Speed Bump 2

Neutralizing Quantum Threats

Shape*Shift*™

Neutralizing Quantum Threats™

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Agenda

Executive Overview

- Cryptography System Weakness
- Shape*Shift* Advantage

Technology Overview

- Shape*Shift* Encryption
- Benefits
- Development Status

Patent Pending

Current Cryptography Systemic Weakness

Mathematic Foundations

Attack Tool: Mathematics

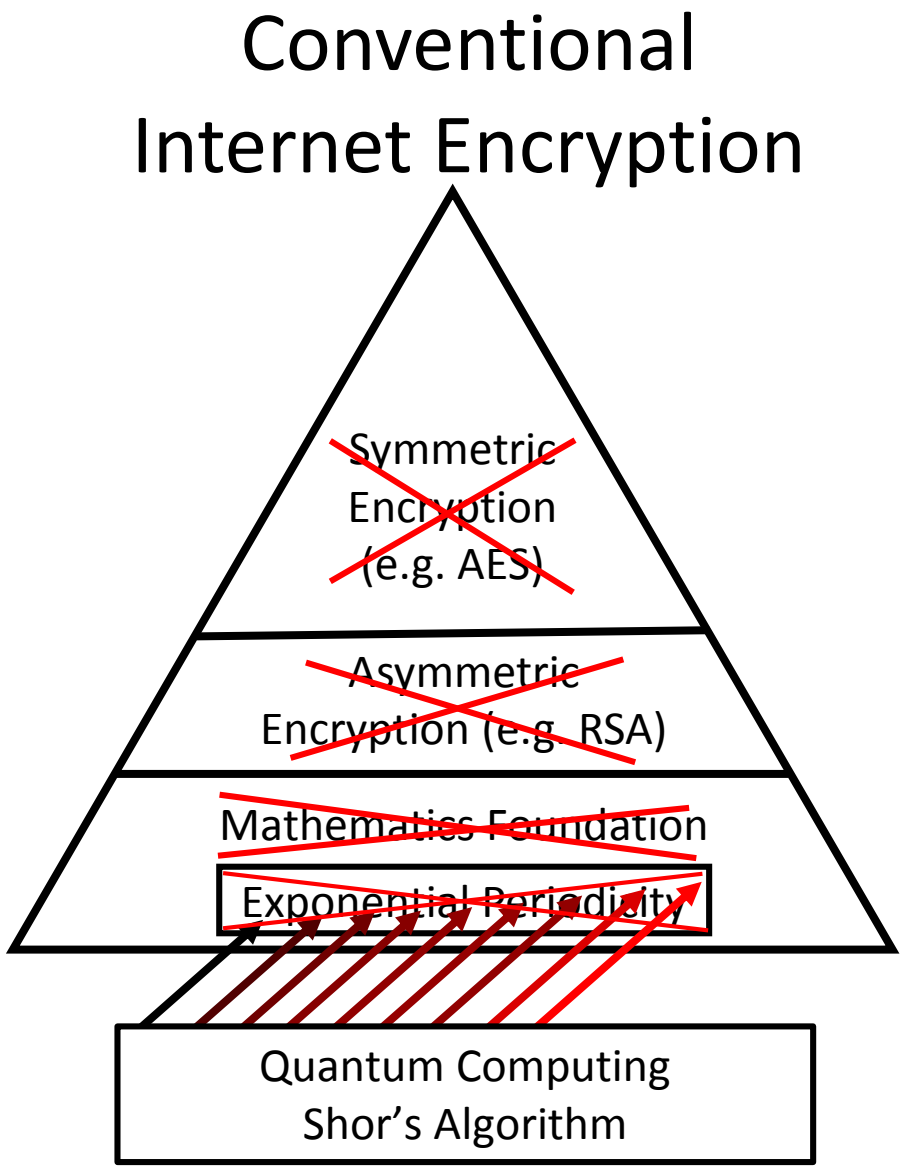
Solution: Mathematically Impenetrable Foundation

Dynamical System Foundation

e.g. *Deterministic Chaos*

Unstable Aperiodic Deterministic Non-linear* [*Discreet*] *Dynamical System

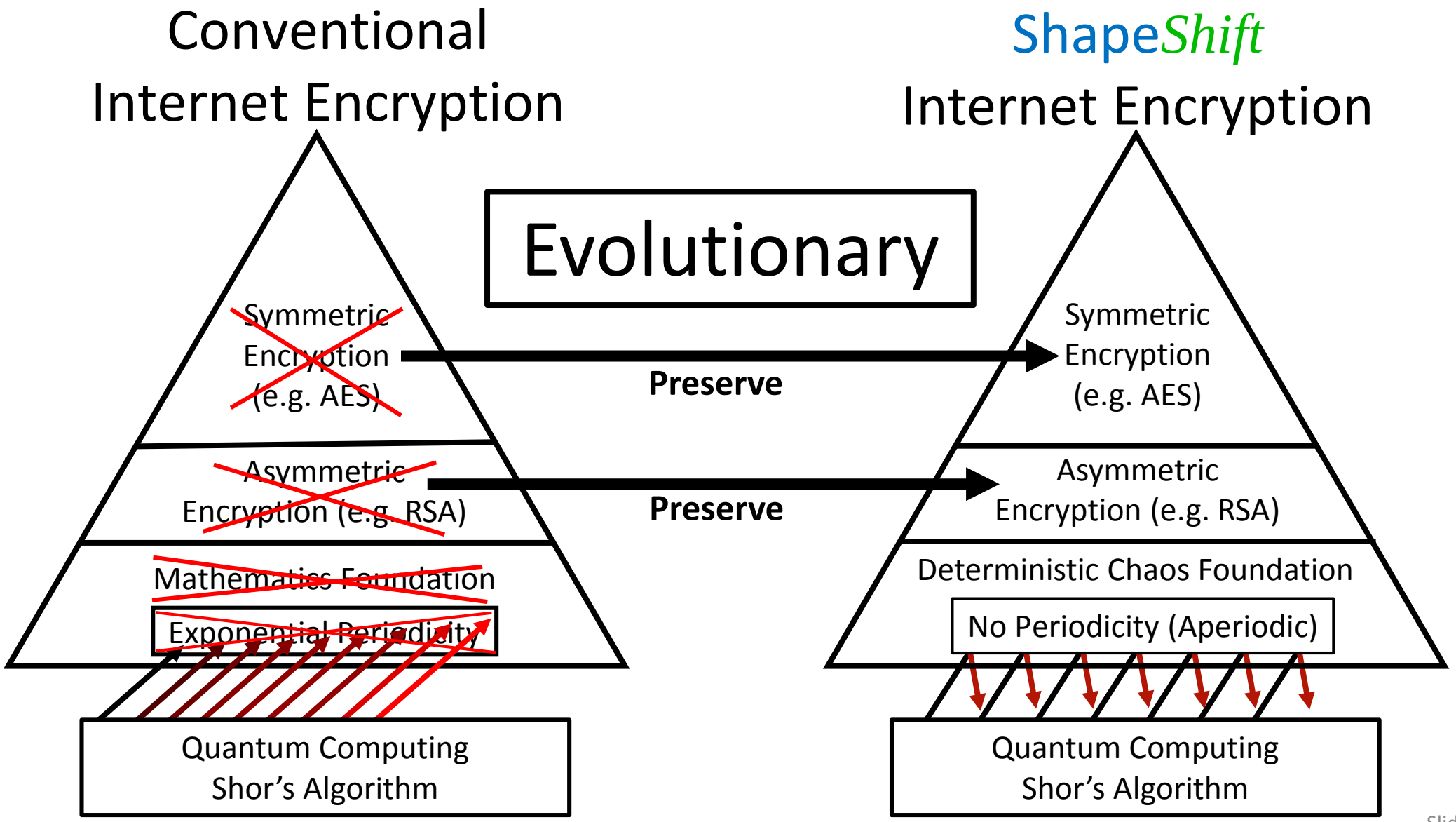
Conventional Cryptography Systemic Weakness



Mathematics Foundation is the Problem

Patent Pending

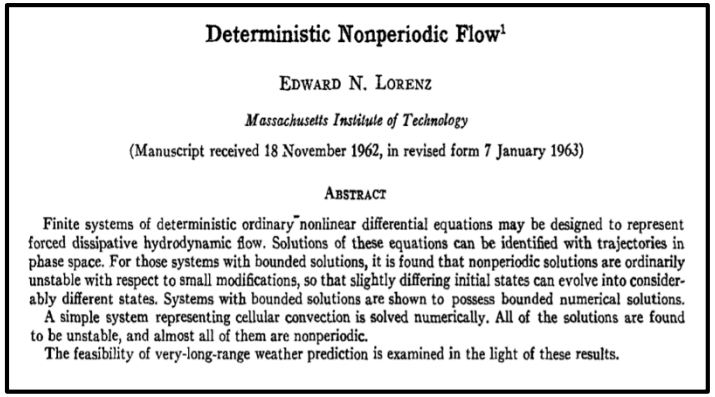
Conventional Cryptography Systemic Weakness



Patent Pending

Chaos Concepts are 130+ Years Old

Henri Poincaré
1889



Deterministic Nonperiodic Flow[1]

EDWARD N. LORENZ

Massachusetts Institute of Technology

(Manuscript received 18 November 1962, in revised form 7 January 1963)

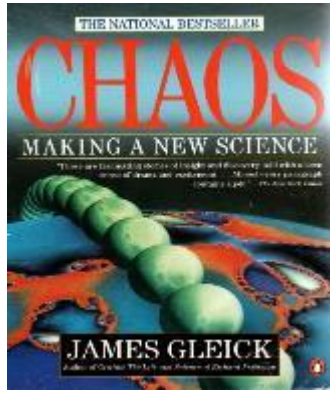
ABSTRACT

Finite systems of deterministic ordinary nonlinear differential equations may be designed to represent forced dissipative hydrodynamic flow. Solutions of these equations can be identified with trajectories in phase space. For those systems with bounded solutions, it is found that nonperiodic solutions are ordinarily unstable with respect to small modifications, so that slightly differing initial states can evolve into considerably different states. Systems with bounded solutions are shown to possess bounded numerical solutions.

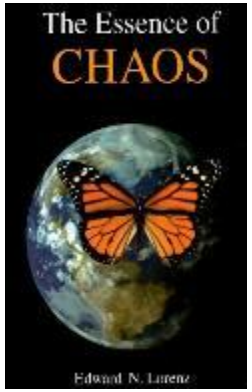
A simple system representing cellular convection is solved numerically. All of the solutions are found to be unstable, and almost all of them are nonperiodic.

The feasibility of very-long-range weather prediction is examined in the light of these results.

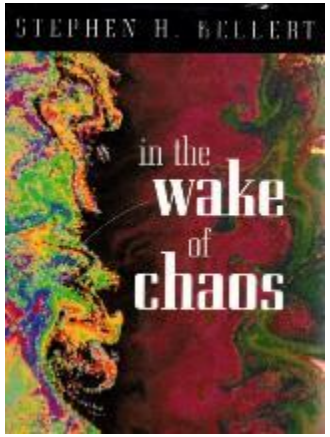
1960



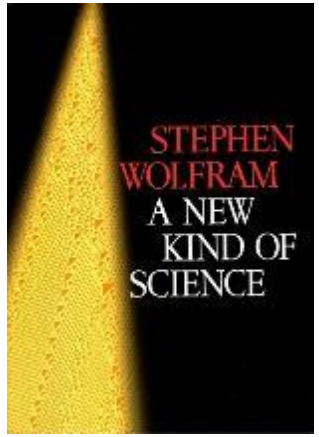
1991



1993



1993



2002

Patent Pending

Shape*Shift* Differentiation

Traditional Encryption

~~Small Key~~

~~Key Management~~

~~Rigid, Formulaic Process~~

~~Byte-Alignment~~

~~Mathematical Foundation~~

~~Difficult Math Problem~~

Shape*Shift* Encryption

Unpredictable Length Initialization Vectors (IVs)

Amorphous, Unpredictable Process

Alignment-Free

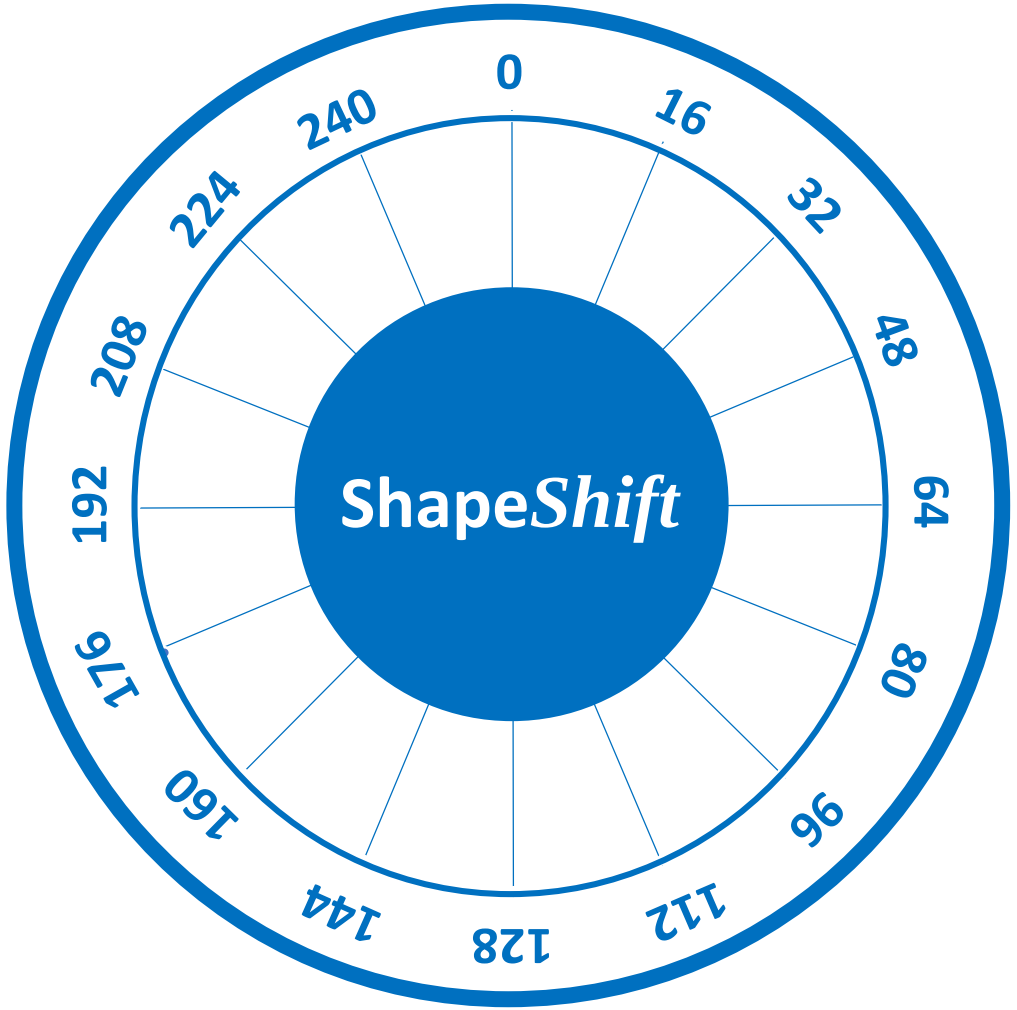
Deterministic Chaos Foundation

Unsolvable Math Problem

Shape*Shift* is Disruptive

Patent Pending

“Combination Lock” Decryption Metaphor



Decryption *Combination*:

