Building an AI Assistant Factory

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A journey on the introduction of a state of the art technology in one of the oldest bank of Canada

https://www.bnc.ca/fr/a-propos-de-nous/notre-organisation/la-banque/histoire.html

History : Changing paradigm, making things differently & creating a new mindset

June 2019 : platform integration using RASA and creation of AI Factory team

February 2020 : Online Banking Chatbot during the COVID pandemic

April 2020 : pre-login chatbot

January 2018 :
- 9 bots projects
- 9 different technologies
- 9 different vendors
- No performances evaluation

Summer 2018 : proposal to standardize dialog technology using RASA Platform – Proof of concept FAQ BNC

Q3 2019 à Q4 2020: R&D work on robustness (paraphrasing, disambiguation)

September 2018 :
- Proof of concept of FAQ Bots for online banking
- Creation of a specific algorithm to generate FAQ dialog system from FAQ

Q1 2020: R&D work on automation for model update (Ongoing)

November 2018 :
Multiple Proof of concepts using the technology : legal bot, acquisition tools …

November 2020 : Executive presentation for a bank wide dialog systems strategy

December 2018: Patent registration *System and methods for performing automated interactive conversation with a user*

December 2020 : Validation of the strategy

Poor technology gives poor satisfaction

Challenges of Using Chatbots According to US Internet Users, May 2018
% of respondents

|	
Keeps me from a live person	50.7%
Too many unhelpful responses	47.5%
Redirects to self-serve FAQs	39.5%
Bad suggestions	28.2%
Pop-up chatbot prompts	25.0%
Unnecessary pleasantries	24.9%
Takes too long to respond	24.2%
They never have enough data about me	19.7%
Other	2.8%
None of these	8.4%
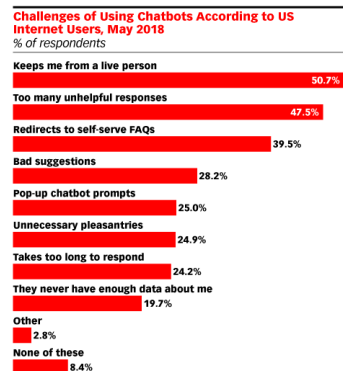
Note: ages 18+
Source: Helpshift, May 31, 2018
238508 www.eMarketer.com

Leader in dialog technology applied to banking industry in Canada

## Unique chatbots expertise in Canada banking environment:

- **One patent on disambiguation** (unique patent on dialog by a bank in Canada)

- Innovative technologies published in 4 tier one AI and NLP conferences

- Highly qualified team of Dialog specialists qualified in NLP and Computational Linguistic (Ph.D, Masters)

- **Dialog Platform fully based on open source**

- In house Analytic solution to handle the full life cycle and maintain **the highest level of robustness**
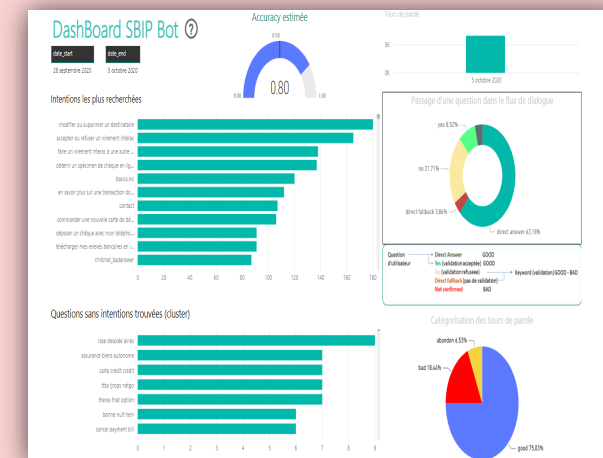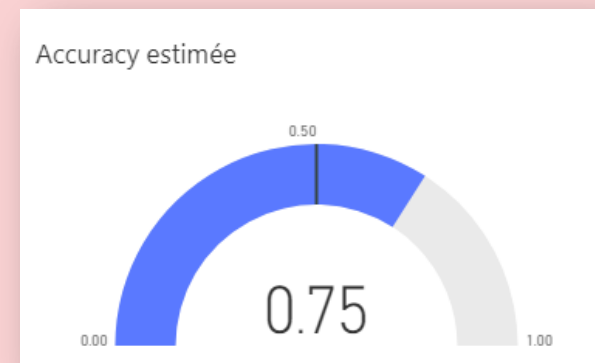
Conference communications
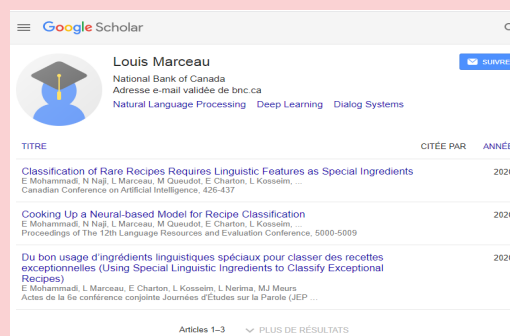
CompSci publications
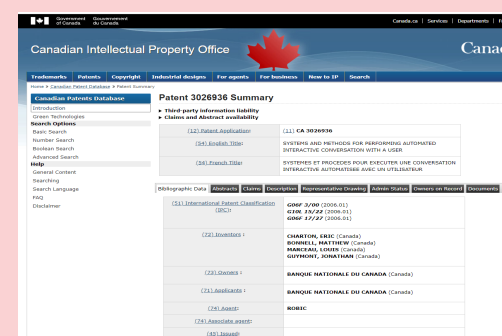
Patents

