
AWS
re:Invent

ARC209

Delivering scalable citizen communication in critical times

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Amazon Web Services

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DevOps Engineer
NSW Health Pathology

AWS re:Invent

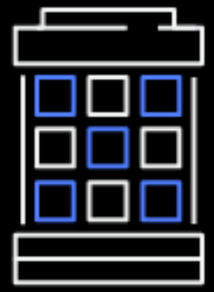
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Simple paradigm?



Citizen

Needs to stay informed and find answers



Government Entity

Wants to be able to provide information

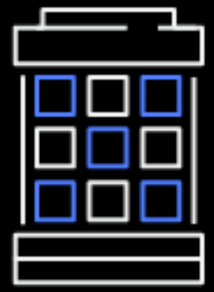
The challenge



Citizen

Needs to stay informed and find answers





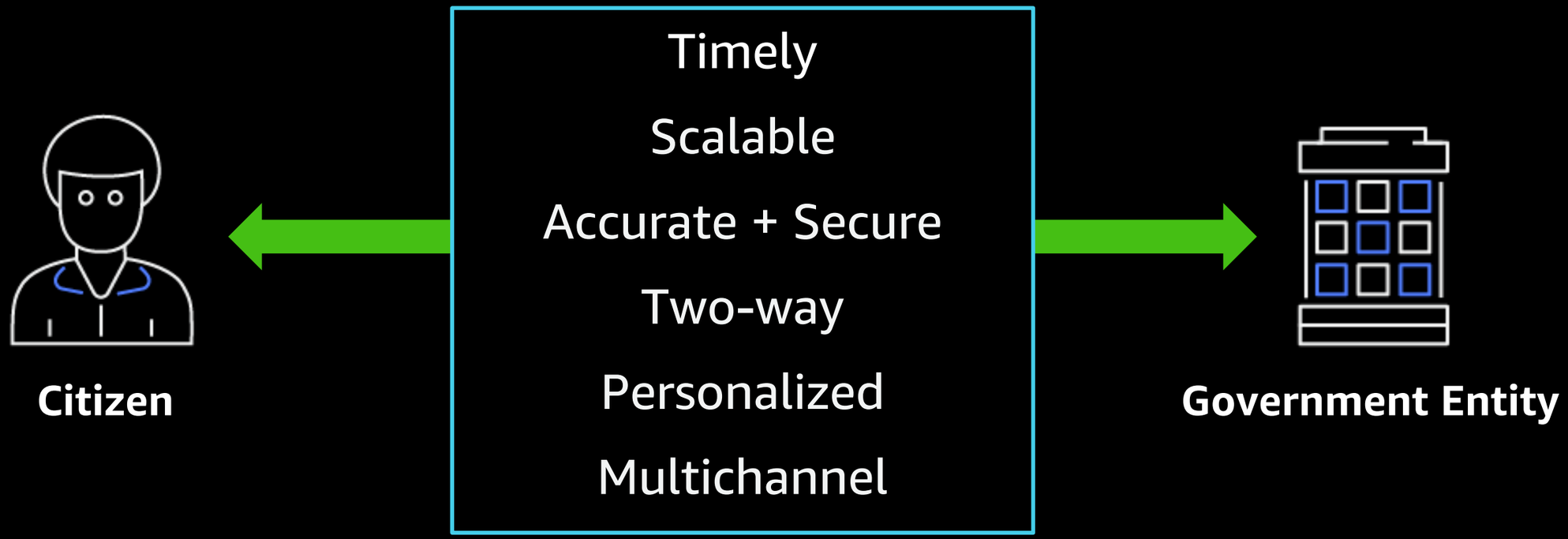
Government Entity

Wants to be able to provide information

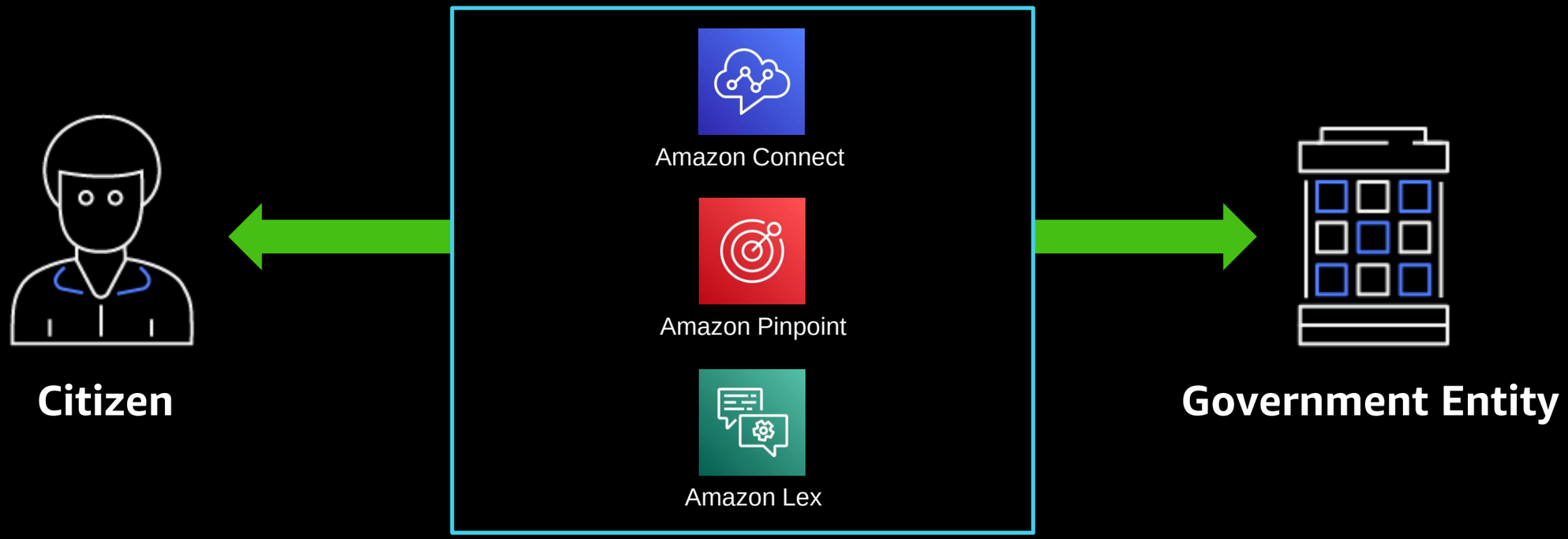
Effective cloud-based communication solution



Effective cloud-based communication solution



Effective cloud-based communication solution



Amazon Connect



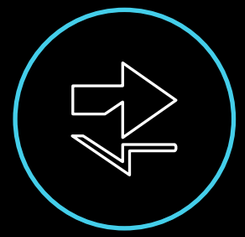
Automated conversation flows



Pay as you go



No-hassle telephony



Automatic scaling



No hardware or space required

Cloud contact center – Set up in minutes!

