



ACNS Controls

Nick Hauser & ACNS Computing and Electronics Group

ATF Conference. 29th October, 2020

Science. Ingenuity. Sustainability.

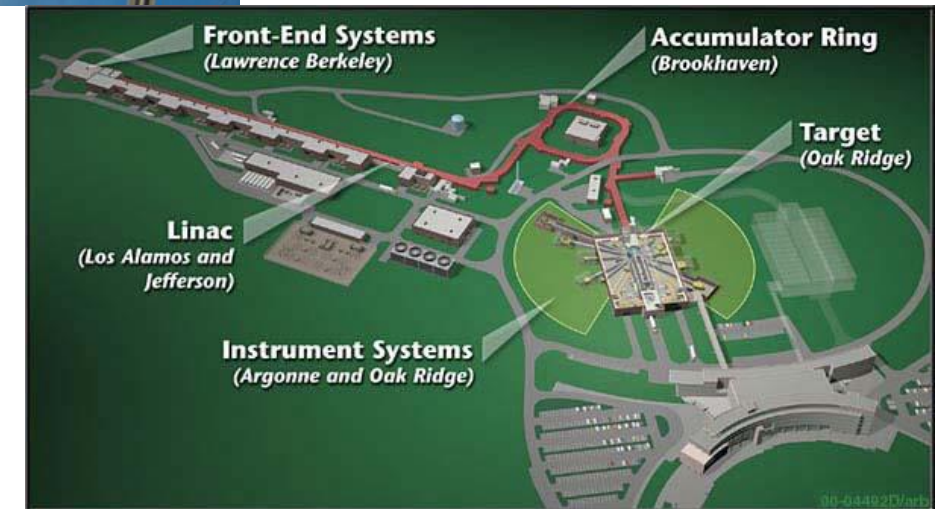
Adding spokes...

- Endeavoured **_not_** to reinvent the wheel...
- ...just to add spokes to an existing wheels
- ‘Unfortunately’ several systems were developed in parallel in early 2000’s. Sardana, GDA, IROHA2, CSS - BOY Gumtree...

