Recovering Debug Information from Randomized Code Movement

Steven Neisius, UC Irvine

SoCal PLS, Fall 2013

Motivation

* Many projects have applied diversity to binaries

* A. Homescu, S. Neisius, P. Larsen, S. Brunthaler, and M. Franz; "Profile-guided Automated Software Diversity,"' in 2013 International Symposium on Code Generation and Optimization (CGO 2013), Shenzhen, China; February 2013.

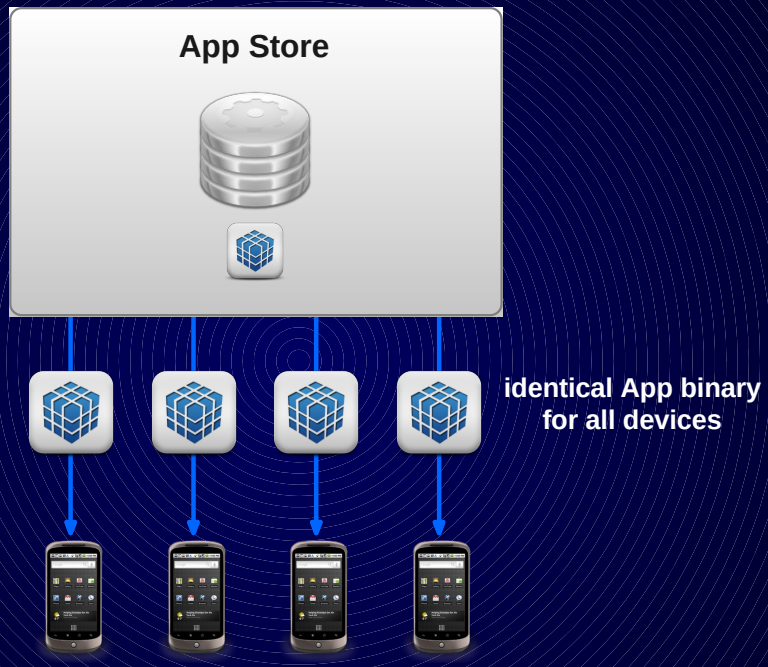
* Richard Wartell, Vishwath Mohan, Kevin W. Hamlen, and Zhiqiang Lin. 2012. Binary stirring: self-randomizing instruction addresses of legacy x86 binary code. In Proceedings of the 2012 ACM conference on Computer and communications security (CCS '12). ACM, New York, NY, USA.

* Etc...

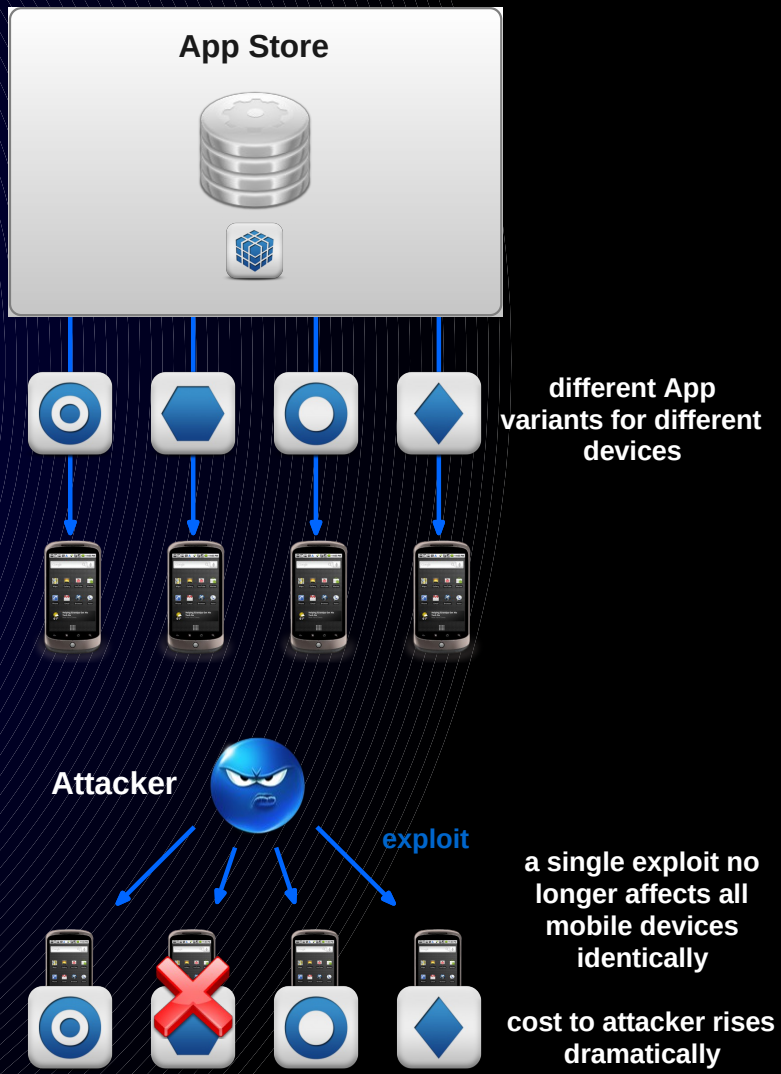
* None have explored crash reporting

Diversity In A Nutshell

Current Practice



With Software Diversity

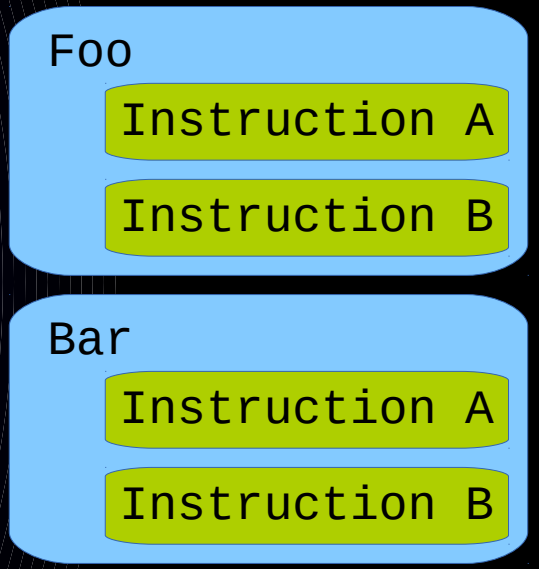


Code Movement Transformations

* NOP Insertion

* Schedule Randomization

* Function Layout



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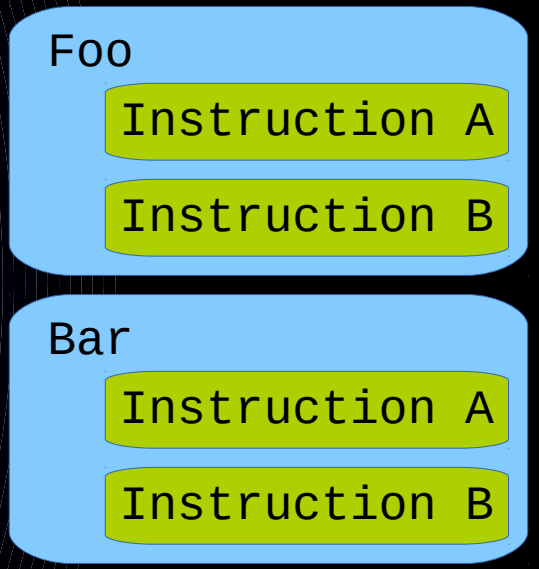

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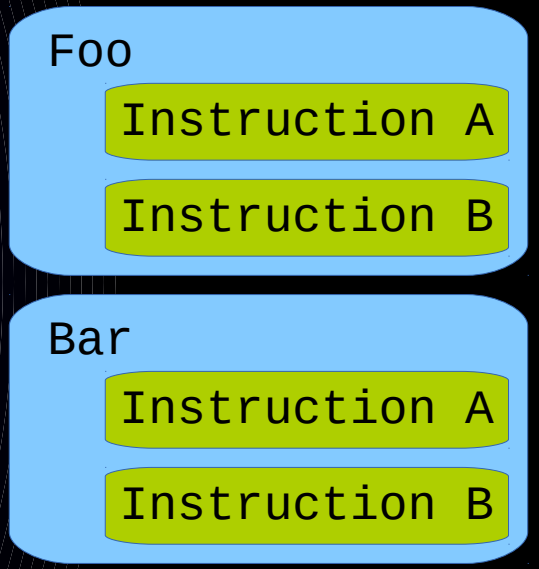

