Interoperability, Resilience & Availability

“Jeppe” Jepsen

Motorola

Board Member, TETRA Association

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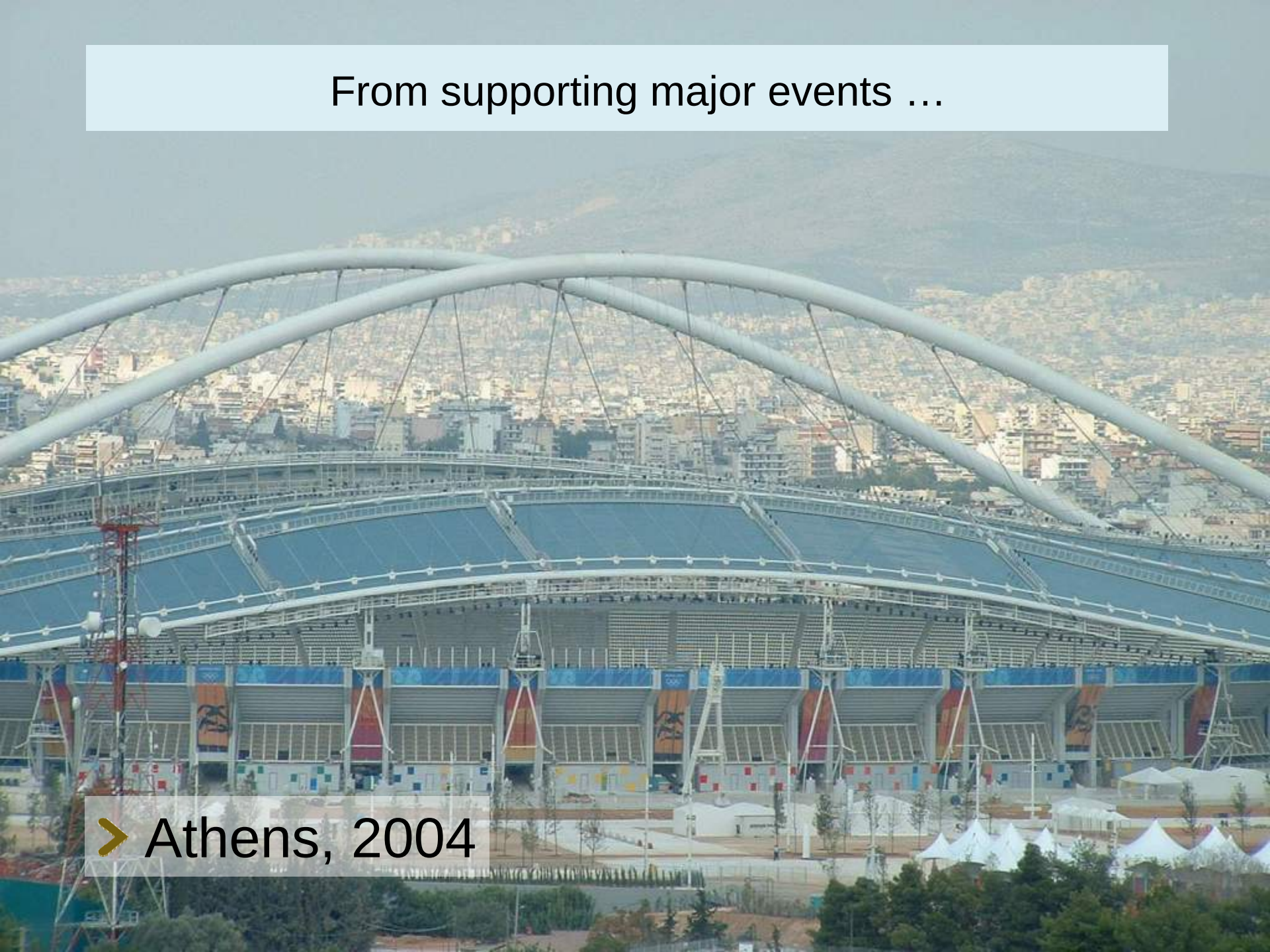
Critical communications workers simply cannot afford to be without communications…
from ‘man down’ notifications …

To the day to day operation of emergency services.

