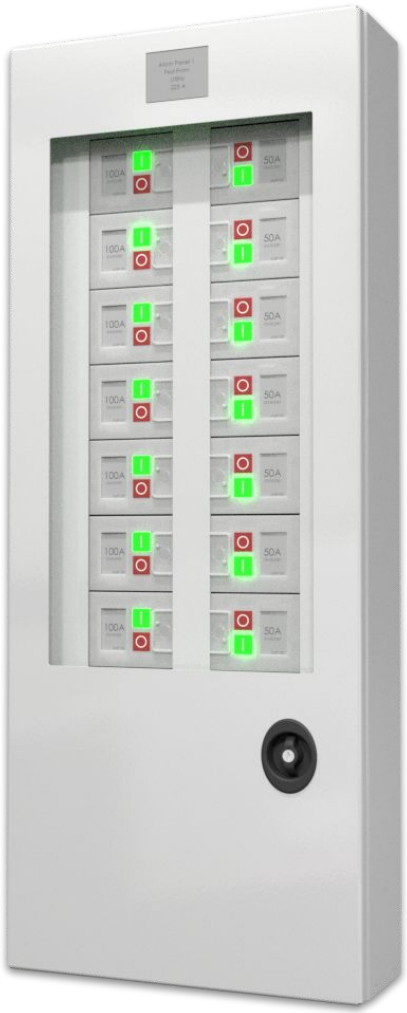
AP3P400

400A Atom Panel™ Smart Panelboard



20”W x 8”D x 60”H

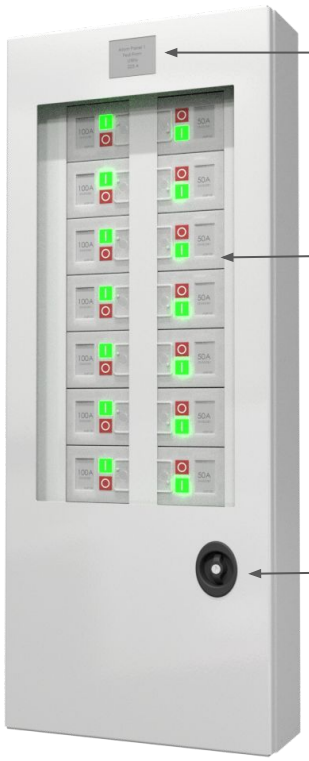
Features

Load and Demand Management
Programmable Input Relays (Users configure Atom Switch response to relay input for the entire panel)
TCP/IP over Ethernet Communication
Laminated Composite Busbar
Polycarbonate Front Window
E-Ink Display

Input Voltage	208/120VAC - 480/277VAC
Max Current	400A
Phase	3
Wire	4
AC Interrupting Capacity	100KAIC
MLO or MCB	MLO
Main Lugs Size	#6AWG - #300KCMIL AL/CU
Atom Switch Slots	14
Max. Atom Switch Rating per Slot	100A
Neutral Rating	100%
Standard	UL 67
NEMA rating	1
Programmable Relay Inputs	5
Communications Protocols	TCP/IP (external), CAN (internal)

Operational Overview

The Atom Panel houses the Atom Switch circuit breakers and connects all Atom Switches to the Gateway which, in turn, hosts the Atom OS web application. All Atom Switches communicate via CAN bus to the Gateway, and the Gateway provides the aggregation of all CAN bus data, then, outputs this through the Atom OS via one (1) ethernet connection and one (1) IP address to the user. This provides the user access to the Atom OS without downloading any software and can be used on any device, anywhere with the necessary credentials. On the front of the panel you have access to information such as, panel name, feeder, and voltage on the e-ink display, and breaker status can be seen through the polycarbonate window.

