

# hackerspace global grid

## world domination - one measurement at a time

hadez@hgg.aero, @hdznrrd    timm@hgg.aero, @timmedia



shackspace - devision for aerospace research, space exploration and other improbable sciences

27. Oktober 2012

## 1 What is hgg

## 2 What we're actually doing

# Once upon a time

- There were 3 guys wanting to understand satellite communications
- Build networked receiver stations just for kicks

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- Joined forces with the Constellation project (Andreas Hornig)
- We're building a distributed measurement network
- Aiming to track HAMSATs

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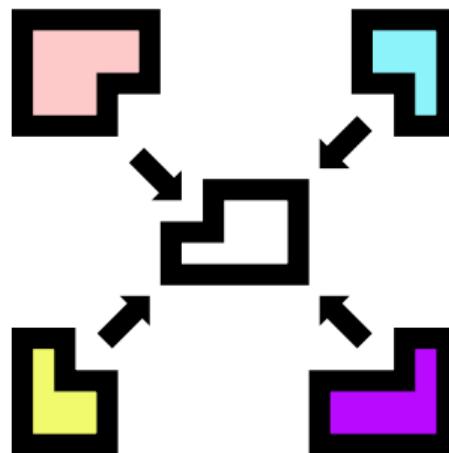
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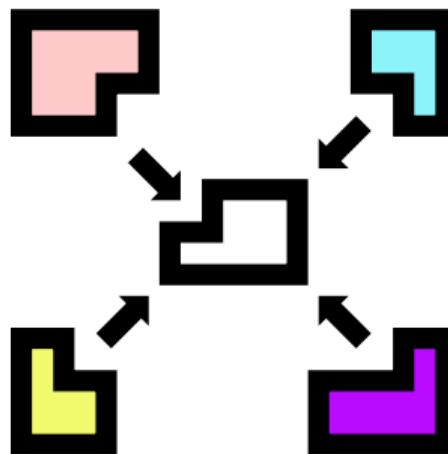
- The core idea
- Status quo
- How to help

# Build a modular system



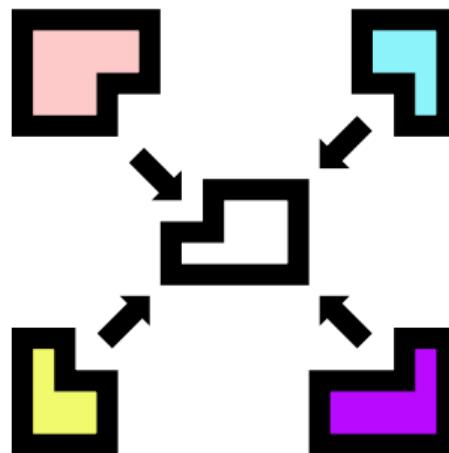
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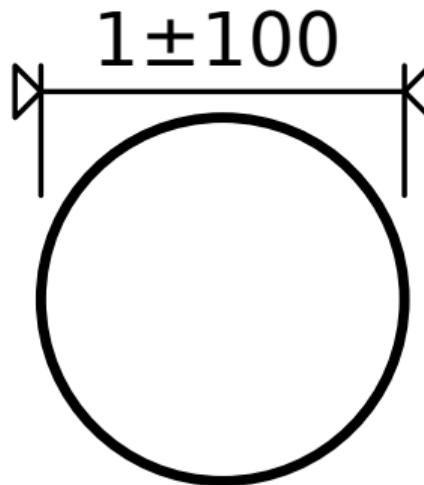
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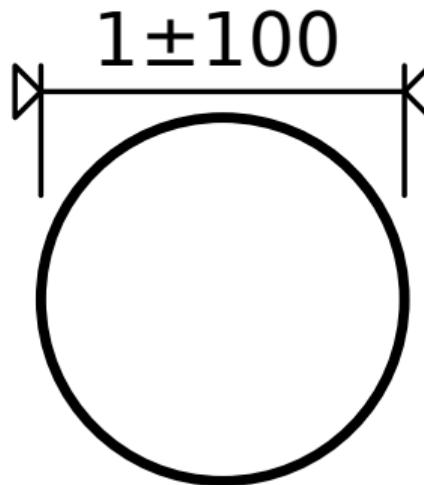
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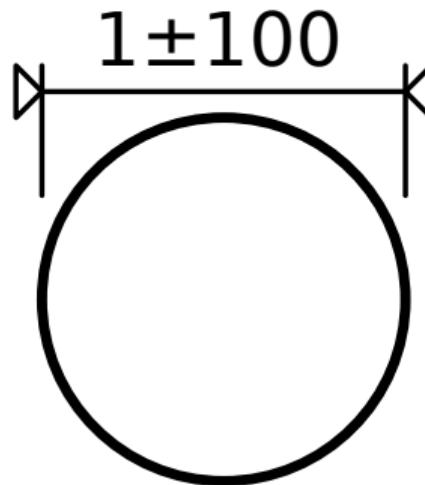
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- Allow scaling up to "ridiculous" (for a hobby project)

