



## APPENDIX **B**

# Data Object Definitions

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The following are definitions of data objects that are used by the LicenseManager class. Getter methods are used for getting the value of class member data. Setter methods are used for setting new values for class member data. This section provides the getter and setter methods for each class and hides the private member data.

```
// Data structure for UserToken information.
public class UserToken implement Serializable {
    private String token;// token generated by the server during login.
    private String username; //username in the server account.
    private int m_timeout = 0; //timeout for the token, 0 represents permanent
    private boolean m_ssl_enabled = false;
}

// Data structure for Group information.
public class Group implement Serializable {
    private String m_group;//group name
    private HashSet<String> m_group_access_list; //group access list
    private HashSet<String> m_devices; //devices belong to this group
}

// Data structure for PAK information.
public class PAK implement Serializable {
private String m_internal_id; //internal encrypted PAK id, use as db key
    private String m_pak_name; //PAK name
    private SKU[] m_sku_list; // list of SKU
    private Date m_last_download; //last time download occurred
    private int m_download_status;//status for the download
    private String m_download_by;//username who perform the download
    private String m_pak_type; //PAK type

    private String m_owner; //username who created this PAK
    private String m_display_name; //PAK name to be displayed
    private HashSet<String> m_pak_access_list; //access list for the PAK
}

// Data structure for SKU information.
public class SKU implement Serializable {
    private String m_device_platforms;
    private String m_type; //SKU type, such as counted, uncounted
    private String m_name; //name of the SKU
    private String m_desc; //description for this SKU
    private int m_ordered_qty; //quantity of the SKU ordered
    private int m_available_qty; //quantify of the SKU left
    private String[] m_features; // feature name of the SKU
    private String m_entitlement; //PAK internal id
    private String[] m_licenseid_list; //list of licenseline id
```

```

    private String m_count;//count available in the ordered SKU
}

// Data structure for the obtained license.
public class License implement Serializable {
    public enum ObtainSource { CISCO, PREINSTALL, UNKNOWN };
    public enum DeployStatus { DEPLOYED, UNDEPLOYED, PARTIALLY_DEPLOYED};

    private String m_license_id; //license id as db key, this is generated by CLM server
    private String[] m_feature_names; //feature names contain in the
    private String[] m_feature_versions;//feature version
    private String m_file_name; //filename that contains this License,
not used by CLM
    private String m_device_id;//device UDI this license associated with.
    private Date m_obtain_date;//license obtain date
    private ObtainSource m_obtain_source; //where this license obtained from
    private String m_obtain_by; //username who obtained the license
    private DeployStatus m_deploy_status; //license deploy status
    private String[] m_lic_line_ids; //licenseline ids contain in this license
    private String m_pak_id; // PAK id where this license used to obtained from Cisco.com
}

// Data structure for the obtained licenseline.
public class LicenseLine implement Serializable {
    public enum LLDeployStatus { DEPLOYED, UNDEPLOYED };
    public enum LLType { EVALUATION, EXTENSION, PERMANENT, UNKNOWN};
    public enum LLExpireType { DAY_BASE, DATE_BASE };
    public enum LLState { ACTIVE_IN_USE, ACTIVATE_NOT_IN_USE, INACTIVATE, UNKNOWN }

    private String m_license_line_id; //licenseline ID to identify this licenseline, used
as db key
    private String m_feature_name;//feature name of this licenseline
    private String m_license_xml; //xml string for this licenseline
    private String m_udi;//device UDI this licenseline associated with
    private String m_license_id;//license ID of this licenseline associated with
    private String m_pak_id; //PAK ID of this licenseline associated with
    private LLDeployStatus m_deploy_status = LLDeployStatus.UNDEPLOYED;//Licenseline
deploy status

    private String m_annotation; //Annotation string for this licenseline
    private String m_sku_name; //SKU name this licenseline associated with
    private String m_deployed_by_user; //username who deployed this licenseline
    private Date m_deployed_date; //The date of this licenseline be deployed
    private LLState m_state; //The state of this licenseline read from the device.
    private boolean m_eula_required; //Is EULA required from this licenseline?
    private LLType m_type;//Licenseline type, check LLType enum for options.
    private ExpiryInfo m_expiry_info; //Expiry information if this licenseline is an
expiry license
    private UsageInfo m_usage_info; //Usage left for this licenseline if this licenseline
is an expiry license.

    private long m_index; //Storage index in the device for this licenseline
    private String m_storage;//Storage name of this licenseline is kept
    private CountInfo m_count_info;//CountInfo that keep how many count in the licenseline
//if this is a counted licenseline

    private String m_version; //licenseline feature version
}

Public ExpiryInfo implements Serializable{
    private LLExpireType expire_type; // DAY_BASE, DATE_BASE
    private int expire_days; //number of days to expire for DAY_BASE
    private int expire_days_from_last_poll; //number of days to expire from last poll, for
DAY_BASE

