



*Promoting
better health*



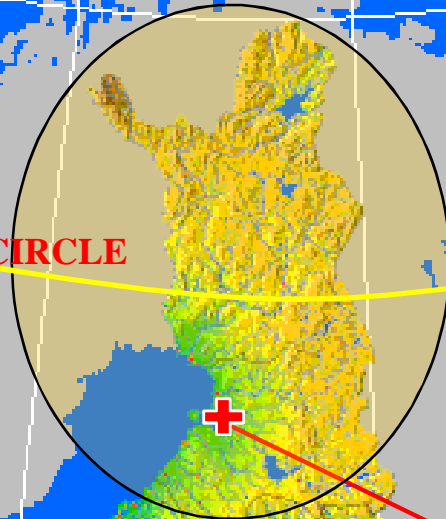
BUSINESS CONTINUITY FACING NEW CHALLENGES - CASE OULU UNIVERSITY HOSPITAL

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Oulu University Hospital

Oulu University Hospital - service area

... Great Bear Lake, Baffin Island ...

ARCTIC CIRCLE

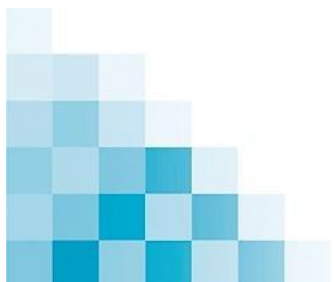
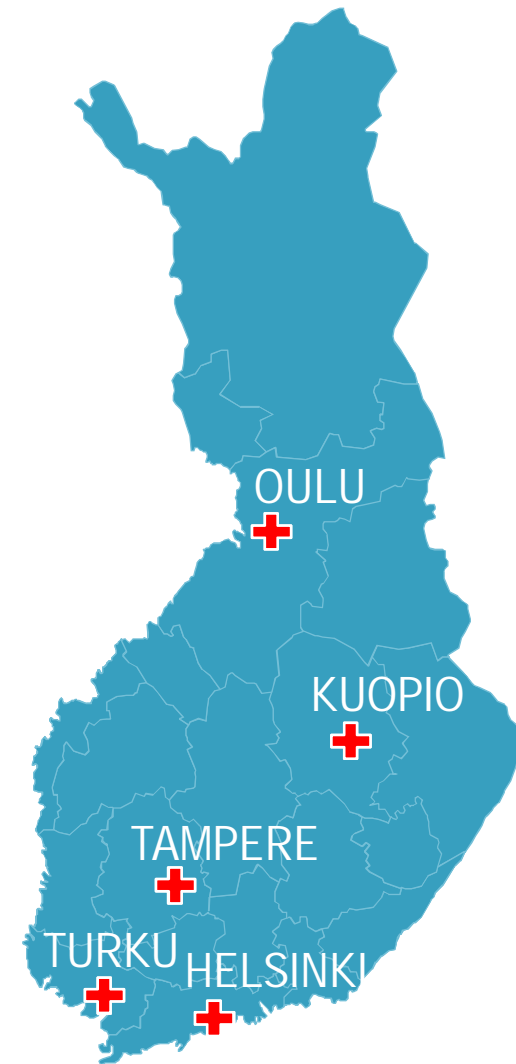


Oulu University Hospital

- population 742 000
- area > 50 % of Finland

5 UNIVERSITY HOSPITALS

In Finland most advanced and highly specialised medical care is provided by university hospitals



Oulu University Hospital - OYS

is a main hospital in Northern Finland (opened 1972)

Staff	7 000
Beds	800
Outpatient visits	450 000 / year
In-patient days	265 000 / year
Operating revenue	572 M€
Investments	40 - 50 M€ / year



FUTURE HOSPITAL 2030

The Smartest Hospital in the World



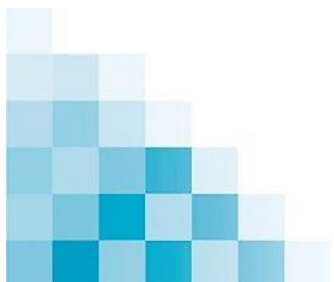
Knowhow adds value



Kontinkangas campus

Content

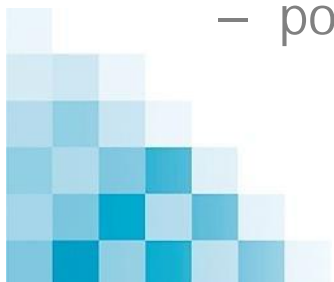
- Oulu University Hospital
 - Short introduction
- Case Oulu University Hospital
 - Business Continuity Planning (BCP) in practice
 - Experiences of security incidents
 - Experiences and vision of cloud services and IoT
- OYS TestLab - safe testing environment



Engagement for information security and data protection

What is needed?

