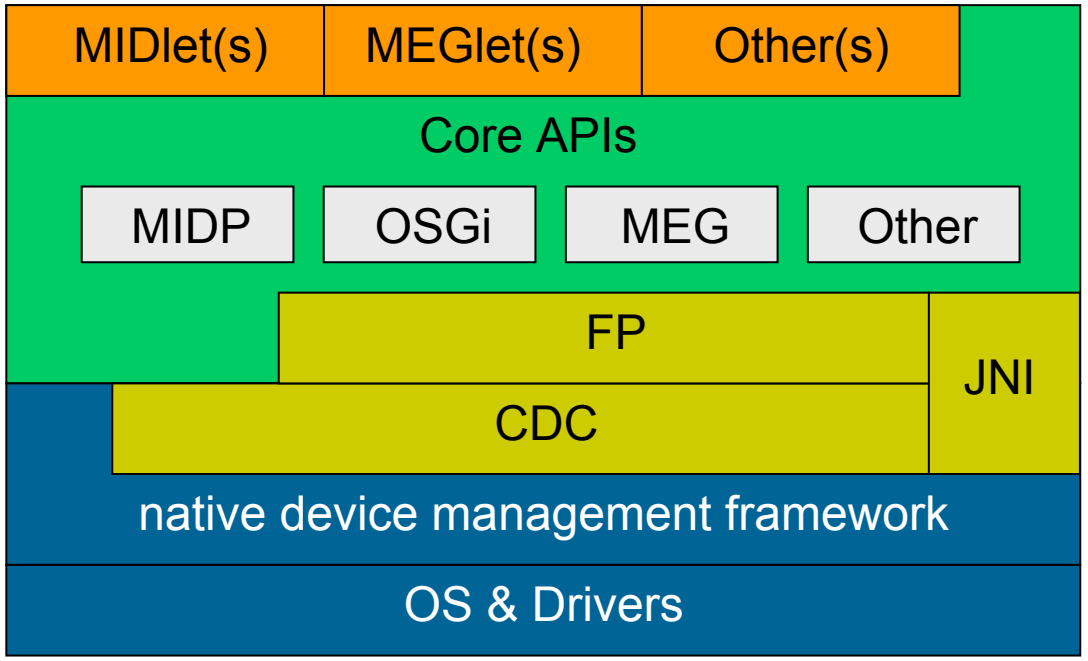
OSGi Overview
Excurs: MIDP versus OSGi Model

Main differences

MIDP Model	OSGi R3 Model
CLDC based	CDC 1.0 / FP 1.0 based
Static set of APIs	APIs and application code updates & upgrades possible at runtime
Focus: MIDlet application model	Focus: component model, not application model
Lightweight applications	Almost unlimited Java core features
Market dedication: mobile phones	Horizontal market orientation

Overview of stacks



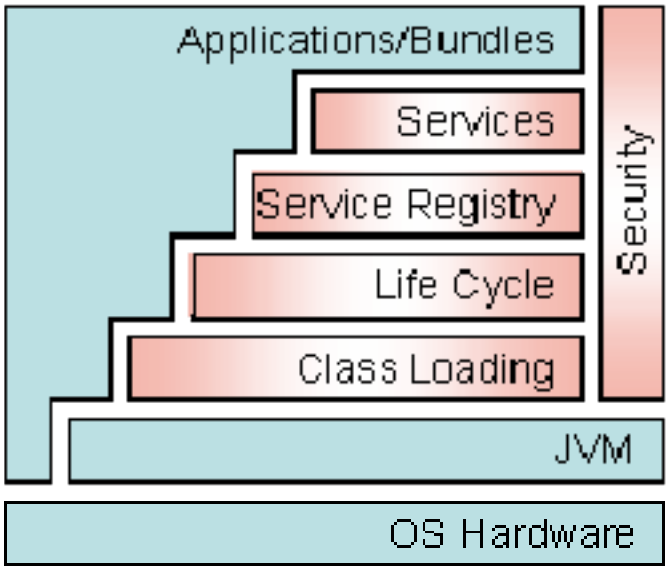


- ➔ MIDlets only
- ➔ Only MIDlet at a time
- ➔ Multiple apps (types, instances)
- ➔ Core APIs are not static

OSGi Overview
OSGi Specification Details

Base platform: the framework

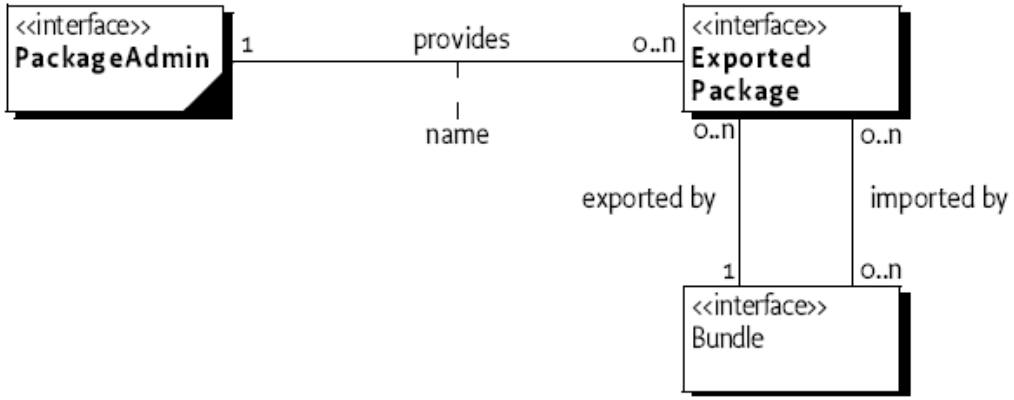
- Bundle & service administration (life cycle management, dependencies)
- Service registry
- Event transport
- Boot management
- Permissions



Runtime environment for OSGi services

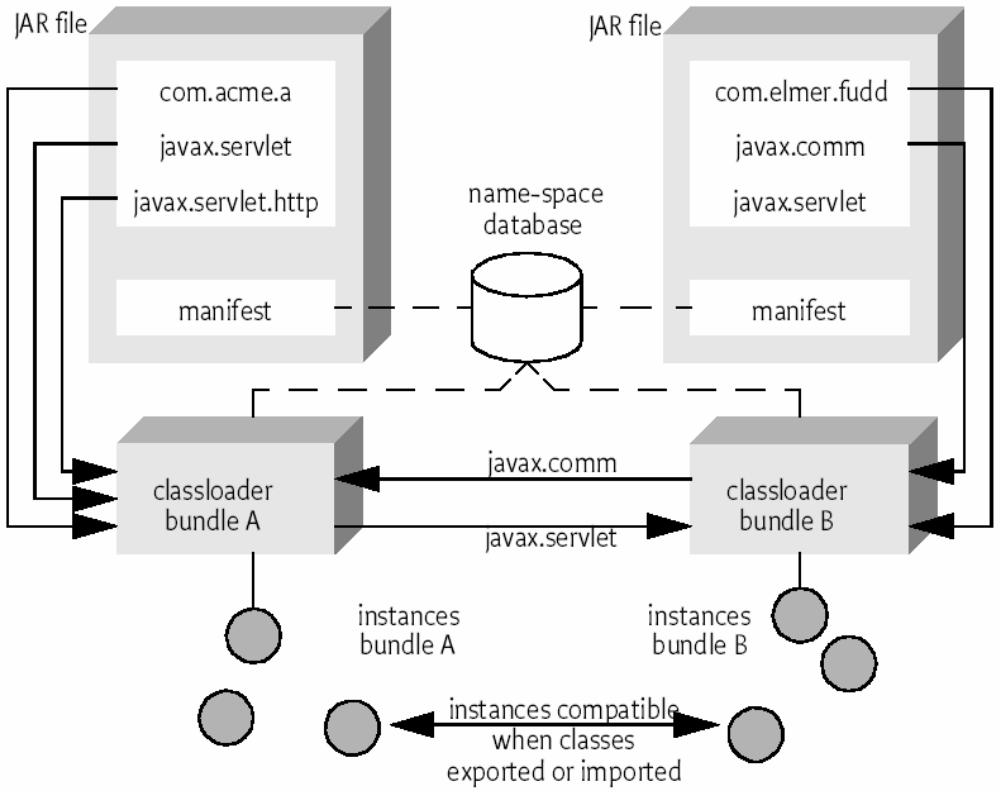
The Package Admin Interface

- Bundles can come and go at any time. This requires the bundle dependencies and states to be recalculated
- PackageAdmin is a service interface registered by fw
- It provides information to a Management Agent about a bundle's exported packages



