

Allgemeine Relativitätstheorie mit dem Computer

*PC-POOL RAUM 01.120
JOHANN WOLFGANG GOETHE UNIVERSITÄT
23. JUNI, 2017*

MATTHIAS HANAUSKE

*FRANKFURT INSTITUTE FOR ADVANCED STUDIES
JOHANN WOLFGANG GOETHE UNIVERSITÄT
INSTITUT FÜR THEORETISCHE PHYSIK
ARBEITSGRUPPE RELATIVISTISCHE ASTROPHYSIK
D-60438 FRANKFURT AM MAIN
GERMANY*

10. Vorlesung

Allgemeines zur Vorlesung, Plan für die heutige Vorlesung

- **Kompensationstermine der Vorlesung 14.07.2017: Dienstag der 27.06.2017 um 12.15-13.45 Uhr.**
- **Kompensationstermine der Vorlesung am 30.06.2017: Dienstag der 04.07.2017 um 12.15-13.45 Uhr.**
- **Teil III: Das Einstein Toolkit (ET)**
 - Installation des ET auf dem eigenen Linux Rechner (Laptop Installation)
 - Installation auf dem Fuchs-Cluster
 - Radiale Oszillation eines Neutronensterns mit dem ET
 - Visualisieren der Ergebnisse einer Test-Simulation mit Mathematica

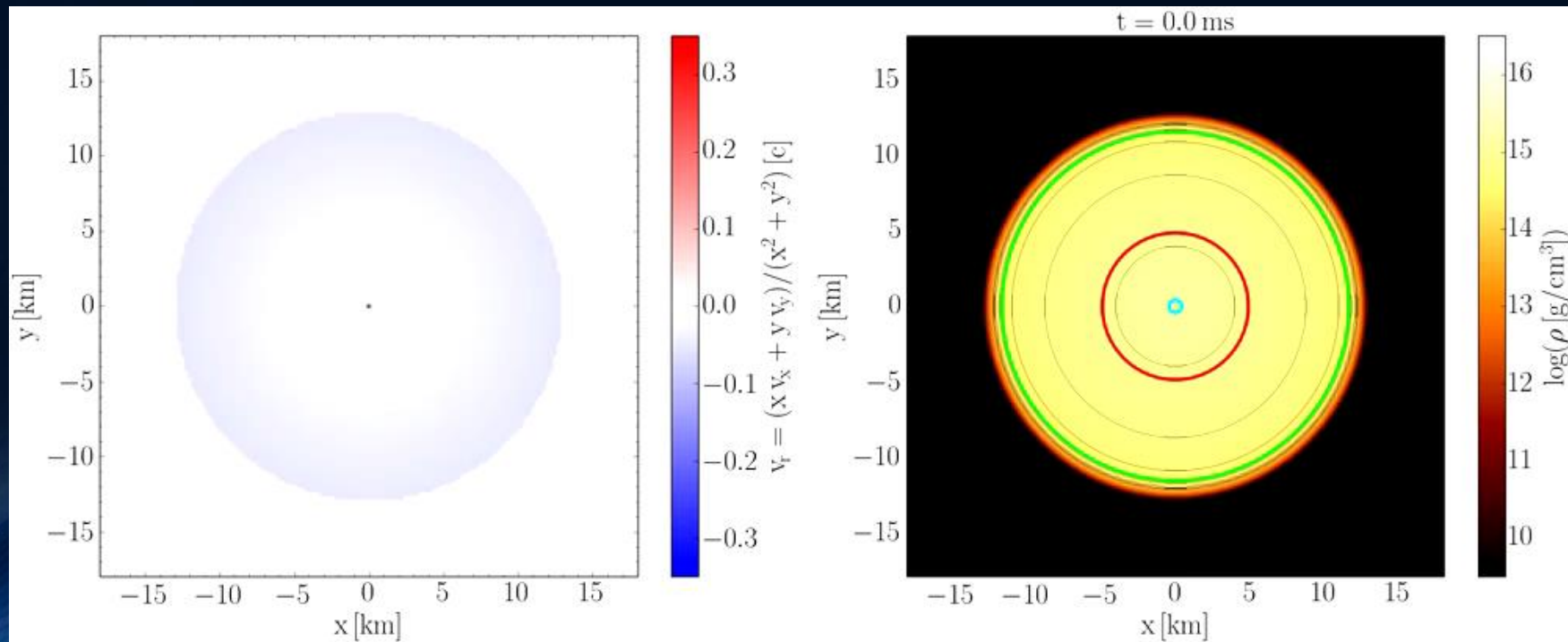
Weiteres siehe Homepage der Veranstaltung

