Checker – Consolidation – Trial Evaluation

Status after Trial (Hradec Králové and Pardubice 12/2014 swaped) 12.3.2015

Project **Checker-Kondensator**

Martin Havlík & ProjectTeam

pro společné zážitky

Trial Evaluation - Agenda

- Preparation
- Realization
- Operation
- Executive summary

Preparation phase – Common Grid (CG)

- 75 TM+O2 Clusters
- TM CG preparation last 11 months – Finished 12/2014 ✓
- O2 CG preparatiuon - Not finished yet (5 clustres missing) ☹

- Average Consolidation Factor in CG for all clusters reached = 60,2 %
  → Quality impacts on customers in some cases

⇨ **To be analyzed if increase CF to i.e. 62%**

Consolidation Factor in HK & PU exact numbres:

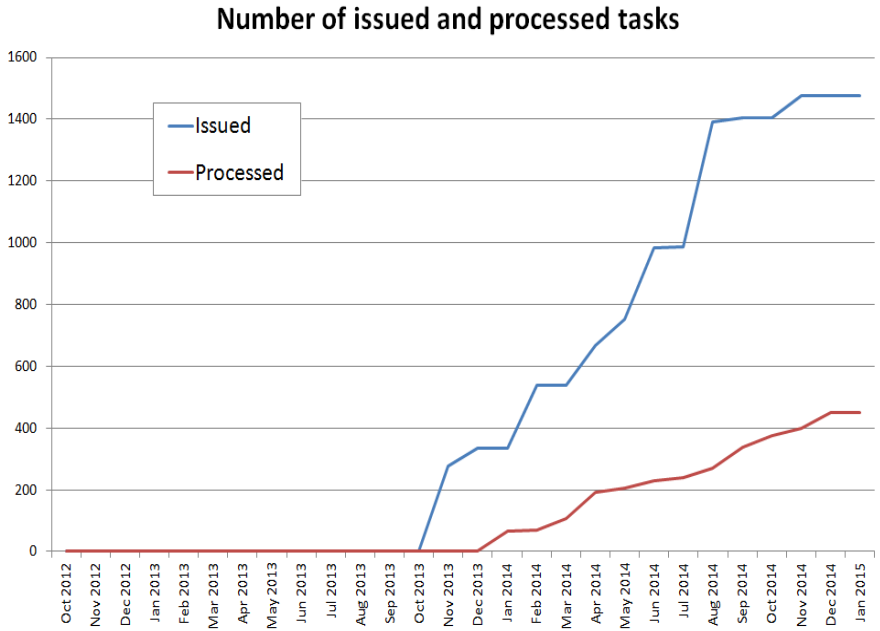
Status	Ave CF	#Sites HK	CF HK	# Sites PU	CF PU
Theoretical CG before Trial	60,7 %	89/144	61,8%	84/141	59,6%
CG after Trial*	62,1%	91/144	63,2%	86/141	60,9%
CG planned**	61,7%	90/144	62,5%	86/141	60,9%

* Not all sites consolidated (5 HK, 1 PU), some unilateral sites for TM added after Trial (1 HK , 2 PU)

** Final status estimation with all TM substitutions solved (6 substitutions in HK solved by 5 final sites)

Preparation phase – RF Planning

- **Complicated cooperation with Huawei planning**
  - TMCZ planning principles not kept
  - Fulfillment of promised terms
  - Responsibility for the overall result
  - Imperfect neighbour planning
  - Not available resources & Delays
  - Preplanning of CG done internally (saving is approx. 8 million CZK)



Next steps:

⇨ **Trainings for planners**

⇨ **In sourcing of planning unit back to TMCZ…**

⇨ **Neighbour planning performed by NM…**

Preparation phase – RF Planning

- **Cooperation difficulties with O2 planning:**

  - Never ending postponing of Common Grid
    - Site balance risk with wrong LTE installation

  - Different RF Strategy & Planning process
    - Common Planning Principles (free angles, tilt settings, more sectorizations…)
    - Not always kept

    ⇨ **Trainings for planners**

    ⇨ **Implementation of D0 check needed**

  - Different Tools & Databases
    - Not working intefaces

  - DCS under discusion

  - Troubles with resources
    - Passive cooperation, TM prepare principles & train O2 planners…

But Still Good team spirit ☺

Preparation phase – Construction Standards

- There are no fundamental site standard modifications required

- Battery backup and PSU standard were not applied within trial area

→ Testing for proper battery implementation

→ Agreement is to implement Trial area till May 2015

→ From 2015 onwards all consolidated sites shall reflect the standard for battery and PSU

- TMCZ was successful to convince O2 to implement some saving measures e.g. Temperature management, higher deformation allowed for MW structures, freecooling.

- Site design 2G/3G Network Sharing Standard agreed with O2

→All sites are going to be constructed according to these STD 

→ Risk: Abis over IP not in Trial → Plzen jih first cluster with IP solution = Trial

Preparation phase – Lease contract negotiation

- In the trial the Lease Contract negotiations done by Master
- After trial new rule – Lease Contract negotiations done by Site owner

- Task to conclude sharing contract and achieve savings on rent

  Expectations:

  - 30% of savings on LC rent
  - max. 6 months for the contract negotiations
  - Implemented motivation program to achieve savings on LC rent (80% from yearly rent price)

  Reality:

  - In average **2%** of rental savings in HK
  - LC negotiations on complicated sites (e.g. multi-owners) last **up to 12** months
    - 2 out of 88 sites still not contracted (1x VDF site, 1x House w/o subst.)
    - 4 still under implementation (municipal owners/multi-owners)

Preparation phase – Acquisition

- Carpet bombing in procedure for 10 clusters (clusters in 2017)

  First 100 sites done → **only 5%** savings achieved

☹ **VDF sites – still waiting for final agreement / decision**

- Agreement with VDF to use their sites
- Use other candidates if available (always with quality impact) or higher CF
- **Build new sites** (in most cases no replacement available & long delivery time)

Realisation phase – Cluster readiness

- Compact area of minimum 95% sites in the cluster is the optimal target for cluster consolidation

- Due to complicated sites with extremly long LC negotiations could happen that targeted 95% can´t be reached at all.