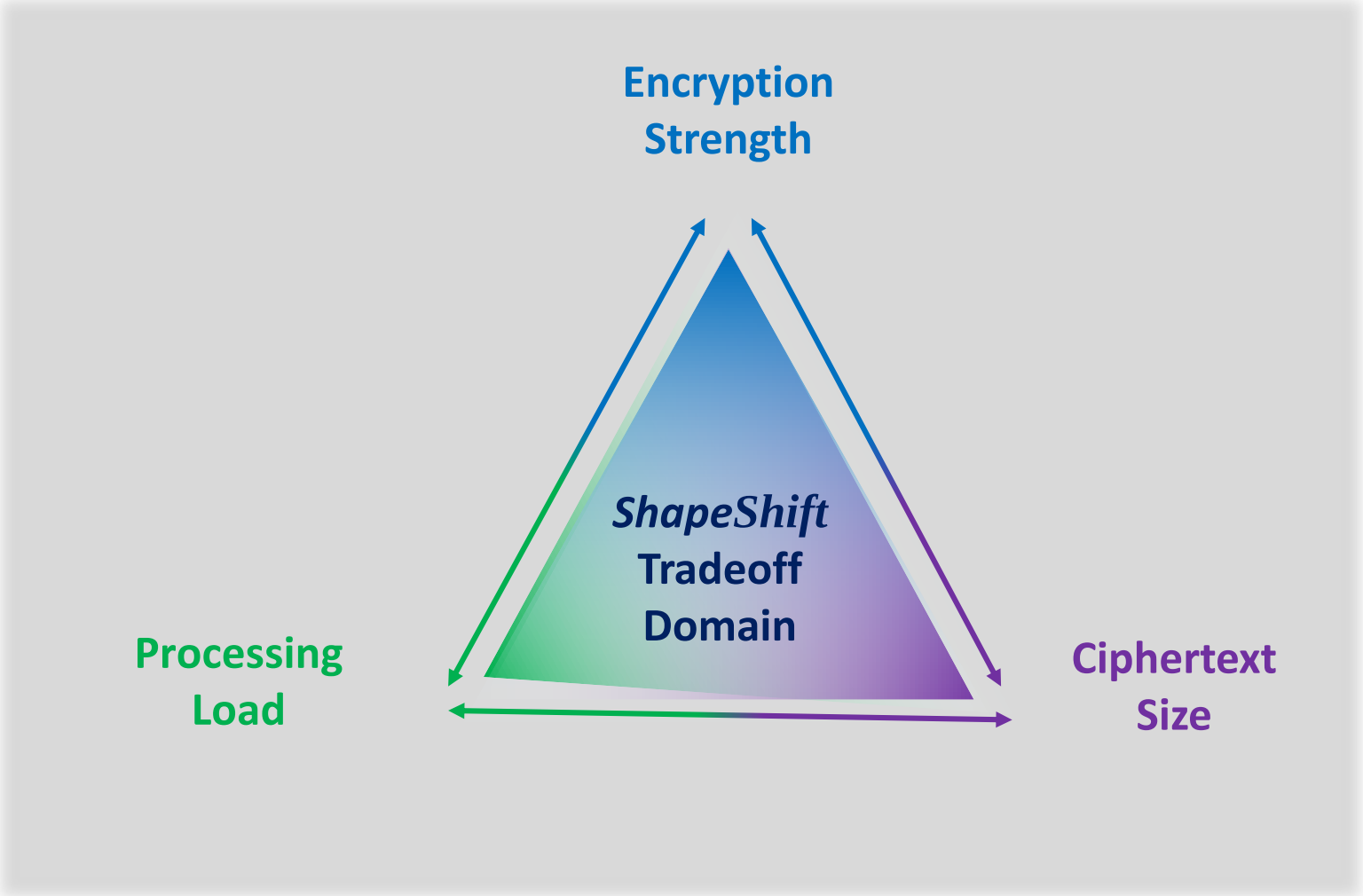
- 250,000,000(?) #s, (0-255)
- Precise, Ordered Sequence
- Multi-Turn Spins (1-16,777,215)

Greater Than *Practical Encryption*

- No Error Forgiveness
- Silent Failure

Patent Pending

Shape*Shift* Tradeoffs



Supports Edge to Cloud & Carbon Reduction

Patent Pending

ShapeShift™

Technology Overview

Shape*Shift* Encryption Phases

1. Pseudo Random Number Generator (PRNG) ***Complex*** Construction
2. Hierarchical Fragmentation
3. Fragment Encryption (Optional)
4. Scrambled Hierarchical Reassembly

Phase 1: PRNG Complex Construction

Construct a *Unique* Pseudo Random Number Generator ***Complex***

PRNG *Complex*

ShapeShift Does Not Use Traditional Keys

- Custom & Dynamically Constructed
- Arbitrarily Large, Ephemeral Initialization Vector (IV) for the PRN ***Complex***
- Generated Using Persistent & Immutable Data
- At Least One Shared Secret

PRNG ***Complex*** Output Attributes

- ~ Computationally Indistinguishable
- Computationally Irreducible
- Mathematically Incompressible

Phase 1: PRNG Complex Construction

PRNG *Complex*

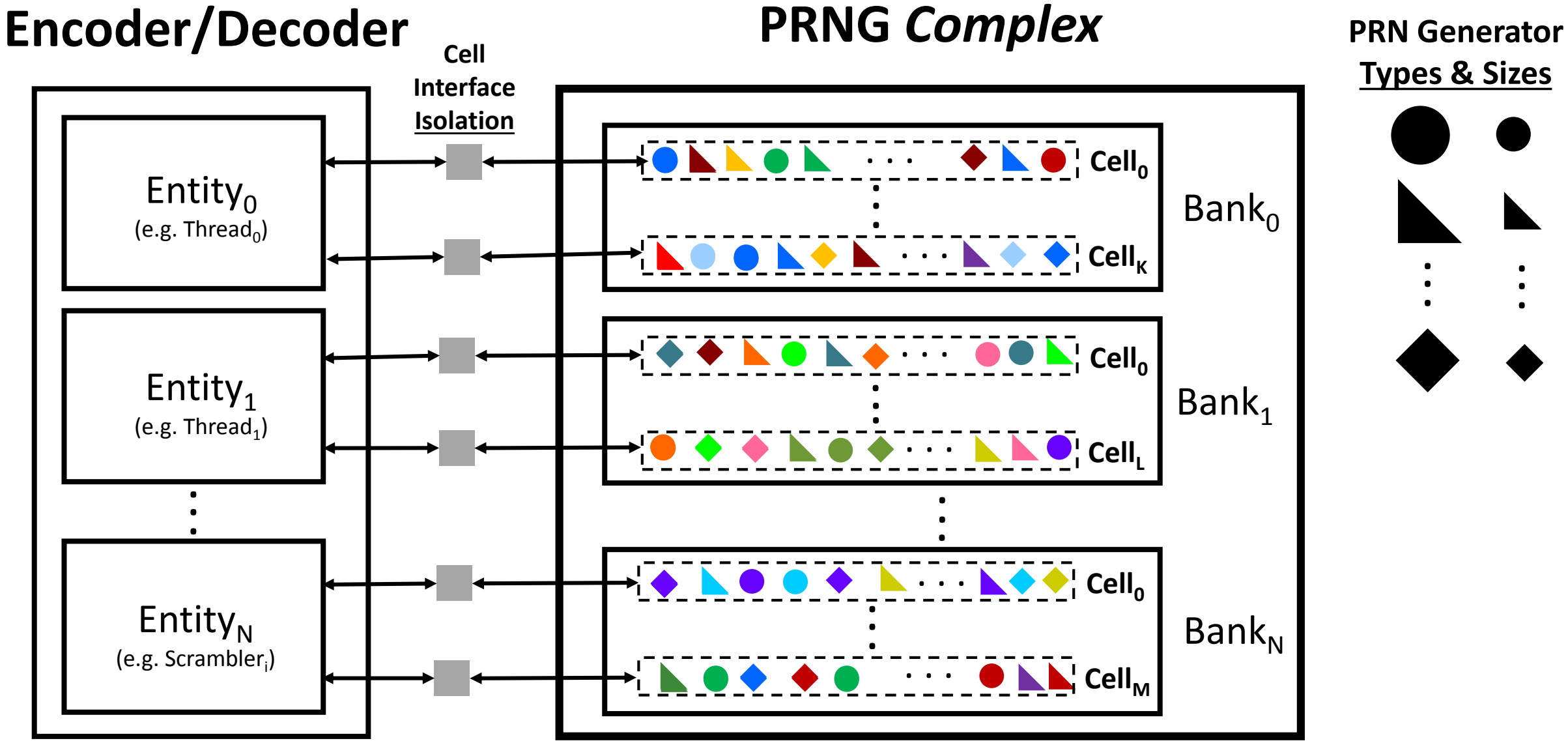
Operates

- Autonomously
- Opaquely

Output Utilization

- Directs Scrambling Operations
- Identifies *Minces* & Transformations
- Provides Parameter Values

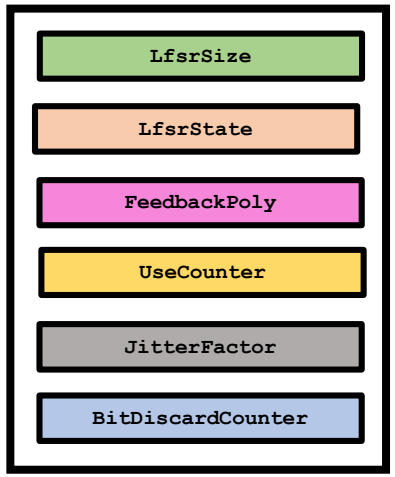
Conceptual Shape*Shift* PRNG *Complex*



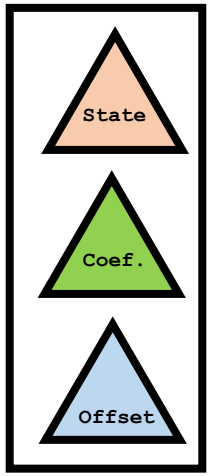
Patent Pending

Heterogeneous PRNG Cell DRAM Dispersion

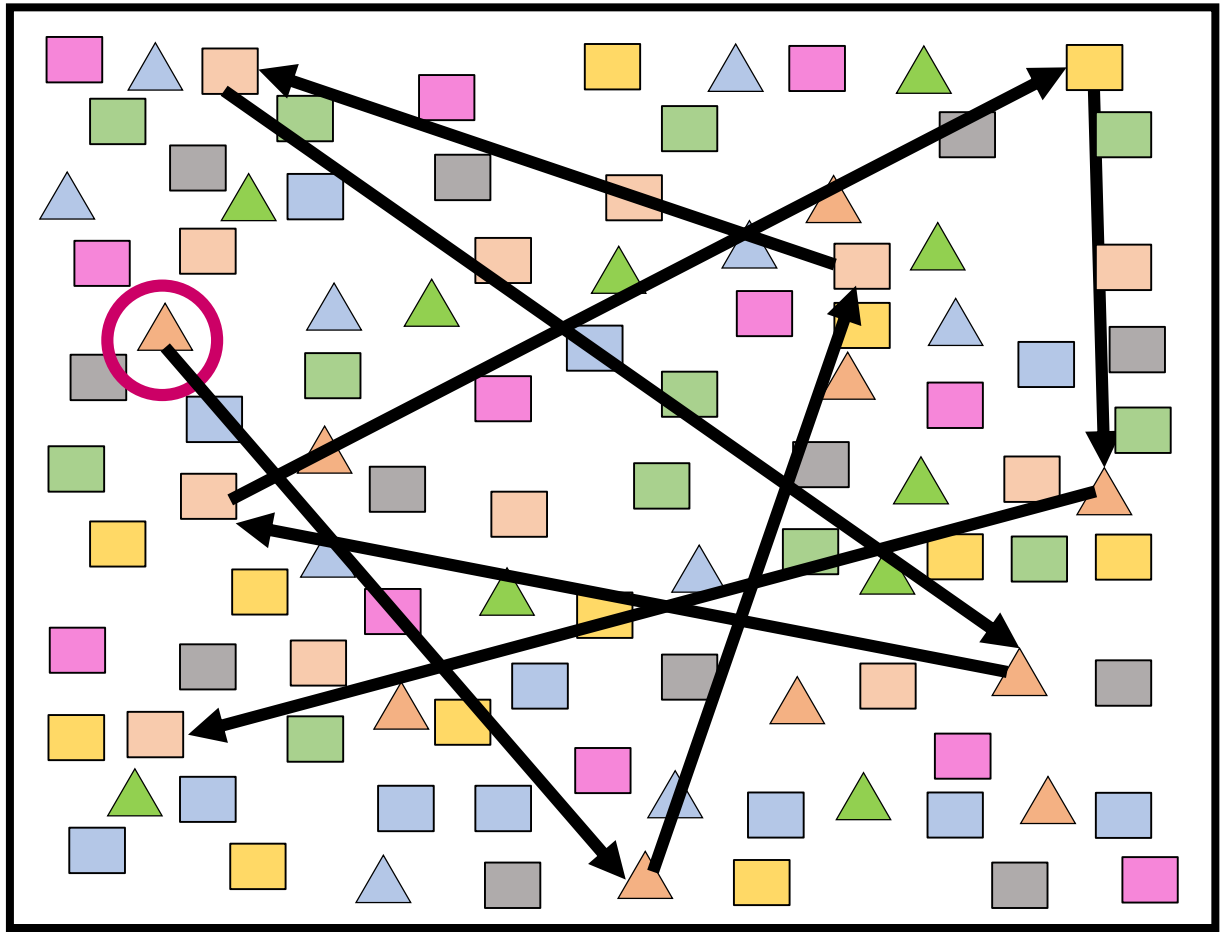
$LFSR_n$



LCG_n



DRAM



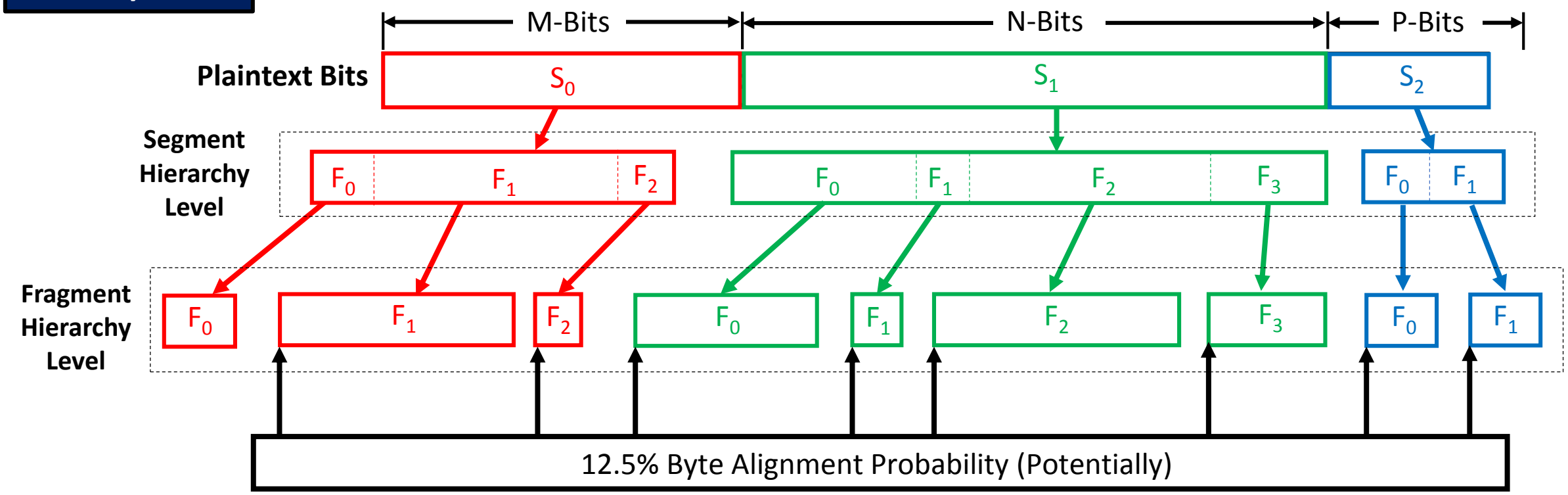
0xD3, 0x8A, 0x6C, 0xBB, 0x71, 0x1E, 0xA2, 0xFE, …

