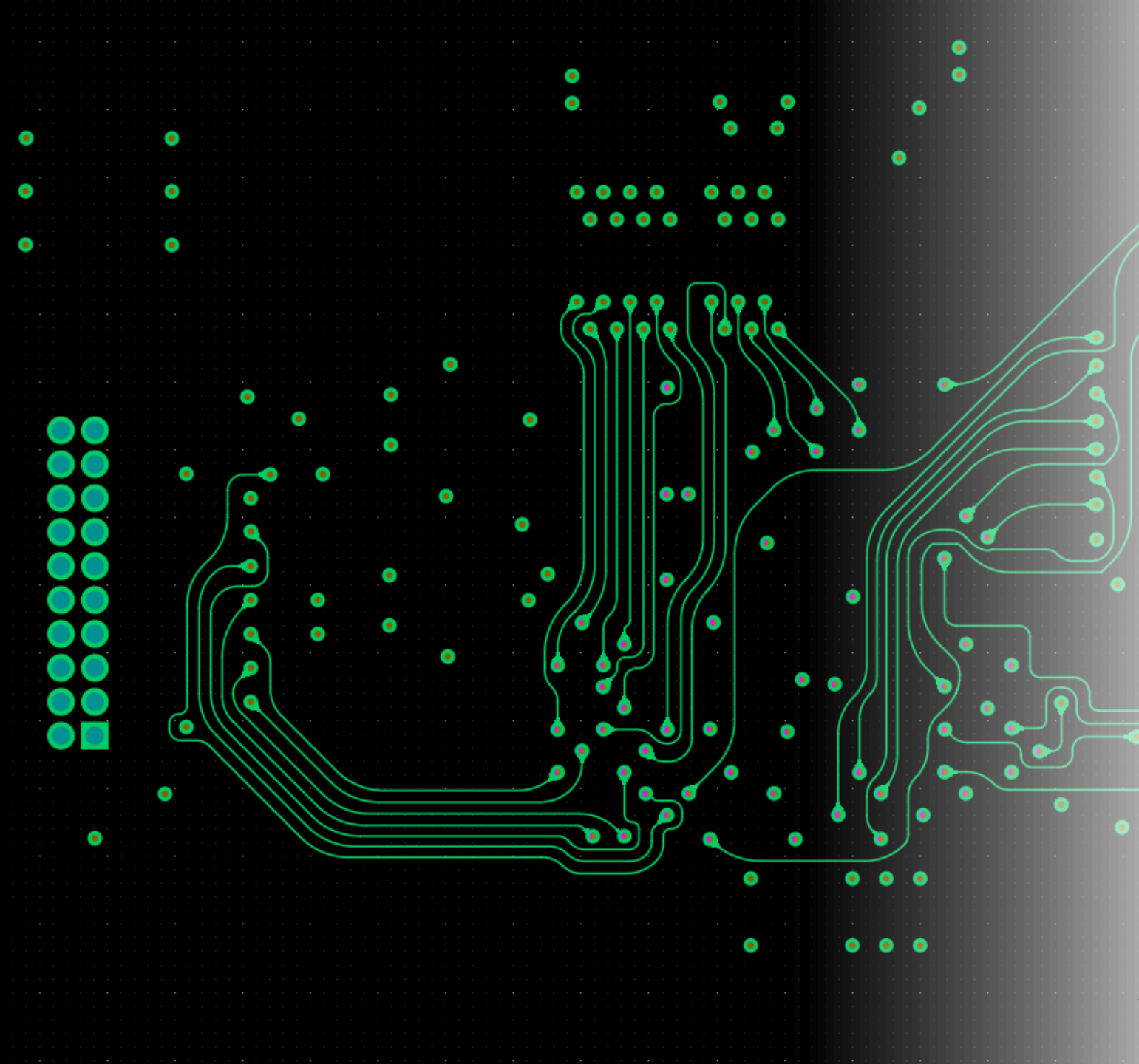


The Myth of Over-Constraining

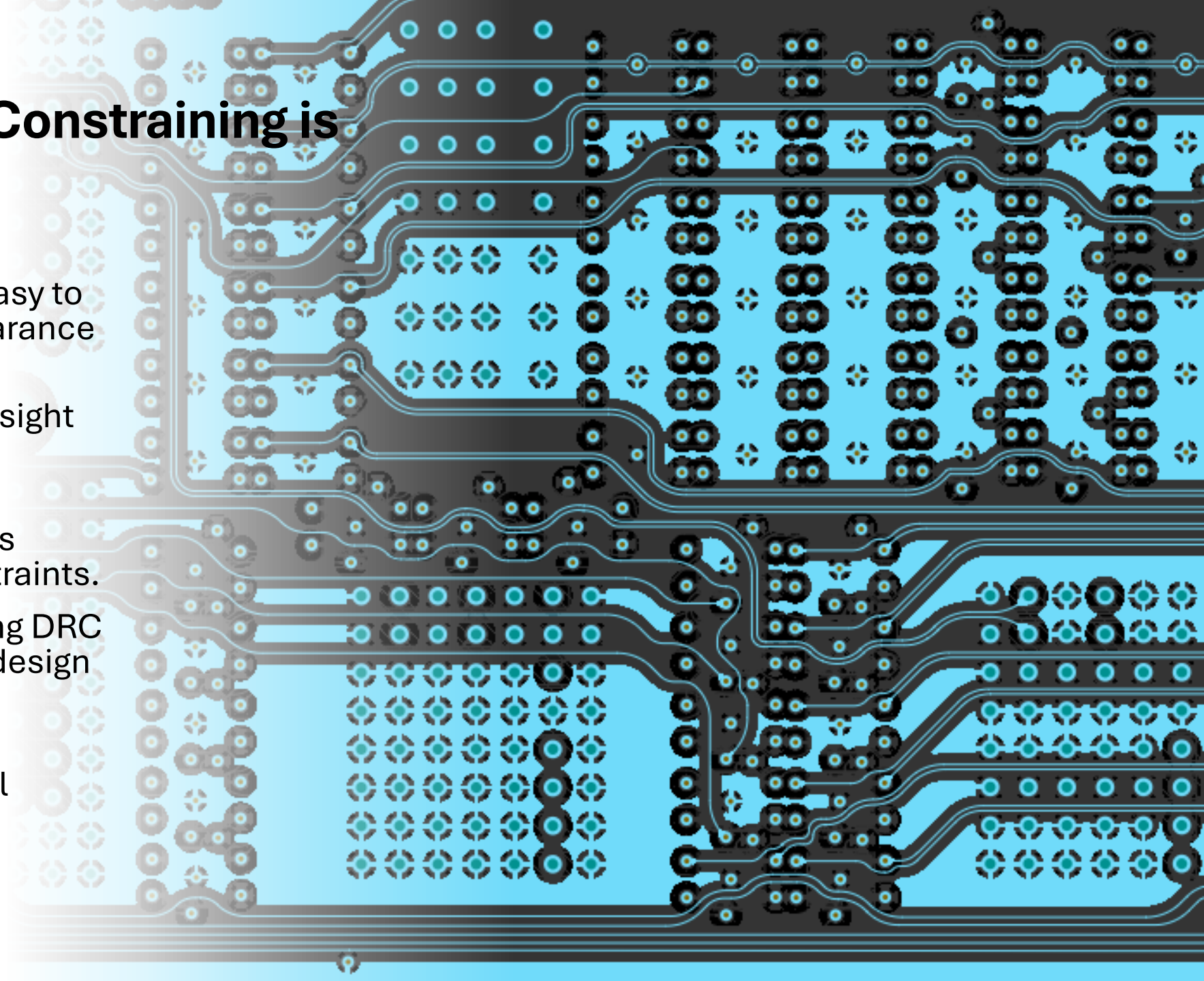
Why experienced engineers should trust their design judgement, not over-restrict their tools

Layout examples in slides are from one of my boards enjoy the organic style routing ☺

