



RSU-301U

Information Sheet

V2X Roadside Unit,
DSRC stack, V2Xcast®



Overview:

RSU-301U is a V2X (Vehicle to Everything) roadside unit with waterproof IP67 enclosure designed to enable DSRC V2X in the Cooperative Intelligent Transport Systems (C-ITS) environment. RSU-301U provides secure data communication between vehicles and infrastructure, such as Advanced Traffic Controller, to enable cooperative ITS applications. Preloaded DSRC stack and V2Xcast® software, RSU-301U provides highest Vehicle to Infrastructure (V2I or I2V) application flexibility to fit the various deployment needs of different ITS and V2X system integrators.

Feature:

- ❖ A rich SDK contains facility-layer messages, APIs and example codes supports quick development of V2X applications.
- ❖ Seamlessly enable V2X on roadside Linux host via Ethernet connection and V2Xcast®.
- ❖ On-board mPCIe socket allows add-on module such as LTE or Wi-Fi/Bluetooth radio.

Specifications:

Chipset	<ul style="list-style-type: none"> ❖ Autotalks® CRATON2 V2X communication processor <ul style="list-style-type: none"> ◆ dual 600MHz ARM Cortex-A7 32-bit CPU cores ◆ 1140 DMIPS processing power each Cortex-A7 core ◆ ARM Cortex M3 32-bit processor with memory protection unit (MPU) and ECC protected memory ❖ Autotalks® PLUTON2 V2X RF Transceiver ❖ Embedded Hardware Secure Module (eHSM) <ul style="list-style-type: none"> ◆ Dedicated ARM Cortex-M0 CPU ❖ Telit® SL869-V3 GNSS module (SL869-ADR optional)
Operation System	Linux Yocto
System Service	RS-232 console (baud rate 115200 bps) through on-board interface
System Memory	128MB NAND, 128MB DDR3
Preloaded Firmware	DSRC stack including IEEE 802.11p, IEEE 1609.2/3/4, and SCMS client*(*Est. in Q2 '21)
Development Tool	V2Xcast® SDK, including APIs and SAE J2735 facility layer messages
Hardware Security	<ul style="list-style-type: none"> ❖ Dedicated ROM containing certified secure V2X signing firmware ❖ Secure encrypted off-chip storage of private keys ❖ Private material is inaccessible outside HSM ❖ Capable of >110 signatures / second, with <9ms signing latency for ECDSA NIST P256 or ECDSA Brainpool P256R1 ❖ Line-rate ECDSA verification engine (>2500 ECDSA NIST P256 verifications / second) ❖ Embedded HSM supports less than 9ms latency on ECDSA NIST P256 signing, it's granted FIPS 140-2 Level 3 certification ❖ Tamper detection
DSRC	<ul style="list-style-type: none"> ❖ Frequency band: 5.85 ~ 5.925 GHz ❖ Radio mode: 802.11p ❖ Channel: 172, 174, 176, 178, 180, 182, 184 ❖ Channel bandwidth: 10MHz (5MHz & 20MHz by project) ❖ Data rate: 3, 4.5, 6, 9, 12, 18, 24, 27Mbps for 10MHz BW signal

- ❖ RF transmit power: > +20dBm, Class C RF spectrum mask compliant with margins
- ❖ RF receive power: < -92dBm, compliant with SAE J2945

GNSS

- ❖ Update Rate: 10Hz
- ❖ Sensitivity:
 - ◆ Acquisition: -146dBm
 - ◆ Navigation: -158dBm
 - ◆ Tracking: -162dBm
- ❖ NMEA Standard: NMEA 0183
- ❖ Accuracy: 1.5m (CEP50 with SBAS)
- ❖ Telit® SL869-V3 GNSS receiver supports GPS/Glonass constellations. SBAS like EGNOS (EU), WAAS (US), and MSAS (JP) are also supported

External Connector

- ❖ one M25 waterproof Ethernet port with 802.3af PoE
- ❖ two Type-N RF port for DSRC
- ❖ one Type-N RF port for GNSS