From supporting major events …



- Athens, 2004

to ensuring communications in a disaster …

"July 7 has brought home more than ever the need for trusted, resilient & reliable emergency communications..."

Pete Richardson, 02 Airwave

- London, 2005

Public Safety & Security Sector Needs

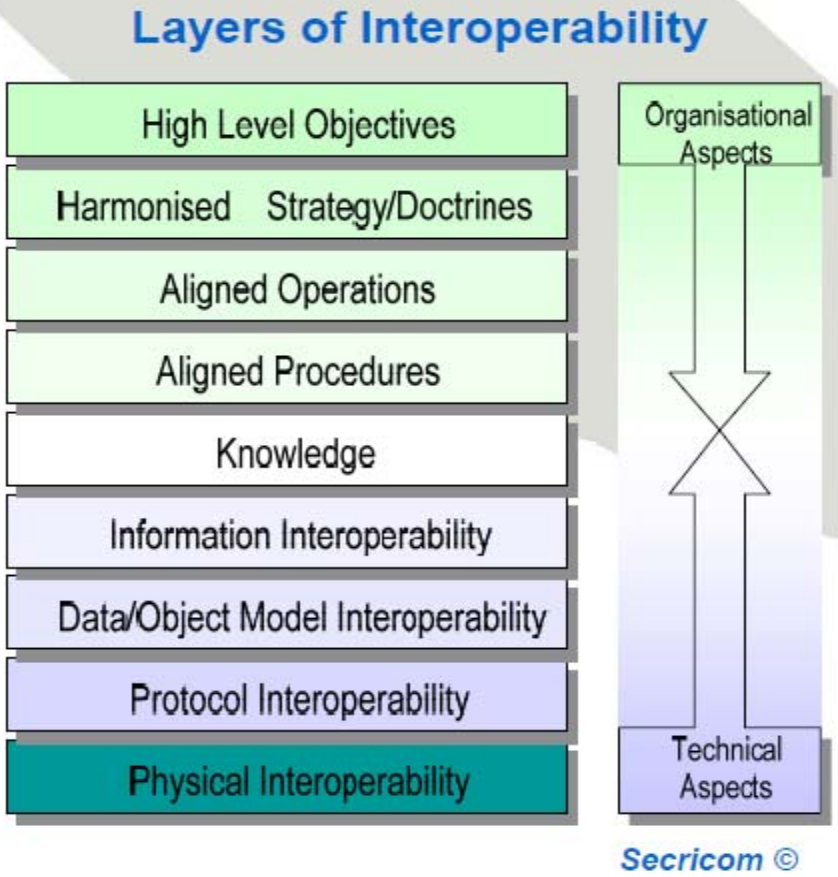
- Interoperability
  - Harmonized Spectrum
  - Single open standard
- Special functional requirements
- Competition
  - Multi-vendor supply
  - Specialized vendors
  - Innovation

Interoperability

Interoperability (1/2)

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.

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



Interoperability ??

- Capability to have seamless communication between several organisations.
- Considered ESSENTIAL after 9/11, 9M & 7/7.
- Multi-vendor supply.
  - Innovation & competition
- Competiton on terminal supply
  - During the lifetime – YES.
- Competition of infrastructure supply
  - Yes – but only by compromising the top-level objective.

