IT-SIMPLICITY SOLUTIONS BV

www.itsimplicity.nl

Introduction IT-Simplicity
FTTH / FTTX software solutions
Fibre network for Radio telescopes
Cost optimized network design
FTTX network solutions examples

CONTENT

- ABOUT US
- PROJECT VISION
- SOFTWARE
- SERVICES
- REFERENCES
- RADIO TELESCOPE NETWORK EXAMPLES

ABOUT US

IT-SIMPLICITY consists of a team of specialists with over 20 years of grounded experience in Telecom, Network Engineering, Project Management and Telecom Software solutions.

Since we did a management buy-out in 2013-02-01 and took over all Software rights and ownerships. We can now offer our software outside of DRAKA (PRYSMIAN).

Our keywords are:
generic, flexible, scalable, strong and most important…… **SIMPLICITY**!

PROJECT VISION

Our project vision and software is developed within the same project department that build Telecom projects around the world for more than 20 years.

Therefor our software solutions are:

- simple to use
- quick to learn
- totally customizable
- easy accessible
- controlling the whole project-process

PROJECT VISION

Lego–like ‘building blocks’ are used to control and steer the project.

The project structure uses only three levels (ABC) .

While showing all project information in clear dialog–screens any project can be designed, built and maintained.

SOFTWARE

FTTH / FTTX ITS-Software Suite™

FTTH / FTTX ITS–Software Suite ™
Is a proven software solution to Design, Build & Maintain FTTX networks.

The ITS–Software Suite™ has designed, registered and installed many millions of connections.

The ITS–Software Suite™ :

- Cost optimized automatic CAD design
- Dedicated software for FTTH / FTTX Project–Management
- Simple conversion from pre–registration to As–built network registration
- Offers full control over your projects

SOFTWARE

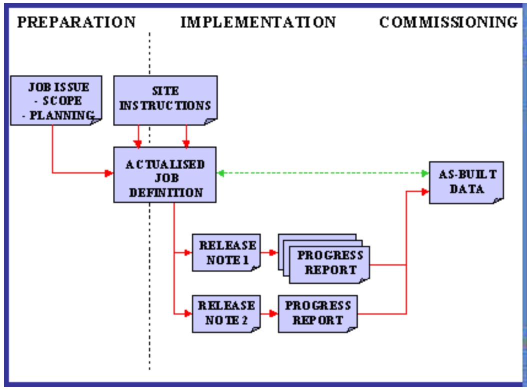
FTTH / FTTX network design

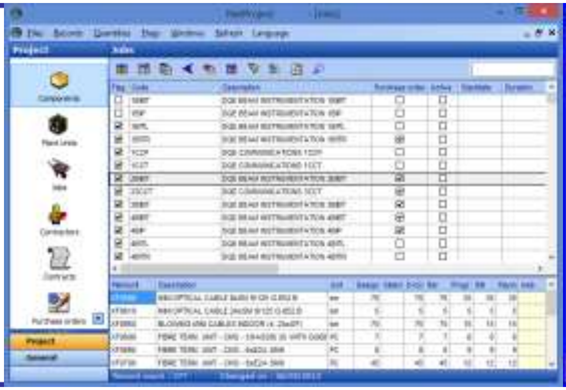
NetDesign™
Flexible solution for FTTH / FTTX **design**, based on Autocad.
Automatic: costing, cabling, labelling, easy switch from P2P to GPON.
Fast output as: schematics, installer ready & as-built designs. Easy to learn.

SOFTWARE

FTTH / FTTX project management

NetProject™
Extensive system for: Material, Contract and **Project management**.
Lego–like structure: three project levels with ‘building blocks’.
Total process control, including: purchasing, contractors, progress reports.
Completely customizable and simple to operate.



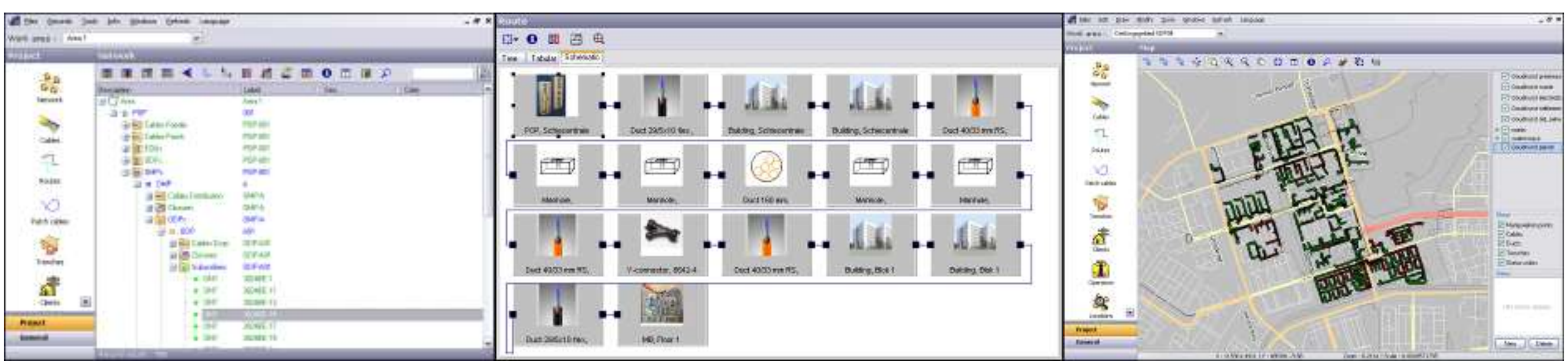


SOFTWARE

FTTH / FTTX network registration

NetID™

Network **registration** with easy tree structure en integrated GIS.
All information directly available for multiple users.
All network details are direct available in multiple views and GIS.
Lego–like customizable building blocks. Easy to operate.

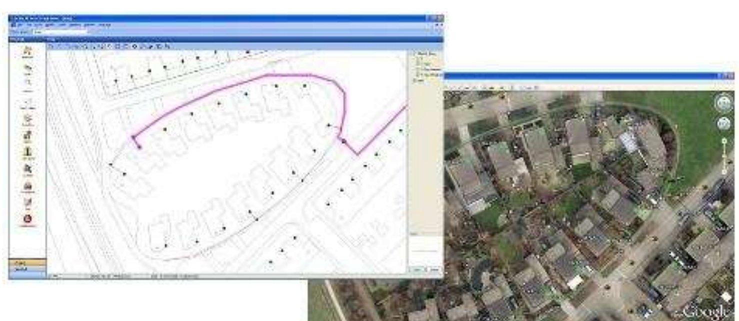


SOFTWARE

FTTH / FTTX network registration

NetID™ the integrated Geographical Information System:

- Approx. 3,000 pre-defined geographic coordinate systems
- Support for EPSG codes and OpenGIS WKT definitions
- On-the-fly re-projection of vector, raster, and grid layers between coordinate systems for real-time map display



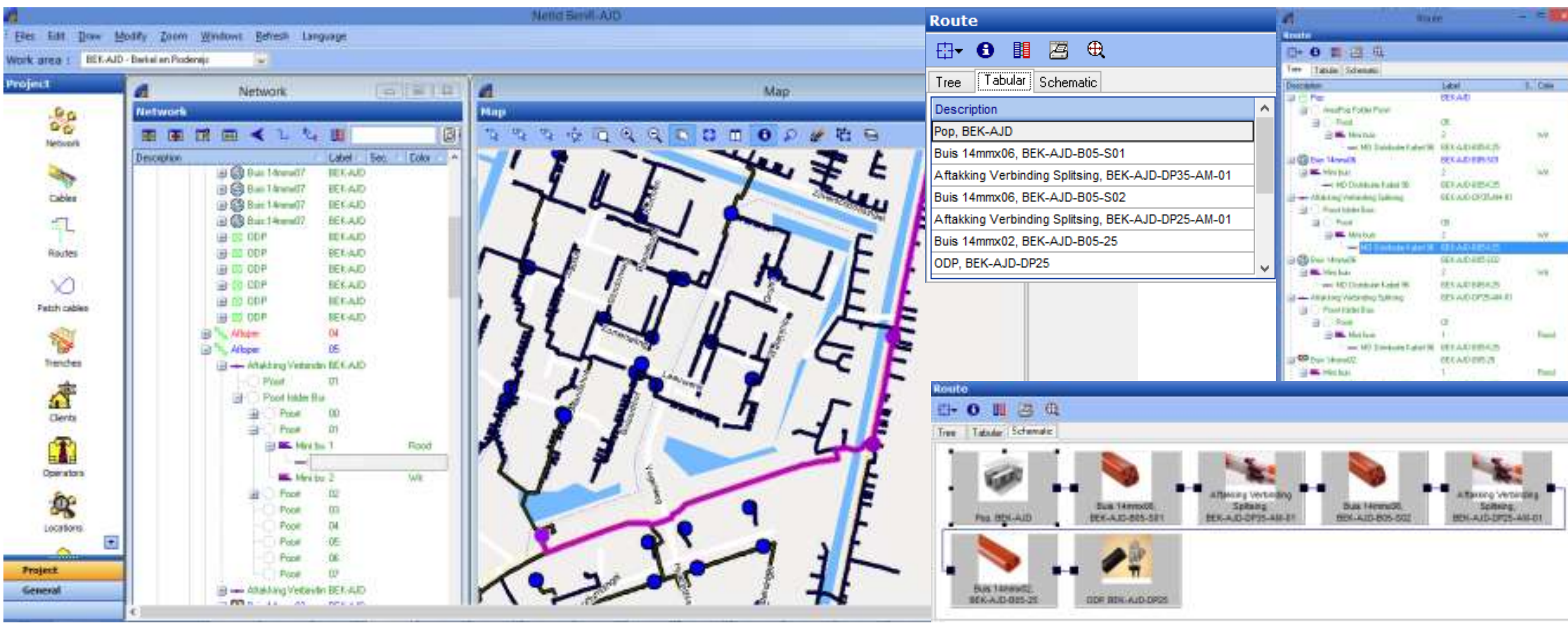
IT-SIMPLICITY

FTTH / FTTX Software & Network Solutions

SOFTWARE

FTTH / FTTX network registration

NetID™ the network tree & GIS & route views



SOFTWARE

NetOptimus™

NetOptimus™
Our automatic network design & planning solution.

