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DNS TASK File Ref.ATT.DOCX

Network and Data Security Considerations and Updates for Protocol & Network
Stack Tasks (Ref: ATT.DOCX) as of 2025-08-14

Threats and new vectors (Circa 2 generations) and mitigations, security notes for the
Protocol & Network Stack tasks (Ref: ATT.DOCX), and the TCP/IP protocol file for the
Protocol & Network Stack tasks (Ref: ATT.DOCX). Covers DNS, DHCP, TLS/DTLS, QUIC,
HTTP/3, and network security, and the Application Layer Protocol Negotiation (ALPN)
extension. Includes a table of contents, a glossary of terms, and a bibliography with
annotations. Intended for software engineers and network architects working on
embedded systems, IoT devices, and real-time operating systems. Includes code
examples in C, Python, and pseudocode for illustrative purposes. Includes a table of
contents, a glossary of terms, and a bibliography with annotations. Intended for
software engineers and network architects working on embedded systems, IoT devices,
and real-time operating systems.

Contains threats and recent vulnerabilities as known at the creation of the document.

The network TCP/IP protocol architecture is illustrated in Figure 1 using the 5-layer model. The Application Layer is the highest layer, and the Physical Layer is the lowest.

    +-----------------------+
    |  Application Layer    |
    +-----------------------+
    |  Transport Layer      |
    +-----------------------+
    |  Network Layer        |
    +-----------------------+
    |  Data Link Layer      |
    +-----------------------+
    |  Physical Layer       |
    +-----------------------+

    Figure 1: TCP/IP Protocol Architecture

The DNS Resolver Stack will create a DNS transport file and process the
/etc/resolv.conf file. The DNS Resolver Stack will also create a DNS cache file.
This document DNS Resolver will then be used for all forward resolutions and
queries.

Below is a sample DNS process flow for the DNS to interact with the DNS transport
file, the DNS cache file, and the /etc/resolv.conf file, and for the TLS
transport:

    +-------------------+
    | DNS Resolver Stack|
    +-------------------+
    | /etc/resolv.conf  |
    +-------------------+
    | DNS Transport File|
    +-------------------+
    | DNS Cache File    |
    +-------------------+

DNS configuration files, DNS cache files, and DNS transport file have details and
examples. The DNS Resolver Stack will also create a DNS transport file for DNS over
TLS (DoT) or DNS over HTTPS (DoH) for secure private query resolution.

Below is a sample DNS process flow for the DNS Resolver Stack to interact with the
DNS transport file, the DNS cache file, and the /etc/resolv.conf file, and for the
TLS transport:

