Zero Touch Configuration

Newton ESL Gateway

REV 1.0

SOLUM

04-03-2022

SUMMARY

As the name implies, SOLUM Zero-touch configuration enables IT teams to configure hundreds or more devices remotely. It is an alternative way to configure each device one at a time typically on-site, where they are installed. Not only is this process faster but it provides greater consistency in the device configuration and reduces the costs as far less human interaction and errors are involved.

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS DOCUMENT ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR SOLUM REPRESENTATIVE FOR A COPY.
NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS.SOLUM AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.
IN NO EVENT SHALL SOLUM OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF SOLUM OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES
Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.
SoluM and the SoluM logo are trademarks or registered trademarks of SoluM and/or its affiliates in the KOREA. and other countries Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between SoluM and any other company.

TABLE OF CONTENTS

DOCUMENT HISTORY

Rev.	Date	Revision history	Page
0.2	December 20, 2020	Initial draft	-
0.3	January 20, 2021	Second draft	-
0.4	January 21, 2021	Third draft – Customer Approval	-

1 Preface

1.1 Purpose

The purpose of this System Requirements Specification (SRS) is to describe the client-view and developer-view requirements for the SOLUM Zero-touch configuration function. Client-oriented requirements describe the system from the client's perspective. The requirements include a description of the different types of users served by the system. Developer-oriented requirements describe the system from the system developer's perspective. These requirements include a detailed description of the function, process, data, performance and other important requirements.

1.2 Scope

The scope of the SOLUM Zero-touch configuration function includes its distinct features, its benefits, and limitations. Its distinct features are:

- Automated firmware upgrade of the Newton ESL Gateways and SOLUM ESL Labels

The SOLUM Zero-touch configuration is intended to streamline the process by:

- Install Newton ESL Gateways without any additional tools or access to the customers infrastructure.

However, the SOLUM Zero-touch configuration will not:

- Replace the manual configuration of the Newton ESL Gateways
- Use a central single configuration system managed outside of the client's infrastructure

1.3 Product

The SOLUM Zero-touch configuration will be valid for the following Newton ESL Gateway products:

- Newton ESL Gateway
- Newton USB ESL Gateway
- Newton PCIe ESL Gateway for Huawei Access Points

1.4 Related documents

n/a

1.5 Definitions, Acronyms, and Abbreviations

Term	Definition. Acronym, Abbreviation
ESL	An abbreviation for Electronic Shelf Labels.
ESL Gateways	A physical component that interacts between the ESL Server and ESL Label wirelessly.
ESL Label	A physical component that displays the content to the end-user.
ESL Server	A physical or virtual component that interacts between the ESL Gateways and Client's Infrastructure.
SRS	An abbreviation for System Requirements Specification. This is the document you are reading.
TCP	The Transmission Control Protocol (TCP) is one of the main protocols of the Internet protocol suite.
MTU	In computer networking, the maximum transmission unit (MTU) is the size of the largest protocol data unit (PDU) that can be communicated in a single network layer transaction.
PDU	In telecommunications, a protocol data unit (PDU) is a single unit of information transmitted among peer entities of a computer network. A PDU is composed of protocol-specific control information and user data.
TCP MSS	The maximum segment size (MSS) is a parameter of the options field of the TCP header that specifies the largest amount of data, specified in bytes, that a computer or communications device can receive in a single TCP segment
TCP SYN	The SYN flag synchronizes sequence numbers to initiate a TCP connection.
TCP MSS Clamping	The TCP MSS clamping enables you to reduce the maximum segment size (MSS) value used by a TCP session during connection establishment.
DHCP	The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on Internet Protocol (IP) networks, whereby a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on the network, so they can communicate with other IP networks.