Patent Pending

Phase 2: Hierarchical Fragmentation

PRNG
Complex

Two-Level Hierarchy Depiction



Encryption Thread "View"

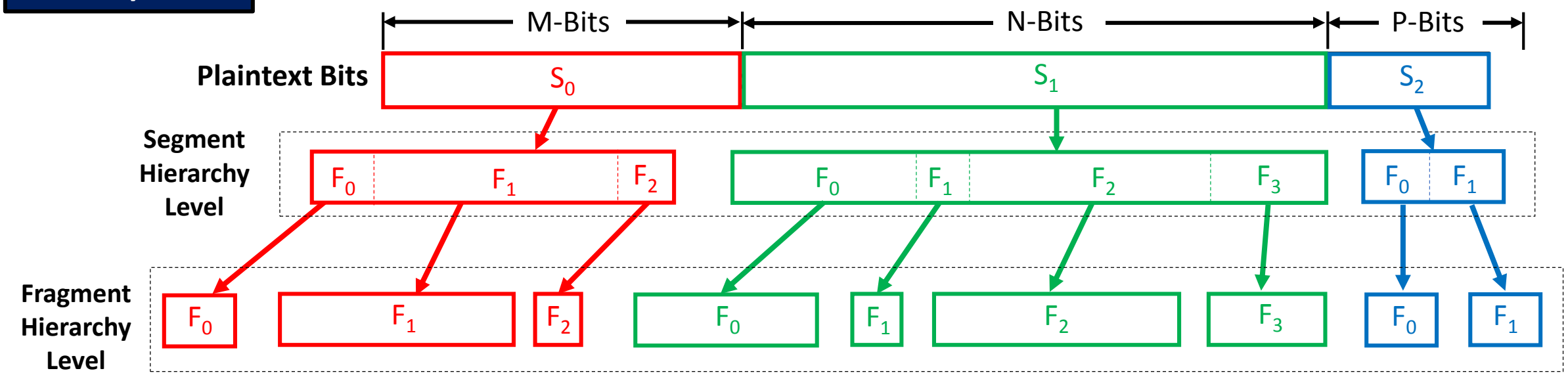
Highly Parallelizable Processing

Patent Pending

Phase 2: Hierarchical Fragmentation

PRNG
Complex

Two-Level Hierarchy Depiction



Optional Encryption at Fragment Level: AES, Chacha, … Shape*Shift*

Optional Fragment Extensions: CRCs, ECCs, Checksums, Garbage, …

Phase 3: Shape*Shift* Fragment (F_i) Encryption (Optional)

PRNG
Complex

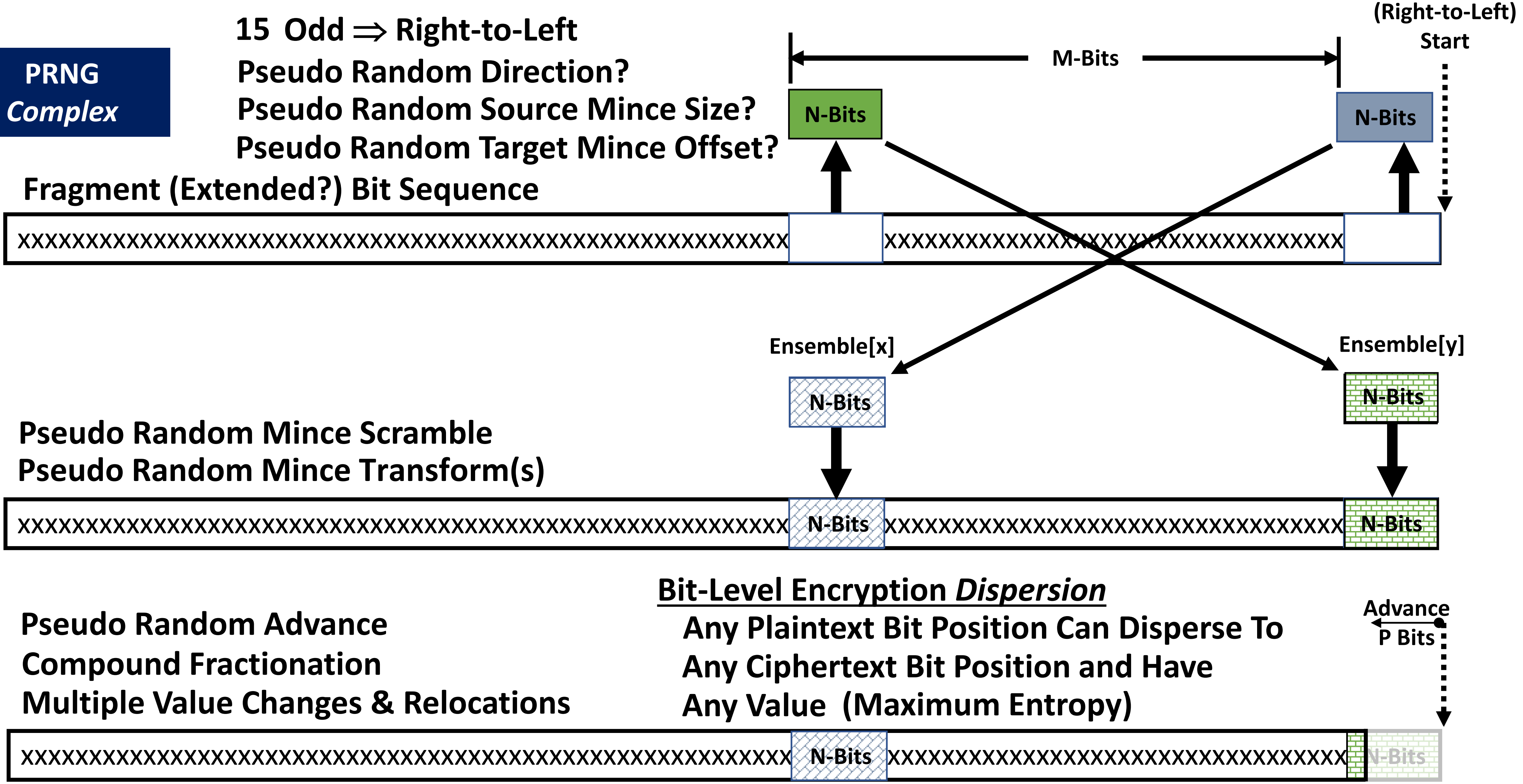
15 Odd ⇒ Right-to-Left
Pseudo Random Direction?
Pseudo Random Source Mince Size?
Pseudo Random Target Mince Offset?

Fragment (Extended?) Bit Sequence

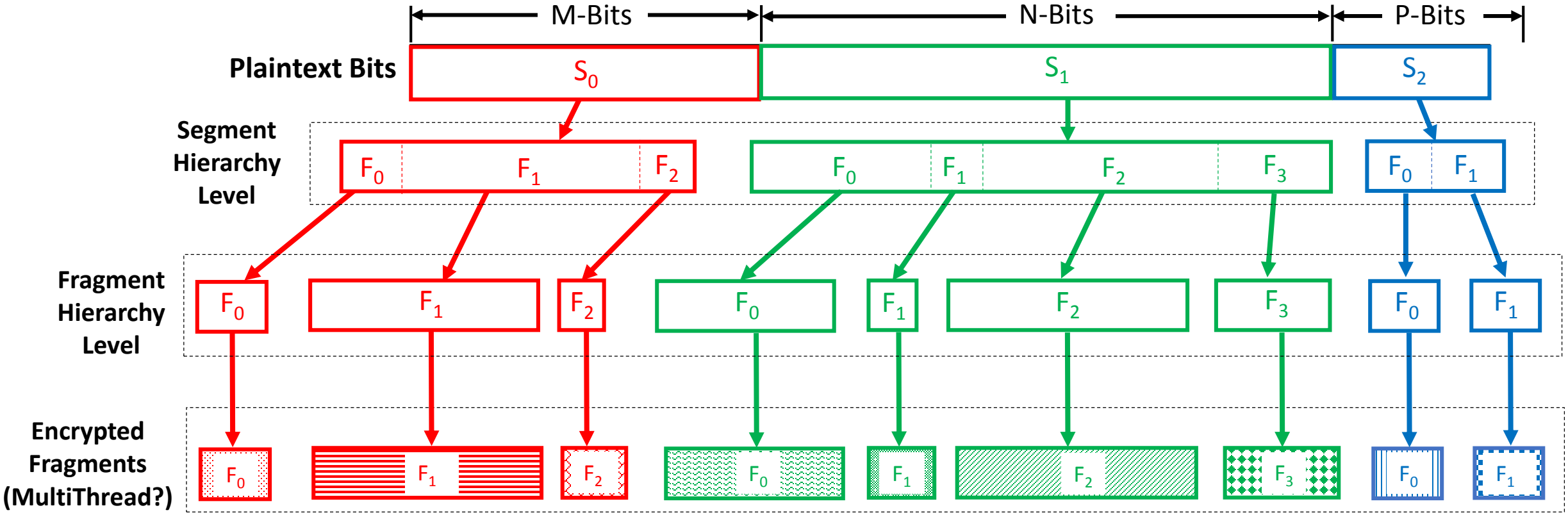
Pseudo Random Mince Scramble
Pseudo Random Mince Transform(s)

Pseudo Random Advance
Compound Fractionation
Multiple Value Changes & Relocations

<u>Bit-Level Encryption *Dispersion*</u>
Any Plaintext Bit Position Can Disperse To
Any Ciphertext Bit Position and Have
Any Value (Maximum Entropy)



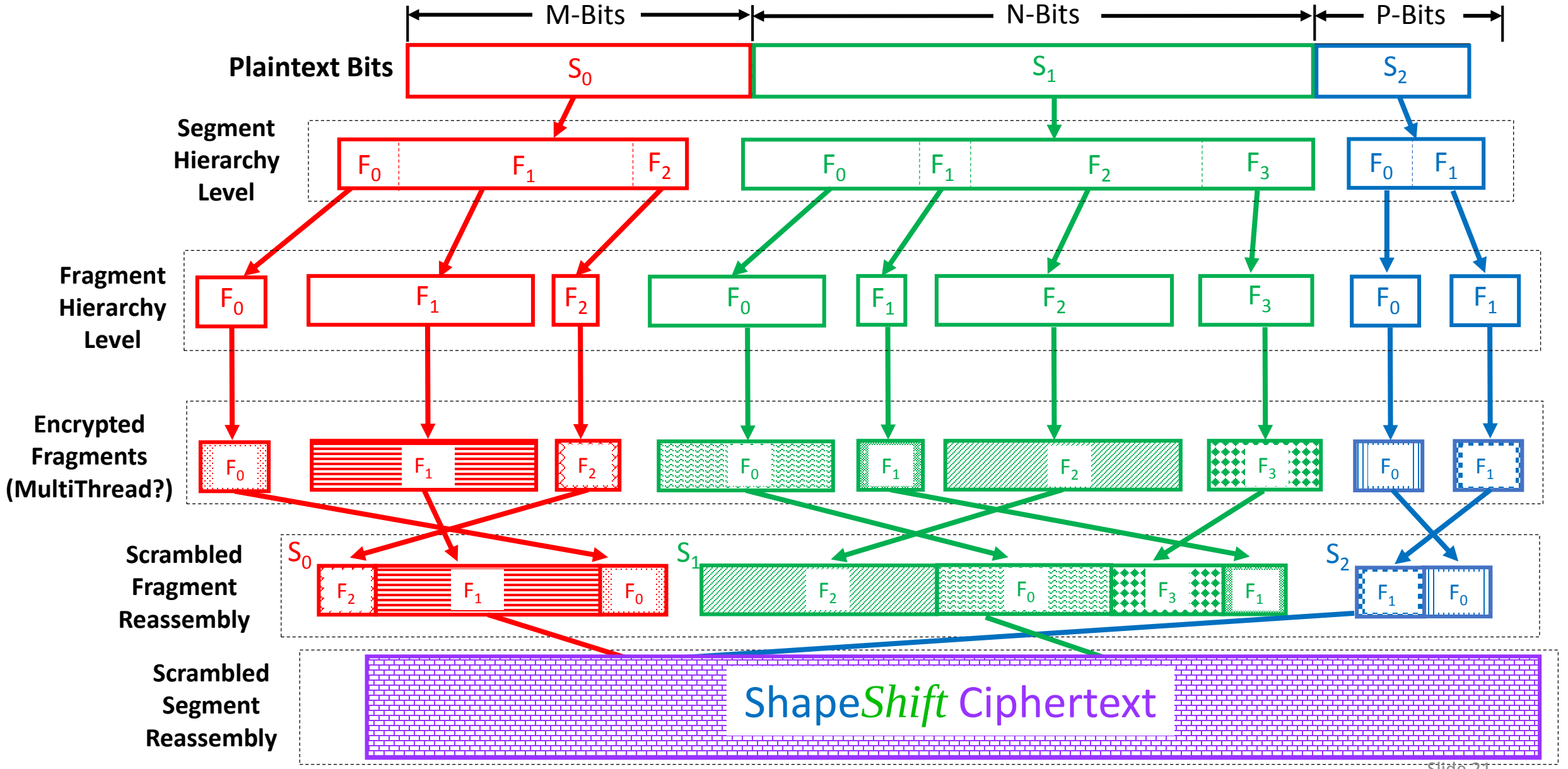
Phase 4: Scrambled Hierarchical Reassembly



