



The Impact of CR/SDR on Multi-Agency/National Crisis Management

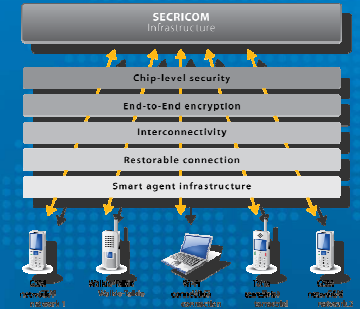
Recover quickly
Keep on talking



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Presentation Objectives:

1. Project Background
2. User Requirements
3. Business, Technical and Environmental Aspects
4. Interoperability
5. Cognitive Approach
6. Organisation
7. Benefits
8. Achievements
6. Summary



Terrorism, major industrial accidents, natural disasters...



...unpredictable catastrophic events...

...require **innovative and affordable communication and situation awareness solutions** for Public Safety Agencies and first responders...

A key aspect in helping to recover?



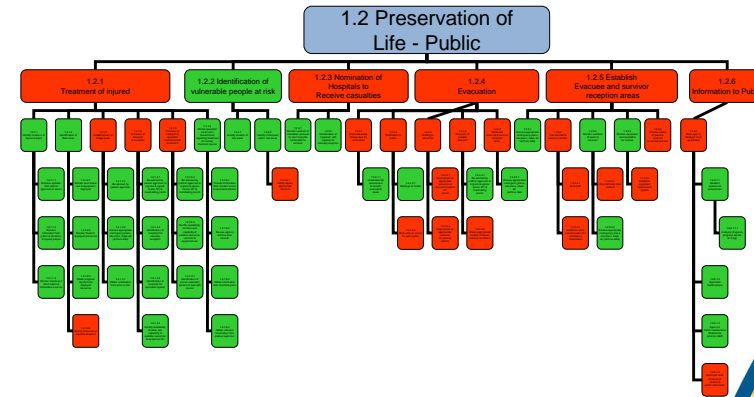
Project SECRICOM Key Facts

- ★ Seamless Communication for Crisis Management
- ★ Multi-Agency and Multi-National Communications for Crisis Management
- ★ EU funded project – FP7
- ★ Start date: 1 Sept 2008
- ★ End date: 30 April 2012



User Requirements

Towards User Requirements (Use Case Study)



Command and Control

Situational Awareness



IER Exercise - Key Findings

- Voice is predominant (~50%) with Messaging next (~25%)
- More voice at Operational level and decreasing up the CofCmnd
- Data is concentrated at Strategic level and decreasing down the CofCmnd
 - Need for data, image and video capabilities at the Operational level
- Intra-agency communications is key at all levels of command
- Inter-agency communications account for nearly a quarter of all IERs
- Situation Awareness (SA) is the greatest proportion of IERs (~59%)
 - Ratio of C2:SA is approx 3:2 driven by need for audit trail leading to versions of the same IER voice & data
- Voice remains most significant IER data type for both C2 and SA, with SA demands a greater use of data types



High-Level Business Drivers

- Enabling agencies, when required, to be securely networked using existing and differing legacy communication systems for effective interoperability
 - Including across international borders
- Enhancing resilience in support of business continuity during crisis response
- Enrichment of business information service types for more effective operations (video, imagery, web, etc)
- Cost reduction through convergence of services onto one common IP infrastructure



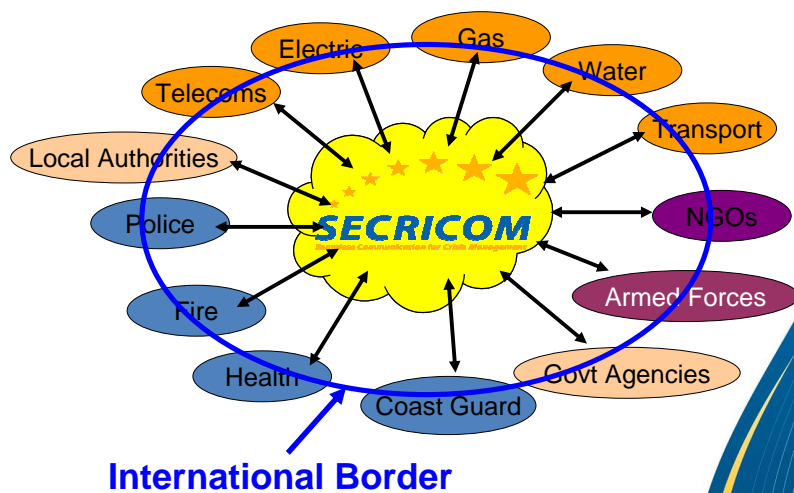
Aspects of Crisis Management

- Business Aspects
- Technology Aspects
- Environment Aspects
- Organisation Aspects



