MCPC-TR-010
Bluetooth Phonebook Access Profile Implementation Guideline
Version 1.10(E)
Nov/28/2013

Mobile Computing Promotion Consortium
Technical Committee
How we distinguish binary, decimal and hexadecimal numbers:

- For binary numbers, we append a small letter "b" (e.g. 10b)
- For binary numbers, we insert a space after every four bits. (e.g. 1000 0101 0010b)
- For hexadecimal numbers, we append a small letter "h" (e.g. FFFFFh and 80h)
- All other numbers shall be considered to be written in decimal

Key Words

- "May" means that something is recommended or optional at the free discretion of the vendor.
- "Should" means that although something is not essential, it is strongly recommended. When implementing, the vendor shall take this requirement into consideration and determine whether this is essential or not.
- "Shall" means that something is an essential requirement. For connectivity and specification compliance, the feature must be implemented, and is mandatory.

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Bluetooth Phonebook Access Profile Implementation Guideline

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1 Phonebook Access Profile Use Cases Description

1.1 Summary of the use cases

1.1.1 Introduction

The Car Communication Application Promotion group (CCAP) is concerned that Car-WG profiles may not provide sufficient definition to assure interoperability of Bluetooth devices supporting these profiles. CCAP believes that this application guide for the Bluetooth PhoneBook Access applications will improve interoperability between handheld devices and the car, and help implementers understand the Phonebook Access Profile for user convenience. This guideline provides:

- Recommended values of parameters
- Recommended sequence charts
- Typical use cases
- Implementation issues

The intent is that this guideline be applied to the application layer above the Phonebook Access Profile (PBAP). CCAP may also provide additional guidelines in the future such as the Message Access Profile (MAP) etc. and future versions of these profiles.

1.1.2 Target system

The figure below shows a system diagram that this guideline specifies. PBAP and HFP (HandsFree Profile) may be operated together in some use cases. In this case the minimum functionality of the PhoneBook Client Equipment (PCE) or Handsfree Unit (HF) is a speaker, microphone, control switch and display. The Sound Generator is optional.

There might be a case of only PCE operation, without HF role such as PC. It should be also covered in this guideline.
1.1.3 Example of the system

1.1.4 Table of the Use Cases

<table>
<thead>
<tr>
<th>Category</th>
<th>Use Case</th>
<th>Description</th>
<th>PBAP Sect.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Standalone use cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.1 Phonebook download</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.1.1 Download of the main phonebook</td>
<td>Download the entire content of the main phone book object in &quot;pb&quot;</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>1.2.1.2 Download of call history information</td>
<td>Download the entire content of the call history object in &quot;ich&quot;, &quot;och&quot;, and &quot;mch&quot;</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>1.2.1.3 Usage of &quot;cch&quot; repository</td>
<td>Download the entire content of the call history object in &quot;ce&quot;</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>1.2.2 Phonebook browsing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.2.1 Download of selected entries</td>
<td>Browse the content of each folder, select and download entry/entries</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.2.2.2 Caller name lookup upon incoming call</td>
<td>Search the caller name from &quot;pb&quot; with CLI of an incoming call via HFP</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.2.2.3 Dial</td>
<td>Browse the content of each folder and dial a number via HFP</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.3 Multi-profile use cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.1 Caller name lookup upon incoming call</td>
<td>Search the caller name from &quot;pb&quot; with CLI of an incoming call via HFP</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.3.2 Consultation of the Phonebook during a conversation</td>
<td>Browse the content of each folder during a conversation via HFP</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.3.3 Consultation of the Phonebook during a DUN session</td>
<td>Browse the content of each folder during data transfer via DUN</td>
<td>4.3</td>
<td></td>
</tr>
</tbody>
</table>
1.2 **Standalone use cases**

1.2.1 **Phonebook download**

1.2.1.1 **Download of the main phonebook**

The PCE can download the PSE’s main phone book object.

- Main phone book object: pb

Figure 1 shows the example of the use case.

(PCE,HF)

Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG)

Mobile Phone

Figure 1: Download of the main phonebook

- Name: pb.vcf
- Application parameters:
  - `<MaxListCount>`: A value between "0" and "65535".
    - "0" means PSE shall return only the number of entries registered in the phonebook or call histories, without the body of entries. If PCE specifies the "MaxListCount" parameter to "65535", PSE can then return all entries even if there are more than "65535".
  - `<ListStartOffset>`: This header shall be used to indicate the offset of the first entry of the object. (The offset shall be 0 if this header is not specified.)

The PCE download the PSE’s main phone book object.

Main phone book of vCard form.

vCard
NAME: Abe
TEL: 090-XXXX-XXXX
EMAIL: abe@a.com
ADD:XXX,XXX-456
BDAY:2006/01/01

<Owner card>

The special handle 0.vcf in the pb folder is reserved for the owner card. It shall always be present and contain at least the mobile number of the PSE, whenever the PSE has the knowledge of this number. When the owner card is not known, handle 0.vcf can be an empty vCard, or a vCard that contains the mobile number of the PSE, if the PSE has a mobile number and does know it. The 0.vcf shall always be present in the pb.vcf file.
1.2.1.2 Download of call history information

The PCE can download the PSE's history information object.
- Incoming Calls History object: ich
- Outgoing Calls History object: och
- Missed Calls History object: mch
- Combined Calls History object: cch

Figure 2 shows the example of the use case.