Voice & Data services

Voice Services

- *Group Call (commonly called 'all informed net' and 'talk group call')*
- *Individual Call*
- *Telephone interconnect*

Pre-Emptive Priority Call (Emergency Call)

Call Retention

Priority Call

Busy Queuing

Dynamic Group Number Assignment (DGNA)

Ambience Listening

Call Authorised by Dispatcher

Area Selection

Late Entry

Data Services

- *Short Data Service*
- *Packet Data*

Voice Encryption

TETRA Release 2

Resilience

&

Availability

Ensuring System Availability

The % of time that the system can perform its function

Resilience	Ensure continued operation even in the presence of faults
Fallback	Enable alternative means of providing a service in the event of a failure
Reliability	Ensuring components do not fail in the first place (MTBF)
Disaster Recovery	Minimise loss of service in the event of a disaster
Services	From designing the optimal solution to providing a complete support portfolio
Expansions & Events	Maintaining availability during network expansions and major events

Why TETRA For Availability

TETRA Offers a Robust and Reliable Network

Guaranteed grade of service and priority access

A dedicated network for critical communications

Examples are well documented[*1] of commercial networks failing in a crisis whilst critical communications networks continued to give excellent service.

Consider an Incident…

Likely motorist reaction:

- Large Increase in voice & demand for data

If emergency services use cellular services

- Network overloaded due to usage peak

If emergency services use TETRA

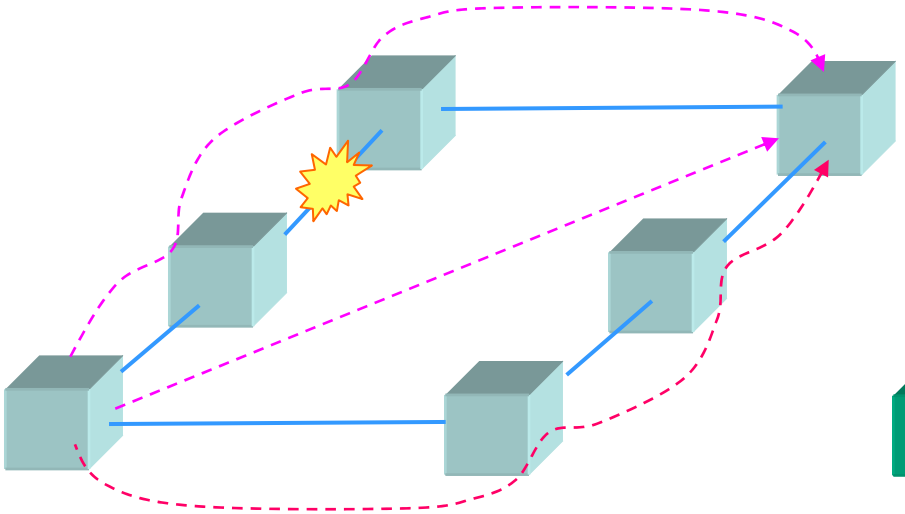
- No impact on voice & data services from public usage
- Guaranteed grade of service

**1 See 'The ability of Public Mobile Communications to support mission critical events for the Emergency Services' by Mason Communications Ltd., available at www.tetramou.com/catalogue*

Why IP For Resilience

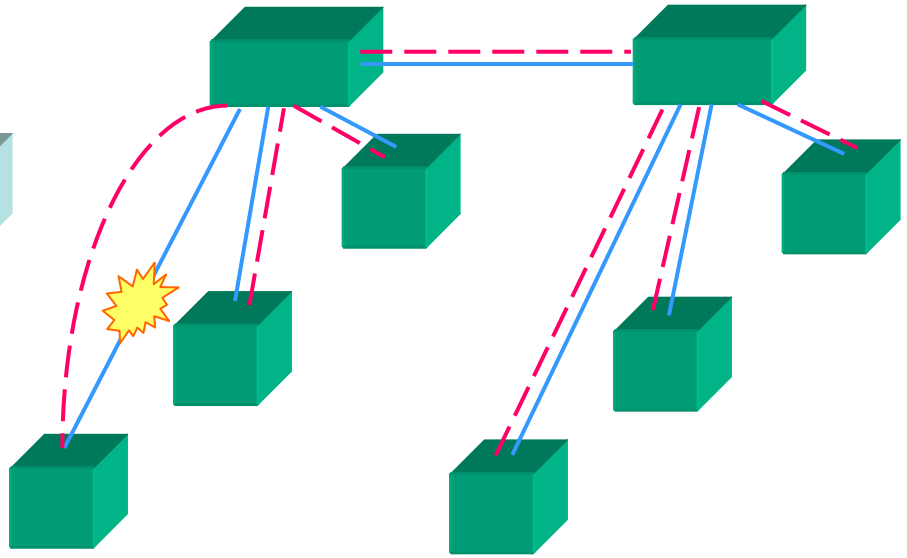
The Advantage of Distributed IP Networks

Packet needing to route here…
Actually hops round between routers



There is always a redundant path inside the network – for the price of one link more than the absolute minimum

More switches needed (more cost)



A failed link causes isolation – unless every link is duplicated (expensive!)

