

u-Bit Microprocessor Design

Glen Monahan¹

¹BA [Philosophy major (discipline – Natural and Human Sciences), Computer Science minor], independent researcher

Abstract- An obvious, but overlooked, micro-computer architecture design methodology may allow for the mass-distribution of non-legacy potential PCs by virtue of a forty-pin package. Hobbyists, individuals and mom-and-pop business operations will be empowered at the expense of Silicon Valley's "sexy and mysterious" mythology whilst the landfills need no longer be receptacles of much (if not most) of this "five-year technology cycle" feces. Such is the promise of universal bit (u-Bit) design.

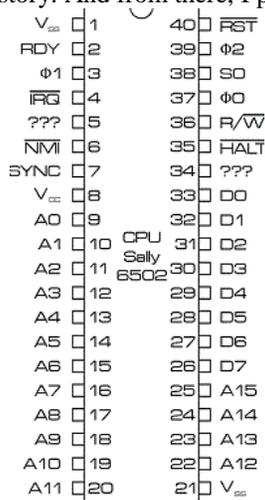
Keywords – computer architecture, microprocessor, 8086, data bus, legacy, corporate greed

I. INTRODUCTION

A comparison of MOS Technology's 6502 and Intel's 8086 pin diagrams reveals an interesting principle design methodology advancement.

On the 6502 (figure 1) [1], an 8-bit processor, the 16-bit address bus is separate from the 8-bit data bus. No problem here since, with all the other pins (power, ground, interrupts and what not), there is still a pin or two to spare on a forty-pin integrated circuit (IC).

The 8086 with a 16 bit data bus is a different story. And from there, I propose a design yet to be told until now.



Key

- A0-A15: Memory address bus
- D0-D7: Memory data bus
- V_{ss}: Ground
- RDY: Memory ready signal
- Ø1: Clock out (inverted Ø2)
- IRQ: Interrupt request signal
- NMI: Non-maskable interrupt signal
- SYNC: (unknown)
- V_{cc}: +5V power
- HALT: Halts the CPU
- R/W: Read/write direction
- Ø0: Clock in
- SO: Set Overflow flag
- Ø2: Sync / Clock out
- RST: Resets the CPU

Figure 1. MOS Technology's 6502

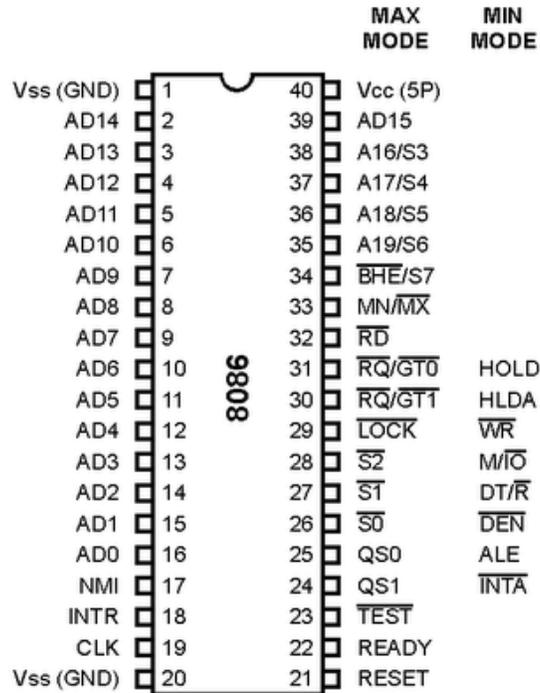


Figure 2. Intel's 8086

II. FORTY-PIN SOCKET

But perhaps first, a discussion on the forty-pin socket is in order.

This socket is the largest of the commonly available IC sockets. Though one may come across a 68-pin socket (which supports Intel's 286 processor) during an extensive Google search, that rareness, in addition to the 286 backward design (I'll explain what I mean by backward design in section IV) and pin layout, is likely good evidence of a flowering PC industry engaging in grey-area market practices of the "made to break" or (in this case) inherent design obsolescence variety which eventually evolved into licensing on the software side.

In short, by expanding processor pin requirements to eliminate utilization of the 40 pin socket, Silicon Valley (or should I say Silly Con Valley) began a heavily concerted effort to ensure themselves a steady revenue flow as they forced untold millions of computers into local dumps and material recycling centers across the globe.

III. SEXY AND MYSTERIOUS

There are two things to notice on the 286 pin layout (figures 3&4, note that figure 4 is the bottom view but has been mislabeled "TopView" on the diagram) [2].

