

# Research to Operations (R2O)

45 minute session at #UEF2020

Jenny Rourke and Mike Sleigh

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# Introduction



**Dr Jenny Rourke**  
**Head of Production Services Section, ECWMF**

**Dr Michael Sleigh**  
**Head of Integrated Forecast Systems (IFS) Section, ECWMF**



## Introduction

1. What is the R2O process?
2. How do you fit into this as a user of ECMWF data?

Timings:

3 minutes

5 minutes

Time for you to get involved 😊

5 minutes

3. Overview of the R2O process at ECMWF

15 minutes

4. Improvements planned for the future of R2O at ECMWF

5 minutes

Another chance for you to get involved 😊

5 minutes

5. What can we learn from your organisation?

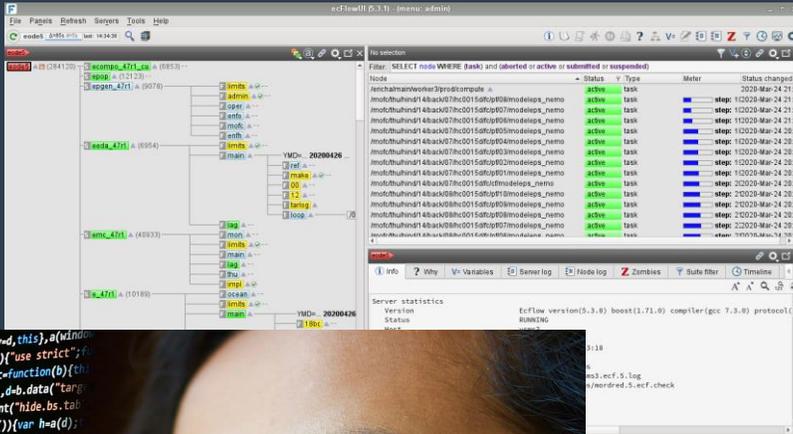
2 minutes

# 1. What is the R2O process?

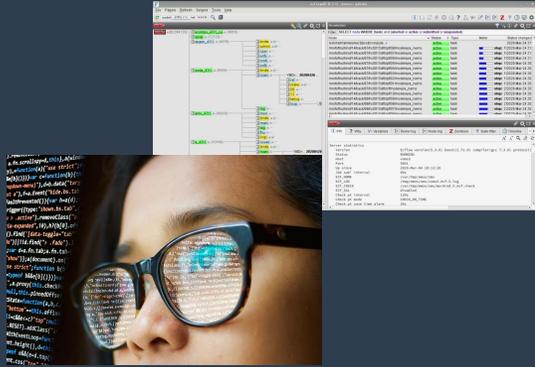
Research



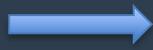
Operations



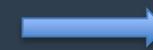
# 1. What is the R2O process?



**Planning:  
10 year  
strategy**



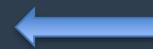
**Planning:  
5 year  
plans**



**Individual  
developments  
(stand alone  
testing)**



**Developments  
are combined  
and tested**



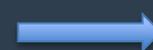
**Accepted  
developments are  
merged in the new  
IFS cycle**



**Testing  
and  
evaluation**



**Operational testing  
and assessment**



**Test data to users  
and communication**



**Cycle  
upgrade**



## 2. How do you fit into this as a user of ECMWF data?

One of the main ways we collect feedback from Users is at the UEF – so thank you for your feedback!



## 2. How do you fit into this as a user of ECMWF data?

### Service Desk

Services News and updates Organisation Quick

### Welcome to Service Desk

**The Service Desk is the first point of contact for any questions or problems.**

The Service Desk is staffed by the Core Service Desk Team during Office Hours and by Shift-Staff at all other times.

#### Office Hours:

8:30am - 5:30pm Mon - Fri

#### The Service Desk contact details are:

Email: [servicedesk@ecmwf.int](mailto:servicedesk@ecmwf.int)

Internal Extension number 2303

From the outside +44 (0)1189 499303

You can reach out to us any time with feedback.

The best way is via the “Service Desk”

[Servicedesk@ecmwf.int](mailto:servicedesk@ecmwf.int)

+44 (0)1189 499303

Or

You can tweet [@ECMWF](https://twitter.com/ECMWF)

Or

Email or call any of your contacts at ECMWF any time with feedback!

## 2. How do you fit into this as a user of ECMWF data?

We gather a lot of useful feedback through our Member State visits:

Montenegro and  
Serbia February  
2020



Lithuania and Latvia  
November 2019

## 2. How do you fit into this as a user of ECMWF data?

Every other year (next will be 2021) we also collect reports on the application and verification of ECMWF's forecast products from Member & Cooperating states:  
"The Green Book"

### **Application and verification of ECMWF products 2019- Denmark**

*H Gisselø, B Hansen Sass, K Skovgaard Madsen*

2019, Green Book 2019, Book Chapter, ECMWF.