Creates the highest quality FTTH / FTTX network designs by using complex optimization algorithms within a user friendly graphical interface.

Cost optimized network designs are made in minutes instead of days.

Optimization parameters:

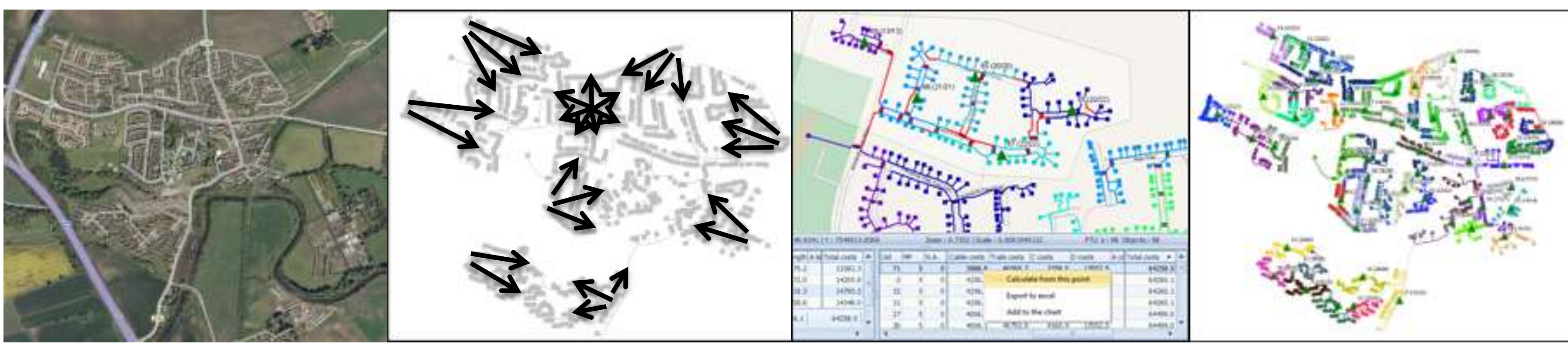
- Civil costs
- Material costs
- Installation costs

SOFTWARE

NetOptimus™

NetOptimus™ offers substantial benefits in terms of reducing the engineering time and network building costs. No training required.

Output to: CAD & GoogleEarth & Excel etc..



SOFTWARE REFERENCES

Africa:	Ghana; Mali; Rwanda; Tanzania; Zimbabwe
Asia:	Kazakhstan; Sri Lanka; Vietnam
Caribbean:	Curacao
Europe:	Denmark; England; Germany; Netherlands; Norway; Scotland; Sweden; Switzerland (CERN)
Middle–East:	Qatar

SOFTWARE REFERENCES

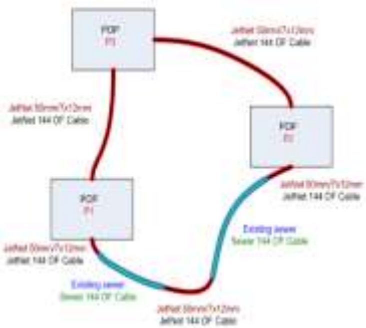
The Netherlands:
Mayor contractors in the Netherlands work daily with the ITS Software to engineer and install FTTH / FTTX networks.

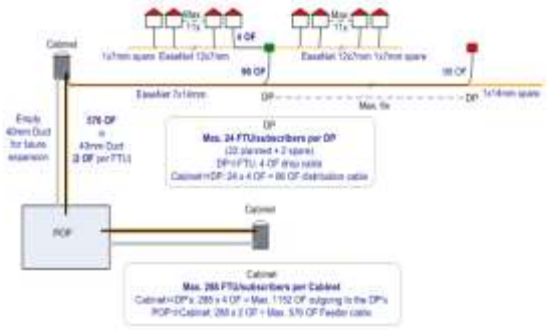
Approx. amount of homes engineered with the ITS Software in the Netherlands:

Year	Homes
2008	15.000
2009	40.000
2010	50.000
2011	70.000
2012	120.000
2013	200.000
	495.000

OUR SERVICES

- Developing network concepts
- Creating cost optimized network–designs
- Full service, from design to on–line network registration (including SaaS)
- Business case support with detailed costs & quantities
- High packing density data–centres (space saving)

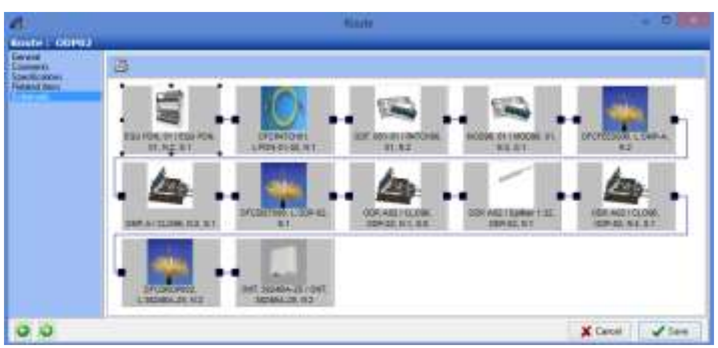




SERVICE REFERENCES 2013

- FTTH, FTTB,
- FTTX: Tunnels/Metro/Railway
- Hybrid: Copper/Power/ Optical

In: Mid–Africa, South America, The Middle East, Europe.



EXAMPLES

Examples of OFC network calculations and solutions for radio telescopes

IT-SIMPLICITY

FTTH / FTTX Software & Network Solutions

In Phase one, the addition of 190 dish antennas will expand the 64-dish precursor array. South Africa and eight African partner countries will host the dish array in Phase two and will also host the Phase two mid frequency aperture array antennas

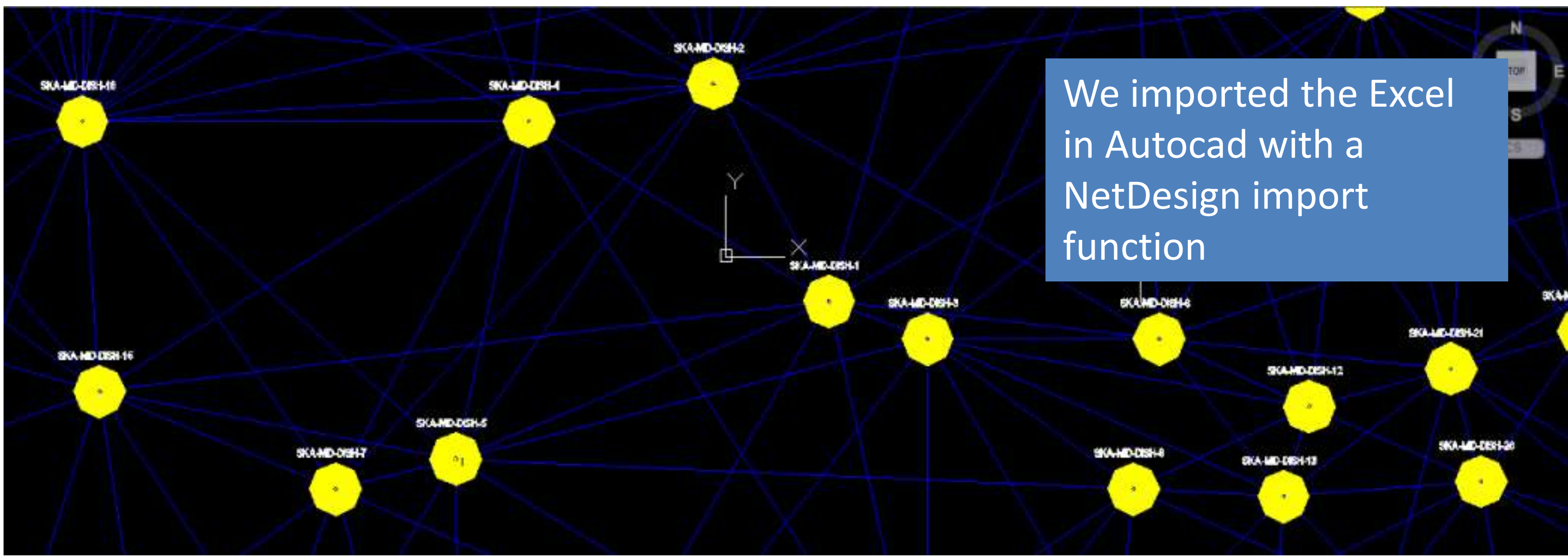
Phase one, the addition of 190 dish antennas in South Africa