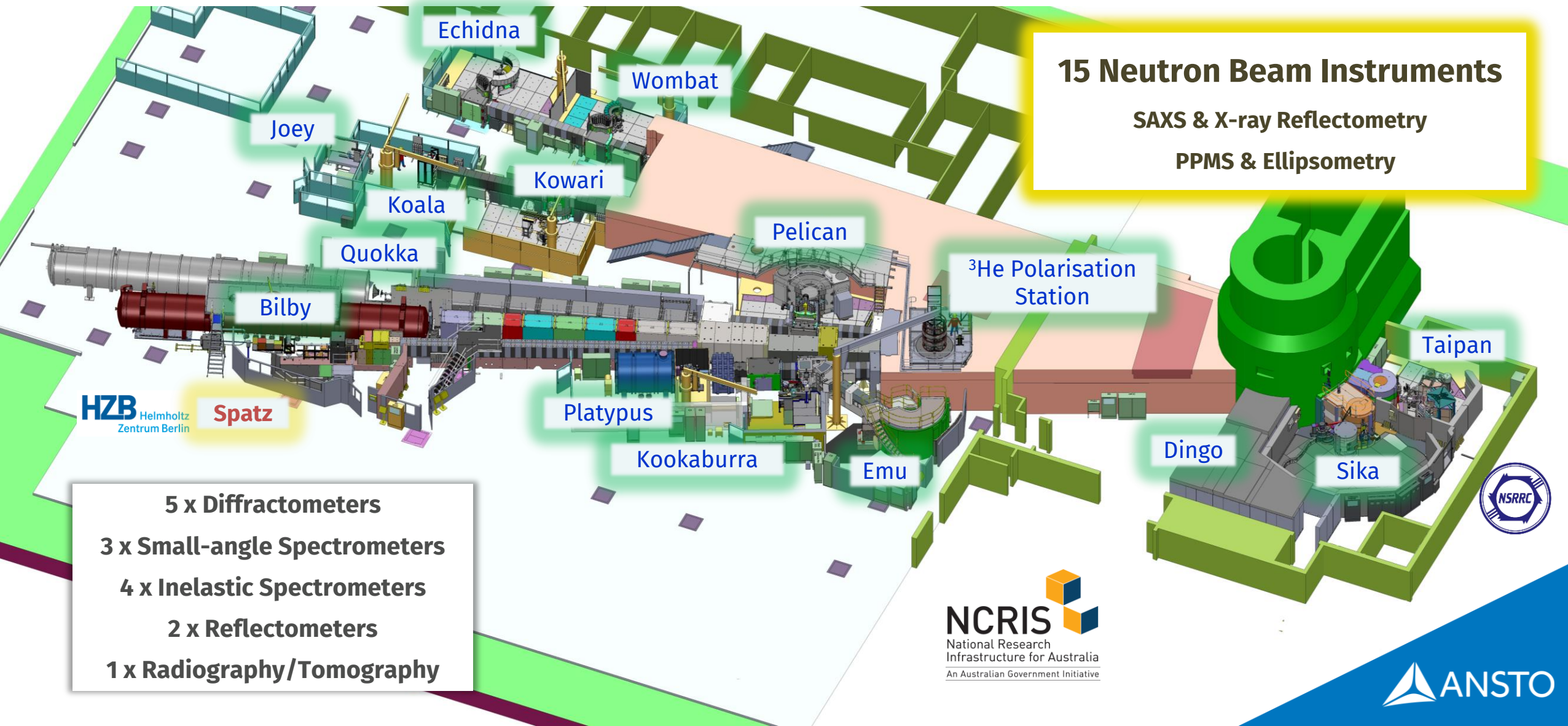


OPAL Reactor

- Multi-purpose facility
 - Isotope production
 - Si NTD
 - Materials Irradiation
 - NAA & DNAA
 - Neutron beams
- 20 MW
- Open pool
- Compact core
- D₂O reflector
- Plate type Low Enriched Uranium fuel
- Commenced operation 2007



Australian Centre for Neutron Scattering



15 Neutron Beam Instruments

SAXS & X-ray Reflectometry

PPMS & Ellipsometry

Echidna

Wombat

Joey

Kowari

Koala

Pelican

Quokka

³He Polarisation
Station

Bilby

Taipan

HZB
Helmholtz
Zentrum Berlin

Spatz

Platypus

Kookaburra

Emu

Dingo

Sika



5 x Diffractometers

3 x Small-angle Spectrometers

4 x Inelastic Spectrometers

2 x Reflectometers

1 x Radiography/Tomography

NCRIS
National Research
Infrastructure for Australia
An Australian Government Initiative

ANSTO

Acknowledgements

The NOBUGS, ICALEPCS & NeXus communities. For ideas, relationships and standards.

Collaborators and ACNS Computing staff, past and present.

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The ACNS hardware and software team 2020

Luke Lu. Electronics team lead

James Spedding. Detectors

Luis Abuel and Anowar Chowdhury. Electronics Technicians

Douglas Clowes. Data acquisition software

Ferdi Franceschini. Controls software

Norman Xiong. Controls UI

gumtree ecosystem

made possible by Eclipse plugins – adding spokes to a wheel

The image displays several overlapping screenshots of the Quokka software ecosystem, illustrating its capabilities in neutron scattering data analysis and reactor control. The interfaces are presented in a collage style, showing different views of the same system.

