

# SYNCHRONOUS VS ASYNCHRONOUS DIGITAL CIRCUITS AS AN ANALOGY TO ORGANIZATIONAL DYSFUNCTION AND APPLIED TO DEVOPS PRACTICES



## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WATKINS (2014)**  
This book explores the benefits of asynchronous communication in the workplace, highlighting how it can improve productivity, reduce stress, and foster a more inclusive and collaborative environment.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics are circuits where the output depends on both the current input and the state of the circuit at a previous point in time. They are characterized by a common clock signal that synchronizes the operation of all components.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics are circuits where the output depends only on the current input. They do not require a common clock signal and can operate at different rates.

**KEY DIFFERENCES**  
Synchronous circuits are easier to design and analyze but can be slower due to the need for a common clock. Asynchronous circuits are faster and more efficient but are more complex to design and analyze.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR LATCH**  
The SR latch is a fundamental asynchronous digital logic device. It has two inputs, Set (S) and Reset (R), and two outputs, Q and Q-bar. It can be used to store a single bit of information.

**SR LATCH WITH NAND GATES**  
An SR latch can be implemented using two NAND gates and two cross-coupled inverters. This configuration allows for the storage of a single bit of information.

**SR LATCH WITH NOR GATES**  
An SR latch can also be implemented using two NOR gates and two cross-coupled inverters. This configuration is similar to the NAND-based implementation but uses different gate types.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**LOW POWER CONSUMPTION**  
Asynchronous digital logic designs can consume significantly less power than synchronous designs, making them ideal for battery-powered devices and low-power applications.

**INTEGRATED WITH ANALOG**  
Asynchronous digital logic can be more easily integrated with analog circuits, allowing for the design of mixed-signal systems with reduced complexity and power consumption.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**ORGANIZATIONAL STRUCTURE**  
Organizations are becoming more hierarchical and structured, similar to synchronous digital circuits. This allows for better coordination and control of resources.

**COMMUNICATION**  
Organizations are using more synchronous communication methods, such as video conferences and instant messaging, to ensure that everyone is on the same page and working together effectively.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE SAFE "FLOW MODEL" STUFF**  
The safe "flow model" stuff refers to traditional organizational models that focus on top-down communication and control. While these models have been successful in the past, they are becoming less effective in today's fast-paced, dynamic business environment.

**THE REALITY OF ASYNCH**  
The reality of asynchronous communication is that it allows for more flexibility and autonomy. This can lead to increased productivity and innovation, but it also requires a shift in organizational culture and communication methods.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**MEETINGS AS A CULTURAL NORM**  
Meetings have become a cultural norm in many organizations, often leading to inefficiency and wasted time. This is a result of a top-down communication model that values face-to-face interaction.

**THE RISE OF ASYNCH**  
The rise of asynchronous communication has challenged the traditional meeting model. Asynchronous communication allows for more thoughtful and deliberate decision-making, reducing the need for frequent meetings.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are meetings that do not require participants to be present at the same time. They can be conducted through video conferencing, instant messaging, or email.

**ASYNCHRONOUS MEETINGS WITH AGENDAS**  
Asynchronous meetings with agendas allow participants to prepare in advance and discuss specific topics during the meeting. This can lead to more focused and productive discussions.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine. This can help reduce hardware costs and improve resource utilization.

**CONTAINERIZATION**  
Containerization allows applications to run in isolated environments called containers. This can help improve application performance and security.

## CLOSING THOUGHTS AND TAKEAWAYS

**ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is a powerful tool for improving productivity and reducing stress in the workplace. It allows for more thoughtful and deliberate decision-making.

**ORGANIZATIONAL STRUCTURE**  
Organizations should move away from top-down communication models and embrace more flexible and collaborative structures. This can lead to increased innovation and productivity.

# WTF IS THIS TALK ABOUT?

## ABOUT ME



Howard Deiter  
Twitter: @hdeiter



PROGRAMMING SINCE HIGH SCHOOL IN 1988 (SOME DAY, I'LL FIGURE IT OUT) (COOL RETRO IBM 1130)

WORKING FULL-TIME SINCE 1995 (WAZLE STILL A JUNIOR IN COLLEGE)

HAVE HAD THE PLEASURE OF WORKING AT ALL LEVELS (INDIVIDUAL CONTRIBUTION TO EXECUTIVE), BOTH COMMERCIAL AND SCIENTIFIC

HAVE BEEN AN AGILE COACH SINCE 2005 (SO FEW OF US BACK THEN THAT IT SEEMED THAT WE ALL KNEW ONE ANOTHER)

TO BE SUCCESSFUL BACK THEN, YOU HAD TO BE BOTH A PROFESSOR AND EXTREME PROGRAMMING COACH

THROUGHOUT MY LIFE, TWO THINGS HAVE FACINATED ME

- DIGITAL ELECTRONICS
- SOFTWARE DEVELOPMENT

## "THE WASTES ARE WATER", AND OTHER ADVICE FROM THE OLDER AGILE FISH.



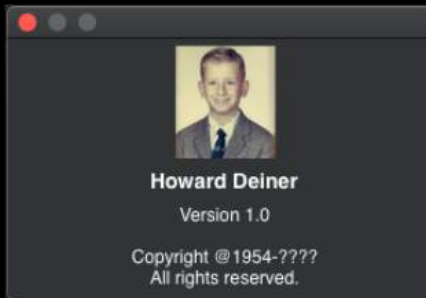
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I HOPE TO BE ABLE TO GIVE YOU JUST A BIT OF A VIEW INTO WHAT I FEEL IS A TERRIBLE AFFLICTION THAT WE SUFFER UNDER: WE LIVE IN A WORLD FILLED WITH CLOCK SIGNALS.

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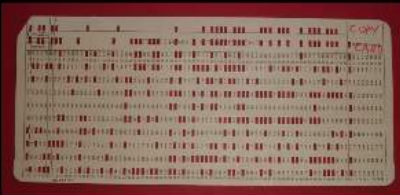
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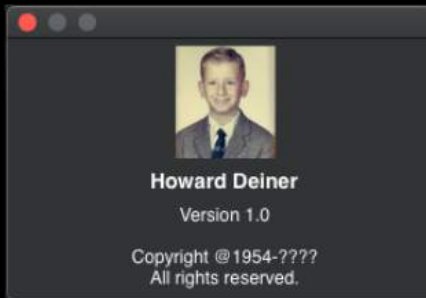








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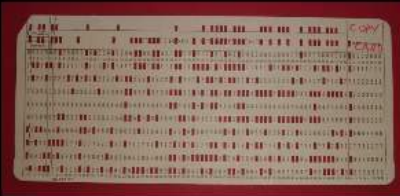
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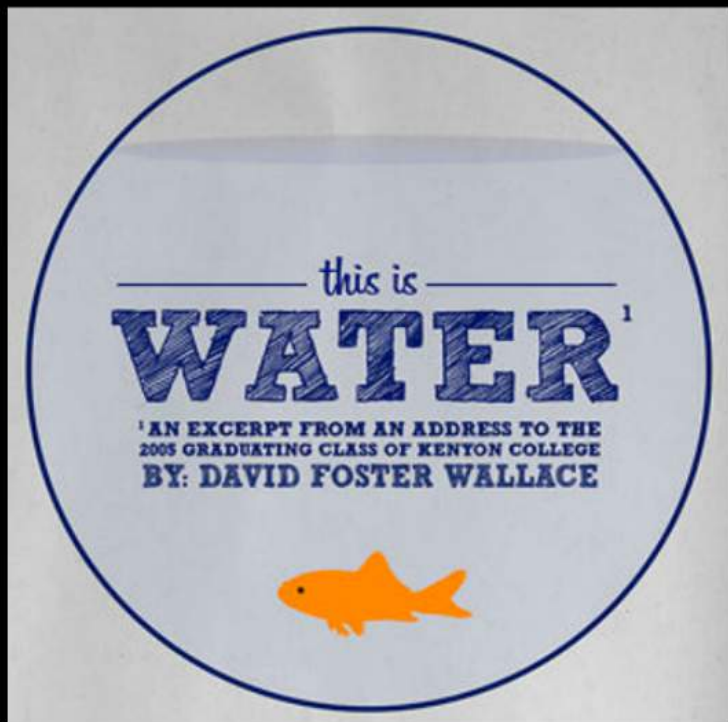
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Asynchronous communication is a type of communication that does not require the participants to be present at the same time. It allows for communication to occur at different times and from different locations. Examples include email, text messaging, and video conferencing.

**"THE MAGIC OF ASYNCH" - MITCHELL WEISSER, FORTUNE MAGAZINE**  
Asynchronous communication is the secret to getting things done. It allows you to work at your own pace, without the constraints of a traditional 9-to-5 workday. It's the key to productivity and flexibility in the modern workplace.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics is a type of digital logic where the output of a circuit depends on the current input and the state of the circuit at a specific point in time. It is characterized by a clock signal that synchronizes the operation of the circuit.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics is a type of digital logic where the output of a circuit depends on the current input and the state of the circuit at any point in time. It does not require a clock signal to synchronize the operation of the circuit.

**KEY DIFFERENCES**  
Synchronous circuits are easier to design and test, but they are slower and more expensive. Asynchronous circuits are faster and cheaper, but they are more difficult to design and test.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR LATCH**  
The SR latch is a basic asynchronous digital logic device. It has two inputs, S (Set) and R (Reset), and two outputs, Q and Q-bar. It is used to store a single bit of information.

**D LATCH**  
The D latch is another basic asynchronous digital logic device. It has one input, D, and two outputs, Q and Q-bar. It is used to store a single bit of information.

**JK LATCH**  
The JK latch is a more complex asynchronous digital logic device. It has two inputs, J and K, and two outputs, Q and Q-bar. It is used to store a single bit of information.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**LOW POWER CONSUMPTION**  
Asynchronous digital logic devices consume less power than synchronous devices. This is because they do not require a clock signal to synchronize their operation, which reduces the power consumption of the circuit.

**INTEGRATION WITH MEMS**  
Asynchronous digital logic devices are well-suited for integration with MEMS (Micro-Electro-Mechanical Systems) devices. This is because they can operate at very low voltages and are not sensitive to process variations.

**SCALABILITY**  
Asynchronous digital logic devices are highly scalable. They can be used to build circuits of any size, from simple logic gates to complex multi-bit processors.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**DETERMINISTIC BEHAVIOR**  
Synchronous digital circuits exhibit deterministic behavior, meaning that the output of the circuit is always the same for a given input. This is similar to the way that organizations are becoming more deterministic in their operations.

**GLOBAL CLOCK SIGNAL**  
Synchronous digital circuits are synchronized by a global clock signal. This is similar to the way that organizations are becoming more synchronized in their operations, often through the use of standardized processes and protocols.

**SCALABILITY**  
Synchronous digital circuits are highly scalable. This is similar to the way that organizations are becoming more scalable, often through the use of cloud computing and other technologies.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE FLOW MODEL**  
The flow model is a traditional way of thinking about organizational operations. It assumes that work flows through a series of steps in a linear fashion, from start to finish.

**ASYNCHRONOUS WORK**  
Asynchronous work is a more modern way of thinking about organizational operations. It assumes that work can be done at any time and from any location, and that it can be done in parallel or sequentially.

**KEY DIFFERENCES**  
The flow model is rigid and inflexible, while asynchronous work is flexible and adaptable. The flow model is slow and inefficient, while asynchronous work is fast and efficient.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**MEETINGS AS A RITUAL**  
Meetings have become a ritual in many organizations. They are often held at the same time and in the same place, and they often follow a similar agenda.

**MEETINGS AS A TOOL**  
Meetings are often used as a tool for communication and collaboration. They allow people to share ideas, discuss problems, and make decisions together.

**MEETINGS AS A BARRIER**  
Meetings can also be a barrier to productivity and innovation. They can be time-consuming and inefficient, and they can often be used as a way to avoid difficult decisions.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are meetings that do not require participants to be present at the same time. They can be held through video conferencing, text messaging, or other digital communication tools.

**ASYNCHRONOUS DECISION MAKING**  
Asynchronous decision making is a process where decisions are made without the need for a meeting. It often involves the use of digital tools and processes to facilitate decision making.

**KEY BENEFITS**  
Asynchronous meetings and decision making are faster and more efficient than traditional meetings. They also allow for more participation and collaboration.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
Virtualization is a technology that allows multiple operating systems to run on a single physical machine. It is used to improve resource utilization and reduce costs.

**CONTAINERIZATION**  
Containerization is a technology that allows applications to be packaged and run in containers. It is used to improve application portability and scalability.

**KEY BENEFITS**  
Virtualization and containerization can help organizations reduce costs, improve resource utilization, and increase application portability and scalability.

## CLOSING THOUGHTS AND TAKEAWAYS

**ASYNCHRONOUS IS THE FUTURE**  
Asynchronous communication and work are becoming increasingly important in the modern workplace. Organizations that embrace asynchronous work will be more productive and efficient.

**MEETINGS ARE NOT THE ANSWER**  
Meetings are not the best way to communicate and collaborate. Asynchronous communication tools and processes are often more effective.

**EMBRACE ASYNCHRONOUS**  
Organizations should embrace asynchronous communication and work to improve productivity and efficiency. This will involve adopting new tools and processes, and changing the way that work is done.



# A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS – SYNCHRONOUS VS ASYNCHRONOUS

## LET'S START WITH SYNCHRONOUS CIRCUITS

IN SYNCHRONOUS CIRCUITS, AN ELECTRONIC OSCILLATOR GENERATES A REPETITIVE SERIES OF EQUALLY SPACED PULSES CALLED THE CLOCK SIGNAL.

THE CLOCK SIGNAL IS APPLIED TO ALL THE ELEMENTS IN THE CIRCUIT.

THE OUTPUTS OF THE CIRCUIT ONLY CHANGE WHEN TRIGGERED BY THE EDGE OF THE CLOCK PULSE, SO CHANGES TO THE LOGIC SIGNALS THROUGHOUT THE CIRCUIT ALL BEGIN AT THE SAME TIME, AT REGULAR INTERVALS SYNCHRONIZED BY THE CLOCK.

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## MOVING ALONG, LET'S CONSIDER ASYNCHRONOUS CIRCUITS

IN ASYNCHRONOUS CIRCUITS, THERE IS NO CLOCK SIGNAL, AND THE STATE OF THE CIRCUIT CHANGES AS SOON AS THE INPUTS CHANGE.

SINCE ASYNCHRONOUS CIRCUITS DON'T HAVE TO WAIT FOR A CLOCK PULSE TO BEGIN PROCESSING INPUTS, THEY CAN BE FASTER THAN SYNCHRONOUS CIRCUITS, AND THEIR SPEED IS THEORETICALLY LIMITED ONLY BY THE PROPAGATION DELAYS OF THE LOGIC GATES THEMSELVES.

## MORE ABOUT SYNCHRONOUS CIRCUITS

THE CHANGES IN SIGNAL REQUIRE A CERTAIN AMOUNT OF TIME TO PROPAGATE THROUGH THE COMBINATIONAL LOGIC GATES OF THE CIRCUIT.

THIS IS CALLED PROPAGATION DELAY.

THE PERIOD OF THE CLOCK SIGNAL IS MADE LONG ENOUGH SO THE OUTPUT OF ALL THE LOGIC GATES HAVE TIME TO SETTLE TO STABLE VALUES BEFORE THE NEXT CLOCK PULSE.

AS LONG AS THIS CONDITION IS MET, SYNCHRONOUS CIRCUITS WILL OPERATE STABLY, SO THEY ARE EASY TO DESIGN.

## ASYNCHRONOUS CIRCUIT BENEFITS

HIGHER PERFORMANCE, BECAUSE COMPLETION IS BASED ON THE ACTUAL INPUT VALUES, RATHER THAN WORST-CASE COMPLETION.

LOWER POWER CONSUMPTION BECAUSE NO TRANSISTOR EVER TRANSISTORS UNLESS IT IS PERFORMING USEFUL COMPUTATION.

FREEDOM FROM THE EVER-WORSENING DIFFICULTIES OF DISTRIBUTING A HIGH-FAN-OUT, TRADING-SENSITIVE CLOCK SIGNAL.

BETTER MODULARITY AND COMPOSABILITY.

CIRCUIT SPEED ADAPTS TO CHANGING TEMPERATURE AND VOLTAGE CONDITIONS RATHER THAN BEING LOCKED AT THE SPEED MANDATED BY WORST-CASE ASSUMPTIONS.

## SO, WHAT'S WRONG WITH SYNCHRONOUS CIRCUITS?

A DISADVANTAGE OF SYNCHRONOUS CIRCUITS IS THAT THEY CAN BE SLOW.

THE MAXIMUM POSSIBLE CLOCK RATE IS DETERMINED BY THE LOGIC PATH WITH THE LONGEST PROPAGATION DELAY.

SO LOGIC PATHS THAT COMPLETE THEIR OPERATIONS QUICKLY ARE IDLE MOST OF THE TIME.

## EVEN MORE ASYNCHRONOUS CIRCUIT BENEFITS

IMMUNITY TO TRANSISTOR-TO-TRANSISTOR VARIABILITY IN THE MANUFACTURING PROCESS, WHICH IS ONE OF THE MOST SERIOUS PROBLEMS FACING THE SEMICONDUCTOR INDUSTRY AS DEES SHRINK.

LESS SEVERE ELECTROMAGNETIC INTERFERENCE (EMI). SYNCHRONOUS CIRCUITS CREATE A GREAT DEAL OF EMI IN THE FREQUENCY BAND OF THEIR CLOCK FREQUENCY AND ITS HARMONICS. ASYNCHRONOUS CIRCUITS GENERATE EMI PATTERNS WHICH ARE MUCH MORE EVENLY SPREAD ACROSS THE SPECTRUM.

LESS STRESS ON THE POWER DISTRIBUTION NETWORK. SYNCHRONOUS CIRCUITS TEND TO DRAW A LARGE AMOUNT OF CURRENT RIGHT AT THE CLOCK EDGE AND SHORTLY THEREAFTER. THE NUMBER OF NODES SWITCHING (AND THENCE, AMOUNT OF CURRENT DRAWN) DROPS OFF RAPIDLY AFTER THE CLOCK EDGE, REACHING ZERO JUST BEFORE THE NEXT CLOCK EDGE. IN AN ASYNCHRONOUS CIRCUIT, THE SWITCHING TIMES OF THE NODES ARE NOT CORRELATED IN THIS MANNER, SO THE CURRENT DRAW TENDS TO BE MORE UNIFORM AND LESS BURSTY.

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BETTER MODULARITY AND COMPOSABILITY.

CIRCUIT SPEED ADAPTS TO CHANGING TEMPERATURE AND VOLTAGE CONDITIONS RATHER THAN BEING LOCKED AT THE SPEED MANDATED BY WORST-CASE ASSUMPTIONS.

## SO, WHAT'S WRONG WITH SYNCHRONOUS CIRCUITS?

A DISADVANTAGE OF SYNCHRONOUS CIRCUITS IS THAT THEY CAN BE SLOW.

THE MAXIMUM POSSIBLE CLOCK RATE IS DETERMINED BY THE LOGIC PATH WITH THE LONGEST PROPAGATION DELAY.

SO LOGIC PATHS THAT COMPLETE THEIR OPERATIONS QUICKLY ARE IDLE MOST OF THE TIME.

## EVEN MORE ASYNCHRONOUS CIRCUIT BENEFITS

IMMUNITY TO TRANSISTOR-TO-TRANSISTOR VARIABILITY IN THE MANUFACTURING PROCESS, WHICH IS ONE OF THE MOST SERIOUS PROBLEMS FACING THE SEMICONDUCTOR INDUSTRY AS DEES SHRINK.

LESS SEVERE ELECTROMAGNETIC INTERFERENCE (EMI). SYNCHRONOUS CIRCUITS CREATE A GREAT DEAL OF EMI IN THE FREQUENCY BAND OF THEIR CLOCK FREQUENCY AND ITS HARMONICS. ASYNCHRONOUS CIRCUITS GENERATE EMI PATTERNS WHICH ARE MUCH MORE EVENLY SPREAD ACROSS THE SPECTRUM.

LESS STRESS ON THE POWER DISTRIBUTION NETWORK. SYNCHRONOUS CIRCUITS TEND TO DRAW A LARGE AMOUNT OF CURRENT RIGHT AT THE CLOCK EDGE AND SHORTLY THEREAFTER. THE NUMBER OF NODES SWITCHING (AND THENCE, AMOUNT OF CURRENT DRAWN) DROPS OFF RAPIDLY AFTER THE CLOCK EDGE, REACHING ZERO JUST BEFORE THE NEXT CLOCK EDGE. IN AN ASYNCHRONOUS CIRCUIT, THE SWITCHING TIMES OF THE NODES ARE NOT CORRELATED IN THIS MANNER, SO THE CURRENT DRAW TENDS TO BE MORE UNIFORM AND LESS BURSTY.

## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time. It allows for communication to occur at different times and from different locations. Examples include email, instant messaging, and video conferencing.

**"THE MAGIC OF ASYNCH" - MITRETECH DIGITAL LOGIC DESIGN**  
This article discusses the benefits of asynchronous communication in digital logic design, such as improved productivity and flexibility. It highlights how asynchronous methods allow designers to work at their own pace and collaborate effectively across time zones.

## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics is a type of digital logic design where all components operate in lockstep with a common clock signal. This ensures that data is transferred and processed at the same time, leading to predictable and reliable operation.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics is a type of digital logic design where components do not operate in lockstep with a common clock signal. Instead, they operate independently, with data being transferred and processed as soon as it is available. This can lead to more efficient and flexible designs.

**KEY DIFFERENCES**  
Synchronous designs are easier to design and debug but can be slower. Asynchronous designs are more complex to design and debug but can be faster and more efficient.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**1. THE 74139**  
A 4-to-16 decoder IC that is commonly used in digital logic designs. It is an asynchronous device that can be used to generate a wide range of digital signals.

**2. THE 74148**  
A 3-to-8 decoder IC that is commonly used in digital logic designs. It is an asynchronous device that can be used to generate a wide range of digital signals.

**3. THE 74149**  
A 4-to-16 decoder IC that is commonly used in digital logic designs. It is an asynchronous device that can be used to generate a wide range of digital signals.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**1. INCREASED EFFICIENCY**  
Asynchronous designs can be more efficient than synchronous designs because they do not require a common clock signal. This can lead to lower power consumption and faster operation.

**2. FLEXIBILITY**  
Asynchronous designs are more flexible than synchronous designs because they can be designed to operate at different speeds and in different environments. This makes them ideal for use in a wide range of applications.

**3. IMPROVED RELIABILITY**  
Asynchronous designs are more reliable than synchronous designs because they are less susceptible to timing errors and other issues. This makes them ideal for use in critical applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**1. INCREASED COLLABORATION**  
Organizations are becoming more like synchronous digital circuits because they are increasingly relying on real-time collaboration and communication. This is driven by the need for faster decision-making and improved productivity.

**2. STANDARDIZATION**  
Organizations are becoming more like synchronous digital circuits because they are increasingly adopting standard processes and procedures. This helps to ensure consistency and reliability in their operations.

**3. AUTOMATION**  
Organizations are becoming more like synchronous digital circuits because they are increasingly automating their processes. This helps to reduce errors and improve efficiency.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**1. THE PROBLEM WITH THE SAFE "FLOW MODEL"**  
The safe "flow model" is a common approach to project management that focuses on minimizing risk and ensuring that all tasks are completed on time. However, it can be overly restrictive and slow down progress.

**2. THE BENEFITS OF ASYNCHRONOUS WORK**  
Asynchronous work allows team members to work at their own pace and in their own way. This can lead to increased productivity and better results.

**3. HOW TO IMPLEMENT ASYNCHRONOUS WORK**  
To implement asynchronous work, organizations should focus on clear communication, defined roles and responsibilities, and flexible deadlines. This will help to ensure that everyone is working towards the same goals.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**1. THE HISTORY OF MEETINGS**  
Meetings have been a part of human culture for as long as we have been able to communicate. They were used to share information, make decisions, and solve problems.

**2. THE PROBLEM WITH MEETINGS**  
Meetings can be a waste of time and money if they are not managed properly. They can be slow, unproductive, and frustrating for participants.

**3. HOW TO IMPROVE MEETINGS**  
To improve meetings, organizations should focus on clear agendas, defined roles and responsibilities, and active participation from all team members. This will help to ensure that meetings are productive and efficient.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**1. ASYNCHRONOUS COMMUNICATION**  
Use asynchronous communication tools like email and instant messaging to share information and make decisions. This can help to reduce the need for meetings.

**2. CLEAR AGENDAS**  
Create clear agendas for all meetings to ensure that everyone knows what to expect and what needs to be discussed. This will help to keep meetings focused and productive.

**3. DEFINED ROLES AND RESPONSIBILITIES**  
Assign specific roles and responsibilities to each team member for every meeting. This will help to ensure that everyone is contributing and that the meeting stays on track.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**1. VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine. This can help to reduce hardware costs and improve resource utilization.

**2. CONTAINERIZATION**  
Containerization allows applications to be packaged and run in isolated environments. This can help to improve security and make it easier to deploy and manage applications.

**3. THE BENEFITS OF VIRTUALIZATION AND CONTAINERIZATION**  
Both virtualization and containerization can help to reduce costs, improve efficiency, and increase security. They are essential tools for modern organizations.

## CLOSING THOUGHTS AND TAKEAWAYS

**1. ASYNCHRONOUS COMMUNICATION IS THE FUTURE**  
Asynchronous communication is becoming increasingly important in the workplace. Organizations should embrace it to improve productivity and reduce the need for meetings.

**2. MEETINGS ARE NOT ALWAYS NECESSARY**  
Meetings are not always necessary. Organizations should focus on clear communication and defined roles and responsibilities to ensure that everyone is working towards the same goals.

**3. VIRTUALIZATION AND CONTAINERIZATION CAN HELP**  
Virtualization and containerization can help to reduce costs, improve efficiency, and increase security. They are essential tools for modern organizations.



# FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

## The ILS - 1952



The ILS (Interim Language System) was a computer system developed by the RAND Corporation in 1952. It was one of the first computers to use asynchronous digital logic.

Key features include:

- It was a vacuum tube computer.
- It was designed for the purpose of solving the Traveling Salesman Problem.
- It was one of the first computers to use asynchronous digital logic.

## The TILLAC I - 1952



The TILLAC I (Tactical Information Language) was a computer system developed by the RAND Corporation in 1952. It was one of the first computers to use asynchronous digital logic.

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## Asynchronous Microprocessors, East and West



This section discusses asynchronous microprocessors, comparing designs from the East and West. It highlights the challenges of designing asynchronous logic and the benefits of using standard asynchronous logic blocks.

