Asia-Pacific
Economic Cooperation

Advancing Free Trade
for Asia-Pacific Prosperity

APEC Guidelines and Best Practices for the Adoption of Global Data Standards

APEC Committee on Trade and Investment

March 2020

APEC Project: CTI 03 2019S

Produced by

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APEC#220-CT-03.1

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Introduction

The APEC Guidelines and Best Practices for the Adoption of Global Data Standards (GDS) ("the Guidelines") are prepared with the objective to serve as useful reference materials to assist member economies, government agencies (including customs agencies) and traders involved in supply chains (including exporters, logistics companies and importers) in their adoption and implementation of GDS for the purpose of enhancing the overall performance of supply chains and improving risk management.

APEC Leaders and Ministers have recognised that a wider use of GDS can improve supply chain performance. In any international transaction of goods, a range of information needs to be exchanged between various parties as the goods move along global supply chains. GDS is adopted to ensure that relevant information is provided in a common format which is easily understood and sharable by all parties. The current state of GDS Application is at Annex 1. As transactions by governments and the private sector become increasingly electronic, it is more important and useful to ensure that systems used by stakeholders are interoperable.

To enhance the understanding of GDS and its benefits, costs, and solutions to possible obstacles and challenges, a suite of pilot projects was conducted to provide interested member economies with first-hand experience in GDS to track the movement of selected products along the supply chain. A summary of the APEC pilot projects conducted is at Annex 4. The related studies[1] on the pilot projects completed by the APEC Policy Support Unit (PSU) in 2017 have demonstrated that GDS could serve as an effective trade facilitation tool to improve supply chain performance by enhancing efficiency, integrity, visibility and innovation. GDS also strengthens institutional connectivity by contributing to better compliance by supply chain stakeholders and enhanced risk management of customs and border agencies in the region. Yet, challenges to GDS adoption remain, one of which is the lack of awareness of the possible uses and benefits of GDS.

To address this, the Guidelines are developed with the aim to serve as useful reference materials to facilitate relevant stakeholders in the application of GDS on supply chains as well as the wider adoption of GDS across APEC, drawing from the study outcome of previous APEC projects[2] as well as the current state of GDS application among the APEC region. The Guidelines also seek to implement the mandate of the Leaders and Ministers to promote wider use of GDS, and to address relevant impediments, or 'chokepoints', identified in the APEC Supply-Chain Connectivity Framework Action Plan Phase II (SCFAP II)[3].

The table below outlines the findings of the pilot projects on how the functionalities of GDS can be applied to address the chokepoints of SCFAP II and the associated key benefits, in particular chokepoints (i) and (ii).

Objectives	*Key benefits*	*SCFAP II Chokepoint addressed*	*Product Classification*	*Product / Key identification*	*Product information / attributes*	*Common Business Vocabulary*	*Data Visibility / Sharing*	*Product Authentication*
Efficiency	Improve responsiveness by enabling system interoperability			✓		✓	✓	
	Improve supply chain planning by better access	*(i)*		✓	✓	✓	✓	

[1] Study on the Application of Global Data Standards for APEC Supply Chain Connectivity - Phase 1 <https://www.apec.org/Publications/2017/02/Study-on-the-Application-of-Global-Data-Standards-for-APEC-Supply-Chain-Connectivity-Phase-1> and Phase 2 <https://www.apec.org/Publications/2017/11/Study-on-the-Application-of-GDS-for-Supply-Chain-Connectivity-Phase-2>

[2] Studies on the Application of Global Data Standards for APEC Supply Chain Connectivity and Asia-Pacific Model E-Port Network (APMEN) <http://mddb.apec.org/Documents/2019/CTI/CTI1/19_cti1_042.pdf>

[3] The five chokepoints identified by SCFAP II are (i) lack of coordinated border management and underdeveloped border clearance and procedures; (ii) inadequate quality and lack of access to transportation infrastructure and services; (iii) unreliable logistics services and high logistical costs; (iv) limited regulatory cooperation and best practices; and (v) underdeveloped policy and regulatory infrastructure for e-commerce.

	of data							
	Removal of supply chain / processing errors (by elimination of DIFOT (Delivered In Full, On Time) failures & manual data entry errors)		✓	✓	✓	✓	✓	
Integrity	Avoidance of confusion between parties by using a shared terminology	*(i)*	✓		✓	✓	✓	
	Ensure data integrity by improving data accuracy, completion and consistency	*(i)*	✓	✓	✓	✓	✓	
	Ensure product and product attributes integrity	*(i)*		✓	✓		✓	✓
Visibility	*Visibility within the supply chain (e.g. exporter and importer)*	*(i) and (ii)*						
	Risk assessment (by better access of product & supply chain information)	*(i)*	✓	✓	✓	✓	✓	✓
	Improved product traceability in various level		✓	✓	✓		✓	
Innovation	*Collaboration through better collaboration and sharing of information*	*(i)*	✓	✓	✓	✓	✓	✓
	Enhances harmonised tariff code		✓					
	New methods to demonstrate compliance with regulators		✓	✓	✓	✓	✓	✓

Definition of Global Data Standards

The use of GDS can ensure that relevant information is provided in a common format which can be easily understood and shared by all parties. In this document, the term "Global Data Standards" encompasses various traceability, data sharing and identification measures, including identification of product and shipment/consignment.

