March 6, 2020

*Comments submitted via the Federal eRulemaking Portal: http://www.regulations.gov*

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14th Street and Pennsylvania Avenue N.W.
Washington, D.C. 20230

Subject: Interim Final Rule - Software specially designed to automate the analysis of geospatial imagery

Reference: RIN 0694–AH89– Federal Register / Vol. 85, No. 3 / Monday, January 6, 2020 / Interim Final Rule

Dear Mr. Borman:

The Computing Technology Industry Association (CompTIA) is the leading association for the global information technology (IT) industry. We work on behalf of our 120-plus member companies to promote investment and innovation, market access, robust cybersecurity solutions, commonsense privacy policies, streamlined procurement, and a skilled IT workforce. On behalf of our members, thank you for the opportunity to provide feedback on the Interim Final Rule on the Addition of Software Specially Designed to Automate the Analysis of Geospatial Imagery to the Export Control Classification Number 0Y521 Series ("the Rule").

**General Comments**

CompTIA respectfully requests that BIS consider alternative options other than this interim final rule to protect against foreign innovators outpacing U.S. businesses in machine learning functions. ECCN 0D521 No. 1 introduces a variety of new terms and concepts neither defined in the ECCN nor otherwise found in the Export Administration Regulations (EAR). Moreover, many of these terms were either unfamiliar to specialists in this field or too general in nature to provide clarity on the scope of controls. Finally, in some cases, terms were directly inconsistent with the common uses in this field.

If the rule remains in place, CompTIA alternatively requests further specificity to ensure this rule is narrowly tailored and the parameters are clear. Overall, the ambiguity of the terms and concepts in ECCN 0D521 No. 1 complicated the efforts of even seasoned export compliance practitioners as they worked with engineers to review specific software items under this ECCN. This uncertainty presents real risks that companies will fail to correctly identify ECCN 0D521-controlled software in their control -- a risk that jeopardizes BIS's national security and foreign policy goals that originally supported the creation of this control.

Given the expectation that BIS will be issuing new controls on emerging and foundational technologies, CompTIA hopes that the agency will commit to utilizing terms and concepts pulled from standards bodies or academic literature in the relevant technical fields and reference those sources. Where this is not possible, CompTIA requests that the agency draft clear definitions for significant terms and concepts to provide a better understanding of what items are intended to be subject to these controls. If BIS moves forward with this rule, CompTIA requests modified language and clarification on several terms and concepts: geospatial imagery, objects, the rotational pattern comparison concept, and point cloud as outlined below.

**Request 1: BIS should consider removing unilateral controls on the software described in ECCN 0D521 No. 1**

CompTIA respectfully requests that BIS consider removing this interim final rule, since similar software is already being developed globally and continuing to impose a unilateral restriction, even temporarily, will further hurt U.S. competitiveness in this area and cause greater damage to the U.S. economy. Additionally, this ECCN makes it more difficult for U.S. companies to develop and use the software described for humanitarian purposes such as disaster recovery and environmental assessment.

This ECCN controls software that provides machine learning training capabilities that are becoming increasingly common around the world. In recent years, publicly available datasets such as CityPersons and CrowdHuman have enabled researchers around the world to develop algorithms for pedestrian detection which involve aerial object and learning based detection[1] and research on improving object orientation in aerial images.[2] Industry, academics, and governments worldwide are capable of building the type of software described in this ECCN

[1] *See, e.g.*, *Adaptive NMS: Refining Pedestrian Detection in a Crowd* ("Pedestrian detection in a crowd is a very challenging issue. This paper addresses this problem by a novel NonMaximum Suppression (NMS) algorithm to better refine the bounding boxes given by detectors.")

[2] *See, e.g.*, *Learning RoI Transformer for Oriented Object Detection in Aerial Images* (*"*The core idea of [a Regions of Interest (RoI)] Transformer is to apply spatial transformations on RoIs and learn the transformation parameters under the supervision of oriented bounding box (OBB) annotations. RoI Transformer is with lightweight and can be easily embedded into detectors for oriented object detection. Simply apply the RoI Transformer to light-head RCNN has achieved state-of-the-art performances.")

using a combination of open source software and algorithms combined with commercially available or freely downloadable satellite imagery.