Key points include:

- Asynchronous microprocessors are designed to operate without a global clock signal.
- They are often used in applications where power consumption is critical.
- Designing asynchronous logic is more complex than designing synchronous logic.

## The Philips Semiconductors Asynchronous (ACS) Microcontroller



The Philips ACS (Asynchronous) microcontroller is a single-chip device designed for asynchronous operation. It is used in applications where a global clock is not available or where power consumption is a concern.

Key features include:

- It is a single-chip device that integrates logic and memory.
- It is designed to operate without a global clock signal.
- It is used in applications such as remote controls and sensors.

## Intel/Fulcrum Microsystems: Ethernet Switch Chips



Intel/Fulcrum Microsystems developed Ethernet switch chips that use asynchronous logic for high-speed data processing. These chips are used in network routers and switches.

Key features include:

- They are designed for high-speed data processing.
- They use asynchronous logic to handle multiple data streams simultaneously.
- They are used in network routers and switches.

## Achronix: High-Performance FPGAs



Achronix develops high-performance FPGAs (Field-Programmable Gate Arrays) that use asynchronous logic for high-speed data processing. These devices are used in applications such as image processing and signal processing.

Key features include:

- They are designed for high-speed data processing.
- They use asynchronous logic to handle multiple data streams simultaneously.
- They are used in applications such as image processing and signal processing.

## The IBM TrueNorth Neuromorphic Computer



The IBM TrueNorth neuromorphic computer is a specialized hardware architecture designed to mimic the structure and function of the human brain. It uses asynchronous logic for high-speed data processing.

Key features include:

- It is designed to mimic the structure and function of the human brain.
- It uses asynchronous logic for high-speed data processing.
- It is used in applications such as image processing and signal processing.

## Oh, BTW, Computers and Brains Aren't Too Much Alike

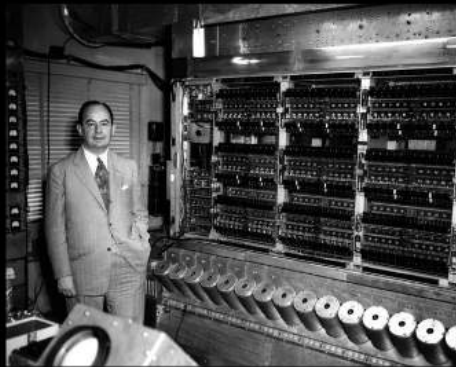
This section discusses the differences between computers and brains, highlighting the limitations of current computer architectures in mimicking the human brain's capabilities.

Key points include:

- Current computer architectures are based on synchronous logic, which is fundamentally different from the asynchronous logic used in the brain.
- The brain's ability to process information in a highly parallel and distributed manner is a major challenge for current computer architectures.
- While there are similarities between computers and brains, the differences are significant and make it difficult to create a true artificial intelligence.

# THE ILS - 1952

BUILT FROM 1945 TO 1951 AT THE INSTITUTE FOR ADVANCED STUDY (IAS) UNDER THE DIRECTION OF JOHN VON NEUMANN, AND PROVIDED THE VON NEUMANN ARCHITECTURE (STILL IN USE TODAY BY THE VAST MAJORITY OF CPUs).



VON NEUMANN ARCHITECTURE GENERALLY MEANS

- A PROCESSING UNIT THAT CONTAINS AN ARITHMETIC LOGIC UNIT AND REGISTER REGISTERS
- A CONTROL UNIT THAT CONTAINS AN INSTRUCTION REGISTER AND PROGRAM COUNTER
- MEMORY THAT STORES DATA AND INSTRUCTIONS
- EXTERNAL MASS STORAGE
- INPUT AND OUTPUT MECHANISMS

THE ILS WAS A BINARY COMPUTER WITH A 40-BIT WORD, STORING TWO 20-BIT INSTRUCTIONS IN EACH WORD

MEMORY WAS 1,024 WORDS (5.1 KILOBYTES)

NEGATIVE NUMBERS WERE REPRESENTED IN "TWO'S COMPLEMENT" FORMAT

HAD TWO GENERAL-PURPOSE REGISTERS AVAILABLE: THE ACCUMULATOR (AC) AND MULTIPLIER/QUOTIENTS (MQ)

USED 1,700 VACUUM TUBES

MEMORY WAS ORIGINALLY DESIGNED FOR ABOUT 2,300 RCA SELECTION VACUUM TUBES.



PROBLEMS WITH THE DEVELOPMENT OF THESE COMPLEX TUBES FORCED THE SWITCH TO WILLIAMS TUBES.

A GRID OF DOTS WAS DISPLAYED ON A CATHODE RAY TUBE, CREATING A SMALL CHANGE OF STATIC ELECTRICITY OVER EACH DOT, WHICH A THIN SHEET OF METAL JUST IN FRONT OF THE DISPLAY WOULD READ.

WHILE THERE WAS PERSISTENCE ON THE SURFACE OF THE TUBE FOR A FRACTION OF A SECOND, MEMORY HEEDED TO BE REWRITTEN IN A SIMILAR OPERATION TO THE MEMORY REFRESH CYCLES OF DRAM IN MODERN SYSTEMS.



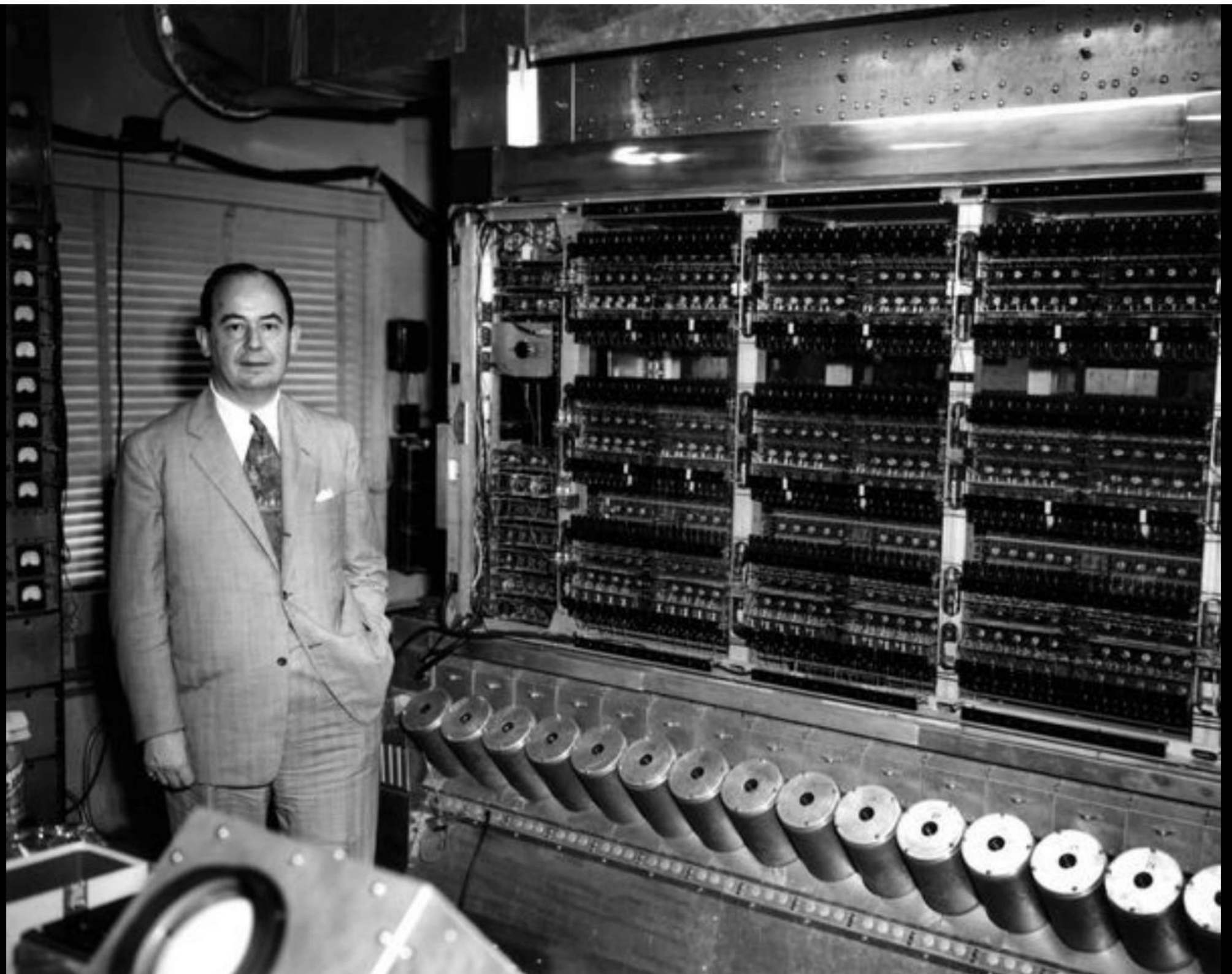
MEASURED 704 BY 0.304 BY 1.204

WEIGHED 450 KG

SINCE IT WAS AN ASYNCHRONOUS MACHINE, INSTRUCTION TIMES VARIED: ADDITION TIME WAS 62 MICROSECONDS AND THE MULTIPLICATION TIME WAS 713 MICROSECONDS.

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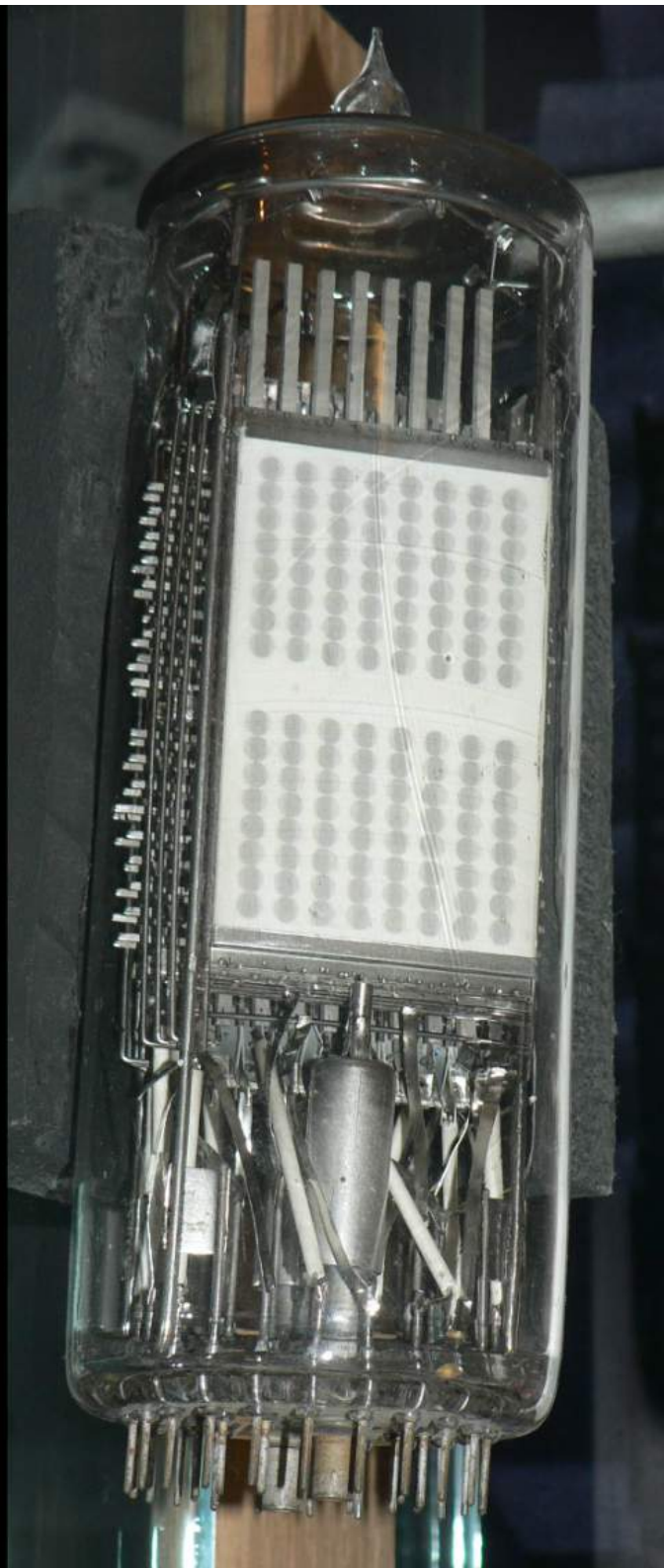
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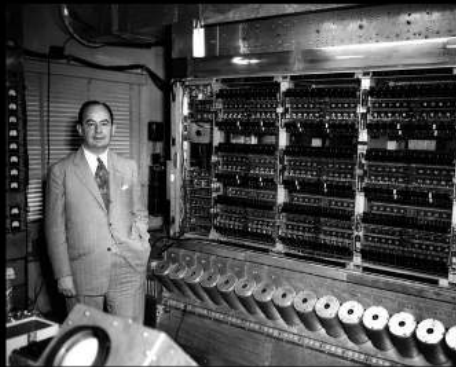
MEASURED 3M BY 0.8M BY 3.2M

WEIGHED 450 KG

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# FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

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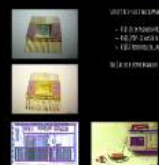


## The TILLAC I - 1952



The TILLAC I was the first computer system to use a magnetic core for data storage. It was developed by the University of Illinois and was used for research in the field of artificial intelligence.

## Asynchronous Microprocessors, East and West



Asynchronous microprocessors are designed to operate without a clock signal. They are used in applications where power consumption is a concern, such as in battery-powered devices.

## The Philips Semiconductors Asynchronous (ACS) Microcontroller



The ACS microcontroller is a single-chip device that combines the functions of a microprocessor and a microcontroller. It is designed for use in applications where a clock signal is not available.

## Intel/Fulcrum Microsystems: Ethernet Switch Chips



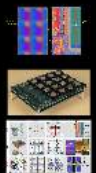
These chips are used in Ethernet switches to manage network traffic. They are designed to be highly efficient and to support a wide range of network speeds.

## Achronix: High-Performance FPGAs



Achronix FPGAs are designed for high-performance applications, such as in data centers and high-frequency trading. They offer a combination of high performance and low power consumption.

## The IBM TrueNorth Neuromorphic Computer



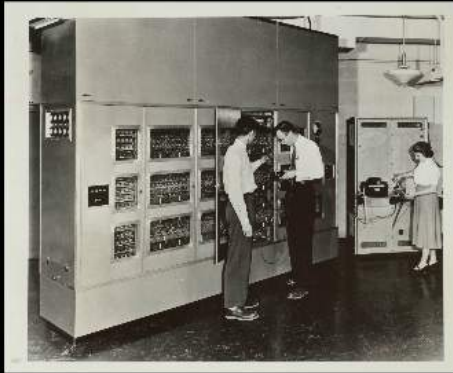
The TrueNorth chip is a neuromorphic computer that is designed to mimic the structure and function of the human brain. It is used for applications in artificial intelligence and machine learning.

## Oh, BTW, Computers and Brains Aren't Too Much Alike

While computers and brains share some similarities, they are fundamentally different. Computers are designed to process information in a linear, sequential manner, while brains are designed to process information in a parallel, distributed manner.



# THE ILLIAC I - 1952



FIRST COMPUTER BUILT AND OWNED ENTIRELY BY A US EDUCATIONAL INSTITUTION.

FIRST COMPUTER TO SHARE AN INSTRUCTION SET WITH ANOTHER COMPUTER (THIS WAS THE SECOND OF IDENTICAL MACHINES, THE FIRST OF WHICH WAS ORDVAC [US ARMY ABERDEEN PROVING GROUNDS], ALSO BUILT AT THE UNIVERSITY OF ILLINOIS.)

HAD 2,800 VACUUM TUBES

MEASURED 3 M BY 0.6 M BY 2.6 M

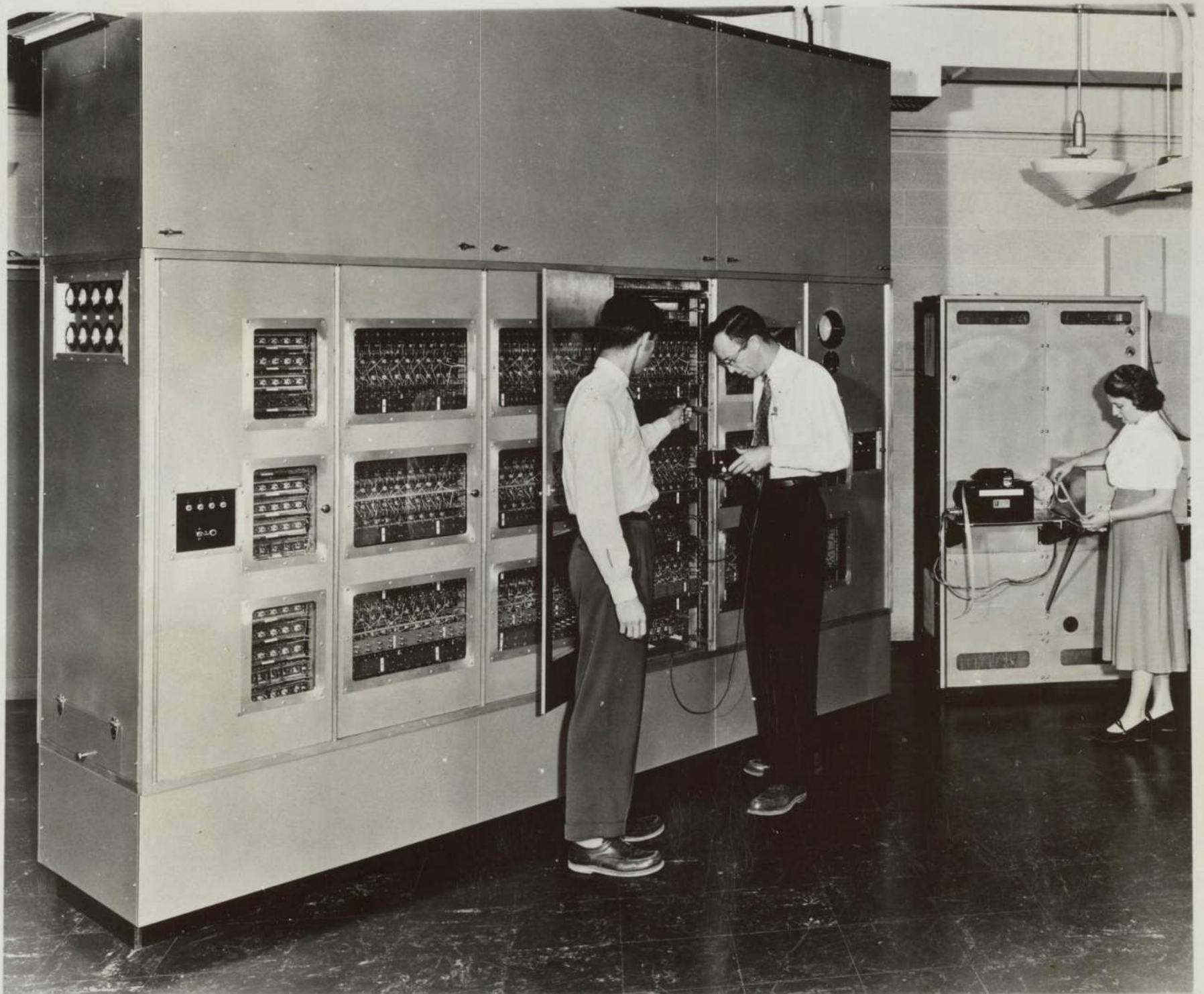


WEIGHED 2668 KG

WAS VERY POWERFUL FOR ITS TIME: IN 1956 IT HAD MORE COMPUTING POWER THAN ALL OF BELL LABS.

BECAUSE THE LIFETIME OF THE TUBES WITHIN ILLIAC WAS ABOUT A YEAR, THE MACHINE WAS SHUT DOWN EVERY DAY FOR "PREVENTIVE MAINTENANCE" WHEN OLDER VACUUM TUBES WOULD BE REPLACED IN ORDER TO INCREASE RELIABILITY.



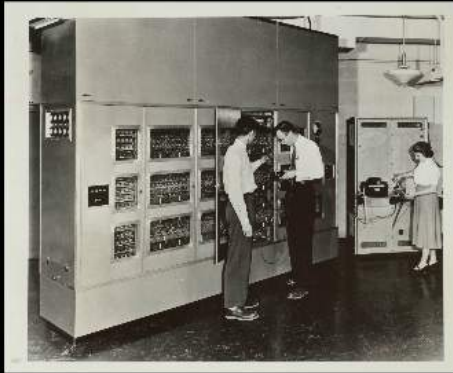








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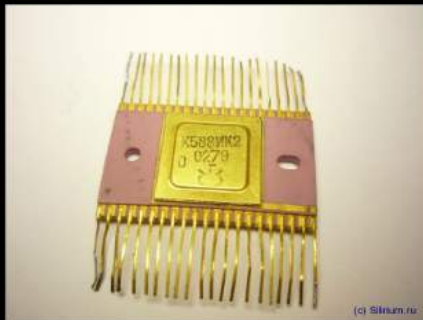
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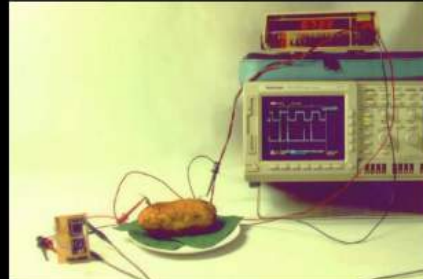
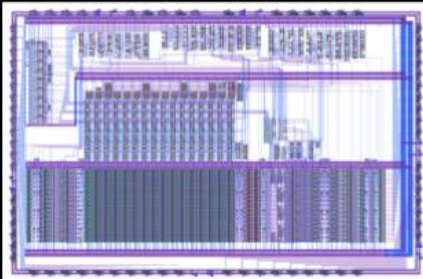
# ASYNCHRONOUS MICROPROCESSORS, EAST AND WEST

SOVIET BIT-SLICE MICROPROCESSOR MODULES (LATE 1970S) PRODUCED AS

- K587 (ELEKTRONIKA NC MICROARCHITECTURE CORE, WITH PDP-11 COMPATIBLE INSTRUCTION SET)
- K588 (PDP-11 INSTRUCTION SET)
- K1883 (CONTROLLER, ALSO KNOWN AS U83x IN EAST GERMANY)



THE CALTECH ASYNCHRONOUS MICROPROCESSOR (CAM), THE WORLD-FIRST ASYNCHRONOUS MICROPROCESSOR (1988).





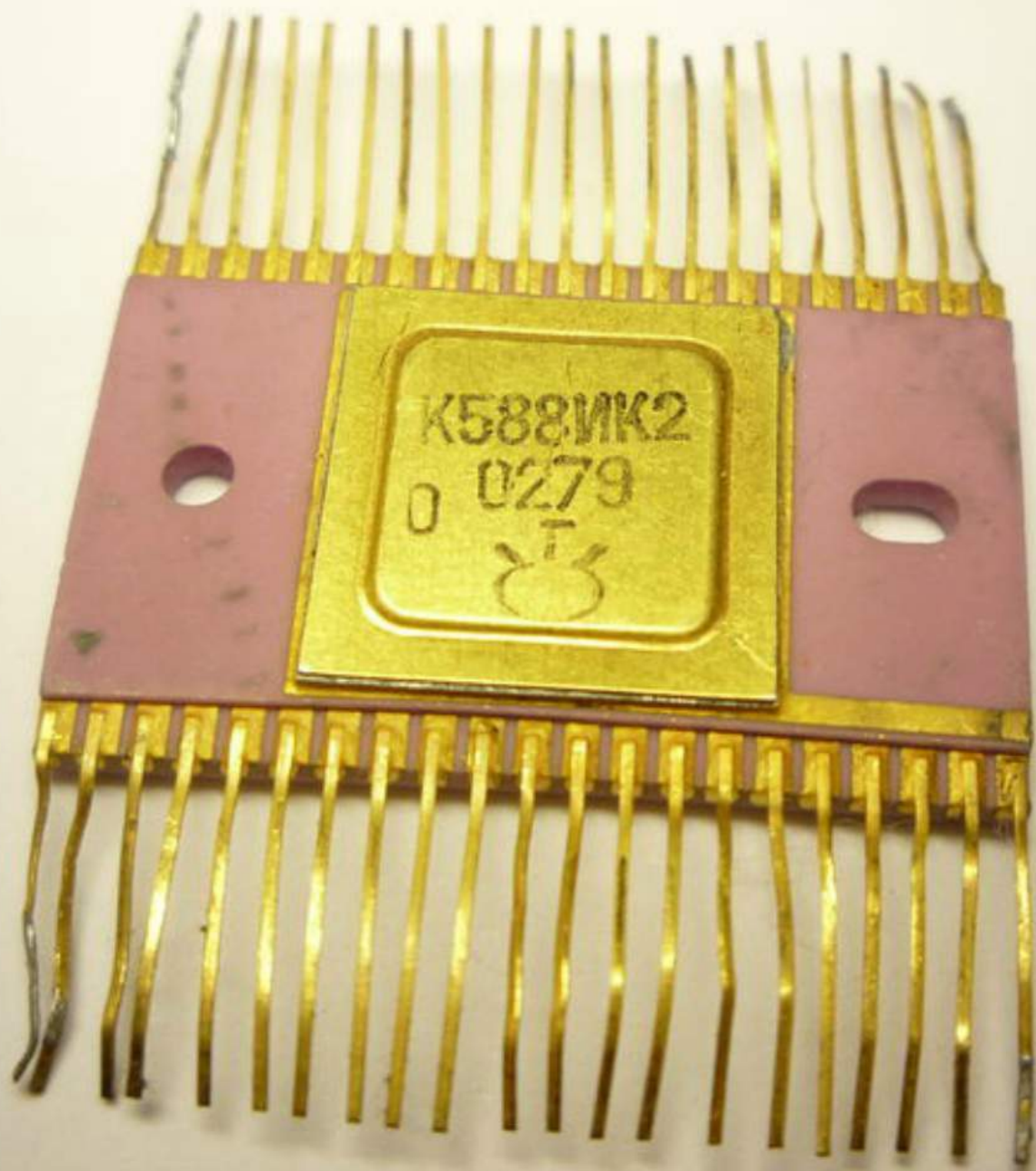
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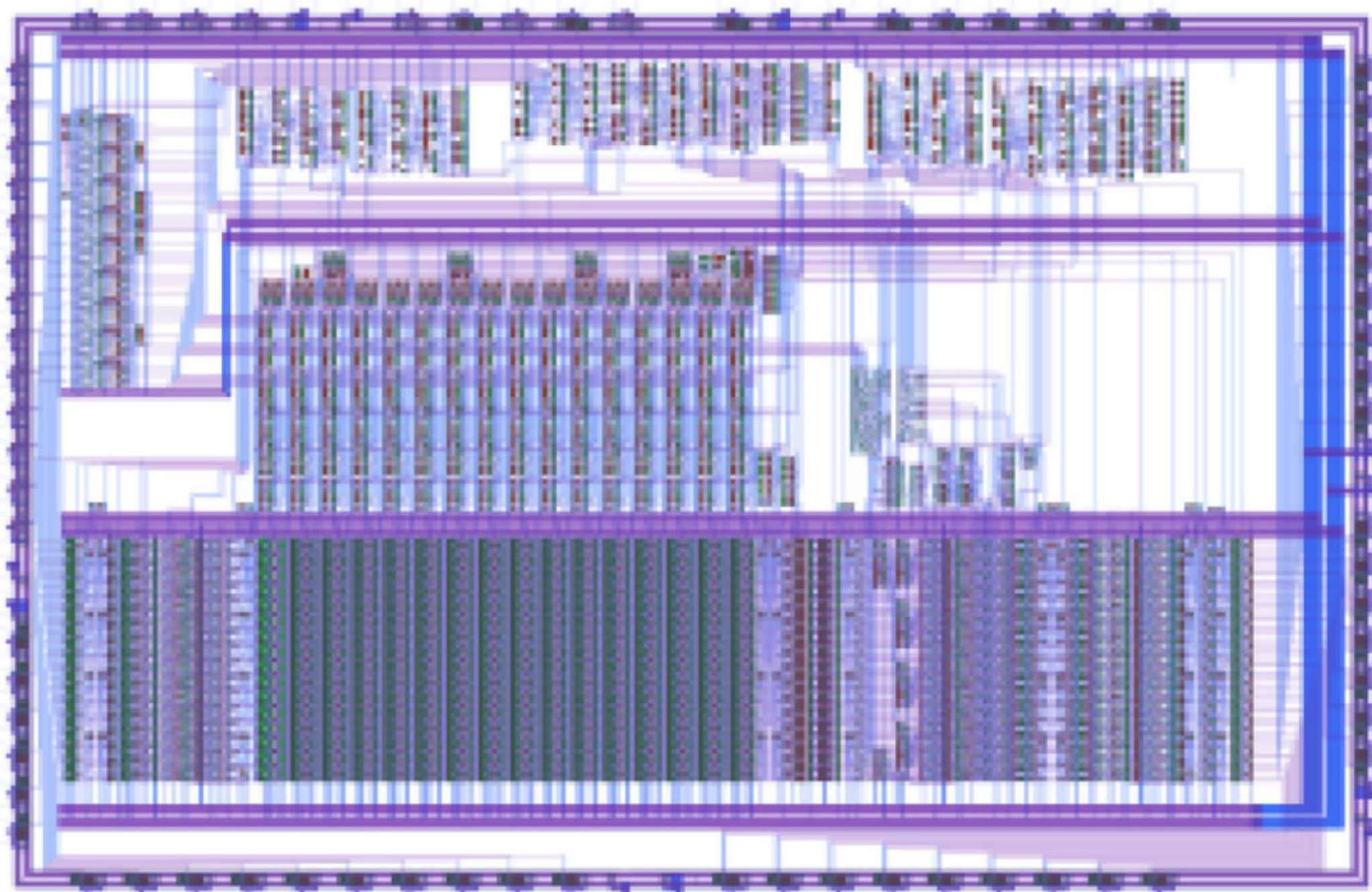