Data preparation: Excel

	A	B	C	D	E	F	G
1	SKA-MID-DISH		1			30,059638	-12,951133
2	SKA-MID-DISH		2			-3,7569974	49,648062
3	SKA-MID-DISH		3			58,866573	-23,744936
4	SKA-MID-DISH		4			-57,614265	38,855334
5	SKA-MID-DISH		5			-78,906698	-58,282416
6	SKA-MID-DISH		6			126,50165	-23,744409
7	SKA-MID-DISH		7			-113,97668	-66,916792
8	SKA-MID-DISH		8			118,98627	-66,916846

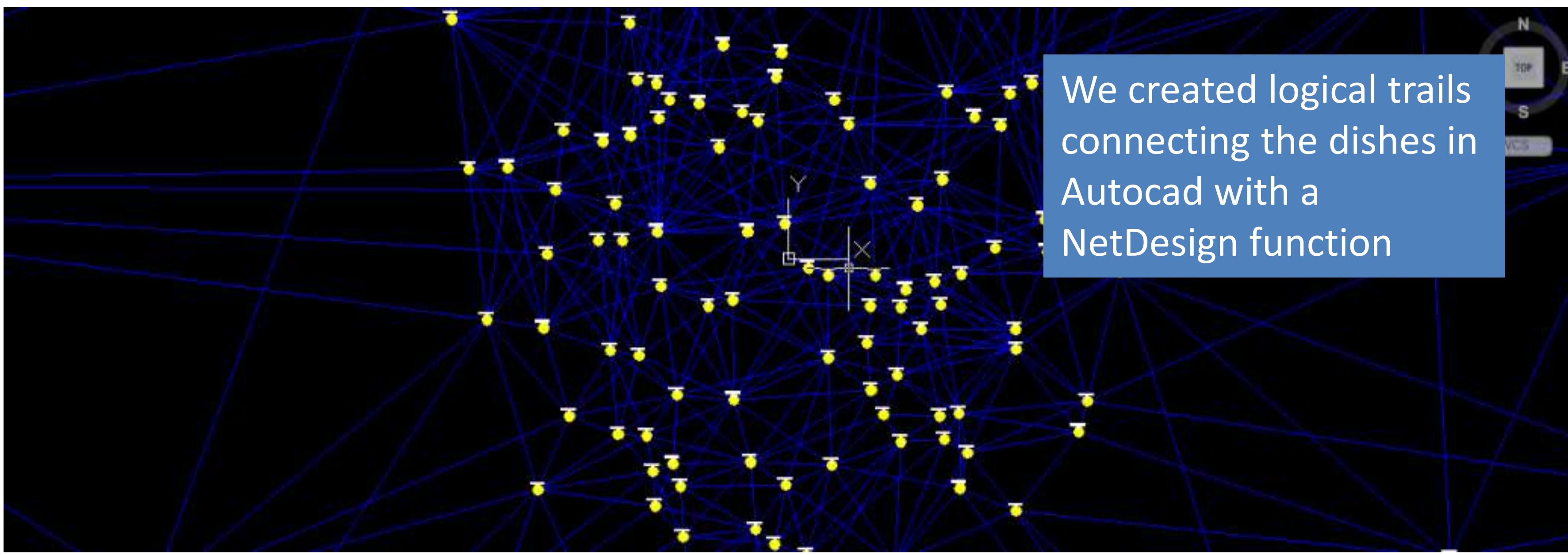
We added certain columns to the Excel for naming & labelling

Phase one, the addition of 190 dish antennas in South Africa
Data preparation: Excel => NetDesign (Autocad)



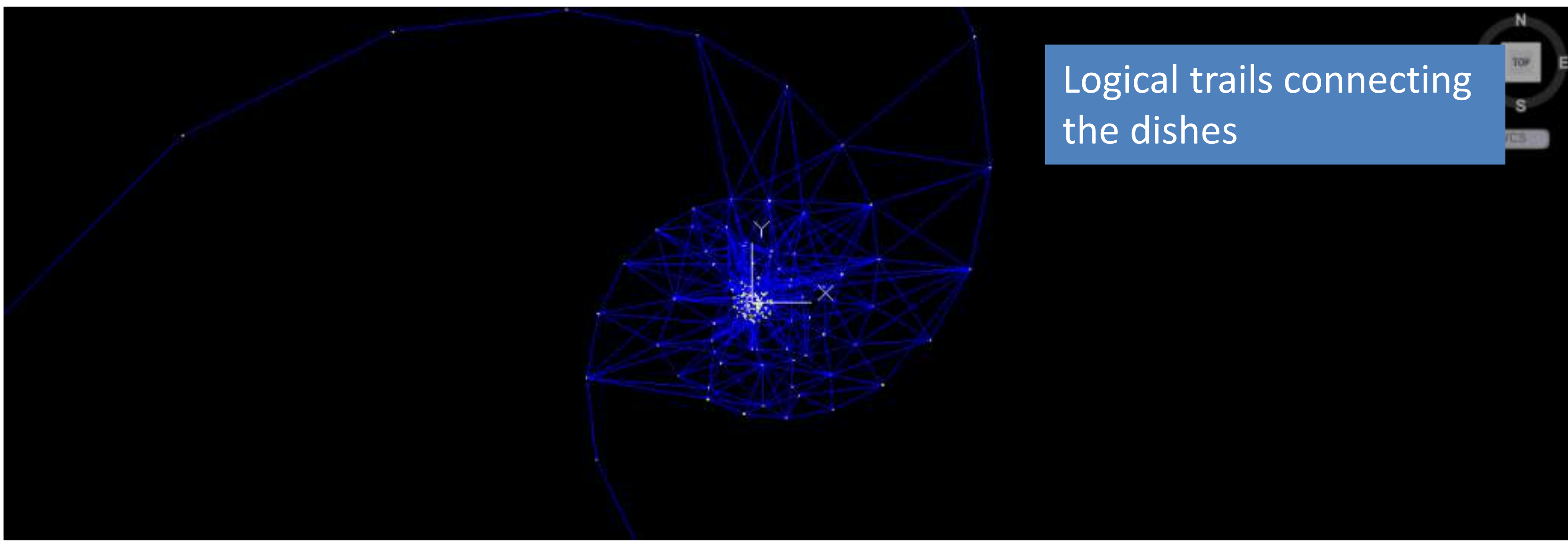
We imported the Excel in Autocad with a NetDesign import function

Phase one, the addition of 190 dish antennas in South Africa
Data preparation: NetDesign (Autocad)



We created logical trails connecting the dishes in Autocad with a NetDesign function

Phase one, the addition of 190 dish antennas in South Africa
Data preparation: NetDesign (Autocad)

