Conjunction Data Message (CDM) Specification for Traffic Coordination System for Space (TraCSS):

1. Purpose

This specification provides the space situational awareness (SSA) community with the specifications on conjunction data messages (CDM) fields in the CDM product that the Department of Commerce (DOC) Traffic Coordination System for Space (TraCSS) will deliver for on-orbit conjunction assessment (CA).

The TraCSS specification builds from the Consultative Committee for Space Data Systems (CCSDS) CDM Recommended Standard 508.0-B-1[1].

2. Background

2.1. Consultative Committee for Space Data Systems

The Consultative Committee for Space Data Systems (CCSDS)[2] is a multi-national organization of international space agencies that develops open communications and data standards for space systems. CCSDS has multiple working groups developing and publishing standards. The Navigation Working Group family of space data messages are most applicable for use by space launch operators, spacecraft operators, SSA service data providers, analysts, and message exchange partners and are freely accessible at the CCSDS website.

2.2. CCSDS Conjunction Data Message

As detailed by the CCSDS in its March 2023 report, the currently available CCSDS Conjunction Data Message (CDM) 508.0-B-1 specifies a standard message format for exchanging spacecraft conjunction information between providers of CA results and spacecraft owners and operators. The CA results provide information associated with the closest point of approach or local minimum in the difference between the position components of two space object trajectories at their time of closest approach (TCA).

The CDM is the final product of CA results and is intended to provide spacecraft owner/operators with sufficient information to assess the risk of collision and design collision avoidance maneuvers, if necessary.

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[1] Conjunction Data Message. Issue 1. Recommendation for Space Data System Standards (Blue Book), CCSDS 508.0-B-1. Washington, D.C.: CCSDS, June 2013 (This current issue includes all updates through Technical Corrigendum 2, dated October 2021. Available at: https://public.ccsds.org/Pubs/508x0b1e2c2.pdf (Accessed April 17, 2025)

[2] Visit https://ccsds.org/ for more information on the CCSDS. (Accessed April 17, 2025)

3. CDM Fields for TraCSS

3.1. CDMs in the TraCSS System

As noted above, the CDM will be the primary product that TraCSS will deliver for on-orbit CA. This TraCSS CDM specification was designed to leverage the format present in the CCSDS CDM Recommended Standard 508.0-B-1 and work of the CCSDS Navigation Working Group on its revision to the maximum extent possible.

TraCSS CDMs will be made available in five formats: Keyword = Value Notation (KVN), Extensible Markup Language (XML), a JavaScript Object Notation (JSON) format similar to the JSON format currently on space-track, a TraCSS unique JSON, and a Comma Separated Value (CSV). These formats are necessary to best support the needs of the many TraCSS users who have drafted their processes around these formats.

The CSV format is not explicitly presented in this document, but it will be consistent with the JSON CDM format. The KVN, and XML versions can be viewed as an implementation of the CCSDS recommended standards. The JSON and CSV formats are largely in agreement with the CCSDS recommended standards, but not in perfect adherence as noted in Table 1.

Table 1 provides a summary of the five CDM formats that TraCSS will provide to its users, and additional information to help users decide which format or formats are best for their use.

Format	Origin	Additional Information
KVN - Section 3.2	CCSDS CDM Version 2.0	• Keywords repeated for object1 and object2 sections • CCSDS standard • ITRF frame state vectors • Most human readable
XML - Section 3.3	CCSDS CDM Version 2.0	• Keywords repeated for object1 and object2 sections • CCSDS standard • ITRF frame state vectors
JSON-ST - Section 3.4	space-track JSON format	• Unique keywords • Widely used ST format • ITRF frame state vectors
CSV	space-track CSV format	• Identical to JSON-ST except in CSV • Unique keywords • ITRF frame state vectors

Format	Origin	Additional Information
JSON-TraCSS - Section 3.5	TraCSS Unique	• Unique keywords • Identical to JSON-St except reference frames • EME2000 frame state vectors

If a CDM meets certain alertable emergency criteria, information about the conjunction will be posted as a TraCSS Conjunction Notification (TCN). Posted TCNs will contain a limited subset of the information in a typical CDM but will be publicly available for the SSA community. In addition to viewing public TCNs, spacecraft owners/operators will be able to access the full CDM information as normal.

3.2. Specifications for the TraCSS CDM

The CDM consists of the following fields. Where applicable, CDM values will also display units.

Table 2: TraCSS CDM Specification KVN

In the KVN format, units will be displayed per the example below:

MISS_DISTANCE = 22 [m]

Keyword	Description	Example
CCSDS_CDM_VERS	CDM format version in the form of X.Y.	2.0
CLASSIFICATION	Description of dissemination controls	UNCLASSIFIED. Operator proprietary data; secondary distribution not permitted, UNCLASSIFIED. Public TraCSS Conjunction Notification
CREATION_DATE	File creation date/time in UTC in month-day format	2015-07-04T12:00:00.000000
ORIGINATOR	Creating agency or operator	TraCSS
MESSAGE_FOR	Spacecraft name(s) for which the CDM is provided	STARLINK-61, <secondary satellite name>
MESSAGE_ID	ID that uniquely identifies the CDM message	000049304_conj_000005614_2024287050914
CONJUNCTION_ID	ID that uniquely identifies all the CDMs representing the same conjunction. Based on object1 id, object2 id, and a TCA with a tolerance	dd8c054b-6bea-48fb-a245-6cb23331b156
TCA	The date and time of the conjunction in UTC ISO8601 format	2015-07-04T12:00:00.000000
MISS_DISTANCE	The overall separation distance of both objects at TCA in meters	437
MAHALANOBIS_DISTANCE	The length of the relative position vector, normalized to one-sigma dispersions of the combined error	12

