ADVANCED INFORMATION TECHNOLOGY APPLICATIONS IN DISASTER RISK REDUCTION

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Republic of Bulgaria

BULGARIA


ROMANIA
YOGOSLAVIA
BULGARIA
Varna
Sofia
Burgas
Plovdiv
BLACK SEA
MACEDONIA
TURKEY
GREECE

BULGARIA

Bulgaria

- **Area** - Total 110,993.6 km^2 (105^{th})
- **Water** - 0.3 %
- **Population** - 7,000,000 (98^{th})
- **Density** - 66.2/km^2 (139th)
- **Capital** – Sofia, 42°41′N 23°19′E
- **Alphabet** – **Cyrillic** (purely phonetic), used in 11 countries

Slavic Language Groups

Language Group – Slavic (> 300 million people)

- **East Slavic** - Belarusians, Russians, and Ukrainians;
- **West Slavic** - Czechs, Poles, and Slovaks;
- **South Slavic** - Bosnians, **Bulgarians**, Croats, Macedonians, Montenegrins, Serbs, and Slovenes.

University of National and World Economy

Established 1920

http://www.unwe.bg

Faculty of Applied Informatics and Statistics

Departments:

- Information Technologies and Communications (established 1967)
- Statistics and Econometrics (established 1947)
- Mathematics (established 1963)

Natural Disasters

CONSEQUENCES

- Destruction
- Lost of Communications
- Diseases
- Famine
- Damages
- Others

Definition of The Problem

Landslides, avalanches, earthquakes, tsunamis, volcanic eruptions and floods are some natural calamities that occur due to changes in weather patterns and soil erosion. Natural disasters come without warning and takes lives of tens, hundreds and thousands of people. Natural disasters can destruct entire cities if precaution is not taken.

The types of natural calamities are earthquakes, floods, tornadoes, hurricanes, tsunamis, wildfires and thunderstorms. The effects of natural disasters are very serious and the destruction caused may take a very long time to recover. The damage caused by natural disaster is severe and may cause damage of billions of dollars. The natural disasters cause severe damage and after the disasters the destruction continues with outbreak of epidemic diseases, undernourishment, sickness and other diseases

Definition of The Problem (contd.)

With the increase of natural disasters that have occurred in the past years it is expected their frequency will continue to increase in the coming years. From a business point of view, the evaluation of the risk of a natural disaster occurring comes in when talking about investing in a large in-house infrastructure. However the idea of having everything at the same physical location is not reasonable since all could be destroyed in a flash.

In order to find alternatives to this problem, a lot of technology experts turn to modern ICT in a hope to solve this issue. They could permit to have redundancy spread across the world to make sure that even if a part of the world is touched by such disasters, that everything can stay in operating order.

Emergency Management - Definition

(Disaster) **Emergency management** is the generic name of an interdisciplinary field dealing with the strategic organizational management processes used to protect critical assets of an organization from hazard risks that can cause disasters or catastrophes, and to ensure the continuance of the organization within their planned lifetime.

The Advent of New ICT Devices

- Volume – more than 5 billion mobile phones and tablets on the market today;
- Constant use - 37% of mobile phone users under the age of 30 are permanently in touch with their devices;
- Video content – social network sites deliver more hours of video each day that all the traditional networks combined, which is 69% of all web traffic;
- Domination of mobile platforms – Android and Apple have seized 97% of all mobile devices' browsing.

Social Collaboration

Social Collaboration is implemented by Web platforms that enable the interactive web by engaging users to participate in, comment on and create content as means of communicating with other users and the public.

SOCIAL COLLABORATION (CONTD.)

- Allows interactions to cross one or more platforms through social sharing, email and feeds.
- Involves different levels of engagement by participants who can create or comment or on social media networks.
- Facilitates enhanced speed and breadth of information dissemination.
- Provides for one-to-one, one-to-many and many-to-many communications.
- Enables communication to take place in real time or asynchronously over time.
- It is device indifferent – it can take place via a computers, tablets and smartphones.
- Extends engagement by creating real-time online events, extending online interactions offline, or augmenting live events online.