But first let me tell you, as with the matching 68-pin socket, it's difficult to find a pin diagram for this long outdated processor. Perhaps this is further evidence of Intel's efforts to maintain its mystic. (Note: The 286 pin diagram may be under copyright.)

Yet the most damning evidence of all is twofold. First, the address and data bus layouts. Here you don't see a relatively logical contiguous sequential layout (as in the cases of the 6502 and 8086) but rather a comparatively random sequence (in the case of the data bus) and increasingly broken sequences (in the case of the address bus). And this is all on top of 60% more pins to deal with and the abandoning of the dual in-line package (DIP) format. There is little doubt in my mind that Intel made a conscious effort to prevent its customers from owning the processors and computers they paid good money for by keeping them from figuring out the pin layout once their customer service requests for the pin diagram fell on deaf ears.

Second is perhaps the most grievous of manipulations perpetrated by a corporation, and indeed, all those collectively complicit; hereon referred to (but by no means exclusive to the Santa Clara Valley region) as Silly Con Valley. Read on.

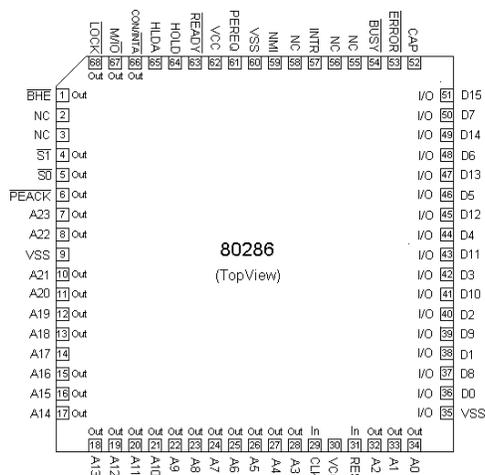


Figure 3. Intel's 286 top view

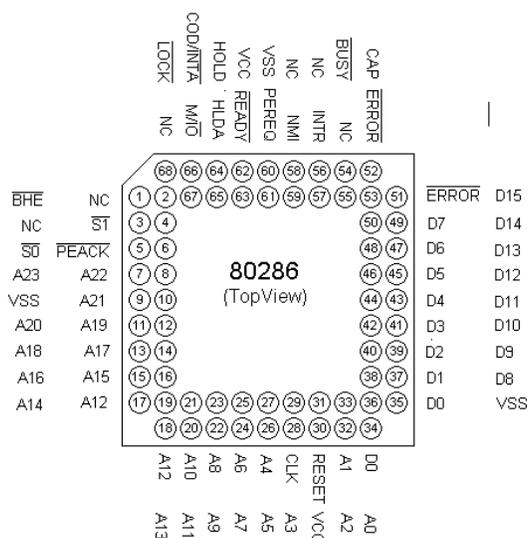


Figure 4. Intel's 286 bottom view

IV. PRINCIPLE DESIGN METHODOLOGY ADVANCEMENT

Like MOS Technology's 6502, the 286 has separate buses for address and data. But, unbelievably, Intel's advanced (relative to the 8086) 286 processor was a trashing of a wonderful design feature of Intel's 8086 processor. On the 8086 (figure.2) [3], the address bus doubled as the data bus! During the first clock cycle, it carries a 16-bit address and after that it carries 16 bits of data. This remarkable innovation allowed for a 16 bit processor in a forty-pin package. Yet Intel, in designing future processors, trashed and buried the advancement like a serial killer disposing of body parts.

V. U-BIT DESIGN

So, it quickly follows that one may design a processor with any number of data or address bits but using only 16 pins to implement. For example, one may design a 32 bit computer with four gigabytes of addressable memory by, for instance, carrying the first half of the address on the first clock cycle, the second half of the address on the second clock cycle, the first 16 bits of data on the third clock cycle and the remaining 16 bits of data on the fourth clock cycle. This I call universal bit (u-Bit) design.

VI. DEEPER FORMAL RESEARCH (MICROCONTROLLERS AND EMBEDDED SYSTEMS)

Intel did not obliterate the dual address/data bus innovation. It is included on their 8051 microcontroller (figure 5) [4]. (Note: The 8051 pin diagram may be under copyright.) However, microcontrollers are for small scale embedded systems such as those found in robots and automobiles, not PCs. It is a fool's errand for one to attempt to build a computer that maintains a robust and efficient website by using microcontrollers and no microprocessor of reasonable performance.

