Emerging Digital Services in Cyber Environments

Moderator
Nitin Agarwal, University of Arkansas at Little Rock, USA

Panelists
Valentin Plenk, Institute of Information Systems at Hof University, Germany
Eugen Borcoci, University POLITEHNICA Bucharest, Romania
Maryam Rezaeian, University of Gloucestershire, UK
Nitin Agarwal, University of Arkansas at Little Rock, USA
Valentin Plenk, Institute of Information Systems at Hof University, Germany

• **Bio:** Prof. Dr.-Ing. Valentin Plenk received diploma in electrical engineering from Technical University of Munich. In 1996 he passed his doctorate in the department of mechanical engineering of the Technical University of Munich in the field of surface roughness measurements. Since October 2000 Valentin Plenk teaches control engineering as a full professor at Hof University. After various small research projects he was elected dean of the department of engineering and managed the department from 2003 to 2007 and 2009 to 2015. In his second term he headed the reorganization process that integrated the former textile department into the department of engineering. Since January 2016 he leads the research team for Cyber-Physical Systems at Hof University’s Institute of Information Systems (iisys). Since January 2016 he is the scientific head of the Institute of Information Systems (iisys).

• **Title:** Stories from Digital Mobility Systems / User Assistance Systems / Citizen Science
Eugen Borcoci, University POLITEHNICA Bucharest, Romania

• **Bio:** He is a professor at University „Politehnica” of Bucharest (UPB), Electronics, Telecommunications and Information Technology Faculty. His expertise, teaching activities and research have been oriented to specific domains of telecommunications and computer networks architectures, protocols, technologies and services. His current research interest is on new technologies like Software Defined Networking (SDN), Network function virtualization (NFV), Fog/edge computing, 4G/5G slicing, vehicular communications. He has published 5 books, 4 textbooks and over 170 scientific or technical papers and scientific reports. He has been UPB team leader in many European research projects.

• **Title:** New services and use-case perspectives in the context of the 5G technology".
Maryam Rezaeian, University of Gloucestershire, UK

- **Bio**: She is a committed IT specialist and researcher with experience at researching and teaching in UK academic institutions. Her qualifications include a PhD in Computing with IT Management and a MA in Computing with IT Management from the University of Gloucestershire. Her PhD focuses on Enterprise Resource Planning (ERP) using implementation models at small and medium enterprises (SMEs). The research reviewed existing implementation methods and main dimension of change (people, process, technology) to propose a new implementation model for SMEs to ERP vendors.

  Her primary research interest is in the area of Management and Information Systems implementation and development in small and medium sized businesses in the developing world. Her research has always been the use of information systems to manage and support business operations. Her future research is to build on the foundation of her PhD and to investigate information management, computing for business, big data analytics, information systems implementation, particularly in developing worlds to support business operation in Manufacturing SMEs. She also uses theoretical analysis that allows exploration of design parameters across wider ranges and in isolation, and helps to understand the impact of each parameter on the observed behaviour of the system.

- **Title**: Cyber security and computer viruses: implications for the IT Service Desk
Nitin Agarwal

- **Bio:** He is the Jerry L. Maulden-Entergy Endowed Chair and Distinguished Professor of Information Science at the University of Arkansas at Little Rock and the Director of the Collaboratorium for Social Media and Online Behavioral Studies (COSMOS). He researches cyber information campaigns, social computing, deviant behavior modeling, group dynamics, social-cyber forensics, data mining, and privacy. He has published 8 books and over 150 articles in top-tier peer-reviewed forums with several best paper awards and nominations. His research is supported by grants from the National Science Foundation (NSF), Office of Naval Research (ONR), Army Research Office (ARO), Defense Advanced Research Projects Agency (DARPA), Air Force Research Laboratory (AFRL), Department of State (DOS), North Atlantic Treaty Organization (NATO), and a priority partnership with the Department of Homeland Security’s (DHS) Center of Excellence for Criminal Investigations and Network Analysis (CINA). He is IARIA fellow. Visit http://ualr.edu/nxagarwal/ for more details.

- **Title:** Disinformation in Cyber Environments
Panel Outcomes

• Digital services have led to several innovative applications (Uber, Air BNB, etc.) that are of commercial impact, support citizen participation, and contribute to social good.