(PCE,HF)  Car navigation system, Hands-Free device with display equipment, etc.
(PSE,AG)  Mobile Phone

The PCE download the PSE's main phone book object.

- Name: ich.vcf or och.vcf or mch.vcf or cch.vcf
- Application parameters:
  <MaxListCount>: A value between “0” and “65535”.
  “0” means PSE shall return only the number of entries registered in the phonebook or call histories, without the body of entries. If PCE specifies the “MaxListCount” parameter to “65535”, PSE can then return all entries even if there are more than “65535”.
  (5.1.4.3 MaxListCount)
  <ListStartOffset>: This header shall be used to indicate the offset of the first entry of the object. (The offset shall be 0 if this header is not specified.)
  (5.1.4.4 ListStartOffset)

- When there is NAME
  vCard
  NAME: Abe
  TEL: 090-XXXX-XXXX
  DATE: 2006/01/01
  TIME: HHMM/Dialed

- When there is no NAME
  vCard
  NAME: 
  TEL: 090-XXXX-XXXX
  DATE: 2006/01/01
  TIME: HHMM/Missed
1.2.1.3 Usage of “cch” repository

The integrated list of incoming call history, outgoing call history, and missed call history is stored in the combined call history (cch) repository. It depends on the implementation of PSE, how it integrates and how it indexes the entries. For example, PCE can display the entries in “cch” as the following order.

· By time stamp, call history is able to be arranged in call sequence.
· To be arranged with the frequency of call.
### 1.2.2 Phonebook browsing

#### 1.2.2.1 Retrieve selected entries

The PCE can retrieve the PSE's Phonebook-listing object and retrieve selected entries.

Figure 1 shows the example of the use case.

(PCE, HF)
Car navigation system, Hands-Free device with display equipment, etc.

(PSE, AG)
Mobile Phone

The PCE retrieves the PSE's Phonebook-listing object.

Phonebook(PSE)
- Abe
- Barfield
- Chiba
- Delacruz
- Egawa
> Next

Phonebook(PSE)
- Fujita
- Galvez
- Hara
- Ishii
- Johbe
Prev<

- (Alphabetical/Indexed/Phonetical) can be specified for an order of the Phonebook-listing object.
- The text string to search for the record that matched to the value of the (Name/Number/Sound) attribute can be specified.
- According to the ability of PCE, the List-Start-Offset and Max-List-Count can be additionally specified.

The following Phonebook-listing object can be acquired specifying List-Start-Offset.

All lists are acquired repeating processing.
The PCE retrieves selected Phonebook entry from the PSE.

Phonebook entry of vCard form.

The PCE retrieves selected Phonebook entry from the PSE.

Phonebook entry of vCard form.

AttributeMask can be specified for filtered vCard.

PCE can select one or more Phonebook entries and retrieve selected entries.

Retrieving selected entries is done.

Figure 1: Retrieve Selected entries

vCard
NAME: Galvez
TEL: 090-XXXX-XXXX
EMAIL: Chiba@def.com
ADD: XXX, XXX-123
BDAY: 2006/11/11

vCard
NAME: Ishii
TEL: 090-XXXX-XXXX
EMAIL: Tokyo@t.com
ADD: XXX, XXX-789
BDAY: 2006/12/12

Two or more Phonebook entries can be acquired by repeating processing.
1.2.2.2 **Caller name lookup upon incoming call**

The PCE searches the phonebook entry from the PSE, and can retrieve it. Figure 2 shows the example of the use case.

![Diagram showing caller name lookup upon incoming call](image-url)

**Figure 2: Caller name lookup upon incoming call**

(PCE, HF)
Car navigation system, Hands-Free device with display equipment, etc.

(PCE, HF)
Mobile Phone

Incoming call

Caller ID notification (HFP)

090-XXXX-XXXX

The PCE retrieves the phonebook of the PSE by Caller ID (PBAP)

Phonebook listing object

<card handle = "nn.vcf"
name = "XXXX">

The PCE displays caller name “XXXX”.

Figure 2: Caller name lookup upon incoming call
1.2.2.3 **Dial**

The PCE can dial it from the telephone book with HFP. The PCE can store Phonebook entries in PCE's Phonebook. Figure 3 shows the example of the use case.

(PCE,HF) Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG) Mobile Phone

![Diagram of dialing process]

The PCE retrieves the Phonebook entries of the PSE. (see 1.2.2.1)

Dial **090-XXXX-XXXX** (HFP)

Outgoing call

**vCard**
NAME: Galvez
TEL: 090-XXXX-XXXX
EMAIL: Chiba@def.com
ADD: XXX, XXX-123
BDAY: 2006/11/11

The PCE can execute the following functions for the retrieved Phonebook entries.
- The PCE can store Phonebook entries in PCE's Phonebook.
- The PCE can dial number of the Phonebook entry.

Figure 3: Dial
1.3 Multi-profile use cases

1.3.1 Caller name lookup upon incoming call

Refer to 1.2.2.2.

1.3.2 Consultation of the Phonebook during a conversation

The PCE can consult the Phonebook during a conversation with HFP if the PSE supports the multi-profile.