Amazon Pinpoint



SMS



Email



Push



Voice



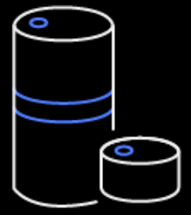
Custom

Scalable multichannel communication



Amazon Lex:
A service for building conversational interfaces using voice and text

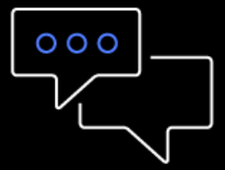
Amazon Lex: Features



Text and speech language understanding: powered by the same technology as Amazon Alexa



Build once and deploy to multiple platforms



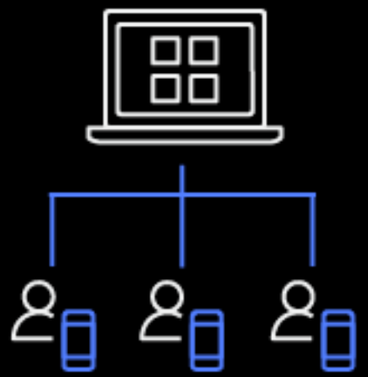
Designed for builders: tools to build conversations; scales automatically



Continuous learning: monitor and improve your bot

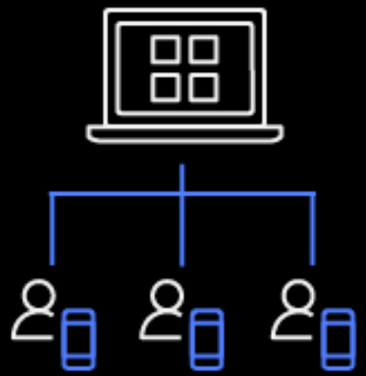
Keys to creating scalable and effective solutions

Keys to creating scalable and effective solutions



Build for scale

Keys to creating scalable and effective solutions

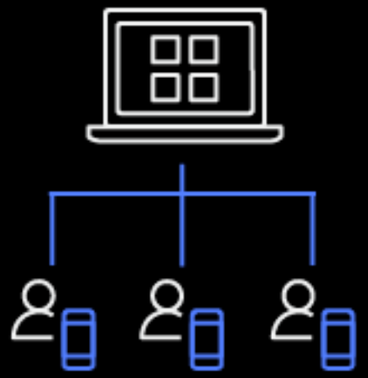


Build for scale



Multichannel + automated

Keys to creating scalable and effective solutions



Build for scale

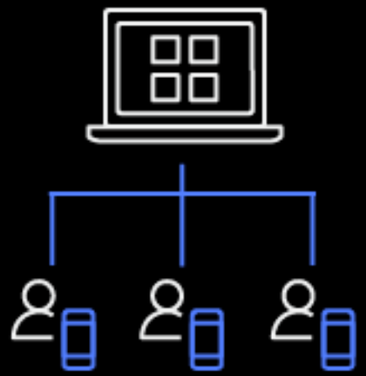


Multichannel + automated



Stay secure

Keys to creating scalable and effective solutions



Build for scale



Be hyperaware of limits

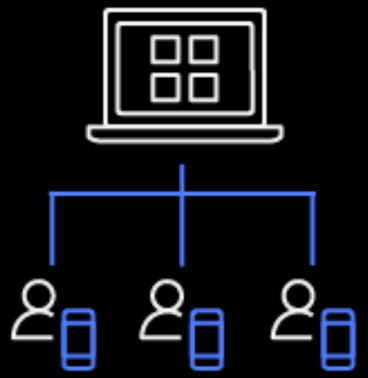


Multichannel + automated



Stay secure

Keys to creating scalable and effective solutions



Build for scale



Be hyperaware of limits



Multichannel + automated



Enable visibility



Stay secure

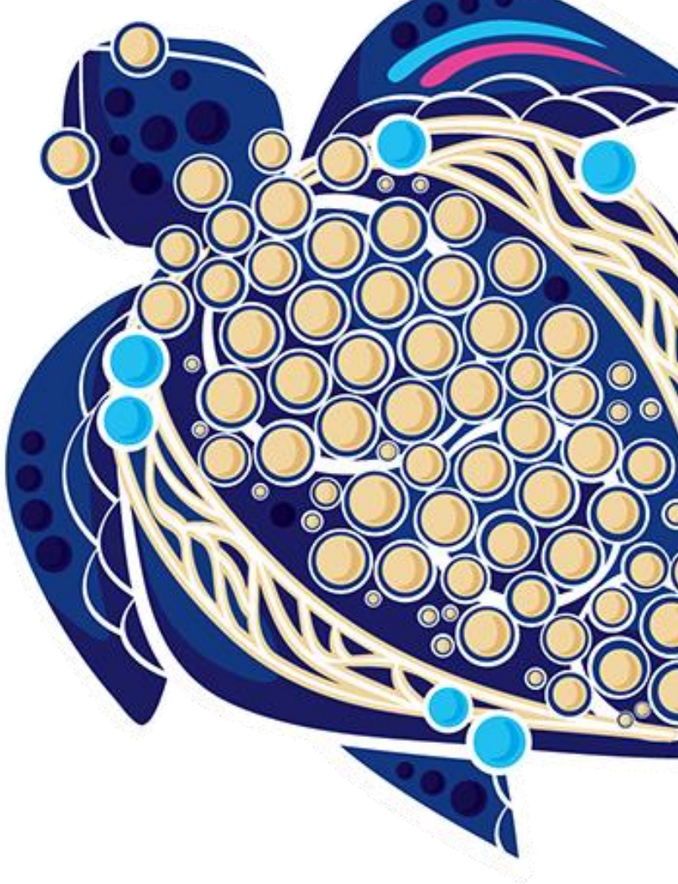
Delivering scalable citizen communication in critical times

Nathan Anstess

NSW GOVERNMENT Health Pathology

for all of us

Acknowledgement of Country



NSW Health Pathology acknowledges the traditional custodians of the lands on which we work and pay our respects to ancestors and Elders, past, present and emerging.

We are committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.

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for all of us

Who am I?

- Nathan Anstess
- DevOps Engineer
- 2 years with AWS







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NSW Health Pathology – NSW, Australia

- Public healthcare provider
- Population 8M+ citizens
- 5,000 employees
  - ~350 specialist medical doctors
- 60+ laboratories
- 200 collection centers
- 60M+ tests per year



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COVID-19

- Increase testing volumes
- Overwhelmed emergency departments
- ~2 weeks multistep handling to general practitioner

COVID-19

- Increase testing volumes
  - Visibility across the state for emergency response
- Overwhelmed emergency departments
  - Let them do what they do best
- ~2 weeks multistep handling to general practitioner
  - Quick and **direct to patient**

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Goals

- Wide adoption
- Give time back to emergency departments
- Reduce turnaround times

- We need this now! 

