

Concept Note on e-Invoice Messaging Flow

(Standard Invoice Messaging Protocol or SIMPoL)

Table of Contents

| | |
|---|-----------|
| 1. Introduction | 2 |
| 2. The Protocol - SIMPoL | 4 |
| 3. Components of Header of the Payload | 7 |
| 4. SIMPoL Stakeholders & their responsibilities | 8 |
| A. Taxpayers: | 8 |
| a. Large Taxpayers: | 8 |
| b. Medium Scale Taxpayers: | 9 |
| c. Small and Micro Business Entities: | 9 |
| B. ERP Providers: | 10 |
| C. Business Name Registry Service (BNRS):..... | 11 |
| D. Invoice Registry Portal (IRPs): | 11 |
| E. Invoice and Business Services Aggregators: | 12 |
| F. Accounting and Billing App providers (Desktop or Mobile):..... | 12 |
| G. Goods and Services Tax Network (GSTN):..... | 13 |
| 5. Scenarios of sale/purchase amongst Large/Medium/Small Taxpayers | 14 |
| 6. Registration Process of BNRS | 18 |
| 7. Attribute List for Messaging header | 19 |
| 8. Header Json Schema..... | 20 |
| APPENDIX I | 21 |

1. Introduction

e-Invoice is an innovative concept introduced by many countries across the globe in order to standardize business communication between all stakeholders in an economy such as counterparties, banks and financial institutions, tax authorities etc. Of 171 countries, 112 have developed some form of standard e-invoice mechanism and have the business entities adopted for effective communication and compliance with laws of land. India has also embarked upon this journey. Few advantages of e-Invoice eco-system are:

- Standards and Protocols for seamless flow of invoice data from one business entity to the other
- Inherent automation of workflows in intra and inter business systems
- A machine-readable format ensuring automation of entry and reconciliation resulting in reduced errors
- Foundation stone for easier compliances with Government
- Reduction in paper use and encouragement of Paperless business
- Simpler reconciliation and reduction of transaction costs
- Reduction in Frauds (False Input Tax Credits)

GST Council in its 37th meeting has approved implementation of e-Invoice in India and has also prescribed format prepared GSTN in consultation with ICAI for creation and reporting of e-invoice.

Adoption of e-invoice by industry and trade requires three things to deliver all the benefits mentioned above:

- Adoption of standard format by all stakeholders (seller, buyer, tax department, banks etc.)
- Creation of a mechanism to enable exchange of e-invoice between seller and buyer in a seamless manner without bringing any complexity and making it part of business. How the e-invoice will get dispatched and how it will be received, read and used.

- Machine readability of e-invoice generated so that e-invoice received from seller gets automatically read by the buyer's system and taken into accounting system once accepted by the buyer.

Standard of e-invoice has been approved by the government in Sept 2019 and shared with all companies selling ERP/Accounting & Billing software.

The current paper attempts to put in place mechanism for ensuring (2) and (3) above. For these two to happen, protocol for dispatch and reception has to be defined and accepted by all. Also, stakeholders will have to be identified who will enable adoption of the protocol, who will create required infrastructure to make it happen.

2. The Protocol - SIMPoL

Invoice messaging is a key factor in ensuring seamless transmission of invoice information in the standard schema notified, in a secured way. The schema which is JSON based, provides for machine to machine interaction between two distinct business entities. While an e-invoice schema and format has been defined very elaborately, a messaging protocol needs to be defined to ensure dispatch and reception of same for workflow-based processing. Should the exchange be through a central clearing house or peer to peer? The closest analogy is from email system where email is created by a user who dispatches the same by press of a button and on receipt it is reflected in the inbox of the recipient. The exchange has a re-defined protocol but users are completely oblivious of the complexity of protocol and underlying IT infra. The attempt here is to bring that kind of simplicity in exchange of invoices, and other related documents like purchase order (PO), Challan, payment information etc. later.

Central clearing house mechanism will bring one large and single point of failure and too much of dependence on one service provider, which is not advisable keeping in view the number of businesses and volume of e-invoices generated. Also, the mechanism should be such that it caters to other documents used between players of the business eco-system like purchase order, bill of supply, challan, payment information etc. The system being designed should be flexible enough to handle documents other than invoice between various types of players such as businesses, banks, transporters etc.