Package Management

- Lazy and eager update
- Package sharing:
  - ➔ Classes
  - ➔ Resources



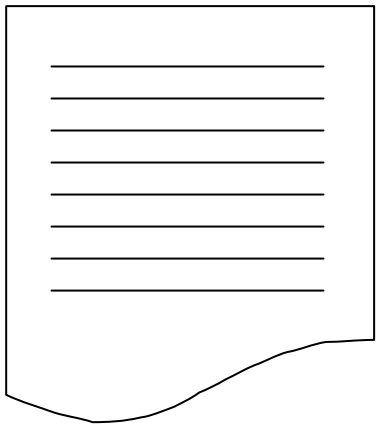
Permission Administration

- The framework keeps a central **store of permissions**
- A bundle has dedicated or default permissions
- The **PermissionAdmin** service (registered by fw) provides read/write access to the permissions store
- Bundle permissions can be modified **before**, **during** or **after** a bundle has been installed.

- Note: permission concept is based on *The Java Security Architecture*

OSGi based logging: the Log Service

- The LogService provides means to write log messages
- The LogReaderService can retrieve log entries
- Log changes can be tracked by a listener
- Categorization of log entries by Log Levels
- Persistency is not specified



- Important tool for keeping logging information

Configuration Admin & ManagedService

- Centralized management of bundle configurations
- ConfigurationAdmin Service:
  - Maintains repository of bundle configs
  - Provides API to access (read/write) this data
  - Delivers configurations to bundles automatically
- Runtime configuration changes of bundles!
- ManagedServices:
  - Service registered by bundle to receive config data
  - Used by ConfigAdmin to pass config data
- Persistency layer not defined by OSGi

Track your services!

- The dynamic environment of OSGi requires services to be tracked
- OSGi provides a utility API called ServiceTracker
- Features:
  - get service references for specified service(s)
  - receive callbacks in case of service state changes
  - filtering is possible, of course.

- Partly shields the dynamics.

OSGi Overview
Benefits and disadvantages

At development time

- Standardized technology
- Availability of ready products and functions
- Modularity based on a good component model
- Reusable components
- Parallel development and portability
- Complementary to other existing standards
- Fast und secure programming environment

Reduction of development time and costs !!

At run time

- Standardized platform base technology
- Dynamic installation/update of software components
- Offering of new services
- Offering of services from different SPs
- Remote administration and configuration
- Remote diagnostics

Some general disadvantages

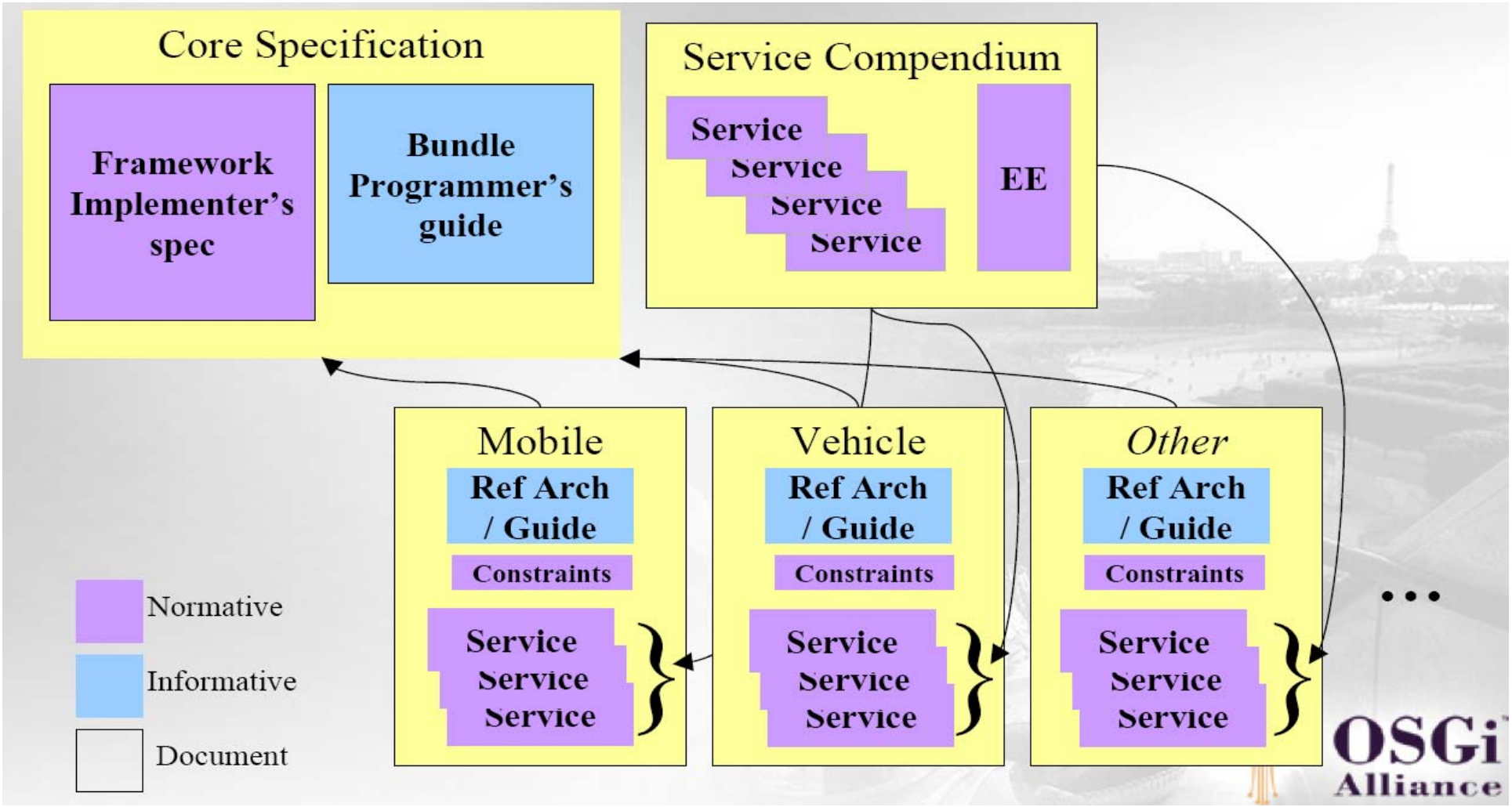
- Added overhead for RAM and flash
- Little amount of vertical services defined
- Complex specification process which involves many participants with different interests
- Missing standard GUI framework model

Typical hardware configurations

Profile	CPU	RAM	Flash
Minimum (Record)	50 MHz	8 MB	4 MB
Low End	50 MHz	16 MB	8 MB
Medium	200 MHz	32 MB	16-32 MB
High End	400 MHz	> 32 MB	> 32 MB