→ In such case master should propose the feasible solution considering quality (e.g. smaller cluster)

→ Each cluster readiness will be mutually agreed by project team

Note: (3 clusters from 2015 TM rollout were postponed 1 month to reach 95% sites….)

Realisation phase – HW reselling on “X-sites”

- Original plan on cross sites to re-use and re-sell all 2G HW which may stay and be used on existing site for the consolidated network was changed after the trial experience.

→ Not feasible for mass rollout

- HW re-selling on “X-sites” was reduced to antenna system only due to complicated process of BTS HW re-selling and inventory evidence.

- 2G BTS HW from X-site to be de-installed and transferred by master to owners warehouse

☹ Additional cost for 2G BTS HW de-installation and transportation (X-sites only)

Realisation phase – Supplier quality

- Low quality of installation work (wrong azimuts, tilt) – both Hua and O2 suppliers
- Last minute changes in installation plan - not according agreed planned work rules.
- Agreed time plan and milestone targets not fullfilled and therefor cluster consolidation time plan was rescheduled
- Acceptance process not sufficient → more intensive acceptance checks to be implemented
- Work Shops with suppliers – share lesson learned collected during the Trial

Realization phase - Integration

- Integration split – 3G in advance – 2G in NDN

- During the NDN is possible to swap up to 80 sites per night in one grid. 2 NDN per month

- Before NDN it is necessary to check completely all transmission path against path loop at the site endpoint

- The most painful problem was with the quality of suppliers and their task made behind agreed schedule

→ Necessary to clarify and consolidate the process of change management to set clear rules and responsibilities

Operation - Incident management

- TT exchange between T-Mobile and O2 was based on email communication of maintenance center specialists. Workaround already implemented.

→ Final setup of IM process information exchange is planned to be implemented in Q3 2015.

- Problems with naming convention of sites between TM-O2

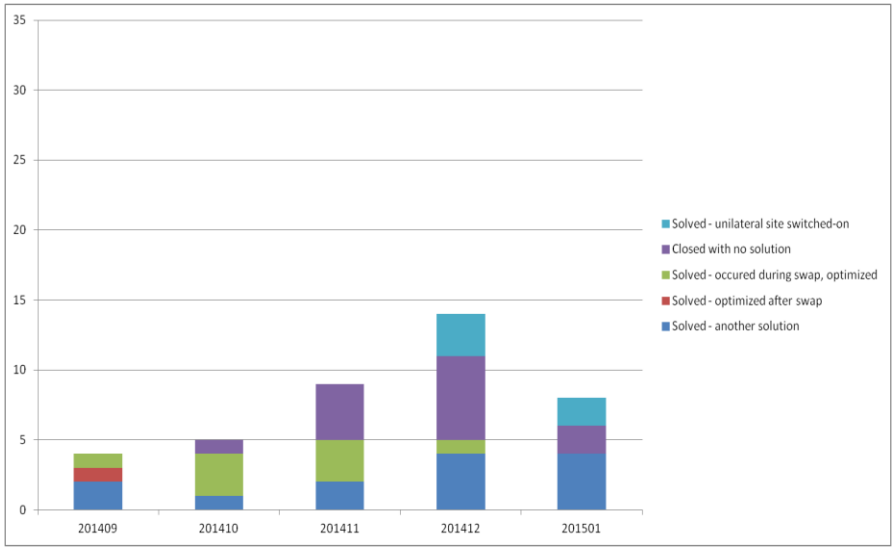
→to be analyzed with O2

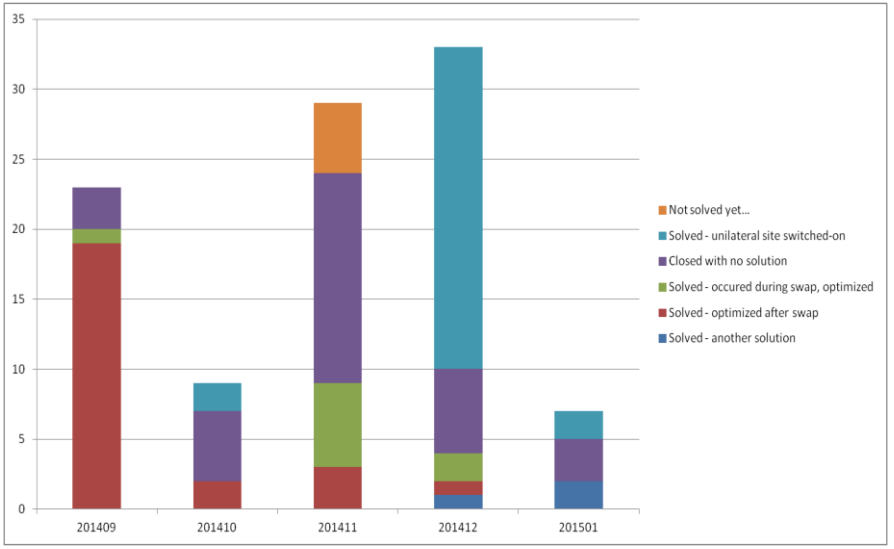
- Configuration items are not properly updated due to incomplete data in NetCracker. Configuration Management is a base stone for all other processes (IM, ChM, PrM).

→Needs to be improved

Operation phase – TM Customer complaints

- Up to **35 per month** and per cluster only (All together 150)
  → In average **Comparable** to the situation prior the consolidation project
- Number of the complaints in PU is several times larger than in the HK cluster
  - May indicate that in the PU cluster is a network with a lower quality (Planning principles not kept..)





