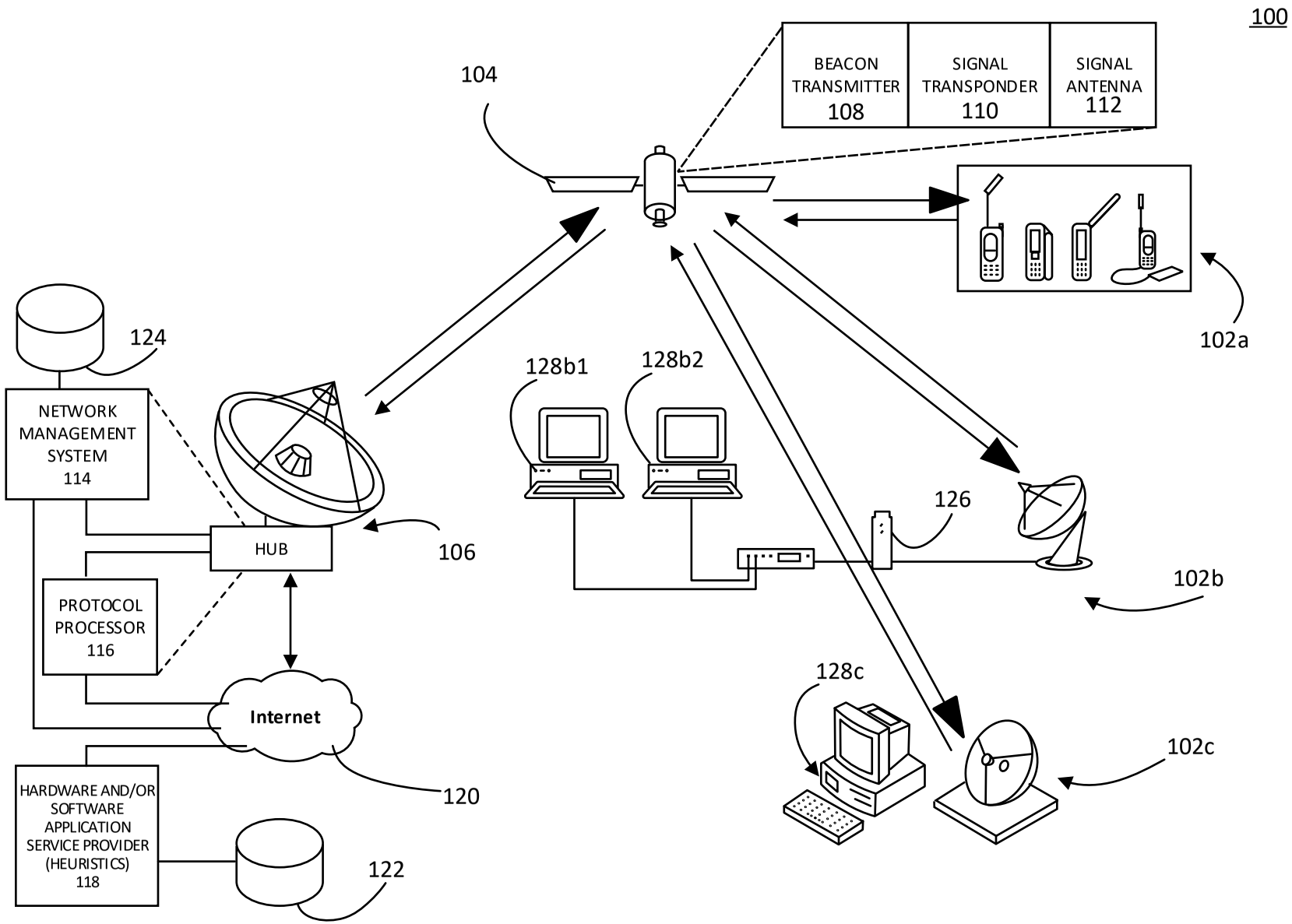

100
104
BEACON TRANSMITTER 108
SIGNAL TRANSPONDER 110
SIGNAL ANTENNA 112
102a
124
NETWORK MANAGEMENT SYSTEM 114
HUB
106
PROTOCOL PROCESSOR 116
Internet
120
HARDWARE AND/OR SOFTWARE APPLICATION SERVICE PROVIDER (HEURISTICS) 118
122
128b1
128b2
126
102b
128c
102c