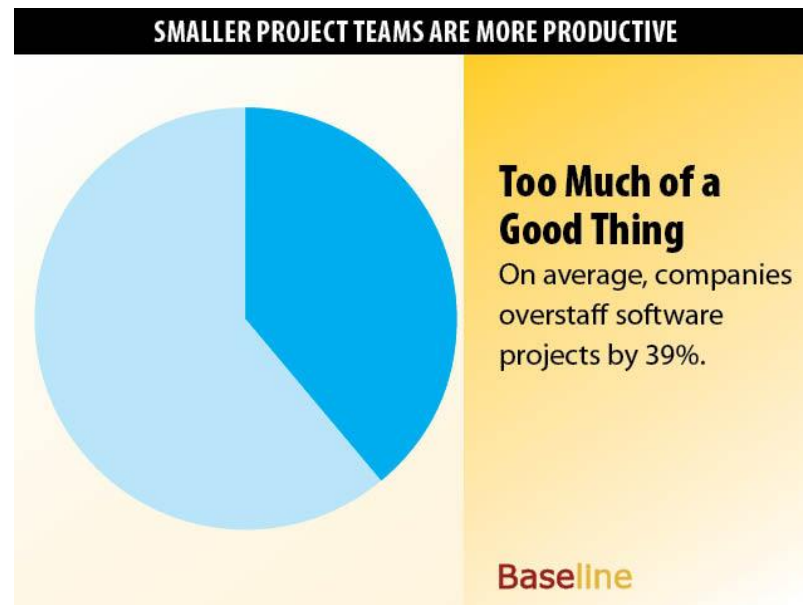
- Quokka Multi Sample Scan:** A table showing sample details for a multi-sample scan. The table includes columns for Sample Name, Thickness, and various detector channels (e.g., 11-12, 13-14, 15-16). The sample name is ABC-AX H₂O.
- Reactor Status:** A panel showing real-time reactor parameters such as Inlet Temp (20.2531 K), Outlet Temp (26.84 K), and Reactor Power (19.102633 MW).
- Server Status:** A panel showing the status of various servers, including Connection (OK), SICS Server (COUNTING), Sample Shutter (OPEN), and Fast Shutter (OPEN).
- Neutron Beam:** A panel showing beam parameters such as Monitor (1.13621E8 cts), Wavelength (5.0007 Å), Velocity Selector (25473 rpm), and Total Rate on Detector (815.585).
- Instrument Configuration:** A panel showing the configuration of the instrument, including L1 (20255 mm) and L2 (20090.6 mm).
- Analysis Scoping - Summary:** A panel showing a summary of the analysis, including the reactor source, detector, and various counts.
- Batch Buffer Runner:** A panel showing the status of the batch buffer runner, including the current sample and the status of the batch.
- Quokka - Small-Angle Neutron Scattering:** A web-based interface showing a Total x-y histogram of the data. The histogram shows a central peak with a color scale from 10² to 10⁵. The interface also includes a reactor status panel and a schematic diagram of the instrument.

Lesson 1: Activity without productivity



Solution

- Well defined interfaces
- Smaller team. 1 product, 1 developer



Regarding Staff:
a small team of
A players can run circles
around a giant team of
B and C players.

Steve Jobs
Co-founder, Apple Inc.