- Due to concentrated complaints in some places → The project team decided to switched on 3 switched off sites = Unilaterals
  → Consolidation Factor 60**% seems to be not enough**, to be re-evaluated again (see more details in Quality KPI seasition)

Realization phase – Data exchange

D0 / D1 data:

- Delivered with a delay, with a limited or even missing functionality
- Manual instead of full-automatic processing
  - many errors and data inconsistencies
- Incorrect or incomplete data repeatedly provided on both sides

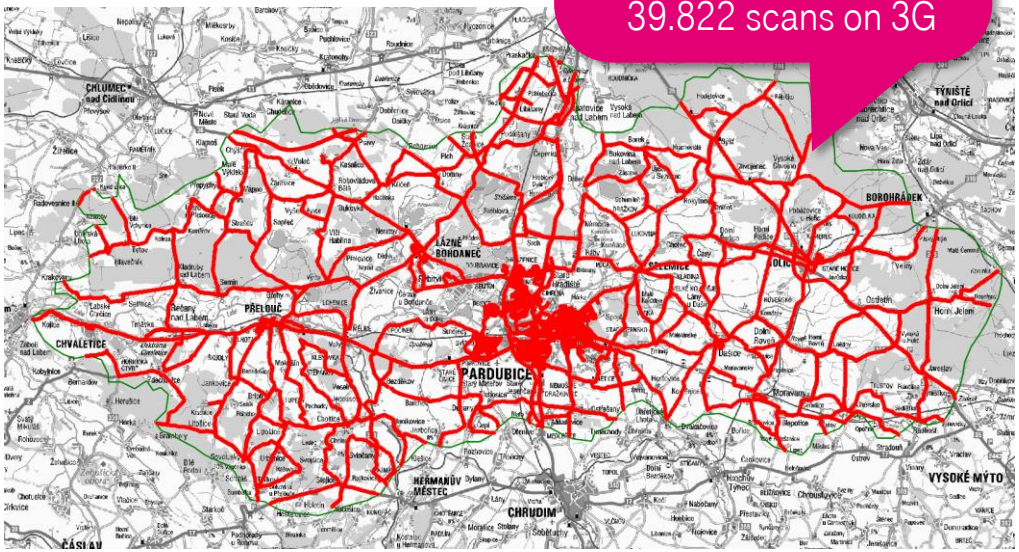
- DX data still in implementation phase

→ **For mass rollout automatic & valid data exchange needed**

Operation – KPI - Network Quality Evaluation

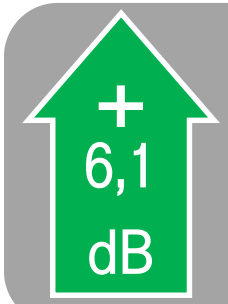
- Network quality KPIs remained on comparable level after consolidation
- Confirmed by both PM system Mycom and extensive drivetests
- Valid for both PU and HK clusters
- Similar result measured for O2 network as well

Example:
(PU cluster drivetest)
1.647 voice calls
4.607 data calls
41.838 scans on 2G
39.822 scans on 3G

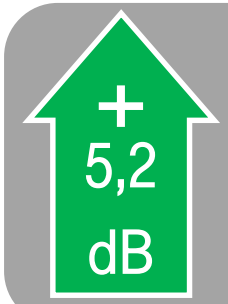


Operation – Evaluation Coverage changes

- Average **coverage improved** for both 2G and 3G network in both clusters
- Similar improvement (2G less, 3G higher) measured for O2 network as well
- A lot of places **with significant coverage decrease** identified as well
- Customer complaints concentrated in 25% areas with confirmed coverage loss