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530

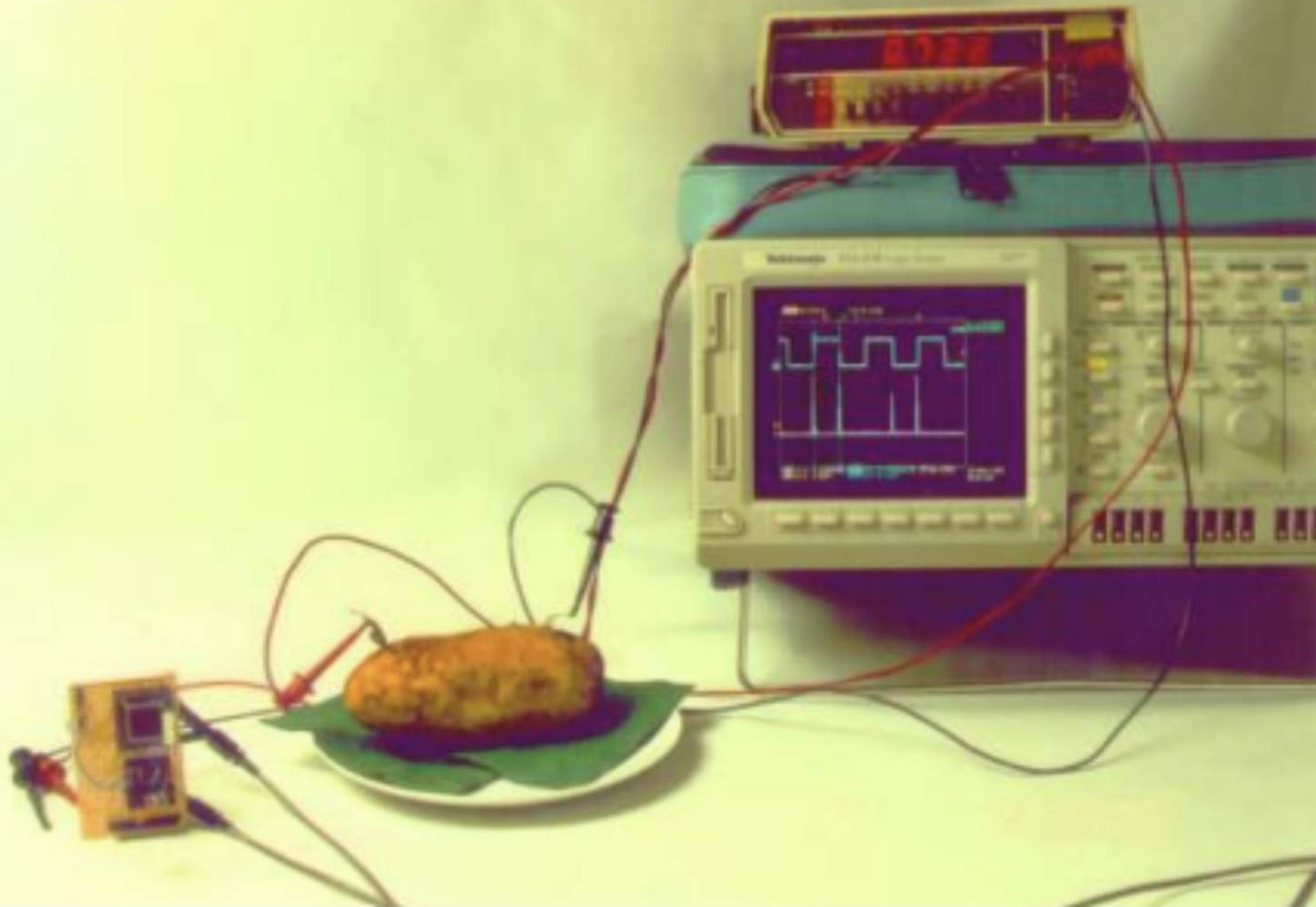
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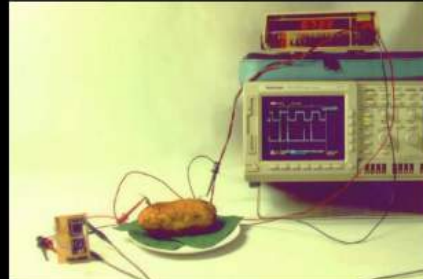
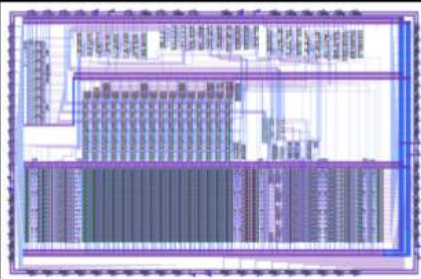
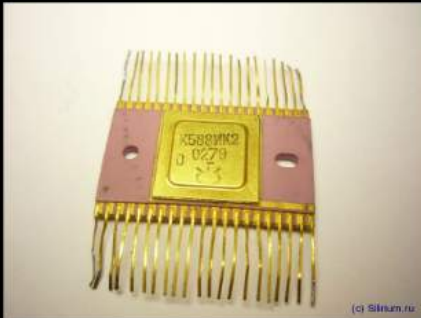


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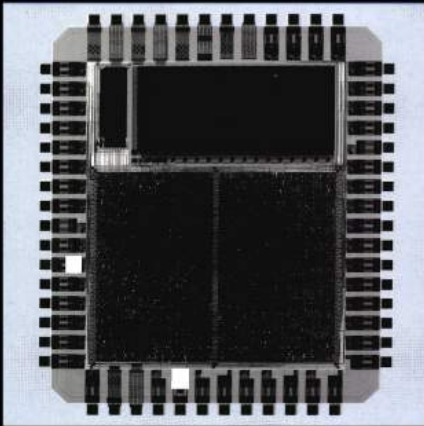
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THE CALTECH ASYNCHRONOUS MICROPROCESSOR (CAM), THE WORLD-FIRST ASYNCHRONOUS MICROPROCESSOR (1988).



# THE PHILIPS SEMICONDUCTORS ASYNCHRONOUS 80C51 MICROCONTROLLER.



INITIALLY AIMED FOR USE IN PAGER CHIPSETS, AND THE MOTIVATION WAS TO LOWER ELECTROMAGNETIC INTERFERENCE (EMI) NOISE EMISSIONS SO THAT THE MICROCONTROLLER COULD OPERATE HARMONIOUSLY WITH THE RADIO-FREQUENCY (RF) DATA LINK, WITHOUT THE USE OF SHIELDING.

CONTAINS 128 BYTES OF RAM , 32 I/O LINES, THREE 16-BIT COUNTER/TIMERS, A SIX-SOURCE, AND A FOUR-PRIORITY LEVEL NESTED INTERRUPT STRUCTURE.

DEMONSTRATED A 4X POWER REDUCTION OVER COMPARABLE SYNCHRONOUS MICROCONTROLLERS.

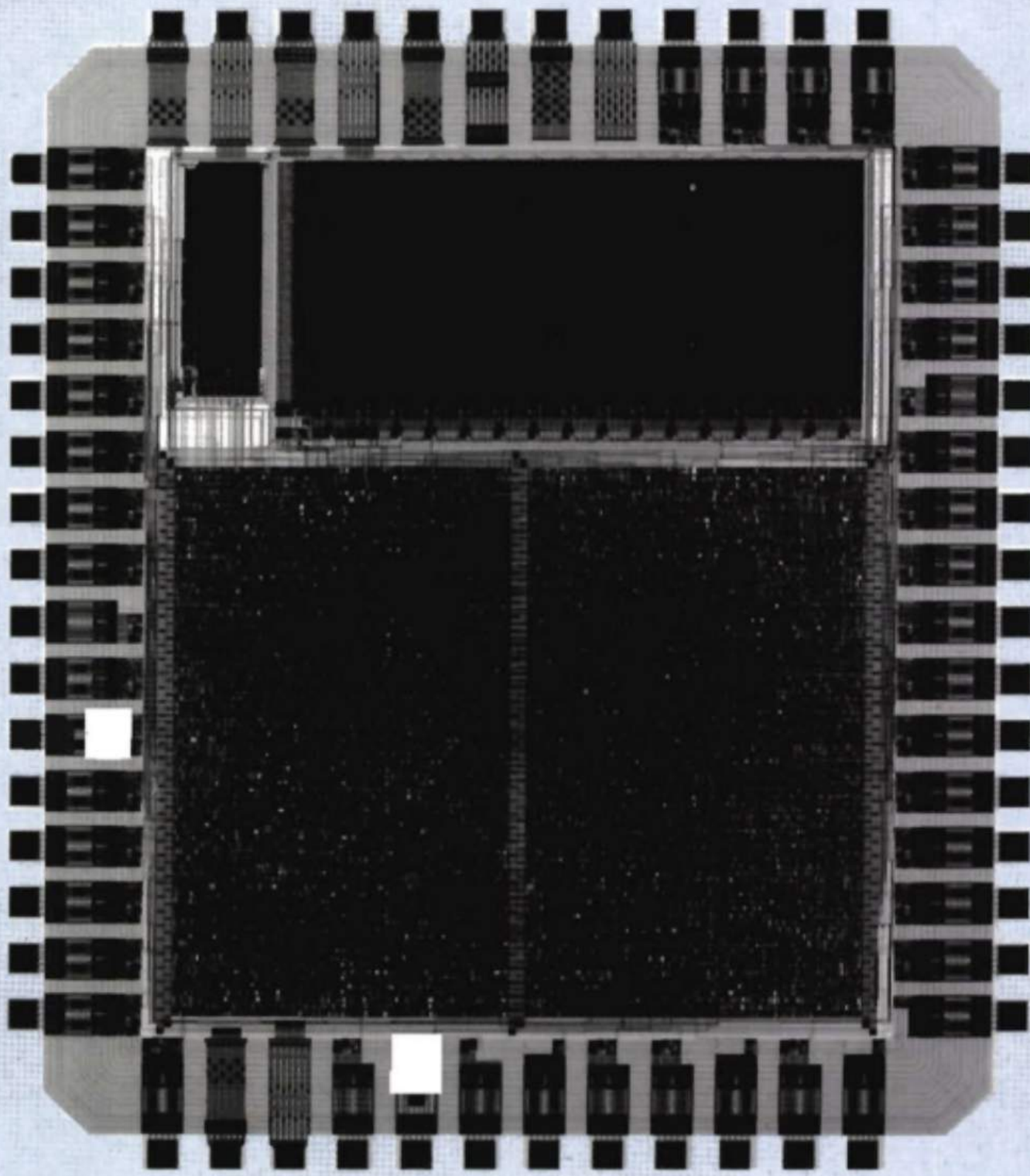


LATER USED IN PUBLIC TRANSPORT SMART CARDS, BECAUSE IT COULD BE POWERED BY ONLY THE BRIEF BURST OF ENERGY INDUCED BY A WAVE THROUGH THE CARD READER.

THE ENHANCED SMARTMX MICROCONTROLLER IS NOW USED IN MORE THAN 75 COUNTRIES, INCLUDING THE EU AND THE US, FOR BIOMETRIC PASSPORTS, IDS, ELECTRONIC TOLL COLLECTION, CAR PARKING, AND LOYALTY PROGRAMS.

BY 2013, THE NUMBER OF COPIES OF THE SMARTMX (AND VARIANTS) SOLD HAS EXCEEDED 2 BILLION CHIPS.





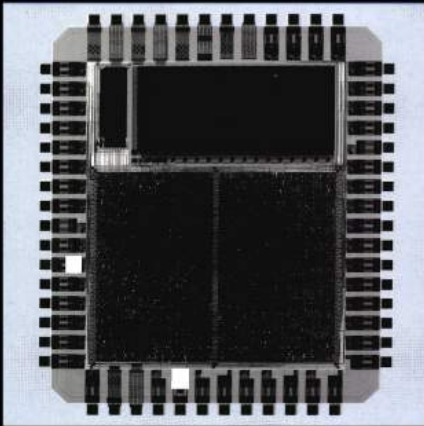
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NP  
www.np.com  
www.ubt.com



# THE PHILIPS SEMICONDUCTORS ASYNCHRONOUS 80C51 MICROCONTROLLER.



INITIALLY AIMED FOR USE IN PAGER CHIPSETS, AND THE MOTIVATION WAS TO LOWER ELECTROMAGNETIC INTERFERENCE (EMI) NOISE EMISSIONS SO THAT THE MICROCONTROLLER COULD OPERATE HARMONIOUSLY WITH THE RADIO-FREQUENCY (RF) DATA LINK, WITHOUT THE USE OF SHIELDING.

CONTAINS 128 BYTES OF RAM , 32 I/O LINES, THREE 16-BIT COUNTER/TIMERS, A SIX-SOURCE, AND A FOUR-PRIORITY LEVEL NESTED INTERRUPT STRUCTURE.

DEMONSTRATED A 4X POWER REDUCTION OVER COMPARABLE SYNCHRONOUS MICROCONTROLLERS.



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# INTEL/FULCRUM MICROSYSTEMS: ETHERNET SWITCH CHIPS

IN 2011, INTEL ACQUIRED FULCRUM MICROSYSTEMS IN A MOVE REGARDED AS A BID TO COMPETE WITH CISCO SYSTEMS.

INTEL'S CURRENT FM5000/FM6000 FAMILY OF SWITCH CHIPS SUPPORTS 40 GIGABIT ETHERNET.

INCLUDES A FULLY-ASYNCHRONOUS HIGH-SPEED CROSSBAR SWITCH THAT PROVIDES HIGH BANDWIDTH, LOW LATENCY, SUPPORT FOR FLEXIBLE LINK TOPOLOGIES, AND HIGH ENERGY EFFICIENCY.

THE CROSSBAR BANDWIDTH OF OVER 1 TERABIT PER SECOND (IN A 130 NM PROCESS) IS ACHIEVED THROUGH FINE-GRAIN ASYNCHRONOUS PIPELINING, AT THE GRANULARITY OF INDIVIDUAL GATES, UNENCUMBERED BY A RIGID CLOCK PERIOD.

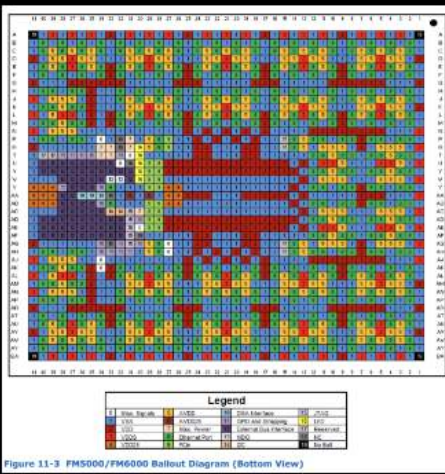
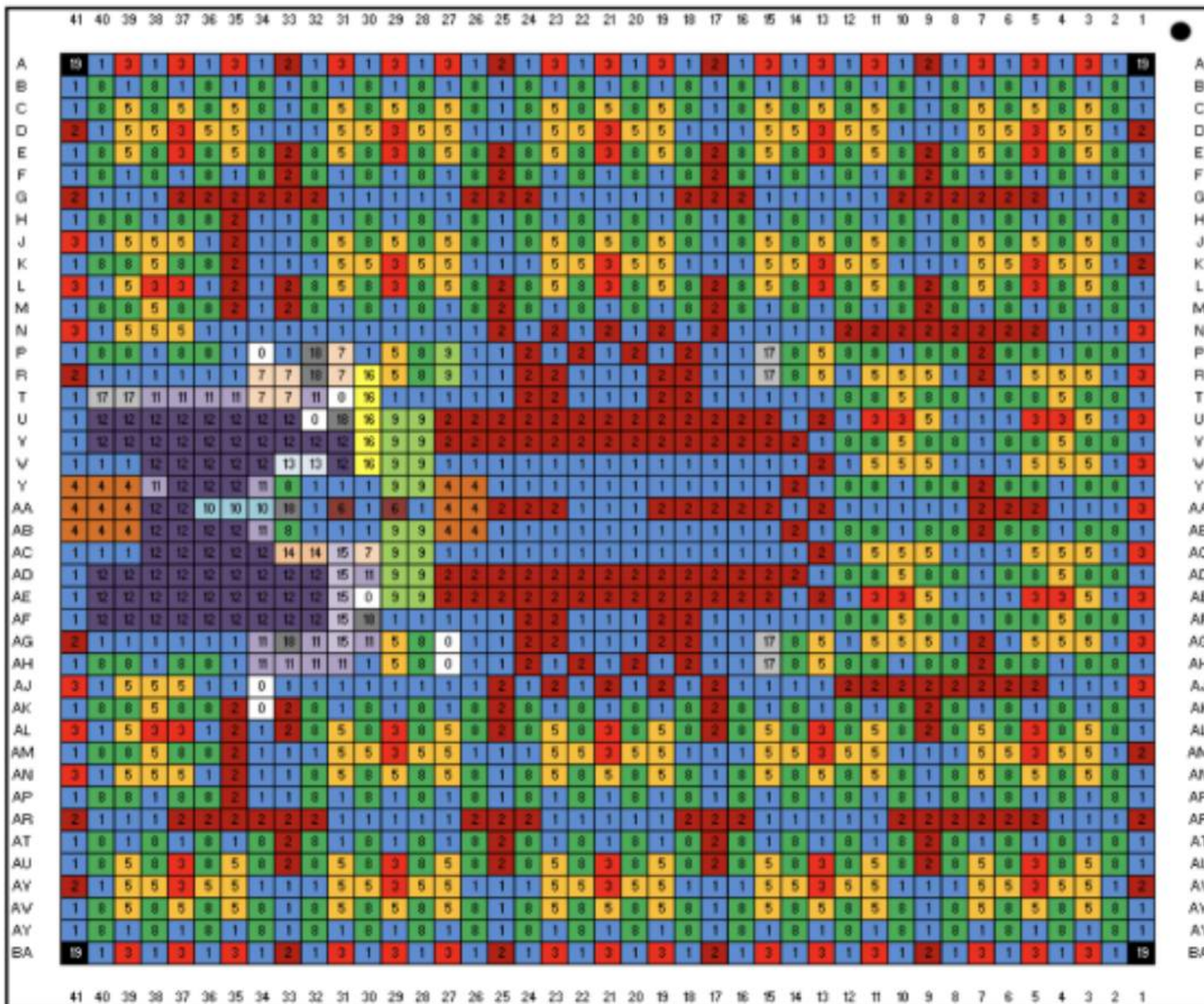


Figure 11-3 FM5000/FM6000 Ballout Diagram (Bottom View)



10012  
W340FT03  
EZFM5224A  
①



Legend							
0	Misc. Signals	5	AVDD	10	DMA Interface	15	JTAG
1	VSS	6	AVDDQ25	11	GPIO and Strapping	16	LED
2	VDD	7	Misc. Power	12	External Bus Interface	17	Reserved
3	VDD5	8	Ethernet Port	13	MDIO	18	NC
4	VDD25	9	PCIe	14	I2C	19	No Ball

Figure 11-3 FM5000/FM6000 Ballout Diagram (Bottom View)

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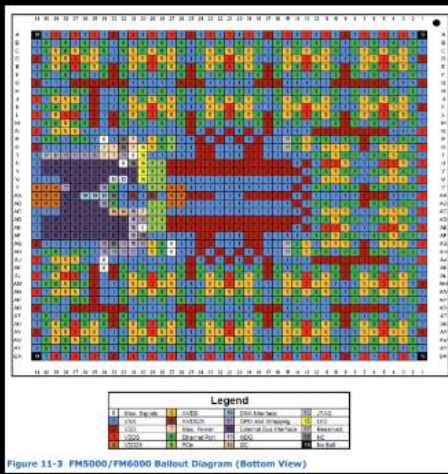


Figure 11-3 FM5000/FM6000 Ballout Diagram (Bottom View)



# ACHRONIX: HIGH-PERFORMANCE FPGAs



A FPGA (FIELD PROGRAMMABLE DATE ARRAY) IS AN INTEGRATED CIRCUIT DESIGNED TO BE CONFIGURED AFTER MANUFACTURE.

THE FPGA CONFIGURATION IS GENERALLY SPECIFIED USING A HARDWARE DESCRIPTION LANGUAGE (HDL), SIMILAR TO THAT USED FOR AN APPLICATION-SPECIFIC INTEGRATED CIRCUIT (ASIC).

THE SPEEDSTER 22I FAMILY OF FPGAs ARE MANUFACTURED IN 22 NM.

THEY OPERATE AT 1.5 GHz AND ARE CURRENTLY CLAIMED AS THE WORLD'S FASTEST FPGAs.





achronix  
SPEEDSTER®  
22i  
AC221HD1000-FB3C1  
FPO1234567  
USA



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# THE IBM TRUENORTH NEUROMORPHIC COMPUTER

THERE HAS BEEN MUCH EXCITEMENT RECENTLY ABOUT NEUROMORPHIC COMPUTING, WHICH SEEKS TO MIMIC THE FUNCTIONING OF THE HUMAN BRAIN BY USING MASSIVELY-PARALLEL COMPUTER SYSTEMS.

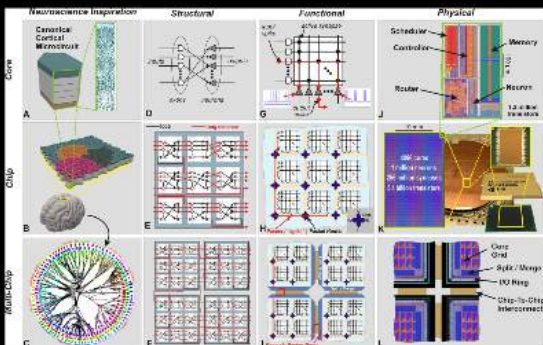
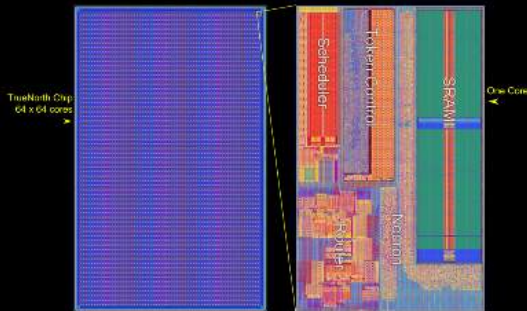
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DUE TO THE SPATIALLY-DISTRIBUTED NATURE OF COMPUTATION AND COMMUNICATION, ALONG WITH WIDE TIMING UNPREDICTABILITY OF DATA EVENTS, NEUROMORPHIC COMPUTING FITS WELL WITH THE ASYNCHRONOUS PARADIGM.