- Organizational engagement - leaders and managers
- Staff engagement
 - Guiding, training, practicing, incentives, sanctions
- Partner engagement
 - Companies (purchasing process!), other stakeholders
- Resources
 - Knowledge, technology, money
- Documentation
 - politics, guidelines, rules, agreements etc.



Organization of information security and data protection

- Information security and data protection board
- Teams
 - Information security team
 - Data protection and privacy team
 - Risk management team
- Officers
 - Data Protection and Privacy
 - Information Security
 - Risk Management



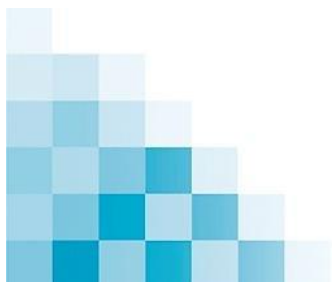
Information security and data protection board

- Steering group
- Members
 - Director of the Hospital District
 - Chief Information Officer
 - Risk Management Officer
 - Chief Administrative Physician
 - Technical Director
 - Data Protection and Privacy Officer
 - Information Security Officer



Documentation

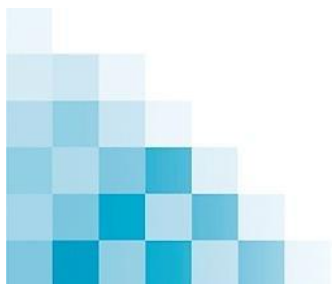
- Data protection and information security politics
 - Principles and responsibilities
- Additional instructions, guidelines and rules
- Business continuity plan
 - Identification of critical eHealth infrastructure and definition of levels
 - Disaster recovery plan
- Risk management plan throughout the organization



Business Continuity Planning

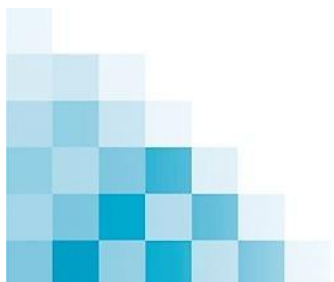


is the process of creating systems of prevention and recovery to deal with potential threats to a company



Business continuity planning

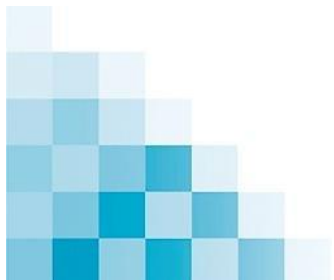
- Protect valuable information
 - find key processes using business impact analysis
 - what happens in our organization if a process is not available?
- Maintain business continuance
 - business processes and their critical information resources





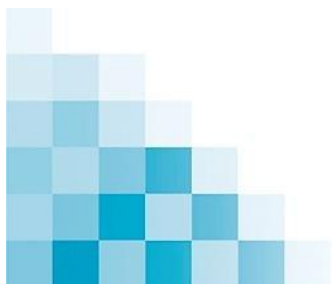
About our

- Continuance
- Disaster recovery
- Practice



Prioritizing apps

- Information systems where classified according to their functions
 - patient work, 43
 - safeguarding operation, 28
 - infrastructure, 34
 - support operation, 17



Identification of critical eHealth infrastructure and definition of levels

- Critical eHealth infrastructure was identified
- Hospital information systems were classified into 4 levels according to their criticality

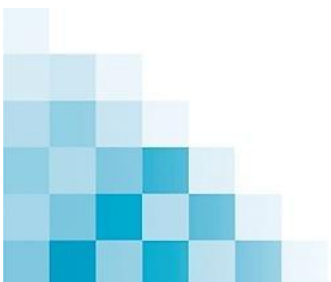
Levels	Down time	Patient information	Business information	Backup Procedures	Test environment	Faulty tolerance	System monitoring after business hours	system supplier support in contract
1	Under 3 hours	✓	✓	✓	✓	✓	✓	✓
2	3-12 hours	✓	✓	✓		✓	✓	
3	12-24 hours	✓	✓	✓				
4	several days							

- level 1 information systems are updated to Disaster Recovery Plan



Practicing

- Two annual system maintenances
- Preparing the organization to operate without information systems
- Announcement 3 months before
- Surveys 2013 and 2016



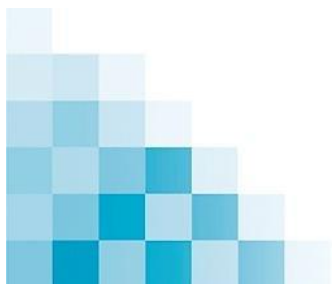
Backup procedures at organization

- Printing
- Announcements
- Checking
 - forms
 - tape recorder
 - prepare to handwriting
 - overwork
 - extra workers