Optional Extensions: CRCs, ECCs, Checksums, Garbage, …

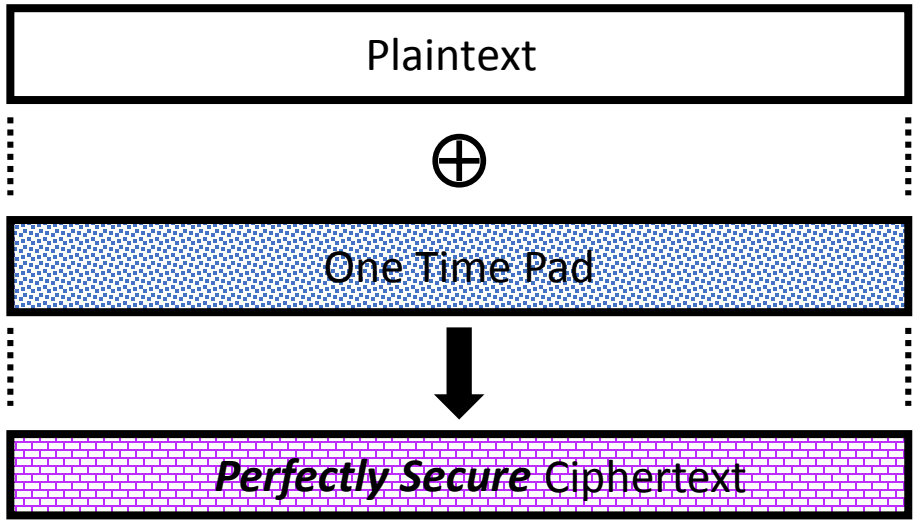
Patent Pending

Phase 4: Scrambled Hierarchical Reassembly



Patent Pending

Shannon *Perfect Secrecy*



~~*Truly* Random~~

Impractical

Computationally Indistinguishable

from

Truly Random

If the One Time Pad is:

1. *Truly* random;
2. At least as long as the plaintext;
3. Never reused in whole or in part;
4. Kept completely secret;

Then

The ciphertext is impossible to break, i.e. is *Perfectly Secure*.

Additional Fortification

Garbage Blending
Scrambling

Patent Pending

Maximum Entropy, Fine-Grain (Bit-level) Scrambling

128 Kib Plaintext (1048576 bits), 1 Segment, 1 Fragment

Total Ciphertext Outcomes

$$n! \sim \sqrt{2\pi n}\left(\frac{n}{e}\right)^n$$
(Stirling's Approximation)

$$(1048576!)\ (2^{1048576})$$

$$\approx \left[\sqrt{2\Pi * 1048576}\right]\left[(1048576/e)^{1048576}\right](2^{1048576})$$

$$\approx 10^{6173320} \approx (10^{80})^{77166}$$

$$\approx \textbf{(Atoms in the observable universe } (\sim 10^{80})\textbf{)}^{77166}$$

Does the Ciphertext Have Any Blended Garbage?

Scrambling Granularity & Size Uniformity?

Shape*Shift* Decryption

Push/Pop Stack “Breadcrumb Trail” Decryption Process

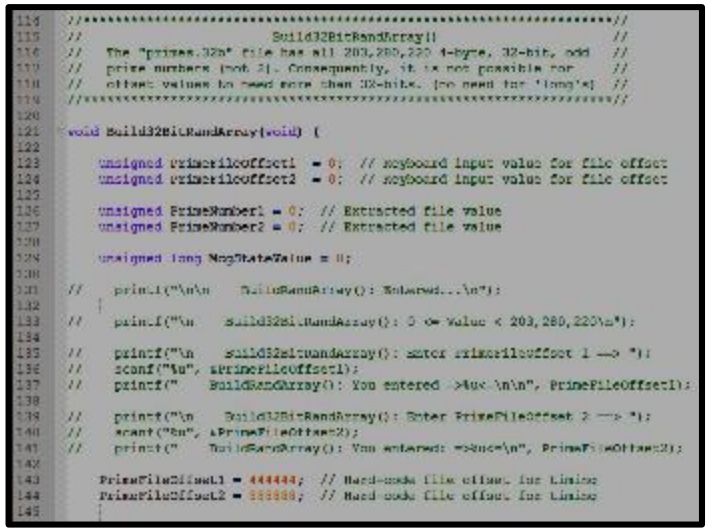
Invertible, Atomic, Bijective Operations

Technology Development Status

Operational Proof of Concept(s)

- Linux Software Implementation(s)
  - X86, Raspberry Pi ARM
  - ANSI C *gcc*
  - CERT® C Compliance Possible

Lightweight Encryption Performance



Receive Encrypted Known File(s) for Analysis

Patent Pending

Benefit Summary

Shape*Shift* *Neutralizes Quantum Threats*

- High-Performance, Evolutionary Data Encryption Technology
- Renders Quantum Computing Periodicity Analysis Irrelevant
- Preserves and Fortifies Global RSA and PKI Investments
- Edge to Cloud Scalability
- Full NIST FIPS 140-2 Hybrid Solution Compliance
- Provides Smooth Path to Future NIST & TLS Standards
- ANSI C Proof of Concept is Operational

Patent Pending

NIST Post-Quantum Cryptography (PQC) Position

Historically, it has taken almost two decades to deploy our modern public key cryptography infrastructure.

Therefore, regardless of whether we can estimate the exact time of the arrival of the quantum computing era, we must begin now to prepare our information security systems to be able to resist quantum computing.

https://csrc.nist.gov/projects/post-quantum-cryptography

Speed Bump 3

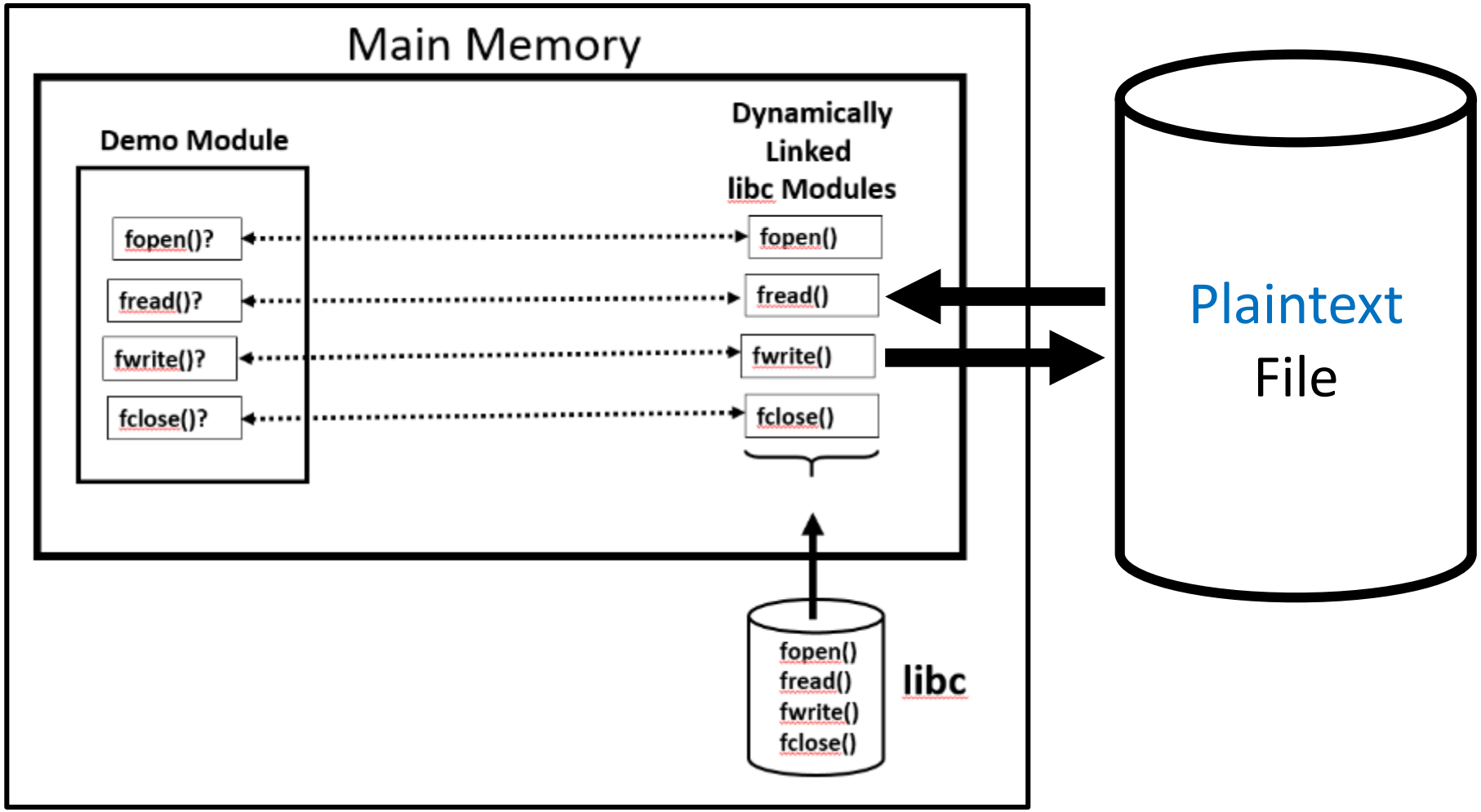
Defeating Ransomware Attacks

Conceptual C Program

```
// Demo.c

#include <stdio.h>

int main(int argc, char *argv) {

    char InputBuffer[4096];     // Read input data into here
    char OutputBuffer[4096];    // Write output data from here

    FILE *ReadFilePtr  = fopen("ReadFileName","r");   // Open the input file
    FILE *WriteFilePtr = fopen("WriteFileName", "w"); // Open the output file

    fread(InputBuffer, 1, 100, ReadFilePtr);    // Read 100 bytes

          //-----------------------------------------//
          //    Process Input Data, Create Output Data   //
          //-----------------------------------------//

    fwrite(OutputBuffer, 1, 256, WriteFilePtr); // Write 256 bytes

    fclose(ReadFilePtr);    // Close the input file
    fclose(WriteFilePtr);   // Close the output file

    return 0;
}
```

Patent Pending

Dynamic Linking Concept



Patent Pending

Shim (Interposer) Pseudocode

```
DemoShim.c

#define _GNU_SOURCE

#include <stdio.h>
#include <stdlib.h>
#include <unistd.h
#include <dlfcn.h>

int fopen(char *FileName, char *Mode) {
    // Shim Logic Placeholder
}

int fread(const void *BufferPtr, size_t size, size_t nmemb, FILE *stream) {
    // Shim Logic Placeholder
}

int fwrite(const void *ptr, size_t size, size_t nmemb, FILE *stream) {
    // Shim Logic Placeholder
}

int fclose(FILE *stream) {
    // Shim Logic Placeholder
}
```

Patent Pending

Shim fopen() Concept

```
// DemoShim.c fopen() Example Logic

FILE *fopen(char *FileName, char *Mode) {

    FILE *(*OriginalFopen)(char *Name, char *OpenMode) = dlsym(RTDD_NEXT, "fopen");

    FILE *FilePtr = OriginalFopen(FileName, Mode);

    if (FilePtr != NULL)
        // Save FilePtr, Calling Parameters for Later References
        // Along with Decryption Method Information

    return FilePtr;
}
```

Patent Pending

Shim fclose() Concept

```
// DemoShim.c fclose() Example Logic

FILE *fclose(FILE *Stream) {

    int (*OriginalFclose)(FILE *FilePtr) = dlsym(RTDD_NEXT, "fclose");

    return OriginalFclose(Stream);
}
```

Patent Pending

Shim fread() Concept

```
// DemoShim.c fread() Example Logic

int fread(void *BufferPtr, size_t Size, size_t nmemb, FILE *Stream) {

    int (*OriginalFread)(void *BufferPtr, size_t Size, size_t nmemb, FILE *FilePtr)
              = dlsym(RTDD_NEXT, "fread");

 // Identify all independent encrypted block(s) containing requested data
 // Read     all independent encrypted block(s) containing requested data
 // If any read error occurs, return 0
 // Decrypt the independently encrypted block(s) containing the data …
 //     … using the encryption information stored by the Interposer Module's fopen()
 // Extract the requested data, move to caller's target buffer

    return nmemb;
}
```

Patent Pending

Shim fwrite() Concept

```
// DemoShim.c fwrite() Example Logic

int fwrite(void *BufferPtr, size_t Size, size_t nmemb, FILE *Stream) {

    int (*OriginalFread)(void *BufferPtr, size_t Size, size_t nmemb, FILE *FilePtr)
              = dlsym(RTDD_NEXT, "fwrite");

 // Determine the current file position at entry
 // Identify the independent encrypted block(s) that will receive the data …
 //   … using the encrytion information stored when the file was opened
 // Determine the file offset of the first block that will store any of the data
 // Read all independent encrypted block(s) that will receive any of the data
 // If any read error occurs, return 0
 // Decrypt the independent encrypted block(s) that will receive the data
 // Move the write data into the appropriate offsets within the unencrypted blocks
 // Independently encrypt the blocks using the encrytion information stored
 //    … when the file was opened and write them to their original offsets …
 // Calculate the current file position at entry plus the requested write size
 // Set the current file position to the calculated value

    return nmemb;
}
```