On-Board Interface

- ❖ Two MHF RF connector (DSRC)
 - ❖ One MMCX RF connector (GNSS)
 - ❖ One Mini PCIe slot (for LTE module) *
 - ❖ One SIM slot*
 - ❖ One PoE Module slot
 - ❖ LED headers
- (* . Support by project)

LED

- ❖ STATUS (USDOT RSU 4.1)
 - ◆ Start-up: Blinking Green
 - ◆ Operational: Solid Green
 - ◆ FW upgrade: Amber (R+G)
 - ◆ Fault: Red

Antenna

- ❖ two Type-N outdoor 7.6dBi DSRC antennas
- ❖ one Type-N outdoor GNSS antenna

Power Supply

802.3af PoE (12W)

Operation Temperature Range

ambient: -40°C ~ +70°C

Operating Humidity

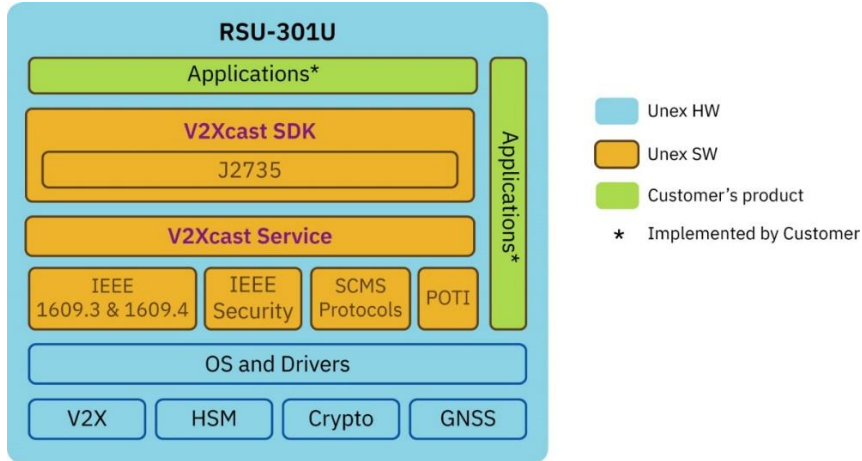
10% ~ 95%, non-condensing

Storage Humidity	max. 95%, non-condensing
Product Dimension	220.5mm (L) x 127.5mm (W) x 72.3mm (H) (excluding antennas)

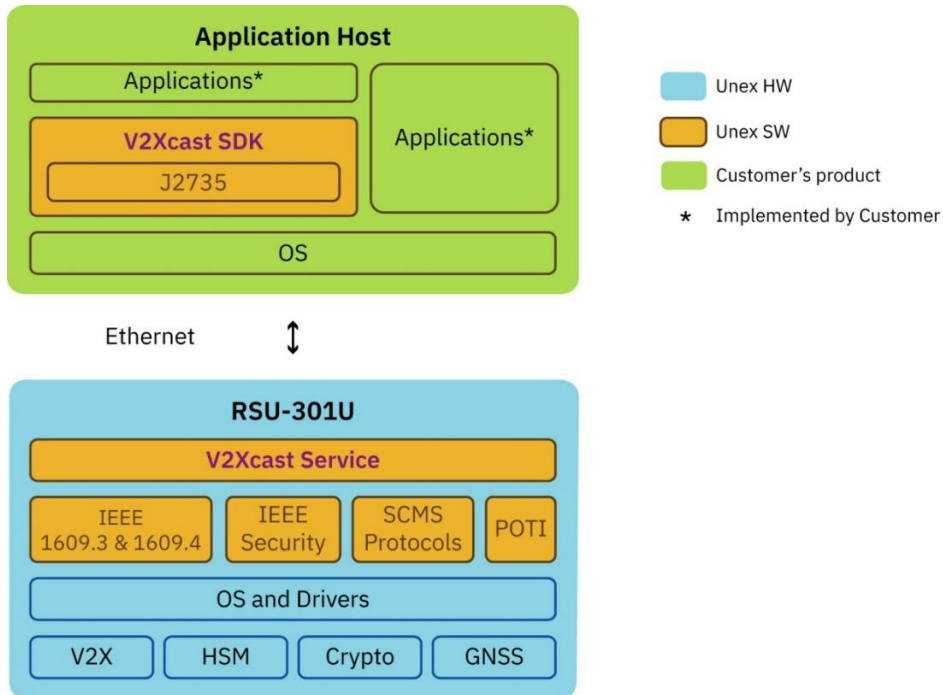
Software:

Featuring with V2Xcast[®], Unex’s innovative software technology, RSU-301U allows two modes of operation:

1. Hostless Mode: RSU works as a standalone full-featured V2X unit



2. Hosted Mode: RSU works as a V2X communication unit to the application host



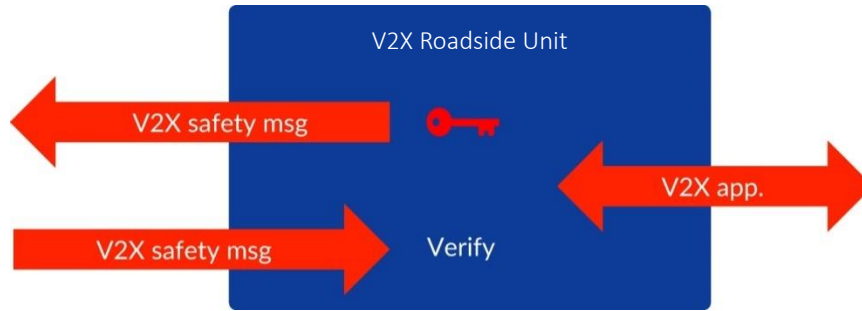
Unex RSU-301U enables ease of V2X software development through its V2Xcast® technology. Previously, V2X protocol software had to be built and verified complicated APIs, resulting in a duplicated effort, risk and cost. With Unex intuitive V2Xcast solution that provides ready-to-use V2X communication services for V2X applications, customers can significantly cut time-to-market with less development and testing cost.

V2Xcast is supported in RSU-301U to facilitate V2I/I2V application development. It includes two parts – V2Xcast Service and V2Xcast SDK.

V2Xcast SDK: Deploy V2Xcast SDK in either RSU-301U or external application host, it includes APIs to get the services from V2Xcast Service and the main functions of facility layer (J2735), such as message encoder/decoder and example code.

V2Xcast Service: V2Xcast Service image resides in RSU-301U, it combines IEEE 1609 WAVE protocol stack that includes IEEE 1609.2/3/4, SCMS protocol, and POTI. V2X communication protocols will be easily enabled via configuration input without any programming.

Security:



Security functions provided by V2Xcast® are designed based on a highly secure HSM (Hardware Security Module).

The highly secure HSM with FIPS 140-2 Level 3 certification is embedded in RSU-301U.

