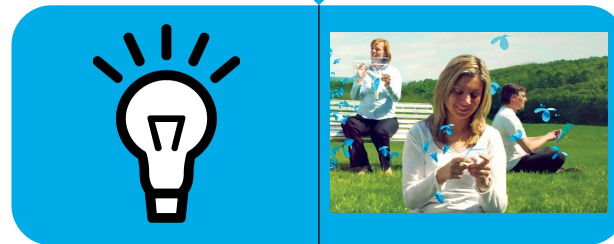




*Correlating
Edge Measurements and Network
Side Logs*

Andres Gonzalez, Telenor Research

SIMULA-CRNA and Telenor-Research have common objectives



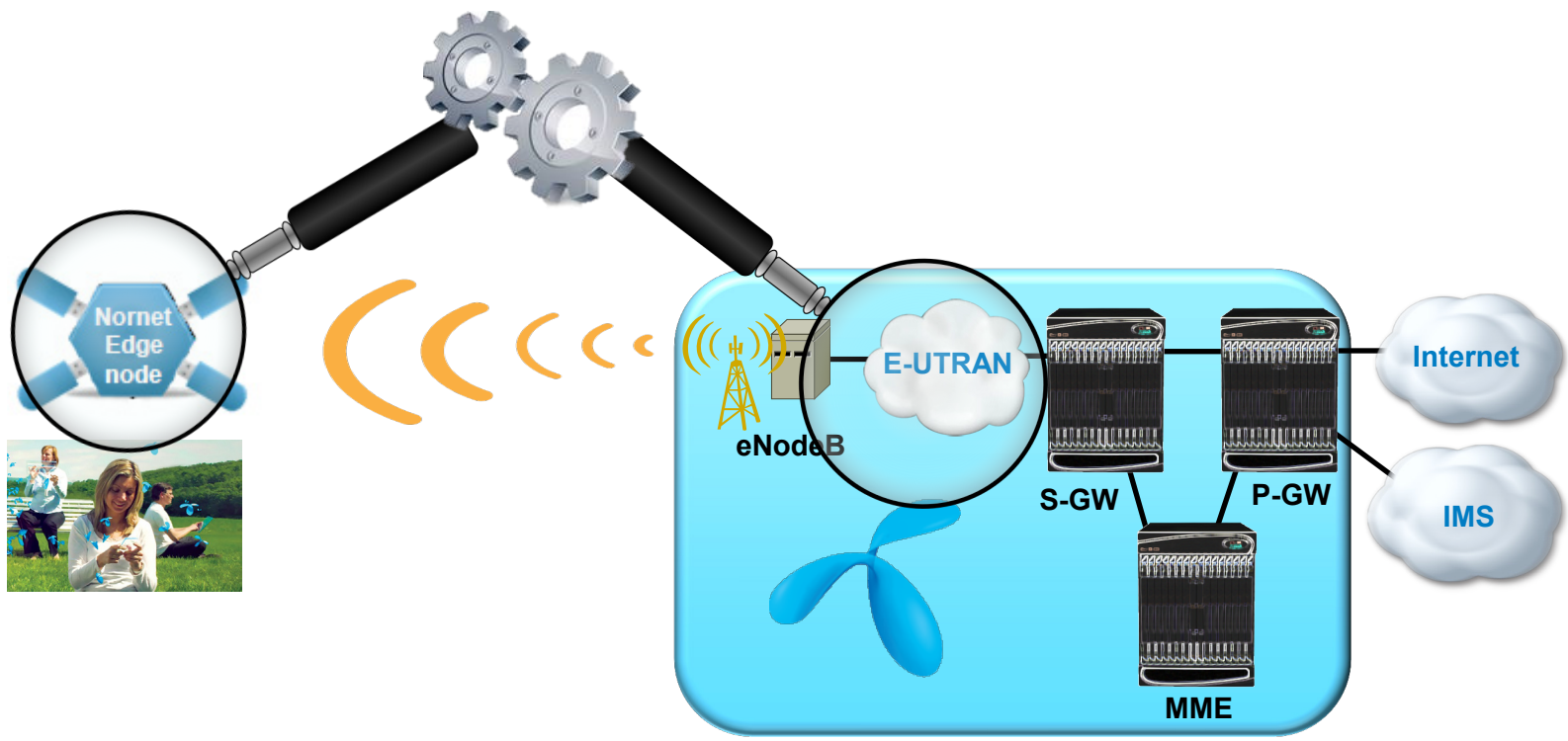
Generate scientific knowledge to:

- Understand better user experience.
- Deliver the robustness that society demands.

