2023 CIO PEER FORUM

CIO ASSOCIATION OF CANADA

BREAKOUT SESSION A:

UNLOCKING THE BUSINESS VALUE OF CONVERSATIONAL AI – CUSTOMER EXPERIENCE

Moveworks

Unlocking Business Value through Conversational AI

Jameson Lee
Global Solution Architect | AI Operations
Moveworks

Session Objectives

What is a (large) language model?   History. Terminology. The AI (Shifting) Landscape.

How are they changing the world?   From Graphical to Conversational Interfaces.

How are they changing the enterprise?   Bot toolkits. Enterprise Context. Use Cases.

What do CIOs need to know about CAI?   Enterprise Readiness Standards. Moveworks.

Conceptually massive model with many parameters…

…and are meant to mimic real-world human behavior when given a text input.

Large Language Model

…that performs language tasks, like predicting the next word…

Moveworks

What is conversational AI?

Everyone was skeptical
about chatbots

Bursting the chatbot bubble TC

Arun Uday   5:00 PM PDT | July 16,2016   💬 Comment

Why do chatbots suck? TC

Faisal Khalid   8:00 PM PDT | May 29,2016   💬 Comment
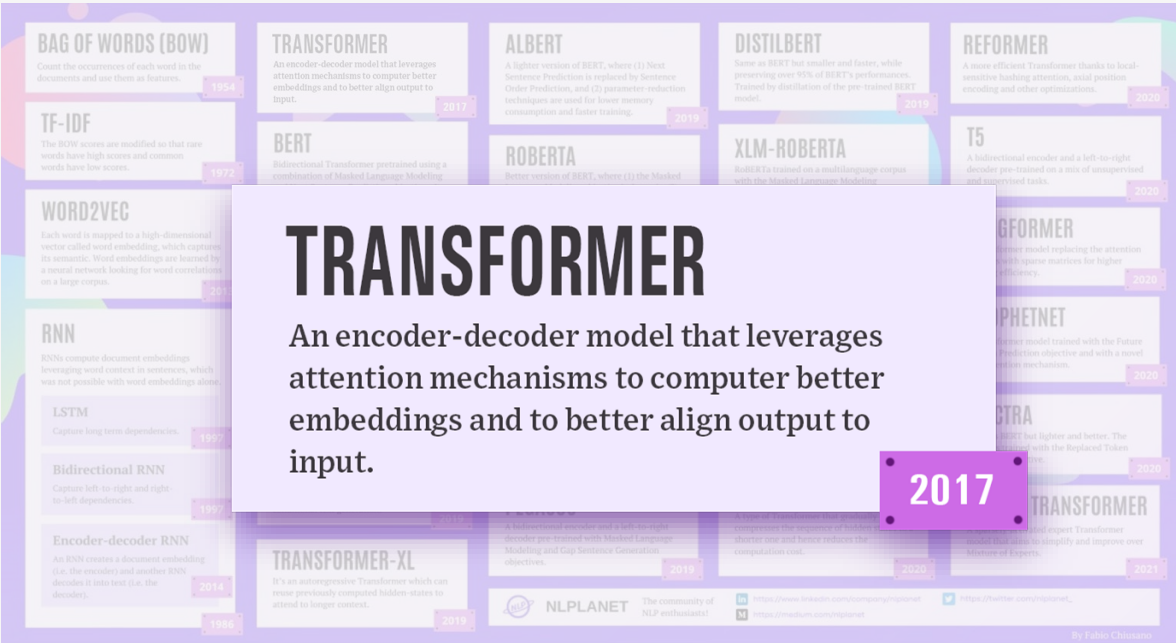
**Please, Facebook, don't make
me speak to your awful chatbots** ⏾

Alex Hern   7:16 PM EDT | Apr 29,2016   💬 **118**

2016

A transformative year in the history of NLP

2016

2017

Language and chat are the most universal human interfaces

2016   2017   2018

Moveworks

Virtual assistants start gaining traction

COMING UP
+ Bloomberg Technology

Bhavin
Shah
Moveworks CEO

Mamoon
Hamid
Kleiner Perkins Partner

Bloomberg Technology | Bloomberg Television | Bloomberg.com | TV<GO>

Enterprise

Moveworks snags $75M Series B to resolve help desk tickets with AI

servicenow   Solutions   Products   Platform   Customers   Events   About

New ServiceNow Virtual Agent Takes Chat from Conversation to Resolution

Home / Innovation / AI & Robotics

**Moveworks bets IT overload is a natural language processing problem**

Help-desk tickets are regularly stranded for 72 hours while admins try to figure out what people are actually asking. Startup Moveworks is adapting natural language understanding to decipher and automate those mysterious requests.

The New York Times

TECH FIX

CES 2019: It's the Year of Virtual Assistants and 5G

2016   2017   2018   2019
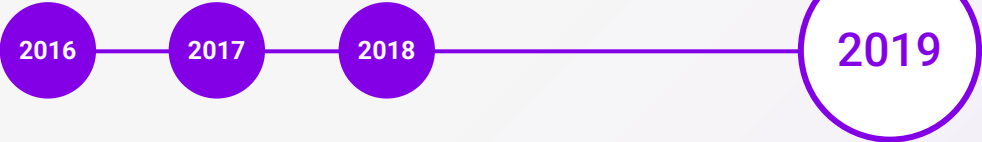
The pandemic made the chatbot the sidekick to employee experience

Why Palo Alto Networks rebuilt its workplace with AI
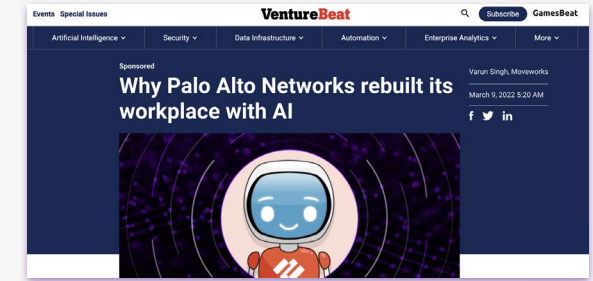
Microsoft Teams Grew Over 90% in 2020 Due To Pandemic

McKinsey & Company

How COVID-19 has pushed companies over the technology tipping point — and transformed business forever

Stanford University — Institute for Economic Policy Research (SIEPR)
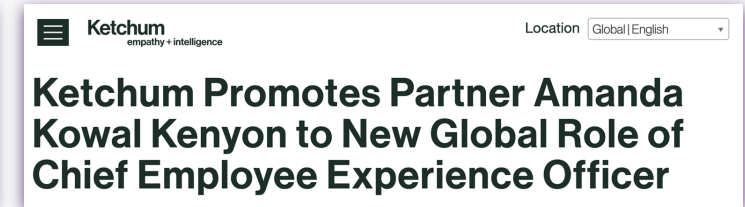
Hybrid is the future of work

2016   2017   2018   2019   2020

Chatbots and EX became a strategic, C-suite initiative

Moveworks

Harvard Business Review

Why Every Company Needs a Chief Experience Officer

Ketchum empathy + intelligence

Location Global | English

Ketchum Promotes Partner Amanda Kowal Kenyon to New Global Role of Chief Employee Experience Officer

Expert Insights

The Case For The Chief (Employee) Experience Officer

THE WALL STREET JOURNAL.