 [19194-application-and-verification-ecmwf-products-2019-denmark.pdf](#)

### **Application and verification of ECMWF products 2019- Austria**

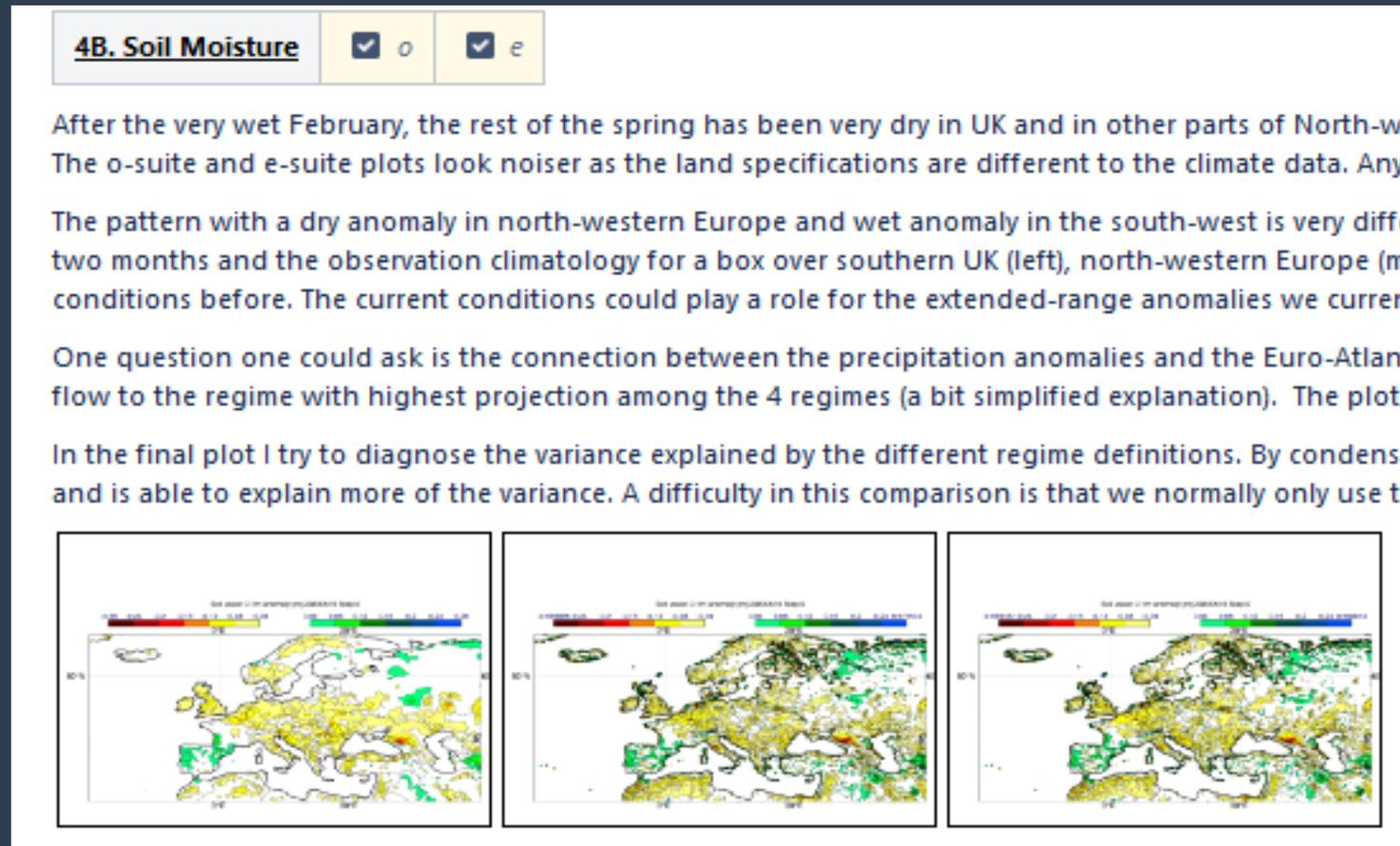
*Wittmann C, Atencia A, Dabernig M, Hirtl M, Kann A, Maurer C, Skomorowski P*

2019, Green Book 2019, Book Chapter, ECMWF.

 [19191-application-and-verification-ecmwf-products-2019-austria.pdf](#)