Outcomes



Over 1 million automated results



87% adoption rate



Patient result within 2 hours of lab completion



180,000 clinical person hours saved

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Outcomes



Over 1 million automated results



87% adoption rate



Patient result within 2 hours of lab completion



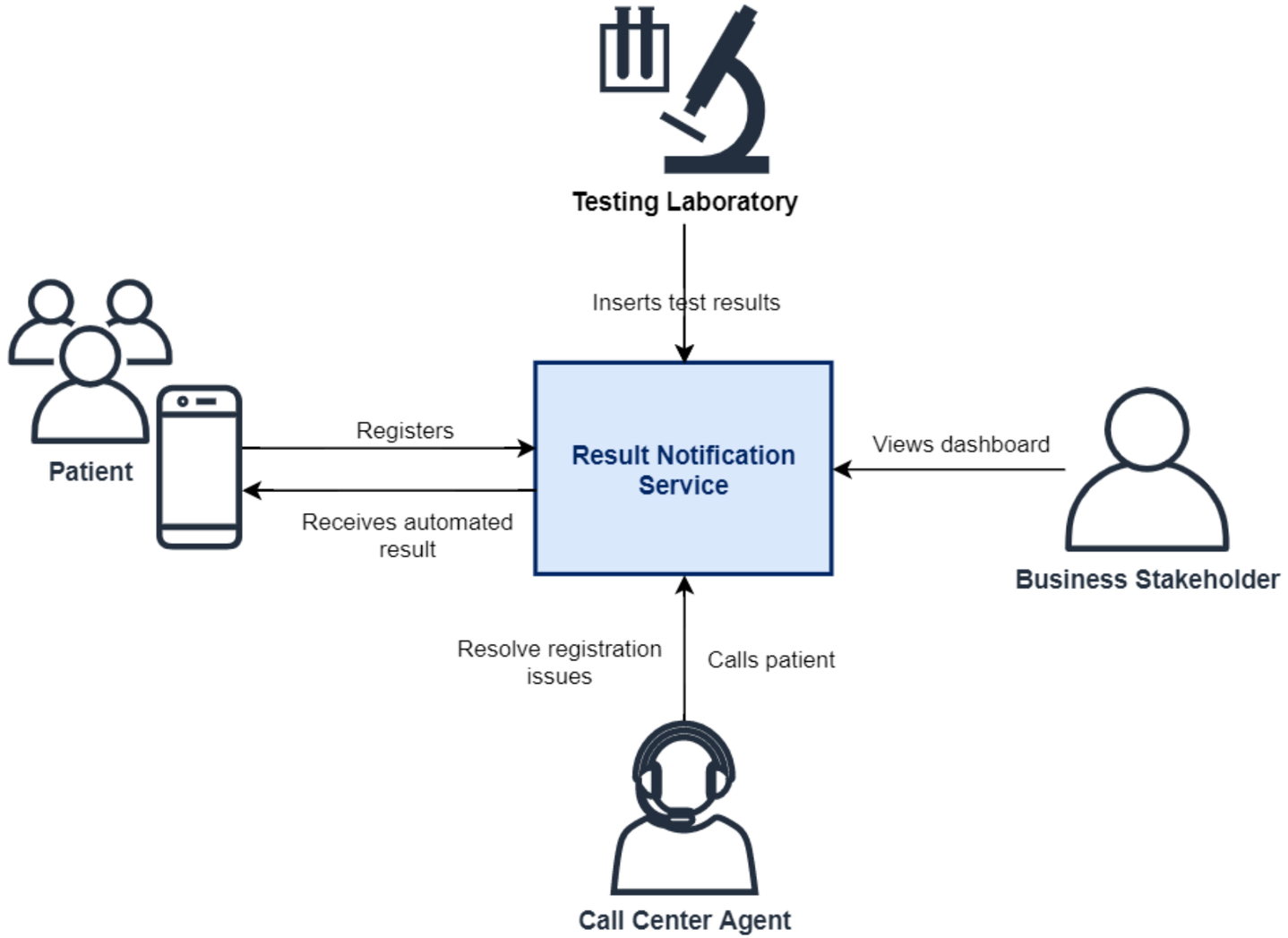
180,000 clinical person hours saved

Went live within 2 weeks with 1 resource

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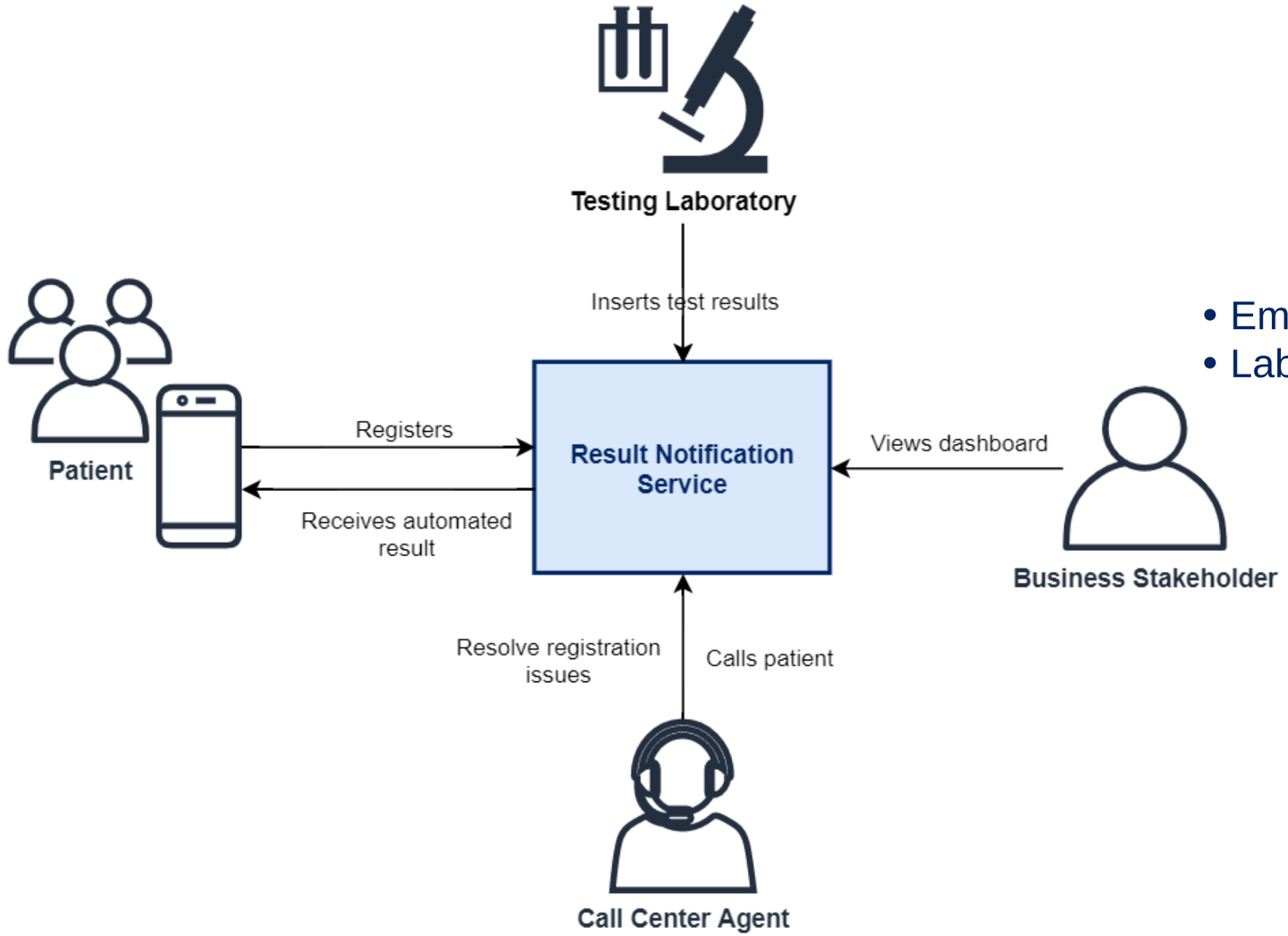
System context



