Data-Driven Signal Operations for High-Growth Regions

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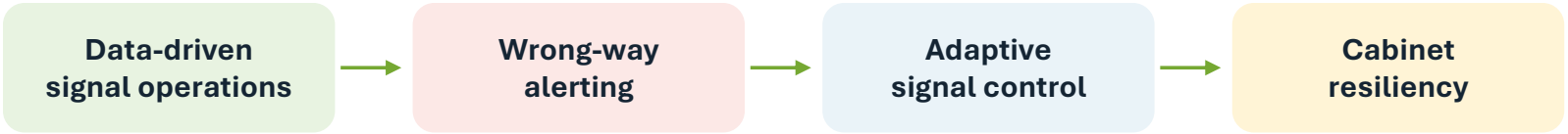
One session, one operating idea

Modern signal systems need to detect conditions, support decisions, and keep operating under stress.



Visibility → faster response → safer, more reliable operations

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The operating challenge is getting harder

Population growth

Freight pressure

Transit expansion

Weather disruption

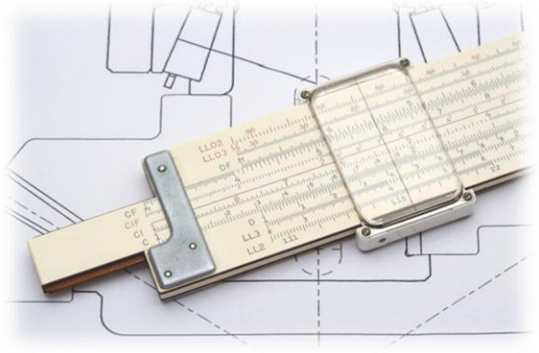
Multimodal safety

Result: more unpredictable demand and higher expectations for response

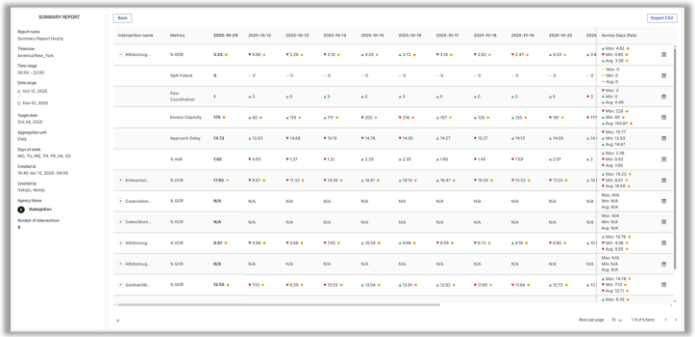
From periodic timing plans to performance management

Data-driven operations turn everyday controller and field information into an actionable operating picture.

Traditional operating model



Performance-based model



The goal is not more data. The goal is a better workflow.

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What should agencies measure first?

Start with metrics that connect directly to an operational decision.

Split failures	Is a movement regularly under-served?
Arrival patterns	Is coordination delivering arrivals on green?
Detector reliability	Can the system trust its own inputs?
Pedestrian delay	Are vulnerable users waiting too long?
Queue buildup	Where are recurring or spillback queues forming?
Offset performance	Is the corridor progressing as intended?

Good metrics point to action: retiming, repair, priority treatment, or operational strategy.

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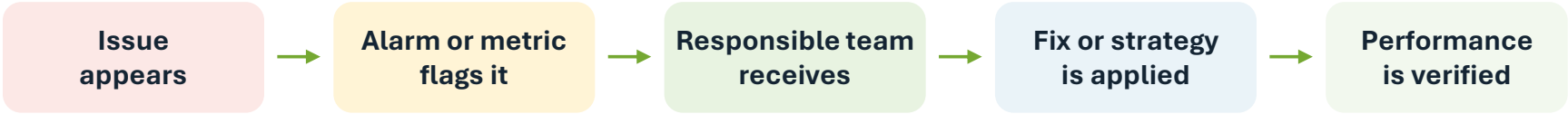
Data has value when it changes workflows

Build the handoff from analytics to engineering, operations, and maintenance.



Examples: detector repair, timing plan review, offset adjustment, queue management, priority treatment, or cabinet resiliency investment.

The workflow is the product: who sees the issue, who owns it, and how the fix is confirmed.

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Safety-critical alerts use the same data-to-action loop

Wrong-way driving changes the time scale: seconds matter.

Operational questions: Can the system detect the event, route a trusted alert, support a rapid response, and preserve data for after-action review?

Alerts are not just for congestion management; it is a safety function.

Adaptive control is data-driven operations in real time

Federal Way shows how smarter operations can support growth, safety, transit, and freight reliability.

GROWTH PRESSURE

- Population growth
- Light rail expansion
- Freight activity along I-5 and SR 18
- Regional trade hub role

ADAPTIVE RESPONSE

- Timing adjusts to actual traffic flow
- Public transport reliability improves
- Pedestrian movements receive stronger support
- Data supports long-term planning

OUTCOMES TO TRACK

- Peak-hour delay
- Transit performance
- Vulnerable-user protection
- Vision Zero
- Freight and first responder access

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The data-driven system still depends on field resiliency

Cabinet design, backup power, and maintenance access determine whether operations survive weather events.

POWER

- Identify vulnerable intersections
- Determine required run time
- Integrate backup power directly into cabinet

ACCESS

- Organize wiring for storm response
- Improve layout efficiency
- Support safer technician access in poor conditions

FIELD FEEDBACK

- Learn from maintenance crews
- Reduce response time
- Prioritize design features that matter during real outages

Analytics may identify the problem, but resilient cabinets keep the system operating.

A practical starting point

1
Start with what you have

2
Build the rhythm

3
Scale toward smarter systems

Data-driven signal operations are the foundation for safer, adaptive, and resilient networks.