Business, Technical and Environmental Aspects

Business: Stakeholders



Business

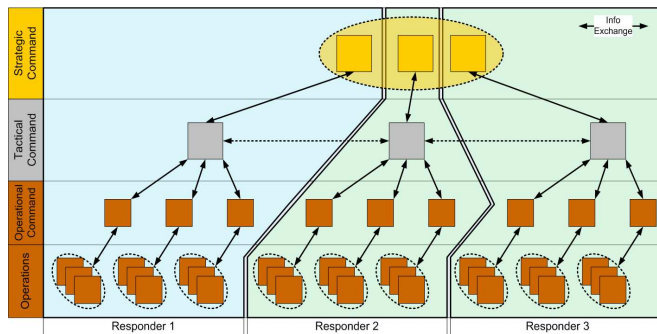
- Multi-Agency
- Multi-National

Cohesive stakeholder collaboration is vital for effective large scale crisis management



Business: Multi-Agency Operations and the Implications

- Different technology maturity levels – **non interoperability?**
- Different operating procedures – **non-compatibility?**
- Very vertical CofCmd – **slow information exchange?**

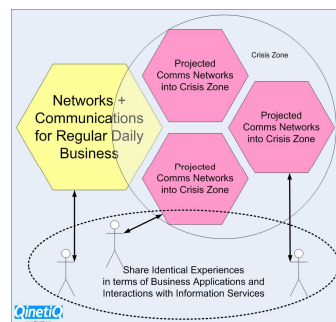


Business: Multi-National Operations and the Implications

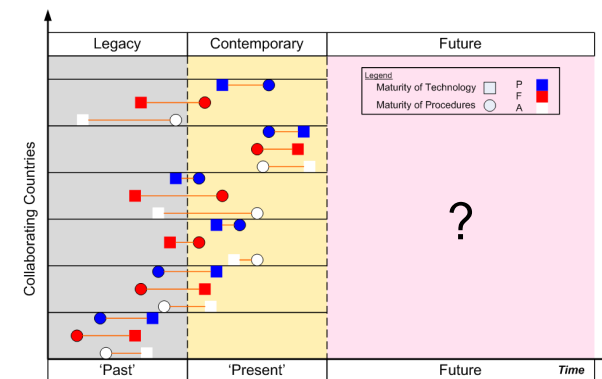
- Variation in procurement
 - Cycles
 - Time scales and
 - Budgets.
- **Difficult to predict capabilities, and hence forward plan?**
- Variation in doctrines & regulations
 - **Inefficient business interoperability?**

Technical

- Assumption: Networks and comms may be partially or completely destroyed in a crisis zone.
- Need the ability for networks and comms establishment amongst participating agencies and nations
- **Variation in technology amongst agencies?**
- **Justification of cost?**



Variability in Technology and Procedures and the Implications



Different agencies collaborating during different crisis leads to variability in effective capability from crisis to crisis

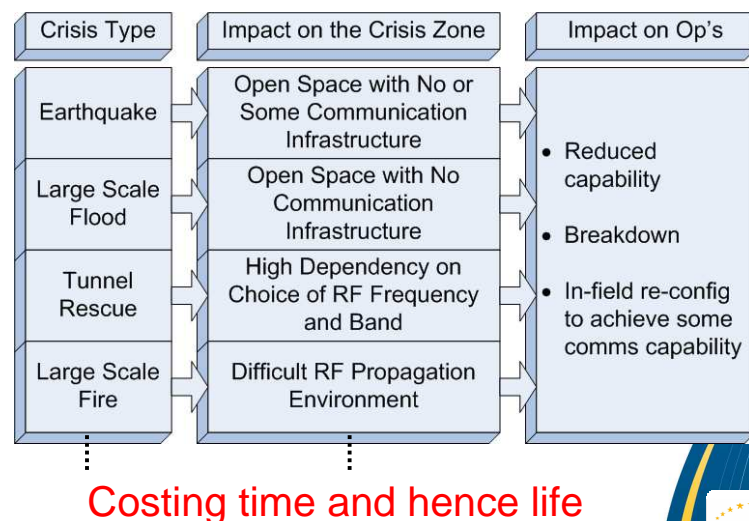
Implications on planning and overall effectiveness?