English Edition ▾ | Print Edition | Video | Podcasts | Latest Headlines | More ▾

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CFO JOURNAL

Companies Offer Investors a Glimpse at Employee Turnover

CFOs evaluate how much to disclose about hirings and firings under new regulation

2016   2017   2018   2019   2020   2021

AI performance nears baseline across generative modalities

Normalized Distance From Human Baseline

- ▲ Image Generation (Fréchet Inception Distance, FID)
- ● Text Generation (SuperGLUE)
- ■ Speech Generation (TTS, LJSpeech dataset MOS)

Human Baseline

Note: All metrics are created by researchers to measure improvements in models. They are updated as model autonomy improves. FID data models from WGAN-GP, BigGAN, AutoGAN, Denoising Diffusion LSGM, StyleGAN assuming a 30 point normalization range (from 2017-2022) with human baseline as 0.0 score. SuperGLUE data from BERT, T5, T5 + Meena, Single Model (Meena Team - Google Brain), Liam Fedus assuming a 20 point normalization range (from 2018-2022) with human baseline as 89.0 score. LJSpeech MOS data from WaveNET, WaveRNN, Transformer TTS, FastSpeech, VITS assuming a 1 point normalization range (2017-2022) with human baseline as 4.5 score.

2016   2017   2018   2019   2020   **2021**

Chatbots and automation became a powerful deflationary tool

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LEADERSHIP STRATEGY

Why Automation Is The One Solution To Inflation We Are Not Talking Enough About.
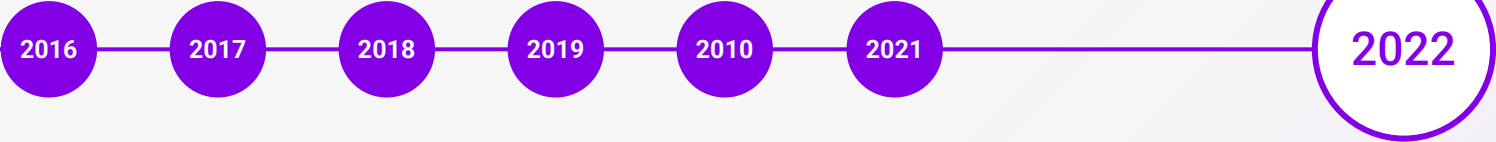

Morgan Stanley

INVESTOR RELATIONS   MEDIA RELATIONS   CLIENT LOGIN

Our Insights   What We Do   About Us   Careers

RESEARCH   SEP 21, 2022

How Technology Can Guard Against the Impacts of Inflation

Change in Prices from Year Before

S&P 500 IN 2022

Source: New York Times

2016 2017 2018 2019 2010 2021 **2022**
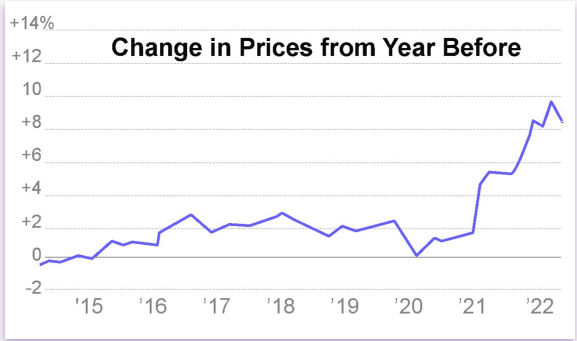
An explosion of models and enabling infrastructure

Stable Diffusion

MT-NLG (530B)

BigScience BLOOM (176B)

Transformer ELMo (465B)

Turing-NLG (17B)

Wave2Vec

Megatron-LM (8.3B)

Megatron

ELMo (94B)

ALBERT

Chinchilla (70B)

DeBERTa

T5

XLM-RoBERTa

Godel (175B)

Whisper

Gopher (280B)

PaLM (540B)

GPT-2 (1.5B)

m2m100

YaLM (100B)

RoBERTa (354B)

mBART

BERT (340B)

Jurassic-1 (178B)

MPNet

GPT-3,davinci-002

OPT-175B (175B)

TK instruct

LaMDA (137B)

DistilBERT

2016   2017   2018   2019   2010   2021

2022

ChatGPT showed the masses what's possible with chatbots

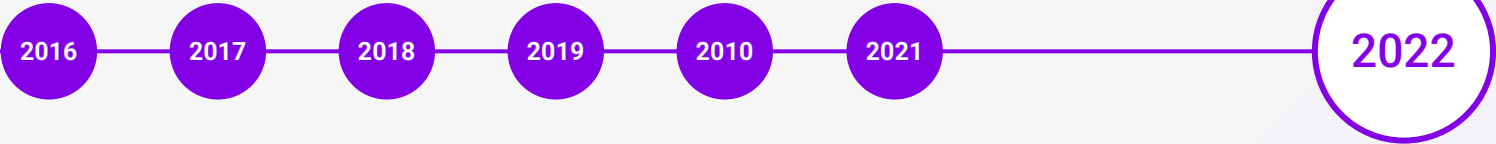*Microsoft to Invest $10 Billion in OpenAI, the Creator of ChatGPT*

The tech giant aims to remain at the forefront of generative artificial intelligence with its partnership with OpenAI.
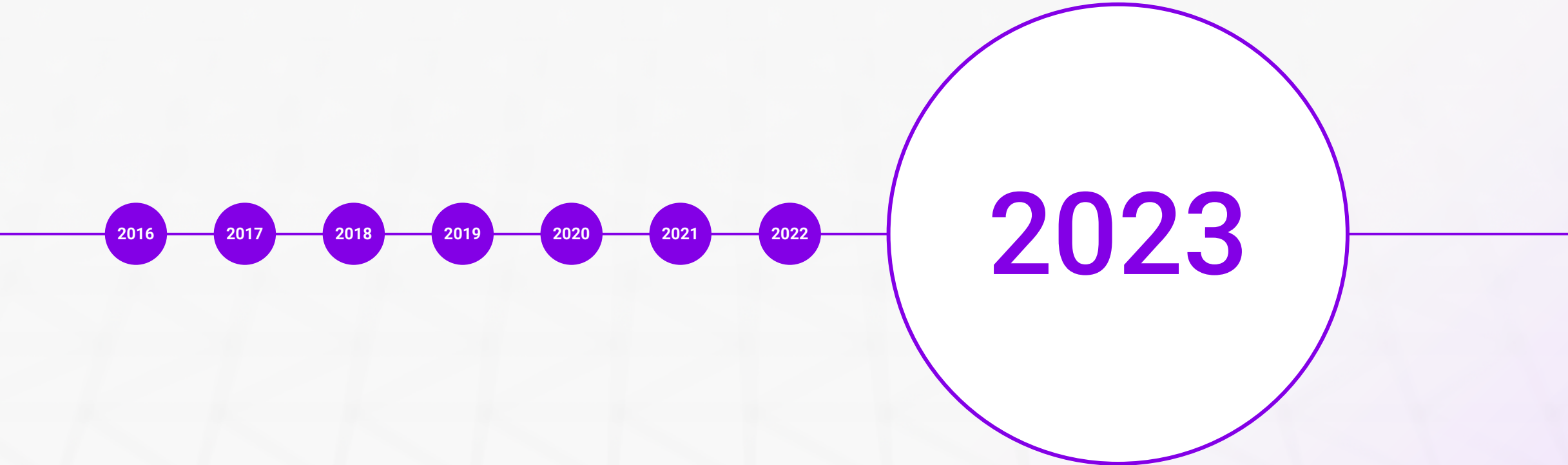
≡ CNBC   MARKETS   BUSINESS   INVESTING   TECH   POLITICS   CNBC TV   INVESTING CLUB 🔒   PRO 🔒

