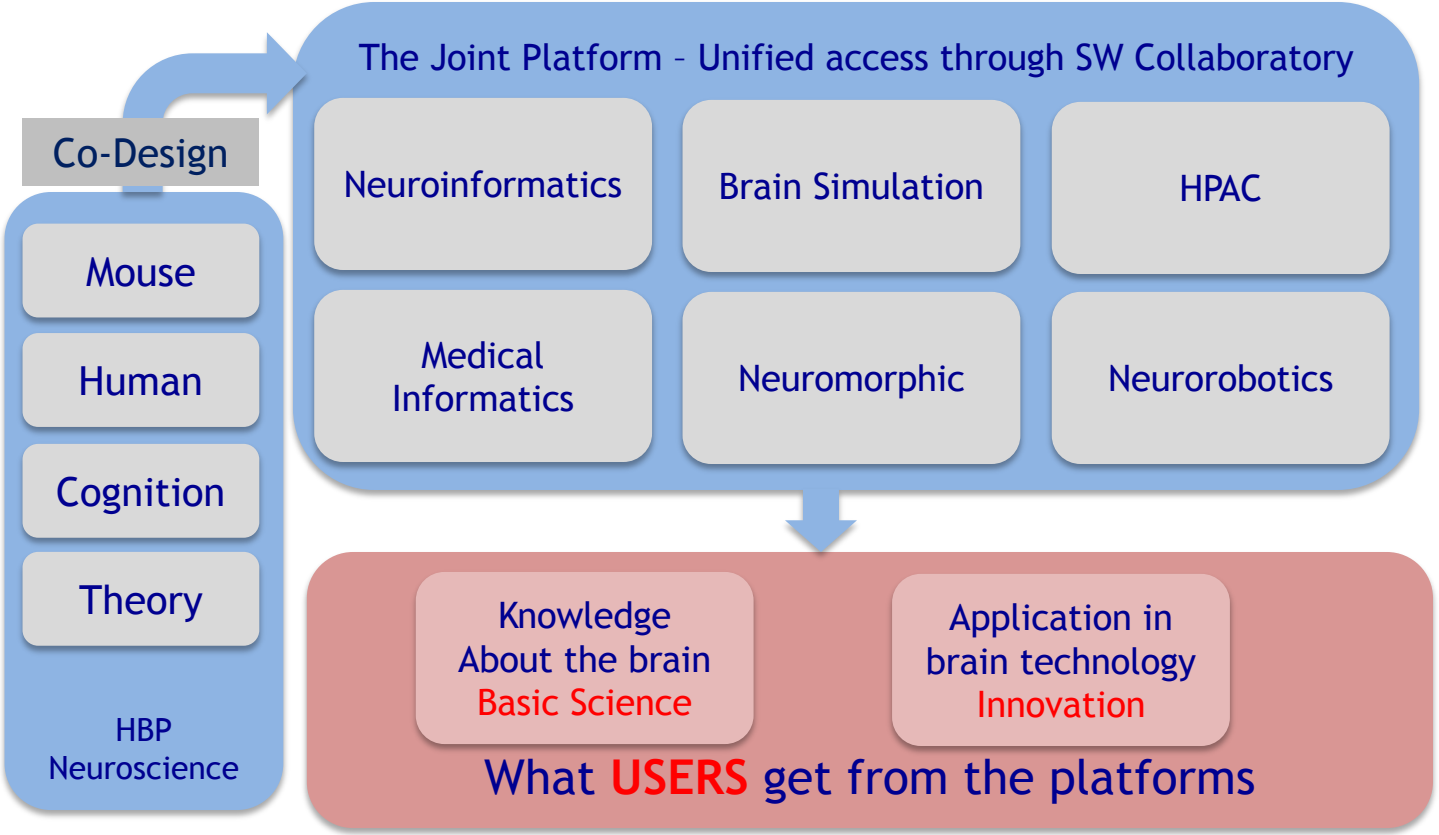
The European HBP
Karlheinz Meier
NICE2018
Portland OR