GDS allows the flow of product to be accompanied by the flow of data about the product, with product identification and sharing of data being done in a standardised way. The foundation of GDS is the ability to identify, track and trace products traded. Traceability is defined as the ability to identify and trace the history, distribution, location and use of products. For example, medicinal product traceability is crucial to ensure patient safety, and customs can benefit from having full access to data on products being imported for risk management purposes.

It is important to note that standardisation is vital to lowering the cost of cross-border international trade, as highlighted by APEC Business Advisory Council (ABAC)[4]. Deviations from standards will require additional investments and complexities. More importantly, having different requirements across regions or between economies adds complexity in operations, increasing the risk for failure and operational costs.

Purpose and Scope of the Guidelines

This document is intended for those who are considering the adoption of GDS for better compliance and risk management at the border, such as the automate clearance of low risk consignments. It aims to provide detailed guidance to support relevant stakeholders before, during and after the development of GDS to be applied in the border environment and in the supply chains. The Guidelines

[4] APEC Supply Chains: Identifying Opportunities for Improvement: USC Marshall School of Business ABAC Team 2011
https://www2.abaconline.org/assets/2011/4%20Honolulu%20Hawaii%20USA/2011-APEC%20Supply%20Chains_Full%20Report.pdf

also address the growing number of requests for the alignment of regional developments and best practices related to identification such as barcoding[5], data sharing[6], authentication, traceability, and the provision of information from a neutral source. The scope of this document covers products, both e-commerce parcels and containerised (air/sea) cargo traded cross-border but excluding bulk cargo containers. This document is prepared for the general consumption of stakeholders without going into the technical details of implementation.

Implementation Phases and Steps for Deployment

This section outlines the steps for the planning and implementing of GDS.

Preparatory phase

Market and trade analysis

In the preparatory phase, a number of analyses need to be carried out to identify the right issues to focus on. At the macro-analysis level, this could include studying export-import patterns, and recognising industries where there is a strategic opportunity to strengthen exports. For border agencies, this may also involve determining the needs for more effective controls on imported goods. To support such analysis, ongoing monitoring should be conducted on how the issues are being developed in the economy and in the region.

As a start, micro-analysis should be conducted to determine what the actual needs are, and to identify the specific products and supply chains that need to be targeted. This can be achieved by addressing questions such as what are the strategic objectives, what are the current challenges and how can the implementation of GDS support them. Examples include improving consumer safety through the provision of multi jurisdiction product identification to reduce the risk of counterfeiting (e.g. enabling authentication of product by the consumers).

GDS should never be viewed as a replacement to existing systems such as the Harmonized System which is used globally by customs to classify goods, but rather as a complementing information provider that can be used in specific cases (e.g. Authorised Economic Operator (AEO)) and for specific product types (e.g. high-risk food and health products). It may also enhance efficiency by providing automated backfilling of import declarations which allows savings in terms of time and cost for manual processing, as well as improvement of data quality.

Define status of cross-border trade and government overall strategic objectives

Risk management is used by border agencies to identify how best to apply their effort and resources. This is not only to maximise seizures of counterfeits or to minimise phytosanitary, biosecurity or public health risks, but also to facilitate legitimate trade.

The principal problem with risk management experienced by border agencies is data inaccuracy. Insufficient data or data errors incur unnecessary and repeated cargo inspections, slowing down the transit of goods across borders and wasting agency resources.

There is a potential for GDS systems to reduce data errors that may lead to unnecessary shipment delays. Most of the data required by agencies is already housed in enterprise resource planning systems of companies and/or held in certified global data pools[7]. The accuracy of this information is tested by retailers and other supply chain participants on a daily basis, which makes it less is likely to

[5] Conforming to ISO/IEC 15459
[6] Conforming to ISO/IEC 19987
[7] GS1 certifies 33 such data pools containing the data of millions of products.

contain errors than data that is manually entered into the system. Using such data systems would also lower business administrative compliance costs.

Many areas have been identified where GDS could assist border agencies with clearance and risk management. These could include:

- Enhancing supply chain integrity – enabling better control of supply chains and the products transported, lowering risks or enhancing supply chain visibility as an anti-counterfeit tool, thereby improving consumer benefits such as product quality and safety;

- Enhancing supply chain visibility – enabling greater knowledge about the products being transported such as when, where, what and why; enabling planning and strengthening risk management including traceability due to regulatory requirements and recall readiness supported by lot/batch numbers; and

- Enhanced supply chain efficiency – executing the processes and communication related to a shipment at a shorter time and a lower cost, with efficiency gains for traders and more effective operations of border agencies.