Influence of Social Technology

- **Social provides an important need for mobility**: Accessing social networks is one of the primary uses of mobile devices and social interactions have much more value when they are possible wherever the user is located.
- **Social depends on cloud for scale and access**: Social networks benefit from scale, the kind of scale that is really only practical through cloud deployment.
- **Social feeds and depends on deep analysis**: Social interactions provide a rich source of information about connections, preferences and intentions. As social networks get larger, participants need better tools to be able to manage the growing number of interactions, which drives the need for deeper social analytics.

Mobile Computing

Mobile computing is human–computer interaction by which a computer is expected to be transported during normal usage. Mobile computing involves mobile communication, mobile hardware, and mobile software:

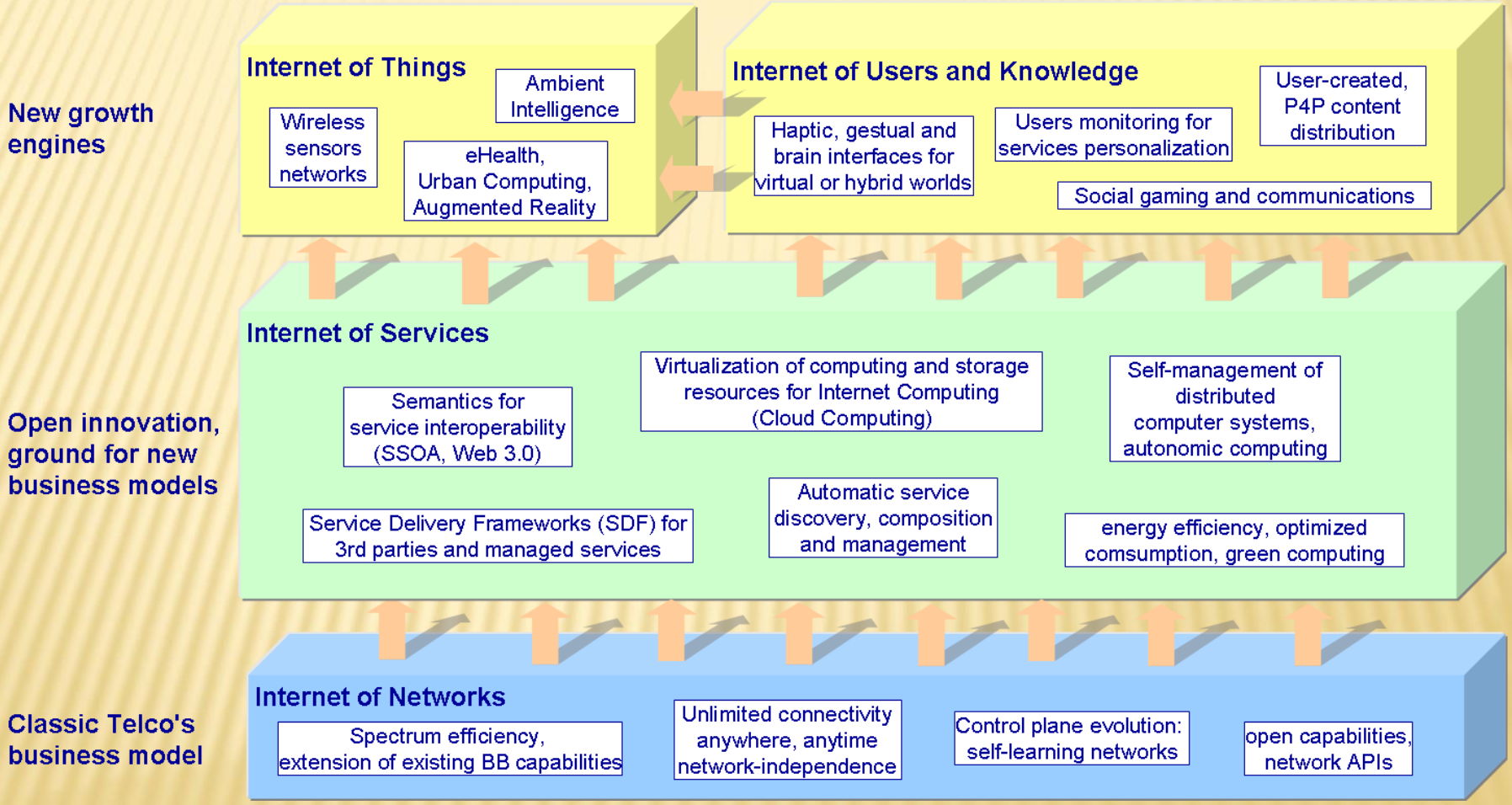
- Mobile communication issues includes ad-hoc and infrastructure networks as well as communication properties, protocols, data formats and concrete technologies.
- Mobile hardware includes mobile devices or device components.
- Mobile software deals with the characteristics and requirements of mobile applications.

