1CRM 8.0 DEVELOPER GUIDE

A Comprehensive Guide to Developing Customizations and Extensions for 1CRM

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Disclaimer

While every effort has been made to ensure the accuracy and completeness of information included in this document, no guarantee is given, or responsibility taken, by 1CRM Corp. for errors and omissions.

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1.0 Welcome

Thank you for using 1CRM! Release 8.0 of the 1CRM Customer Relationship and Business Management (CRBM) System is designed to further energise your organisation's efforts to efficiently organise and maintain information that is crucial to many aspects of your business. 1CRM enables organizations to do business, better.

The 1CRM system is available in four Editions:

- Startup Edition: Free for use On Premise. Request a license key and download link, and you can install Startup Edition on your own server at no charge. It offers all the features of 1CRM Professional Edition, but is limited to 3 Users, 300 Accounts, 750 Leads, 750 Contacts, and 750 Targets. Although it only offers Community support, and no updates, the Startup Edition is a great way for an early stage business to get itself organized and productive while operating on a shoestring budget!
- Startup+ Edition: Similar to the Startup Edition, but for somewhat larger firms, with capacity limits of 10 users, 600 Accounts, 1,500 Contacts, 1,500 Leads and 1,500 Targets. Unlike the Startup Edition, this is a commercial product, available on the 1CRM Cloud or for On Premise software installation.
- Professional Edition: Formerly known as **info@hand**, 1CRM Professional is our mainstream small business CRM product offering, available on the 1CRM Cloud or for On Premise software installation.
- Enterprise Edition: Our premium product. It offers all the features of 1CRM Professional Edition, plus a number of additional features of particular interest to larger, more sophisticated businesses. Administrators can use the Module Designer and PDF Form Designer to create more advanced customizations. Price Books let you establish pricing for multiple client levels. The iOS client provides optimized system access from an iPhone. And Advanced Reporting offers more sophisticated reporting capabilities.

Unlike most CRM solutions, 1CRM offers comprehensive Order Management. It includes a Product Catalog, plus the ability to create Quotations, Sales Orders and Invoices using products from the Catalog. Incoming Payments may be received and allocated against invoices, and the system can produce PDF documents for Quotes, Sales Orders, Invoices, Receipts, and Statements. Purchase Orders may also be created, and Outgoing Payments recorded against them.

1CRM also offers extensive features for Project Management, Service Management, and general office administration (including Expense Reports, Timesheets, Vacation scheduling and tracking, and HR).

Most importantly, the 1CRM system seamlessly blends all of these capabilities into an intuitive and friendly interface. The instructions in this guide will introduce you to the most important CRM concepts and help you get familiar with using your 1CRM system.

1.1 About this Guide

This guide is written for those individuals tasked with adapting the 1CRM system for specialized uses. It is current with the details of operation for 1CRM 8.0. It is designed to explain methods for customization of the 1CRM system, maintaining compatibility with future upgrades to the base product as much as possible.

Readers are expected to be proficient in software development in a web-based environment, including a working knowledge of Apache, PHP and MySQL. For user interface enhancements, capability in JavaScript and CSS may be necessary.

1.2 Who Should Read this Guide?

This 1CRM *Developer Guide* is intended for IT personnel and contractors who are developing custom extensions for the 1CRM system. It is also meant for project managers who need to estimate the scope and duration of development work.

It is not intended for conventional users who wish to record and track company activities and outcomes, or for system administrators looking to install and optimize the 1CRM system – those topics are dealt with in the 1CRM *User Guide* and *Implementation Guide*.

1.3 Additional Documentation

The 1CRM Customer Relationship and Business Management (CRBM) system offers this documentation for the installation and use of its various components:

- 1CRM System User Guide
- 1CRM System Implementation Guide
- 1CRM System Developer Guide
- 1CRM Customer Self-Service Portal & eStore Guide
- 1CRM Finance for QuickBooks Implementation Guide

2.0 Integration with Web Services

2.1 Compatibility APIs

A number of our clients have been interested to use a variety of SugarCRM add-on products from third-party vendors, since the 1CRM core CRM was originally built (starting in 2004) on a base of SugarCRM Open Source.

One of the key issues is the use of third party software that was designed to link with SugarCRM using SOAP or REST web services interfaces. The current revision of 1CRM includes very little residual software from the SugarCRM Open Source project. However, it has been engineered to be closely compatible to the SOAP and REST APIs of SugarCRM CE release 6.4. Note that the methods available (and reported in the generated WSDL file) will depend on the entry point used: soap.php for the evolving, native SOAP API, and service/v[#]/soap.php for specific SugarCRM API versions.

When a third party software uses a SOAP or REST call to 1CRM to ask for the version of SugarCRM software, 1CRM replies with this version info (6.4) by default. If you wish for some reason to change this answer, you may do so, by overriding the *soap.public_version* setting in your *local_config.php* file. This ability to override the reported SugarCRM version can be useful to maintain compatibility with software such as Outlook and ThunderBird plugins that support SugarCRM Community Edition via a SOAP connection.

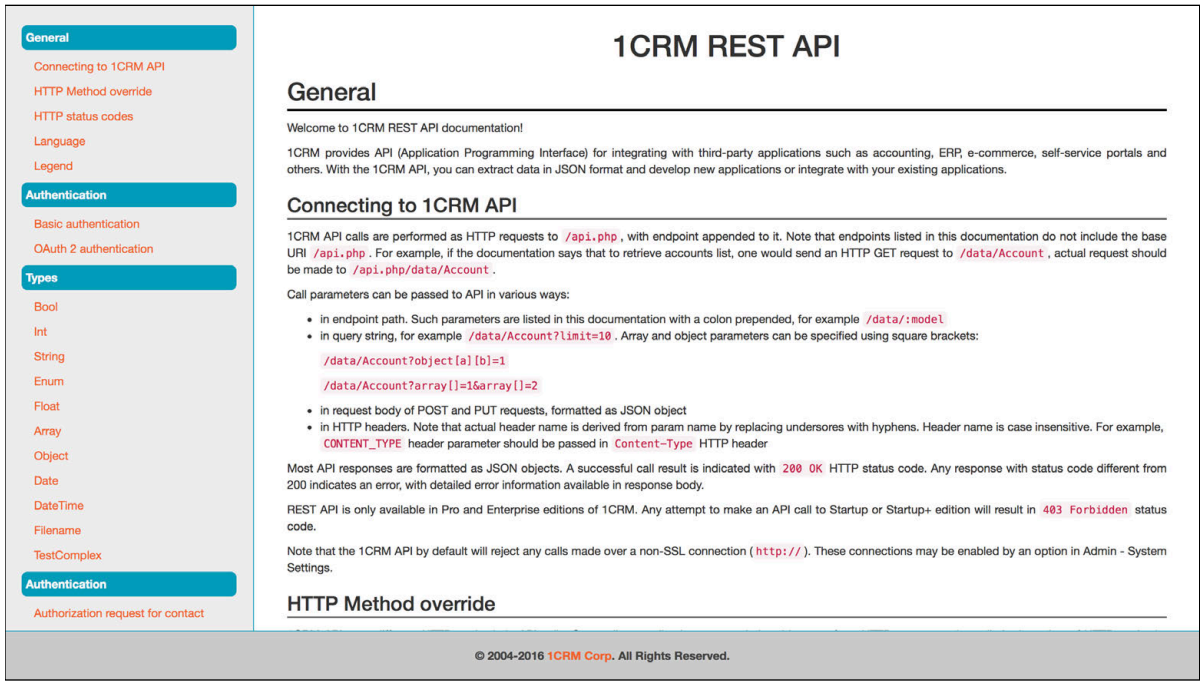
If a third-party module integrates with SugarCRM 6.4 solely by means of the SOAP or REST API, then there is a very good chance it will also work just fine with 1CRM, although there are some changes to the database structure of base modules which can lead to incompatibilities.

If you want to write your own software which accesses 1CRM via the SOAP or REST APIs, you should follow the SugarCRM documentation found here.

2.2 Next Generation REST API

1CRM 8 offers an all-new REST API. It may be accessed at `/api.php` from your URL root. You can also view and navigate the API documentation there if you browse to that URL, as shown below. While this Developer Guide API content is updated regularly, the live API documentation at `/api.php` from your URL root should always be used as the definitive reference information.

Note: This API is used by the 1CRM Mobile iPhone app. By default your 1CRM system is configured only to allow the app to communicate with it securely, via SSL using a URL beginning with `https://`. All 1CRM Cloud installations have an SSL certificate installed by default, so you can simply enter your URL as you normally would, but with `https://` at the front (which you may or may not normally do in your browser anyway). If your 1CRM On Premise instance does not have an SSL certificate, you can allow non-SSL use of the API by going to the *Admin - API and OAuth Settings* screen, and turn on the option *Allow API Calls via insecure connections (http://)*.



2.2.1 General

1CRM provides an API (Application Programming Interface) for integrating with third-party applications such as accounting, ERP, e-commerce, self-service portals and others. With the 1CRM API, you can extract data in JSON format and develop new applications or integrate with existing applications.

Connecting to the 1CRM API

1CRM API calls are performed as HTTP requests to `/api.php`, with endpoint appended to it. Note that endpoints listed in this documentation do not include the base URI `/api.php`. For example, if the documentation says that to retrieve accounts list, one would send an HTTP GET request to `/data/Account`, actual request should be made to `/api.php/data/Account`.