FIG. 1

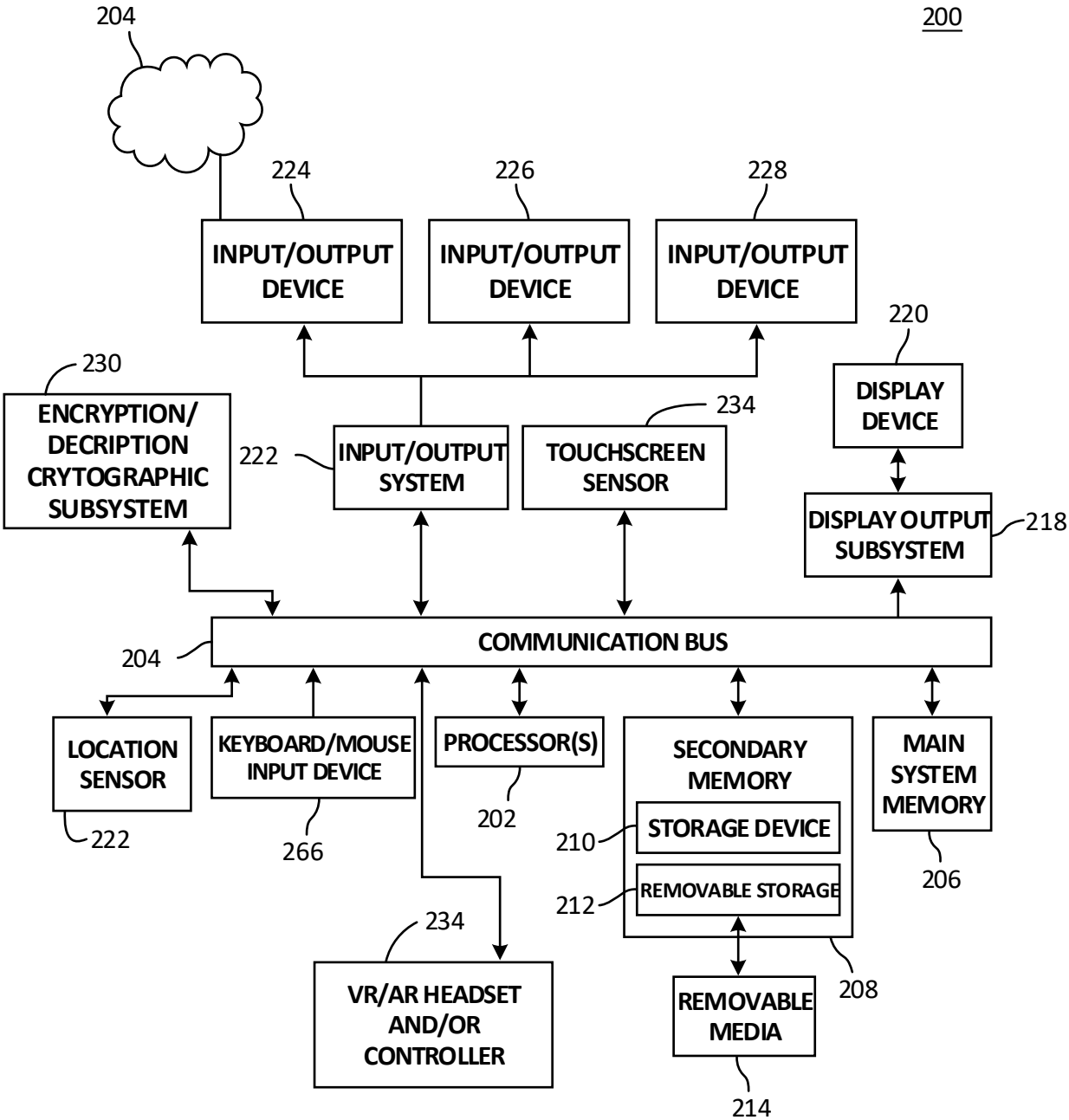

204
200
224
226
228
INPUT/OUTPUT DEVICE
INPUT/OUTPUT DEVICE
INPUT/OUTPUT DEVICE
220
230
DISPLAY DEVICE
ENCRYPTION/ DECRIPTION CRYTOGRAPHIC SUBSYSTEM
222
INPUT/OUTPUT SYSTEM
234
TOUCHSCREEN SENSOR
DISPLAY OUTPUT SUBSYSTEM
218
204
COMMUNICATION BUS
LOCATION SENSOR
222
KEYBOARD/MOUSE INPUT DEVICE
266
PROCESSOR(S)
202
SECONDARY MEMORY
210
STORAGE DEVICE
212
REMOVABLE STORAGE
208
MAIN SYSTEM MEMORY
206
234
VR/AR HEADSET AND/OR CONTROLLER
REMOVABLE MEDIA
214

FIG. 2

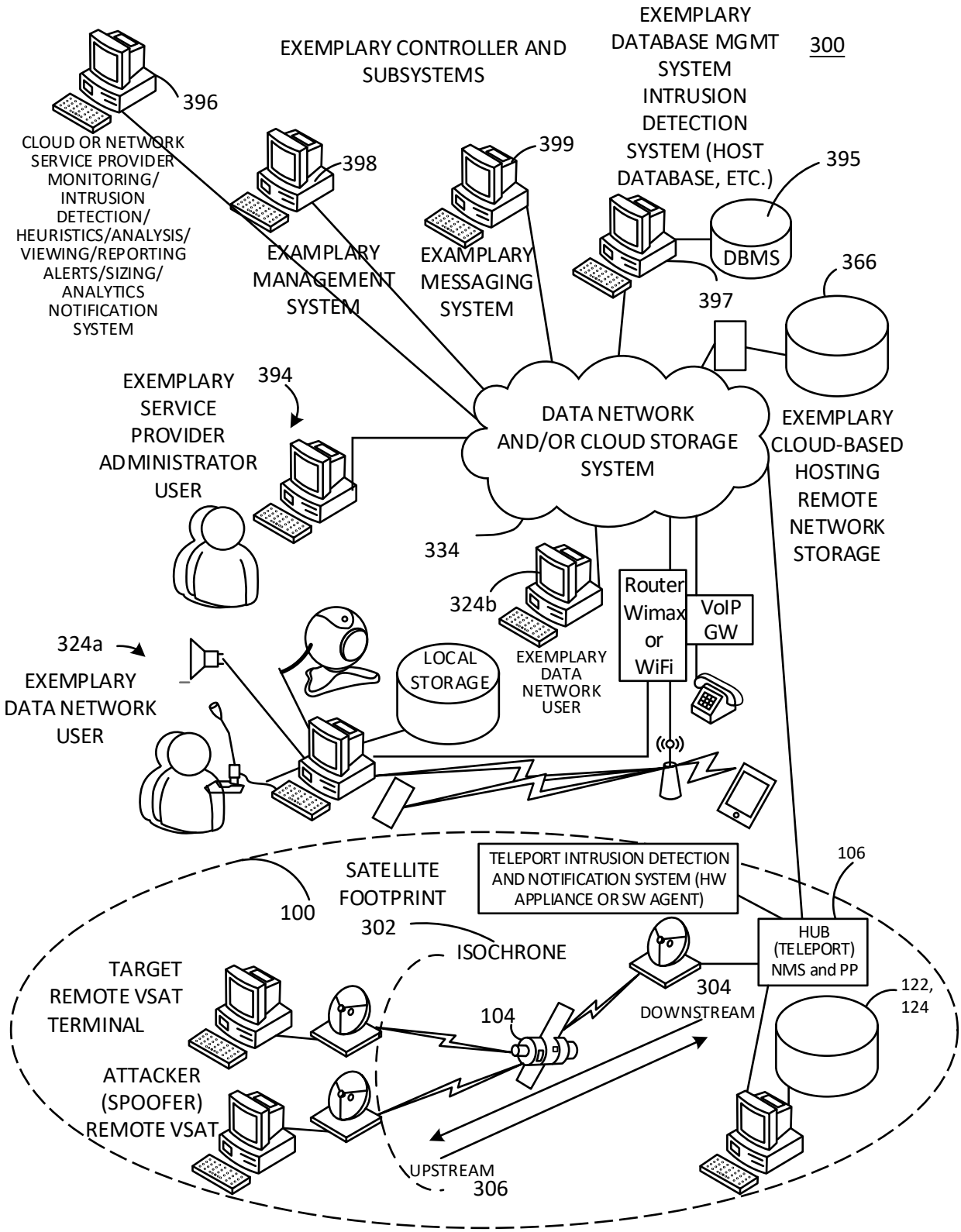

EXEMPLARY CONTROLLER AND SUBSYSTEMS
EXEMPLARY DATABASE MGMT SYSTEM INTRUSION DETECTION SYSTEM (HOST DATABASE, ETC.)
300
396
CLOUD OR NETWORK SERVICE PROVIDER MONITORING/ INTRUSION DETECTION/ HEURISTICS/ANALYSIS/ VIEWING/REPORTING ALERTS/SIZING/ ANALYTICS NOTIFICATION SYSTEM
398
EXAMPLARY MANAGEMENT SYSTEM
399
EXAMPLARY MESSAGING SYSTEM
395
DBMS
366
397
394
EXEMPLARY SERVICE PROVIDER ADMINISTRATOR USER
DATA NETWORK AND/OR CLOUD STORAGE SYSTEM
EXEMPLARY CLOUD-BASED HOSTING REMOTE NETWORK STORAGE
334
324b
Router Wimax or WiFi
VoIP GW
324a
EXEMPLARY DATA NETWORK USER
LOCAL STORAGE
EXEMPLARY DATA NETWORK USER
TELEPORT INTRUSION DETECTION AND NOTIFICATION SYSTEM (HW APPLIANCE OR SW AGENT)
106
SATELLITE FOOTPRINT
100
302
ISOCHRONE
HUB (TELEPORT) NMS and PP
TARGET REMOTE VSAT TERMINAL
304
DOWNSTREAM
122, 124
104
ATTACKER (SPOOFER) REMOTE VSAT
UPSTREAM
306