Keyword	Description	Example
	covariance in the direction of the relative position vector	
RELATIVE_SPEED	The magnitude of the relative velocity vector in meters/sec. The speed at which both objects are moving relative to each other at TCA in meters/second	15031
RELATIVE_POSITION_R	The radial (R) component of Object 2's position relative to Object 1 in Object 1's RTN coordinate frame in meters	-57
RELATIVE_POSITION_T	The transverse (T) component of Object 2's position relative to Object 1 in Object 1's RTN coordinate frame in meters	-264
RELATIVE_POSITION_N	The normal (N) component of Object 2's position relative to Object 1 in Object 1's RTN coordinate frame in meters	260
RELATIVE_VELOCITY_R	The radial (R) component of Object 2's velocity relative to Object 1's velocity in Object 1's RTN coordinate frame in meters/second	1.5
RELATIVE_VELOCITY_T	The transverse (T) component of Object 2's velocity relative to Object 1's velocity in Object 1's RTN coordinate frame in meters/second	-14072.6
RELATIVE_VELOCITY_N	The normal (N) component of Object 2's velocity relative to Object 1's velocity in Object 1's RTN coordinate frame in meter/second	-2511.5

Keyword	Description	Example
APPROACH_ANGLE	The angle between the inertial velocity vector of Object1 and the inertial velocity vector of Object2 with respect to Object1. 0 degrees reflects "overtaking" and 180 degrees reflects "head-on" condition.	30
START_SCREEN_PERIOD	The start time in UTC of the screening period for the conjunction assessment	2015-07-04T12:00:00.000000
STOP_SCREEN_PERIOD	The stop time in UTC of the screening period for the conjunction assessment	2015-07-09T12:00:00.000000
SCREEN_VOLUME_FRAME	Name of the Object 1 or Object 2 centered reference frame in which the screening volume data are given.	RTN
SCREEN_VOLUME_SHAPE	Shape of the screening volume: ELLIPSOID or BOX.	ELLIPSOID BOX
SCREEN_VOLUME_X	The R component size of the screening volume in the SCREEN_VOLUME_FRAME in km	0.4
SCREEN_VOLUME_Y	The T component size of the screening volume in the SCREEN_VOLUME_FRAME in km	25
SCREEN_VOLUME_Z	The N component size of the screening volume in the SCREEN_VOLUME_FRAME in km	25
SCREEN_PC_THRESHOLD	The collision probability screening threshold used to identify this conjunction.	0
COLLISION_PROBABILITY	The probability of collision (Pc) calculated from values of 0.0 to 1.0	0.000003656957

Keyword	Description	Example
COLLISION_PROBABILITY_METHOD	The method utilized to calculate probability of collision	FOSTER-1992
COLLISION_MAX_PROBABILITY	The maximum collision probability that Object1 and Object2 will collide	0.001243656957
COLLISION_MAX_PC_METHOD	Method used to calculate COLLISION_MAX_PROBABILITY	FRISBEE
FIELDS BELOW REPEATED FOR OBJECT 1 AND 2		
OBJECT	The object for which the metadata applies	OBJECT 1 OBJECT 2
OBJECT_DESIGNATOR	The SCC or NORAD CAT ID for the object	25544
CATALOG_NAME	The satellite catalog used for the object	DOD Catalog TraCSS OCM Catalog TraCSS Commercial Data Catalog
OBJECT_NAME	The common name for the object	STARLINK-61 COSMOS 1408 DEB
INTERNATIONAL_DESIGNATOR	The International Designator for the object in a YYYY-NNNP{PP}, where: YYYY = Year of launch. NNN = Three-digit serial number of launch in year YYYY (with leading zeros). P{PP} = At least one capital letter for the identification of the part brought into space by the launch.	1998-06
OBJECT_TYPE	Category of type of object	PAYLOAD ROCKET BODY DEBRIS UNKNOWN OTHER

Keyword	Description	Example
OPS_STATUS	Specification of the operational status of the space object. Information will be pulled from corresponding OCM if available.	OPERATIONAL_MANEUVERABLE NONOPERATIONAL Full list can be found on the SANA Registry at https://sanaregistry.org/r/operational_status/
OPERATOR_ORGANIZATION	The organization of the owner/operator of the object	SpaceX
OPERATOR_PHONE	The phone number of the owner/operator of the object. Space-Track will place a URL for a query that will lead to this information	284-135-4239
OPERATOR_EMAIL	The e-mail of the owner/operator of the object. Space-Track will place a URL for a query that will lead to this information	First.last@email.org
EPHEMERIS_NAME	The MESSAGE_ID of the ephemeris utilized if the data source is an OCM	NONE d49d5103-1124-4909-952a-a391d92dc372
COVARIANCE_METHOD	The method of which covariance is calculated. When covariance cannot be calculated, default values may be used. Caution should be used when using default values when calculating Pc	CALCULATED DEFAULT
MANEUVERABLE	The maneuvering capability of the object for collision avoidance. This field will be populated with information from corresponding OCM, or TraCSS database of satellite information if available	YES NO UNKNOWN
ORBIT_CENTER	The central body about which Object1 and Object2 orbit. If not specified, the	EARTH SUN