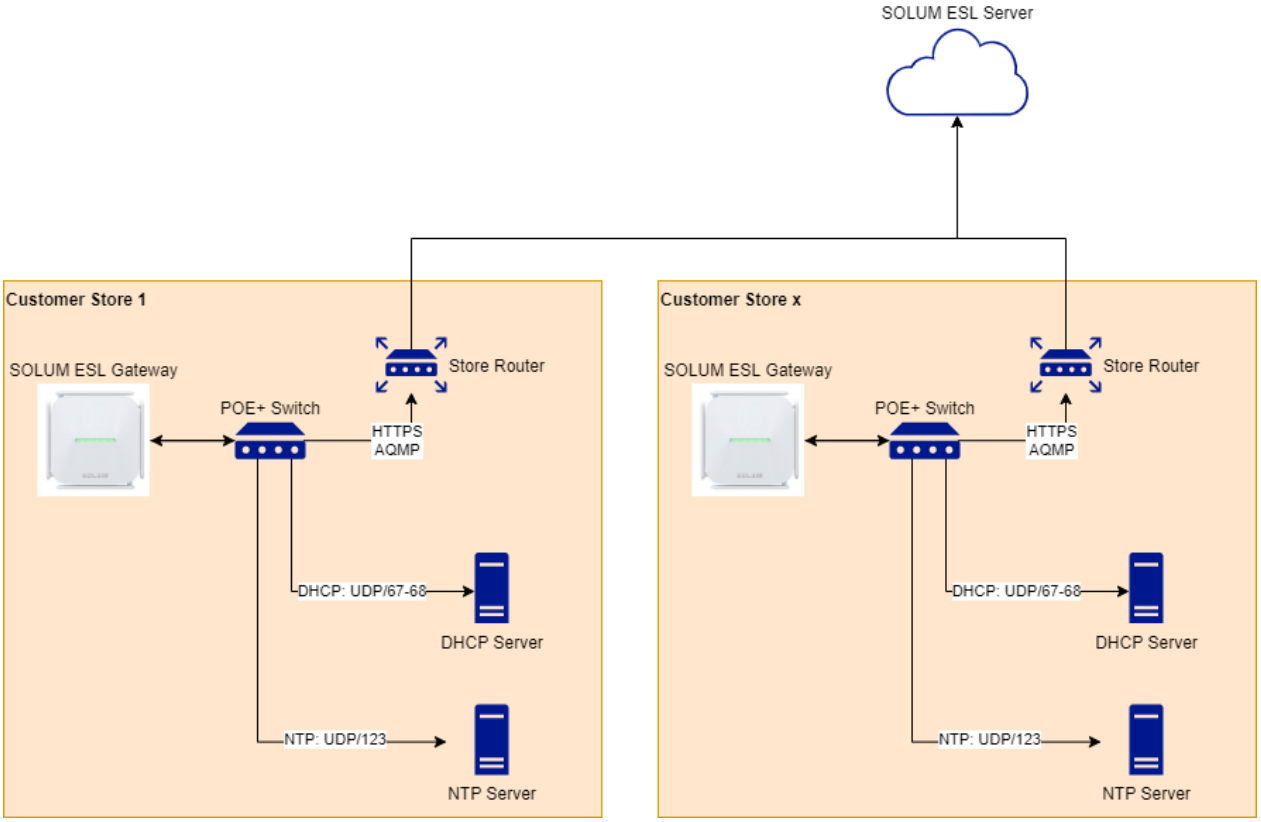
2 SOLUM ESL Gateway

2.1 Customer Requirement

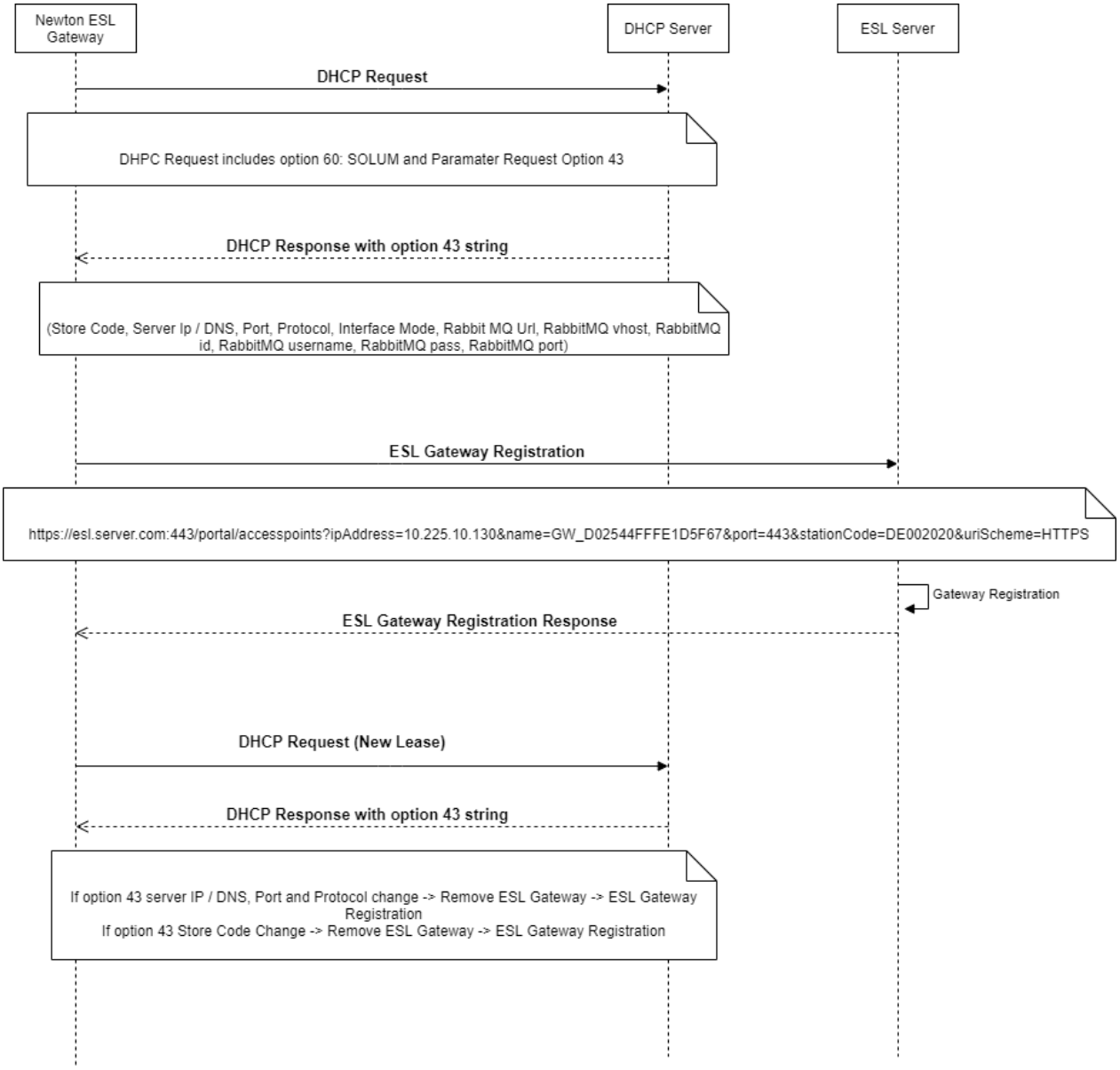
The SOLUM ESL Gateways currently need to be provisioned manually before sending to the store. This requires additional resources and can cause configuration issues when the SOLUM ESL Gateway is not configured correctly. The requirement is that the SOLUM ESL Gateways are send with stock factory settings and automatically configures itself to the ESL Server and is provisioned correctly with the required settings. This plug-and-play approach will reduce a significant maintenance and configuration cost for the customer.

2.2 Software Requirement

2.2.1 Network Diagram



2.2.2 Sequence diagram



2.2.3 DHCP Request Options by the Newton ESL Gateway

The SOLUM ESL Gateway will receive its initial configuration using the DHCP Server. The DHCP Server needs to be configured accordingly so the SOLUM ESL Gateway can connect to the ESL Server which will send its final configuration, firmware and ESL Label information to the SOLUM ESL Gateway during its operational lifespan. The following options will be requested to the DHCP Server.

2.2.3.1 DHCP Option 1: Subnet Maskfff

Required: The subnet mask option specifies the client's subnet mask

2.2.3.2 DHCP Option 2: Time Offset

Required: The time offset field specifies the offset of the client's subnet in seconds from Coordinated Universal Time (UTC).

2.2.3.3 DHCP Option 3: Default Router