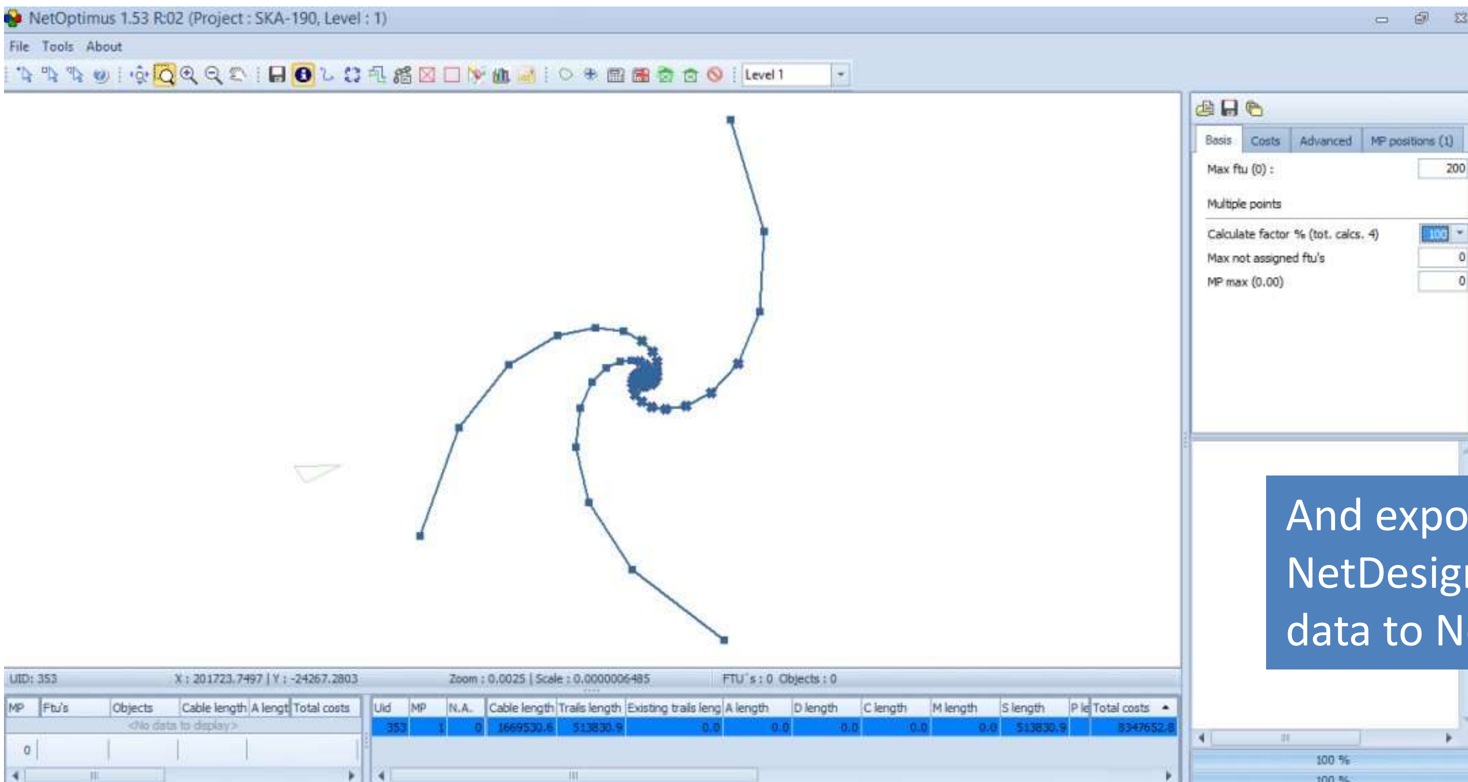


Logical trails connecting the dishes

IT-SIMPLICITY

FTTH / FTTX Software & Network Solutions

Phase one, the addition of 190 dish antennas in South Africa
Data preparation: NetDesign (Autocad) => NetOptimus

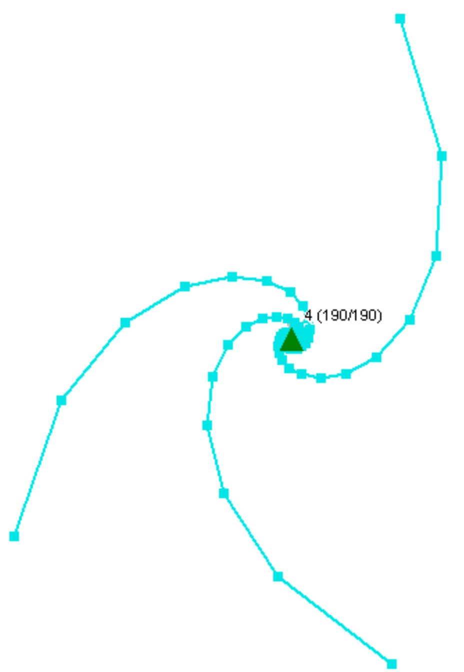


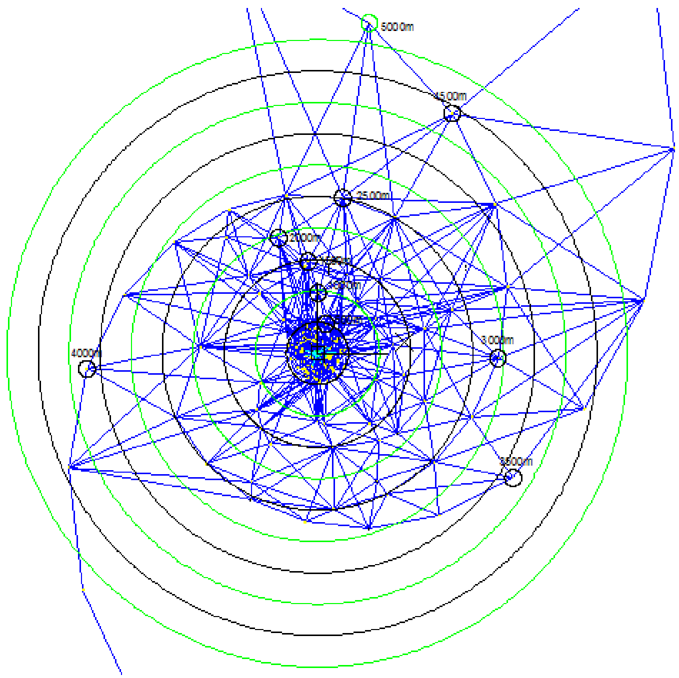
And exported the NetDesign (Autocad) data to NetOptimus

IT-SIMPLICITY

FTTH / FTTX Software & Network Solutions

Phase one, the addition of 190 dish antennas in South Africa
Percentage of dishes within a certain radius from coordinate 0,0



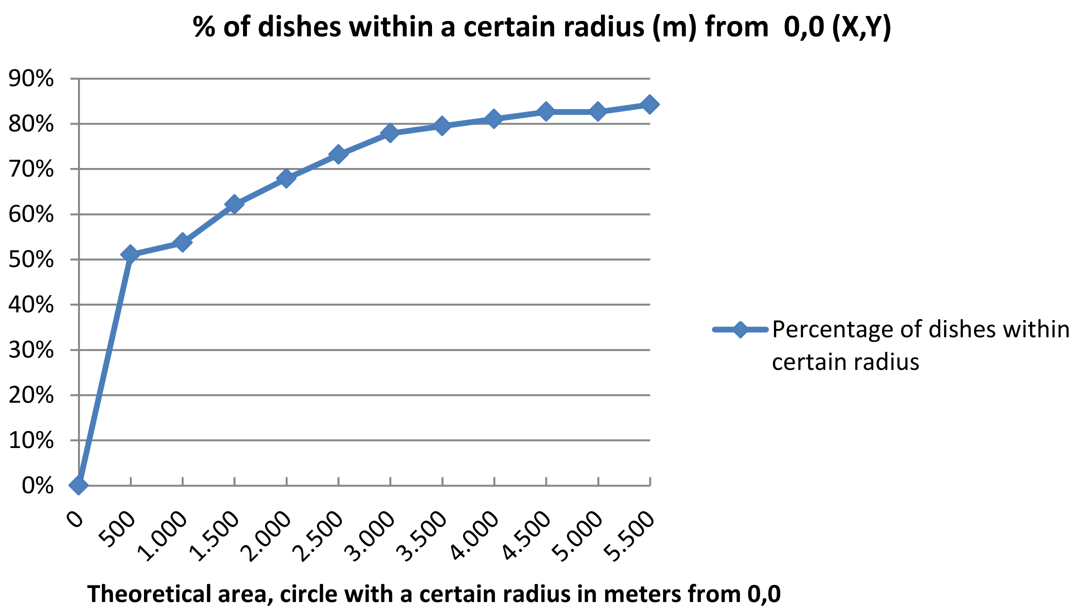


Radius in meters	Amount of dishes	% of 190 dishes
0	0	0%
500	97	51%
1.000	102	54%
1.500	118	62%
2.000	129	68%
2.500	139	73%
3.000	148	78%
3.500	151	79%
4.000	154	81%
4.500	157	83%
5.000	157	83%
5.500	160	84%
102.765	190	100%

Phase one, the addition of 190 dish antennas in South Africa

Percentage of dishes within a certain radius from coordinate 0,0

Radius in meters	Amount of dishes	% of 190 dishes
0	0	0%
500	97	51%
1.000	102	54%
1.500	118	62%
2.000	129	68%
2.500	139	73%
3.000	148	78%
3.500	151	79%
4.000	154	81%
4.500	157	83%
5.000	157	83%
5.500	160	84%
102.765	190	100%



Phase one, the addition of 190 dish antennas in South Africa

Three different design options with the POP location at coordinate 0,0.

190 endpoints are connected, the best, cost optimized central position is in this example inserted as a fixed position.

Option 1: by default the software will design cost optimized networks based on the real costs.

Options 2 and 3 are examples of the way the user can manipulate the software by using different parameter/cost values.

