it-support for handling large volumes of injured people

– the SeCoServ2 support system for MCI management

Dr. Stephan Heuer

PSC Europe Forum Conference , Graz, 28.05.2015

the SeCoServ2 project

- „Secure Communication and Service infrastructure for ad-hoc scenarios"

- 2-year applied research project in German SME tool

- funded by German Federal Ministry of Education and Research (BMBF)
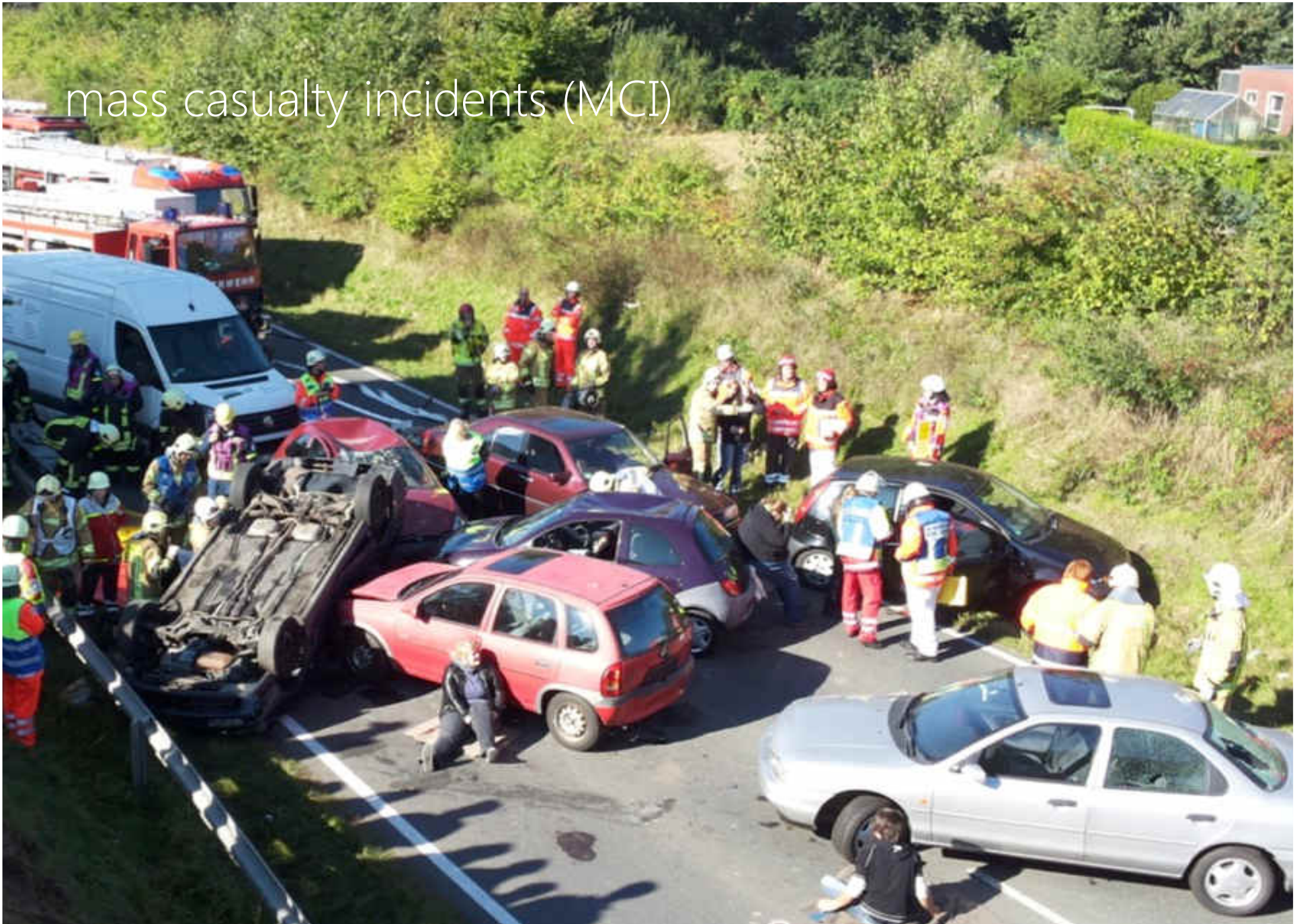
- multi-disciplinary consortium:

why SeCoServ2?