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System context

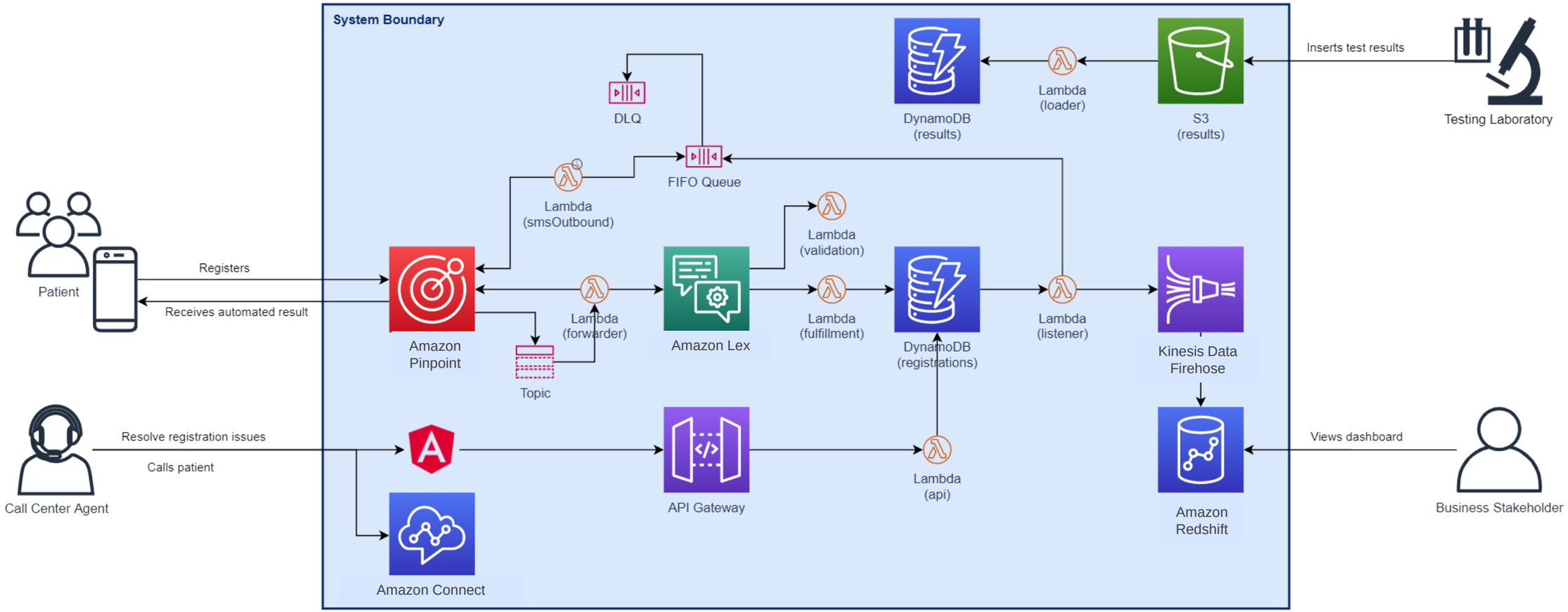


- Emergency Response Center
- Lab Manager



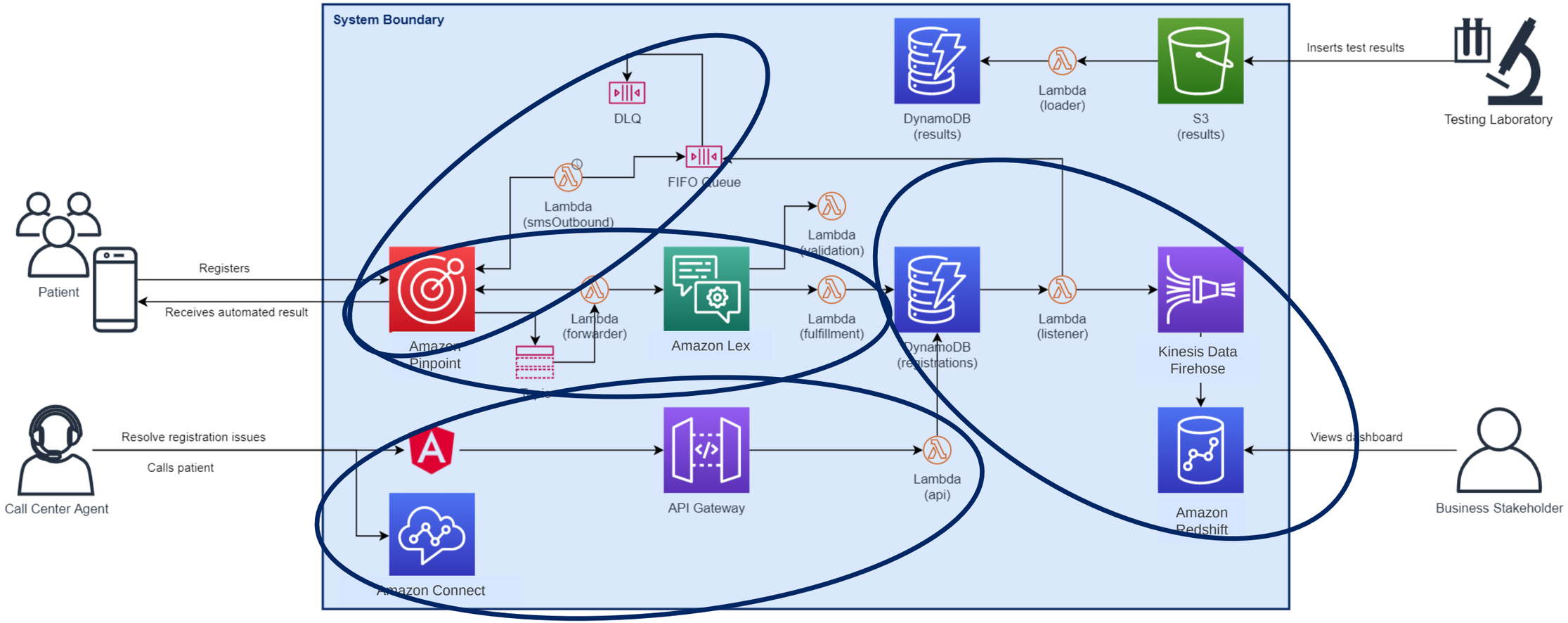
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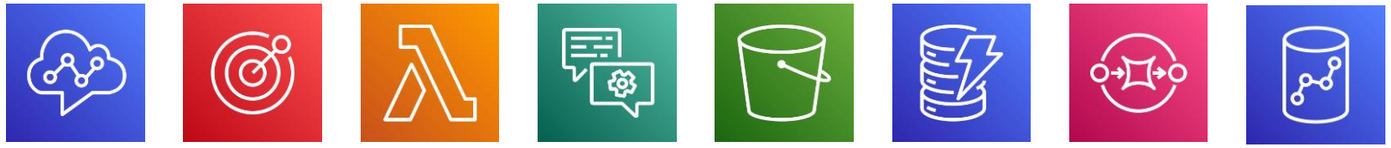
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Key services