Why ChatGPT is a game changer for AI

OpenAI, which Elon Musk helped to co-found back in 2015, is the San Francisco-based startup that created ChatGPT. The company opened ChatGPT up for public testing in November 2022. In under a week, the artificial intelligence model amassed over a million users, according to OpenAI CEO, Sam Altman. By the end of January, ChatGPT was averaging about 13 million visitors per day. Users have had ChatGPT write everything from essays, to lyrics and even correct computer code.
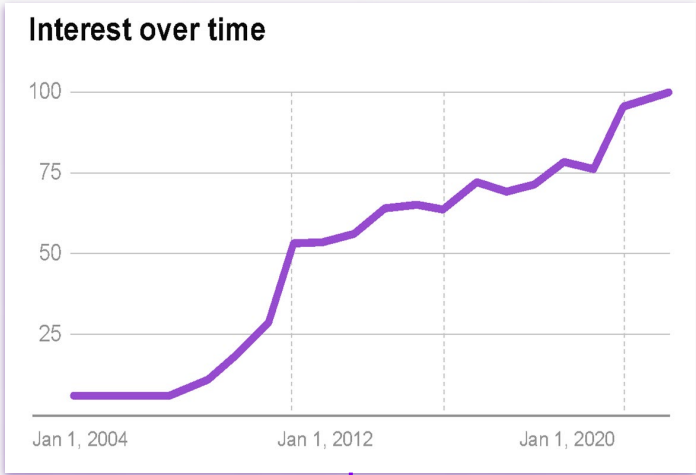
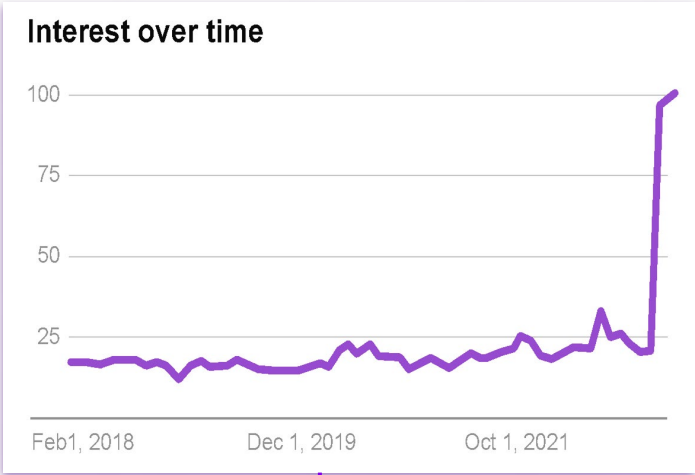## ChatGPT passes exams from law and business schools

2016   2017   2018   2019   2010   2021   2022

Moveworks

2016 **2017** **2018** **2019** **2020** **2021** **2022**

2023

Chatbots and LLMs are entering common vernacular

Cloud Computing

Interest over time

100

75

50

25

Jan 1, 2004   Jan 1, 2012   Jan 1, 2020

Chatbot

Interest over time

100

75

50

25

Feb1, 2018   Dec 1, 2019   Oct 1, 2021

LLMs

Interest over time

100

75

50

25

Feb 13, 2022   Jun 5, 2022   Sep 25, 2021   Jan 15, 2023

2023

17
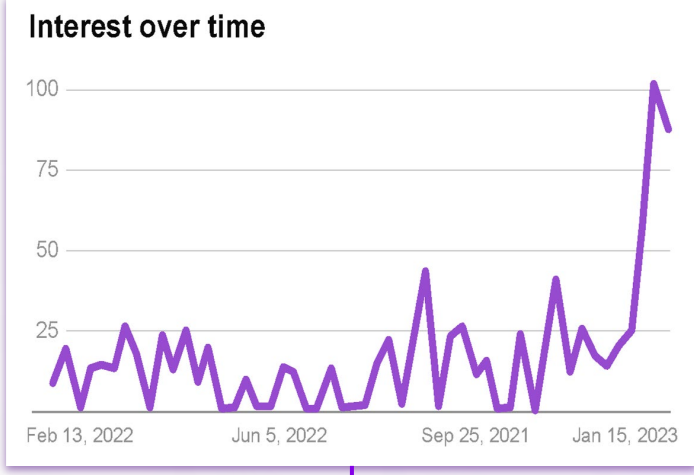
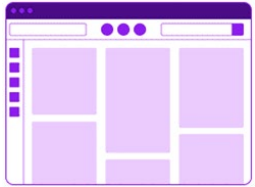AI has entered the mainstream.

How are LLMs changing the _____?

How are LLMs changing the **world**?

Language is becoming the universal interface

Graphical interface
Navigate applications with access to a computer
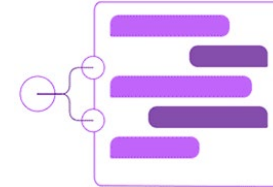
Mobile interface
Navigate applications anytime, anywhere

Chat interface
Navigate applications through programmed flows

Conversational interface
Navigate applications through fluid & effortless conversation
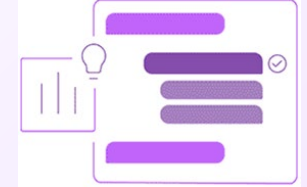
Less natural

Continuum of human-computer interaction

More natural

How are LLMs changing the _____?

Moveworks

How are LLMs changing the **enterprise**?

Moveworks

Bot toolkits are now obsolete.

Hard-coded flow charts are not real AI
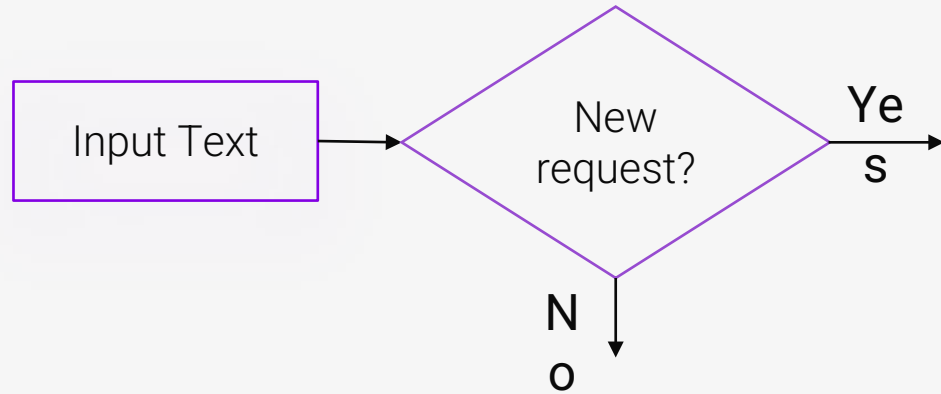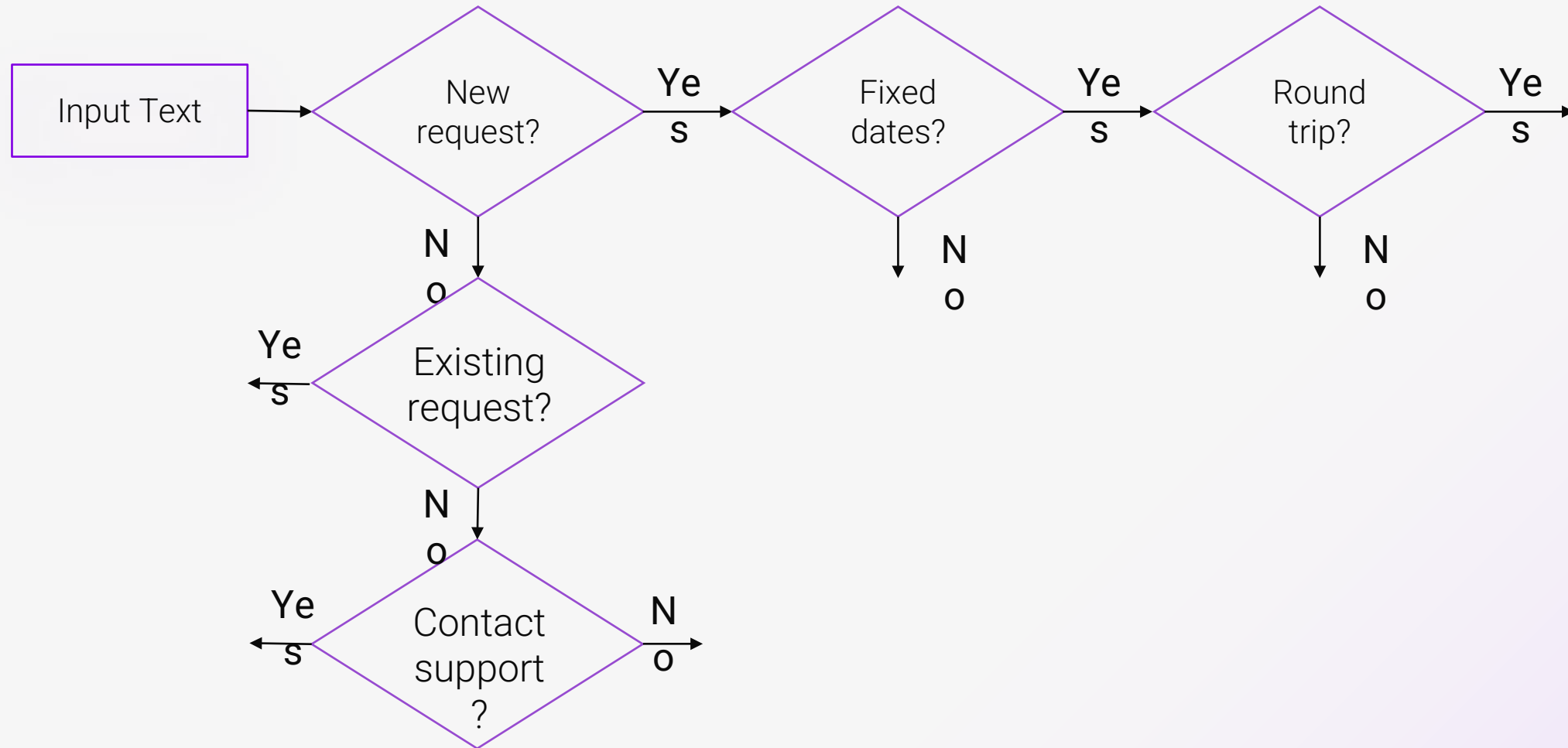
Input Text → New request?