mass casualty incident (MCI)

Image: http://www1.wdr.de/themen/archiv/loveparade_jahresrueckblick100_v-ARDFotogalerie.jpg

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mass casualty incidents (MCI)

MCI definition and challenges

- definition according to DIN 13050:2009-02
  Emergency or incident with an increased number of casualties which can not be handled with available and deployable resources in the respective emergency response area.

- challenges
  - chaotic and complex situation
  - #casualties vs. #resources
  - high demand of information aggregation and processing, especially in chaotic phase
  - high demand of coordination and management but limited resources (staff, time)

- main goals
  - return to individual care as quickly as possible
  - "do the greatest good for the greatest number"

mci challenges (c'td)

- fast and valid identification of vitally threatened patients
- over-triage must be avoided (increases critical mortality)
- immediate transport of critical patients to suitable trauma centers

"Accurately identifying patients who will substantially benefit from early scene intervention or transport to definitive care may be the most important medical function at an MCI"

Alan Garner et al. Comparative analysis of multiple-casualty incident triage algorithms. Annals of Emergency Medicine. 38:5 pp. 541-548

project goals

- support for fast situation assessment and information aggregation in chaotic phase
  - #casualties, statistics
  - automatic pre-triage and triage support
  - efficient deployment of medical staff
- efficient resource dispatch and transport organization

- locally available, robust communication and information platform

  independent from infrastructure availability

- evaluation of the technical development and process support
  in field exercises with end users (DRK Landesverband Westfalen-Lippe e. V.)
- high system usability even in research stage
  - UCD / user centered design
  - rapid prototyping (SW & HW)

triage and incident management support

triage so far

- paper based patient tags
- barcodes and ID numbers
- Informatione exchange via tags
- aggregation and processing with tally sheets
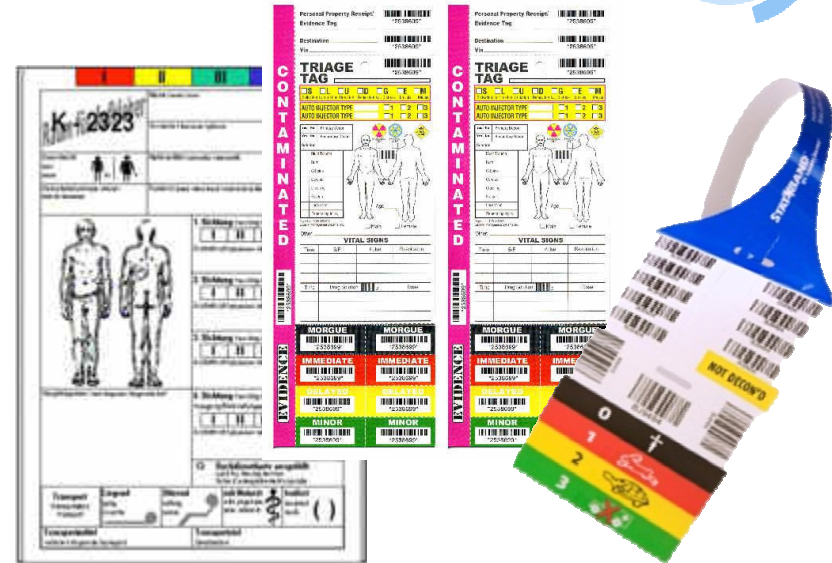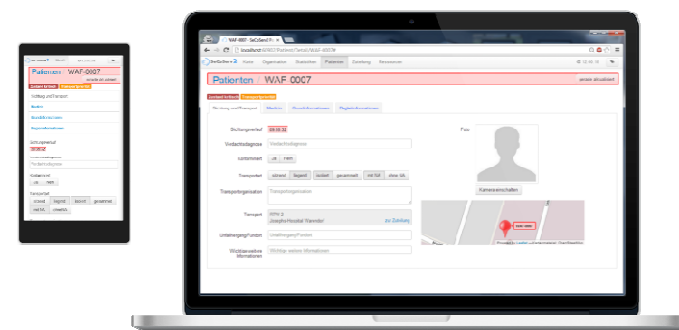
triage with SeCoServ2

