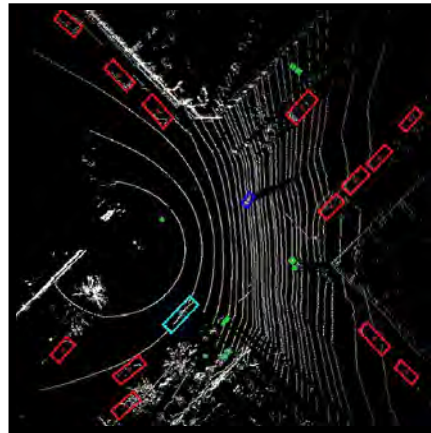
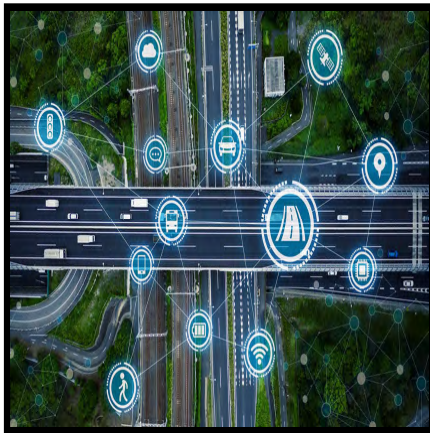


CAVE-IN-A-BOX: AN OVERVIEW



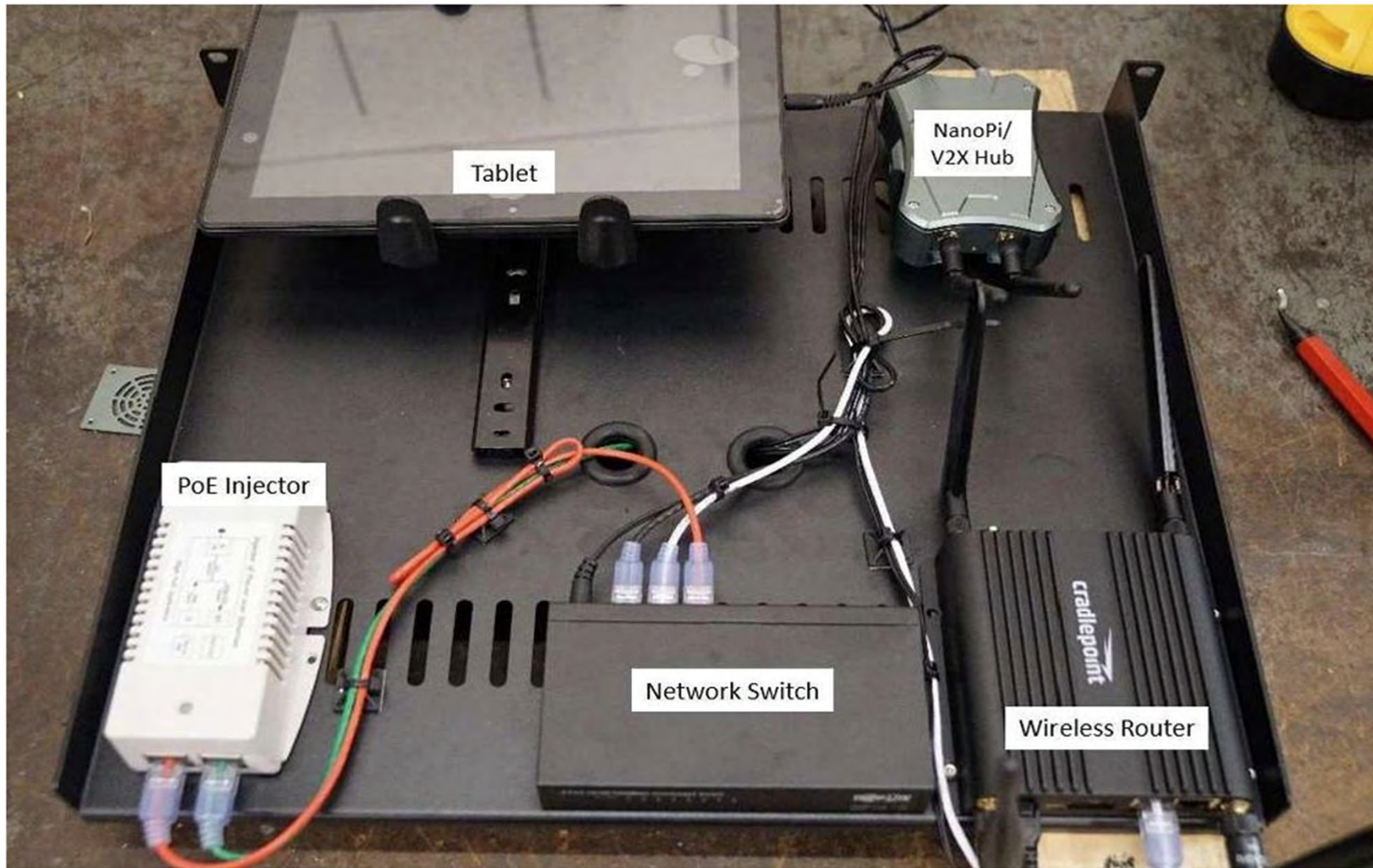
**National Transportation Center
Morgan State University**

