

# iReceptor: A journey from small project to international collaboration

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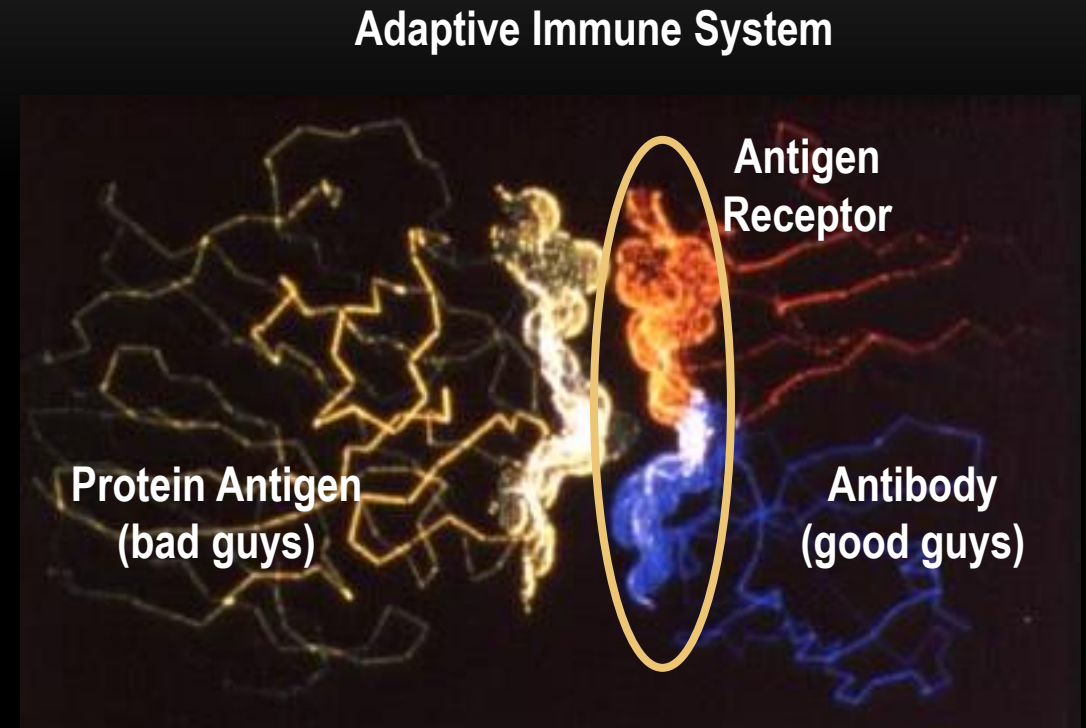
Simon Fraser University

# OUTLINE

- Introduction to Immunogenetics
  - iReceptor approach and history
  - International collaboration – the story...
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# INTRODUCTION

- Immunogenetics
  - Genetics of our immune system
- Goal: Personalized Immunotherapy
  - Cancer, autoimmune, and infectious disease
  - Antigens bind to antibody-producing cells
  - $\sim 10^{13}$  possible receptors,  $\sim 10^8$  cells in each of us
  - Adaptive  $\rightarrow$  Effective  $\rightarrow$  Hard to Understand
- Adaptive Immune Receptor Repertoire (AIRR)
  - Deep sequencing of the immune response (2009)
  - Today possible to acquire  $>10^6$  sequences at a single time point



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# WHY IRECEPTOR?

