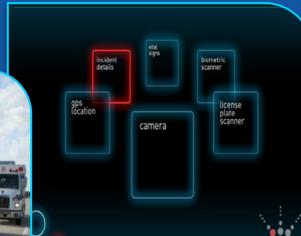


# Small Cell For Public Safety

Bringing Content to Users



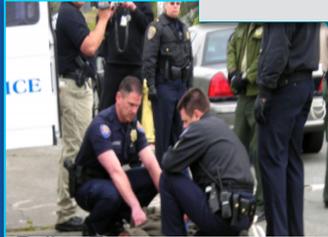
Medical Emergency



Advanced Features



Database



Police Emergency



Sensors



Disaster Relief



Surveillance



First Response



Situation Awareness

**Dharmesh Tyagi**  
**Director E2E Solutions Architect**  
[dharmesh.tyagi@nsn.com](mailto:dharmesh.tyagi@nsn.com)

# Small Cell



# Small Cell Types & Small Cell scenarios

Indoor: 10-100mW  
 Coverage radius: 10s of meters



Indoor: 20-100mW  
 Outdoor: 0.2-1W  
 Coverage radius: 10s of meters



Indoor: >10W  
 Outdoor: >10W



Indoor: 100-250mW  
 Outdoor: 1-5W  
 Coverage radius: < 200meters



Outdoor: 5-10W  
 Coverage radius: < 2 Km



Outdoor: >10W  
 Coverage radius: kilometer(s)