    +-------------------+
    | DNS Resolver Stack|
    +-------------------+
    | /etc/resolv.conf  |
    +-------------------+
    | DNS Transport File|
    +-------------------+
    | DNS Cache File    |
    +-------------------+
```

-1 = -1 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE INSMOD18
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 OUT-OF-SCOPE/

VALUE REVMOB8
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE LPTOP18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 NOT AT ALL/
2 = 2 SOME DIFFICULTY/
3 = 3 A LOT OF DIFFICULTY/
4 = 4 UNABLE TO DO/

VALUE MARRY18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 MARRIED/
2 = 2 WIDOWED/
3 = 3 DIVORCED/
4 = 4 SEPARATED/
5 = 5 NEVER MARRIED/
6 = 6 DOMESTIC PARTNERSHIP/
7 = 7 MARRIED IN HOUSE/
8 = 8 WIDOWED IN HOUSE/
9 = 9 DIVORCED IN HOUSE/
10 = 10 SEPARATED IN HOUSE/

VALUE MCA113F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE MCA115N
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE MCA611F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE MCA6K11N
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE MILWP18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
0 = 0 NONE/ NOT AT ALL
1 = 1 SOME DIFFICULTY/
2 = 2 A LOT OF DIFFICULTY/
3 = 3 UNABLE TO DO/

VALUE MOBLIP18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 EXCELLENT/
2 = 2 VERY GOOD/
3 = 3 GOOD/
4 = 4 FAIR/
5 = 5 POOR/

VALUE MRA13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NON-MRA/

VALUE NMEMB18P
-9 = -9 NOT ASCERTAINED/
-1 = -1 INAPPLICABLE/
1 - 500 = 1 - 500 NUMBER OF EMPLOYEES/

VALUE OFFEX18
-8 = -8 NOT ASCERTAINED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE OTRA13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE OTRW13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PANEL
13 = '13 PANEL 13 NO 3'
14 = '14 PANEL 14 NO 1'

VALUE PID
101 - 903 = '101 - 903 PERSON NUMBER'

VALUE PH13W13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PH18G13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PH18I13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PH19I13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PH19W13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PNOV13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE PNOV18F
-1 = -1 NON-RESPONSE/
1 = 1 RESPONDENT IS MY MOMMER/
2 = 2 RESPONDENT IS A PNOV/

VALUE POTATO13F
-1 = -1 INAPPLICABLE/NON-RESPONSE NO/
0 = 0 INCONSISTELY LISTED IN HU AT WAVE-01 ONLY/
11 = 11 PERSON IN HOUSEHOLD, NOT PT ACTIVE HIL/
12 = 12 PERSON IN HOUSEHOLD, NOT PT ACTIVE/
13 = 13 PT STUD LIVING AWAY FROM HOME/
14 = 14 IN OHIO HH, PT ACTIVE DUTY-INACURE/
21 = 21 LEAVE INSTITUTION & DIED BEFORE WAVE/
22 = 22 LEAVE INSTITUTION - HU ONLY/
23 = 23 LEAVES INSTITUTION & DIES - HU ONLY/
24 = 24 LEAVES INSTITUTION AND DYING NO - HU ONLY/
25 = 25 DECEASED/
31 = 31 INSTITUTIONALIZED IN HEALTH CARE FAC/
32 = 32 INSTITUTIONALIZED IN NON-HEALTH CARE FAC/
34 = 34 MOVED OUTSIDE U.S., NOT AS STUDENT/
