SmartyStreets IIS Integration Analysis
Phase 1

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Introduction

The manual entry of a patient's demographic data to their immunization record has long been a cause for inaccurate data, and therefore a decreased level of confidence in the quality of the population data in the IIS. Patient data entry practices vary from provider to provider; in many instances the data is manually entered into the EHR by an administrative staff member, and the record is sent to the IIS via HL7, and in other instances the patient data is manually entered directly into the IIS, either by a provider staff member or the local health department staff. In either scenario, there is ample room for error in address entry, and current functionality does not offer suggestions for a more accurate address.

Background

In an effort to help mitigate this and increase the quality of data in the IIS, the American Immunization Registry Association (AIRA) has purchased a service subscription with SmartyStreets, a solution that provides address validation, standardization and geocoding services to interested Public Health Immunization Programs that are members of AIRA. The use of this service requires a technical integration with the Immunization Information System (IIS), which STChealth is working to implement within the STC|One platform for current and future IIS clients.

Analysis

STChealth is integrating the SmartyStreets address validation functionality into the STC|One platform in a multi-phased approach:

- Addressing cleansing prior to a QBP being returned
- Address cleansing at the time of patient deduplication
- Batch Address cleansing

This document describes the functionality and workflow of address cleansing after integration of SmartyStreets, and outlines the performance impact of implementation. Each phase will be discussed in their respective sections.

The Address Cleansing Process

Once an address has been submitted to the IIS, there are three distinct triggers that will send the address to SmartyStreets to be cleansed. The first is upon submission of an HL7 message through PHC Hub, the second is prior to either manual or automatic deduplication and the third is prior to nightly deduplication processing. The transmission of addresses from the SIIS to SmartyStreets is running continuously to ensure that all addresses that are eligible for cleansing are cleansed. An address will not be cleansed if it is manually flagged by a user as 'don't send

to SmartyStreets.' If an address is not cleansed, it will be indicated in the patient demographics page as 'not a SmartyStreets verified address.' The diagram below describes the recording process within the IIS, depending on the result of the address cleansing.

The addresses are exported from the SIIS to Kafka, a queueing service, to STChealth's Address Service, which then sends it to SmartyStreets. SmartyStreets will evaluate and determine the most valid address, if there is one. SmartyStreets returns either the cleansed address, or an indicator that a validated address was not available, which is routed back through the Address Service and Kafka, and into the SIIS Database. The diagram below shows the flow of the address to and from SmartyStreets.
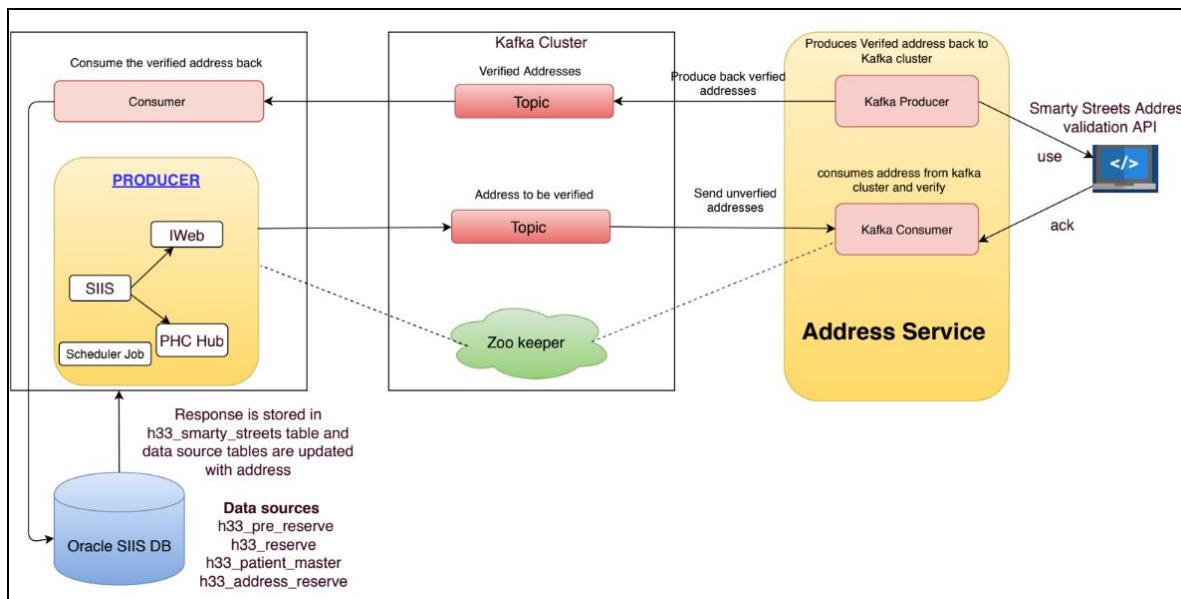
Kafka is an external streaming platform that is designed to process streams of records in real time, and effectively queues up the addresses from the SIIS that need to be cleansed until the Address Service calls for them to pass them on to SmartyStreets. The Address Service polls Kafka every 50 ms, checking to see if there are any new addresses that need to be sent to SmartyStreets.