## 2. How do you fit into this as a user of ECMWF data?

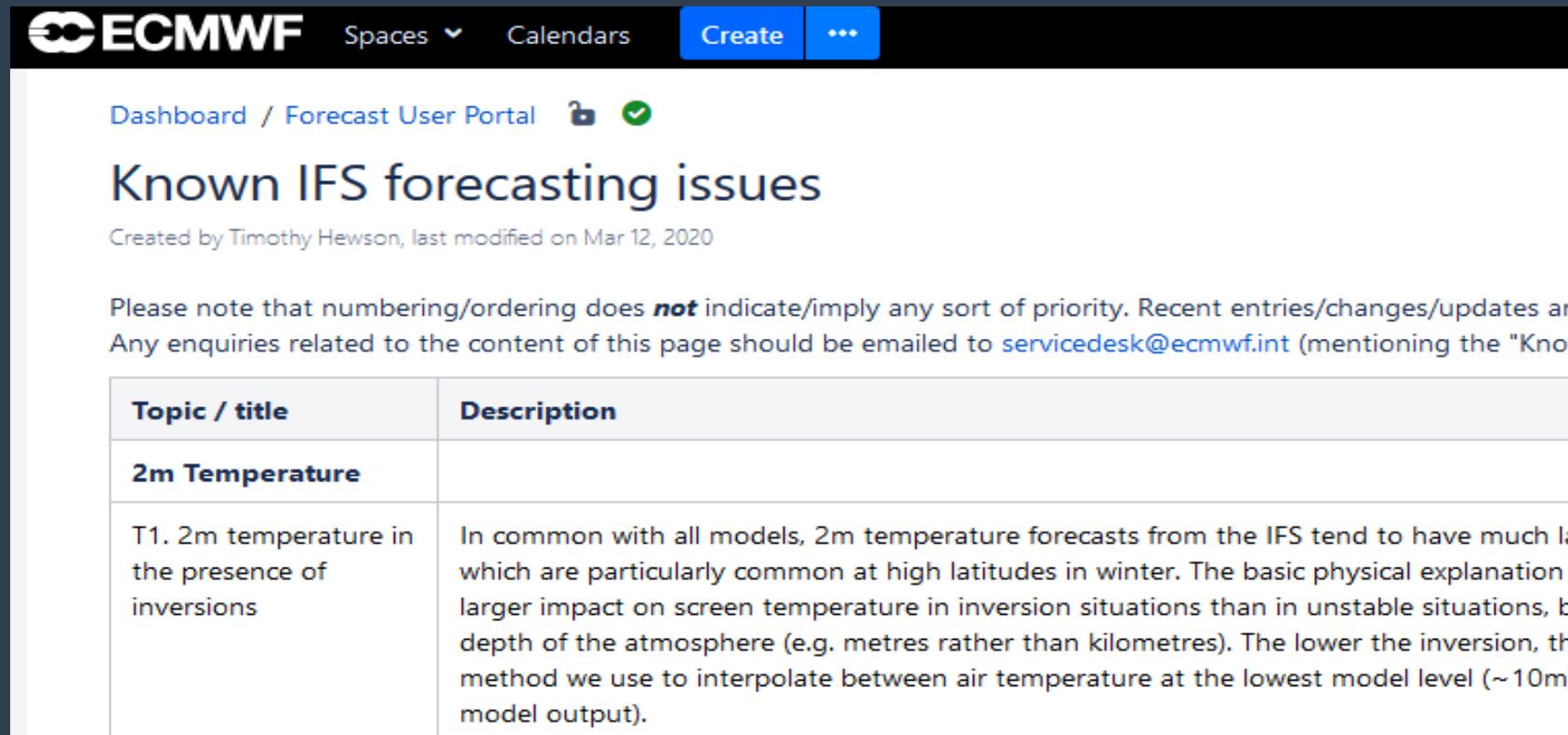
We also have a team of analysts at ECMWF who analyse our output and produce a Daily Report – with a weekly “Weather Discussion”



## 2. How do you fit into this as a user of ECMWF data?

ECMWF have a Quarterly Evaluation and Developments (QED) internal meeting where model issues are also discussed.

All of these feed into the “Known IFS forecasting issues” page (<https://confluence.ecmwf.int/display/FCST/Known+IFS+forecasting+issues>)

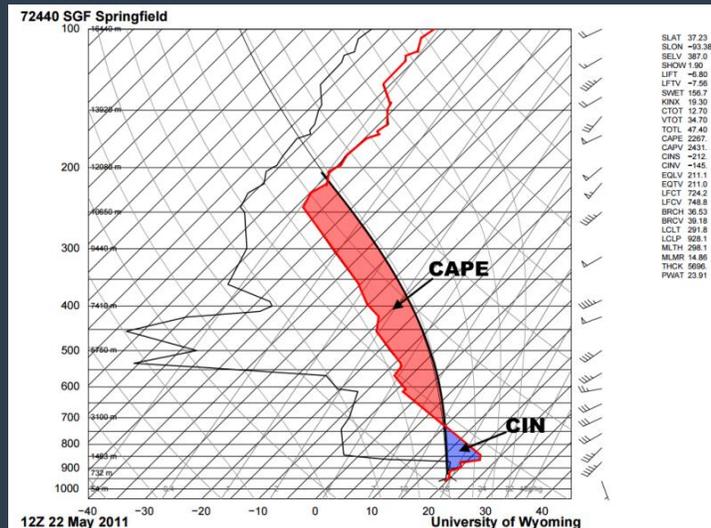


The screenshot shows the ECMWF Confluence interface. At the top, there is a navigation bar with the ECMWF logo, 'Spaces', 'Calendars', a 'Create' button, and a menu icon. Below this, the breadcrumb path is 'Dashboard / Forecast User Portal'. The main heading is 'Known IFS forecasting issues', with a subtext 'Created by Timothy Hewson, last modified on Mar 12, 2020'. A note states: 'Please note that numbering/ordering does **not** indicate/imply any sort of priority. Recent entries/changes/updates are... Any enquiries related to the content of this page should be emailed to [servicedesk@ecmwf.int](mailto:servicedesk@ecmwf.int) (mentioning the "Known IFS forecasting issues" page)'. Below the note is a table with two columns: 'Topic / title' and 'Description'.