Internet of Things

Global network of uniquely addressed and connected objects on the basis of standard communication protocols.

- IoT will have a higher level of heterogeneity since the objects will differ in functionality and in technology, but the application areas will be for a common communication environment.
- New communication protocols will be developed on the basis of semantic languages, since IoT will have to process billions of objects.
- The sensor networks will require a great computing power to process extremely large volumes and to provide a wide range of useful services.

ARCHITECTURE OF IOF



Massive Intelligent Use of Data

Organizations are finding ways to find value in and insight from both structured and unstructured data from internal and external sources. This is expected to complement but not replace long-standing information management programs and investments in data warehouses, business intelligence suites, reporting platforms and relational database experience.

Big Data

- The term "big data" is to describe new technologies and techniques that can handle an order of magnitude or two more data than companies and organizations are capable today.
- The ability to extract data from different sources to perform a specific task and the ability to provide information in real-time with the right context is essential. Information is stored everywhere.
- Social, mobile and cloud make information accessible, shareable and consumable at anytime and anywhere. The knowledge to capture the right information and utilize the smaller subsets applicable to a specific company, a product and customers, at a specific point in time, will be critical to new opportunities and for avoiding risks.

Cloud Computing

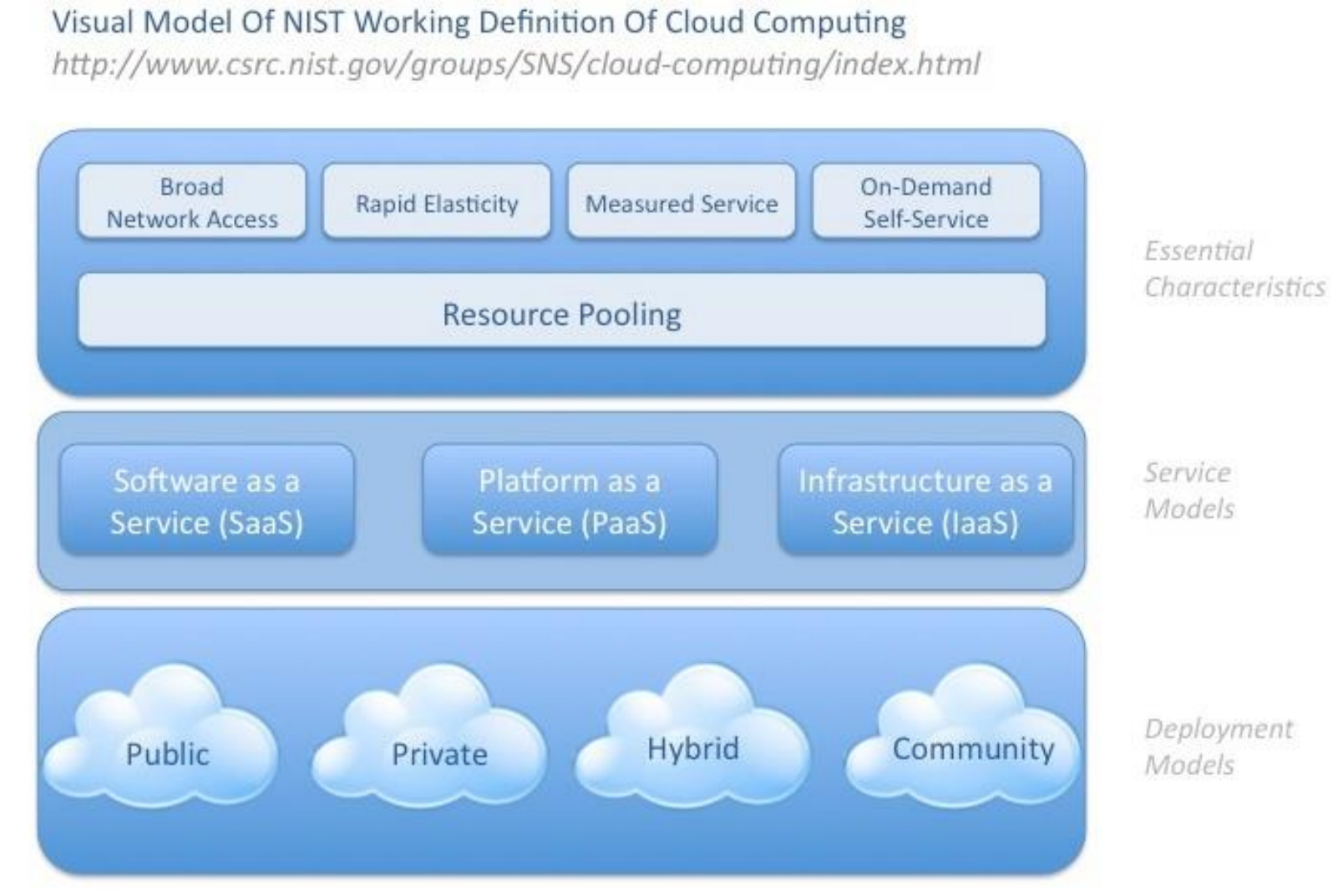
Cloud computing is an on-demand service model for the provision of ICT services based on virtualization and distributed computing technologies. The common business applications are delivered online as services which are accessed from another web service or software like a web browser, while the software and data are stored on servers.