FIG. 3

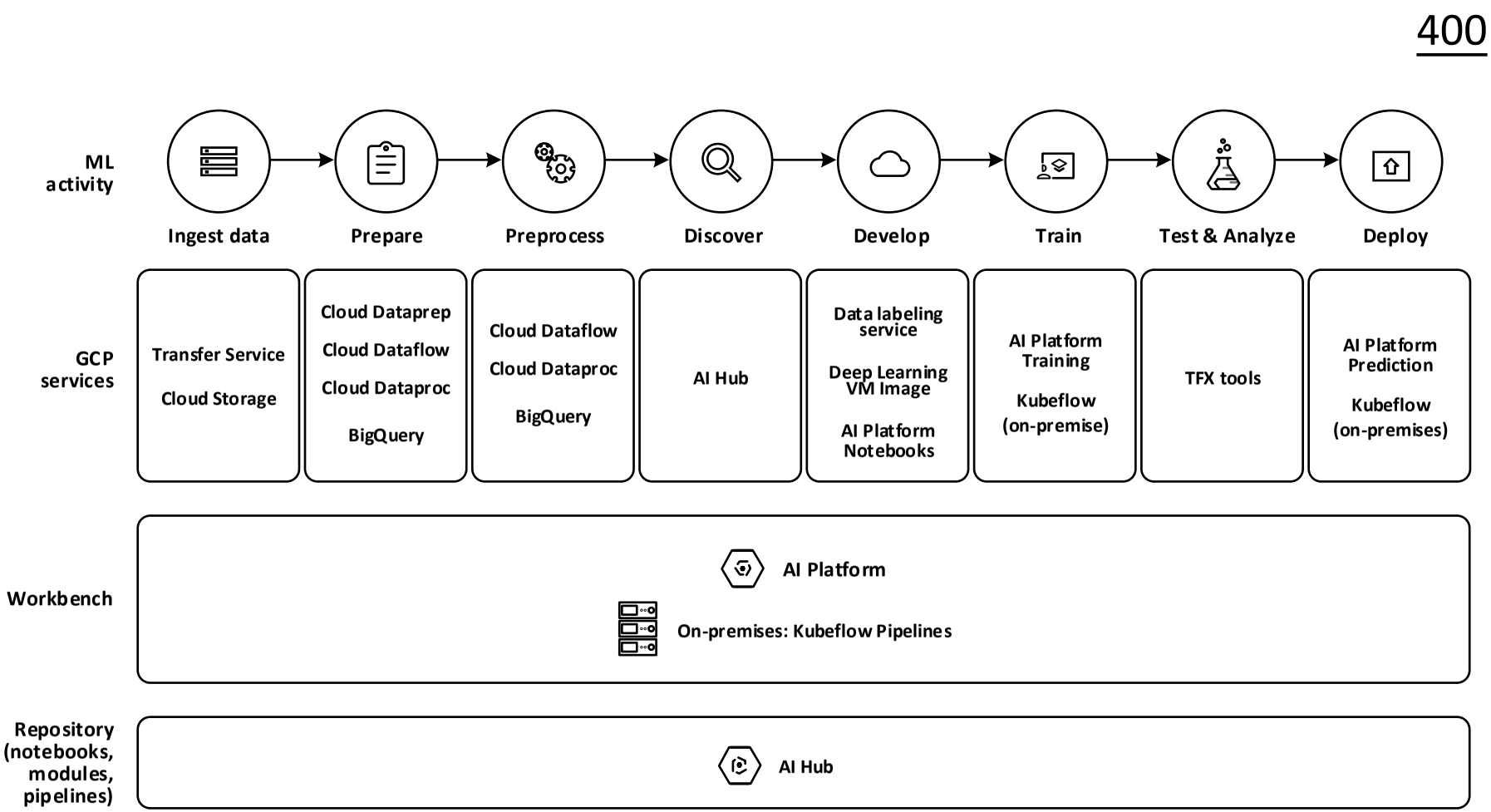

400
ML activity
Ingest data
Prepare
Preprocess
Discover
Develop
Train
Test & Analyze
Deploy
GCP services
Transfer Service
Cloud Storage
Cloud Dataprep
Cloud Dataflow
Cloud Dataproc
BigQuery
Cloud Dataflow
Cloud Dataproc
BigQuery
AI Hub
Data labeling service
Deep Learning VM Image
AI Platform Notebooks
AI Platform Training
Kubeflow (on-premise)
TFX tools
AI Platform Prediction
Kubeflow (on-premises)
Workbench
AI Platform
On-premises: Kubeflow Pipelines
Repository (notebooks, modules, pipelines)
AI Hub

FIG. 4

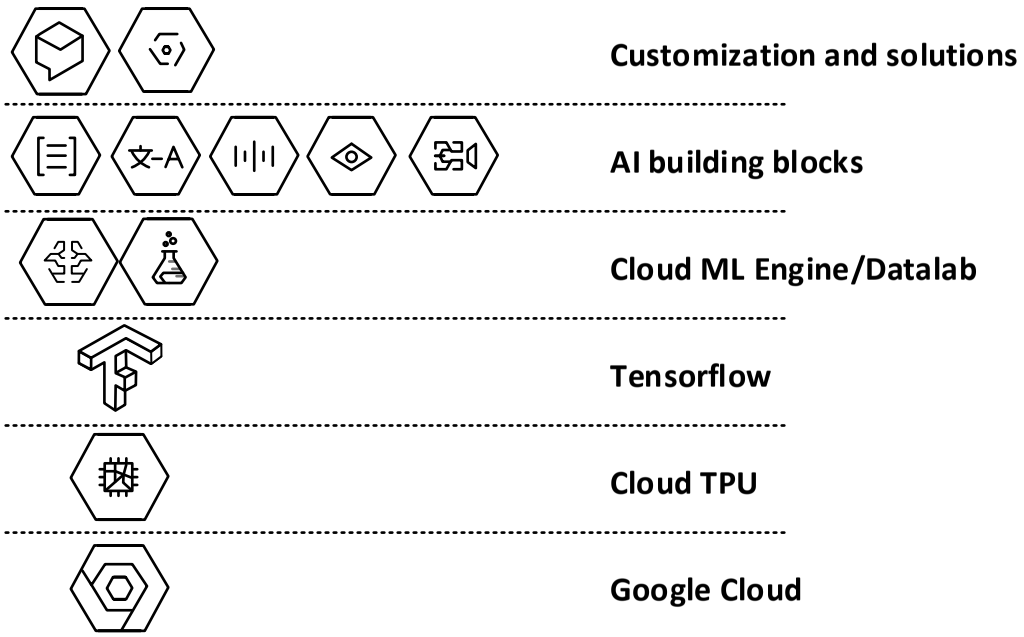

Cloud AI technology stack
Customization and solutions
AI building blocks
Cloud ML Engine/Datalab
Tensorflow
Cloud TPU
Google Cloud

