REST API for Intwine Connect CTA-2045 Universal Communication Modules

1 Overview

This document describes the RESTful API to the Intwine Connect CTA-2045 Universal Communication Module (UCM). This API is used for both AC and DC form-factor UCM, however all messages may not be supported based on the specific Smart Grid Device (SGD) connected.

To use these API it is necessary to first configure the UCM to connect to a Wi-Fi access point and then get the IP address of the UCM. For testing purposes, the Chrome Advanced REST Client can be used. This tool is an extension for the Google Chrome browser and can be downloaded from the following link:

https://chrome.google.com/webstore/detail/advanced-rest-client/hgmloofddffdnphfgcellkdfbfbjeloo

Finally, it is the responsibility of the user (or head-node) to issue a "good" Outside Comm State message at a regular interval (no more than 15 minutes). If this is not done, the SGD may stop any curtailment events in progress.

2 Contents

intwine connect, llc 8401 chagrin rd. suite 10a chagrin falls, oh 44023

3 API

3.1 Outside Comm State

URL	/comm.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{“commstate”: “xxxx” } possible values are "good" or "lost"
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Sent by the UCM to the SGD to indicate the availability of external communications to the UCM. Opcode1 = 0x0E Opcode2 = 0x01 or 0x00 for "good" or "lost", respectively

3.2 Shed Load

URL	/load.cgi
METHOD	POST

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URL PARAMS	N/A
DATA PARAMS	{ “event_name”: “shed”, “event_duration”: “xxxxxxx”} integer number of seconds [see Note]
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Event Duration is encoded internally to the UCM as: Time in Seconds = 2 * (Byte Value)^2 Possible values range from [2, 43200] seconds. The Byte Value will always be rounded up (actual event may be longer than desired, but will never be shorter). --- Sent from the UCM to the SGD when a load shed event begins. If other load management commands are attempted but not accepted by the SGD, then the UCM must fall back to this Opcode. Event Duration: See Section 8.1.2 for description and usage. Note: Event Durations of 10 minutes or less relate to “spinning reserve” uses. Event Durations greater than 10 minutes relate to “shift” uses. Opcode1 = 0x01 Opcode2 = Event Duration Max Event duration = 12 hours

3.3 Critical Peak Event

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A

DATA PARAMS	{ “event_name”: “critical_peak”, “event_duration”: “xxxxxxx”} integer number of seconds [see Note]
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Event Duration is encoded internally to the UCM as: Time in Seconds = 2 * (Byte Value)^2 Possible values range from [2, 43200] seconds. The Byte Value will always be rounded up (actual event may be longer than desired, but will never be shorter). --- Opcode1 = 0x0A Opcode2 = Event Duration Max Event duration = 12 hours

3.4 Grid Emergency

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{ “event_name”: “grid_emergency”, “event_duration”: “xxxxxxx”} integer number of seconds [see Note]
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	

intwine connect, llc 8401 chagrin rd. suite 10a chagrin falls, oh 44023

NOTES	Event Duration is encoded internally to the UCM as: Time in Seconds = 2 * (Byte Value)^2 Possible values range from [2, 43200] seconds. The Byte Value will always be rounded up (actual event may be longer than desired, but will never be shorter). --- Opcode1 = 0x0B Opcode2 = Event Duration Max Event duration = 12 hours

3.5 Present Relative Price

URL	/price.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{ “cur_price”: “xxxxxx”}
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR: ANY OTHER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Sent from the UCM to the SGD when a change in relative price occurs to inform of the new relative price. Relative Price Indicator: See Section 8.2.2 for description and usage. --- Opcode1 = 0x07 Opcode2 = Relative price Indicator

3.6 Next Period Relative Price

URL	/price

METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{ “next_price”: xxxxxxx}
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR: ANY OTHER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Sent from the UCM to the SGD when a change in relative price occurs to inform of the relative price in the next future period. Relative Price Indicator: See Section 8.2.2 for description and usage. ---------- Opcode1 = 0x08 – all are used one after the other Opcode2 = Relative price Indicator