Cloud Computing

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (PaaS)

- Public Cloud
- Private Cloud
- Community Cloud
- Hybrid Cloud

Cloud Computing



Cloud Computing in Emergency Management

- Cloud computing offers capabilities to automate many services, to expedite the implementation of secure configurations to information devices, to reduce dependence on removable media due to broadband services, and to lower costs in disaster recovery and data storage.

- Many companies and organizations typically store their business information in multiple data systems across many different servers located in different countries around the world. Trying to track down the information that is required can be difficult if working remotely through a mobile computing device. When losing the server architecture, the time needed to rebuild everything can cost a lot. If everything is in the cloud, the organizations can restart their operations as soon as they have access to the Internet.

Cloud Computing in Emergency Management (contd.)

- In cloud operations, it is expected that multiple copies of a data set will be created and kept in sync.
- The practice of a business offering a free service to another in an area hit by natural disaster could become a new form of international aid. Under some circumstances virtual machine images of existing workloads can be created in the data center and stored in a cloud data center. In the event of a failure of the former, the virtual machines serve as recovery mechanisms that can be reactivated in the cloud.
- Natural disasters may severely damage Internet access and communications which makes it difficult to access cloud-based servers, applications and data storage. The interruption of network availability is usually temporary, while companies that relied purely on local infrastructure may find their servers completely destroyed and their backup totally lost.

Cloud Computing in Emergency Management (contd.)

- When a disaster occurs, telephone lines in disaster areas are overloaded with calls. Using cloud computing for the emergency management could also improve the computer database by providing government agencies with detailed, real-time disaster information. Recovering data after an emergency can costs typically twice as much as replacing compromised hardware and software. In the case of cloud computing, recovery costs are considerably lower since only local computers used to access the Internet are at risk and user data and cloud servers are protected far from the disaster site.

- In the case of a disaster striking a cloud data center, user data will not be lost since suppliers of cloud infrastructure replicate user data and cloud servers across multiple data centers.