```

```

        private Date start_day; //start date for DATE_BASE
        private Date end_day; //end date for DATE_BASE
    }

    public class UsageInfo {
        public long m_totalUsage; //Total usage in milli-seconds read from the device
        public long m_usageLeft; //Usage left in milli-seconds read from the device
    }

    public class CountInfo {
        public int m_totalCount; //Total count of the licenseline read from the device
        public int m_usageCount; //Count used of the licenseline read from the device
    }

    // Data structure for RehostInfo
    public class RehostInfo implement Serializable{
        private String permission_ticket; //Permission Ticket returned from Cisco.com
        private String rehost_ticket; //Rehost Ticket after Using the Permission Ticket to
revoke a licenseline
        private String[] sku_selection; //SKU selected for Rehost
        private String src_device_id; //source device UDI
        private String dest_device_id; //detination device UDI
    }

    // Data structure for devices.
    public class Device implement Serializable {
        public enum PollStatus { FAILURE, SUCCESS };
        public enum DeviceState { DEV_CONNECT, DEV_CANNOT_PING, DEV_CANNOT_AUTHENTICATE,
DEV_CANNOT_CONNECT }
        public enum TransportMethod {HTTP, HTTPS, TELNET, SSH};
        public enum LicenseOperation {INSTALL, CLEAR, ANNOTATE, REVOKE};
        private String m_pid; //device product ID
        private String m_vid; //device version ID
        private String m_sn; // device serial number
        private String m_device_id; // device ID, same as m_udi
        private String m_ipaddr; // device IP address
        private String m_udi; // device UDI, a string contains m_pid, m_vid and m_sn, used as
key in db
        private String m_hostname; //hostname of the device
        private String m_display_name; //display name for the device, usually same as hostname
or UDI,
if not given by user
        private String[] m_device_access_info; // device access info list, first string is the
TransportMethod,
                //second string is device HTTP url if HTTP/HTTPS is used
                //third string is license agent version.
        private String[] m_licensable_features; //license feature names that are supported by
the IOS image of the device
        private Date m_last_polling_date; //last performed poll date
        private PollStatus m_last_polling_status; //last polled status
        private String m_polled_by; //username who initiated the poll
        private String[] m_member_device_ids; //device UDI list of the child devices,
applicable to master device in
// stackable devices.
        private String m_parent_device_id; //device UDI of the parent device, applicable to
the child devices
//in stackable devices.
        private String m_credential; //device credential, internal generated string to assure
device credibility.
    }

```

```

        private DeviceAuthentication m_device_auth; //device login information such as
        username/password
        private String m_device_model; //device model
        private String m_device_type; //device type
        private HashSet<String> m_device_access_list; //device access list to control user
        access.
        private DeviceState m_state; //device connectivity state, check values of DeviceState
        private LicenseOperation[] m_device_lic_capabilities;//device capability toward
        licenses,
        //such as support resend, rehost
        private String m_sw_version; //software version number for this device
        private FeatureInfo[] m_feature_info; //a data structure that organizes licenselines
        by feature name
        private String[] m_feature_versions; //feature version list mapping to
        m_licensable_feature list.
        private boolean m_rma; //boolean value to indicate if this device is RMA'd
        private boolean m_dirty;//boolean value to indicate if this device is dirty and
        requires polling.
        private int m_slot; //slot number of this device,
        //applicable to stackable devices.
    }

    // Data structure for UserInfo.
    public class UserInfo implements Serializable {
        public enum Role { ADMIN, INVENTORYMGR, PAKMGR, LICENSEMGR, REPORTMGR}
        private String m_username;
        private String m_password;
        private String m_first_name;
        private String m_last_name;
        private String m_company_name;
        private String m_email_address;
        protected boolean m_email_enabled; //enable email notification
        private String m_cco_username; //Cisco.com username
        private String m_cco_password;//Cisco.com password
        private Role m_role; //Associated Role of this user
        private boolean m_has_agree_eula; //boolean value to indicate this user has agree to
        EULA
        private boolean m_do_not_ask_eula_again; //boolean value to indicate the user do not
        want to be queried again

        //once the EULA is agreed.
        private Date m_eula_accepted_time; //Date the EULA is accepted by the user
        private boolean m_show_exp_lic; //boolean value to indicate when user
        // login, GUI will show expired licenses.
    }

    // Data structure to be used when requesting for a license.
    public class LicenseRequest {
        private SKU[] sku_selection;
        private String device_id;
        private int request_status;
    }

    // Data structure to be used when requesting license re-host.
    public class RehostRequest {
        private SKU[] sku_selection;
        private String src_device_id;
        private String dest_device_id;
    }

    // Data structure for device username and password.
    public class DeviceAuthentication implements Serializable {
        private String username;
        private String password;
    }