OSGi Release 4 Extensions

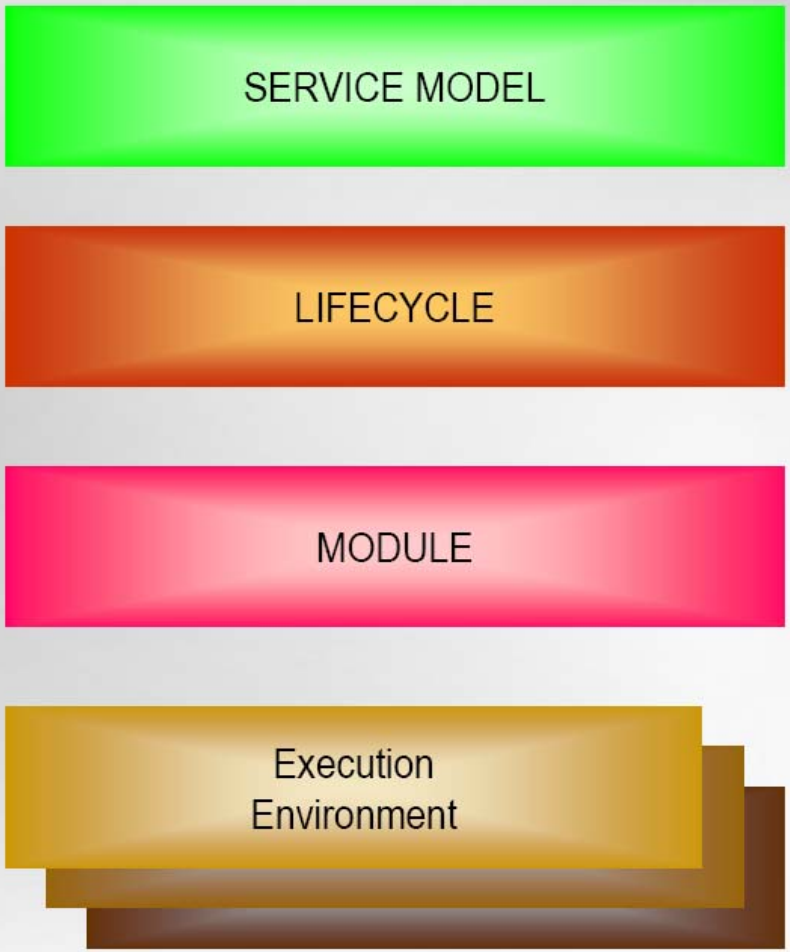
OSGi R4 Documentation Plan



Core Specification Defines The

- ➔Framework – rewritten and updated
  - Module Layer
  - Lifecycle Layer
  - Service Layer
- ➔Framework Services
  - Package Admin - updated
  - Start Level
  - Conditional Permission Admin - updated
  - Permission Admin - updated
  - URL Handlers

Framework Layering



L3 – Provides a publish/find/bind service model to decouple bundles

L2 - Manages the lifecycle of bundle in a bundle repository without requiring the VM be restarted

L1 - Creates the concept of modules (aka. bundles) that use classes from each other in a controlled way according to system and bundle constraints

L0 -
- OSGi Minimum Execution Environment
- CDC/Foundation
- J2SE

OSGi Alliance

Service Compendium

- Log Service - updated
- Http Service - updated
- Device Access
- Configuration Admin - updated
- Preferences Service - updated
- Metatype - updated
- Wire Admin
- User Admin
- IO Connector
- Initial Provisioning
- UPnP Device - updated
- Declarative Services - new
- Event Admin - new
- Service Tracker - updated
- XML Parser
- Position
- Measurement and State
- Execution Environments - updated

Service Programming Model With R4 – Declarative Services

- Simplifies the service oriented programming model (XML description)
- Assists bundle developers in their work
- Handles the dynamic of the service objects

R3 Programming Model

META-INF/Manifest.mf

```
Bundle-Activator: com.velingrad.Hello
```

com.velingrad.Hello.java

```
public class Hello implements BundleActivator
{
public void start(BundleContext bc)
{
ServiceTracker tracker = new
ServiceTracker(bc,
"org.osgi.service.log.LogService", null);
tracker.open();
LogService log =
(LogService)tracker.getService();
if (log != null)
{
log.log(LogService.LOG_INFO,"Hello
Velingrad");
}
else
{
// ??? what to do here
}
}
public void stop(BundleContext bc) {}
}
```

R4 Programming Model

META-INF/Manifest.mf

```
Service-Component: OSGI-INF/activator.xml
```

OSGI-INF/activator.xml

```
<?xml version ="1.0" encoding="UTF-8"?>
<component name="example.Hello">
<implementation class="com.velingrad.Hello"/>
<reference name="LOG"
interface="org.osgi.service.log.LogService"/>
</component>
```

com.velingrad.Hello.java

```
public class Hello
{
protected void activate(ComponentContext cc)
{
LogService log =
(LogService)cc.locateService("LOG");
log.log(LogService.LOG_INFO,"Hello Velingrad");
}
}
```

Generic Event Model

The problem in R3:

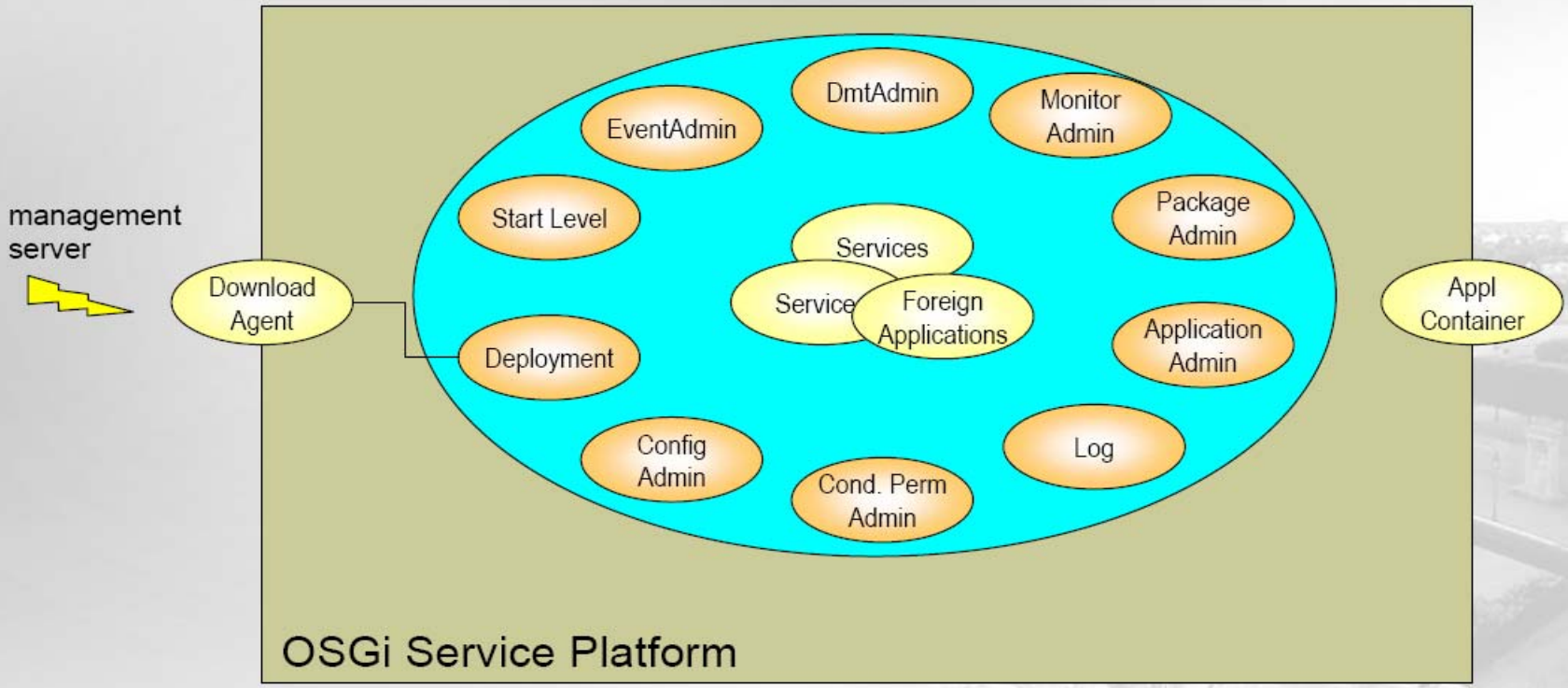
- ➔ Usual event pattern for applications:
  - listening parties register services with dedic. interf.
  - event source references all services with such dedicated interfaces and passes the event over
- ➔ Since services (event source service, event listener services) may come and go, this results in extra programming efforts and potential failures

Generic Event Model

The solution in R4:

- ➔ Central Generic Event service
- ➔ Simple topic based publish/subscription model
- ➔ Synchonous and asynchronous event delivery
- ➔ Support for wildcards
- ➔ Easy binding to native event sources/consumers

Mobile Architecture Overview



Mobile Service Platform - OSGi specifics for mobile devices

MEG is actively working to define Mobile Service Platform (MEG R4). The official release is scheduled for the first quarter of 2006.