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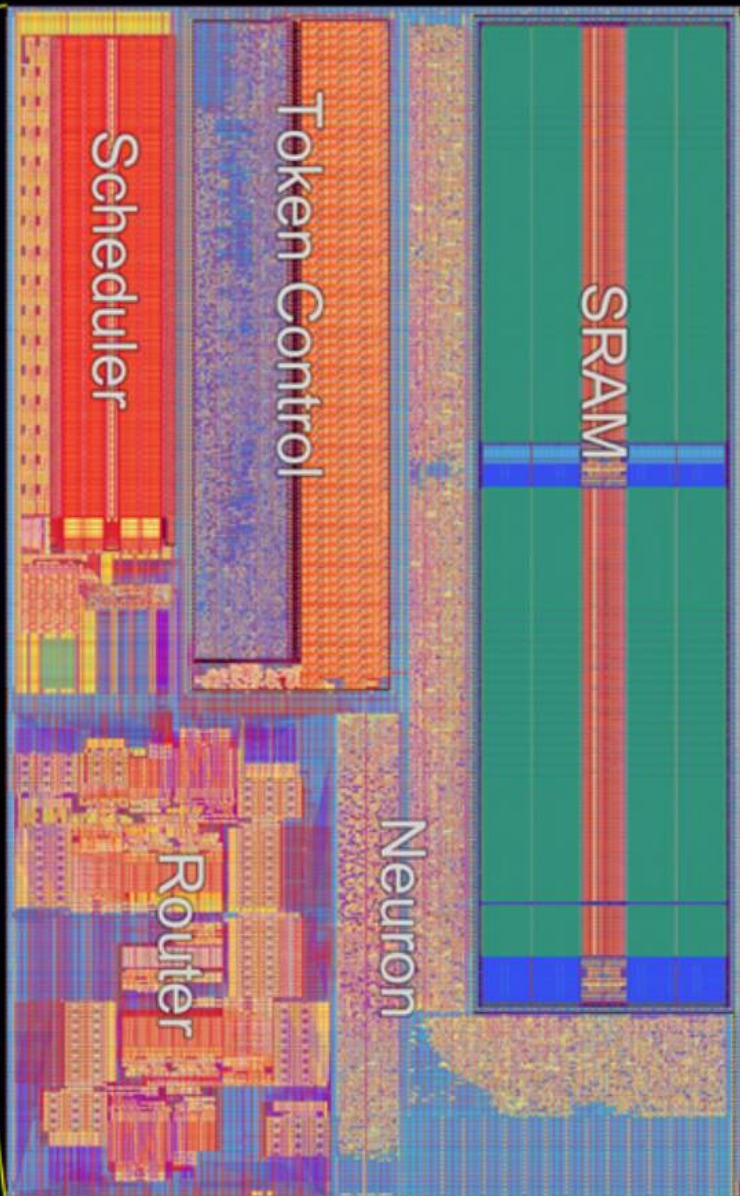
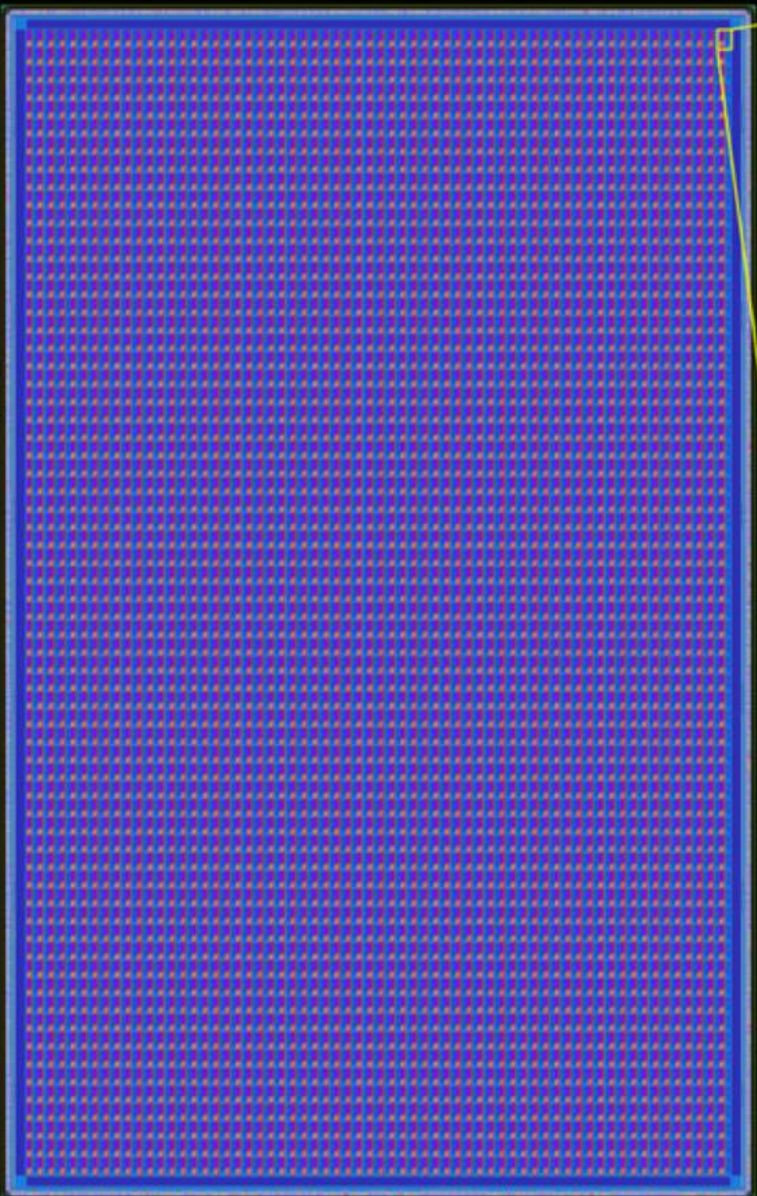
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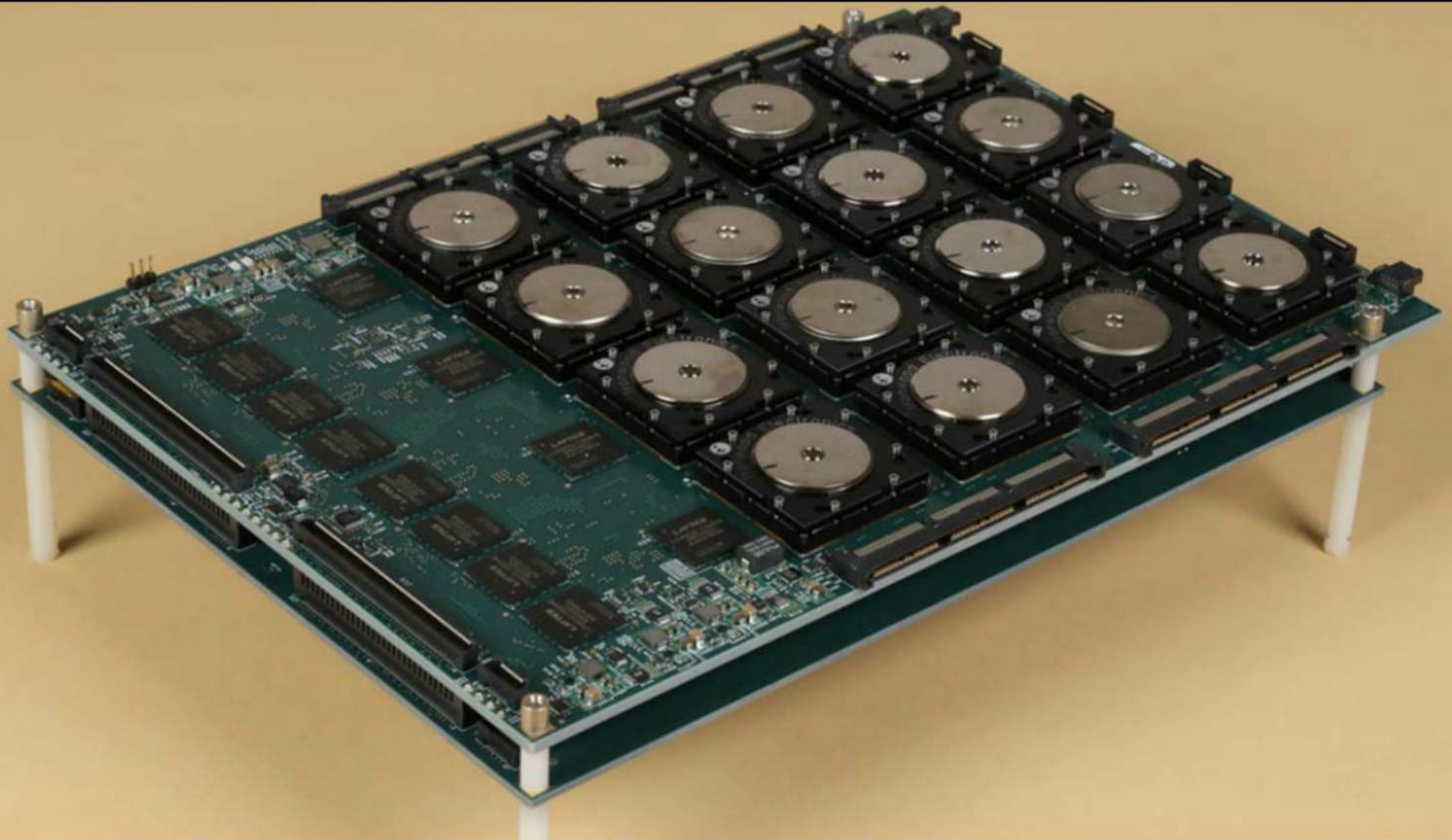


TrueNorth Chip  
64 x 64 cores



One Core





*Neuroscience Inspiration*

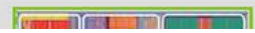
*Structural*

*Functional*

*Physical*

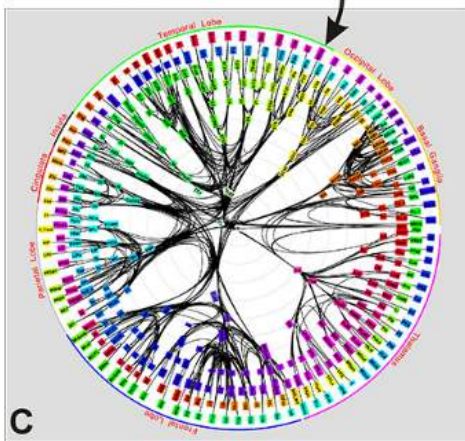
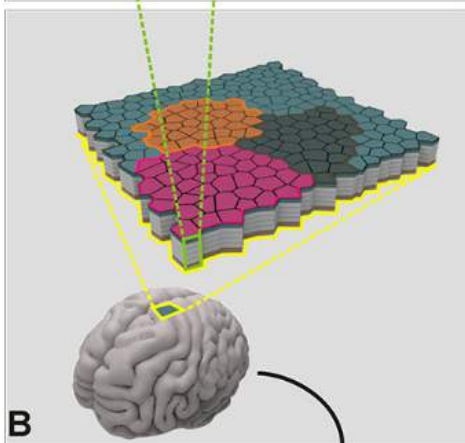
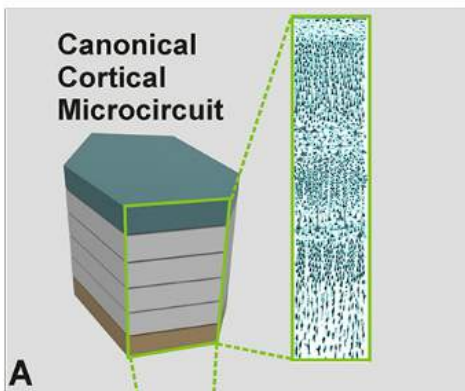
*input*

*active synapse*

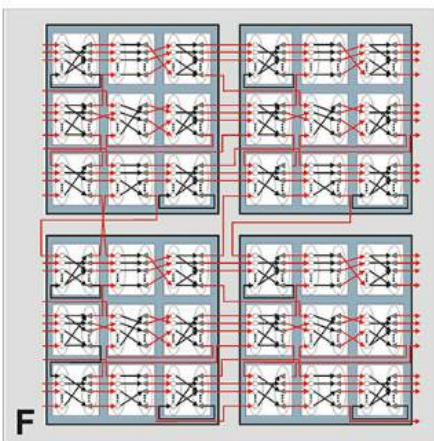
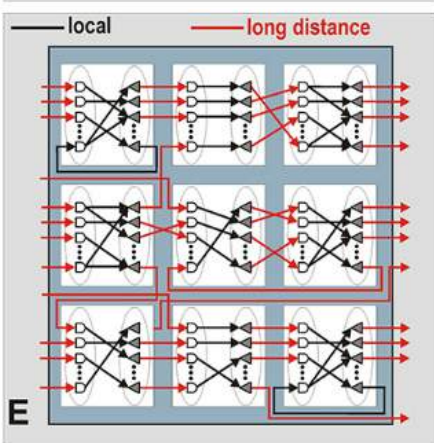
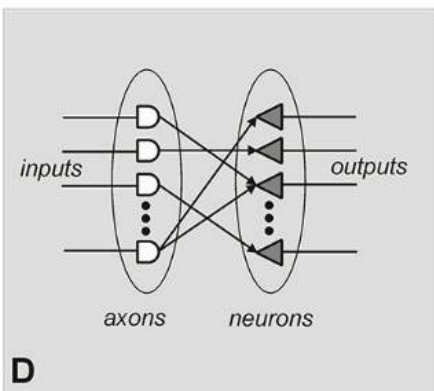




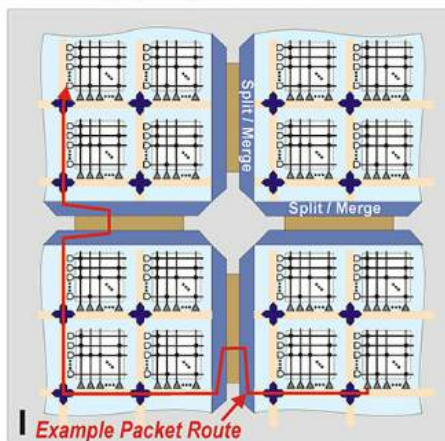
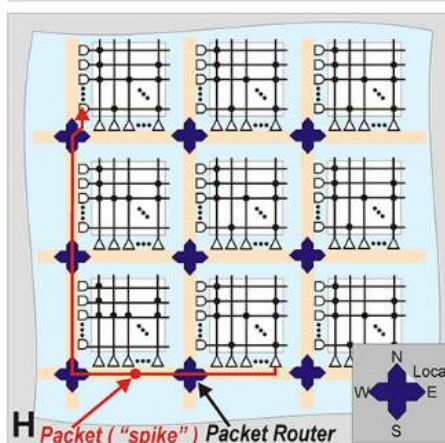
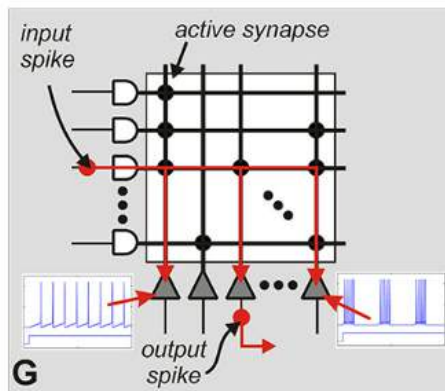
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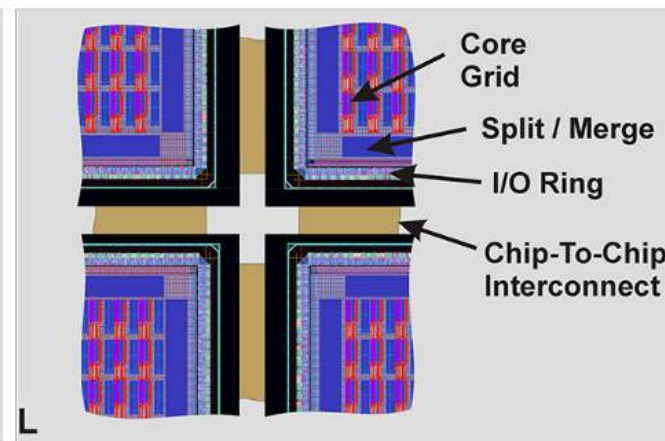
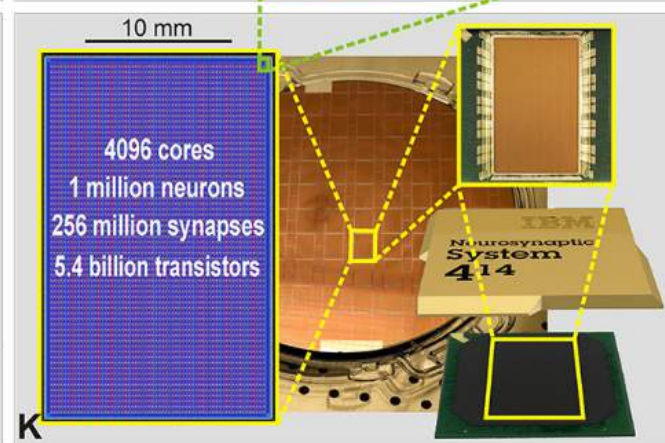
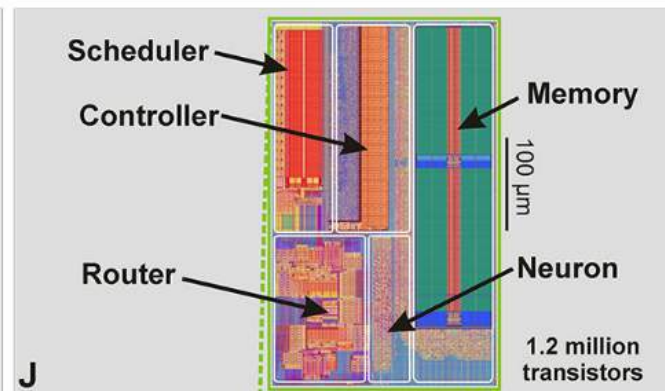
## Structural



## Functional



## Physical





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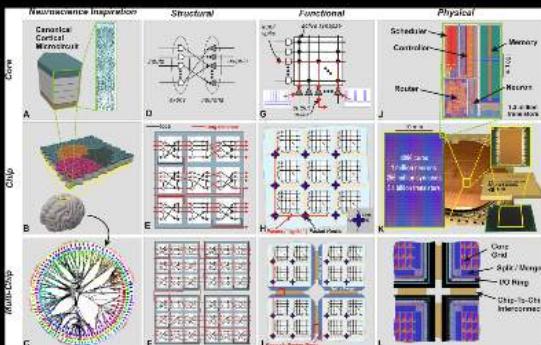
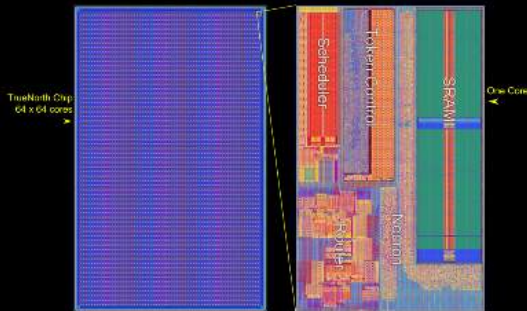
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# OH, BTW, COMPUTERS AND BRAINS AREN'T TOO MUCH ALIKE

BRAINS ARE ANALOGUE, WHILE COMPUTERS ARE DIGITAL.

BRAINS ARE MASSIVELY PARALLEL, WHILE COMPUTERS HAVE A VERY LONG WAY TO GO IN THAT REGARD.

BRAINS USE CONTENT-ADDRESSABLE MEMORY, WHILE VERY FEW COMPUTERS HAVE A GOOD HANDLE ON THAT.

SHORT-TERM MEMORY IN BRAINS SEEMS TO FORM "POINTERS" TO LONG-TERM MEMORY, WHILE COMPUTER RAM IS MUCH MORE LIKE A BYTE FOR BYTE COPY OF PERSISTENT MEMORY ON DISKS AND THE LIKE.

THERE IS NO DISTINCTION BETWEEN HARDWARE AND SOFTWARE IN THE BRAIN: CHANGES IN THE MIND CHANGE THE BRAIN, BUT IN COMPUTERS, WE ABSTRACT AWAY THE HARDWARE FROM THE SOFTWARE.

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BRAINS HAVE BODIES, WHICH CAN OFFER UNIQUE ADVANTAGES. FOR EXAMPLE, DESPITE YOUR INTUITIVE FEELING THAT YOU COULD CLOSE YOUR EYES AND KNOW THE LOCATIONS OF OBJECTS AROUND YOU, A SERIES OF EXPERIMENTS IN THE FIELD OF CHANGE BLINDNESS HAS SHOWN THAT OUR VISUAL MEMORIES ARE ACTUALLY QUITE SPARSE.

WHAT'S HAPPENING IS THAT THE BRAIN IS "OFFLOADING" ITS MEMORY REQUIREMENTS TO THE ENVIRONMENT IN WHICH IT EXISTS: WHY BOTHER REMEMBERING THE LOCATION OF OBJECTS WHEN A QUICK GLANCE WILL SUFFICE?

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# FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

## The IIS - 1952



The IIS (Interim Instructional System) was a computer system developed by the University of Illinois at Urbana-Champaign in 1952. It was one of the first computers to use asynchronous digital logic.

Key features include:

- It was a vacuum tube computer.
- It used asynchronous digital logic for its control system.
- It was designed for teaching computer architecture.

## The TILLACT - 1952



The TILLACT (Tillamook Instructional Logic Laboratory Computer) was a computer system developed by the University of Illinois at Urbana-Champaign in 1952. It was one of the first computers to use asynchronous digital logic.

Key features include:

- It was a vacuum tube computer.
- It used asynchronous digital logic for its control system.
- It was designed for teaching computer architecture.

## Asynchronous Microprocessors, East and West



This section discusses asynchronous microprocessors, comparing designs from the East and West. It highlights the challenges and solutions in designing such devices.

Key points include:

- Asynchronous microprocessors do not rely on a global clock signal.
- They often use local clocks or handshaking protocols for communication.
- Designing them is more complex than synchronous counterparts.

## The Philips Semiconductors Asynchronous (ACS) Microcontroller



The Philips ACS (Asynchronous Controller System) microcontroller is a notable example of asynchronous digital logic. It was designed for low-power, low-cost applications.

Key features include:

- It is a 1-bit microcontroller.
- It uses asynchronous logic for its control system.
- It is designed for applications where a global clock is not feasible.

## Intel/Fulcrum Microsystems: Ethernet Switch Chips



Intel/Fulcrum Microsystems developed Ethernet switch chips that utilize asynchronous digital logic for high-speed data processing.

Key features include:

- They are designed for high-speed data transfer.
- They use asynchronous logic to handle multiple data streams.
- They are used in various networking applications.

## Achronix: High-Performance FPGAs



Achronix's high-performance FPGAs (Field-Programmable Gate Arrays) are designed for applications requiring high-speed, low-latency processing.

Key features include:

- They offer high performance and low power consumption.
- They use asynchronous logic for their internal routing.
- They are used in various high-speed digital applications.

## The IBM TrueNorth Neuromorphic Computer



The IBM TrueNorth neuromorphic computer is a revolutionary design that mimics the structure and function of the human brain.

Key features include:

- It is a sparse, event-driven architecture.
- It uses asynchronous logic for its neurons and synapses.
- It is designed for efficient processing of sensory data.

## Oh, BTW, Computers and Brains Aren't Too Much Alike

This section discusses the similarities and differences between computers and the human brain, particularly in the context of asynchronous digital logic.

Key points include:

- Both computers and brains use asynchronous logic for their internal operations.
- However, the brain's architecture is far more complex and adaptive than current computers.
- Asynchronous logic offers a promising path towards more brain-like computing.

## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WEISSERLEIN'S DISCUSSION**  
This discussion explores the benefits of asynchronous communication, such as increased flexibility, reduced interruptions, and the ability to work at one's own pace. It also touches on the importance of clear communication and documentation in asynchronous environments.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics involves circuits where all components operate in lockstep with a common clock signal. This ensures that data is transferred and processed at predictable intervals, which is essential for reliable data communication in many systems.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics does not rely on a common clock signal. Instead, it uses handshaking protocols to ensure that data is transferred and processed only when both the sender and receiver are ready, which can be more efficient in certain applications.

**KEY DIFFERENCES**  
Synchronous systems are generally simpler to design and implement but can be less flexible. Asynchronous systems are more complex but offer greater flexibility and can be more efficient in terms of power consumption and data transfer rates.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**1. SERIAL-TO-PARALLEL CONVERTERS**  
These devices take data received one bit at a time and convert it into a parallel format that can be processed by a microcontroller or other digital logic.

**2. PARALLEL-TO-SERIAL CONVERTERS**  
These devices take parallel data from a microcontroller and convert it into a serial format for transmission over a single wire.

**3. SHIFT REGISTERS**  
These are used to store and shift data one bit at a time, often used in serial communication and data processing.

**4. COUNTERS**  
These devices count the number of clock pulses and output a binary value, often used in timing and control applications.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**1. FLEXIBILITY**  
Asynchronous design allows for greater flexibility in system architecture, enabling designers to optimize for performance, power consumption, and cost.

**2. POWER EFFICIENCY**  
Asynchronous circuits can consume less power than synchronous circuits because they only draw current when data is being transferred, reducing static power consumption.

**3. SCALABILITY**  
Asynchronous design is more scalable, allowing for the integration of more complex functions and higher data rates in a single chip.

**4. RELIABILITY**  
Asynchronous systems are often more robust to timing variations and noise, making them suitable for high-reliability applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**1. RIGIDITY**  
Synchronous digital circuits are rigid, with all components operating in lockstep. Similarly, organizations with rigid structures and processes can be inflexible and slow to adapt to change.

**2. Synchronization**  
Synchronous circuits require a common clock signal. Organizations that lack clear communication and coordination can suffer from synchronization issues, leading to inefficiencies and errors.

**3. Scalability**  
Synchronous circuits are often limited in scalability. Organizations that struggle to scale their operations effectively may be operating in a more synchronous, rigid manner.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**1. FLOW MODEL**  
The flow model of communication suggests that information flows from sender to receiver in a linear fashion. However, this model is often criticized for being too simplistic and not accounting for the complexities of real-world communication.

**2. NETWORK MODEL**  
The network model views communication as a complex web of interactions between multiple participants, rather than a simple linear flow. This model is more reflective of modern organizational communication structures.

**3. ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication allows for more flexible and efficient information exchange, often bypassing the limitations of the flow model.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**1. TRADITIONAL MEETING CULTURE**  
The idea that meetings are where "the magic happens" is a product of traditional organizational culture, where face-to-face interaction was the primary mode of communication.

**2. LACK OF ASYNCHRONOUS TOOLS**  
Historically, the lack of effective asynchronous communication tools forced organizations to rely on meetings as the primary means of collaboration.

**3. MISPERCEPTION OF ASYNCHRONOUS COMMUNICATION**  
Many organizations still view asynchronous communication as less effective or less legitimate than synchronous communication, leading to an over-reliance on meetings.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**1. ASYNCHRONOUS COMMUNICATION**  
Encourage the use of asynchronous communication tools like email, chat, and video messages to reduce the need for meetings.

**2. CLEAR COMMUNICATION**  
Establish clear communication protocols and expectations to ensure that information is shared effectively without the need for frequent meetings.

**3. ASYNCHRONOUS MEETINGS**  
Use asynchronous meeting formats like pre-recorded video messages and interactive documents to facilitate collaboration without the need for synchronous meetings.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**1. VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine, improving resource utilization and reducing hardware costs.