Programmatic Panel

The basic idea of the Human Brain Project

From Science to Infrastructures to Science and Innovation



The basic idea of the Human Brain Project

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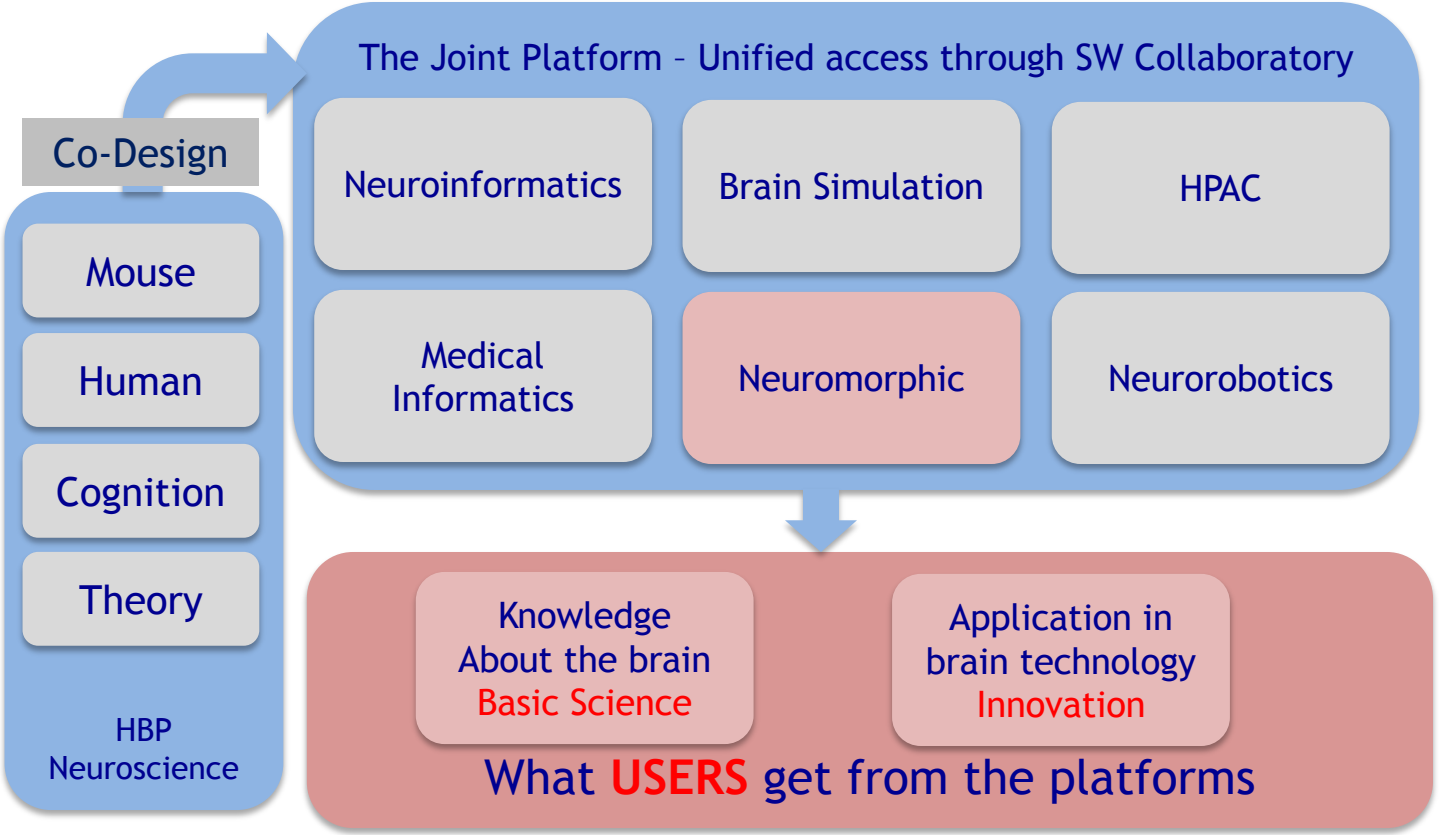


Why and how neuromorphic ?