Required: The router option specifies a list of IP addresses for routers on the ESL Gateway subnet.

2.2.3.4 DHCP Option 6: DNS

Required: The domain name server option specifies a list of Domain Name System.

2.2.3.5 DHCP Option 12: Host Name Option

Provided by the ESL Gateway: This option specifies the name of the ESL Gateway.

2.2.3.6 DHCP Option 15: Domain Name Server

Required: This option specifies the domain name that ESL Gateway should use when resolving hostnames via the Domain Name System.

2.2.3.7 DHCP Option 28: Broadcast Address

Required: This option specifies the broadcast address in use on the ESL Gateway subnet.

2.2.3.8 DHCP Option fffff: NTP Server

Optional: This option specifies a list of IP addresses indicating NTP servers available to the ESL Gateway. This value is optional, when the value is not set the ESL Gateway will use the NTP Server configuration from the ESL Server.

2.2.3.9 DHCP Option 43: Vendor Specific Information

Optional: This option is used by ESL Gateway and DHCP Server to exchange ESL Server specific information. ESL Gateways which do not receive desired vendor-specific information should make an attempt to operate without it, although they may do so in a degraded mode, and/or require manual configuration.

2.2.3.10 DHCP Option 60: Vendor Class Identifier

Provided by the ESL Gateway: This option is used by the DHCP Server to Identify SOLUM network equipment and provide specific DHCP Options for the ESL Gateway, such as Option 42 and Option 43. The vendor class identifier used by the ESL Gateway is SOLUM.