```

```

private String enable_password;
}

Public class UserPwd {
    public String username;
    public String password;
}

public class DiscoveryAuthInfo {
    private UserPwd[] auth_pairs;
    private String[] enable_password;
}

// Data structure for FeatureInfo
Public class FeatureInfo implements Serializable{
    private LinkedList<LicenseLineInfo> ll_info_list; //list of licenselineInfo
    private long total_expiry_usage; //total usage left for this license feature, the
value is in milli-seconds
    private String feature_name ; //feature name
    private String feature_version; //feature version
}

public class LicenseLineInfo implements Serializable {
    public String m_licline_id; //licenseline ID
    public UsageInfo m_usage_info; //exipring usage information for each licenseline
    public LicenseLine.LLType m_type; //licenseline type
    public CountInfo m_count_info; //structure contains count of licenseline if the
licenseline is of counted license.
    public LicenseLine.LLDeployStatus m_deploy_status; //licenseline deploy status
    public LicenseLine.LLState m_state; //licenseline deploy state
}

// Data structure for returning ID and status
public class Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
}

public class IDStatus extends Status implements Serializable {
    private IDStatusItem[] m_item_list;
}

public class IDStatusItem extends Status implements Serializable {
    private String m_id;
}

// Data structure for returning PAK and status
public class Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
}

public class PAKStatus extends Status implements Serializable {
    private PAKStatusItem[] m_item_list;
}

public class PAKStatusItem extends Status implements Serializable {
    private PAK m_pak;
}

// Data structure for returning License and status
public class Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
}

public class LicenseStatus extends Status implements Serializable {
    private LicenseStatusItem[] m_item_list;
}

```

```

}
public class LicenseStatusItem extends Status implements Serializable {
    private License m_license;
}

public class LicLineStatus extends Status implements Serializable {
    private LicLineStatusItem[] m_item_list;
}
public class LicLineStatusItem extends Status implements Serializable {
    private LicenseLine m_licline;
}

public class GroupStatus extends Status implements Serializable {
    private GroupStatusItem[] m_item_list;
}
public class GroupStatusItem extends Status implements Serializable {
    private Group m_group;
}

public class RehostInfoStatus extends Status implements Serializable {
    private RehostInfoStatusItem[] m_item_list;
}
public class RehostInfoStatusItem extends Status implements Serializable {
    private RehostInfo m_group;
}

public class EulaStatus extends Status implements Serializable {
    private boolean accepted_eula;
    private boolean do_not_ask_again;
}

public class ClmJobStatusItem extends Status implements Serializable{
    private ClmJob m_job;
}

public class ClmJobStatus extends Status implements Serializable {
    private ClmJobStatusItem[] m_item_list;
}

// Data structure for returning Device and status
public class Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
}

public class DeviceStatus extends Status implements Serializable {
    private DeviceStatusItem[] m_item_list;
}

public class DeviceStatusItem extends Status implements Serializable {
    private Device m_device;
}

// Data structure for returning ID and status
public class IDStatus extends Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
    private IDStatusItem[] m_item_list;
}
public class IDStatusItem extends Status implements Serializable {
    private int m_error_code;
    private String m_error_message;
    private String m_id;
}