FIG. 5

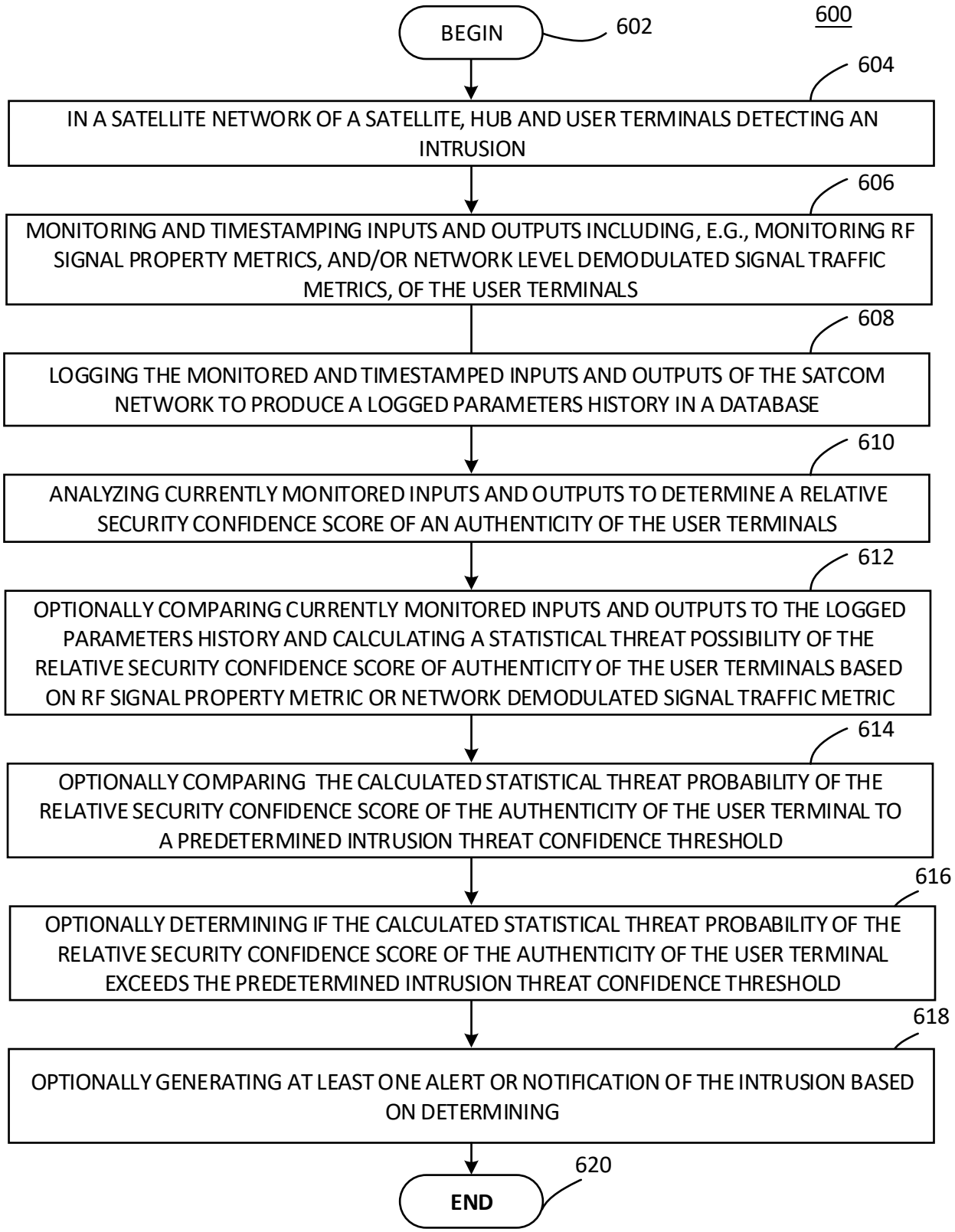

600
BEGIN
602
604
IN A SATELLITE NETWORK OF A SATELLITE, HUB AND USER TERMINALS DETECTING AN INTRUSION
606
MONITORING AND TIMESTAMPING INPUTS AND OUTPUTS INCLUDING, E.G., MONITORING RF SIGNAL PROPERTY METRICS, AND/OR NETWORK LEVEL DEMODULATED SIGNAL TRAFFIC METRICS, OF THE USER TERMINALS
608
LOGGING THE MONITORED AND TIMESTAMPED INPUTS AND OUTPUTS OF THE SATCOM NETWORK TO PRODUCE A LOGGED PARAMETERS HISTORY IN A DATABASE
610
ANALYZING CURRENTLY MONITORED INPUTS AND OUTPUTS TO DETERMINE A RELATIVE SECURITY CONFIDENCE SCORE OF AN AUTHENTICITY OF THE USER TERMINALS
612
OPTIONALLY COMPARING CURRENTLY MONITORED INPUTS AND OUTPUTS TO THE LOGGED PARAMETERS HISTORY AND CALCULATING A STATISTICAL THREAT POSSIBILITY OF THE RELATIVE SECURITY CONFIDENCE SCORE OF AUTHENTICITY OF THE USER TERMINALS BASED ON RF SIGNAL PROPERTY METRIC OR NETWORK DEMODULATED SIGNAL TRAFFIC METRIC
614
OPTIONALLY COMPARING THE CALCULATED STATISTICAL THREAT PROBABILITY OF THE RELATIVE SECURITY CONFIDENCE SCORE OF THE AUTHENTICITY OF THE USER TERMINAL TO A PREDETERMINED INTRUSION THREAT CONFIDENCE THRESHOLD
616
OPTIONALLY DETERMINING IF THE CALCULATED STATISTICAL THREAT PROBABILITY OF THE RELATIVE SECURITY CONFIDENCE SCORE OF THE AUTHENTICITY OF THE USER TERMINAL EXCEEDS THE PREDETERMINED INTRUSION THREAT CONFIDENCE THRESHOLD
618
OPTIONALLY GENERATING AT LEAST ONE ALERT OR NOTIFICATION OF THE INTRUSION BASED ON DETERMINING
620
END

