MUTUAL AID

FOR RESILIENT INFRASTRUCTURE IN EUROPE

KEY OBSERVATIONS REPORT

About ENISA

The European Network and Information Security Agency (ENISA) is a centre of expertise for the European Union (EU), its Member States (MS), the private sector and Europe's citizens. As an EU agency, ENISA's role is to work with these groups to develop advice and recommendations on good practice in information security. The agency assists MS in implementing relevant EU legislation, and works to improve the resilience of Europe's critical information infrastructure and networks. In carrying out its work programme, ENISA seeks to enhance existing expertise in MS by supporting the development of cross-border communities committed to improving network and information security throughout the EU.

Contributors to this report

Karl Frederick Rauscher was the principal author of this report in collaboration with and on behalf of ENISA.

The author conducts advanced research on the scientific and engineering fundamentals of cyber security and reliability and provides senior level guidance on improvement strategies. He is a Bell Labs Fellow and also serves as a Distinguished Fellow and as the Chief Technology Officer for the EastWest Institute.

Acknowledgements

ENISA would like to acknowledge the contribution of:

- Richard E. Krock (Bell Labs, Alcatel-Lucent)
- Stuart Goldman (NGN Communications)

Contents

List of Tables

List of Figures

1 Executive Summary

As European society becomes increasingly dependent upon Information and Communication Technology (ICT), the need for its *continued* operation is more and more of a concern. Our networked electronic infrastructures, while designed, built and operated by highly dedicated and talented engineers and other professionals, have limits. These limits can be stressed by natural disasters such as earthquakes, floods or pandemic disease, or man-made crises such as armed conflict, terrorist attacks or civil unrest, the later of which is of increasing concern.

Earlier this year, the European Commission reiterated its commitment to a path that will "strengthen the security and resilience of vital ICT infrastructures."[1] In so doing, the Commission also recognized "the need for all stakeholders to join their forces in a holistic effort." Such a commitment and recognition set the stage for introducing mutual aid strategies as a new and important area of focus for Europe in the coming years.

Mutual Aid Agreements (MAAs) are an advanced means of emergency preparedness that have the following special characteristics:

- MAAs address the often overlooked tail of the distribution curve of crisis events, i.e. *low* probability but *high* impact events
- despite the above, MAAs are innovative in creating an attractive Return on Investment (ROI) by leveraging external resources with minimal payout until such resources are used in a crisis
- there is no alternative to MAAs that will enable the achievement of similar levels of resilience, other than those that require significant additional cost
- MAAs require overcoming regulatory, legal and competitive barriers – both real and perceived
- MAAs have proven effective in large scale catastrophes

This *Mutual Aid for Resilient Infrastructure in Europe (MARIE) Phase 1 Report* presents twelve Key Observations about MAAs and in so doing lays the foundation for a number of recommendations, which are planned for the *MARIE Phase 2 Report* (in 2012). As one of the most prominent obstacles to further utilization of MAAs is organizations embracing emergency preparedness responsibilities that extend all the way out through to low probability and high impact events, many of the observations offered here are tightly coupled with emergency preparedness motivation. Phases 3 and 4 are designed to serve as implementation and monitoring periods, which will be essential to the full benefit realization of this mutual aid initiative.

---

[1] *Achievements and Next Steps: Towards Global Cyber-Security,* European Commission Communication on Critical Information Infrastructure Protection, Brussels, March 2011.

2 Introduction

This section provides context for the current initiative to promote the use of mutual aid strategies for enhanced emergency preparedness. It also outlines the objectives of the initiative, its scope, approach and next steps and expected outcomes.

2.1 Background and Brief History

In 2007, the EC-sponsored Availability and Robustness of Electronic Communications Infrastructure (ARECI) Report outlined ten recommendations for improving the European systems and networks.[2] Since then, there have been countless initiatives – most of them private sector led – to act on these recommendations to the benefit of European citizens, businesses, and governments and other stakeholders. One such recommendation dealt with MAAs and was presented as follows:[3]

> ARECI Recommendation
>
> The Private Sector should establish formal mutual aid agreements between industry stakeholders to enhance the robustness of Europe's networks by bringing to bear the full capabilities of the European communications community to respond to crises.

The recommendation was made based on extensive analysis of the situation in Europe, and included interviews with over 200 European stakeholder experts and analysis of over 30,000 distinct data points. The recommendation factored in the following critical points:

- competition is a healthy characteristic of the free market
- appeals to use MAAs are directed in part to the corporate conscious regarding the general well-being of fellow Europeans
- formal agreements have important benefits over ad hoc approaches, such as having contacts that extend beyond a few personal relationships that may not be enough in a crisis

Following the release of the ARECI Report, several follow up workshops were convened that resulted in formal MAAs being developed and implemented.

