



Continuous Temperature Mapping (cTM)

“Automate validation, speed compliance, ensure integrity”



INTRODUCTION

Continuous Temperature Mapping (cTM) by xLM is an AI-powered, real-time environmental monitoring and validation solution designed to revolutionize how regulated facilities manage temperature-critical processes. Unlike traditional, manual, and periodic temperature studies, cTM delivers:

- Automated data collection and AI-based analysis
- Predictive alerts and anomaly detection
- GxP-compliant, audit-ready reports
- Real-time dashboards for instant decision-making

With cTM, temperature mapping becomes continuous, compliant, and intelligent improving product integrity while dramatically reducing timelines and manual effort.



Vision for cTM



In the evolving GxP environment, compliance alone is no longer sufficient. Organizations need systems that are:

- Predictive – Not just reactive
- Continuous – Not limited to validation windows
- Integrated – Not siloed across spreadsheets and teams
- Intelligent – Capable of real-time learning and adaptation

cTM embodies this vision by merging IIoT, machine learning, and intelligent automation to transform static temperature mapping into a proactive, resilient, and scalable compliance strategy.

Whether it's storage rooms, cold chains, or manufacturing zones cTM ensures your environment is always validated, monitored, and compliant by design.



OUR PROCESS

► Effortless Sensor Deployment

NFC/RF-based IIoT sensors are installed and connected to cTM cloud gateways.

► ML-Powered Analysis

Data is normalized, cleaned and processed using AI/ML pipelines.

► Anomaly & Drift Detection

Built-in workflows for incidents, change, problem management with audit trail.

► Prioritization & Assignment

Real-time temperature readings flow continuously into the cloud.

► Compliance & Audit Readiness

Fixed/Temporary sensor views with timeline overlays, out-of-spec flags, and T-tests.

► Audit-Ready Reports

GxP-compliant reports auto-generated with complete audit trails.

INTELLIGENT FEATURES

- ▶ **Validated GxP Dashboards**
Monitor and compare sensors in real time with role-based access.
- ▶ **AI/ML Automation**
Automates data preprocessing, anomaly detection, and prediction.
- ▶ **Predictive Alerts & Analytics**
Detect drifts, flag excursions, and forecast trends.
- ▶ **Automated Compliance Reports**
Compliant PDF reports with versioning and e-signatures.
- ▶ **Audit Trail**
All actions from collection to download are fully traceable.
- ▶ **“Chat with Data” Interface**
AI agents turn natural queries into insights.



VALUE MATRIX

Aspect	Traditional Validation	cTM by xLM	ROI Impact
Setup Time	Manual sensor placement and config for each run	One-time sensor deployment with auto-connection	Setup time reduced by 70–80%
Data Collection	Offline loggers collected post-study	Real-time wireless transmission	Instant data access
Data Analysis	Excel-based manual calculations	AI/ML models with automatic normalization and statistical analysis	90% faster insight delivery
Reporting	Manual QA review and formatting of PDF reports	Automated GxP-ready reports	90% reduction in report time
Anomaly Detection	Reactive, post-study	Predictive, real-time alerts	Prevent issues before escalation
Compliance Risk	High due to fragmented data and human error	Minimal with auto-validation and logging	Built-in Part 11 / Annex 11 readiness
Cost Efficiency	High FTE demand, study delays, compliance risk penalties	Automation reduces resource load and rework	Up to 80% total cost savings

ABOUT US

xLM is a trusted managed application provider enabling FDA-regulated organizations to modernize compliance, quality, and IT operations.

With decades of domain expertise and a technology-first mindset, xLM helps companies scale digital transformation without compromising on validation, traceability, or audit-readiness.

Our Other Applications

➤ Continuous Intelligent Validation (cIV)

➤ Continuous Predictive Maintenance (cPdM)

➤ Continuous Environmental Monitoring System (cEMS)

➤ Continuous Temperature Mapping (cTM)



Our stack incorporates intelligent and responsible AI into all our managed services. From Predictive Analytics to Software Validation, our apps are pre-built with best practices so that they can be deployed within days or hours.



Intelligent Application Provider

All our apps are delivered as managed apps. We do the heavy lifting so that you can focus on building your business



Intelligent and Responsible AI

Through our partnership with IBM, all our AI centric apps are delivered with cLCG (Continuous Life Cycle Governance)



White Glove Service

Our team does more than 95% of the heavy lifting. All we need from you are approvals



Extensive App Portfolio

xLM leverages its robust partner ecosystem to deliver over 15 managed apps and it is growing



Delivered Validated

All our managed apps are delivered “validated”



21 CFR Part 11/Annex 11/FDA CSA Compliant

Ensures all our managed services are compliant out of the box



High Data Integrity Assurance

Our services guarantee accurate, reliable and resilient data across all our managed apps

[Get Started](#)