MEG R4 will be based on OSGi R4 Framework which has been extended from the R3 Framework with…

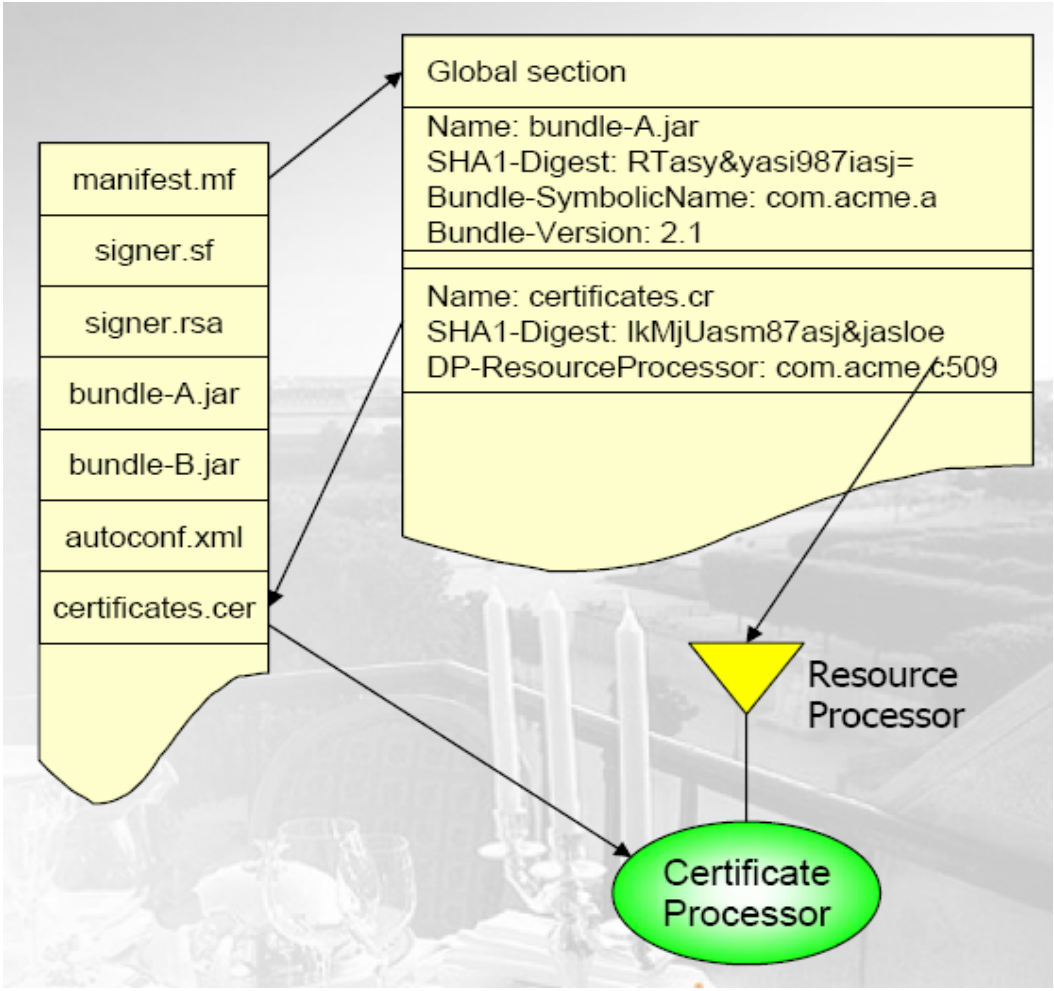
- ➔ Security and Policy Framework
- ➔ Permissions and Signatures
- ➔ Generic Events Mechanism

..and for the Mobile Service Platform the enhancements are:

- ➔ Deployment model and infrastructure
- ➔ Application model and lifecycle
- ➔ Device management functionality

Deployment Package

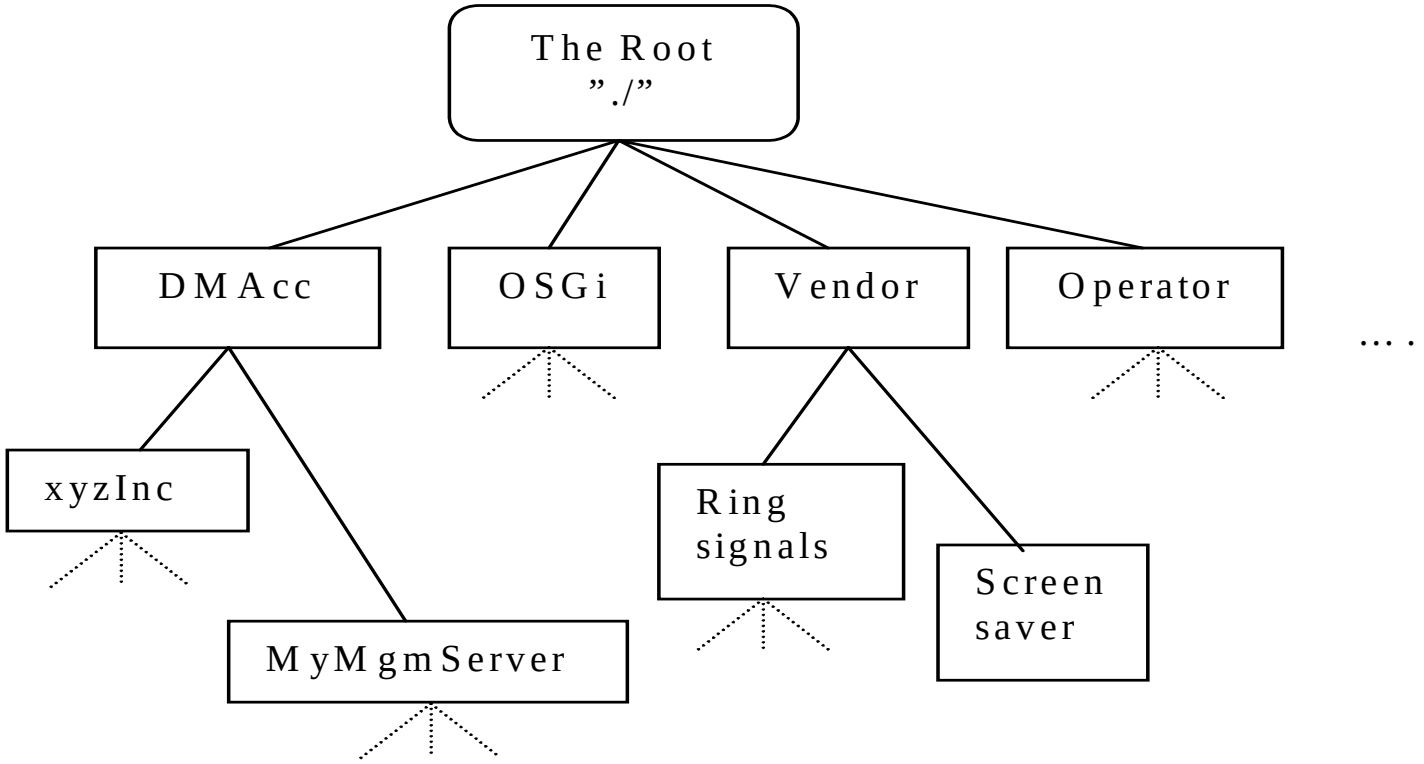
- Deployment Package
  - Based on JAR Format
- Manifest describes the resources and associates them with a Resource
- Processor
- Fix Packages
- Provide only updated contents



