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| Market Requirements Document- FOS Solution | | |  |
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# Introduction

This document captures market overview, opportunity, customer and competitor landscape and technical requirements of FOS solution for physical intrusion detection applications. The requirements described in this document are based on inputs provided by STL Sales team, recent RFPs from customers and competitor data sheets.

# FOS Solution Description

# Market Analysis

# Customer Analysis

# Competition Mapping

# Specification Requirements

This section captures the market requirements for FOS solution application wise ie., perimeter intrusion detection in fence mounted and buried configurations.

## Fence Detection Requirements

### Must have Requirements

1. FOS in fence mounted configuration should detect and locate and classify intrusion events such as climbing, cutting, stretching and lifting of fence
2. The system shall have 2 independent sensing channels
3. In single cable cut scenario, the system shall retain its detection and locating capabilities in the portion of the cable from the interrogator till the cut
4. The system shall be capable of detecting and locating cable cut
5. The system shall be capable of detecting and locating multiple simultaneous intrusion events
6. The sensor should have programmable and automatic dynamic threshold
7. The system shall not suffer nuisance alarms from sources like Sunrise/Sunset, Temperature changes, Wind, Temperature changes, Rain, Hail, Snow, Seismic vibration caused by nearby traffic, Disturbance due to running water bodies, Sand storms
8. Sensing range per channel shall be 40 km
9. Event location accuracy shall be ≤ ± 3 m
10. Detection resolution shall be ≤ 50 m
11. Accuracy of cut location shall be ≤ ±25 m
12. Time to detection and classification shall be 2-5 sec and 2-10 sec, respectively
13. Zonal deployment:
    1. Zones shall be software-configurable
    2. Number of zones shall be 25/km
    3. There shall be provision to set different sensitivities in different zones
14. Probability of detection shall be ≥ 99%
15. False alarm rate for fence shall be ˂ 1/km/year
16. Nuisance alarm rate shall be negligible

### Market Competitive/SHOULD have Requirements

1. FOS in fence mounted configuration should detect and locate and classify intrusion events such as climbing, cutting, stretching and lifting of fence
2. The system shall have 2 independent sensing channels
3. In single cable cut scenario, the system shall retain its detection and locating capabilities in the portion of the cable from the interrogator till the cut
4. The system shall be capable of detecting and locating cable cut
5. The system shall be capable of detecting and locating multiple simultaneous intrusion events
6. The sensor should have programmable and automatic dynamic threshold
7. The system shall not suffer nuisance alarms from sources like Sunrise/Sunset, Temperature changes, Wind, Temperature changes, Rain, Hail, Snow, Seismic vibration caused by nearby traffic, Disturbance due to running water bodies, Sand storms
8. Maximum sensing range per channel shall be 40 km
9. Event location accuracy shall be ≤ ± 2 m
10. Detection resolution shall be ≤ 15 m
11. Accuracy of cut location shall be ≤ ±15 m
12. Time to detection and classification shall be 2-5 sec and 2-10 sec, respectively
13. Zonal deployment:
    1. Zones shall be software-configurable
    2. Number of zones shall be 57/km
    3. There shall be provision to set different sensitivities in different zones
14. Probability of detection shall be ≥ 99%
15. False alarm rate for fence shall be ˂ 1/km/year
16. Nuisance alarm rate shall be negligible