Less Links. Higher Resilience. Lower Cost

Component Level Resilience

All Key Switch Components Need Resilience Built In…

Zone Controllers	*Two controllers in a redundant configuration. One active and one on standby.*
Gateway Routers	*Arranged in a 1:1 redundant configuration.*
Authentication Centre	*Server continuously updates the redundant server so that it holds a database copy*
LAN Switch	*Two LAN switches are used to ensure call processing will continue during a LAN switch failure.*
Resilience Also Built In To…	*Core routers; data gateways; MTIGs; exit routers; domain controllers; links & backup power supplies.*

Fallback Solutions

Switch Fallback Solution

In the unlikely event a switch becomes isolated, service can be maintained (within the switch area)

All functions operate locally in the same manner as they operate when the network is integrated:

- Speech calls
  - Group, individual, broadcast, telephone
- Emergency calls
- Data calls
  - Short data, packet data, multislot packet data
- Radio management
  - DGNA, MS enable/disable, ambience listening
- Security
  - Authentication, encryption

Local Site Trunking

Motorola's fallback solution should base station link fail

Key site functionality maintained including:

- Group call
- Priority emergency calls
- Call queuing, Late entry
- Recent user priority
- Air Interface Encryption
- No radio user intervention required

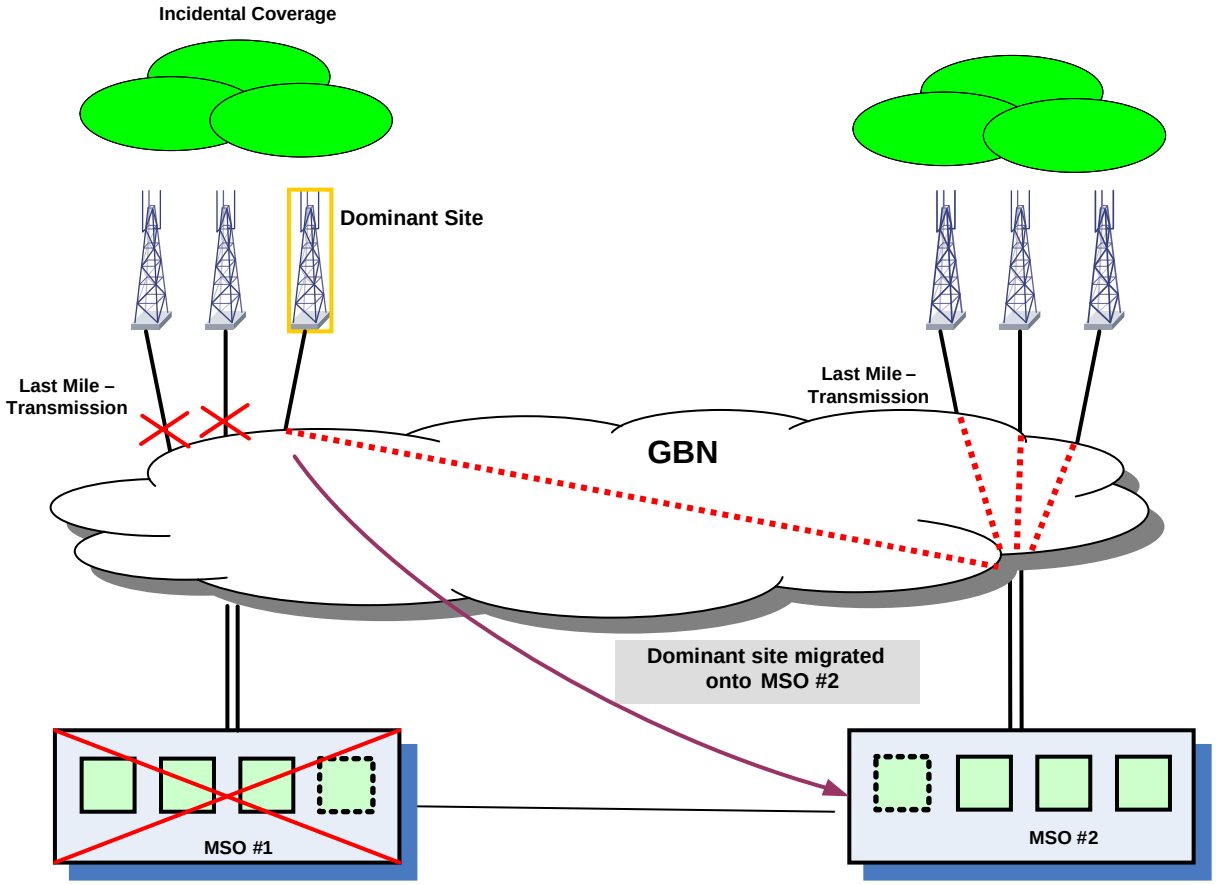
System attempts to move users onto neighbouring, operational sites or to facilitate the co-location of subscribers should several site links fail