FIG. 6A

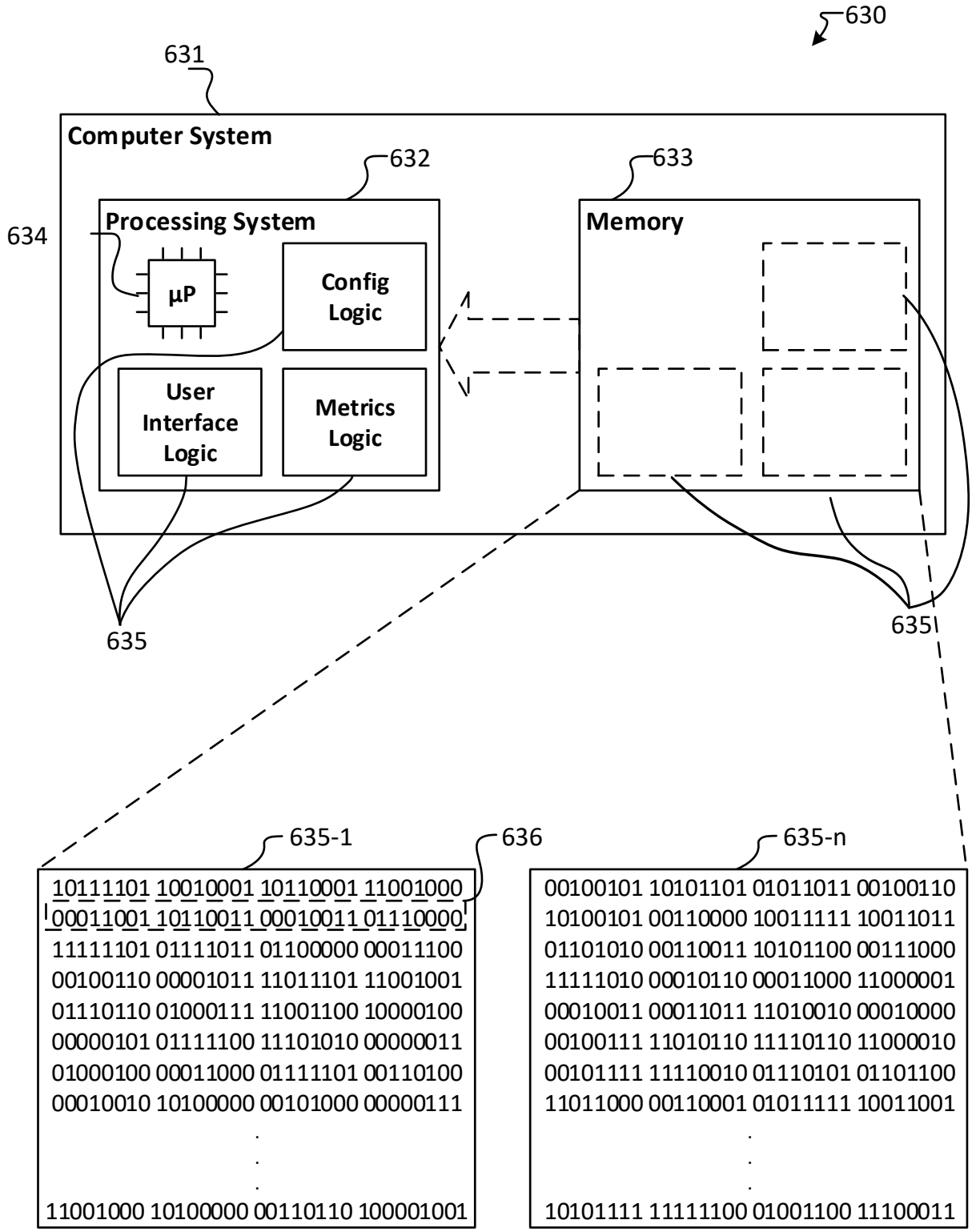

630
631
Computer System
632
633
634
Processing System
Memory
µP
Config Logic
User Interface Logic
Metrics Logic
635
635
635-1
636
635-n
10111101 10010001 10110001 11001000
00011001 10110011 00010011 01110000
11111101 01111011 01100000 00011100
00100110 00001011 11011101 11001001
01110110 01000111 11001100 10000100
00000101 01111100 11101010 00000011
01000100 00011000 01111101 00110100
00010010 10100000 00101000 00000111
11001000 10100000 00110110 100001001
00100101 10101101 01011011 00100110
10100101 00110000 10011111 10011011
01101010 00110011 10101100 00111000
11111010 00010110 00011000 11000001
00010011 00011011 11010010 00010000
00100111 11010110 11110110 11000010
00101111 11110010 01110101 01101100
11011000 00110001 01011111 10011001
10101111 11111100 01001100 11100011