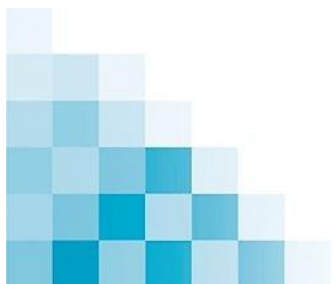
Security incidents in OYS

- Zepto ransomware
 - All crypted files restored from backup
 - 5 days recovering time
- Denial of Service (DoS) at National identification service
 - National EHR archive - Kanta
 - National ePrescription



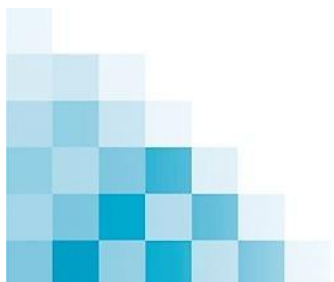
ENISA recommendations (1/2)

1. Identification of critical eHealth infrastructure and definition of levels (OYS done)
2. Cybersecurity guidelines (OYS done)
3. Cost benefit analysis of the security incidents (OYS to be done)
4. eHealth incident reporting system (OYS done and willing to report)
5. Information sharing (OYS willing to share)



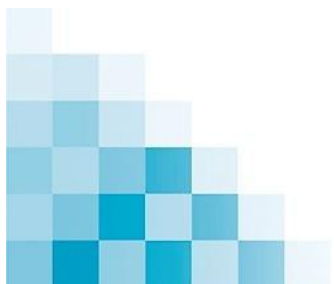
ENISA recommendations (2/2)

6. Baseline security measures (OYS willing to participate)
7. Implementation of widely accepted security standards (OYS willing to participate)
8. Raise awareness and knowledge of cybersecurity (OYS done)
9. eHealth cybersecurity strategy should be aligned nationally



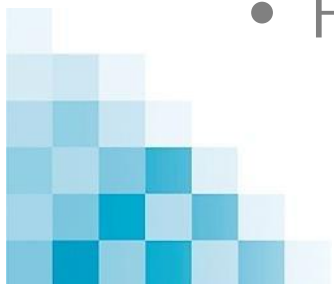
Cloud services, why?

- More capacity
- More speed
- More mobility
- Less cost
- More or less security?



Cloud service guidelines

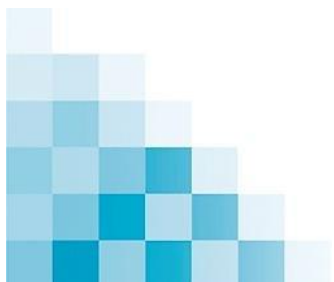
- Hospital information systems are classified into 4 levels according to their criticality
- No cloud services for critical eHealth infrastructure (levels 1-2)
 - For example EHR, RIS, LIS, PACS
- Cloud may be used for non-critical eHealth infrastructure
 - For example testing environments



ESKO - electronic health record

Own private cloud

- "Browser based" since 1996
- Cloud service for regional professionals
- Deeply integrated with several health information systems
- One user interface



Test and Training ESKO 2016

To be used for...

- Testing
- Piloting
- Training
- Education
- Research
- 5G, IoT etc.

To be integrated...



IoT in Oulu University Hospital

- Limited experience
 - Devices in medical imaging, diagnostics...
 - No figures or measures available
- Pilots in testing environment
 - Wearables, monitors, mobile apps
 - No connection to real hospital information system
- Need for a systematic approach is recognized