Call parameters can be passed to API in various ways:

- in endpoint path. Such parameters are listed in this documentation with a colon prepended, for example `/data/:model`
- in query string, for example `/data/Account?limit=10`. Array and object parameters can be specified using square brackets:
  `/data/Account?object[a][b]=1`
  `/data/Account?array[]=1&array[]=2`
- in request body of POST and PUT requests, formatted as JSON object
- in HTTP headers. Note that actual header name is derived from param name by replacing underscores with hyphens. Header name is case insensitive. For example, `CONTENT_TYPE` header parameter should be passed in `Content-Type` HTTP header

Most API responses are formatted as JSON objects. A successful call result is indicated with `200 OK` HTTP status code. Any response with status code different from 200 indicates an error, with detailed error information available in response body.

REST API is only available in Pro and Enterprise editions of 1CRM. Any attempt to make an API call to Startup or Startup+ edition will result in `403 Forbidden` status code.

Note that the 1CRM API by default will reject any calls made over a non-SSL connection (`http://`). These connections may be enabled by an option in Admin - System Settings.

HTTP Method override

1CRM API uses different HTTP methods in API calls. Some client applications may only be able to perform HTTP requests using a limited number of HTTP methods. Also, 1CRM application server may be behind an HTTP proxy that does not accept HTTP methods other than GET and POST. To use 1CRM API in such situations, one can send POST requests instead of PUT, PATCH and DELETE, and add X-HTTP-Method-Override header.

```
POST /api.php/Account/123 HTTP/1.1

Host: 1crm.ca

X-HTTP-Method-Override: DELETE
```

HTTP status codes

`200 OK`
Requested action was executed. Response body may contain the requested data.

`400 Bad request`
Returned if required parameters are missing, or parameters do not match expected data type. Response body contains additional information

`401 Unauthorized`
Returned when client is not authenticated.

`403 Forbidden`
Returned when:

- client is not authorized to access requested resource according to 1CRM ACLs
- an API call is made to Startup or Startup+ edition

`404 Not found`
Returned when requested endpoint does not exist, or when requested record does not exist.

`500 Internal error`
Returned when an internal server error occurred. Response body may contain additional information

Endpoints may define additional response codes – see endpoint documentation for details.

Language

Some endpoints, especially metadata-related, may return data that is locale-dependent. To specify preferred language, use `Accept-Language` HTTP header. If that header is missing, default locale is used as configured in 1CRM settings. Note that even if `Accept-Language` header is present, formatting may be applied to some data according to authenticated user's locale preferences.

Legend

Authentication required

GET POST PUT PATCH DELETE Request methods

! Required parameter

P Parameter is located in endpoint path

Q Parameter is located in query string

B Parameter is located in request body

H Parameter is located in HTTP header

[1:] [:20] [1:100] numeric values limits, or limits for number of elements in arrays or string length

{String} Type constraint for values in an object

(123) default value

Authentication

The vast majority of 1CRM API calls require authentication. Upon successful authentication, further API calls respect access rules defined by 1CRM administrator. This includes access to certain modules, access to records belonging to other users, permissions to edit and/or delete records, etc. Basically, any restrictions that apply to a user using 1CRM web UI, also apply to api calls when API client is authenticated on behalf of that user.

The 1CRM REST API supports 2 authentication mechanisms: **Basic** authentication and **OAuth 2** authentication. **OAuth 2** authentication should be preferred if possible.

Basic authentication

HTTP basic authentication is the simplest authentication method accepted by 1CRM API. Authentication is performed by adding `Authorization` header to all requests. No special authentication request is required.

To perform basic authentication, application should perform the following steps:

1. Make MD5 hash of password, for example `supersecret` becomes `9a618248b64db62d15b300a07b00580b`

2. Concatenate user name and password hash with a colon: `admin:9a618248b64db62d15b300a07b00580b`

3. Encode concatenated string as Base64 : `YWRtaW46OWE2MTgyNDhiNjRkYjYyZDE1YjMwMGEwN2IwMDU4MGI=`

4. Add `Authorization` header to the HTTP request: `Authorization: Basic YWRtaW46OWE2MTgyNDhiNjRkYjYyZDE1YjMwMGEwN2IwMDU4MGI=`

While Basic authentication is very simple to use, you should always prefer OAuth 2.0. Note that in the 1CRM Implementation Guide, we highly recommend disabling Basic Authentication, and most administrators should do so.

OAuth 2 authentication

1CRM API utilizes the industry-standard OAuth 2.0 protocol. You should always prefer OAuth to Basic authentication.

To use OAuth 2.0 authentication, you first need to obtain a token. After that, you should add `Authorization` header to HTTP requests when calling endpoints that require authentication : `Authorization: Bearer access_token`. Replace `access_token` with actual access token.

See OAuth 2.0 for details about obtaining access tokens.

2.2.2 Types

Bool

This type represents a boolean value. Strings `yes`, `1` and `true` are recognized as `true`, and `no`, `0` and `false` are recognized as `false`. When sending parameters of this type in request body, prefer using JSON values of `true` or `false` instead of strings.

Int

This type represents an integer value. Parameters of this type can have limits set for minimum and maximum accepted values

String

This type represents a generic string value. Parameters of this type can have limits set for minimum and maximum accepted string length and/or regular expression that the string should match

Enum

This type represents a string that can only take one of predefined values

Float

This type represents a floating point numeric value. Parameters of this type can have limits set for minimum and maximum accepted values

Array

This type represents an array of values. Parameters of this type can be either a generic array without a predefined element type, or a typed array that should have only values of specific type as array elements

Object

This type represents a data structure known in different programming languages as associative array, map, symbol table, or dictionary. Object keys are always strings. Parameters of this type can have *schema* to specify accepted keys and value types for those keys

Date

Inherits String

This type represents a date value. The value must conform to `Y-m-d` format as used by PHP date function

DateTime

Inherits String

This type represents a date/time value. The value must conform to `Y-m-d H:i:s` format as used by PHP date function. Use GMT timezone.

Filename

Inherits String

This type represents a file name. The value should not contain any path information.

TestComplex

Inherits Object

This type exists solely for testing purposes. Do not use.

Schema

Name	Type	Description	
x	String		!
y	Int		
z	TestComplex		
q	DateTime		!

2.2.3 Authentication

Authorization request for contact

GET /auth/contact/authorize

See OAuth 2.0

Parameters			
Name	**Type**	**Description**	
response_type	Enum {code, token}	Expected response type	Q
client_id	String	API client identifier	Q
redirect_uri	String	This parameter is optional, if not specified, the user will be redirected to a pre-registered redirect URI	Q
scope	String	A space delimited list of scopes	Q
state	String	CSRF token. This parameter is optional but highly recommended. You should store the value of the CSRF token in the user's session to be validated when they return	Q

Authorization request for user

GET /auth/user/authorize

See OAuth 2.0

Parameters			
Name	**Type**	**Description**	
response_type	Enum {code, token}	Expected response type	Q
client_id	String	API client identifier	Q
redirect_uri	String	This parameter is optional, if not specified, the user will be redirected to a pre-registered redirect URI	Q
scope	String	A space delimited list of scopes	Q
state	String	CSRF token. This parameter is optional but highly recommended. You should store the value of the CSRF token in the user's session to be validated when they return	Q

Authorization grant for contact

`POST` `/auth/contact/access_token`

See OAuth 2.0

Parameters			
Name	**Type**	**Description**	
grant_type	Enum {client_credentials, password, authorization_code, refresh_token}	Grant type	B
client_id	String	API client identifier	B
client_secret	String	API client secret	B
refresh_token	String	Refresh token	B
redirect_uri	String	This parameter is optional, if not specified, the user will be redirected to a pre-registered redirect URI	B
code	String	Authorization code	B

Return			
Name	**Type**	**Description**	
token_type	String	Access token type. Always `Bearer`	!
expires_in	Int	An integer representing the TTL of the access token	!
access_token	String	A JWT signed with the authorization server's private key	!
refresh_token	String	An encrypted payload that can be used to refresh the access token when it expires	
state	String	State parameter sent in the original request. You should compare this value with the value stored in the user's session to ensure the authorization code obtained is in response to requests made by this client rather than another client application	

Authorization grant for user

`POST` `/auth/user/access_token`

See OAuth 2.0

Parameters			
Name	**Type**	**Description**	
grant_type	Enum {client_credentials, password, authorization_code, refresh_token}	Grant type	B
client_id	String	API client identifier	B
client_secret	String	API client secret	B
refresh_token	String	Refresh token	B
redirect_uri	String	This parameter is optional, if not specified, the user will be redirected to a pre-registered redirect URI	B
code	String	Authorization code	B

Return			
Name	**Type**	**Description**	
token_type	String	Access token type. Always `Bearer`	!
expires_in	Int	An integer representing the TTL of the access token	!
access_token	String	A JWT signed with the authorization server's private key	!
refresh_token	String	An encrypted payload that can be used to refresh the access token when it expires	
state	String	State parameter sent in the original request. You should compare this value with the value stored in the user's session to ensure the authorization code obtained is in response to requests made by this client rather than another client application	

2.2.4 Working with data

Add or remove a record from user's favorites

POST /data/favorites/{model}/{id}

Parameters			
Name	**Type**	**Description**	
model	String [1:]	Model	P !
id	String [1:]	Record ID	P !