Amazon Connect

- Outbound call center

Amazon Pinpoint

- Patient SMS endpoint

AWS Lambda

- Business logic

Amazon Lex

- Conversation bot

AWS Simple Storage Service

- Result data lake

Amazon DynamoDB

- Database (registrations, results)

AWS Simple Queue Service

- Message queuing

Amazon Redshift

- Data warehouse

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Why SMS?



Pros

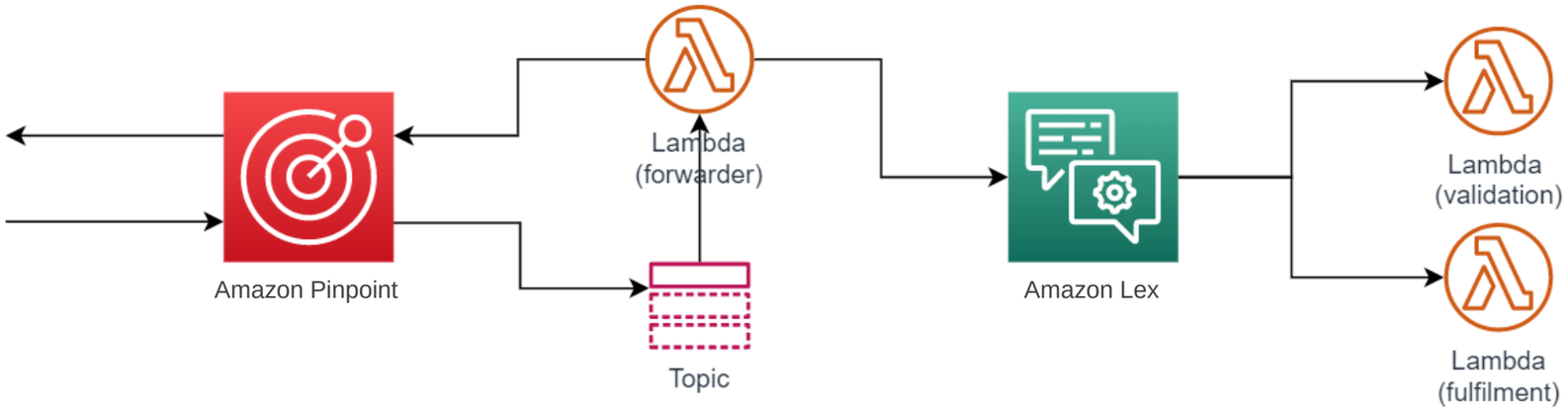
- “Free” for patients
- Simplicity
- No app needed
- No internet connection needed
- Difficult to attack

Cons

- Expensive
- Not end-to-end encrypted
- Typically used for promotional notifications
- Not stateful (transactional) communication

Transactional SMS

Patient



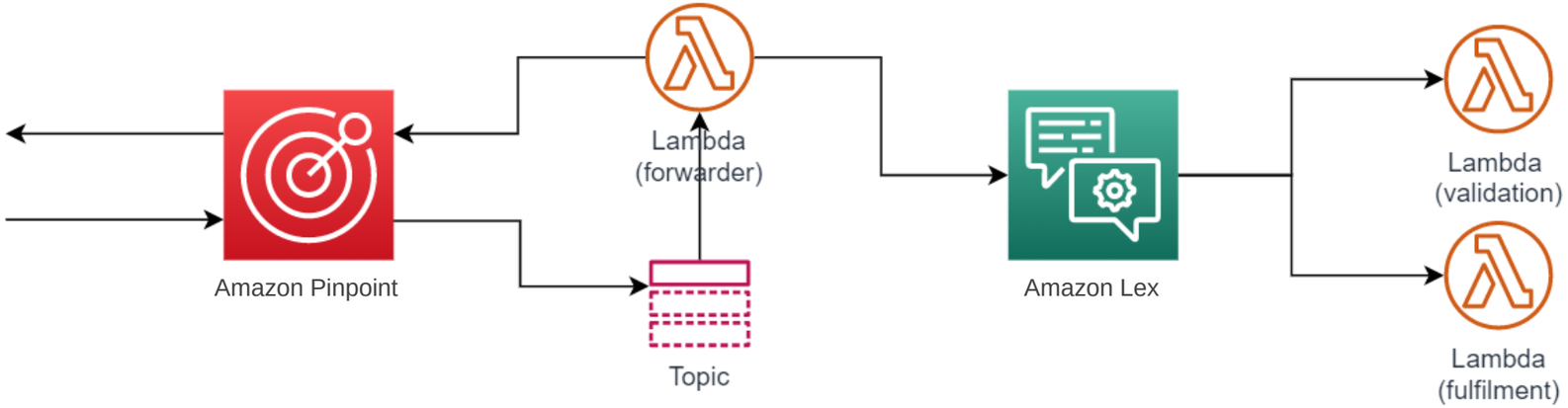
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Transactional SMS