Rather than retrace the steps of the ARECI progress, this current ENISA initiative is intended to build on the ARECI successes and promote the further deployment of this effective resilience building measure throughout Europe.

---

[2] Rauscher, Karl F., *Availability and Robustness of Electronic Communications Infrastructures (ARECI) Report*, European Commission-sponsored Bell Labs Study, March, 2007.

[3] Appendix A has the complete language of ARECI Recommendation 3.

2.2 Objective

The objective of this initiative is to promote the resilience of European ICT infrastructures through the use of MAA strategies. To accomplish this, the *value* of mutual aid assistance will be described, insights into *challenges* in implementing MAAs will be captured and *guidance* will be articulated that will lead to greater utilization of this advanced emergency preparedness measure.

2.3 Scope

Mutual Aid Agreements are arrangements entered into by two or more parties that make provision for lending assistance across normal boundaries during an emergency situation. The types of mutual aid with the scope of this study includes:

Sector orientation

- private sector aid to private sector
- private sector aid to public sector
- public sector aid to private sector
- public sector aid to public sector

Types of assistance[4]

- equipment
- services
- manpower

Geographical range

- local
- national
- regional (within Europe)
- international

Network and Technology

[4] Key Observation 6, *Ingredient Transfer Potential*, and Key Observation 7, *Offloading Payload*, provide more details on this subject.

- all network access types
    - cable (coaxial cable)
    - optical (fibre optic cable)
    - wireless (air interface)
    - wire line (copper wire)
- all technologies (ATM, BWA, DOCSIS, CDMA, GSM, IN, IP, IMS, MPLS, SIP, C7, SS7, SONET, SDH, 3G, 4G, TDM, WIFI, WLAN, WIMAX, …)
- all services types (data, hosting, Internet, test, video, voice …)

Formality

- ad hoc (informal)
- contracted (formal)
- combinations of informal and formal

3 Key Observations

This section presents twelve observations that are pivotal in understanding the situation in Europe for why mutual aid agreements are underutilized as a strategy for preparing for catastrophic events. Other relevant observations could be presented here, but these are the crucial ones on which future recommendations will be made (i.e. Phase 2).

In addition to its brief title, each observation is composed of three elements: its *Essence*, an *Examination*, and its *Effect*. The first provides a concise statement of the heart of the matter. The second, an analysis to enhance understanding of why the observation is what it is. The third element underscores the significance of the insight.

The twelve Key Observations are summarized below. Their order is significant as there is a progressive logical flow for most of them. Observations 1 through 5 deal progressively with the environment that affects decision-making in emergency preparedness. Observations 6 through 8 address the actual shared resources in a mutual aid situation.

1 Maximum Opportunity for Mutual Aid Assistance

Mutual aid provides high value for emergency situations that are typically of (a) low frequency and (b) of very high impact.

2 Tail Event Syndrome

Corporate and government emergency preparedness is often reactive in nature, and little forethought is usually given to low frequency, catastrophic events.

3 Planning

The degree of planning for low frequency catastrophic events suffers from diminished responsibilities for managing responses for these types of events, as they are treated as out of scope.

4 Economic Considerations

Critical emergency preparedness planning neglects low-probability events that have a high impact due to the very natures of these two distinguishing attributes.

5 Best Effort Acceptance

Emergency response and restoration capabilities are usually considered successful based on best effort with available resources, and especially so for rare, unexpected events.

6 Ingredient Transfer Potential

Resource sharing is possible for six of the eight ingredients that constitute information and communication technology (ICT) infrastructure: power, environment, hardware, software, networks and human.

7 Transfer of Responsibility

The ultimate support is provided when the responsibility for completing services is transferred between contracted parties.

8 Mutual Aid is Good Policy

Mutual aid agreements are an advanced means of extending resilience through the use of mutual common interests.

9 Resource Sharing Constraints

Perceived and real constraints regarding competitive and legal issues impede early and sustained dialogue with potential mutual aid partners.

10 Mutual Aid Successes

Mutual aid agreement activity in Europe has been largely uncelebrated and therefore general awareness suffers.

11 Full Spectrum Emergency Preparedness

Mutual aid agreements are essential for critical infrastructure operators that need to be prepared for the full range of crisis scenarios.

12 Smart Planning

The utilization of mutual aid agreements for managing low frequency, high impact events is an emergency preparedness ROI breakthrough.

3.1 Maximum Opportunity for Mutual Aid Assistance

Essence

Mutual aid provides high value for emergency situations that are typically of (a) low frequency and (b) of very high impact.