• However, security and privacy concerns persist

• To address these concerns, panel concurred there is a need for better education and awareness, stringent policies or regulations, and accountability.
Softnet 2018
Panel on Emerging Digital Services
in Cyber Environments

Theme: New services and use-case perspectives in the context of the 5G technology

Eugen Borcoci
University Politehnica Bucharest
Electronics, Telecommunications and Information Technology Faculty (ETTI)

Eugen.Borcoci@elcom.pub.ro
The 5G (fifth generation) networks, in E2E architectures

- **Driving forces for 5G** - need of enhanced and new services for IoT, smart cities, industry, governance, IoV/automotive, safety/emergency, entertainment, environment, etc.

- **5G- technology** – aiming to
  - provide a **large set of services** for different categories of **tenants/users**
  - offer flexibility, high capacity/bandwidth, low response time, admit large number of terminals, energy saving, etc.

- **5G- high interest** from: user communities, operators/providers/manufacturers, academia, and standardization/fora organizations
  - 3GPP, 5GPP, ETSI, ITU-T, GSMA, ONF, NGNM, IETF, IEEE, etc.
Three views/sets-of-requirements for 5G

- **user-centric** (uninterrupted connectivity and communication services, smooth consumer experience in various contexts)

- **service-provider-centric** (connected intelligent systems, multi-tenant, multi-domain capabilities, large area of IoT services, critical monitoring/tracking services)

- **network-operator-centric** (scalable, energy-efficient, low-cost, efficiently managed, programmable, and secure communication infrastructure)
Network slicing – important 5G concept: resource sharing (with logical isolation) among multiple tenants/users or network operators in a multi-domain context

- Each slice can be customised for a given set of services with flexible set of QoS/QoE guarantees for users

- On demand, concurrent deployment of multiple E2E logical, self-contained and independent shared or partitioned networks on a common infrastructure platform

- E2E concept: covers all network segments: radio, wire access, core, transport and edge networks.
Network slicing – in cyber environments

Isolation - requirement for parallel slices running on a shared underlying substrate

Isolation aspects:
- Performance:
  - each slice is defined to meet particular service reqs. (KPIs)
  - service-specific performance reqs. should be always met on each slice, regardless of the congestion and performance levels of other slices.

- Security and privacy:
  - Attacks/faults in one slice must not have an impact on other slices
  - mgmt issues: each slice must have independent security functions
    • to prevent unauthorized entities to have r/w access to slice-specific configuration/management/accounting information
    • to record any of access attempts, whether authorized or not
New services and use-case perspectives in the context of the 5G technology

- **5G slicing example**—different slices are dedicated to a set of services.


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New services and use-case perspectives in the context of the 5G technology

Categories of 5G fundamental scenarios

- Massive machine type communication (mMTC)
- Ultra reliability low latency communication (URLLC)
- Enhanced mobile broadband (eMBB)

- different requirements on 5G: functional (e.g. priority, charging, policies, security, and mobility) and performance (e.g. latency, mobility, availability, reliability and data rates) → dedicated slices can be constructed

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>mMTC</th>
<th>URLLC</th>
<th>eMBB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>Regular</td>
<td>Very High</td>
<td>Regular (baseline)</td>
</tr>
<tr>
<td>E2E latency</td>
<td>Not highly sensitive</td>
<td>Extremely sensitive</td>
<td>Not highly sensitive</td>
</tr>
<tr>
<td>Throughput type</td>
<td>Low</td>
<td>Low/med/high</td>
<td>Medium</td>
</tr>
<tr>
<td>Frequency of Xfers</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Density</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Network coverage</td>
<td>Full</td>
<td>Localized</td>
<td>Full</td>
</tr>
</tbody>
</table>


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Use-cases family and category per 3GPP and NGMN


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- **Verticals and Use cases**
  - **Augmented Reality (AR)/ Virtual Reality (VR)**
    - Strong-Interactive VR: Audio-visual interaction
    - Strong-Interactive VR: Low-delay speech and video coding
    - Strong-Interactive AR: Use Cases
  - **Automotive (CV2X)**
    - Infotainment
    - Telematics
    - Road Safety and Efficiency:
      - road warning, information sharing
    - Advanced Driving Service
      - Cooperative driving
      - Platooning
      - Tele-operation
  - **Energy**
    - Smart-grids, Micro-grids
    - Smart meters and aggregator gateways
    - Electricity traffic scheduling
New services and use-case perspectives in the context of the 5G technology