Home

Office

Airport

Shopping Center

City Walk

Stadium

City center

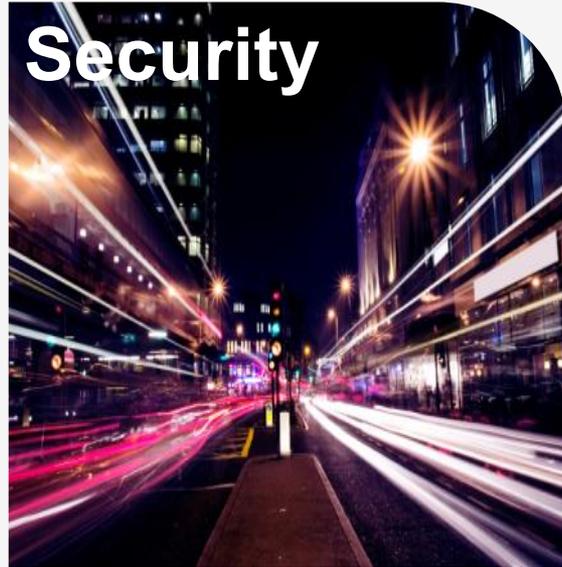
Suburban

Rural Village

**Small Cell Challenge ....**



## Key Challenges of Small Cells



**Physical Access**



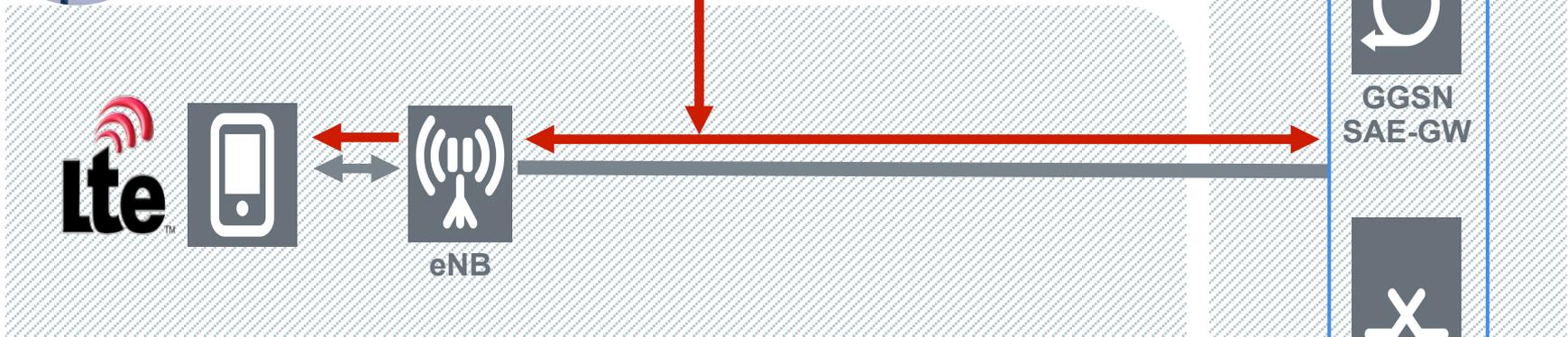
**Sites, Planning,  
Scale, Backhaul**



**HetNet, Management**

**Small Cells introduce new problems to be solved**

# Security Challenges



**Eavesdropping on subscriber data**

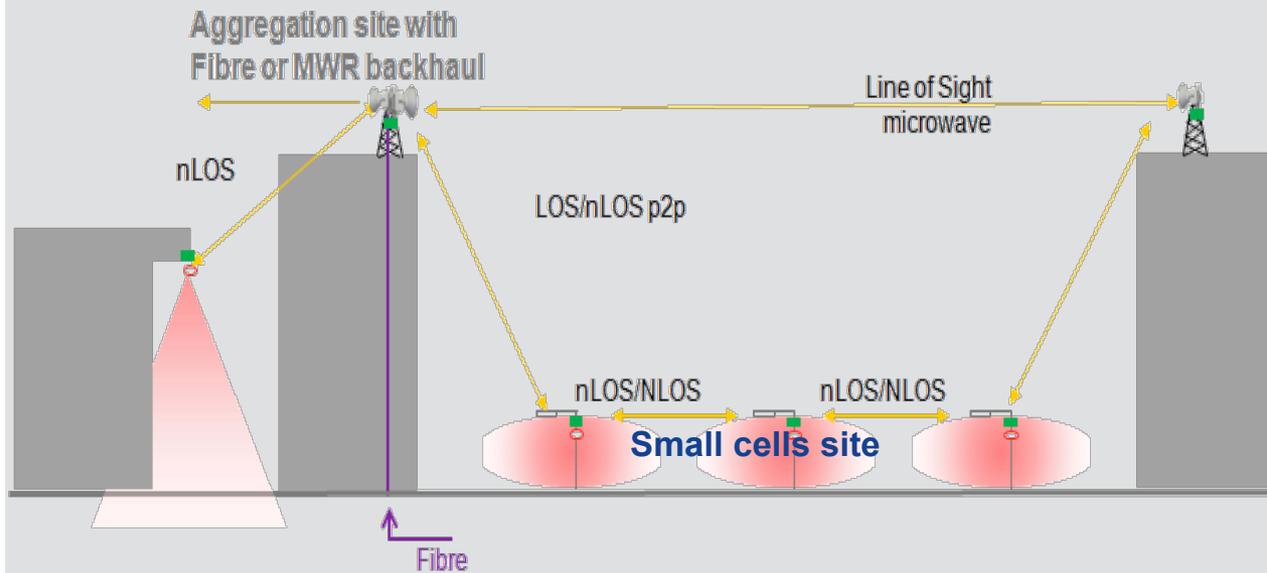
**Unauthorized access to Public Safety network, base station and mobile**