Topic / title	Description
<b>2m Temperature</b>	
T1. 2m temperature in the presence of inversions	In common with all models, 2m temperature forecasts from the IFS tend to have much larger errors in the presence of inversions, which are particularly common at high latitudes in winter. The basic physical explanation is that the model tends to have a larger impact on screen temperature in inversion situations than in unstable situations, because the inversion is much shallower (depth of the atmosphere (e.g. metres rather than kilometres). The lower the inversion, the larger the impact. The method we use to interpolate between air temperature at the lowest model level (~10m) and the screen temperature (1.5m) is a simple linear interpolation of the model output).

## 2. How do you fit into this as a user of ECMWF data?

Examples of User feedback making improvements to operations:



Improvements to CIN  
and CAPE in cycle 47r1  
(30<sup>th</sup> June 2020)



Please see Ivan  
Tsonevsky's  
presentation at the  
#UEF2020 "Speaker's  
Corner"

12:40-13:45 UTC  
Wednesday 3<sup>rd</sup> June  
2020

## 2. How do you fit into this as a user of ECMWF data?

Examples of User feedback making improvements to operations:



**Newsletter**  
Number 163 - Spring 2020  
Published in April 2020

**METEOROLOGY** Quintic vertical interpolation improves forecasts of the stratosphere

[View all Newsletters](#)

Inna Polichtchouk, Michail Diamantakis, Filip Váňa

<https://www.ecmwf.int/en/newsletter/163/meteorology/quintic-vertical-interpolation-improves-forecasts-stratosphere>

# Time for you to get involved

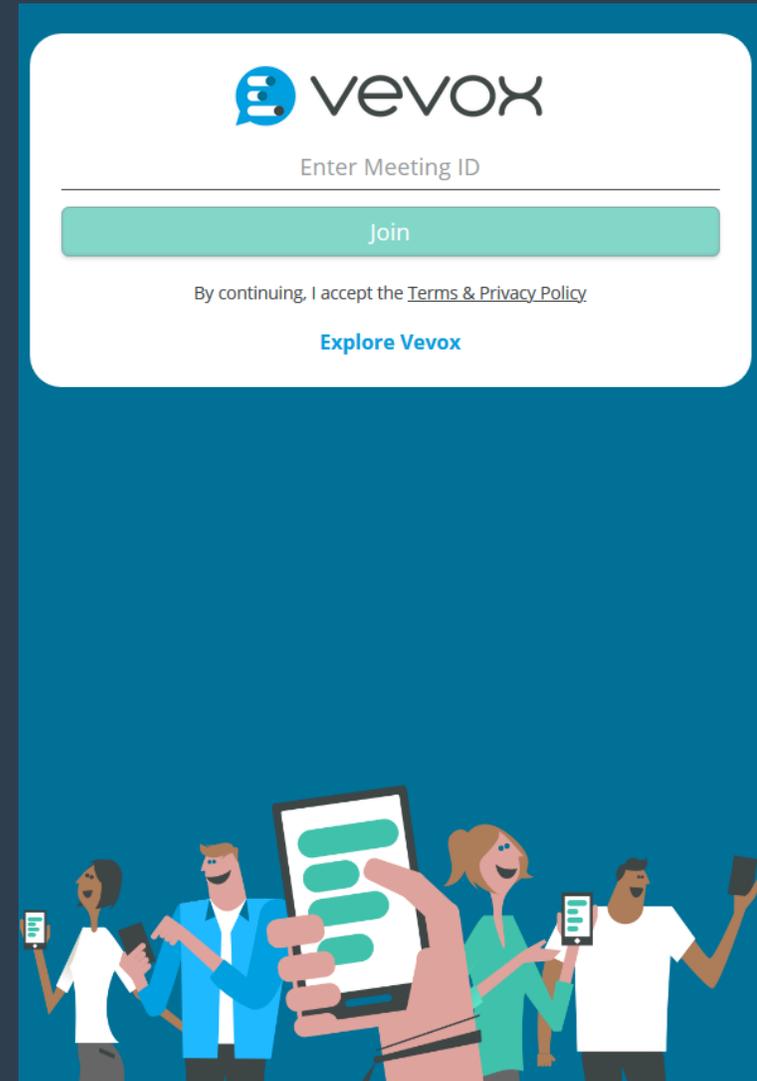
Live poll!

On your smart phone or computer, please go to:

**VEVOX.app**

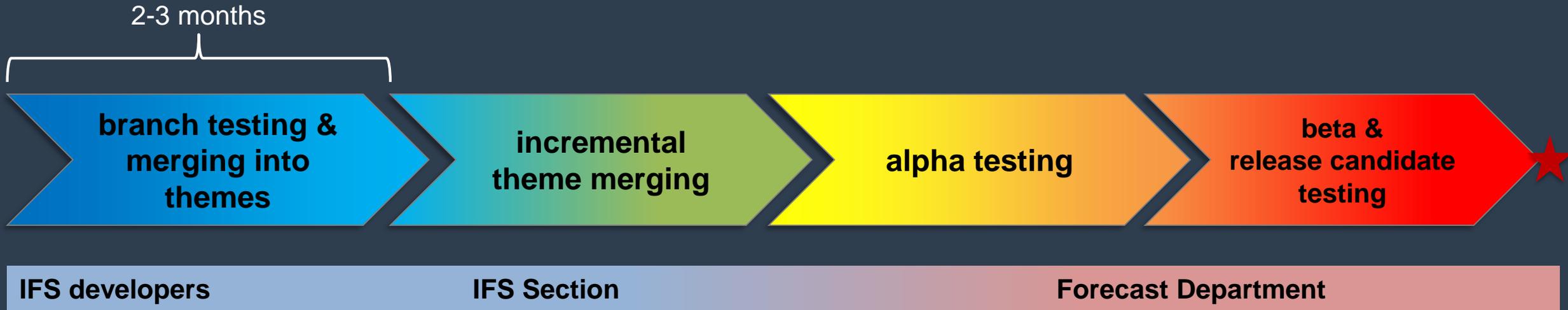
Put in the Meeting ID:

**199-103-393**



### 3. Overview of the R2O process at ECMWF

# The road to implementation: timeline



branch testing & merging into themes

incremental theme merging

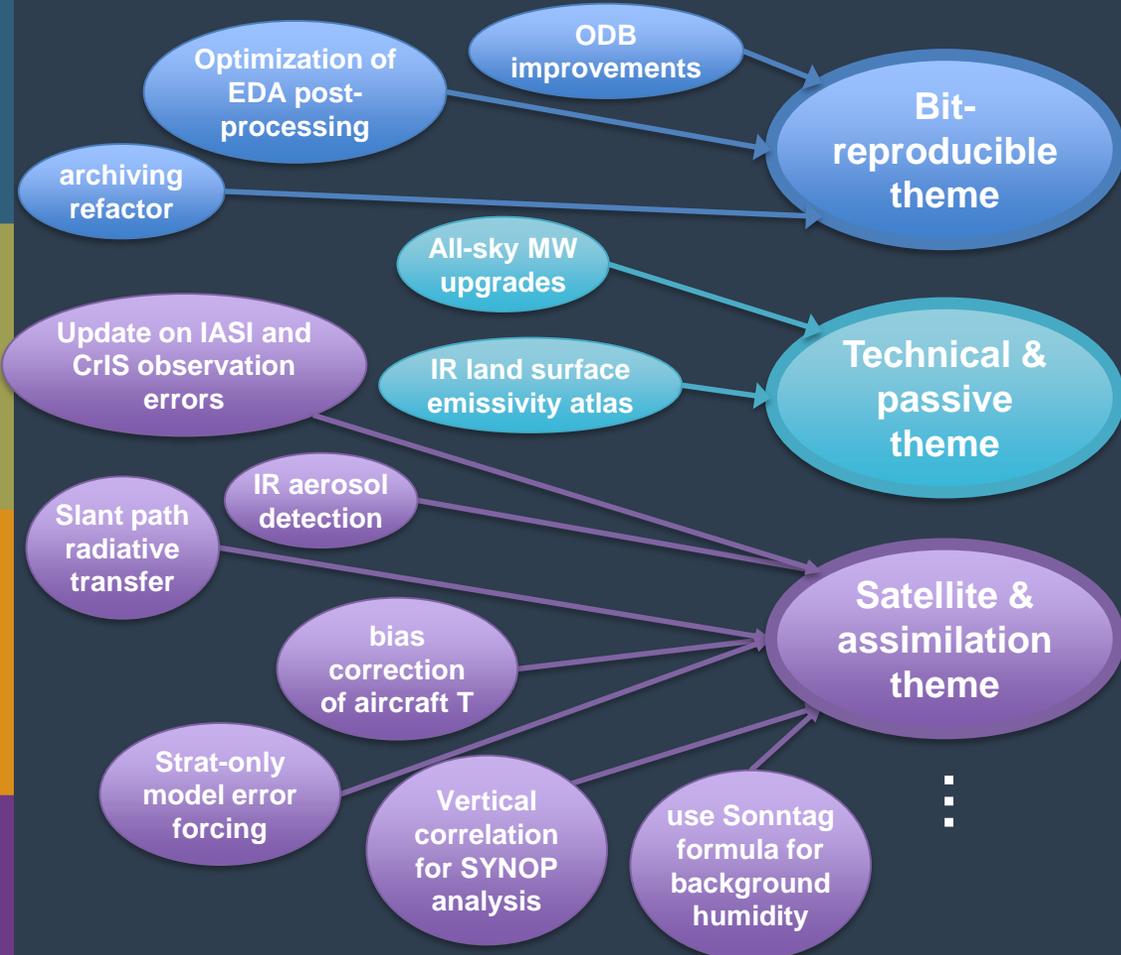
alpha testing

beta & release candidate testing