Casey Gollan
Business Coaching

Lessons 2: Slow development



414

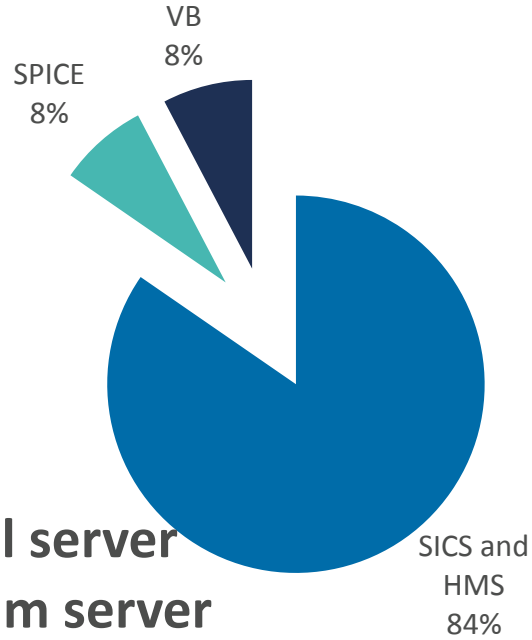
Request-URI Too Long

Solution

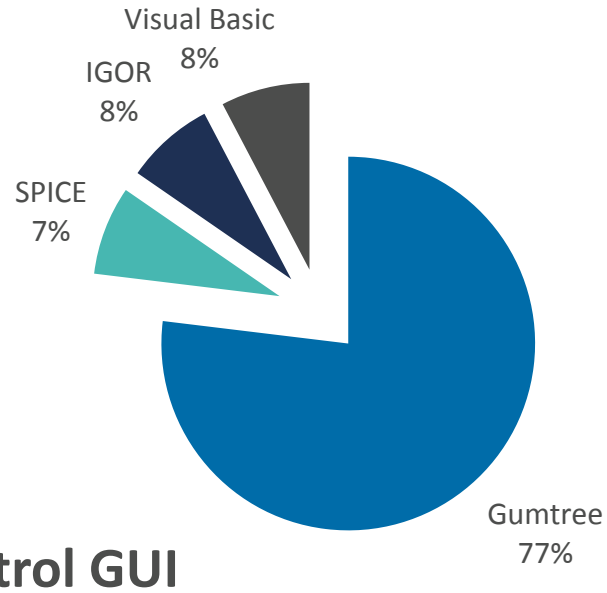


Standardisation

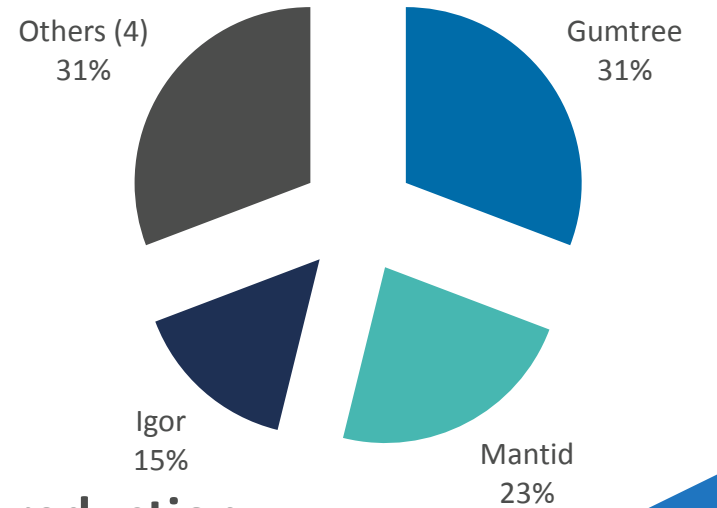
14 instruments



Control server
Histogram server



Control GUI



Data reduction

Common Data Model Access CDMA

- Please consider this as a way to share data within plugins in an application. Java or C++
- Never write another file reader / exporter again
- Reads/writes hdf5, netcdf, xml file
- Output / exports to hdf5, xml, cif, xyd
- C++ and Java versions – Mantid integration?
- jython/jnumpy API for data & array operations
- error propagation for neutron scattering (Poisson stats)
- Successful collaboration with Soleil. Both facilities benefited. Open to further collaborations
- <https://code.google.com/p/cdma/>

Multi sample workflow

- **Automation interface** & engine for instruments with sample changers, sample environment controllers and instrument configuration changes e.g. SANS
- generated xml file has **file associations** e.g. transmission, scattering, empty cell – **automated data reduction**

Experiment Time Estimate

Using a statistical approach

The screenshot displays the Quokka Scan software interface. The main window is titled "Quokka Multi Sample Scan" and shows a configuration for a scan. The "Workflow Info" panel on the left indicates the current step is "/sample/tc1/setpoint" with a value of 150.0. The "Experiment Control" panel contains buttons for "Duplicate", "Remove", "Up", "Down", "Import Excel", "Script Preview", "Script (Python)", "Table (Image)", "Table (Excel)", and "Result (XML)".

The main table lists the scan parameters for five samples:

Sequence	Position	Sample Name	Thickness	Op15T_L1=L...	Transmission	Scattering	Preset (sec)	L1=10m_L2=...	Transmission	Scattering	Preset (cou...)
1	1	Sample 1	3.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	240	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2.4E6
2	2	Sample 2	10.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	240	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2.4E6
3	3	MT cell	0.0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	240	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2.4E6
4	4	MT beam	0.0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	300	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2.4E6
5	5		0.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	240	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1E6

At the bottom of the main panel, there are fields for "Data collection time", "Configuration time", and "Total Estimated Time", along with an "Update" button. Below the main panel is a "Console" window showing the engine version and language information:

```
Engine: jython
Engine Version: 2.7.0
Language: python
Language Version: 2.7
```