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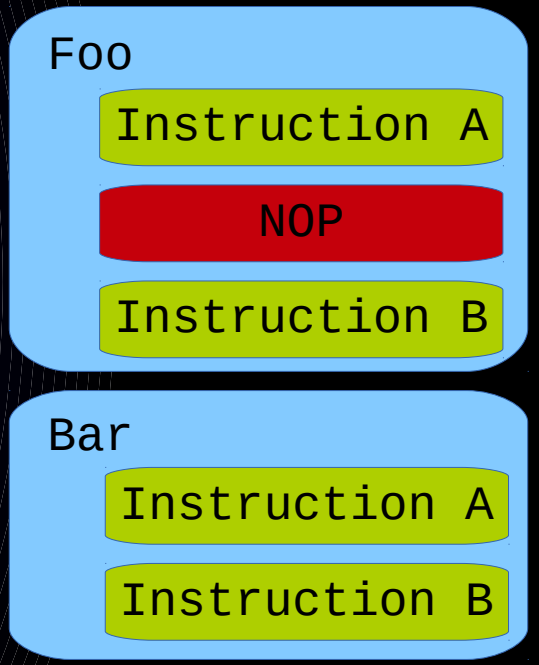

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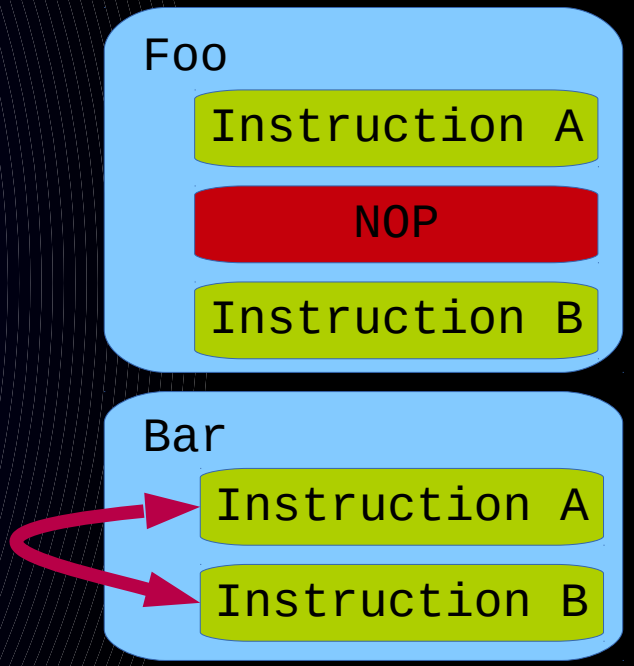

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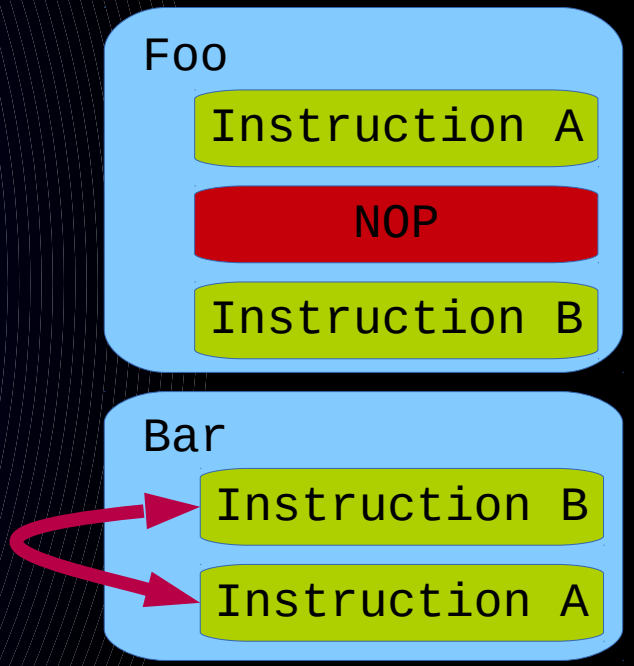

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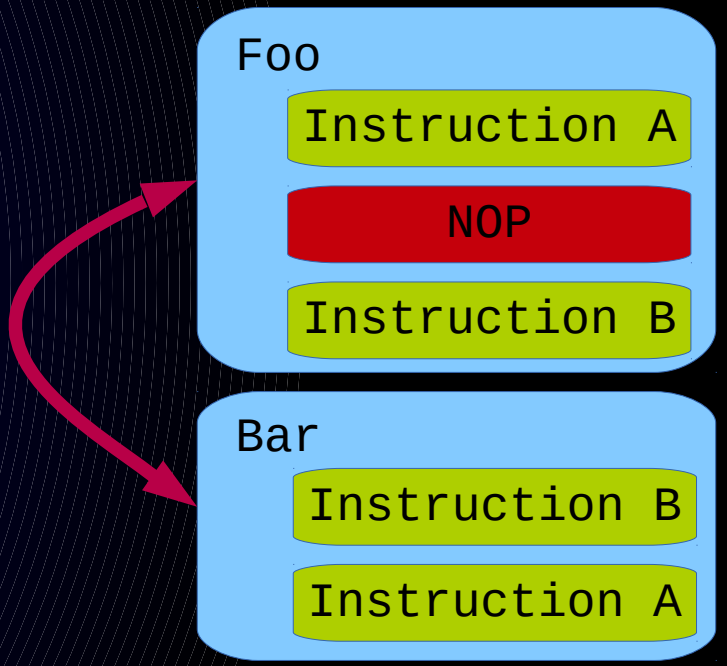

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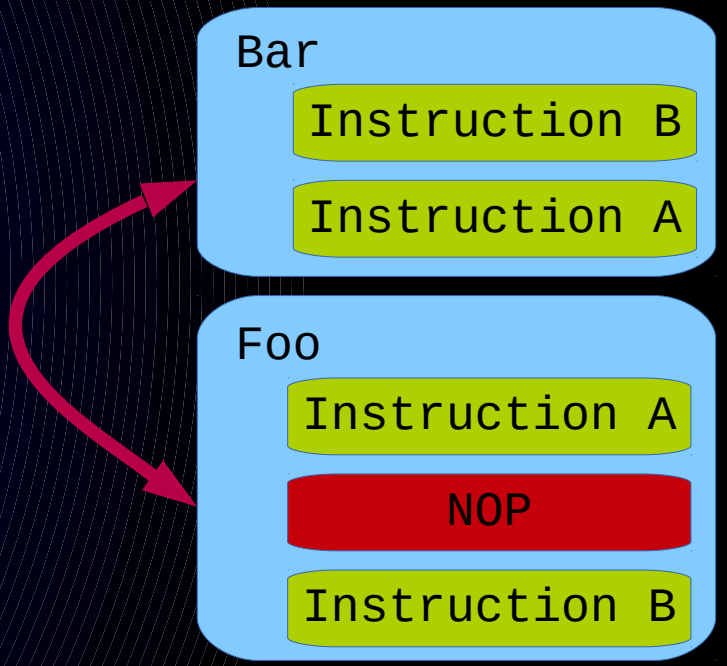
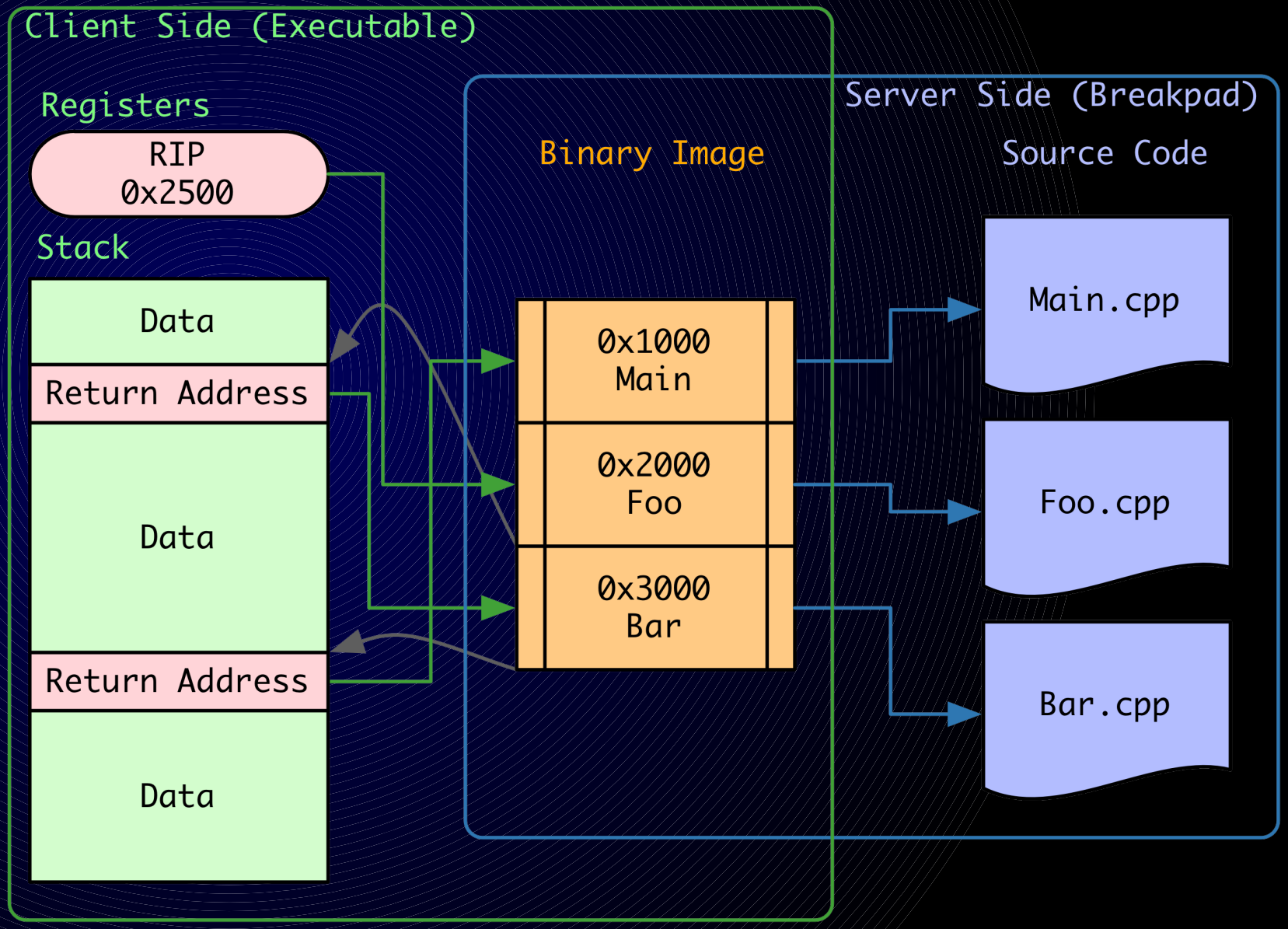