Return		
Name	**Type**	**Description**
status	Int	New favorite status. 0 if added, 1 if removed

Get list of records

GET /data/{model}

Retrieve list of records belonging to specified `model`

Returned objects do not have a predefined structure, it depends on model and requested fields. See Metadata

Parameters

Name	Type	Description	
model	String [1:]	Model to query	P !
fields	Array	Array of field names to fetch. When omitted, a limited number of fields are returned, depending on model. Record ID is guaranteed to be returned, and for most models, `name` and/or `_display` fields.	Q
↳[n]	String		Q
query_favorite	Bool	Query favorites. If set, `favorite` field will be added to each result row, indicating whether the current user added the item to Favorites. Note that item is in favorites if and only if the value of `favorite` field is zero	Q
filter_text	String	Generic search string. Fields involved in search depend on model	Q
filters	Object {String}	Filters to apply. To get list of available filters for a model, use metadata	Q
order	String	Sort order	Q
offset	Int [0:] (0)	Offset in the list to start retrieval from	Q
limit	Int [1:200] (20)	Limits number of records returned	Q

Return

Name	Type	Description	
records	Array	Array of retrieved records	!
↳[n]	Object		
total_results	Int	Total number of results, without taking offset and limit in account	!

Create records

POST /data/{model}

Create a record of specified `model`

Parameters			
Name	**Type**	**Description**	
model	String [1:]	Model to query	P !
data	Object	An object with keys matching field names to update. Fields not defined in this object are not modified	B !

Return			
Name	**Type**	**Description**	
id	String	ID of created record	!

Get single record

GET /data/{model}/{id}

Retrieve single record belonging to specified `model`, identified by `id`

Returned object does not have a predefined structure, it depends on model and requested fields. See Metadata

Parameters

Name	Type	Description	
model	String [1:]	Model to query	P !
id	String [1:]	Record ID	P !
fields	Array	Array of field names to fetch. When omitted, all available fields are returned.	Q
↳[n]	String		

Return

Name	Type	Description	
record	Object	Retrieved record	!

Update a record

PATCH `/data/{model}/{id}`

Update record belonging to specified `model`, identified by `id`

Parameters			
Name	**Type**	**Description**	
model	String [1:]	Model to query	P !
id	String [1:]	Record ID	P !
data	Object	An object with keys matching field names to update. Fields not defined in this object are not modified	B !

Return			
Name	**Type**	**Description**	
result	Bool	Always true	!

Delete a record

DELETE `/data/{model}/{id}`

Delete record belonging to specified `model`, identified by `id`

Parameters			
Name	**Type**	**Description**	
model	String [1:]	Model	P !
id	String [1:]	Record ID	P !

Return			
Name	**Type**	**Description**	
result	Bool	True if deleted successfully	!

Get list of related records

GET /data/{model}/{id}/{link}

Retrieve list of related records belonging to specified `model` and `id` via specific `link`

Returned objects do not have a predefined structure, it depends on model and requested fields. See Metadata

Parameters

Name	Type	Description	
model	String [1:]	Model to query	P !
id	String [1:]	Record ID	P !
link	String [1:]	Link name	P !
fields	Array	Array of field names to fetch. When omitted, a limited number of fields are returned, depending on model. Record ID is guaranteed to be returned, and for most models, `name` and/or `_display` fields.	Q
↳[n]	String		
filter_text	String	Generic search string. Fields involved in search depend on model	Q
filters	Object {String}	Filters to apply. To get list of available filters for a model, use metadata	Q
order	String	Sort order	Q
offset	Int [0:] (0)	Offset in the list to start retrieval from	Q
limit	Int [1:200] (20)	Limits number of records returned	Q

Return

Name	Type	Description	
records	Array	Array of retrieved records	!
↳[n]	Object		
total_results	Int	Total number of results, without taking offset and limit in account	!

Add related records

POST /data/{model}/{id}/{link}

Add list of related records belonging to specified `model` and `id` via specific `link`

Parameters

Name	Type	Description	
model	String [1:]	Parent Model	P !
id	String [1:]	Parent ID	P !
link	String [1:]	Link name	P !
records	Array	Array of related record IDs to be added to specified link.	B
↳[n]	String		

2.2.5 Working with calendars

Get list of events

GET /calendar/events

Retrieve list of events within specified dates range. Returned records are grouped by type, and within each type records are sorted by date. No more than 200 records of each type are returned.

Parameters

Name	Type	Description	
start_date	DateTime	Lower date bound	Q !
end_date	DateTime	Upper date bound	Q !
types	Array	When present, this parameter limits returned events to specified types	Q
↳[n]	Enum {Call, Meeting, Task, ProjectTask}		

Return

Name	Type	Description	
records	Array	Array of retrieved records	!
↳[n]	Object		
↳[id]	String	Record ID	!
↳[start_date]	DateTime	Event start date/time	
↳[due_date]	DateTime	Event due date/time	
↳[name]	String	Event name	!
↳[type]	Enum {Call, Meeting, Task, ProjectTask}	Event type	!
↳[location]	String	Event location, if applicable	

2.2.6 Working with metadata

Get fields definition for a model

GET /meta/fields/{model}

Parameters			
Name	**Type**	**Description**	
model	String [1:]	Model to query	P !

Return			
Name	**Type**	**Description**	
fields	Array	An array with fields definitions	!
filters	Array	An array with filters definitions	

2.2.7 Working with files

Upload a small file

POST /files/upload/base64

Upload a file. Uploaded file will be saved to a temporary location. Returned file ID can be used as a value for fields having `file_ref` or `image` type when creating or updating records.

This endpoint is suitable for uploading relatively small files, such as contact or user photos. Request body length should not exceed 1048576 bytes.

Note that uploaded files will be kept on server for a limited amount of time if not linked in `file_ref` or `image` field after upload.

Parameters

Name	Type	Description	
model	String [1:]	File name. Should not contain any path information	B !
mimetype	String [1:]	File MIME type	B !
data	String	File data, `base64` encoded	B !

Return

Name	Type	Description	
id	String	Uploaded file ID	!

Upload a file

POST /files/upload

Upload a file. Uploaded file will be saved to a temporary location. Returned file ID can be used as a value for fields having `file_ref` or `image` type when creating or updating records.

This endpoint is suitable for uploading larger files, compared to `/files/upload/base64`. File size limit depends on maximum post size defined in PHP configuration.

Note that uploaded files will be kept on server for a limited amount of time if not linked in `file_ref` or `image` field after upload.

Parameters

Name	Type	Description	
CONTENT_TYPE	String (application/octet-stream)	File content type	H
CONTENT_LENGTH	Int [0:]	File size	H !
X_ONECRM_FILENAME	Filename [1:]	File name	H !

Return

Name	Type	Description	
id	String	Uploaded file ID	!

Download a file

GET /files/download/{model}/{id}

Download a file.

This endpoint is for downloading 1CRM Documents, Note attachments and temporary uploaded files (see /files/upload/base64).

File source is identified with `model` and `id` parameters:

- When `model` equals to `Document`, latest document revision will be downloaded. `id` is the Document ID
- When `model` equals to `DocumentRevision`, specific document revision will be downloaded. `id` is the Document Revision ID
- When `model` equals to `Notes`, note attachment will be downloaded, `id` is Note ID
- When `model` equals to `upload`, contents of temporary uploaded file will be downloaded. `id` is the ID returned from upload endpoint

On success, the response body contains raw file data. Additional information may be returned in `Content-Type`, `Content-Length`, `Content-Disposition`, and `X-OneCRM-Filename` response headers.

On failure, HTTP response code different from 200 will be returned, and response body contains additional information in JSON format.

Parameters

Name	Type	Description	
model	Enum	Specifies model	P !
id	String [1:]	Specifies ID	P !

Get information about a file

GET /files/info/{model}/{id}

Get information about a file.

This endpoint is for Retrieving metadata for 1CRM Documents, Note attachments and temporary uploaded files (see /files/upload/base64).

See /files/download/:model/:id for description of `model` and `id` parameters.

Parameters

Name	Type	Description	
model	Enum	Specifies model	P !
id	String [1:]	Specifies ID	P !

Return

Name	Type	Description	
name	String	File name	!
mimetype	String	File MIME type	!
modified	Int	File modification time, in secons since UNIX epoch	!
size	Int	File size in bytes	!
temp_url	String	Temporary download URL	

2.2.7 Utility

Get information about authenticated user

GET /me

Returns 1CRM version. Can be used to validate login info

Return			
Name	**Type**	**Description**	
version	String	1CRM version	!
products	Array	List if licensed products	!
↳[n]	String		
authenticated	Bool	True if the request contains valid authentication header	!

Get server public key

GET /public_key

Returns 1CRM version. Can be used to validate login info

Return			
Name	**Type**	**Description**	
key	String	Contents of server public key	!

Get 1CRM version

GET `/version`

Returns 1CRM version. Can be used to validate login info

Return			
Name	**Type**	**Description**	
version	String	1CRM version	!
products	Array	List if licensed products	!
↳[n]	String		
authenticated	Bool	True if the request contains valid authentication header	!

3.0 SugarCRM Compatibility

Third party software designed to install on SugarCRM Community or Professional/Enterprise Editions via the Upgrade Wizard or the Module Loader will need very significant editing to function with 1CRM. From the format of the PHP manifest file to the methods used for defining table models and views, the module architecture of 1CRM 7.0 and later releases is entirely different from that of SugarCRM.

Packages will need to be updated for compatibility by a competent PHP software developer, and in some cases entirely rewritten. 1CRM Corp, via one of our 1CRM Partner organizations, can assist you with this sort of development work if required.