A well-defined scope based on the above requirements would facilitate successful and strategically aligned implementation. Yet, the larger the number of products included, the more complex the implementation would be. At the initial stage, a limited range of products should be included, and preferably be those where instances of counterfeiting, duty under reporting, data inaccuracy etc. have been detected, as well as products of high-risk (such as infant formula and cosmetics), and high-value products. Some examples of products are those:

- Easily perishable (fruit, vegetables, seafood)
- High value (alcohol, luxury goods, rugs)
- Long, complex supply chains (electronics, pharmaceuticals, seafood)
- Origin-sensitive (alcohol, food)
- Subject to regulatory control (alcohol, fresh and frozen food, pharmaceuticals, sugar, tobacco)
- Temperature-sensitive (fresh and frozen food, pharmaceuticals)

Capacity Building

As the initiative of adopting GDS in the supply chain management may be a new approach to users, capacity building activities prior to the pilot are recommended. This could entail introductions to the standards system leveraged and an explanation of the different applications of the standards foreseen in the implementation. Capacity building trainings/workshops for concerned stakeholders are also recommended.

Identification and technology analysis

The following analyses should be undertaken before embarking on implementation:

- What is the level of maturity of technology used by customs/border agencies?
- How are imported goods identified? Is there any automated data sharing mechanism in place?
- What product identifiers are currently in use? For what purposes?
- Are there any currently existing barcoding / RFID requirements? For what purposes?
- Are there currently any traceability requirements for imported products? For what categories?

Selection of suitable border use case application

Foundational for the successful deployment of GDS is that it is aligned with the objectives of the relevant Government agencies and results in a positive impact for affected users, i.e. importers and exporters. Implementation of change processes can be faced with internal challenges, even in the

agencies tasked to carry out the change. Furthermore, impacted importers and exporters may also be reluctant to adopt GDS given that the initial changes would lead to short term extra costs that are often rejected by industry, even though there will be savings in the longer term. Therefore, qualitative and quantitative benefits should be presented to all stakeholders as part of an extensive socialisation of the initiative.

The application of GDS varies from sophisticated deployment to simple barcode scanning and data retrieval. To make the most out of the adoption of GDS, the application that aligns with relevant government strategy should be selected. The border use cases will not only define the suitable implementation approach in general purpose and structure, but also on a technical level in defining the data to be captured, and the data sharing mechanism for master data/visibility data. An extensive list of border use cases of GDS is available in Annex 2.

While border agencies have adopted computer-based clearance systems to some degree, there is considerable diversity in how agencies operate systems, what the regulatory requirements are, and which government agencies are involved in border procedures. Furthermore, border agency remits cover diverse issues, such as duty collection, biosecurity, environmental protection, illicit trade[8], counterfeits[9], and public health and safety. It is also worth noting that border procedures, official forms, and information requirements are often subject to the provisions under relevant legislations and their subsidiaries. Due to these complexities, better communications and coordination among border agencies are understanding and cooperation are vital in order to facilitate a successful implementation of GDS. It is vital that the exporting and importing governments have a bilateral G2G understanding and cooperation for the supply chains in order for successful implementation. This is especially vital if the use of GDS is underpinning full supply chain visibility and exchange of data, for example the so called "farm to fork traceability." If the agencies in the exporting and importing economies have agreed on a formalised way to exchange the product data, it would enable the sharing of data throughout the entire supply chain, as we have seen from the APEC GDS pilot project on the meat supply chain from Australia to the U.S. where the exchange of traceability data has been formalised[10].

Implementation phase

Implementation of open, global and proven standards enable effective and efficient visibility systems. A visibility system is a data sharing tool that can be used through the internet on a computer or other interface. It gives users access to supply chain information related to, for example, where in the supply chain a shipment is, when it is scheduled to arrive, and who has it in custody at any given time. This information is often referred to as visibility, and the data sharing platform used is often referred as a visibility system. Typically, the implementation of visibility system includes the setup of database for managing supply chain and related data, and user and system interfaces for capturing and sharing of data, depending on the business needs of stakeholders.

By using a common standardised way to identify goods/products traded and sharing the associated data, it is possible to make the data available throughout the supply chain among stakeholders, as needed and permissible. Normally this data would be shared on a need-to-know basis, but with the use of a common set of identifiers it would allow the sharing of relevant data among the stakeholders,

[8] Illicit trade is one of the greatest global challenges that adversely affect the industry, governments, and the general public. Collection of duty at the border is a key priority for customs globally, and illicit trade is a global issue that can cause loss of tax revenue for governments.