The solution : technological components on catalog supported by 2 teams

AI Practice: **Product Ownership**, includes Business analysis, model design, technological innovations, model update automation, bank wide strategy

AI Factory (IT): **Solution integration**, industrialization, implementation of technologies, operational support
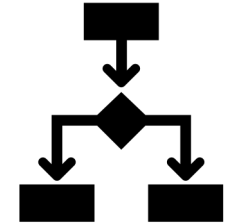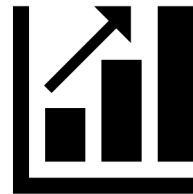
Available components

Dialog engine

Cloud architecture, multi canal

Automatic model generation tools (based on question answering)

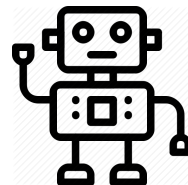Reporting system to measure performances and collect feedback

Log export in the analytic system with user ID to make deep analysis

Gateways to expose the dialog engine on various mediums (web, online banking, TEAM …)
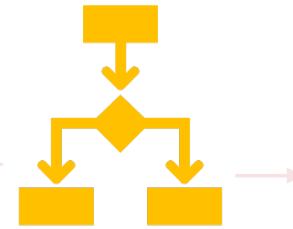
Other's components in preparation

Automatic model update

New channels

BANQUE NATIONALE
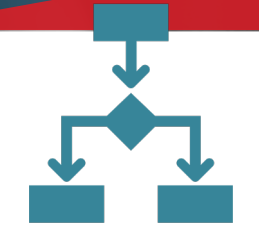*Réalisons vos idées*

Chat Bot lifecycle

Development

- Data Collection
- Business analysis

Experimental model

Proof of concept:
- Measures
- Tuning
- Demos

Updating production model - Publishing

Feedback from users' interactions

Production

Production version deployment

Cloud

Logs generation

Performance's tracking

- During the COVID Crisis, time to market for changes in the model of 72 hours
- From **100 questions to 324 in 3 months**
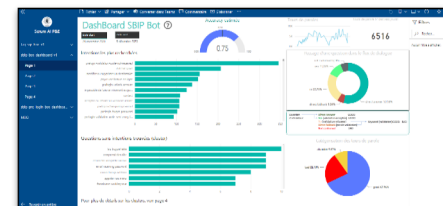
THE ROAD TO INDUSTRIALIZATION