Figure 4 shows the example of the use case.
Figure 4: Consultation of the Phonebook during a conversation

The PCE retrieves selected Phonebook entry from the PSE.

Phonebook entry of vCard form.

The PCE retrieves selected Phonebook entry from the PSE.

Phonebook entry of vCard form.

Two or more Phonebook entries can be acquired by repeating processing.

AttribMask can be specified for filtered vCard.

PCE can select one or more Phonebook entries and retrieve selected entries.

Figure 4: Consultation of the Phonebook during a conversation

Retrieving selected entries is done.
1.3.3 Consultation of the Phonebook during a DUN session

The PCE can retrieve the PSE’s Phonebook-listing object and retrieve selected entries during a DUN session.

Figure 5 shows the example of the use case.

(PCE,HF,DT)
Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG,GW)
Mobile Phone

1.3.3 Consultation of the Phonebook during a DUN session

The PCE can retrieve the PSE’s Phonebook-listing object and retrieve selected entries during a DUN session.

Figure 5 shows the example of the use case.

(PCE,HF,DT)
Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG,GW)
Mobile Phone

1.3.3 Consultation of the Phonebook during a DUN session

The PCE can retrieve the PSE’s Phonebook-listing object and retrieve selected entries during a DUN session.

Figure 5 shows the example of the use case.

(PCE,HF,DT)
Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG,GW)
Mobile Phone

1.3.3 Consultation of the Phonebook during a DUN session

The PCE can retrieve the PSE’s Phonebook-listing object and retrieve selected entries during a DUN session.

Figure 5 shows the example of the use case.

(PCE,HF,DT)
Car navigation system, Hands-Free device with display equipment, etc.

(PSE,AG,GW)
Mobile Phone
2 General Implementation Issues

2.1 Link establishment

The PSE and the PCE shall create a sure connection specified in section 2.5 “Bluetooth Security” of PBAP. This Procedure may include entering a Passkey and will include creation of link keys. A fixed Passkey may also be used during the GAP authentication procedure. The PBAP mandates the use of several Bluetooth security features:

<table>
<thead>
<tr>
<th>Security features</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security mode</td>
<td>2 or 3 shall be used.</td>
</tr>
<tr>
<td>Encryption</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Passkey</td>
<td>A zero-length passkey shall be prohibited.</td>
</tr>
<tr>
<td>Link keys</td>
<td>Combination keys shall be used.</td>
</tr>
<tr>
<td>Encryption key length</td>
<td>At least 64 bits. Maximum length is recommended.</td>
</tr>
<tr>
<td>User confirmation</td>
<td>The PSE user shall have to confirm at least the first PBAP connection from each new PCE.</td>
</tr>
</tbody>
</table>

Either the PSE or the PCE may initiate bonding. As a minimum the PSE shall support Inquiry in order to initiate bonding. Both the PSE and the PCE shall support Inquiry Scan Mode in order to accept bonding. (2.4 Profile fundamental)

The SDP record for the PCE can be ignored for current Bluetooth V2.0, however, it will be effective if QoS is applied in the future. The PSE will be able to prepare for connecting PBAP from the PCE in anytime.

2.2 vCard format

The format of the phonebook should be followed ver.2.1 of vCard. However, especially considering in Japanese situation, the PCE has to handle some of the ver.3.0 of vCard because the property of “Sort-String” is used for information of “Furigana” in vCard 3.0. The following requirements or attentions should be considered for implementation.

2.2.1 Properties

Properties of vCard for a standard cellular phone, which shall be careful to be implemented, are listed below. Multiple phone numbers for a name entry of vCard can be stated. However, this guideline does not specify the number of phone numbers.