Yes

No

Hard-coded flow charts are not real AI

Input Text →

New request? — **Yes** →

Fixed dates? — **Yes** →

Round trip? — **Yes** →

New request? — **No** ↓

Existing request? — **Yes** ←

Existing request? — **No** ↓

Contact support? — **Yes** ←

Contact support? — **No** →

Fixed dates? — **No** ↓

Round trip? — **No** ↓

Hard-coded flow charts are not real AI

Input Text

New request?

Yes → Fixed dates?

Yes → Round trip?

Yes

No

Existing request?

Yes

No

Contact support?

Yes

No

Hard-coded flow charts are not real AI
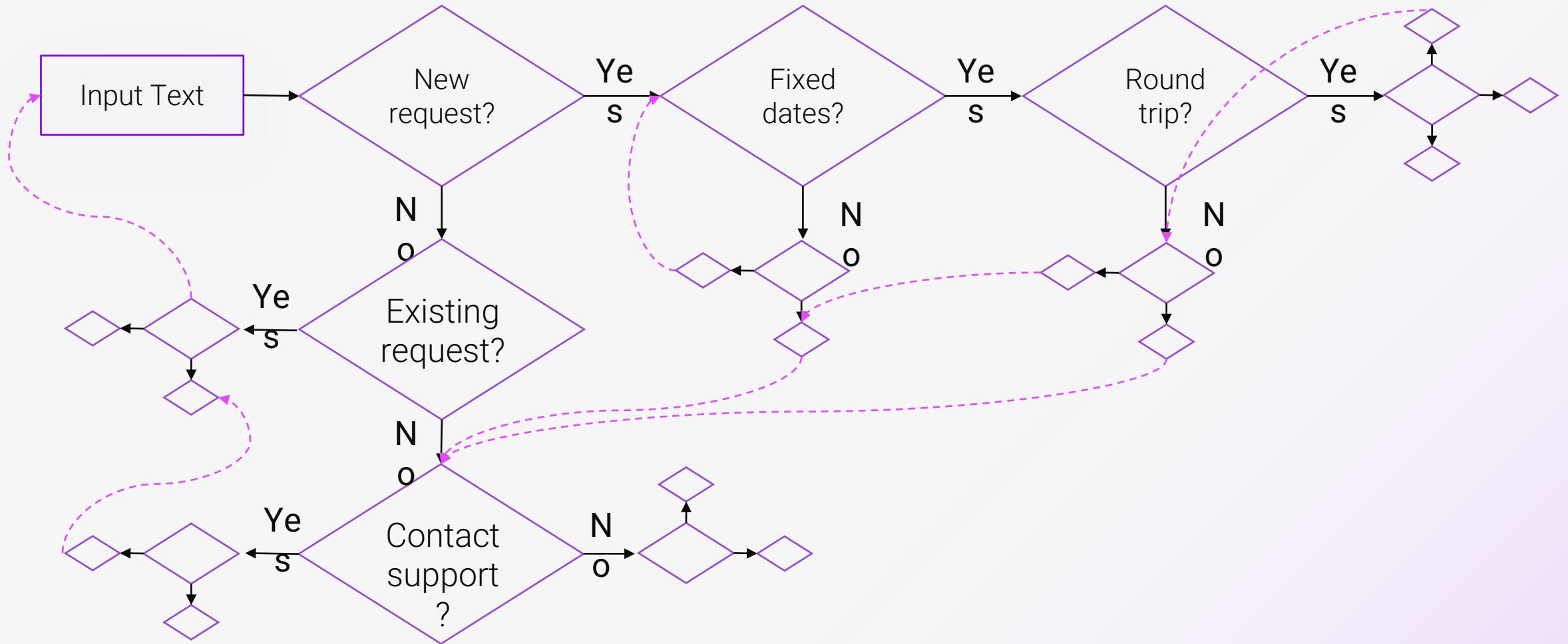
Every application will have a conversational UX

IT applications

servicenow
okta
onelogin

HR applications

ADP
workday.
ZENEFITS
SAP Fieldglass
paylocity

Finance applications

CONCUR
SAP Ariba
bill.com

Sales applications

GONG
Outreach
salesforce
people.ai
HIGHSPOT
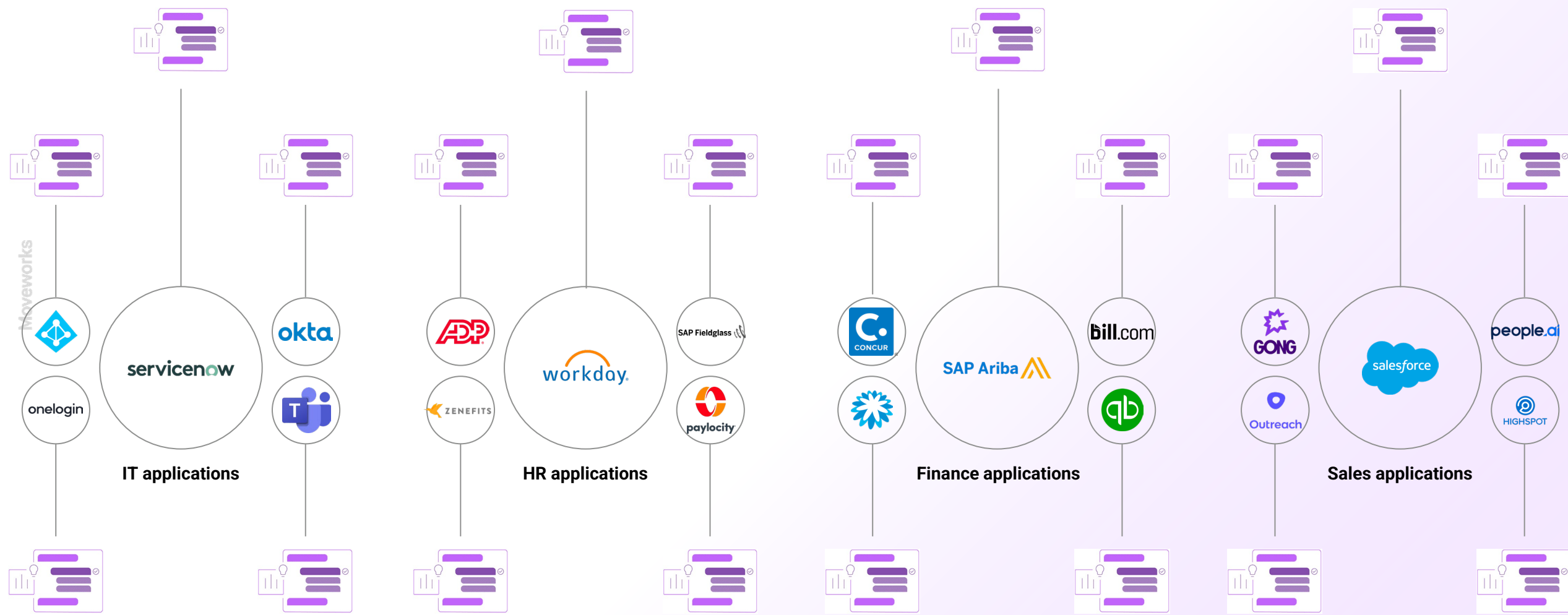
Generative AI will change the enterprise