Keyword	Description	Example
	center is assumed to be Earth.	
REF_FRAME	Name of the reference frame for the provided state vectors	EME2000 for position and velocity
GRAVITY_MODEL	The name of the gravity model used for propagation. Information will be pulled from corresponding OCM if available.	EGM-96: 36D 360, NONE
ATMOSPHERIC_MODEL	The name of the atmospheric model used for propagation. Information will be pulled from corresponding OCM if available.	JBH09, NONE
N_BODY_PERTURBATIONS	The gravitational perturbation models used in a comma separated format. Information will be pulled from corresponding OCM if available.	MOON, SUN, NONE
SOLAR_RAD_PRESSURE	Indicates whether solar radiation pressure was used during the Orbit Determination (OD) of the object. Information will be pulled from corresponding OCM if available.	YES NO
EARTH_TIDES	Indicates whether solid Earth and ocean tides were used in the OD of object. Information will be pulled from corresponding OCM if available. Will be YES if both OCEAN_TIDES_MODEL and SOLID_TIDES_MODEL are YES	YES NO
INTRACK_THRUST	Indicates whether in-track thrust modeling was used for the OD and propagation of the object.	YES NO
TIME_LASTOB_START	The binned time in UTC of the start of the timespan that	2015-07-04T12:00:00.000000

Keyword	Description	Example
	contains observations used in the OD. If last observation time < 24 hours from CDM creation, TIME_LASTOB_START = CREATION_DATE - 1 day If 24 < last observation time < 48, TIME_LASTOB_START = CREATION_DATE – 2 days If last observation time < 48 hours, TIME_LASTOB_START = CREATION_DATE – 180 days	
TIME_LASTOB_END	The binned time in UTC of the end of the timespan that contains observations used in the OD. If last observation time < 24 hours from CDM creation, TIME_LASTOB_END = CREATION_DATE If 24 < last observation time < 48, TIME_LASTOB_END = CREATION_DATE – 1 day If last observation time < 48 hours, TIME_LASTOB_END = CREATION_DATE – 2 days	2015-07-04T12:00:00.000000
RECOMMENDED_OD_SPAN	The recommended time span for the OD of the object in days. Information will be pulled from corresponding OCM if available.	2.76
ACTUAL_OD_SPAN	The actual time span used in the OD of the object in days. Information will be pulled from corresponding OCM if available.	2.76
OBS_AVAILABLE	Total amount of observations available for the OD of the object. Information will be pulled from corresponding OCM if available.	57

Keyword	Description	Example
OBS_USED	Actual number of observations used in the OD of the object. Information will be pulled from corresponding OCM if available.	57
TRACKS_AVAILABLE	The number of sensor tracks available for the OD of the object. Information will be pulled from corresponding OCM if available.	7
TRACKS_USED	The number of sensor tracks accepted for the OD of the object. Information will be pulled from corresponding OCM if available.	7
RESIDUALS_ACCEPTED	The percentage of residuals accepted in the OD of the object	99.3
WEIGHTED_RMS	The weighted Root Mean Square (RMS) of the residuals from a batch least squares	1.4
AREA_PC	The cross-sectional area of the object in m2. This value is NOT used to calculate Pc	3.12
MASS	The mass of the object in kg	10.1
HBR	The Hard Body Radius in m used by the TraCSS system to calculate probability of collision	3.00
CD_AREA_OVER_MASS	The object's CD•A/m used in the propagation of the vector and covariance to TCA in m2/kg	0.161615504658
CR_AREA_OVER_MASS	The object's CR•A/m used in the propagation of the vector and covariance to TCA in m2/kg	0

Keyword	Description	Example
THRUST_ACCELERATION	The object's acceleration in the In-track or Transverse (T) direction (RTN) used for propagating the state vector and covariance until TCA in m/s2	0 0.634
SEDR	The Specific Energy Dissipation Rate, which is the amount of energy being removed from the object's orbit by the non-conservative forces. This value is an average calculated during the OD	0.020492
APOAPSIS_ALTITUDE	The apogee of the object in km above oblate earth surface	460
PERIAPSIS_ALTITUDE	The perigee of the object in km above oblate earth surface	437
INCLINATION	The inclination of the object in deg	60.7
X	Object position vector X component in km	1670.352554
Y	Object position vector Y component in km	-6834.579872
Z	Object position vector Z component in km	-1430.950837
X_DOT	Object velocity vector X component in km/s	2.780391335
Y_DOT	Object velocity vector Y component in km/s	2.808606433
Z_DOT	Object velocity vector Z component in km/s	-5.751722603
CR_R	Object covariance matrix [1,1] in m2 in Object 1's RTN coordinate frame	2.762478951638903E+01
CT_R	Object covariance matrix [2,1] in m2 in Object 1's RTN coordinate frame	-6.541950061667144E+00