The PSE shall support VERSION, TEL and N as mandatory. In case of vCard 3.0, FN shall be also mandatory. SOUND for ver. 2.1 or Sort-String for ver. 3.0 is recommended to be Mandatory in Japanese implementation. (*1)
<table>
<thead>
<tr>
<th>Bit</th>
<th>Property</th>
<th>Name</th>
<th>Support</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>VERSION</td>
<td>Version</td>
<td>M</td>
<td>vCard 2.1 or vCard 3.0</td>
</tr>
<tr>
<td>1</td>
<td>FN</td>
<td>Formatted name</td>
<td>M</td>
<td>Mandatory for vCard 3.0</td>
</tr>
<tr>
<td>2</td>
<td>N</td>
<td>Name</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PHOTO</td>
<td>Associated Image or Photo</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BDAY</td>
<td>Birthday</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ADR</td>
<td>Address</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LABEL</td>
<td>Delivery</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TEL</td>
<td>Phone number</td>
<td>M</td>
<td>Allow multiple entries</td>
</tr>
<tr>
<td>8</td>
<td>EMAIL</td>
<td>Electronic Mail address</td>
<td>O</td>
<td>Allow multiple entries</td>
</tr>
<tr>
<td>9</td>
<td>Mailer</td>
<td>Electronic Mail</td>
<td>O</td>
<td>Type of email software</td>
</tr>
<tr>
<td>10</td>
<td>TZ</td>
<td>Time Zone</td>
<td>O</td>
<td>Offset from UTC</td>
</tr>
<tr>
<td>11</td>
<td>GEO</td>
<td>Geographic Position</td>
<td>O</td>
<td>Longitude and latitude</td>
</tr>
<tr>
<td>12</td>
<td>TITLE</td>
<td>Job</td>
<td>O</td>
<td>Job title</td>
</tr>
<tr>
<td>13</td>
<td>Role</td>
<td>Role within the Organization</td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td>LOGO</td>
<td>Organization Logo</td>
<td>O</td>
<td>Image or graphic</td>
</tr>
<tr>
<td>15</td>
<td>AGENT</td>
<td>vCard of Person Representing</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>ORG</td>
<td>Name of Organization</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>NOTE</td>
<td>Comments</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>REV</td>
<td>Revision</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Sound</td>
<td>Pronunciation of name</td>
<td>M¹</td>
<td>Date and time of the last Update to the vCard Furigana (for vCard 2.1)</td>
</tr>
<tr>
<td>20</td>
<td>URL</td>
<td>Uniform Resource Locator</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>UID</td>
<td>Unique ID</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>KEY</td>
<td>Public Encryption Key</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>NICKNAME</td>
<td>Nickname</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CATEGORIES</td>
<td>Categories</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>PROID</td>
<td>Product ID</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>CLASS</td>
<td>Class Information</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Sort-String</td>
<td>String used for sorting operations</td>
<td>M¹</td>
<td>Furigana (for vCard 3.0)</td>
</tr>
<tr>
<td>28</td>
<td>X-IRMC-CALL-DATETIME</td>
<td>Time stamp</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>29-38</td>
<td>Proprietary Filter</td>
<td>Reserved for future use</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Proprietary Filter</td>
<td>Indicates the usage of a proprietary filter</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>40-63</td>
<td>Proprietary Filter</td>
<td>Reserved for proprietary filter usage</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

(5.4.4.1 Filter {AttributedMask(64-bit value)} Table 5.2 Attributed Mask)
(1) Character code settings: CHARSET, ENCODING
   - CHARSET: UTF-8
   - ENCODING: Quoted-Printable
PBAP mandates UTF-8 as default and does not allow other character sets to be used. However, some legacy devices have implemented to send Japanese characters with Shift-JIS character sets. Therefore it recommends for the PCE to decode Shift-JIS character sets to keep higher interoperability.

(2) Version information: VERSION
   - vCard 2.1 / vCard 3.0 (3.1.4 Phone Book Entries Format)

(3) Formatted name: FN
   - This property specifies the formatted name string associated with the vCard object. This is the way that the name is to be displayed. It can contain desired honorific prefixes, suffixes, titles, etc. For example, “Mr. John Q. Public, Jr.”, Dr. Ann Tyler, or Hon. Judge Blackwell. This property is based on the semantics of the X.520 Common Name attribute.
   The following is an example of the Formatted Name property:
   FN:Mr. John Q. Public, Esq.

(4) Name: N
   - When the delimiter between the first name and the last name is needed, ‘;’ shall be used. The first Name shall be set in Field-2 and the last name in Field-1.
   When the delimiter is not needed, the first name and the last name shall be set in Field-1.
   If the PSE uses no structure of name representation, the PSE should provide everything as a LastName field of the N attribute. Other more advanced internal representations should be able to map correctly the name information into a structured N vCard attribute. (3.1.6.1 Name attribute format)

(5) Address: ADR
   - Each field of ADR is shown below:
     Field-1 Postal address (Not popular in Japan.)
     Field-2 Extension address (Room No. of apartment, dormitory etc.)
     Field-3 Street (House No., Block No. etc.)
     Field-4 Minor district (Town, City etc.)
     Field-5 Major district (State, Prefecture etc.)
     Field-6 Postal code
     Field-7 Country
   - If the address cannot be classified, it shall be described in Field-2.

(6) Telephone number: TEL
   - Multiple TEL shall be able to be included in a vCard.
   - Type of TEL shall be supported at least 5, general, cellular, home, work and FAX.
   - Multiple TEL shall be able to be set for a type of TEL.
   - Example of type of TEL and the parameter:
     General -> VOICE [default]
     Cellular -> CELL
     Home -> HOME;VOICE
     Work -> WORK;VOICE
     FAX -> FAX
(7) E-mail address: EMAIL
   - Multiple EMAIL shall be able to be included in a vCard.
   - Multiple EMAIL shall be able to be set for the same address type of e-mail.
   - The parameter shall be supported at least INTERNET [default].

(8) Company name: ORG
   - Company name shall be set in Field-1.
   - Section name shall be set in Field-2.

(9) Furigana: SOUND (for 2.1) or Sort::String (for 3.0)
   - The extended parameter shall be used to indicate which property of “Furigana” is.
   - Default parameter shall be X-IRMC-N.
   - Extended parameter name of property adding X-IRMC-“Furigana”
   - Field etc. Same field shall exist as described after X-IRMC-[Property].
   - CHARSET, ENCODING CHARSET: UTF-8, ENCODING: Quoted-Printable
   - Using the extended parameter X-IRMC-N, this shall be “Furigana” of N and have five fields as same as N.