- electronic triage tag with radio comm.
- automatic pre-triage via sensor data (=ATR)
- triage done directly on the tag
- information aggregation and analysis in SeCoServ2 portal application
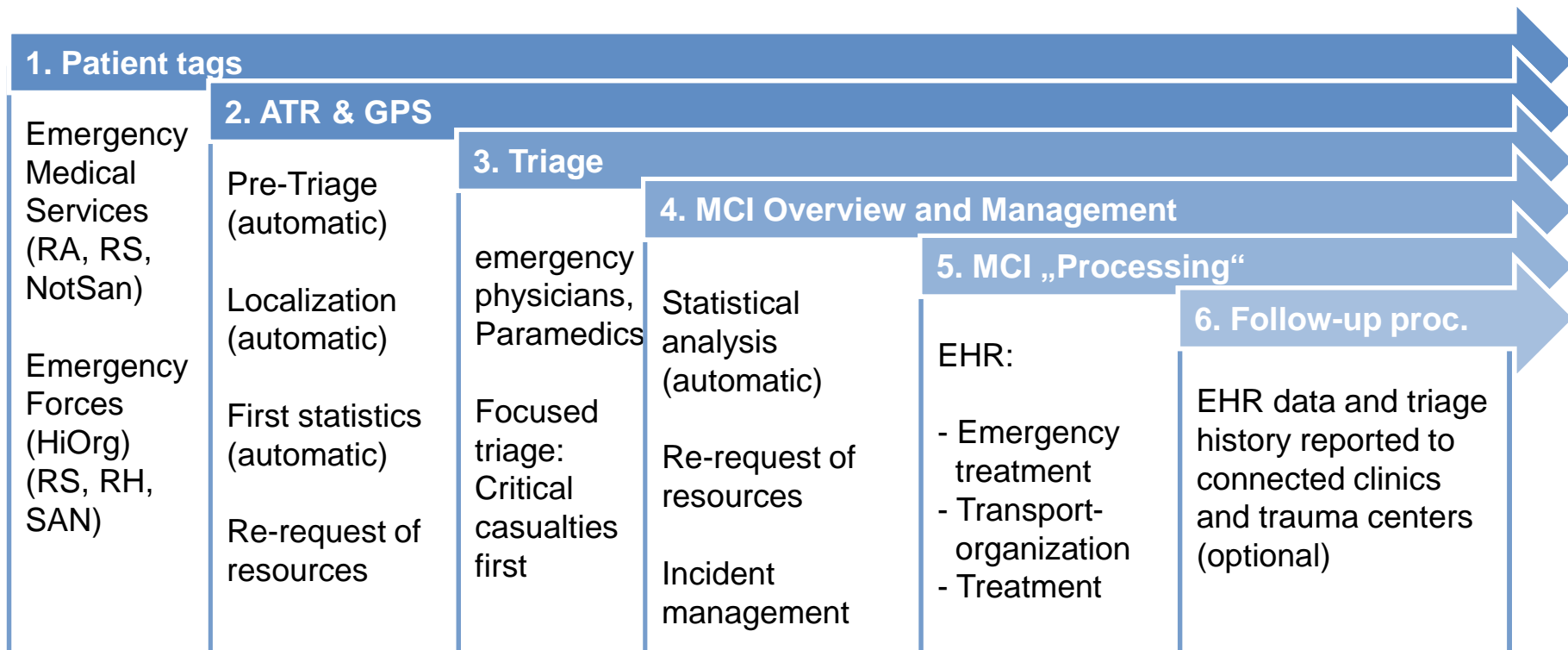
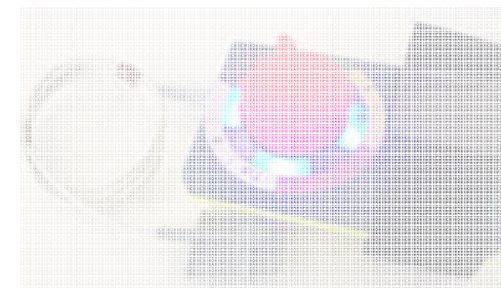the SeCoServ2-system