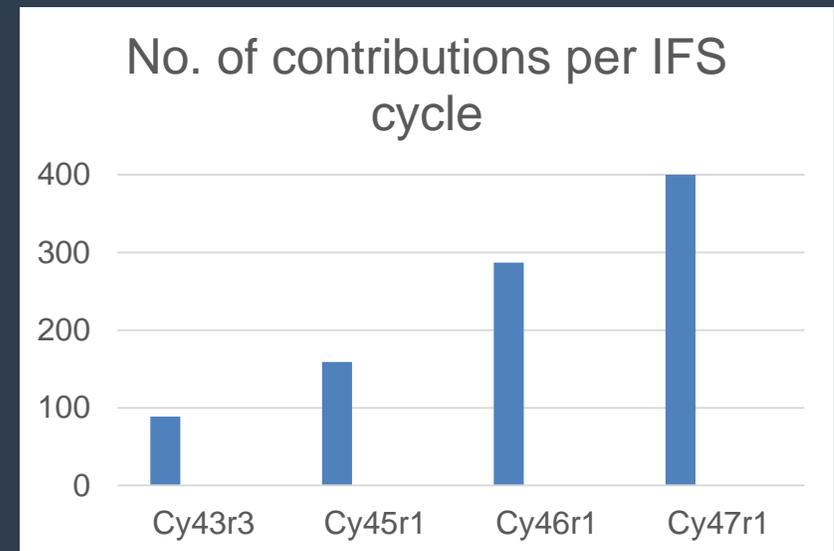
IFS developers

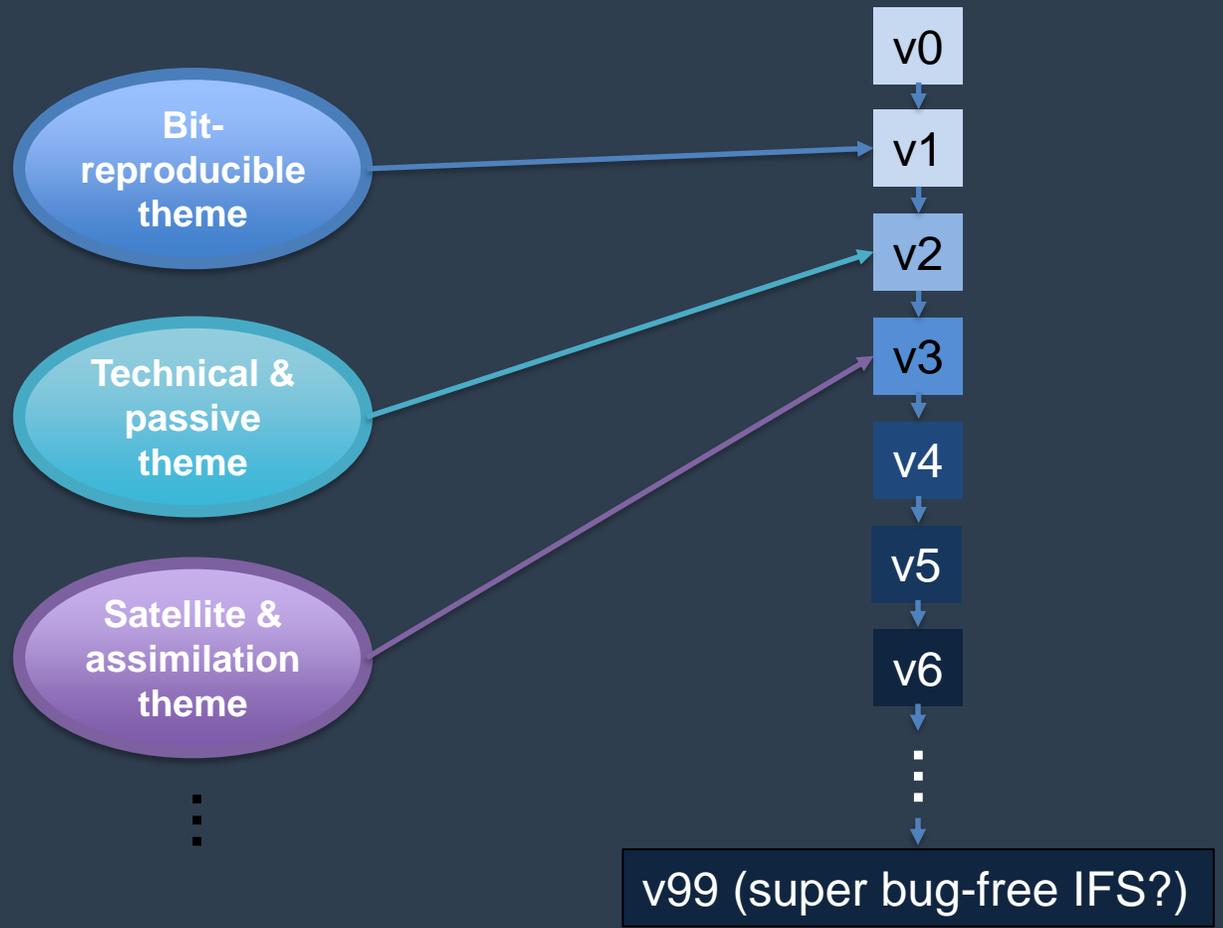
IFS Section

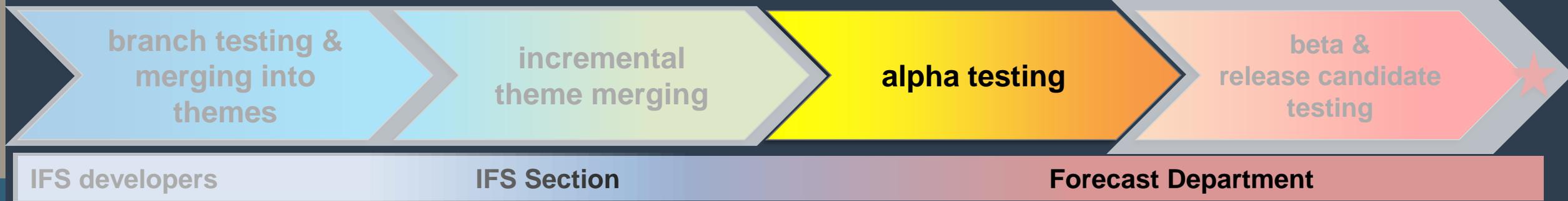
Forecast Department



Cycle	No. of contributions
43r3	89
45r1	159
46r1	287
47r1	400 !!!