Future computing based on biological information processing

Understanding biological information processing

Requires model system to test principles

Two **fundamentally different** modeling approaches

- **NUMERICAL MODEL (Turing)**
  represents model parameters as binary numbers
- **PHYSICAL MODEL (not Turing)**
  represents model parameters as physical quantities
  → **voltage, current, charge** (like the biological brain)

Combined into hybrid system

The HBP Neuromorphic Computing Strategy

SpiNNaker-1 machine

Many-core system
0.5 (1.0) Million ARM cores
Real-time simulator

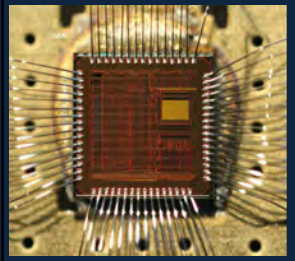
BrainScaleS-1 machine

Physical model system
4M neurons, 1B plastic syn.
Accelerated emulator

SpiNNaker-2 prototype

144 Cortex M4F per chip
36 GIPS/Watt per chip
x10 with constant power

BrainScaleS-2 prototype



On-chip plasticity processor
Flexible hybrid plasticity
Active dendritic spatial structure

Common software ecosystem, remote access, open user facility
Very collaboration with theoretical neuroscience

The HBP Neuromorphic Computing Strategy

SpiNNaker-1 machine

Steve Furber

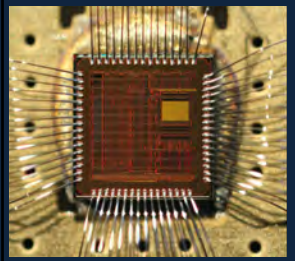