CAVE-IN-A-BOX

- Traffic Signal Controller
- RSU
- V2X Hub
- Wired Network Switch
- Wi-Fi Router
- Power Supply
- Touchscreen tablet (or PC)
- OBU
- Controller Area Network

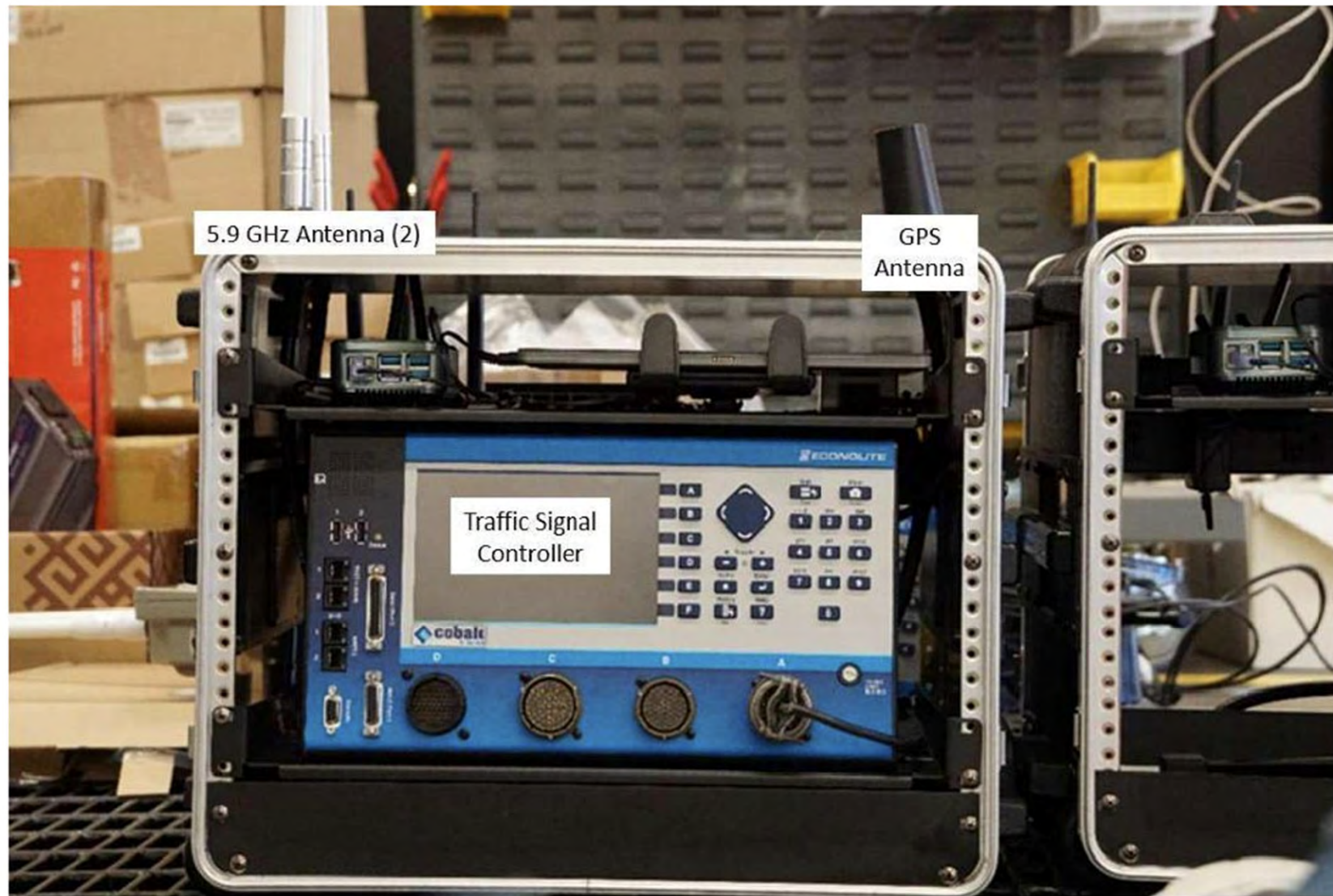


CAVE-IN-A-BOX COMPONENTS



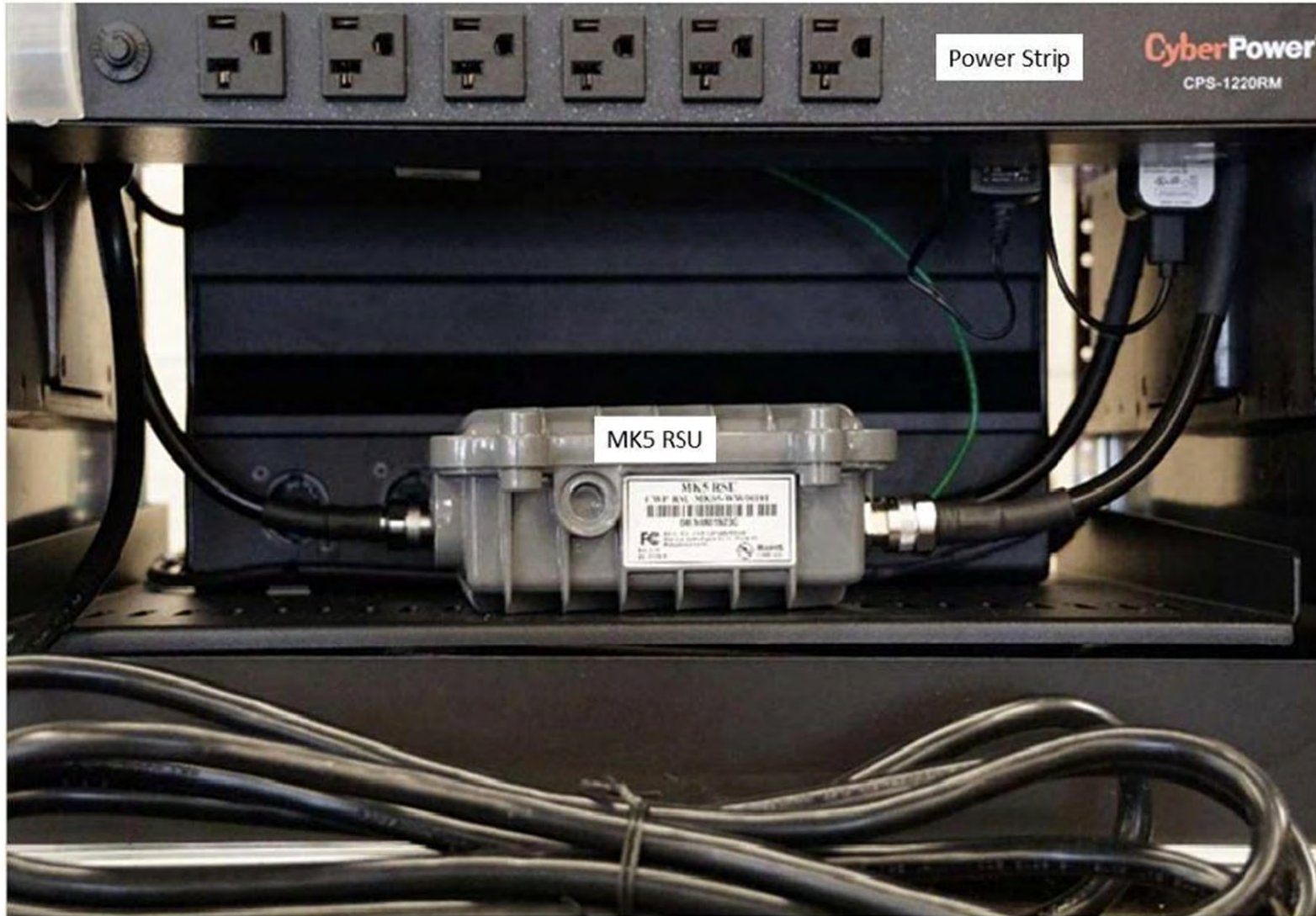
Source: FHWA.