Crash Reporting



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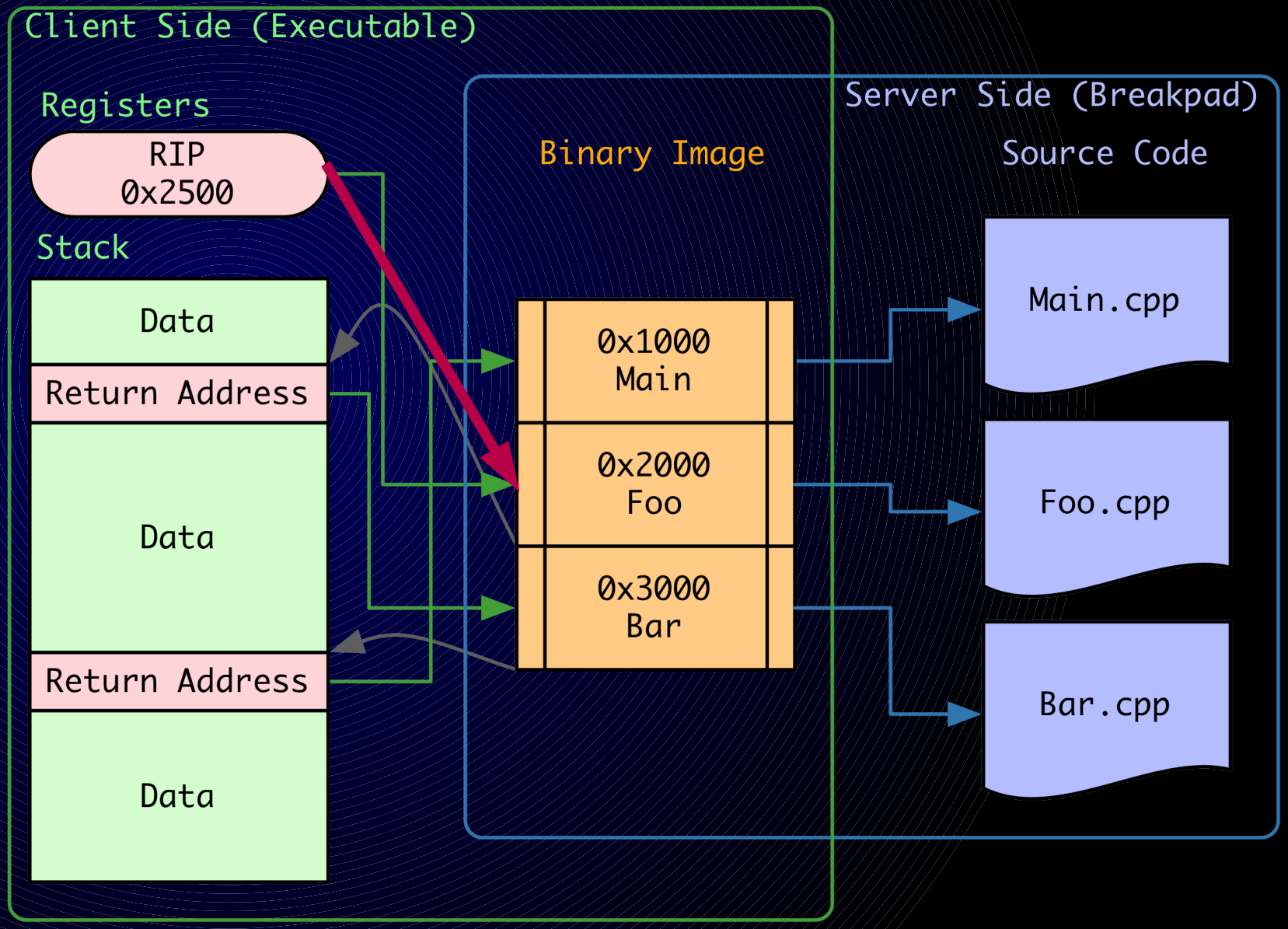

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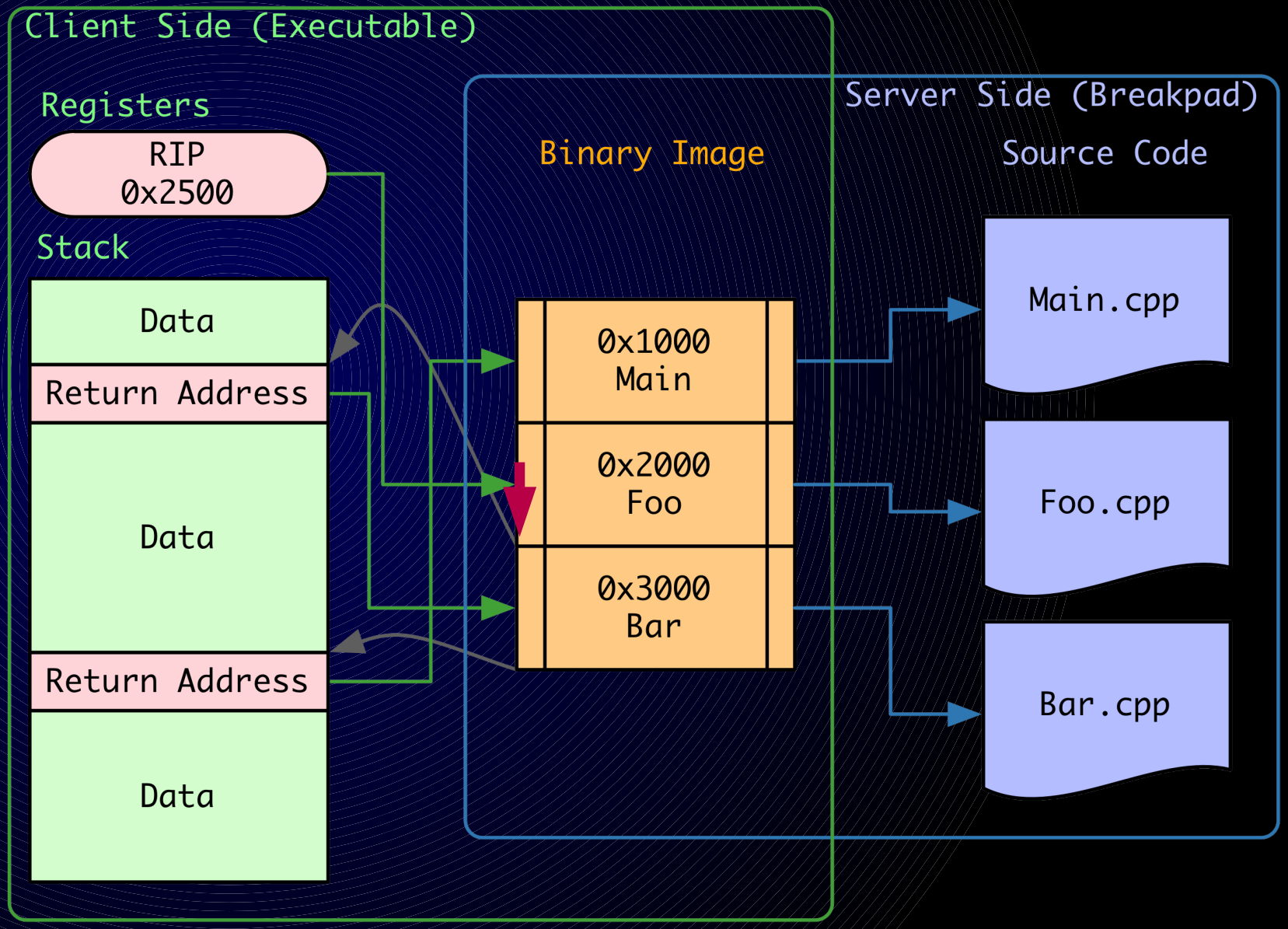