```

```

}

// Data structure for returning asynchronous Progress
public class ProgressStatus extends Status implements Serializable {
private int m_error_code;
private String m_error_message;
    private String[] current_process_ids;
private int total_task;
private int num_processed;
private int overall_percentage;
private String[] function_history;
private int num_dev_found;
private Date exec_time;
}

// Interface for asynchronous request status listener.
public interface IDStatusListener {
    public void onStatus(IDStatus status);
}

// Data structure for notifications.
public class Notification {
public enum Operation={LIC_INSTALL, LIC_CLEAR, LIC_REVOKE, LIC_ANNOTATE,
    DEV_CONNECT, DEV_CANNOT_PING, DEV_CANNOT_AUTHENTICATE,
    DEV_CANNOT_CONNECT, DEV_RMA, DEV_RMA_BUT_RUNNING }
    public enum DevModel={TBD};
    public enum DevType={UNKNOWN};
    public enum Severity={SEVERE, MODERATE, LOW, INFO};

private String message; //message of what this notification is about
private Date time_stamp;//Date of the notification sent
private String dev_id; //device ID of the involved device
private String dev_name; //device name of the involved device
private DevType dev_type; //device type
private DevModel dev_model; //device model
private Severity severity; //severity level, using X.733 standard
private string[] group; //group list the device associated with
private Operation op; //enum value to indicate defined operation
private string licline_id; //involved licenseline ID
private string feature_name; //involved feature name
}

// Interface for notification listener.
public interface NotificationListener {
    public void onNotification(Notification notification);
}

public class AuditTrail implements Serializable {
    public enum OperationStatus { SUCCESS, FAILURE }

    private String m_id;
private String m_user;
private Date m_start_time;
private Date m_end_time;
private String m_operation;
private OperationStatus m_operation_status;
private String m_msg;
private String m_affected; //involved elements, usually a list of device IDs,
licenseline IDs or PAK IDs.
}

// Data structure for EulaInfo statement and agreement
public class EulaInfo {

```

```
private const String eula_agreement_statement="
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```

By clicking the "accept" button or typing "yes" Customer indicates that it has
read and agrees to be bound by all the terms provided herein including the terms
of the End User License Agreement and the Supplement.";
    private boolean I_have_read_and_I_accept_this_EULA;
    private boolean do_not_ask_me_again;
    private Date eula_accepted_time;
}

// Data structure for Schedule
public class Schedule implements Serializable{
    public enum ClmTask { POLL_LICENSES, CHECK_EXPIRING_LICENSES};
    public enum Frequency { EVERY_DAY, EVERY_TWO_DAYS, EVERY_THREE_DAYS, EVERY_FOUR_DAYS,
EVERY_FIVE_DAYS, EVERY_SIX_DAYS, WEEKLY, EVERY_EIGHT_DAYS, EVERY_NINE_DAYS,
EVERY_TEN_DAYS, EVERY_ELEVEN_DAYS, EVERY_TWELVE_DAYS, EVERY_THIRTEEN_DAYS, BI_WEEKLY };
    private Calendar m_starting_date;

    private String m_name;//task name
    private Frequency m_frequency; //frequency of the scheduled task
    private int m_notify_if_less_than; //number of days to be notify if the license is
expiring.
}

public class Policy {
    public enum DeviceAttribute {
        MODEL, GROUP
    };
    public enum SKUAttribute {
        FEATURE_NAME
    };
    String id;                // ID of the policy
    String name;              // name of the policy
    String owner;             // owner of the policy
    String desc;              // description of the policy
    boolean is_public;        // is this policy public?
    DeviceFilter dev_filter;  // the device filter
    SKUFilter sku_filter;     // the SKU filter
    SKUIdentifier sku_in_use; // the SKU in use by the policy
    String executed_by;       // user who executes the policy
    Date executed_at;         // time when executing the policy
}

public class SKUFilter {
    String feature_name;      // specify the interested feature name
}

```

```

public class DeviceFilter {
    String type;           // specify the interested type of device (for future use)
    String model;         // specify the interested model of device
    String sw_version;    // specify the interested dev sw version (for future use)
    String group;         // specify the interested device group
    String ip_lower_limit; // specify the upper limit of IP addr in a range
    String ip_upper_limit; // specify the lower limit of IP addr in a range
}

public class SKUIdentifier {
    String pak;           // PAK of the selected SKU
    String sku_name;      // name the selected SKU
}

//report structure
enum OutputFormat={ HTML, TEXT };
enum ReportSubject={LICENSE_DISCREPANCY, REDEPLOYABLE_LICENSE,
    UNUSED_LICENSE, DEVICE_SUMMARY, LICENSE_EXPIRY,
    RMA_DISCREPANCY, AUDITTRAIL};

//ClmJob structure
public class ClmJob implements Serializable{
    private String m_job_id; // Job ID to identify a Job in DB, it is the same as request
    ID
    private Date m_start_date; //date when the Job started.
    private Date m_end_date; //date when the Job ends
    private String m_username; //username who initiates the job
    private String m_func_name; //function name of the job is performed
    private boolean m_safe_to_kill=true; //boolean value to indicate if it is safe to
    cancel this task
    private String m_comment; //human readable statement for this job
    private ProgressStatus m_progress; //ProgressStatus for this job
    private boolean m_job_done=false; //boolean value to indicate the job has completed.
    private ModuleLifeCycleIf m_module_handler; //an interface to handle cancel job
    instruction
    private IDStatusm_idstatus; //the IDStatus of the operation after it is completed.
}

```