The IT side

Building enterprise virtual assistants

3 Truths

1 An enterprise level chatbot is an **IT project** of which AI is a small component

2 Projects must first focus on **infrastructure & performance aspects** (NLU, etc.)

3 **Operational excellence** of which DevOps is a major part is crucial for the success of a chatbot project
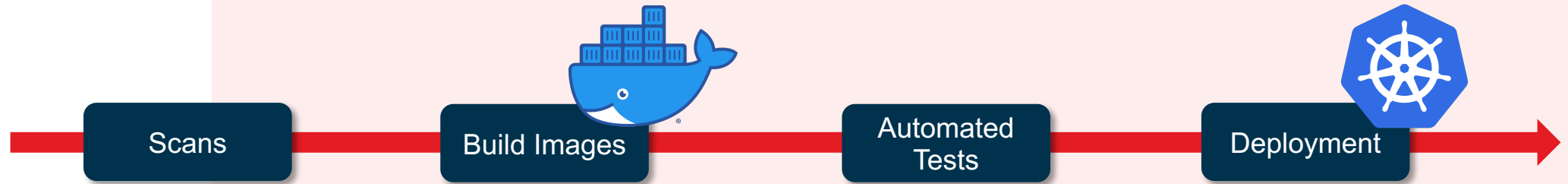
Operational excellence is needed to succeed

The DevOps Way

- Every asset should be version-controlled (git)
  - Code (actions, policies, etc.)
  - Multimedia resources (images, etc.)
  - Training data (NLU, stories)
  - Configurations, thresholds
  - Infrastructure (as code)
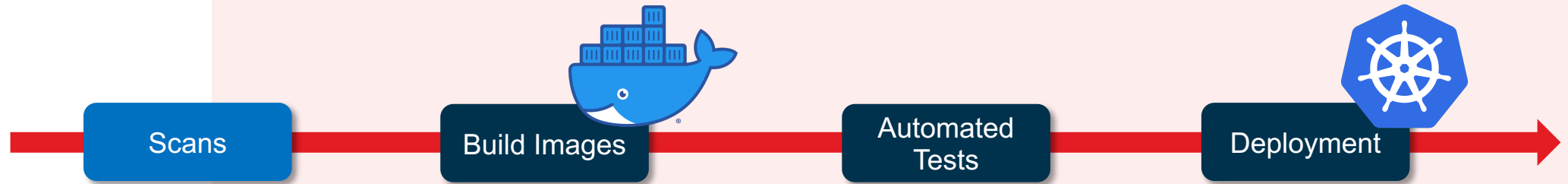
- CI / CD pipelines

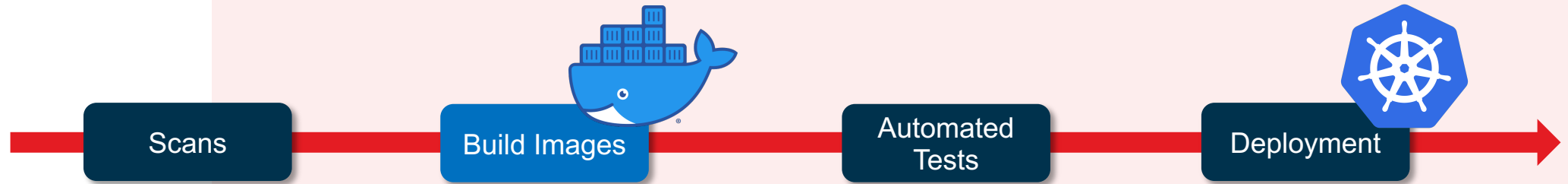Use of project templates to streamline the creation of new projects!

CI / CD

Scans → Build Images → Automated Tests → Deployment →

CI / CD

Scans → Build Images → Automated Tests → Deployment

Coding Standards

Vulnerabilities

Code quality metrics

Bugs (code smells)

BANQUE NATIONALE
Réalisons vos idées™

CI / CD

Scans → Build Images → Automated Tests → Deployment

Build Docker images (Rasa + actions)

Fetch trained model from storage bucket

CI / CD

Scans → Build Images → Automated Tests → Deployment
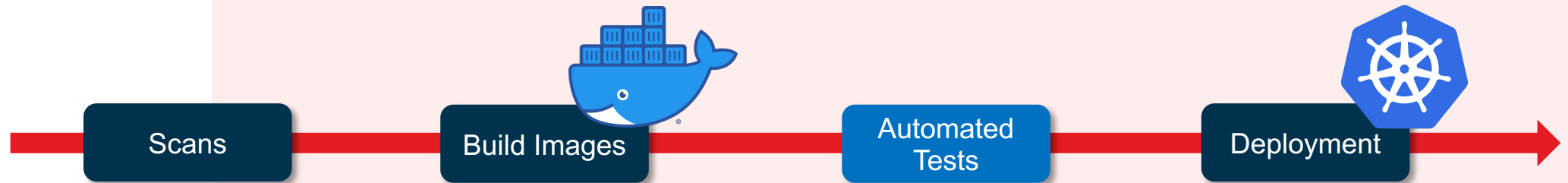
Unit Tests