The second mode of exchange is **Peer-to-Peer** (P2P) basis where a sender is expected to send an encrypted payload over internet to the receiver or receiver's authorized invoice repository. In order to achieve this, each business entity needs to have a well-defined endpoint to receive the payload along with header with information identifying the sender. Each payload being sent, will be pre-padded with a compulsory header that needs to be embedded into the e-invoice payload that will be received and processed by receiving entity. It will need a central resolver to provide a central repository of information pertaining to an entity such as endpoint HTTPS URL, Public Key (to be used for encrypting payload being sent to

the entity), encryption algorithm used etc., which in turn can decrypt the same using the private key.

An optional (salted) auth key may also be prescribed as part of central service in order to secure the transport channel between the entities. A diagram below depicts the invoice message flow between entities under SIMPoL is shown below:

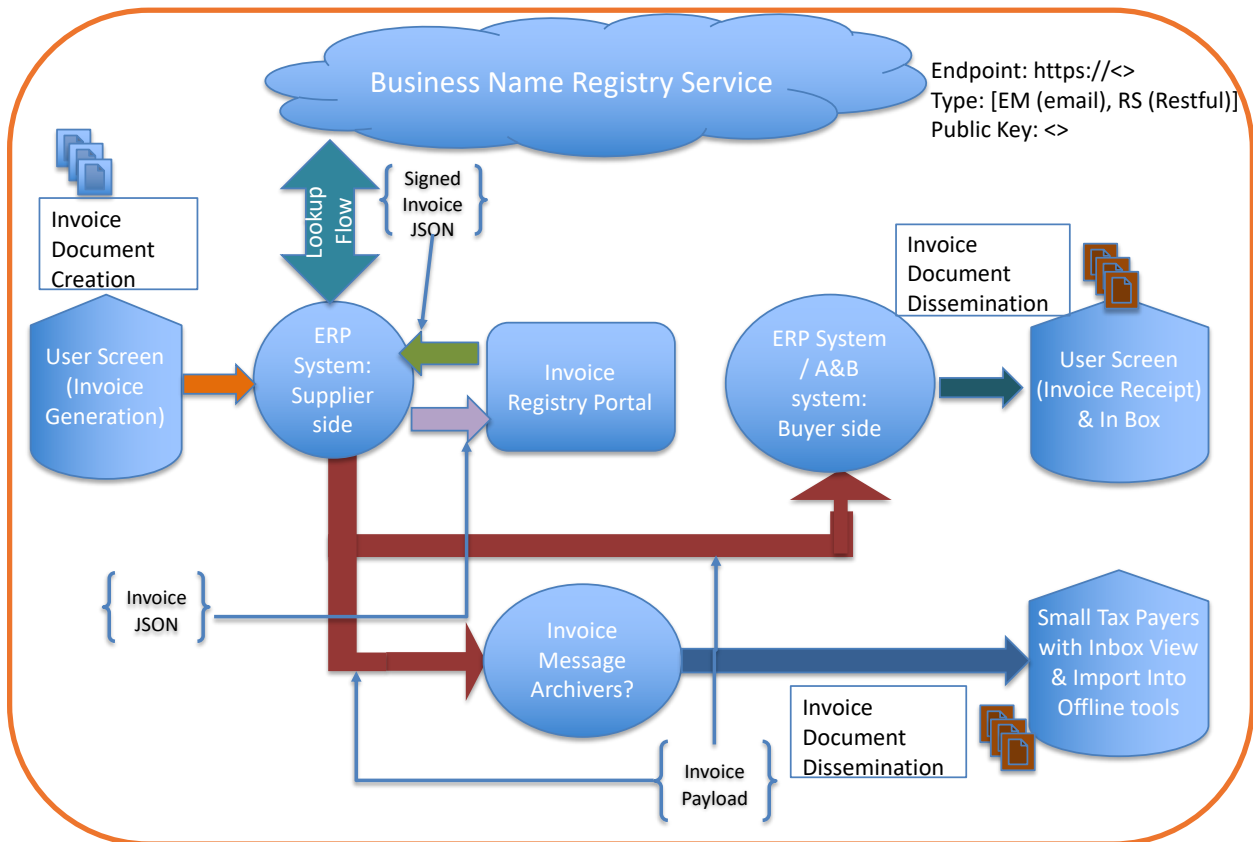


Fig. F1

It is proposed to call the central resolver service as “Business Name Registry Service” (BNRS), which shall be hosted by GSTN. This service currently be hosted by GSTN at service identifier as “einvoice” behind an indentified RESTFUL service, however, it may be further extended with services hosted by other players also, with GSTN BNRS being the root for the federation.