Teil III



Inhalte des Teil III:

- How to download and build (compile) the Einstein Toolkit
- How to run a test simulation
- Run and visualize (Mathematica or Python) one of the following problems
 - Migration of an unstable neutron star to a stable configuration
 - Collapse of an unstable neutron star to a black hole
 - Binary neutron star mergers
 - Collapse of a neutron star to a quark star (twin star collapse)



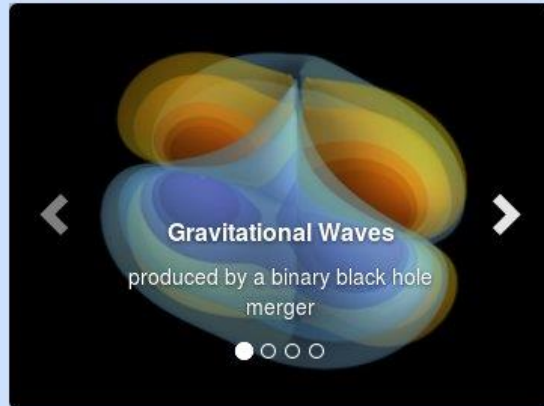
Das Einstein Toolkit



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The Einstein Toolkit



[Gallery](#)

Einstein Toolkit School and Workshop

Join us at the North American [Einstein Toolkit School and Workshop](#) at NCSA, at the University of Illinois at Urbana-Champaign from July 31 to August 4 2017.

This meeting is open to anyone interested in numerical relativity and computational astrophysics and cosmology and in particular to Einstein toolkit users.

The first three days will be dedicated to a school useful for new users of the Einstein Toolkit followed by a two day long workshop open to developers interested in the Einstein Toolkit.

Registration closes *July 17, 2017*.

[More information](#)

About

The Einstein Toolkit is a [community](#)-driven software platform of core computational tools to advance and support research in relativistic astrophysics and gravitational physics.

[About](#)

Download

We provide a convenient method to get all of the Einstein Toolkit with just a few commands, and explain the whole process.

[Download](#)

Documentation

A lot of the documentation within the Einstein Toolkit is generated from comments in the source code, and more can be found on the [Einstein Toolkit Wiki](#) or other documents. We provide links to guides, tutorials and references.

[Documentation](#)

Contribute

The Einstein Toolkit would not exist without numerous contributions from its community. It is easy to learn how you can contribute as well.

[Contribute](#)

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Download & Requirements

The Einstein Toolkit is hosted on many different machines around the world. We provide a script called [GetComponents](#) to simplify downloading the toolkit. This page just describes how to download the toolkit - you may also be interested in the [Tutorial for New Users](#) which leads you through these steps and more on the Queen Bee supercomputer, or in a simpler [tutorial](#) for setup on a typical Linux box.

Users of the Einstein Toolkit are encouraged to [register](#) which also signs up for the [users mailing list](#).

Main Toolkit

Citations

The development of production level scientific software, such as the components of the Einstein Toolkit, represents the academic output of researchers. These scientific contributions should be acknowledged and respected on par with those solely based in theory or experiment. Please review our [Citation Policy](#).

Current release: Payne-Gaposchkin (released on December 16th, 2016)

This is the recommended version of the toolkit for most users. See the [release notes](#) for more information.

Note: OSX users cannot use the 'subversion' client shipped by Apple. In that case install subversion either from homebrew or macports.