2G coverage improved in average

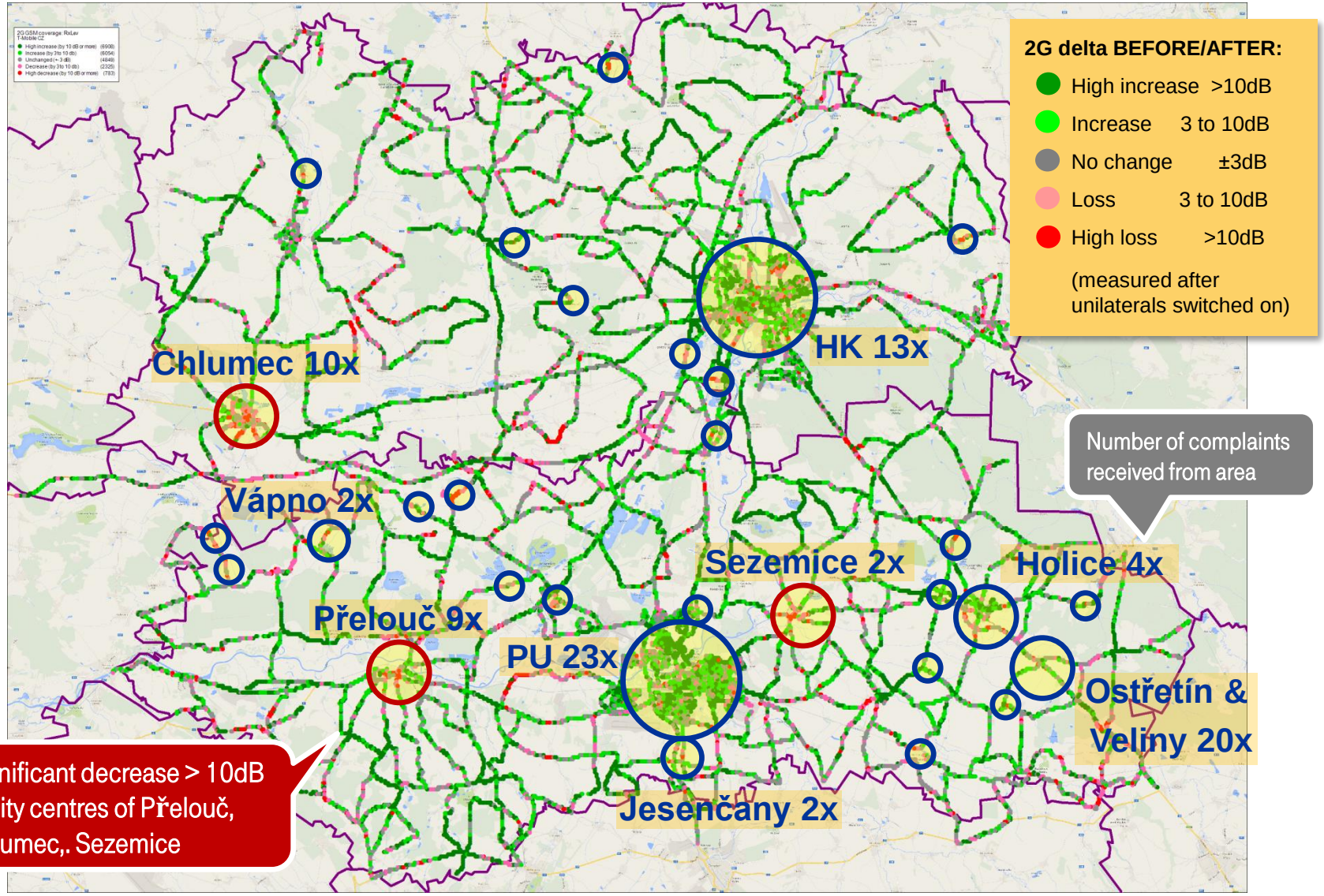


3G coverage improved in average

Complaints:
Ostřetín/Veliny.
Roudnička, Pardubice –
solved by 3 unilateral sites

Complaints:
Chlumec, Sezemice,
Přelouč, Jesenčany and
many others – no solution

Operation - Complaints & 2G Delta Coverage



Network Swap KPI results – TMCZ clusters

Hradec Kralove:T-Mobile Master

2G_HK cluster	Week 36 (1 Sep 14)	Week 51 (15 Dec 14)	delta
Voice Call Setup Success Rate 2G	99.34	99.43	0.09%
Voice Call Drop Rate 2G	0.44	0.38	13.64%
Data Call Setup Success Rate 2G	98.04	98.31	0.28%
Data Call Drop Rate 2G	1.72	1.27	26.16%

Pardubice: T-Mobile Slave

2G_PU cluster	Week 36 (1 Sep 14)	Week 51 (15 Dec 14)	delta
Voice Call Setup Success Rate 2G	99.28	99.59	0.31%
Voice Call Drop Rate 2G	0.47	0.31	34.04%
Data Call Setup Success Rate 2G	97.96	98.77	0.83%
Data Call Drop Rate 2G	1.76	1.78	-1.14%

Quality improvement

Quality decrease within tolerance window

Quality degradation out of tolerance

3G_HK cluster	Week 36 (1 Sep 14)	Week 51 (15 Dec 14)	delta
Voice Call Setup Success Rate 3G	99.86	99.86	0.00%
Voice Call Drop Rate 3G	0.19	0.16	15.79%
Data Call Setup Success Rate 3G	99.93	99.92	-0.01%
Data Call Drop Rate 3G	0.73	0.66	9.59%

3G_PU cluster	Week 36 (1 Sep 14)	Week 51 (15 Dec 14)	delta
Voice Call Setup Success Rate 3G	99.87	99.83	-0.04%
Voice Call Drop Rate 3G	0.17	0.19	-11.76%
Data Call Setup Success Rate 3G	99.39	98.22	-1.18%
Data Call Drop Rate 3G	0.89	0.45	49.44%

- **The Network Quality counter based KPIs Before/After Swap are comparable** with exception of **3G Voice call drop rate in PU cluster** (Contract tolerates relative degradation up to minus 20%/KPI)
- The Network swap result performed a bit better in HK cluster (T-Mobile Master)
- Local cell based degradations caused by:
  - Poor performing cell sat the edge of coverage , insufficient capacity dimensioning, improper initial antenna and neighbourhood planing
- Next steps
  - Optimization of Top Worst performing cells in progress via IM/ Optimization process

Drive test swap KPI results – TMCZ clusters

Hradec Králove:T-Mobile Master

TMCZ Drivetest KPIs				
Voice KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Call setup success rate [%]	99.34%	99.43%	+0.09%	OK
Call success termination rate [%]	99.57%	99.50%	-0.07%	IN LIMIT
Average speech quality [MOS]	4.03	4.00	-0.75%	NOT OK
Data KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Data Session Setup Success Rate [%]	94.80%	98.60%	+3.85%	OK
Data Success Termination Rate [%]	100.00%	99.60%	-0.40%	IN LIMIT
Average Data transfer rate FTP DL [Mbit/s]	7131	7837	+9.01%	OK
Average Data transfer rate FTP UL [Mbit/s]	1595	1523	-4.76%	IN LIMIT

Small degradation of speech quality

TO2 Drivetest KPIs				
Voice KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Call setup success rate [%]	98.84%	99.50%	+0.66%	OK
Call success termination rate [%]	98.67%	99.50%	+0.83%	OK
Average speech quality [MOS]	4.04	4.02	-0.50%	IN LIMIT
Data KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Data Session Setup Success Rate [%]	92.70%	96.80%	+4.24%	OK
Data Success Termination Rate [%]	100.00%	100.00%	+0.00%	OK
Average Data transfer rate FTP DL [Mbit/s]	4480	5872	+23.70%	OK
Average Data transfer rate FTP UL [Mbit/s]	2061	1833	-12.45%	NOT OK

Decrease of FTP UL throughput of TO2 confirmed also by TO2 drive test

- The Drive test based KPIs Before/After Swap are comparable with exception of small degradation of TMCZ MOS speech quality→ target t will be changed in the updated of the contract (marginal change w/o impact on custumer
- For TO2 network was detected decrease of average UL throughput.