Implications of Multi-National and Multi-Agency Operations on Crisis Management

The variability in technology and business procedures leads to

- Reduced collaboration effectiveness
- Increased risk to life saving operations

Environment



Organisation: Public Safety & Security

Organizations	Chain of Command	Domains	Technology	Local Requirements
Police, fire, ambulance, national crisis center, critical infrastructure protection, MoD, MoI, MoJ, local government, transport, first responders, PSAP, intelligence services, prisons, customs, immigration, etc.	Headquarters Operations Emergency Ops Incident Command Field Personnel/ Vehicles	Crisis management, urban security, border control and critical infrastructure protection, mass venues and events, public transport, prisons and probation, etc.	Sensors, artificial intelligence, video analytics, IPv6, ad hoc mobility, biometrics, cloud computing, green, spectrum reuse, rich-media collaboration, anytime/anywhere connectivity, mass notification systems, etc.	Each country, region/state, city, customer has specific requirements, which seems to justify dedicated solutions. In some cases, local integrators are mandated for national security.

Complex and fragmented landscape

- Many agencies with own local requirements
- Multiple domains
- Fragmented CofCmnd
- New technologies incredibly complex with interoperability issues

EA for Public Safety & Security: OSSAF

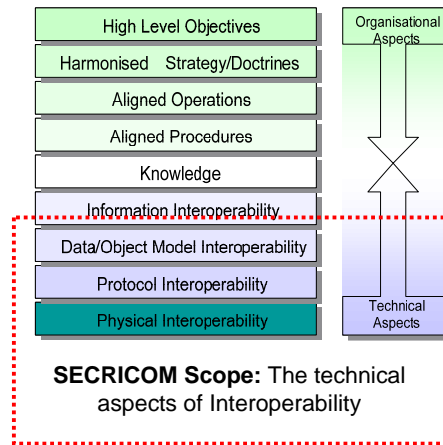
The Open Safety & Security Architecture Framework aims to align stakeholders within a PS&S organisation and helps to achieve effective transformation, leading to the following benefits:

- **Agility:** Responsive technology to evolving needs of the user
- **Interoperability:** at the forefront and not an afterthought
- **Cost Reduction:** Investments rationalised across multiple agencies/providers and different generations of systems
- **Decision Support:** Strong support for Programme Management
- **Information Management:** Better distribution of information, throughout the chain of command
- **Higher Mission Effectiveness:** Achieve better access to information and common SOPs

Interoperability

Interoperability is Key

Layers of Interoperability

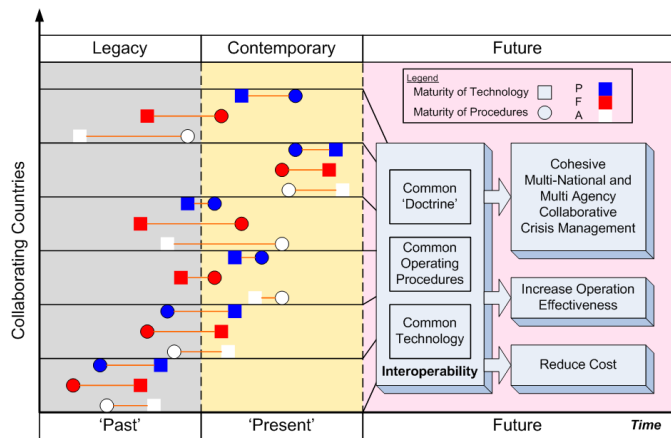


SECRICOM Definition:

The capability of two or more organisations or discrete parts of the same organisation to exchange decision-critical information and to use the information that has been exchanged.

Interoperability ranges from organisational to technical aspects all of which must be 'harmonised' in order to achieve full interoperability.

