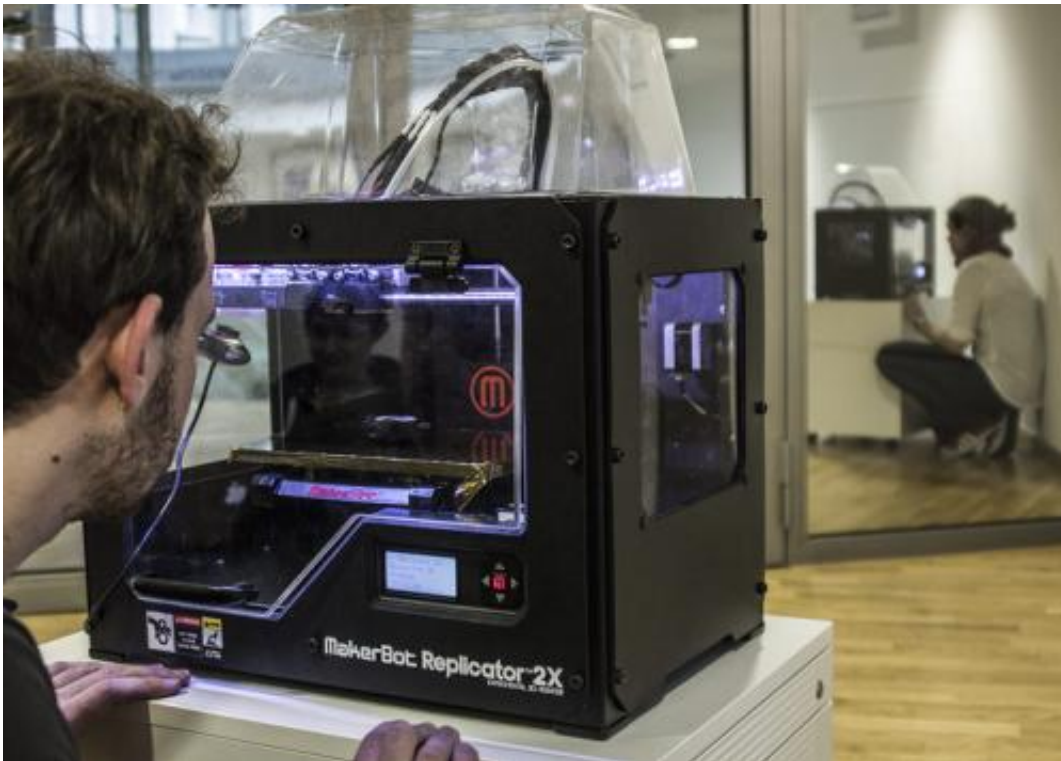


# Scotty project eyes uniqueness, sharing issues in 3D printing

January 23 2015, by Nancy Owano

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A teleportation machine system this week caught the attention of tech writers this week, including John Biggs, East Coast Editor of *TechCrunch*. The system involves units of off-the-shelf 3D printers extended with a 3-axis milling machine, camera, and a microcontroller for encryption, decryption and transmission. Users place an object into

the sender unit, enter the address of a receiver unit and press the teleport button. The sender unit digitizes the original object layer-by-layer, shaving off material using the milling machine, takes a photo using the camera, encrypts the layer using the public key of the receiver, and sends it. The receiving unit decrypts the layer and starts printing right away. So the object sent by one person is destroyed and reassembled elsewhere.

"[Teleportation](#), as it's commonly understood, suggests the movement of one object to another place, perhaps through the disassembly and reassembly of atoms or other similarly impossible means," wrote Biggs. "This project teleports items by scanning them layer by layer and then grinding them away." The scan is sent securely to another 3D printer which recreates the object in plastic; the data transferred between machines is quickly destroyed once the object is printed.

What's the point? At this stage, this is not a commercial device but a project, dubbed Scotty, which, said Biggs, "makes sure only one copy of a certain object exists at any time – thereby preserving the emotional or commercial uniqueness." The system's destruction and encryption mechanisms guarantee that only one copy of the object exists at a time. Brian Krassenstein on Thursday in *3D Print.com* spelled why such a concept matters—ensuring that only one of a certain object exists when transferring it to another location—and may increasingly matter. He said he was "willing to bet that the number of 3D printers in existence is going to be an order of magnitude or more higher. With prices dropping, the number of applicable uses for both hobbyists and businesses expanding, and the technology progressing rapidly, the next decade will undoubtedly see this technology enter the mainstream." When it does, issues will emerge regarding IP security and protection, which, he said, "will certainly need to be [resolved](#)."

Such a system will also help ensure a desired transfer of ownership between parties. "At the same time that it's destroying the original

artifact, a copy is being sent to another location and encrypted to ensure that this copy is only accessible at the receiving computer, where it can then be refabricated via a 3D printer," said Krassenstein.

The team that came up with Scotty are from the Hasso Plattner Institute in Germany. They extended the MakerBot Replicator 2X with a RaspberryPi processor board that runs Scotty's software. A USB hub connected to the RaspberryPi contains the cable for the MakerBot, camera, and Arduino, which controls the mill.

The team have prepared a paper on their work, titled "Scotty: Relocating Physical Objects Across Distances Using Destructive Scanning, Encryption, and 3D Printing." They said the findings of their exploration suggest that "users do care about [uniqueness](#), when it comes to sharing personal objects among close friends and partners." Moving forward, the researchers said they plan "to create high-definition versions of Scotty that allow transmitting objects in much higher fidelity."

**More information:** — [www.stefaniemueller.org/wp-con ... i-mueller-scotty.pdf](http://www.stefaniemueller.org/wp-content/uploads/2015/01/i-mueller-scotty.pdf)  
— [hpi.de/baudisch/projects/scotty](http://hpi.de/baudisch/projects/scotty)

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