## Buried Detection Requirements

### Must have Requirements

1. FOS in buried configuration should detect, locate and classify intrusion events such as human walking, running, crawling, vehicle movement (LMV, Heavy vehicle, moving heavy tracked vehicle), digging and tunneling
2. The system shall have 2 independent sensing channels
3. In single cable cut scenario, the system shall retain its detection and locating capabilities in the portion of the cable from the interrogator till the cut
4. The system shall be capable of detecting and locating cable cut
5. The system shall be capable of detecting and locating multiple simultaneous intrusion events
6. The sensor should have programmable and automatic dynamic threshold
7. The system shall not suffer nuisance alarms from sources like Sunrise/Sunset, Temperature changes, Wind, Temperature changes, Rain, Hail, Snow, Seismic vibration caused by nearby traffic, Disturbance due to running water bodies, Sand storms
8. Sensing range per channel shall be 40 km
9. Event location accuracy shall be ≤ ± 5 m
10. Detection resolution shall be ≤ 15 m
11. Accuracy of cut location shall be ≤ ±25 m
12. Time to detection and classification shall be 2-5 sec and 2-10 sec, respectively
13. Zonal deployment:
    1. Zones shall be software-configurable
    2. Number of zones shall be up to 25/km
    3. There shall be provision to set different sensitivities in different zones
14. Probability of detection shall be ≥ 95% (95% confidence factor)
15. False alarm rate shall be ˂ 1/km/month
16. Nuisance alarm rate shall be negligible
17. Buried detection range: Buried detection range shall be as below
    1. Detection range for human walking shall be 4 m
    2. Detection range for human running shall be 10 m
    3. Detection range for human crawling shall be 1 m
    4. Detection range for moving light vehicle shall be 10 m
    5. Detection range for moving heavy vehicle shall be 20 m
    6. Detection range for manual digging shall be 20 m
    7. Detection range for machine digging shall be 20 m
    8. Detection range for tunnel digging shall be 20 m
18. Cable depth shall be 25-50 cm

### Market Competitive/Should have Requirements

1. FOS in buried configuration should detect, locate and classify intrusion events such as human walking, running, crawling, vehicle movement (LMV, Heavy vehicle, moving heavy tracked vehicle), digging and tunneling
2. The system shall have 2 independent sensing channels
3. In single cable cut scenario, the system shall retain its detection and locating capabilities in the portion of the cable from the interrogator till the cut
4. The system shall be capable of detecting and locating cable cut
5. The system shall be capable of detecting and locating multiple simultaneous intrusion events
6. The sensor should have programmable and automatic dynamic threshold
7. The system shall not suffer nuisance alarms from sources like Sunrise/Sunset, Temperature changes, Wind, Temperature changes, Rain, Hail, Snow, Seismic vibration caused by nearby traffic, Disturbance due to running water bodies, Sand storms
8. Sensing range per channel shall be 55 km
9. Event location accuracy shall be ≤ ± 5 m
10. Detection resolution shall be ≤ 15 m
11. Accuracy of cut location shall be ≤ ±15 m
12. Time to detection and classification shall be 2-5 sec and 2-10 sec, respectively
13. Zonal deployment:
    1. Zones shall be software-configurable
    2. Number of zones shall be up to 25/km
    3. There shall be provision to set different sensitivities in different zones
14. Probability of detection shall be ≥ 95% (95% confidence factor)
15. False alarm rate shall be ˂ 1/km/month
16. Nuisance alarm rate shall be negligible
17. Buried detection range: Buried detection range shall be as below
    1. Detection range for human walking shall be 4 m
    2. Detection range for human running shall be 10 m
    3. Detection range for human crawling shall be 1 m
    4. Detection range for moving light vehicle shall be 10 m
    5. Detection range for moving heavy vehicle shall be 20 m
    6. Detection range for manual digging shall be 20 m
    7. Detection range for machine digging shall be 20 m
    8. Detection range for tunnel digging shall be 20 m
18. Cable depth shall be 25-50 cm

## Miscellaneous Requirements

***Electrical Characteristics Requirements***

1. Input voltage shall be 110-240 V AC, 50/60 Hz
2. Power consumption shall be ≤ 380 W

***Environmental Characteristics Requirements***

1. Operating and storage temperature range:
   1. Operating temperature shall be 0 to 45 °C
   2. Storage temperature shall be – 40 to 55 °C
2. Operating, shipping and storage humidity range:
   1. Operating humidity shall be 0 to 90% (non-condensing)
   2. Shipping and storage humidity shall be 0 to 90% (non-condensing)