Keyword	Description	Example
CT_T	Object covariance matrix [2,2] in m2 in Object 1's RTN coordinate frame	1.090607087502915E+03
CN_R	Object covariance matrix [3,1] in m2 in Object 1's RTN coordinate frame	-1.587445746741558E+00
CN_T	Object covariance matrix [3,2] in m2 in Object 1's RTN coordinate frame	-5.317841526701392E+01
CN_N	Object covariance matrix [3,3] in m2 in Object 1's RTN coordinate frame	8.797136762538368E+01
CRDOT_R	Object covariance matrix [4,1] in m2/s in Object 1's RTN coordinate frame	-6.857932575721321E-03
CRDOT_T	Object covariance matrix [4,2] in m2/s in Object 1's RTN coordinate frame	-1.093942116989287E+00
CRDOT_N	Object covariance matrix [4,3] in m2/s in Object 1's RTN coordinate frame	5.141264772990662E-02
CRDOT_RDOT	Object covariance matrix [4,4] in m2/s2 in Object 1's RTN coordinate frame	1.122438786460208E-03
CTDOT_R	Object covariance matrix [5,1] in m2/s in Object 1's RTN coordinate frame	-2.853074300735485E-02
CTDOT_T	Object covariance matrix [5,2] in m2/s in Object 1's RTN coordinate frame	5.986579249990964E-03
CTDOT_N	Object covariance matrix [5,3] in m2/s in Object 1's RTN coordinate frame	1.478514422166540E-03
CTDOT_RDOT	Object covariance matrix [5,4] in m2/s2 in Object 1's RTN coordinate frame	7.996126426440161E-06
CTDOT_TDOT	Object covariance matrix [5,5] in m2/s2 in Object 1's RTN coordinate frame	2.947267656834074E-05

Keyword	Description	Example
CNDOT_R	Object covariance matrix [6,1] in m2/s in Object 1's RTN coordinate frame	-6.272024074839294E-03
CNDOT_T	Object covariance matrix [6,2] in m2/s in Object 1's RTN coordinate frame	-5.847356784490015E-02
CNDOT_N	Object covariance matrix [6,3] in m2/s in Object 1's RTN coordinate frame	2.510808305542750E-02
CNDOT_RDOT	Object covariance matrix [6,4] in m2/s2 in Object 1's RTN coordinate frame	5.918716392405004E-05
CNDOT_TDOT	Object covariance matrix [6,5] in m2/s2 in Object 1's RTN coordinate frame	6.412943205733823E-06
CNDOT_NDOT	Object covariance matrix [6,6] in m2/s2 in Object 1's RTN coordinate frame	3.037280667193719E-05
DENSITY_FORECAST_UNCERTAINTY	The dynamic considers parameter (DCP) 1-sigma uncertainty of the relative atmospheric density for the specified object (given as a simple ratio). This is the uncertainty of the average atmospheric density exerting drag on the object, relative to the nominal (measured) atmospheric density	2.143370310000000E-0
SCREENING_DATA_SOURCE	The data used to generate the CDM	DoD HAC State Vector O/O Operational Ephemeris O/O Candidate Ephemeris Commercial SSA Provider
DCP_SENSITIVITY_VECTOR_POSITION	The DCP position sensitivity vector expressed in the object's radial-transverse-normal (RTN) reference frame in meters. This sensitivity vector relates changes in the object's TCA position vector to variations in	-7.345809012167026E+02 3.865957136169006E+05 -1.456925086066596E+02

Keyword	Description	Example
	relative atmospheric density and is in meters	
DCP_SENSITIVITY_VECTOR_VELOCITY	The DCP velocity vector that relates changes in the object's TCA inertial velocity vector to variations in relative atmospheric density and is in m/s	-2.195009966872100E+02 2.630946954519584E-01 3.265607422364180E-01
USER_DEFINED_MEETS_ALERTABLE_CRITERIA	A comment placed here to indicate if this CDM meets TraCSS alertable criteria defined in the TraCSS user handbook.	YES NO
USER_DEFINED_RUN_ID	The unique ID of the conjunction analysis run that produced this CDM, for traceability.	258526987
USER_DEFINED_CORRELATION_ID	The unique ID correlates the CDM to the package of SP Vectors used by TraCSS. May be used by operators to get insight on SP Vector updates	258526987
USER_DEFINED_DILUTION_STATUS	Flag indicating whether the conjunction is in the dilution region or robust region.	ROBUST DILUTED
USER_DEFINED_DILUTION_SIGNIFICANCE	Value indicating difference between Pc and Max Pc. This relates how severely diluted a conjunction is or how safely robust it is.	
USER_DEFINED_ENVIRONMENTAL_IMPACT_FRAGMENTATION	Value indicating number of predicted fragments if this collision were to occur	2438
USER_DEFINED_FRAGMENTATION_MODEL	Free text field containing the name of the space environment fragmentation model used	