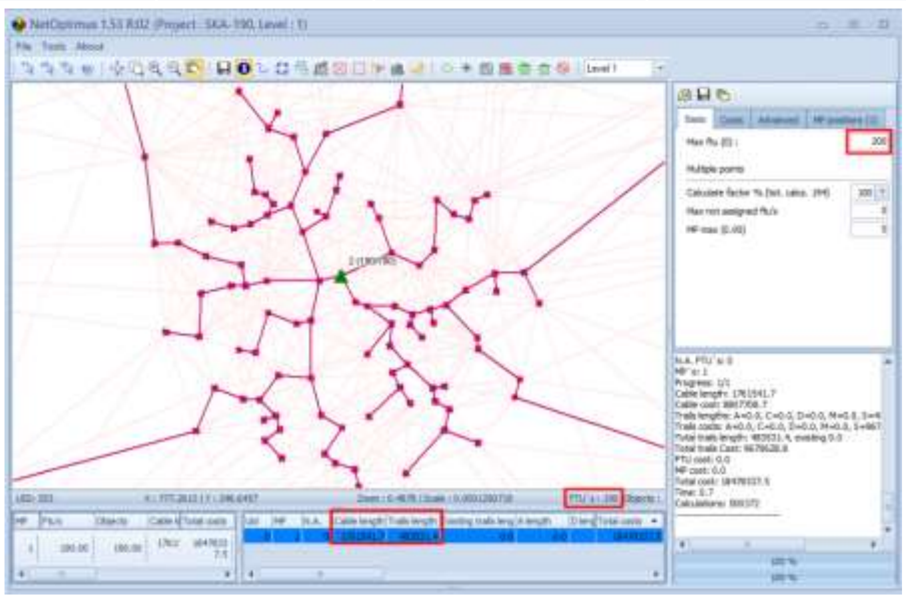
Option 1:	Minimum costs	Calculating with the real costs of trenching and cabling
		NetOptimus will design the cheapest network
Option 2:	Minimum cable	Calculating with a relative high value for cabling.
		NetOptimus will calculate the shortest cable lengths
Option 3:	Minimum trench	Calculating with a relative high value for trenching.
		NetOptimus will calculate the minimum trenching length

	Price setting A		Option 1		Default	Option 2			Option 3		
	material cost/m	installation cost/m	parameter	quantity	total cost A	parameter	quantity	total cost A	parameter	quantity	total cost A
Trench		20	20	483531	9670620	0	513831	10276620	20	481813	9636260
Cable	4	1	5	1761542	8807710	5	1669531	8347655	0	1849656	9248280
					18478330			18624275			18884540
					Minimum costs			Minimum cable			Minimum trench

Phase one, the addition of 190 dish antennas in South Africa
Minimum costs design with the POP location at coordinate 0,0.

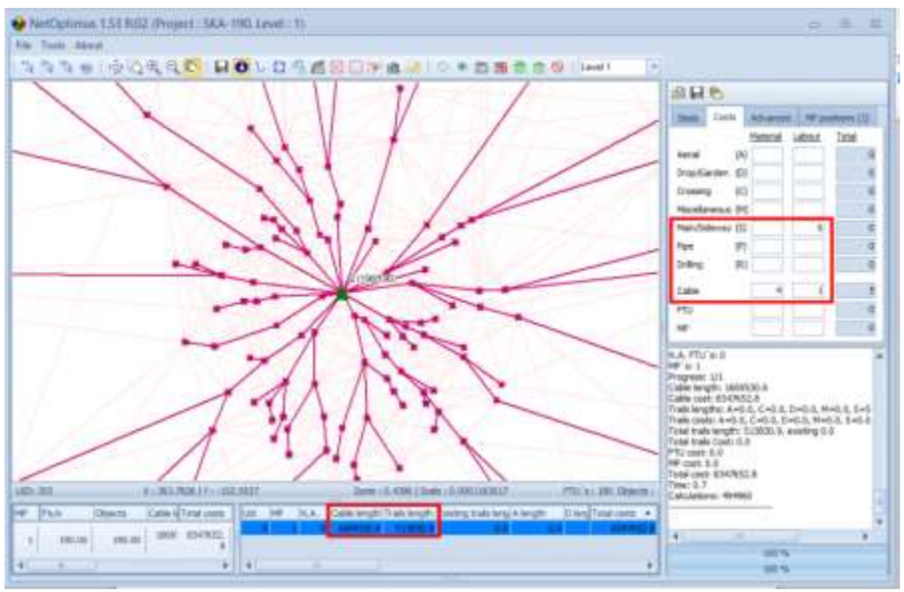
Option 1: Minimum costs calculation (default)

	Parameter	Price	Total length	
Trench	20	€ 20/m	483.531 m	€ 9.670.620
Cable	5	€ 5/m	1.761.542 m	€ 8.807.710
Total				€ 18.478.330



Phase one, the addition of 190 dish antennas in South Africa
Minimum cable amount design with the POP location at coordinate 0,0.

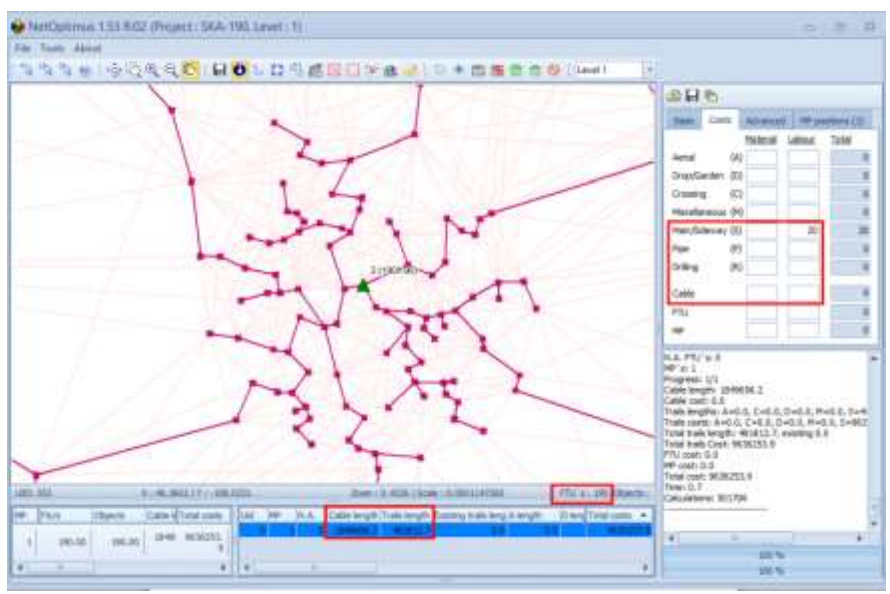
Option 2: Minimum cable amount calculation				
	Parameter	Price	Total length	
Trench	0	€ 20/m	513.831 m	€ 10.276.620
Cable	5	€ 5/m	1.669.531 m	€ 8.347.655
Total				€ 18.624.275



Phase one, the addition of 190 dish antennas in South Africa
Minimum trench amount design with the POP location at coordinate 0,0.

Option 3: Minimum trench amount calculation

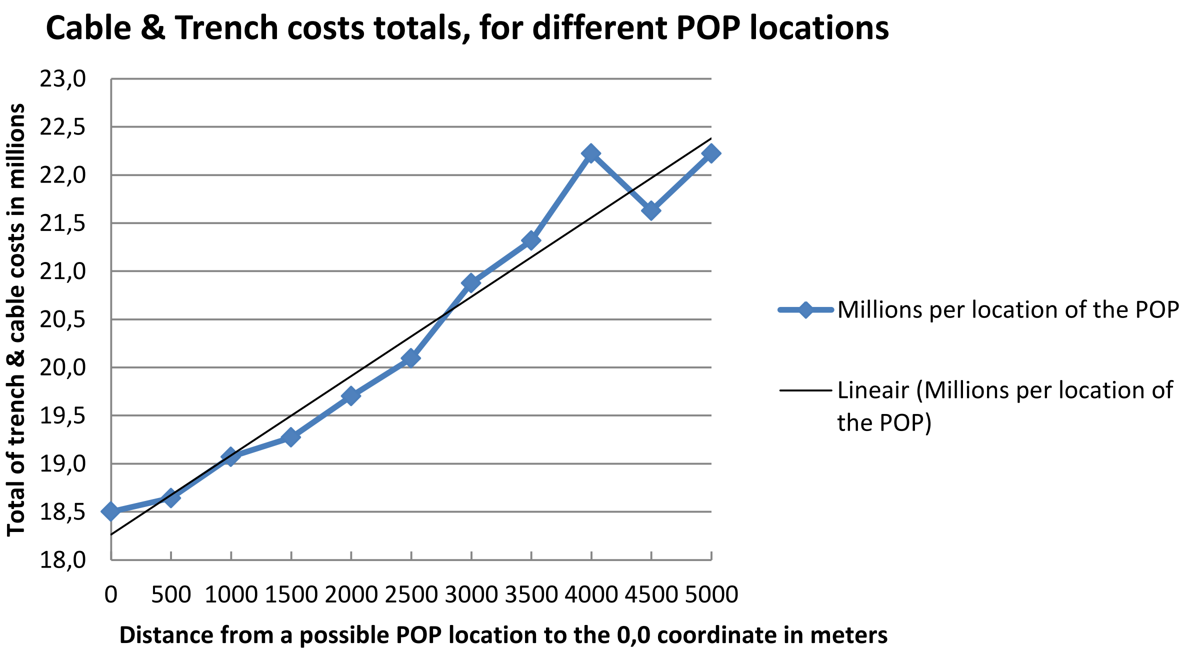
	Parameter	Price	Total length	
Trench	20	€ 20/m	481.813 m	€ 9.636.260
Cable	0	€ 5/m	1.849.656 m	€ 9.248.280
Total				€ 18.884.540

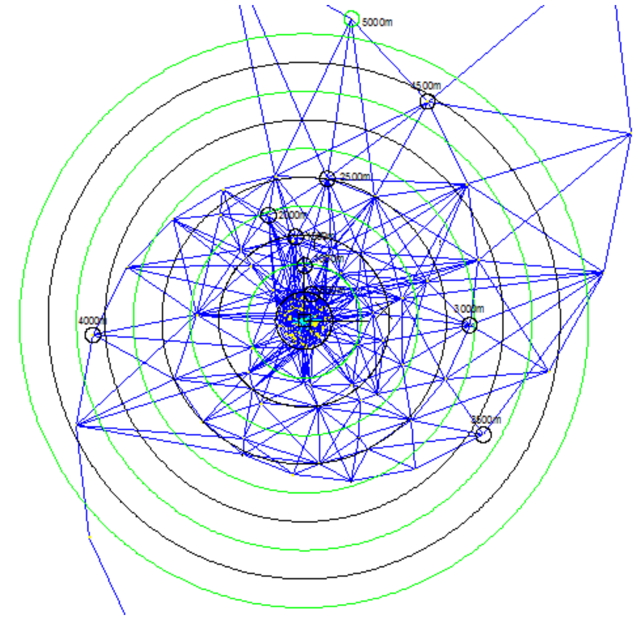


Phase one, the addition of 190 dish antennas in South Africa
Total of cable & trench costs for different POP locations.