how does it work?

system components

- for data transmission and aggregation:
  robust ad-hoc network on emergency vehicles

- for casualties:
  electronic patient tag with physiological sensors,
  localization via GPS, identification via NFC/QR-code
  and triage switch

- for incident command (ORGL), medical group
  supervisor (LNA) and section leaders:
  device independent management portal

SeCoServ2 supported process

1. Patient tags

Emergency Medical Services (RA, RS, NotSan)

Emergency Forces (HiOrg) (RS, RH, SAN)

2. ATR & GPS

Pre-Triage (automatic)

Localization (automatic)

First statistics (automatic)

Re-request of resources

3. Triage

emergency physicians, Paramedics

Focused triage: Critical casualties first

4. MCI Overview and Management

Statistical analysis (automatic)

Re-request of resources

Incident management

5. MCI „Processing"

EHR:

- Emergency treatment
- Transport-organization
- Treatment

6. Follow-up proc.

EHR data and triage history reported to connected clinics and trauma centers (optional)
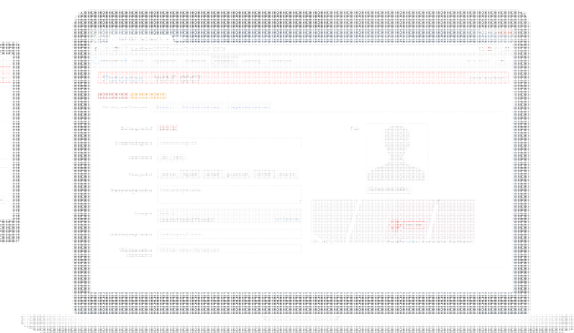
system components