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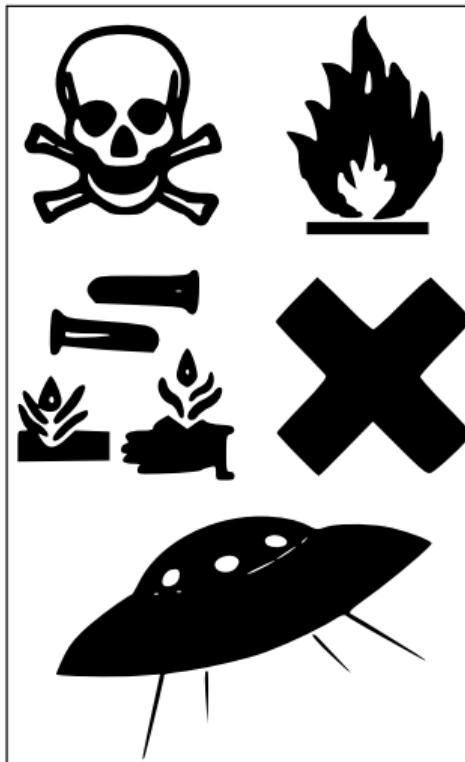
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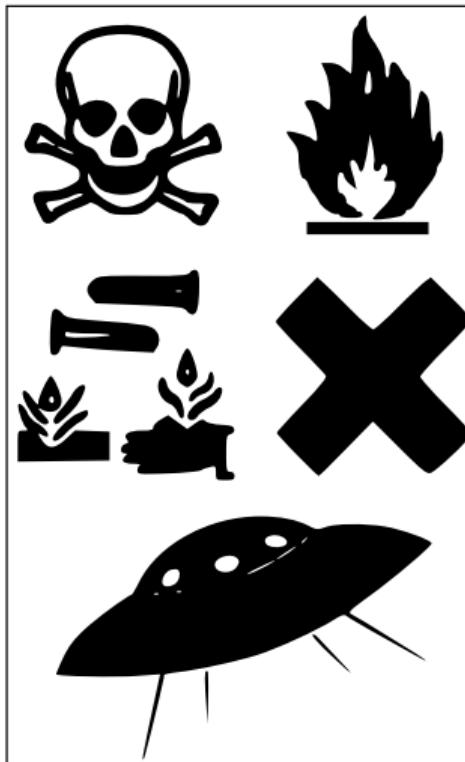
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- Airplanes
- Satellites
- Background radiation
- Or even just the temperate

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# Make it a distributed system



- Many simple measurement stations
  - networked together
  - providing geo-coded data

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- Realistic: assemble a kit
- Lazy: buy it, plug it in, forget about it

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- Just a bunch of folks, really

- reloc0 & hadez & Timm working on hgg
- Andreas Hornig working on Constellation
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# Consolidating existing and new information

- There is already *a lot* of information available
  - HAM radio community
  - Amateur satellite community
  - Hackers & makers
- We're collecting information relevant to the ask
- Improve documentation where we had found details difficult to understand
- Document our findings, results and failures for others to learn from

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# What about applications?