		Cable & Trench costs, for different POP locations						
		Distance (approx) from POP to 0,0	Total costs	Cable	Trench	Cable	Trench	Total
	Cost/m	Meters	Millions	Meters	Meters	Costs	Costs	Costs
Cable	5	0	18,5	1.766.202	483.545	8.831.010	9.670.900	18.501.910
Trench	20	500	18,6	1.794.315	483.576	8.971.575	9.671.520	18.643.095
		1000	19,1	1.879.230	483.757	9.396.150	9.675.140	19.071.290
		1500	19,3	1.914.687	484.955	9.573.435	9.699.100	19.272.535
		2000	19,7	2.001.151	484.847	10.005.755	9.696.940	19.702.695
		2500	20,1	2.074.295	486.158	10.371.475	9.723.160	20.094.635
		3000	20,9	2.238.512	484.232	11.192.560	9.684.640	20.877.200
		3500	21,3	2.327.469	484.059	11.637.345	9.681.180	21.318.525
		4000	22,2	2.495.544	487.201	12.477.720	9.744.020	22.221.740
		4500	21,6	2.381.983	485.980	11.909.915	9.719.600	21.629.515
		5000	22,2	2.493.395	487.751	12.466.975	9.755.020	22.221.995

Phase one, the addition of 190 dish antennas in South Africa
Total of cable & trench costs for different POP locations.



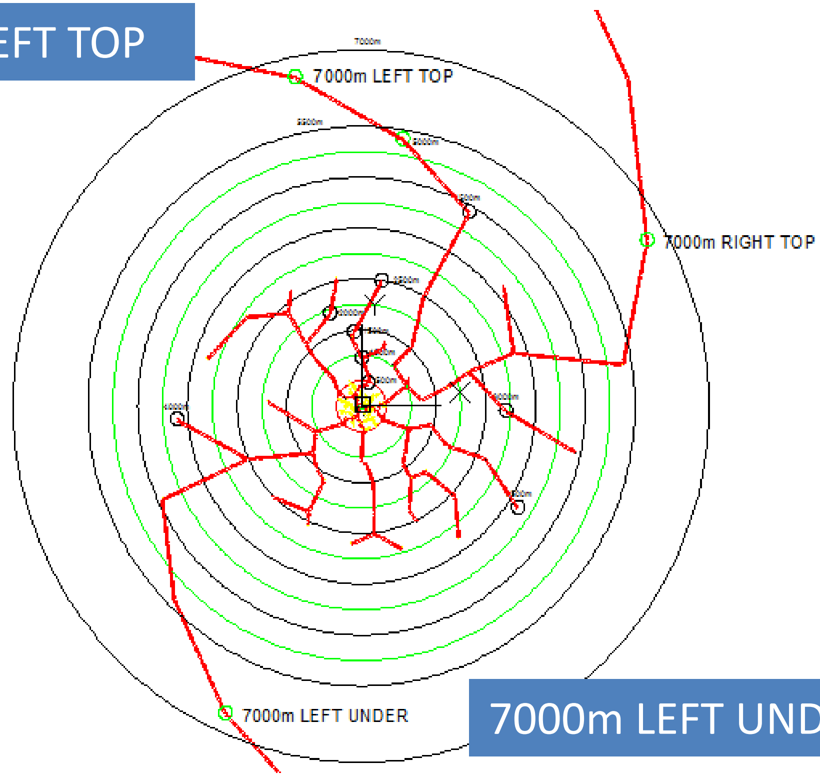


IT-SIMPLICITY

FTTH / FTTX Software & Network Solutions

Phase one, the addition of 190 dish antennas in South Africa
Total of cable & trench costs for three POP locations near 7000m from coordinate 0,0.

7000m LEFT TOP



7000m RIGHT TOP

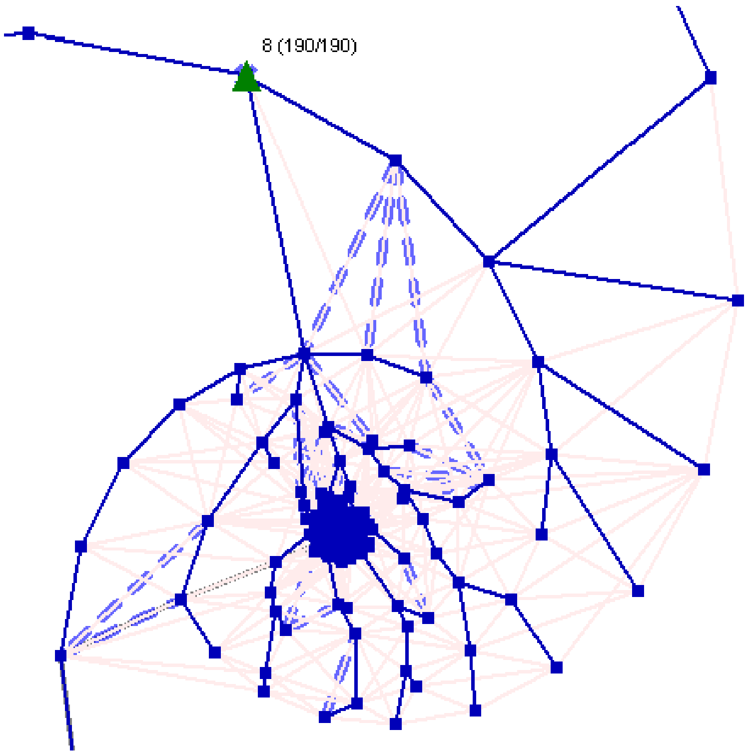
7000m LEFT UNDER

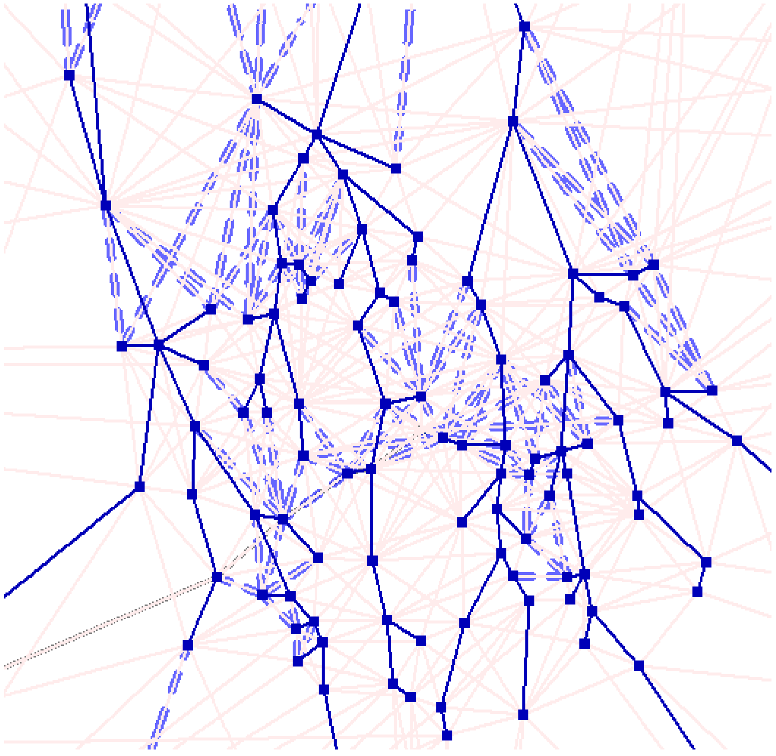
Phase one, the addition of 190 dish antennas in South Africa
Total of cable & trench costs for different POP locations near 7000m from coordinate 0,0.