***Reliability parameters Requirements***

1. Mean time between failures (MTBF) shall be ≥ 100,000 hrs (~ 11.4 Yrs)
2. Mean time to repair shall be 10 mins (excluding logistics, repair by replacement)

***Regulatory Compliance Requirements***

1. **EMC/EMI** : FCC 47 CFR Part 15, subpart B requirements for class A devices, FCC Part 15b Class B, EN61000-6-4/A-1:2011, EN50130-4:2011, Industry Canada ICES-003
2. **RoHS:** Issue 4 requirement for class A devices RoHS2, REACH
3. **LVD:** CE:EC Low Voltage Directive 2006/95/EC

## SW Requirements

### Configuration and Calibration features

1. Configuration and calibration of processors shall be performed via a Windows based software tool with a graphical user interface (GUI), which should be accessible locally or via Windows Remote Desktop
2. Configuration and calibration settings shall be capable of being stored in a computer file for record keeping purposes and available for reuse when configuring additional or replacement processors

### Networking Features

1. The system shall be capable of operating in a standalone or networked configuration
2. The system’s software shall provide the following capabilities:
   1. System status tool that provides a visual display of the status of all processors in the system
   2. System event log tool that provides a searchable log of system events.
   3. Carry out a self-diagnostic test of the system and individual processors, sensors and CCTV cameras
3. The processors shall support Dual Gigabit Ethernet RJ-45 connector as a physical media option for communication with the integrated sensor network
4. The system’s software shall provide a TCP/IP-based interface for communicating alarm, status, and configuration data to and from security management systems

### Integration Features

1. The system shall be integrated with:
2. CCTV(PTZ & Fixed Camera) (both fixed as well as motion detection capability enabled)
   1. Detection of motion by the CCTV cameras will automatically activate the cameras and start providing visual feed to the Central control room
   2. Respective zone sensors will also be activated on detection of intrusion and start providing visual feed to the Central control room
3. Siren
4. Thermal imaging camera
5. Automatic dialers
6. Automatic voice message/SMS
7. Flood lights
8. Alarm
9. Email
10. Control room
11. VMS (Video Management System)

### Event Management Features

1. The system shall provide a local PC-based operator interface with graphical alarm annunciation at the sensor unit
2. The system shall provide access to the following information and functionality when in a local or networked configuration:
   1. A user-configurable image depicting the protected site with a schematic perimeter overlay
   2. Hardware monitoring and control
   3. Event detection and alarm generation
   4. Basic alarm management
   5. Event and alarm logging
   6. Detection zone definition and configuration
   7. Adjustment of detection parameters

### Alarm Management Features

1. Maintain complete information on all alarms for 24 hours or until the alarm is cleared
2. Alarms shall be cleared by local or remote operator or automatically in 24 hours after alarm generation
3. Until cleared, the alarm information shall be compiled in a scrollable multi-column table
4. The maintained information shall include
   1. Time label alarm accrued
   2. Time label it was acknowledged
   3. Time label it was cleared
   4. Event duration
   5. Event status
   6. Event strength
   7. Event location
   8. Event type
   9. Confusion matrix/probability of classification
5. Operator shall be able to
   1. Select any of the alarms from the list
   2. Choose a reason for the alarm from options menu
   3. Enter text notes regarding the cause of the alarm and the mitigation measures
   4. Clear the alarm
6. Operator notes as well as the alarm clearing event shall be recorded in the event log
7. All the alarm handling should also be made possible through software
8. Alarm location format:
   1. The primary format of the alarm location shall be the linear position along the sensor cable
   2. It shall be possible to express the alarm location in either meters or feet
   3. It shall be possible to provide secondary alarm location formats including:
      1. Software-defined zones
      2. Latitude and longitude (GPS) co-ordinates
9. Event logging:
   1. The system shall maintain and display an event log, including alarms, system notifications, and user actions
   2. The logs shall be periodically saved to the hard drive
   3. A new set of log files shall be generated every 24 hours at midnight