Smart Hospital IoT

DATA ACQUISITION

- Sensors and measurements in surgery, ICU, wards
- HVAC sensors & meters

NETWORK LAYER

- Physical cabling
- WLAN and cellular
- Professional and visitor access

PHYSICAL LAYER

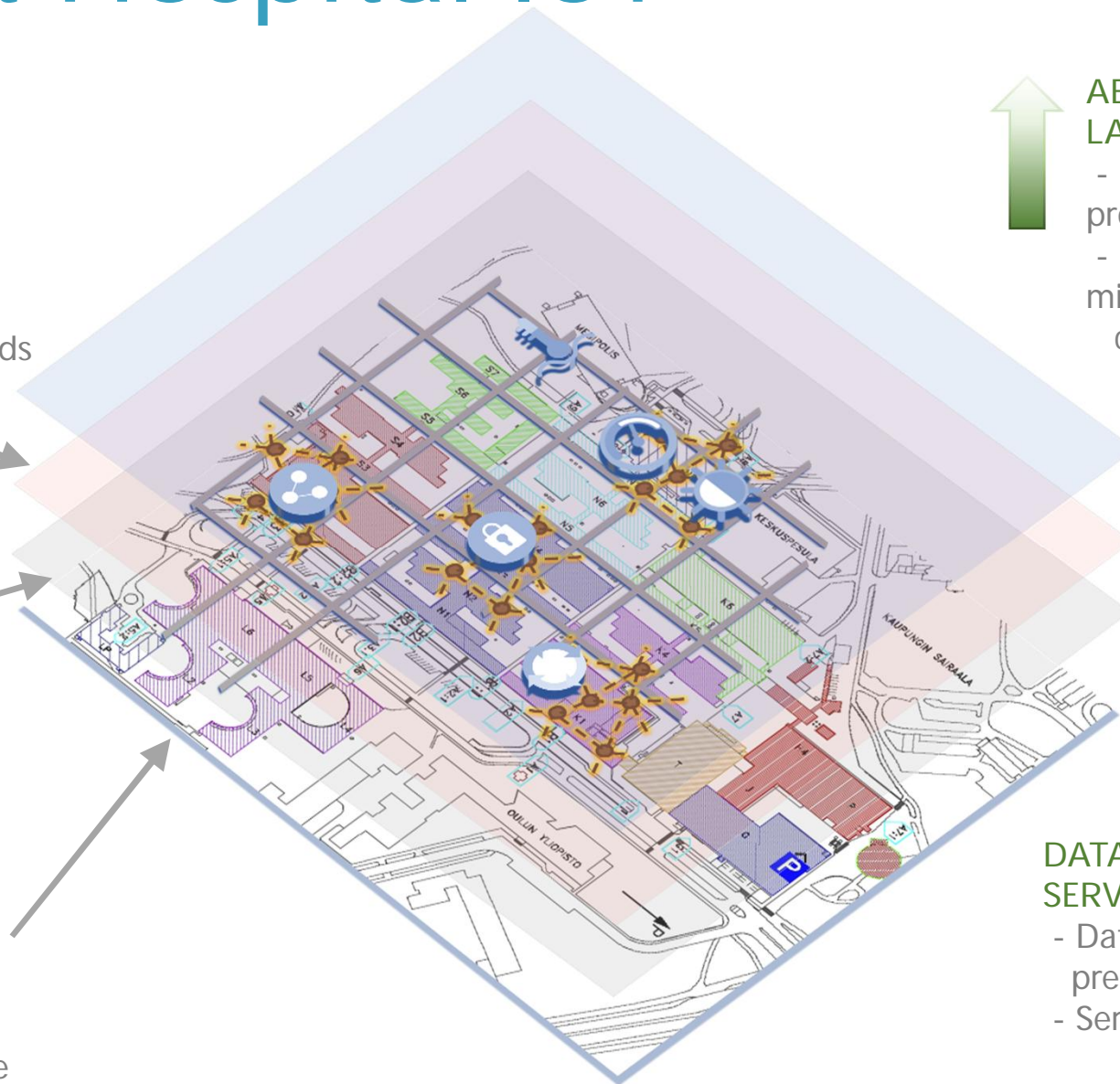
- HVAC
- Logistics flow
- Routing of people and goods

ABOVE THESE LAYERS

- Business processes
- EHR and other mission critical elements

DATA ANALYSIS & SERVICES

- Data analysis and presentation
- Services





OYS | OULU
UNIVERSITY
HOSPITAL

OYS TESTLAB - SAFE TESTING ENVIRONMENT

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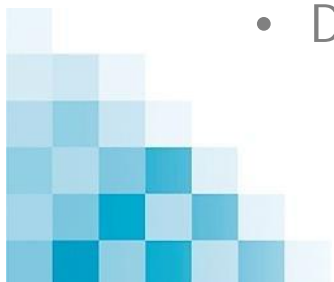
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www.oys2030.fi

<http://ouluhealth.fi/>

5G Test Network

- Center for Wireless Communications (CWC) has been building a 5GTN to OYS TestLab
 - Three Pico Cell basestations cover the whole test environment
- Basestations provided by Nokia
- Connected to Oulu University's 5G backbone network
- Network administration controlled by CWC
- SIM-cards provided to OYS TestLab that allow usage of the network
- Expected latency down from 50ms (4G) to 1ms
 - Enables Real-time communication
- Bandwidth expected to be vastly greater than 4G
 - Up to 10 Gbps
 - Sensor networks
 - Data analytics



5G POSSIBILITIES

- Efficient wireless connectivity
- Accurate indoor positioning of people and assets
- Wireless sensor networks that monitor patients vitals
- Autonomous logistics systems
- Streamline healthcare processes





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OYS