		Cable & Trench costs, for different POP locations						
		Distance (approx) from POP to 0,0	Total costs	Cable	Trench	Cable	Trench	Total
	Cost/m	Meters	Millions	Meters	Meters	Costs	Costs	Costs
Cable	5	7000 lt-left top	24,5	2.952.447	487.815	14.762.235	9.756.300	24.518.535
Trench	20	7000 rt-right top	23,7	2.785.266	486.633	13.926.330	9.732.660	23.658.990
		7000 lu-left under	25,7	3.188.042	485.933	15.940.210	9.718.660	25.658.870
		7000 lt-left top auto	24,5	2.952.447	487.815	14.762.235	9.756.300	24.518.535
		7000 lt-Further optimized (Trench=1 & trail blocking)	22,9	2.605.917	495.352	13.029.585	9.907.040	22.936.625
		Auto - Optimized		346.530	-7.537			
		Price per meter		5	20			
		Cost difference		1.732.650	-150.740	1.581.910	Total cost difference	

* Further optimized within one hour:
Using different settings and the blocking of trails in NetOptimus

Phase one, the addition of 190 dish antennas in South Africa
NetOptimus: 7000 lt-left top further optimized by blocking of trails (POP to 0,0 is 6616m)





Phase one, the addition of 190 dish antennas in South Africa
NetOptimus, required time for the automatic design.

Each design took NetOptimus 0.7 seconds (Intel i7 processor) with approx. 0.5 million calculations made.

This design time depends on:

- The processor power
- The network configuration, aggregation size
- The selected area:
- The number of trails/trenches within the area
- The number of dishes/endpoints/nodes/ONT's/FTU's within the area

Typically for a FTTH network with 1000 endpoints the design time is 45 minutes.

But with this P2P network with 1 central location for 190 dishes it takes only 0.7 seconds.

Phase one, the addition of 190 dish antennas in South Africa
NetOptimus, optimization settings and options.

With NetOptimus the user can:

- Favour certain trail/trench sections by setting the cost to zero.
- Favour certain ways of optimization by changing the cost parameters.
- Block certain trenches by using the ‘Block’ function.
- Insert the fixed position(s) of certain Central points.
- Enter the aggregation size

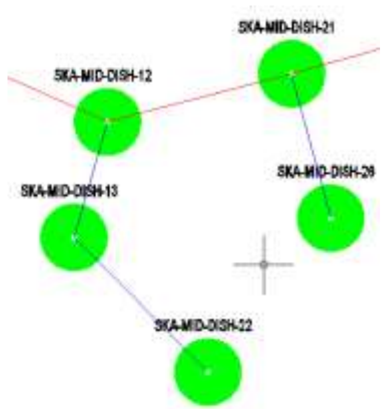
(amount of endpoints connected to a single aggregation/manipulation point)

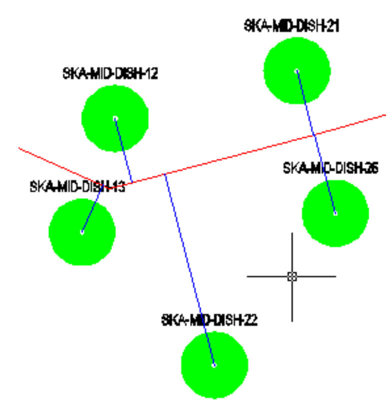
Phase one, the addition of dish antennas in South Africa
NetOptimus & the Software Suite, remarks.

Remarks:

- All individual cable details (labelling and length) can be made available automatically.
- For an actual design the main-trails will probably not run straight through the dish-site but will pass the dish-site at a safe distance. In Autocad, new trails can be made automatically with for example an offset of 15 meters.
- The branch-off from the main-trail to the Dish-site can be made automatically also.

Trail through dish centre





Trail at 15m from dish centre

Phase one, the addition of 190 dish antennas in South Africa
Plug & Play & Reduced space solutions

96x LC duplex ports on 1U (192 fibres)

Modules for every connector type

FO cables preterminated in all lengths
MPO connectors for 12x FO

Reduced space need in cable trays and racks
Quick and simple „plug and play“ installation

Phase one, the addition of 190 dish antennas in South Africa
Micro ducts and cable jetting: extra costs ⇔ advantages

The total of the costs per meter of Micro-duct + installation + Jetting cable + installation is typically more than the total costs per meter of Direct buried cable + installation.

Still micro-duct systems offer big advantages which have to do with:

- Limited risks of cable damage/ theft, a cable can be blown in from end => end point with limited cable exposure
- Timing, the investment in cable installation can be delayed until the last moment
- No additional digging at a later stage by using extra / spare micro-duct space
- Proven systems

Spliceless links of up to 12 km by placing jetting equipment in tandem

Phase one, the addition of 190 dish antennas in South Africa
Micro ducts ⇔ Direct Buried cables

It seems logical to use a micro duct network in some part of the network and direct buried in other parts.

Example: with strategically located handholes at approx 1500m & 3000m radius from the central (0,0) location it is possible to reach 155 dishes with jetted cables.

So without any intermediate splicing we can connect 82% of the 190 dishes.

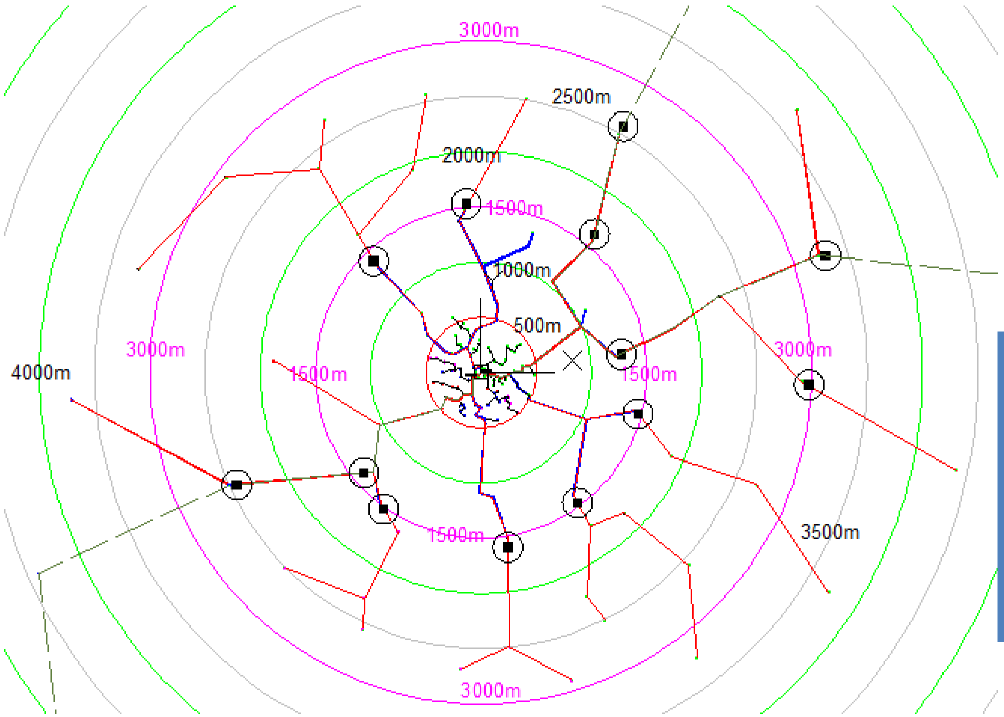
With the handholes at the 3000m locations future expansion possibilities are provided.

It would be interesting to compare the costs of a direct buried network with the costs of a micro duct network with for example 10/12mm ducts and 192 OF Nano Loose Tube cables.

IT-SIMPLICITY

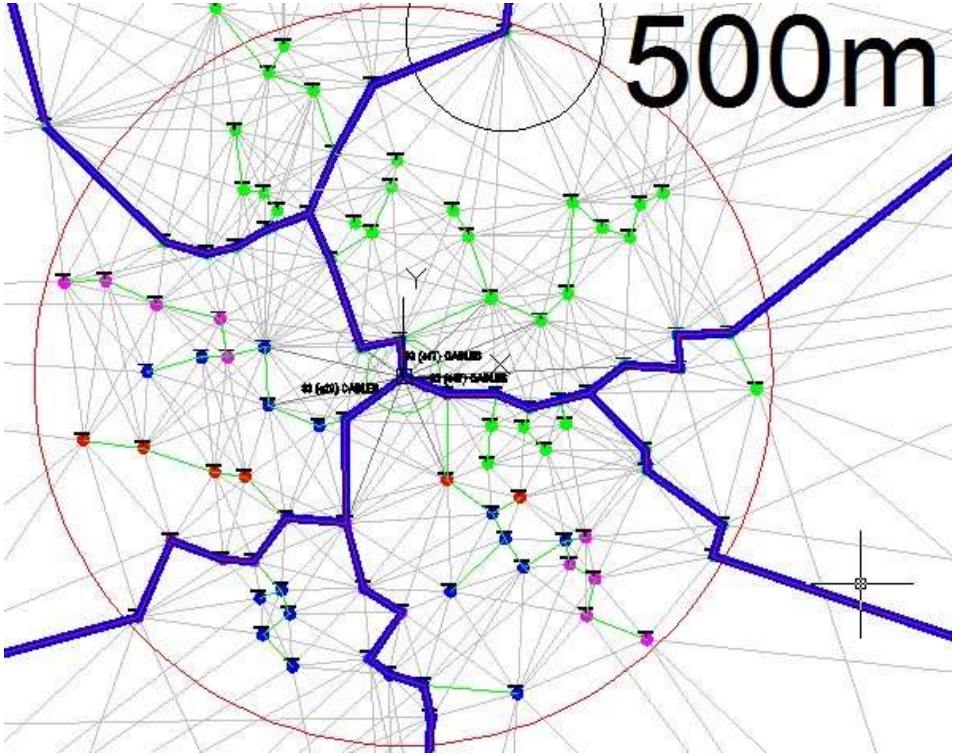
FTTH / FTTX Software & Network Solutions

Phase one, the addition of 190 dish antennas in South Africa
Handholes (13) at approx 1500m & 3000m radius from the central (0,0) location.