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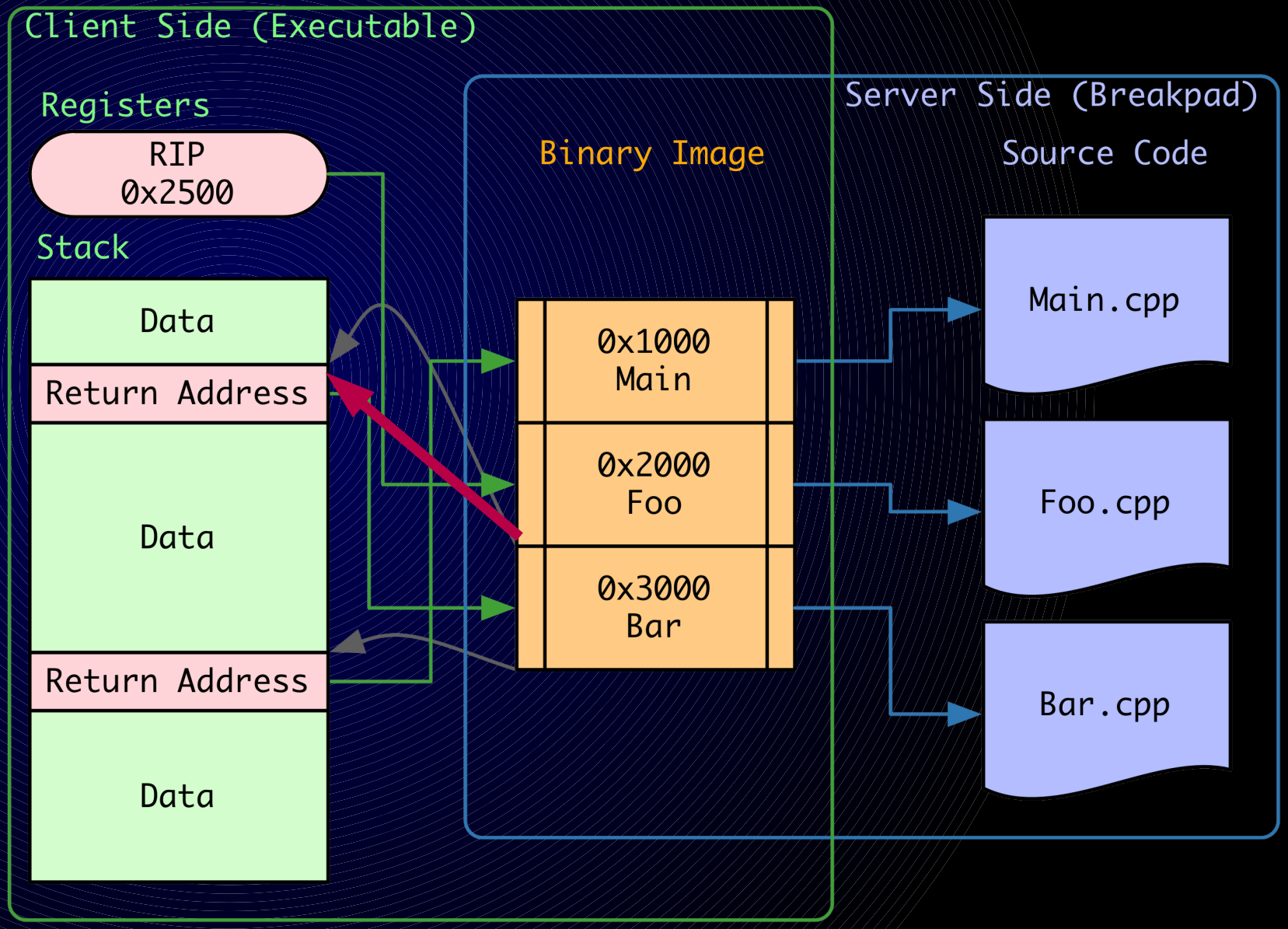

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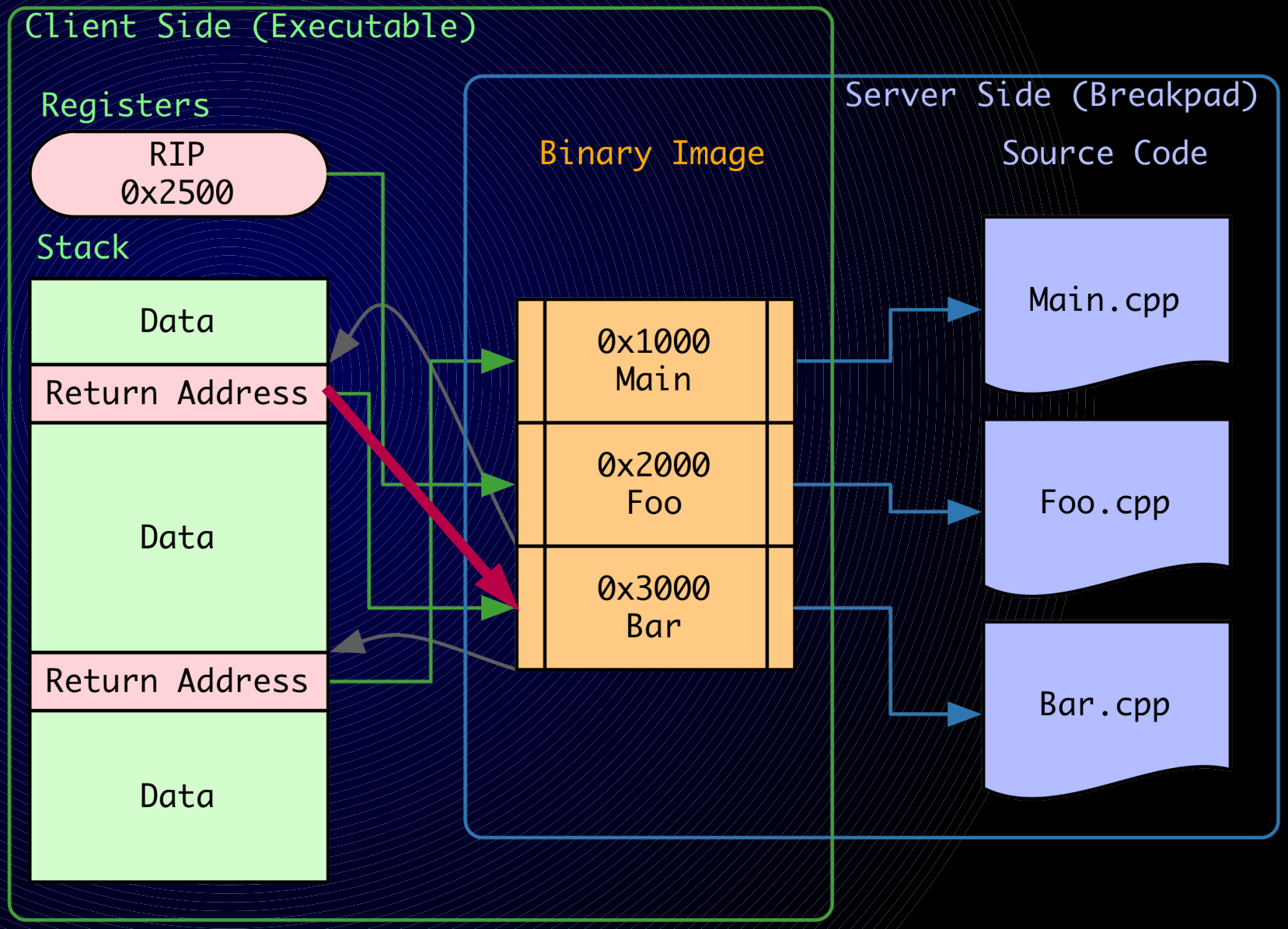