Variability in Technical and Operational Capabilities; and Interoperability



Convergence is a key efficient enabler of Interoperability

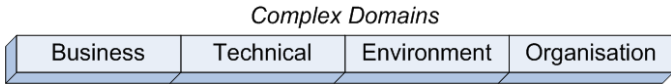
Technical Interoperability

From an agency perspective, new systems should provide for:

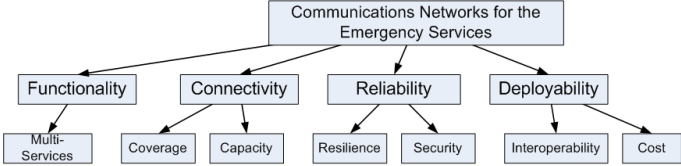
- **“Intra-agency interoperability”**
i.e. new technology works with the agency’s:
 - Current technology, and
 - Future technology
- **“Inter-agency interoperability”**
i.e. new technology works with other agencies’:
 - Current technology, and
 - Future technology

Cognitive Approach

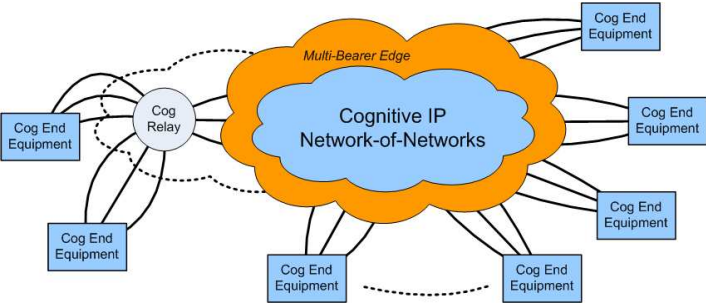
Convergence as the Approach



Need for Flexible, Business-focused IT Solution Capable of Delivering Diverse Business Applications over Different Communication Systems, Devices and Standards with Resilience to support Business-continuity during Critical and Non-critical Business Operations



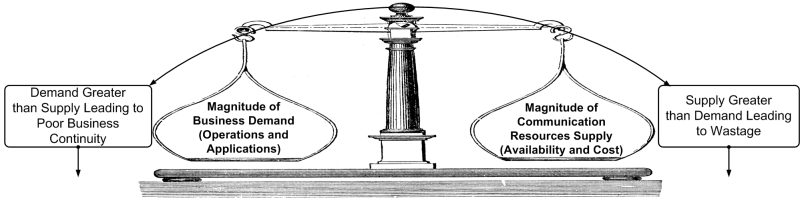
Cognitive Networking



- IP Network-of-networks combines together wired, wireless, fixed, ad hoc and mobile networks
- Multi-bearer edge
- Multi-bearer capable end equipment



Cognitive



- Management of the
 - Business demand to support operations, and
 - Supply of the communication resource
- Business continuity is the goal



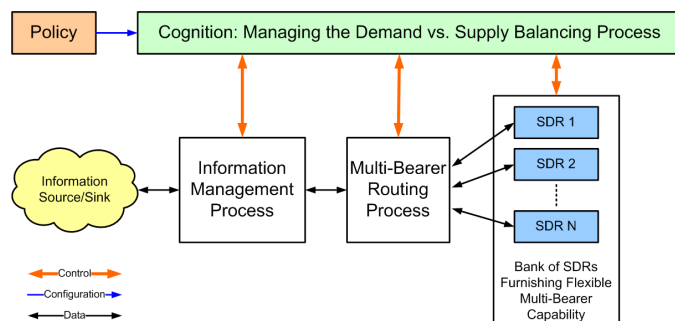
Cognitive IP Network-of-Networks

- Self-planning
 - Self-configuration
 - Self-optimising
 - Self-testing
 - Self-healing
 - Self-maintenance
- ➔
- Management of business demand and supply of communication resource
 - Minimise Cost
 - CAPEX
 - OPEX