- for data transmission and aggregation:
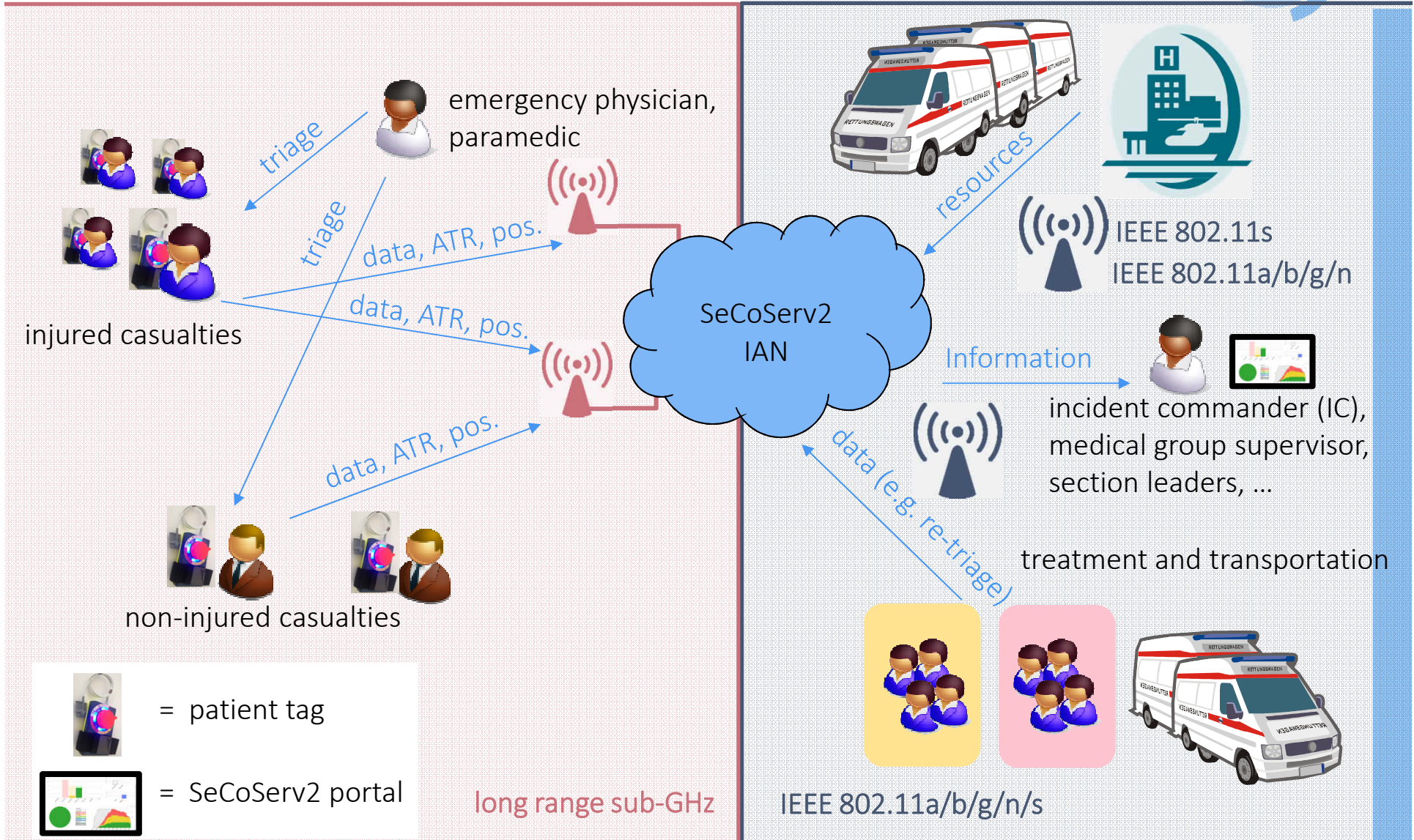 robust ad-hoc network on emergency vehicles

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 device independent information portal

SeCoServ2 communication concept

emergency physician, paramedic

triage

triage

data, ATR, pos.

data, ATR, pos.

data, ATR, pos.

injured casualties

non-injured casualties

SeCoServ2 IAN

resources

IEEE 802.11s
IEEE 802.11a/b/g/n

Information

incident commander (IC), medical group supervisor, section leaders, …

data (e.g. re-triage)

treatment and transportation

= patient tag

= SeCoServ2 portal

long range sub-GHz

IEEE 802.11a/b/g/n/s

system components

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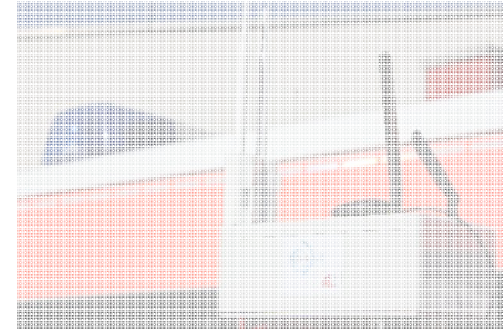
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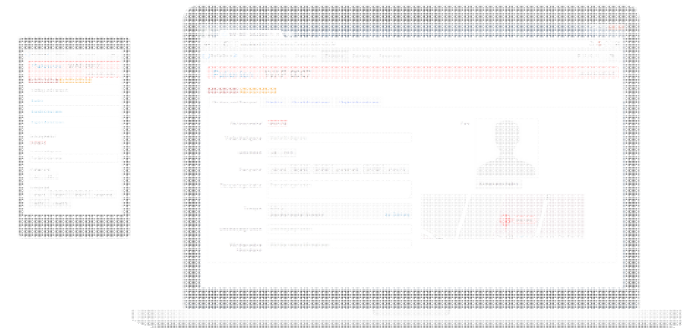
electronic patient-tag: how it's done