The proposed flow for Small taxpayers as visualized through a central Invoice Repository / Accounting & billing service is depicted below in Fig F2:

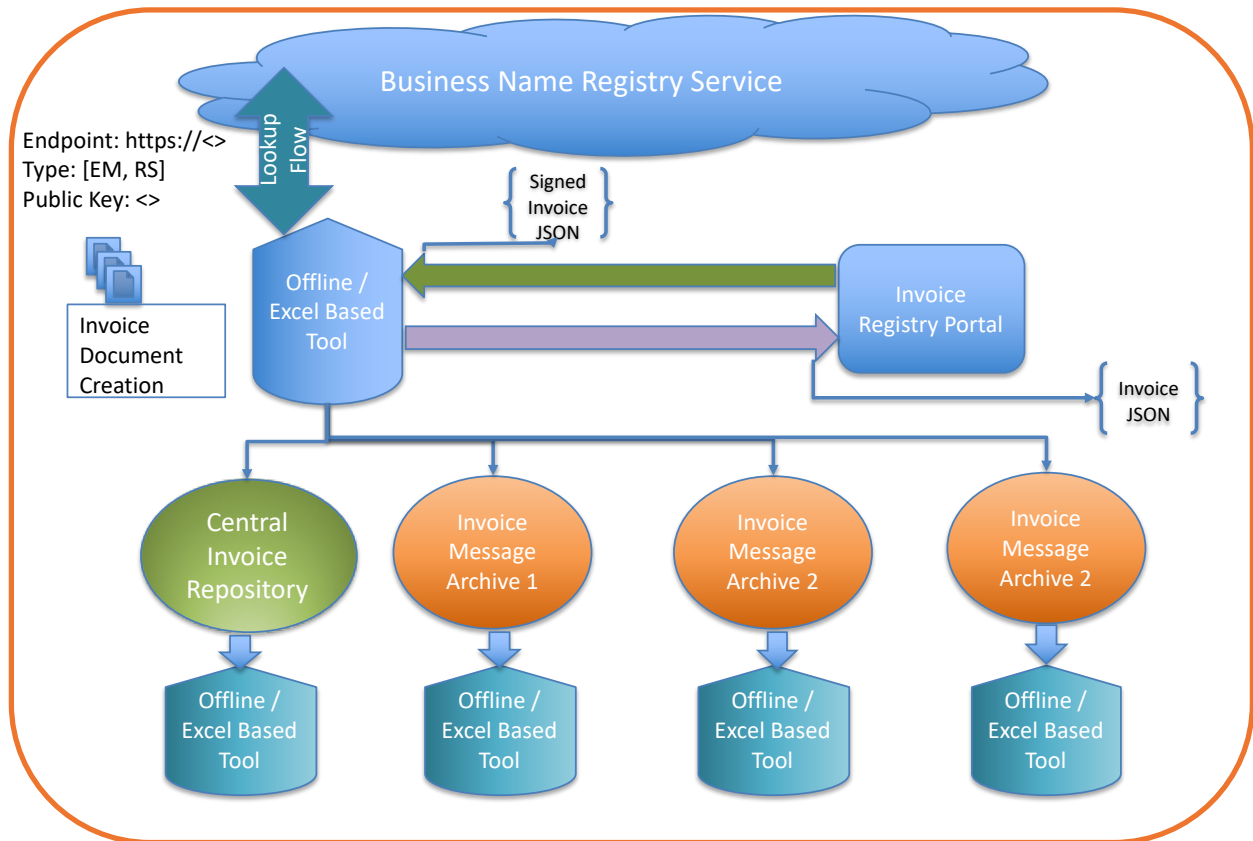


Fig. F2

3. Components of Header of the Payload

- I. The header payload will be added post facto in a standard JSON format to the e-invoice payload. Header payload shall contain all information necessary for transmission of e-invoice payload between counterparties. This header needs to be understood separately from HTTP/HTTPS headers.
- II. First version of contents of the header payload that will be tagged as part of e-invoice payload attached before being sent to the recipient are suggested to be as follows:
 - Version: Version of Header Schema for backward compatibility (Eg 1.01)
 - Payload Identifier: Unique Name of e-invoice payload. May be used for handling multi-part data-streams. A unique IRN is a possibility but be left open for entity to decide
 - From Address: <[GSTIN](#)>[@einvoice](#) (@einvoice is lookup service will return an endpoint URL. (eg. https://einvoice.<entity_name>.com)
 - To Address: <[GSTIN](#)>[@einvoice](#) (Same as Above)
 - Content Type: Only e-invoice at this moment, can be used as message carrier in future versions)
 - Content Encoding: Nil, HMAC, Base64 etc.
 - Signed: Yes/No (whether e-invoice payload is signed)
 - A message hash for tamper proofing due to transmission losses or malicious activity
- III. The mechanism proposed above brings multiple players in the ecosystem being proposed. Such players will be extending the BNRS service and will be resolved using root resolver (BNRS) and may carry extension, such as [einvoice.xyz](#) which will define and point to a sub-BNRS server that will further resolve the end points. These servers may either be hosted by receiving or sending entities and they will register it with central BNRS service, whereby, they can define rule-based workflow to direct invoices at different locations.

4. SIMPoL Stakeholders & their responsibilities

SIMPoL visualizes three distinct type of users who are possibly required to interact with each other, sending and consuming e-invoices for contractual and compliances purposes.

A. *Taxpayers*: These entities are the primary stakeholder of the protocol. They are further classified in 3 distinct categories as stated below:

- a. *Large Taxpayers*: Such taxpayers are expected to have their own ERP systems, and have matured Information technology processes. Such taxpayers are expected to be able to successfully integrate with APIs exposed by Invoice Registry Portal (IRPs) and elaborate automated workflows. Such taxpayers will get a signed copy of Invoices with IRN from IRPs and eventually be able to automatically resolve the entity details, finally posting the invoices to exposed endpoints in a secure way. Such taxpayer account for smallest section of business community at approximately 9%. They need to ask their IT partners to develop requisite processes and plugins to:
 - i. Be able to register with an IRP and BNRS (Detailed in section **Registration**)
 - ii. Generate the e-invoice schema as prescribed
 - iii. Send the payload to IRP on an exposed RESTful API through internet
 - iv. Receive and process the signed payload along with IRN thus generated on IRP
 - v. Create visualization of invoices for seamless experience of end users
 - vi. Generate and append header information in the prescribed format.
 - vii. Resolve the end point from central registry service (BNRS) along with public key
 - viii. Encrypt the payload and send (POST) on resolved endpoint.
 - ix. The ERP software providers should also be able to consume the e-invoices received from their suppliers process them for other purposes.

- b. Medium Scale Taxpayers: These are taxpayers who have some level of Information technology maturity with mostly manual processing of invoice information. Such taxpayers have some accounting package that also handles crude billing information and are assisted by tax consultants and Chartered accountants to stay compliant. Such taxpayer will require an Invoice/billing aggregator in between. Invoice Aggregators are defined below as one of the stakeholders. Such taxpayers constitute anything between 30-40% of all taxpayers' base. Steps to be followed by such taxpayers are:
- i. Generate Invoices in their respective Accounting and billing packages.
 - ii. Send invoices in standard user format (CSV, XML, TSV etc.) to Invoice/billing aggregators
 - iii. Aggregators then generate the e-invoice schema as prescribed
 - iv. Send the payload to IRP on an exposed RESTful API through internet
 - v. Receive and process the signed payload along with IRN thus generated on IRP
 - vi. Resolve the end point from central registry service (BNRS) along with public key
 - vii. Encrypt the payload and send (POST) on resolved endpoint.
 - viii. Convert the invoice back into taxpayers' identifiable format (CSV, XML, TSV etc)
 - ix. Taxpayers billing system consumes this format and create visualization for end users, locally.
 - x. Such taxpayers, should also be able to consume the e-invoices received from their suppliers process them for other purposes.
- c. Small and Micro Business Entities: These will be the largest taxpaying section of India constituting approximately 50-60% taxpayer base. These taxpayers are in very nascent or negligible stage of Information technology evolution. They mostly record their business transactions in a paper or book and seek help from Tax consultants and chartered accountants for compliances. They generally send invoices in print form to their recipients who in turn, either make manual entries in their respective IT systems or store the invoices manually and generate the return files independently. These taxpayers are required

