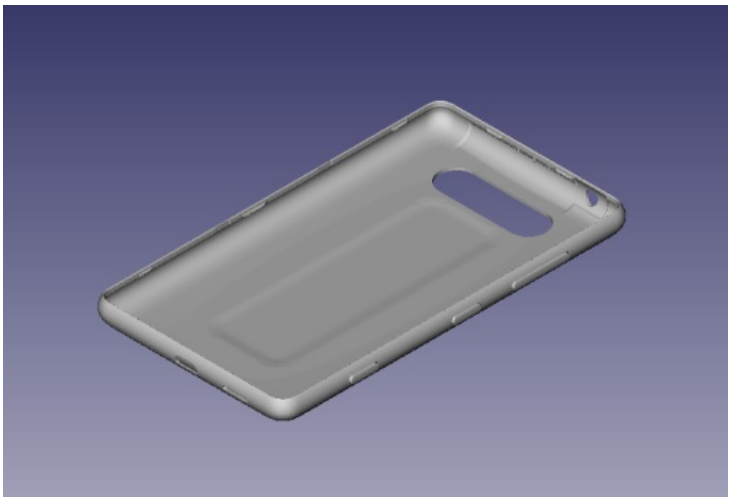
3D print a shell for your Nokia Phone

Introduction/inspiration

27 Jan 2013

Here at Nokia, we like to be on the leading edge, and we have for you what we believe is a phone manufacturer first – providing the mechanical models for a phone's back shell so you can make modifications or accessories to print out on your 3D printer.



The Lumia 820 Shell

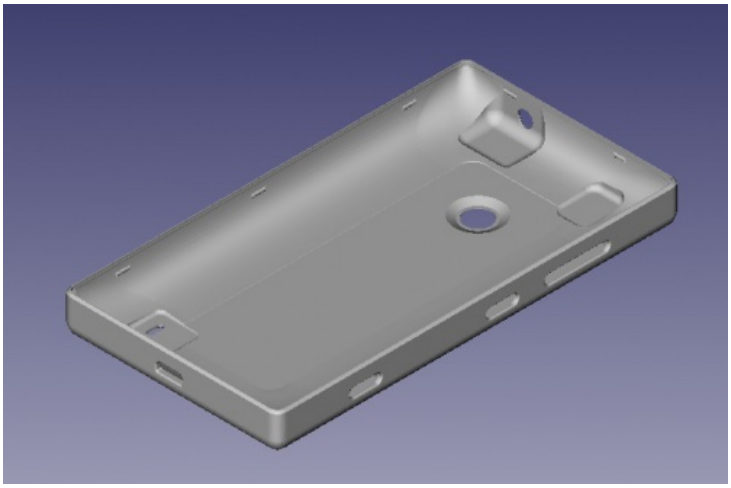
While the outside of the phone case can take almost any shape, limited only by your imagination, the inside is a bit trickier. You have to make sure there's room for the battery, antennae, and other protuberances, as well as openings for buttons, speaker, microphone, etc. Not fun to figure out on your own, so we've taken the guesswork out of the equation for you.

Since the back for the Nokia Lumia 820 is user-removable, we started with that as our baseline. We've provided models in STL and STEP format, both the complete backshell/button assembly and the individual models for the shell and each of the buttons.

With the release of the Lumia 520, which also has a removable backshell, we've released those models as well. Special thanks to our friends at Makerbot for optimizing the model!

You'll find our versions of the files here:

1. Lumia 820 shell, separated, STL format
2. Lumia 820 shell with all parts, STL format
3. Lumia 820 shell, STP (STEP) format
4. Lumia 520 shell and buttons STL format. (Note that these are not the exact shape of of the backshell, but are optimized to print on a filament deposition printer.)



The Lumia 520 Shell

Here are some versions optimized for other printers and services:

1. i.materialise version on Thingiverse. Some very interesting ideas from them here.
2. Makerbot 2 version on Thingiverse

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3. Makerbot 2 STP format (works well with Autodesk 123D)
4. Shapeways - Keep an eye out here for an optimized version.
5. Sculpteo - See their blog post for some suggestions for materials and the ability to print photos on the material.

Which files to choose? If you just want to start experimenting, use the first set in the list of our files, the STL files with components separated. STL files are the ones you can slice directly and print, and the first set separates out the buttons so you can choose not to print them. (You can always use the buttons that come with your phone.) You can also use the STL files as a starting point for modifications with some 3D design programs.

We've also provided STP files because they're a very common interchange format for 3D models in mechanical engineering. If you're really in to 3D mechanical design, you'll probably want to start with that set.

Note that you will have to have a Nokia ID and be registered with Nokia Developer to download these files. You will also need to agree to the terms and conditions, which are based on Creative Commons Attribution-NonCommercial-ShareAlike.

Explore this article for more information and inspiration, and be sure to contribute your ideas and experience as well. Have questions? Check out our Discussion Board topic. 3D printing is a relatively new technology, and there's a lot of learning to be done.