Examination

The frequency of events varies based on type, region and other factors. Certain types of events like power outages and cable cuts are more common in most regions than are terrorist attacks or war. The ability to respond to *higher* frequency type events is tested on a *more* regular basis and therefore organizations are *likely* to have higher degrees of competency, available resources and expectations for performance for these types of events. The complement is also true, in that the ability of organizations to respond to *lower* frequency type events is tested on a *less* regular basis and therefore organizations are *unlikely* to have higher degrees of competency, available resources and expectations for performance for these types of events. There are therefore competency, resource and performance management gaps for low frequency events.

In addition, for events that have very high impact, there is more likelihood that the resources of a single organization can be overwhelmed.

For these two reasons, applicability or ''sweet spot for mutual aid is most beneficial for low frequency events of very high impact

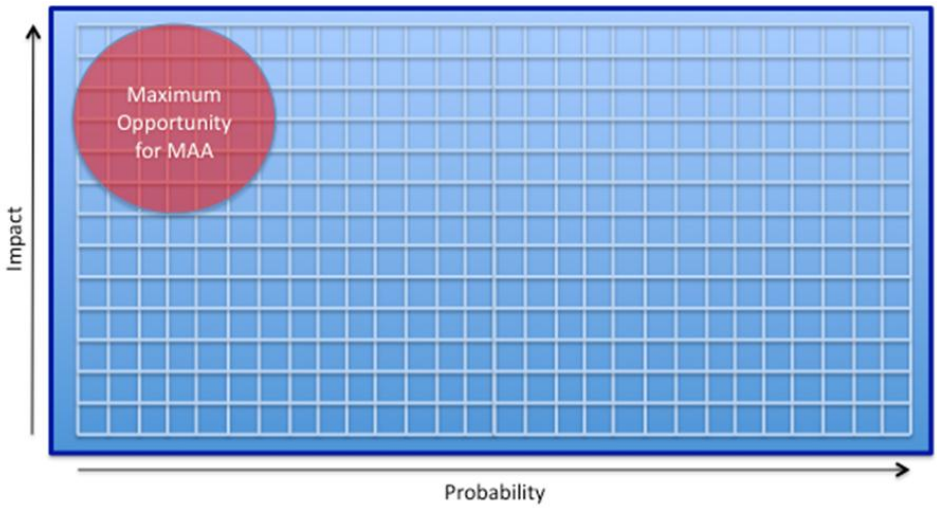

Figure 1. Event Frequency vs Event Impact.

Effect

The significance of this observation is that without a mature understanding of the types of emergency preparedness scenarios, the value proposition for mutual aid agreements will be lost.

3.2 Tail Event Syndrome

Essence

Corporate and government emergency preparedness is often reactive in nature, and little forethought is usually given to low frequency, catastrophic events

Examination

A familiar saying has it that *"Generals are always prepared to fight the last war."* So too are business and government leaders when it comes to preparing for crises. The reactive influence in establishing expectations for future events is strong. While learning from the past certainly makes sense, and should be a most basic requirement, the danger of tunnel vision with regard to unfamiliar or less frequent events is very real, as the future is truly unpredictable.

When the broad spectrum of events is considered by planners with limited resources, it is inevitable that political and other forces will shape the contour of their focus with an alignment that is either disproportionate with the actual expected frequency of events or with the actual expected potential impact of such events. This can take place for a number of reasons. In addition to a simple over-reaction to the last events on memory, other factors include insufficient rigor or discipline in planning, a bias in prioritization, (e.g., from special interests), or a poor understanding of the optimum parameters to effectively define an appropriate contour of focus.

The mindset of diminished responsibility on the part of authorities and leaders for being prepared for handling events within the tail of the distribution of events is evident not only within government organizations and industry, but also among the media and general public. Some of this acceptance is propagated from a lack of awareness of planning strategies such as mutual aid agreements, that if implemented could reduce the duration and impact of the most serious events faced.

Ultimately, it is problematic that responsibilities are defined such as to overweigh previously experienced events relative to the events that fall within the tail of the distribution, but which could have a devastating impact.