- **Verticals and Use cases (cont’d)**
  - **Healthcare**
    - Hospitals, Rehabs and care homes
    - Health and wellness monitoring
    - Remote healthcare, Remote surgery
  - **Industry 4.0, Manufacturing**
    - Augmented reality, Control-to-control (C2C)
    - Motion control, Mobile robots and mobile platforms
    - Mobile Control Panels with Safety Functions, Closed-loop control
    - Process monitoring, Plant asset management
  - **Internet of Things for Low Power Wide Area Applications**
    - Asset Tracking and monitoring, Waste management, Smart parking, Smart manhole, Water metering, Gas Metering
  - **Public Safety**
    - Mission critical : Push-To-Talk, data, video, IoT
  - **Smart Cities**
    - Intelligent lighting
    - Public safety
    - Emergency service management

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Conclusions

- 5G and slicing technology offer a large range of digital services in multi-tenant, multi-domain and E2E context

- Still many R&D open issues related to
  - business models, architecture, services creation and management, network management and control, security, virtualisation techniques, implementation and deployment, etc.

- Estimations exist - that commercial 5G-based networks will be available after 2020....

- Thank you!
Cyber security and computer viruses: implications for the IT Service Desk

Martin Wynn and Maryam Rezaeian
University of Gloucestershire
Information security in IT services

- Information Security is a critical part of how we run the Infrastructure.

- No industry segment is immune to cyber-attacks and the public sector tops the list for targeted security incidents (Benson, 2017). Institutions should consider important structural and resource-related issues before establishing such a competition.

- Critical infrastructures increasingly rely on information systems and on the Internet to provide connectivity between systems. Maintaining and protecting these systems requires an education in information warfare that doesn't merely theorize and describe such concepts.

- Most organizations’ IT help desk serves as a clearinghouse of information about internal and external activities, as well as usage of technology. As such, it can be a logical first line of defence against hackers and other criminals.
Issues/dangers

- User Account Policy (there are staff accounts that are still alive)
- Privileged Access (Admin rights)
- Managing the security Configuration (such as password, unnecessary software)
- Security update (windows update on users machine)
- System Administrators
- Mobile devices and IPad and users devices
Potential solutions/Challenges

- Secure the internet connection (use the firewall to secure the internet connection)
- Secure University’s devices and software (choose the most secure settings for your devices and software)
- Control access to the university data and services (control who has access to our data and services)
- Protect from viruses and other malware (protect ourselves from Viruses and other malware)
- Keep the university devices and software up to date
The Institute of Information Science at Hof University
Digital Mobility Systems / User Assistance Systems / Citizen Science

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Industry 4.0 Testcenter at the Institute of Information Systems, Hof
Analog to Digital – Production Log
Analog to Digital – Workflow

Bildquelle: eigenes Foto

Bildquelle: eigener Screenshot mit Camunda Modeler erstelltes Diagramm
Analog to Digital – Condition Monitoring

Smart devices / Citizen Science
Smart devices / Citizen Science

Nahrungs- / Genussmittel
- Alkohol
- Geschmacksverstärker
- Histamin-haltige Nahrungsmittel
- Kaffee / Koffein
- Mangelernährung (z.B. Magnesiummangel)
- Wassermangel

Umwelteinflüsse
- Feinstaub
- Föhnwinde
- Vollmond
- [extreme] Wetterbedingungen
- Wetterumschwünge

Medikamente
- häufige Einnahme von Triptanen

Körper & Psyche
- Hormonstoffwechsel
- Menstruation
- Muskelsverspannungen / Blockaden
- Psychische Faktoren
- Reize mit Lokalisation Nase
- Reizzustände
- Schlafmangel / Schlafmuster
- Stress
- Übersäuerte Magen
- Unglückliche Zeit
- Wechsel zwischen Anspannung und Entspannung

Aktivitäten
- Autofahrten
- extreme körperliche Anstrengungen

Kombinationen
- viel / wenig Nahrung + Wetterumschwung
- Kombination von Nahrungsmitteln
- Schlaf im überheizten Raum + bestimmtes Nahrungsmittel oder Wetterumschwung
- Eisenmangel + körperliche Anstrengung
Digital Mobility

- Motion profiles are
  - incomplete
  - imprecise
  - dependent on many constraints
- Motion profiles as such do not provide sufficient explanations for movements!
- Model based prediction

Funded by

Model based prediction
Thanks for listening

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Deception, Disinformation, Digital Services in Cyber Environments

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Maulden-Entergy Endowed Chair and Distinguished Professor
Collaboratorium for Social Media and Online Behavioral Studies (COSMOS)
University of Arkansas – Little Rock
Cross-Media Disinformation Campaigns

A YouTube channel with several Anti-NATO propaganda videos. The channel is called, “ANTI NATO”.