- Long code
- Patient mobile
- Message



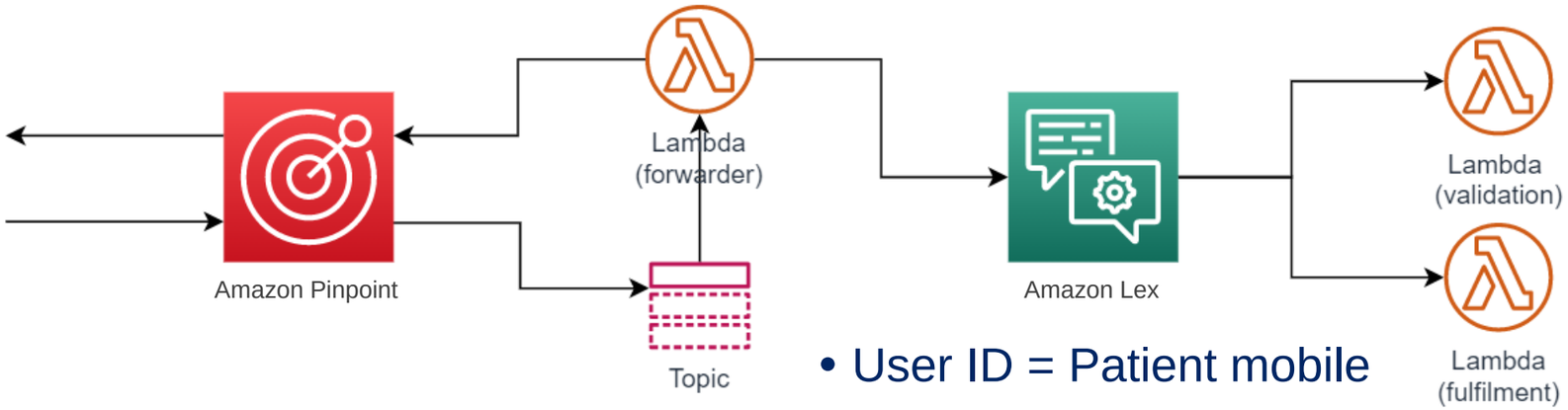
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Transactional SMS



- Long code
- Patient mobile
- Message



- User ID = Patient mobile

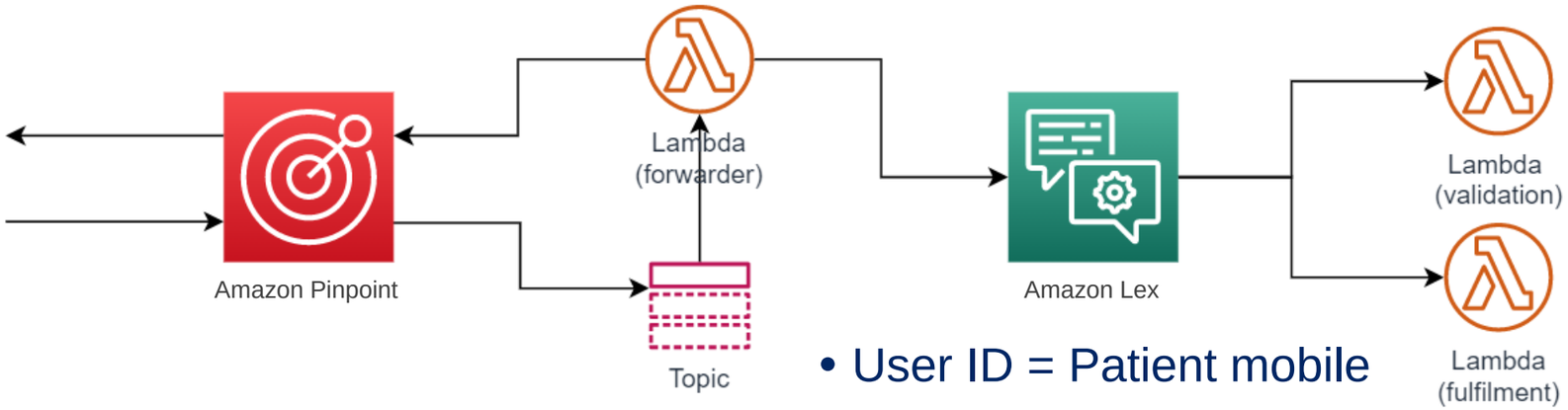
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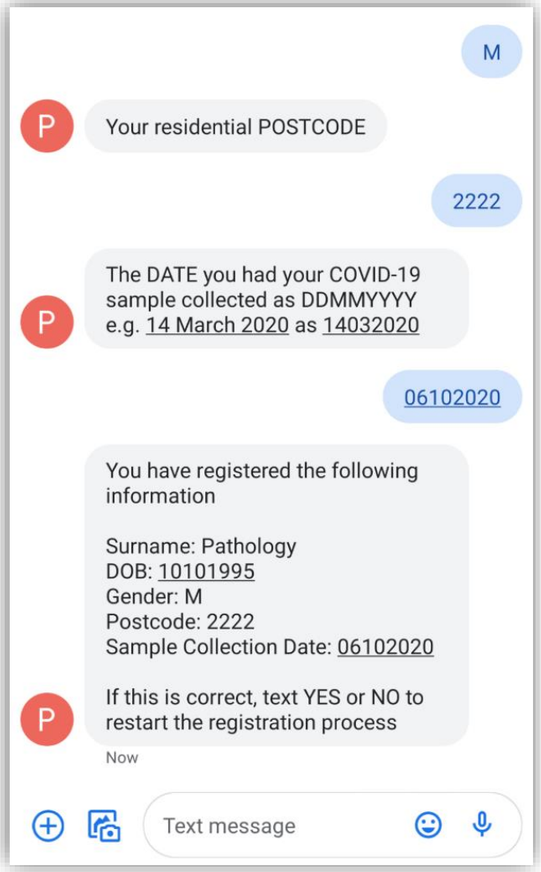
Transactional SMS



- Long code
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- User ID = Patient mobile