Automatically generated and summarized...

	Knowledge articles	Conversation flows	Ticket threads	
...ense reports	Forms	Employee comms	Phone call transcripts	Meetin...
...endas	Product documentation	Ticket descriptions	Datasets	Websi...
Emails	Code	Work notes	Utterance variations	Banne...
...Social media posts	REST API documentation	Ticket solutions	Queries	
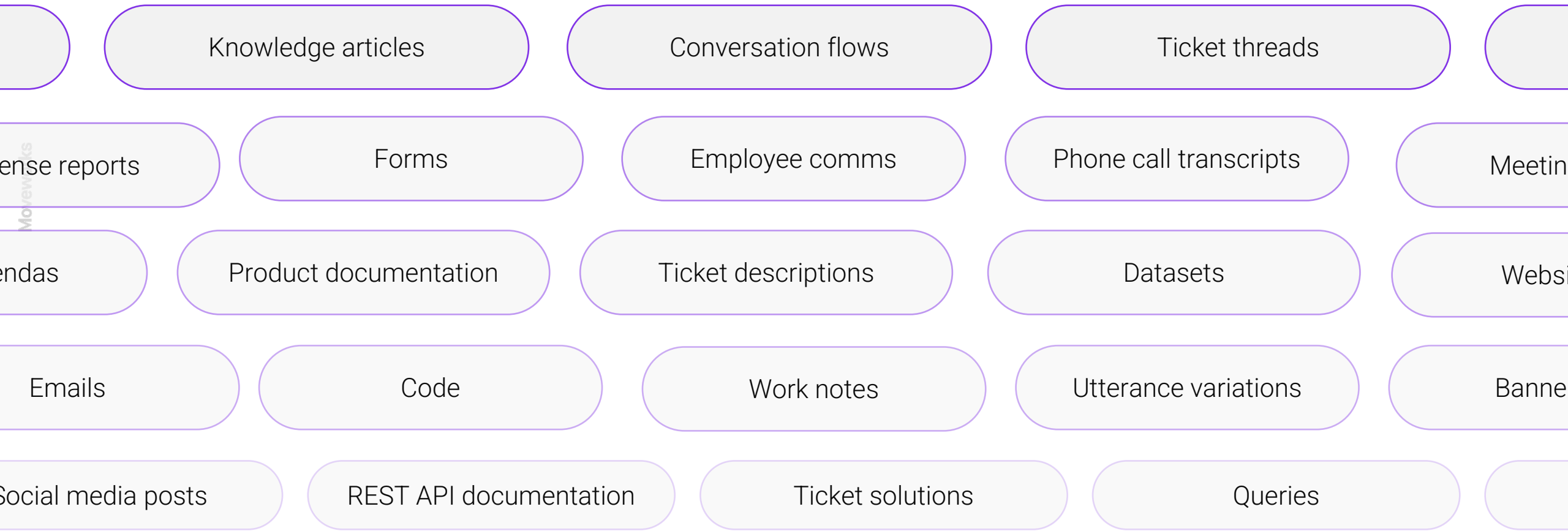
MOVEWORKS

Moveworks

Customers

250+

ML Models

200+

Investors

$315 million in funding at a $2.1 billion valuation
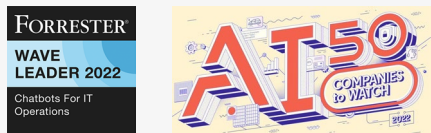
KLEINER PERKINS · Lightspeed · BainCapital VENTURES · SAPPHIRE VENTURES · ALKEON CAPITAL MANAGEMENT · TIGERGLOBAL · ICONIQ

Partnerships

tcs TATA CONSULTANCY SERVICES · HCL · wipro · carahsoft · aws · Microsoft · nexthink · OpenAI

Certifications

ISO 27001 Certified · ISO 27017 Certified · ISO 27018 Certified · STAR LEVEL TWO · AICPA SOC 2 · GDPR · HIPAA COMPLIANT · CCPA

Recognition

FORRESTER WAVE LEADER 2022 Chatbots For IT Operations · AI 50 COMPANIES to WATCH 2022 · Forbes 2023 AMERICA'S BEST STARTUP EMPLOYERS · AMERICA'S MOST LOVED WORKPLACES Newsweek

Press

WIRED · VentureBeat · Forbes · FAST COMPANY · TechCrunch · BUSINESS INSIDER · WSJ

reddit · Dropbox · Spotify · paloalto NETWORKS

jamf · salesforce · LinkedIn · GitHub

databricks · DocuSign · Wellstar · illumina

GameStop · Unilever · Coca-Cola CONSOLIDATED · DICK'S SPORTING GOODS

SAIA · MATTEL · Honeywell · BROADCOM

FOX · Disney · HEARST · WARNER MUSIC GROUP

T. Rowe Price · ICE · Capital One · airbnb

Attributes of a Best in Class CAI Platform

Model Requirements?

Platform Level Requirements.

ML Ops Platform	Continuously Finetuning	Enterprise Grounding	Always Configurable	Always Secure

ML Operations and Fine-tuning

Goal

With rapid advances in language models, it is integral to quickly evaluate multiple models, fine tune them with enterprise data, and introduce them in the platform.

Moveworks solution

- MLOps platform for dataset management, evaluating models, serving & monitoring infrastructure

- Deep capacity to fine tune and train base models to improve performance

- State-of-the-art GPU hardware and hosting software to serve fine-tuned LLMs with reduced latency and high performance.

LLM Breakthroughs in the last 30 days. The model landscape is quickly changing.