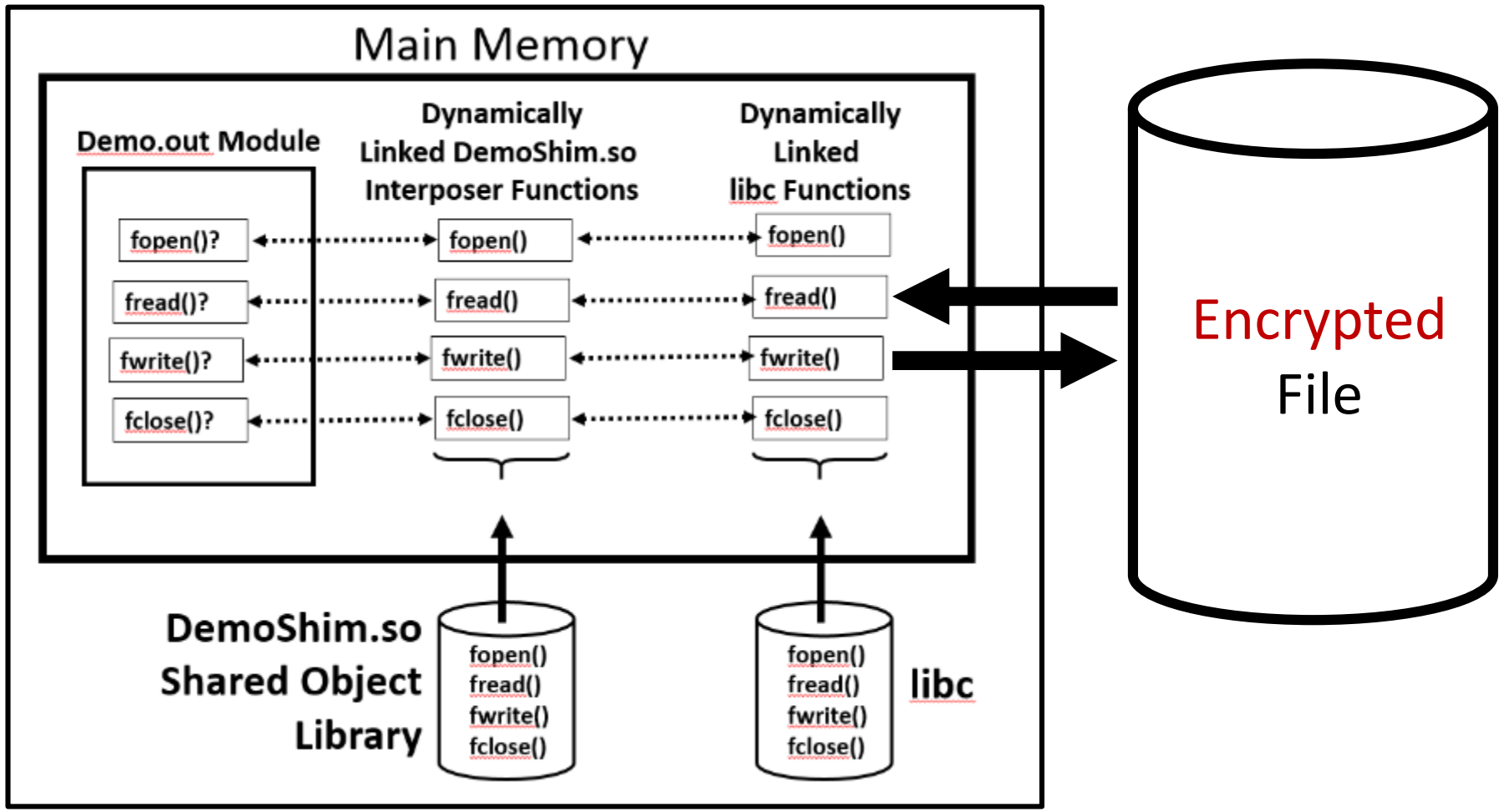
Patent Pending

Shim *makefile*

```
BINS=Demo.out DemoShim.so      # The two files to build

all: $(BINS)

%.out: %.c
    $(CC) $(CFLAGS) -o $@ $^

%.so:  %.c
    $(CC) $(CFLAGS) -shared -fPIC -o $@ $^ -ldl

clean:
     rm -f $(BINS)

# Runs As:
#    cc -o Demo.out Demo.c
#    cc -shared -fPIC -o DemoShim.so DemoShim.c -ldl
```

Shim Interposer Operation

LD_PRELOAD=./DemoShim.so ./Demo.out



Patent Pending

The Human Condition in Changing Times

If you want to make enemies, try to change something.

– Woodrow Wilson

Addresses to Salesmanship Congress
July 10, 1916
Detroit, MI

Aeolipile (aka *Hero's Engine*)

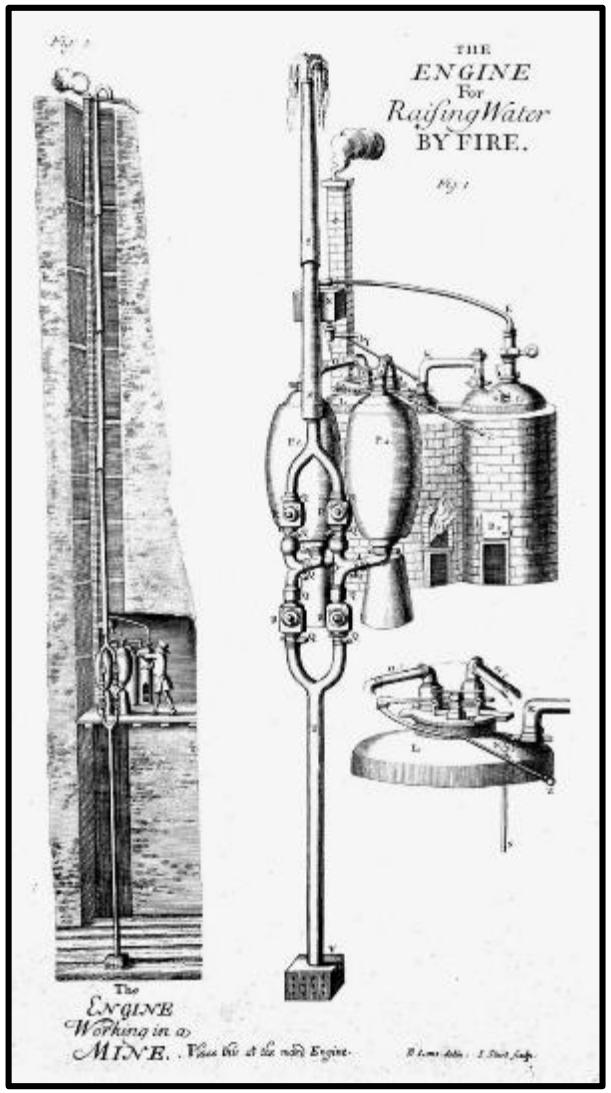
Vitruvius (c. 80 BCE – c. 15 CE)

Mentions *aeolipiles* by name

Hollow brazen vessels, which have an opening or mouth of small size, by means of which they can be filled with water. Prior to the water being heated over the fire, but little wind is emitted. As soon, however, as the water begins to boil, a violent wind issues forth

Thomas Savery July 1698 Patent

No illustrations, No description, 35 year protection



Pump water out of mines

Poor efficiency
High pressure broke soldered joints
Atmosphericly constrained
Pressure safety constrained

Very broad patent covered all pumps that raised water by fire

Patent hindered early steam machinery development in the British Isles

Denis Papin

22 August 1647 – 26 August 1713

Worked with Savery

Denied credit for contributions

Died destitute

Thomas Newcomen

Invented the *Atmospheric (Newcomen) Engine*
Based on Savery/Papin's work
Licensed Savery's patent

125 *Atmospheric Engines* by 1733

~600 *Atmospheric Engines* by 1775

~2,000 *Atmospheric Engines* by 1800

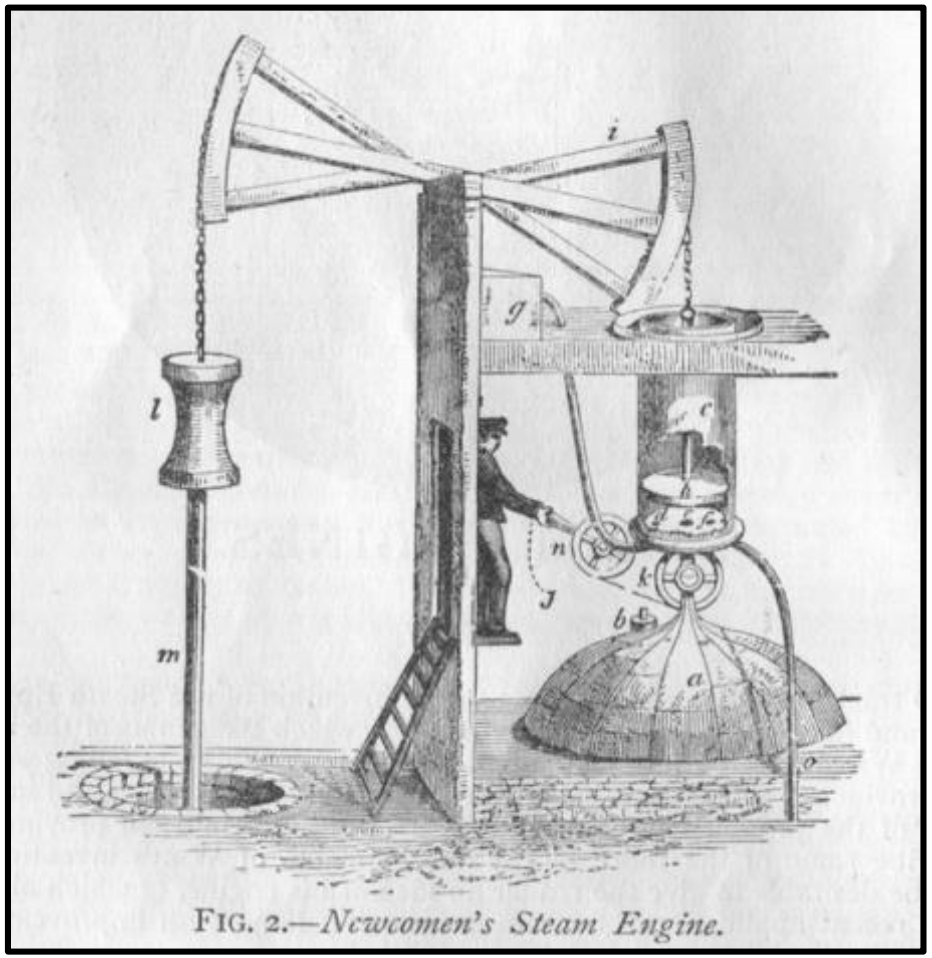
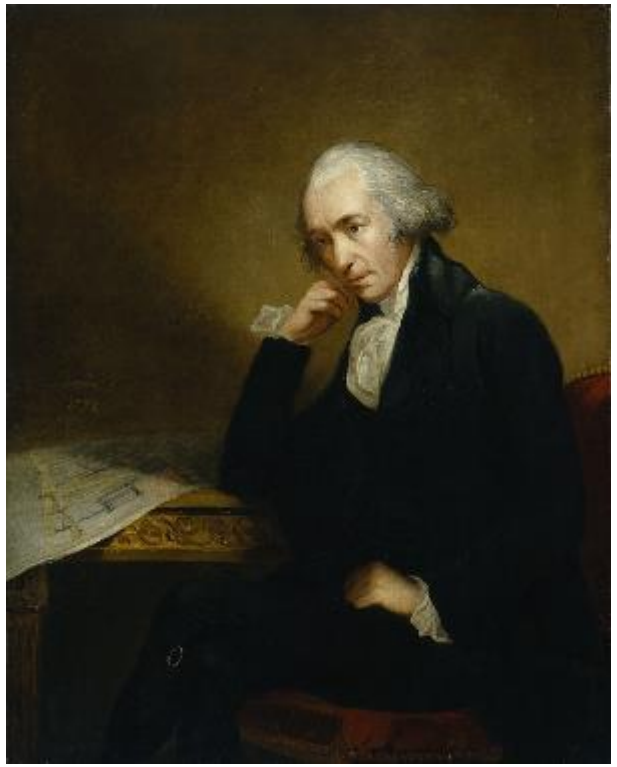


FIG. 2.—*Newcomen's Steam Engine.*

Inefficient

Gradual *1775 Watt Steam Engine* replacements where coal was expensive

James Watt



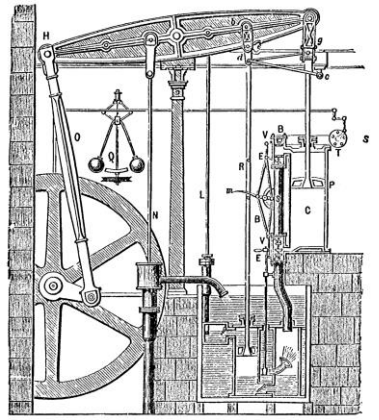
1776 - Invented the *Watt Steam Engine*
Significantly more efficient
Well suited for rotary motion

Partnered with Matthew Boulton in 1775

Boulton and Watt
Licensed designs
License == 1/3rd coal cost savings

5x as efficient as Newcomen engines

Numerous successful patent infringement suits
Arbitration



Enormous Structures

Safety ⇒ Low Pressure ONLY!

It is never advisable to work with a strong steam when it can be avoided, as it increases the leakages of the boiler and joints of the steam case, and answers no good end.

***The Steam Engine and its Inventors; A Historical Sketch*, Galloway, Robert L. 1881**

1825, Ten Years After

Sunday, 18 June 1815

The Duke of Wellington

The Problem

30,000
Steam-Powered
Looms

US Cotton

Cloth

Transportation Options

Congested Dirt/Muddy Roads

- Multi-day Horse-Drawn Wagons
- 20 Hour Stagecoach Journey
  - Uncomfortable
  - Tips Required
- Walk & Stay at Inns

Canals – 36 Hours One Way

Slow, Expensive

- Canal Monopolies
- Horse Feed Shortage

ining districts. The progress of railways was, indeed, such that the canal interests became somewhat uneasy respecting them. The Duke of Bridgewater, when congratulated by Lord Kenyon on the successful issue of his scheme, made answer , with far sighted shrewdness, —“ Yes, we shall do well enough if we can keep clear of these damned tram-roads — there's mischief in them ! ”

Transportation Options

The progress of railways was, indeed, such that the canal interests became somewhat uneasy respecting them. The Duke of Bridgewater, when congratulated by Lord Kenyon on the successful issue of his scheme, made answer, with far sighted shrewdness, —“ Yes, we shall do well enough if we can keep clear of these damned tram-roads — there's mischief in them ! ”

However, the improvements *thus far* effected had been confined almost entirely to the road. The railway wagons still continued to be drawn by horses. The gradual improvements made in the rail, by improving the firmness and smoothness of the track, had, indeed , effected considerable economy in horse-power; but that was all.

What was further wanted was, the adoption of some mechanical agency applicable to the purpose of railway traction. Unless some such agency could be invented, it was clear that railway improvement had almost reached its limits.