(10) Time stamp: X-IRMC-CALL-DATETIME
    - The time of each call found in och, ich, mch and cch folder, can be shown using the IrMC defined X-IRMC-CALL-DATETIME property that extends the vCard specification. This attribute can be used in combination with three newly created property parameters:
      - MISSED
      - RECEIVED
      - DIALED
    These are used to indicate the nature of the call that is time-stamped with X-IRMC-CALL-DATETIME.
    For instance, a call that was missed on March 20th, 2005 at 10 am would be stamped:
    X-IRMC-CALL-DATETIME;MISSED:20050320T100000
    It is strongly recommended to use this property parameter whenever possible. They are especially useful in vCards that are retrieved from the cch folder.
    Note that it is legal to use this property with no data i.e.,
    X-IRMC-CALL-DATETIME;MISSED:
    This scenario may occur if the device did not have the time/date set when the call was received. The phone number would be recorded but no date/time could be attached to it.
    It will still need to be added to the vCard as the cch log needs it to indicate the type of call that the record identifies. (3.1.4.1 Call History extension)
    Time stamp should be used UTC or local time in combination with TZ, Time Zone so that call histories can be sorted in time order.

2.2.2 Owner's vCard
   The special handle 0.vcf in the pb folder shall be reserved for the owner's card. It shall always be present. When the owner card is not known, index 0 can be an empty vCard, or a vCard that contains the mobile number of the PSE, if the PSE has a mobile number and does know it. The 0.vcf shall be present in the pb.vcf file.
   (3.1.5.2 Local Phone Books: PB and SIM1)

2.2.3 Call history
   For call history items, only the phone number used for the call shall be included in
the TEL vCard field, rather than every number. (3.1.5.3 Call Histories)

The X-IRMC time stamp attribute shall be always present even if no time information is available for a given history item, since it conveys the nature of the missed, outgoing and incoming call history.

Regarding the vCard format for call histories which does not have phone number information because of an errata is proposed. This will be defined as X-IRMC extensions, CLI_BARRED, CLI_UNAVAILABLE and CLI_PUBLICPHONE.

2.3 Handles

All the vCards of the PSE are identified by their handle (<handle.vcf>). The handles are 32 bit values, represented as up to 8 hexadecimal digits. The length of the handles can be variable.

PBAP has been developed on the assumption that the handles are not modified during the lifespan of a given PBAP session i.e. that the internal index and the actual content of each vCard does not change. If for some reason the implementation allows for handle modifications (including possibly deletion operations) during an active PBAP session, it shall support either of the following 2 behaviours:

Error reporting: If any of the handles are modified/deleted during an active PBAP session, then the PSE shall return Error "Precondition failed" to all read requests until the PCE has updated the vCard listing.

Change tracking: The PSE keeps track of all the changes that are brought to the handles during the active PBAP session.

(3.1.5.1 Handles)
2.4 Folder Structure

OBEX SetPath Command (the basis for the SetPhoneBook function) allows only for setting the current folder to the root, parent or a child folder. For example in order to set the current phone book folder to "pb", from the root, it is necessary to apply SetPath twice: the first is necessary to change into "telecom" and the second is necessary to change into "pb". (5.2 SetPhoneBook Function)
2.5 Attributes filtering

With the exception of the mandatory attributes, the attributes that are requested by the PCE can be ignored by the PSE in case the PSE does not support them. However, all the attributes that are supported by the PSE shall be returned, provided that their value is not null for the current phone book entry. For instance, if the PSE supports EMAIL and TITLE (in addition to VERSION, N and TEL) and the PCE requests the EMAIL and BDAY attributes, the PSE shall include EMAIL in the vCard objects that are returned to the PCE for which the value of EMAIL is not null (in addition to the mandatory VERSION, N and TEL fields).

The basic rules are:
- Absence of "Filter" means that all the attributes shall be returned.
- Filter = 0x00000000 means that all the attributes shall be returned.
- It is mandatory for the PSE to support and be capable of returning N and TEL in the case of vCard2.1, FN and TEL in the case of vCard3.0. Also SOUND or Sort-String shall be supported in Japanese implementation.
- Besides N, FN and TEL, the PSE can ignore the attributes that it does not support.
- All the attributes that are supported by the PSE and are requested by the PCE shall be returned to the PCE.

(5.1.4.1 Filter {AttributeMask (64-bit value)})

2.6 Example of the usage for MaxListCount and ListStartOffset

```
<table>
<thead>
<tr>
<th>&lt;Case 1&gt;</th>
<th>vCard in “pb”</th>
</tr>
</thead>
<tbody>
<tr>
<td>offset</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.vcf</td>
</tr>
<tr>
<td>1</td>
<td>1.vcf</td>
</tr>
<tr>
<td>2</td>
<td>2.vcf</td>
</tr>
<tr>
<td>3</td>
<td>3.vcf</td>
</tr>
<tr>
<td>:</td>
<td>..</td>
</tr>
<tr>
<td>n</td>
<td>n.vcf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&lt;Case 2&gt;</th>
<th>vCard in “pb”</th>
</tr>
</thead>
<tbody>
<tr>
<td>offset</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>7.vcf</td>
</tr>
<tr>
<td>1</td>
<td>2.vcf</td>
</tr>
<tr>
<td>2</td>
<td>5.vcf</td>
</tr>
<tr>
<td>3</td>
<td>0.vcf</td>
</tr>
<tr>
<td>:</td>
<td>..</td>
</tr>
<tr>
<td>m</td>
<td>xx.vcf</td>
</tr>
</tbody>
</table>
```

Case 1:
- PullPhoneBook/PullvCardListing result with MaxListCount=0
  The PSE shall return a value ‘n’, the number of vCard.
- PullPhoneBook/PullvCardListing result with MaxListCount=3, ListStartOffset=0
  The PSE shall return 0.vcf, 1.vcf and 2.vcf.
- PullPhoneBook/PullvCardListing result with MaxListCount=3, ListStartOffset=1
  The PSE shall return 1.vcf, 2.vcf and 3.vcf.