ATR (Automatic Triage Report)

B
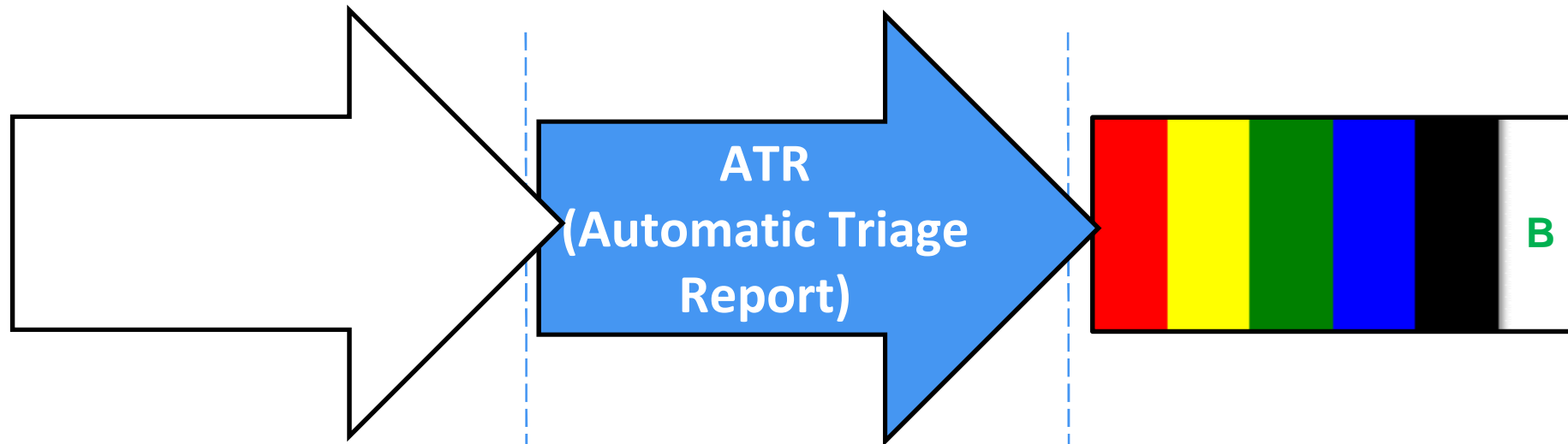
- responder activates tag and attaches tag to patient
- patient not triaged yet
- number of local non-triaged patients grows in portal application

- ATR assessment critical / non-critical, Simplified START
- ATR as preliminary tactical value until triage by medical responder
- automatic transmission to portal: ATR, GPS-coordinates, patient ID

- Tag supports triage
- Re-triage possible
- Hands free of pen and paper
- automatic transmission to management portal.

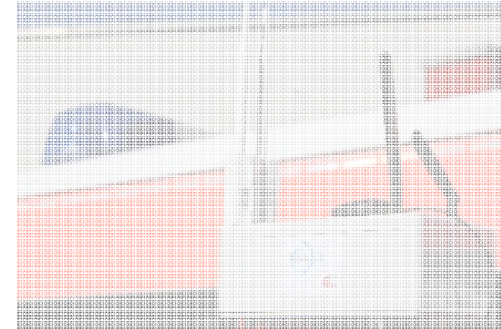fast and easy application of the
SeCoServ2 patient tag