35 = 35 MOVED, PT ACTIVE DUTY/
41 = 41 MOVED WITHIN U.S. (STATE UNKNOWN)/
42 = 41 MOVED WITHIN U.S.,/
43 = 42 PERSON WAS JOINED BY/
44 = 43 MOVED WITHIN U.S., NEW LOCATION/
45 = 44 JOINS ANOTHER HH, & IS INACURE/
51 = 51 REMARRIED IN HSP PERIOD/
52 = 52 INSTITUTIONALIZED IN HSP PERIOD-HIL/
53 = 53 INSTITUT PRIOR TO HSP PER-HIL/
63 = 63 LEFT U.S. PRIOR TO HSP PER-HIL/
64 = 64 MOVED, PT ACTIVE DUTY, NOT AS STUDENT-HIL/
71 = 71 LIVING ABRD (ARMED C-12 HOMES)/
72 = 72 DELIBL NON-KEY/RESIDENCY ECHO, TR ONLY/
73 = 73 MOVED, PT ACTIVE DUTY, NOT AS STUDENT/
74 = 74 MOVED AS PT HIL, NOT TO A, ACTIVE HIT/
81 = 81 MOVED, PT STUD, NO RESP, DATA IMPUTED/

VALUE PSR13F
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE RACE&8
-1 = -1 INAPPLICABLE/
1 = 1 ASIAN-NO OTHER RACE REPORTED/
2 = 2 BLACK-NO OTHER RACES REPORTED/
3 = 3 ALL OTHER RACE ASSIGNMENTS/

VALUE RACE8R8
-1 = -1 INAPPLICABLE/
1 = 1 ASIAN-NO OTHER RACES REPORTED/
2 = 2 BLACK-NO OTHER RACES REPORTED/
3 = 3 ALL OTHER RACE ASSIGNMENTS/

VALUE RACE7F8R4
-1 = -1 INAPPLICABLE/
1 = 1 ASIAN-NO OTHER RACES REPORTED/
2 = 2 PERSON IS BLACK-NO OTH RACE/NOT HISPANIC/
3 = 3 PERSON IS ASIAN-NO OTH RACE/NOT HISPANIC/
4 = 4 OTHER RACE/NOT HISPANIC/

VALUE RACE8R8
-1 = -1 INAPPLICABLE/
1 = 1 WHITE-NO OTHER RACE REPORTED/
2 = 2 BLACK-NO OTHER RACES REPORTED/
3 = 3 ASIAN-NO OTHER RACES REPORTED/

VALUE RACE8
-1 = -1 INAPPLICABLE/
1 = 1 WHITE - NO OTHER RACE REPORTED/
2 = 2 BLACK - NO OTHER RACES REPORTED/
3 = 3 AMER INDIAN/ALASKA NATIVE - NO OTH RACE/
4 = 4 ASIAN - NO OTHER RACE REPORTED/
5 = 5 NATIVE HAWAIIAN/PACIFIC ISLANDER-NO OTHR/
6 = 6 MULTIPLE RACES REPORTED/

VALUE RCHGH13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 NO DIFFICULTY/
2 = 2 SOME DIFFICULTY/
3 = 3 A LOT OF DIFFICULTY/
4 = 4 UNABLE TO DO/

VALUE REGION13F
-1 = -1 INAPPLICABLE/
1 = 1 NORTHEAST/
2 = 2 MIDWEST/
3 = 3 SOUTH/
4 = 4 WEST/

VALUE RSNOS13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 - 31 = 1 - 31 DAY/

VALUE RSNOW18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = JANUARY/
2 = FEBRUARY/
3 = MARCH/
4 = APRIL/
5 = MAY/
6 = JUNE/
7 = JULY/
8 = AUGUST/
9 = SEPTEMBER/
10 = OCTOBER/
11 = NOVEMBER/
12 = DECEMBER/

VALUE RSNYS13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
2009 = 2009 YEAR/

VALUE RSNSS13F
-1 = -1 INAPPLICABLE/
1 = 1 YES, FIRST RESPONDENT/
2 = 2 NO, NOT FIRST RESPONDENT/
3 = 3 BOTH DETERMINED/

VALUE RTRS13R
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
0 = 0 SELF/
1 = 1 MOTHER/
2 = 2 FATHER/
3 = 3 SISTER/STEP/HALF/
4 = 4 BROTHER/STEP/HALF/
5 = 5 DAUGHTER/STEP/HALF DAUGHTER/
6 = 6 SON/STEP/SOI SON/
7 = 7 WIFE/SPOUSE/
8 = 8 HUSBAND/SPOUSE/
9 = 9 MOTHER-IN-LAW/
10 = 10 FATHER-IN-LAW/
11 = 11 SISTER-IN-LAW/
12 = 12 BROTHER-IN-LAW/
13 = 13 DAUGHTER-IN-LAW/
14 = 14 SON-IN-LAW/
15 = 15 STEPMOTHER/
16 = 16 STEPFATHER/
17 = 17 GRANDMOTHER/
18 = 18 STEPSON/
19 = 19 GRANDMOTHER/
20 = 20 GRANDFATHER/
21 = 21 AUNT/
22 = 22 UNCLE/
23 = 23 NIECE/
24 = 24 NEPHEW/
25 = 25 COUSIN/
26 = 26 GRANDDAUGHTER/