Power Point Presentation By
Andy Carpenter 2025

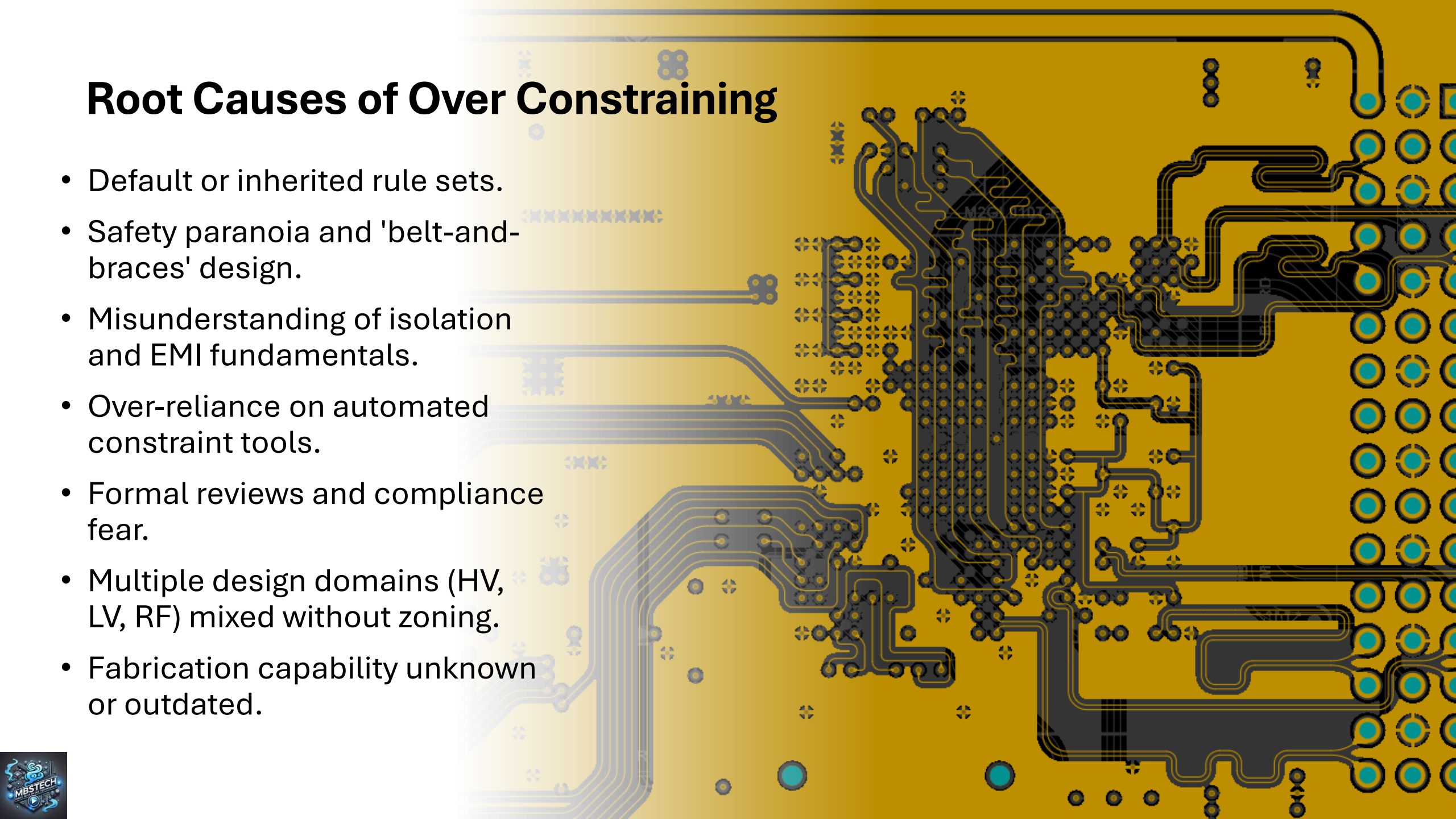
The Problem: Over-Constraining is Common

- Modern EDA tools make it easy to lock every net, pair, and clearance with rigid rules.
- Fear of failure, audit, or oversight leads to 'margin on margin' culture.
- Copy-pasted legacy rule sets accumulate irrelevant constraints.
- Engineers spend time fighting DRC errors instead of improving design integrity.
- Result: Slower layout, larger boards, higher cost, and dull innovation.



Root Causes of Over Constraining

- Default or inherited rule sets.
- Safety paranoia and 'belt-and-braces' design.
- Misunderstanding of isolation and EMI fundamentals.
- Over-reliance on automated constraint tools.
- Formal reviews and compliance fear.
- Multiple design domains (HV, LV, RF) mixed without zoning.
- Fabrication capability unknown or outdated.