FIG. 6B

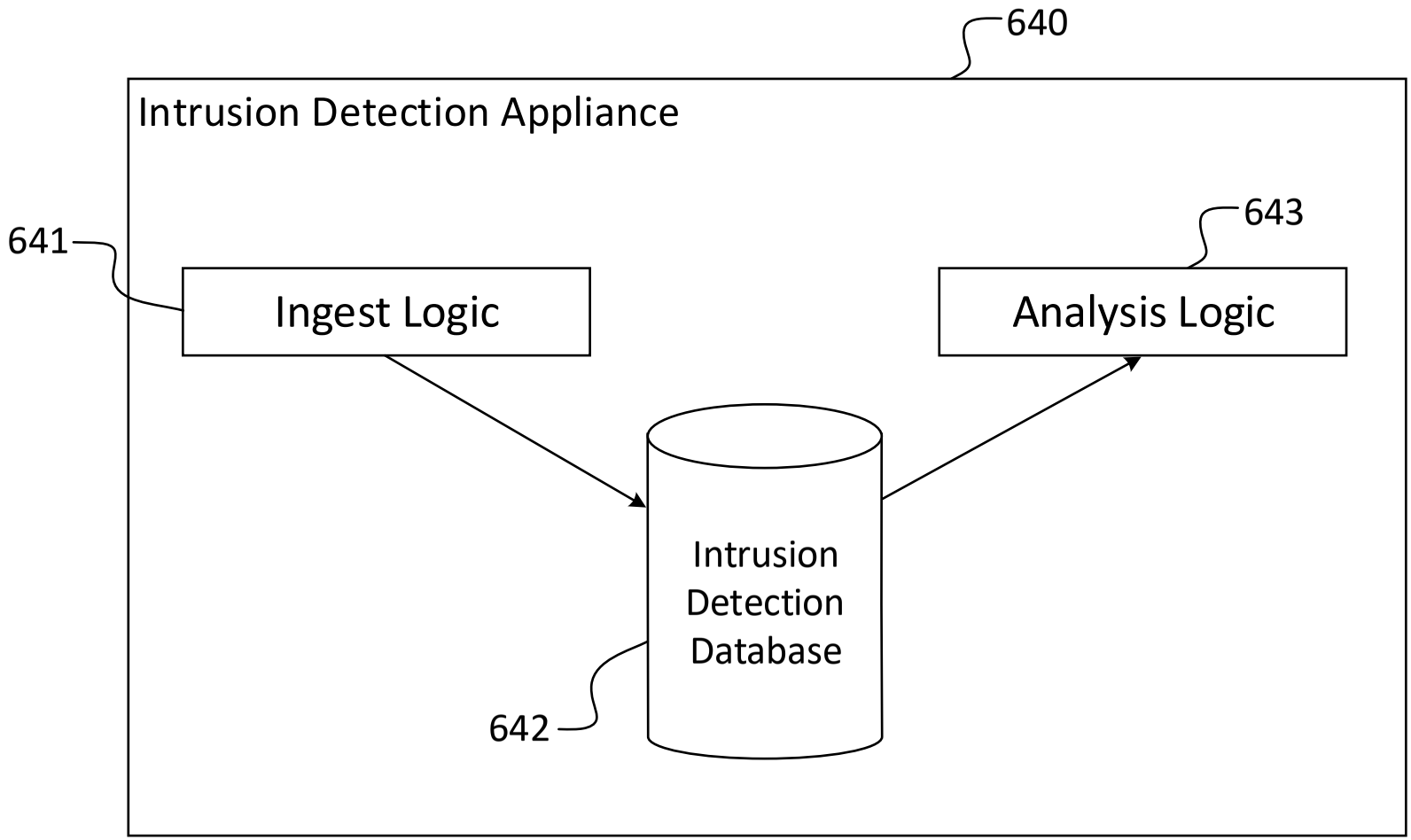

640
Intrusion Detection Appliance
641
Ingest Logic
643
Analysis Logic
Intrusion
Detection
Database
642

FIG. 6C

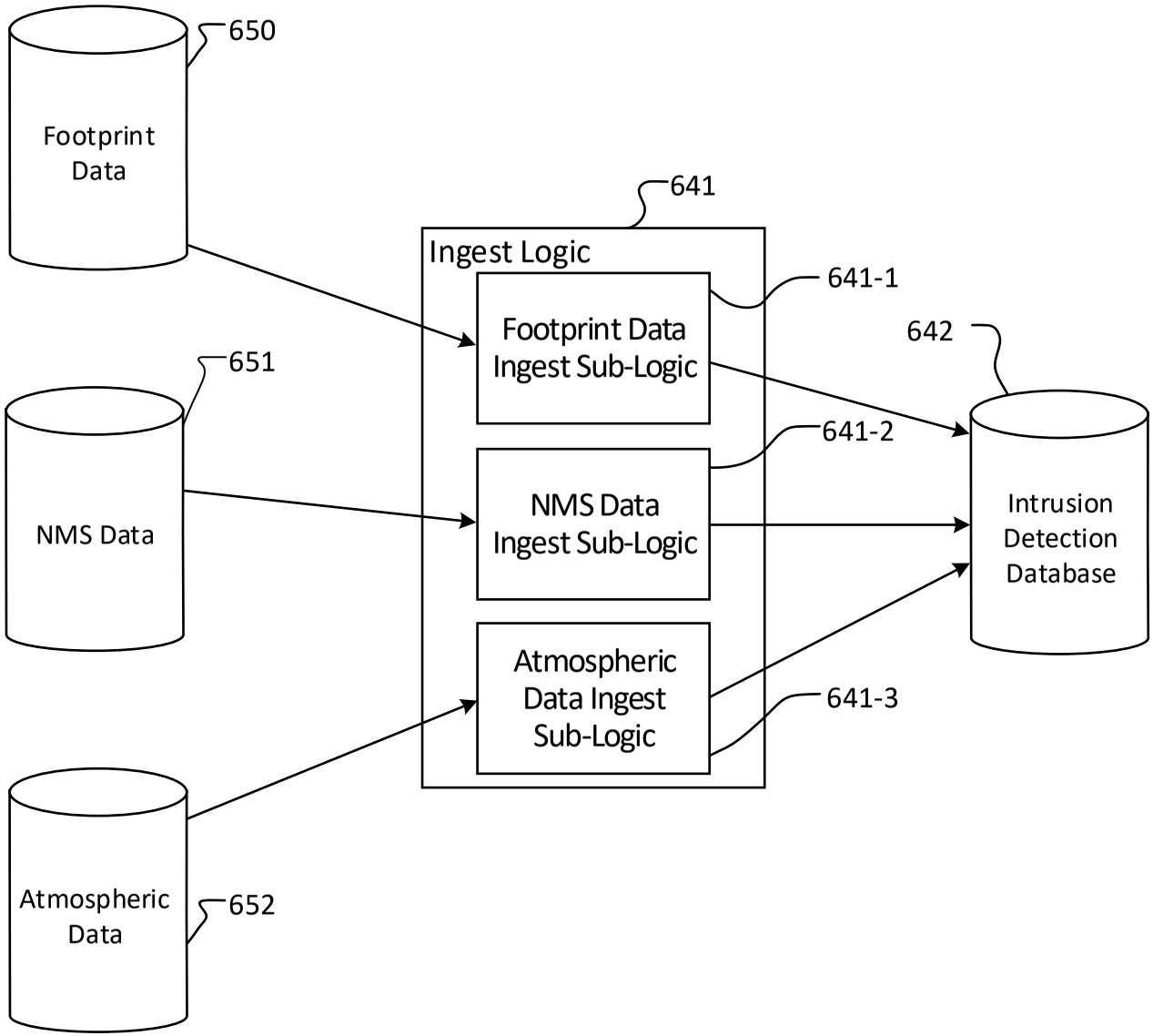

650
Footprint Data
641
Ingest Logic
641-1
Footprint Data Ingest Sub-Logic
642
651
NMS Data
641-2
NMS Data Ingest Sub-Logic
Intrusion Detection Database
Atmospheric Data Ingest Sub-Logic
641-3
Atmospheric Data
652