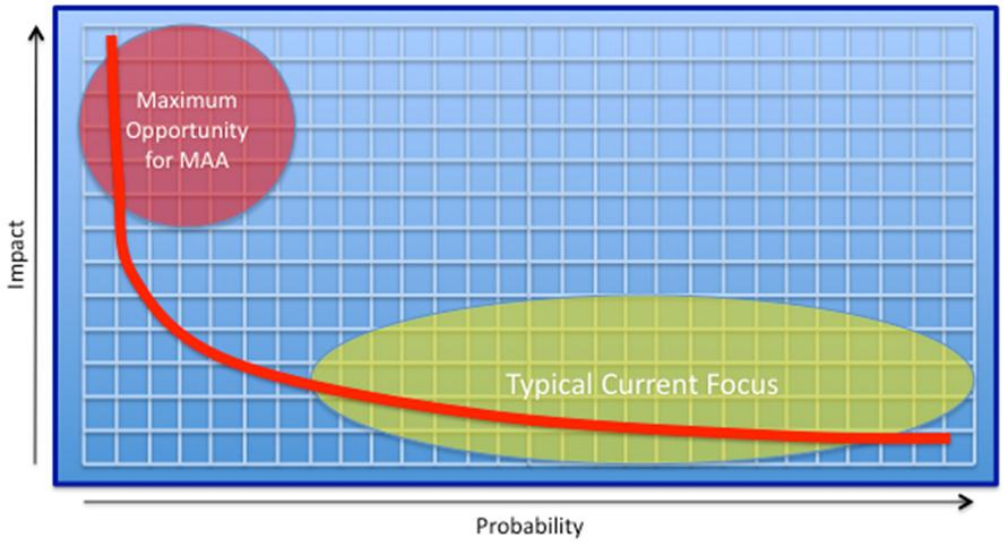

Figure 2. Neglected Distribution Tail

Effect

The significance of this observation is that without key decision makers taking more proactive postures toward emergency preparedness for low frequency events that could have a high impact, their organizations - and direct and indirect stakeholders - will be ill-prepared for the worst crisis scenarios. Since the continued operation of critical infrastructures is vital to national security, economic stability and public safety, getting the balance of focus right is vital.

3.3 Planning

Essence

The degree of planning for low frequency catastrophic events suffers from diminished responsibilities for managing responses for these types of events, as they are treated as out of scope.

Examination

There is a natural high correlation between an organization's responsibilities and how it spends it resources. This is also true for organizations tasked with emergency preparedness. During the 1950s and 1960s, when the likelihood of a nuclear war was felt to be a real and present danger, many North Atlantic Treaty Organization (NATO) countries developed and implemented civil defence plans that included specifics on how to survive a nuclear attack. However, there are few critical infrastructure providers that have plans for robust operations in response to a nuclear catastrophe. While it is fortunate that nuclear explosions have been avoided for many decades, it is important to remember that these and other high impact scenarios have a *non-zero* probability of occurring. Most planning today is limited to covering scenarios that have been experienced recently by that organization or by others in the region or perhaps world.

Effect

When there are not plans for managing the response to catastrophic events, the impact of such events will likely be greater, meaning more lives and property lost.

3.4 Economic Considerations

Essence

Critical emergency preparedness planning neglects low-probability events that have a high impact due to the very natures of these two distinguishing attributes.

Examination

Since preparing for emergencies is not the core business objective for private sector companies, it is managed as a cost of doing business.[5] It is therefore understandable why such decisions would be made with good business analysis, taking into account the cost of a given course of action and expected benefits. There are two simple factors for why planning for tail events falls short.

First, any opportunity for a return from an investment made is rare for these events themselves are rare and therefore the responsibility for being prepared is not established and planning not undertaken. This point is directly derived from Observations 2 and 3, Tail Event Syndrome and Not in the Plan, respectively, that underscore the basic reactive mindset that permeates emergency planning, such that low probability events are neglected and responsibilities and plans are not established.

Second, high impact events have enormous costs precisely because they have a high impact: large scale equipment damage, employee resource demand beyond that of the organization workforce and extended hours for the same.

Thus the event *in*frequency implies a *low* return and the *high* impact, a *high* investment. The combination of these two factors forms an imposing ROI barrier. In fact, these are the exact opposite conditions that attract business investment – *low* investment and *high* return.

Effect

This observation presents the insight that a typical internally sourced plan for managing low probability, high impact events collides with sound business management.

[5] With the obvious exception of those with emergency preparedness-related products and services.

3.5 Best Effort Acceptance

Essence

Emergency response and restoration capabilities are usually considered successful based on best effort with available resources, and especially so for rare, unexpected events.

Examination

Emergency response organizations are often made up of highly dedicated and talented individuals who go to great lengths and employ considerable creativity to perform their service to society in the face of extreme conditions. However, the relative effectiveness of their performance from event to event across organizations is difficult to ascertain objectively.

Emergencies are distractions from the normal operation of a business. But business leaders are sufficiently motivated to resolve them as soon as possible and with as little negative impact on their customers and other stakeholders as possible. Because of the wide variability in the types of events and the often-customized response that is needed to handle any particular situation, determining the success of a response is typically a highly subjective matter. *What types of customer complaints did we receive? How did our competitors fare? Were there negative media reports that make mention of our response?*

Emergency response organizations will likely have concrete measurements of certain quantifiable aspects surrounding an event – e.g., the percentage of customers affected, the number of systems impaired or the duration of the time for which operations were affected. When evaluating the performance of an organization's response, resources limited to the organization's own equipment and personnel will be used to determine "best effort". However, the available resources calculation should be done *with* consideration of mutual aid strategies and the significant positive contribution they can have.