- Constellation

- Track amateur satellites
  - Using pseudo-ranging w/ multiple receiver stations

- Once ground stations start gathering and publishing data, the possibilities are endless

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  - Basis for assisted GPS solutions
  - and many, many more

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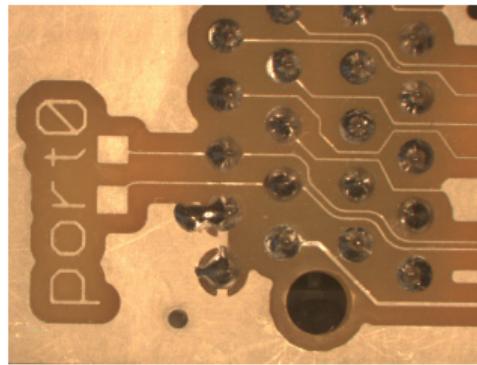
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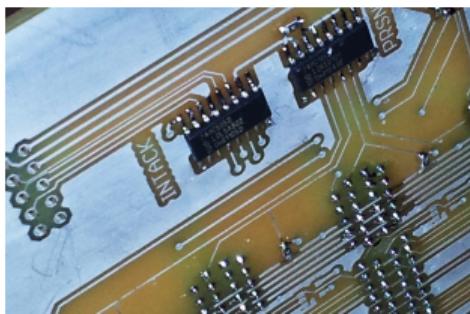
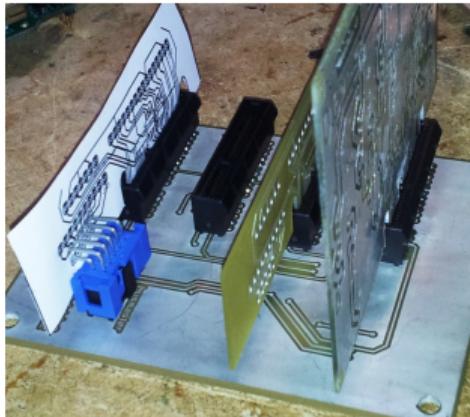
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# Specification of physical interface between modules



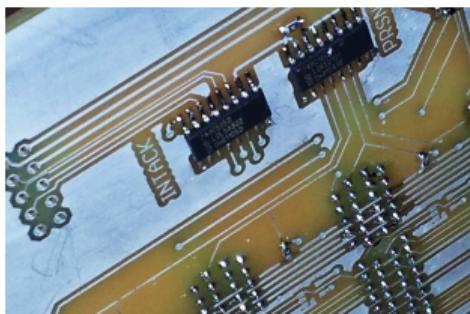
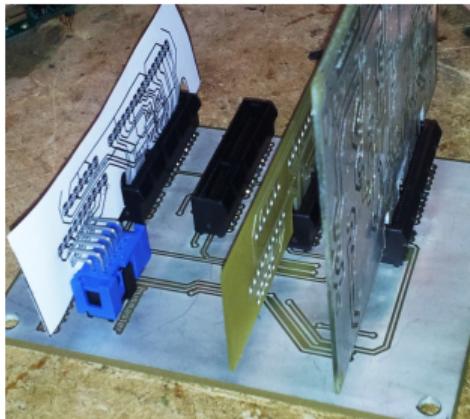
- Modules are connected via a backplane
- PCIe 4x plug w/ custom pinout
- 2x RS485 lanes for inter-module communication
- SPI-ish time broadcast bus
- Differential clock signal for high-res timing signal
- Each module sports storage for calibration data