4.0 1CRM Module Development

4.1 Introduction

The process for developing custom modules for 1CRM 7+ is very different compared to previous versions, due to a set of fundamental changes in the 1CRM base framework. Modules are more self-contained and their code contains fewer redundancies. A new configuration format is used in place of various PHP code files, meaning fewer opportunities for uncontrolled fatal errors. HTML templates are no longer used to define module `DetailView` or `EditView` forms, with new layout descriptors taking their place. Finally, separate model and display descriptor files replace `vardefs.php` for defining the structure of real and virtual database columns.

4.2 Configuration Files

The new configuration file format (`IAHConfig`) is a simple hierarchical format similar to YAML. Defining arrays of data, primarily character strings, it is easily parsed and written programmatically and designed to be human-editable as well.

The IAHConfig Format

By default, each line of the file specifies a key in an array. When the key is not followed by a colon character, the value associated with it is assumed to be another array. Hard tabs are normally used to indicate depth although a sequence of four spaces is considered equivalent. The first line of the file generally consists of a PHP snippet which is not interpreted by the configuration system, but serves to protect the file contents from viewing by end-users. Comments are preceded by a hash (#) character.

```
<?php return; /* no output */ ?>
Key1
        Key2
# => array("Key1" => array("Key2" => array())
```

When the key is followed by a colon, the value is represented by either a quoted string or an unquoted value, which may evaluate to a string or a special value. The subsequent value may also be written over multiple (indented) lines, in which case the result is obtained by removing the indentation and trimming the string. Within quoted strings, the backslash character may be used for C-style character escaping. Special values include integer, float, and boolean literals (`true` and `false`) as well as `null`. Finally, array literals can be written as special values by using the square bracket format below.

```
String: test
Integer: 42
Float: 3.1416
Boolean: true
Array: [1, unquoted, "test\t\n"]
Multiline:
       A string
       on multiple lines.
# => array("String" => "test", "Integer" => 42, "Float" => 3.1416,
#      "Boolean" => true, "Array" => array(1, "unquoted", "test\t\n"),
#      "Multiline" => "A string\non multiple lines")
```

Because unquoted values are automatically trimmed, strings having leading or trailing whitespace need to be quoted. The special key value `-` (hyphen) represents the next numeric key, equivalent to setting `$result[]`, and is followed by a simple value or array literal. The special key value `--` (double hyphen) begins a new nested array at the next numeric key, and should be written alone on a line:

```
- Value1
--
       Key: Value2
# => array("Value1", array("Key" => "Value2"))
```

IAHConfig files may be easily parsed and written using the `ConfigParser` and `ConfigWriter` classes located in `include/config/format/`.

4.3 Module Directory Structure

Each module directory (subdirectory of `modules/`) follows a common directory structure. In the root of the directory, there is expected to be at least one PHP file containing a class deriving SugarBean. This is the primary bean class. Modules may contain more than one SugarBean class, with additional classes being more limited in their functionality (they won't be displayed in the Recently Viewed menu, cannot be referenced by `ref` fields, and have other restrictions). Each of these classes is also mapped to a Model, which describes the database mapping for the class. See Model Descriptors for details on these files, in particular the `bean_file` attribute on bean models.

Unlike in previous 1CRM versions, these SugarBean classes are not required for most database operations. Although the `retrieve()`/`save()` pattern may still be used, the preferred method is to perform insertions and updates using a `RowUpdate` object for the target record. This method requires less memory and eliminates the formatting and un-formatting of field values for display (including numbers, dates, and time values).

Each module directory will also contain several subdirectories:

Dashlets	This optional directory stores any custom Dashlets (widgets employed by the Home module) relating to the module.
display	This directory contains any Model Display Descriptor files. See section 4.6 for more information.
ext	For code extending existing modules. See section 5.1 for more information.
language	The location for any supporting language files for this module. See section 4.5 for more information.
metadata	Currently, the only file required in this directory is module_info.php, described below.
models	This directory contains any Model Descriptor files. See section 4.4 for more information.
views	This is the location for any Layout Descriptor files. See section 4.7 for more information.
widgets	Custom display widgets may be stored in this optional directory. See section 4.8 for more information.

The majority of these are explained in separate sections. For now, let's examine the module_info.php file located in the metadata/ subdirectory. This file is required in order to let the system discover the primary SugarBean class and to display a tab for the module.

Sample module_info.php contents for the Contacts module

```
detail
        primary_bean: Contact
        tab_visibility: normal
        default_group: LBL_TABGROUP_SALES_MARKETING
```

Inside the detail array there are 3 required attributes. primary_bean is the name of the primary model, a bean model descriptor, which will then provide the path to the primary class file. The tab_visibility attribute defines the display mode for the module tab: normal, indicating that a module tab should always be shown; hidden, meaning it should never be shown; and manual, if the tab should be shown only when specifically added to the system tab layout. In most cases this value should be normal, while supporting modules may use hidden to avoid cluttering the menu system. The last attribute, default_group, defines the tab group this module tab should be placed under. The tab may still be placed into another group by an administrator editing the system tab layout. If no default is provided and the tab visibility is normal, then it will be placed in whichever tab group contains the Administration module.

For a custom module it may also be desirable to set the icon property. This should contain the path to a custom 16x16 icon file for the module.

4.4 Model Descriptors

Previously represented by `vardefs.php`, in 1CRM 7 model descriptors are split into multiple files located in the `models/` subdirectory of the module directory, with additional system-level model descriptors are located in `include/models/`. These are further classified as `bean`, `link`, and `table` descriptors with each generally representing a single database table. These files are automatically indexed by the ModelManager class with cached results written to `cache/system/model_cache.php`, and their names are expected to be unique within the system. The Database Repair task (under Administration > Maintenance) is used to update the database definition according to these descriptors, creating tables, columns and indexes as required.

Of the standard model descriptor types, `bean` descriptors represent the common case. These are linked to a SugarBean-derived class, can be referenced by other `bean` and `link` descriptors (using `ref` fields), and use an `id` field as the primary index. Next are the `link` descriptors, which define tables representing many-to-many relationships between `bean` records. These tables may contain additional fields, known as relationship role columns. In order to prevent duplicate records in these tables, the primary key is usually composed of the two `id` columns defining the relationship. Finally, `table` descriptors map to general-purpose SQL tables with no default behaviour. Operations on these tables must be defined explicitly and auditing is not supported.

Each file must define a `detail` section, with properties that vary according to the descriptor type. These include:

`type`	The descriptor type, also used in the filename prefix.
`bean_file`	In `bean` descriptors, the path to the SugarBean-derived class file represented by this model.
`primary_key`	The column or columns used to create the table's primary key.
`table_name`	The (unique) name of the table as represented in the SQL database.
`default_order_by`	The default column and order (ASC/DESC) used in sorting ListView results.

`display_name`	The column used to represent the displayed name of this record, for example when pointed to by a `ref` field or shown on the recently-viewed menu. Note that this property must be defined in order to properly display the title on a DetailView form. The display_name property may also be define a combination of fields, for example the display name of a Case consists of the case name with the case number as a prefix: display_name type: prefixed fields - case_number - name

Various optional flags are available to configure system features for bean-type models:

`activity_log_enabled`	Setting this value to true causes changes to records in this module to be shown in the system activity log (dashlet).
`audit_enabled`	Enables auditing of database updates. Updates to fields also marked `audited` will be written to a separate audit table, along with the previous value, the time of the change, and the user ID performing the update. The audit table is automatically created during a database repair operation.
`comment`	A text comment describing the function of the table.
`duplicate_merge`	To enable duplicate merging when a new record request appears similar to an existing record.
`optimistic_locking`	To enable optimistic locking for updates to this module. This feature is meant to warn users when others are performing updates to the same record simultaneously.
`importable`	To allow mass importing of records into this module via the ImportDB interface. The value may be a string representing the name of a custom label (language string) for the import action.
`reportable`	Whether to allow Reports to be created and run against this model.
`unified_search`	To display this model (if it is the module primary bean) in the system Unified Search. Fields also marked with `unified_search: true` will be used to automatically filter relevant results.

4.4.1 Business Logic Hooks

Model descriptors may also define a hooks array containing a mapping of function hook definitions to be invoked when certain actions are performed. A function hook definition is itself an array, with most

hooks defining only a `class_function` attribute. This is the name of a static class method on the SugarBean-derived class referred to by this model (the attribute `class` may be set in order to override the containing class name). In place of `class_function`, the attribute `function` may be used to refer to a non-class function. In this case the attribute `file` should contain the path of the file containing this method (to be included once as needed). The `file` attribute should also be provided for classes which are not associated with a 1CRM model, and thus can't be included automatically.

Sample business logic hooks defined by the Cases model

```
hooks

    new_record

        --

            class_function: init_record

    notify

        --

            class_function: send_notification

            required_fields: [cust_contact_id]
```

Logic hooks may also define a `required_fields` attribute containing an array of field names. Fields added to this list will be automatically queried before the hook is executed so that their current values are available to the function.

Several logic hooks are currently supported:

`new_record ( RowUpdate &$update, array $input )`	This hook is called in order to populate a new row, both before displaying the EditView form and after that form has been submitted. It is also executed for records created from external APIs (SOAP/JSON). The function may examine request parameters and update fields accordingly; it is most often used when creating a new record based on a related record in another module (in which case the related ID will be passed as a request parameter).
`load_input ( RowUpdate &$update, array $input, bool $formatted )`	This hook is called when user input is being loaded for either a new record, or a modification to an existing record. Because this input may come via an HTTP, SOAP or JSON request, it is not always correct to look at $_REQUEST (or $_GET or $_POST) for this information.
`load_request ( RowUpdate &$update, array $req, bool $ignore_blank )`	A lower-level hook than `load_input`, this method may be used to capture any form input, including fields which do not correspond with a known (updatable) field from the model, and uploaded files.