[9] Counterfeiting of products is a global issue that can cause injuries and death for consumers, loss of revenues for companies and loss of tax revenue for governments. Those who face counterfeiting infringements for their brand are looking for ways to detect fake products, authenticate products and their origin, and remove all counterfeit products from the supply chain. A challenge is that rights holders must be contacted to determine whether or not goods are in fact counterfeit, and to seize goods.

[10] *https://meatmessaging.info/iots/home.asp*

e.g. for compliance with traceability requirements for imported food products possible to share throughout the supply chain. GDS is applicable to companies of any size and to all levels of organisational complexity and system sophistication, although the depth and breadth of operational implementation vary across organizations in line with their visibility priorities. Visibility is multi-disciplinary. In a company, many departments will be involved in the development and implementation of a visibility system. A fundamental decision to make at the beginning of this process is to define internal and external roles and responsibilities, the scope of the visibility process across the supply chain, timelines, the partners involved, the main use cases (e.g., where is my product, inventory management), and the level of required visibility (e.g., at pallet, case, conveyance level).

Planning stage

The planning stage starts with mapping the physical flow of items through the supply chain. The mapping can be done by walking through each step of the supply chain to identify the physical locations, inputs, internal processes and outputs that an object goes through. Next step is to identify the type of products that are exchanged between partners, describe the logical hierarchies, and how each of these objects will be identified. The results are a project plan, gap analysis and functional specifications (including supply chain links, operating and data exchange processes, relevant documents, key departments, critical control point definitions and assignment of roles). In order to create a visibility system with different components of the visibility framework, decisions need to be made on the technology and solution providers for each of the components of the system, i.e., readers and tags, middleware, capturing application, repository, and accessing applications.

Hardware and testing

It would be beneficial to test the visibility system first to ensure that everything is working as expected. This system would be a software that allows the standardised exchange and sharing of data among supply chain stakeholders. All hardware and all the components of the network should be tested. The visibility system is recommended to undergo tests in order to identify and resolve any inherent problems. It is also important to provide training and develop training manuals and documentation which records the costs of the project and overall benefits of the system. All documentation will be beneficial in assisting future implementations with other trading partners.

Post-implementation phase

Reports and evaluation

A post-implementation report which includes a Cost/Benefit Analysis should be prepared. Analysis should also focus on areas where additional benefits are achieved, and whether it would be beneficial to implement changes i.e., integration to existing systems. Furthermore, the report should outline how GDS implementation supported the objectives, and measure how the cost-effectiveness of adopting GDS in supply chains for relevant stakeholders (e.g., traders, logistic operators and border agencies).

Annex 1 Current State of GDS Applications

The following outlines the current state of GDS applications in the APEC region.

U.S. International Trade Data System (ITDS)

The U.S. agencies endeavoured to use standard codes already adopted by industry wherever possible[11]. Several ITDS agencies conducted table-top pilots to assess the usefulness of product identification codes around 2009-2010. These codes are the same types of codes used in the APEC GDS pilot projects. Tests on toys, cut flowers, and meat products have been executed and evaluated. According to a report to the U.S. Congress[12], the initiative could provide a useful addition to the U.S. Customs and Border Protection's efforts to "simplify entry reporting." The identification of specific products using a globally unique product number also has cost-saving potential. A Global Trade Identification Number (GTIN, the bar code on nearly all retail products) can be linked to details about the individual product. One GTIN number, rather than several data elements, may be all a trader would need to report for an adequate description of a product.

Canada Single Window Initiative

Through the Single Window Initiative, traders are able to provide all required import information electronically to the Canada Border Services Agency (CBSA), improving the manual, paper-based system previously in use. The new Integrated Import Declaration (IID) further expands the ability for clients to submit and obtain a release for commercial goods regulated by Participating Government Agencies (PGAs). CBSA is looking for an increase in client uptake within the initiative to increase participation.

The concept aimed to demonstrate the feasibility of utilizing a local product registry service for commodity identifiers as a point of access between trading partners to share product data based on global data standards, and to be a pipeline of data to be shared between industry, CBSA and PGAs. It's also targeted to demonstrate the feasibility, benefits and potential savings of utilizing the GDS (GTIN) as a commodity/goods identifier to streamline the IID process for CBSA, PGAs and TCPs. A streamlined process for creating and reviewing IIDs can be created driving efficiencies for Customs Brokers. There is an opportunity to align business processes with the import declaration process by using GDS to drive efficiencies for importers. Risk Management is improved by accessing risks by product and assess whether it should be cleared at the border. IID's uniquely associate each importer to the GTINs being imported, including validation of the Product (GTIN)/Importer relationship. IID's uniquely associate each importer to the GTINs being imported, which could be useful when making references to LPCOs (License, Permit, Certificate, Others) required at the GTIN level.