Case 2:
- PullPhoneBook/PullvCardListing result with MaxListCount=0
  The PSE shall return a value ‘m’, the number of vCard.
- PullPhoneBook/PullvCardListing result with MaxListCount=3, ListStartOffset=0
  The PSE shall return 7.vcf, 2.vcf and 5.vcf.
- PullPhoneBook/PullvCardListing result with MaxListCount=3, ListStartOffset=1
  The PSE shall return 2.vcf, 5.vcf and 0.vcf.
3 Phonebook Download Implementation Issues

3.1 Download of the main phonebook

If PCE specifies the “MaxListCount” parameter to 0, PSE shall return only the number of entry registered in the phonebook or call history without the body of entries.

65535 is the maximum possible size for “MaxListCount”. However, if PCE specifies the “MaxListCount” parameter to 65535, PSE can then return all entries even if there are more than 65535.
3.2 **Download of call history information**

PSE shall return only one telephone number related to “incoming call” or “outgoing call” in a vCard.

When requesting for the call history, PSE returns a set of entries with each entry containing a telephone number from the call history list together with the name of the owner of this number based on the phonebook. This is instead of sending the original phonebook entry which may contain several other phone numbers.

When PCE requests for the "Missed Call" history, PSE shall return the number of recent missed call using the “NewMissedCalls” parameter.

In the event when PSE cannot confirm the exact number of recent missed calls but it is definite that there is at least 1 missed call: it would set the variable “NewMissedCalls” to 65535.

The integrated list of incoming call history, outgoing call history, and missed call history is stored in the combined call history (cch) repository. It depends on the implementation of PSE, how it integrates and how it indexes the entries.


4 Phonebook Browsing Implementation Issues

4.1 Generic issues

4.1.1 SetPhoneBook Function

Usages of the SetPhoneBook Function are allowed only three types: (1) Go back to root, (2) Go down 1 level, and (3) Go up 1 level. The Name header doesn’t use absolute path name for this function. The usage of the flags and Name header is as follows: (5.2 SetPhoneBook Function)

<table>
<thead>
<tr>
<th>(1) Go back to root</th>
<th>(2) Go down 1 level</th>
<th>(3) Go up 1 level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flags bit 0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flags bit 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Flags bit 2-7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Name header</td>
<td>EMPTY</td>
<td>name of the child folder optional</td>
</tr>
</tbody>
</table>

Example: Going to “SIM1/telecom/ich” from “SIM1/telecom/pb”

<table>
<thead>
<tr>
<th>type</th>
<th>current folder</th>
<th>type</th>
<th>current folder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go up 1 level</td>
<td>1</td>
<td>Go back to root</td>
</tr>
<tr>
<td>2</td>
<td>Go down 1 level</td>
<td>2</td>
<td>Go down 1 level</td>
</tr>
<tr>
<td></td>
<td>“SIM1/telecom”</td>
<td>3</td>
<td>Go down 1 level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Go down 1 level</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“SIM1/telecom/pb”</td>
</tr>
</tbody>
</table>

In both cases, PCE can set the current folder, but in the Case1, PCE has to know a path name of the current folder without asking PSE. There is no command to retrieve the path name from PSE.

4.1.2 Search Function

The header of “Search Attribute” shall be used to indicate to the PSE, which vCard attribute the search operation shall be carried out on. If this header is not specified, the search shall be performed on the “Name” attribute. (5.3.4.2 SearchAttribute)

This header of “Search Value” shall be used to indicate to the PSE, which vCards shall be contained in the object. All the vCards shall be returned if this header is not specified. The UTF-8 character set shall be used for <text_string> in this header. (5.3.4.3 SearchValue)

4.1.3 Sorting Function

The sorting algorithm is implementation dependent. UTF-8 conversion should be performed before the sorting.

The sorting algorithm should be based on UTF-8 representation of the Sound attribute. Note that sorting on the Sound attribute makes sense only when the Sound attribute values of the phonebook objects on the PSE are in textual form. (5.3.4.1 Order)
4.2 Retrieve selected entries

4.2.1 Retrieve selected entries w/o search parameter

Retrieve of selected phone book objects

Car Equipment

HMI | PCE

Cellular Phone

PSE | HMI

Cellular Network

Session Establishment (PBAP)

SetPath (Go back to root)
Flags = 0x02
Name header = EMPTY

Success

SetPath (Go down 1 level)
Flags = 0x02
Name header = "SIM1"

Success

SetPath (Go down 1 level)
Flags = 0x02
Name header = "telecom"

Success

Get
Type = "x-bt/vcard-listing"
Name header = "pb"
MaxListCount = 0

Success with vcard-listing object
(with PhonebookSize)