**Injection of malicious traffic (signaling and user plane)**

**Denial of service attack against EPC**

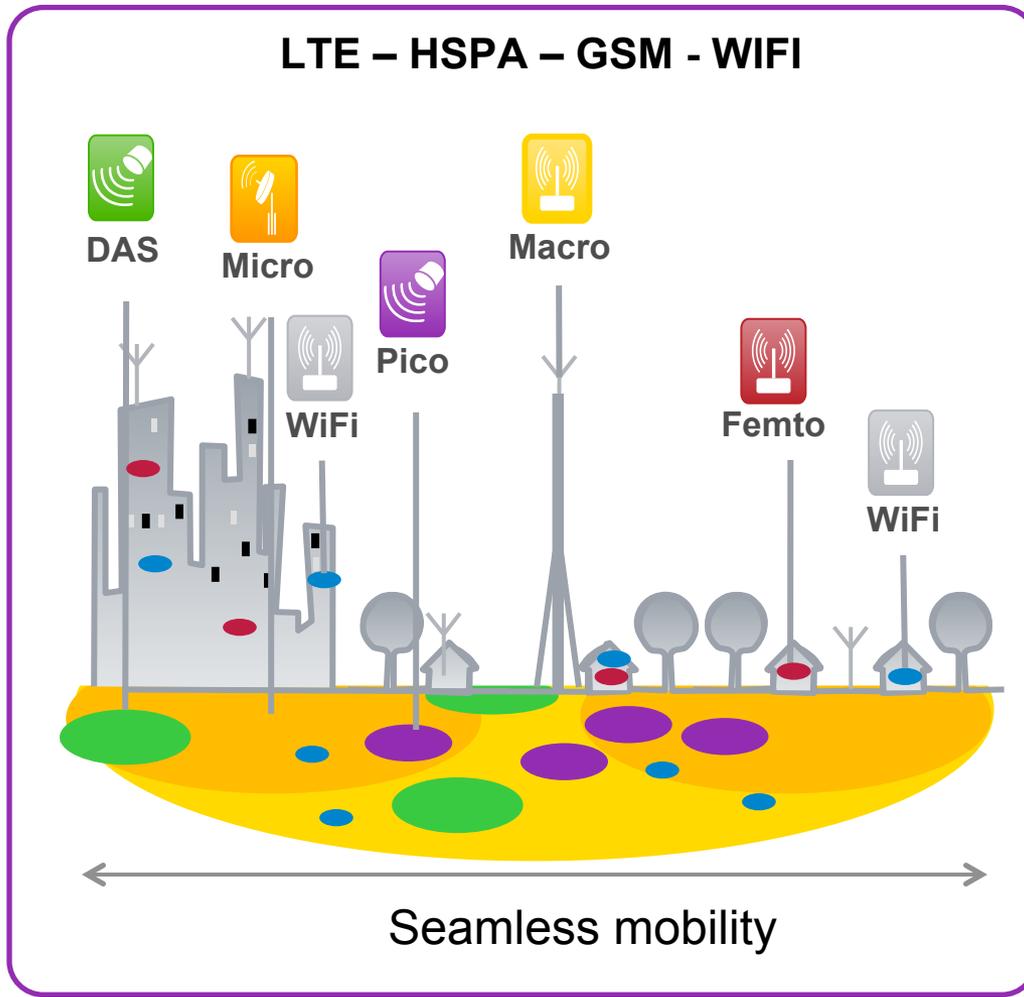
# Backhaul Challenges

Most appropriate SC BH selection & planning



**NEW - 3D backhaul propagation + 3D Maps (Nokia HERE)**

# Heterogeneous Networks With Small Cell



**Always Best Connected**  
user experience

**Seamless interworking**  
between different cell sizes, frequency  
layers and radio technologies

**Interference management**

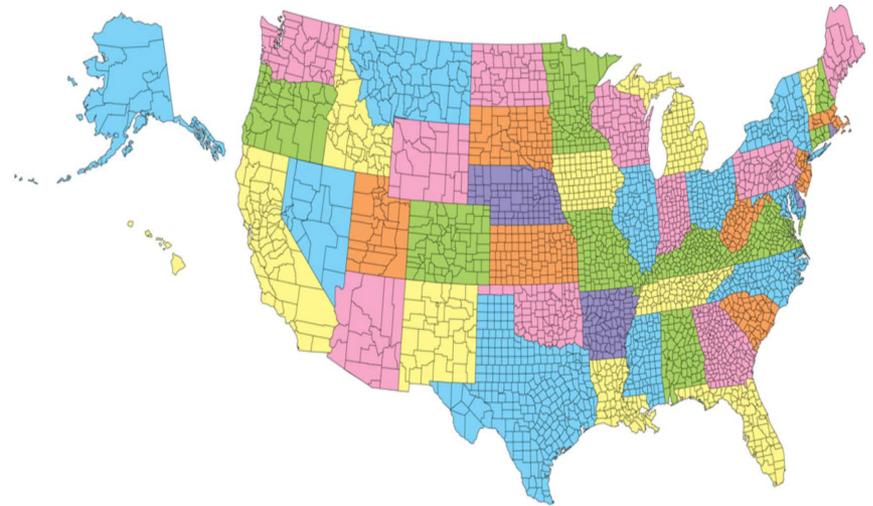
Layer Optimization  
and Traffic Steering

Scalable smart network  
management and SON automation

# Why Small Cell Solution For Public Safety

Deployable Solutions are tools to help meet the geographical challenge and keep cost down