Improved predictive analysis is also supported. The initiative facilitates the monitoring of trends of the type of products arriving at the border through watching a series of import declarations that are taking place at the border. IID's uniquely associate each importer to the GTINs being imported, providing more precision in the identification of products imported. GTIN normalizes product identification across importers and IIDs. It also enables CBSA to target specific GTINs or Importers.

Australia MeatMessaging

MeatMessaging[13] addressed an industry-wide problem associated with product shipped to the U.S. being deemed ineligible due to missing or illegible shipping marks. The MeatMessaging program is an

[11] OMB Circular A-119 "directs agencies to use voluntary consensus standards in lieu of government-unique standards except where inconsistent with law or otherwise impractical."

[12] Report to Congress on the International Trade Data System (December 2013) page 11-12 https://prolog.ee/wp-content/uploads/2015/10/2013_itds_report-US-ITDS.pdf

[13] *https://meatmessaging.info/iots/home.asp*

industry-owned web-based application which facilitates the collection, processing and reporting of commercial and regulatory meat product information along the supply chain. It operates with the approval of the U.S. Government and Australian Government. The MeatMessaging platform's messages assist users and regulatory authorities with the authenticity, verification and traceability of meat products. Authorised regulatory entities have access to regulatory data to facilitate compliance activities. The GS1 barcoding standards and GS1 electronic message standards, including GTIN, GLN, SSCC, EPCIS and CBV, do not replace existing regulatory requirements, they assist and supplement these requirements instead.

MeatMessaging has provided the Australian industry with an electronic solution for reducing costs of shipments into the U.S. following USDA FSIS recognition of barcodes as a means of verifying product with missing or illegible shipping marks. MeatMessaging uses the AUS-MEAT Trade Description Language (UNECE Bovine Cut Descriptions), Importing Economy Label requirements (USDA) and the GS1 Global Data Standards (for data transfer). Since 2016, 68 establishments (including seven U.S. importers) have applied to use the portal; including the three largest processors in Australia. It represents more than of 70% of Australian export capacity. To date in excess of 3.4 million cartons (representing approx. 10,000 consignments) have been processed through the MeatMessaging site.

Hong Kong Logistics Development Council Cross-Border Supply Chain Visibility

The "Feasibility Study for Cross Border Supply Chain Visibility Across Guangdong, Hong Kong and Asia"[14] conducted by GS1 Hong Kong, in collaboration with the Asian Institute of Supply Chains & Logistics of the Chinese University of Hong Kong and sponsored by the Hong Kong Logistics Development Council (LOGSCOUNCIL), was completed in October 2014. This pilot was undertaken with the objectives to reduce trade barriers between ASEAN members and facilitate customs and border clearance by increasing cross-border supply chain visibility. Electronic Product Code Information Services (EPCIS) standards were adopted in the pilot to enhance real-time visibility of cargo and information flow, and hence increasing cross-border supply chain visibility (SCV) for global businesses. Two core values of SCV were identified in the Study, namely the abilities to provide advance cargo information and monitor cargo movement status and security, suggesting that the adoption of GDS as standardised codes would facilitate cross-border interoperability by enabling unique identification for all products, business locations, documents and sharing of information interoperability, which ultimately enhances supply chain visibility.

China, Japan, Korea Neal-net

Northeast Asia is one of the centres of the world economic activities, but the sharing of shipping information has been inefficient. To address this, the governments of China, Japan and Korea signed a Memorandum of Understanding to establish the Northeast Asia Logistics Information Service Network (NEAL-NET) and speed up the sharing of logistics information. NEAL-NET is used to define the interface standards of each public logistics nodes and promote the reform of logistics nodes' interfaces in accordance with these standards to realise cross nodes data sharing. At the current stage, NEAL-NET cooperation mainly focuses on International Marine Transport. NEAL-NET's logistics information sharing standards including data elements, code sets and interface format, is based on the GDS visibility framework, EPCIS.

[14] *https://www.gs1hk.org/sites/default/files/media_plus/event-and-news/publications/industry-collaterals/Report_of_Feasibility_Study_for_Cross_Border_Supply_Chain_Visibility_Across_Guangdong_Hong_Kong_and_Asia_0.pdf*

New Zealand Business Number

The New Zealand Government has established the New Zealand Business Number (NZBN) registry to provide an authoritative and comprehensive register of all businesses in New Zealand. The NZBN identifier is based on GDS to support New Zealand businesses with more efficient interactions with each other and interfacing with the government.

APEC Life Science Innovation Forum Supply Chain Security Initiative

In an effort to address the issue of substandard and falsified medical products, regulators, industry stakeholders, representatives from non-governmental organizations, international organizations, and academics came together as members of the "Roadmap to Promote Global Medical Product Quality and Supply Chain Security" project, a collaborative multi-year project commissioned by APEC with oversight by its Life Sciences and Innovation Forum (LSIF) and the Regulatory Harmonization Steering Committee (RHSC). This work culminated in the development of this Supply Chain Security Toolkit[15], which contains best practices on the use of GDS and tools to prevents and detect substandard and falsified medical products before they reach the consumer and to efficiently respond to incidents involving substandard and falsified medical products. The Toolkit can be used in conjunction with the World Health Organization's (WHO) guidance on developing a plan for preventing, detecting, and responding to actions, activities, and behaviours that result in substandard and falsified medical products.