3.7 Time Remaining in Price Period

URL	/price.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{ “time_remaining”: “xxxxxxx” }
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR: ANY OTHER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	

NOTES	Sent from the UCM to the SGD when a change in price occurs to inform of the duration of the present price period. Event Duration: See Section 8.1.2 for description and usage. --- Opcode1 = 0x09 Opcode2 = Event Duration

3.8 End Shed / Run Normal

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{ “event_name”: “normal” }
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	This command must be sent once from the UCM to the SGD when a load shed or other curtailment event ends, regardless of whether the Event Duration is provided for informational purposes. Curtailment event commands that are terminated by this End Shed include: Shed 0x01, Request for Power Level 0x06, Critical Peak Event 0x0A, Grid Emergency 0x0B, and Load Up 0x17. Opcode1 = 0x02 Opcode2 = 0x00

3.9 Request Change in Power Level

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A

intwine connect, llc 8401 chagrin rd. suite 10a chagrin falls, oh 44023

DATA PARAMS	{ “event_name”: “change_level”, “load_percent”: “xxxxxxx”} integer between [-100, 100] inclusive. Negative implies load reduction, positive implies load increase
SUCCESS RESPONSE	HTTP 200 – OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Sent from the UCM to the SGD to request that its average Power Level (relative to the full rating of the device) be reduced to a level between 0 and 100% of full value on a 7 bit precision scale. Percent Setting: MSbit = 0, Least significant 7 bits: 0x00 to 0x7F = 0 to 100% power absorbed MSbit = 1, Least significant 7 bits: 0x00 to 0x7F = 0 to 100% power produced Details regarding the use of this command are provided in Section 8.2.1 . Opcode1 = 0x06 Opcode2 = Percent Setting

3.10 Get Current State

URL	/state_sgd.cgi?
METHOD	GET
URL PARAMS	N/A
DATA PARAMS	N/A
SUCCESS RESPONSE	HTTP 200 OK { “code”: “xx”, “meaning”: “xxxxxxxx”}
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR

	HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Code 0 "Idle Normal" Indicates that no demand response event is in effect and the SGD has no/insignificant energy consumption. Code 1 "Running Normal" Indicates that no demand response event is in effect and the SGD has significant energy consumption. Code 2 "Running Curtailed" Indicates that a curtailment type demand response event is in effect and the SGD has significant energy consumption. Code 3 "Running Heightened" Indicates that a heightened-operation type of demand response event is in effect and the SGD has significant energy consumption. Code 4 "Idle Curtailed" Indicates that a curtailment type demand response event is in effect and the SGD has no/insignificant energy consumption. Code 5 "SGD Error Condition" Indicates that the SGD is not operating because it needs maintenance support or is in some way disabled (i.e. no response to the grid) Code 6 "Idle Heightened" Indicates that a heightened-operation type of demand response event is in effect and the SGD has no/insignificant energy consumption. Code 7 "Cycling On" Indicates that a cycling type of demand response event is in effect and the SGD has significant energy consumption (i.e. cycled on) Code 8 "Cycling Off" Indicates that a cycling type of demand response event is in effect and the SGD has no/insignificant energy consumption (i.e. cycled off) Code 9 "Variable Following" Indicates that a variable-setting type of demand response event is in effect and the SGD is presently following the specified setting. Code 10 "Variable Not Following" Indicates that a variable-setting type demand response event is in effect and the SGD is presently not following the specified setting (e.g. the has no/insignificant energy consumption. Code 11 "Idle, Opted Out" Indicates that the SGD is presently opted out of any demand response events and the SGD has no/insignificant energy consumption. Code 12 "Running, Opted Out" Indicates that the SGD is presently opted out of any demand response events and the SGD has

intwine connect, llc 8401 chagrin rd. suite 10a chagrin falls, oh 44023

	significant energy consumption. --- Opcode1 = 0x12 Response: Sent from the SGD to the UCM in response to an Opcode 0x12 query Operating State Codes: See Section 8.2.4 for description and usage. Opcode1=0x13 Opcode2 = Operating state code