Continuing to impose a unilateral control on this software, even with the intention of proposing it for multilateral control at the Wassenaar level, will inhibit U.S. software companies, academics, and satellite imagery providers from continuing to innovate in this space, and will not prevent similar entities outside the U.S. from doing so. U.S. companies will be left on the sidelines of the global technology economy, and foreign competitors will have increased opportunity to supplant the U.S. as the global leader in the machine learning/geospatial imagery sector. This loss would ripple through the U.S. economy and cost American jobs as technology companies move outside the country.

Additionally, imposing a license requirement on this software for all countries other than Canada imposes a significant burden and disincentive on U.S. companies who are developing and using this type of software for humanitarian purposes. If BIS is concerned about the national security implications of this type of software it should, at most, propose end-use controls on the software rather than a sweeping license requirement that does not take end-use into account.

**Request 2: BIS should specify the definition of "Geospatial Imagery" and "Point Clouds"**

If BIS chooses to maintain this control, CompTIA proposes adding a definition for "geospatial imagery" that clarifies that this rule applies only to imagery, point clouds, and digital surface models captured by or created from remote sensing space systems (satellites) or high-altitude aircraft. "Geospatial imagery" and "point clouds" are not defined in ECCN 0D521 No. 1 or the EAR and can be interpreted in many different ways. A broad interpretation could include:

- any image that contains geographical coordinates as metadata, including countless images captured by smartphone users every day;
- images taken by aircraft at low altitudes or by vehicles at ground level; or
- surveillance camera footage of indoor environments.

CompTIA members understand that BIS intends this ECCN to apply to a narrower set of imagery collected from high altitude aerial sources. By adding a definition, the final rule would continue to apply to the satellite/high-altitude imagery and associated point clouds and digital surface models that appear to be the focus of the rule without inadvertently placing overly restrictive controls on imagery captured by widely available drone, ground vehicle, or surveillance systems.

As such, CompTIA respectfully requests that BIS add a note or technical note to ECCN 0D521 No. 1 defining geospatial imagery as follows:

***"'Geospatial imagery' is defined as imagery captured by satellite, aerial, or other overhead sources from an altitude of greater than 60,000 feet above sea level."***

**Request 3: BIS should clarify what an "Object" is**

ECCN 0D521 No. 1 includes several references to the word "objects," but the only guidance as to the scope of this term is the parenthetical "(e.g., vehicles, houses, etc.)." This suggests that ECCN 0D521 No. 1 is intended to control software for identifying discrete physical items, but the fact that the parenthetical is presented as illustrative rather than exhaustive raises questions about what else might qualify as an "object."

This is an important question because of the broad range of applications for which deep convolutional neural networks are used in geospatial-image analysis. These techniques can help to support mapping efforts by identifying roads or parking lots. They can also be used to track deforestation by identifying the type of ground cover present in a given area. Roads, parking lots, and forests are just a few examples of features that would not commonly be referred to as "objects."

In light of the above, CompTIA asks that BIS provide additional clarification as to what constitutes an "object" for purposes of ECCN 0D521 No. 1. Specifically, CompTIA proposes that "objects" be limited to countable items with well-defined shapes, characteristic sizes, and identifiable parts.[3] In addition, CompTIA requests that BIS provide additional examples of what the agency considers to be "objects" as well as examples of features that can be identified in geospatial imagery but are not "objects."

**Request 4: BIS should modify additional language in the first criterion of ECCN 0D521 No. 1 to ensure the controls are more narrowly targeted**

Related to the above request, CompTIA also proposes limiting the ECCN to machine learning software that would train a Deep Convolutional Neural Network to identify objects by effectively improving the resolution of a commercial satellite image beyond the National Oceanic and Atmospheric Administration's current licensing limitation -- a 25 cm ground sampling distance or higher. Stated differently, the interim final rule should not apply to machine learning that does not improve the quality of an image beyond what is already detectable by the human eye in commercially available satellite imagery.

[3] This proposal is based in part on work in machine learning research to differentiate between "things" (i.e., objects) and "stuff." *See, e.g.*, *COCO-Stuff: Thing and Stuff Classes in Context*.