to be brought into the digital framework through Aggregators. The steps involved for such taxpayers are as follows:

- i. Enable such taxpayer to have an offline authenticated apps on mobile or desktops to generate invoices in a prescribed format
- ii. These taxpayers register their applications after identifying themselves through their GSTIN and user IDs on GST Portal.
- iii. After authenticating, IRPs provide an APP_KEY to the APP that needs to record it and send it with every payload coming from the application
- iv. The APPs in turn send invoices in standard user format (CSV, XML, TSV, JSON etc.) to Invoice/billing aggregators
- v. Aggregators then generate the e-invoice schema as prescribed
- vi. Send the payload to IRP on an exposed RESTFul API through internet
- vii. Aggregators then receive and process the signed payload along with IRN thus generated on IRP
- viii. Resolve the end point from central registry service (BNRS) along with public key
- ix. Encrypt the payload and send (POST) on resolved endpoint.
- x. Convert the invoice back into taxpayers' identifiable format (CSV, XML, TSV, JSON etc) for APPs in an InBox like format
- xi. Taxpayers app (mobile or desktop or on a portal) calls a service from IRP and download such invoices
- xii. Such taxpayers, should also be able to consume the e-invoices received from their suppliers process them for other purposes.

B. *ERP Providers:*

ERP Behemoths, such as SAP, Oracle, NetSuite etc. will be important to the success of e-invoicing. They will play a major role in ensuring the implementation of e-Invoice and transmission protocol SIMPoL. ERP providers shall write plugins to consume invoices as they are generated by their users, and convert them into standard e-invoice format. They will also ensure seamless integration with IRPs, process the e-invoices with IRN and be responsible for sending e-invoice payload with respective header to designated recipients.

C. *Business Name Registry Service (BNRS):*

BNRS will be a central service working on query and response. The root of this service shall be held by GSTN, however, it can eventually be federated where the service could also be extended with other providers. BNRS sets a protocol of destination (endpoint) resolution of invoice end points. The service shall employ standard RESTful based payload service and will respond in a similar fashion. The service shall be hosted on port 100.

- i. The query parameters to access BNRS shall include:
 - a. The address format for uniquely identifying source, destination & type
 - b. Will follow RFC-5322 notation (GSTIN@invoice).
 - c. First part will contain a GSTIN (Unique registration number provided to each registrant by GST System in India)
 - d. Second part will be service identifier, with root being invoice.
 - e. A sample address shall look like 27AAYR2312K1Z0@invoice

The service response will be again on a RESTful service in a standard JSON encoded payload which the receiver shall read and process accordingly. The response from BNRS shall carry following parameters apart from original query parameters:

- a. Type
 - i. EM (Email)
 - ii. RS (RestFul)
- b. Endpoint
 - i. Email ID: If Type chosen as EM
 - ii. RESTFul: URL if Type chosen as RS (Including Port)
- c. Public Key for payload encryption (Optional)

D. *Invoice Registry Portal (IRPs):*

IRPs, as notified by the Government, provide e-invoice registry service. They receive the e-invoice, validate and generate IRN basis 4 constituents, namely GSTIN, Document Type, Financial Year and Document (invoice) number. Once IRN is validated, the same will be checked for deduplication on IRN

validation service being exposed and will return success or failure basis response from IRN lookup service. IRPs will be a faceless service to receive and process 1 invoice at a time on designated well-defined APIs.