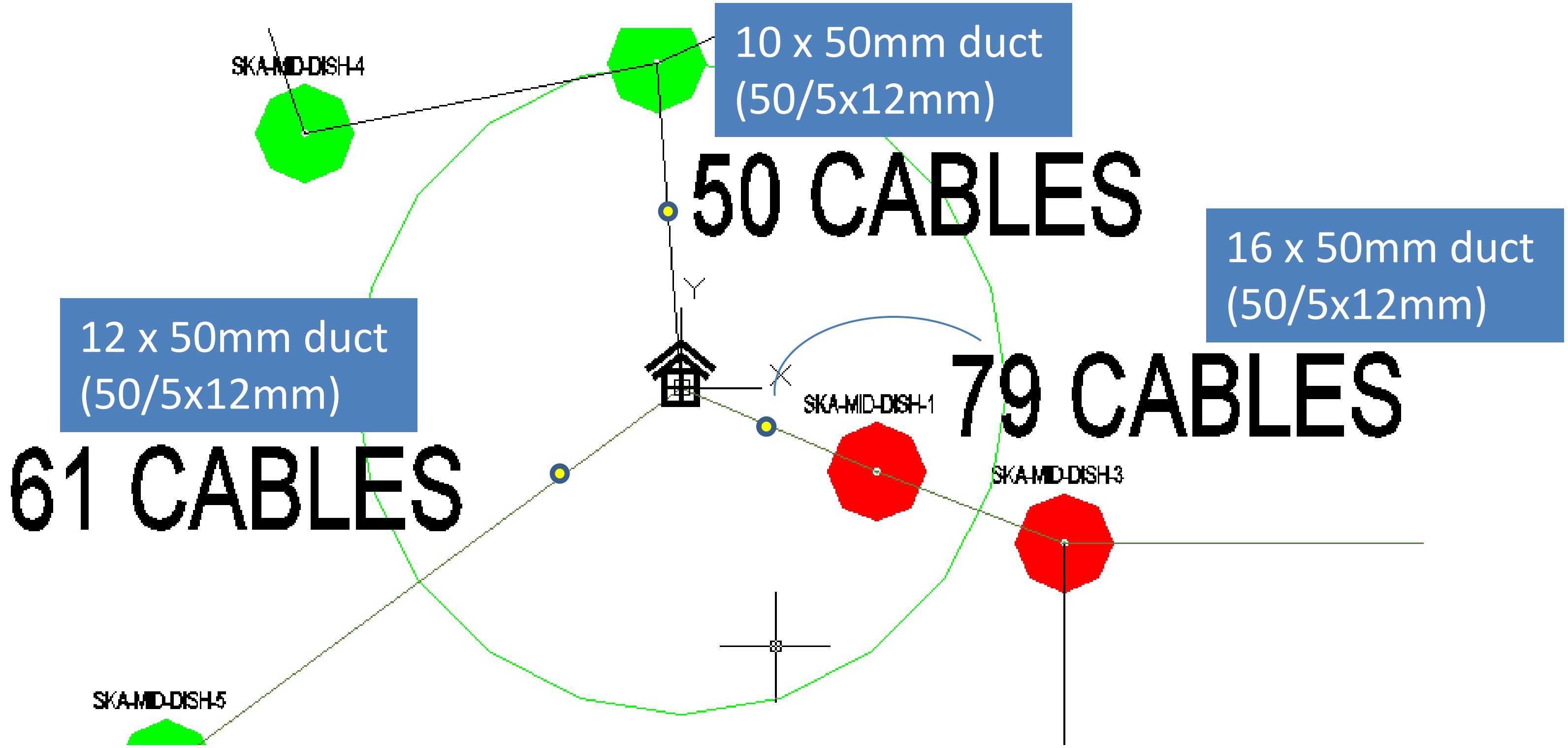


155 dishes with jetted cables and 35 dishes with Jetted=>Direct Buried cables?

Phase one, the addition of 190 dish antennas in South Africa
Example: design 192 OF jetted cables in 50mm/5x12mm ducts



Phase one, the addition of 190 dish antennas in South Africa
Example: 192 OF jetted cables in 50mm/5x12mm ducts



SKA one, the addition of 190 dish antennas in South Africa
Questions, options.

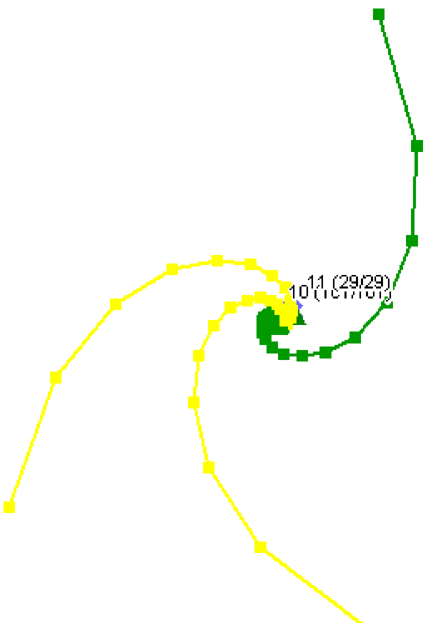
POP location? Or one central point for certain dishes and POP at separate location?

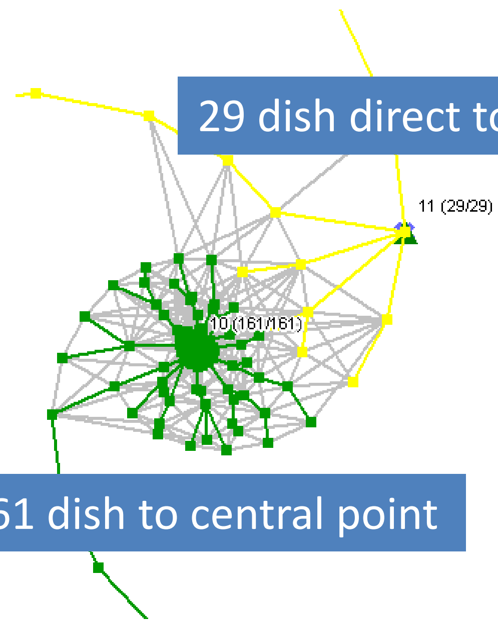
Different phases within Phase one?
Phase 1A: Direct buried cables plus empty micro-duct installation?
Phase 1B-Z: Jetting cables (until dish or handhole+direct buried cable)
Or
Phase 1A: Micro-duct network with the jetting of cables for phase 1A
Phase 1B-Z: Jetting cables (until dish or handhole+direct buried cable)

Existing ducts, roads, buildings?
Future plans?
Installation and material unit costs?

Amount of fibre per dish?

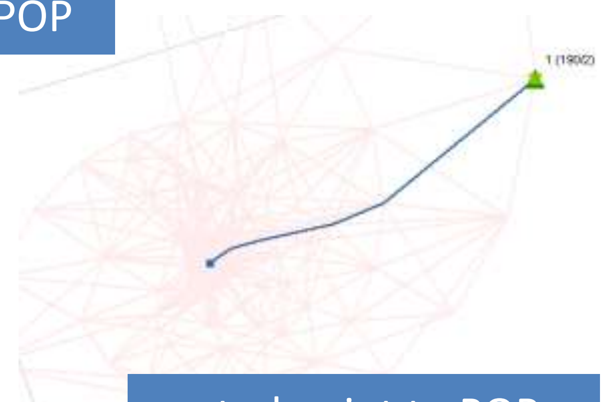
Phase one, the addition of 190 dish antennas in South Africa
One central point for certain dishes and POP at separate location approx. 7000m from 0,0





29 dish direct to POP

161 dish to central point



central point to POP

POSSIBLE NEXT STEPS

Set the real cable-fiber/fibre amounts, calculate alternative concepts
Select the most suitable network concept

Deliverables:

- Cost optimized network-designs in CAD & GIS
- BOM & BOQ reports
- Fiber schematics
- Project-plan reports
- Financial reports

Developing cost optimized cabling solutions for datacentres.

IT-SIMPLICITY

ITSimplicity Solutions BV
info@itsimplicity.nl
M +31-646430926
T +31-348552981
Skype: itsimplicity
www.itsimplicity.nl