FIG. 6D

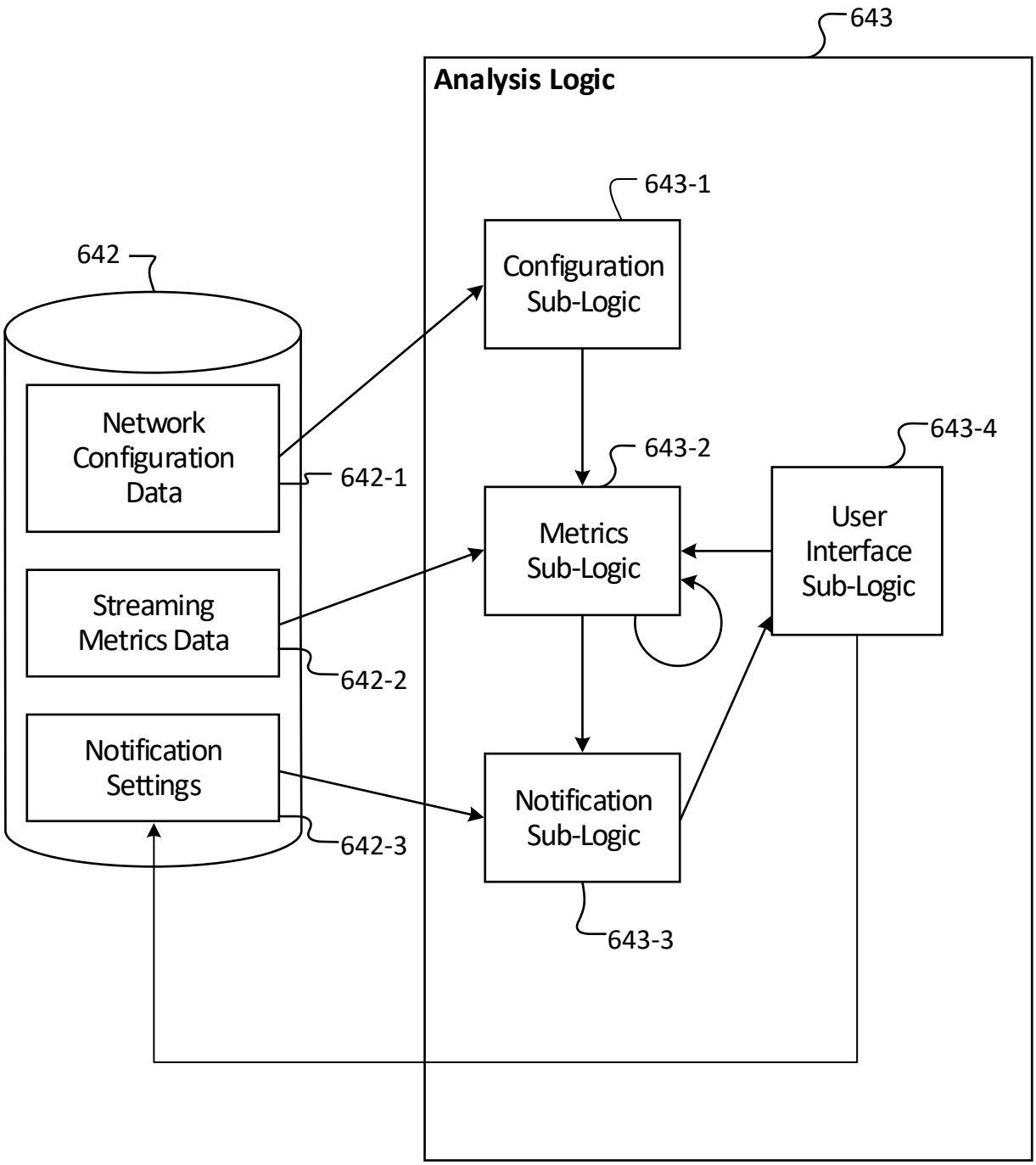

643
Analysis Logic
643-1
Configuration Sub-Logic
642
Network Configuration Data
642-1
643-2
Metrics Sub-Logic
643-4
User Interface Sub-Logic
Streaming Metrics Data
642-2
Notification Settings
642-3
Notification Sub-Logic
643-3