CAVE-IN-A-BOX COMPONENTS



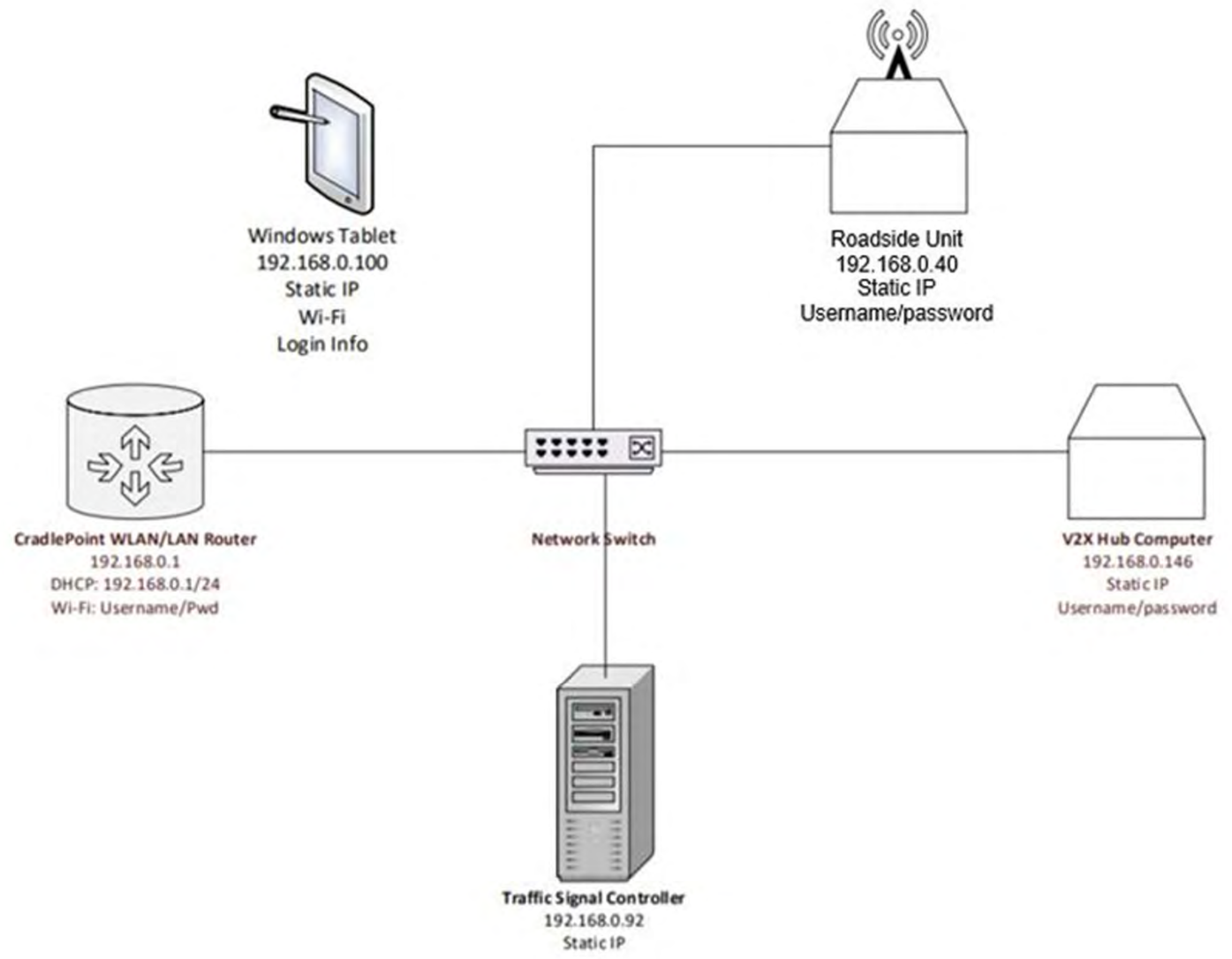
Source: FHWA.

CAVE-IN-A-BOX COMPONENTS



Source: FHWA.

CAVE-IN-A-BOX NETWORK CONNECTION



Source: FHWA.

OPEN SOURCE CONNECTED VEHICLE TOOLS

- CARMA
- V2X Hub
- Operational Data Environment (ODE)
- Secure Data Commons (SDC)

V2X HUB

- The Curve Speed Warning Plugin
- The Dynamic Message Sign (DMS) Plugin
- MAP Plugin
- SPAT Plugin
- Location Plugin
- RTCM Plugin
- ODE Forward Plugin
- Pedestrian Plugin
- Preemption Plugin
- TIM Plugin
- Message Logger Plugin

V2X HUB

- Immediate Forward Plugin
 - Sends all J2735 traffic to the 4.1 RSU for transmission out the V2X radio.
- Message Receiver Plugin
 - Receives all J2735 traffic incoming from the 4.1 RSU for consumption by other V2X Hub plugins.
- SPAT Plugin
 - Communicates with a traffic signal controller (TSC) using NTCIP 1202, and creates a J2735 SPaT Message.