`fill_defaults ( RowUpdate &$update )`	Called when a `RowUpdate` object is validated (after the standard validation checks and before saving), this hook should be used to populate fields which have calculated values, often depending on the values of other fields. Doing so in a `before_save` hook is not always sufficient, as required fields may be flagged as missing in that case.
`before_save ( RowUpdate &$update )` `after_save ( RowUpdate &$update )`	These hooks are executed for every row update. They may be used as a last chance to enforce class invariants and check user input, and to manage updates to related resources. The field updates to be performed may be accessed via the `$updates` property of the `RowUpdate` object. A `before_save` hook may throw an `IAHActionCompleted` exception to indicate that the record update has been completed and the default behaviour must be skipped. An `IAHActionAbort` exception indicates that certain conditions have not been met and the record update cannot be completed.
`fill_defaults ( RowUpdate &$update )`	Called as part of the process for saving a record, this hook is intended to populate required fields which are not provided by the user, but may otherwise be determined.
`validate ( RowUpdate &$update )`	The last step when a `RowUpdate` object is validated before saving. Additional validation checks may be performed on the field values, and validation errors added using `$update->addValidationError('invalid_value', string $field_name)`.
`notify ( RowUpdate &$update )`	This hook is called after a successful `save` operation in order to send notification emails or otherwise alert users to the changes.
`before_delete ( RowUpdate &$update )` `after_delete ( RowUpdate &$update )`	These hooks are called when a record is to be deleted (by setting `deleted=1` in the record, not removing it from the table). Like the `before_save` hook, the `before_delete` hook may throw `IAHActionCompleted` or `IAHActionAbort`.
`before_add_link ( RowUpdate &$update, string $link_name )` `after_add_link ( RowUpdate &$update, string $link_name )`	These hooks are executed when a record is being added or updated in a `link` model table. The details of the relationship data may be accessed via the `$link_update` property of the `RowUpdate` object. This hook is called for the models on both sides of the relationship. Like the `before_save` hook, the `before_add_link` hook may throw `IAHActionCompleted` or `IAHActionAbort`.

`before_remove_link ( RowUpdate &$update, string $link_name ) after_remove_link ( RowUpdate &$update, string $link_name )`	Called when a relationship between two records is being removed. Like the `before_save` hook, the `before_remove_link` hook may throw `IAHActionCompleted` or `IAHActionAbort`.

There are also a special set of logic hooks associated with the User model, used to perform actions as part of the user's browsing experience:

`after_login ( string $user_id, string $login_type )`	Executed after a successful login, including logins via the SOAP or JSON interfaces.
`page_init ( BasePage &$page )`	This hook are executed when a BasePage is initialized (early in the rendering pipeline for normal web-based sessions). It can be used to inject global javascript libraries or CSS styles, for instance.
`before_page_render ( BasePage &$page ) after_page_render ( BasePage &$page )`	These hooks are executed later in the rendering pipeline for a standard application page, once all normal global variables have been initialized and permissions have been checked for the current action.

4.4.2 Field Descriptors

The `fields` section of a model descriptor file contains a set of arrays describing the database columns. This is much like the `fields` section of earlier `vardefs.php` files. Each array key must be unique and represents either the name of the column or a reference to a system-defined field descriptor (these are listed in section 4.4.3). Properties defined inside the array control the behaviour of the field. A non-exhaustive list of these properties follows, while other properties are specific to certain field types.

`type`	The column type, which corresponds indirectly to an SQL column type. See the table of common field types below.
`dbType`	A value overriding the database column type, which is generally inferred based on the `type` value.
`vname`	A reference to a language string in either the module or application language files representing a label for this field.

`vname_list`	A language string to override `vname` in the context of list column labels.
`audited`	A flag indicating that updates to this field are logged to the associated audit table, as long as `audit_enabled` is set in the model detail descriptor.
`charset`	For varchar-type fields, this property may be set to 'ascii' in order to restrict the input to ANSII characters and reduce the database storage requirements to one byte per character.
`comment`	A string describing the usage of this field.
`decimal_places`	For `float` or `double`-type fields, the number of decimal places to display in the user interface.
`default`	A default value for the column when none is specified by the user or by one of the pre-save hooks on the model (`fill_defaults` or `before_save`).
`detail_link`	Set to true in order to render the field as a link to the target record when included in a ListView.
`editable`	Set to false to disable user editing of a field, including on new records.
`id_name`	For `ref`-type fields, the name of the corresponding ID field. When not provided this will default to the name of the `ref` field with '_id' appended. If not defined explicitly then the corresponding ID field will be automatically created.
`importable`	Generally defaulting to true, set this flag to false to hide this field inside the ImportDB module.
`len`	The length of the corresponding database column in characters.
`massupdate`	A flag to control visibility of this field on the ListView's mass-update panel.
`reportable`	Whether to allow make this field available for reports.
`required`	Marks this field as required, meaning it must contain a non-null value.
`updateable`	Like `editable`, disables user updates to the field, but only for existing records.
`unified_search`	A flag indicating that this field should be added to the default unified search filter.
`width`	The normal rendering width of the field in characters (if not overridden by the layout) when shown in a ListView, DetailView or EditView.

4.4.3 System-Level Field Descriptors

These field descriptors may be referenced to include standard field descriptors (each an array specifying standard properties for the given field) within a model descriptor file. Properties of the standard field descriptors may be overridden by listing them underneath this key.

app.id	A standard record ID.
app.date_entered	A datetime representing the record creation date.
app.date_modified	A datetime representing the last modification date.
app.created_by_user	The user who created this record (a ref field).
app.assigned_user	The user assigned to this record (a ref field).
app.modified_user	The user who last modified this record (a ref field).
app.currency	A standard currency ref field.
app.exchange_rate	A standard exchange rate field.

4.4.4 Common Field Types

id	A 36-character string field containing a unique, system-generated identifier (GUID).
varchar	A string value.
char	A string value, defaulting to ASCII (8-bit) database representation.
text	This field type represents a multi-line text field and is stored in an SQL text column.
tinyint, int, float, double, currency, base_currency, percentage	Standard numeric field types.
bool	A true or false value, usually represented as an SQL tinyint. Fields of this type are rendered as checkboxes.
date, time, datetime	Standard date and time field types. These are always stored in GMT, and shown to the user in their local time zone.
duration	A duration field, stored as an integer representing a number of a minutes.
enum	A dropdown list, usually represented as a varchar column and having an associated options array. Options may also be defined programmatically by defining an options_function property, referencing a function which produces the array of options for the selection input.
multienum	A set of values chosen from a multi-select list. In the database values are stored in a single string with '^,^' as the separator between values.
phone	A phone number, stored using a varchar column.

`email`	An email address, stored using a `varchar` column.
`url`	An internet URL, stored using a `varchar` column.
`ref`	Representing a reference to a record in another model. This field does not map to a database column itself, but will have an associated ID field (automatically created, or named by the `id_name` property). When this field is queried by adding it to a form or list layout, a link to the related record is rendered using the target's display name. Normally a `ref` field defines `bean_name`, representing the name of the target model. Otherwise, a `ref` field must define `dynamic_module` (a column name), in which case it can target a record in one of multiple modules. See the Calls or Tasks modules for examples of this usage.
`html`	An HTML field, such as the body of an email template.
`item_number`	A simple string value, but generally rendered using fixed-width characters. This field type often used to represent product identifiers and serial numbers, as well as unique numeric IDs for various record types.
`module_name`	A reference to a module name, used for instance when implementing a `multi-ref` input (which allows both the related module and ID to be selected).
`file_ref`	A reference to an uploaded file. When rendered, this field type will automatically handle uploading and storage of the associated file.
`image_ref`	Essentially a `file_ref` field specialized for image-type files.

4.4.5 Table Indexes

For improved speed in performing common searches, multiple indexes may be defined on each model descriptor. These are contained within the `indices` section. Each entry consists of an array key representing the unique name for the index, along with an array of properties. For most purposes the only relevant property is `fields`, containing an array of column names used to construct the index. The primary key index is specified automatically (based on the `primary_key` property in the `detail` section of the model) and does not need to be repeated.

A sample index definition used by the EmailTemplate model

```
indices
       idx_email_template_name
              fields
                     - name
```

4.4.6 Model Links and Relationships

Model link definitions are used to manage one-to-many and many-to-many associations between records, while one-to-one or many-to-one record linkages are generally represented using `ref` fields. These link definitions are most often used as the basis for sub-panels, and are contained in the `links` section of the model descriptor file.

Sample link definitions used by the Account model

```
links
	members
		relationship: member_accounts
		module: Accounts
		bean_name: Account
		vname: LBL_MEMBERS
	tasks
		relationship: account_tasks
		module: Tasks
		bean_name: Task
		vname: LBL_TASKS
```

Each link must reference a corresponding relationship, which may be defined in the current model descriptor file or in a separate model descriptor. When defined inside a `bean` descriptor file relationship definitions resemble the following (corresponding to the link definitions above).

Sample relationship definitions used by the Account model

```
relationships
	member_accounts
		relationship_type: one-to-many
		key: parent_id
		target_bean: Account
		target_key: id
	account_tasks
		relationship_type: one-to-many
		key: id
		target_bean: Task
		target_key: parent_id
		role_column: parent_type
		role_value: Accounts
```

In the above relationship descriptors, the `key` property names a field in the current model definition used to establish the relationship. Matching records in the table defined by the `target_bean` model are found by equating its `target_key` field to the value of `key`.