Device Management

- ➔The basic OSGi architecture is management protocol agnostic
  - Provides a model where many parties can participate
- ➔What is missing is an abstraction to manage a device in detail
- ➔The OMA DM protocol is dominant in the mobile device market
  - Will be supported by a wide range of devices
- ➔The MEG therefore supports the OMA DM management model with the Dmt Admin Service

DMT – Introduced by OSGi R4 MEG



- The management tree organizes all available management objects in the device as a hierarchical tree structure where all nodes can be uniquely addressed with a URI
- `./SyncML/DMAcc/xyzInc`

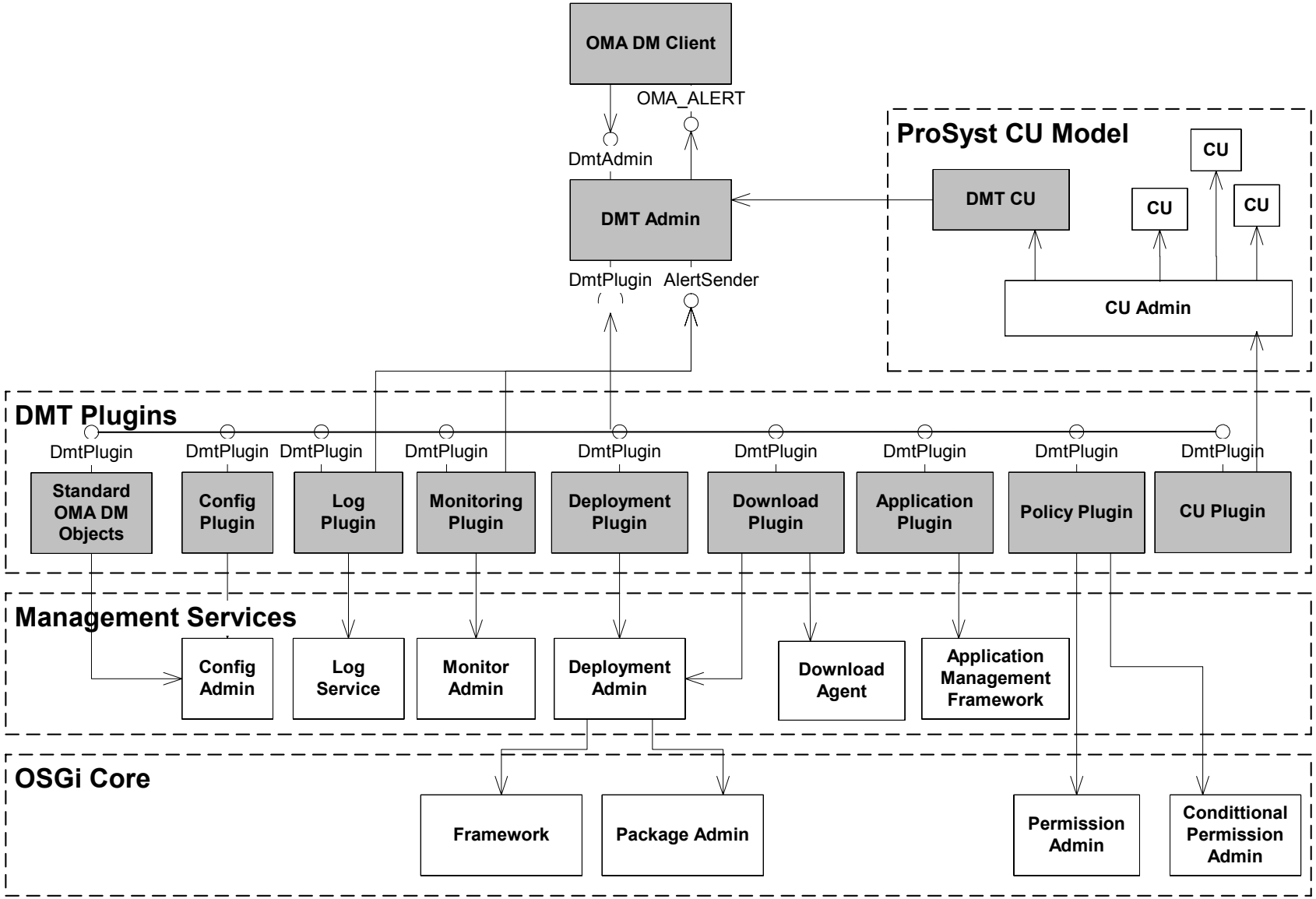
DMT Basics

- Introduced in support of the SyncML DM (now OMA DM) protocol
- DMT is a tree of interior and leaf nodes
- All nodes in the data tree have names
- Only leaf nodes have values
- Base value types:
  - Integer
  - String
  - Boolean
  - Binary
  - XML
- (b64 | bin | bool | chr | int | node | null | xml | date | time | float)

DMT Basics

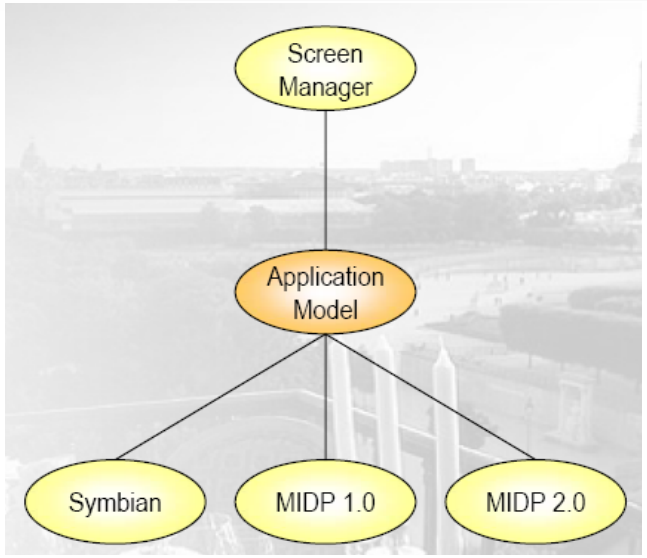
- OMA DM defines five possible operations on the nodes of DMT
  - Add,
  - Get,
  - Replace,
  - Delete,
  - Execute
- ACL of a node specified which entity is permitted to perform the different operations on that node.
- The DMT is dynamic and it is not required to be stored

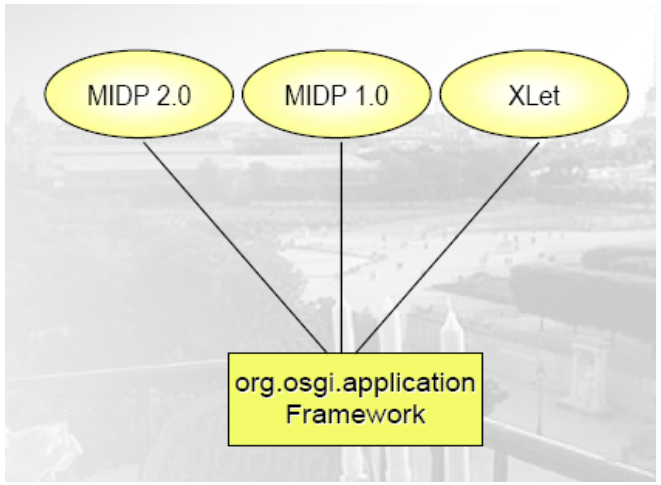
ProSyst Plugin Structure – OSGi Mobile Management Tree