NLU Performance

- Ensure minimal performance

- Teams notification on failure

Rasa end-to-end

- No regression on the channel

- Coverage of basic flows

```
thresholds:
  en:
    precision: 0.60
    accuracy: 0.42
    f1_score: 0.47
  fr:
    precision: 0.60
    accuracy: 0.56
    f1_score: 0.57
```

devops-notifications 02/02 16:43

Build Success

[vsd-faq-chatbot] [staging] More information here
Results:

```
fr: [precision:0.64571726 >= 0.6, accuracy:0.57051283 >=
0.56, f1_score:0.5821968 >= 0.57, success:true]
en: [precision:0.72156864 >= 0.6, accuracy:0.627451 >= 0.
42, f1_score:0.63439155 >= 0.47, success:true]
```

↵ Répondre

Réalisons vos idées

End-to-end Rasa Testing

Small Python library

- Integrated with pytest
- Makes HTTP requests to a deployed bot
- Used on local machines and in pipelines (docker-compose)

```python
1   import pytest
2   import requests
3
4   from agent import Conversation
5
6
7   @pytest.fixture
8   def fr_convo():
9       return Conversation(language="fr")
10
11
12  @pytest.fixture
13  def en_convo():
14      return Conversation(language="en")
15
16
17  def test_get_started_fr(fr_convo):
18      answers = fr_convo.say("/get_started")
19      answers.expect(text="Bonjour, je suis l'assistant virtuel de la Banque Nationale.")
20      answers.expect(text="Je suis là pour vous aider à vous connecter à votre banque en ligne et à l'utiliser.")
21      answers.expect(text="Sélectionnez le sujet qui vous intéresse ou écrivez une question. 😊',
22          quick_replies=[{'title': 'Faire un Virement Interac', 'type': 'postback', 'payload': '/FAQ_110'},
23                         {'title': 'Télécharger mes relevés bancaires', 'type': 'postback', 'payload': '/FAQ_132'},
24                         {'title': 'Obtenir un spécimen de chèque ', 'type': 'postback', 'payload': '/FAQ_103'},
25                         {'title': 'Déposer un chèque avec mon téléphone ', 'type': 'postback', 'payload': '/FAQ_101'}])
26
27
28  def test_get_started_en(en_convo):
29      answers = en_convo.say("/get_started")
30      answers.expect(text="Hi, I'm National Bank's virtual assistant.")
31      answers.expect(text="I'm here to help you sign in and use your online bank.")
32      answers.expect(text="Select the subject that interests you or type a question. 😊',
33          quick_replies=[{'title': 'Send an Interac e-Transfer ', 'type': 'postback', 'payload': '/FAQ_110'},
34                         {'title': 'Download my eStatements ', 'type': 'postback', 'payload': '/FAQ_132'},
35                         {'title': 'Get a specimen cheque', 'type': 'postback', 'payload': '/FAQ_103'},
36                         {'title': 'Deposit a cheque using my phone', 'type': 'postback', 'payload': '/FAQ_101'}])
```
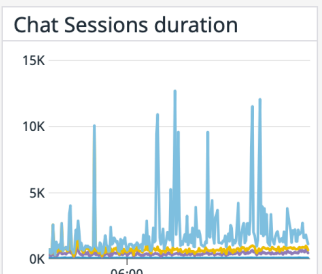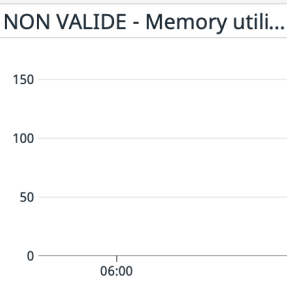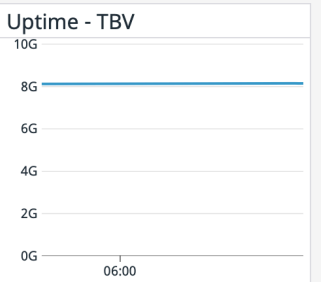
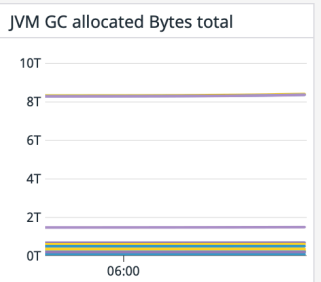# The « Ops » in DevOps – monitoring and alerting

