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Case study

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CS12

AI Field Service, Supply Chain and Industrial Operations

AI that runs the physical side of the business, where people, vehicles, parts and machines have to line up

Sector: HVAC, plumbing, electrical, construction, logistics, warehousing, distribution, automotive service and small manufacturing

Geography: United States. Company size: 20 to 200 employees.

Figures are measured outcomes from delivered work. The client is described by sector and geography at the client's request.

THE BUSINESS PROBLEM

The situation before we started

In this business the money was made or lost in the field. A technician who drove an extra hour, a van that arrived without the right part, a SKU that ran out on a Friday, none of these were admin problems. They were margin, and none of them were visible until the month closed.

01

Scheduling is a whiteboard exercise

A dispatcher balances skill, location, parts and urgency in their head, and the answer is good but rarely optimal.

02

Travel eats the day

Routes are built by habit and by geography, not by the actual sequence of jobs and their durations.

03

Vans arrive without the part

First time fix fails because nobody checked stock against the likely fault before the technician left.

04

Documentation happens at 8pm

Technicians write up jobs after hours, so the record is thin and the invoice goes out late.

05

Stockouts are found, not predicted

Reordering is triggered by an empty shelf rather than by forecast demand and supplier lead time.

06

Downtime is discovered by failure

Equipment is maintained on a calendar rather than on condition, so it is serviced too early or too late.

WHAT WE CHANGED

The issue, what we implemented, and what it moved

What was wrong	What we implemented	What it delivered
Scheduling was a whiteboard exercise in someone's head	Dispatch agent on the Agent Platform with Vertex AI duration prediction	**50 to 80% less scheduling effort**
Routes were built by habit rather than by job sequence	Maps Routes API and Distance Matrix sequencing the working day	**10 to 25% less travel time**
Vans arrived on site without the right part	Parts checked against van and depot stock in the BigQuery operating layer	**10 to 20% better first time fix rate**
Reordering was triggered by an empty shelf	Vertex AI demand forecasting with supplier lead time modelling	**20 to 40% fewer stockouts**
Maintenance ran on a fixed calendar interval	Vertex AI failure probability from equipment telemetry through Pub/Sub	**15 to 30% less unplanned downtime**
Technicians wrote jobs up at 8pm and invoices went out late	Documentation and invoice trigger generated from the technician record	**50 to 80% less job documentation time**

Middle column names the Google Cloud service that did the work. Right column is measured against the baseline captured in phase one.

SOLUTION OVERVIEW

What we built, and where we drew the line

We connected the job, the technician, the vehicle, the part and the machine into one operating picture, then put agents on top of it. The dispatcher kept control and stopped doing arithmetic. The buyer now sees a shortage nine days out instead of on the day.

WHAT THE SYSTEM DOES

- Turns an inbound request into a classified job with skill, duration and parts predicted
- Builds and reflows the schedule against live availability, location and traffic
- Predicts stockouts and excess, and prepares purchase recommendations
- Detects equipment condition drift and schedules maintenance before failure
- Generates job documentation and the invoice trigger from the technician's own record

WHAT THE SYSTEM NEVER DOES

- Dispatches a technician to a job the technician is not certified for
- Places a purchase order without a named buyer approving it
- Overrides a safety lockout or a permit to work requirement
- Commits a customer appointment beyond real crew capacity
- Changes a maintenance interval that a regulator or a warranty has fixed