Synergy between both side measurements may have a lot of potential.

CRNA Centre for Resilient Networks & Applications
[simula . research laboratory]

telenor | research



Simula Data (3G and 4G)



- Delay
- Packet Loss %
- Failed Download

IMSI	Location	Time Stamp	RTT avg	Loss	Failed Downloads
242013054215801	Oslo	13.06.2015 00:05	0,200	0,000	0,000
242013054215766	Ås	13.06.2015 00:05	0,034	0,000	0,000
242013054215752	Bergen	13.06.2015 00:05	0,033	0,000	0,000
242013054115752	Trondheim	13.06.2015 00:05	0,034	0,000	0,000
242013054215801	Oslo	13.06.2015 00:10	0,219	0,000	0,000
242013054215766	Ås	13.06.2015 00:10	0,035	0,000	0,000
242013054215752	Bergen	13.06.2015 00:10	0,033	0,000	0,000
242013054115752	Trondheim	13.06.2015 00:10	0,035	0,000	0,000

Handover

Time Stamp	IMSI	Node - id	CELL - ID
14.08.2015 00:14	242013054215766	531	D03633
14.08.2015 00:17	242013054215766	531	D09E4E
14.08.2015 00:26	242013054215766	531	D03633
14.08.2015 00:38	242013054215766	531	D08DE3
14.08.2015 00:39	242013054215766	531	D09E4E
14.08.2015 01:00	242013054215766	531	D03633
14.08.2015 01:02	242013054215766	531	D08DE3

Signal Strength

RSCP - RSSI - ECIO

Time	IMSI	node - id	_key	Value
14.08.2015 00:00	242013054215766	531	ecio	-5
14.08.2015 00:01	242013054215766	531	rscp	-98
14.08.2015 00:01	242013054215766	531	rscp	-97
14.08.2015 00:02	242013054215766	531	ecio	-5



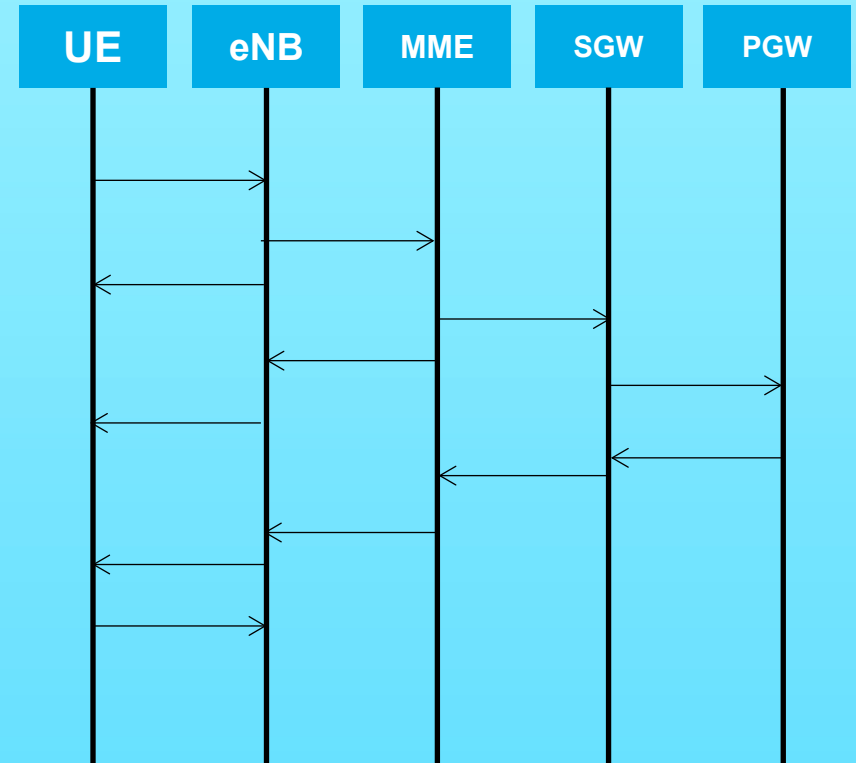
RAN and Core Network Performance

For example:

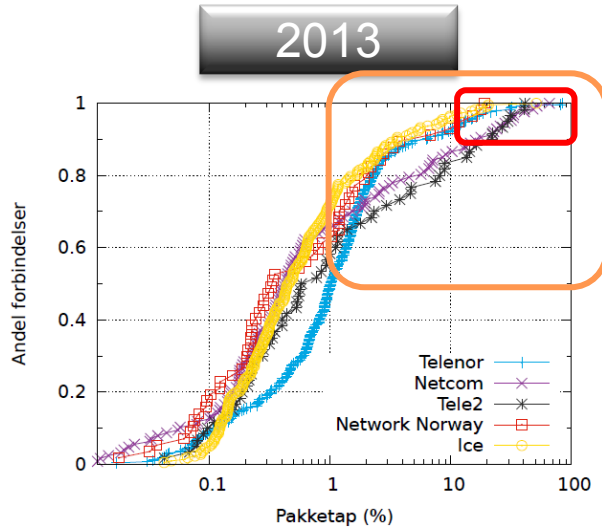
- Abnormal behavior.
- Congestion
- Failures.

CELL NAME	PERFORMANCE COUNTER	TS 1	TS 2	TS 3	TS 4	TS 5
MOBILE_L08	L.E-RAB.AbnormRel	0	0	1	0	0
MOBILE_L08	L.E-RAB.AbnormRel.Radio	0	0	0	0	0
MOBILE_L08	L.E-RAB.AbnormRel.MME	0	0	0	1	0
MOBILE_L08	L.UECNTX.AbnormRel	0	0	0	0	0
MOBILE_L08	L.E-RAB.Fail.NoRadioRes	0	0	0	0	0
MOBILE_L08	L.E-RAB.FailEst.MME	0	0	0	0	0
MOBILE_L08	L.E-RAB.ULSyncFail	0	0	1	0	0
MOBILE_L08	L.RRC.SetupFail.NoReply	0	0	0	0	0
MOBILE_L08	L.E-RAB.FailEst.NoReply	0	0	0	1	0

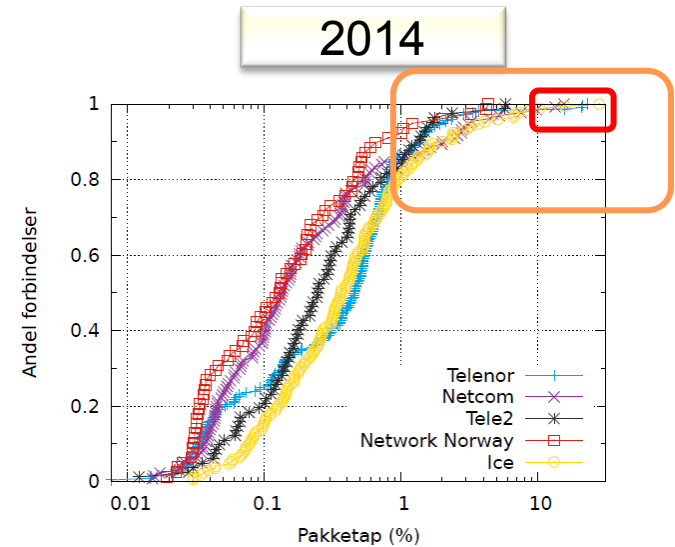
UE Tracing



Considerable improvements have been observed after the first SIMULA report.

