Report of the Scrutiny Group to the LHC RRBs

Christos Touramanis

26-28 October 2015
General comments

- LS1 successfully completed. LHC & experiments now running
- Online replacements happened smoothly as planned
- Incidents with subsystems dealt with efficiently; small cost over-runs mostly balanced from savings in other areas
  - Remarkable given the volume and complexity of works carried out
- Collaborations currently working on:
  - Complete commissioning
  - Collect high quality data for physics – first ever collisions at 13TeV
  - Phase I upgrade projects
  - Preparations for phase II upgrade

- Maintaining skills base at CERN and at collaborating institutes is crucial for the long term success of the LHC programme
Exchange rates

• €/CHF exchange rate:
  – All collaborations presented estimates of the effect on their M&O spending: 1% - 3% maximum
  – ATLAS and LHCb have gained from large computing replacements contracts placed in € before the drop and paid after it
  – ATLAS and LHCb proposed reduction in budgets to reflect the achieved / expected savings
    • Note (trivial): exchange rates can move in the other direction
  – ALICE and CMS will re-evaluate the actual effect on 2015 spend and propose actions in 2016
Upgrades monitoring

- Systems trialled and assessed with collaborations
- Multiple rounds of discussions
- MoUs define scope/deliverables
  - Milestone tracking done by LHCC
- No central funds (except “common fund”) or contingency
  - Action on any observations?
- The design of projects and costing of milestones at project preparation stage define the degree of monitoring possible during execution
- Robust system to gather compatible, dependable data
- SG will follow upgrade common funds in phase I
Scrutiny Group 2015 membership

G. Barker (Warwick)

W. Christie (BNL)

M. Dracos (Strasbourg)

G. Ginther (FNAL, Rochester)

E. Iacopini (INFN Firenze)

W. Klempt (CERN)

M. Moll (CERN)

L. Moneta (CERN)

C. Niebuhr (DESY)

F. Hahn (CERN; Scient. Secretary)

S. Stapnes (CERN)

C. Touramanis (Liverpool; Chair)

E. Tsesmelis (CERN)

G. Vasseur (CEA)
ALICE M&O A

Closing Report 2014 (all in kCHF)

Budget no power: 4,691
Actual costs: 4,794
End of Year Commitments: 139 [from 645]
NMS Power cost: 12

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>No power</td>
<td>4,687</td>
<td>4,692</td>
<td>4,692</td>
<td>4,692</td>
<td>4,692</td>
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<tr>
<td>Full power</td>
<td>7,103</td>
<td>6,601</td>
<td>6,308</td>
<td>6,132</td>
<td>4,723</td>
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</tbody>
</table>

kCHF
ALICE M&O A

- 3.4 M spent on online replacement
  - 2.3 M for nodes (11.5k cores, 198 CHF/core)
  - 1.1 M for storage & network
- €/CHF estimated <3.3%, will be analysed end 2015
- The SG recommends approval of the ALICE M&O A closing report for 2014 and the budget request for 2016
2014 spend: 1.7 MCHF (budget: 1.6 MCHF)
Main difference from PHOS and trigger
2016 budget request and projection:

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total (kCHF)</td>
<td>1,328</td>
<td>1,384</td>
<td>1,387</td>
<td>1,247</td>
<td>1,086</td>
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<tr>
<td>Tech. Man-months</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>177</td>
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</table>

The SG recommends approval of the ALICE M&O B closing report for 2014 and the budget request for 2016
### Closing Report 2014 (all in kCHF)

**Budget no power:** 14,420  
**Actual costs:** 14,982  
**EoY Commitments:** 4,222 [from 89]  
**NMS Power cost:** 705

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<tbody>
<tr>
<td>No power</td>
<td>14,645</td>
<td>14,045</td>
<td>14,413</td>
<td>14,387</td>
<td>14,482</td>
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<tr>
<td>Full power</td>
<td>16,845</td>
<td>16,245</td>
<td>16,613</td>
<td>16,587</td>
<td>16,682</td>
</tr>
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</table>

### Diagram

- **Budget**
- **Spending**
- **Cumulative Budget Balance**
- **Cumulative [Contributions - Invoices]**

KCHF range: -4,000 to 16,000
• Of 4.2M open commitment end 2014, 3.9M was online replacement contract
  – This became 3.5M after €/CHF rate drop
  – Special online replacement account held 1.6M
• 20% of spending in 2014 was in €
  – 15% exchange rate change is 3% of total
  – ATLAS proposed 2016 budget 3.4% below previously planned
• The SG recommends approval of the ATLAS M&O A closing report for 2014 and the budget request for 2014
2014 spend: 4,887kCHF (budget: 5,030kCHF)
Main spending on electronics and repairs in-situ
2016 budget request after returns, and projection:

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</tr>
</thead>
<tbody>
<tr>
<td>Total (kCHF)</td>
<td>4,553</td>
<td>4,555</td>
<td>4,787</td>
<td>4,813</td>
<td>4,718</td>
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<tr>
<td>Technical FTE</td>
<td>301</td>
<td>274</td>
<td>283</td>
<td>283</td>
<td>278</td>
</tr>
<tr>
<td>Computing FTE</td>
<td>152</td>
<td>152</td>
<td>152</td>
<td>152</td>
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</tr>
</tbody>
</table>

The SG recommends approval of the ATLAS M&O B closing report for 2014 and the budget request for 2016
Closing Report 2014 (all in kCHF)

Budget no power: 13,646
Actual costs: 13,673
EoY Commitments: 4,838 [from 2,633]
NMS Power cost: 761

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</thead>
<tbody>
<tr>
<td>No power</td>
<td>12,460</td>
<td>12,557</td>
<td>12,316</td>
<td>12,506</td>
<td>12,506</td>
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<tr>
<td>Full power</td>
<td>14,160</td>
<td>14,257</td>
<td>14,016</td>
<td>14,206</td>
<td>14,206</td>
</tr>
</tbody>
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Budget vs Spending vs Cumulative Budget Balance vs Cumulative Contributions - Invoices
CMS M&O A

• Open commitments end 2014: 4.8 M
  – 3.9M was DAQ orders
  – Special online replacement account held 3.8 M

• Remediation of pixel tracker incident required extra spend of 360 kCHF, spread across 2014-2015

• Gas consumption
  – 2014: 103 kCHF over budget
  – task force as requested; multiple remedial actions
  – expect to stay on budget in the future
CMS M&O A

- 8% of spending in 2014 was in €
  - 15% exchange rate change is 1.2% of total
  - CMS will re-evaluate the effect end 2015
- Magnet cryogenic system pollution in 2015
  - CERN will bear most of the remediation cost
  - CMS expects around 200k to fall on their M&O
  - Bottom-up risk assessment on-going
- The SG recommends approval of the CMS M&O A closing report for 2014 and the budget request for 2016
CMS M&O B

• 2014 spend on budget
• Certain sub-systems still hold significant reserves
• 2016 budget request (lower by 85 k than previously planned), and projection:

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</thead>
<tbody>
<tr>
<td>Total (kCHF)</td>
<td>5,463</td>
<td>5,582</td>
<td>5,665</td>
<td>5,623</td>
<td>5,585</td>
</tr>
<tr>
<td>Computing FTE</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

• The SG recommends approval of the CMS M&O B closing report for 2014 and the budget request for 2016
LHCb M&O A

Closing Report 2014 (all in kCHF)

- Budget no power: 2,580
- Actual costs: 2,608
- End of Year Cash Balance: 77
- NMS Power cost: 81

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</thead>
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<tr>
<td>No power</td>
<td>2,530</td>
<td>2,480</td>
<td>2,480</td>
<td>2,480</td>
<td>2,480</td>
</tr>
<tr>
<td>Full power</td>
<td>2,830</td>
<td>3,080</td>
<td>3,450</td>
<td>3,450</td>
<td>3,450</td>
</tr>
</tbody>
</table>

-1,000 0 500 1,000 1,500 2,000 2,500 3,000 3,500

- Budget
- Spending
- Cumulative Budget Balance
- Cumulative [ Contributions - Invoices ]
LHCb M&O A

- 2014 spend just 28k above budget
  - LS1 was, as predicted, ~10% above normal running
  - M&O A was kept flat, extra spend reduced balance as previously agreed
- LHCb propose to lower future budgets by 2% to reflect the €/CHF exchange rate
- The SG recommends approval of the LHCb M&O A closing report for 2013 and the budget request for 2015.
LHCb M&O B

- 2014 spend: on budget
- 2016 budget request and projection:

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<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (kCHF)</td>
<td>1,049</td>
<td>990</td>
<td>970</td>
<td>970</td>
<td>970</td>
</tr>
</tbody>
</table>

- The SG recommends approval of the LHCb M&O B closing report for 2014 and the budget request for 2016
TOTEM M&O

- M&O A 2014: budget 439 kCHF, spend 444 kCHF
- Budget request 2016: 492kCHF
- Budget projection 2016-2019: 492kCHF / year
- The SG recommends approval of the TOTEM M&O closing report for 2014 and the budget request for 2016
CT-PPS project

• TOTEM & CMS project
  – Most TOTEM collaborators participate
  – Small fraction of CMS participates
  – LHCC approved, MoU signed, ready for operation in 2016

• SG invites the CT-PPS project leadership, in agreement with CMS and TOTEM managements, to submit in 2016 their proposal for how the specific M&O expenses will be presented and scrutinised.
Acknowledgments

• The SG wishes to thank the Resources Coordinators of the Collaborations for their efforts and excellent cooperation which makes the scrutiny process possible

• We also thank CERN management and staff for their support