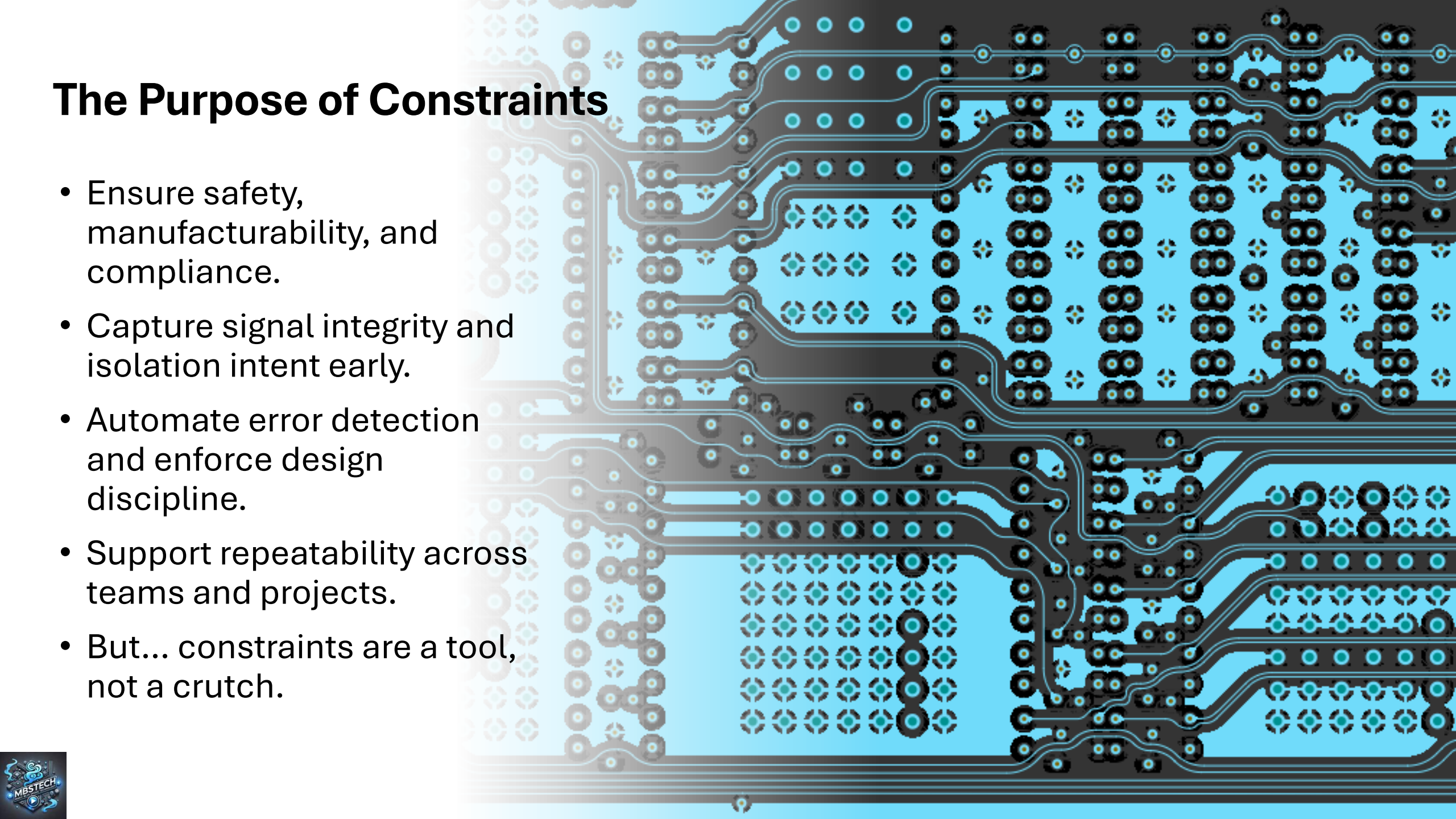


The Experienced Engineer’s Mindset

- If you can read schematics, understand high-speed design, EMI coupling, PDN behaviour, and voltage clearance physics — you don’t need to constrain everything to death.
- Use rules where they protect safety, manufacturability, or timing — not to silence the DRC.
- Apply constraints surgically — by domain, not globally.
- Document rationale, not excess margins.
- Stop letting the tool do your Job, it doesn’t know everything, not yet anyways ☺.