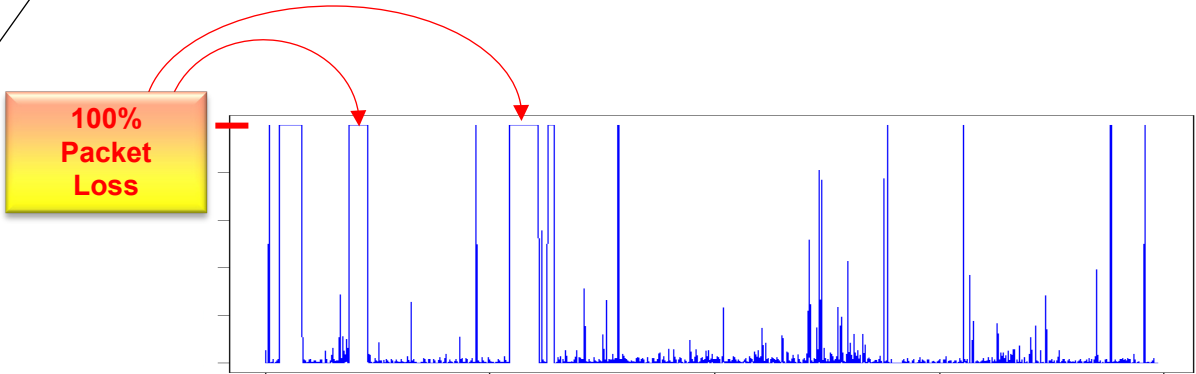
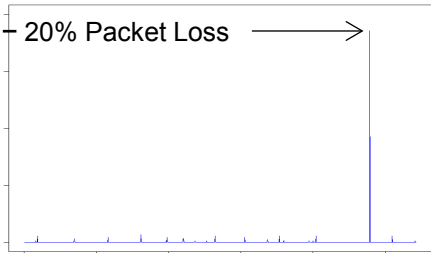
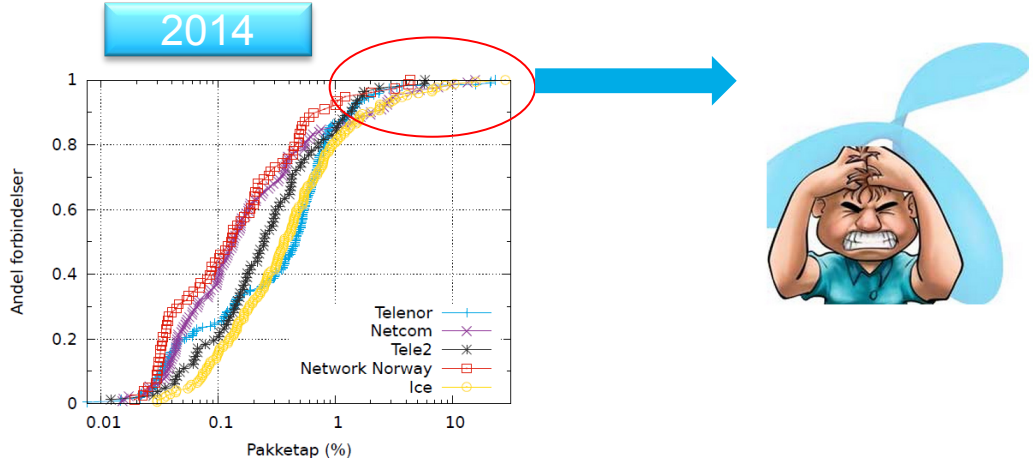


- ≈ 50% UE present more than 1% packet loss.
- ≈ 10% UE present more than 10% packet loss.



- ≈ 15% UE present more than 1% packet loss.
- ≈ 1% UE present more than 10% packet loss.

However, many interesting challenges remain.



In the first phase of this study, we have identified three different cases.

- Correlation between both side measurements.