3.3 CDM Specification Example XML


```xml
<?xml version="1.0" encoding="UTF-8"?>

<cdm xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"


xsi:noNamespaceSchemaLocation="https://nav.sanaregistry.org/r/ndmxml_unqualified/n
dmxml-

5.0.0-master-4.0.xsd"

    id="CCSDS_CDM_VERS" version="2.0">


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not permitted</CLASSIFICATION>

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    <ORIGINATOR>TraCSS</ORIGINATOR>

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D>

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      <MAHALANOBIS_DISTANCE units="m">12</MAHALANOBIS_DISTANCE>

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        <RELATIVE_POSITION_T units="m">-2269.7</RELATIVE_POSITION_T>

        <RELATIVE_POSITION_N units="m">4325.9</RELATIVE_POSITION_N>

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<OBJECT_DESIGNATOR>43013</OBJECT_DESIGNATOR>

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<OBJECT_NAME>NOAA 20</OBJECT_NAME>

<INTERNATIONAL_DESIGNATOR>2017-073A</INTERNATIONAL_DESIGNATOR>

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<OPERATOR_ORGANIZATION>NOAA</OPERATOR_ORGANIZATION>

<OPERATOR_PHONE>123-456-7891</OPERATOR_PHONE>

<OPERATOR_EMAIL>First.Last@email.org</OPERATOR_EMAIL>

<EPHEMERIS_NAME>d49d5103-1124-4909-952a-a391d92dc372</EPHEMERIS_NAME>

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<CR_AREA_OVER_MASS units="m**2/kg">0</CR_AREA_OVER_MASS>

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</physicalParameters>
<stateVector>
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<X units="km">2844.283804</X>
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<CTDOT_RDOT units="m2/s**2">7.996126426440161E-06</CTDOT_RDOT>**

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<DCP_SENSITIVITY_VECTOR_VELOCITY units = “m/s”>-2.195009966872100E+02 2.630946954519584E-01 3.265607422364180E-01</DCP_SENSITIVITY_VECTOR_VELOCITY>

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<OBJECT_NAME>THOR ABLESTAR DEB</OBJECT_NAME>

<INTERNATIONAL_DESIGNATOR>1961-015AH</INTERNATIONAL_DESIGNATOR>

<OBJECT_TYPE>DEBRIS</OBJECT_TYPE>

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<EARTH_TIDES>YES</EARTH_TIDES>
<INTRACK_THRUST>NO</INTRACK_THRUST>
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<TRACKS_USED>60</TRACKS_USED>
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<Z units="km">6574.679699</Z>
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<Y_DOT units="km/s">7.197457219</Y_DOT>
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</stateVector>
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<CNDOT_RDOT units="m**2/s**2">-4.242901051675628E-05</CNDOT_RDOT>

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-2.037024691761134E-04</DCP_SENSITIVITY_VECTOR_VELOCITY>

</covarianceMatrix>

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<USER_DEFINED_CORRELATION_ID>34772645</USER_DEFINED_CORRELATION_ID>

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</userDefinedParameters>

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</segment>

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</cdm>

3.4 TraCSS CDM Specification Example JSON-ST

This section provides an example of a TraCSS CDM in the JSON format. Please see Table 2 for descriptions of the fields. Notice that compared to the KVN version of the standard, this version has SAT1_ and SAT2_ prefixes added to the object1 and object2 sections to match what TraCSS users may be used to from using space-track.org

{“tracssCdms”:

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"TRACSS_CDM_VERS":"2.0",

"CLASSIFICATION":"UNCLASSIFIED. Operator proprietary data; secondary distribution not permitted",

"CREATION_DATE": "2025-05-16T02:14:49.000",

"ORIGINATOR": "TraCSS",

"MESSAGE_FOR": "NOAA 20",

"MESSAGE_ID": "000043013E_conj_000000147_2025106110855_1747361689",

“CONJUNCTION_ID”: “dd8c054b-6bea-48fb-a245-6cb23331b156”,

"TCA": "2025-05-16T11:08:55.944",