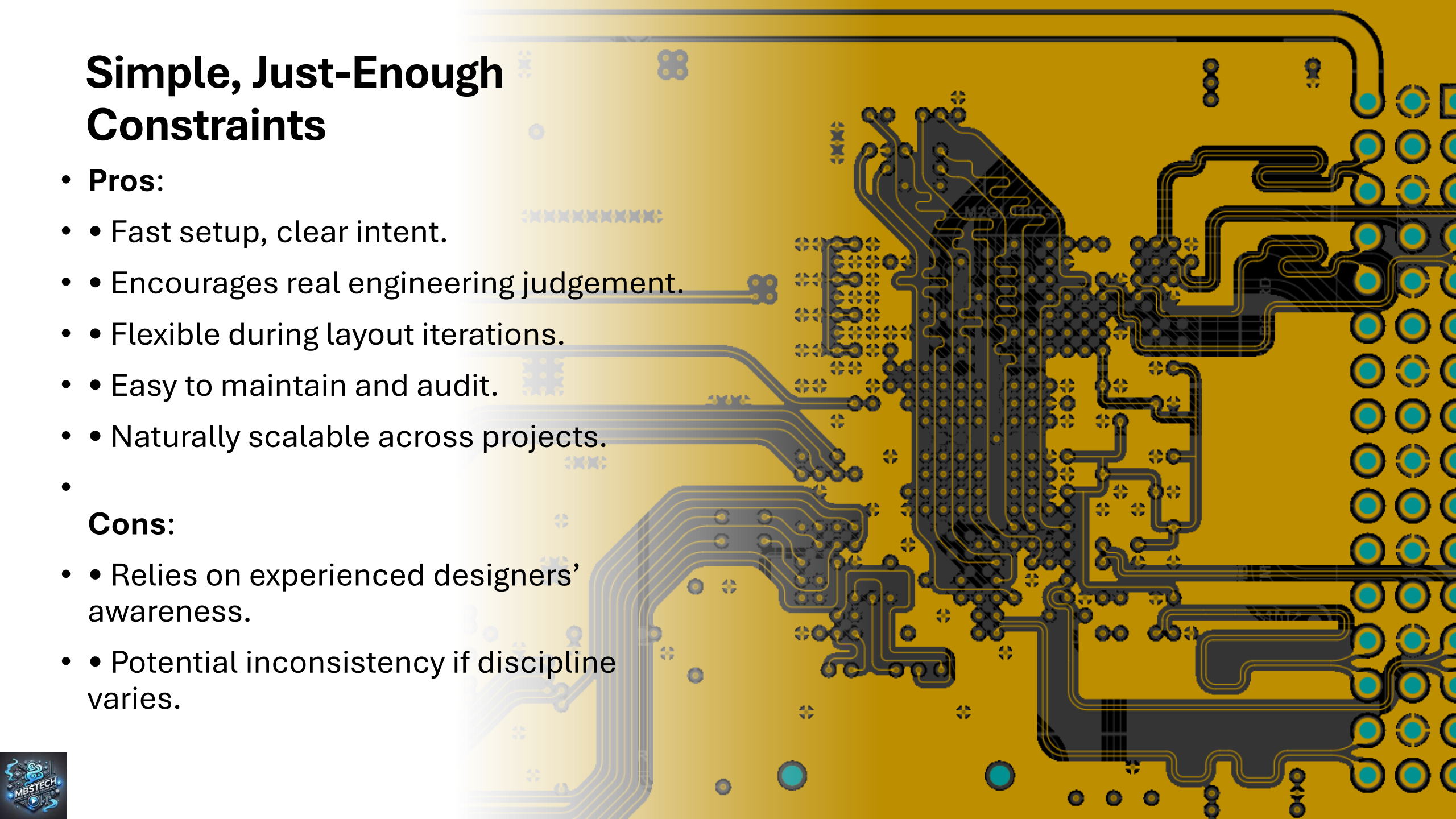
The Purpose of Constraints

- Ensure safety, manufacturability, and compliance.
- Capture signal integrity and isolation intent early.
- Automate error detection and enforce design discipline.
- Support repeatability across teams and projects.
- But… constraints are a tool, not a crutch.



