Resilience in Computing Systems and Information Infrastructures: A Research Agenda

Diversity

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About D13 Diversity at large

Deliverable D13 - From Resilience-Building to Resilience-Scaling Technologies: Directions on Diversity

- Good analysis and assessment
- Valuable conclusions and directions for future research
- Following comments/observations intended solely as contributions to reasoning/discussion
- No implicit or explicit criticism
Unforeseen events vs. Unavoidable changes

Adverse events
- extreme, catastrophic
- rare, unlikely
- correlated, insider
  - ...  

Diversity

Continuous evolution
- context
- technology
- size
  - ...  

Robustness

Where did complexity end up?

Security vs. Survival

Hostile attacker
- enemy
- terrorist
- vandal
  - ...

Malicious attacker
- thief
- spy
  - ...  

Mike’s paradox: “Whatever the choice, Resilience is in the other”
Diversity vs. Redundancy

Fault-Tolerance vs. Performance, Coverage, …

Fault Survival with some Degradation

High Performance / Low Resilience + Low Performance / High Resilience

Structural vs. Infrastructural

→ In-built vs. Outsourced

→ Systems vs. Services

→ Redundancy vs. Multiplicity

In-built systems vs. Outsourced services

Public Networks

Private and Ad-hoc Networks

2G

3G

BWA

2G

3G

BWA

NGN Operator A

MN Operator B

FN Operator C

Service Provide X

Service Provide Y

W-LAN

GSM-R

TETRA

Ad-Hoc

to Public Networks

Same basic functions but totally different characteristics
Space vs. Time related Diversity

Space related
- replication
- segmentation
- ...

Time related
- expansion
- evolution
- ...

Diversity

Interoperability (horizontal & vertical)

Compatibility (backward & forward)

A different focus/role for standards?

Architectures with explicit redundancy

Suggested fully redundant GSM-R architecture
(Fully duplicated network structure with overlayed radio cells)

Can we quantify diversity pro/con tradeoffs?
Architectures without explicit redundancy

GSM/GPRS Reference Architecture

Time related diversity is unavoidable in complex, long lasting systems