Feb 24th — Release of LLaMa (65B parameter LLM)

March 21st — Release of Google Bard in limited beta (LLM not public yet)

March 21st — Nvidia announces they are training their own LLMs (NeMO Megatron) for public use

Harnessing best-in-class LLMs for their unique strengths

Domain and Intent Classification

BERT

Google

Generative model for Knowledge Writing

GPT-2

OpenAI

Generative language translation for MLS

M2M-100

Meta

Creates Clusters for Knowledge Gap Analysis

MPNet

Microsoft

In-context language understanding and generation

GPT-3.5

OpenAI

| H2 2019 | H1 2020 | H2 2020 | H1 2021 | H2 2021 | H1 2022 | H2 2022 | H1 2023 |

RoBERTa

Multilingual Classification for Triage

Ai2
Allen Institute for AI

TK Instruct

Generative model for Business Queries

OpenAI

Whisper

Multilingual ASR for Voice

Microsoft

DeBERTa

Cross Encoder for Search Ranking

OpenAI

GPT-4

Conversational Reasoning

36

ur ML Operations Pipeline

500MM+

Support tickets used
for training

Dataset management

3MM

Annotations/quarter
added to training data

50

Model
updates/quarter

Annotate

Monitor

Continuous Monitoring

Train

Training Infra

Deploy

Serving Infra

5MM
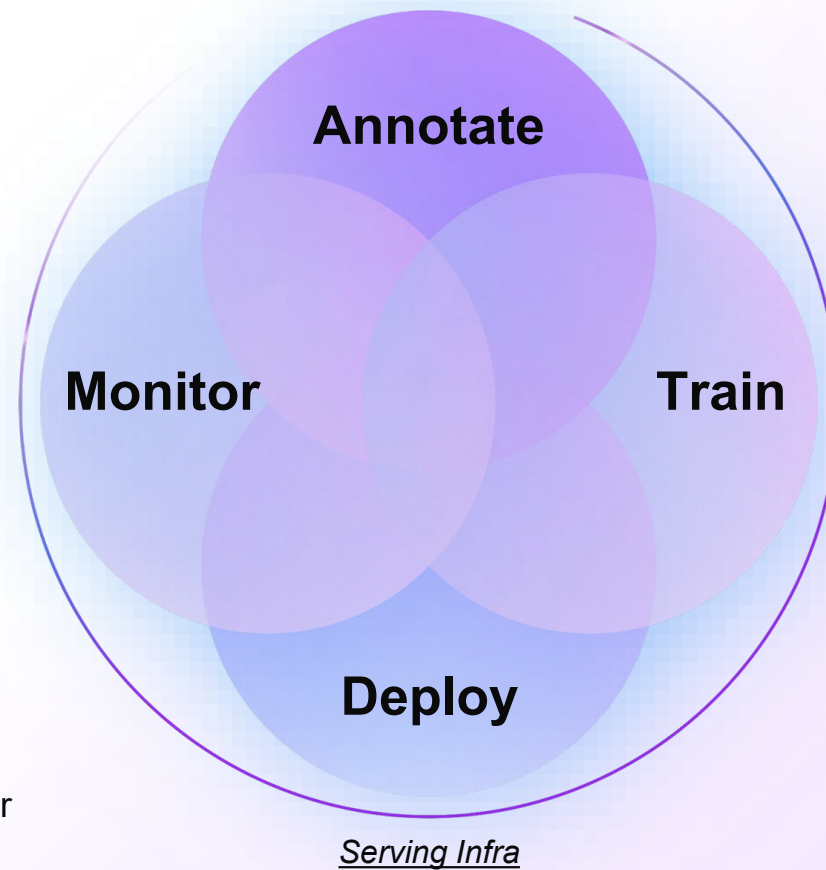
User interactions/quarter
added to training data

200+

ML Models (Includes
proprietary fine-tuned
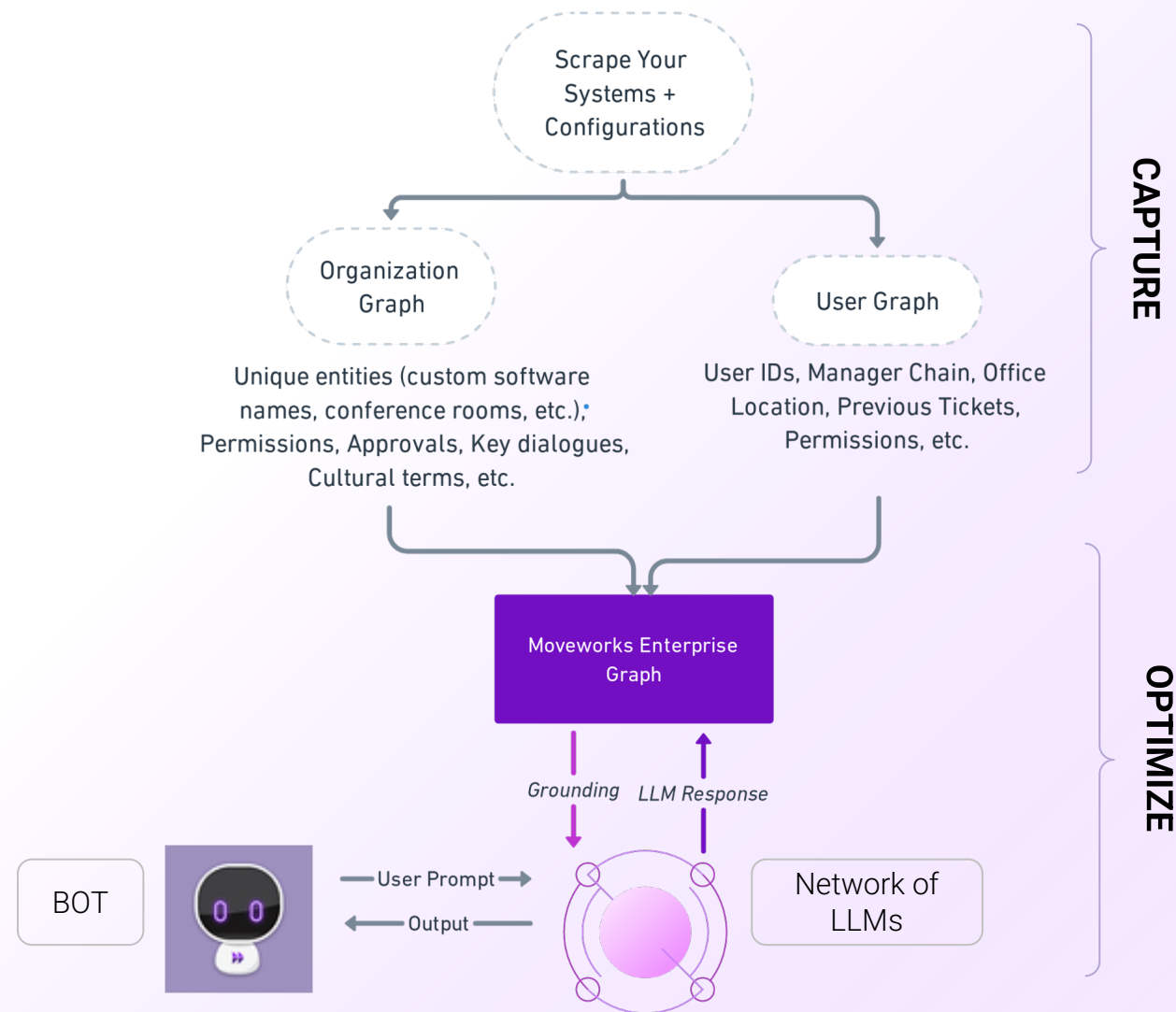models

Moveworks

eworks, Inc

Enterprise Entity Graph for <u>Grounding</u>

Goal

Pretrained LLMs need instructions and context that are grounded by enterprise specific data to perform well in enterprise settings.

Moveworks solution

- Moveworks Enterprise Entity Graph map your organization and employees from multiple business systems to create a network linking relevant information

- Moveworks bots use graph to instruct or provide examples to LLMs to ensure their responses are meaningful. These responses are also verified against the graph for factualness

Scrape Your Systems + Configurations

Organization Graph

User Graph

Unique entities (custom software names, conference rooms, etc.); Permissions, Approvals, Key dialogues, Cultural terms, etc.

User IDs, Manager Chain, Office Location, Previous Tickets, Permissions, etc.

Moveworks Enterprise Graph

Grounding | LLM Response

BOT

User Prompt →
← Output

Network of LLMs

CAPTURE

OPTIMIZE

Moveworks

Integrated with the entire enterprise

Goal

Businesses need a conversational system that integrates and orchestrates actions across multiple enterprise systems

Moveworks solution

Connected to 100+ systems for triggering and ingests information, permissions, rules, and workflows in real-time. Ability to fulfill end to end automations, look ups, search across all enterprise systems

# Empower service owners to build on LLMs

Goal

Service Owners and developers need to exert control on their conversational assistant. They need to build customer use cases and conversation flows to address business users' currently unmet requests.