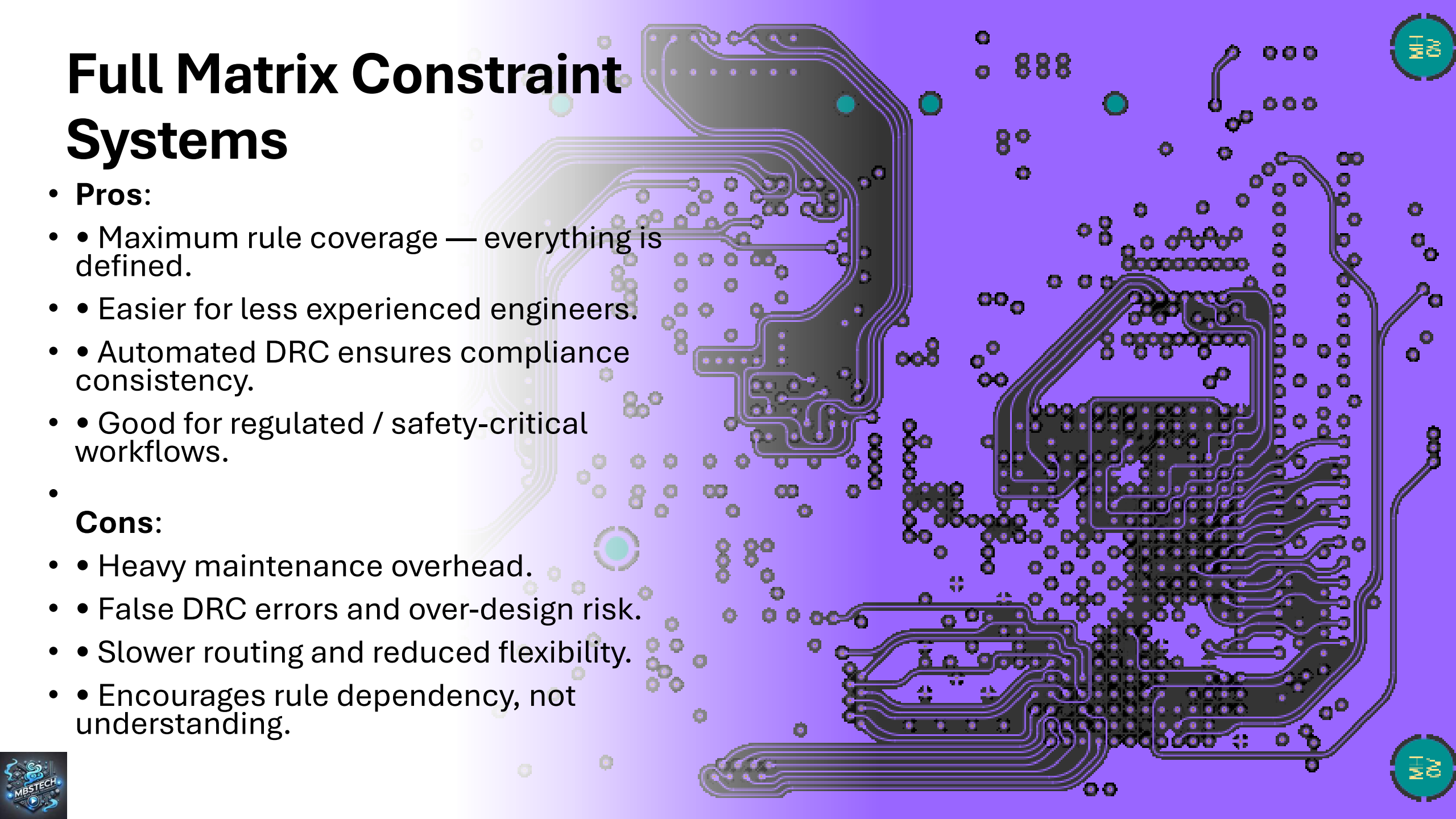
Simple, Just-Enough Constraints

- **Pros**:
- • Fast setup, clear intent.
- • Encourages real engineering judgement.
- • Flexible during layout iterations.
- • Easy to maintain and audit.
- • Naturally scalable across projects.
- **Cons**:
- • Relies on experienced designers' awareness.
- • Potential inconsistency if discipline varies.