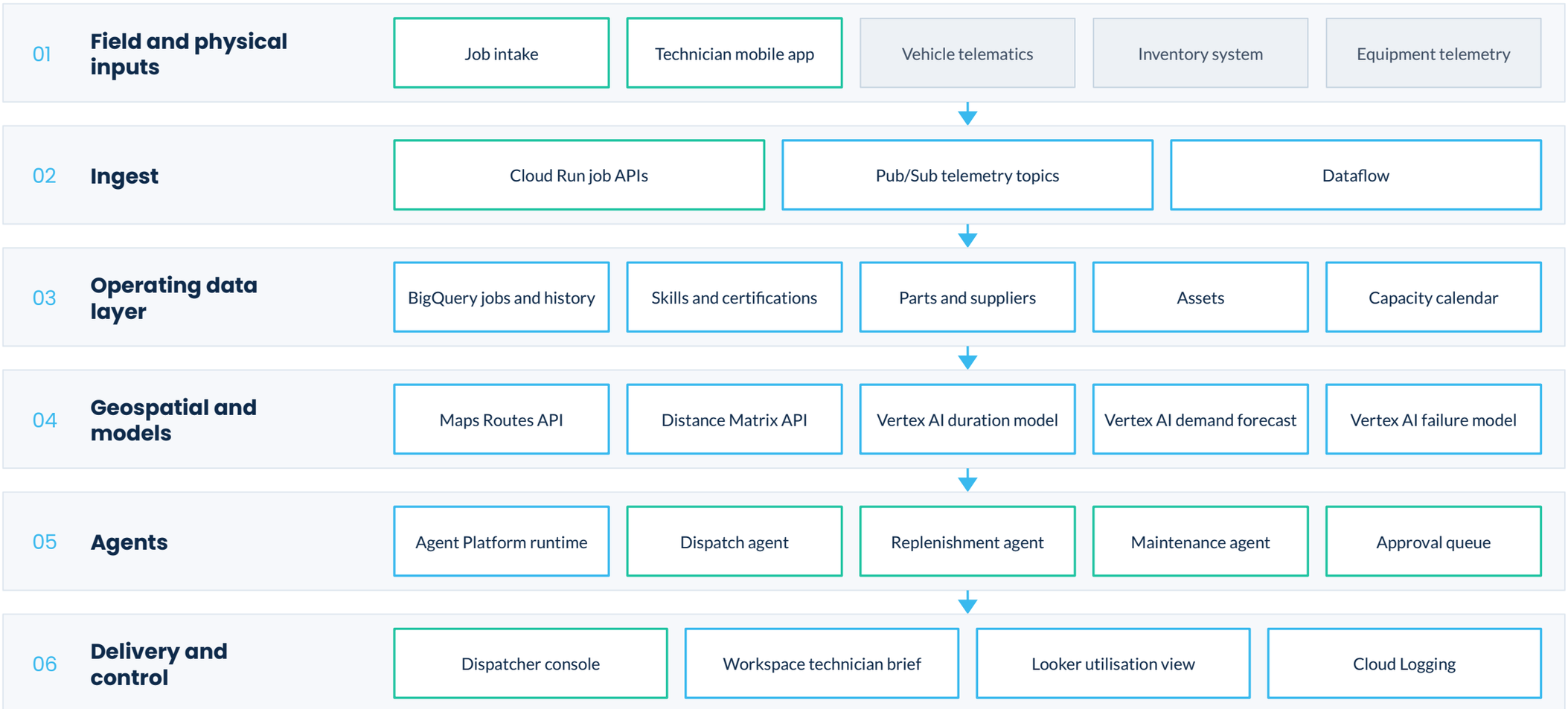
ARCHITECTURE

How the platform is put together

01	**Field and physical inputs**	Job requests, technician mobile updates, vehicle telematics, inventory movements and equipment telemetry through Pub/Sub
02	**Operating data layer**	BigQuery holds jobs, skills, parts, suppliers, assets and history in one model, so scheduling and buying use the same truth
03	**Geospatial**	Maps Platform provides travel time, distance matrices and route sequencing against real road conditions
04	**Models**	Vertex AI carries duration prediction, demand forecasting, lead time modelling and failure probability
05	**Agents**	The Agent Platform runs dispatch, replenishment and maintenance agents on triggers and on schedule
06	**Delivery**	Dispatcher console, technician briefing in Workspace, buyer recommendations and Looker for utilisation and margin

Google Cloud services used Gemini · Agent Platform · BigQuery · Vertex AI · Maps Platform · Looker · Pub/Sub · Cloud Run · Workspace

The components and how they connect



RUNTIME DATA FLOW

What happens when a callout comes in

01

Classify

The dispatch agent reads the request and identifies the fault class.