Enter the directory on your machine in which you would like to download the ET (for example, your home directory), and type the commands listed below. This will create a directory called Cactus in which the components of the Einstein Toolkit are downloaded.

```
curl -kLO https://raw.githubusercontent.com/gridaphobe/CRL/ET_2016_11/GetComponents
chmod a+x GetComponents
./GetComponents --parallel https://bitbucket.org/einsteintoolkit/manifest/raw/ET_2016_11/einsteintoolkit.th
```

A tarball of the release is also available [here](#), but using `GetComponents` is the preferred method to obtain the code. Use the tarball only if there is no way to use `GetComponents` (which should almost never be the case).

ET-Download auf dem Fuchs-Cluster

```
[prakti1@login02.csc ~]$ cd ET-2016-11/
[prakti1@login02.csc ET-2016-11]$ curl -kLO https://raw.githubusercontent.com/gridaphobe/CRL/ET_2016_11/GetComponents
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           % Dload  % Upload   Total   Spent    Left  Speed
100 99330  100 99330    0     0  486k    0  --:--:--  --:--:--  --:--:-- 30.9M
[prakti1@login02.csc ET-2016-11]$ chmod a+x GetComponents
[prakti1@login02.csc ET-2016-11]$ ./GetComponents --parallel https://bitbucket.org/einsteintoolkit/manifest/raw/ET_2016_11/einsteintoolkit.th
-----
Checking out module: par
  from repository: https://bitbucket.org/einsteintoolkit/einsteinexamples.git
    into: Cactus
-----
    into: Cactus
    as: flesh
-----
Checking out module: COPYRIGHT
  from repository: https://bitbucket.org/cactuscode/cactus.git
    into: Cactus
    as: flesh
-----
Checking out module: doc
  from repository: https://bitbucket.org/cactuscode/cactus.git
    into: Cactus
    as: flesh
-----
Checking out module: lib
  from repository: https://bitbucket.org/cactuscode/cactus.git
    into: Cactus
    as: flesh
-----
Checking out module: ./utils
  from repository: https://bitbucket.org/cactuscode/utilities.git
    into: Cactus
    as: utils
-----
Checking out module: Makefile
  from repository: https://bitbucket.org/cactuscode/utilities.git
    into: Cactus
    as: Makefile
-----
    into: Cactus
    as: flesh
-----
    from repository: https://bitbucket.org/einsteintoolkit/pitnullcode.git
    into: Cactus/arrangements
-----
Checking out module: EinsteinInitialData/IDConstraintViolate
  from repository: https://bitbucket.org/einsteintoolkit/einsteinexamples.git
    into: Cactus/arrangements
-----
Checking out module: ./CoreDoc
  from repository: https://bitbucket.org/cactuscode/coredoc.git
    into: Cactus/arrangements/CactusDoc
    as: CoreDoc
-----
268 components checked out successfully.
0 components updated successfully.

Time Elapsed: 18 minutes, 5 seconds

[prakti1@login02.csc ET-2016-11]$
```

Das Einstein Toolkit: Setup mit SimFactory

```
[prakti1@login02.csc Cactus]$ ./simfactory/bin/sim setup --machine fuchs
```

Here we will define some necessary Simulation Factory defaults.

```
Determining local machine name: login02.cm.cluster
```

```
Creating machine login02.cm.cluster from generic: machine login02.cm.cluster [/home/agmisc/prakti1/ET-2016-11/Cactus/repos/simfactory2/mdb/machine]
```

```
enter value for key user [prakti1]:
```

```
enter value for key email [prakti1]:
```

```
enter value for key allocation []:
```

```
enter value for key sourcebasedir (the parent directory containing the Cactus sourcetree) [/home/agmisc/prakti1/ET-2016-11]:
```

```
enter value for key basedir (the location of simfactory simulations) [/home/agmisc/prakti1/simulations]:
```

```
would you like to enter key/value pairs for a specific machine? [Y/N*]:
```

```
-----SUMMARY-----:
```

```
[default]
```

```
user          = prakti1
```

```
email         = prakti1
```

```
allocation    =
```

```
sourcebasedir = /home/agmisc/prakti1/ET-2016-11
```

```
basedir       = /home/agmisc/prakti1/simulations
```

```
-----END SUMMARY-----:
```

```
Save contents [Y*/N]:
```

```
Contents successfully written to /home/agmisc/prakti1/ET-2016-11/Cactus/repos/simfactory2/etc/defs.local.ini
```

```
[prakti1@login02.csc Cactus]$ █
```