situation and triage information in SeCoServ2-portal

triage directly with elctronic patient tag: no other device necessary!
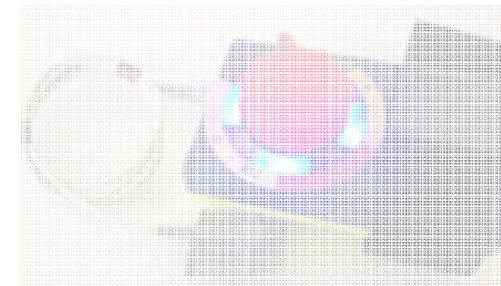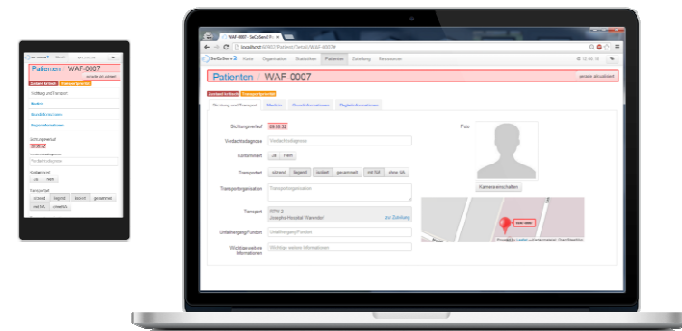
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definition of command and organization structures

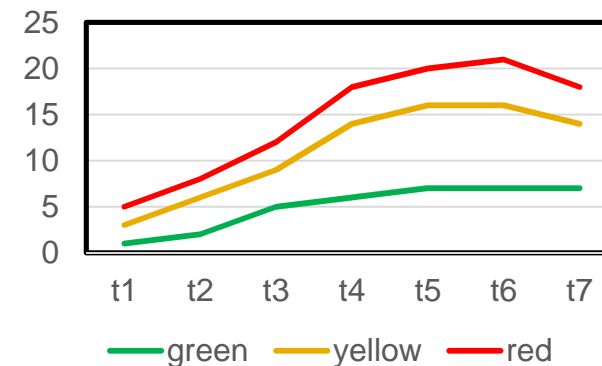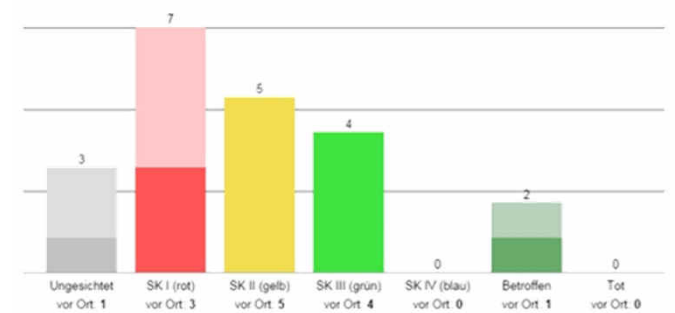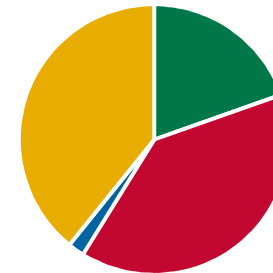Real time incident and patient statistics

IEEE 802.11a/b/g/n/s

Platform
independent
functionality
(IAN WLAN)

SeCoServ2-portal: statistics

- triage ratio (triaged / non-triaged)

- triage (local and transported patients)