The Life of George Stephenson, Railway Engineer
Samuel Smiles
Fourth London Edition, 1859, Pg. 68

Transportation Options

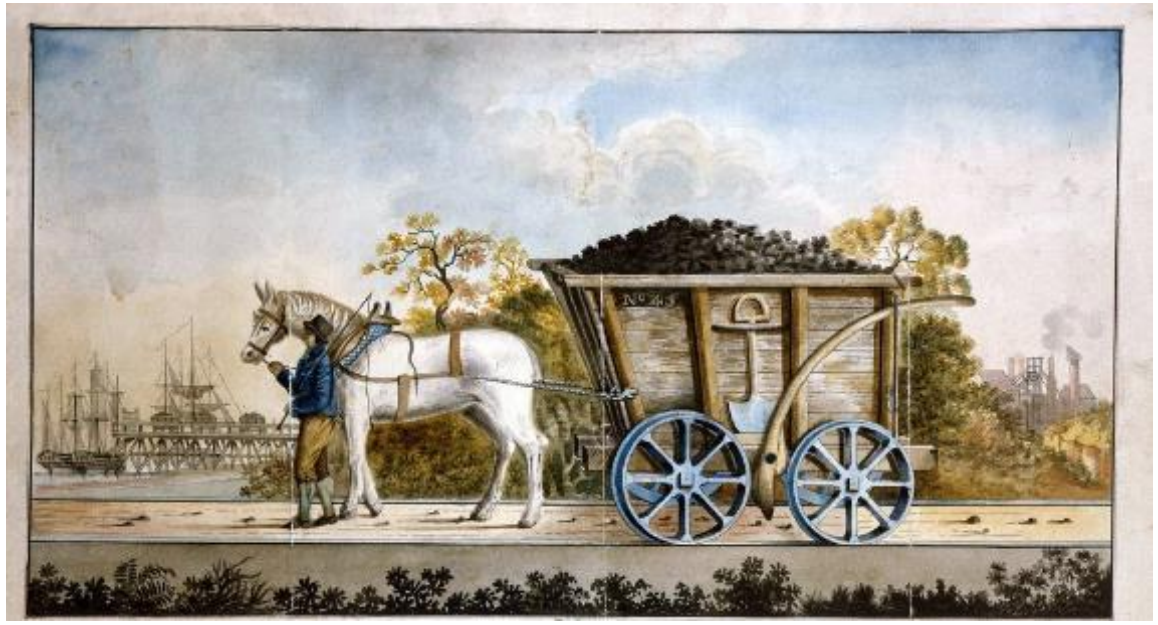
The canal proprietors were confident in their imagined security. They revelled in the prospect of enjoying in perpetuity their enormous dividends, which were so great that one of their undertakings (the Old Quay) had paid to its thirty-nine proprietors, every other year for half a century, the total amount of their original investment; and the income derived from the Duke of Bridgewater's canal amounted to not less than 100,000l. a year.

Mr. Bradshaw knew that no third canal could be made, because all the available water was already absorbed by the two existing ones. As for the proposed railway, the canal proprietors ridiculed it as a chimera. It had been spoken about years before, when Mr. [Dr. James Anderson, of Edinburgh] made his survey, and nothing had come of it then. It would be the same now. The thing, they said , was got up merely to frighten them; but they were not so to be intimidated.

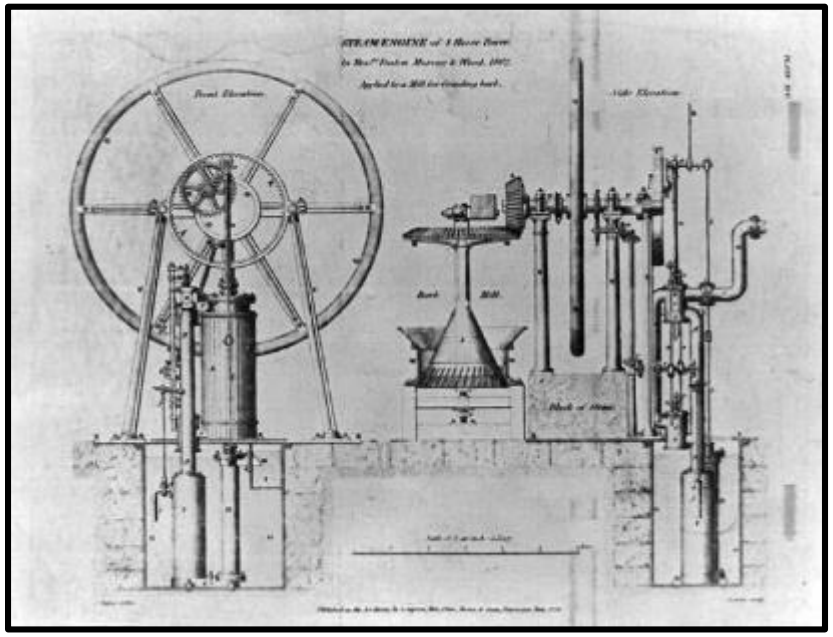
The old system must therefore continue; and there was no alternative for the merchants of Liverpool and the manufacturers of Manchester but to submit with the best grace possible to the obstructions and extortions of the canal companies.

The Life of George Stephenson, Railway Engineer
Samuel Smiles
Fourth London Edition, 1859, Pg. 188

George Stephenson Railway Solution



Railway Solution



Stationary Steam Engines Solution

Chris55 at en.wikipedia

Richard Trevithick

First recorded use of steam power on a railway

In 1804, Richard Trevithick, ran a smooth wheel, high-pressure steam locomotive on a 'L' section plateway from the Penydarren iron mines near Merthyr Tydfil, UK.

He hauled ten tons of iron, 70 passengers, and five wagons from the Penydarren ironworks to the Merthyr-Cardiff Canal, but it was more expensive than horses.

On the third trip, it broke down after breaking rails designed for horse wagon loads. Horses hauled it back to the Penydarren ironworks where it was converted to a stationary steam engine.

Chris55 at en.wikipedia

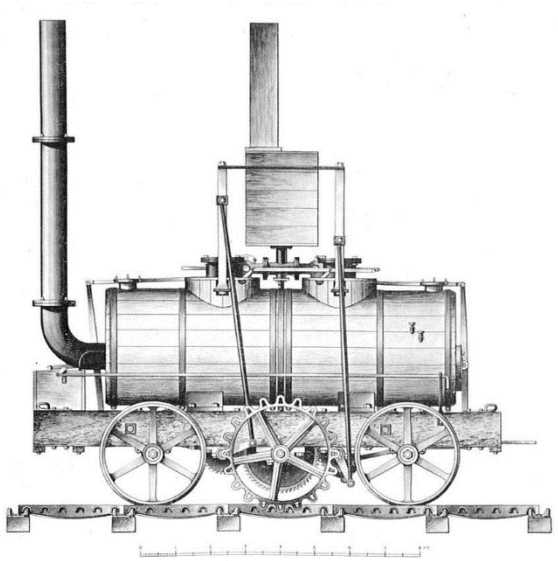
Richard Trevithick

I have been branded with folly and madness for attempting what the world calls impossibilities, and even from the great engineer, the late Mr. James Watt, who said to an eminent scientific character [Mr. John Isaac Hawkins] *still living, that I deserved hanging for bringing into use the high-pressure engine.*

- Note to Davies Gilbert

Died in poverty in 1833, unmarked grave.

John Blenkinsop

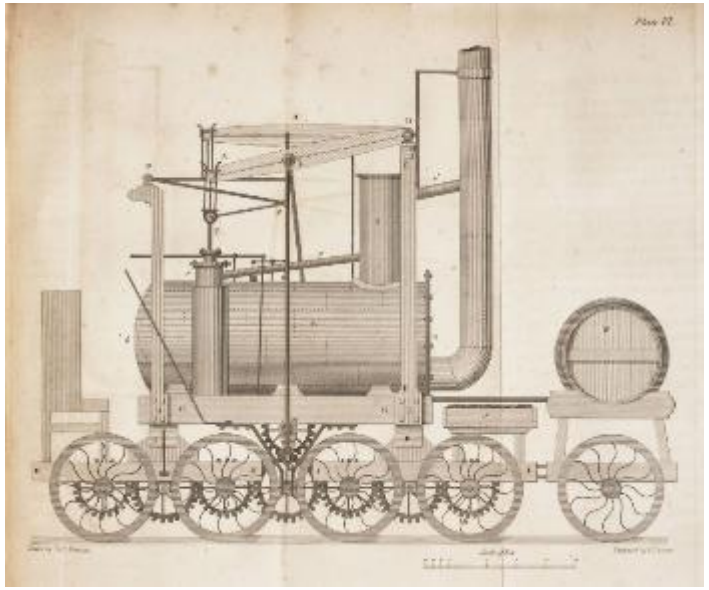


Salamanca - the first commercially successful steam locomotive, built by Matthew Murray of Holbeck in 1812

The first rack and pinion locomotive, using Blenkinsop's patented design

Destroyed six years later - boiler explosion

William Hedley



Puffing Billy - 1816

Eight-ton weight broke the cast iron rails.

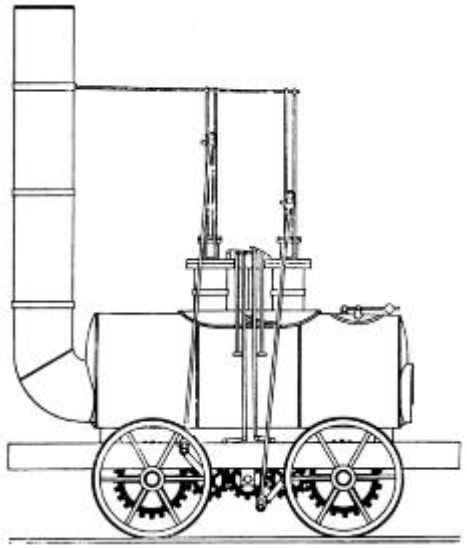
A four axle redesign evenly spread the weight.

Achieved 5 mph maximum.

Numerous serious technical limitations.

George Stephenson

“Traveling Engine”

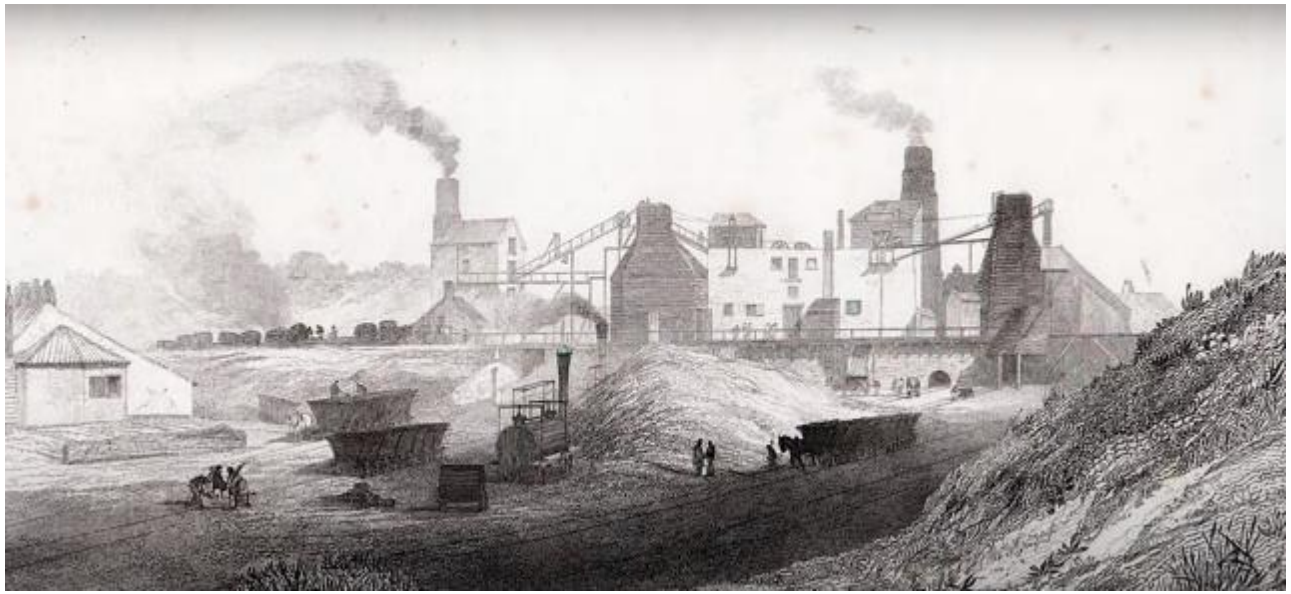


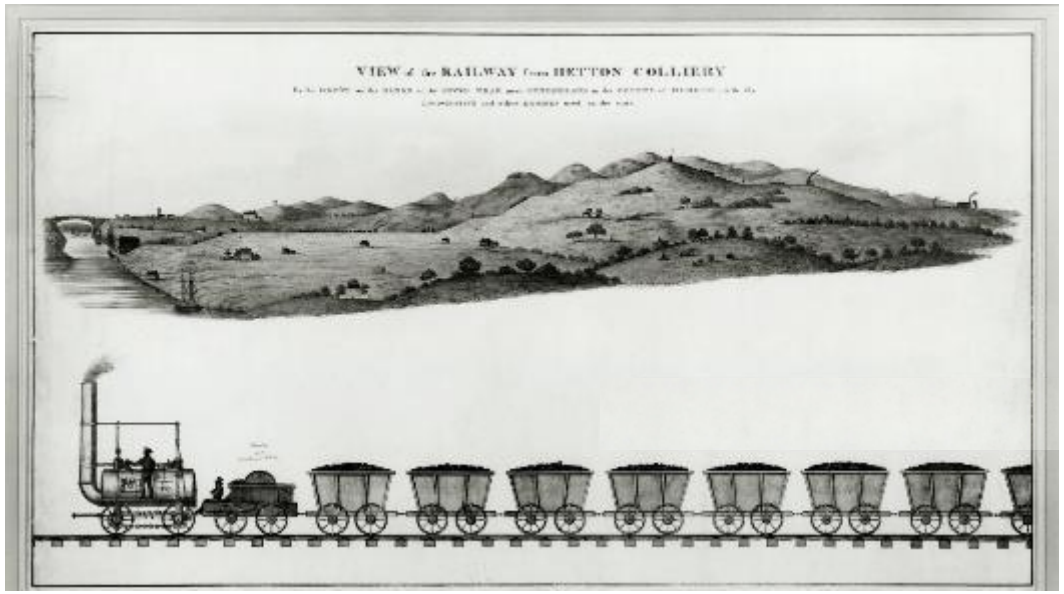
Blücher - 1814

It moves at the rate of three miles an hour, dragging after it 14 waggons, loaded each with about two tons of coals; so that in this case the expense of 14 horses is saved by the substitution of the steam-engine.

“Clunky, Jerky, and Loud"

George Stephenson

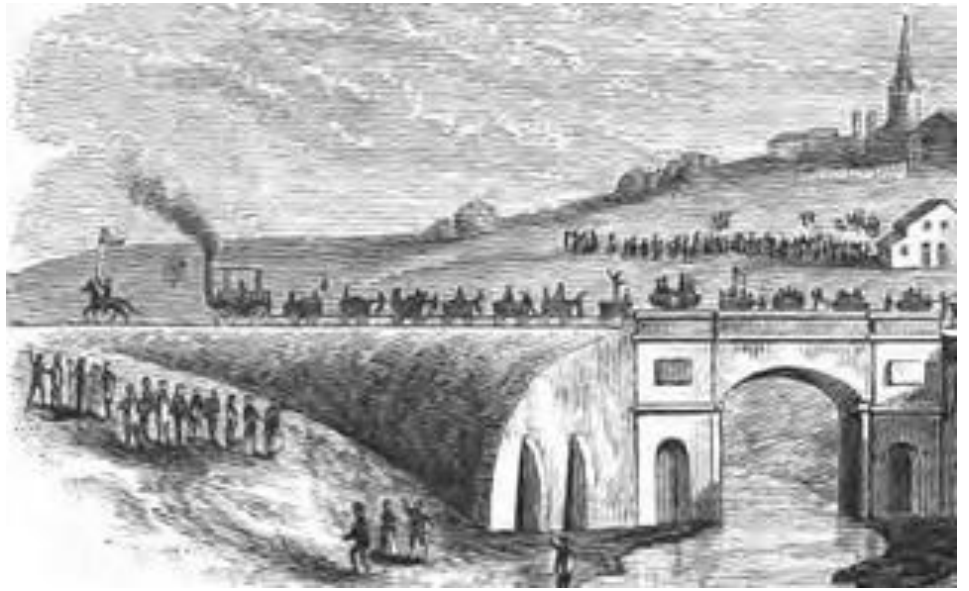




Hetton Colliery Railway – Cast Iron Rails - 1822

An 8 mile private railway,
The first railway designed to be operated without animal power.