Effect

Without quantifiable measurements it is difficult for managers to optimize performance, which is a primary motivator for employing advanced emergency response strategies such as mutual aid agreements.

3.6 Ingredient Transfer Potential

Essence

Resource sharing is possible for six of the eight ingredients that constitute information and communication technology (ICT) infrastructure: power, environment, hardware, software, networks and human. .[6]

Examination

ICT infrastructure consists of eight ingredients Without any one of these, services cannot be provided. Fortunately, six of these ingredients have transferability potential in the form of tangible resources in an emergency response situation. The following list outlines examples of specific tangible assets that can be shared through a mutual aid agreement:

Table 1. Examples of Assets per Ingredient

Ingredient	Example of Asset
Environment	space in a strategically located data centre
Power	diesel generator
Hardware	cell on wheels (COW)
Software	program on hardware provided (above)
Network	spare critical ingress or egress capacity
Payload	*see Key Observation 7*
Human	cable splicer
ASPR	*see Key Observation 8*

In addition to these six, a seventh, the Payload ingredient, can also benefit from mutual aid agreements, but in a different sense. It is also noted that mutual aid agreements are a type of ASPR, as discussed in Key Observation 8.

---

[6] Rauscher, Karl F., Proceedings of 2001 IEEE Communications Society Technical Committee Communications Quality & Reliability (CQR) International Workshop, Rancho Bernardo, CA, USA, (www.comsoc.org/~cqr); Rauscher, K. F. *Protecting Communications Infrastructure*, Bell Labs Technical Journal Homeland Security Special Issue, Volume 9, Number 2, 2004

Effect

There is wide diversity in the types of resources that can be shared in mutual aid ingredients, essentially spanning the entire range of tangible assets needed to operate ICT systems and networks and provide services through them.

3.7 Transfer of Responsibility

Essence

The ultimate support is provided when the responsibility for completing services is transferred between contracted parties.

Examination

The previous observation captured the value surrounding each of six ingredients that include tangible assets that can be shared between parties during a crisis. However the ultimate reason for this entire infrastructure is for the Payload to be used by the end users per their interests and needs. This seventh ingredient can also benefit from mutual aid agreements, but in a different sense. In contrast to resources being provided by Party B to Party A, the later of which is in need of aid, Payload assistance takes place when Party A offloads its traffic or other services to the care of Party B. So the Payload transfer takes place in the *opposite* direction. When extreme damage has been done to a party's systems and other capabilities, its best option may be to transfer the fulfilment of its service obligations to another party. This is of course undesirable in some situations from a business standpoint as customer loyalty may be challenged in circumstances where customers are introduced to a potential rival. In addition, costs are incurred when the mutual aid contract is exercised and proprietary practices may be exposed. However, for some critical functions, it may be the clear responsible action to take and in the long run will be most appreciated by customers. In fact it may be considered the only acceptable option.

An example of such Payload offload planning can be seen in the Hong Kong area where there is a high dependence upon a Global Undersea Communications Cable Infrastructure (GUCCI) network chokepoint in the Luzon Strait.[7] As a partial remedial countermeasure, network operators have contracted with terrestrial network operators to provide alternative transport services in anticipation of future cuts. Another example is a call centre service being delegated to a contracted party by one that has lost its similar capability.

[7] Connectivity between North America and this primary regional financial center is accomplished almost completely through the Luzon Strait, an area that has experienced two major natural earthquakes in recent history (2006, 2009) that resulted in multiple cables being severed and out of service for extended periods of time. Rauscher, Karl Frederick, *The Reliability of Global Undersea Communications Cable Infrastructure (ROGUCCI), The Report,* IEEE: 2010.

Table 2. Payload Offloading

Ingredient	Examples of Aid
Payload	*creating, processing, storing or transporting data*

Effect

For critical functions with high dependence for public safety, economic stability and national security, a comprehensive suite of agreements that extends to service provision may be appropriate.

3.8 Mutual Aid Is Good Policy

Essence

Mutual aid agreements are an advanced means of extending resilience through the use of mutual common interests

Examination

Mutual aid agreements are a type of ASPR[8]. These agreements enable a party to anticipate the behaviour of another, the behaviour namely being that they will provide specified resources under specified conditions. Characteristics of mutual aid agreements include the following:

- can be initiated by either the private or public sector
- either party can request implementation, *but both parties* must agree to implement it during the disaster.
- may require governmental legal support (depending on the regulatory framework)[9]
- as an ASPR instrument, speed of development and implementation is relatively fast
- formal agreements are preferred over informal arrangements
- cost is low when compared to other alternatives to achieve similar levels of resilience
- effectiveness in strengthening resilience is high
- risk not to implement MAAs is correlated with the likelihood of catastrophic events

[8] *Agreements, Standards, Policy and Regulation*

[9] See Key Observation 9, *Resource Sharing Constraints*.