Asia-Pacific Model E-port Network Pilot Projects

Ports play an important role in the supply chain acting in the first place as a transportation hub as well as an information hub. Yet, finding the most suitable and accurate source of information is not an easy task in a global supply chain. Shippers and logistics operators need to be able to share information documents with operators and administrators of other ports to achieve "end-to-end" visibility. Thus, the Asia-Pacific Model E-Port Network (APMEN) Visualisation of Sea-Freight Logistics Project [16] (Phase 1) was commissioned to improve the visibility, integrity and transparency of cross-border trade in the Asia-Pacific by automating the exchange of Sea Freight data between APMEN members using GS1 GDS.

For each critical event, data standards were developed to capture information about these events as the basis for the data exchange. Data attributes such as container ID, vessel ID etc. were agreed and aligned to the GS1 EPCIS Supply Chain Visibility Standards to enable physical supply chain critical tracking events (e.g. a container being loaded on a vessel) to be defined, and for event data (e.g. what where, when, why) to be captured and shared across enterprises so that users can gain a shared view of inventory as it transitions between process steps across an extended supply chain.

The exchange of critical sea freight data between ports can deliver benefits to participants including greater transparency in container movements, improved planning of port operations through increased visibility, more efficient track and trace operations, better access to data for port management systems, better customer service support to port community stakeholders. In the project, the majority of participants also agreed that the sharing of data and events would deliver implementation of early warning systems, visibility of vessel location and status, improved track and trace, strengthening regulatory and operational efficiencies.

[15] *http://www.nifds.go.kr/apec/SupplyChain/APEC_SupplyChainToolkit_170317.pdf*
[16] *http://mddb.apec.org/Documents/2019/CTI/CTI1/19_cti1_042.pdf*

Annex 2 Potential Areas for GDS Applications

The following outlines potential areas where APEC economies can explore for further applications of GDS.

Implementation of WTO Agreement on Trade Facilitation (TFA)

The TFA sets out binding obligations for all WTO Members to improve and harmonize their import/export and customs formalities and procedures. The adoption of GDS could assist economies to better implement TFA in the following areas:

Pre-arrival processing

GDS can assist in pre-arrival processing procedures by providing information on the status of the consignment could be provided directly to border agencies by electronic data exchange (EDI), in advance of arrival, by trading parties, thereby help in prioritising border agency resources.

Risk management

GDS can assist in facilitating the identification and speedy release of low-risk consignments by the shipping history of traders, in terms of shipping routes and their compliance history. This would involve assigning unique product identification, allowing access to product data repositories, leveraging of industry product classification systems and industry visibility platforms.

Authorised operators

The use of GDS could facilitate operators in meeting the specified criteria required for authorised operators, such as maintaining a good record of compliance and a system of managing records with enhanced data accuracy, completion and consistency.

Perishable goods

GDS could facilitate the identification of perishable consignments, thereby allowing speedy release of goods and proper storage pending the release of goods.

There could be a potential to leverage GDS as an information technology to support the implementation of Single Window with product identifiers and data sharing standards. This is further explained in the following section.

Single Window

The Single window is a single information technology platform for the submission of B2G documents for meeting regulatory requirements of trade in goods. Border agencies can use GDS Product Master Data held in certified global data pools to make more informed customs decisions, strengthening data risk analysis.

The use of GDS Product Identification Code can help expedite and improve upon the process of sharing product data between exporters, regulatory agencies and importers. This is done by including the goods/commodity identifier in the import declaration form. The identifier will link to the National Product Catalogue/Global Data Synchronization Network (GDSN) as a source of data for the import of goods/commodities to help admission decisions and expedite clearance. Furthermore, border agencies could also build up product identification code databases based on admission history and reference it for future risk management purposes.

Authorised Economic Operator / Trusted Trader

Authorised Economic Operators (AEO, C-TPAT in the U.S., or "trusted trader" in some economies including Australia) are actors in the international supply chain (traders, forwarders, brokers, transport companies etc.) with a proven record of compliance who are certified by customs to qualify for certain agreed beneficial procedures. Yet, the full benefits of AEO would require G2G mutual recognition arrangements (MRAs) for their respective AEO schemes.

Governments can leverage GDS GS1 identification and visibility data for AEO border clearance decisions, enabling the single border concept. With two economies cooperating based on an AEO mutual recognition agreement with a two-way, end-to-end Secure Trade Lane, participating Governments will be able to have greater visibility of the goods along the entire supply chain from consignment initiation to delivery. Trade data could also be viewed in advance and with greater details, allowing more time to make better-informed risk assessment decisions.

