Technology Fusion and R&D for Border and Public Safety

Presented by

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Borders of India

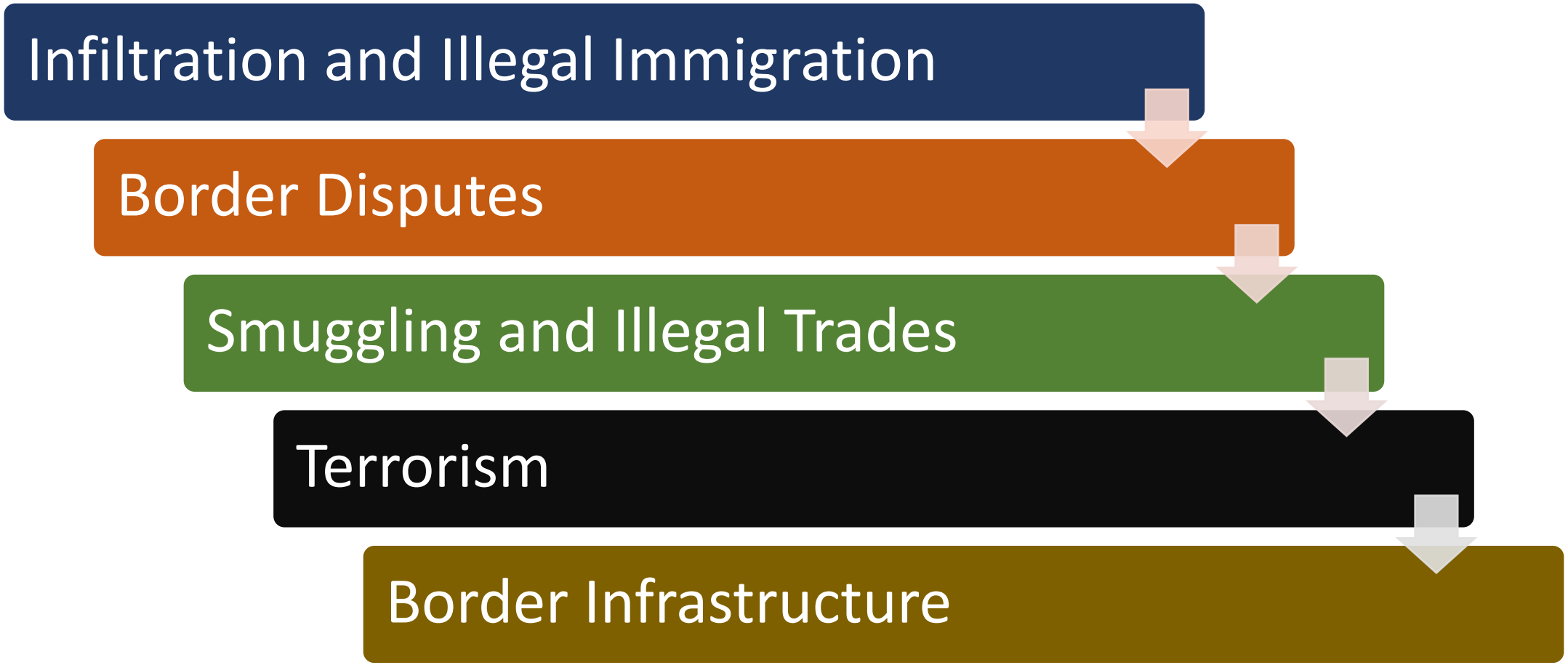
Land Borders

- Bangladesh, Bhutan, China, Nepal, Myanmar, Pakistan

Maritime Borders

- Bangladesh, Indonesia, Myanmar, Pakistan, Thailand, Sri Lanka, Maldives

Multi-layer Border Security Challenges