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"MISS_DISTANCE_UNIT": "m",

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"MAHALANOBIS_DISTANCE_UNIT": "m",

"RELATIVE_SPEED": "13169",

"RELATIVE_SPEED_UNIT": "m/s",

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"SAT1_INTERNATIONAL_DESIGNATOR": "2017-073A",
"SAT1_OBJECT_TYPE": "PAYLOAD",
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"SAT1_OPERATOR_ORGANIZATION": "NOAA",
"SAT1_OPERATOR_PHONE": "123-456-7891",
"SAT1_OPERATOR_EMAIL": "First.Last@email.org",
"SAT1_EPHEMERIS_NAME": "d49d5103-1124-4909-952a-a391d92dc372",
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"SAT1_MANEUVERABLE": "YES",

"SAT1_ORBIT_CENTER": "EARTH",

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"SAT2_Z_UNIT": "km",

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"SAT2_CTDOT_TDOT_UNIT": "m**2/s**2",
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"SAT2_CNDOT_R_UNIT": "m**2/s",
"SAT2_CNDOT_T": "6.755770070597844E-02",
"SAT2_CNDOT_T_UNIT": "m**2/s",
"SAT2_CNDOT_N": "1.837606688621818E-02",
"SAT2_CNDOT_N_UNIT": "m**2/s",

"SAT2_CNDOT_RDOT": "-4.242901051675628E-05",

"SAT2_CNDOT_RDOT_UNIT": "m2/s**2",**

"SAT2_CNDOT_TDOT": "-9.295502195125371E-06",

"SAT2_CNDOT_TDOT_UNIT": "m2/s**2",**

"SAT2_CNDOT_NDOT": "1.015446392022411E-04",

"SAT2_CNDOT_NDOT_UNIT": "m2/s**2",**

"SAT2_DENSITY_FORECAST_UNCERTAINTY": "2.046460670000000E-01",

"SAT2_SCREENING_DATA_SOURCE": "DoD HAC State Vector"

"SAT2_DCP_SENSITIVITY_VECTOR_POSITION": "-2.156258246508294E+00 1.320945659001562E+02 -6.733863560415601E-02",

"SAT2_DCP_SENSITIVITY_VECTOR_POSITION_UNIT": “m”,

"SAT2_DCP_SENSITIVITY_VECTOR_VELOCITY": "-1.362417045790363E-01 1.217913130193752E-03 -2.037024691761134E-04",

"SAT2_DCP_SENSITIVITY_VECTOR_VELOCITY_UNIT": “m/s”,

"USER_DEFINED_MEETS_ALERTABLE_CRITERIA": "NO",

"USER_DEFINED_RUN_ID": "8e815679-b659-48df-957e-9c5b4921af52",

"USER_DEFINED_CORRELATION_ID": "34772645",

"USER_DEFINED_DILUTION_STATUS": "",

"USER_DEFINED_DILUTION_SIGNIFICANCE": "",

"USER_DEFINED_ENVIRONMENTAL_IMPACT_FRAGMENTATION": "2438",

"USER_DEFINED_FRAGMENTATION_MODEL": "",

}]}

3.5 CDM Specification Example JSON-TraCSS

This section provides an example of a TraCSS unique CDM. Please see Table 2 for descriptions of the fields. Notice that compared to the KVN version of the standard, this version has SAT1_ and SAT2_ prefixes added to the object1 and object2 sections to match what TraCSS users may be used to from using space-track. The only difference between this format and JSON-ST is that this format uses EME2000 state vectors

{“tracssCdms”:

[{

"TRACSS_CDM_VERS":"2.0",

"CLASSIFICATION":"UNCLASSIFIED. Operator proprietary data; secondary distribution not permitted",

"CREATION_DATE": "2025-05-16T02:14:49.000",

"ORIGINATOR": "TraCSS",

"MESSAGE_FOR": "NOAA 20",

"MESSAGE_ID": "000043013E_conj_000000147_2025106110855_1747361689",

“CONJUNCTION_ID”: “dd8c054b-6bea-48fb-a245-6cb23331b156”,

"TCA": "2025-05-16T11:08:55.944",

"MISS_DISTANCE": "4899",

"MISS_DISTANCE_UNIT": "m",

"MAHALANOBIS_DISTANCE": "12",

"MAHALANOBIS_DISTANCE_UNIT": "m",

"RELATIVE_SPEED": "13169",

"RELATIVE_SPEED_UNIT": "m/s",

"RELATIVE_POSITION_R": "-372.4",

"RELATIVE_POSITION_R_UNIT": "m",

"RELATIVE_POSITION_T": "-2269.7",

"RELATIVE_POSITION_T_UNIT": "m",

"RELATIVE_POSITION_N": "4325.9",

"RELATIVE_POSITION_N_UNIT": "m",

"RELATIVE_VELOCITY_R": "46.5",

"RELATIVE_VELOCITY_R_UNIT": "m/s",

"RELATIVE_VELOCITY_T": "-11660.6",
"RELATIVE_VELOCITY_T_UNIT": "m/s",
"RELATIVE_VELOCITY_N": "-6121.1",
"RELATIVE_VELOCITY_N_UNIT": "m/s",
"APPROACH_ANGLE": "30",
"APPROACH_ANGLE_UNIT": "deg",
"START_SCREEN_PERIOD": "2025-05-16T01:57:29.615",
"STOP_SCREEN_PERIOD": "2025-05-21T01:57:29.615",
"SCREEN_VOLUME_FRAME": "RTN",
"SCREEN_VOLUME_SHAPE": "BOX",
"SCREEN_VOLUME_X": "0.4",
"SCREEN_VOLUME_Y": "12",
"SCREEN_VOLUME_Z": "12",
"SCREEN_PC_THRESHOLD": "0",
"COLLISION_PROBABILITY": "0.000003656957",
"COLLISION_PROBABILITY_METHOD": "FOSTER-1992",
"COLLISION_MAX_PROBABILITY": "0.001243656957",
"COLLISION_MAX_PC_METHOD": "FRISBEE",