V2X HUB

The screenshot displays the V2X HUB administration interface. The browser address bar shows the URL `127.0.0.1/admin/admin.html`. The page header includes the V2X HUB logo, the IP address `127.0.0.1`, the user `v2xhub (System Administrator)`, and a `Sign Out` link. The date and time are `Sun, 27 Dec 2020 21:27:35 GMT`, and the version is `3.2.0`. The navigation menu includes `Plugins`, `Messages`, `Event Log`, and `Users`. The `Plugins` section is active, showing a filter for `Enabled` plugins. A table lists various plugins with their status and version:

Plugin Name	Status	Version	Action
CommandPlugin	Enabled	5.0	
CSW	Disabled	5.0	Enable
DynamicMessageSign	Disabled	5.0	Enable
DSRCMessageManager	Enabled	5.0	Disable
Location	Disabled	5.0	Enable
MAP	Disabled	5.0	Enable
MessageReceiver	Disabled	5.0	Enable
ODEPlugin	Disabled	5.0	Enable
RTCM	Disabled	5.0	Enable
SPAT	Disabled	5.0	Enable

V2X HUB

127.0.0.1 v2xhub (System Administrator) Sign Out
Sun, 27 Dec 2020 21:29:57 GMT

Plugins Messages Event Log Users

Filter by Time 10 minutes Show Keep Alive

Search:

Plugin	Type	Subtype	Count	Last Timestamp	Average Interval
CommandPlugin	System	KeepAlive	2	2020-12-27 21:29:16	0
BsmLoggerPlugin	System	KeepAlive	1	2020-12-27 21:27:54	0
MessageReceiver	System	KeepAlive	1	2020-12-27 21:27:48	0
DSRCMessageManager	System	KeepAlive	1	2020-12-27 21:27:42	0

Showing 1 to 4 of 4 entries

Previous 1 Next

V2X HUB

W HUB 127.0.0.1 v2xhub (System Administrator) Sign Out

Sun, 27 Dec 2020 21:30:10 GMT 3.2.0

Plugins Messages **Event Log** Users

Search:

Level	Source	Description	Timestamp
Info	ivpcore.PluginMonitor	Plugin 'BsmLoggerPlugin' (id: 13) startup time: 906 milliseconds	2020-12-27 21:27:49
Info	BsmLoggerPlugin	Plugin registered	2020-12-27 21:27:44
Info	ivpcore.PluginMonitor	Plugin 'MessageReceiver' (id: 7) startup time: 502 milliseconds	2020-12-27 21:27:43
Info	MessageReceiver	Plugin registered	2020-12-27 21:27:38
Info	ivpcore.PluginMonitor	Plugin 'DSRCMessageManager' (id: 4) startup time: 97 milliseconds	2020-12-27 21:27:37
Info	DSRCMessageManager	Plugin registered	2020-12-27 21:27:32
Info	ivpcore.PluginMonitor	Plugin 'CommandPlugin' (id: 1) startup time: 469 milliseconds	2020-12-27 21:21:21
Info	CommandPlugin	Plugin registered	2020-12-27 21:21:17
Info	ivpcore.PluginMonitor	Plugin registered	2020-12-27 21:21:01
Info	ivpcore.MessageProfiler	Plugin registered	2020-12-27 21:21:01
Info	ivpcore.HistoryManager	Plugin registered	2020-12-27 21:21:01
Debug	-----	-----	2020-12-27 21:20:59
Info	Ivp Core	IVP Core Starting	2020-12-27 21:20:59
Info	ivpcore.PluginMonitor	Plugin 'CommandPlugin' (id: 1) startup time: 1073 milliseconds	2020-03-25 13:01:08
Info	CommandPlugin	Plugin registered	2020-03-25 13:01:04

V2X HUB

The screenshot displays the V2X HUB web application interface. At the top left, the logo 'V2X HUB' is visible, followed by the IP address '127.0.0.1'. On the top right, the user is identified as 'v2xhub (System Administrator)' with a 'Sign Out' link. Below the header, a navigation bar contains tabs for 'Plugins', 'Messages', 'Event Log', and 'Users'. The main content area shows a 'User List' table with entries for 'v2xhub' and 'System'. A modal dialog box titled 'Add New User' is open in the center, featuring the following fields: 'New Username' (empty text input), 'Select New Access' (dropdown menu set to 'Read Only'), 'Enter New Password' (text input with 'Password' placeholder), and 'Re-Enter New Password' (text input with 'Password' placeholder). At the bottom of the dialog are 'Add' and 'Cancel' buttons. A separate 'Add New User' button is also visible on the right side of the page.