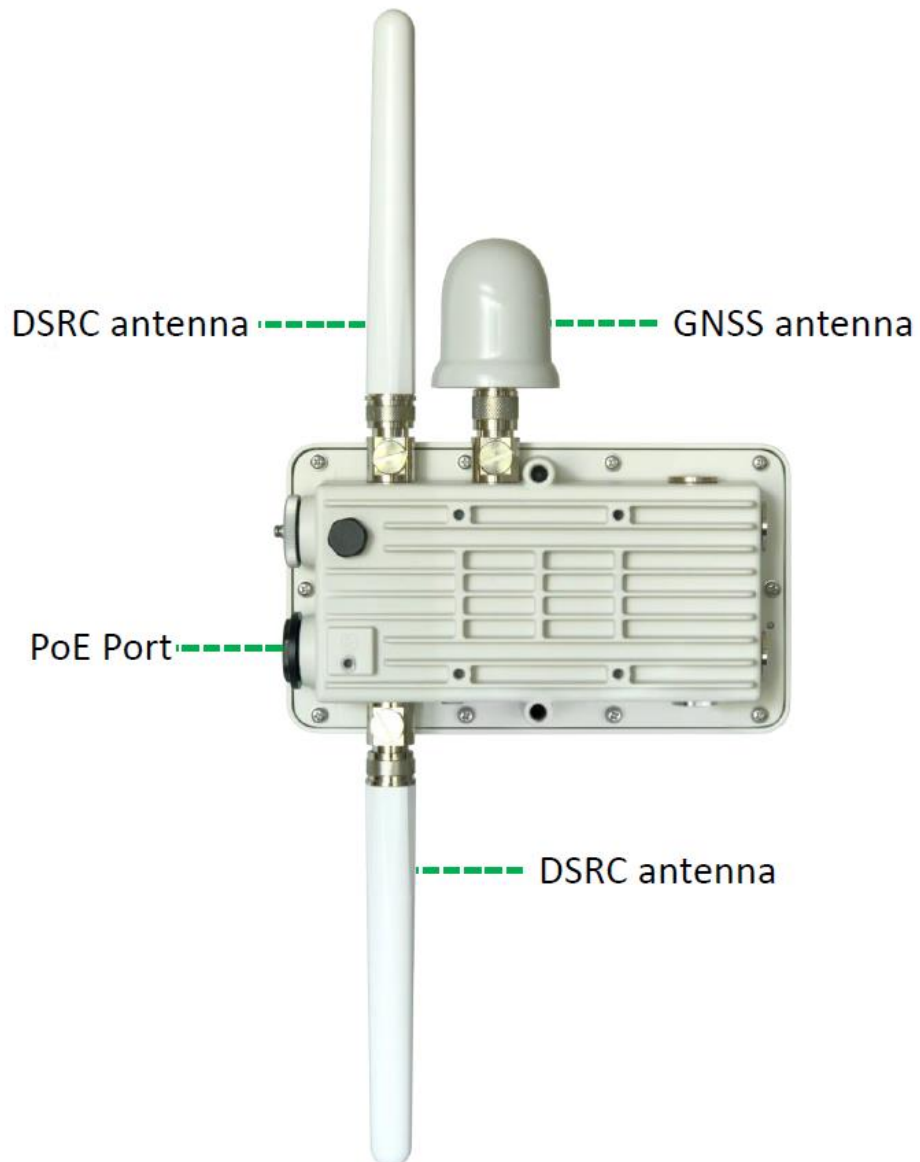
Cryptographic processor eliminates bottlenecks, maximizes application performance and offload CPU's computation. To protect your sensitive cryptographic keys in a high-assurance key vault, the design provides leverage a keys-in-hardware solution. With the keys-in-hardware solution, all the cryptographic operations are inside HSM and those keys never leave the HSM.

Typical Using Case:



The traffic controller unit acts as SPATEM/MAPEM or SPAT/MAP generator to perform the relative encode/ decode. Implement the required V2X stack on RSU-301 to co-operatively work with the traffic controller unit and serves to receive and forward the SPATEM/MAPEM or SPAT/MAP messages as a payload for communication between vehicles and traffic controllers in co-operative ITS. V2I/I2V applications can be flexibly implemented on the traffic controller unit or RSU-301.

Connectivity:



Package Contents:

1. One RSU-301U
2. Two outdoor DSRC antennas
3. One outdoor GNSS antenna
4. One PoE surge protector
5. One cable gland
6. Mounting Bracket and accessories
7. One earth wire
8. Hardware Guide and software development kit available on Unex server

Other Recommended RSU:

RSU-301E	V2X Roadside Unit, ITS-G5 stack, V2Xcast®
RSU-311U (offer by project)	V2X Roadside Unit, RF Compensator, DSRC stack, V2Xcast®
RSU-311E (offer by project)	V2X Roadside Unit, RF Compensator, ITS-G5 stack, V2Xcast®