A blog using YouTube video to spread anti-NATO propaganda suggesting NATO’s troops obstructing Russian operations in Syria thereby helping ISIS.

A blog using YouTube video to spread anti-NATO propaganda by suggesting NATO is waging war against Syrian refugees.

Agarwal, Nitin

IARIA SoftNet 2018, Nice, France
• **What is Cyber Forensics?**
  o It is the science of collecting, analyzing, and reporting of evidence in a legal way. These evidences can be used to detect or prevent a crime or a dispute where evidences are stored digitally.

• **What do we mean by Social Cyber Forensics?**
  o It is a branch of "Cyber Forensics" and defined as the process of investigating the relationships between "entities" (single actors, groups, organizations, nation-states, etc.) and revealing the digital connections among them in social media space by extracting/collecting metadata associated with their social media accounts, e.g., affiliations of the user, geolocation, IP address.
Towards a Renewed Imperialist Intervention in Libya? Anti-NATO Forces Retake Areas in Southern Libya

Afghanistan, where after 12 years the Pentagon-NATO forces are no closer to victory than in 2001. The US and NATO must be forced to withdraw their occupying forces and shut down their presence in this country.

President Bashar al-Assad.

Over 100,000 people have died in Syria over the last three years to a "terrorist threat." These developments have prompted French Admiral Edouard Guillaud to call for a "humanitarian intervention." This means war. French troops have joined the NATO forces in Libya.

For nearly seven months in 2011, NATO planes - particularly from the US, France, Britain and Canada - conducted a massive bombing campaign in Libya intended to overthrow the government of Muammar Gaddafi. After getting the UN Security Council to pass a resolution authorizing an arms embargo and a limited financial sanctions embargo, the imperialists succeeded in forcing Gaddafi to capitulate and throw his forces into a "no-fly zone" in which only their planes could fly. The imperialists succeeded in paving the way for the establishment of a new regime that would further their interests in that oil-rich Arab country.

Now, just two and a half years later, this puppet government is being granted in southern and eastern Libya to pro-Saudi forces.
“US will provide weapons to NATO Commandos to attack Ukrainian separatists.”
Cyber Forensic Analysis - Blogs

Case Study 1
Cyber forensic analysis helps extracting metadata, such as,

- Web traffic tracker codes (Google Analytics IDs)
- Email addresses
- IP address
- Contact details e.g., phone number
- Names under which the domain is registered
- Other digital presence e.g., Twitter handles, YouTube links, Facebook profile, other blogs, etc.


Agarwal, Nitin

IARIA SoftNet 2018, Nice, France
Cyber Forensics Using Web Traffic Trackers
(Google Analytics ID)
Cross Media Campaign Network

Founder of @nomilservice

Founder of @warresistant

affiliated to No Military Service Facebook page

Agarwal, Nitin @warresistant

IARIA SoftNet 2018, Nice, France
Cyber Forensics – Identifying Bridge Bloggers

Blog in Spanish

Same Blog in English

Blogger’s Google Plus Profile

Agarwal, Nitin

IARIA SoftNet 2018, Nice, France
Automated Blog Farms (via Tracker Codes)

- Blogs mentioning Ukraine’s recent political events (January 2018 onwards).
- Fabricate perception of a virtual crowd.
Disinformation Campaign Coordination

• The above figure is a network of blogsites and shared hyperlinks.
• The network contains 21 blogs (red nodes) and 2,321 hyperlinks (blue nodes).
• Size of a node is proportional to the number of hyperlinks (i.e., out-degree centrality).
• Edge thickness is proportional to the number of times a blogsite has a hyperlink.

• The above figure is a network of blogs based on commonly shared hyperlinks.
• The network is fully connected, i.e., a clique, where every blog is connected with every other blog.
• This depicts massively coordinated information campaign.

RT.com article mocking the Reuters article. Published: 21 May 2016. Last accessed: 03 June 2016.
Information Operations and Googlearchy
Cyber Forensic Analysis – YouTube (vlogs)

Case Study 2
- Total number of videos: 2,449
- Total number of views: 4,743,103
- Number of subscribers: 24,830
- Most videos posted in last week, yet received over 1,000,000 views in total.
- Related channels - RT, Russia Insight
- Collected 15,401 comments from 788 videos (data collection currently ongoing)
The sharp increase in number of videos posted and a similar increase in the number of comments is suspiciously interesting.
Video-Commenter Network

**Core commenters.** Prolific commenters that commented on several videos posted on this channel. Next, we investigate these core commenters in depth.