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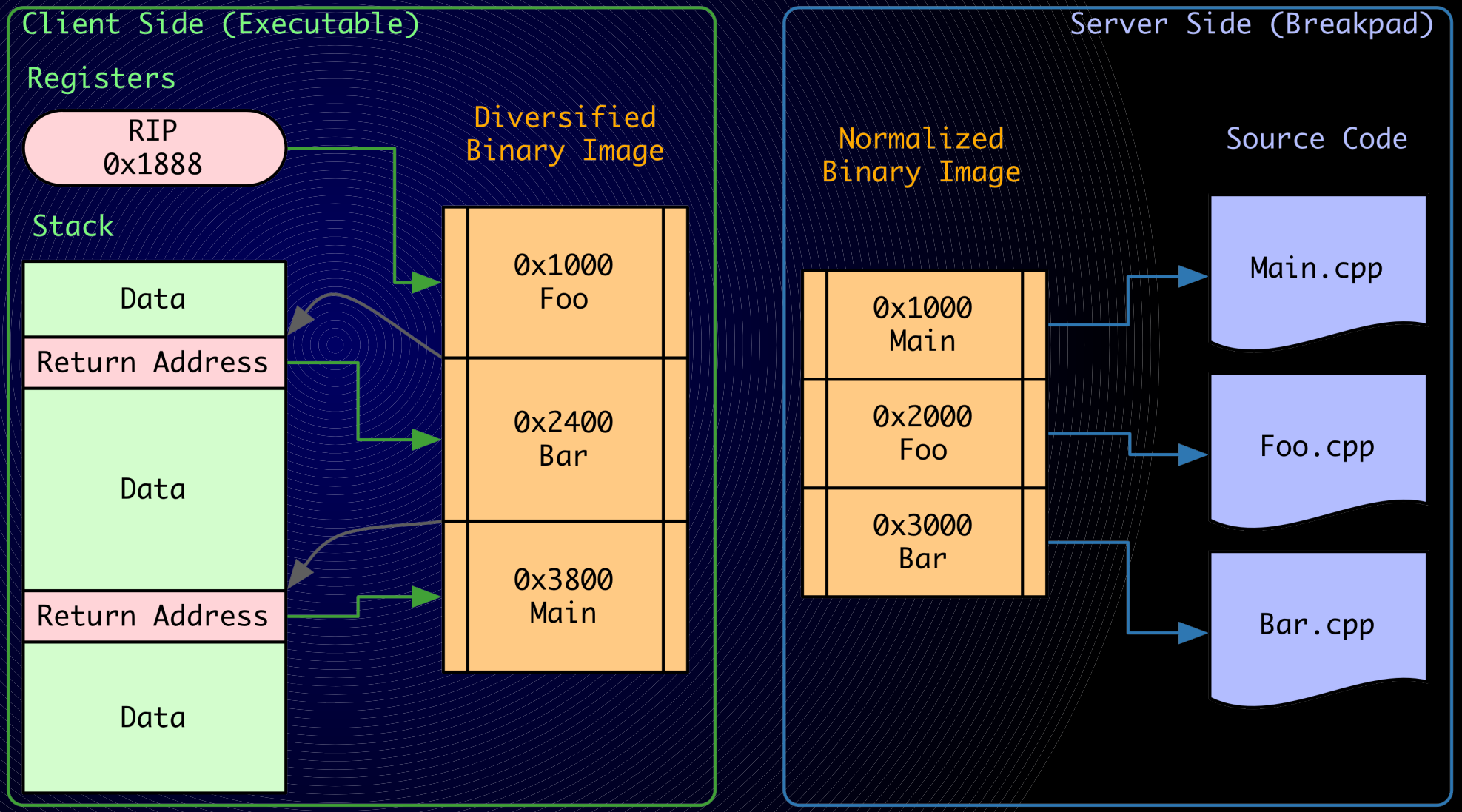

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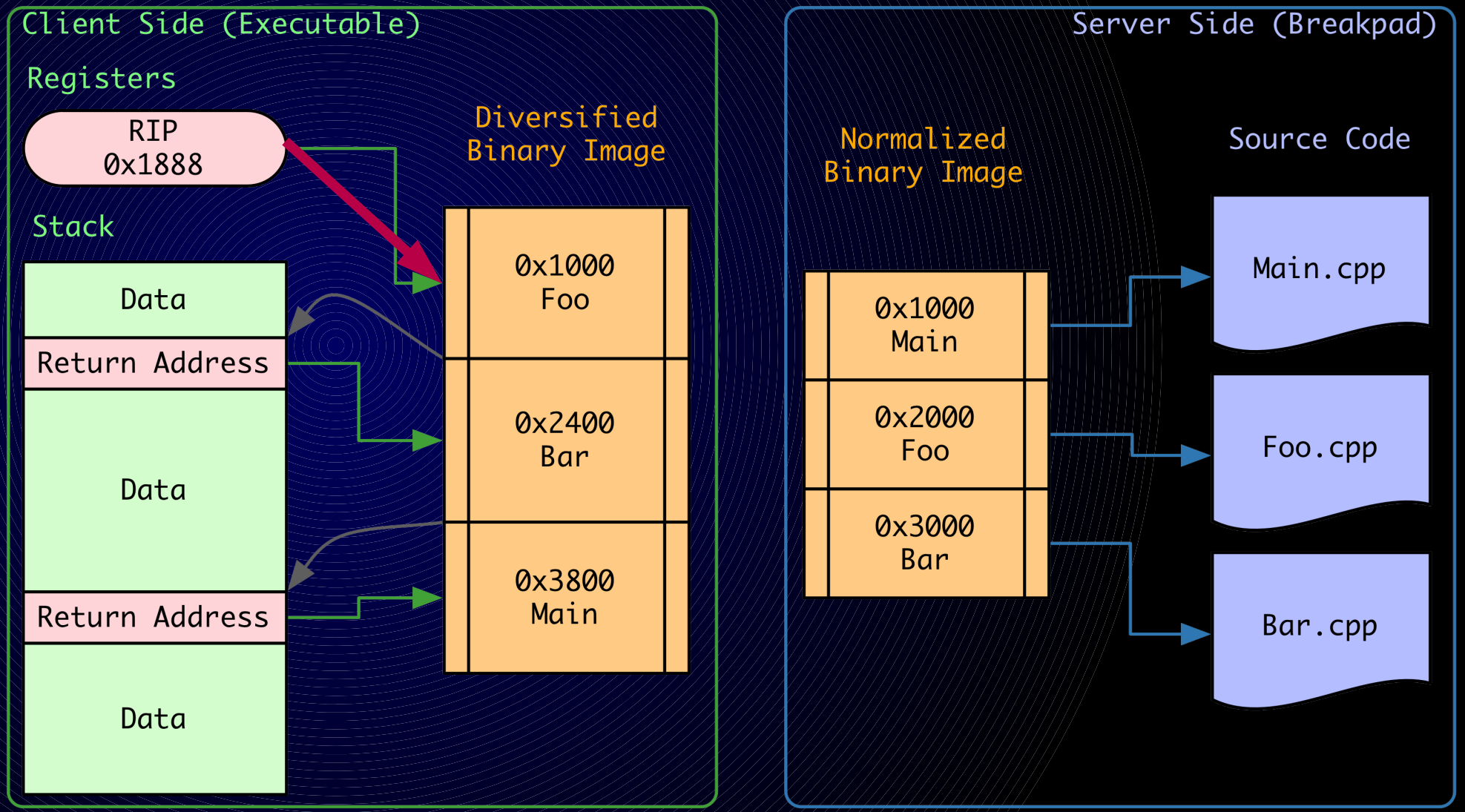