**2. CONTAINERIZATION**  
Containerization allows applications to run in isolated environments called containers, making it easier to deploy and manage applications across different environments.

**3. SCALABILITY**  
Both virtualization and containerization enable organizations to scale their infrastructure more easily and efficiently, supporting growth and flexibility.

## CLOSING THOUGHTS AND TAKEAWAYS

**1. FLEXIBILITY**  
Asynchronous communication and design offer greater flexibility and adaptability in both technology and organizational structures.

**2. EFFICIENCY**  
Asynchronous systems and virtualized environments can improve efficiency by reducing waste and optimizing resource usage.

**3. INNOVATION**  
Embracing asynchronous and virtualized technologies can foster innovation and drive the development of new, more effective solutions.



# WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

## MOORE'S LAW HAS STALLED, BUT ASYNCHRONOUS CAN SAVE US

STIMPE VON MELDRUM COMPUTERS WINNING AGAINST EVER FASTER CAN'T HAPPEN ANYMORE BECAUSE OF THE EFFECT OF PHYSICS ON ELEMENT SIZE AND FASTER CLOCK SPEEDS.

BUT WITH ASYNCHRONOUS CIRCUITS, WE CAN CONTINUE TO GO TO THE FUTURE:

- NO WORRIES ABOUT CLOCK SKEW (THE NEED TO SEND A SINGLE CLOCK TO ALL OF THE HANGING'S CIRCUITS AT ONCE - AS CLOCK SPEED GETS FASTER BUT THE SPEED OF LIGHT STAYS THE SAME - BUT WITH ASYNCHRONOUS CIRCUITS WE DON'T HAVE TO WORRY ABOUT A CLOCK THAT NEEDS TO BE GLOBALLY DISTRIBUTED AND WE DON'T HAVE TO SLOW DOWN A CIRCUIT TO BEYOND ACCOMMODATE THE SKEW.)
- LOWER POWER REQUIREMENTS (WE ONLY HAVE TO WORRY ABOUT THOSE PORTIONS OF THE CIRCUIT THAT ARE IN USE FOR THE CURRENT COMPUTATION, AND THE UNUSED PORTIONS OF THE CIRCUIT DON'T GET POWERED UNNECESSARILY.)
- AVERAGE CASE INSTEAD OF WORST CASE PERFORMANCE (SYNCHRONOUS CIRCUITS MUST WAIT UNTIL ALL POSSIBLE COMPUTATIONS HAVE COMPLETED BEFORE ENTERING THE RESULTS, FOLLOWING WORST CASE PERFORMANCE. MANY ASYNCHRONOUS SYSTEMS FINISH WITH A COMPUTATION AND COMPLETE, ALLOWING THEM TO CIRCUIT AVERAGE CASE PERFORMANCE.)
- TACKLING OF RARER TESTING ISSUES (IN SYSTEMS SUCH AS A SYNCHRONOUS MICROPROCESSOR, THE SYSTEM CLOCK, AND THIS SYSTEM PERFORMANCE, IS DICTATED BY THE SLOWEST (OR UNUSUAL) PART. THATS, MOST PORTIONS OF A CIRCUIT MUST BE CONSIDERED OPTIMIZED TO ACHIEVE THE HIGHEST CLOCK RATE, INCLUDING RARELY USED PORTIONS OF THE SYSTEM. SINCE MANY ASYNCHRONOUS SYSTEMS OPERATE AT THE SPEED OF THE CIRCUIT PATH CURRENTLY IN OPERATION, RARELY USED PORTIONS OF THE CIRCUIT CAN BE LEFT UN-OPTIMIZED WITHOUT ADVERSELY AFFECTING SYSTEM PERFORMANCE.)
- AUTOMATIC ADAPTATION TO PHYSICAL PROPERTIES (THE DELAY THROUGH A CIRCUIT CAN VARY WITH VARIATIONS TO FABRICATION, TEMPERATURE, AND POWER SUPPLY VOLTAGE. SYNCHRONOUS CIRCUITS MUST ASSUME THAT THE WORST POSSIBLE COMBINATION OF FACTORS IS PRESENT AND CLOCK THE SYSTEM ACCORDINGLY. MANY ASYNCHRONOUS CIRCUITS FINISH COMPUTATION COMPLETION, AND WILL RUN AS QUICKLY AS THE CURRENT PHYSICAL PROPERTIES ALLOW.)

## SO, WHY ARE SO MANY NEW CHIPS SYNCHRONOUS?

THE REASONS I THINK THAT ASYNCHRONOUS ISN'T COMMONPLACE TODAY:

- DESIGN TOOLS.
- MOST CPU DESIGN TOOLS ASSUME A CLOCKED CPU.
- MOST TOOLS ENFORCE SYNCHRONOUS DESIGN PRACTICES.
- MAKING A CLOCKLESS CPU INVOLVES MODIFYING THE DESIGN TOOLS TO HANDLE CLOCKLESS LOGIC AND DOING EXTRA TESTING TO ENSURE THE DESIGN AVOIDS METASTABLE PROBLEMS.
- AND MOST CPU DESIGNERS HAVE BEEN TRAINED TO DESIGN SYNCHRONOUS CIRCUITS THESE DAYS!

IT'S JUST EASIER TO DESIGN SYNCHRONOUS CIRCUITS GIVEN WHERE WE ARE. SO THAT'S WHAT WE MOSTLY DO.

OK. ENOUGH ABOUT ELECTRONICS. BACK TO SOFTWARE DEVELOPMENT.

# MOORE'S LAW HAS STALLED, BUT ASYNCHRONOUS CAN SAVE US

SIMPLE VON NEUMANN COMPUTERS RUNNING AGAINST EVER FASTER CAN'T HAPPEN ANYMORE BECAUSE OF THE EFFECT OF PHYSICS ON ELEMENT SIZE AND FASTER CLOCK SPEEDS..

BUT WITH ASYNCHRONOUS CIRCUITS, WE CAN CONTINUE INTO THE FUTURE:

- NO WORRIES ABOUT CLOCK SKEW (THE NEED TO SEND A SINGLE CLOCK TO ALL OF THE MACHINE'S CIRCUITS AT ONCE - AS CLOCK SPEED GETS FASTER BUT THE SPEED OF LIGHT STAYS THE SAME. BUT WITH ASYNCHRONOUS CIRCUITS WE DON'T HAVE TO WORRY ABOUT A CLOCK THAT NEEDS TO BE GLOBALLY DISTRIBUTED AND WE DON'T HAVE TO SLOW DOWN A CIRCUIT TO HELP ACCOMMODATE THE SKEW).
- LOWER POWER REQUIREMENTS (WE ONLY HAVE TO WORRY ABOUT THOSE PORTIONS OF THE CIRCUIT THAT ARE IN USE FOR THE CURRENT COMPUTATION, AND THE UNUSED PORTIONS OF THE CIRCUIT DON'T GET POWERED UNNECESSARILY).
- AVERAGE-CASE INSTEAD OF WORST-CASE PERFORMANCE (SYNCHRONOUS CIRCUITS MUST WAIT UNTIL ALL POSSIBLE COMPUTATIONS HAVE COMPLETED BEFORE LATCHING THE RESULTS, YIELDING WORST-CASE PERFORMANCE. MANY ASYNCHRONOUS SYSTEMS SENSE WHEN A COMPUTATION HAS COMPLETED, ALLOWING THEM TO EXHIBIT AVERAGE-CASE PERFORMANCE.)
- EASING OF GLOBAL TIMING ISSUES (IN SYSTEMS SUCH AS A SYNCHRONOUS MICROPROCESSOR, THE SYSTEM CLOCK, AND THUS SYSTEM PERFORMANCE, IS DICTATED BY THE SLOWEST (CRITICAL) PATH. THUS, MOST PORTIONS OF A CIRCUIT MUST BE CAREFULLY OPTIMIZED TO ACHIEVE THE HIGHEST CLOCK RATE, INCLUDING RARELY USED PORTIONS OF THE SYSTEM. SINCE MANY ASYNCHRONOUS SYSTEMS OPERATE AT THE SPEED OF THE CIRCUIT PATH CURRENTLY IN OPERATION, RARELY USED PORTIONS OF THE CIRCUIT CAN BE LEFT UN-OPTIMIZED WITHOUT ADVERSELY AFFECTING SYSTEM PERFORMANCE.)
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OK. ENOUGH ABOUT ELECTRONICS. BACK TO SOFTWARE DEVELOPMENT.



# WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

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OK. ENOUGH ABOUT ELECTRONICS. BACK TO SOFTWARE DEVELOPMENT.

## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WEISSERSTEIN'S DISCUSSION**  
This discussion explores the benefits of asynchronous communication, such as increased flexibility, reduced interruptions, and the ability to work at one's own pace. It also touches on the importance of clear communication and documentation in asynchronous environments.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics involves circuits where all components operate in lockstep with a common clock signal. This ensures that data is transferred and processed at regular intervals, leading to predictable and reliable performance.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics does not rely on a common clock signal. Instead, components communicate through handshaking protocols, allowing for more flexible and potentially faster data transfer rates.

**KEY DIFFERENCES**  
Synchronous systems are easier to design and debug but can be limited by the clock speed. Asynchronous systems are more complex to design but can offer higher performance and better scalability.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**1. SERIAL ADDERS**  
Serial adders perform addition one bit at a time, making them a classic example of asynchronous logic.

**2. SERIAL SUBTRACTORS**  
Serial subtractors perform subtraction one bit at a time, also utilizing asynchronous logic.

**3. SERIAL MULTIPLIERS**  
Serial multipliers calculate the product of two numbers bit by bit, demonstrating asynchronous data flow.

**4. SERIAL DIVIDERS**  
Serial dividers perform division one bit at a time, another common asynchronous logic device.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**1. ENERGY EFFICIENCY**  
Asynchronous logic can consume less power than synchronous logic because it only uses energy when data is being transferred.

**2. SCALABILITY**  
Asynchronous designs are often more scalable, allowing for the integration of more components without the performance penalties associated with high clock speeds.

**3. FLEXIBILITY**  
Asynchronous logic can adapt to varying workloads and data rates, making it suitable for a wide range of applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**1. RIGIDITY**  
Synchronous digital circuits are rigid, with all components operating in lockstep. Similarly, organizations with rigid hierarchies and fixed processes lack the flexibility needed for rapid change.

**2. SCALED**  
Synchronous circuits are scaled by increasing the clock speed. Organizations that scale by adding more layers of management or bureaucracy become slower and less efficient.

**3. SLOW**  
High clock speeds in synchronous circuits lead to increased power consumption and heat. Organizations with slow decision-making processes struggle to keep up in a fast-paced market.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**1. THE FLOW MODEL**  
The flow model of organizational communication suggests that information flows from top management down through the hierarchy. This model is often criticized for being too rigid and top-down.

**2. NETWORKED ORGANIZATIONS**  
Networked organizations have a more fluid and interconnected structure, allowing for faster communication and more collaborative decision-making.

**3. THE BENEFITS OF NETWORKING**  
Networked organizations are more adaptable, innovative, and resilient. They can respond more quickly to market changes and foster a culture of continuous learning.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**1. THE MEETING CULTURE**  
The idea that meetings are where "the magic happens" is a common but often misguided belief. It suggests that important decisions and ideas are only formed during face-to-face meetings.

**2. THE RISE OF ASYNCHRONOUS WORK**  
Asynchronous work allows for more focused and productive time. Many organizations are realizing that important work can be done without the need for a meeting.

**3. THE BENEFITS OF ASYNCHRONOUS WORK**  
Asynchronous work reduces interruptions, allows for deeper concentration, and can lead to more thoughtful and creative solutions.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**1. ASYNCHRONOUS COMMUNICATION**  
Encourage the use of asynchronous communication tools like email, chat, and project management software to reduce the need for meetings.

**2. CLEAR AGENDAS**  
When meetings are necessary, have a clear agenda and stick to it. This helps ensure that meetings are productive and focused.

**3. ASYNCHRONOUS DECISION-MAKING**  
Empower employees to make decisions on their own or in small teams, reducing the need for large group meetings.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**1. VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine, improving resource utilization and reducing hardware costs.

**2. CONTAINERIZATION**  
Containerization allows applications to run in isolated environments, making it easier to deploy and manage software across different environments.

**3. THE BENEFITS OF VIRTUALIZATION AND CONTAINERIZATION**  
Both technologies improve scalability, flexibility, and security. They also reduce the time and effort required to set up and maintain IT infrastructure.

## CLOSING THOUGHTS AND TAKEAWAYS

**1. ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is a powerful tool for improving productivity and reducing interruptions in the workplace.

**2. NETWORKED ORGANIZATIONS**  
Networked organizations are more agile and innovative, better equipped to handle the challenges of a rapidly changing market.

**3. THE BENEFITS OF ASYNCHRONOUS WORK**  
Asynchronous work leads to more focused and productive time, allowing for deeper concentration and more thoughtful decision-making.

# HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

## BECAUSE IT'S A REACTION TO COMPLICATED THINGS



ORGANIZATIONS HAVE TAKEN THE SAME PLAY THAT SYNCHRONOUS CIRCUIT DESIGNERS TOOK WHEN THINGS GOT COMPLICATED.

FEAR OF UNCERTAINTY, ESPECIALLY IN RISK ADVERSE ORGANIZATIONS THAT WERE AFRAID THAT THEY COULDN'T DO "BIGGER THINGS" MADE THEM DECIDE THAT THEY NEEDED TO "SCALE THE ORGANIZATION" OR "SCALE AGILE" TO ACCOMPLISH THESE THINGS.

## BECAUSE THE CONCEPT IS SIMPLE



AND JUST LIKE WITH SYNCHRONOUS CIRCUIT DESIGNERS, THE USE OF CLOCKS IS A FAIRLY EASY TO UNDERSTAND CONCEPT.

IT WORKS IN EXACTLY THE SAME WAY: WHEN THE CLOCK SIGNAL HAPPENS, WE USE WHATEVER INFORMATION IS AVAILABLE ON OUR INPUTS AND GET TO THE NEXT STATE.

WE JUST CALL IT DIFFERENT THINGS IN A CORPORATE SETTING.

LIKE PJ PLANNING, MEETINGS, AGILE PROCESS TOOLS, AND AGILE RELEASE TRAINS.



# BECAUSE IT'S A REACTION TO COMPLICATED THINGS



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## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time. It allows for communication to occur at different times and from different locations. Examples include email, instant messaging, and video conferencing.

**"THE MAGIC OF ASYNCH" - MITRETECH DIGITAL LOGIC DESIGN**  
This article discusses the benefits of asynchronous communication in digital logic design, such as the ability to work at your own pace and collaborate with team members across different time zones.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics is a type of digital logic design where all components are clocked by a common clock signal. This ensures that all components are updated at the same time, which simplifies the design and analysis of the circuit.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics is a type of digital logic design where components are not clocked by a common clock signal. Instead, each component is updated only when its inputs change. This allows for more flexible and efficient designs, but it is more difficult to analyze and design.

**KEY DIFFERENCES**  
Synchronous designs are easier to design and analyze, but they can be slower and less efficient. Asynchronous designs are more flexible and efficient, but they are more difficult to design and analyze.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**1. SR LATCH**  
The SR latch is a basic asynchronous digital logic device that can store a single bit of information. It is composed of two cross-coupled NOR gates.

**2. D LATCH**  
The D latch is another basic asynchronous digital logic device that can store a single bit of information. It is composed of two cross-coupled NAND gates.

**3. JK LATCH**  
The JK latch is a more complex asynchronous digital logic device that can store a single bit of information. It is composed of two cross-coupled NAND gates and two additional NAND gates.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**1. FLEXIBILITY**  
Asynchronous digital logic design allows for more flexible and efficient designs, as components are only updated when their inputs change.

**2. EFFICIENCY**  
Asynchronous designs can be more efficient than synchronous designs, as they do not require a common clock signal and can operate at higher frequencies.

**3. SCALABILITY**  
Asynchronous designs are more scalable than synchronous designs, as they can be easily adapted to larger and more complex systems.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**1. RIGIDITY**  
Synchronous digital circuits are rigid and inflexible, as all components are updated at the same time. Similarly, organizations that are becoming more like synchronous digital circuits are becoming more rigid and inflexible.

**2. SLOWNESS**  
Synchronous digital circuits are slower than asynchronous circuits, as they require a common clock signal. Similarly, organizations that are becoming more like synchronous digital circuits are becoming slower and less efficient.

**3. LACK OF ADAPTABILITY**  
Synchronous digital circuits are not adaptable to change, as they are designed to operate in a fixed environment. Similarly, organizations that are becoming more like synchronous digital circuits are becoming less adaptable to change.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**1. THE PROBLEM WITH THE SAFE "FLOW MODEL"**  
The safe "flow model" is a common approach to organizational design that focuses on creating a rigid and inflexible structure. This approach is based on the idea that organizations should be designed to operate in a fixed environment, and that change should be avoided.

**2. THE BENEFITS OF ASYNCHRONOUS ORGANIZATIONAL DESIGN**  
Asynchronous organizational design is a more flexible and efficient approach to organizational design. It allows organizations to adapt to change and operate in a dynamic environment. This approach is based on the idea that organizations should be designed to operate in a dynamic environment, and that change should be embraced.

**3. THE FUTURE OF ORGANIZATIONAL DESIGN**  
The future of organizational design is asynchronous. Organizations that embrace asynchronous design will be more flexible, efficient, and adaptable to change. Organizations that continue to use the safe "flow model" will be slower, less efficient, and less adaptable to change.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**1. THE HISTORY OF MEETINGS**  
Meetings have been a part of human culture for as long as we have been able to communicate. In the past, meetings were often held in person and were a key part of decision-making.

**2. THE RISE OF ASYNCHRONOUS COMMUNICATION**  
The rise of asynchronous communication has changed the way we think about meetings. Asynchronous communication allows us to communicate and make decisions without the need for a meeting.

**3. THE FUTURE OF MEETINGS**  
The future of meetings is asynchronous. Meetings should be used only when necessary, and they should be designed to be as efficient and effective as possible.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**1. ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are meetings that are held using asynchronous communication tools, such as email, instant messaging, and video conferencing. These meetings allow participants to communicate and make decisions at their own pace.

**2. ASYNCHRONOUS DECISION-MAKING**  
Asynchronous decision-making is a process where decisions are made using asynchronous communication tools. This process allows decisions to be made more quickly and efficiently.

**3. ASYNCHRONOUS COLLABORATION**  
Asynchronous collaboration is a process where team members collaborate using asynchronous communication tools. This process allows team members to work together more effectively and efficiently.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**1. VIRTUALIZATION**  
Virtualization is a technology that allows multiple operating systems to run on a single physical machine. This technology allows organizations to reduce their hardware costs and improve their efficiency.

**2. CONTAINERIZATION**  
Containerization is a technology that allows applications to be packaged and run in containers. This technology allows organizations to improve their application performance and reduce their deployment time.

**3. THE BENEFITS OF VIRTUALIZATION AND CONTAINERIZATION**  
Virtualization and containerization offer many benefits, including reduced hardware costs, improved efficiency, and faster deployment times. These technologies are essential for organizations that want to improve their IT infrastructure.

## CLOSING THOUGHTS AND TAKEAWAYS

**1. THE FUTURE OF ORGANIZATIONAL DESIGN**  
The future of organizational design is asynchronous. Organizations that embrace asynchronous design will be more flexible, efficient, and adaptable to change.

**2. THE FUTURE OF MEETINGS**  
The future of meetings is asynchronous. Meetings should be used only when necessary, and they should be designed to be as efficient and effective as possible.

**3. THE FUTURE OF VIRTUALIZATION AND CONTAINERIZATION**  
Virtualization and containerization are essential technologies for organizations that want to improve their IT infrastructure. These technologies will continue to evolve and become more widely adopted.

# ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

## Yeah. Much of it is wrong. But it's a good business!



I had to go to the doctor recently. Actually my gastroenterologists told me that he was out of clocks, and referred me to the "Niece" for my condition. Mount Sinai Hospital in Manhattan.

I met a doctor there that was, basically, the best doctor I've ever worked with. A rare combination of a very smart person who also has great bedside manner. He's actually a professor at the School of Medicine who also sees some patients.

And then I realized something about doctors. There are three types:

- Those who research, write papers, and present at conferences (like the new doctor).
- Those who read the occasional paper on topics they deal with (like my current doctor).
- Those who are licensed, but only learn of new things through pharmaceutical reps and product brochures.

And that's when I realized that it occurs in software development as well.

## Let's Look for Clocks in This Popular "Scaled Agile Framework"



This flowchart is the "Scaled Agile Framework" (SAF) framework, which is the most popular SA framework.

SAF is a framework for scaling agile practices across multiple teams. It includes various roles, responsibilities, and processes. The diagram shows a complex network of interconnected elements, including roles like Product Manager, Business Analyst, and various team members, along with processes like Backlog Management and Release Management.

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## And Here's the Two Extremely Damning Aspects to All of This



While safe is good, "scaling agile to the enterprise" is the reality that most "development" teams (and not just people, but teams) have to face. These teams are often in a state of flux, with people moving in and out, and the work being done is often complex and changing. This makes it difficult to maintain a consistent workflow and to manage the overall process.

SAF is a framework for scaling agile practices across multiple teams. It includes various roles, responsibilities, and processes. The diagram shows a complex network of interconnected elements, including roles like Product Manager, Business Analyst, and various team members, along with processes like Backlog Management and Release Management.



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I want organizations to stop trying to scale up team agile practices to work on the projects that are "enterprise big," and instead to work on scaling down these big monster monolithic systems into smaller, loosely-coupled systems of highly-decoupled parts, and be smart about how the parts get wired together.



Or, technically, one method of accomplishing this is to use microservices that work with various APIs that are tolerant of system mismatches, can automatically fall back to previous API versions, and handle themselves by real-time negotiation of negotiating.

Yes, that will take software craftsmanship and major architectural re-architecting from the majority of the monolithic systems that exist in the world. It's my hope that I'm never involved with the organizations that have these sorts of unextractable in place already. I guess they have no need for me, since they are already doing the right things. :-)

## And What About ARTs, aka CI Pipelines



This is nothing more than traditional CI/CD (development, test, accept, deployment) thinking, with decision making, hand-offs, and wait states for approvals to occur.



Most of the agile release train (ART) which is the Scaled Agile Framework (SAF) pipeline does not pump software's pipeline code for the integration pipeline to consume. The train's engine's shunter and the shunter's engine instead of getting to where they need to be.

The train is always stuck to the track and never from positive automated test results.

Releases should not be viewed as something abnormal and risky. Releases should happen all the time, because that's why we develop code in the first place.

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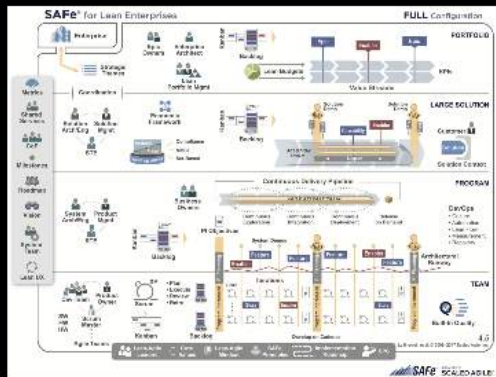
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# LET'S LOOK FOR CLOCKS IN THIS POPULAR "SCALED AGILE FRAMEWORK"



DO YOU SEE THE CLOCKS? THEY'RE HIDING BEHIND "AGILE/LEAN/SCRUM" SOUNDING WORDS. BUT THEY'RE THERE! LET'S TAKE A LOOK.

WITHIN TEAMS, SCRUM IS SUPPOSED TO BE A SAVIOR. THE TRADITIONAL SCRUM CEREMONIES HAVE DAILY STAND-UPS, BI-WEEKLY SPRINT PLANNING, BI-WEEKLY REVIEWS/DEMOS, BI-WEEKLY RETROSPECTIVES, BI-WEEKLY GROOMING, ETC. TEAMS THEN WORK IN SYNCHRONIZED SPRINTS, SO THEY CAN HAVE SYNCHRONIZED SYSTEM DEMOS.

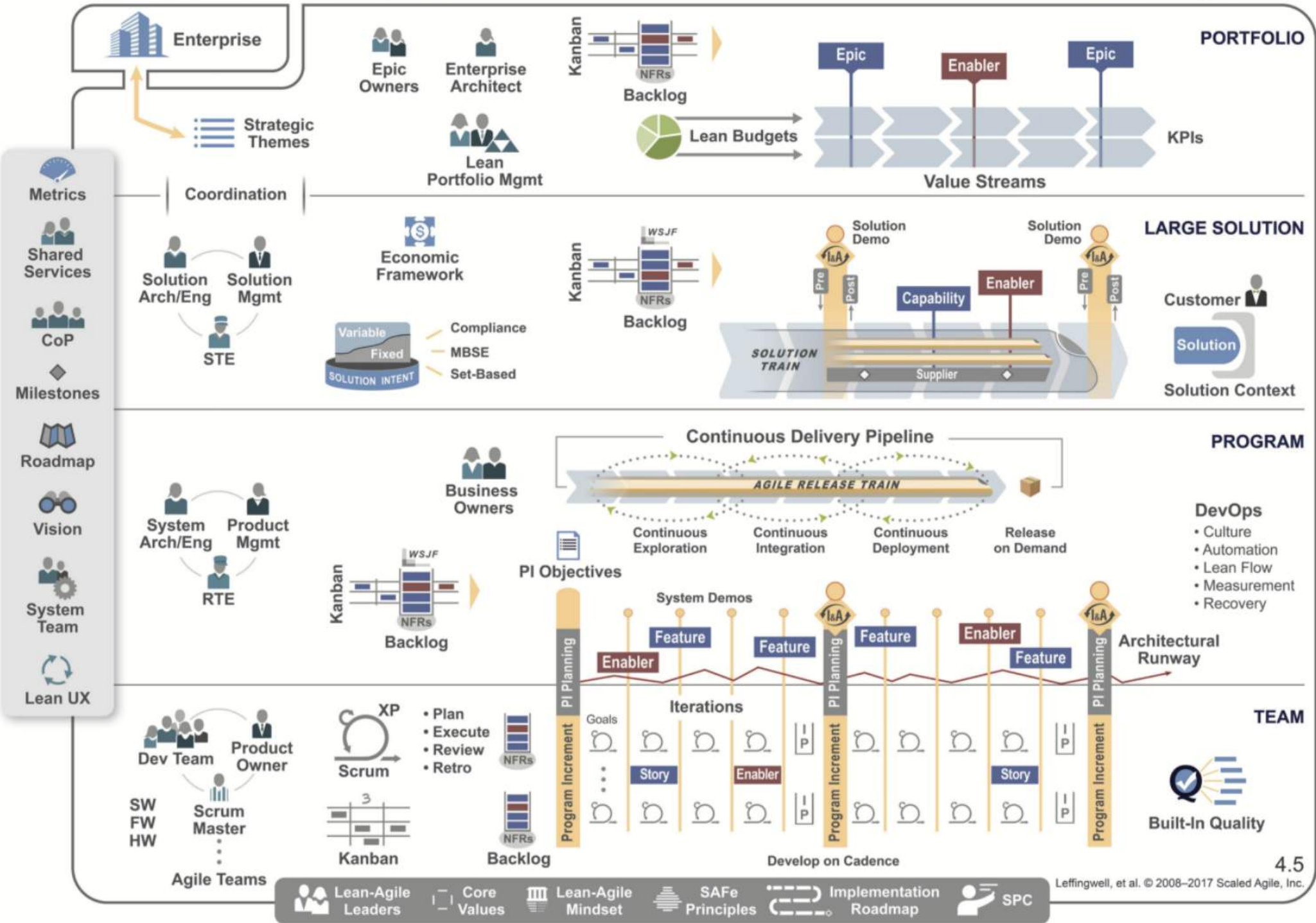
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THEN, WE HAVE THE "AGILE RELEASE TRAIN" CONCEPT. WHICH IS SUPPOSED TO HAPPEN EVERY DAY OR WEEK, BUT TYPICALLY HAPPENS RIGHT BEFORE THE QUARTERLY RELEASES, SO THE "HARDENING SPRINTS" CAN OCCUR. [THE WHOLE CONCEPT OF RELEASE TRAINS IS THAT IF YOU MISS ONE, ANOTHER ONE IS COMING SOON, SO DON'T FRET. BUT IN REALITY FOR ORGANIZATIONS THAT ARE STILL STUCK IN LARGE MONOLITHIC ARCHITECTURES, WE HAVE HEROES AND DEATH MARCHES HAPPENING TO ASSEMBLE THE TRAINS, WHICH USUALLY DON'T END IN RELEASED CODE, BUT TRAIN WRECKS!]