Get
Type = "x-bt/vcard-listing"
Name header = "pb"
MaxListCount = 5

Success with vcard-listing object

Parameters of vcard-listing
Max List Count
number of entries PCE wants to retrieve
List Start Offset
offset of the first entry of the retrieved object

Ex) PCE wants to retrieve 5 entries every time.
1st : MaxListCount = 5, ListStartOffset = 0
2nd : MaxListCount = 5, ListStartOffset = 5

if user selects SIM card.

if PCE wants to know the number of entries.

if user selects call history, for
Incoming calls : Name header = "ich"
Outgoing calls : Name header = "och"
Missed calls : Name header = "mch"
Combined calls : Name header = "cch"

select next list
select next phonebook
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object
select next phonebook
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object
Session Release (PBAP)
exit phonebook browsing
4.2.2 Retrieve selected entries with search parameter

Retrieve of selected phone book objects

<table>
<thead>
<tr>
<th>Car Equipment</th>
<th>Cellular Phone</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>PCE</td>
<td>PSE</td>
</tr>
</tbody>
</table>

- **select device**
  - **SetPath (Go back to root)**
    - Flags = 0x02
    - Name header = EMPTY
    - Success
  - **SetPath (Go down 1 level)**
    - Flags = 0x02
    - Name header = "SIM1"
    - Success
  - **SetPath (Go down 1 level)**
    - Flags = 0x02
    - Name header = "telecom"
    - Success

- **listing folder**
- **select phonebook in the phone's memory**
  - **Get**
    - Type = "x-bt/vcard-listing"
    - Name header = "pb"
    - MaxListCount = 0
    - Order = 0x01
    - Search Value = "<value>"
    - Search Attribute = 0x00
    - Order is 0x00: indexed
      0x01: alphabetical
      0x02: phonetical
    - Search Attribute is 0x00: Name
      0x01: Number
      0x02: Sound
    - Search Value is text of word.
    - Success with vcard-listing object (with PhonebookSize)
  - **Get**
    - Type = "x-bt/vcard-listing"
    - Name header = "pb"
    - MaxListCount = 5
    - Order = 0x01
    - Search Value = "<value>"
    - Search Attribute = 0x00
    - Success with vcard-listing object

- **if user selects SIM card.**
- **if PCE wants to know the number of entries.**
- **if PCE wants to know the number of entries.**
- **if user selects call history,** for
  - Incoming calls: Name header = "ich"
  - Outgoing calls: Name header = "och"
  - Missed calls: Name header = "mch"
  - Combined calls: Name header = "cch"
  - Order is 0x00: indexed
    0x01: alphabetical
    0x02: phonetical
  - Search Attribute is 0x00: Name
    0x01: Number
    0x02: Sound
  - Search Value is text of word.
repeat to find targeted phonebook.

select other list
display phonebook
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"

Success with vcard-listing object

select phonebook
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object
Set "List Start Offset"

select next phonebook
display phonebook
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object

exit phonebook browsing
Session Release (PBAP)
4.3 **Caller name lookup upon incoming call**

4.3.1 **Caller name lookup upon incoming call ("telecom/pb")**

PCE retrieves caller name from incoming call number, so AG (PSE) has to send HF (PCE) caller number.

At the following MSC, PBAP session is established after the +CLIP message. If PBAP session is established before incoming call, the displayed caller name may be incorrect. The phonebook entry may be modified at the incoming call.

It is assumed that the handles are not modified during this period.

"nnn" is the caller number of +CLIP message.
Success with vcard-listing object

SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"

Success

Get
Type = "x-bt/vcard"
Name = "><handle>.vcf"

Success with vcard object

display phonebook

Session Release (PBAP)

After the caller name displayed, PBAP session should be released

accept

if audio connection is not

audio connection established

call active

Session Release (PBAP)

audio connection established

start the call establishment procedure and the call established

voice communication
4.3.2 Caller name lookup upon incoming call (“SIM1/telecom/pb”)

In this chart, PSE can’t find the caller name in the folder “telecom/pb”. PSE tries to look up another folder “SIM1/telecom/pb”, and find the caller name in this folder. At the following MSC, PBAP session is established after the +CLIP message. If PBAP session is established before incoming call, the displayed caller name may be incorrect. The phonebook entry may be modified at the incoming call.

**Caller name lookup upon incoming call**

- AG needs to send the caller number.
- It is assumed that the handles are not modified during this period.
- "nnn" is the caller number of +CLIP message
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "SIM1"
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "telecom"
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"
SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"
Success
Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "SIM1"
Success
SetPath (Go down 1 level)
Flags = 0x02
Name header = "telecom"
Get
Type = "x-bt/vcard-listing"
Name = "pb"
MaxListCount = 1
Search Value = nnn
Search Attribute = 0x01
Success with vcard-listing object
Session Release (PBAP)
After the caller name displayed, PBAP session should be released
If audio connection is not
start the call establishment procedure and the call established
Call active
Voice communication
accept
Audio connection established
ATA
OK
+CIEV : (call = 1)
+CIEV : (callsetup = 0)
"nnn" is the caller number of +CLIP message
Display phonebook
Display phonebook
Display phonebook
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4.4 Dial