- **Full-resolution testing and EDA**
- Some contributions only tested at this stage
- Bug fixes
- Gradual handover from Research to Forecast department

branch testing &  
merging into  
themes

incremental  
theme merging

alpha testing

beta &  
release candidate  
testing

Research Department Sections

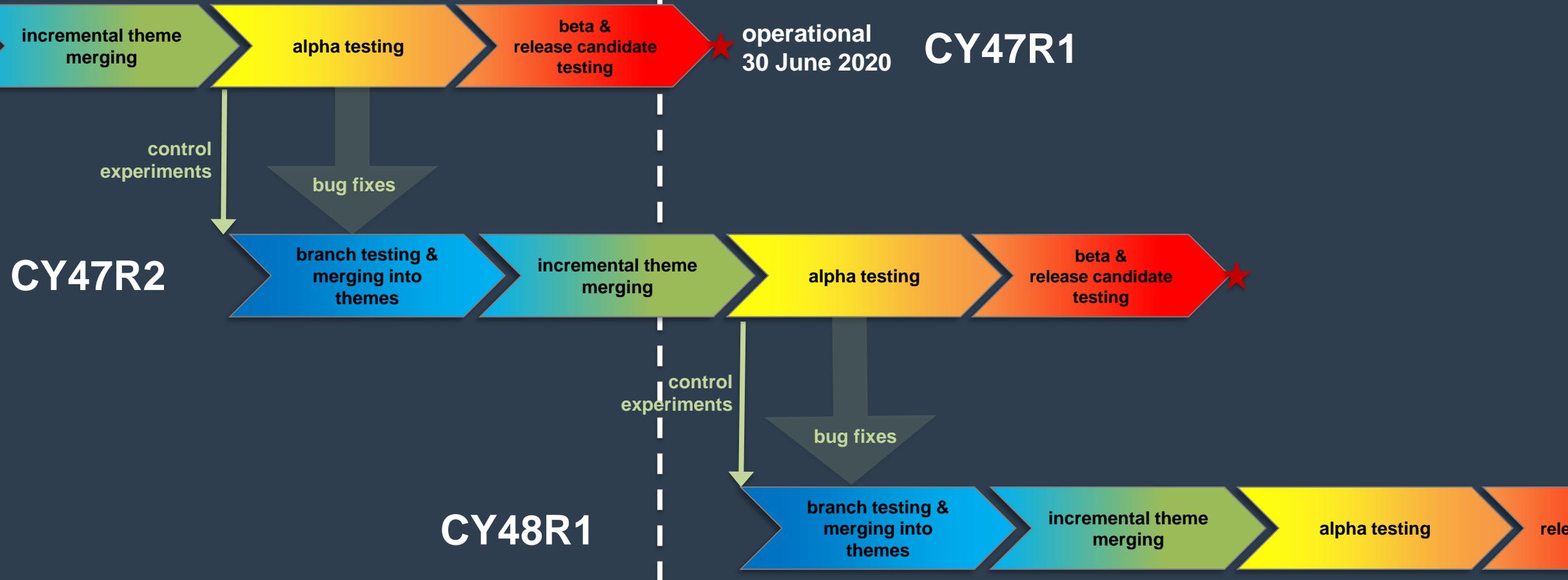
IFS Section

Forecast Department

- E-suite – full-system end-to-end testing in operational mode
- Decision & announcement to external users
- Data available to external users
- Real-time testing
- Frozen parallel run (1 or 3 months)
- Product generation & dissemination

# Overlapping releases

Early June  
2020:  
We are here!



## Improvements to date

- Modernised development process and tools
- More formalised process
  - defined roles & decisions
  - minimum & standard tests
- Involve Forecast Department much earlier
- Improved communication
  - content, progress & interactions
  - central place for docs & “audit trail”
- Continuous improvement



The screenshot shows the JIRA issue tracker interface for ECMWF. The top navigation bar includes 'Dashboards', 'Projects', 'Issues', 'Capture', 'Boards', and 'Create'. The main content area is divided into two sections: 'Open issues' on the left and a detailed view of issue 'IFS-120' on the right. The 'Open issues' list includes items like 'activate constrained varbc for AMSU-A channel 14 a...', 'RTTOV-12 upgrade for radiance assimilation in the IFS', and 'Treatment of radiosonde drift'. The detailed view for 'IFS-120' shows the issue title, status ('IN PROGRESS'), priority ('Major'), and assignee ('Tomas Kral'). The description states: 'This change depends on Tomas Kral's change to introduce ecCodes in bufi2odb. In COPE BUFR radiosonde reports can be split up - we use 15 minute intervals for now (specified in seconds)'. The JIRA logo is overlaid on the right side of the screenshot.