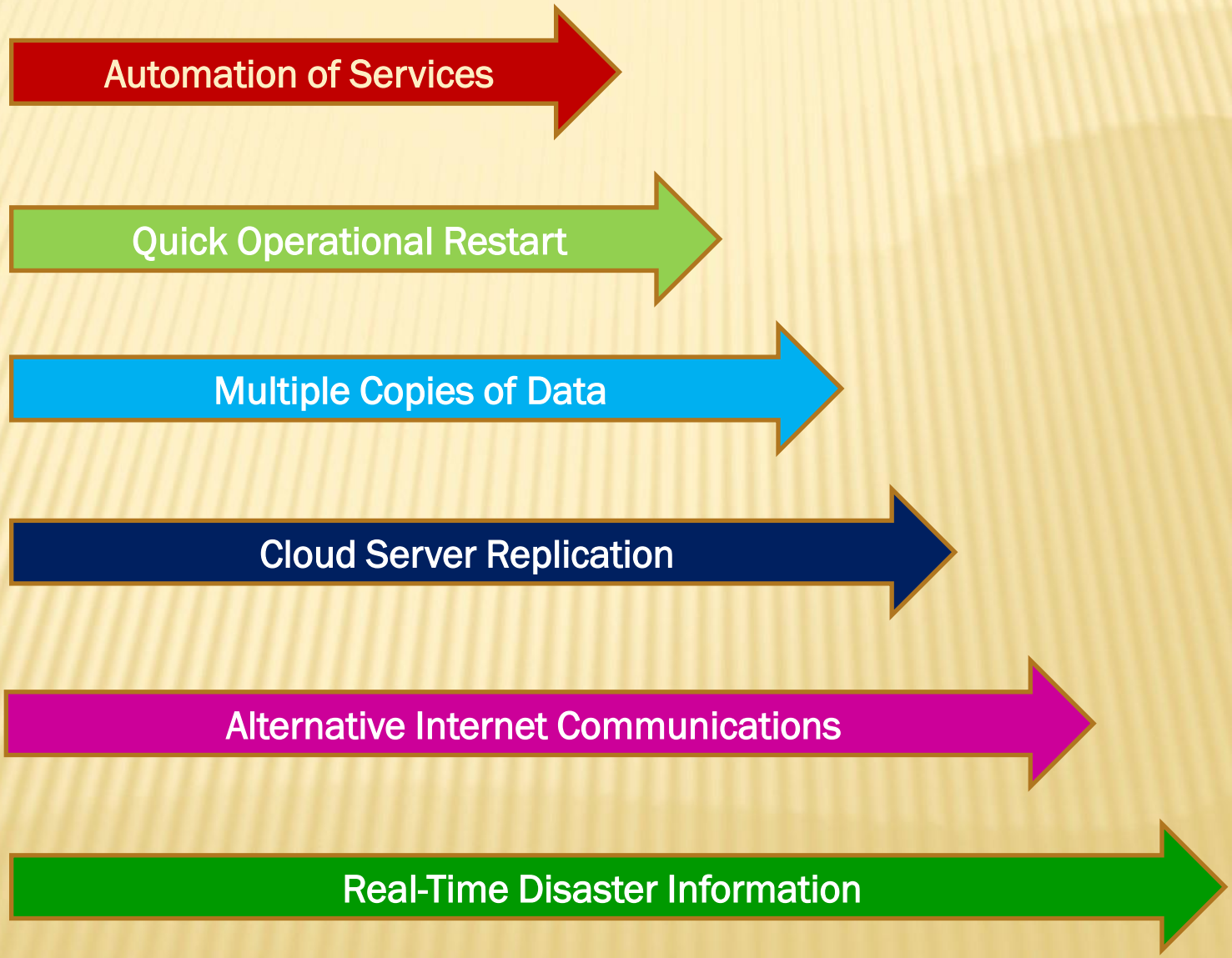
Cloud Computing in Emergency Management (contd.)

- One of the benefits of cloud computing is that information and operations are hosted in well protected data centers. Best cloud providers keep information on numerous systems and locations. Redundancy, availability and reliability are advantages of cloud computing, hence users can access their information quickly, no matter where they are located.

- The cloud is not in one place, meaning the risk of systems failures substantially decreases. In the case of cloud computing, recovery costs are considerably lower since only local computers used to access the Internet are at risk and user data and cloud servers are protected far from the disaster site. In the case of a disaster striking a cloud computing data center, user data will not be lost since suppliers of cloud infrastructure replicate user data and cloud servers across multiple data centers.