Table 3. Complement to Tables 1 and 2.

Ingredient	Example
ASPR	*mutual aid agreements*

Effect

MAAs can be the difference as to whether or not critical services will be provided during times of a catastrophe.

3.9 Resource Sharing Constraints

Essence

Perceived and real constraints regarding competitive and legal issues impede early and sustained dialogue with potential mutual aid partners.

Examination

Mutual aid agreements are often never pursued because of the difficulty in starting discussions with potential competitors. This is due to a number of reasons. First, there are often legal constraints that prevent competitors from collaborating and the scope of such restrictions may be too vague as to warrant caution on the part of companies. Another reason is that the competitive spirit of a company may make it reluctant to engage in effective dialogue. In addition, competitors often have concerns about revealing too much about its operations should an agreement ever go into effect.

Mutual aid agreements can also be entered into with non-competitive organizations. One of the barriers to success in such an option is the lack of awareness of suitable partners. Another is that entering into such an agreement with non-competitive organizations suggests that one of the aid may only be one way, and not a mutual aid agreement.

Effect

Establishing MAAs requires overcoming competitive, legal and regulatory hurdles.

3.10 Unsung Mutual Aid Successes

Essence

Mutual aid agreement activity in Europe has been largely uncelebrated and therefore general awareness suffers.

Examination

Mutual aid agreements play a critical role in enabling companies and stakeholders to demonstrate a best-in-class level of emergency preparedness. However, their benefits are less well known than they should be given their value to society, government and businesses.

Several factors diminish the visibility and resulting general awareness of mutual aid agreements as an advanced instrument of emergency preparedness. First, the subject of emergency preparedness is seldom of interest, that is, until disaster strikes. Second, the relative low frequency of their being needed tracks with the rareness of catastrophic events themselves, so opportunities to be in the focus of discussion are uncommon. Finally, participants may not want to expose the dependencies they have developed with other parties for reason that include, corporate image, competitive advantage and security.

Effect

There are opportunities for new applications of MAAs in Europe and resulting benefits for infrastructure resilience.

3.11 Full Spectrum Emergency Preparedness

Essence

Mutual aid agreements are essential for critical infrastructure operators that need to be prepared for the full range of crisis scenarios.

Examination

Most organizations that provide an important function for society are already prepared for the more common emergencies, but are less likely to be prepared for uncommon events. The likelihood of preparedness decreases with the probability of the event. This leaves a gap in emergency preparedness for many organizations and their stakeholders. Mutual aid agreements address that gap with effective means of greatly enhancing an operation's resilience for events that are of low frequency and high impact. The other options are for an organization to invest more fully in its own internal capacity at considerable cost, or to simply be unprepared for the worst-case events.

There are scenarios where a party's contracted mutual aid partner may also be affected. For this reason consideration needs to be given with regard to factors of the contracted party such as the nature of the operation, the region of operation, the time to transport resources, the available modes of transportation and the languages spoken by employees.

Effect

Mutual aid agreements are an effective means of providing operational resilience for low probability, high impact crises.

3.12 Smart Planning

Essence

The utilization of mutual aid agreements for managing low frequency, high impact events is an emergency preparedness ROI breakthrough.

Examination

Mutual aid agreements provide a low cost means of greatly enhancing an operation's resilience for events that are of low frequency and high impact. An alternative approach for achieving similar levels of resilience, is for an organization to invest more fully in its own internal capacity, however the costs of preparing for extreme scenarios is too often an insurmountable cost barrier.

Developing and implementing mutual aid agreements to address the emergency preparedness gap that most organizations have is smart planning because it takes advantage of a relatively low cost investment and provides a high return, if needed.

Effect

Mutual aid agreements are an attractive, low cost option for supporting operational resilience for low probability, high impact crises.

4 Summary & Next Steps

The 2007 ARECI Report called on the private sector across Europe to take the initiative to establish formal mutual aid agreements in order to enhance existing resilience capabilities. As a result, some noteable progress has been made, however there are many more opportunities for mutual aid agreements to be implemented. It is imperitive that the private sector in Europe champion the available opportunities because the difference between gettting, or not getting this done, can mean the continued operation, or failure, of critical infrastructure in the times when it is most needed by society. Failure in this area can mean the loss of life and property at significant levels.

The first phase of this initiative has presented twelve Key Observations that concisely capture the most important aspects of the current landscape in Europe reagarding the state of MAAs. These observations are foundational to recommendations to be provided in the MARIE Phase 2 Report.