**Peripheral commenters.** Either stragglers or they posted just single comments.

*Accepted at ASONAM*
Analyzing core commenters reveal small but dense communities, i.e., group of commenters who have commented frequently on same set of videos.

*Accepted at ASONAM

The commenter clique (1) commented on 6 videos. Two most commented videos by the commenter clique are shown below.

The commenter clique (1) is mainly amplifying the russia, putin, world war signal and the brokers (2, 3, 4) are connecting trump and other US political narratives (e.g., jobs, elections, hillary) to this conspiracy.
IO and Googearchy (YouTube Commenter Bots)

- Two commenters are connected if they commented on a video.
- Large Communities of commenters exist.

Commenter cliques observed

Agarwal, Nitin

IARIA SoftNet 2018, Nice, France
Botnets – Evolution and Dissemination
*published in NATO Defense Strategic Communication

COORDINATION/BEHAVIOR COMPLEXITY

Mutual reciprocity. IFYFM & FMIFY

No mutual reciprocity. Coordination in information network

Organizational hierarchy. Core and peripheral bots

Crimean Invasion 2014
Dragoon Ride 2015
Trident Juncture 2015
ISIS Propaganda 2016
The Flourishing Business of Fake YouTube Views

Plays can be bought for pennies and delivered in bulk, inflating videos’ popularity and making the social media giant vulnerable to manipulation.

By MIchael H. Keller  AUG. 11, 2018
The same video appeared on YouTube in 2016, 2017, and 2018 on the following channels:

- **FOLLOW THE MONEY**
  - Published on Apr 18, 2018
  - [https://www.youtube.com/watch?v=i9K1wYHYsak](https://www.youtube.com/watch?v=i9K1wYHYsak)
- **WORLD NEWS UPDATE**
  - Published on Sep 20, 2017
  - [https://www.youtube.com/watch?v=rMQofGXhtVQ](https://www.youtube.com/watch?v=rMQofGXhtVQ)
- **SHOCK NEWS**
  - Published on Apr 26, 2017
  - [https://www.youtube.com/watch?v=WONxppeB3wk](https://www.youtube.com/watch?v=WONxppeB3wk)
- **Julian Assange TV**
  - Published on Dec 3, 2016
  - [https://www.youtube.com/watch?v=ljd-FtnWFew](https://www.youtube.com/watch?v=ljd-FtnWFew)
- **Doll Channel**
  - Published on Nov 6, 2016
  - [https://www.youtube.com/watch?v=OzuWOxXHIP4](https://www.youtube.com/watch?v=OzuWOxXHIP4)
- **Robert Christiansen**
  - Published on Oct 11, 2016
  - [https://www.youtube.com/watch?v=JJa41eD59-I](https://www.youtube.com/watch?v=JJa41eD59-I)
- **Flat Earth Verified**
  - Published on Jul 4, 2017
  - [https://www.youtube.com/watch?v=KT-OxdVMFsg](https://www.youtube.com/watch?v=KT-OxdVMFsg)

The same video was shared 975 times by 30 YouTube channels.

*Accepted at ASONAM*
The title of the video was tweeted by the following Twitter handles:
- Trending NATO News
- @NATIONALIZER
- Faramarz Kashigari
- @farazkashigari
- Rhodonbrown
- @rhodonbro

The video is related to the following domains:
- www.stanvanhoucke.blogspot.com
- www.freewka.com
- www.euvolution.com
- www.thesaker.is
- www.trendsreader.com
- v2.godsterz.com
- oriharu.net
- www.whlib.ac.cn
- www.express.co.uk
- www.pinterest.com
- www.greenspun.com
- www.mydailyinformer.com
- http://revolutionradio.org
- http://beforeitsnews.com
The title of the YouTube video appeared on multiple Pinterest pages.

The video also appeared on GenTube.co which is a SUSPICIOUS video website.

The title of the YouTube video appeared on www.mydailyinformer.com which does not exist anymore.
Challenges

- Data collection/data retention/data sharing policies
- Privacy (GDPR, etc.)
- How we can advance the debate over social cyber security leading to policy and action in the cyber diplomacy space.


Tools

- Tools Developed:
  - Blogtrackers - http://blogtrackers.host.ualr.edu/
  - YouTubeTracker - http://youtubetracker.host.ualr.edu/
  - Focal Structure Analysis - http://fsa.host.ualr.edu/

- Follow us: @cosmographers

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