Moveworks solution

Provides simple developer interface for users to create tailored, company specific use cases that bot follows. This is all powered by best-in-class LLMs grounded by Moveworks Enterprise Entity Graph.

One of our three developer tools — Conversations. Others include Queries and Events.

Our idea libraries will inspire use case ideas
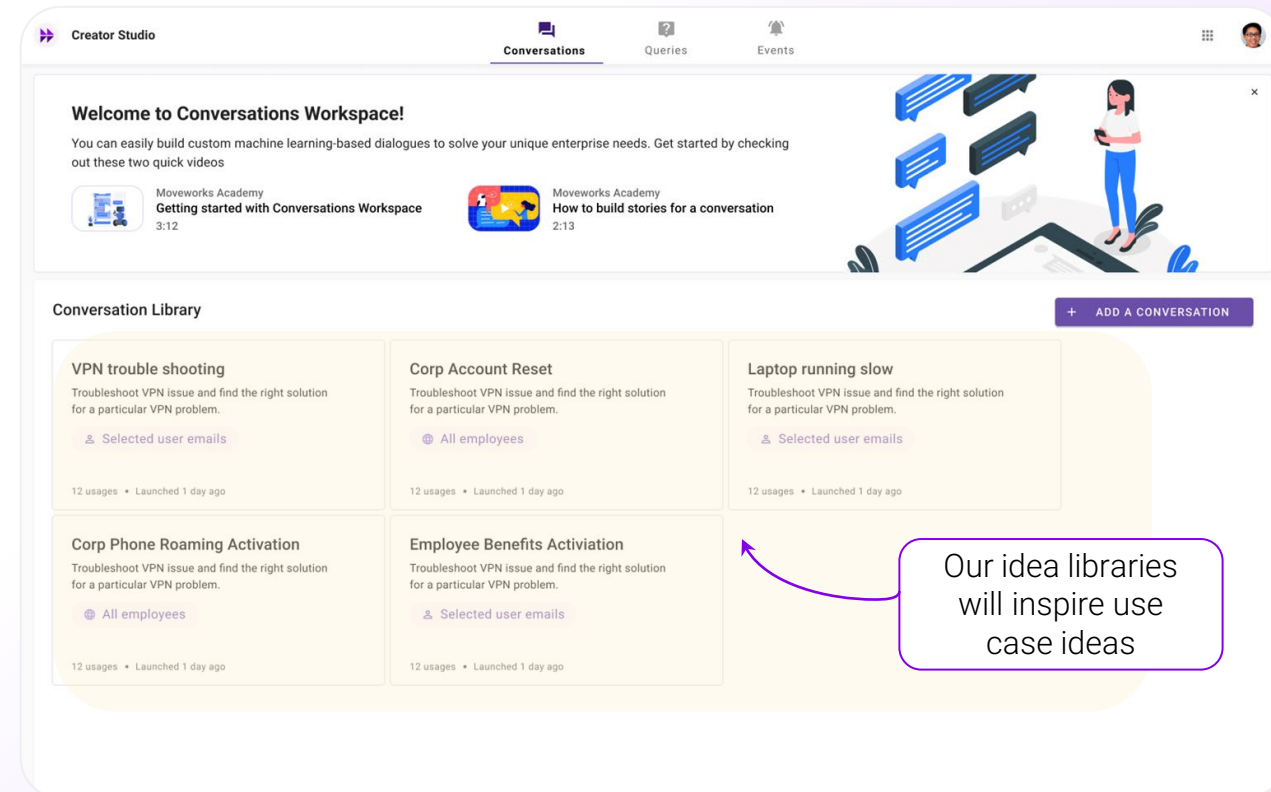
Certifications

Masking Personally Identifiable Information (PII)

Multi-Tenant Access Control
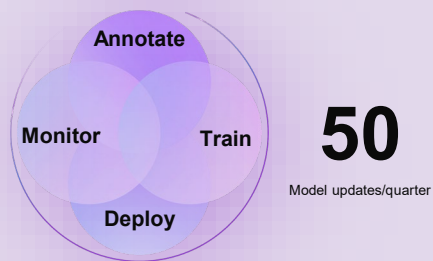
Encryption & Government Requirements

Moveworks

The generative conversational AI platform for the **entire** enterprise

Alex 2:30 PM
Howdo I add Bhavin to the marketing group

200+ Models

Annotate
Monitor Train
Deploy

50
Model updates/quarter

Google OpenAI
Ai2
Allen Institute for AI

100+ Integrations

servicenow
okta
onelogin
CONCUR
SAP Ariba
bill.com

ADP
workday.
SAP Fieldglass
GONG
salesforce
people.ai
ZENEFITS
paylocity
HIGHSPOT

biz rules   perms   approvals   language

Enterprise Readiness

ISO   AICPA SOC   CSA cloud security alliance
ISO 27001   ISO 27017   ISO 27018
GDPR   CCPA   HIPAA

Dev tools

Language analytics

ROI analytics

Moveworks 9:32 AM
Got it, working on it...

🎉 Good news, Bhavin Shah is added to
Marketing NA email group!
Bhavin can now receive emails from
marketingna@moveworks.us

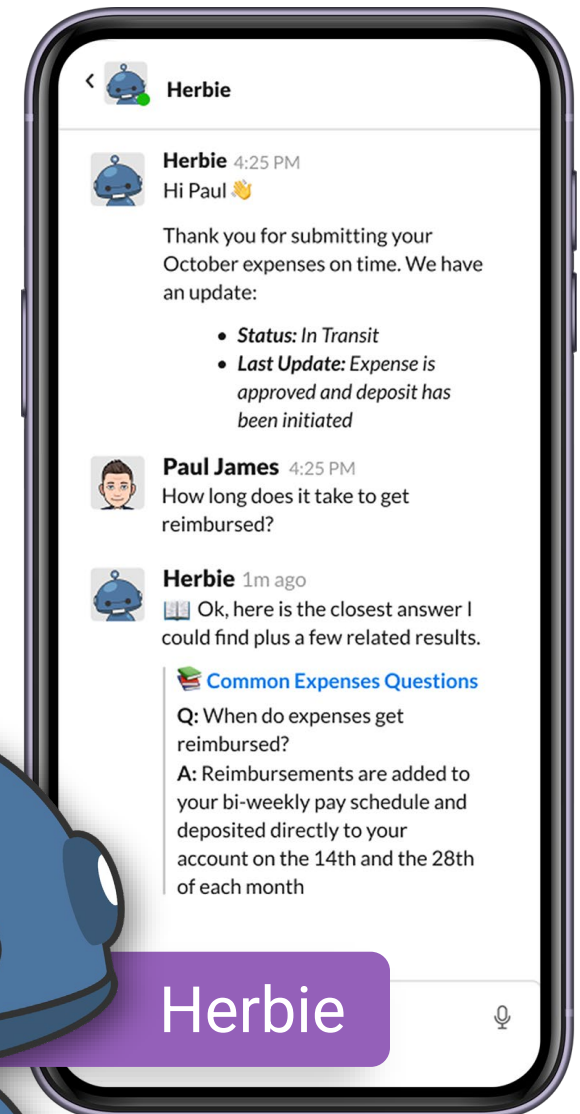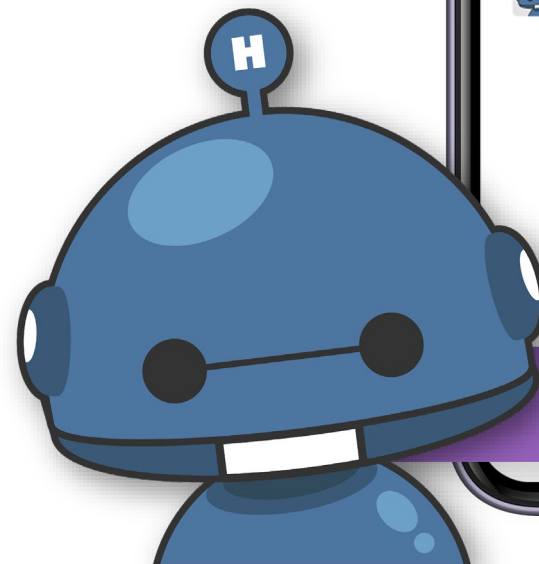# A single place for everything

HEARST

Hearst is a landmark media company that operates more than 360 businesses, including Cosmopolitan, Billboard, and Esquire.
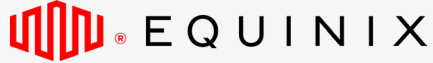
Challenge

A history of acquisitions created a complex IT environment, filled with dozens of disconnected systems that frustrated employees.