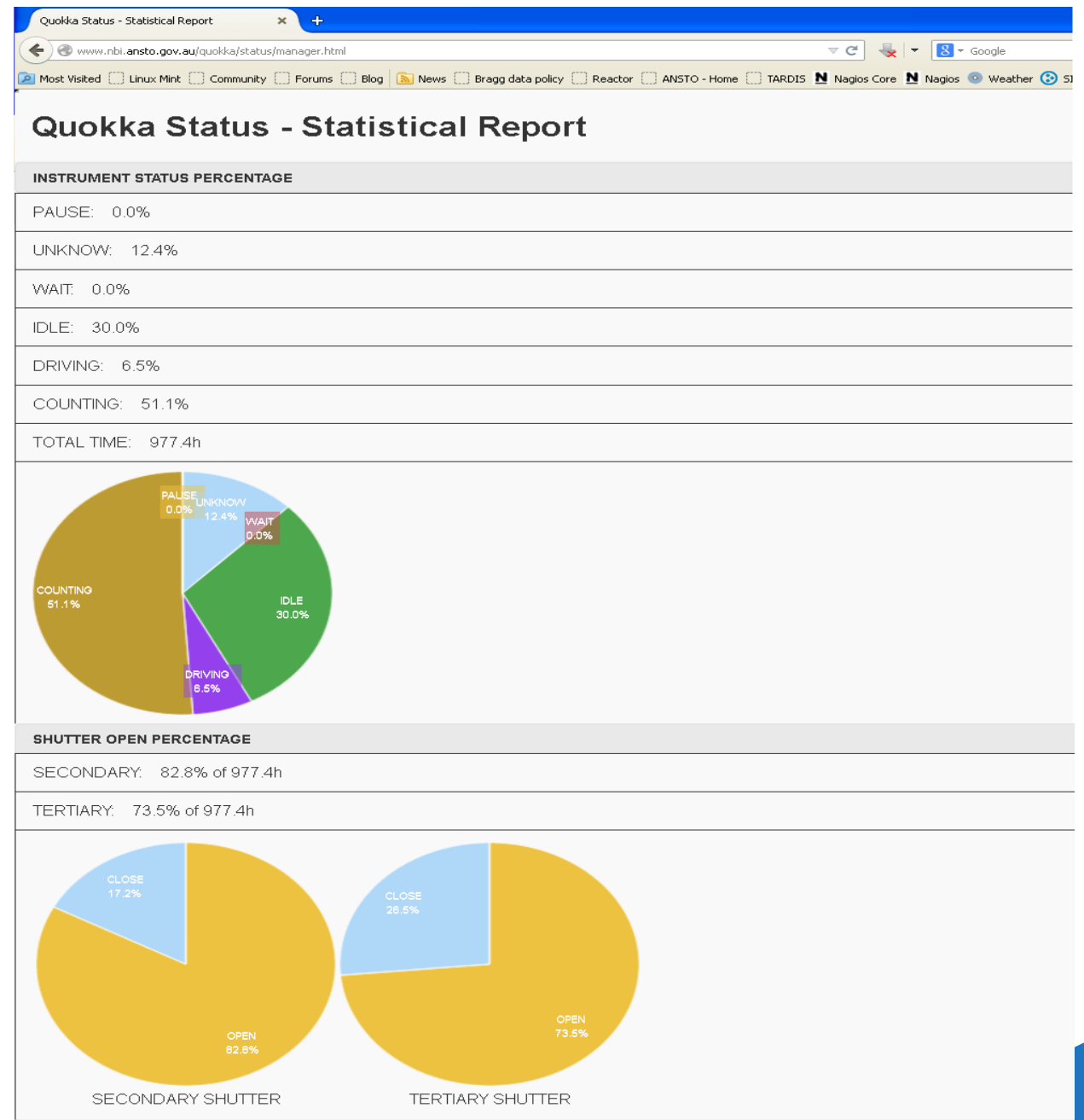
The right-hand side of the interface features a "Quokka" status panel with various system metrics:

- REACTOR SOURCE: Power 18.453 MW, CNS Inlet Temp 20.248 K, CNS Outlet Temp 26.730 K
- SHUTTER STATUS: Secondary OPEN (green), Sample CLOSED (red)
- SERVER STATUS: EAGER TO EXECUTE (green)
- PAUSE COUNTING: Click to Pause Counting (button)
- DEVICES: att: 120.03 deg, srce: 150.07 deg, apx: -0.00 mm, wavelength: 5.00 Å
- DETECTOR: total counts: 5613 cts, detector_y: 7199.98 mm, detector_x: -0.00 mm, beam stop: 1, bsx: 100.00 mm, bsz: 251 mm
- NEUTRON COUNTS: BM1 counts: 14661874 cts, BM2 counts: 0 cts
- SAMPLE: Number: 15.33, Name: UNKNOWN
- GUIDE: configuration: ga
- ENVIRONMENT CONTROLLERS: T1 Sensor1: 0 K

A large red stop button is visible at the bottom of the status panel. The bottom of the window shows the system tray with the file path "ics1-quokka.nbi.ansto.gov.au:60003" and memory usage "123M of 1046M".