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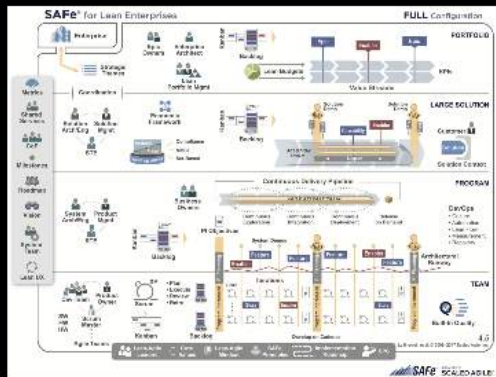
# SAFe® for Lean Enterprises

FULL Configuration





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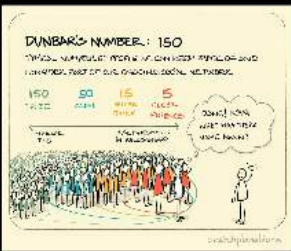
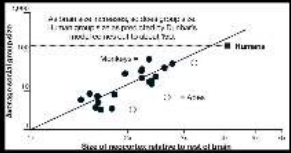
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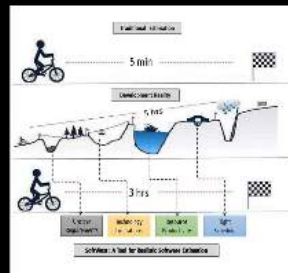
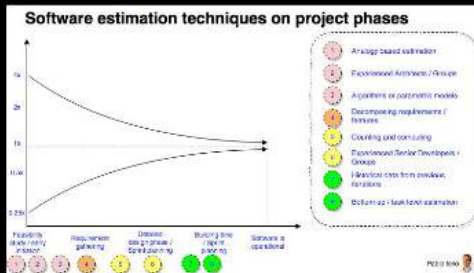


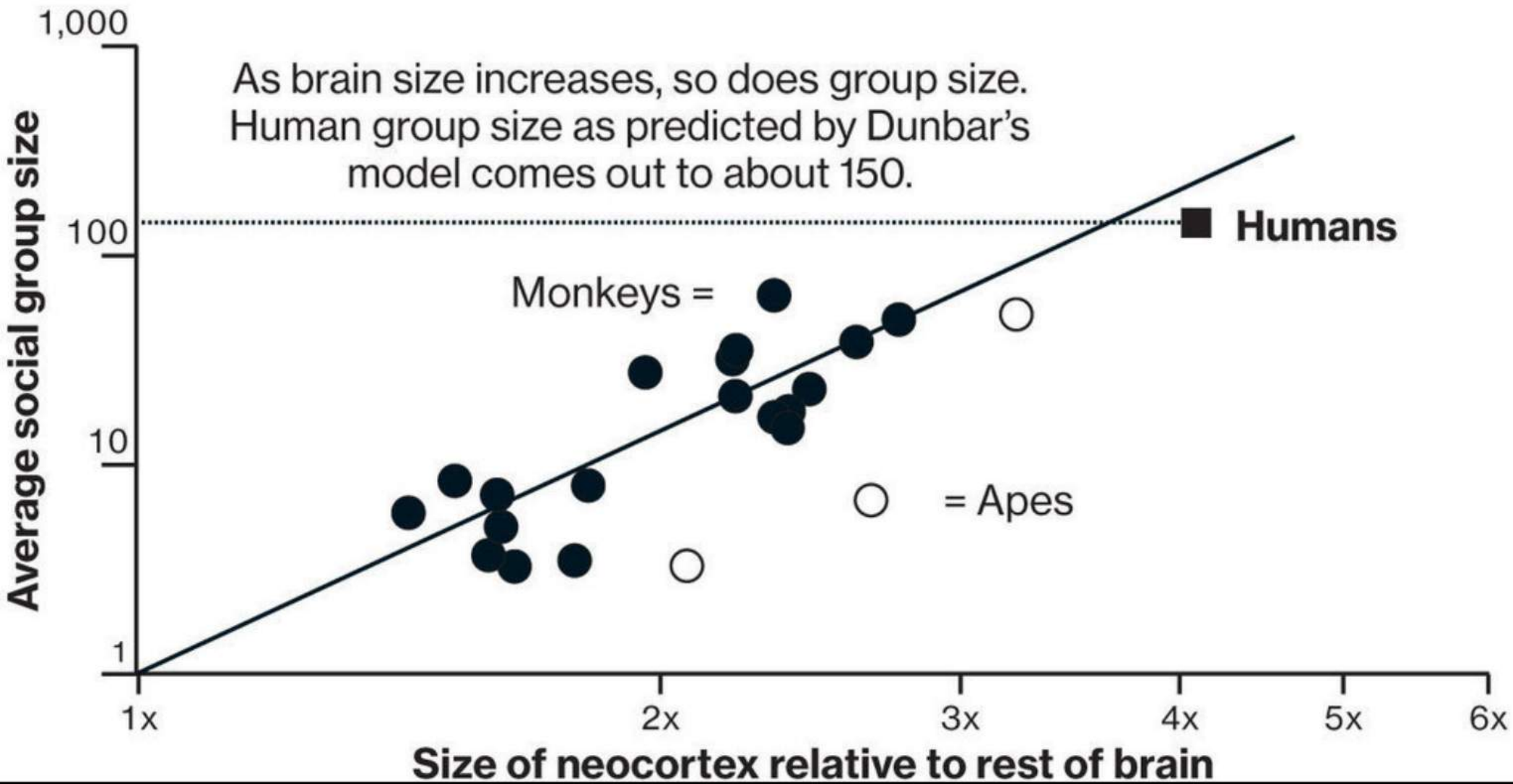
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WHILE SAFE IS SOLD AS “SCALING AGILE TO THE ENTERPRISE”, THE REALITY IS THAT ONCE WE REACH DUNBAR’S NUMBER (AROUND 150 PEOPLE), YOU CAN NO LONGER HAVE EFFECTIVE PI PLANNING MEETINGS. THERE’S JUST TOO MANY PEOPLE TO INTERACT WITH EFFECTIVELY. THIS IS A DIRECT ANALOGY TO CLOCK FANOUT PROBLEMS ON SYNCHRONOUS CIRCUITS WHERE THINGS LIKE CLOCK SKEW MUCH BE TAKEN INTO ACCOUNT, AND THE ROOT CAUSE OF WHY IT’S REALLY TOUGH TO SCALE CLOCKED CPUs PAST CERTAIN CLOCK SPEEDS.

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# DUNBAR'S NUMBER : 150

TYPICAL NUMBER OF PEOPLE WE CAN KEEP TRACK OF AND  
CONSIDER PART OF OUR ONGOING SOCIAL NETWORK

150  
TRIBE

50  
CLAN

15  
SUPER  
FAMILY

5  
CLOSE  
FRIENDS

← WEAKER TIES → MORE INVESTMENT IN RELATIONSHIP →

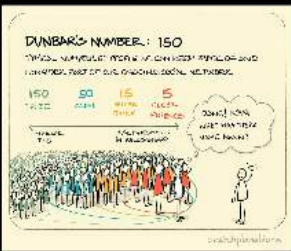
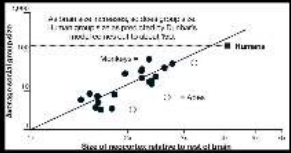
DANG! NOW,  
WHAT WAS THEIR  
NAME AGAIN?



sketchplanations

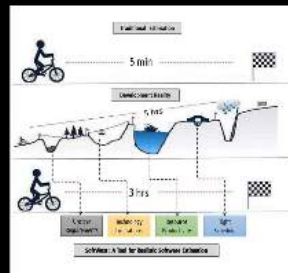
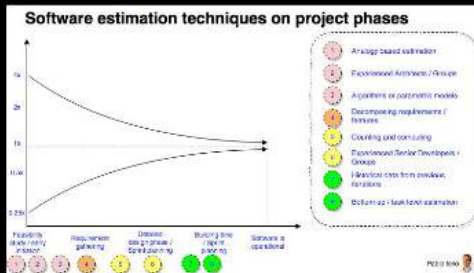


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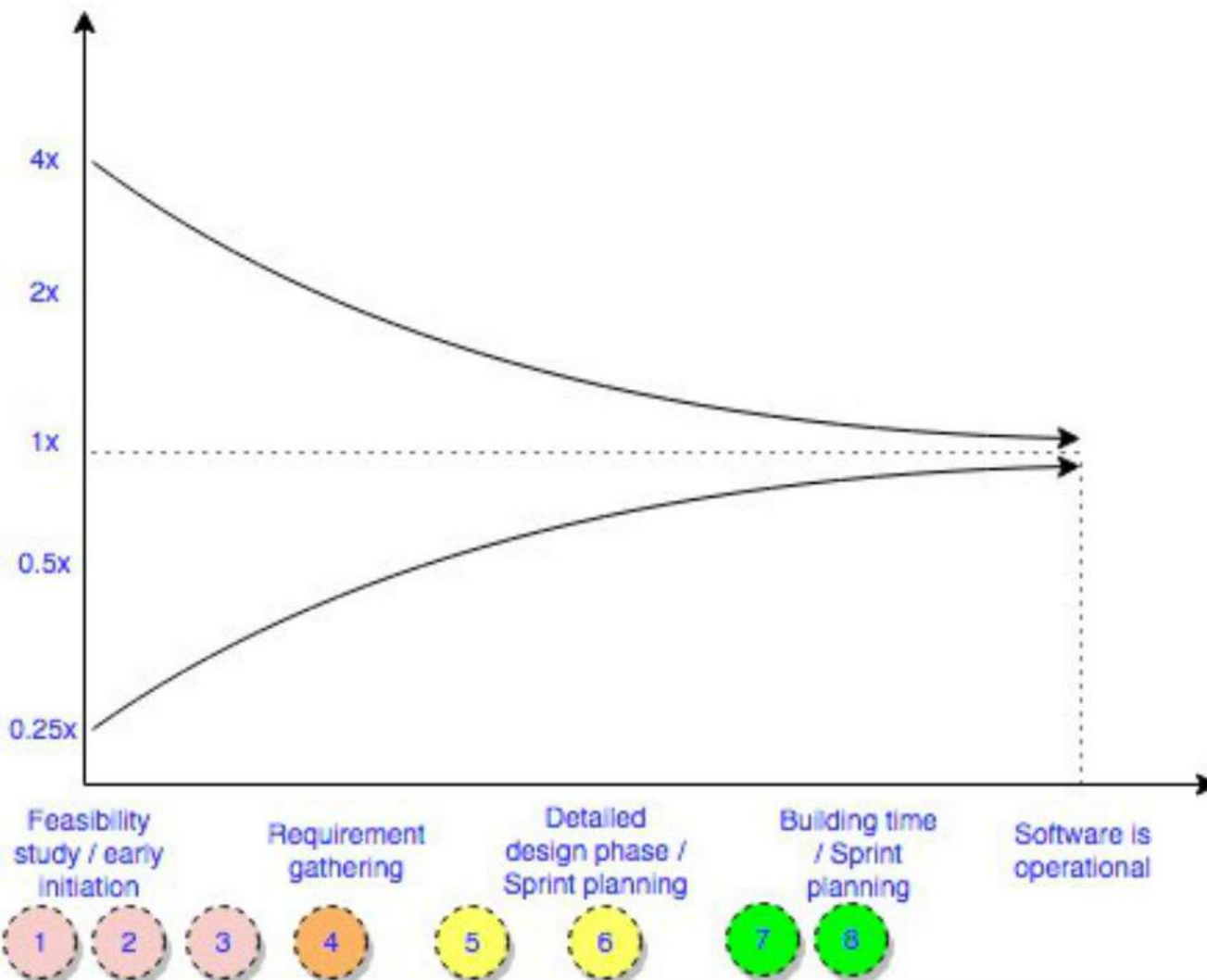


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# Software estimation techniques on project phases



- 1 Analogy based estimation
- 2 Experienced Architects / Groups
- 3 Algorithms or parametric models
- 4 Decomposing requirements / features
- 5 Counting and computing
- 6 Experienced Senior Developers / Groups
- 7 Historical data from previous iterations
- 8 Bottom up / task level estimation

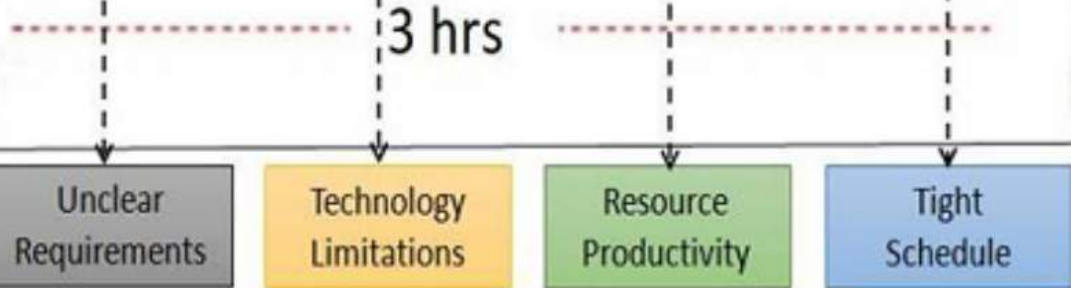
Traditional Estimation



5 min



Development Reality



SoftWest : A Tool for Realistic Software Estimation



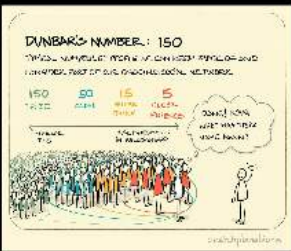
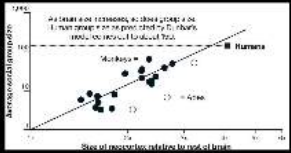


E-mail: SCOTTADAMS@AOL.COM

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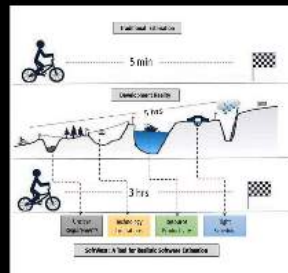
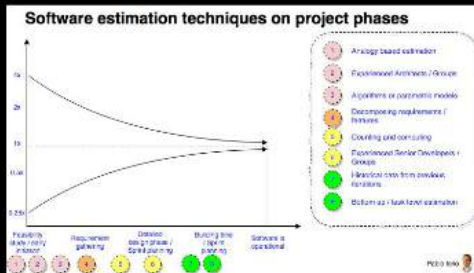
www.dilbert.com

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# HERE'S THE REAL PROBLEM TO SOLVE



I WANT ORGANIZATIONS TO STOP TRYING TO SCALE UP TEAM AGILE PRACTICES TO WORK ON THE PROJECTS THAT ARE “ENTERPRISE BIG” AND INSTEAD TO WORK ON SCALING DOWN THOSE BIG MONSTER MONOLITHIC SYSTEMS INTO SMALLER LOOSELY COUPLED SYSTEMS OF HIGHLY COHESIVE PARTS, AND BE SMART ABOUT HOW THE PARTS GET WIRED TOGETHER.



OK. TECHNICALLY, ONE METHOD OF ACCOMPLISHING THIS IS TO USE MICROSERVICES THAT WORK OVER VERSIONED APIS THAT ARE TOLERANT OF VERSION MISMATCHES, CAN AUTOMATICALLY FALL BACK TO PREVIOUS API VERSIONS, AND ANNEAL THEMSELVES BY REAL TIME NEGOTIATION OF VERSIONING.

YES. THAT WILL TAKE SOFTWARE CRAFTSMANSHIP AND MAJOR ARCHITECTURAL REFACTORING FOR THE MAJORITY OF THE MONOLITHIC SYSTEMS THAT I ENCOUNTER. [IT'S MY PLIGHT THAT I'M NEVER INVOLVED WITH THE ORGANIZATIONS THAT HAVE THESE SORTS OF ARCHITECTURES IN PLACE ALREADY. I GUESS THEY HAVE NO NEED FOR ME, SINCE THEY ARE ALREADY DOING THE RIGHT THINGS. :-)]





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## And Here's the Two Extremely Damning Aspects to All of This



While safe is good in "scaling agile to the enterprise", the reality is that when we redevelop it, many companies find people who can't work in the new environment. These days many people are engaged with effectively. This is a really bad way to look at the problem. It's not about the people, it's about the process. It's about the process, it's about the process.

Safe is a good thing, but it's not the only thing. It's not the only thing, it's not the only thing. It's not the only thing, it's not the only thing. It's not the only thing, it's not the only thing.



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Releases should not be viewed as something abnormal and risky. Releases should happen all the time, because that's why we develop code in the first place.

## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WATKINS (2014)**  
This book explores the benefits of asynchronous communication, such as increased productivity, reduced stress, and improved work-life balance. It provides practical tips and strategies for implementing asynchronous communication in the workplace.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics are circuits where the output depends on the current input and the state of the circuit at a specific point in time. They are characterized by a common clock signal that synchronizes the operation of all components.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics are circuits where the output depends on the current input and the state of the circuit at any point in time. They do not require a common clock signal and can operate at different rates.

**KEY DIFFERENCES**  
Synchronous circuits are easier to design and test, but they can be slower and more expensive. Asynchronous circuits are faster and more efficient, but they are more complex to design and test.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR LATCH**  
The SR latch is a basic asynchronous digital logic device. It has two inputs, S (Set) and R (Reset), and two outputs, Q and Q-bar. It can be used to store a single bit of information.

**JK LATCH**  
The JK latch is a more complex asynchronous digital logic device. It has two inputs, J and K, and two outputs, Q and Q-bar. It can be used to store a single bit of information and can be configured to perform various logic functions.

**MONOSTABLE MULTIVIBRATOR**  
The monostable multivibrator is a circuit that produces a single pulse of a fixed duration. It is commonly used in timing applications.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**LOW POWER CONSUMPTION**  
Asynchronous digital logic devices consume less power than synchronous devices, making them ideal for low-power applications such as IoT devices and embedded systems.

**INTEGRATION WITH ANALOG CIRCUITS**  
Asynchronous digital logic devices can be easily integrated with analog circuits, allowing for the design of mixed-signal systems.

**IMPROVED PERFORMANCE**  
Asynchronous digital logic devices can operate at higher frequencies and with lower delays than synchronous devices, leading to improved performance in high-speed applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**INCREASED DEPENDENCY**  
As organizations become more interconnected, the need for synchronous communication increases. This is because tasks are often dependent on the completion of other tasks, and delays can have significant consequences.

**COMPLEXITY**  
As organizations grow and become more complex, the need for synchronous communication increases. This is because complex tasks often require coordination and collaboration between multiple team members.

**GLOBALIZATION**  
As organizations expand globally, the need for synchronous communication increases. This is because team members are often located in different time zones and need to coordinate their work.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE FLOW MODEL**  
The flow model is a traditional organizational structure where tasks are performed in a linear sequence. It is often used to describe the flow of information and resources within an organization.

**CRITICISMS**  
The flow model is often criticized for being inflexible and inefficient. It can lead to bottlenecks and delays, and it may not be well-suited for complex or dynamic environments.

**ALTERNATIVES**  
There are several alternatives to the flow model, including flat structures, matrix structures, and network structures. These alternatives offer more flexibility and adaptability to changing circumstances.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**TRADITIONAL MEETINGS**  
Traditional meetings are often characterized by a hierarchical structure and a focus on decision-making. They are often used to discuss important issues and make decisions about the organization's future.

**PROBLEMS**  
Traditional meetings can be inefficient and time-consuming. They often involve a lot of discussion and debate, which can lead to delays and frustration. They may also not be the best way to make decisions in a complex or dynamic environment.

**ALTERNATIVES**  
There are several alternatives to traditional meetings, including asynchronous decision-making, virtual meetings, and decision-making through email or other digital tools. These alternatives can be more efficient and effective than traditional meetings.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are meetings that do not require participants to be present at the same time or in the same place. They can be conducted through email, video conferencing, or other digital tools.

**BENEFITS**  
Asynchronous meetings can be more efficient and effective than traditional meetings. They allow participants to contribute at their own pace and on their own terms. They can also be more inclusive, as they allow participants from different time zones to participate.

**IMPLEMENTATION**  
To implement asynchronous meetings, organizations need to establish clear guidelines and protocols. They need to ensure that all participants have access to the necessary tools and resources. They also need to encourage a culture of transparency and collaboration.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
Virtualization is the process of creating a virtual version of a physical resource, such as a server or a storage device. It allows multiple virtual machines to run on a single physical machine, increasing efficiency and reducing costs.

**CONTAINERIZATION**  
Containerization is the process of packaging an application and its dependencies into a container. This allows the application to run consistently across different environments, making it easier to deploy and manage.

**BENEFITS**  
Virtualization and containerization can help organizations improve their IT infrastructure. They can reduce costs, increase efficiency, and improve security. They can also make it easier to scale and manage applications.

## CLOSING THOUGHTS AND TAKEAWAYS

**ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is a key component of modern organizations. It allows for more flexible and efficient communication, and it can help organizations improve their productivity and reduce their costs.

**DIGITAL ELECTRONICS**  
Digital electronics are the foundation of modern technology. Understanding the differences between synchronous and asynchronous digital electronics is essential for designing and building modern systems.

**ORGANIZATIONAL STRUCTURE**  
Organizational structure is a critical factor in an organization's success. Understanding the benefits and drawbacks of different organizational structures can help organizations make better decisions about how to organize their work.



# WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE “THE MAGIC HAPPENS?”

## REMEMBER PRINCIPLE 6 IN THE AGILE MANIFESTO?



“THE MOST EFFICIENT AND EFFECTIVE METHOD OF CONVEYING INFORMATION TO AND WITHIN A DEVELOPMENT TEAM IS FACE-TO-FACE CONVERSATION.”

WHY FOR MANY YEARS AND ORGANIZATIONS THAT I COULD SWEAR TO HAVE BELIEVED THAT THIS WAS TRUE.

AND I’M SURE I’M NOT THE ONLY ONE WHO LOVES TO QUOTE HIM “THE SCRUMBER SEES AN IDEAL DEVELOPMENT TEAM.”

I’M SURE THAT THESE YEARS WERE TRULY YEARS – THEY’RE NOT LIKE JUST A HURRY BY PEOPLE THAT WANT TO BE WORKING IN THE SAME SPACE.

MOST OF THESE YEARS WERE ABOUT MANAGEMENT AND MANY WERE OVERHAULS AND DEVELOPMENT.

SO, WHY DIDN’T THESE YEARS GET THAT OLD FASHIONED FEELING ABOUT FACE-TO-FACE COMMUNICATION BEING THE BEST COMMUNICATION?

## WHY DON’T WE MEET FACE-TO-FACE? SOME REASONS OFF OF THE TOP OF MY HEAD:



PEOPLE WORK A LOT FROM HOME. OR IN SOME OTHER LOCATION. OR IN SOME OTHER TIME ZONE. OR IN SOME OTHER LANGUAGE. EVEN THOUGH THE BARRIERS LANGUAGE IS LOWER THESE DAYS, IT’S NOT THE BEST LANGUAGE FOR THE NATURALITY OF DEVELOPERS IN THE WORLD.

PEOPLE ARE MORE COMFORTABLE WORKING ON A SCREEN, LAPTOP OR MOBILE, THEN JUST THINKING.

- BYE, I DON’T WANT TO STAND UP AND ARGUMENT.
- AND THE REASON FOR THAT IS THAT IT’S BETTER TO NOT HAVE TO TALK TO PROVE TO SOMEbody SOMETHING.
- LOOK AT YOUR SCREENSHOTS. DID YOU KNOW THAT YOU CAN ACTUALLY CALL PEOPLE WITH TRUST. IT KINGS THEM, THEY ANSWER, AND YOU HAVE A REAL TIME CONVERSATION? I KNOW. WHAT WOULD HAVE THOUGHT?

WE ARE TOLD THAT ALL OF OUR PROBLEMS ARE SOLVED WITH TDD, TACKLER, REVERSE ENGINE, BALLY, WEBS, SLACK, SKOOL, TEAMS AND OTHER “INTERPRETED” “BARRIERS” “PROCESS AND COLLABORATION TOOLS”

## DO WE NEED TO BE SO DISCONNECTED FROM EACH OTHER?



BY THE VERY NATURE OF THE PROCESS TOOLS, PEOPLE WHO TEAMS ARE ISOLATED TO WORK ON THE TOOL’S INTERFACE. ALONG AND DISCONNECTED FROM ONE ANOTHER. PERFECTING THEIR SCREENS, TASKS, AND ESTIMATES. AND, MANY TIMES, RECORDING ACTUALS VERSUS ESTIMATES. THAT DOESN’T LEAVE VERY PRODUCTIVE TO ME!