Quality improvement | Quality degradation | Quality decrease within tolerance window

Measurement before: 20.6. - 2.7.2014

Measurement after: 6.1. - 16.1.2015

Drive test swap KPI results – TMCZ clusters

Pardubice:T-Mobile Visitor

TMCZ Drivetest KPIs				
Voice KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Call setup success rate [%]	98.77%	98.01%	-0.77%	IN LIMIT
Call success termination rate [%]	98.16%	98.79%	+0.64%	OK
Average speech quality [MOS]	4.03	4.05	+0.50%	OK
Data KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Data Session Setup Success Rate [%]	85.40%	99.40%	+16.39%	OK
Data Success Termination Rate [%]	100.00%	100.00%	+0.00%	OK
Average Data transfer rate FTP DL [Mbit/s]	6484	7365	+13.59%	OK
Average Data transfer rate FTP UL [Mbit/s]	1769	2169	+22.61%	OK

TO2 Drivetest KPIs				
Voice KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Call setup success rate [%]	98.77%	98.95%	+0.18%	OK
Call success termination rate [%]	99.66%	98.93%	-0.73%	IN LIMIT
Average speech quality [MOS]	4.04	4.10	+1.49%	OK
Data KPIs	**Before value**	**After value**	**R. Delta**	**Traffic Light**
Data Session Setup Success Rate [%]	82.40%	98.50%	+19.54%	OK
Data Success Termination Rate [%]	100.00%	100.00%	+0.00%	OK
Average Data transfer rate FTP DL [Mbit/s]	6944	6517	-6.14%	NOT OK
Average Data transfer rate FTP UL [Mbit/s]	2261	2339	+3.48%	OK

Decrease of FTP DL throughput of TO2 confirmed also by TO2 drive test

- All TMCZ statistics improved or in range of degradation acceptable limit.
- For TO2 degradation of DL throughput.

Quality improvement | Quality degradation | Quality decrease within tolerance window

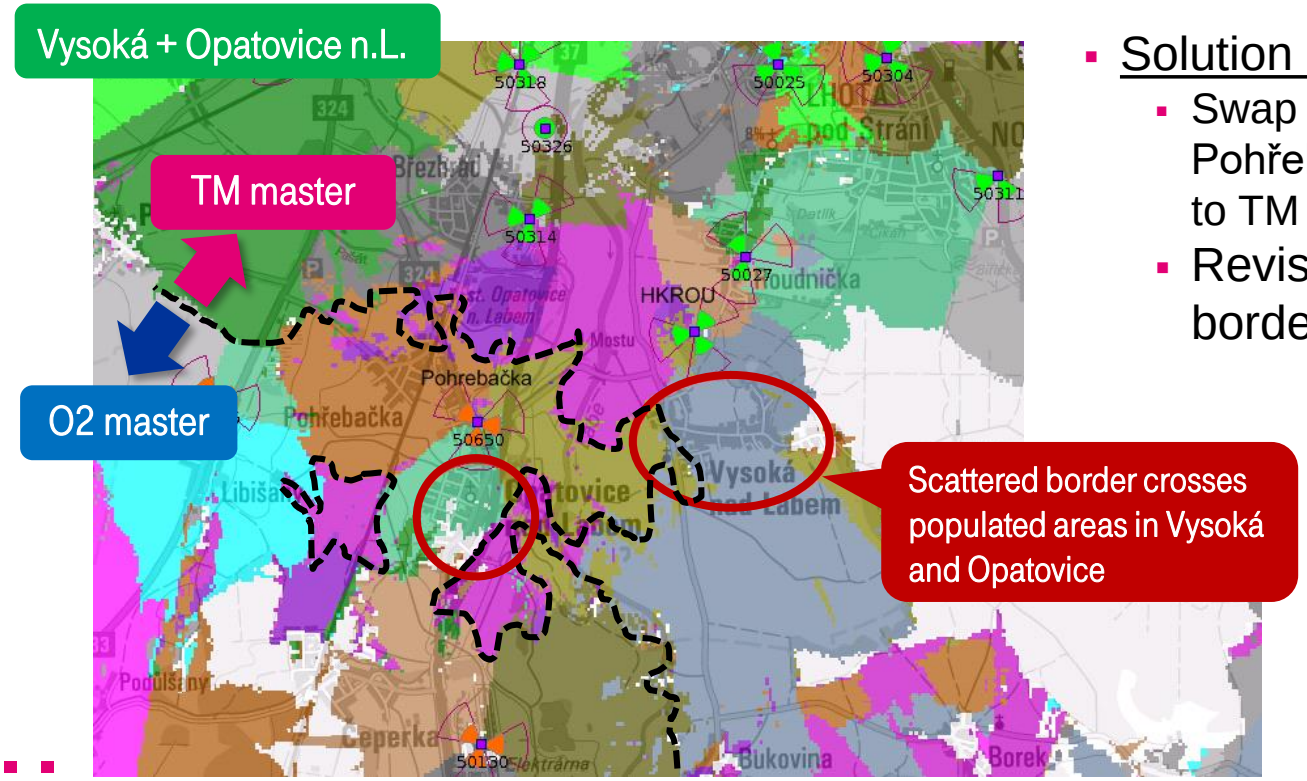
Measurement before: 20.6. - 2.7.2014

Measurement after: 6.1. - 16.1.2015

Quality Issue on Master / Visitor Boarder-Planning

- Problem occurs if this border is passing through populated area
- UE often performs reselection between master / visitor network
  - Limited availability for incoming calls
  - Limited possibility of making outgoing calls
  - Data speed is very poor

Appears mostly in indoor locations



- Solution proposed:
  - Swap site 50650 Pohřebačka back from O2 to TM
  - Revise and optimize border in planning phase