Application Model

- Generic Application Model - A generic model that is intended to abstract different application models so they can be treated as one
  - Provides for third party screen managers
  - Provides for rich GUIs
    - Icons, help, etc.
    - Can monitor the state of running instances
  - Interacts with JSR 211 Content Handlers
- Foreign Application Model - defines how non-OSGi Applications can access and provide services
  - Header usage
  - Access to Framework class





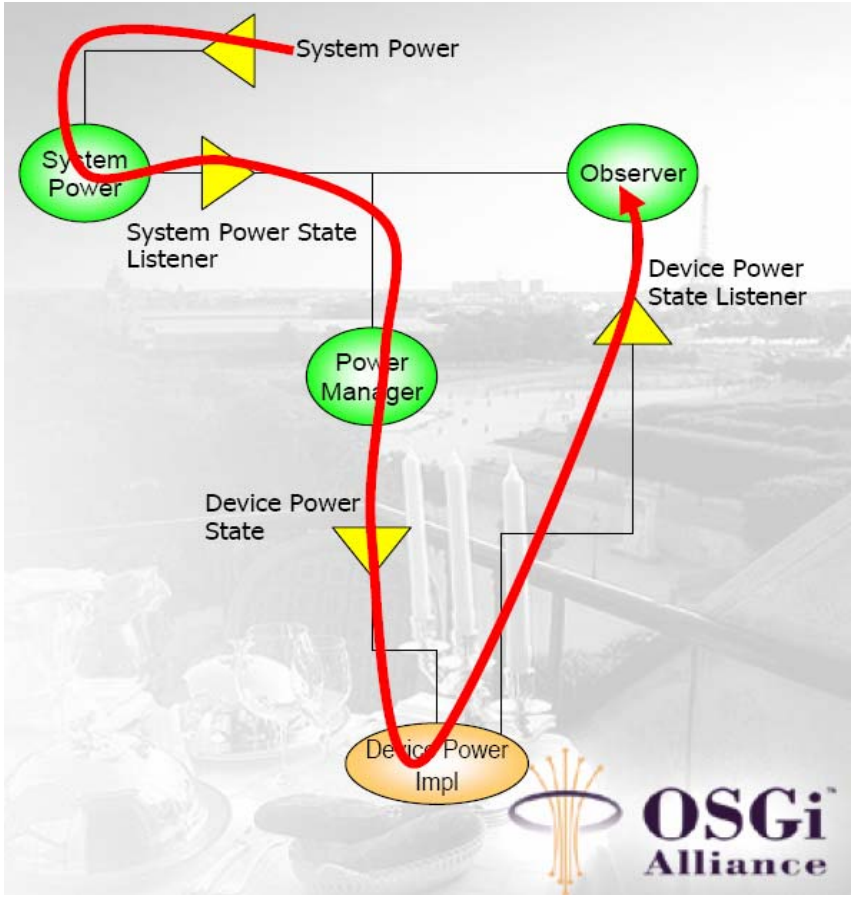
Vehicle Profile

- The OSGi Vehicle Profile shares its architecture with the Mobile Profile
- The Vehicle Profile provides specific vehicle oriented services
- The Vehicle Profile uses many more of the Core Compendium Services because it is more mature
- It is likely the vertical profiles will come closer in the future

- Start Level Service
- URL Handlers
- Package Admin Service
- Permission Admin Service
- Log Service
- Http Service
- Device Access
- Configuration Admin Service
- Metatype(2) Service
- Preference Service
- User Admin Service
- Wire Admin Service
- IO Connector Service
- Declarative Services
- Event Admin Service
- Power Management Service
- Diagnostic Service
- Service Tracker Utility
- XML Parser Utility
- Position Utility
- Measurement and State Utility

Vehicle Profile – Power Management

- The power management service makes power management pluggable
- The system power state can be set externally
  - Full Power
  - PM Active
  - Suspend
  - Sleep
  - Power off
- is mapped to different device power state
  - D0-D3 power states
- Power manager can take device specific capabilities in consideration
- An observer bundle can follow the transitions in the system and device power state



OSGi Products

Products available on the market

OSGi Products - ProSyst

mBedded Server

Embedded Software

Deploy and Deliver

mBedded Builder

Development IDE

Develop and Debug

mPower Remote Manager

Remote Management Software

Manage and Maintain

OSGi Products - Siemens VDO

- Siemens VDO & OSGi Alliance
  - Siemens VDO is involved in OSGi Alliance since 2001
- TIA is the Siemens VDO Platform
  - multimedia system based on OSGi Service Platform
  - used in BMW 1, 3, 5 and 6 Series, X3
  - used in current developments for other Car makers

OSGi Alliance

WCTME 5.7.2 tools

"Embedded" WCTME 5.7.2

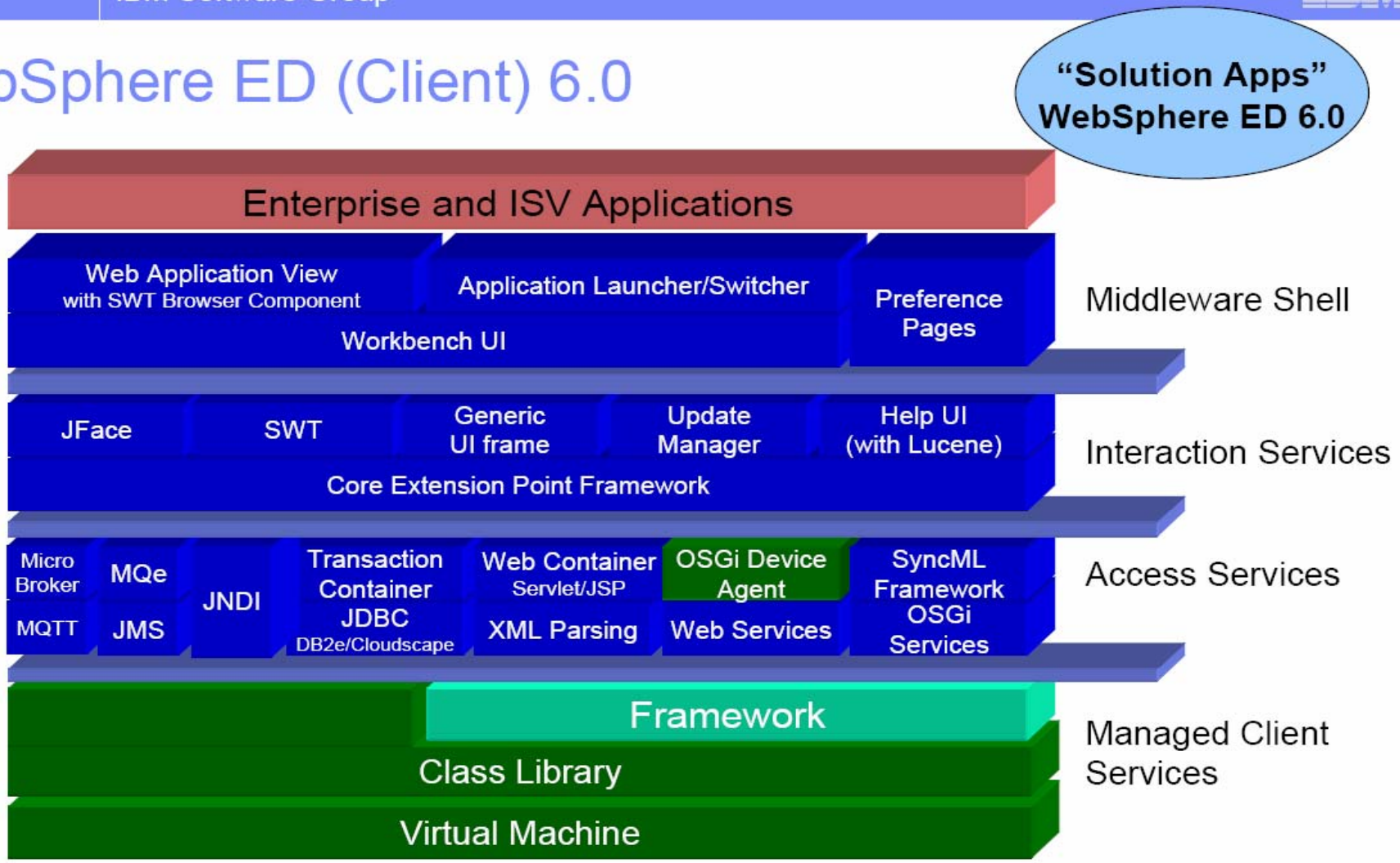
MIDP mobile handhelds | Advanced mobile handhelds, tablets, laptops, desktops