FIG. 6E

700

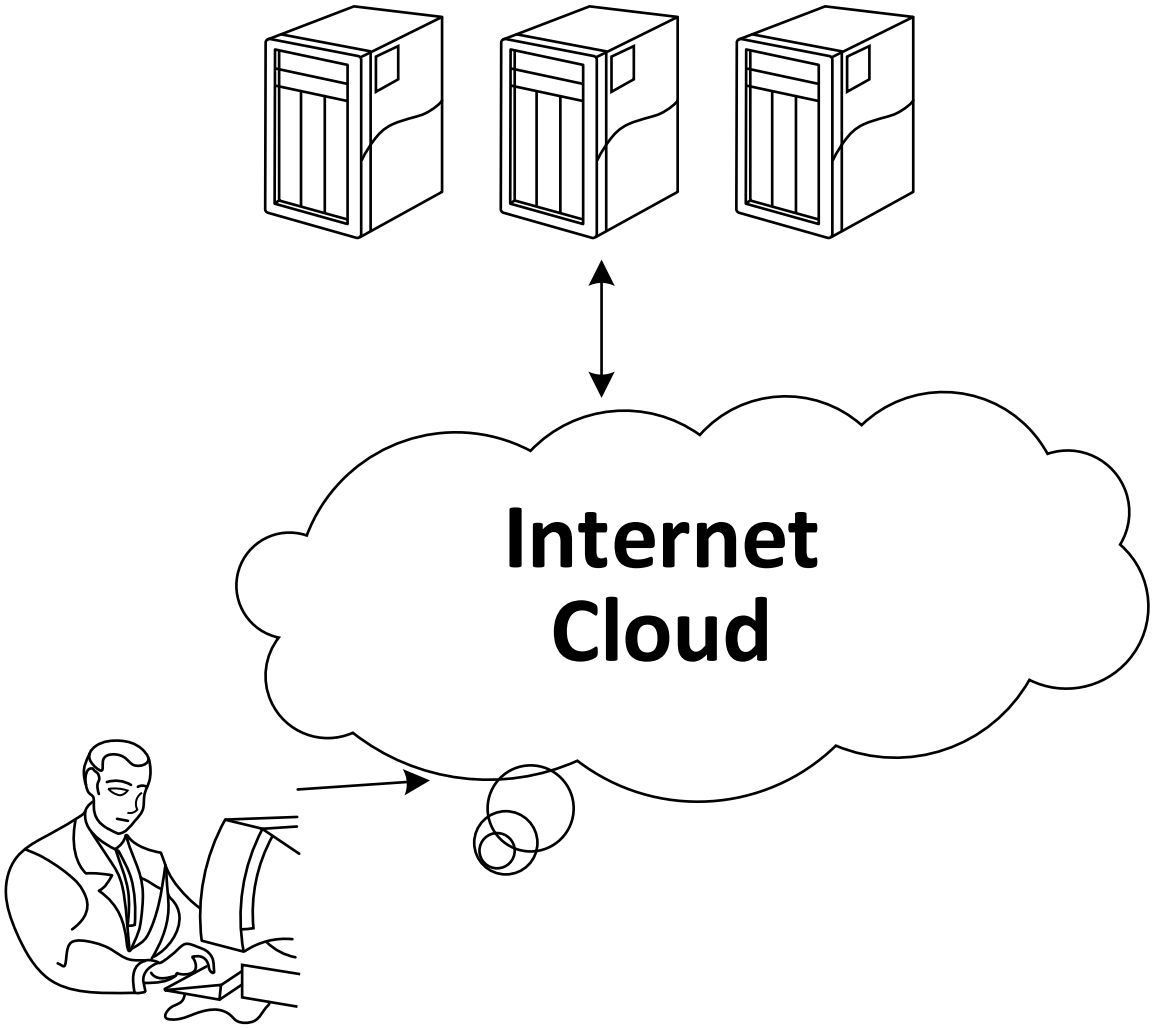


FIG. 7

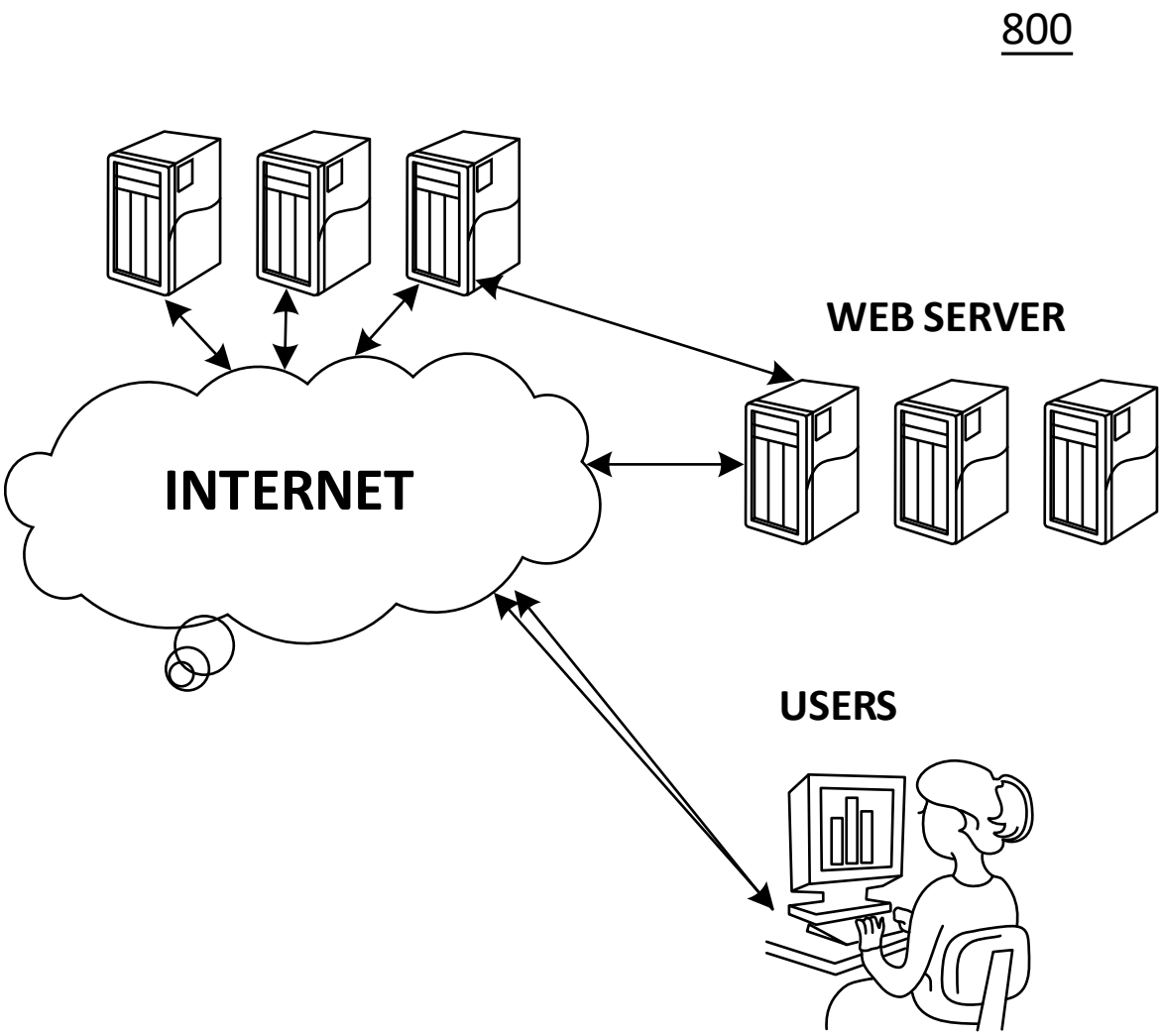


FIG. 8

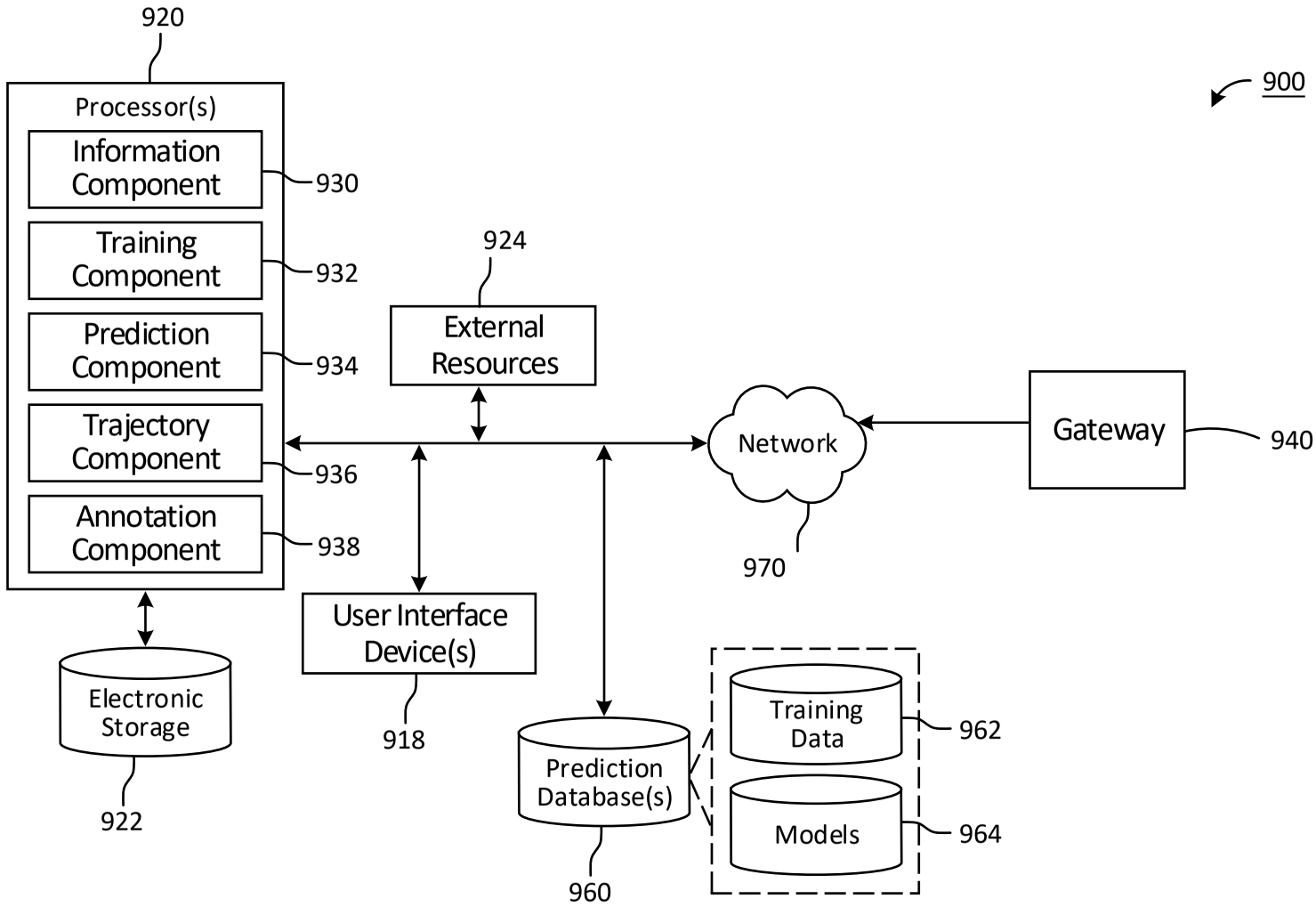

920
Processor(s)
Information Component
930
Training Component
932
Prediction Component
934
Trajectory Component
936
Annotation Component
938
924
External Resources
Network
970
Gateway
940
900
User Interface Device(s)
918
Electronic Storage
922
Prediction Database(s)
960
Training Data
962
Models
964

FIG. 9