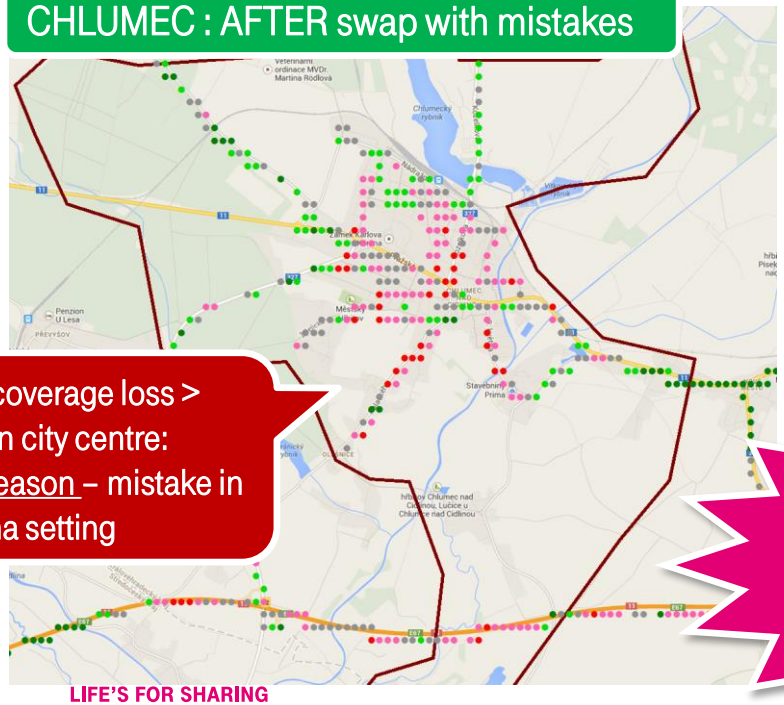
Operation - Bad Installation Quality

- Mixed sectors found after swap on 10% of sites
- Wrong antenna parameters (tilts, azimuths) found on more than 70% of sites, cause for:
  - Coverage loss
  - Interference rise up in wide area – quality degradation, drops, slow data

→ Intensive optimization of network necessary

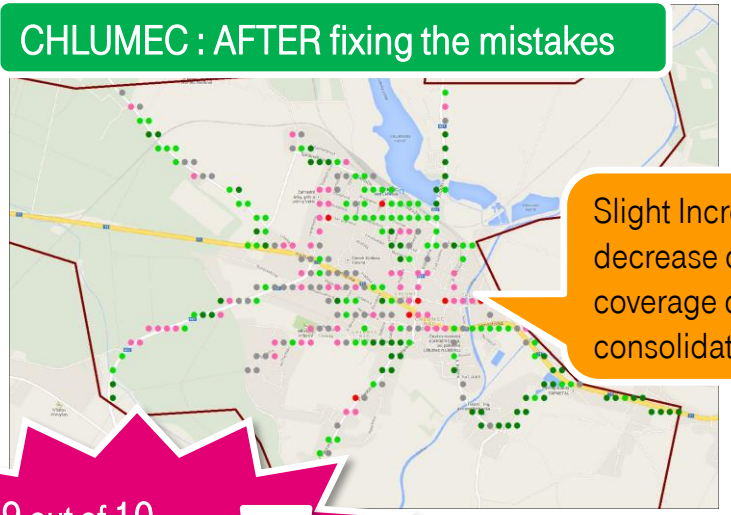
Risk → not enough time & resources during mass of consolidation rollouts

CHLUMEC : AFTER swap with mistakes



Huge coverage loss > 10dB in city centre: Main reason – mistake in antenna setting

CHLUMEC : AFTER fixing the mistakes



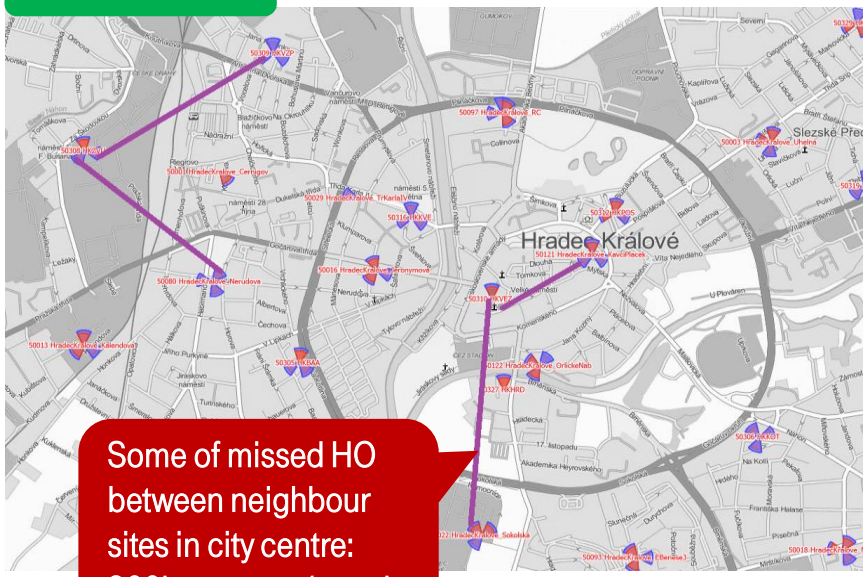
Slight Increase / decrease of coverage due to consolidation only

9 out of 10 complains after swap caused by antenna mistake

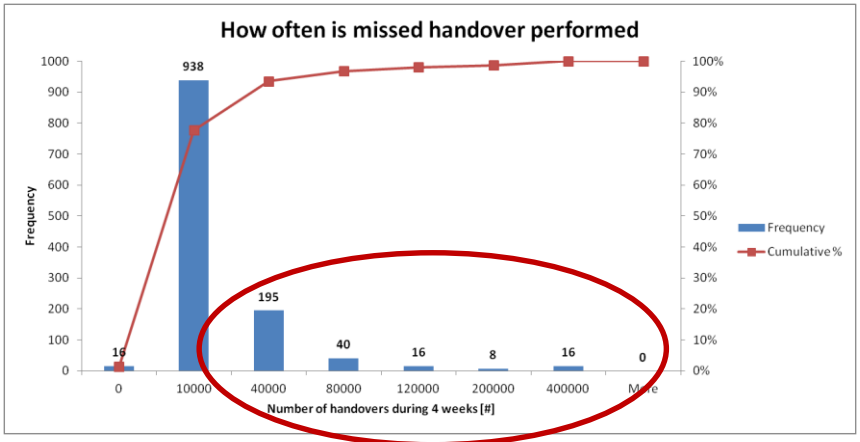
Operation - Poor neighbourhood planning

- Lot of important HO were forgotten by HUA to define
- Complained quality degradation: drops, slowing down data speed, poor voice
- It was necessary to add 1.200 HO on top (based on DT and SON OM)
  - 275 out of added HO are the key top HOs which are performed 1.000 times and more per day!!!