CompTIA also proposes adding the word "associated" before point clouds to clarify that the ECCN does not regulate software that uses Deep Convolutional Neural Networks to identify small objects on point clouds that are not derived from geospatial imagery, such as a robot that uses point clouds to navigate indoors or a self-driving car that uses point clouds to estimate its position.

Taking these changes into account, the following language should be added to the first criterion of ECCN 0D521 No. 1, with examples of what the agency considers to be objects (countable items with well-defined shapes, characteristic sizes, and identifiable parts):

> Provides a graphical user interface that enables the user to identify objects (*e.g.*, vehicles, houses, etc.) from within geospatial imagery and ***associated*** point clouds in order to extract positive and negative samples of an object of interest ***smaller than 625 $cm^2$ (i.e., effectively exceeding a ground sampling distance from geospatial imagery of 25 centimeters)***.

**Request 5: BIS should clarify the "rotational pattern" comparison concept**

The final criterion of ECCN 0D521 No. 1 applies to identifying objects in geospatial imagery by "matching the rotational pattern from the positive samples with the rotational pattern of objects in the geospatial imagery." As used here, the concept of "matching the rotational pattern" appears to refer to a specific methodology, but CompTIA members have found that specialists in this field do not recognize the phrase "matching the rotational pattern" as referring to any commonly understood method of imagery analysis.

In light of this uncertainty, CompTIA asks that BIS provide further clarification about "matching the rotational pattern" of a positive sample to an object in a geospatial image by providing a definition of the term "rotational pattern" as well as examples systems where "matching the rotational patterns" is used to identify objects.

**Request 6: BIS should clarify the definition of "Point Cloud"**

A technical note to ECCN 0D521 No. 1 defines the term "point cloud" as follows:

*A point cloud is a collection of data points defined by a given coordinate system. A point cloud is also known as a digital surface model.*

CompTIA members respectfully submit that this definition suffers from two deficiencies. First, point clouds are generally understood to be representations of data points in three-dimensional

space.[4] However, this definition of point cloud does not specify whether the data points are defined in two or three dimensions. Second, it is incorrect to state that point clouds are also known as digital surface models. A digital surface model is an intermediate data product that is specific to geographic information contexts.[5] While point clouds are commonly used to generate digital surface models, they are also used in a variety of non-geographic applications such as medical imaging.[6]

In light of the above, CompTIA requests that BIS clarify whether it intends to control software for analyzing either point clouds or digital surface models (in conjunction with geospatial images). If the former, CompTIA asks that BIS revise the definition of "point cloud" to read as follows: "A 'point cloud' is a collection of three-dimensional data points describing the surface of objects and terrain." If the latter, CompTIA requests that BIS remove all references to "point cloud," replace them with the more specific term "digital surface model," and include the following definition of "digital surface model": "A 'digital surface model' is a three-dimensional representation of the surface of a region of geographic terrain."

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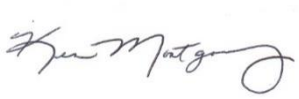
CompTIA sincerely appreciates the opportunity to provide feedback on this significant rule and hopes to continue engaging with BIS on this issue. Our members are in full support of furthering U.S. national security goals and believe that the above requested changes will serve to provide greater clarity to U.S. companies looking to comply with the EAR.

Sincerely,



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[4] *See, e.g.*, *3D Point Cloud Enhancement Using Graph-Modelled Multiview Depth Measurements* ("Point Cloud . . . is a signal representation composed of discrete geometric samples of a physical object in 3D space"); *Review: Deep Learning on 3D Point Clouds* ("Point cloud is simply a set of data points in a space. The point cloud of a scene is the set of 3D points sampled around the surface of the objects in the scene.")

[5] *See, e.g.*, *Learning Dense Stereo Matching for Digital Surface Models from Satellite Imagery* ("A Digital Surface Model (DSM) is a 3D representation of the surface of a region of terrain.")

[6] *See, e.g.*, *An "Augmentation-Free" Rotation Invariant Classification Scheme on Point-Cloud and its Application to Neuroimaging*.