Das Einstein Toolkit: Kompilierung

```
[prakti1@login02.csc Cactus]$ ./simfactory/bin/sim build et --thornlist ./manifest/einsteintoolkit.th --machine fuchs
Using configuration: et
Reconfiguring et
Writing configuration to: /home/agmisc/prakti1/ET-2016-11/Cactus/configs/et/OptionList
Cactus - version: 4.2.3
Reconfiguring et.
Using configuration options from configure line
  Setting fds to '4,5 -j --'
End of options from configure line
Adding configuration options from '/home/agmisc/prakti1/ET-2016-11/Cactus/configs/et/OptionList'...
  Setting VERSION to '2015-05-16'
  Setting CPP to 'cpp'
  Setting FPP to 'cpp'
  Setting CC to '/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/bin/intel64/icc'
  Setting CXX to '/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/bin/intel64/icpc'
  Setting F77 to '/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/bin/intel64/fort'
  Setting F90 to '/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/bin/intel64/fort'
  Setting CPPFLAGS to '-DCCTK_DISABLE_OMP_COLLAPSE -DCCTK_DISABLE_RESTRICT'
  Setting FPPFLAGS to '-DCCTK_DISABLE_OMP_COLLAPSE -traditional -DCCTK_DISABLE_RESTRICT'
  Setting CFLAGS to '-g -traceback -msse3 -align -std=c99 -U__STRICT_ANSI__'
  Setting CXXFLAGS to '-g -traceback -msse3 -align -std=c++11 -D__builtin_fmaxf=fmaxf -D__builtin_fmaxl=fmaxl -D__builtin_fm'
  Setting F77FLAGS to '-g -traceback -msse3 -align -pad -safe-cray-ptr'
  Setting F90FLAGS to '-g -traceback -msse3 -align -pad -safe-cray-ptr'
  Setting C_LINE_DIRECTIVES to 'yes'
  Setting F_LINE_DIRECTIVES to 'yes'
  Setting LDFLAGS to '-Wl,--export-dynamic -Wl,-rpath,/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/ipp/lib/intel64 -Wl,-rpath,/cm/shared/apps/intel/composer_xe/2013_sp1.3.174/composer_xe_2013_sp1.3.174/tbb/lib/intel64/gcc4.4'
  Setting BEGIN_WHOLE_ARCHIVE_FLAGS to '-Wl,--whole-archive'
```


Das Einstein Toolkit: Weitere Informationen



einstein toolkit

WELCOME

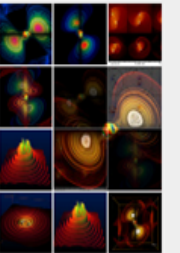
The Einstein Toolkit Consortium is developing and supporting open software for relativistic astrophysics. Our aim is to provide the core computational tools that can enable new science, broaden our community, facilitate interdisciplinary research and take advantage of emerging petascale computers and advanced cyberinfrastructure.

Please read our pages [about](#) the Einstein Toolkit, its [governance](#), and how to [get started](#) with the toolkit for more information.

Download

November 2014: We are pleased to [announce the tenth release](#) (code name "[Herschel](#)") of the Einstein Toolkit, an open, community developed software infrastructure for relativistic astrophysics.

<https://www.youtube.com/watch?v=EO4d32ch6OI>
<https://www.youtube.com/watch?v=p5bq2iUO3DE>
https://www.youtube.com/watch?v=MNpyd_o0MT4
<https://www.youtube.com/watch?v=Qg6PwRI2uS8>
<https://www.youtube.com/watch?v=ZW3aV7U-aik>



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