## Improvements to date - continued

- Continuous integration for IFS has been introduced
  - Bit-identical branches merged any time – no need to wait for a cycle release
  - Tested nightly in a wide range of full research experiment configurations (ENS, HRES, extended-range, CAMS, ocean, etc.)



## 4. Improvements planned for the future of R2O at ECMWF

- Develop a “d-suite” to do full end-to-end testing, nightly – cheap, but complete, e-suite
- This builds on the continuous integration testing for IFS and all the other individual software packages in the end-to-end forecast chain
- We still aspire to do more frequent cycles; make cycles less complex (fewer changes)
- The upside to users is that fixes and improvements get into operations quicker than otherwise
- The downside is that each cycle upgrade implies a lot of work for forecast users too, to adapt to our changes
- A middle way, which deserves investigation, is to do more frequent minor updates (Cy47r1.1, Cy47r1.2, Cy47r1.3, ...) between major cycles
  - Minor updates would, by design, imply minimal work for the majority of users
  - We already do this for new observations, for example, critical bug fixes, infrastructure changes (but not versioned)
  - Extend to other types of improvement to allow the delivery of these to be spread out rather than delivered in big bangs

## Time for you to get involved again

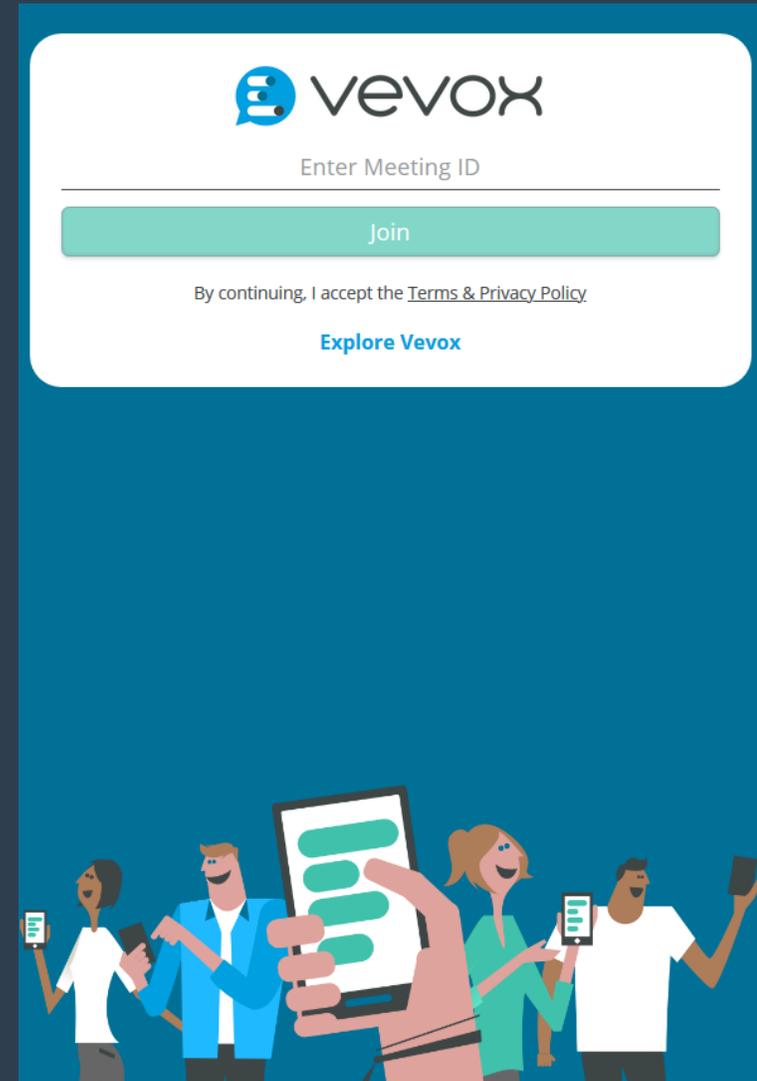
Live poll!

On your smart phone or computer, please go back to:

**VEVOX.app**

If you have been logged out, please re-enter the Meeting ID:

**199-103-393**



## 5. What can we learn from your organisation?

We would like to learn from you:

- Can we benefit from aspects of your organisation's R2O process?
- Would you like to connect with us to learn more from each other?

How do you get in touch.....?



## 5. What can we learn from your organisation?

We would like to learn from you:

- Please go to our oral presentation page on the UEF website → and leave comments at the bottom so that we can gather your feedback and respond

Or email us directly:

Jenny.rourke@ecmwf.int &  
Michael.sleigh@ecmwf.int

5/29/2020 GEM - Using ECMWF's Forecasts (UEF2020)

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### Improving the Research to Operations process at ECMWF

Last modified May 28 2020

Jenny Rourke, Michael Sleigh

Mike Sleigh and myself would like to either co-chair a workshop or give a joint presentation on the work going on at ECMWF to improve the R2O process. We would like to discuss this more with the organiser(s) to see what would fit best into the programme. Topics to include:

- Overview of the current R2O process at ECMWF
- Identifying ways we can improve the process
- Our current focus to improve R2O, including the development of a d-suite
- Options for the future, would it be better to do more frequent smaller updates rather than the big cycle upgrades?

We would welcome feedback and ideas from the attendees, hence we are open to the idea of more of a workshop, or panel discussion rather than just a presentation.

Happy to take your questions