2.2.4 DHCP Response Options by the DHCP Server

2.2.4.1 DHCP Option 43: Vendor Specific Information

The DHCP Option 43 will provide the initial configuration settings for the ESL Gateway, such as Store Code and Server IP Address to register the access point with the ESL Gateway

```
STX,STORE_CODE,https://SERVER:PORT,ETX
```

2.2.5 ESL Gateway Registration

Once the configuration is changed the ESL Gateway will register itself automatically with the server and receive the final configuration.

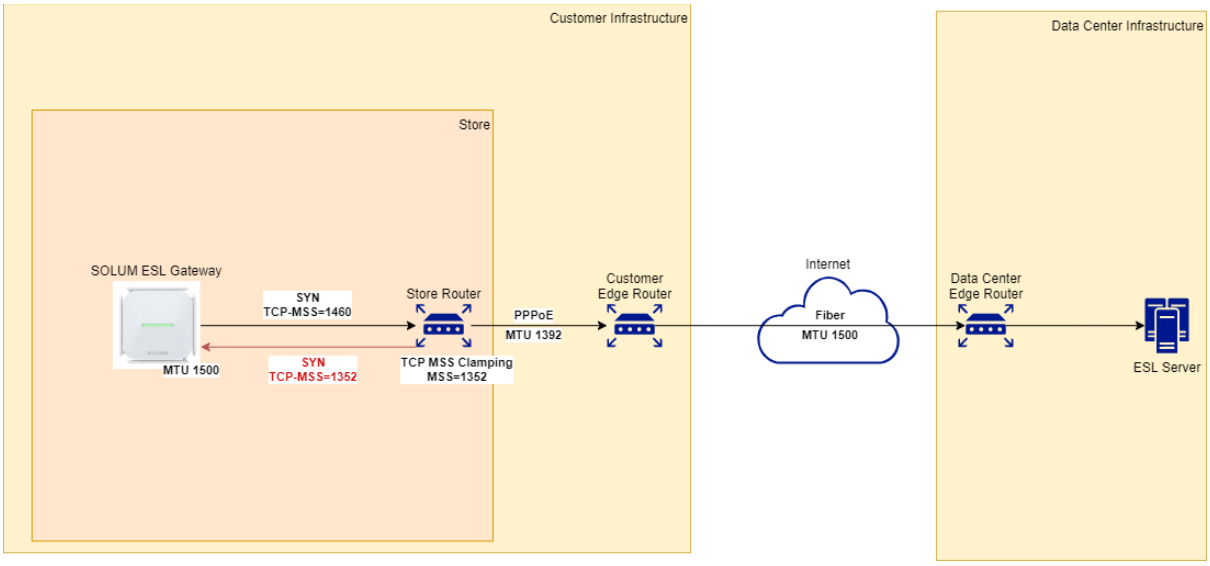
2.3 Considerations

2.3.1 HTTPS, Fragmentation, MTU Size and Maximum Segment Size

When migrating to Public or Private Cloud providers the service can be interfered when the MTU Size is larger than the WAN connection of the provider. When the packet is larger than the WAN connection, the packet will be dropped.

By default the SOLUM ESL Gateway is configured using the standard MTU Size of 1500 and packets will be sent with the DF (Don't Fragment) Flag . Changing this value will require manual interaction and provisioning, which means additional resources are required to pre-configure of the SOLUM ESL Gateway.

SOLUM recommends mitigating this issue using TCP MSS Clamping on the routers where all the devices in the network connecting to the Public or Private Cloud will receive the Maximum Segment Size directly from the router. This will avoid any upstream package loss, and no manual configuration is required on the SOLUM ESL Gateways or other network devices such as mobile handheld (PDA). The below diagram explains the basics how TCP Clamping works by informing the ESL Gateway the MSS by modifying the SYN TCP-MSS packet with the correct value.



3 Supported Architectures

The SOLUM ESL Gateways requires following infrastructure components to operate:

- DHCP Server
- NTP Server
- Network Router
- SOLUM ESL Server
- SOLUM Message Queue (RabbitMQ) for Cloud

3.1 Newton ESL Gateway with RabbitMQ (AIMS 4.x)

In this configuration the ESL Server is in the On-Premise or Cloud Data Center and the Newton ESL Gateway located within a private network. The network communication is initiated from the ESL Gateway to the ESL Server to get its configuration or retrieve Firmware Upgrades. The network communication between the ESL Gateway and the ESL Message Queue is to Pull Label Images and Push Label information. Within the same network the Newton ESL Gateway communicates with the DHCP Server and NTP Server.