4.4.1 Dialing from retrieved phonebook entry

Dialing

Cellular Phone

| AG | PSE | HMI |

Car Equipment

| HMI | PCE | HF |

Service Level Connection (HFP)

Session Establishment (PBAP)

SetPath (Go back to root)
Flags = 0x02
Name header = EMPTY

Success

SetPath (Go down 1 level)
Flags = 0x02
Name header = "telecom"

Success

Get
Type = "x-bt/vcard-listing"
Name header = "pb"
MaxListCount = 0

Success with vcard-listing object

if PCE wants to know the number of entries.

if user selects SIM card.

if user selects call history, for
Incoming calls : Name header = "ich"
Outgoing calls : Name header = "och"
Missed calls : Name header = "mch"
Combined calls : Name header = "cch"
repeat to find targeted phonebook.

listing phonebook

select phonebook

Get
Type = "x-bt/vcard-listing"
Name header = "pb"
MaxListCount = 5
Success with vcard-listing object

SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"
Success

Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object

select phonebook

display phonebook

select next phonebook

Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"
Success with vcard object

display phonebook

dialing

Session Release (PBAP)

After select phonebook for dialing, PBAP session should be released

ATD ddddd…;

OK

+CIEV : (callsetup = 2)

audio connection established

if audio connection is not

if the AG enables to transfer ring back tone

audio connection setup (HFP 4.11)

start the call establishment procedure using the phone number ddddd
+CIEV : (callsetup = 3)
+CIEV : (call = 1)
+CIEV : (callsetup = 0)

voice communication

the call established
4.4.2 Dialing from incoming call history (PSEs entries are modified during an active PBAP session)

If any of the PSEs entries are modified/deleted during an active PBAP session, then the PSE shall return Error "Precondition failed" to all read requests until the client has updated the vCard-listing. When the PCE receive Error “Precondition failed”, PCE shall go back to root folder and retry to retrieve Phonebook entries. If PSE has “Change tracking” function, PSE does not return Error. In this case, the MSC is similar to section 4.4.1.

**Dialing**

```
<table>
<thead>
<tr>
<th>Car Equipment</th>
<th>Cellular Phone</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>PCE</td>
<td>AG</td>
</tr>
<tr>
<td>PSE</td>
<td>HMI</td>
<td>PSE</td>
</tr>
</tbody>
</table>
```

- **Service Level Connection**
- **Session Establishment (PBAP)**
  - SetPath (Go back to root)
    - Flags = 0x02
    - Name header = "EMPTY"
  - Success
- **Listing folder**
- **select phonebook in the phone's memory**
  - SetPath (Go down 1 level)
    - Flags = 0x02
    - Name header = "telecom"
  - Success
  - SetPath (Go down 1 level)
    - Flags = 0x02
    - Name header = "SIM1"
  - Success
  - Get
    - Type = "x-bt/vcard-listing"  
      - Name header = "pb"  
      - MaxListCount = 0
    - Success with vcard-listing object (with PhonebookSize)
    - Get
      - Type = "x-bt/vcard-listing"  
        - Name header = "ich"
        - MaxListCount = 5
Error code
"Precondition Failed"

SetPath (Go down 1 level)
Flags = 0x02
Name header = "ich"

Success

Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"

Error code
"Precondition Failed"

SetPath (Go back to root)
Flags = 0x02
Name header = "telecom"

SetPath (Go down 1 level)
Flags = 0x02
Name header = "SIM1"

Success

SetPath (Go down 1 level)
Flags = 0x02
Name header = "pb"

Get
Type = "x-bt/vcard-listing"
Name header = "ich"
MaxListCount = 5

Success with vcard-listing object

Get
Type = "x-bt/vcard-listing"
Name header = "ich"
MaxListCount = 5

Success with vcard-listing object

SetPath command is not "read requests".
PSE shall return Error "Precondition Failed" to all read requests.

Incoming call

Modified incoming call history (ich)

PCE must retry browsing from root folder.

If user selects SIM card.

If PCE wants to know the number of entries.

Select phonebook or dialing

Listing phonebook

Select other list

Listing phonebook

Repeat to find targeted phonebook.
Success with vcard-listing object

Get
Type = "x-bt/vcard-listing"
Name header = "ich"
MaxListCount = 5

Success with vcard-listing object

Get
Type = "x-bt/vcard-listing"
Name header = "ich"
MaxListCount = 5

Success

Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"

Success with vcard object

SetPath (Go down 1 level)
Flags = 0x02
Name header = "ich"

Success

Get
Type = "x-bt/vcard"
Name = "<handle>.vcf"

Success with vcard object

select phonebook or dialing

list phonebook

select other list

listing phonebook

repeat to find targeted phonebook.

repeat to find targeted phonebook.

after select phonebook for dialing, PBAP session should be released

Session Release (PBAP)

ATD ddddd...;

OK

+CIEV : (callsetup = 2)

after select phonebook for dialing, PBAP session should be released

if audio connection is not

audio connection established

audio connection established
If the AG enables to transfer ring back tone:

- Start the call establishment procedure using the phone number ddddd.

The call established:

- +CIEV : (callsetup = 3)
- +CIEV : (call = 1)
- +CIEV : (callsetup = 0)

Voice communication:

- Call active
- Ring back tone