Relationship descriptors may also define a `role_column` and `role_value` to further restrict the targeted set of records. This is generally used when the referenced field is a `ref` field with `dynamic_module` defined.

Relationships defined within `link` model descriptors have slightly different formatting, as seen below. Note that the relationship shares the name of the `link` model in this case.

A sample relationship definition used by the discounts_products link model

```
relationships
	discounts_products
		relationship_type: many-to-many
		lhs_key: id
		lhs_bean: Product
		join_key_lhs: product_id
		rhs_key: id
		rhs_bean: Discount
		join_key_rhs: discount_id
```

In this definition, `lhs` represents the (arbitrary) left-hand side of the relationship and `rhs` the right. `join_key_lhs` and `join_key_rhs` are fields defined by this link model, while `lhs_key` is a field in the `lhs_bean` model, and `rhs_key` is a field in the `rhs_bean` model. You can think of the SQL join statement as setting `lhs_bean.lhs_key = join_key_lhs` and `join_key_rhs = rhs_bean.rhs_key`.

4.5 Localization

In 1CRM 7, the organization of translatable language strings changed significantly in comparison to earlier versions. The `language/` subdirectory of each module directory is expected to contain at least two files: `lang.en_us.meta.php` and `lang.en_us.strings.php`. The first contains the label for this module (the `label` key in the excerpt below), which is automatically collected in the system-wide `$app_strings['moduleList']` array familiar from previous 1CRM versions. This file may also define a module from which to inherit language strings (`inherit_from`) – useful in the case of similar modules which share common strings. This functionality can help to reduce the translation work required and is also supported by the javascript framework.

lang.en_us.meta.php from the Invoice module

```
detail
	label: Invoices
	comment: en_us language file for Invoice module
	inherit_from: Quotes
```

Module language strings are listed in the file `lang.en_us.strings.php`. This is a simple array of key-value pairs, and should not contain any nested arrays. These strings may be referenced in field descriptors and in layout descriptors, and may be accessed programmatically using the system function `translate($label, $module)`. If module-specific language arrays are to be used, they may be placed in `lang.en_us.lists.php`.

4.6 Model Display Descriptors

In addition to the model descriptor file, most 1CRM model classes will also be associated a display descriptor file. These are located in the `display/` subdirectory of each module. This file is used to define standard filters for the model as well as any non-database fields and various display-related settings. Note that all of these settings are optional.

`list.default_order_by`	A field name (with optional 'ASC' or 'DESC' appended) representing the default sort order for this model's ListView, overriding the default_order_by defined by the model descriptor.
`list.buttons`	An array of button descriptors representing mass-update actions on the ListView for this model. Each entry should generally define a `vname` property (the label), an `icon`, and a `perform` property containing javascript to submit the mass-update action (this generally means calling `sListView.sendMassUpdate`). These buttons generally map to mass-update handlers, defined below.
`list.massupdate_handlers`	An array of mass-update handler descriptors. Each entry is an array defining a few required properties: `name`, the unique name of the mass-update action; `class`, the name of the class which will perform the action; and `file`, the path to the file containing that class. Once the class is loaded, the static class function `listupdate_perform (ListMassUpdate $mu, string $perform, ListFormatter &$list_fmt, ListResult &$list_result, $uids)` is called in order to perform the mass-update action.

`list.layouts`	An array of standard ListView layouts for the model, which will be represented as tabs along the top of the form. Normally each array key represents the name of the layout, but this can be overridden by setting the `view_name` property. Set the `vname` property to provide the tab label. An `override_filters` array may also be provided in order to set default values for ListView filters, whether they are shown on the filter form or not.
	
	An example from the Accounts module, adding a Customers tab to the ListView form:
	`list`
	`layouts`
	`Customers`
	`vname: LBL_CUSTOMERS`
	`override_filters`
	`is_supplier: 0`
	`account_type: Customer`

`list.show_favorites`	Show a favorites column in the ListView and DetailView, along with a standard filter to display only favorite records.
`edit.quick_create.via_ref_input`	Allow the user to quick-create new records when a ref field based on this model is placed on any standard EditView form.
`view.layouts`	Similar to `list.layouts`, this property may contain an array of alternate layouts for the DetailView. Each entry will be represented as a tab at the top of the standard DetailView form.
`basic_filters`	A simple list of ListView filter names which are shown by default in the Browse ListView layout and in popups.
`auto_filters`	A list of filter names which are to be applied automatically when included in the HTTP request, even when not placed on the current filter form.
`filters`	See the next section for more information on module filters.
`fields`	A set of field descriptors, exactly like the field descriptors in the model descriptor file but assumed to be non-database fields (generally widgets or other virtual fields like addresses).
`hooks`	A set of display hooks associated with the model. These are explained in section 4.6.3.
`widgets`	Definitions for custom display widgets. See section 4.8 for more information.

4.6.1 ListView Filter Definitions

Each entry in the `filters` section of the display descriptor file defines a separate ListView filter. It is not generally necessary to define filters for existing database fields; instead these filter definitions are used to create more complex restrictions on the ListView results while providing a simple external interface.

There are a few supported filter types. The most basic is the `flag` filter, which is presented as a simple checkbox on the filter form. In each case the `vname` defines the displayed name of the filter, which may be translated. An example definition from the Accounts module:

```
filters
    nonzero
        type: flag
        default_value: false
        vname: LBL_NONZERO_BALANCE
        operator: non_zero
        field: balance
```

In this case 'nonzero' defines a flag filter, off by default, which restricts the ListView results to those with a non-zero value for the `balance` column. When the user checks the button labeled 'Non-Zero Balance Only', the filter becomes active. Normally flag filters are ignored unless the filter value is set to true, but the `negate_flag` property may also be set in order to reverse this behavior. To test this particular filter, one could pass HTTP parameters `nonzero=1&query=1` in the URI for the ListView form.

The next major filter type is the `section` filter. This is normally rendered as a dropdown list, and presents an set of alternate filter actions to be selected between. An example from the Users module:

```
filters
    status
        type: section
        field: status
        vname: LBL_STATUS
        options_function: [User, get_status_options]
        default_value: NotInactive
        filter_clause_source: [User, get_search_status_where]
```

In this example the options for the dropdown list are provided by a callback (`options_function`), but they could also be written in place using the `options` property, as with an enum field definition. Normally the behaviour of a section filter is simply to restrict the set of records by setting the database column `field` equal to the filter value, but in this case a custom filter clause generator is used to generate the desired expression.

Most basic field types can be automatically used as filters, including `varchar`, `date`, `time`, `ref`, and the various numeric fields. Often the rendering of filter inputs will vary from that on a standard EditView in order to allow for more flexibility.

4.6.2 Display Hooks

In addition to the model hooks which are generally associated with RowUpdate objects, 1CRM supports a set of display hooks which are associated with form generator objects.

`view ( StandardDetailManager $m )`	Executed after a DetailView form has been initialized but before it is rendered.
`edit ( StandardDetailManager $m )`	Executed after an EditView form has been initialized but before it is rendered.
`after_edit ( StandardDetailManager $m )`	Executed after a successful update is performed to a record via an EditView form or Delete button.
`before_subpanel_create ( StandardDetailManager $m, &$stop )`	Called when a new record has been created by the user and is about to be added to a subpanel on the parent record. `$stop` may be set to a true value in order to prevent the action.
`after_subpanel_create ( StandardDetailManager $m )`	Called after a new record has been saved by a user and added to a subpanel on the parent record.

4.7 Layout Descriptors

The use of HTML templates in 1CRM 7 is strongly discouraged in favour of the new form generation system. `DetailView` and `EditView` forms are now rendered by the `StandardDetailManager` class (in `include/DetailView`). `ListViews` are rendered by the ListViewManager and ListFormatter classes (in `include/ListView`). The layout templates for all actions are located in the `views/` module subdirectories and prefixed with the relevant action name. Custom overrides for layout templates (as generated by the layout editor) are stored in `custom/modules/MODULE/new_views/`.

`view.Standard.php`	The DetailView form layout. Other layouts named as `view.*.php` may be accessed using specific values for the `layout` request parameter (in particular when using a tabbed form layout).
`edit.Standard.php`	The standard EditView form layout.

`list.Standard.php`	The standard ListView column layout. Other layouts named as `list.*.php` may be made accessible by listing them in the Model Display Metadata.
`popup.Standard.php`	The standard layout for a Popup ListView (shown for example when the popup button on a `ref` input field is used). If not present then `list.Standard.php` is used instead.
`subpanel.Standard.php`	The standard sub-panel layout used for this module. If not present, then `list.Standard.php` will be used to generate the sub-panel instead.
`search.Standard.php`	The search form layout used on the 'Quick Filter' module ListView.
`additional.Standard.php`	The DetailView-style form layout used in the 'additional details' popup generated on various ListViews.

Each layout descriptor begins with a `detail` array defining the layout type (which should generally equal the prefix on the filename). Certain layouts including `view` and `edit` may also define a `title`, representing a default title to be used at the top of the form. Further metadata may also be contained in this header. Following this is the `layout` array, which contains the details of the form layout.

Layout descriptors can be grouped into two basic formats. The `list`, `popup` and `subpanel` layouts define a `columns` array underneath `layout`, containing an ordered list of column descriptors. A column descriptor may consist of a string referencing a field in the model, or an array. If an array, that array should generally define a `field` key, again referencing a field in the model. Using an array also allows the customization of properties like `width` (an integer representing the column width in characters) and `vname` (an alternate column label). Array column descriptors may also define `add_fields`, another array of field names to be added on subsequent lines within each column entry.