Disaster Recovery

A Range of Disaster Recovery Solutions

Synchronised Standby	**Premium 1+1 system redundancy solution. Industry leading full service recovery.**
Geographical Redundancy	**Geographically separated switch redundancy. Industry leading recovery times for critical services.**
Automated Back Up & Restore	**Cost effective N+1 system redundancy solution. Recovery times traded against available budget.**
Base Site Migration	**Sites reconfigured remotely to use alternate switch. Partial service restoration that maintains coverage.**

Base Site Migration



- Dominant sites from a lost MSO are migrated to a pre-configured operational MSO
- Operator invoked switchover mechanism for sites
- Coverage restored together with a partial set of services
- Suited to small, lightly loaded systems, with excess switch capacity

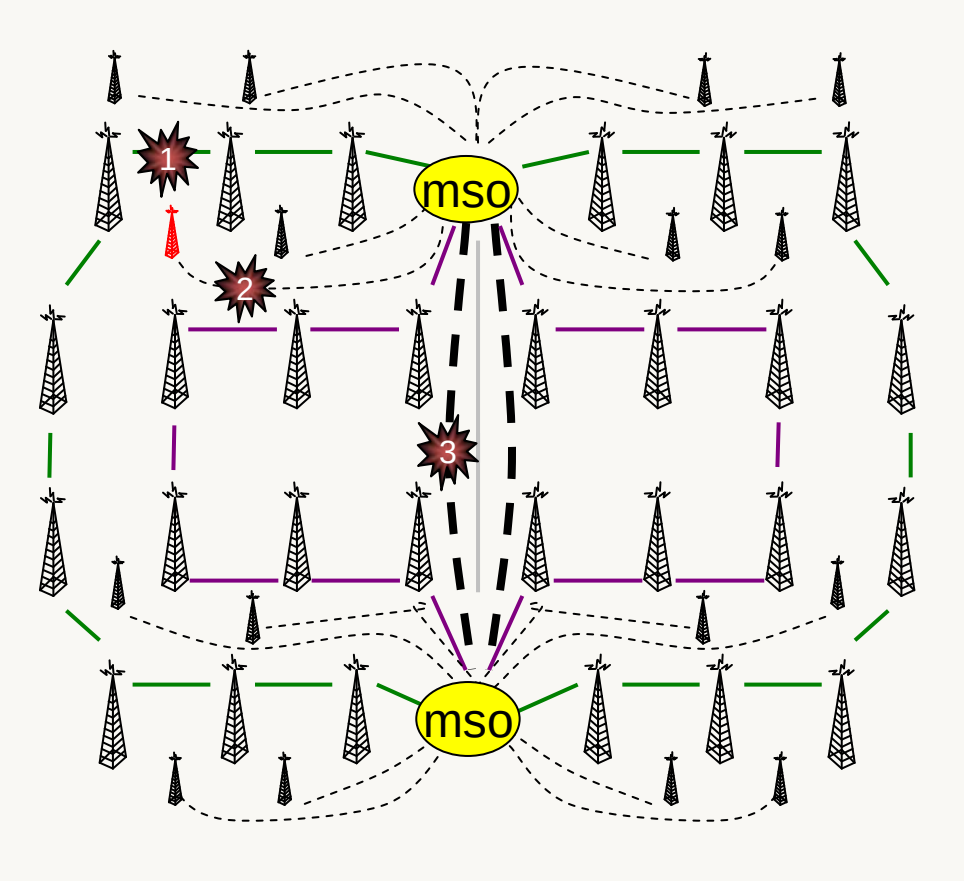
Cost effective solution that utilises spare MSO capacity