- 27% Wilderness will be primarily covered by Satellite
- 68% Rural will be primarily covered by Tall Towers
- 5% Urban dense site penetration with lower towers
- 5% Dense Urban site penetration will be covered by **Small Cells**



DC



Puerto Rico



Virgin Islands



American Samoa



Guam

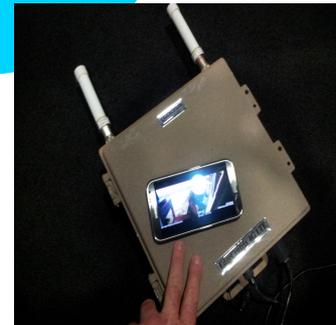


Northern  
Mariana  
Islands

## Deployment Scenarios and Use Cases



# PS Network Deployable Solution



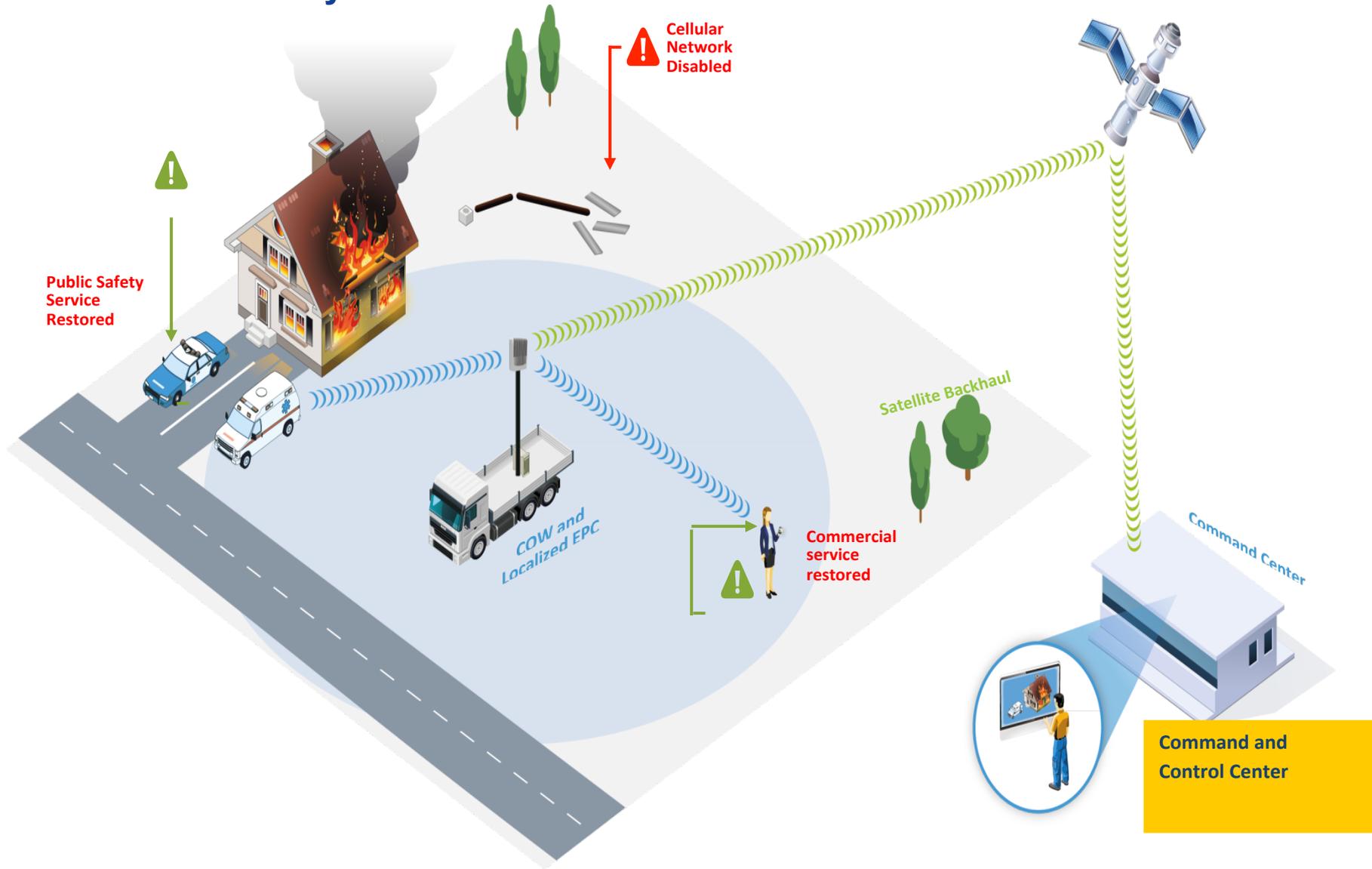
**NOKIA**

Emergency Command Center

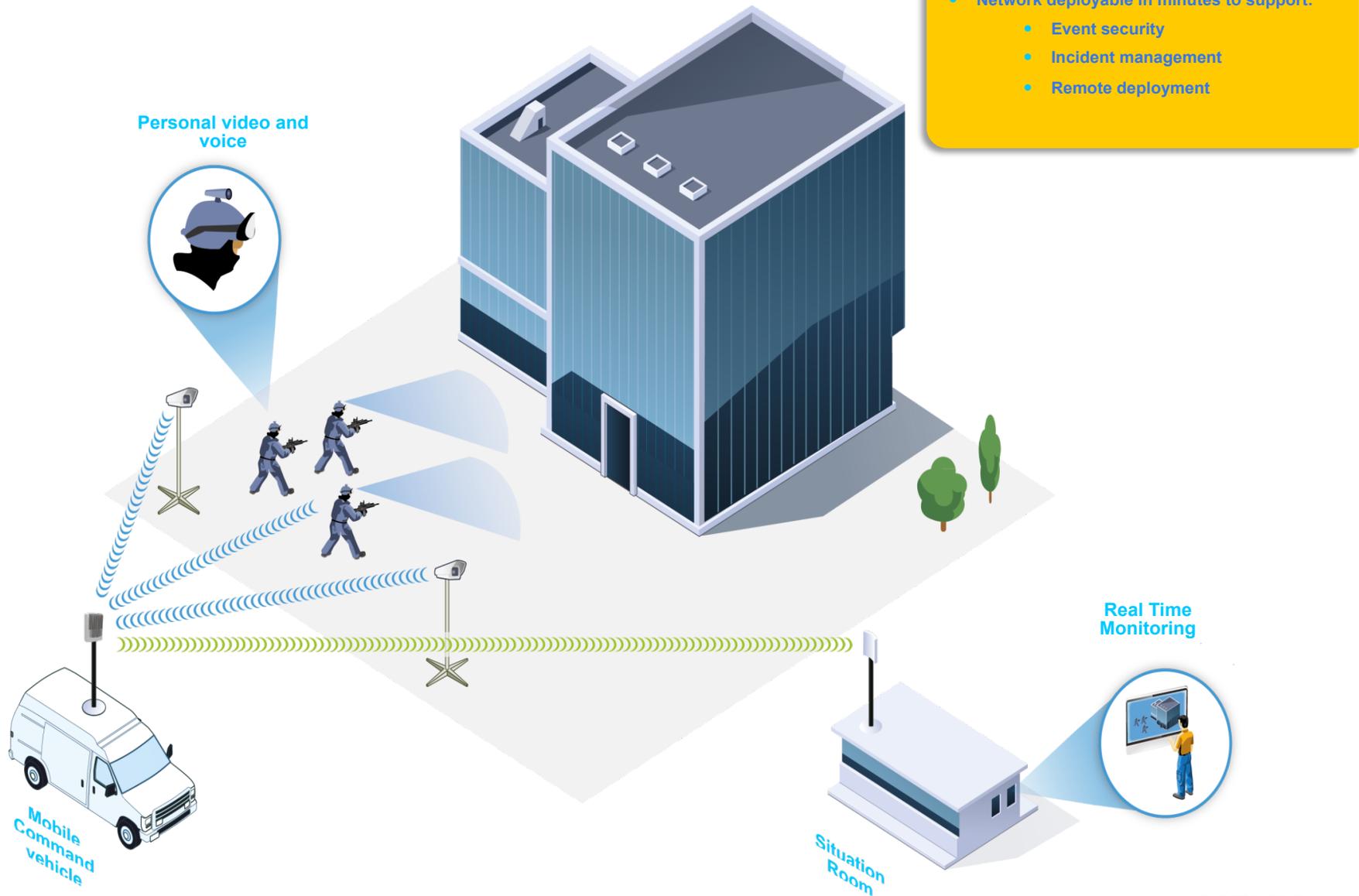
Man Portable LTE Solution