Technology Fusion for Effective Border Management

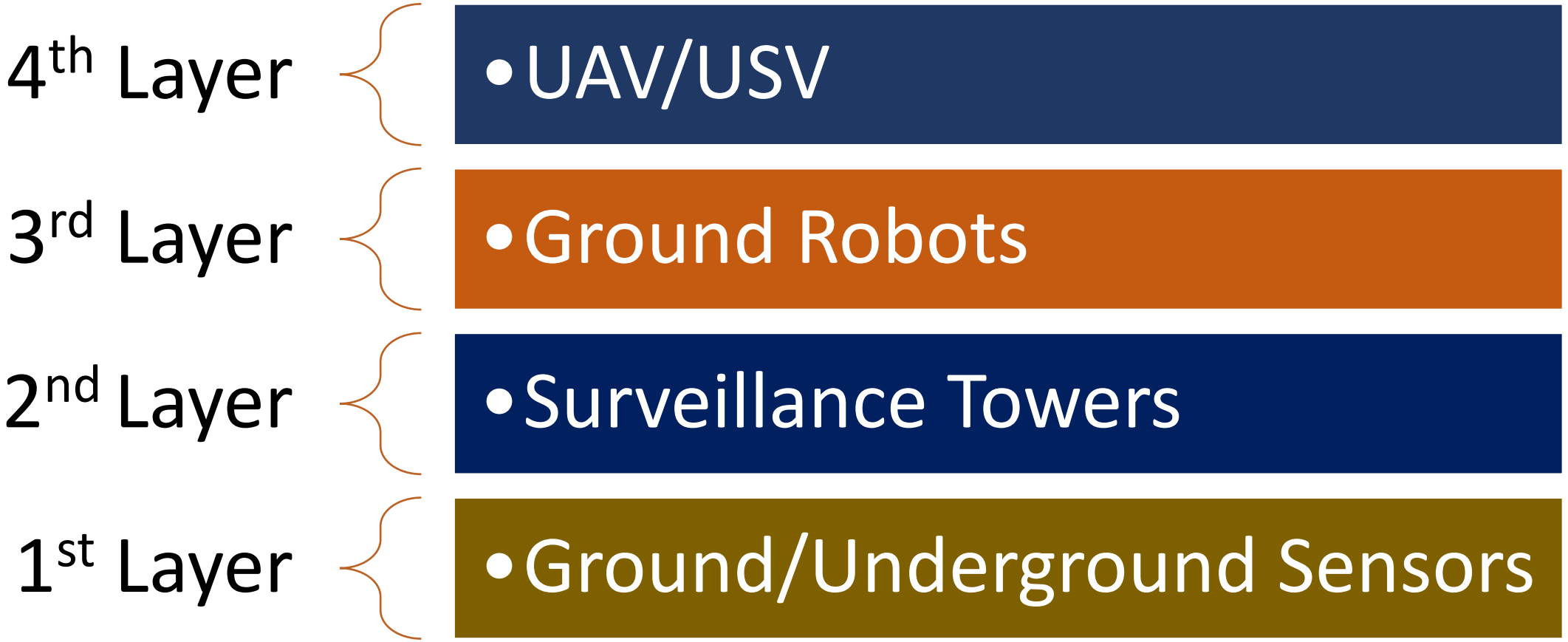
SURVEILLANCE

SITUATIONAL AWARENESS

AI BASED RISK MANAGEMENT

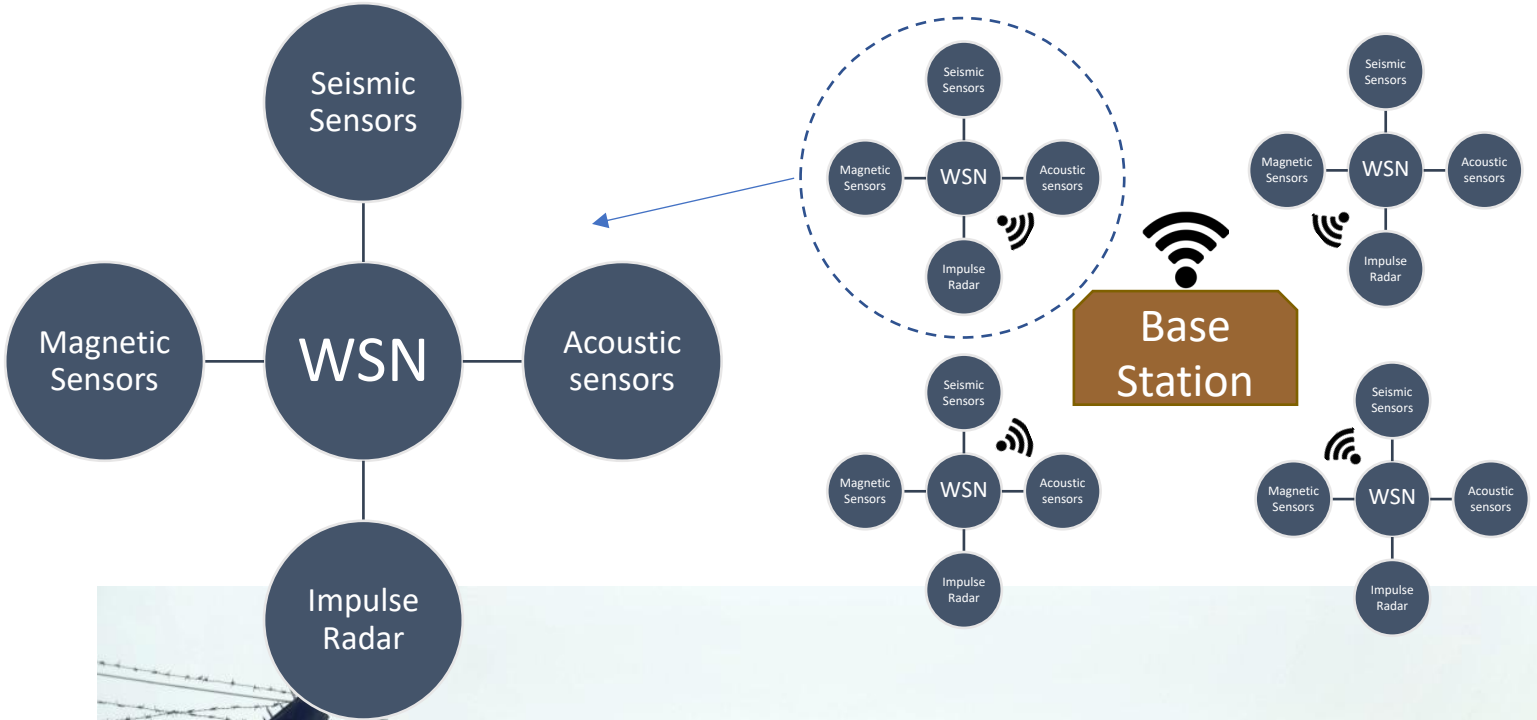
DATA MINING AND DISTRIBUTED NETWORKING

Border Surveillance Layers



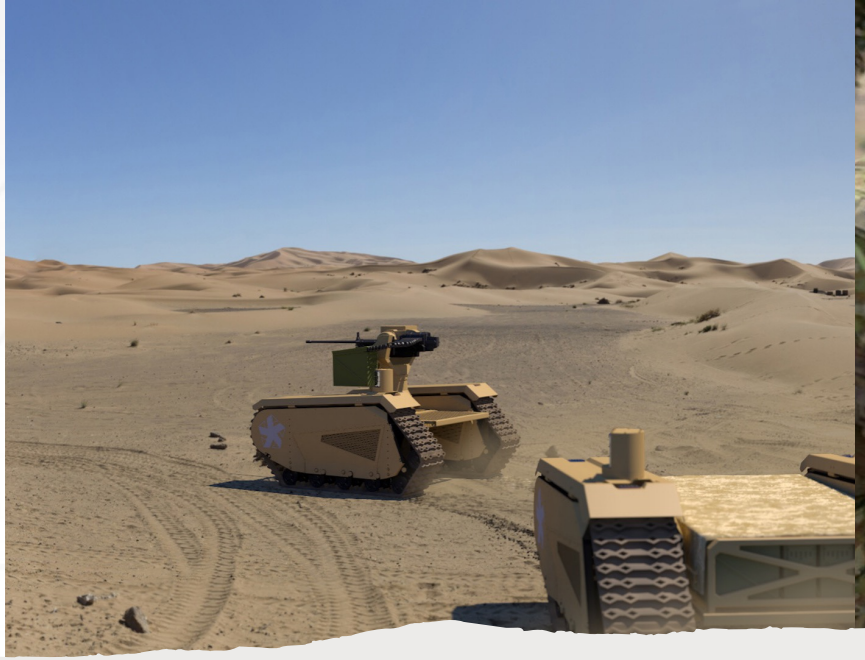
Ground/Underground Sensors

Ground/Underground Sensors for Intrusion detection



- Wireless Sensor Networking (WSN) for Ground Sensors
- Sensor Types: Magnetometers, seismic sensors, motion sensors Micro-powered impulse radars, fiber optic sensors
- Underground Sensors for Perimeter security “Project Smart Fence”
- Base Station to command and control
- AI based algorithm to identify the detection of intrusion signature