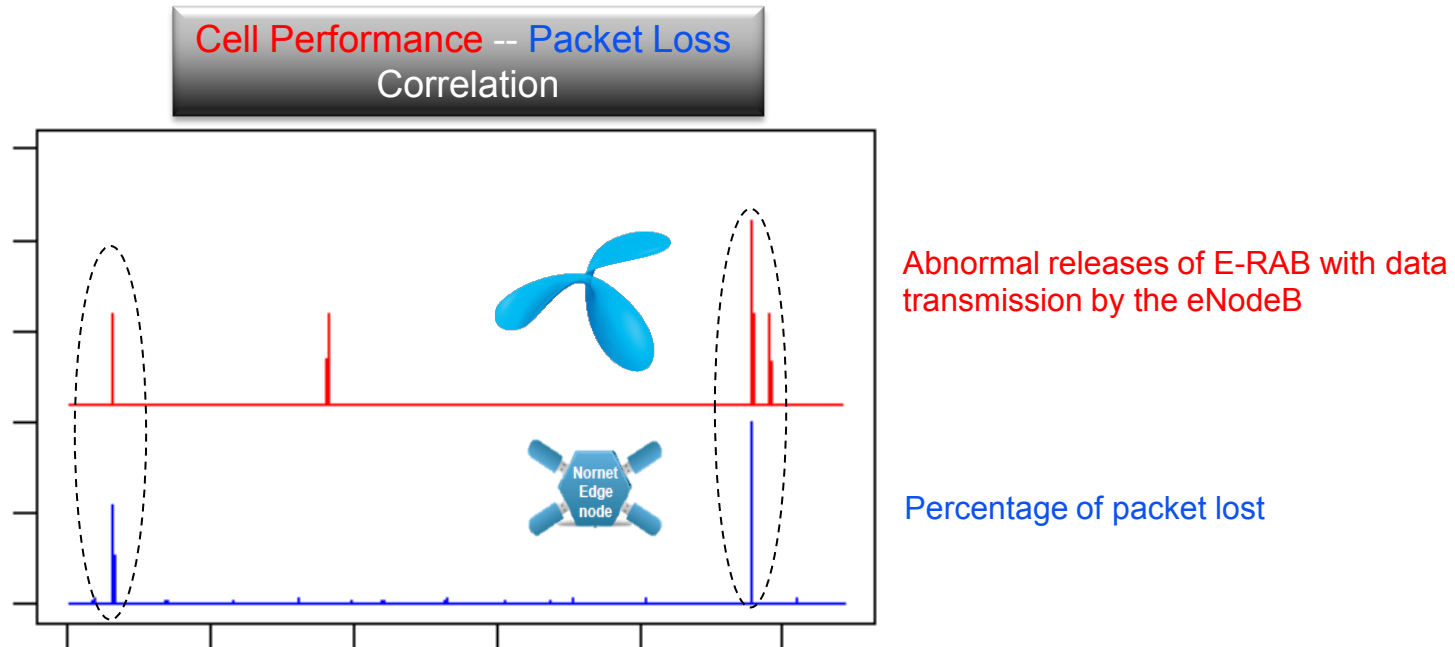
- Bad UE performance – Good Cell performance.



- Good UE performance – Bad Cell performance.