Design ideas

In this section, we'd like you to share ideas about designs you've done or would like to see. Even if you don't have any interest in the design aspect, perhaps you have an idea you'd like to see somebody pick up and run with. We'll start:

1. Backs
   - Built-in belt clip or loop
   - Attachment point for camera accessories
   - Raised texture for non-slip grip
   - Winding post for headphone cable
   - Accommodation for larger batteries
2. Mounts/holders
   - Car mount
   - Bicycle mount
   - Backpack hanger
3. Accessories
   - Camera accessories
   - Extra SIM or MicroSD holder

Software

The proper toolchain is critical to getting the results you want out of Computer Aided Design (CAD), in this case, of the 3D variety. Share your experiences with the various tools you've worked with, whether commercial, FOSS, or something else.

Typically, you will start with a 3D design program, then use a program like Slic3r to section the resulting model up for printing. For best results, consider a parametric solid modeling program. Finally, a driver program is used to do the printing or to write the files to an SD card that the printer can read.

1. Design (TinkerCad, Sketchup, FreeCAD, OpenSCAD, Alibre Design...)
   - Phone-specific suggestions/best practices
2. Printing Stuff
   - Slicing (Slic3r, Skeinforge)
   - Driving (Pronterface, ReplicatorG, Repetier-Host). Note that many driving programs integrate one of the available slicing programs.
   - 3rd-party services (Shapeways, Ponoko, i.materialise)

Hardware

The bottom line with all this of course is to get your idea realized in glorious plastic. For this, you will either need access to a 3D printer or be willing to use a 3rd party service [link] to print your object for you.

Do you have experience with a printer, scanner, print material, or service? Add it here so we can all benefit from your insight. Depending on the printer, the models may need some degree of modification to optimise the printout. (For example, see the version optimized for the Makerbot Replicator 2, posted by Makerbot on Thingiverse.) For extrusion type printers, there is cooling shrinkage to take into account, and that differs based on material choice, whether or not you're using a heated bed, etc. Everybody has their own favorite temperature settings, so there are probably slight differences just in scaling for that.

If you have an optimisation or favorite settings for a particular printer, please let us know.

We'd like to include printers that community members have experience with. If you'd like to add your experiences, please include the following information:

- The brand/design
- Whether the platform is Open source/DIY or proprietary
- A brief summary of your experiences.

MakerBot

The good folks over at MakerBot were quick to crank out a Lumia 820 cover using their Replicator 2. The results can be found here on Thingiverse.

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Here are their recommendations:

For best results* print with the following settings in MakerBot MakerWare:
Layer Height = .2 mm
Infill = 10%
Shells = 1 total
*Files optimized for PLA.

Here's one we did at Nokia Developer Relations on our MakerBot Replicator 2. For this one, pushed the envelope a bit and used a 0.1mm layer thickness. It looks really nice. We also used the blue painter's tape on the build platform to see if it would stick less than our first attempt.

And here it is installed, complete with buttons.

miniFactory

First Finnish proprietary 3D printer manufacturer shows their 3D printed Lumia 820 cover. You can find the blog post here (written in Finnish).

Material used 1.75mm PLA translucent green. Print took 2h 20min with quite low speed settings and with 0.08mm layer height. The cover was real nut to crack for low cost 3D printers. The tricky part was to 3D print high radius shape without the support materials, but miniFactory was able to print it out with quite good results.

Materials

Typically, the current range of affordable 3D printers gives you the option of printing with either ABS or PLA, supplied as filament on spools, with a working diameter of either 3mm or 1.75mm. In this section, share your experience with these materials, or others if you printer works with them.

If you're using your home 3D printer, PLA and ABS are acceptable materials. If you decide to outsource printing, **do not be tempted by non-plastic materials!** Metals are definitely off-limits, and ceramics and stone type materials won't have the flexibility needed to survive being a phone case.

1. PLA - This is what we've used here at Nokia to print the backs. It's more brittle than ABS, but it's cornstarch based and biodegradable. It's harder than ABS, and more difficult to extrude, but it works at a lower temperature and doesn't require a heated bed.
2. ABS - Another popular choice. ABS is tough (hey, they make Lego out of it!), but requires higher temperatures from your extruder and printer bed for fabrication, and does smell a bit when printing.

Outsourcing

If you don't have the necessary printing or scanning hardware, there are services out there who will take your 3D models, print them on your choice of material, and ship them to you. Often, the range of materials is greater than you would have available to you with the current crop of affordable printers.(By the way, you never know where you may find a printer service – we spotted a Makerbot Replicator at Oddyssea in Half Moon Bay, California, that offered to print an object you brought in on an SD card, charging you by the gram for the plastic used. How fun is that?)

1. Printing - An advantage of 3D printing services is the range of materials they have available to print in. Where a home printer will likely be limited to ABS, PLA, and similar materials, with printing services, you can print in ceramics, resins, ceramics, and even metals. Example suppliers include

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Shapeways, Ponoko, i.materialize, and Sculpteo. Again, however, we must emphasize: **plastics only for phone shells**!

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