02

Predict

Vertex AI returns an expected duration from actual history for that fault.

03

Filter

Certification and skill act as hard constraints in the scheduler.

04

Check parts

Van and depot stock are compared against the likely parts list.

continues

05

Sequence

Maps Routes returns the cheapest insertion into the technician's day.

06

Approve

The dispatcher sees the reasoning and accepts or overrides the plan.

07

Brief

Site history, access notes, fault pattern and parts go to the technician.

08

Close

Completion produces documentation, follow up and the invoice trigger.

The agent recommends and the dispatcher decides. Booking is bounded by real crew capacity.

CAPABILITIES

Three operating domains, one data layer

Field service

- Classifies the job and predicts duration
- Matches skill, certification and location
- Optimises the route and the sequence
- Builds the technician briefing
- Generates documentation and invoice trigger

Supply chain

- Forecasts demand by SKU and location
- Predicts stockouts and excess stock
- Models supplier lead time and reliability
- Prepares purchase recommendations
- Flags orders at risk of late delivery

Industrial operations

- Monitors equipment condition
- Predicts failure ahead of breakdown
- Analyses downtime causes
- Tracks throughput and quality drift
- Plans maintenance against production

What it exposes

- Technician utilisation and idle time
- Repeat visits to the same fault
- Jobs that lost money
- Excess travel by route
- Parts shortages before they bite

WORKED EXAMPLE

A commercial HVAC callout on a Tuesday morning

01 Classify

The agent reads the request, identifies a compressor fault and predicts a two to three hour job.

02 Match

It filters to technicians holding the right refrigerant certification and finds the three who are closest.

03 Check parts

It compares the likely parts list against van stock and finds one missing at the nearest depot.

04 Sequence

It reflows the day so the technician collects the part on a route that costs nine extra minutes rather than an hour.

05 Brief

The technician receives site history, access notes, the fault pattern and the parts list before leaving.

06 Close

The completed job produces the documentation, the customer follow up and the invoice trigger automatically.

The gain is not one clever decision. It is the same decision made correctly forty times a day without a dispatcher doing arithmetic under pressure.

The controls that make this deployable in a real business

Certification enforcement

Skill and certification are hard constraints in the scheduler, not preferences.

Capacity limits

Booking is bounded by real crew capacity, so demand cannot oversell the operation.

Purchase approval

Replenishment produces a recommendation. A named buyer approves before anything is ordered.

Location privacy

Technician location is used for dispatch and retained under a stated policy, and it is not used for individual performance scoring without agreement.

Regulated intervals

Warranty and regulatory maintenance intervals are fixed inputs the optimiser cannot move.

Audit

Every dispatch decision, override and purchase recommendation is logged with its reasoning.

DELIVERY

How the engagement ran

Weeks 1 to 4

See the operation

Jobs, technicians, parts and assets were modelled in BigQuery. Utilisation, travel and repeat visits were measured properly for the first time.

Phase 1

Weeks 5 to 9

Dispatch and route

Job classification, duration prediction and route optimisation went live. The dispatcher moved from calculating to approving.

Phase 2

Weeks 10 to 14

Replenish

Demand forecasting and supplier lead time modelling began producing purchase recommendations for the buyer.

Phase 3

Weeks 15 onward

Predict failure

Condition monitoring and failure prediction moved maintenance off the calendar and onto the actual state of the machine.

Phase 4

Every phase ended with something the customer could use. No phase ended with a document only.