Resilience Strategies

Illustrating how resilience solutions can be combined to provide a cost effective solution against:

- Power failure
- Switch failure
- Link failure

Geographical Redundancy, Dominant Site Strategy: Link Failures



1. **Dominant site link fails**
   - Full coverage maintained due to redundant ring configuration
2. **Small site link fails**
   - Small site enters local site trunking
3. **MSO link fails**
   - Service maintained due to redundant link

Almost Complete Coverage Maintained

Actual Incidents - Case Studies

Where Interoperability, Resilience & Availability has made the difference

2005 London Bombings

"July 7 has brought home more than ever the need for trusted, resilient and reliable emergency communications...
one technology, one open standard."
Pete Richardson, 02 Airwave

- The Airwave service remained operational and fully functional when other forms of communication were suffering due to the number of people using mobile and fixed networks
- Airwave established an incident room at 10.00am and Motorola immediately opened an incident desk which was continuously manned for the next 30 hours
- Additional radios were acquired, programmed and driven to Airwave in London within 4 hrs

Madrid Bombing

Following the terrorist attack in Madrid, Mr. Javier Quiroga, SAMUR (Madrid Municipality Medical Services) Operations Director, explained on Spanish TV the critical role played by their TETRA system. He observed that:

- The cellular network did not handle the situation due to a communications overload.
- The TETRA system, supplied by Motorola, worked very well. It handled over 180,000 calls during the first day of the rescue operation alone.
- It was clear that they needed a dedicated, secure, private communication network in order to deal with life threatening situations, day in day out.
- They made the right decision back in 2001 to chose TETRA.

Ensuring Availability At Major Events

Proven capability including:
- 2004 Olympics (Athens)
- 2007 G8 Summit (Germany)

Major network expansions and emergency simulations also supported

Complete range of supporting services
- Special event monitoring service
- Total network care solutions
- Capacity planning services
- Enhanced monitoring capability

Flexible options for extending service
- Satellite link for fast and flexible coverage extension
- Scalable network for flexible capacity extension

Athens – 2004 Olympics

- *Olympic Size Statistics*

•Secure, integrated voice and data communication system for:

  - 16.5 K Users
  - 2.3 M Group Calls
  - 230 K Private Calls
  - 104 K Phone Calls

- *Specific Olympic Support Included Additional:*

  - In country support teams including specialist highly skilled field engineers
  - RF drive teams
  - 2 mobile base stations
  - All required spares in country

Conclusion

Resilience & Availability strategies can effectively be implemented when designed in from the start of a project.

Multiple

- technologies,
- frequency bands and
- infrastructure suppliers

will have an negative impact on Interoperability, Resilience & Availability.

"There is no compermise when lives are involved"

Thank You

www.Tetra-Association.com

www.etsi.org

www.Motorola.com/Tetra

Jeppe.Jepsen@Motorola.com


High mountain site


. . . . . in the Winter