WCTME 5.x IDE

Enterprise MIDP Tools	Web Services for MIDP	eSWT	Extension Services (includes Web Services)	Application Tools for Extension Services
		SMF Bundle Development Kit		J2EE Tooling
WEME CLDC/MIDP		WEME CDC/F/PBP/PP, OSGi MEE , J2SE		J2EE
WSDD				WSSD/AD
Eclipse				

- WSDD
- ME Toolkit
- Complimentary Elements

WebSphere ED (Client) 6.0

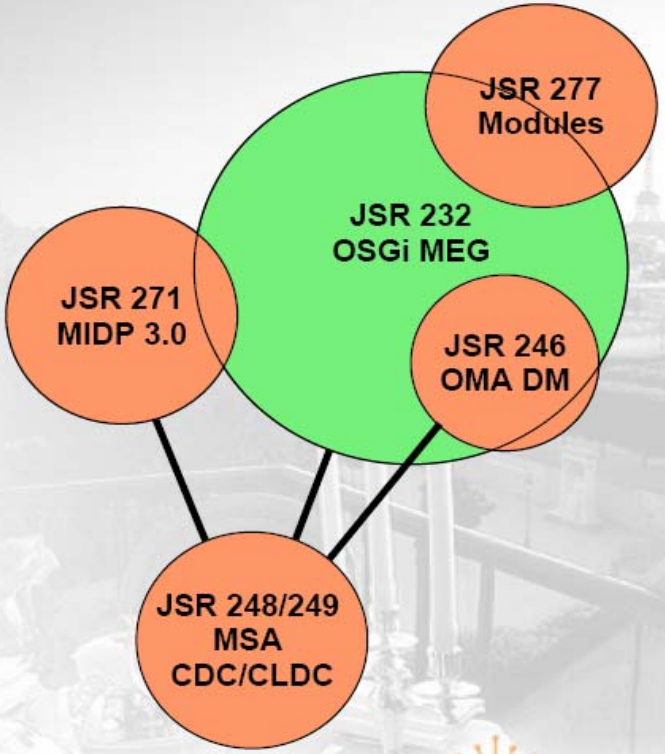


OSGi Products - Open Source

Knopflerfish

Relation to JCP

- The relation to the JCP is troublesome
- Several JSRs overlap with JSR 232
- JSR 277 Modularization
  - However, long way off from J2ME
- JSR 271 MIDP 3.0
  - Is addressing some of the solutions that MEG provides
- JSR 246 OMA DM Access
  - Based on JSR 232 Dmt Admin, but slightly different
  - Needs to be merged
- JSR 249/248 MSA CDC/CLDC
  - Must select JSR 232 to make MEG viable



OSGi Alliance

Resources

- http://www.osgi.org
- http://www.osgi.org/blog/index.html
- http://www.ibm.com/embedded
- http://dz.prosyst.com
- http://member.openmobilealliance.org/ftp/public_documents/dm/Permanent_documents/
- http://www.openmobilealliance.org/release_program/index.html
- http://eclipse.org/equinox

Contact

Thank you! For further information please contact us!

Pavlin Dobrev

ProSyst Labs EOOD

Vladajska Str. 48

Sofia 1606, Bulgaria

Tel. +359 2 952 35 81

Fax +359 2 953 26 17

p.dobrev@prosyst.com

www.prosyst.com

dz.prosyst.com – ProSyst Developer Zone (free registration)

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OSGi Alliance

CABA

JAVA COMMUNITY PROCESS

UPnP FORUM

OSGi Programming
Theory and Hello World Example

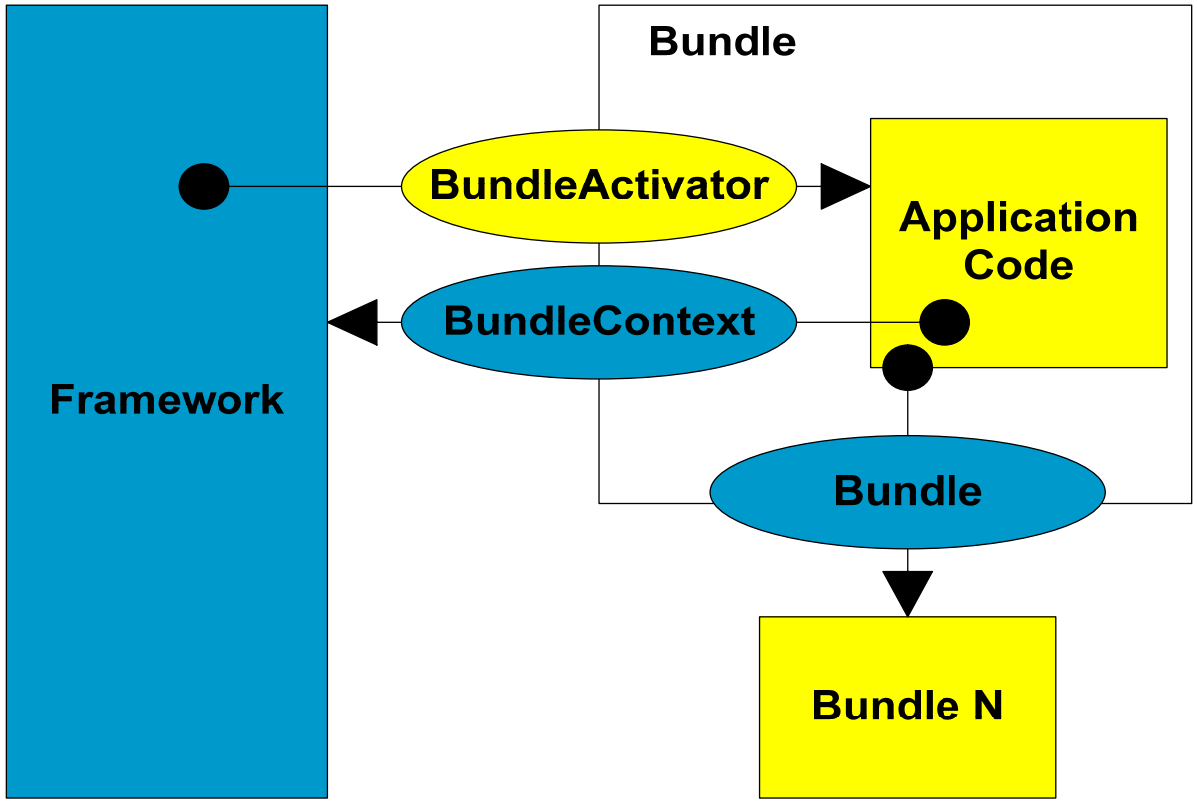
These slides are not intended to be presented.
They will be available for all users that download the presentation