Gathering usage statistics

Gumtree helps in the management process to maximise instrument productivity



Virtualisation & containers

reducing admin workload, making systems robust

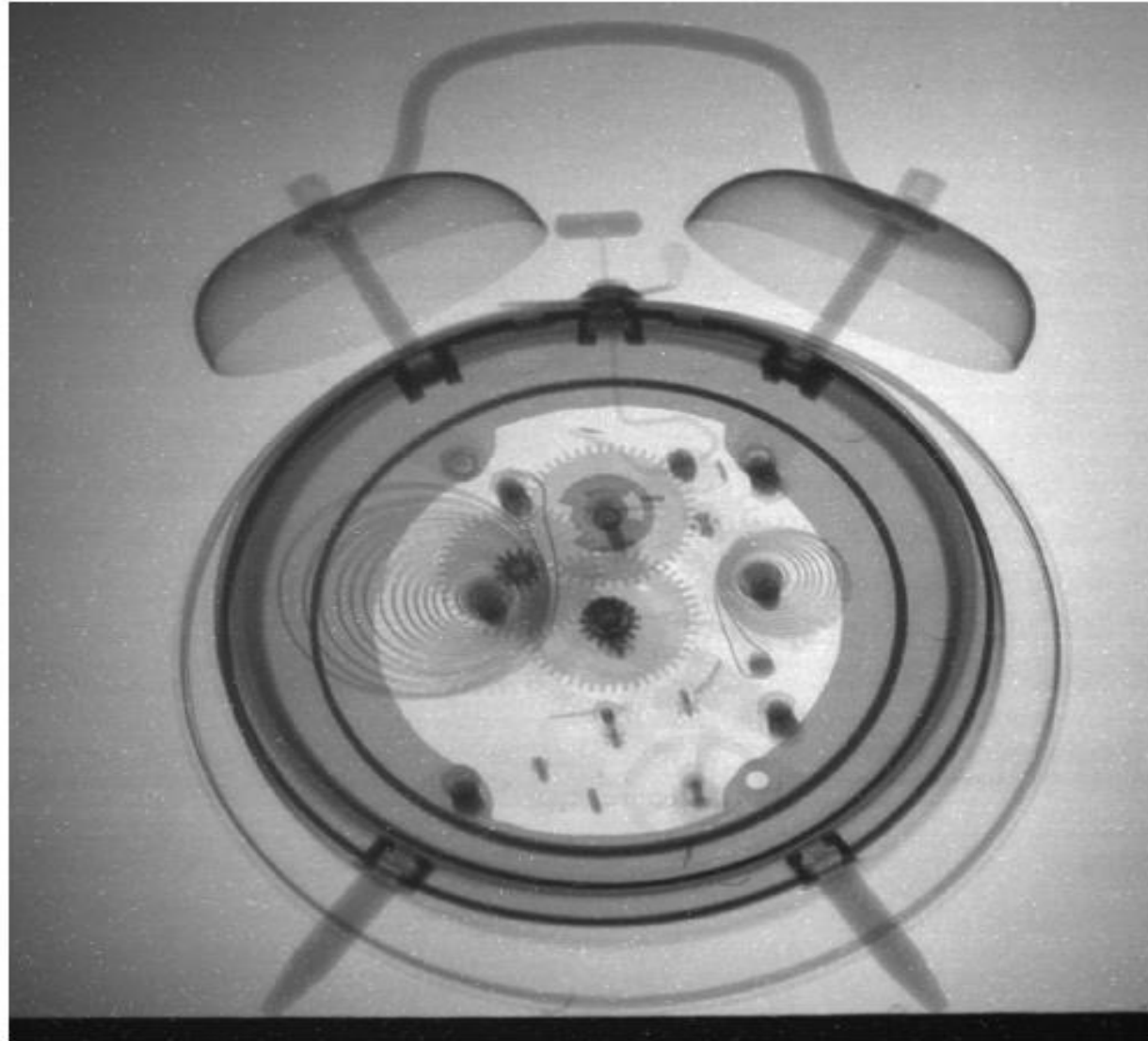


And we had the privilege to host ICALEPCS 2015



2015
ICALEPCS
melbourne • australia

DINGO First Image



Questions