Hrade Králové



Some of missed HO between neighbour sites in city centre: 300k attempts/month



275 missed top HOs with 40k+ attepmts/month

Realization - Deinstalation & Liquidation Trial

Deinstalation plan PU+HK:

Months	1/15	2/15	3/15	4/15	5/15
Sites	0	0	**15**	**20**	**16**
Suma (Cumul.)	**0**	**0**	**15**	**35**	**51**

Average savings for 1 site:

- Technology dismantle 85 ths Kč
- Site Dismantle 215 ths Kč

☹ **Liquidation Strategy** not clear – needed decision !

Especialy for expensive or strategic sites (Towers & Optics sites)

→ Sell, Keep, Liquidate…?

→ Risks (Legal and tax issues, more expensive….)

Realization - Uninstallation & Liquidation Trial

Types of sites for uninstallation:

- 70 non CG sites → candidates for deinstalation
- Technology dismantle = 36 sites
- Site dismantle = 25 sites

- Unilaterals 3 sites
- 6 sites are waiting for CG sites finalization – then dismantle

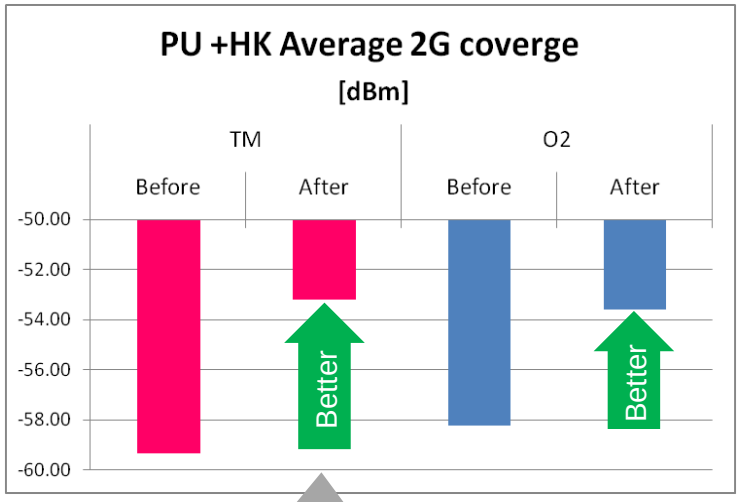
Executive summary – Trial evaluation

1. Average Consolidation Factor in CG for all clusters reached → Quality impacts on customers → Analyzes to increase CF
2. Complicated cooperation with Huawei planning → Planning & HO insourcing
3. Targets for rental savings and LC delivery time not reached → Accepted
4. VDF sites – still waiting for final agreement / decision
5. Complicated sites with extremly long LC negotiations - targeted 95% can´t be reached → Find feasible solution considering quality
6. During the NDN is possible to swap up to 80 sites per night in one grid. 2 NDN per month
7. In average comparable amount of complaints before & after consolidation
8. Network quality KPIs remained on comparable level after consolidation
9. Average coverage improved network in both clusters, but A lot of places with significant coverage decrease identified as well
10. Bad Installation Quality
11. Not clear deinstallation Strategy

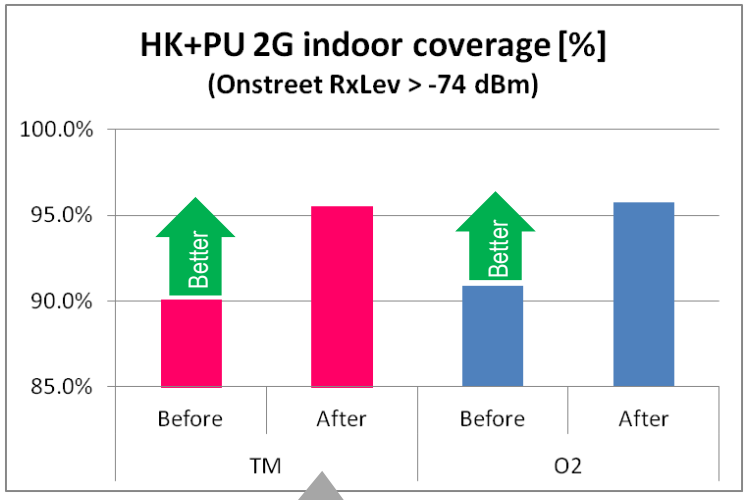
BACK *UP*

Drivetest – coverage 2G

- Both T-Mobile and O2 have **improved** 2G coverage, T-Mobile gained 1.5dB more than TO2.
- Nevertheless a lot of places with significant coverage decrease identified as well
- **Customer complains** concentrated in areas with coverage loss confirmed by measurement
- Highest coverage loss: Chlumec, Přelouč, Sezemice, Ostřetín/Veliny (solved), parts of HK
  → solution ongoing



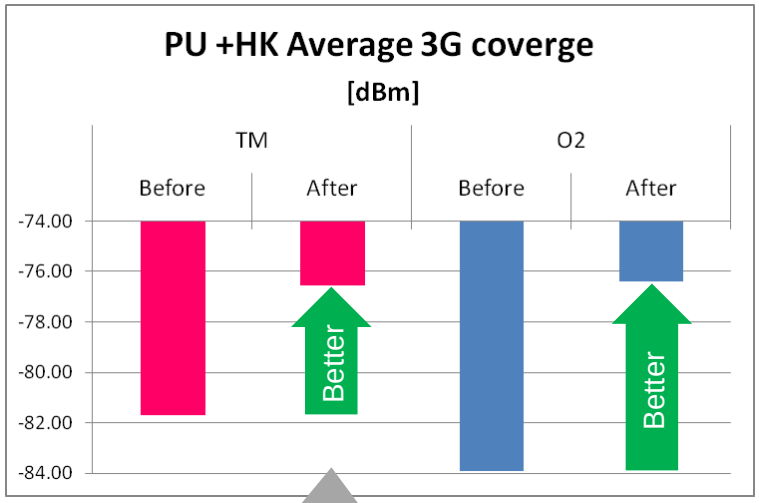
Cluster-wide avarage gain:
T-Mobile: +6,1dB
O2 CZ : +4,6dB



