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Touch a Phone, Touch a Friend: Using RFID and Visual Tags with JSR 257

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TS-3789

Goal

Learn how to communicate with different contactless targets using JSR 257
Contactless Communication API

Agenda

RFID, NFC and Visual tags

Use Cases for JSR 257

Application Design Guidelines

Executing the Use Cases

RFID in Brief

- RFID (Radio Frequency IDentification) is a technology to carry information over short range by radio waves
- 13.56 MHz frequency used in mobile devices
- A tag (transponder) contains digital information in a microchip
- A reader communicates with a tag
- Two types of tags
 - Active tag has own power source and longer distance
 - Passive tag gets power from the incoming signal

NFC and NFC Forum

- NFC (Near Field Communication) specifies simple wireless communication between close coupled devices
- NFC enables
 - Establishing other types of wireless communication between devices
 - Compatibility with existing contactless smart cards
- NFC Forum defines common protocols for basic links between NFC enabled devices
- NFC Forum Data Exchange Format (NDEF) provides vendor independent structure for data

Visual Tags in Brief

- Optically machine readable information on printed material, typically in the form of bar codes or data matrices
- Widely used in product identification
- Symbology defines the features of the visual tag
 - Used character set
 - Encoding and decoding rules
 - Data size
 - Error checking
 - Printing requirements
- Over 200 known symbologies, only few widely used
 - UPC / EAN / JAN in article numbering

Agenda

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Use Cases for JSR 257

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Executing the Use Cases

Use Cases for JSR 257

- Read a URL to movie web page from a tag
- Store personal shortcuts like phone numbers to a tag
- Bluetooth or WLAN connection initiation in a multiplayer game with RFID communication
- Set device access point settings from a tag
- Field force on-the-job reporting using RFID tags
- Data gathering from RFID tags to a server

Agenda

RFID, NFC and Visual Tags

Use Cases for JSR 257

Application Design Guidelines

Executing the Use Cases

Application Design Guidelines

- Select target and register for discovery
 - Supported targets: NDEF tag, RFID tag, smart card, visual tag
 - Read only or also write access to NDEF tag
 - Limitations in registration
- Target discovered, check properties
- Open connection to target
- Communicate with the target
- Close connection

Agenda

RFID, NFC and Visual Tags

Use Cases for JSR 257

Application Design Guidelines

Implementing the Use Cases

Registering for Target Discovery

```
// Get DiscoveryManager instance and set TargetListener
// for NDEF_TAG target

DiscoveryManager dm = DiscoveryManager.getInstance();

try {
    dm.addTargetListener(this, TargetType.NDEF_TAG);
}
catch (ContactlessException ce) {
    // handle exception
}
```

Registering for NDEF Record Discovery

```
// Get DiscoveryManager instance and set TargetListener
// for NDEF_TAG and NFC_PEER targets

DiscoveryManager dm = DiscoveryManager.getInstance();

try {
    NDEFRecordType recordType = new NDEFRecordType(
        NDEFRecordType.NFC_FORUM_RTD,
        "MyOwnType");
    dm.addNDEFRecordListener(this, recordType);
}
catch (. . .) {
    // handle exception
}
```

Making a Connection to the Target

```
public void targetDetected(TargetProperties[] prop) {  
  
    // Select first target  
    TargetProperties target = prop[0];  
    try {  
        // NDEF_TAG target found  
        String url = target.getUrl();  
        // Open NDEFTagConnection to the target  
        conn = (NDEFTagConnection)Connector.open(url);  
  
        // Read data from the target  
        NDEFMessage message = conn.readNDEF();  
        NDEFRecord[] records = message.getRecords();  
        . . .  
    }  
    catch (. . .) {  
    }  
}
```

Receive Read-Only Data from NDEF Tag

```
public class MyMIDlet extends MIDlet implements
NDEFRecordListener {

    public void recordDetected(NDEFMessage ndefMessage) {

        NDEFRecord[] records = ndefMessage.getRecords();
        for (int i=0; i<records.length; i++) {
            // Handle data
        }
    }
}
```

DEMO

Read an Image from the RFID Tag
and Write a URL to the RFID Tag

Read Visual Tag Image

```
public void readVisualTag() {
    checkReadSymbologySupport();
    try {
        String[] images =
            SymbologyManager.getImageClasses();
        // Open connection to visual tag
        VisualTagConnection conn = (VisualTagConnection)
            Connector.open("vtag://");
        String data = conn.readVisualTag(getImage(),
            images[0], mySymbology);
        // Handle data from the image
        conn.close();
    }
    catch (. . .) {
        // handle exception
    }
}
```

Generate Visual Tag Image

```
public void generateVisualTag() {
    checkReadSymbologySupport();
    try {
        // Get properties for symbology
        ImageProperties properties =
            SymbologyManager.getImageProperties("code-39");

        String imageClass = getImageClass();
        VisualTagConnection conn = (VisualTagConnection)
            Connector.open("vtag://");
        // Generate visual tag image
        Object vtagImage = conn.generateVisualTag(
            "test", imageClass, properties);

        . . .
    }
    catch (. . .) {
        // handle exception
    }
}
```

DEMO

Read a URL from a Visual Tag

Plans for the Future

- Add high level access to vendor dependant data on the NFC Forum mandated tags
- Add support for NFC peer-to-peer communication
- Specifications for these ongoing in the NFC Forum
- Features will be included once the documents are available

Summary

- JSR 257 offers communication to various contactless targets
 - Can be extended to cover future contactless targets
- Provides general discovery mechanism
 - Eases tasks of the application developer
- Supports MIDP push mechanism for automatic application launch for NDEF formatted data
- Flexible design and minimal set of mandatory features
 - Allows implementations to support only RFID tags or visual tags or both

For More Information

- JSR 257 Contactless Communication API in Java Community ProcessSM
 - <http://jcp.org/en/jsr/detail?id=257>
- NFC Forum
 - <http://www.nfc-forum.org/home>
- Visual tag information on AIM Global
 - <http://www.aimglobal.org/technologies/barcode/>
- Nokia booth on the Pavilion for more demos

Q&A

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