The approach used by the MARIE Study and Report builds upon existing progress made (i.e., ARECI). It extends this progress by conducting analyses of the current situation that would lend insights into how best to move forward, providing guidance to achieve further MAA deployments and creating an environment in Europe that will continue to sustain long term utilization of mutual aid strategies that greatly enhance European critical Information infrastructures.

These objectives are planned to be carried out across four phases:

Table 4. MARIE Study and Report Overview.

Phase	Focus	Deliverables
1	Key Observations	Report (Issue 1)
2	Recommendations	Report (Issue 2)
3	Implementation	Public Workshops & Updates
4	Monitoring	Public Updates

5 References

Achievements and Next Steps: Towards Global Cyber-Security, European Commission Communication on Critical Information Infrastructure Protection, Brussels, March 2011.

Andrianavaly, Valerie, *Security & Resilience in Information Society*, Proceedings from ARECI Mutual Aid and Emergency Preparedness Workshops, London, December 2007.

Fallout Protection: What To Know And Do About Nuclear Attack, United States Department of Defense and The Office of Civil Defense: December 1961.

Gomes, Jose Fino, *Emergency Preparedness and Network Infrastructures*, Proceedings from ARECI Workshop on Resilience of Electronic Communications Infrastructures, Lisbon, Portugal, May 2009.

Krock, Richard E., *Lack of Emergency Recovery Planning Is a Disaster Waiting to Happen,* IEEE Communications Magazine, Volume: 49 Issue: 1, ISSN: 0163-6804, January 2011, pages 48-51.

Krock, Richard E., *Recent Disasters and Lessons Learned*, Proceedings from ARECI Workshop on Resilience of Electronic Communications Infrastructures, Lisbon, Portugal, May 2009.

Lindford, Noel, *A BCM Network Proposal*, Proceedings from ARECI Mutual Aid, Information Sharing, and Emergency Preparedness Workshops, Lisbon, Amsterdam, April 2008.

Nillson, Jonny, *Preparing for Incidents in Sweden*, Proceedings from ARECI Workshop on Resilience of Electronic Communications Infrastructures, Lisbon, Portugal, May 2009.

NRSC Pandemic Planning Checklist, Version 1, ATIS, August 2009.

Rauscher, Karl F., *Availability and Robustness of Electronic Communications Infrastructures (ARECI) Report*, European Commission-sponsored Bell Labs Study, March, 2007.

ec.europa.eu/information_society/policy/nis/strategy/activities/ciip/areci_study/index_en.htm

Rauscher, Karl Frederick, *The Reliability of Global Undersea Communications Cable Infrastructure (ROGUCCI), The Report,* IEEE: 2010.

www.ieee-rogucci.org

Verwaayen, Ben, *Remarks at the EU Ministerial Conference on Critical Information Infrastructure Protection (via video recording)*, Tallinn, April, 2009.

6 Acronyms

3G	Third Generation Wireless
4G	Fourth Generation Wireless
8i	Eight Ingredient (Framework for ICT Infrastructure)
ARECI	Availability and Robustness of Electronic Communications Infrastructure (Report)
ATM	Asynchronous Transfer Mode
ASPR	Agreements, Standards, Policy and Regulation
BWA	Broadband Wireless Access
C7	Signalling System 7
CDMA	Code Division Multiple Access
COW	Cell on Wheels
CIIP	Critical Information Infrastructure Protection
DOCSIS	Data Over Cable Service Interface Specification
EC	European Commission
EIII	Electronic Infrastructure Integrity Institute
ENISA	European Network and Information Security Agency
EU	European Union
GSM	Global System for Mobile
GUCCI	Global Undersea Communications Cable Infrastructure
ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronics Engineers
IMS	IP Multimedia Subsystem
IN	Intelligent Network
IP	Internet Protocol
MAA	Mutual Aid Agreement

MPLS	Multiprotocol Label Switching
NATO	North Atlantic Treaty Organization
NGN	Next Generation Networks
NRSC	Network Reliability Steering Committee
ROI	Return on Investment
SDH	Synchronized Digital Hierarchy
SIP	Session Initiation Protocol
SONET	Synchronized Optical Networking
SS7	Signalling System 7
TDM	Time-Division Multiplexing
WIFI	Wireless Fidelity IEEE 802.11
WIMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area

7 Attachment A. ARECI Report Recommendation 3

4.3 Formal Mutual Aid Agreements

Background

The enterprises that comprise the critical infrastructure of Europe are fiercely competitive, as is appropriate in a free market economy. They can best serve the public by tending to their own networks and maximizing the return on their investment. However, as citizens of the European community they also suffer when the critical infrastructure that serves the community is imperilled during a crisis, either natural or man-made. At these times, given the vital nature of communications networks, the greater well-being of society and the restoration of communications services outweigh individual business interests. Mutual aid between companies can greatly extend the robustness of their networks for a relatively low cost.[142] *However, while there are some few exceptions, mutual aid in Europe is not widely practiced.*[143] *Further, when mutual aid is practiced, it is largely ad hoc and susceptible to failure – especially during times of stress.*[144, 145]

Recommendation 3
The Private Sector should establish formal mutual aid agreements between industry stakeholders to enhance the robustness of Europe's networks by bringing to bear the full capabilities of the European communications community to respond to crises.