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"SAT1_OBJECT_DESIGNATOR": "43013",
"SAT1_CATALOG_NAME": "TraCSS OCM Catalog",
"SAT1_OBJECT_NAME": "NOAA 20",
"SAT1_INTERNATIONAL_DESIGNATOR": "2017-073A",
"SAT1_OBJECT_TYPE": "PAYLOAD",
"SAT1_OPS_STATUS": "OPERATIONAL_MANEUVERABLE",
"SAT1_OPERATOR_ORGANIZATION": "NOAA",
"SAT1_OPERATOR_PHONE": "123-456-7891",
"SAT1_OPERATOR_EMAIL": "First.Last@email.org",
"SAT1_EPHEMERIS_NAME": "d49d5103-1124-4909-952a-a391d92dc372",

"SAT1_COVARIANCE_METHOD": "CALCULATED",
"SAT1_MANEUVERABLE": "YES",
"SAT1_ORBIT_CENTER": "EARTH",
"SAT1_REF_FRAME": "EME2000",
"SAT1_GRAVITY_MODEL": "NONE",
"SAT1_ATMOSPHERIC_MODEL": "NONE",
"SAT1_N_BODY_PERTURBATIONS": "NONE",
"SAT1_SOLAR_RAD_PRESSURE": "NO",
"SAT1_EARTH_TIDES": "NO",
"SAT1_INTRACK_THRUST": "NO",
"SAT1_TIME_LASTOB_START": "2025-05-15T02:14:49.000",
"SAT1_TIME_LASTOB_END": "2025-05-16T02:14:49.000",
"SAT1_RECOMMENDED_OD_SPAN": "2.76",
"SAT1_RECOMMENDED_OD_SPAN_UNIT": "d",
"SAT1_ACTUAL_OD_SPAN": "2.76",
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"SAT1_OBS_AVAILABLE": "57",
"SAT1_OBS_USED": "57",
"SAT1_TRACKS_AVAILABLE": "7",
"SAT1_TRACKS_USED": "7",
"SAT1_RESIDUALS_ACCEPTED": "99.3",
"SAT1_WEIGHTED_RMS": "1.4",
"SAT1_AREA_PC": "3.12",
"SAT1_AREA_PC_UNIT": "m**2",
"SAT1_MASS": "10.1",
"SAT1_MASS_UNIT": "kg",
"SAT1_HBR": "5.00",
"SAT1_HBR_UNIT": "m",
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"SAT1_CD_AREA_OVER_MASS_UNIT": "m2/kg",**

"SAT1_CR_AREA_OVER_MASS": "0",

"SAT1_CR_AREA_OVER_MASS_UNIT": "m2/kg",**

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"SAT1_THRUST_ACCELERATION_UNIT": "m/s2",**

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"SAT1_SEDR_UNIT": "W/kg",

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"SAT1_APOAPSIS_ALTITUDE_UNIT": "km",

"SAT1_PERIAPSIS_ALTITUDE": "813",

"SAT1_PERIAPSIS_ALTITUDE_UNIT": "km",

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"SAT1_Y_UNIT": "km",

"SAT1_Z": "6576.532975",

"SAT1_Z_UNIT": "km",

"SAT1_X_DOT": "-5.436234569",

"SAT1_X_DOT_UNIT": "km/s",

"SAT1_Y_DOT": "-4.382970189",

"SAT1_Y_DOT_UNIT": "km/s",

"SAT1_Z_DOT": "2.799657377",

"SAT1_Z_DOT_UNIT": "km/s",

"SAT1_CR_R": "2.762478951638903E+01",

"SAT1_CR_R_UNIT": "m2",**

"SAT1_CT_R": "-6.541950061667144E+00",

"SAT1_CT_R_UNIT": "m2",**

"SAT1_CT_T": "1.090607087502915E+03",

"SAT1_CT_T_UNIT": "m2",**

"SAT1_CN_R": "-1.587445746741558E+00",

"SAT1_CN_R_UNIT": "m2",**

"SAT1_CN_T": "-5.317841526701392E+01",

"SAT1_CN_T_UNIT": "m2",**

"SAT1_CN_N": "8.797136762538368E+01",

"SAT1_CN_N_UNIT": "m2",**

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"SAT1_CRDOT_R_UNIT": "m2/s",**

"SAT1_CRDOT_T": "-1.093942116989287E+00",

"SAT1_CRDOT_T_UNIT": "m2/s",**

"SAT1_CRDOT_N": "5.141264772990662E-02",

"SAT1_CRDOT_N_UNIT": "m2/s",**

"SAT1_CRDOT_RDOT": "1.122438786460208E-03",

"SAT1_CRDOT_RDOT_UNIT": "m2/s**2",**

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"SAT1_CTDOT_R_UNIT": "m2/s",**

"SAT1_CTDOT_T": "5.986579249990964E-03",

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"SAT1_CTDOT_TDOT": "2.947267656834074E-05",

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"SAT1_CNDOT_T": "-5.847356784490015E-02",

"SAT1_CNDOT_T_UNIT": "m**2/s",

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"SAT1_CNDOT_N_UNIT": "m**2/s",

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"SAT1_CNDOT_RDOT_UNIT": "m**2/s**2",

"SAT1_CNDOT_TDOT": "6.412943205733823E-06",

"SAT1_CNDOT_TDOT_UNIT": "m**2/s**2",

"SAT1_CNDOT_NDOT": "3.037280667193719E-05",

"SAT1_CNDOT_NDOT_UNIT": "m**2/s**2",

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"SAT1_SCREENING_DATA_SOURCE": "O/O Operational Ephemeris"

"SAT1_DCP_SENSITIVITY_VECTOR_POSITION": "-7.345809012167026E+02 3.865957136169006E+05 -1.456925086066596E+02",

"SAT1_DCP_SENSITIVITY_VECTOR_POSITION_UNIT": “m”,

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"SAT1_DCP_SENSITIVITY_VECTOR_VELOCITY_UNIT": “m/s”,

"SAT2_OBJECT": "OBJECT 2",

"SAT2_OBJECT_DESIGNATOR": "147",

"SAT2_CATALOG_NAME": "DOD Catalog",