AND BY THE VERY NATURE OF THE COLLABORATION TOOLS, PEOPLE ARE STILL ALONE AND DISCONNECTED FROM ONE ANOTHER. MANY TIMES, CREATING RECORDS, LOSS OF CONNECTIVITY, AND SAYING A LOT OF “CAN YOU HEAR ME NOW?” INSTEAD THERE’S A WEBCAM ON. AND OTHER PEOPLE GET TO PLAY WITH A LOT OF AVATARS TO COVER UP THEIR ONLINE IMAGE WITH A LOT OF EMOJIS.

THIS LEADS TO CIRCUMVENTING, ALREADY JUST ANOTHER CIRCULAR, TO BECOME A RECREATION OF WHAT’S ON THE PROCESS TOOL. SORT OF A STATUS OF A STATUS OF A STATUS... AND OF ALL THE “THREE QUESTIONS OF A STAND-UP”, THE LEAST IMPORTANT ONE IS “WHAT DID YOU DO YESTERDAY?”

## IT SEEMS THAT ULTIMATELY, TOOLS TEMPT US TO DO TOO MUCH WORK IN MEETINGS



THE ULTIMATE RESULT OF THESE PROCESS AND COMMUNICATIONS TOOLS IS TO MAKE OUR TIME WASTE AS THE ONLY TIME WE GET TO ACT AS A TEAM.

AND PEOPLE SEEM TO WANT TO WORK, BECAUSE OF A LACK OF TRUST BY MANAGEMENT AND A LACK OF INDEPENDENT MANAGEMENT BY THE ORGANIZATION.

THEY BECOME A POOR ANALOGY OF WHAT WOULD HAPPEN IF THE PEOPLE ON THE TEAM WERE ACTUALLY INTERACTING PERSON-TO-PERSON.



## MEETINGS BEGET MORE MEETINGS



THE BAD MEETINGS THAT WE SEEM TO HAVE RESULT IN FOLLOW-UP MEETINGS THAT HAVE TO BE SCHEDULED TO FURTHER REVEAL AND REFINE THE WORK TO BE DONE.



FROM A SYSTEMS THINKING PERSPECTIVE, THE FACT THAT MORE MEETINGS NEED TO BE SCHEDULED RESULTS IN YET MORE DAYS OF THE DAY BEING IN MEETINGS IN A DISTRACTIVE FEEDBACK LOOP.



FROM A LEAN WASTE PERSPECTIVE, WE LOSE IN:

- WAITING ON MEETINGS, RATHER THAN COMPLETING WORK
- TRANSFORMING RESULTS FROM ONE MEETING TO THE NEXT (USUALLY RESULTS IN LOSS OF IMPORTANT DETAILS)
- WASTING TIME IN THE FEAR OF SAYING AND RE-ESTABLISHING CONTACT FROM ONE MEETING TO THE NEXT
- ETC, ETC.

## MEETINGS ARE NOT WHERE THE MAGIC HAPPENS



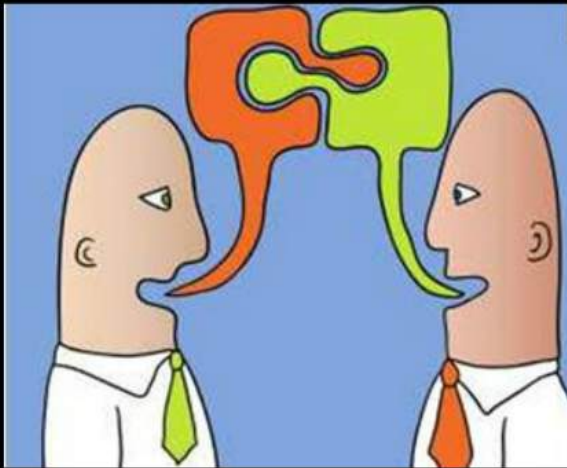
ON FACE, IT SEEMS TO BE THAT WE’RE TRYING TO TAKE AWAY FROM THE TOOL, IT’S TO PROBABLY THAT MEETINGS ARE JUST A LEAN WASTE.

NO OTHER SOME MEETINGS ARE NEEDED. BUT MORE MEETINGS IS JUST MORE LEAN WASTE.

REAL TIME COLLABORATION, WHERE ONE DEVELOPER LEANS OVER TO ANOTHER DEVELOPER AND HAS TO LOOK AT THE METING, ON AIP FOR SOME HELP IN GETTING SOMETHING DONE IS WHERE THE MAGIC HAPPENS.

IT’S COMPLETELY UNSCHEDULED, UNEXPECTED, AND VERY PRODUCTIVE!

# REMEMBER PRINCIPLE 6 IN THE AGILE MANIFESTO?



“THE MOST EFFICIENT AND EFFECTIVE METHOD OF CONVEYING INFORMATION TO AND WITHIN A DEVELOPMENT TEAM IS FACE-TO-FACE CONVERSATION.”

WAY TOO MANY TEAMS AND ORGANIZATIONS THAT I COACH SEEM TO HAVE FORGOTTEN THAT ONE THESE DAYS.

AND I DEAL A LOT WITH TEAMS THAT LOVE TO TOUT HOW “THE SUN NEVER SETS ON THEIR DEVELOPMENT EFFORTS!”

I FIND THAT THESE TEAMS AREN'T REALLY TEAMS – THEY'RE MORE LIKE JUST A BUNCH OF PEOPLE THAT HAPPEN TO BE WORKING ON THE SAME STUFF.

MOST OF THESE TEAMS HAVE US BASED MANAGEMENT AND MANY HAVE OVERSEAS BASED DEVELOPMENT.

SO, WHY DON'T THESE TEAMS GET THAT OLD FASHIONED THING ABOUT FACE-TO-FACE COMMUNICATION BEING THE BEST COMMUNICATION?

# WHY DON'T WE MEET FACE-TO-FACE? SOME REASONS OFF OF THE TOP OF MY HEAD:



PEOPLE WORK A LOT FROM HOME. OR IN SOME OTHER LOCATION. OR IN SOME OTHER TIME ZONE. OR IN SOME OTHER LANGUAGE. EVEN THOUGH THE DEFAULT LANGUAGE IS ENGLISH THESE DAYS, IT'S NOT THE FIRST LANGUAGE FOR THE MAJORITY OF DEVELOPERS IN THE WORLD.

PEOPLE ARE MORE COMFORTABLE WORKING ON A DEVICE, LAPTOP OR MOBILE, THEN JUST TALKING.

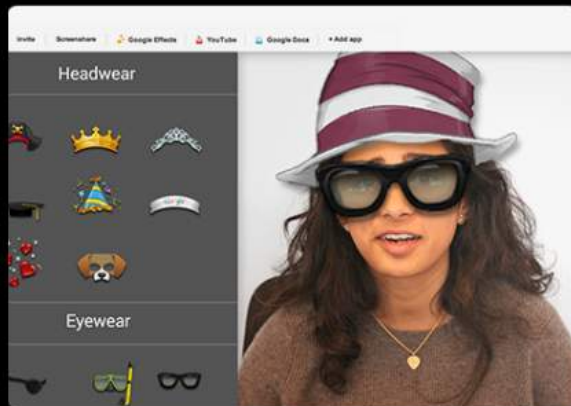
- HEY. I DON'T SHOP IN STORES VERY MUCH ANYMORE.
- AND ONE REASON FOR THAT IS THAT I'D PREFER TO NOT HAVE TO TALK TO ANYONE TO JUST BUY SOMETHING.
- LOOK AT YOUR SMARTPHONE. DID YOU KNOW THAT YOU CAN ACTUALLY CALL PEOPLE WITH THIS? IT RINGS THEM, THEY ANSWER, AND YOU HAVE A REALTIME CONVERSATION! I KNOW. WHO WOULD HAVE THOUGHT?



WE ARE TOLD THAT ALL OF OUR PROBLEMS ARE SOLVED WITH JIRA, TRACKER, VERSIONONE, RALLY, WEBEX, SLACK, SOCOCO, TEAMS AND OTHER "ENTERPRISE INDUSTRIALIZED PROCESS AND COLLABORATION TOOLS"



# DO WE NEED TO BE SO DISCONNECTED FROM EACH OTHER?



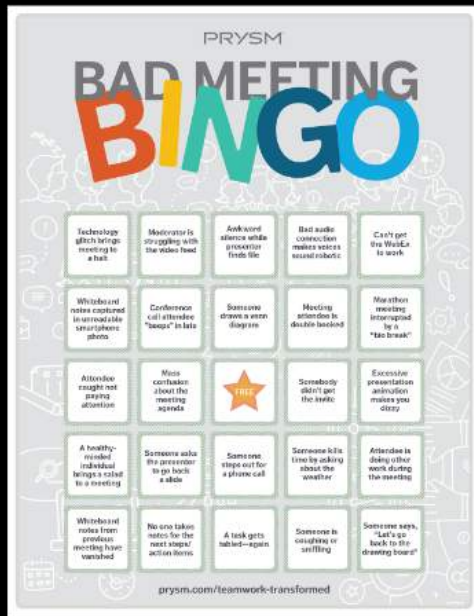
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AND BY THE VERY NATURE OF THE COLLABORATION TOOLS, PEOPLE ARE STILL ALONE AND DISCONNECTED FROM ONE ANOTHER. MANY TIMES, FIGHTING ECHOES, LOSS OF CONNECTIVITY, AND SAYING A LOT OF "CAN YOU HEAR ME NOW?". MAYBE THERE'S A WEBCAM ON. AND MAYBE PEOPLE GET TO PLAY WITH COOL AVATARS OR DRESS UP THEIR ONLINE IMAGE WITH A COOL SET OF EYEGLASSES.

THIS LEADS TO CEREMONIES, ALREADY JUST ANOTHER CLOCK SYNC, TO BECOME A RECITATION OF WHAT'S ON THE PROCESS TOOL. SORT OF A STATUS OF A STATUS OF A STATUS.... AND, OF ALL THE "THREE QUESTIONS OF A STAND-UP", THE LEAST IMPORTANT ONE IS "WHAT I DID YESTERDAY."



# IT SEEMS THAT ULTIMATELY, TOOLS TEMPT US TO DO TOO MUCH WORK IN MEETINGS



THE ULTIMATE RESULT OF THESE PROCESS AND COMMUNICATIONS TOOLS IS TO MAKE OUR TIME TOGETHER AS THE ONLY TIME WE GET TO ACT AS A TEAM.

AND PEOPLE TEND TO WANT TO WAIT TO WORK, BECAUSE OF A LACK OF TRUST BY MANAGEMENT AND A LACK OF INDEPENDENT ENABLEMENT BY THE ORGANIZATION.

THEY BECOME A POOR ANALOGY OF WHAT WOULD HAPPEN IF THE PEOPLE ON THE TEAM WERE ACTUALLY INTERACTING PERSON-TO-PERSON.





PRYSM

# BAD MEETING BINGO

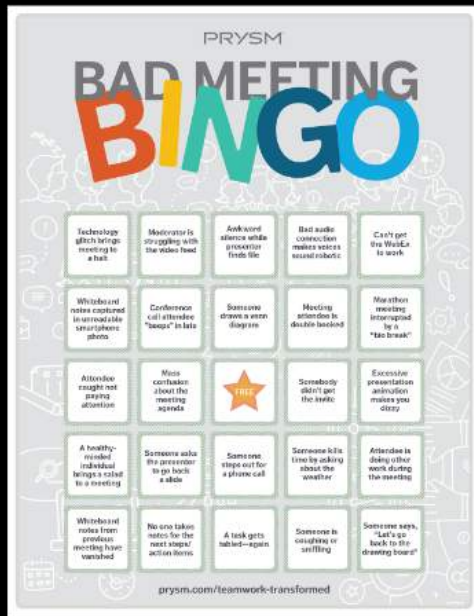
Technology glitch brings meeting to a halt	Moderator is struggling with the video feed	Awkward silence while presenter finds file	Bad audio connection makes voices sound robotic	Can't get the WebEx to work
Whiteboard notes captured in unreadable smartphone photo	Conference call attendee "beeps" in late	Someone draws a venn diagram	Meeting attendee is double booked	Marathon meeting interrupted by a "bio break"
Attendee caught not paying attention	Mass confusion about the meeting agenda	FREE	Somebody didn't get the invite	Excessive presentation animation makes you dizzy
A healthy-minded individual brings a salad to a meeting	Someone asks the presenter to go back a slide	Someone steps out for a phone call	Someone kills time by asking about the weather	Attendee is doing other work during the meeting
Whiteboard notes from previous meeting have vanished	No one takes notes for the next steps/ action items	A task gets tabled—again	Someone is coughing or sniffing	Someone says, "Let's go back to the drawing board"

[prysm.com/teamwork-transformed](http://prysm.com/teamwork-transformed)





# IT SEEMS THAT ULTIMATELY, TOOLS TEMPT US TO DO TOO MUCH WORK IN MEETINGS



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# MEETINGS BEGET MORE MEETINGS



THE SHORT MEETINGS THAT WE TEND TO HAVE RESULT IN FOLLOW-UP MEETINGS THAT HAVE TO BE SCHEDULED TO FURTHER RESOLVE AND REFINE THE WORK TO BE DONE.



FROM A SYSTEMS THINKING PERSPECTIVE, THE FACT THAT MORE MEETINGS NEED TO BE SCHEDULED RESULTS IN YET MORE FRAGMENTS OF THE DAY BEING IN MEETINGS IN A DESTRUCTIVE FEEDBACK LOOP.



FROM A LEAN WASTES PERSPECTIVE, WE LOSE IN:

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- MOTION WASTE IN THE FORM OF SAVING AND RE-ESTABLISHING CONTEXT FROM ONE MEETING TO THE NEXT
- ETC, ETC.



WE'RE HAVING A MEETING TO DISCUSS EMPLOYEE RETENTION.



www.dilbert.com scottadams@aol.com

TELL THEM THAT EMPLOYEES QUIT BECAUSE THERE ARE TOO MANY USELESS MEETINGS.



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WE WON'T BE GETTING INTO REASONS AT THE FIRST MEETING.



WHAT'S YOUR  
TAKE ON THIS,  
DILBERT?



WHAT? SORRY. I  
WAS USING THIS  
TIME TO THINK  
ABOUT SOMETHING  
USEFUL.





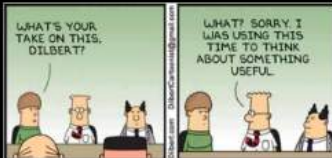
"SO WE ARE ALL AGREED  
AT LAST! ... WE DEFER A  
FINAL DECISION UNTIL  
OUR NEXT MEETING...."



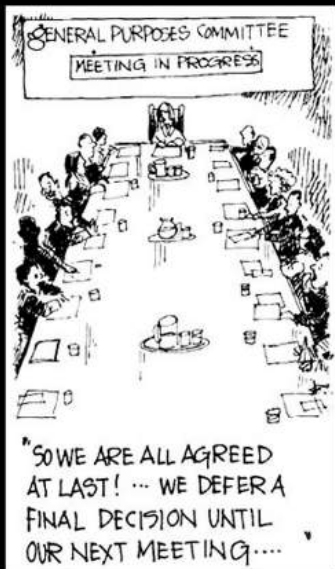
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# MEETINGS ARE NOT WHERE THE MAGIC HAPPENS



IN FACT, IF THERE'S ONE THING TO TAKE AWAY FROM THIS TALK, IT'S TO RECOGNIZE THAT MEETINGS ARE JUST A LEAN WASTE.

NO DOUBT SOME MEETINGS ARE NEEDED. BUT MORE MEETINGS IS JUST MORE LEAN WASTE.

REAL TIME COLLABORATION, WHERE ONE DEVELOPER LEANS OVER TO ANOTHER DEVELOPER AND ASKS TO LOOK AT SOMETHING, OR ASK FOR SOME HELP ON GETTING SOMETHING DONE IS WHERE THE MAGIC HAPPENS.

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# WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE “THE MAGIC HAPPENS?”

## REMEMBER PRINCIPLE 6 IN THE AGILE MANIFESTO?



“THE MOST EFFICIENT AND EFFECTIVE METHOD OF CONTINUING INTERACTION IS AND WITHIN A DEVELOPMENT TEAM IS FACE-TO-FACE CONVERSATION.”

WAY TOO MANY TEAMS AND ORGANIZATIONS THAT I COULD LIST TO HAVE FORGOTTEN THAT ONE THESE DAYS.

AND I SURE HATE WHEN TEAMS WANT TO GO TO HIM “THE SCRUMMER SAYS ON THEIR DEVELOPMENT TO DOING”

I FEEL THAT THESE TEAMS WENT TO THEIR TEAMS - THEY’RE MORE LIKE JUST A NUMBER BY PEOPLE THAT WANT TO BE WORKING IN THE SAME SPACE.

MOST OF THESE TEAMS HAVE TO DO WITH MANAGEMENT AND MANY HAVE OVERLAP WITH DEVELOPMENT.

SO, WHY DON’T THESE TEAMS GET THAT OLD FASHIONED TALK ABOUT FACE-TO-FACE COMMUNICATION BEING THE BEST COMMUNICATION?

## Why Don't We Meet Face-to-Face? Some reasons off of the top of my head:



PEOPLE WORK A LOT FROM HOME. OR IN SOME OTHER LOCATION. OR IN SOME OTHER TIME ZONE. OR IN SOME OTHER LANGUAGE. EVEN THOUGH THE BARRIER LANGUAGE IS LOWER THESE DAYS, IT’S NOT THE BEST LANGUAGE FOR THE NATURALITY OF DEVELOPERS IN THE WORLD.

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- BYE, I DON’T WANT TO STAND UP AND ARGUMENT.
- AND THE REASON FOR THAT IS THAT IT’S PREFER TO NOT HAVE TO TALK TO PEOPLE TO GET MY SOMETHING.
- LOOK AT YOUR SCREENSHOTS. DID YOU KNOW THAT YOU CAN ACTUALLY CALL PEOPLE WITH TRUST. IT KINGS THEM, THEY ANSWER, AND YOU HAVE A REAL TIME CONVERSATION? I KNOW. WHAT WOULD HAVE THOUGHT?

WE ARE TOLD THAT ALL OF OUR PROBLEMS ARE SOLVED WITH TDD, TACKLER, REVERSEMENT, BALLY, WEBS, SLACK, SKOOL, TEAMS AND OTHER “INTERFACED” “TOOLS” “PROCESSES” AND “COLLABORATION TOOLS”

## Do We Need to Be So Disconnected From Each Other?



BY THE VERY NATURE OF THE PROCESS TOOLS, PEOPLE AND TEAMS ARE ISOLATED TO WORK ON THE TOOL’S INTERFACE. ALONE AND DISCONNECTED FROM ONE ANOTHER. PERFECTING THEIR SCREENS, TASKS, AND ESTIMATES. AND, MANY TIMES, RECORDING ACTUALS VERSUS ESTIMATES. THAT DOESN’T LEAVE VERY PRODUCTIVE TO ME!



AND BY THE VERY NATURE OF THE COLLABORATION TOOLS, PEOPLE ARE STILL ALONE AND DISCONNECTED FROM ONE ANOTHER. MANY TIMES, CREATING RECORDS, LOSS OF CONNECTIVITY, AND SAYING A LOT OF “CAN YOU HEAR ME NOW?” “HANG ON THERE’S A WEBCAM ON.” AND OTHER PEOPLE GET TO PLAY WITH A LOT OF AVATARS TO COVER UP THEIR ONLINE IMAGE WITH A BUNCH OF PSEUDOLOGIES.

THIS LEADS TO CEREEMONIES, ALREADY JUST ANOTHER CEREEMONIAL, TO BECOME A RECREATION OF WHAT’S ON THE PROCESS TOOL. SORT OF A STATUS OF A STATUS OF A STATUS... AND, OF ALL THE “THREE QUESTIONS OF A STAND-UP”, THE LEAST IMPORTANT ONE IS “WHAT DID YOU DO YESTERDAY.”

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THE ULTIMATE RESULT OF THESE PROCESS AND COMMUNICATIONS TOOLS IS TO MAKE OUR TIME WASTE AS THE ONLY TIME WE GET TO ACT AS A TEAM.

AND PEOPLE SEEM TO WANT TO WORK, BECAUSE OF A LACK OF TRUST BY MANAGEMENT AND A LACK OF INDEPENDENT MANAGEMENT BY THE ORGANIZATION.

THEY BECOME A POOR ANALOGY OF WHAT WOULD HAPPEN IF THE PEOPLE ON THE TEAM WERE ACTUALLY INTERACTING PERSON-TO-PERSON.



## MEETINGS BEGET MORE MEETINGS



THE WORST MEETINGS THAT WE SEEM TO HAVE RESULT IN FOLLOW-UP MEETINGS THAT HAVE TO BE SCHEDULED TO FURTHER REVEAL AND REFINE THE WORK TO BE DONE.



FROM A SYSTEMS THINKING PERSPECTIVE, THE FACT THAT MORE MEETINGS NEED TO BE SCHEDULED RESULTS IN YET MORE THOUSANDS OF THE DAY BEING IN MEETINGS IN A DISTRACTIVE FEEDBACK LOOP.



FROM A LEAN WASTE PERSPECTIVE, WE LOSE IN:

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- WASTEN WASTE IN THE FORM OF SAYING AND RE-ESTABLISHING CONTACT FROM ONE MEETING TO THE NEXT
- ETC, ETC.

## MEETINGS ARE NOT WHERE THE MAGIC HAPPENS



ON FACE, BY THINKING OUR THINKING TO TAKE AWAY FROM THE TOOL, IT’S TO PROBABLY THAT MEETINGS ARE JUST A LEAN WASTE.

NO OTHER SOME MEETINGS ARE NEEDED. BUT MORE MEETINGS IS JUST MORE LEAN WASTE.

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IT’S COMPLETELY UNSCHEDULED, UNEXPECTED, AND VERY PRODUCTIVE!



## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WATKINS (2014)**  
This book explores the benefits of asynchronous communication in the workplace, highlighting how it can improve productivity, reduce stress, and foster a more inclusive and collaborative environment.

## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics are circuits where the output depends on both the current input and the state of the circuit at a previous point in time. They are characterized by a common clock signal that synchronizes the operation of all components.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics are circuits where the output depends only on the current input. They do not require a common clock signal and can operate at different rates, making them more flexible and efficient in certain applications.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR FLIP-FLOP**  
The SR flip-flop is a fundamental building block in digital logic design. It has two inputs, Set (S) and Reset (R), and two outputs, Q and Q-bar. It is used to store a single bit of information and is commonly found in registers and memory elements.

**D FLIP-FLOP**  
The D flip-flop is another common digital logic device. It has a single data input (D) and a clock input. The output (Q) follows the input (D) when the clock signal is active, making it useful for data storage and transfer.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**LOW POWER DESIGN**  
Asynchronous digital logic is becoming increasingly popular in low-power design applications. It can consume significantly less power than synchronous designs, especially in low-frequency or burst-mode operations, making it ideal for battery-powered devices and IoT applications.

**INTEGRATED CIRCUIT MANUFACTURING (ICM)**  
Advances in ICM technology have enabled the production of more complex and efficient asynchronous digital logic devices. This has led to a resurgence of interest in asynchronous design for high-performance, low-power applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**ORGANIZATIONAL STRUCTURE**  
Organizations are adopting more hierarchical and centralized structures, similar to synchronous digital circuits. This allows for better coordination and control, but it can also lead to slower decision-making and reduced flexibility.

**COMMUNICATION MODELS**  
The use of synchronous communication models, such as meetings and reports, is increasing. While these models can ensure that everyone is on the same page, they can also be time-consuming and inefficient.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE SAFETY OF ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is often touted as a safer alternative to synchronous communication. It allows individuals to communicate at their own pace and in their own time, reducing the risk of miscommunication and conflict.

**THE BENEFITS OF ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication offers several benefits, including increased flexibility, reduced stress, and improved productivity. It allows for more thoughtful and deliberate communication, which can lead to better outcomes.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**THE HISTORY OF MEETINGS**  
Meetings have been a part of human organization since the beginning of time. They were used to coordinate activities, share information, and make decisions. However, the modern meeting as we know it is a relatively recent invention.

**THE RISE OF MEETINGS**  
The rise of meetings is largely due to the increasing complexity of organizations and the need for coordination and collaboration. Meetings have become a central part of organizational life, but they are often criticized for being inefficient and unproductive.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are a new approach to meetings that allows participants to contribute at their own pace. This can be achieved through the use of digital tools and platforms that facilitate asynchronous collaboration.

**REDUCE MEETINGS**  
Reducing the number of meetings is a key strategy for improving organizational efficiency. This can be done by identifying unnecessary meetings, consolidating overlapping meetings, and encouraging asynchronous communication.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine. This can help reduce hardware costs and improve resource utilization. It is commonly used in server environments and cloud computing.

**CONTAINERIZATION**  
Containerization allows applications to be packaged and run in isolated containers. This makes it easier to deploy and manage applications, and it can help improve security and performance. Containerization is becoming increasingly popular in cloud environments.

## CLOSING THOUGHTS AND TAKEAWAYS

**THE FUTURE OF ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is expected to continue to grow in popularity as organizations seek to improve efficiency and reduce costs. Advances in technology will continue to drive this trend forward.

**THE BENEFITS OF ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication offers a wide range of benefits, including increased flexibility, reduced stress, and improved productivity. It is a valuable tool for organizations looking to optimize their communication processes.



# START WITH RETROSPECTIVES



FOR MOST "AGILE/SCRUM" TEAMS I ENCOUNTER, RETROSPECTIVES ARE A WASTE OF TIME DOING A CHOREOGRAPHED CEREMONY THAT HAS PRECIOUS LITTLE VALUE.

TRY REPLACING THAT WITH GOOD TEAM INTERACTIONS IN REALTIME, AS SOMETHING IS LEARNED (GOOD OR BAD).

I LIKE "WHAT DID WE LEARN? WHAT SURPRISED YOU? AND WHAT WILL YOU DO DIFFERENTLY IN THE FUTURE" IF YOU NEED A PLACE TO START.

BUT ESTABLISHING A FEEDBACK LOOP IN AN ENVIRONMENT WHERE PEOPLE AREN'T AFRAID TO START WITH SOMETHING THEY CAN SAY THEY DON'T KNOW, HAVE TIME TO LEARN AND FIGURE IT OUT, AND THEN EFFECTIVELY SHARE THAT WITH OTHERS IS VITAL.

AND ANOTHER THING TO TRY IS TO CELEBRATE NOT JUST THE SUCCESSES WE HAVE (EVEN THOUGH WE REALLY NEED THEM!), BUT ALSO THE FAILURES. PEOPLE NEED TO NOT BE AFRAID TO THINK "OUTSIDE THE BOX", TRY SOMETHING, AND THEN TRY SOMETHING ELSE IF IT DOESN'T WORK OUT. HAVING A GOOD TIME EXPLAINING WHAT WENT WRONG IS PROBABLY EVEN MORE IMPORTANT THAN MERE APPLICATION OF SOMETHING THAT WORKED BEFORE. IT'S HOW YOU MAKE AN ENVIRONMENT WHERE INNOVATION HAPPENS!