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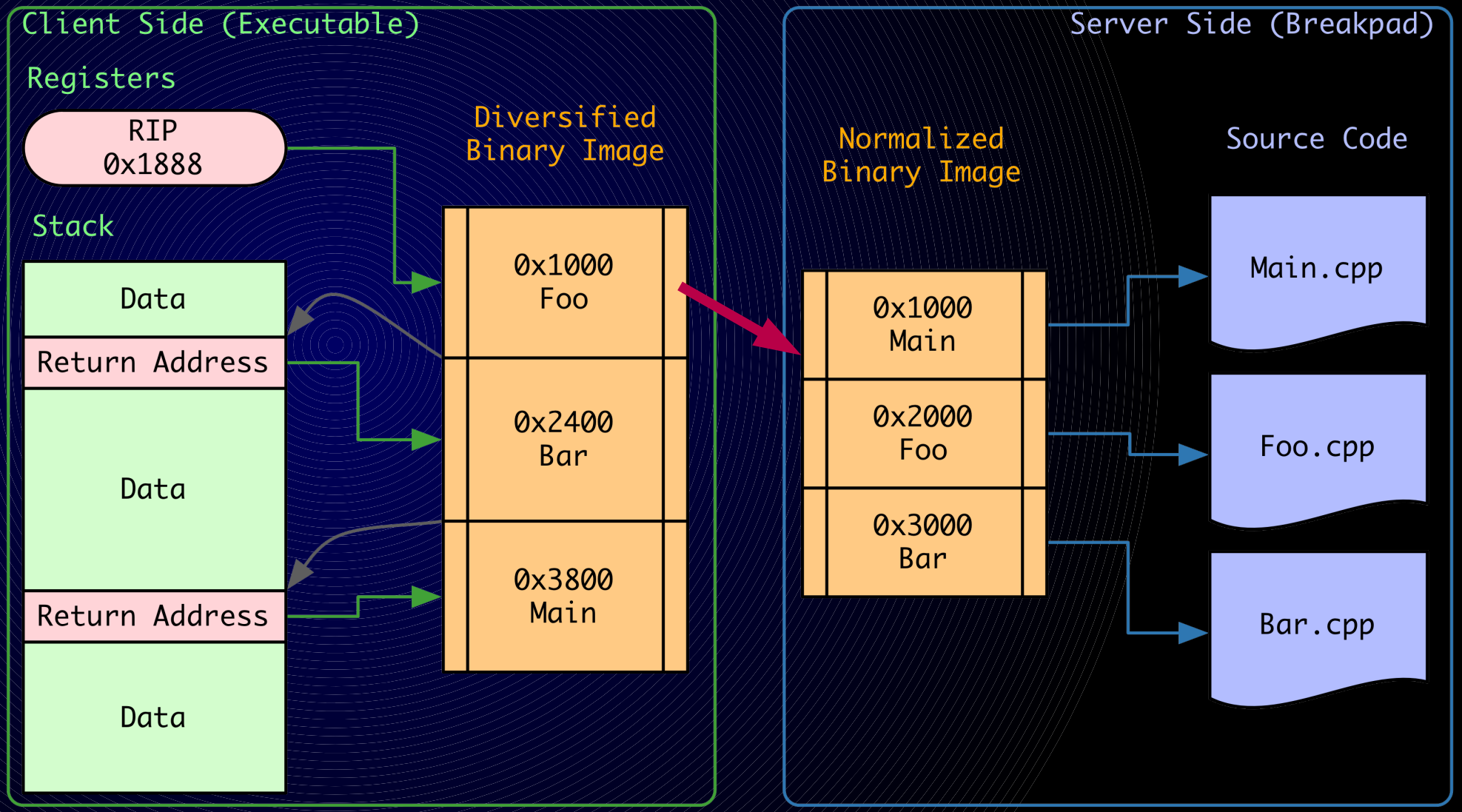
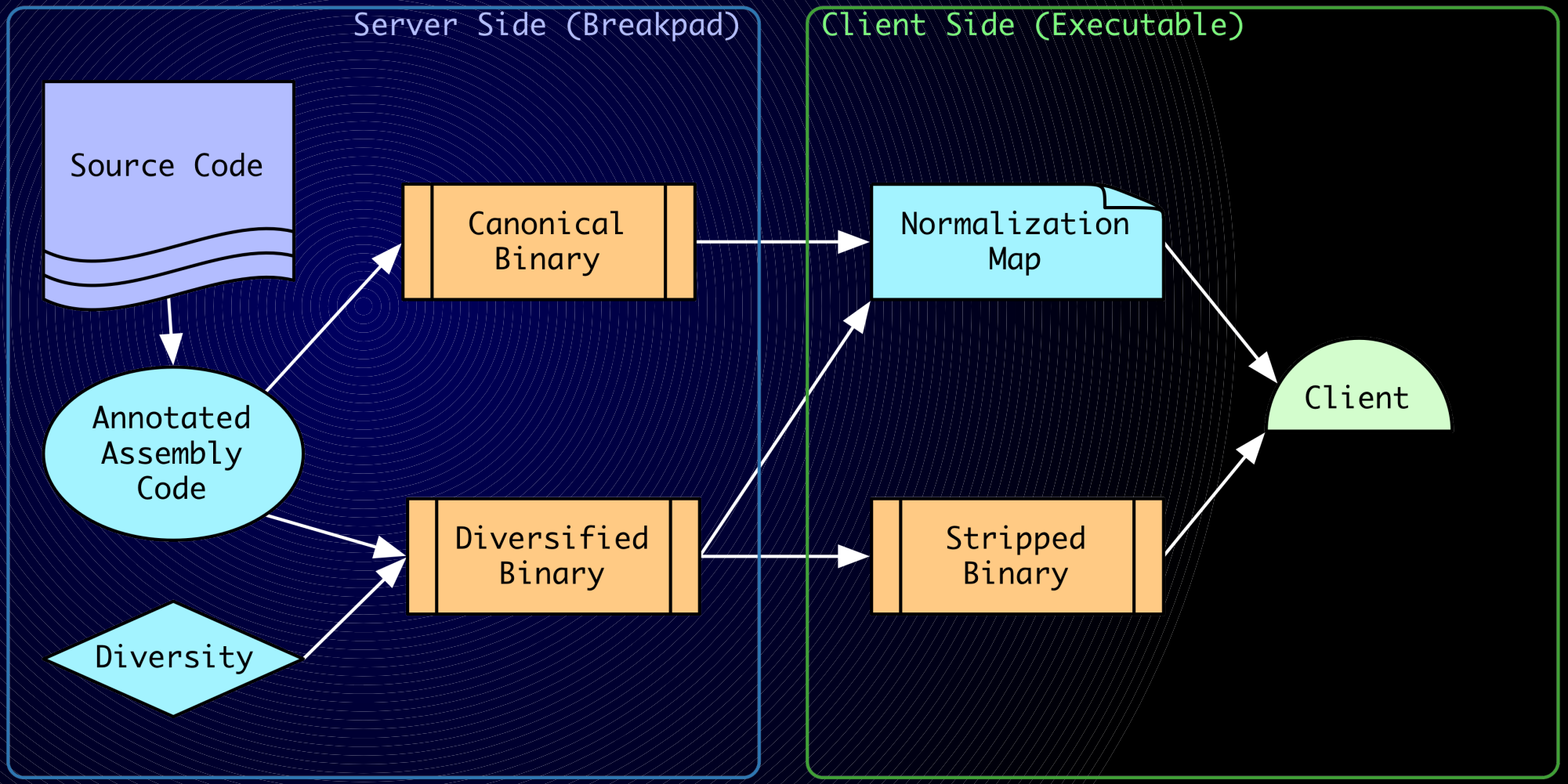