Intellectual Property Rights and Illicit Trade

Detection of counterfeit trade is improved through enhanced use of scanning at the border to retrieve additional data about the product to verify authenticity, and to detect counterfeits and illicit trade in cross-border trade. It may also give access to more granular data related to the product for further investigation, such as brand owner, country of origin, product image, etc.

Using visibility platform ensures information remains in a format readable by all parties. If underpinned by product identification and full supply chain visibility, the functionality becomes more comprehensive and builds trust in international supply chains. It also facilitates rapid and reliable identification of trade as it moves physically through the supply chain; facilitates matching of physical items to the electronic bill of lading supplied in advance by the trader; and authoritatively helps verify the authenticity of products traded across borders.

Cross Border Food Alert

Product identification code (+batch number) can be used in border control systems to identify contaminated food at the border, thereby preventing them from being imported for domestic distribution and ensuring the safety of domestic consumers. By using the suitable GDS product identification code (GTIN/batch/lot, etc.), information of product safety or contamination issue may also be shared with the border agencies or food safety authorities in other economies through the inclusion of relevant coding in the import document, such that the concerned product could be easily identified and flagged as contaminated or unsafe for consumption.

Annex 3 Technical Guidelines and References

Name	Description
Electronic Product Code Information Services & Core Business Vocabulary	The Electronic Product Code Information Services (EPCIS) standard defines a data-sharing interface that enables supply chain partners to capture and communicate data about the movement and status of objects in the supply chain. The EPCIS specification provides technical standards, as well as a standardised set of service operations and associated data elements. In addition, the EPCIS standard also incorporates data standards for how to populate EPCIS data elements. (See Core Business Vocabulary below.) The Core Business Vocabulary (CBV) provides data standards for populating EPCIS data elements and lists of acceptable values for how to express what business process was operating on an object and the status of the object upon exiting the process. It includes syntaxes, vocabularies, and element values (with definitions).
Electronic Data Interchange	Electronic Data Interchange (EDI) is the computer-to-computer exchange of business documents in a standard electronic format between business partners. GS1 EDI is a subset of the international EDI standard developed under the United Nations. It provides global standards for electronic business messaging that allow automation of business transactions commonly occurring across the entire supply chain. It covers master data alignment, order and delivery and financial settlement management, as well as transport and warehouse management. The main business partners in scope for this are retailers, manufacturers, material suppliers and logistic service providers.
GDS Master Data; National Product Catalogue; Global Data Synchronization Network	The Global Data Synchronization Network (GDSN) provides an efficient and effective approach to (1) storing GS1 Identifiers with their associated attributes; (2) checking to make sure that the identifiers and attributes are properly defined and formatted; and (3) sharing that information with supply chain partners. The GDSN is a network of interoperable data pools. The GDSN-certified Data Pools store and manage supply chain information for their users. The GDSN offers a continuous, automated approach to data management that ensures that supply chain information is identical among trading partners, increasing data accuracy and driving costs out of the supply chain.
Global Shipment Identification Number	The Global Shipment Identification Number (GSIN) is for shipments comprised of one or more logistics units intended to be delivered together. The logistics unit belonging to a particular shipment keep the same GSIN during all transport stages, from origin to final destination. GSIN meets the WCO requirements for Unique Consignment Reference (UCR) and is compatible with ISO/IEC 15459 (part 8, grouping of transport units).

Serial Shipping Container Code	The Serial Shipping Container Code (SSCC) is the globally unique GS1 Identification Number used to identify individual logistic units (i.e., an item of any composition established for transport and/or storage which needs to be tracked individually and managed through the supply chain). SSCCs serve as "license plates" from the carton level to the trailer load level to facilitate simple tracking of goods and reliable look-up of complex load detail. SSCC is compatible with ISO/IEC 15459 (part 1, unique identifiers for transport units – the ISO Licence Plate).
Global Location Number	The Global Location Number (GLN) is a globally recognized identification number used to uniquely identify legal entities, trading partners, and locations in electronic commerce transactions. The GLN can be used to identify a functional entity (like a hospital pharmacy or accounting department), a physical entity (like a warehouse or hospital wing), or a legal entity (like a health system corporation). The attributes defined for each GLN [e.g., name, address, location type (e.g., ship to, bill to, deliver to, etc.)] help users to ensure that each GLN is specific to one unique location within the world. A GLN Registry is the single source for location information, offering a comprehensive list of locations/legal entities with corresponding Global Location Numbers (GLNs). GLN is recognised in ISO Standard 6523 (International Code Designator for GLN is 0088).
Global Trade Item Number	The Global Trade Item Number (GTIN) is the globally unique Identification Number used to identify "trade items" (i.e., products and services that may be priced, ordered or invoiced at any point in the supply chain). GTINs are assigned by the brand owner of the product, and are used to identify products as they move through the global supply chain to the hospital, pharmacy, super market or ultimate end user. GTIN is compatible with ISO/IEC 15459 (Part 4, Individual Products and Product Packages).
Application Identifiers	GS1 Application Identifiers (AIs) are a finite set of specialised identifiers encoded within barcodes to indicate the type of data represented in the various barcode segments. Each AI is a two, three, or four-digit numeric code. (When rendered in human-readable form, the AI is usually shown in parentheses. However, the parentheses are not part of the barcode's encoded data.) Each data element in a barcode is preceded by its AI. For example, the AI for GTIN is 01. Thus, when "01" appears in the encoded content of a barcode, it means the next 14 digits comprise a GTIN. There are AIs for various types of information to enable supply chain partners to communicate item-specific information wherever the barcode is scanned (e.g., expiration date; lot number; batch number).
Data Carrier	A Data Carrier provides machine-readable representations of Identification Numbers that facilitate automatic identification and data capture. In order to accommodate a variety of environments