- ATR overview

- Incident development over time

- Transport progress

SeCoServ2-portal: additional functionality

- Map view to localize patients

- On site patient overview

- EHR for casualties

- Support view for transport organization

summary and outlook
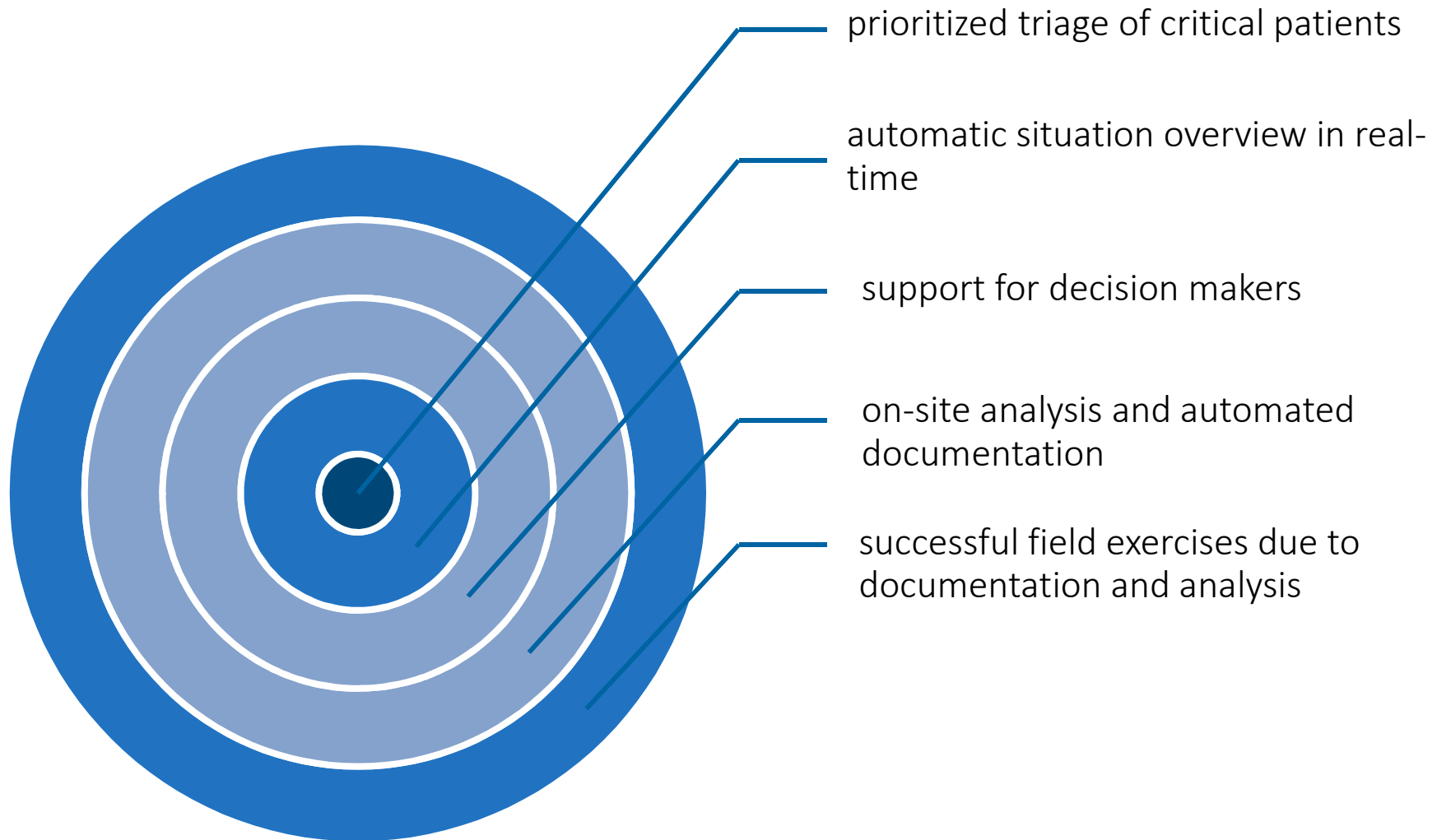
evaluation at MCI Drills

- 11 MCI exercises
- 30 patient tags
- 280 hrs of recorded data
- 500 rescue forces

SeCoServ2 features

- early stage support for medical tactical decisions

    - # patients, location/local distribution

    - automatic triage report (ATR): critical vs. non-critical patients

    - real time situation overview

- support for improved allocation of resources

    - efficient resource deployment and transport organization

    - continuous situation monitoring and resource overview

    - demand driven re-request of additional resources

- documentation of incident development and patient data

- interfaces to emergency services / clinics / etc. possible

SeCoServ2 advantages

prioritized triage of critical patients

automatic situation overview in real-time

support for decision makers

on-site analysis and automated documentation

successful field exercises due to documentation and analysis

future work

- scientific validation of ATR

    - Problem of „healthy" actors in exercises

    - Clinical ATR validation still needs to be carried out

- verification of scalability of IAN network

- redesign of SW and HW according to user feedback from last exercises