### Access Control Features

1. The system shall require the entry of a valid password at start-up and shutdown.
2. The system shall divide user access into three security levels:
   1. Operator level for routine operation
   2. Supervisor level for advanced system monitoring, configuration, and troubleshooting
   3. Installer level for advanced configuration and troubleshooting

### Misc Features

1. The sensor unit software shall be filed-upgradeable, either locally via a USB connection or over the network
2. The sensor unit shall be capable of performing internal self-diagnostic tests of the internal circuitry, cable continuity and termination, and detection processing

## Fiber Cable Requirements

1. The OFC shall be suitable for capturing vibrations on fence/underground
2. No of cores in the OFC shall be 12/24 as per requirement
3. Optical loss of OFC shall be ≤ 0.25 dB/km @ 1550 nm
4. Life time of the cable shall be ≥ 20 yrs
5. Operating temperature shall be – 40 to 70 °C
6. Operating relative humidity shall be 0 to 100%
7. Minimum static bend radius shall be 10× cable OD
8. Minimum dynamic bend radius shall be 20× cable OD
9. Tensile rating (installation) of cable shall be 600 lb-f (2700 N)
10. Tensile rating (residual) of cable shall be 180 lb-f (800 N)
11. Short term crush resistance shall be 125 lb-f/in (220 N/cm)
12. Long term crush resistance shall be 63 lb-f/in (110 N/cm)
13. The cable shall have additional fibers (≥ 6) for other communication applications
14. Cable shall be all dielectric for buried applications and can have metallic armor for fence applications for protection from rodents etc