	and applications, the GS1 System supports a number of barcode symbologies (i.e., GS1 Barcodes) and two RFID tags [i.e., GS1 Electronic Product Code / Radio Frequency Identification Tags (EPC/RFID Tags)].
RFID tag and GDS data content in shipping container identification	Different readers and tags will be used for different layers of the visibility system: In most cases passive UHF Gen 2 tags will be used. If active tags or HF tags are used, then different readers need to be installed for different tags. Tag commissioning is the process of associating an EPC with a particular object (product, shipment, asset or container). A tag may have been encoded and applied in this step, or may have been previously encoded. Cartons/Items: Tag issuance, cargo tagging and commissioning is the first key fundamental steps for cargo track and trace using EPC/RFID technology. Tag issuance is referring to the printing (labels) and encoding of tags. Tagging is referring to the process of slapping a RFID tag on to the cargo units. Cargo units can be a carton box, pallet unit or container etc. which requires track and trace visibility. Pallets: If pallets already have an EPC/RFID tag, the tag should be read when the cartons are loaded on the pallet and the cartons aggregated to the pallets. If the pallets do not have an EPC/RFID tag, the tag will need to be applied to the pallet and the tag commissioned.
XML Messages and Schemas	XML is a mark-up language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. An XML schema is a description of a type of XML document, typically expressed in terms of constraints on the structure and content of documents of that type, above and beyond the basic syntactical constraints imposed by XML itself. XML messages and schemas are used as open, standardised interfaces that allow for seamless integration of well-defined services in inter-party environments.
WCO Unique Consignment Reference	The World Customs Organization (WCO) Unique Consignment Reference (UCR) is a reference number to provide customs with a standard way of identifying unique shipments for effective risk assessment and audit-based controls.

Annex 4 Summary of the Pilot Projects Conducted to Explore Benefits and Costs of Applying GDS at Product Level

Three pilot projects, asparagus from Peru to the U.S.[17]; durian from Malaysia to China and Hong Kong, China; and tequila from Mexico to the U.S., were conducted as a continuation of the previous two self-funded pilots on boxed meat from Australia to the U.S. and wine from Australia to Hong Kong, China. The benefits and costs of applying GDS on supply chain performance for each selected trade route were identified based on reports from firms participating in the pilots and from the respective GS1 local offices.

Three tasks were carried out to identify the impact of GDS on each supply chain. The first was to conduct baseline surveys to identify the existing extent of supply chain visibility stakeholders have. The second step, determined key performance indicators (KPIs) associated with each measure: efficiency, visibility/traceability, risk management/integrity, responsiveness, collaboration, and innovation. Lastly, the impact of GDS on each supply chain was identified and evaluated based on the submitted reports from GS1 local offices.

A number of benefits were identified following the evaluation of the pilot projects. Significant savings were reported due to the reduction of efforts and time spent on information search and consolidation efforts. GDS enables better tracking and sharing of information with all stakeholders facilitating greater visibility along the supply chain through the use of a digital platform. GDS also allows accurate and timely capture of data, thus reducing regulatory compliance errors. Additionally, clearer and more accessible information because of GDS helps companies to save detention related costs.

The full study reports on the pilot projects can be found at APEC website:

- Study on the Application of Global Data Standards for APEC Supply Chain Connectivity (Phase 1) <*https://www.apec.org/Publications/2017/02/Study-on-the-Application-of-Global-Data-Standards-for-APEC-Supply-Chain-Connectivity-Phase-1*>

- Study on the Application of Global Data Standards for APEC Supply Chain Connectivity (Phase 2) <*https://www.apec.org/Publications/2017/11/Study-on-the-Application-of-GDS-for-Supply-Chain-Connectivity-Phase-2*>

[17] *https://www.youtube.com/watch?v=aOp8tHIYmU4*