A sample module list layout with two columns

```
detail
       type: list
layout
    columns
        --
            field: name
            add_fields
                --
                    field: number
                    list_position: prefix
                    list_format: separate
            width: 60
        - assigned_user
```

In this example the display of the `number` additional column field is customized using the `list_format` and `list_position` options. The first, `list_position`, may be set to `prefix` or `suffix`, in order to display the value either before or after the primary field value without an additional line break. The `list_format` property defines how the value is stylized: `separate` adds a colon (possibly language dependent) character between the two values; `parenth` wraps the value in parentheses; `brackets` wraps it in square brackets; and `hyphen` adds a hyphen character as a separator. This example would be formatted as one line in the form "`number`: `name`" (possibly wrapping onto multiple lines for long values).

The layout descriptors for `view` and `edit` layouts follow a separate common format. The primary entry within the `layout` array is `sections`, which defines a list of top-level form sections.

Each `sections` entry is an array. Start by defining a unique `id` for the section. This may be used in javascript to obtain a reference to the containing element. Next, the `vname` (a title header for the section) may be provided. For a `view` or `edit` layout, the default number of layout columns is 2, but this may be overridden by setting the `columns` attribute. For `search` layouts an appropriate number of columns is normally decided based on the number of fields to be rendered.

Field references are then provided in the `elements` array within the `sections` entry. When the form is rendered, these are generally presented as a pair of table cells, one for the label and one for the representation of the field (which will vary depending on whether the field is editable). Each entry in `elements` may be either a string, for a simple field reference, or an array for more complicated cases. If an array is used then various properties may be overridden, including the `colspan` for this field, the `vname` (field label), and some field type-specific properties. Setting a custom value for the `colspan` is demonstrated by the `description` field in the sample code below.

A sample module view (DetailView) layout

```
detail
    type: view
    title: LBL_MODULE_TITLE
layout
       sections
              --
                     id: main
                     elements
                            - name
                            - type
                            -
                            - date_modified
                            - assigned_user
                            - date_entered
                            --
                                   name: description
                                   colspan: 2
    subpanels
        - accounts
        - contacts
```

For `view` layouts, it often makes sense to define a list of sub-panels following the form sections. These are entered in the `subpanels` array, a child of `layout`. Each entry here references an entry in the `links` section of the model descriptor (see Model Links and Relationships). The entry may be a simple string naming the link descriptor, or an array if additional properties of the subpanel are to be customized (including the `vname`).

In both `view` and `edit` layouts it is also possible to define custom form buttons. These are entered in the `form_buttons` array, also child of `layout`. Each entry should have a unique key representing the name of the button. It should define a `vname` (button label), may define a custom button `icon`, and can specify `async: false` if the default behaviour of performing a partial page load is not desired. The `params` attribute defines a list of properties to be overridden in the resulting HTTP request. If more complex behaviour is required, a custom javascript handler may be provided in an `perform` attribute.

Defining a custom form button

```
# ...
layout
      form_buttons
              pdf
                      vname: LBL_PDF_BUTTON_LABEL
                      icon: icon-print
                      params
                             action: PDF
                      async: false
       sections
            # ...
```

Because the classic DetailView.php, EditView.php, Save.php and Delete.php files are no longer present, custom behaviours when displaying, creating and updating records should be specified within model hooks. See the section on Business Logic Hooks for more information.

4.8 Display Widgets

It will often occur in custom extensions to 1CRM that there is a need to generate HTML outside of the normal HTML form generator. In these cases, and indeed for many cases within the 1CRM system, display widgets are used to encapsulate the rendering and processing logic for custom buttons, form fields, and form sections. These widgets may then be embedded in ListView, DetailView and EditView forms.

Application-level widgets are defined in the system file `include/config/display/display.app_widgets.php`. For widgets which are specific to a single module or which are to be packaged as part of an extension, the `widgets` section of a display descriptor file may be used instead. Widget definitions simply register the widget with the system, along with a unique name, its basic type, and the path to the file containing it:

Sample widget definitions

```
widgets
    PdfButton
        type: form_button
        path: include/layout/widgets/PdfButton.php
    RunIntervalInput
        type: field
        path: include/layout/widgets/RunIntervalInput.php
    SocialAccountsWidget
        type: section
        path: modules/SocialAccounts/widgets/SocialAccountsWidget.php
```

Widgets of type `form_button` must inherit from the FormButton class (`include/layout/forms/FormButton.php`). They can be included in the form_buttons section of a DetailView or EditView layout by simply setting the `widget` property of the button definition to the name of the widget.

Widgets of type `field` can be included either in a ListView layout as a column, or in a DetailView or EditView form as a single cell with an associated label. They must inherit from FormField (`include/layout/forms/FormField.php`) or from a subclass.

The last type, `section` widgets represent an entire table in an DetailView or EditView form. Examples include the social accounts panel on an Account, and the line items editor used in Quotes or Invoices. These widgets must inherit from FormSection (`include/layout/forms/FormSection.php`) or from a subclass such as FormTableSection.

Each widget generally overrides the `renderHtml(HtmlFormGenerator &$gen, RowResult &$row_result, array $parents, array $context)` method in order to perform its rendering. For `field`-type widgets which may be included in a ListView, it may be desirable to override the `renderListCell(ListFormatter &$fmt, ListResult &$result, $row_id, $list_params=null)` method for an alternate rendering format. If certain database fields are required in order to produce the result, then they should be returned in an array from a custom `getRequiredFields()` method.

When included in an EditView form, widgets are also given a chance to respond to certain form events. It may be desirable to override these FormElement methods in order to perform additional processing within the widget class, as opposed to setting separate hooks on the model itself:

```
function loadUpdateRequest(RowUpdate &$update, array $input)
function validateInput(RowUpdate &$update)
function beforeUpdate(RowUpdate &$update)
function afterUpdate(RowUpdate &$update)
```

5.0 Extending System Modules

1CRM provides upgrade-safe methods to extend existing modules.

5.1 The ext/ subdirectory

Each 1CRM module may contain an `ext/` subdirectory providing extensions to the model definition, layouts, or language of another module, as well as similar extensions to application-level configuration files and the 1CRM Administration module. In practice the `ext/` subdirectory is not employed by system modules, and is used exclusively by custom modules. These extensions are indexed by the ExtManager configuration class (`include/config/ExtManager.php`) and cached in `cache/system/ext_cache.php` in order to avoid scanning every subdirectory on each page load.

In general, files located under these directories are parsed by the configuration manager after the base system configuration files (and after the configuration files of any module being extended), but before any site-specific customizations located under the `custom/` subdirectory. This means that custom layouts saved by the layout editor and modifications to the module or application language saved by the dropdown editor will override or extend module extensions.

For the purpose of this document we will assume the existence of a custom module named TestModule which performs several (arbitrary) extensions to the system and to standard system modules. For testing purposes you may wish to create this module under your development system's `modules/` directory. Be sure to delete the extension cache file along with any related caches (model, display, or language) in order to see any changes. When a custom module is installed using the Upgrade Wizard these caches are automatically refreshed.

5.1.1 System Language Extensions

The standard system language files under `include/language/` may be easily extended by creating corresponding configuration extension files under the `ext/include/language/` subdirectory of any module. In particular, the system language strings file may be extended by `ext/include/language/lang.en_us.strings.php`, and the language lists (dropdowns) file by `ext/include/language/lang.en_us.lists.php`. In this example we are making changes to the dropdown list options in the English language file. Any dropdown options not defined by other language packs will be automatically inherited when those language packs are in use.

modules/TestModule/ext/include/language/lang.en_us.lists.php

```
<?php return; /* no output */ ?>

# create a new dropdown options list
test_dropdown_dom
    first: First Option
    second: Second Option

# add an option to an existing list
account_type_dom
    Nemesis: Nemesis

# replace an existing options list using @clear to erase any previous entries
terms_dom
    @clear
    Now: Now
    Never: Never
```

5.1.2 Model and Display Extensions

For any existing module located in `modules/M/` (for instance), a custom module may choose to define override files located under its own `ext/modules/M/` subdirectory. At this time module extensions are limited to model, display, language, and layout modifications.

These extensions all follow the same pattern. They are parsed directly by the configuration manager and operate on the tree structure resulting from existing configuration files.

Extending a model descriptor for an existing module is straightforward. In this example we add a new field to the Accounts module. We use the `vname_module` field parameter so that the language string may be defined in the language/ directory of our custom module. Note that the Database Repair task must be run in order to create the corresponding column in the database:

modules/TestModule/ext/modules/models/bean.Account.php

```
<?php return; /* no output */ ?>

fields
    test_duration
        type: duration
        vname: LBL_TEST_DURATION
        vname_module: TestModule
```

Similarly, we can extend the display model of the Account model. In this example we add a new filter, and automatically place it on the Browse layout of the Accounts ListView by adding a new entry to `basic_filters`.

modules/TestModule/ext/modules/display/display.Account.php

```
<?php return; /* no output */ ?>

basic_filters
    only_customers
filters
    only_customers
        type: flag
        vname: LBL_ONLY_CUSTOMERS
        vname_module: TestModule
        field: account_type
        value: Customer
```

5.1.3 Module Layout Extensions

There are two methods to extend module layouts. Existing layouts for a module `M` may be modified by creating a corresponding file under the `ext/modules/M/views/` subdirectory of the custom module, while new layouts and replacements for existing layouts in said module may be added to `ext/modules/M/new_views/`.