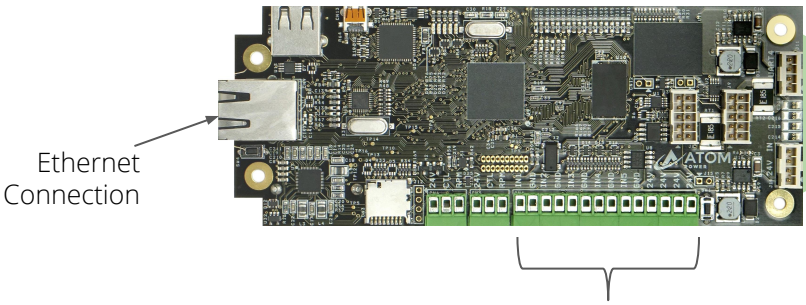


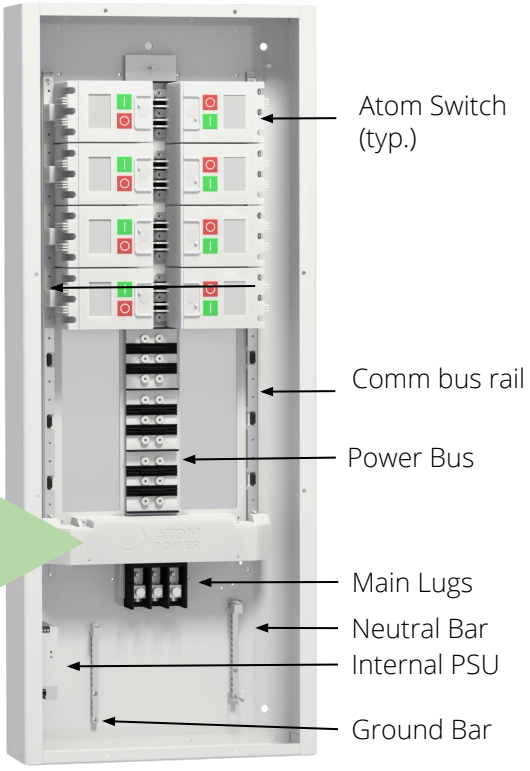
20”W x 8”D x 60”H

Atom Gateway

Every Atom Panel contains an Atom Gateway microprocessor. The Atom Gateway contains the Atom OS webapp software, Atom Switch CAN bus connections, customer ethernet connection, and customer external relay inputs (if used). The external relays are used if the customer requires an external method to open/close the Atom Switches within the panel and are programmable through the Atom OS software. The switching scenarios available to be programmed are virtually innumerable and can programmed to any sequence based on the pre-setup within the OS. The Gateway is energized via an internal 200-500VAC-24VDC power supply unit (PSU) which is tapped off of phases A and B at the main lugs. The Gateway then provides the necessary 24VDC and CAN bus communication to the comm bus rail and into the Atom Switches.

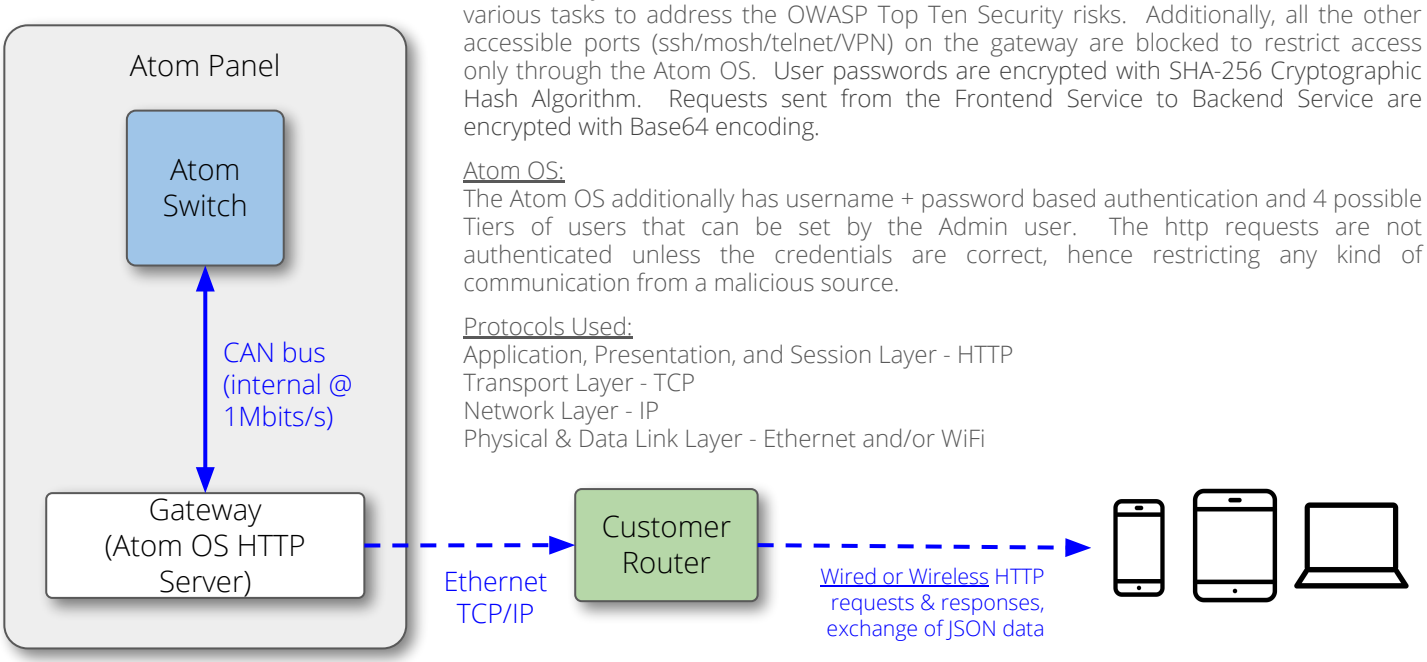
Atom Gateway (6” x 2.25”)