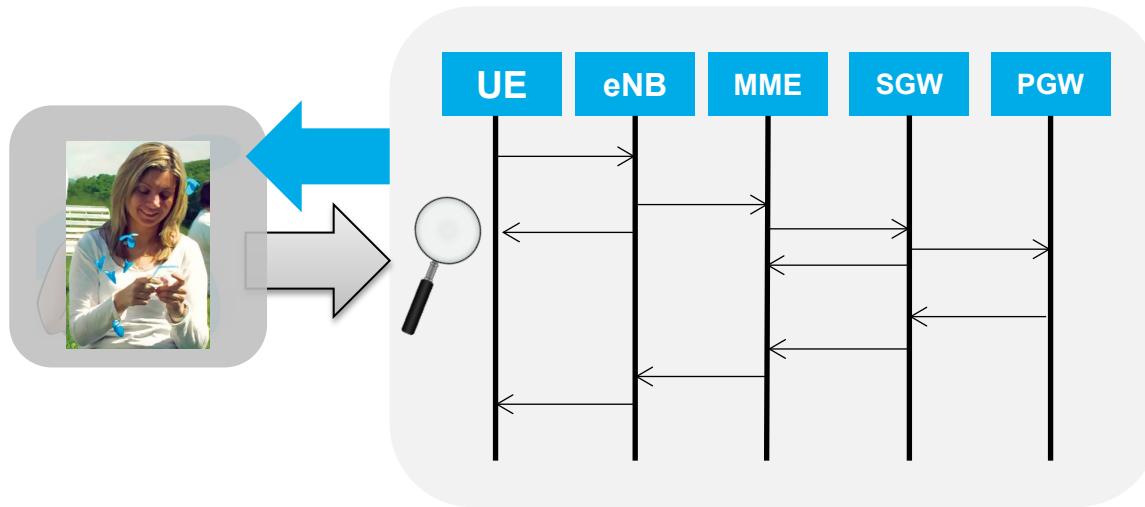
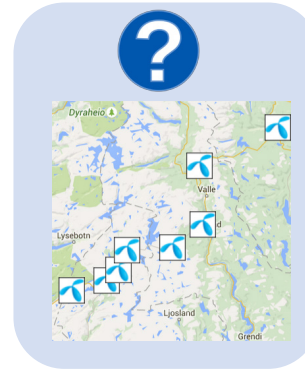
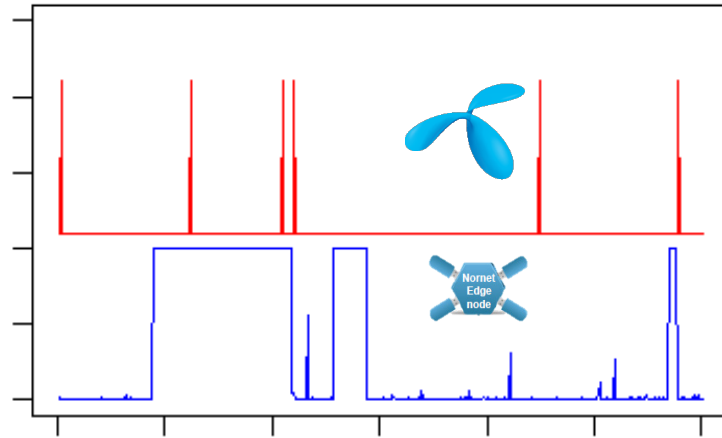
Finding correlations helps to map the user perception with specific key performance parameters.



Through these cases, we can understand better the implications of the observed cell-performance behavior on the final user perception.

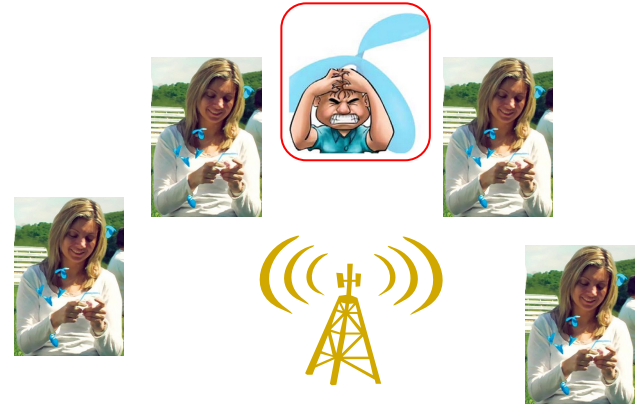
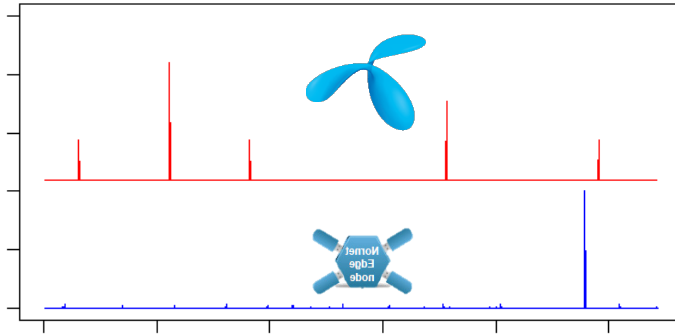


A deeper study of the “Bad UE Performance – Good Cell Performance” case may provide interesting findings.





The “Good UE Performance – Bad Cell Performance” case can be addressed by using the results obtained in the previous two cases.



NORNET measurements sometimes do not reflect the perception of other customers in the same cell

However, the proper modelling of the previous two cases will help to address these scenarios.

There is good potential to produce interesting scientific findings and improve our robustness and users experience understanding.



Thank you!

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