- Driver: Data Deluge from Next Gen Sequencing of Immune Response
    - $\sim 10^{13}$  possible antibody cells,  $\sim 10^8$  cells/person at a single time point
    - $>10^6$  sequences/sample,  $>1$  time point/subject as immune system adapts
    - Many subjects/studies, many studies/lab, 100s of labs
    - New research area: emerging analysis tools, few data standards
  - Researcher needs:
    - Federate data from multiple labs/institutions (*securely*)
    - Perform analyses across federated data (*as authorized*)
    - Perform complex analyses (*using advanced computational resources*)
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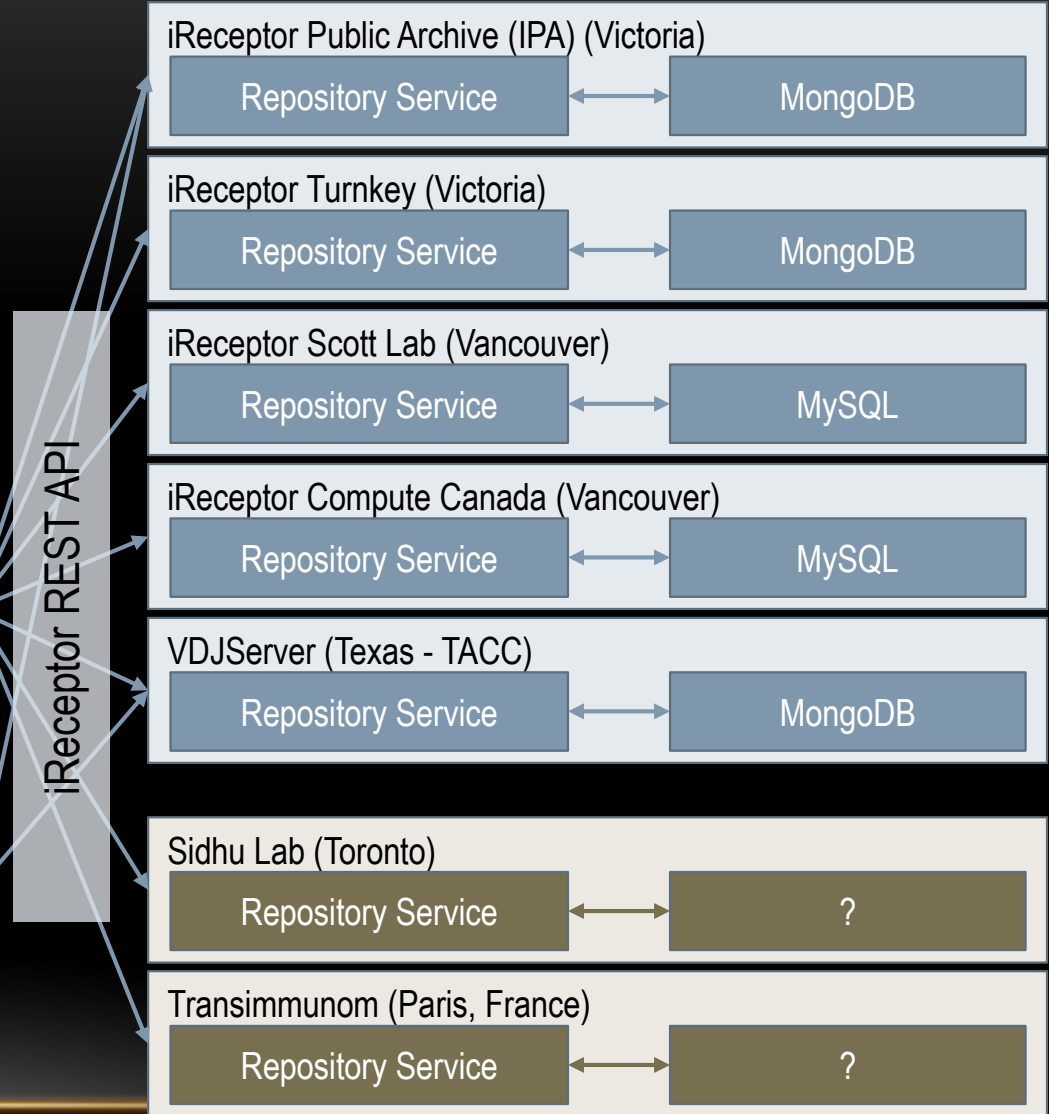
# Complex Scientific Analyses

- Advanced Research Computing
  - BC Genome Sciences Centre
- Advanced Research Computing
  - Compute Canada (Cedar)
- Advanced Research Computing
  - TACC

# Scientific Analysis Tools

- iReceptor Scientific Gateway
  - User authentication
  - Query generation
  - Results federation
  - Analysis staging/management
  - Analysis result presentation
- Other Data Commons Tool
  - Query generation
  - Results federation