E. Invoice and Business Services Aggregators:

Accounting and billing aggregators shall provide services to medium and small taxpayers for their e-invoice compliance requirements. These aggregators will act as brokers providing Open RESTful APIs to Small ERPs and, some desktop and Mobile APPs as well that will provide accounting and billing solutions to taxpayers. Taxpayers shall have standard forms for invoice generation as per their business requirements. These taxpayers will generate invoice in standards understood by them and these aggregators shall convert these invoices into prescribed e-invoice formats. Further integration with IRPs shall be responsibility of these aggregators to perform conversion and creation of e-invoices in the prescribed format.

These aggregators will also provide interfaces (offline tools, web forms etc.) for taxpayers to upload multiple invoices in bulk and interface with APIs exposed by IRPs one by one for each invoice.

The same service providers will also provide facility to download and consume the invoices received from sellers into the ERP/Tools etc. for easier processing and visualization.

F. Accounting and Billing App providers (Desktop or Mobile):

For very small and micro segment of taxpayers, these application service providers (ASP) will provide another set of applications on mobile or desktops which will integrate directly with IRPs exposed APIs. These ASPs shall perform KYC activity for taxpayers using a special Auth Service from GST System that will consume a user name taxpayers use to login to GST Portal. Once a taxpayer successfully authenticates the taxpayer, IRP shall issue a license key to be stored with the APP such provided and will bind the mobile / desktop APP with taxpayer. It is expected that the same APP should support multi-tenancy as there could be multiple GSTINs associated with a single APP.

This facility will also be made available to medium taxpayers, as an option.

G. Goods and Services Tax Network (GSTN):

GSTN shall play the pivotal role in the whole ecosystem. GSTN shall provide following services in the eco-system besides being regulator of this model:

- a.** A centralized IRN deduplication service to ensure single IRN for each given string of constituent, namely GSTIN, Document type, FY and Document number
- b.** Root service for Business Name Registry Service (registration and query/response)
- c.** Persistent repository of all e-Invoices. This repository will be query-able for summary and complete view
- d.** Sink for input into ANX-1, ANX-2 for tax compliance on GST Portal

GSTN shall also be a governing body of the eco-system in order to ensure smooth implementation and functioning of e-invoice implementation. Overtime, the governing council for e-invoice implementation in India can be notified as a consortium.

5. Scenarios of sale/purchase amongst Large/Medium/Small Taxpayers

Sale and purchase can happen between large and small, or large and medium or between medium and small. This section will describe various scenarios along with what a seller will do and how a buyer will get the invoices.

| # | Seller | Buyer | How and where sale e-invoices be placed | How will buyer get the purchase e-invoice | Remarks |
|---|--------|--------|---|--|---|
| 1 | Large | Large | Seller's ERP System | Buyer's ERP System | Seller will directly resolve the destination address where the encrypted payload will be posted. |
| 2 | Large | Medium | Seller's ERP System | Accounting & Billing Invoice repository (Freemium model) | The buyer may either choose to use a free to use cloud repository with a web interface, or can buy a service from authorized invoice archive service provider which will also value add with offline accounting tools |
| 3 | Large | Small | Seller's ERP System | Central Repository (provided by GSTN) with simple to use web interface to download the | While a central repository will be made available with minimum basic feature of viewing and downloading a CSV of an invoice coming from Seller's ERP |

| | | | | | |
|---|--------|--------|--|---|---|
| | | | | same in CSV format. | <p>System. The end point will be resolved by Seller of an Invoice Archive (like Hotmail, Gmail services)</p> <p>Alternatively, an email address resolved through BNRS can be a recipient of the invoice</p> |
| 4 | Medium | Large | Accounting & Billing Invoicing System (Freemium model) | Buyer's ERP System | Taxpayer in this category needs to use an accounting and billing application, offline or online, to generate Invoice, send it to defined destination resolved through resolving service BNRS. |
| 5 | Medium | Medium | Accounting & Billing Invoice repository (Freemium model) | Accounting & Billing Invoice repository (Freemium model) | Taxpayer in this category needs to use an accounting and billing application, offline or online, to generate Invoice, send it to defined destination resolved through resolving service BNRS. |
| 6 | Medium | Small | Accounting & Billing Invoice repository (Freemium model) | Central Repository (provided by GSTN) with simple to use web interface to | Taxpayer in this category needs to use an accounting and billing application, offline or online, to generate Invoice, |