Network Architecture & Security

General Overview:
Atom Switches send and receive information to/from the Gateway Controller through the CAN bus. The Gateway Controller processes the data and organizes it in a database through the Backend Service and hosts the data on the Atom OS. Conversely, The Atom OS also takes user inputs and the Frontend service sends this data to the Backend Service, and eventually to the Atom Switches over the CAN bus. The data is exchanged in the JSON format in between the services, and this exchange takes place only when the HTTP requests are authenticated with Tokens. The http protocol operates over TCP/IP in the underlying layers.

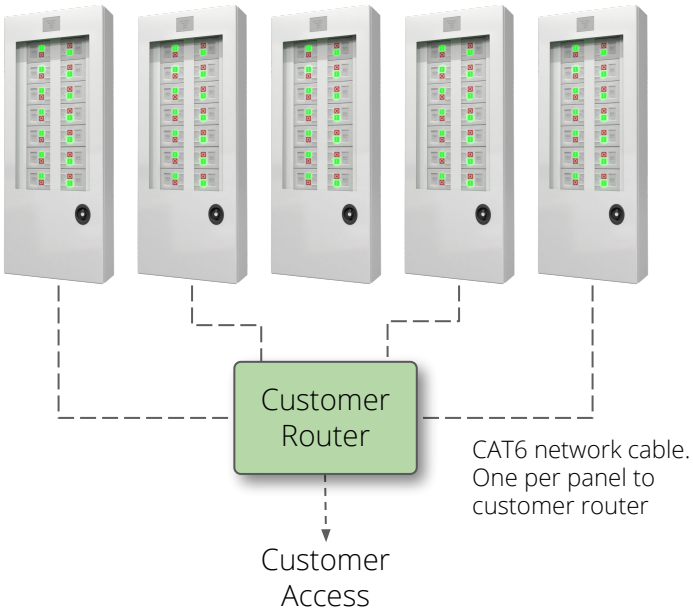


Gateway Controller:
The Gateway runs a linux based OS. Hence, the default linux firewall "IPtables" is used for various tasks to address the OWASP Top Ten Security risks. Additionally, all the other accessible ports (ssh/mosh/telnet/VPN) on the gateway are blocked to restrict access only through the Atom OS. User passwords are encrypted with SHA-256 Cryptographic Hash Algorithm. Requests sent from the Frontend Service to Backend Service are encrypted with Base64 encoding.

Atom OS:
The Atom OS additionally has username + password based authentication and 4 possible Tiers of users that can be set by the Admin user. The http requests are not authenticated unless the credentials are correct, hence restricting any kind of communication from a malicious source.

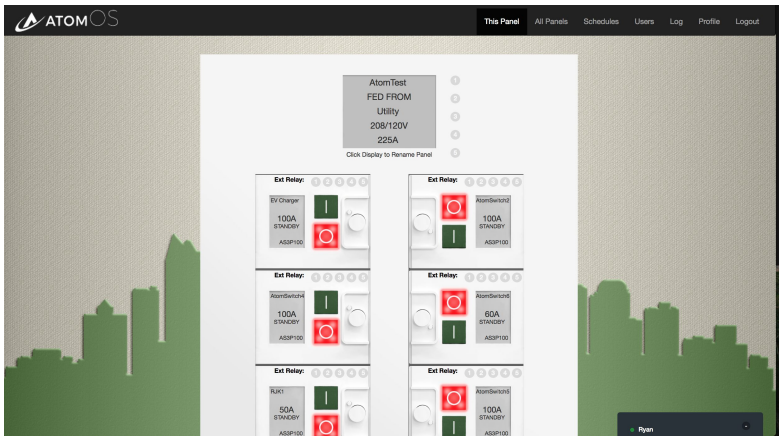
Protocols Used:
Application, Presentation, and Session Layer - HTTP
Transport Layer - TCP
Network Layer - IP
Physical & Data Link Layer - Ethernet and/or WiFi