# AIRR Data Commons - Repositories



# DRIVER FOR INTERNATIONAL COLLABORATION

- Goal:
  - To create an international AIRR Data Commons that is FAIR

# Complex Scientific Analyses

# Scientific Analysis Tools

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• BC Genome Sciences Centre

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iReceptor Scientific Gateway  
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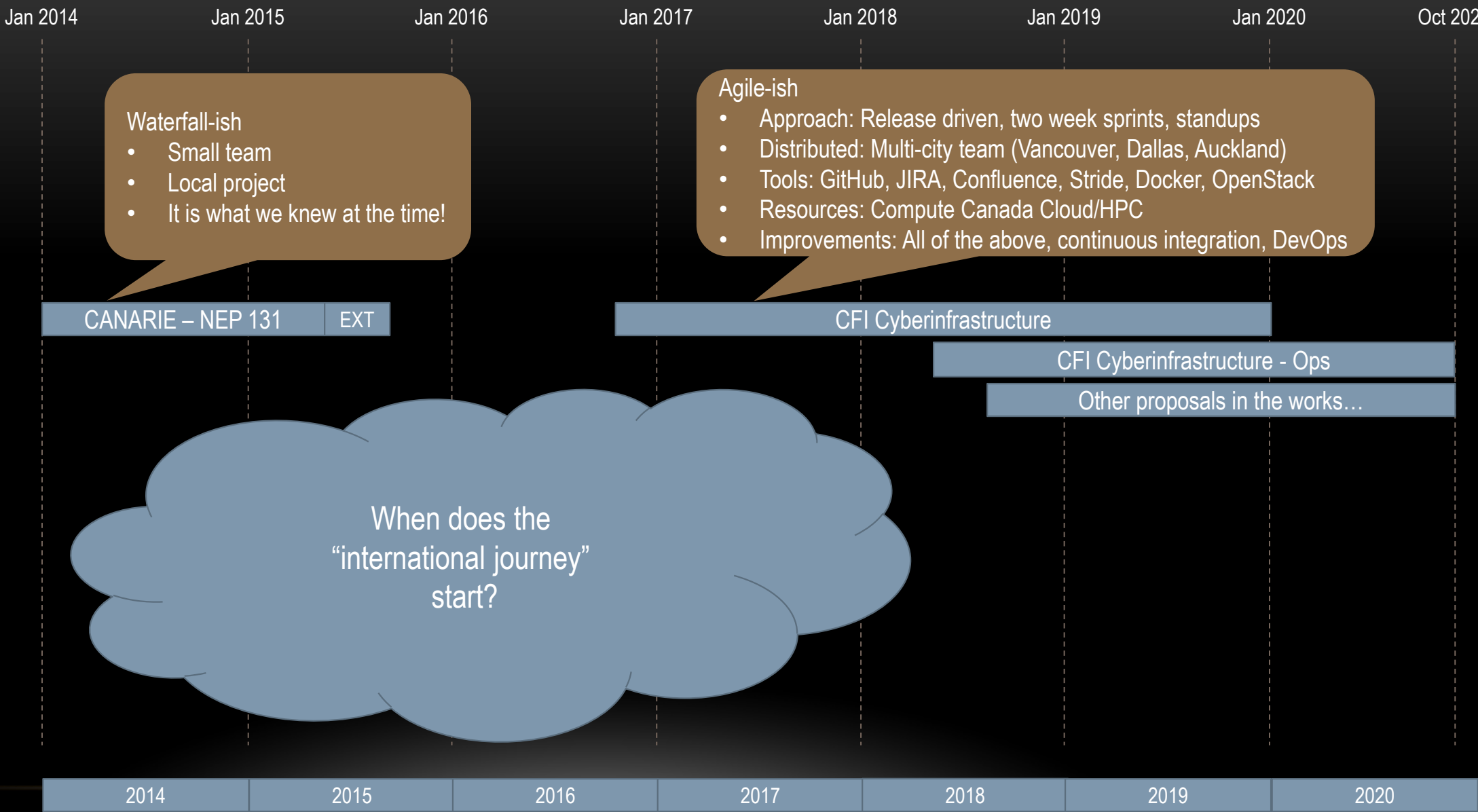
# DRIVER FOR INTERNATIONAL COLLABORATION

- Goal:
    - To create an international AIRR Data Commons that is FAIR
  - Requirements (FAIR)
    - Findable: International registry of repositories
    - Accessible: International API standard for accessing repositories
    - Interoperable: International standards for data exchange
    - Reusable: International standards for data collections and curation
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# OUTLINE