# Disaster Recovery

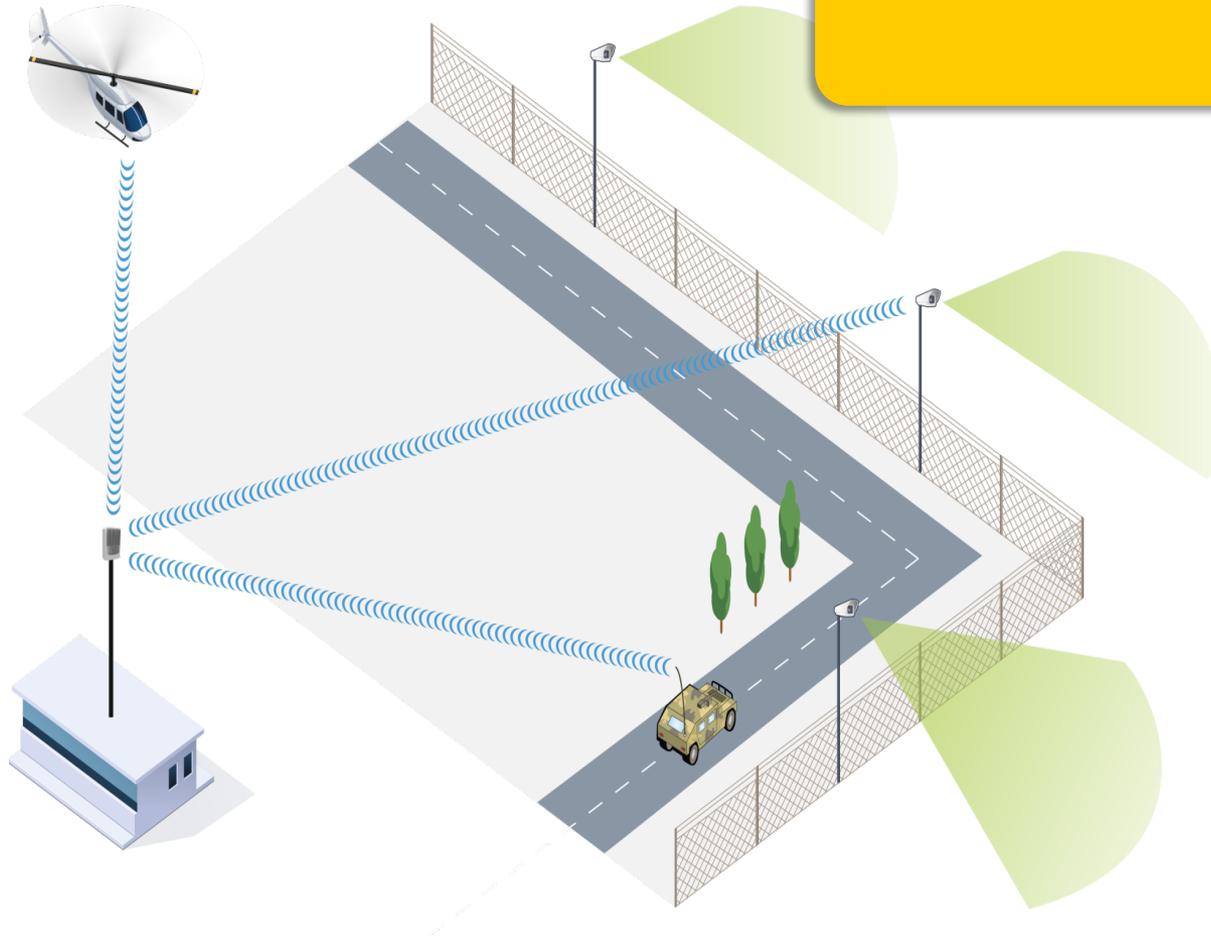


# Ad-Hoc Network



# Remote Site Monitoring

- Provide voice, video surveillance, mobile office etc.



**NOKIA**

**Dharmesh Tyagi**  
**Director E2E Solutions Architect**  
[dharmesh.tyagi@nsn.com](mailto:dharmesh.tyagi@nsn.com)