## C&C Requirements

1. The C&C platform shall be a truly open architecture which technically integrates all sensor inputs including new & existing legacy sensors/ equipments to provide centralized control, situational awareness & event response coordination through one comprehensive user interface
2. The C&C system shall enable new systems and devices to be integrated without impacting existing system functionality
3. Systems that shall be integrated to CCC are as follows
   1. Power fence
   2. CCTV-IP& Thermal cameras
   3. Vibration sensors
   4. Other PIDS
4. The C&C system shall be a modular & scalable open architecture and if required shall allow plugging any industry open standards like BACnet, Modbus, OPC, TCP/IP, ONVIF, KNX or OBIX
5. The C&C system shall have the ability to identify unfolding events, manage them effectively and mitigate their potential risk while ensuring operational continuity
6. The C&C system shall support true Geospatial mapping so that in the event of a situation, the nearest assets (such as CCTV feeds) can automatically and dynamically be calculated and presented to the operator without the need for extensive and time-consuming physical mapping tables
7. The C&C system shall guide an operator through event resolution via Standard Operating Procedures and workflows
8. The C&C system shall include the ability to redirect events handling to other operators based on manual buttons as well as using automated procedures for escalation using time delays, alarm priority, zones, or other criteria yet to be determined
9. It shall be possible to change the workflows and process guidance without upgrading the software or restarting the solution
10. The administration access in the system shall be role based and allow the administrator to add supported systems and/or devices, modify, customize or create configurations of user GUI, setting levels of user permissions and pre-emption rules for control of system functions and capabilities
11. The C&C system shall visually present security information to an operator based on their levels of authority, seniority, zonal or functional roles
12. The C&C system shall be able to make following restrictions on what is available to users, user groups & device groups
    1. Events user permitted to view and actions they are permitted to make
    2. Assign users to groups to simplify authorization assignments
    3. Allow devices to be assigned to groups to simplify administration
13. The system shall log all events, whether received from external systems or initiated by operator actions within the system & ultimately archive all relevant information about processed data from integrated systems, subsystems and devices
14. The C&C system shall provide a report filter engine to enable the quick generation of user-defined reports including
    1. Report of all user commands and actions
    2. Report of all alerts, alarms, events, and conditions
    3. Health status for connected systems
    4. Processed data from integrated systems, subsystems and devices
15. The C&C system software shall support native web-based clients which means that it can be scaled easily without the need to install a hard client at each operator location or any other remote machine
16. The C&C system shall include video wall tools that turn any screen into a dynamic video wall & shall provide the capability for users to manage these displays & contents on them
17. The app must support Geo Tilf and SHP formats as well from various standard formats
18. Automated detections should identify the unusual objects and bring to focus with live real time video and establish tracking by providing useful information and situational awareness in logical form
19. The map should always be displayed on the centre cubicle of the data wall with coloured depiction of all sensors and its serviceability state
20. The Zone/ Sector in the map should have a transparent colour layer for selection On selection of a particular zone/sector, all the sensors in the particular zone and their fused videos must be available on the data wall consoles
21. The complete suite of the applications should be browser based and should work on https protocol
22. The GUI should be visual representations of information with maps in the background and should facilitate role based login/authentication for various roles like administration, user etc
23. The data analytics must bring to the notice of the user the changes or the detections in real time. The data analytics should also suggest recommended actions/selections to the users
24. The applications response time is critical and must have reliability of 100%. To achieve real time response, it is desirable for processing to be done locally i.e. sensor level and final results are transmitted to the control centre
25. The administrator using his dashboard on the browser application at command centre should be able to administer the following:
    1. Sensors Operational Status
    2. Sensor configurations
    3. Sensor event logs
    4. Sensors firmware updating
    5. Sensor diagnostics and self test
26. The command and control centre application should be able to integrate access control, firm alarm, CCTV and so on in future if required. To achieve this future integration, the system should support growth through physical interfaces and software configuration. Full integration method should be employed wherein a software layer translates the networked sensors into the control displayed. This is achieved by using the integration modules SDK (Software Development Kit) or API (Application Programming Interface)
27. The browser based application should at least have the following 3 tabs functionality
    1. Network Manager Services:(Write Access-Read Only Access)
       1. System management
       2. IP Layer configuration-Write
    2. Service Manager Services: (Write Access)
       1. Sensors operational status
       2. Sensors Configuration
       3. Sensors event logs
       4. Sensor Firmware updating
       5. Sensors diagnostics and self test
    3. Command and Control Services : (Write Access- Read Only Access)
    4. Change background maps
    5. Colour depictions
    6. Map layers
    7. Create new sector
28. The containerized data centre hosting the compute and storage should be facilitated with a 55inch LED display to replicate the application hosted at GDCC. This will ensure that the monitoring would continue in the event of network connectivity loss to GDCC
29. The C & C software should have provision for time-line generation based on this long sources identified and should be able to simultaneously play the videos in sync with the detections on the sensors
30. The C & C software should have provision for acknowledgment of alarms generated by the operator, with a provision to write/annotate remarks. This acknowledged alarms/alerts should be approved by the supervisor
31. Alert activation should be possible by selecting either a single sensor or a combination of two, three or four sensors
32. Tabs to select CMOS/IR/Radar/Dual PTZ display should be provided. The default display in case of alert should be visible camera in day time and Near IR at night. In case of tracking sequencing having initiated the dual PTZ video should be made available as default. Further, in PTZ during day the visible camera and at night thermal should be made default selection
33. Present look angle definition should be on PTZ camera should be configurable by operator
34. In case of alert from two zones for single PTZ , the default priority sensor sequence for cueing the PTZ would be as give below:
    1. UVDS
    2. Smart fence
    3. Vari-focal camera
    4. Radar
35. In case of alert generation from two or more sensors from different zone for a common PTZ, the bore sight will maintain as a centre of the end points. Further, as in case of the alerts distance is more than the FOV coverage by PTZ then a default sequence of toggling between the targets will be performed be the PTZ with configurable time on the target, default 5 sec. on each target
36. During the above toggling sequence, it will provide with manual over ride feature for manual tracking
37. Zone of alert to be highlighted on map presented on the data wall
38. Each sensor display will display of zones name, which are configurable by the user as per the requirement. For example, the display will bear name of "Tech Gate" on the display at top left of the display panel
39. Radar blip should be presented only on map display instead of regular Radar monitor

# Supporting References

* 1. RFP/QR documents from Navy, Air force, BSF and DRDO