Surveillance



Unmanned Ground Systems/Military Robots

- Remotely Operated Weapon Systems
- Unmanned Border Patrolling
- Low profile surveillance robots with precise controls
- Capacity to relay the information to the command and control
- Precise positioning using RTK GNSS
- Use of Military robots

Unmanned Aerial Vehicles / Drones

- High / Low endurance Drones
- Reliable Navigation Systems with Anti-jamming and anti spoofing technology for assured performance
- Real-time AI based facial recognition / object identification
- Low altitude mission objective for closer views
- Ability to withstand in harsh environment

Continuous Automated Surveillance

- Continuous surveillance for 24 X 7 monitoring
- Realized through Aerostat/Tethered drones
- Maximum detection range up to 400 kms
- Can carry payloads ~ 1000 kgs

Drone Swarming Technology

- Coordinated mission
- Larger coverage with greater penetration
- Localized surveillance with Low detection profile
- Live feed transmission

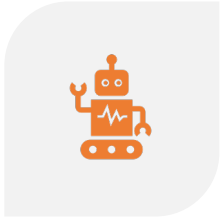
Optical/RF based RADAR for Surveillance

- Long Range (> 20 km) and continuous zoom up
- Capable to see beyond line of sight
- Portable setup with post processing capabilities
- Counter- Unmanned Aerial Systems (C-UAS)

Maritime Border Security

- Maritime border security technologies ensure coastal border protection and maritime security.
- Vessel tracking technologies to monitor vessel movements and identify suspicious activities.
- Advanced surveillance systems enhance situational awareness and decision-making capabilities.
- Communication and information systems enable real-time sharing and coordination among stakeholders.

Technologies in Maritime Border Security



RADAR AND AIS (AUTOMATIC IDENTIFICATION SYSTEM)

COASTAL SURVEILLANCE SYSTEMS

SONAR AND UNDERWATER SENSORS

MARITIME PATROL AIRCRAFT AND DRONES

SATELLITE-BASED MONITORING

Unmanned Surface Vehicles: Solution

- Autonomous Unmanned Surface Vehicle for surveillance
- Carries advantage of operating precisely with planned path
- Capacity to carry and process several payload data
- High Speed communication of audio and video data
- Precise INS-GNSS based tracking
- Used with Swarm Technology for better area coverage

Artificial Intelligence: Practical Use cases

- Artificial intelligence (AI) for accurate, real-time classification of border incidents.
- Threat analysis and identifications
- AI based Real-Time language translator modules to control escalations (Similar to DARPA's Automatic Language Transcription Program)
- AI based Data mining, analysis and predictive surveillance models

Technology Fusion

Situational Awareness: Need of a time

- Situational awareness is the ability to perceive, understand, and respond effectively to the ever-changing environment, enabling better decision-making and improved outcomes in various contexts.
- Precise positioning with the help of INS-GNSS anti-jamming and anti-spoofing devices
- Autonomous control and command
- Centralized command and control data prcessing

Intelligence, Surveillance and Reconnaissance (ISR)

- ISR (Intelligence, Surveillance, and Reconnaissance) involves gathering, handling, and sharing accurate information to support decision-making.
- ISR systems collect data from diverse sources: electrical communications, optical imagery, radar, and infrared imagery.
- Tools used for data collection include satellites, aviation systems, ground/sea/space-based equipment, unmanned aircraft, and human intelligence teams.

INDigenization and Practical goals

- **UAV for Surveillance:** Need to work on having controls on the drone components to make it more reliable model
- **Smart Fencing:** WSN based ground sensor networks: Solved problem for INDIAN industries
- **Situational Awareness (SA):** Control over technologies like GNSS aided Inertial Navigation Systems, Radio Receivers and related software's
  - Small Scale SA like for border surveillance (Soldiers, Surveillance Towers, Robots)
  - UAV, USV swarming with SA point of view
- **Smart Soldiers** equipped with navigation and communication payloads

Thank you