Goal

Simplify the support process for hybrid employees — enabling them to keep pace with an increasingly rapid news cycle.

Herbie 4:25 PM
Hi Paul 👋
Thank you for submitting your October expenses on time. We have an update:
- *Status: In Transit*
- *Last Update: Expense is approved and deposit has been initiated*

Paul James 4:25 PM
How long does it take to get reimbursed?

Herbie 1m ago
📖 Ok, here is the closest answer I could find plus a few related results.

📚 **Common Expenses Questions**
Q: When do expenses get reimbursed?
A: Reimbursements are added to your bi-weekly pay schedule and deposited directly to your account on the 14th and the 28th of each month

Herbie
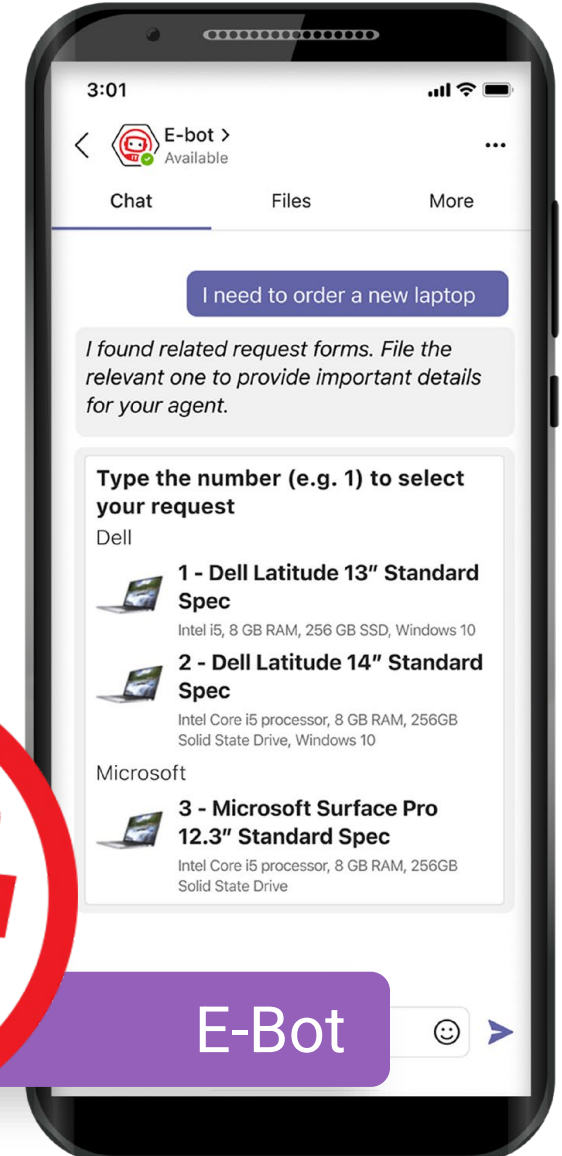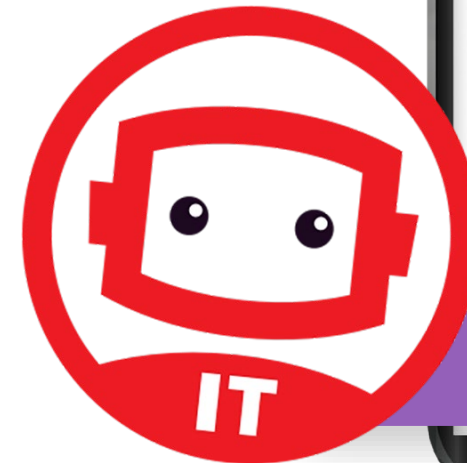
Meet employees where they are

EQUINIX

Equinix is the world's largest interconnection and colocation platform. Its 248 data centers are spread across 27 countries on 5 continents.

Challenge

Driving global adoption of a new chat platform.

Goal

Direct employees to a single hub for all IT support issues.
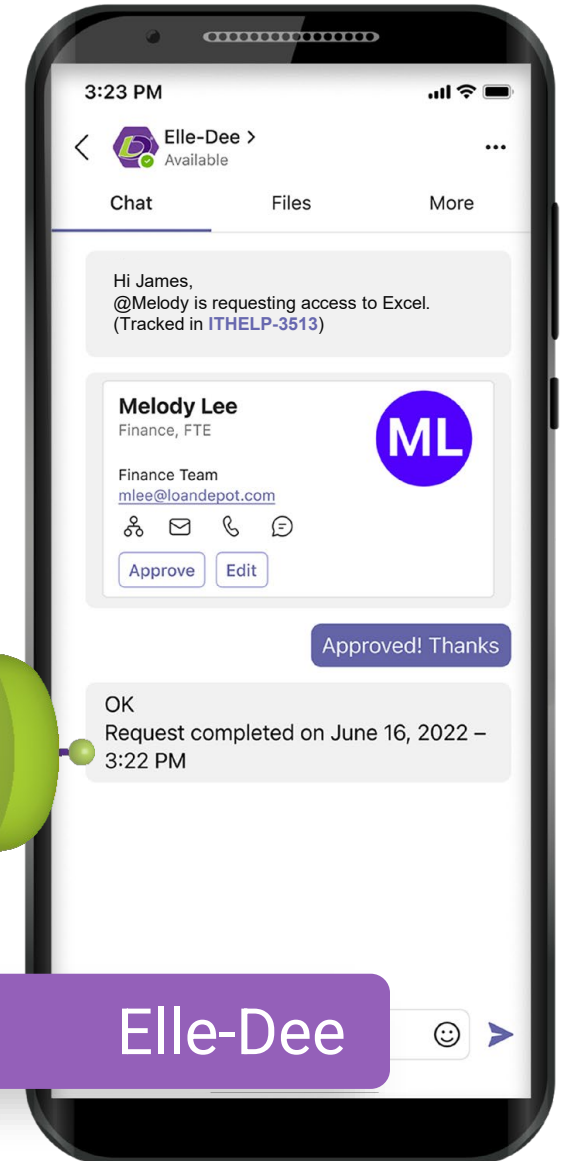
Approvals in seconds

loanDepot

loanDepot is the fifth largest mortgage lender in America. Since 2009, it has funded nearly $300 billion.

Challenge

Approvals processes take days, impacting employee productivity while they wait.

Goal

Use conversational AI to handle the approval process instantly and automatically.

3:23 PM

Elle-Dee >
Available

Chat   Files   More

Hi James,
@Melody is requesting access to Excel.
(Tracked in **ITHELP-3513**)

Melody Lee
Finance, FTE

Finance Team
mlee@loandepot.com

Approve   Edit

Approved! Thanks

OK
Request completed on June 16, 2022 –
3:22 PM

Elle-Dee

Thank you

Jameson Lee

Global Solution Architect

jlee@moveworks.ai