SOME CHALLENGES
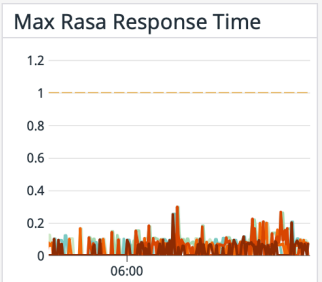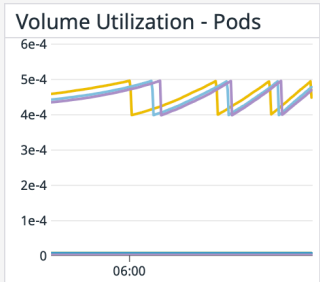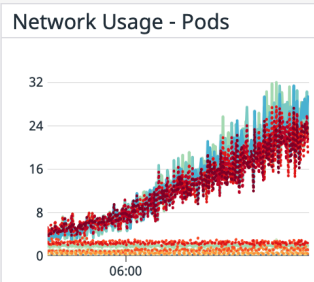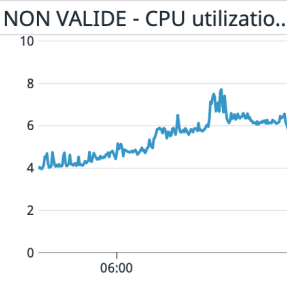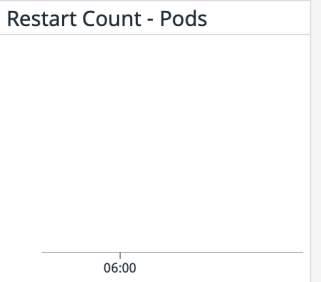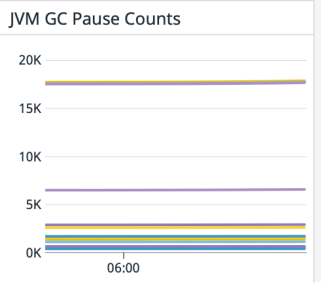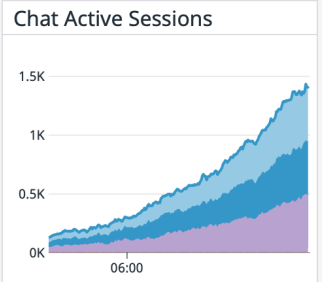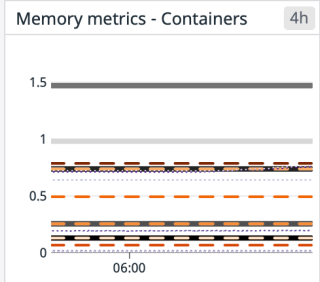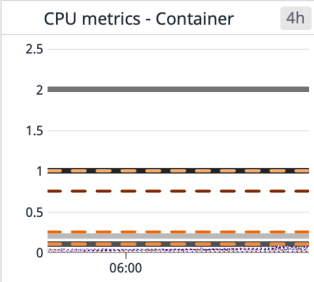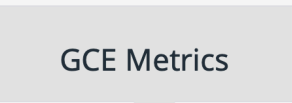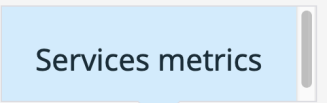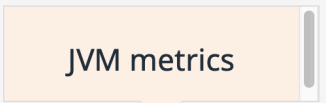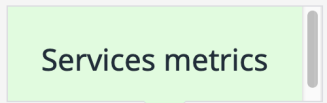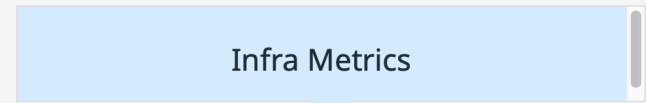
BANQUE
NATIONALE
Réalisons vos idées℠

The reality of large organizations (and financial institutions)

1 **Security**

2 **Integration in the target application**

3 **UI Tax**

Thank you!

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