Once the address load is received by SmartyStreets, it will attempt to find a matching valid address and cleanse if needed.There are three outcomes that may occur once an address reaches SmartyStreets:

1. A valid address is received from Smarty Streets and returned to the SIIS, which then updates the patient demographics with the cleansed address.
2. SmartyStreets is unable to find a valid matching address, and will return an indicator to the SIIS showing that an attempt was made but no valid address was found. In this scenario, the SIIS will proceed to process the original request with the original address.
3. The SIIS will wait on a response from SmartyStreets - if no response is received from SmartyStreets (i.e. connection is broken), the SIIS will continue on with the original

request (HL7 submission or deduplication). *Note: there is very little chance for broken connection*

Response Times

Once the address has been sent from the SIIS to SmartyStreets, the SIIS will wait for up to 500 ms for a response, before continuing on with the original request. The SmartyStreets Service Level Agreement (SLA) guarantees sub-100 ms response times for address cleansing 99.8% of the time, although external latency can cause the number to go up to 160 ms. Average response time is 30 ms. Excluding internet latency, SmartyStreets has kept a 500 ms threshold for providing a response.

Latency

Internet latency is defined as the amount of time it takes for a given request to receive a response when travelling over a public network, whereas internal or application latency is defined as how long it takes the Service to interpret a request and return a response. SmartyStreets has no control over internet latency, but STChealth has taken steps to reduce internet latency by implementing the recommendations set forth by SmartyStreets (See Appendix A).

Bulk Requests

STChealth's Address Services can perform bulk requests. It can validate up to 100 addresses at the exact same time. Furthermore, it can run multiple versions of the service running in parallel, to scale to meet any address quantity demands. The latency time for bulk requests is 100 ms for both verified and unverified addresses.

Phase 1: Query Response

Upon receipt of an HL7 Query (QBP) into PHC Hub, the address is immediately sent to SmartyStreets for validation. Once the validated address is returned, the IIS query process continues, and the appropriate HL7 response is returned to the submitting provider.

System Capabilities Prior to SmartyStreets Integration

Currently, when a QBP is received by PHC Hub, the response is sent to the provider with an average response time ranging from 2800 ms - 2511 ms (*see Appendix B for calculation of this response time*). This varies based on several factors including but not limited to the database scan for the patient, deduplication and hardware.

System Capabilities Post SmartyStreets Integration

Upon receiving a QBP to PHC Hub with the integration of SmartyStreets, response times increased by XXX ms. Once the query has been received and the matching patient record has

been identified, the address is sent to SmartyStreets via the workflow identified above, and the following scenarios may occur:

1. A returned valid address is received from SmartyStreets and is used as part of the official HL7 submission.
2. SmartyStreets is unable to find a valid matching address. The system will wait on a valid response from SmartyStreets for 500 milliseconds, and if no valid response is received, the system will proceed to process the QBP with the original request.

Phase 2: Address Cleansing Prior to Deduplication

Phase 2 analysis will be updated upon completion.

Phase 3: Batch Address Cleansing

Phase 3 analysis will be updated upon completion

Appendix

A. Minimum Technical Requirements for SmartyStreets Integration

The following technical requirements have been implemented in order to avoid connectivity issues and service interruptions not covered under the SmartyStreets SLA:

- Use DNS to resolve IP addresses
- Resolve DNS according to TTLS
- Expectation of SmartyStreets SSL certificates to change
- Use of modern security and cipher suites
- Added technical/operations contacts to accounts
- Complied with HTTP, URI, XML and JSON specifications
- Used modern browsers
- Used secure endpoints and won't ignore security warnings
- Character set UTF-8

B. Average Query Response Times for QBP over a 7 day period*

State	Average Time (milliseconds)*	Average Time (milliseconds)**
Alaska	1645	1272
Arizona	3120	3011
Indiana	2853	3169
Louisiana	2024	1823
Mississippi	2723	2386
Montana	1915	1730
Ohio	2944	2913
Tennessee	3586	2331
Washington	6884	5954
West Virginia	2058	1999
Wyoming	1032	1035
Average time	2800 ms	2,511 ms

* Timeframe: 6/16/2020 - 6/22/2020

** Timeframe: 6/1/2020 - 6/30/2020