1. Hello Bundle.zip
Source Code

Purpose of the Hello World bundle

- Demonstrate the Bundle lifecycle
- Demonstrate how a bundle is developed, packed and deployed manually
- Demonstrate how a bundle is developed, packed and deployed using the OSGi plug-in

Basic Interfaces



Bundle: the BundleActivator interface

- Implemented by some class in bundle
- Used by framework to start and stop a bundle
- Must be assigned through manifest
- Interface signature:

```
package org.osgi.framework;

public interface BundleActivator {
  // start method
  public void start (BundleContext) throws Exception;
  // stop method
  public void stop (BundleContext) throws Exception;
}
```

Bundle: the BundleContext interface

- Implemented by framework
- Represents the execution environment of the bundle
- Acts as a proxy between framework and the bundle
- Instantiated by framework on bundle start

- Doc: OSGi R3 Spec, chapter 4.23.5, page 98

Bundle: the BundleContext interface

- What bundles can do with **BundleContext**:
  - Register services in the framework
  - Retrieve services from the framework
  - Subscribe to framework events
  - Obtain a persistent storage area
  - Interrogate other bundles
  - Install new bundles in the framework

Bundle: the Bundle interface

- Implemented by framework
- One Bundle object instantiated for each bundle (by fw)
- Represents the bundle and its state
- Used to observe and control a bundle's life-cycle
- Can list all registered services
- Can list all used services

Never Forget!

Whatever you do – keep in mind that bundles and service come and go at runtime!

Creating a Hello World bundle manually

Step 1: Create a working directory: /osgi_test/

Step 2: Create a *BundleActivator* Implementation class

- Create the package directory: */osgi_test/examples/hello*
- Create in it a Java file containing the *BundleActivator* implementation:

```
public class Activator implements BundleActivator {
    public void start(BundleContext bc) throws Exception {
        System.out.println("Bundle Started !!");
    }
    public void stop(BundleContext bc) throws Exception {
        System.out.println("Bundle Stopped !!");
    }
}
```

Creating a Hello World bundle manually

Step 3: Create a Manifest file:

- Location of the file: */osgi_test/META-INF/Manifest.mf*
- Content of the Manifest

Bundle-Activator: examples.hello.Activator
Bundle-Category: examples
Bundle-Vendor: Nokia
Bundle-Version: 1.0
Bundle-Name: Hello World Bundle

Creating a Hello World bundle manually

Step 4: Compile the *Activator.java* with javac

javac –classpath %MBS%/lib/frameworklib.jar examples/hello/.java*

Step 5: Pack the bundle with the jar.exe from the JDK

jar cmf META-INF/Manifest.mf hello.jar examples/hello/.class*

Step 6: Optionally write a script file that will atomize these two steps

Step 7: Deploy the bundle on the framework using the mBS console:

fw>$ install –s /osgi_test/hello.jar

ProSyst OSGi Eclipse Plug-in

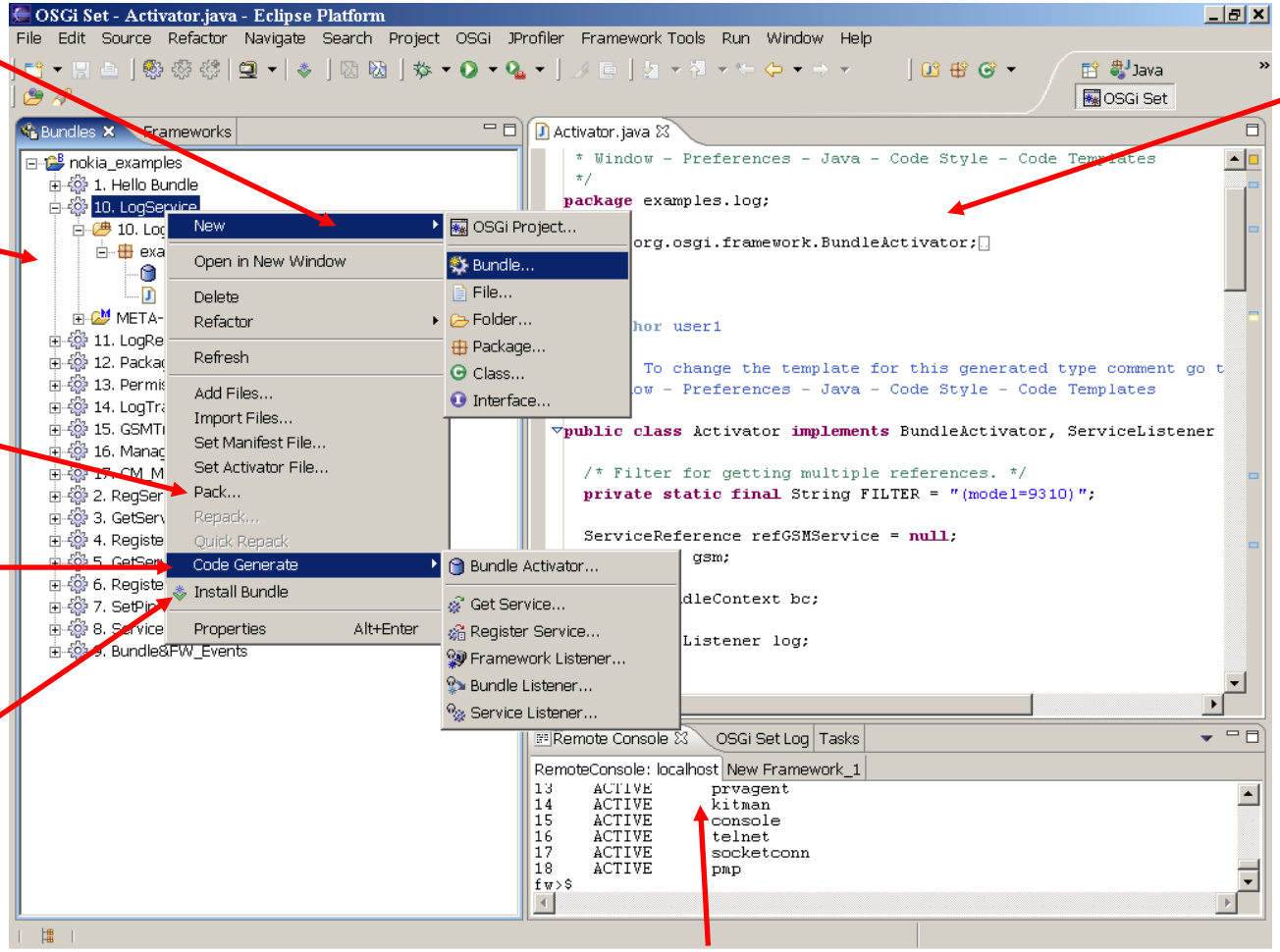
New OSGi Project or Bundle

OSGi Bundles

Make Bundle jar file

Code Generate

Install Bundle



Java Editor. Code of the Bundle Activator

Framework Console

Creating a Hello World bundle with the Eclipse plug-in

Step 1: Create Bundle with the plug-in:

- Right-click on the *Bundles* tree and choose *New/Bundle*
- Specify the Bundle Name & click the *Finish* button

Step 2: Create the *BundleActivator* implementation class:

- Right-click on the Hello Bundle node in the *Bundles* tree and choose *Code Generate/Bundle Activator*
- Implement the start & stop methods

Step 3: Edit the manifest file

- The *Bundle-Activator* header is generated automatically
- Add the additional headers

Creating a Hello World bundle with the Eclipse plug-in

Step 4: Generate a bundle JAR file

- Right-click the Hello Bundle node and choose *Pack*
- Select a jar file name & location and click the *Finish* button

Step 5: Install the bundle in the framework, and start/stop it

- Right-click the Hello Bundle node and choose *Install Bundle*