| | | | | | |
|---|-------|--------|---|--|--|
| | | | | download the same in CSV format. | <p>send it to defined destination resolved through resolving service BNRS.</p> <p>Alternatively, an email address resolved through BNRS can be a recipient of the einvoice</p> |
| 7 | Small | Large | Local System (In Excel), Uploaded on a portal after declaring the Destination Address | Buyer's ERP System / Email System | Small taxpayers will maintain all invoices in a simple CSV/Excel format. They will need to use a free-to-use invoice archives. Once uploaded, they can choose to draft an email like message with destination address that archive will resolve and post. Alternatively, they can simply attach the invoice in an email and send it to buyers. |
| 8 | Small | Medium | | Accounting & Billing Invoice repository (Freemium model) | Small taxpayers will maintain all invoices in a simple CSV/Excel format. They will need to use a free-to-use invoice archives. Once uploaded, they can choose to draft an email like message with destination address that archive |

| | | | | | |
|---|-------|-------|--|--|--|
| | | | | | will resolve and post. Alternatively, they can simply attach the invoice in an email and send it to buyers. |
| 9 | Small | Small | | Central Repository (provided by GSTN) with simple to use web interface to download the same in CSV format. | Small taxpayers will maintain all invoices in a simple CSV/Excel format. They will need to use a free-to-use invoice archives. Once uploaded, they can choose to draft an email like message with destination address that archive will resolve and post. Alternatively, they can simply attach the invoice in an email and send it to buyers. |

6. Registration Process of BNRS

BNRS has been defined in detail in previous section. It is supposed to provide endpoint resolution service to send e-invoices from sellers to receivers.

BNRS will register each taxpayer through a web interface. The web interface shall authenticate the authorized signatory and issue an APP_KEY with which the service will be called each time. Each business needs to provide following information:

- A. A GSTIN as provided by GST System
- B. An end point URL (<https://<web address>/<service filter>>)
- C. An optional public key pair either generated by BNRS registry service or provided by the taxpayer themselves.
- D. The private key thus generated will be used to decrypt the e-invoice payload that was encrypted by the public key as published in BNRS
- E. The public key will be freely visible to all service consumers of BNRS for a given GSTIN

A detailed depiction of the registration flow is shown in the figure below:

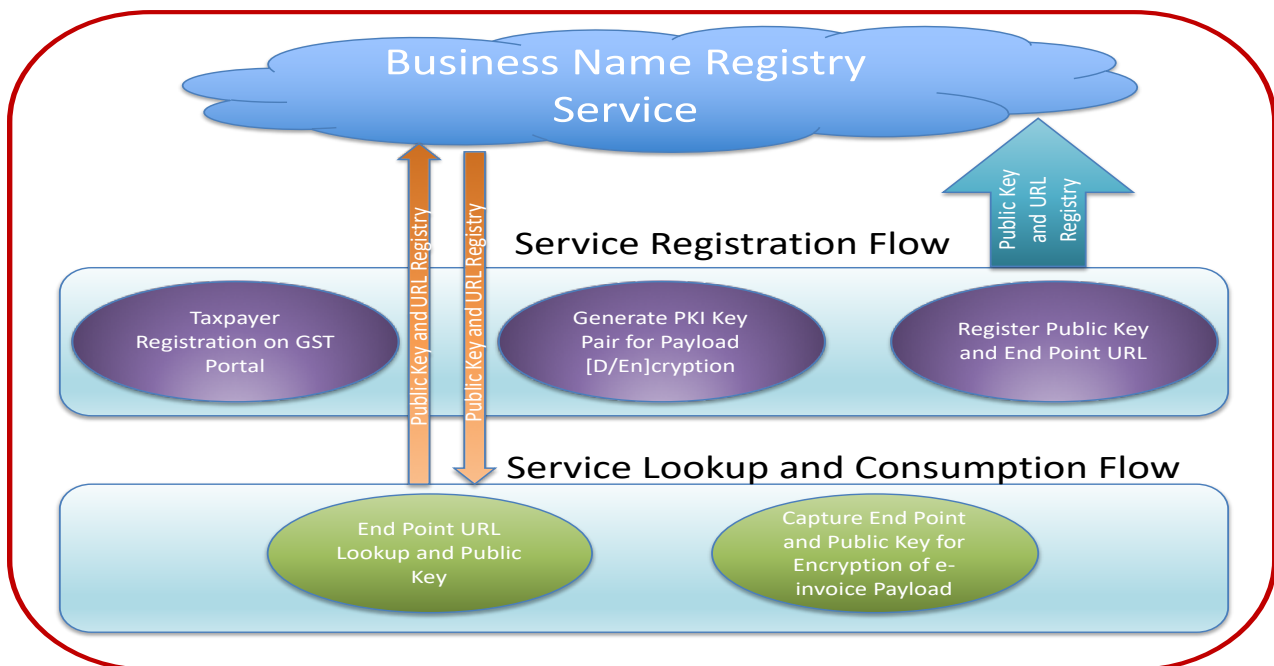


Fig. F3

7. Attribute List for Messaging header

| Parameter Name | Description | Field Specifications | Sample Value | Mandatory (Y/N) |
|----------------|--|--------------------------------|--|-----------------|
| version | A version number information of the header Payload | Number (max length: 2.2) | 11.02 | Y |
| pid | Payload Identifier (unique identifier of payload being sent) | string: (max length: 15) | inv_202220_hdr_1.1 | N |
| frm_addr | unique identifier for source of message | string:(max length: 100) | 27AAREP1001K1Z9@einvoice | Y |
| to_addr | unique identifier for destination of message | string:(max length: 100) | 27AAREP1001K1Z9@einvoice | Y |
| con_typ | Enumerated list of content type in payload | enum:["INV", "PO", "CE", "DE"] | | N |
| stssgn | Whether payload is signed | enum:["yes","no"] | | Y |

8. Header Json Schema

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "title": "E-Invoice MSG",
  "description": "A header for identifying meta data about payload being transmitted",
  "type": "object",
  "properties": {
    "version": {
      "description": "The version number for Schema format",
      "type": "number", "multipleOf": 1.0 },
    "pid": {
      "description": "Unique Payload Identifier",
      "type": "string"
    },
    "frm_addr": {
      "description": "unique identifier for source of message",
      "type": "string",
      "pattern": "^[A-Z0-9]{15}@[a-z0-9-]{8,99}.*$"
    },
    "to_addr": {
      "description": "unique identifier for destination of message",
      "type": "string",
      "pattern": "^[A-Z0-9]{15}@[a-z0-9-]{8,99}.*$"
    },
    "con_type": {
      "description": "Content Type definition",
      "type": "string",
      "enum": ["INV", "PO", "CE", "DE"]
    },
    "stssgn": {
      "description": "Signing Status of payload",
      "type": "string",
      "enum": ["yes", "no"]
    }
  }
}
```

APPENDIX I

Some Questions:

- Can we quote email services which are provided by many providers free of cost. Will aggregators be like Gmail, Hotmail, Yahoo?
 - We must propagate this model. Even Gmail and Yahoo offers Freemium model where the SLAs and email guarantees are minimum and are mined for generating User intelligence. The paid or professional model offers personalized services.
- The Invoice and Business Services Aggregators will get all the invoices. There will be temptation to mine the data to create financial health score and other such indicators using GST Data. This will be a dangerous proposition and may jeopardize the entire proposal. The obvious answer will be to encrypt the data but then how to ensure that these Aggregators do not do any mischief.
 - The services of aggregators will be could by a contract between buyer and seller. Moreover, we are visualizing multiple Service aggregators, therefore, not all invoices will be at one place, however, there may be a possibility of them colluding.
 - We may propose a model contract for the purpose, just like what RERA has done for builder-buyer agreements for real-estate sale. This contract shall ensure that privacy clauses are inherently built into contract.
- If they provide free service and do not mine the data, how will they run the service? Basically, we also need to examine economic feasibility of such a model.
 - The model provides them foot-in-door of small and medium taxpayers. They can make money through targeted ads on their platform, up/cross selling their products, and have 1:1 engagement. The model will also provide direct consumer engagement reducing their marketing expenses. One date, the value is of the volume of consumers on a platform that brings in Ads revenue for the prospects. I see a strong market potential on this model.

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