3.11 Update Local Time

URL	/time.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{“day”: “x”, Day of week: 0=Sunday, 6=Saturday “hour”: “xx”} Local hour of day [0, 23]
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	When supported, this command is sent from the UCM to the SGD on the hour. Time Value: Bits 7..5 = Weekday (0 = Sunday, 6 = Saturday) Bits 4..0 = Hour* of Day (0 to 23) *This is the local hour, including DST where applicable, for display on the SGD clock as-is. Opcode1 = 0x16 Opcode2 = Time Value

3.12 Load Up

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{“event_name”: “load_up”, "event_duration" : "xxxxxx" }
SUCCESS RESPONSE	HTTP 200 OK HTTP 302
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	This command is the opposite (complement) of the “Shed” command. It requests that the end device run now, and continue as possible. The assumption of this command is that energy is not wasted, but rather that things like thermal devices will cycle on and operate until the maximum stored energy state is reached. Sent from the UCM to SGD at the beginning of the event. The End Shed/Run Normal message will end this event. Event Duration See section 8.1.2 for description and usage Opcode1 = 0x17 Opcode2 = duration

3.13 Start Autonomous Cycling

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A
DATA PARAMS	{"event_name ": "start_cycling", "eventID": "xxxx", "start_time": "xxxx",

	"event_duration": "xx", "duty_cycle": "x", "start_rand": "x", "end_rand":"x"}
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Event ID Unsigned 32 bit value control event identifier Start Time Unsigned 32 bit value of seconds since 1/1/2000 00:00:00 UTC, 0 = NowDuration Duration of the control event in minutes Duty Cycle % reduction of the load (e.g., 75 means that the device will be off ¾ of the time) Start Randomization The start of the control will be delayed by this randomized value in minutes. The start randomization does not change the duration of the event. End Randomization The event duration will be lengthened by this random value given in minutes.

3.14 Terminate Autonomous Cycling

URL	/load.cgi
METHOD	POST
URL PARAMS	N/A

DATA PARAMS	{"event_name ": "stop_cycling", "eventID": "xxxx", "end_rand":"x"}
SUCCESS RESPONSE	HTTP 200 OK
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Event ID Unsigned 32 bit value control event identifier End Randomization Continue the control for random value time to prevent large groups from turning on at the same time (given in minutes).

3.15 Request Information

URL	/info_sgd.cgi?
METHOD	GET
URL PARAMS	N/A
DATA PARAMS	N/A
SUCCESS RESPONSE	HTTP 200 OK {"CTA-2045 ver": xx, "Vendor ID": 0xXXXX, "Device Type": 0xXXXX, "Device Revision": 0xXXXX, "Capability Bitmap": XXXX, "Model Number": XXXXXXXXXXXXXXX, "Serial Number": XXXXXXXXXXXXXXX, "Firmware Year": 20XX, "Firmware Month": XX, "Firmware Day": XX, "Firmware Major": X,

	"Firmware Minor": X}
ERROR RESPONSE	HTTP 400 – BAD REQUEST: BAD PAYLOAD BYTE #2 HTTP 401 - UNAUTHORIZED: BUSY HTTP 403 – FORBIDDEN: OTHER ERROR HTTP 414- URL TOO LONG : LENGTH ERROR HTTP 500- INTERNAL SERVER ERROR HTTP 501- NOT IMPLEMENTED: UNSUPPORTED COMMAND
SAMPLE CALL	
NOTES	Vendor ID Vendors who support this command must request a unique vendor ID provided by the standard development organization or users alliance. Device Type Used by both SGDs and UCMs, this is a 16 bit value identifying the class to which a device belongs. For more information see section 9.1.1.1. Capability Bitmap

Bit (2^n)	Description
0	Cycling supported
1	Tier mode supported
2	Price mode supported
3	Temperature Offset supported
4-15	Reserved

Model Number
Device model number, all zeros = not supported

Serial Number
Device serial number, all zeros = not supported

Firmware Year
Year – 2000 (e.g., Firmware Year = 11 (0x0B) for 2011)

Firmware Month
0 (0x00) = January, 11 (0x0B) = December

Firmware Day
1 - 31