George Stephenson



Stockton Darlington Railway - 1822

Stephenson advocated using steam locomotives.

Specified malleable, wrought iron rails, even though he owned a share of the patent for the cast iron rail alternative

Canal Proprietor Response

<u>Leeds & Liverpool and Bridgewater Canal Companies</u>

- Organized Kingdom-Wide *Slime* Attack
- Contrived a *Fake News, Misinformation* Campaign
- Enlisted Complicit Newspapers (Corrupt Media)
- Distributed *Libelous* Pamphlets
- Had *Slanderous* Road Trip Briefings
- Hired the Best Barrister Team for Parliamentary Attacks
- Hired Educated, Credential *Shills* To *Denigrate* in Parliament Reviews

Liverpool to Manchester Expressway Slander

- People will be frightened by locomotive noise, fire, and smoke
- Ladies will have miscarriages
- Hens will stop laying eggs
- All area sheep will stop grazing, starve, and die
- All area cows will stop grazing, producing milk, and die
- Horses will become useless, idle, and extinct
- Expensive horse fodder - oats and hay - will become unsaleable
- Birds flying anywhere near locomotive exhaust will instantly drop dead from poisoned air
- Local pheasants and foxes will disappear
- Clouds of smoke will pollute neighborhood air
- Smoke will destroy estate grass
- Houses will be incinerated by locomotive embers/sparks
- Near by property values will be destroyed
- Towns will be depopulated

No man in his senses would build houses there.
Mr. Thomas Dickson

Liverpool to Manchester Expressway Slander

- Stagecoach lines will be destroyed
- Turnpike roads will become deserted
- Highway men will make road travel highly dangerous
- Country innkeepers will be ruined
- Agriculture and Farms will collapse
- Farmland will become unused
- Farmers, inn keepers, coachmen, and landowners will become beggars
- Higher unemployment rates
- People will fear explosions and accidents
- Bursting boilers will scald and blow passengers to atoms

Liverpool to Manchester Expressway Slander

Tunnels will expose healthy people to colds, catarrhs, and consumption.
– Sir Anthony Carlisle

Tunnel noise, darkness, and dangers of travelling were depicted in all their horrors. Worst of all (Dr. Lardner) was "the destruction of the atmospheric air." Ventilating shaft provisions were altogether insufficient to prevent dangers arising from coke combustion producing carbonic acid gas, which, in large quantities, was fatal to life.

Dr. Lardner: The passage of a 100-ton load Great in the Western Railway's proposed Box Tunnel would deposit about 3090 lbs. of noxious gases incapable of supporting life. Here was the uncomfortable prospect of suffocating passengers between London and Bristol.

Liverpool to Manchester Expressway Slander

Going faster than 10 Miles Per Hour Causes Insanity.

The objections … against the high speed attainable on railways, then a mere matter of speculation, were also entertained by nearly all the practical and scientific men* of the kingdom, and by the public generally.

* For instance, Dr. Lardner affirmed that "carriages could not go at any thing like the contemplated speed; if driven to it, the wheels would merely spin on their axles, and the carriages would stand stock-still."

The Life of George Stephenson, Railway Engineer
Samuel Smiles
Fourth London Edition, 1859, Pg. 199

Liverpool to Manchester Expressway Slander

Those infernal railroads.
Charles de Laet Waldo Sibthorp
Member of Parliment

Nothing is more distasteful to me than to hear the echo of our hills reverberating with the noise of hissing railroad engines running through the heart of our hunting country, and destroying that noble sport to which I have been accustomed from my childhood.
Mr. H. Berkeley (Cheltenham MP)

[I] would rather meet a highwayman, or see a burglar on my premises, than an engineer; he should be much more safe, and of the two classes, he thought the former more respectable.
Col. Sibthorpe (Lincoln MP)

Liverpool to Manchester Expressway Slander

- The public will not use the railroads
- Steam powered railways will never work
- Locomotives will be too heavy to move
- Railroads will only experience folly, ruin, and disaster
- Canals will beat the railroads

Manchester & Liverpool Railway Bill Passage

Indeed, when George Stephenson, at the interviews with counsel held previous to the Liverpool and Manchester Bill going into Committee of the House of Commons, confidently stated his expectation of being able to run his locomotive at the rate of twenty miles an hour, Mr. William Brougham, who was retained by the promoters to conduct their case, frankly told him that if he did not moderate his views, and bring his engine within a reasonable speed, he would "inevitably damn the whole thing, and be himself regarded as a maniac fit only for Bedlam."

George Stephenson agrees to never claim more than 10 MPH.

Manchester & Liverpool Railway Bill Passage

First Passage Attempt – March 21, 1825

- Landowner-obstructed survey discredited
- George Stephenson discredited, dismissed
  - *The most absurd scheme that ever entered the head of a man.*
  - Stephenson *must certainly be laboring under a delusion*!
- George and John Rennie
  - Appointed to conduct a new survey
  - Invited to build it
  - Refused to work with Stephenson – “not a real engineer”
  - Appointed Charles Blacker Vignoles surveyor

Manchester & Liverpool Railway Bill Passage

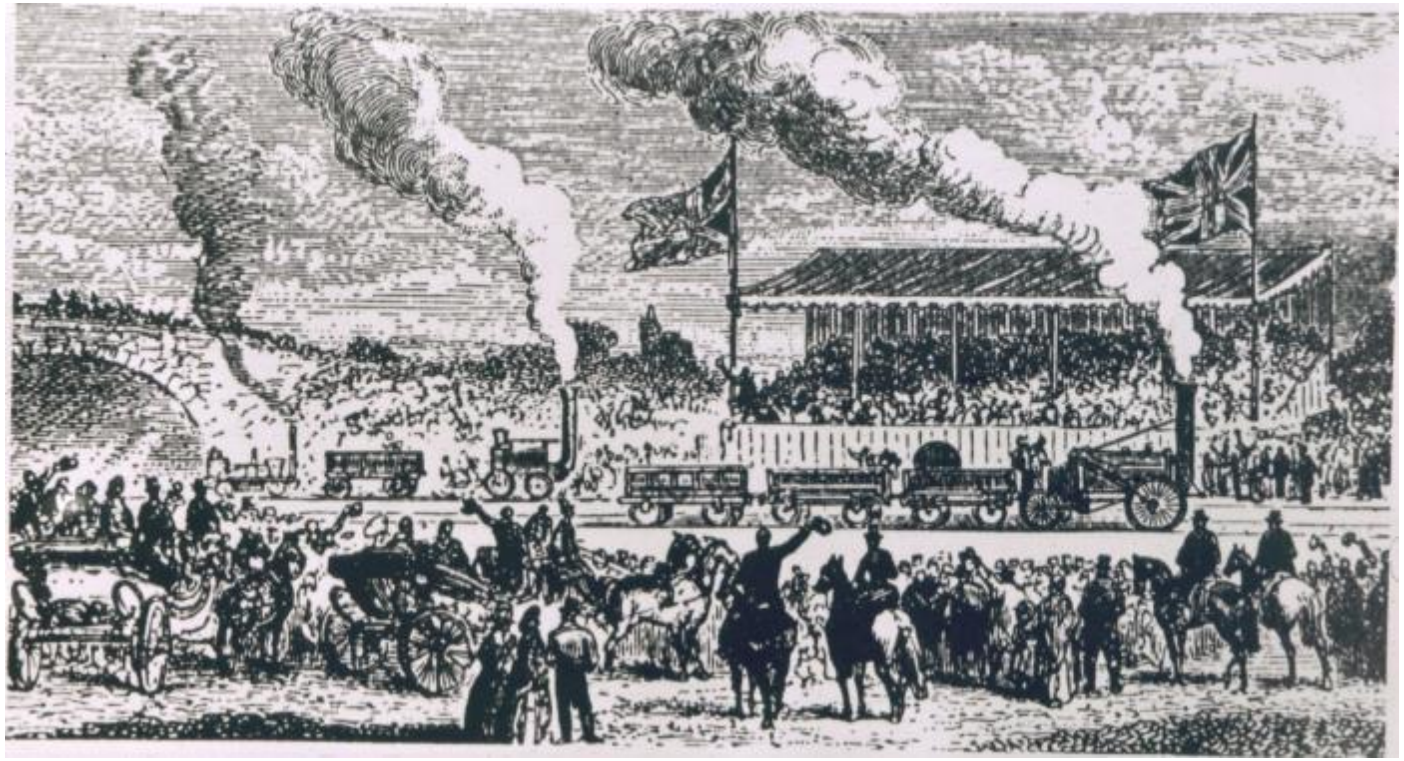
After Years of Parliamentary Debate: May 5, 1826 Success.

- Bridgewater Canal heir as an investor
- Steam locomotives would not provide primary propulsion
- Carriages and wagons had right of way
- No locomotives in Liverpool

George Stephenson appointed lead engineer to construct tracks.

Rainhill Trial - October 6-14, 1829

Horse-Pulled Wagons?
Stationary Steam Engines?
Locomotive Propulsion?



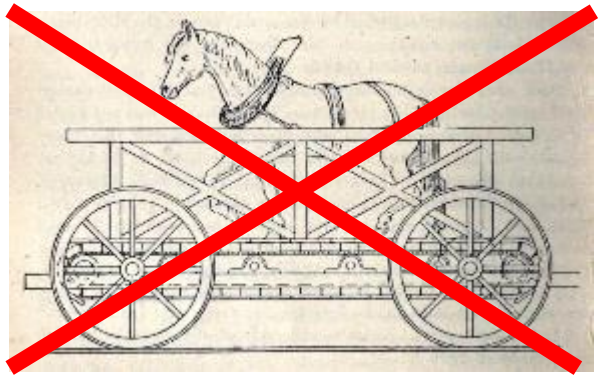
(1.5 Miles of Track, 10 Round Trips) ≥ 10 MPH

Rainhill Trial

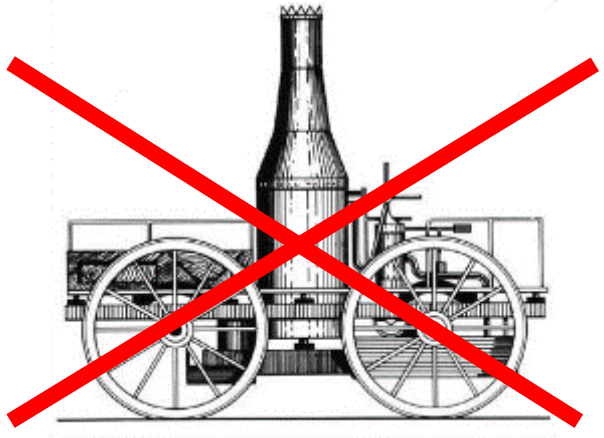
Each Engine Must

- Be steam powered
- Weigh less than 4.5 tons or have six wheels (rail breakage)
- Be able to haul three times its own weight
- “Consume its own smoke” $\Rightarrow$ Coke
- Be $\leq$ 15 Feet in length
- Have $\leq$ 50 PSI boiler pressure and three safety valves
- Reach a speed of at least 10 miles per hour
- Cost less than £550
- Traverse the 1.5 mile Rainhill track section twenty times forward and in reverse (Liverpool/Manchester round trip)

