RECODIS

Resilient communication services protecting end-user applications from disaster-based failures

Introducing University of Iceland members and natural hazards in Iceland

WG1

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cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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1. University of Iceland (UICE): new RECODIS member

- Prof. Dr. Esa Hyytiä, esa@hi.is (MC Member)
  - Performance Modelling and Analysis of Computer & Communication Systems
  - Novel networking concepts (e.g., opportunistic networks, IoT)
  - Parallel server systems (e.g., data centers, server farms)
  - Advanced simulation methods
  - Queueing theory

- Prof. Dr. Helmut Neukirchen, helmut@hi.is (MC Substitute)
  - Software Engineering and Distributed systems
    - Distributed testing (such as mobile telephone networks)

- Research on opportunistic, delay & disruption tolerant networking (DTN) for IoT.

2. Recurring natural disasters in Iceland: Volcanic eruption, in particular ash fall

- Electrically-charged ash can cause interference to radio waves.
- Air-cooling systems of communication equipment vulnerable to over-heating if these units fail or need to be switched off (due to ash fall).
- Ash is conductive and may cause short circuits.
- And of course affects air traffic…

Photo:
Ragnar Þ. Sigurðsson

Recurring natural disasters in Iceland: Glacial outburst flood

- Volcano under glacier melting ice (plenty).
- Photo: Eyjafjallajökull eruption 2010: 3000 m^3/s peak water.
  - Niagara falls: 2400 m^3/s
- Grímsvötn eruption 1996: 50 000 m^3/s.
- Katla eruption 1755: ≈400 000 m^3/s.
- Destroys roads and communication infrastructure.

Photo:
Helga P. Finnsdóttir

Recurring natural disasters in Iceland: Earth quakes

- Destroying communication cables/fibres and other communication structures.
- Causing landslides destroying communication structures.
- Typically not stronger than magnitudes 6.3-6.5 (however, earthquake 1784: magnitude 8 assumed).

Photo:
Ragnar Þ. Sigurðsson

Recurring natural disasters in Iceland: Storms, blizzards, icing

- Storms and/or weight of accumulated icing let power transmission and communication structures collapse.
- Many rural areas/farms only connected by radio: Antennas subject to icing leading to communication failures.


Photo: Landsnet


Photo: RARIK

3. Communication disruptions in Iceland

- So far coped well with natural hazards – most failures due to **technical problems**.
- **Redundancy of communication links** due to fibre ring around Iceland.
  - Disruption due to glacial outburst flood/earthquake in South Iceland no problem as long as de-tour via North Iceland is possible, but:
    - Westfjords are connected via a single fibre only (backup only via radio).
    - Many rural areas/single farms connected only by radio.
- **Communication nodes often single point of failure**:
  - E.g. Central server infrastructure for whole country typically located in Reykjavík only.
- Hydroelectric **power plants** (providing power for communication) at **risk** due to glacial outburst floods as well as **power grid lines** due to storms/blizzards.
  - Communication not only needed to co-ordinate repair but also for remote controlling/sensing the power grid.
  - In case of BTS power outage: switch off 3G/4G to leave more battery-backup power to 2G.