# friendship0 backplane



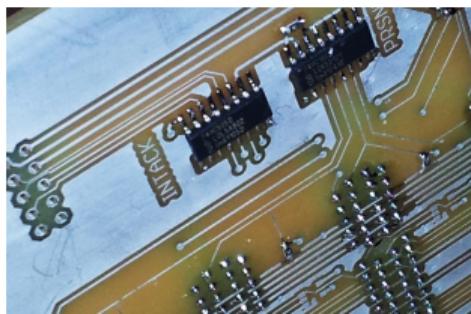
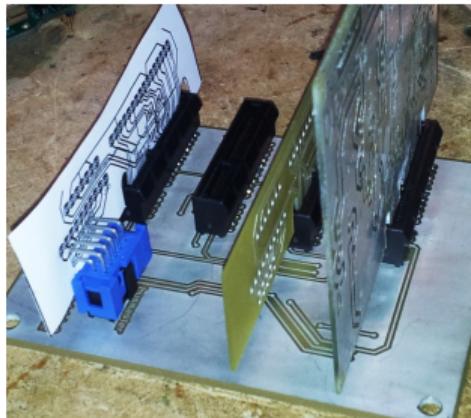
- Four modules slots, one dedicated to bus master module
- ICs for interrupt handling
- Can be easily scaled up, next step eight or nine slots

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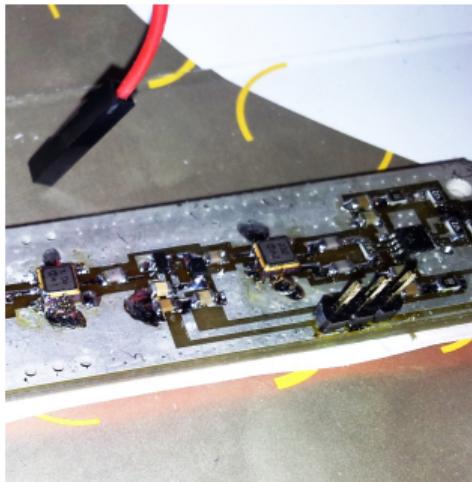
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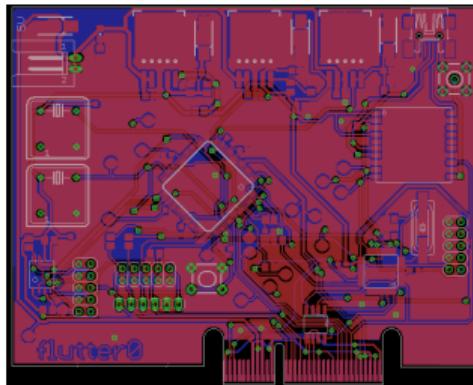
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# dash0 proof of concept



- ADS-B receiver based around miniADSB module
- Easily track commercial aircrafts
- Perfect for verifying pseudo ranging algorithms

# flutter0 high precision distributed time source module



- Spartan3 FPGA for high-res timing (<100 ns)
- ATmega 168 for lo-res timing (1 s to 1/10th s)
- Low cost GPS module w/ external antenna support

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## Join us

- We meet almost every Saturday at shackspace, the stuttgart hackerspace

# Keep in touch

- Wiki

- Edit away at <http://hgg.aero/>
- There's a list of open tasks. Pick one or add one!

- GitHub

Check out our GitHub organization to see what projects we're currently working on.  
You can also contribute by forking and pushing changes.

- Public mailing list

The public mailing list is a great way to keep up with what's happening at the space.  
It's also a good place to ask questions and get answers from other members.

- twitter

Follow us on Twitter for updates and news.

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Check out the repository for the latest news and developments.

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Join the mailing list to receive updates about the project and the hackerspace.

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For general discussion, announcements, and other topics that affect the entire community.

- twitter

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## Public mailing list

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## twitter

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