Full Matrix Constraint Systems

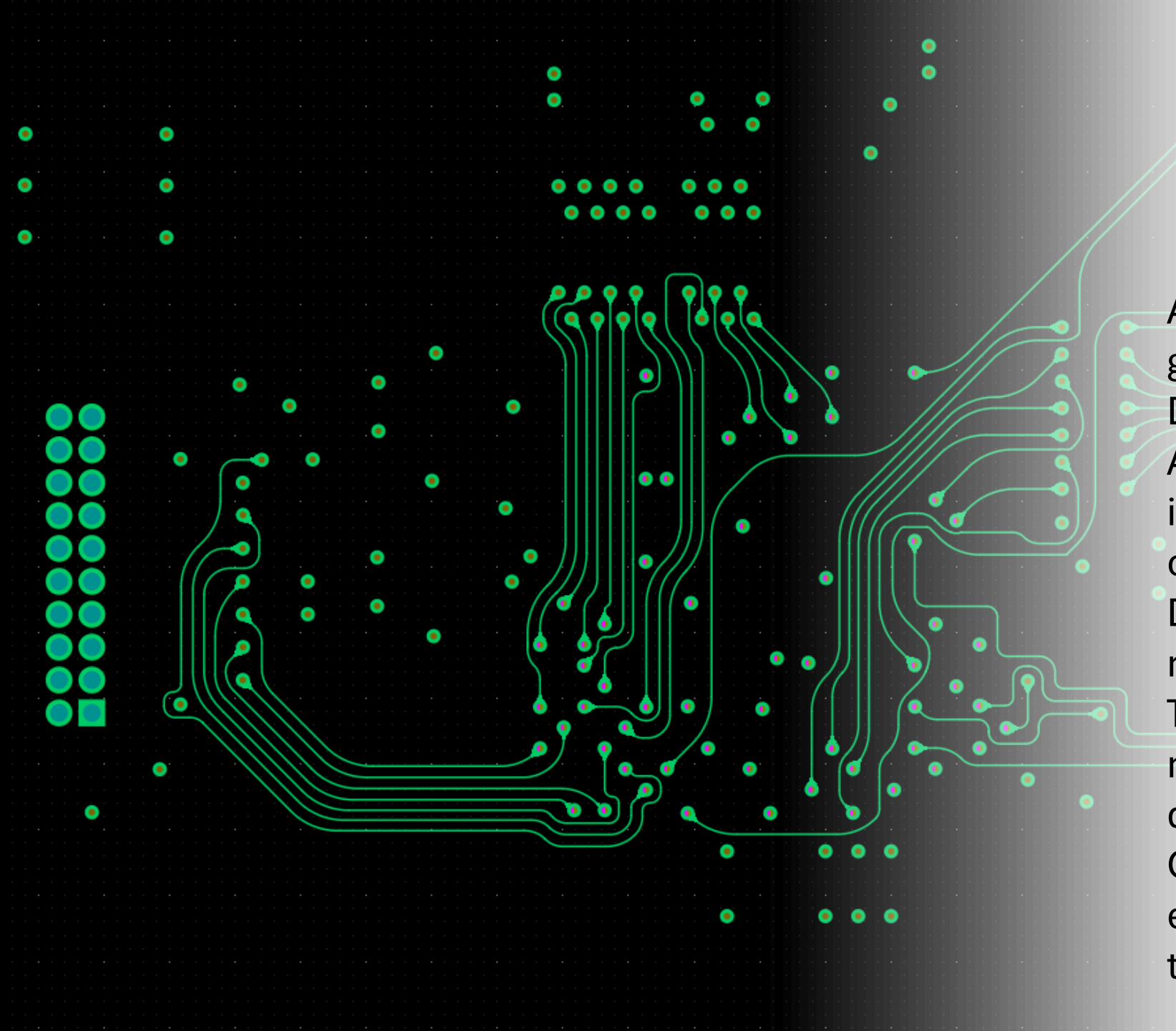
- **Pros**:
- • Maximum rule coverage — everything is defined.
- • Easier for less experienced engineers.
- • Automated DRC ensures compliance consistency.
- • Good for regulated / safety-critical workflows.
- **Cons**:
- • Heavy maintenance overhead.
- • False DRC errors and over-design risk.
- • Slower routing and reduced flexibility.
- • Encourages rule dependency, not understanding.



The Balanced Approach

Domain	When to Constrain	When to Use Judgement
Clearance	Only across isolation or safety barriers	Within low-voltage logic regions
Impedance	On differential or long high-speed lines	On short or low-frequency nets
PDN/Vias	For high current paths	Standard signal vias
Timing/Length Matching	On synchronous interfaces	Asynchronous control signals
ESD/EMI	Apply per topology	Avoid global 'shield all' rules

“Constraint discipline is not about quantity — it’s about credibility.”



Striking the Balance

Apply simple constraints globally — spacing, hole sizes, DFM limits.

Add targeted constraints — impedance, clearance, timing — only where critical.

Document the rationale, not the rule count.

Trust experienced engineers to make informed layout decisions.

Goal: Just enough constraint to enforce intent, not to replace thinking.