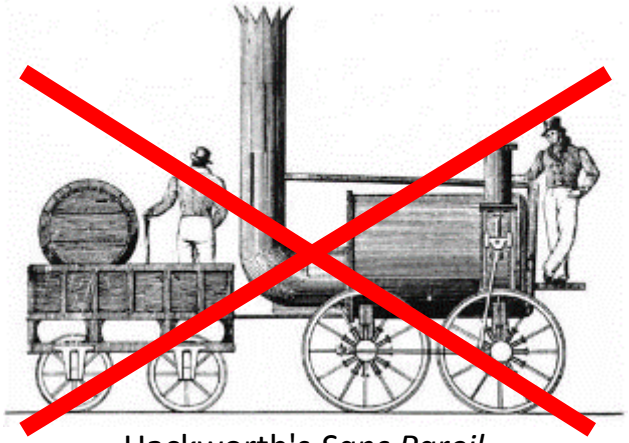
Rainhill Trial Entries



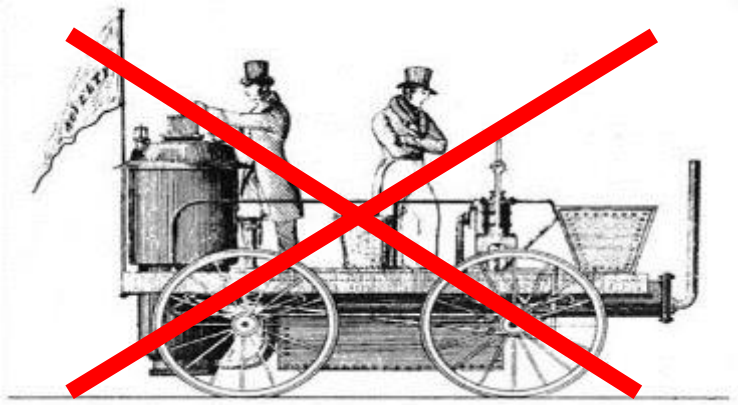
Brandreth's *Cycloped*



Burstall's *Perseverance*

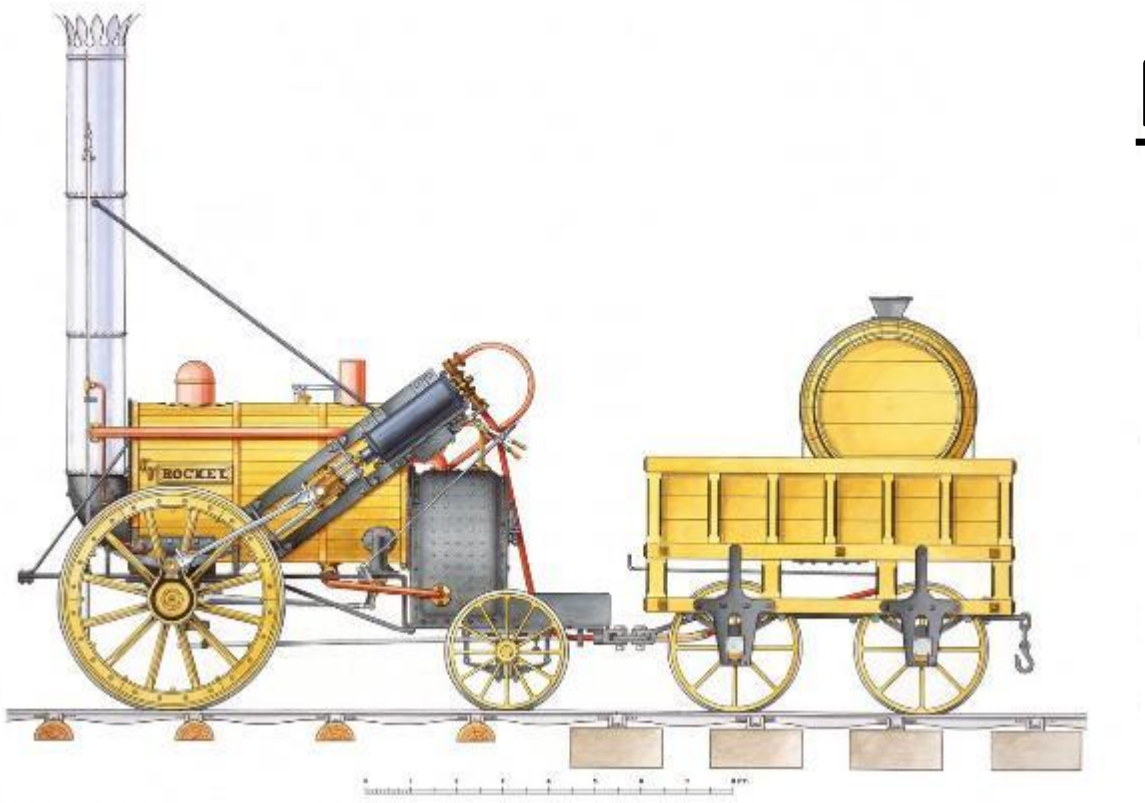


Hackworth's *Sans Pareil*



Ericsson and Braithwaite's *Novelty*

Rainhill Trial Winner – Stephenson's *Rocket*



Purpose-built Device

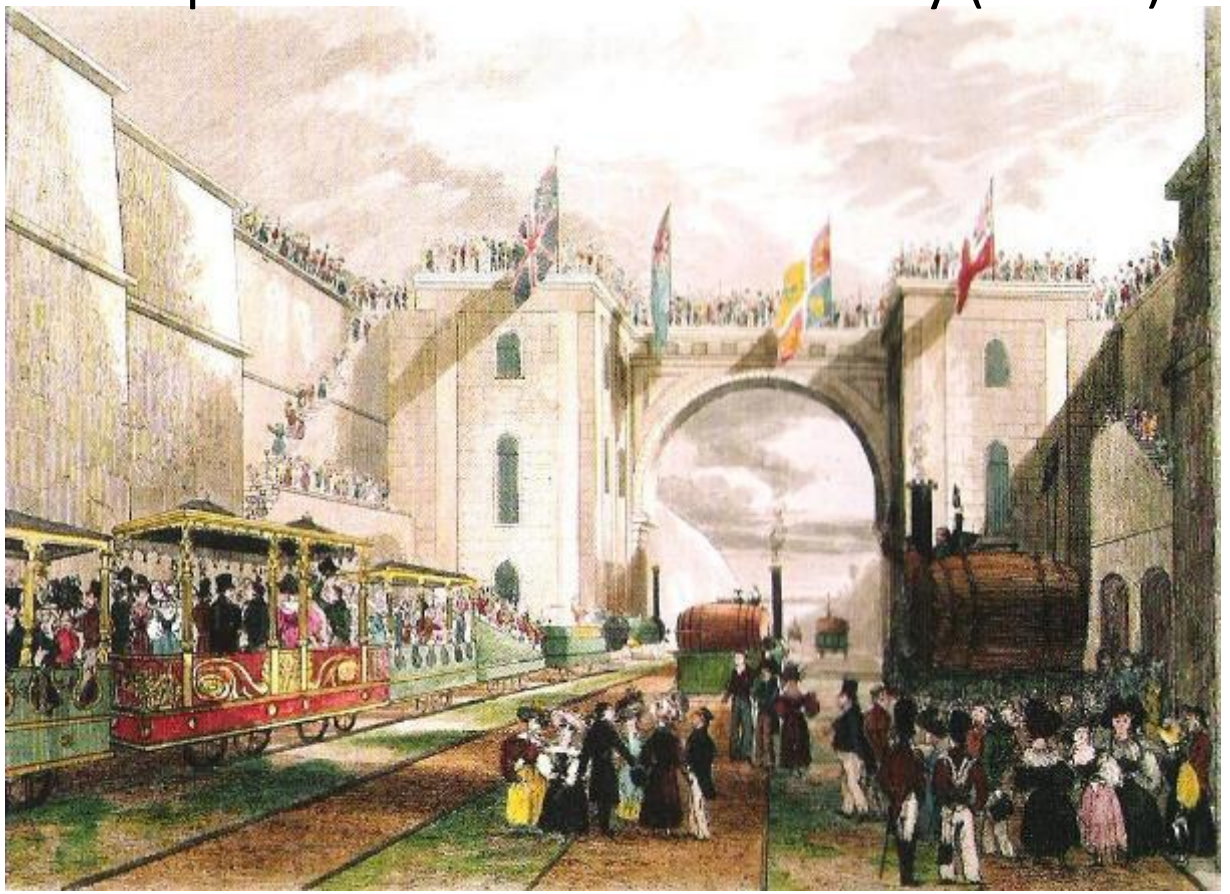
- Multi-tubular Boiler
- Strongest Iron
- Externa, Angled Pistons
- Powerful Exhaust Blast
- Yellow ⇒ Speed
- White Smokestack ⇒ Cleanliness
- Trial Debug Run

Already Obsolete by Competition

Inaugural Day Ceremonies – September 15, 1830

The Duke of Wellington

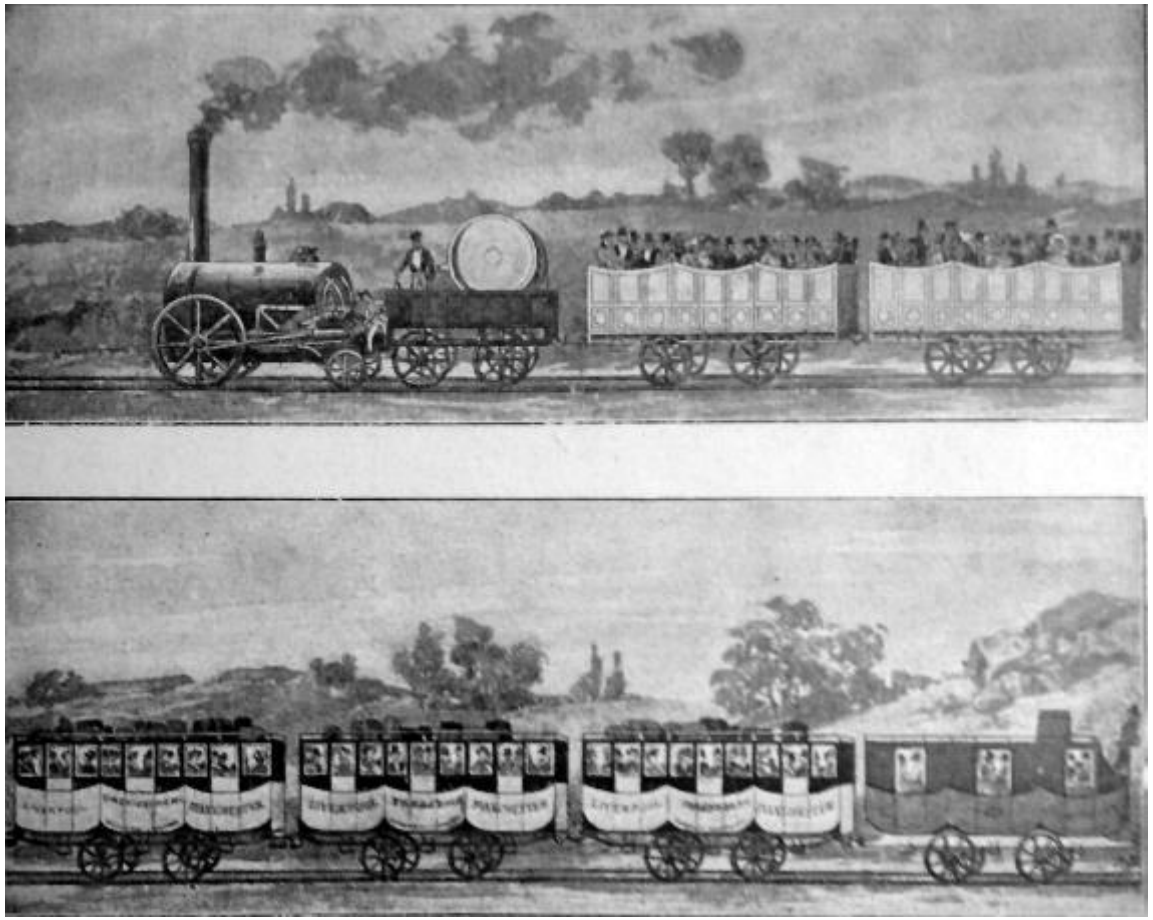
Liverpool and Manchester Railway (L&MR)



William Huskinson
Liverpool PC

Rocket runs over Huskinson, rushed to hospital at 34 MPH, later dies.

Liverpool and Manchester Railway (L&MR)



The first railway to

- Exclusively use steam powered locomotives
- Prohibit horse-drawn traffic
- Have double tracks throughout its length
- Have a true signaling system
- Have a full timetable
- Carry mail

View of the Railway across Chat Moss, 1831

Liverpool to Manchester Expressway Epilogue

Passing locomotives were considered interesting.

Property *Near a Station* Exploded in Value.

Chat Moss farm development started.

Horses were not frightened.

Horse Meat Prices Increased.

Stagecoaches Used More Horses.

Trains Became Cheaper Than Walking.

To/From London Trips Increased.

Fresh Vegetables & Meat Became Available in Cities.

Canals made more money.

Liverpool to Manchester Expressway Epilogue

Farmers bought coal , lime, and manure, for less money.

Farmers obtained a readier access to the best stock and produce markets.

No man in his senses would build houses there? – Covered in villas.

Higher Adjacent Farm Rents.

Adjacent Farm Sales became more Competitive.

Previously hostile landowners demanded *siding* access.

Previously hostile cities demanded expansion.

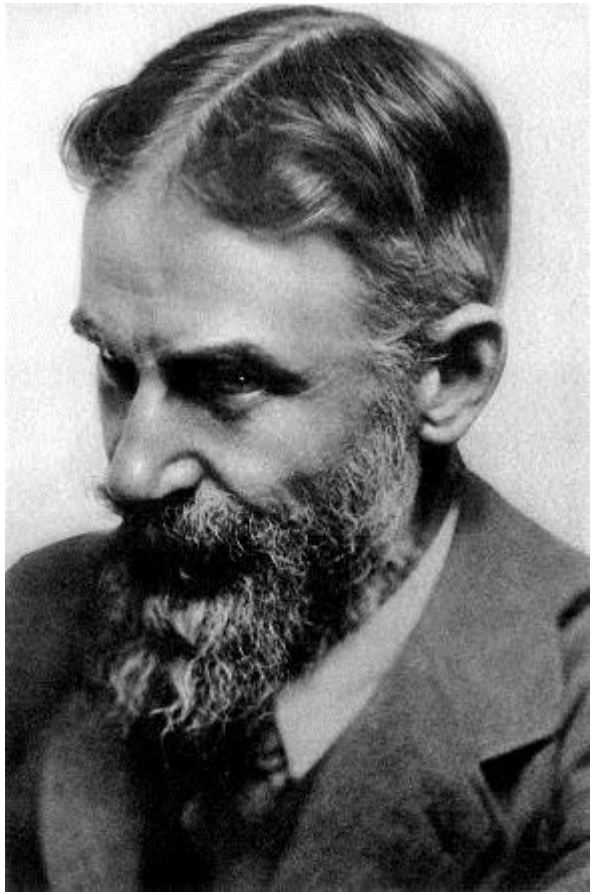
Coal Became Less Expensive.

Locomotive evolution accelerated.

Railway Travel Was the Safest Travel.

The World Changed Forever

George Bernard Shaw



https://upload.wikimedia.org/wikipedia/commons/c/ca/George_bernard_shaw.jpg

All great truths begin as blasphemies.
Annajanska the Bolshevik Empress

The reasonable man adapts himself to the world;
the unreasonable man persists in trying to adapt the world to himself.
Therefore, all progress depends on the unreasonable man.
Maxims for Revolutionists,

People are always blaming circumstances for what they are.
I don't believe in circumstances.
The people who get on in this world are the people who get up and look for the circumstances they want, and,
if they can't find them, make them.
Mrs. Warren's Profession, Vivie, Act II

You see things; and you say *Why?*

But I dream things that never were; and I say *Why not?*
***Back to Methuselah,* Act I, *Selected Plays with Prefaces,* vol. 2, p. 7 (1949)**

Thomas Paine

A long habit of not thinking a thing wrong, gives it a superficial appearance of being right, and raises at first a formidable outcry in defense of custom.

Change Thoughts

I do not believe in the collective wisdom of individual ignorance.
- Thomas Carlyle

Every person takes the limits of their own field of vision for the limits of the world.
- Arthur Schopenhauer

Change is not made without inconvenience, even from worse to better.
- Richard Hooker

Every great advance in natural knowledge has involved the absolute rejection of authority.
- Thomas Henry Huxley

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it. - Max Planck

History records no more gallant struggle than that of humanity against the truth.
- Unknown

Change Thoughts

When people are free to do as they please, they usually imitate each other.
- Eric Hoffer

In the fight between you and the world, back the world.
- Franz Kafka

Every society honors its live conformists and its dead troublemakers.
- Mignon Mclaughlin

Man and nations will act rationally when all other possibilities have been exhausted.
- Katz's law

When a true genius appears in this world, you may know him by this sign,
that the dunces are all in confederacy against him.
- Jonathon Swift

Robert Anson Heinlein

https://en.wikipedia.org/wiki/Robert_A._Heinlein#/media/File:Heinlein-face.jpg

Throughout history, poverty is the normal condition of man.

Advances which permit this norm to be exceeded — here and there, now and then — are the work of an extremely small minority, frequently despised, often condemned, and almost always opposed by all right-thinking people.

Whenever this tiny minority is kept from creating, or (as sometimes happens) is driven out of a society, the people then slip back into abject poverty.

This is known as "bad luck."

End of Part 2

Thank You