Required Commitments

To sustain the viability of this Recommendation, the Private Sector, Member State and European Institution governments must be committed to defined courses. Specifically,

(a) Private Sector service providers, network operators and equipment suppliers must acknowledge and accept their reasonable responsibility for maintaining critical services that directly impact social well-being and national security.

(b) The Private Sector must be willing to offer resources to help competitors in times of crisis.

(c) Service providers and network operators must consider executing mutual aid agreements with a wide range of industry participants, including non-traditional entities that comprise the European critical infrastructure.[146]

(d) Government powers (especially local governments) must provide communications workers with priority access to disaster sites during crisis situations and assistance in procuring and moving necessary materials (e.g., fuel).[147]

(e) European Institution and Member State governments must encourage industry cooperative efforts by removing legal barriers to mutual aid for crisis situations.

142 Companies that establish formal mutual aid agreements are able to make use of a wide range of "back-up" equipment only when they need it, and avoid the costs of its purchase and maintenance.
143 2006 European Experts Workshop on Policy & Human, Issues Voting, slide 6, www.comsoc.org/~cqr/EU-Proceedings-2006.html.
144 Key Finding 3, Emergency preparedness is largely informal, Section 3.1
145 2006 European Experts Workshop on Power & Environment, Issues Voting, slide 8, www.comsoc.org/~cqr/EU-Proceedings-2006.html.
146 Key Finding 4, Future network operators may not be recognised as part of the critical infrastructure, Section 3.1.
147 A key finding of the U.S. industry experience with the September 11, 2001 terrorist attacks and the 2005 Hurricane Katrina New Orleans Flood was that emergency access to these disaster sites by communications company technicians was vital to the recovery services.

Purpose
This Recommendation addresses the issue of *how to significantly extend the robustness and resiliency of any given network through the shared resources of other industry stakeholders.*

Benefits of Formal Mutual Aid Agreements
The nature of disasters is such that one network is often impaired more than another. The restoration of the former can be greatly assisted by the resources of the later. Examples include portable generators, fuel, personnel, or specific network equipment. In these situations, it may be in the best interests of the pubic – and individual companies, for competitors to work together. A formal, well planned agreement, entered into voluntarily as part of emergency preparedness and business continuity planning, fosters swift and coordinated responses to disaster situations and takes advantage of the combined strengths of stakeholders to further the public good.[148] While these agreements are not legally binding in terms of requiring a participant to give up resources, nor do they necessarily suggest that offered assistance is free, they do provide a framework that can expedite the emergency assistance process. Formal mutual aid agreements provide a low cost option for strengthening the robustness of any given network in a competitive environment.

Alternative Approaches and Their Consequences
- Stakeholders fend for themselves . . . *resulting in higher industry costs to adequately prepare for disasters, or inadequately prepared stakeholders.*
- Informal agreements between stakeholders . . . *take additional time to implement when disaster strikes.*
- Agreements based on personal contacts . . . *result in single points of failure should the personal contact be unavailable.*
- Agreements with only traditional stakeholders . . . *exposes elements of future networks critical infrastructure to inadequate support in times of crisis.*
- Private Sector efforts without European Institution or Member State support . . . *may encounter regulations that encumber the mutual aid process – discouraging industry efforts, raising costs, and reducing the reliability of critical infrastructure.*

Next Steps
The implementation of this Recommendation can be accelerated by following these suggested steps:

3-1. The Private Sector should convene to establish the characteristics that should be part of a standard template for mutual aid.[149, 150] These discussions should be open to any stakeholder who provides critical infrastructure.

3-2. Member States and European Institutions should examine regulation under their influence or control to ensure that it does not impede mutual aid between competitors or across national boundaries during crisis situations.
3-3. Mutual aid scenarios should be incorporated into industry, national, and international disaster recovery exercises.

148 Key Finding 58, Mutual aid agreements are essential for effective incident response, Section 3.4.
149 The standard template, once complete is intended to be a starting point (i.e. it can be modified by users to suit their specific requirements and preferences).
150 Examples of aspects of an agreement template include: lists of available equipment, services, network capacity, schedule of fees, 24-hour contact information, safety, confidentiality, and legal and liability framework.

P.O. Box 1309, 71001 Heraklion, Greece
www.enisa.europa.eu