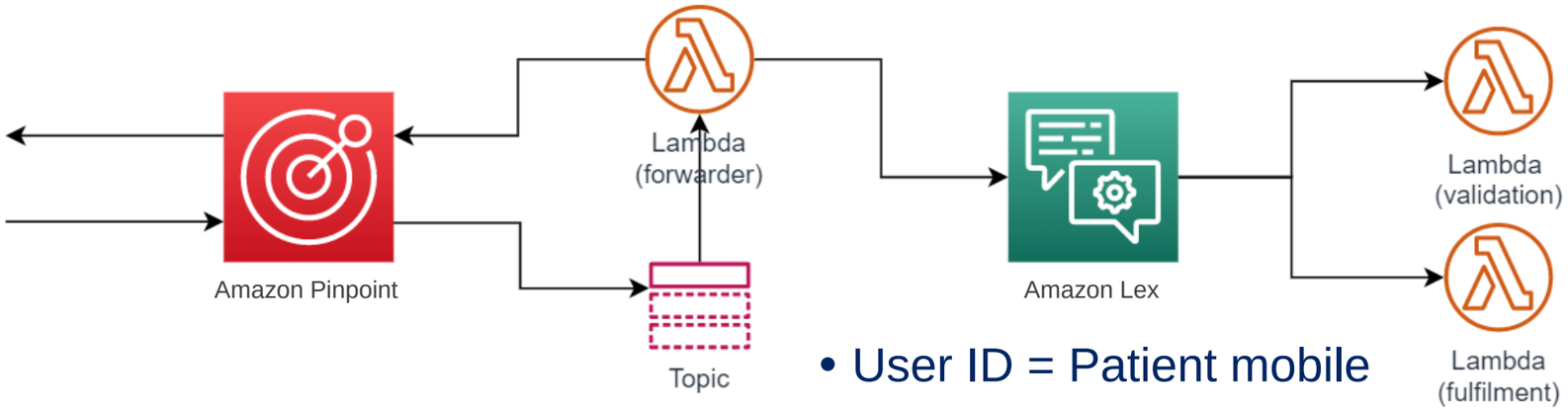
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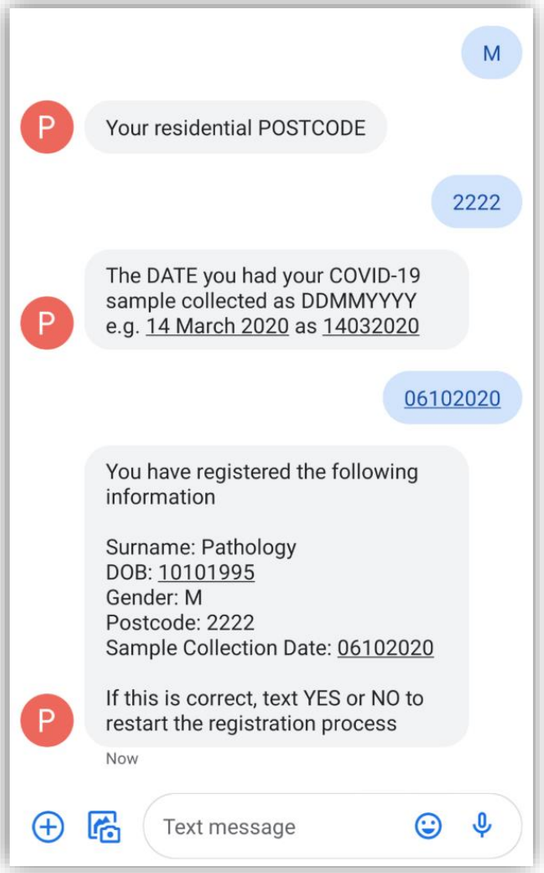
Transactional SMS