Atom OS with Multiple Atom Panels in a Facility

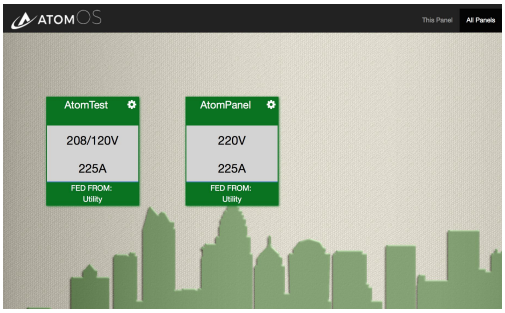


It is generally desirable to *not* have a singular server manage an electrical infrastructure. With this in mind, Atom Power developed the Atom OS software and corresponding Atom Gateway. In the likely case where multiple Atom Panels are installed within a facility, each Atom Gateway acts as its own server. Therefore, each Atom OS within each Atom Panel will mirror its individual data onto all other connected Atom Panels within the system as long as they are connected to the same network (see adjacent diagram). This has the advantage that, if any of the Atom Panels are taken down for maintenance or otherwise, as long as at least one (1) Atom Panel is energized, then the Atom OS will be accessible by the customer.

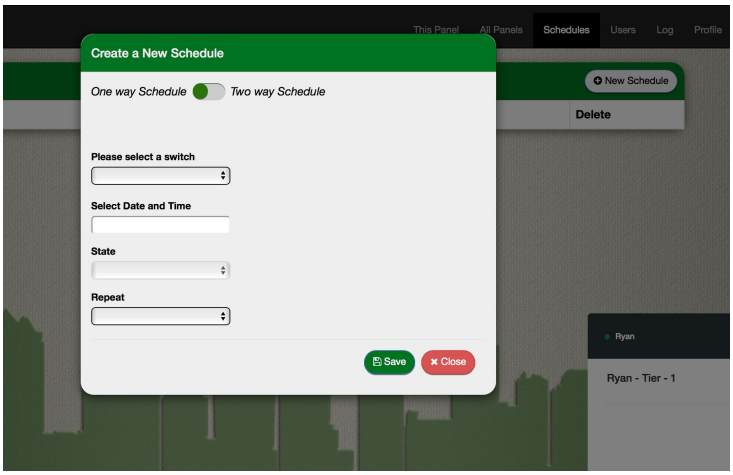
Atom OS™ Enablement of Atom Panel features



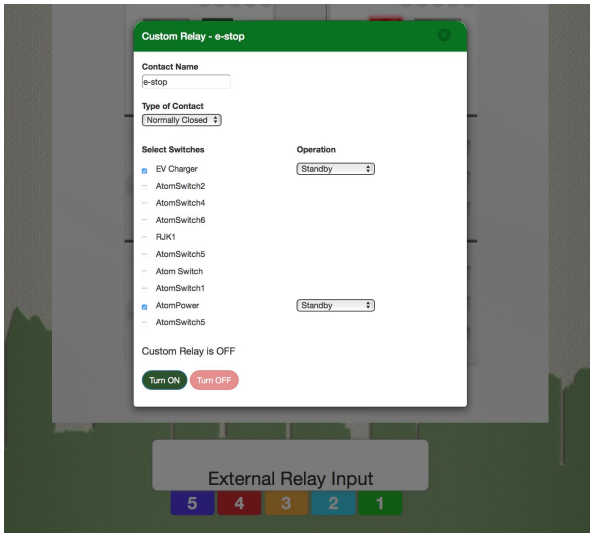
Main Panel Screen in Atom OS



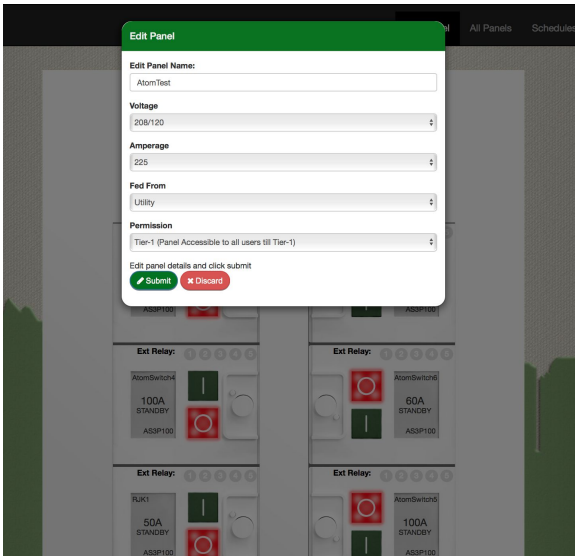
All panels on the Network Screen



Power Scheduling Menu on Atom OS



Customer Relay Input Menu on Atom OS



Atom Panel Information input