27 = 27 GRANDSON/SOFTER/
28 = 28 FEMALE PARTNER/
29 = 29 MALE PARTNER/
30 = 30 MOTHER'S PARTNER/
31 = 31 FATHER'S PARTNER/
32 = 32 DAUGHTER'S PARTNER/
33 = 33 SON OF PARTNER/
35 = 35 GREAT GRANDMOTHER/
36 = 36 GREAT GRANDFATHER/
37 = 37 GREAT GRANDDAUGHTER/
38 = 38 GREAT GRANDSON/
39 = 39 GREAT AUNT/
40 = 40 GREAT UNCLE/
41 = 41 GREAT NIECE/
42 = 42 GREAT NEPHEW/
43 = 43 FOSTER MOTHER/
44 = 44 FOSTER FATHER/
45 = 45 FOSTER DAUGHTER/
46 = 46 FOSTER SON/
47 = 47 FOSTER SISTER/
48 = 48 FOSTER BROTHER/
91 = 91 OTHER RELATED, SPECIFY/
99 = 99 NOT RELATED/

VALUE RELATI3F
-1 = -1 INAPPLICABLE/
'A' = 'A'
'B' = 'B'
'C' = 'C'
'D' = 'D'
'E' = 'E'
'F' = 'F'
'G' = 'G'
'H' = 'H'
'I' = 'I'

VALUE RSPF13F
-1 = -1 INAPPLICABLE/
101 - 903 = '101 - 903'

VALUE SEX13F18
-1 = -1 INAPPLICABLE/
'1' = '1 STANDARD M'
'2' = '2 FEMALE'
'3' = '3 STUDENT M'

VALUE RSS13I3F
-1 = -1 INAPPLICABLE/
1 = 1 PERSON IS NO'
2 = 2 PERSON IS NO'
3 = 3 PERSONS IS NO'
4 = 4 PERSONS IS NO'
5 = 5 PERSONS IS NO'
6 = 6 PERSONS IS NO'
7 = 7 PERSONS IS NO'
8 = 8 PERSONS IS NO'
9 = 9 PERSONS IS NO'
10 = 10 PERSONS IS A'
11 = 11 PERSONS IS A'
12 = 12 PERSONS IS A'
13 = 13 PERSONS IS A'
14 = 14 PERSONS IS A'
15 = 15 PERSONS IS A'
16 = 16 PERSONS IS A'
17 = 17 PERSONS IS A'
18 = 18 PERSONS IS A'

VALUE RCHLH13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE SEX
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 MALE/
2 = 2 FEMALE/

VALUE SLFCH13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 SELF-EMPLOYED/
2 = 2 WORKS FOR SOMEONE ELSE/

VALUE SOCIAL3F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE SPIS13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
101 - 994 = '101 - 994 VALID SPOUSEID'/
995 = '995 LESS THAN 1K THE OLD'/
996 = '996 EXACTLY, STATUS UNKNOWN'/
997 = '997 LESS THAN 1K THE OLD'/

VALUE SPOUSE13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
101 - 903 = '101 - 903 VALID SPOUSEID'/
904 = '904 SPOUSE NOT IN HOUSEHOLD'/
905 = '905 SPOUSE DIED BEFORE 1/1/19'/
906 = '906 SPOUSE DIED AFTER 1/1/19, NO PROXY'/
907 = '907 UNDER 18 IN INAPPLICABLE'/

VALUE STRKP13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 NO DIFFICULTY/
2 = 2 SOME DIFFICULTY/
3 = 3 A LOT OF DIFFICULTY/
4 = 4 UNABLE TO DO/

VALUE STRKW18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE SMKLS18
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE TAXPD3
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE TAXES&
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE WEIGHT
0.0 = 0.0 = '0.0'
274.301608 = 57713.22964 = '274.301608 - 57713.229644 WEIGHT'

VALUE WGTPSU18
0.0 = 0.000000/
248.421308 = 59001.245334 = '248.421308 - 59001.245334 WEIGHT'

VALUE WLKSP13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 NO DIFFICULTY/
2 = 2 SOME DIFFICULTY/
3 = 3 A LOT OF DIFFICULTY/
4 = 4 UNABLE TO DO/

VALUE WLWLH13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/

VALUE WRKLH13F
-8 = -8 NOT ASCERTAINED/
-9 = -9 DK/
-7 = -7 REFUSED/
-1 = -1 INAPPLICABLE/
1 = 1 YES/
2 = 2 NO/