- The location of a data center can have a significant impact on the performance of applications running in a cloud computing environment. If a cloud computing provider's primary data center is in country that is to far away from the current location of the natural disaster, the performance of that application will be adversely affected by the prorogated time needed for the messages to travel between the data center and the users in disaster condition.

Cloud Computing in Emergency Management



SUMMING-UP

- Cloud computing is the best solution to the needs and requirements of the government, organizations and individuals responding to catastrophic disasters. Cloud computing services are more readily available for a response to any emergency situation.
- Social collaboration is best conducted by Cloud computing – blogs, wikis, file sharing, and social document collaboration create great opportunities for productivity.
- Mobile computing can be viewed as a cloud infrastructure enhanced to provide a mobile ecosystem for mobile apps and to allow access to apps from mobile devices. The data processing and the data storage happen outside the mobile device, and results are displayed through the mobile device screen or speakers.
- Big data does not only manage large volumes of data, but also controls the velocity, variety, veracity and value (The 5 V's) of data that exists nowadays. It is expected data will continue to grow exponentially in future.
- IoT is becoming a more sophisticated application area that will have significant impact on emergency management.

Current Research Projects

A CONCEPTUAL MODEL OF CLOUD BASED INFORMATION SYSTEM FOR RISK ASSESSMENT FROM NATURAL DISASTERS

- Shenyang University of Chemical Technology, Shenyang, China
- University of National and World Economy, Sofia, Bulgaria