BrainScaleS-1 machine

Sebastian Schmitt

SpiNNaker-2 prototype

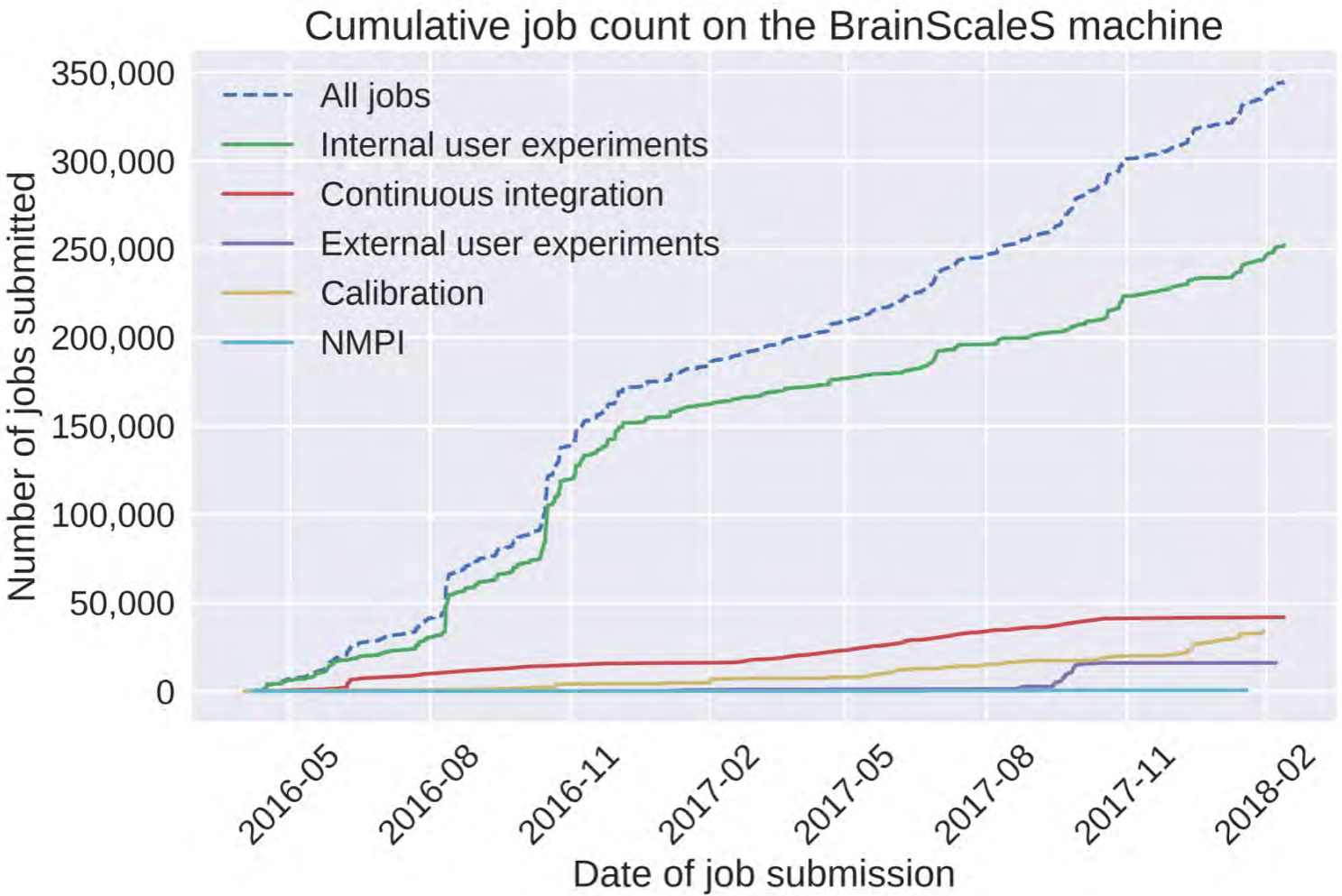
Sebastian Höppner

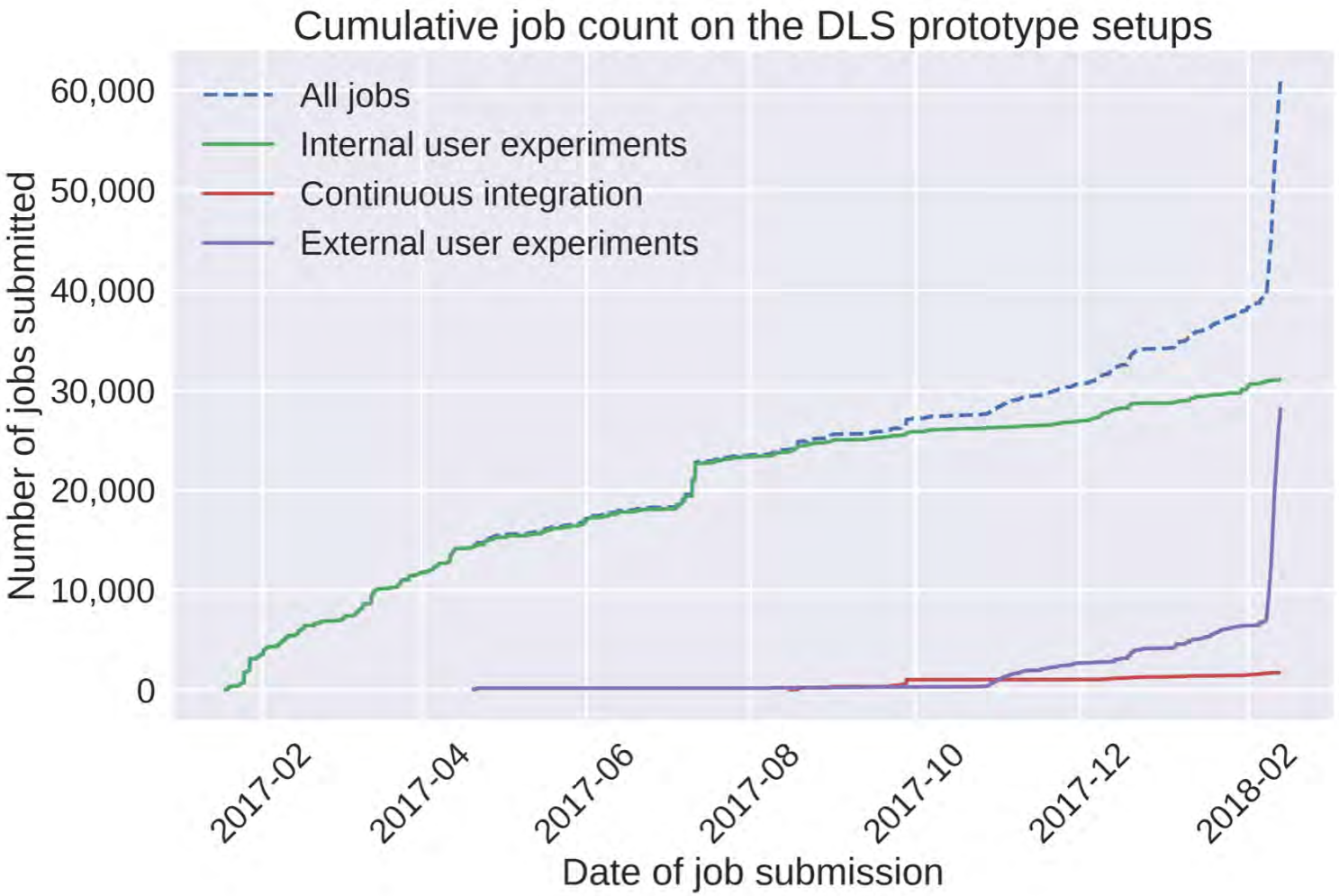
BrainScaleS-2 prototype



Johannes Schemmel
Eric Müller (Demo)

Common software ecosystem, remote access, open user facility
Very collaboration with theoretical neuroscience *Wolfgang Maass*


Cumulative job count on the BrainScaleS machine
All jobs
Internal user experiments
Continuous integration
External user experiments
Calibration
NMPI
Number of jobs submitted
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2016-05
2016-08
2016-11
2017-02
2017-05
2017-08
2017-11
2018-02
Date of job submission


Cumulative job count on the DLS prototype setups
All jobs
Internal user experiments
Continuous integration
External user experiments
Number of jobs submitted
60,000
50,000
40,000
30,000
20,000
10,000
0
2017-02
2017-04
2017-06
2017-08
2017-10
2017-12
2018-02
Date of job submission


SpiNNaker
country with machine(s)

Groundbreaking Ceremony
European Institute for Neuromorphic Computing (EINC)
Heidelberg (Germany), May 5th 2017

UNIVERSITÄT HEIDELBERG
ZUKUNFT SEIT 1386

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Supported by

The Klaus Tschira Foundation (KTS)
The Dietmar Hopp Foundation
The Wild Foundation

next: Getting started

The HBP Neuromorphic Computing Platform¶

Living document version:

6aeeeae Wed, 22 Feb 2017 17:03:48 GMT

The Neuromorphic Computing Platform allows neuroscientists and engineers to perform experiments with configurable neuromorphic computing systems. The platform provides two complementary, large-scale neuromorphic systems built in custom hardware at locations in Heidelberg, Germany (the "BrainScaleS" system, also known as the "physical model" or PM system) and Manchester, United Kingdom (the "SpiNNaker" system, also known as the "many core" or MC system). Both systems enable energy-efficient, large-scale neuronal network simulations with simplified spiking neuron models. The BrainScaleS system is based on physical (analogue) emulations of neuron models and offers highly accelerated operation (10^4 x real time). The SpiNNaker system is based on a digital many-core architecture and provides real-time operation.

Next topic

Getting started

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