- Long code
- Patient mobile
- Message



- User ID = Patient mobile



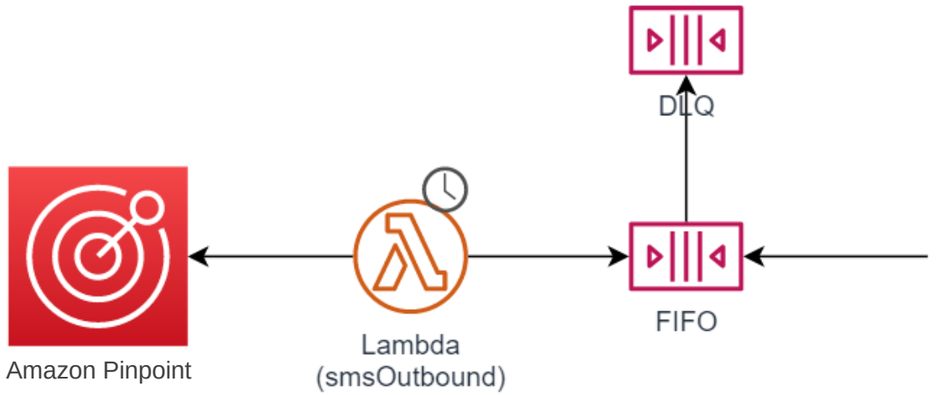
One SMS to single recipient per second

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Outbound SMS

Patient

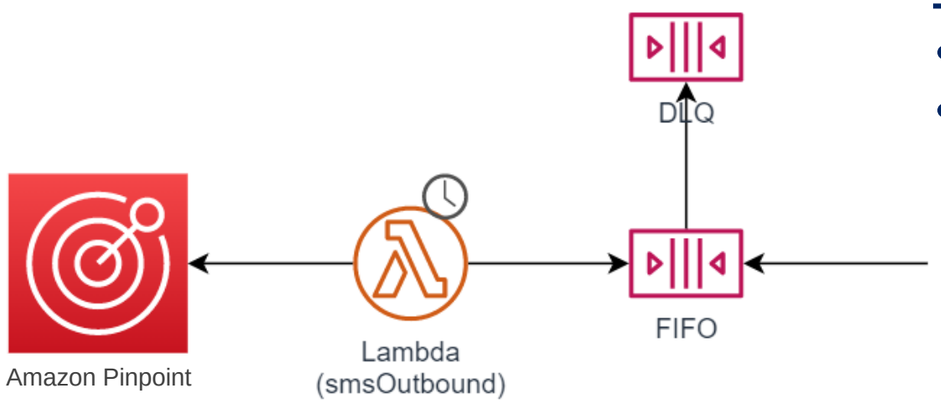


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Outbound SMS

Patient

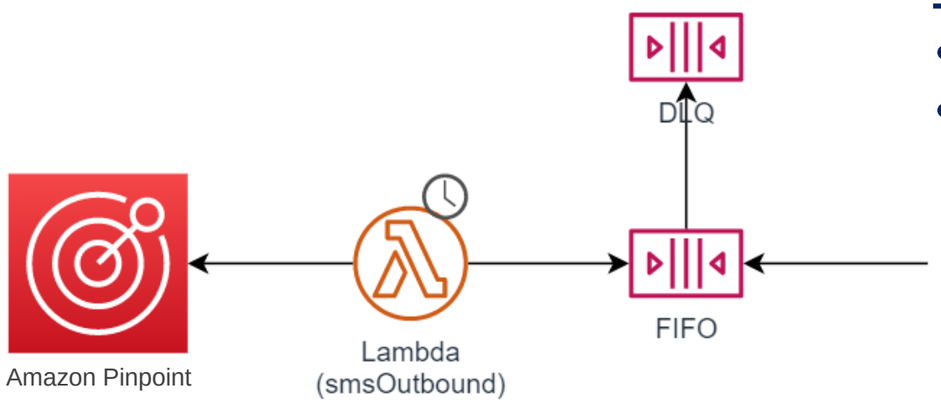


SQS FIFO

- Content-based deduplication
- Message group ID = Patient mobile

Outbound SMS

Patient



SQS FIFO

- Content-based deduplication
- Message group ID = Patient mobile

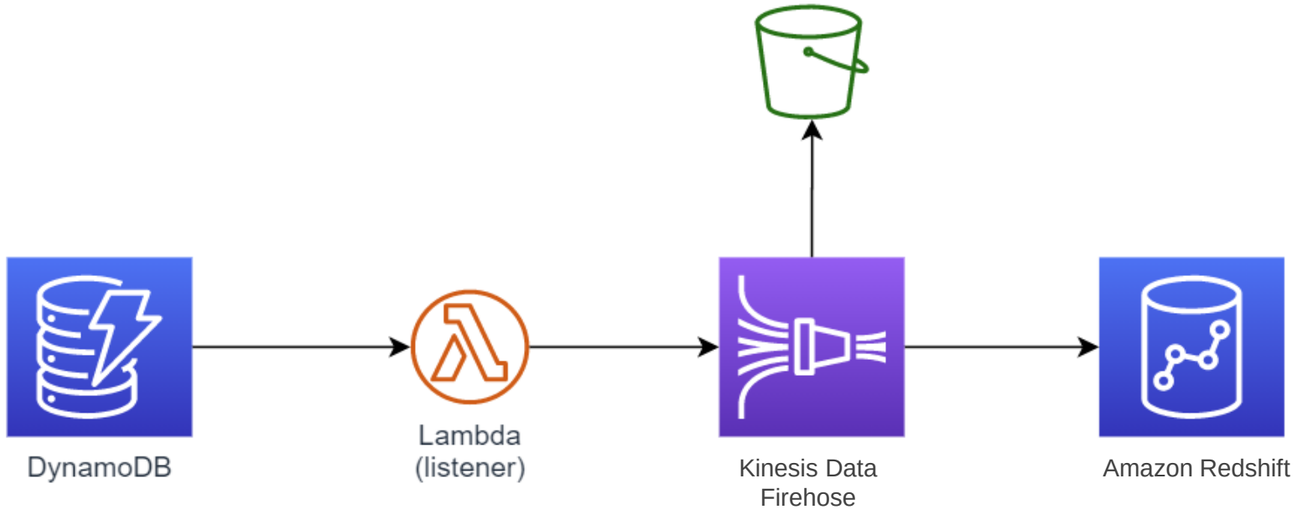
Users can opt out of receiving messages

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Data sync



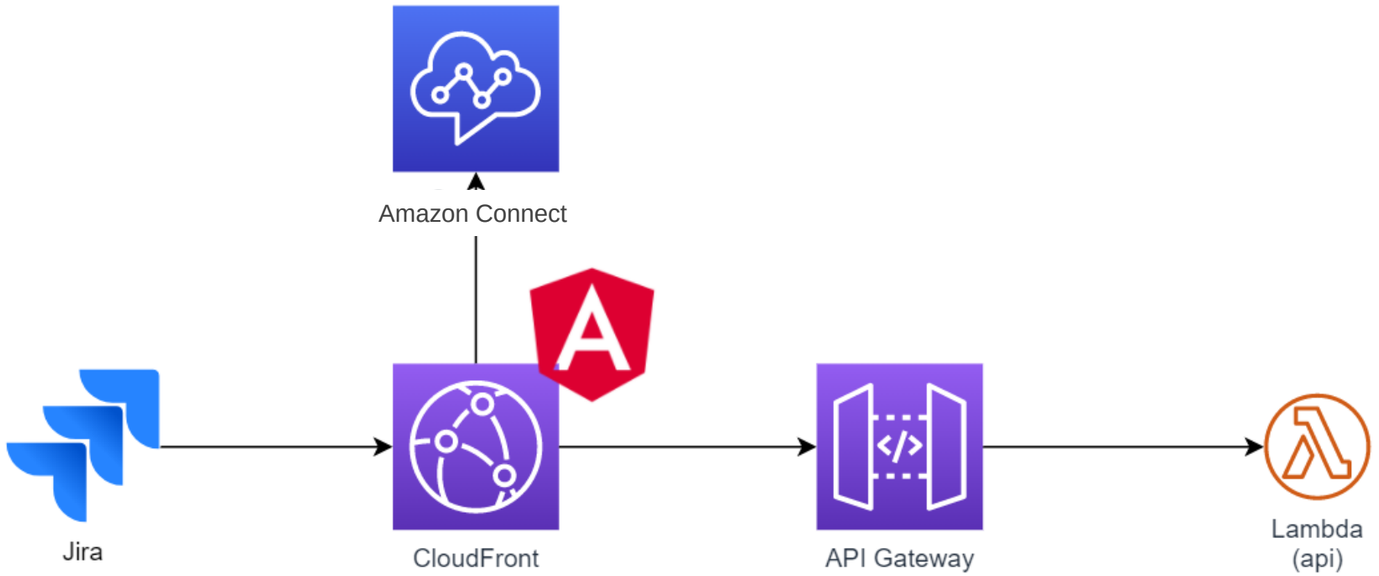


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Registration management





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Conclusion

- 1 million automated results delivered
- Business transformation
  - Patient referral → direct patient engagement

"*As a young mother it was extremely important to me to get these results quickly and I felt this service was easy and effective from the start of the process.*"

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Next steps

Pandemic

- Expanding communication channels
  - More automation
  - Patient clinic appointments
  - Self-serve web portal
  - IVR/Inbound calls
  - Cross-agency integrations

Business

- AWS Cloud–based genomics
  - Whole-exome service (WES)
  - Whole-genome service (WGS)

What we covered

Crisis response: The challenge

AWS services

Best practices

Customer journey: NSW Health Pathology



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Building clinically-validated conversational agents to address novel coronavirus

https://aws.amazon.com/blogs/industries/building-clinically-validated-conversational-agents-to-address-novel-coronavirus/

Building multilingual SMS chatbot campaigns to support COVID-19 patients remotely

https://aws.amazon.com/blogs/industries/building-multilingual-sms-chatbot-campaigns-to-support-covid-19-patients-remotely/

Architecture resources

AWS Well-Architected Framework

The official best practices for architecting in the AWS Cloud

https://aws.amazon.com/architecture/well-architected/

AWS Well-Architected Labs

Hands-on labs to help you learn, measure, and build using architectural best practices

https://wellarchitectedlabs.com/

AWS Architecture Center

Official AWS repository for all architecture resources

https://aws.amazon.com/architecture/

AWS Solutions Library

Vetted reference implementations and well-architected patterns

https://aws.amazon.com/solutions/

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