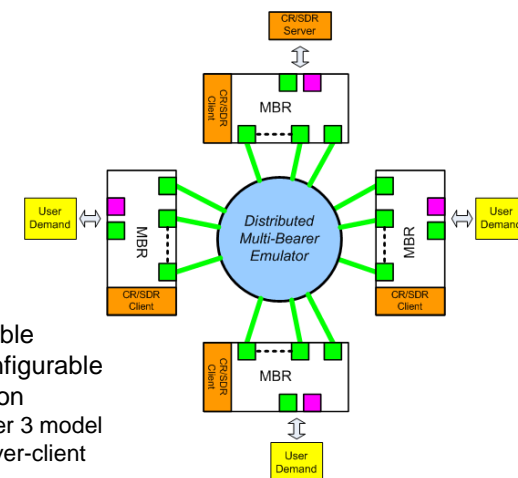
Cognitive Radio

- Ability to pass IPv4/6 traffic, preferably 'natively'
- Ability to operate over any infrastructure: mobile, fixed, satellite and in the following modes:
 - Single bearer, and
 - Multi-bearer: key for interoperability with other agencies
- Ability to manage user traffic in dynamic multi-bearer availability
- Ability to operate independently of any infrastructure
- Ability to use multiple frequencies/bands to match to the operational environment
 - Tunnels, caves and corridors: Waveguide effect
 - Fires: evidence of fire blocking RF needs to be investigated
- The ability to use repeaters at key points with CR capability between the WAN (i.e. with repeaters and also IP Network-of-Networks) and user equipment

Cognitive Radio Architecture (IP)



SECRICOM CR/SDR Testbed



- Extensible
- Re-Configurable
- Based on
 - Layer 3 model
 - Server-client
- Supports infrastructure and infrastructure-less modes

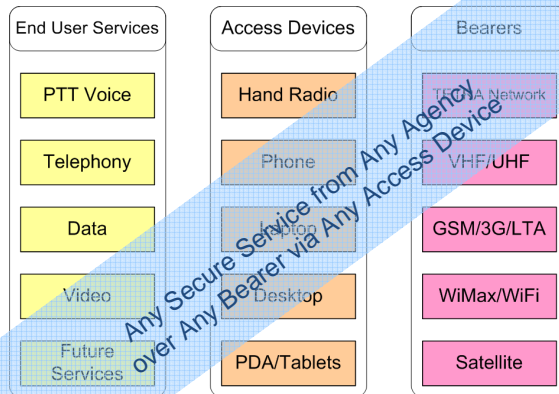
Benefits

SECRICOM's Benefits

- **Increased number of first responders**
 - Trusted use of Mobile Telephony
 - Voice communication/instant text messaging
 - Exchange of imagery and hand-drawings
- **Enhanced information for better operation**
 - Faster info gathering accessible from mobile devices
 - Intelligent resource management
- **No eaves-dropping**
 - Chip-based security
 - End-to-End encryption
 - Network monitoring centre
- **Resilient communication service**
 - Multi-bearer based for resilience
 - Network monitoring centre



SECRICOM: Access Devices, Bearers and Services



Achievements within a User Framework



Achievements to Date

- Multi-national and multi-agency information exchange over multi-bearers over commercial networks and COTS products
- SECRICOM capabilities proven to function effectively in a multi-agency and multi-national live Civil Protection Exercise (CBRN)
- Resilient PTT voice over IP using a network-of-networks underpinned by SECRICOM's multi-bearer router
- Use of commercial networks: PTT voice calls conducted between a Tablet/PCs in the UK and mobile Smart Phones on a Slovak Mobile network



Achievements to Date

- Range of integrated user devices
 - Legacy radios (UHF/VHF): Walkie-Talkies and Citizen-Band Radios
 - PCs, Laptops, Mobile Phones, PDAs, Tablets
- Range of integrated/converged information services
 - Real-time: PTT Voice, Telephony, Video, Mapping
 - Data: Imagery, Chat, Web, File Transfer, etc.
- Range of integrated communication systems
 - Satellite and deployable networks
 - Internet, wireless (WiFi, 3G and GSM) and wired technologies (Broadband, LANs).
- Vendor independence through the integration of different devices: PCs, Laptops, Mobile Phones, PDAs and Tablets



Demonstration/Exercise Activities

- UK 2010
- BAPCO 2010
- CP NATO 2010
- BAPCO 2011



Summary

- User requirements
 - Multi-agency and multi-national
 - Impact on business, technical, environmental, organisation
- Convergence and flexibility are key enablers for interoperability
- Cognitive networking
 - Management of demand & supply for business continuity
 - Cognitive IP network-of-networks
 - Cognitive IP radio and its architecture
- Benefit: towards any secure service from any Agency over any bearer via any access device
- Project achievements