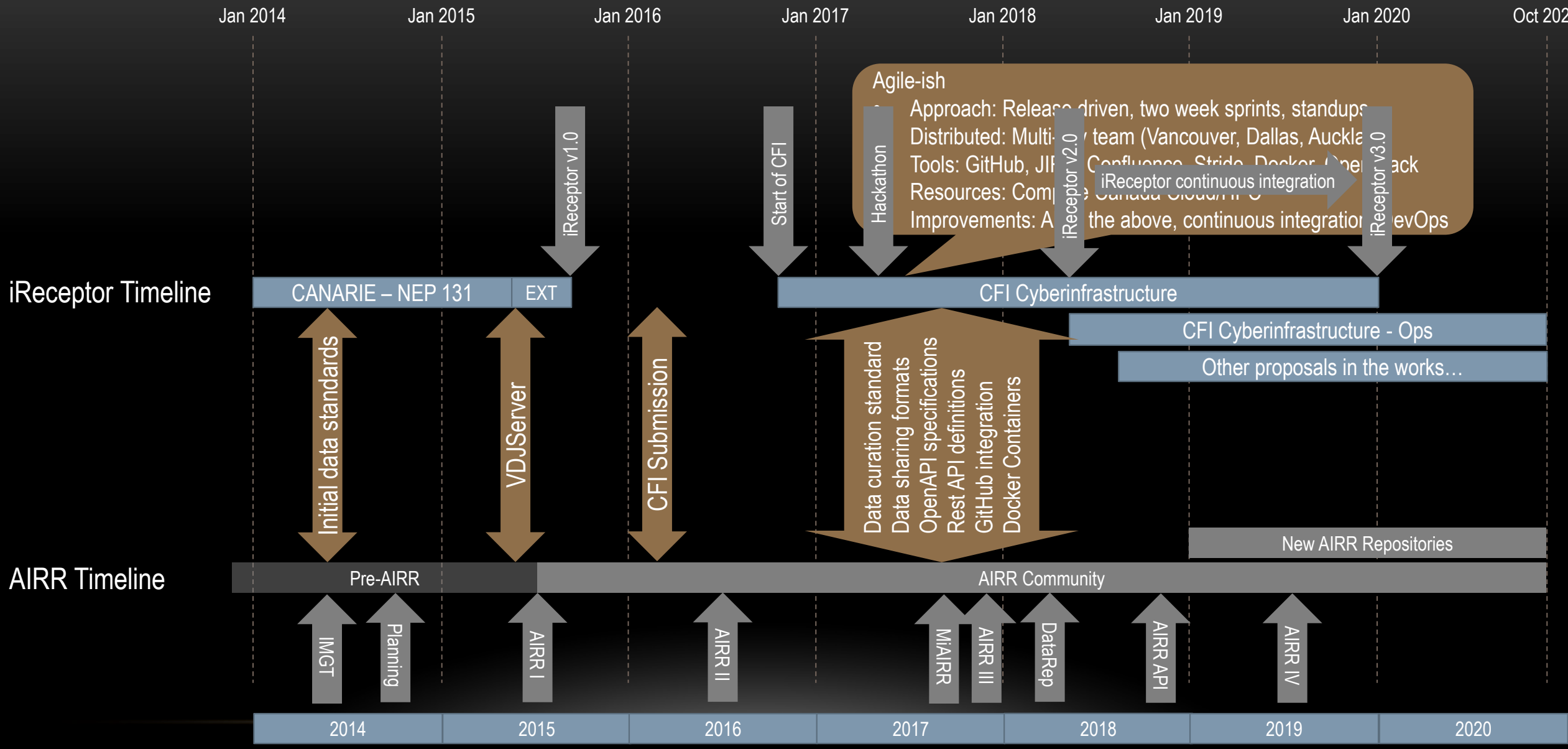
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iReceptor Timeline



# THE AIRR COMMUNITY

- Promote the sharing and reuse of AIRR-seq data (FAIR)
    - International, community driven organization – open and inclusive
    - Standards and protocol development
    - Founded in 2015 – Planning Meeting (2014) and AIRR Community I (2015) @ SFU
  - Working Groups
    - FA – Common Repository Working Group (AIRR Data Commons – Registry, REST API)
    - I – Data Representation Working Group (Data sharing standards/protocols)
    - R – Minimal Standards Working Group (MiAIRR minimal standard for data curation)
  - Strong developer focus
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# OBSERVATIONS

- Local team
    - Move from “traditional waterfall” to “agile” “successful” - we are still learning
      - Helpful in “getting things out the door”
      - Useful in managing multi-site team (the tools work)
      - Facilitates a user experience (UX) focus – Use cases, user testing/feedback
  - International Collaboration
    - Dynamic development (data standards, data formats, APIs)
    - Challenging to track and integrate multiple external efforts
    - “Agile” approach helps to keep things in sync
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# USEFUL REFERENCES

- Websites
  - iReceptor web site: [www.ireceptor.org](http://www.ireceptor.org)
  - iReceptor Scientific Gateway: [gateway.ireceptor.org](http://gateway.ireceptor.org)
  - AIRR Community: [www.airr-community.org](http://www.airr-community.org)
- GitHub
  - <https://github.com/sfu-ireceptor>
  - <https://github.com/airr-community>
- Publications
  - iReceptor paper: In Press - Immunological Reviews – June 2018 (DOI: 10.1111/imr.12666)
  - AIRR paper: Frontiers in Immunology - <https://www.frontiersin.org/articles/10.3389/fimmu.2017.01418/full>
  - MiAIRR paper: Nature Immunology - <https://www.nature.com/articles/ni.3873>
  - AIRR Data Representation Paper: In preparation...

Questions...

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