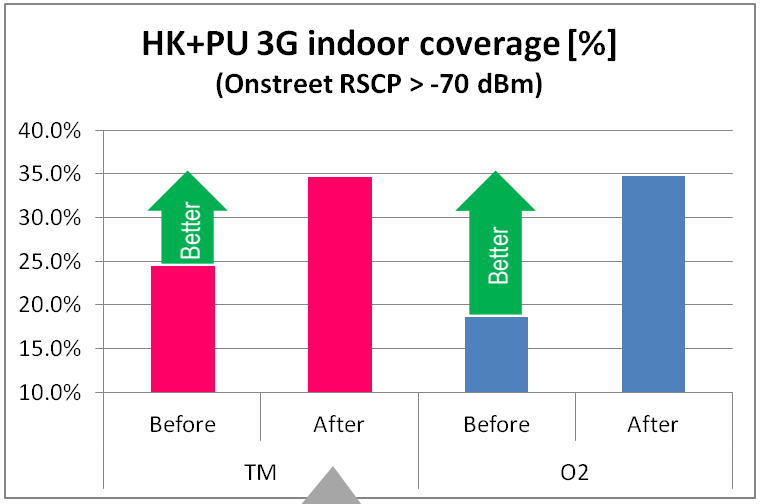
Cluster-wide avarage gain:
T-Mobile: +5,4%
O2 CZ : +4,9%

Drivetest – coverage 3G

- Both T-Mobile and O2 have improved 3G coverage, O2 gained 2.3dB more than TMCZ.
- Nevertheless a lot of places with significant coverage decrease identified as well
- O2 used to have worse 3G coverage in the area, consolidation accounts higher benefits for O2
- Remarkable increase of 3G indoor coverage >10%

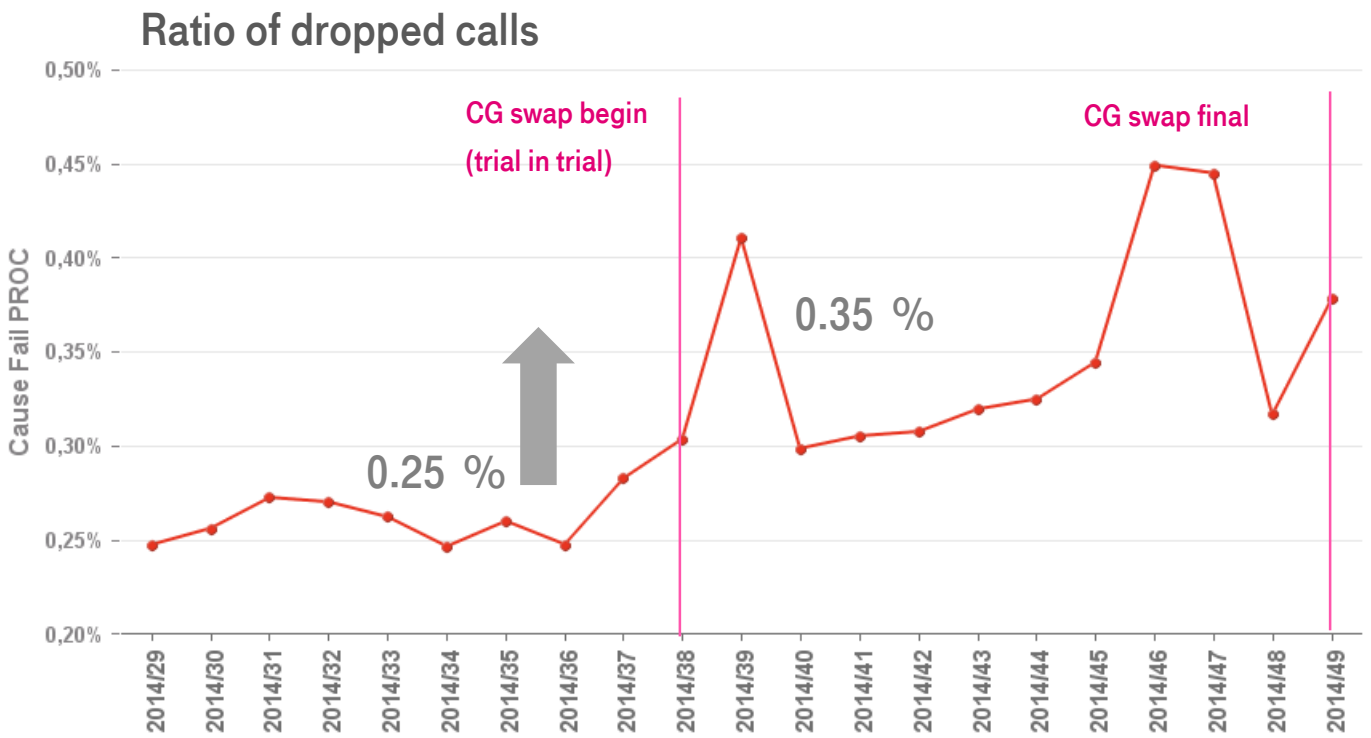


Cluster-wide avarage gain:
T-Mobile: +5,2dB
O2 CZ : +7,5dB



Cluster-wide avarage gain:
T-Mobile: +10,1%
O2 CZ : +16,2%

Billing BO statistics – clusters HK+PU



- Increase of average dropped calls ratio after CG swap 0.25 % > 0.35 %
- Evaluated from billing statistics (LE, SME and postpaid customers)
- Calls only from PA-HK cluster sites
- Temporary high increase of drops – tuning of HO plan

SON OM helps with after swap optimization

- SON OM ANR has taken part in the optimization process in HK
- 1st week after swap – collection of PM data
- Results:
  - During 1 week of operation more than 1000 HO added
  - Decreased 3G call drop rate by 25%