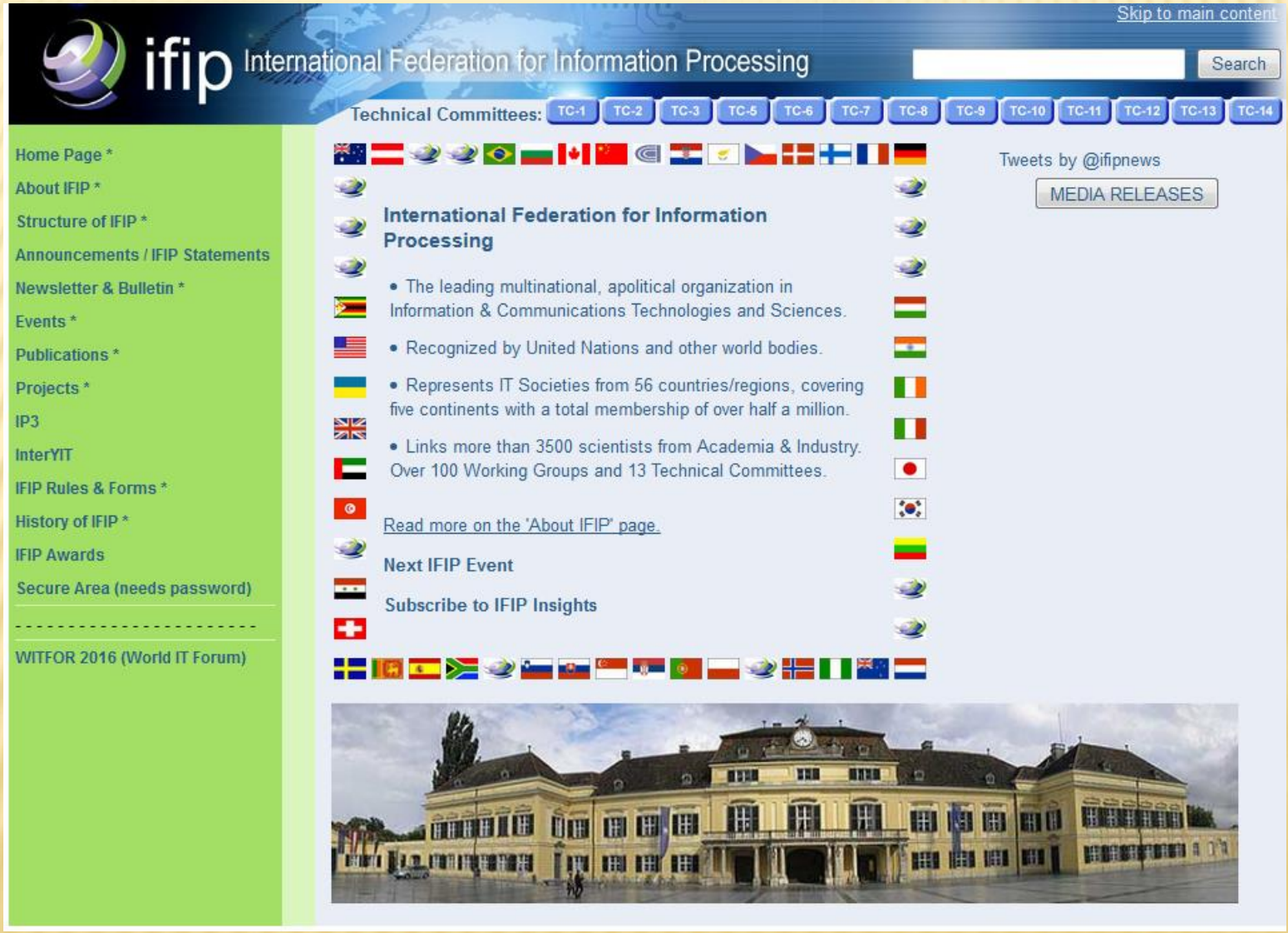
INFORMATION SYSTEM FOR INTEGRATED RISK ASSESSMENT FROM NATURAL DISASTERS

- Bulgarian National Research Fund

PROJECT GOALS

- Definition and analysis of risk sources (possible disasters) and risk components (monitored objects), as well as their interrelationship for both countries – Bulgaria and China;
- Economic and financial assessment of the consequences (losses) for the monitored objects;
- Complex risk assessment by the use of classical and intelligent mathematical methods;
- New information retrieval for the levels of extremity of the monitored objects and presentation of the corresponding recommendations for efficient distribution of the financial funds, defined for preventing and reducing risk from possible disasters;
- Integration of heterogeneous databases with chronological and expert information for the possible disasters for both countries – Bulgaria and China;
- Development of new and adaptation of appropriate existing methods for risk analysis and evaluation;
- Organizating and conducting thematic conferences and training seminars in both countries – Bulgaria and China.
- Development of educational modules for the Ms.Sc. courses and special training.

INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING (IFIP)



MY ROLE IN IFIP

- Vice-chair of IFIP TC5 for New Activities and Interdisciplinary Cooperation
- Vice-chair of the IFIP DCCC (Domain Committee on Cloud Computing)
- Secretary of IFIP DCITDRR (Domain Committee on Information Technology in Disaster Risk Reduction)

IFIP DOMAIN COMMITTEE ON INFORMATION TECHNOLOGY IN DISASTER RISK REDUCTION

The International Federation for Information Processing at its General Assembly, hold on October 8 – 9th, 2015 at the Daejon Convention Center, Daejon, Korea, has proposed the establishment of **DOMAIN COMMITTEE ON INFORMATION TECHNOLOGY IN DISASTER RISK REDUCTION** (***DCITDRR***) to:

- promote disaster risk reduction (DRR) within the IT community;
- provide an additional opportunity for IFIP members to work with external specialized bodies such as UN, UNISDR, ICSU, ITU and ISCRAM;
- coordinate the efforts of member societies as well as different Technical Committees and Working Groups of IFIP in its specific disaster-related field.

DCITDRR BOARD

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Chair
(1st term:2015-2018) TC-11

Diane Whitehouse
Vice Chair
(1st term:2015-2018) TC-9

Erich Neuhold
Vice Chair
(1st term: 2015-2018) TC-5

Plamena Zlateva
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(1st term:2015-2018)

Dimiter Velev
Secretary
(1st term:2015-2018)

Eduard Dundler
IFIP Liaison Secretary
(1st term: 2015-2018)

IFIP ITDRR 2016

First IFIP Conference

on Information Technology in Disaster Risk Reduction

(ITDRR 2016)

November 16 - 18th, 2016,

University of National and World Economy, Sofia, Bulgaria

http://itdrr.unwe.bg/

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