"SAT2_OBJECT_NAME": "THOR ABLESTAR DEB",

"SAT2_INTERNATIONAL_DESIGNATOR": "1961-015AH",

"SAT2_OBJECT_TYPE": "DEBRIS",

"SAT2_OPS_STATUS": "NONOPERATIONAL",

"SAT2_OPERATOR_ORGANIZATION": "",

"SAT2_OPERATOR_PHONE": "",

"SAT2_OPERATOR_EMAIL": "",

"SAT2_EPHEMERIS_NAME": "NONE",

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"SAT2_MANEUVERABLE": "N/A”,

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"SAT2_REF_FRAME": "EME2000",
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"SAT2_ATMOSPHERIC_MODEL": "JBH09",
"SAT2_N_BODY_PERTURBATIONS": "MOON,SUN",
"SAT2_SOLAR_RAD_PRESSURE": "YES",
"SAT2_EARTH_TIDES": "YES",
"SAT2_INTRACK_THRUST": "NO",
"SAT2_TIME_LASTOB_START": "2025-05-15T02:14:49.000",
"SAT2_TIME_LASTOB_END": "2025-05-16T02:14:49.000",
"SAT2_RECOMMENDED_OD_SPAN": "7.25",
"SAT2_RECOMMENDED_OD_SPAN_UNIT": "d",
"SAT2_ACTUAL_OD_SPAN": "7.25",
"SAT2_ACTUAL_OD_SPAN_UNIT": "d",
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"SAT2_OBS_USED": "313",
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"SAT2_WEIGHTED_RMS": "0.996",
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"SAT2_AREA_PC_UNIT": "m**2",
"SAT2_MASS": "10.1",
"SAT2_MASS_UNIT": "kg",
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"SAT2_HBR_UNIT": "m",
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"SAT2_CD_AREA_OVER_MASS_UNIT": "m**2/kg",
"SAT2_CR_AREA_OVER_MASS": "0.058242754989",

"SAT2_CR_AREA_OVER_MASS_UNIT": "m**2/kg",
"SAT2_THRUST_ACCELERATION": "0",
"SAT2_THRUST_ACCELERATION_UNIT": "m/s**2",
"SAT2_SEDR": "2.97971E-04",
"SAT2_SEDR_UNIT": "W/kg",
"SAT2_APOAPSIS_ALTITUDE": "846",
"SAT2_APOAPSIS_ALTITUDE_UNIT": "km",
"SAT2_PERIAPSIS_ALTITUDE": "765",
"SAT2_PERIAPSIS_ALTITUDE_UNIT": "km",
"SAT2_INCLINATION": "66.6",
"SAT2_INCLINATION_UNIT": "deg",
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"SAT2_X_UNIT": "km",
"SAT2_Y": "678.294469",
"SAT2_Y_UNIT": "km",
"SAT2_Z": "6574.679699",
"SAT2_Z_UNIT": "km",
"SAT2_X_DOT": "-0.180419626",
"SAT2_X_DOT_UNIT": "km/s",
"SAT2_Y_DOT": "7.197457219",
"SAT2_Y_DOT_UNIT": "km/s",
"SAT2_Z_DOT": "-0.621074506",
"SAT2_Z_DOT_UNIT": "km/s",
"SAT2_CR_R": "1.498875410381331E+01",
"SAT2_CR_R_UNIT": "m**2",
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"SAT2_CT_R_UNIT": "m**2",
"SAT2_CT_T": "1.853398041175769E+03",
"SAT2_CT_T_UNIT": "m**2",

"SAT2_CN_R": "-2.569785155327145E+00",
"SAT2_CN_R_UNIT": "m**2",
"SAT2_CN_T": "2.564985254662077E+01",
"SAT2_CN_T_UNIT": "m**2",
"SAT2_CN_N": "2.542050981357448E+01",
"SAT2_CN_N_UNIT": "m**2",
"SAT2_CRDOT_R": "2.777020131804811E-02",
"SAT2_CRDOT_R_UNIT": "m**2/s",
"SAT2_CRDOT_T": "-1.908691876104752E+00",
"SAT2_CRDOT_T_UNIT": "m**2/s",
"SAT2_CRDOT_N": "-1.565827888876557E-02",
"SAT2_CRDOT_N_UNIT": "m**2/s",
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"SAT2_CTDOT_TDOT_UNIT": "m**2/s**2",
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"SAT2_CNDOT_T": "6.755770070597844E-02",
"SAT2_CNDOT_T_UNIT": "m**2/s",
"SAT2_CNDOT_N": "1.837606688621818E-02",

"SAT2_CNDOT_N_UNIT": "m2/s",**

"SAT2_CNDOT_RDOT": "-4.242901051675628E-05",

"SAT2_CNDOT_RDOT_UNIT": "m2/s**2",**

"SAT2_CNDOT_TDOT": "-9.295502195125371E-06",

"SAT2_CNDOT_TDOT_UNIT": "m2/s**2",**

"SAT2_CNDOT_NDOT": "1.015446392022411E-04",

"SAT2_CNDOT_NDOT_UNIT": "m2/s**2",**

"SAT2_DENSITY_FORECAST_UNCERTAINTY": "2.046460670000000E-01",

"SAT2_SCREENING_DATA_SOURCE": "DoD HAC State Vector",

"SAT2_DCP_SENSITIVITY_VECTOR_POSITION": "-2.156258246508294E+00 1.320945659001562E+02 -6.733863560415601E-02",

"SAT2_DCP_SENSITIVITY_VECTOR_POSITION_UNIT": “m”,

"SAT2_DCP_SENSITIVITY_VECTOR_VELOCITY": "-1.362417045790363E-01 1.217913130193752E-03 -2.037024691761134E-04",

"SAT2_DCP_SENSITIVITY_VECTOR_VELOCITY_UNIT": “m/s”,

"USER_DEFINED_MEETS_ALERTABLE_CRITERIA": "NO",

"USER_DEFINED_RUN_ID": "8e815679-b659-48df-957e-9c5b4921af52",

"USER_DEFINED_CORRELATION_ID": "34772645",

"USER_DEFINED_DILUTION_STATUS": "",

"USER_DEFINED_DILUTION_SIGNIFICANCE": "",

"USER_DEFINED_ENVIRONMENTAL_IMPACT_FRAGMENTATION": "2438",

"USER_DEFINED_FRAGMENTATION_MODEL": "",

}]}