# AND THEN START SINGLE STREAMING



WITHOUT HAVING MANY NON-VALUE PRODUCING STREAMS IN MOTION, YOU WILL GET A LOT LESS LEAN WASTES TRACEABLE TO TRANSPORTATION, INVENTORY, MOTION, WAITING, AND DEFECT, BECAUSE YOU DON'T HAVE TO COORDINATE AND PLAN AS MUCH, SINCE YOU START TO LIVE IN THE HERE AND NOW.

STOP STARTING SO MANY THINGS AND TRACKING WHERE THEY ARE EACH DAY AND START FINISHING THINGS, EVEN JUST ONE THING, EACH DAY AS A TEAM.

THE ABILITY TO WORK AS A REAL TEAM IS WHAT MAKES IT STRONGER THAN THE SUM OF ITS PARTS.

# NEXT, BURN ENTERPRISE SCALING FOR AGILITY TO THE GROUND



STOP TRYING TO SCALE AGILE WITH ALL OF THE PLANNING, PREPLANNING, POST PLANNING, SWAG ESTIMATION, HIGH ACCURACY ESTIMATION, ETC.

STOP OBSESSING ABOUT THE COST OF DEVELOPMENT OR THE COST ACCOUNTING OF IT. LET PEOPLE LIKE SCRUMMASTERS HANDLE THOSE DIRTY TASKS IF YOU REALLY NEED TO. LEARN TO TRACK VALUE ADDED, NOT COST AS MEASURED BY HOURS WORKED.

REPLACE THAT PLANNING WITH AUTONOMY OF T-SHAPED FULL-STACK TEAMS THAT WORK DIRECTLY FOR THE BUSINESS OWNER.

HIRE GOOD PEOPLE AND TRUST THEM TO MAKE GOOD CHOICES FOR WHICH CUSTOMERS TO PLEASE, WITH WHAT, AND WHEN.

# AND DON'T FORGET TO PRACTICE GOOD ENGINEERING!



EMBRACE THE DEVOPS CULTURE AND A GOOD ARCHITECTURE THAT PERMITS TRUNK DEVELOPMENT AND CONTINUOUS DELIVERY.

REMEMBER THAT WHEN YOU DO SOFTWARE DEVELOPMENT, YOU'RE INVOLVED IN PRODUCT DEVELOPMENT, NOT PROJECT DELIVERY.

SO, SOFTWARE IS NEVER REALLY EVER DONE. YOU WANT IT TO WORK AND THEN IMPROVE IT OVER TIME.

MAKE SURE THAT YOUR ENGINEERING PRACTICES AND ARCHITECTURE REFLECT THAT MINDSET.





## WTF IS THIS TALK ABOUT?

**ASYNCH**  
Asynchronous communication is a type of communication that does not require the participants to be present at the same time or in the same place. It allows for communication to occur at different times and in different locations, making it more flexible and convenient for participants.

**"THE MAGIC OF ASYNCH" - MITCHELL WEISSERSTEIN'S DISCUSSION**  
This discussion explores the benefits of asynchronous communication, such as increased flexibility, reduced interruptions, and the ability to work at one's own pace. It also touches on the importance of clear communication and the use of asynchronous tools to facilitate collaboration.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics are circuits where the output depends on both the current input and the state of the circuit at a previous point in time. They are characterized by a common clock signal that synchronizes the operation of all components.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics are circuits where the output depends only on the current input. They do not require a common clock signal and can operate at different rates.

**KEY DIFFERENCES**  
Synchronous circuits are easier to design and analyze but can be slower due to the need for a common clock. Asynchronous circuits can be faster and more efficient but are more complex to design and analyze.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR FLIP-FLOP**  
A basic asynchronous digital logic device used for data storage and control.

**JK FLIP-FLOP**  
A more complex asynchronous digital logic device that can be configured to perform various functions.

**CMOS INVERTER**  
A common asynchronous digital logic device used for signal inversion and buffering.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**POWER EFFICIENCY**  
Asynchronous designs can consume less power than synchronous designs, which is crucial for battery-powered devices and low-power applications.

**SCALABILITY**  
Asynchronous designs are more scalable and can be used in a wider range of applications, from small embedded systems to large-scale data centers.

**RESILIENCE**  
Asynchronous designs are more resilient to timing errors and can maintain operation in the presence of clock jitter and other timing-related issues.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**GLOBALIZATION**  
The need for organizations to operate across different time zones and cultures has led to the adoption of synchronous communication tools like video conferencing.

**TECHNOLOGY**  
Advancements in technology have made it easier for organizations to coordinate and collaborate in real-time, mimicking the behavior of synchronous digital circuits.

**COMPLEXITY**  
The increasing complexity of modern organizations and their operations has led to the need for more structured and synchronized communication and decision-making processes.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE FLOW MODEL**  
A traditional model of organizational communication that focuses on the flow of information through a hierarchy.

**ASYNCHRONOUS COMMUNICATION**  
A more flexible model of communication that allows for information to be shared and processed at different times and in different ways.

**KEY TAKEAWAYS**  
The flow model is not inherently wrong, but it may not be the most effective model for all organizations. Asynchronous communication offers a more adaptable and efficient alternative.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**TRADITIONAL MEETING CULTURE**  
The idea that meetings are where the magic happens is a result of traditional organizational structures and communication methods.

**ASYNCHRONOUS COLLABORATION**  
The rise of asynchronous collaboration tools and methods has challenged the traditional meeting-centric view of work.

**KEY TAKEAWAYS**  
Meetings are not the only place where magic happens. Asynchronous collaboration can be a more effective way to foster creativity and innovation.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Meetings that are held asynchronously, allowing participants to contribute and discuss at their own convenience.

**KEY TAKEAWAYS**  
Asynchronous meetings can reduce the time and cost of traditional meetings while maintaining the quality of discussion and decision-making.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
The process of creating a virtual version of a physical system, such as a server or operating system.

**CONTAINERIZATION**  
The process of packaging an application and its dependencies into a container, which can be run on a virtualized environment.

**KEY TAKEAWAYS**  
Virtualization and containerization can improve the efficiency and flexibility of IT infrastructure, leading to better performance and cost savings.

## CLOSING THOUGHTS AND TAKEAWAYS

**ASYNCHRONOUS COMMUNICATION**  
A key tool for improving organizational efficiency and reducing the time and cost of meetings.

**KEY TAKEAWAYS**  
Asynchronous communication is not just a tool, but a mindset. It's about embracing flexibility and collaboration in a way that works for everyone.

# ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

## The Goal is Shorter Concept to Cash, Not Great Schedules!



One thing that is many times overlooked as organizations try to get to shorter "concept to cash" cycle times is the role of infrastructure as code and cloud/automation tools.



Did you hate all predictive model thinking was out of fashion. We wanted to have a smooth transition to production, so we started planning as early as possible, doing things like scheduling things like "QA" systems (managed servers), and making grand time-gained plans as early as possible.

But that old adage from Mary and Tom Poppendieck of "Delay Decisions Until the Last Responsible Moment, when you have the most information, and you have the best decisions" has a load of relevance here.

Software development and integration testing does not work from a schedule that may be wish it would.

## Why Containers Make So Much Sense



In keeping with the "pull" approach, the use of containers for housing developed modules extends and enhances. Now:

- We can test on the desktop, CI server, and all upstream environments in the very same fashion that we will use for production. Smaller testing is always better testing.
- We can make it real easy and very effective to network these systems together for integration testing tools like Docker-Compose to make networking and data storage easy for when we don't need to worry about those concerns.
- Deploying components into containers and then deploying containers to create systems enhances creation of reproducible artifacts that can be built locally, tested often, and then reliably performed with non-destructive encapsulated and pre-verified before final deployment into production.

## We Want to Pull Solutions, Not Push Schedules



That clear thinking requires extensive precise estimate planning to form a "push schedule" by way of the tunneling on the teams involved.

A more pull approach is to allow a "pull solution", where once we know that we need a test system of some form, we use the principles of infrastructure as code and create the system from unmanaged cloud resources "just in time."

This solution has many advantages:

- There is less overhead that things will be wrong than when we have a centralized process that results in the promotion of some test system into the production system, because we have practices built into the system many times before production (of course, with different instance capabilities for each environment)
- It's more in line with the DevOps concept of "little versus big"
- We involve ourselves from yet another synchronous clock cycle that slows us down more.

## And, Oh By The Way, While You Transition Your Architecture to a Better Place...



During the transition to the desired cloud services, break dependencies on components that are waiting in and place them in easily deployed containers.

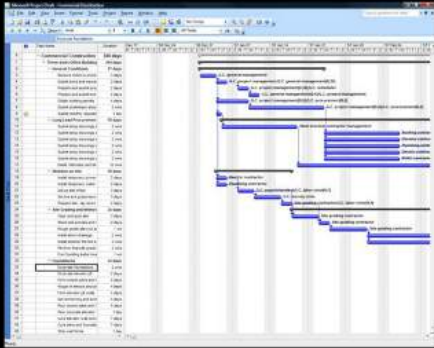
Also make sure that you deploy test doubles (twice) at the earliest possible time for all dependent upon components to permit early integration on credible requirements which we depend on remaining or replacement.

That way, there is no waiting on completion for early integration. We can be as thorough and end up in a better place while we wait.

That is, move testing as far left as possible.



# THE GOAL IS SHORTER CONCEPT TO CASH, NOT GREAT SCHEDULES!



ONE THING THAT IS MANY TIMES OVERLOOKED AS ORGANIZATIONS TRY TO GET TO SHORTER “CONCEPT TO CASH” CYCLE TIMES IS THE ROLE OF INFRASTRUCTURE AS CODE AND CONTAINERIZATION TOOLS.

OLD STYLE WATERFALL PREDICTIVE MODEL THINKING WAS DTAP DRIVEN. WE WANTED TO HAVE A SMOOTH TRANSITION TO PRODUCTION, SO WE STARTED PLANNING AS EARLY AS POSSIBLE, DOING THINGS LIKE SCHEDULING THINGS LIKE “QA” SYSTEMS (MANAGED SERVERS), AND MAKING GRAND FINE GRAINED PLANS AS EARLY AS POSSIBLE.



BUT THAT OLD ADAGE FROM MARY AND TOM POPPENDIECK OF “DELAY DECISIONS UNTIL THE LAST RESPONSIBLE MOMENT, WHEN YOU HAVE THE MOST INFORMATION, AND CAN MAKE THE BEST DECISIONS” HAS A LOAD OF RELEVANCE HERE.

SOFTWARE DEVELOPMENT AND INTEGRATION TESTING DOES NOT WORK FROM A SCHEDULE THE WAY THAT WE WISH IT WOULD.

# WE WANT TO PULL SOLUTIONS, NOT PUSH SCHEDULES



THAT DTAP THINKING REQUIRES EXTENSIVE PRECISE ESTIMATE PLANNING TO FORM A “PUSH SCHEDULE” BY WAY OF THE TIMELINES ON THE TEAMS INVOLVED.

A MORE AGILE APPROACH IS TO ALLOW A “PULL SOLUTION”, WHERE ONCE WE KNOW THAT WE NEED A TEST SYSTEM OF SOME FORM, WE USE THE PRINCIPLES OF INFRASTRUCTURE AS CODE AND CREATE THE SYSTEM FROM UNMANAGED CLOUD RESOURCES “JUST IN TIME.”

THIS SOLUTION HAS MANY ADVANTAGES:

- THERE IS LESS LIKELIHOOD THAT THINGS WILL GO WRONG THAN WHERE WE HAVE A CERTIFICATION PROCESS THAT RESULTS IN THE PROMOTION OF SOME TEST SYSTEM INTO THE PRODUCTION SYSTEM, BECAUSE WE HAVE PRACTICED BUILDING THE SYSTEM MANY TIMES BEFORE PRODUCTION (OF COURSE, WITH DIFFERENT INSTANCE CAPACITIES FOR EACH ENVIRONMENT).
- IT’S MUCH MORE IN LINE WITH THE DEVOPS CONCEPT OF “CATTLE VERSUS PETS”.
- WE DIVORCED OURSELVES FROM YET ANOTHER SYNCHRONOUS CLOCK CYCLE THAT SLOWED US DOWN BEFORE.



# WHY CONTAINERS MAKE SO MUCH SENSE



IN KEEPING WITH THE "PULL" APPROACH, THE USE OF CONTAINERS FOR HOUSING DEVELOPED MODULES EXTENDS AND ENHANCES. NOW:

- WE CAN TEST ON THE DESKTOP, CI SERVER, AND ALL UPSTREAM ENVIRONMENTS IN THE VERY SAME FASHION THAT WE WILL USE FOR PRODUCTION. EARLIER TESTING IS ALWAYS BETTER TESTING.
- WE CAN MAKE IT REAL EASY AND VERY EFFECTIVE TO NETWORK THESE SYSTEMS TOGETHER FOR INTEGRATION USING TOOLS LIKE DOCKER-COMPOSE TO MAKE NETWORKING AND DATA STORAGE EASY FOR WHEN WE DON'T NEED TO WORRY ABOUT THOSE CONCERNS.
- DEPLOYING COMPONENTS INTO CONTAINERS AND THEN DEPLOYING CONTAINERS TO CREATE SYSTEMS ENHANCES CREATION OF REPRODUCIBLE ARTIFACTS THAT CAN BE BUILT EARLY ON, TESTED OFTEN, AND THEN RELIABLY DEPLOYED WITH DEPENDENCIES ENCAPSULATED AND PRE-VERIFIED BEFORE FINAL DEPLOYMENT INTO PRODUCTION.



# AND, OH BY THE WAY, WHILE YOU TRANSITION YOUR ARCHITECTURE TO A BETTER PLACE...



DURING THE TRANSITION TO FINE GRAINED MICRO SERVICES, BREAK DEPENDENCIES ON COMPONENTS YOU ARE WAITING ON AND PLACE THEM IN EASILY DEPLOYED CONTAINERS.

ALSO MAKE SURE THAT YOU DEPLOY TEST DOUBLES (FAKES) AT THE EARLIEST POSSIBLE TIME FOR ALL DEPENDED UPON COMPONENTS TO PERMIT EARLY INTEGRATION ON EXECUTABLE REQUIREMENTS WHICH WE DEFINED AT BEGINNING OF DEVELOPMENT.

THAT WAY, THERE IS NO WAITING ON COMPLETION FOR EARLY INTEGRATION. WE CAN BE ASYNCHRONOUS AND END UP IN A BETTER PLACE WHILE WE'RE AT IT.

THAT IS, MOVE TESTING AS FAR LEFT AS POSSIBLE.

# ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

## The Goal is Shorter Concept to Cash, Not Great Schedules!



One thing that is many times overlooked as organizations try to get to shorter "concept to cash" cycle times is the role of infrastructure as code and cloud/automation tools.



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- We involve ourselves from yet another synchronous clock cycle that slows us down more.

## And, Oh By The Way, While You Transition Your Architecture to a Better Place...



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## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

**SYNCHRONOUS DIGITAL ELECTRONICS**  
Synchronous digital electronics involves circuits where all components operate in lockstep with a common clock signal. This ensures that data is transferred and processed at predictable intervals, which is essential for reliable data communication in many systems.

**ASYNCHRONOUS DIGITAL ELECTRONICS**  
Asynchronous digital electronics does not rely on a common clock signal. Instead, it uses handshaking protocols to ensure that data is transferred and processed only when both the sender and receiver are ready. This can be more efficient in certain applications but is more complex to design.

**KEY DIFFERENCES**  
Synchronous systems are simpler to design and easier to debug, but they can be less efficient in terms of power consumption and data throughput. Asynchronous systems are more complex to design and debug, but they can be more efficient and better suited for certain types of data processing.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**1. SERIAL-TO-PARALLEL CONVERTERS**  
These devices take a single data stream and convert it into a parallel format, allowing for faster data transfer to memory or other processing units.

**2. PARALLEL-TO-SERIAL CONVERTERS**  
These devices take parallel data and convert it into a single data stream, which is useful for transmitting data over long distances or through narrow channels.

**3. FIFO BUFFERS**  
First-In-First-Out buffers are used to manage data flow between different parts of a system, ensuring that data is processed in the order it was received.

**4. COUNTERS**  
Asynchronous counters are used to generate a sequence of digital signals, often used in timing and control applications.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**1. ENERGY EFFICIENCY**  
Asynchronous designs can be more energy-efficient than synchronous designs, especially in low-power applications where minimizing power consumption is critical.

**2. FLEXIBILITY**  
Asynchronous systems are more flexible and can be reconfigured more easily than synchronous systems, making them ideal for applications that require dynamic reconfiguration.

**3. SCALABILITY**  
Asynchronous designs are often more scalable than synchronous designs, allowing for the creation of larger and more complex systems.

**4. RESILIENCE**  
Asynchronous systems are generally more resilient to noise and timing errors, making them more reliable in noisy or unpredictable environments.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**1. RIGIDITY**  
Synchronous digital circuits are rigid and inflexible, requiring all components to operate in lockstep. Similarly, organizations that become more like synchronous circuits may become rigid and inflexible, unable to adapt to changing market conditions.

**2. SLOW TO RESPOND**  
Synchronous circuits are slow to respond to changes in input, as they must wait for the next clock cycle. Organizations that become more like synchronous circuits may be slow to respond to market changes, losing competitive advantage.

**3. HIGH OVERHEAD**  
Synchronous circuits have high overhead due to the need for a common clock signal and complex control logic. Organizations that become more like synchronous circuits may have high overhead due to complex bureaucracy and inefficient processes.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**1. THE SAFETY OF ASYNCHRONOUS DESIGN**  
Asynchronous design is often considered safer than synchronous design because it does not rely on a common clock signal, reducing the risk of timing-related errors.

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## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**1. THE HISTORY OF MEETINGS**  
Meetings have been a part of human communication for centuries, but the modern meeting as a formalized activity is a relatively recent phenomenon.

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## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**1. ASYNCHRONOUS COMMUNICATION**  
Encourage the use of asynchronous communication tools like email, chat, and video conferencing to reduce the need for synchronous meetings.

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## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**1. VIRTUALIZATION**  
Virtualization allows multiple operating systems to run on a single physical machine, improving resource utilization and reducing hardware costs.

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## CLOSING THOUGHTS AND TAKEAWAYS

**1. ASYNCHRONOUS DESIGN**  
Asynchronous design is a powerful tool for improving efficiency and reducing overhead in digital systems.

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# CLOSING THOUGHTS AND TAKEAWAYS

THERE'S A DIFFERENCE BETWEEN  
SYNCHRONOUS AND ASYNCHRONOUS  
DIGITAL CIRCUITS.

AND IT HAS TO DO WITH A CLOCK.

THERE ARE A LOT OF VENDORS OUT THERE WHO WANT TO SELL YOU  
PROCESSES AND SOFTWARE THAT WILL FIX YOUR ORGANIZATION'S  
PROBLEMS.

BUT MOST OF THOSE PRODUCTS ULTIMATELY ARE SORT OF LIKE  
PUTTING LIPSTICK ON A PIG AND GIVING THEM AN APPLE WATCH.

YOU'RE GOING TO GET DIRTY, AND THE PIG IS NOT GOING TO LIKE IT.

KEEP LOOKING FOR THAT WATER AND  
THINK ABOUT THE IMPLICATIONS OF  
SWIMMING IN IT LIKE AGILE FISH.

SYNCHRONOUS CIRCUITS ARE NOT THE MOST EFFICIENT  
OR EFFECTIVE CIRCUITS THAT WE CAN MAKE.

BUT THEY ARE THE EASIEST.

SO IS IT WITH ORGANIZATIONS.

YOU AREN'T GOING TO GET RID OF THE  
SYNCHRONOUS NATURE OF YOUR  
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MAKE IT RUN AS FAST AS THE FASTEST  
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ORGANIZATIONS USE CLOCK SIGNALS JUST  
LIKE SYNCHRONOUS CIRCUITS.

WE JUST AREN'T TRAINED TO SEE THEM OR TO  
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BUT THERE ARE THINGS THAT WE CAN  
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UNDERSTANDING THAT YOU HAVE A  
PROBLEM IS THE FIRST STEP.

QUESTIONS.  
ANSWERS.  
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**"THE MAGIC OF ASYNCH" - MITRETSKY AND LEONARDI**  
This article discusses the benefits of asynchronous communication, such as increased productivity and flexibility. It also highlights the importance of clear communication and setting expectations when using asynchronous tools.



## A TINY BIT OF THEORY ABOUT DIGITAL ELECTRONICS - SYNCHRONOUS VS ASYNCHRONOUS

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Synchronous digital electronics are circuits where the output depends on both the current input and the state of the circuit from a previous time step. They are characterized by a common clock signal that synchronizes the operation of all components.

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Asynchronous digital electronics are circuits where the output depends only on the current input. They do not require a common clock signal and can operate at different rates.

**KEY DIFFERENCES**  
Synchronous circuits are easier to design and analyze but can be slower. Asynchronous circuits are faster and more efficient but are more difficult to design and analyze.

## FAMOUS ASYNCHRONOUS DIGITAL LOGIC DEVICES THAT YOU MAY BE FAMILIAR WITH

**SR LATCH**  
The SR latch is a basic asynchronous digital logic device. It has two inputs, S (Set) and R (Reset), and two outputs, Q and Q-bar. It can be used to store a single bit of information.

**JK LATCH**  
The JK latch is a more complex asynchronous digital logic device. It has two inputs, J and K, and two outputs, Q and Q-bar. It can be used to store a single bit of information and can be configured to perform various logic functions.

**TRI-STATE BUFFER**  
The tri-state buffer is an asynchronous digital logic device that can be used to connect multiple devices to a common bus. It has three states: high, low, and high-impedance.

## WHY ASYNCHRONOUS IS A HOT TOPIC IN DIGITAL LOGIC DESIGN TODAY

**LOW POWER CONSUMPTION**  
Asynchronous digital logic devices consume less power than synchronous devices because they only draw current when they are switching. This makes them ideal for low-power applications such as IoT devices and wearable electronics.

**INTEGRATED WITH ANALOG CIRCUITS**  
Asynchronous digital logic devices can be easily integrated with analog circuits, making them a good choice for mixed-signal applications. This is particularly true for asynchronous CMOS technology.

**SCALABILITY**  
Asynchronous digital logic devices are highly scalable and can be used to build large, complex systems. This makes them a good choice for high-performance computing applications.

## HOW AND WHY ARE ORGANIZATIONS BECOMING MORE LIKE SYNCHRONOUS DIGITAL CIRCUITS?

**INCREASED DEPENDENCY**  
As organizations become more complex, they become more dependent on each other. This is similar to how synchronous digital circuits depend on a common clock signal. This dependency can lead to inefficiencies and delays.

**COMPLEXITY**  
As organizations grow, they become more complex. This complexity can make it difficult to manage and coordinate activities, leading to inefficiencies and delays. This is similar to how synchronous digital circuits become more complex as they integrate more components.

**GLOBALIZATION**  
Globalization has led to the spread of organizations across different time zones. This can make it difficult to coordinate activities and manage dependencies, leading to inefficiencies and delays. This is similar to how synchronous digital circuits become more difficult to manage as they span different time zones.

## ARE YOU SAYING THAT ALL THE SAFE "FLOW MODEL" STUFF IS ALL WRONG?

**THE FLOW MODEL**  
The flow model is a common way of thinking about organizations. It suggests that organizations are like a flow of information and resources. This model is often used to explain organizational structure and processes.

**CRITICISMS**  
The flow model has been criticized for being too simplistic and not accounting for the complexity of organizations. It is argued that the flow model is based on a flawed understanding of how organizations actually work.

**ALTERNATIVES**  
There are several alternative models for thinking about organizations. These models focus on the social and cultural aspects of organizations, rather than just the flow of information and resources.

## WHERE DID ORGANIZATIONS GET THE IDEA THAT MEETINGS IS WHERE "THE MAGIC HAPPENS?"

**THE MEETING CULTURE**  
The meeting culture is a common way of thinking about organizations. It suggests that meetings are where the magic happens. This culture is often based on the idea that meetings are a necessary part of organizational life.

**CRITICISMS**  
The meeting culture has been criticized for being inefficient and wasteful. It is argued that meetings are often unnecessary and that the time spent in meetings could be better spent on other activities.

**ALTERNATIVES**  
There are several alternative ways of thinking about organizations. These alternatives focus on the importance of individual contributions and the role of communication in organizations.

## OK, NOW, AS AN ORGANIZATION, LET'S IMPROVE AND REDUCE MEETINGS. WHAT WOULD THAT LOOK LIKE?

**ASYNCHRONOUS MEETINGS**  
Asynchronous meetings are meetings that do not require participants to be present at the same time. They can be conducted using video conferencing, instant messaging, or email. Asynchronous meetings can be more efficient and less time-consuming than synchronous meetings.

**SMART MEETINGS**  
Smart meetings are meetings that are well-planned and focused. They have a clear purpose and agenda, and participants are encouraged to contribute. Smart meetings can be more productive and less time-consuming than unstructured meetings.

**HYBRID MEETINGS**  
Hybrid meetings are meetings that combine synchronous and asynchronous elements. They can be conducted using video conferencing and asynchronous communication tools. Hybrid meetings can be more flexible and efficient than traditional meetings.

## ON VIRTUALIZATION AND CONTAINERIZATION AND WHY THEY CAN HELP

**VIRTUALIZATION**  
Virtualization is a technology that allows multiple operating systems to run on a single physical machine. This can help reduce costs and improve efficiency. Virtualization can also help improve security and disaster recovery.

**CONTAINERIZATION**  
Containerization is a technology that allows applications to run in isolated environments called containers. This can help improve security and make it easier to manage applications. Containerization can also help improve performance and scalability.

**BENEFITS**  
Both virtualization and containerization offer several benefits, including cost savings, improved efficiency, and enhanced security. They can also help improve disaster recovery and make it easier to manage applications.

## CLOSING THOUGHTS AND TAKEAWAYS

**ASYNCHRONOUS COMMUNICATION**  
Asynchronous communication is a key tool for improving organizational efficiency and productivity. It allows for communication to occur at different times and from different locations, making it more flexible and convenient.

**ASYNCHRONOUS DIGITAL LOGIC**  
Asynchronous digital logic devices offer several advantages over synchronous devices, including lower power consumption and easier integration with analog circuits. They are a good choice for low-power and mixed-signal applications.

**ORGANIZATIONAL EFFICIENCY**  
Organizations can improve their efficiency and productivity by adopting asynchronous communication and asynchronous digital logic. This can help reduce costs and improve the quality of work.



# SYNCHRONOUS VS ASYNCHRONOUS DIGITAL CIRCUITS AS AN ANALOGY TO ORGANIZATIONAL DYSFUNCTION AND APPLIED TO DEVOPS PRACTICES