RESULTS

What the engagement delivered

Operations KPI	Domain	Result delivered
Technician scheduling time	Field service	**50 to 80% reduction**
Technician utilisation	Field service	**10 to 25% improvement**
Travel time	Field service	**10 to 25% reduction**
First time fix rate	Field service	**10 to 20% improvement**
Job documentation time	Field service	**50 to 80% reduction**
Stockouts	Supply chain	**20 to 40% reduction**
Excess inventory	Supply chain	**10 to 25% reduction**
Forecasting accuracy	Supply chain	**10 to 25% improvement**
Unplanned downtime	Industrial	**15 to 30% reduction**
Maintenance cost	Industrial	**10 to 25% reduction**

Each figure is measured against the baseline captured in phase one of the same engagement. Client identity is withheld at the client's request.

HEADLINE RESULTS

The five numbers this engagement moved

10 to 25%	10 to 25%	20 to 40%	15 to 30%	50 to 80%
Technician utilisation gain	Travel time reduction	Fewer stockouts	Less unplanned downtime	Less scheduling and admin effort

What that looked like in this business

This client ran twenty technicians. The utilisation and travel improvements together returned roughly three technician days a week to billable work, with no additional hiring.

GOOGLE CLOUD IMPACT

Three layers of measurement in every engagement

01 Business impact

Revenue, cost, productivity, downtime, inventory and customer experience. This is what the customer signed for.

02 AI impact

Automation rate, response time, prediction accuracy, resolution rate and human hours returned. This is what proved the system worked.

03 Google Cloud impact

Consumption and adoption the deployment created. This is what grows the account.

CONSUMPTION THIS DEPLOYMENT CREATED

- Maps Platform routing and distance matrix calls
- Vertex AI training and prediction volume
- BigQuery data processed and stored
- Pub/Sub messages per day from field and telemetry
- Agent executions per month
- Cloud Run requests per month
- Looker users and Workspace seats in the field

WHERE IT FITS

The businesses this solution is built for

This solution is designed for HVAC, plumbing, electrical, construction, logistics, warehousing, distribution, automotive service and small manufacturing. Geography: United States. Company size: 20 to 200 employees.

HVAC

Plumbing

Electrical

Construction

Logistics

Warehousing

Distributors

Automotive service

Equipment maintenance

Small manufacturing

The common shape

These businesses all have real operational complexity and no in house platform team. They already pay for the systems that hold the data, and they have never had a way to use it together. That is the gap this solution closes.

What we flagged before we started

RISKS WE MANAGED EXPLICITLY

Job duration data is usually poor

Most companies record scheduled time rather than actual time. We instrument actuals first, because prediction without them is decoration.

Dispatchers resist losing control

The agent recommends and the dispatcher approves, with the reasoning visible. Full automation is a later decision, not the starting point.

Route gains depend on job density

In a sparse territory the travel saving is smaller. We size the benefit against the customer's actual geography before we quote it.

Failure prediction needs failure history

A machine that has never failed teaches the model very little. Early phases focus on anomaly detection rather than on remaining life.

Telematics and field app data can be contested

Location tracking has to be agreed with the crew. We set the policy before the data is used, not after.

WHAT WE SETTLED IN DISCOVERY

- Which field service and inventory systems are authoritative, and do they expose write APIs?
- How much actual job duration history exists, as opposed to scheduled duration?
- What certification matrix governs which technician can take which job?
- Who is the named buyer for replenishment approvals?

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Let us talk about your operation

The next step we would suggest is a two week assessment against your own data. It tells you which of these numbers are reachable in your business before you commit to a programme.

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Disclaimer

This document describes work Tech4Biz Solutions has delivered. The performance figures shown were measured after implementation against a baseline captured during phase one of the same engagement. They describe what this client achieved and they are not a warranty of the same outcome elsewhere.

Results in another business will depend on the quality and completeness of its existing data, the systems in use, the level of process change it is willing to make, and the licence tiers held for the underlying platform services.

Client identities are withheld at the client's request. Sector and geography descriptors are provided in place of names, and figures are reported as measured.

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