Our Approach



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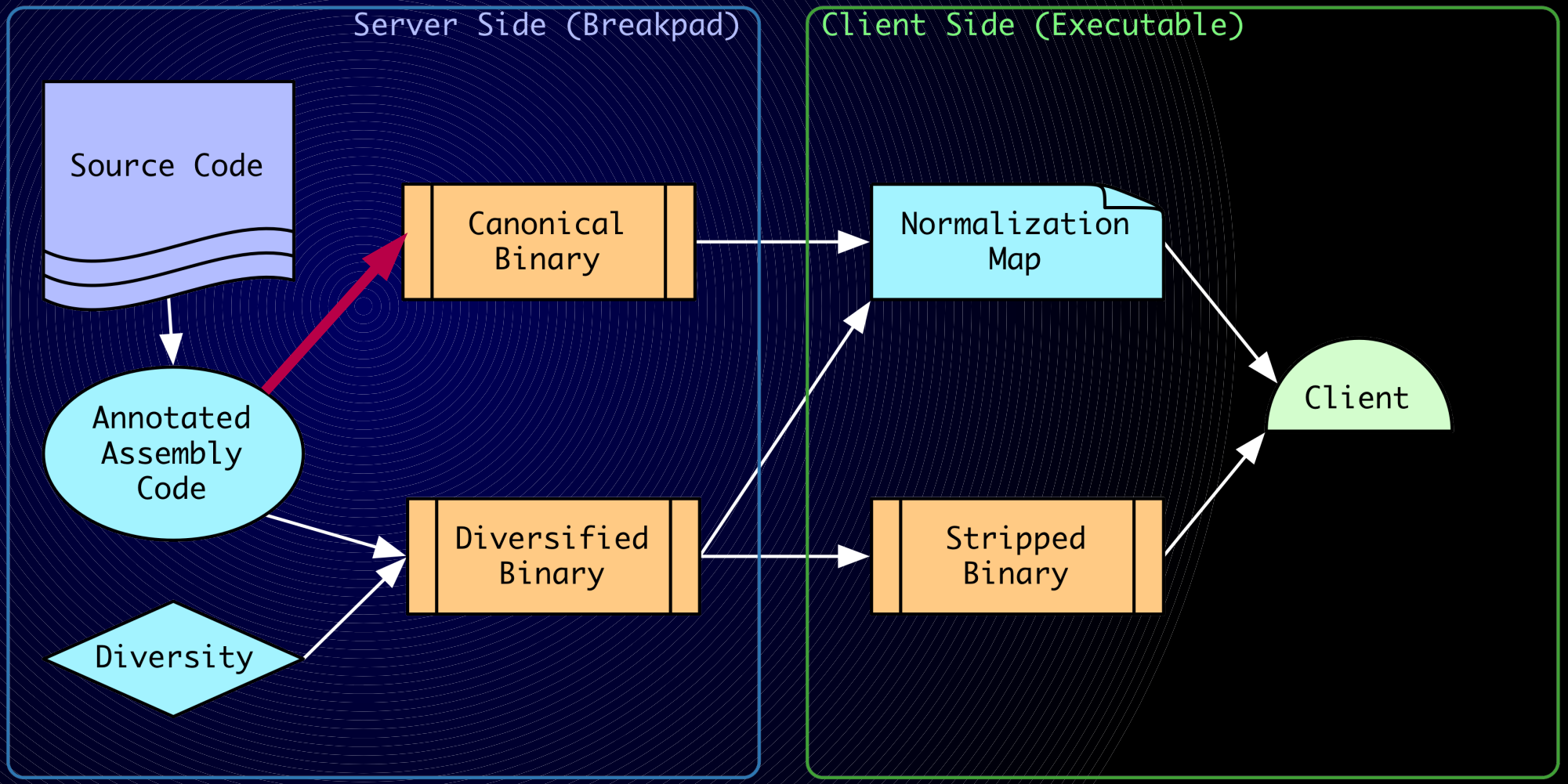

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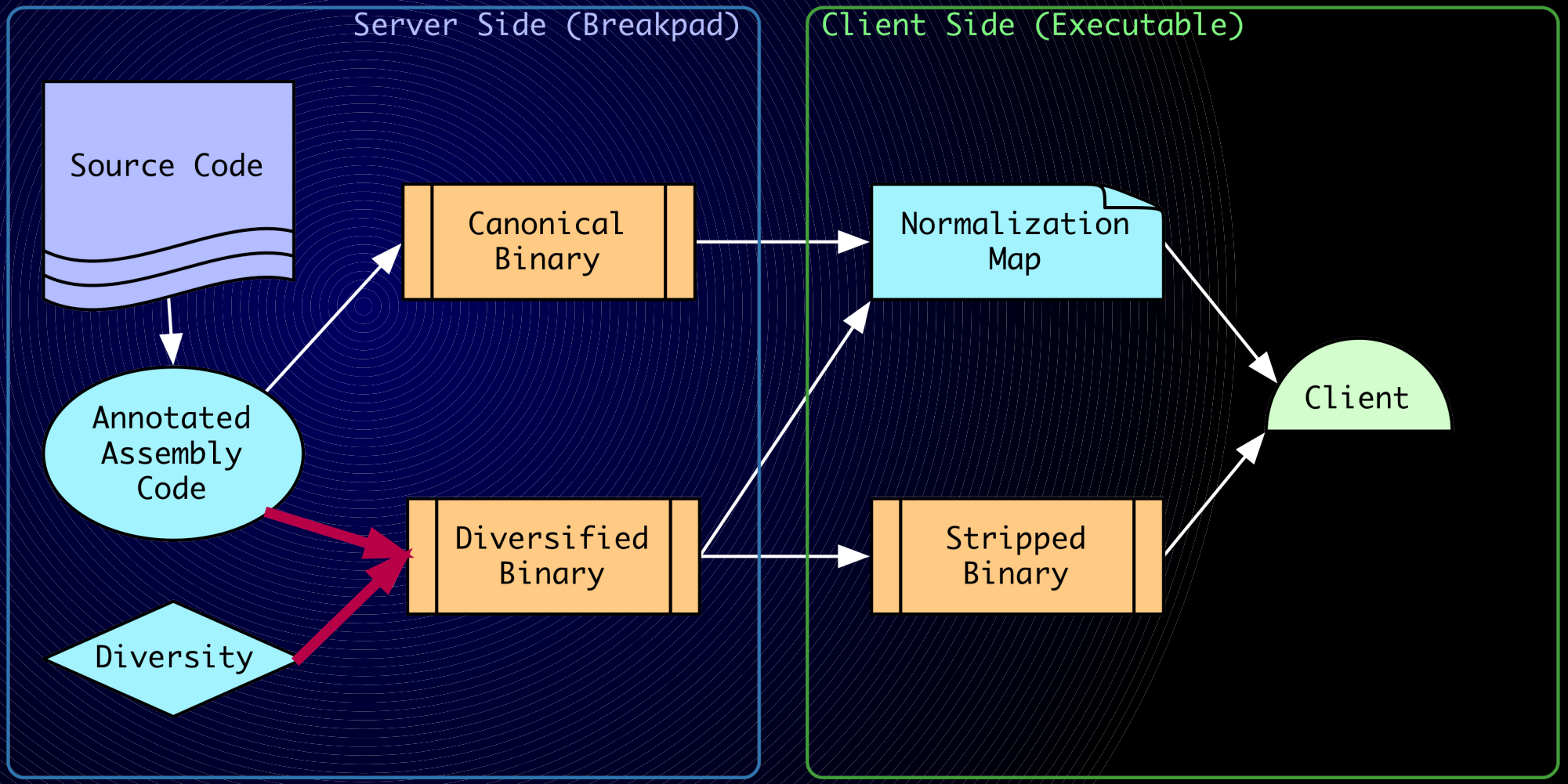