Replacement views are no different from normal layout files, but view extensions may use additional methods in order to place fields at the correct location within an existing layout. Under the `layout` property, view extensions may define the `ext_elements` property in order to list layout modifications with respect to existing fields in the layout. These modifications are able to add new fields, remove existing fields, and replace existing fields by new content. Modifications are made relative to existing fields, which must be named, and must have been previously placed within the layout. Each entry in ext_elements may define either a `name` (for a single field), or an `elements` array. It must define one of the properties `after`, `before`, `replace`, or `remove`.

In this example we update the standard Accounts layout by adding our new custom field (defined in section 5.1.2), then swapping two existing fields (`website` and `email1`).

modules/TestModule/ext/modules/Accounts/views/view.Standard.php

```
<?php return; /* no output */ ?>

layout
    ext_elements
        # add our custom test_duration field after 'name'
        --
            after: name
            name: test_duration
        # remove the email1 field
        --
            remove: email1
        # replace the website field with a pair of fields, email1 and website
        --
            replace: website
            elements
                - email1
                - website
```

Layout extensions may also add or remove subpanels using a similar method, via the `ext_subpanels` property. In this example we add the `cases` subpanel to the Sales layout for the Accounts module, directly after the `opportunities` subpanel. Note that each subpanel must refer to an existing link definition in the corresponding model – to add a new subpanel, a new link definition must also be added using the model extension method outlined in section 5.1.2. Each entry in ext_subpanels may define a `before` or `after` property; otherwise the new subpanel is added to the end of the list.

modules/TestModule/ext/modules/Accounts/views/view.Sales.php

```
<?php return; /* no output */ ?>

layout
    ext_subpanels
        # add the standard cases subpanel after the opportunities subpanel
        --
            after: opportunities
            name: cases
```

5.1.4 Extending the Administration Module

The Administration index page may be easily updated by custom modules. By simply adding files named as `ext/modules/Administration/administration.Custom.php` (the Custom part is arbitrary), additional entries may be added to the `$admin_group_header` array defined in `modules/Administration/index.php`. Each of these files is included and parsed as normal PHP code.

In this example we add a new entry to the first group of links. Note that `modules/TestModule/Configure.php` must be created separately, and must be added to the `web_actions` section of TestModule's module information file (under `metadata/`) in order to be accessed.

modules/TestModule/ext/modules/Administration/administration.Custom.php

```
<?php
$admin_group_header[0][3]['testmodule'] = array(
    'Administration', # the icon
    array('LBL_TESTMODULE_CONFIG', 'TestModule'), # the title
    array('LBL_TESTMODULE_CONFIG_DESC', 'TestModule'), # the description
    './index.php?module=TestModule&action=Configure')
);
?>
```

6.0 Debugging Methods

6.1 Application Settings

When developing it can be helpful to enable one or more settings in the 1CRM configuration. Some of these will have UI equivalents in the Configurator module, but most are hidden and must be added manually to the application config file, `include/config/local_config.php`. These settings are intended for temporary debugging or on private development sites only, as they may pose a security risk or performance overhead on public sites.

`cache.disabled:` Disable the external memory cache (such as APC) if any has been detected.

`site.allow_debug:` When this flag is enabled, ListViews and DetailView forms may have additional debugging information shown by adding `&debug=1` to the page URI. This includes printing the generated SQL queries.

`site.performance.calculate_response_time:` When enabled, 1CRM calculates and displays the time required to render the current page in the footer.

`site.performance.show_page_resources:` Show the number of PHP files included as well as statistics on the external cache.

`site.performance.show_memory_usage:` Show the amount of memory used in preparing the page.

`site.performance.log_all_queries:` Log all database queries performed during the generation of the page to `sql.log`, along with the time required for each.

`site.performance.suppress_display_errors:` Normally, 1CRM disables the PHP configuration setting `display_errors` during initialization. In order to display PHP errors as they arise, set this value to false.
`site.performance.force_display_errors:` Set this value to true in order to display all PHP errors and notices. This has the same effect as `error_reporting(E_ALL); ini_set('display_errors', 1)`. Note that syntax errors raised before system PHP files are included may still result in a blank page, depending on the PHP configuration.

`site.performance.suppress_deprecation_warnings, site.performance.suppress_strict_warnings:` Normally 1CRM suppresses any PHP notices of type E_DEPRECATED or E_STRICT. Set these flags to false in order to log or display them.

`site.log.detail_errors, site.log.detail_internal_errors:` When a PHP exception is raised during page rendering 1CRM will display a simple error message. In order to show a stack trace of the exception instead, enable these settings. `detail_internal_errors` is required in order to display exceptions subclassing `IAHInternalError`, as these are considered more sensitive.

`site.js_custom_version`: Set this property to a different value (generally an incrementing integer) in order to override any javascript caching on the client or server side.

`layout.jsmin_enabled:` Set this value to false in order to disable the built-in javascript caching, which causes javascript files to be minified and loaded via jsmin.php.

`layout.show_validate_button:` This setting enables a Validate setting on all EditView forms, which may be used to check record pre-save conditions and display a detailed report of any issues discovered.

`json.log_level, soap.log_level:` Set these values to a custom error level (info, warn, error, or fatal) in order to log details of all requests to the given external interface (SOAP or JSON) to the application log file.

6.2 Utility Functions

`AppConfig::current_user_id()`	Fetch the ID of the current user.
`AppConfig::setting ( $name, $default=null, $standard=false )`	Fetch a setting from the application config, returning `$default` if it is not defined. Pass `$standard` to return the application default for a setting, ignoring any custom setting.

`$log->info ( $msg )`
`$log->warn ( $msg )`
`$log->error ( $msg )`
`$log->fatal ( $msg )`
	Write a custom message to the 1CRM system log file. Note that if the log level is below the minimum (adjustable on the System Settings page) then it will be ignored.

`pr2 ( $message, $title=null, $wrap=false, $hide=false, $escape=true )`	Use this function to quickly output debugging information. Arrays and objects are automatically formatted to be more legible. Word wrapping is enabled via the `$wrap` parameter, and the output may be shown in a more compact format by setting the `$hide` parameter. The `$escape` parameter (default true) escapes any HTML characters in the message.
`tr2 ( $format=false, $title=null, $html=true, $hide=false )`	This function can be used to quickly print a formatted stack trace and output via the `pr2` function. In order to return the output instead of printing it, pass the format parameter.
`prq ( $query, $title=null, $hide=false )`	Quickly format an SQL query with syntax highlighting and output it via the `pr2` function.

Appendix A - Standard Icons

In addition to the theme icons located in each theme's images/ subdirectory, which are used primary to identify different modules, 1CRM defines a standard set of icons for common actions. When adding buttons and similar UI elements to a layout, it is generally preferable to choose from this set of icons when possible. Icons are rendered by creating a div element of class `input-icon` and adding the specific class (for example `<div class="input-icon icon-accept"></div>`). The following table summarized these icons and their intended uses.

`icon-add`	Create a new record
`icon-accept`	Save changes to a record or confirm another action
`icon-action`	For a standard 'tools'-type menu, shown as a gear icon
`icon-cancel`	Return from an action without committing any changes
`icon-calendar`	Used by date and datetime-type fields
`icon-changelog`	For the change log (audit log) of a particular module
`icon-convert`	Convert a record, generally by creating a new record in a separate module
`icon-close`	Close the current form or window
`icon-delete`	Delete a record
`icon-duplicate`	Duplicate a record
`icon-edit`	Edit a record
`icon-editlayout`	Edit a standard form layout
`icon-editlist`	Edit a ListView layout
`icon-email`	Create a new email or link to the Emails module
`icon-exchangerate`	For actions relating to a record's exchange rate
`icon-expand`	Expand a record, subpanel, or part of a record
`icon-export`	Export a record or set of records
`icon-filter`	Add a filter to a ListView or other object
`icon-help`	For quick help tips or links to other documentation
`icon-layout`	To identify form layouts
`icon-note`	For creating related Note objects or linking to the Note modules
`icon-print`	Prepare the current record or set of records for printing
`icon-reports`	Used by the Reports tab on each relevant ListView

icon-return	Return to the previous step or action
icon_search	Search for a record
icon-send	Send an email or other notification
icon-skype	For integration with the Skype messaging system
icon-sortlist	To adjust the sort method of a particular list
icon-sources	For adjusting related sources on a ListView
icon-star	Used to indicate Favorite records
icon-recur	For recurring events or scheduled items
icon-teams	For team restrictions and other links to the SecurityGroups module
icon-time	For time-type fields
icon-user	Used to represent a single, non-administrative user
icon-users	Used to represent a mixed group of users
icon-adminuser	Used to represent an administrative user
icon-view	Show details on a selected record

Among these standard icons there are also icons intended for inline use within text or for navigation purposes. These may not always be the correct size for embedding in a standard form button.

icon-info	Show quick information on a record
icon-popup	Indicates a button which produces a popup window
icon-up icon-down icon-left icon-right	Large arrow icons, generally used when moving content within a container. For example, when moving line items within a Quote
icon-prev icon-next icon-start icon-end icon-dprev icon-dnext	Navigation arrows, used to move between records or pages of records
icon-ledgrey icon-ledgreen icon-ledred icon-ledyellow icon-ledviolet icon-ledblue icon-ledorange	Standard LED-type indicators in different colors

`icon-temail`
`icon-tlink`
`icon-tphone`
	Small type indicators for links to email addresses, external web addresses, and phone numbers respectively

1CRM 8.0 DEVELOPER GUIDE

A Comprehensive Guide to Developing Customizations and Extensions for 1CRM