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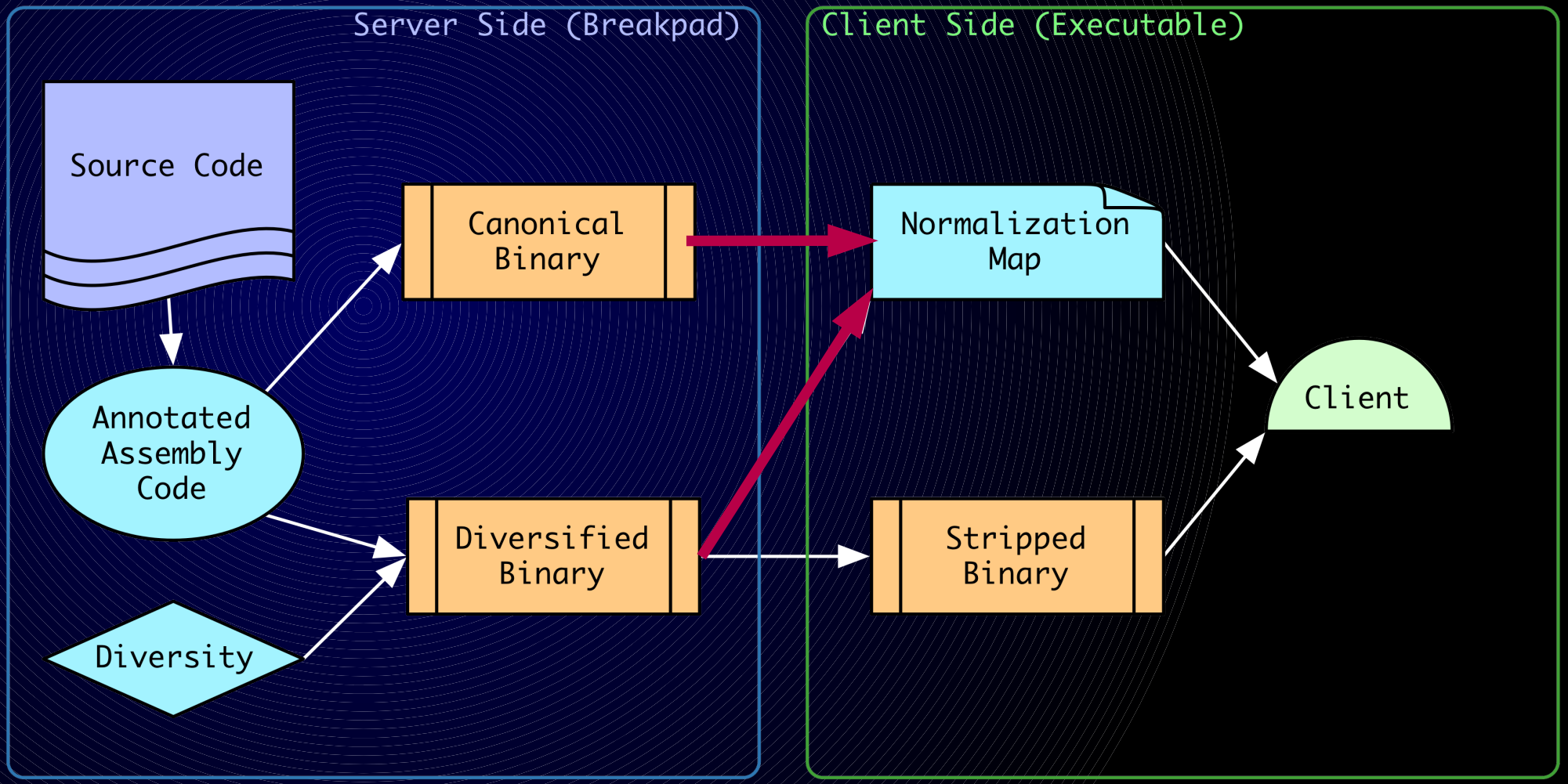
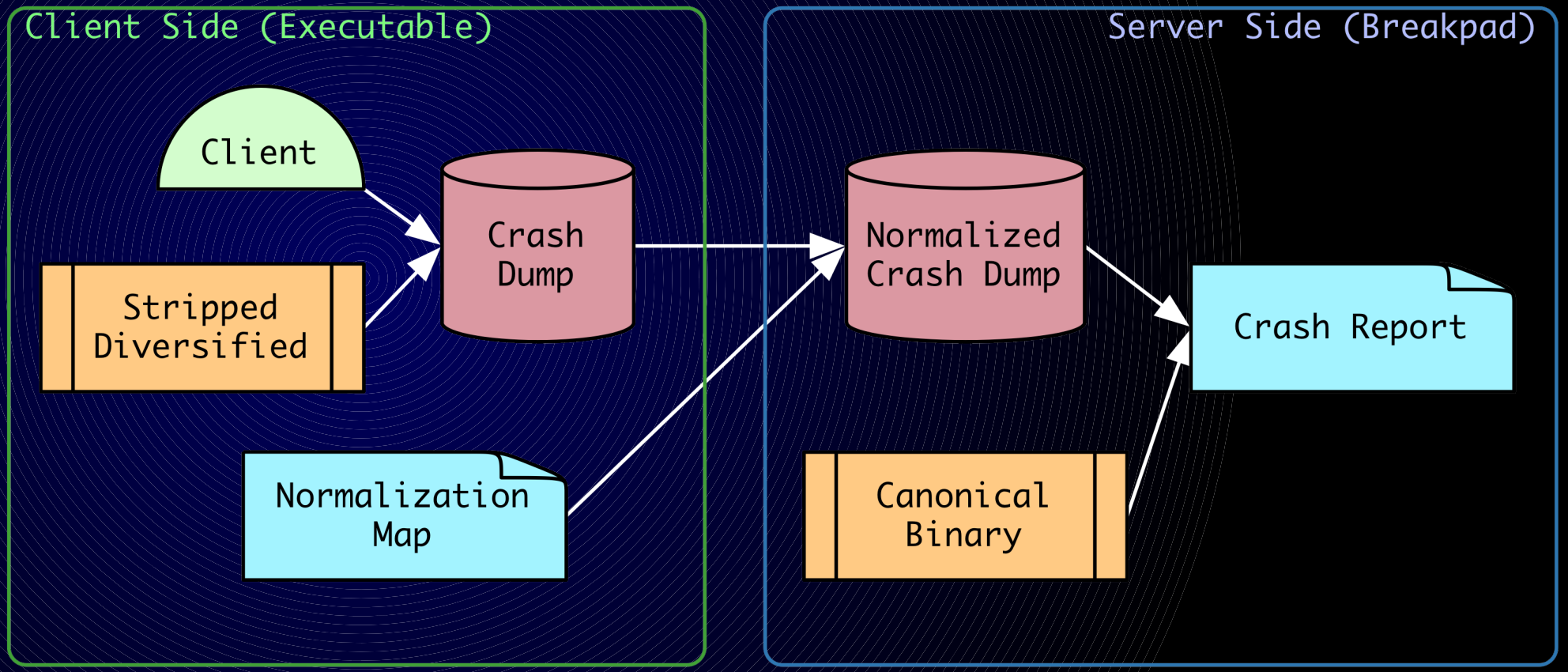


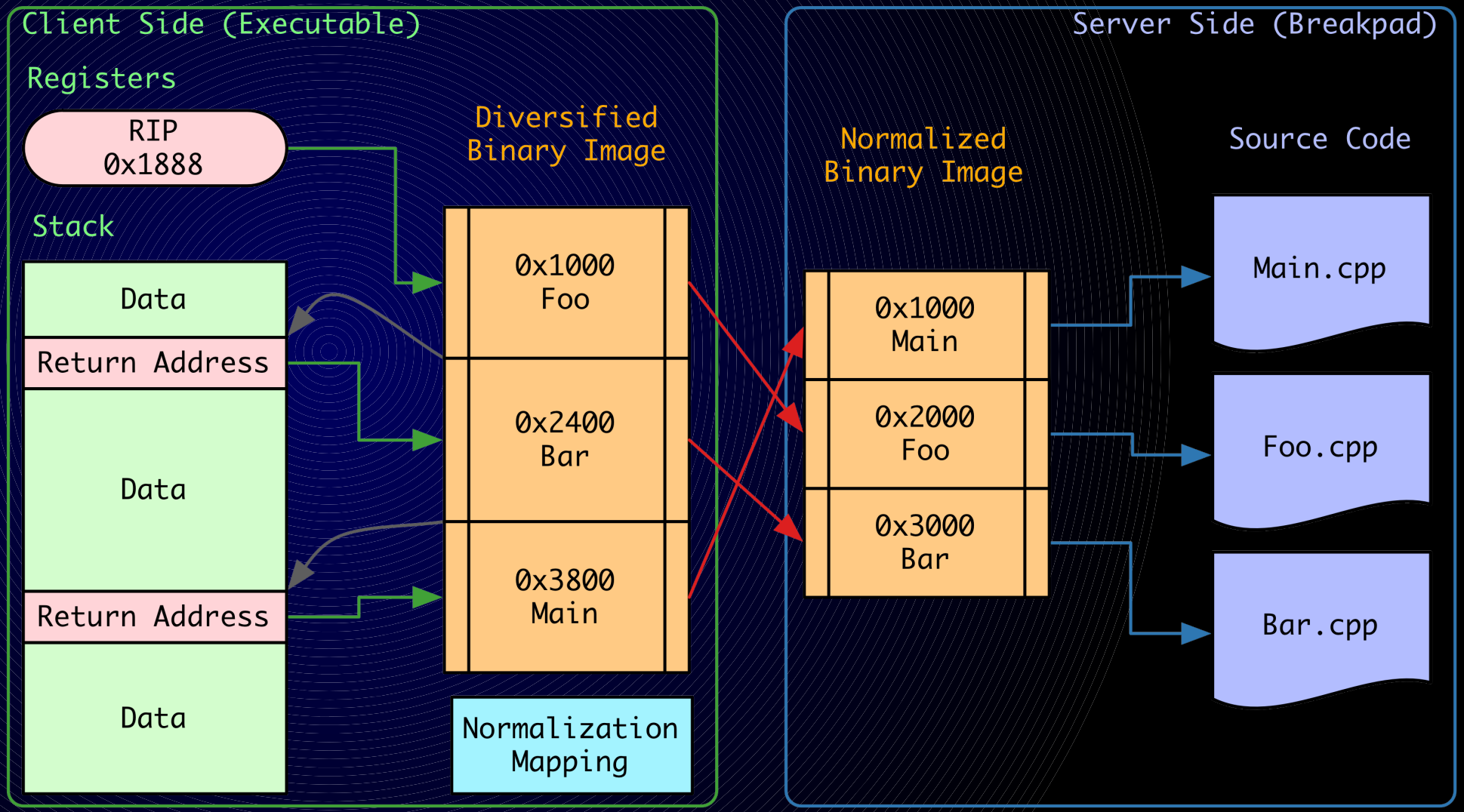
Diversified Crash Reporting



Normalization Locale

Client	Server
+ Privacy	+ Frame info
+ Transparency	- More bandwidth
- More work	- Modify tracker

Normalization Method



Results

* Successfully stackwalk a diversified crash dump as if it was created by the canonical version

* Supports any code movement transformation that operates on assembly code

Future Work

* Optimize mapping time and size

* Mapping for register and stack randomization

* Patching and updating

Questions?

Thanks!