And it is very interesting to note that "8051s are still available as discrete parts, but they are mostly used as silicon intellectual property cores (IP cores)" [5]. And "IP cores may be licensed to another party or can be owned and used by a single party alone" [6]. So again, we see the industry, Silly Con Valley, perched on the technology cycling bandwagon. This time, by way of embedded systems in addition to licensing and all the way back to the 1980s and into the 90s. The next decade brought us the smart phone and the following decade gave us the state of the art iPhone 4s. Query: "Does anyone know how to adjust the screen-saver time on the iPhone 4s?" Answer: "Throw it out and try the latest model".

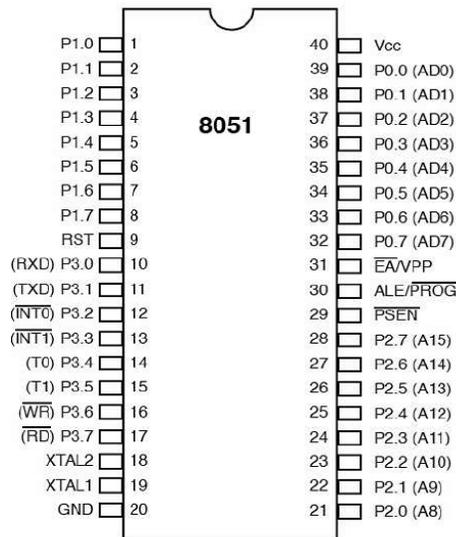


Figure 5. Intel's 8051

VII. FURTHER RESEARCH BUT OF THE INFORMAL VARIETY (CUSTOMER SERVICE EXPERIENCE)

As we see a pattern of dubious behavior emerging by simply following the evolution of a few semiconductor chips, so too do we see comparable behavior in the verbatim transcript of a customer service experience I recently endured with Intel (see section XI. Appendix).

On the one hand, David is determined to appear eager to assist and claims that the information I wish to access will be made available even though I don't have a company email address. Meanwhile, on the other hand, he knows full-well that Chantall Marie will not grant me access to the information portal as it is her job to restrict the area to those who have signed the corporate non-disclosure form. So Chantall Marie is placed in the impossibly awkward position of agreeing with David and disagreeing with me while David and I are in agreement.

VIII. FROM BAIT & SWITCH TO FOUNDATION

Another interesting pattern we can currently witness developing is a broader one vis a vis the societal implications. From Silly Con Valley's surreptitious hoarding of access to the functionality of PCs, did spring-up Raspberry Pi. Raspberry Pi is a foundation to promote computer science education [7] [8]. While education is all good and well, hobbyists wishing to parlay their passion into a business ("Choose a job you love, and you will never have to work another day in your life." [9]), individuals seeking self-employment and mom-and-pops are hardly the purview of charitable organizations.

And this particular pattern is brazenly attempting to extend even into embedded systems as I write! Just a few months prior to the reported pulling of "many open-source licenses, schematics, and code from the Arduino website, prompting scrutiny and outcry" [10] [11], it was announced that the Arduino Foundation would be established [12].

IX. SCIENTIFIC METHOD

Well, emerging patterns are a hallmark of successful scientific inquiry. Yet, alone, they do not constitute scientific method. The method I use is what I call the Cryptanalytical Theory of Discovery and is attributed to Dr. Tyrone Lai. I will now point out two mechanisms of this method and show how they relate to this paper.

1. Mutual Assisting Parallel Processes (MAPPS) [13] - two parallel processes help each other move forward; finding more cypher facilitates finding more clear text and vice-versa. So did, for example, finding out more about Intel's implementation (analogically speaking, cypher) of its intent led to me stumbling upon the 8051 (analogically speaking, clear text) as explained in the following sequence of events: Having witnessed the move (clear text) by Intel from the 8086 to the 286 effectively creating an embedded system PC (cypher), I was quickly able to recognize the importance of the 8051 (clear text) as soon as I saw it. I discovered the dual address/data bus 8051 was a microcontroller (cypher); again, a device for embedded systems.

Also, as further example of MAPPS, my customer service inquiry regarding the microprocessor socket (clear text) produced the word "deliberately" (cypher) from Chantall Marie not only once but twice.

2. Method of Progressive Evaluation (MPE) [14] - the MPE provides the verification mechanism for the scientific inquiry. If the investigation (inquiry) is stalled, it likely means you no longer have a working theory; your hypothesis has been most likely refuted. In this paper, you can see how I progressed from the 8086 to the 286 to the 8051, each time reaffirming how Silly Con Valley maintains its mystic. And, of course, additional confirmation came from the customer service experience which, no doubt, could have progressed further had I decided to continue to respond to David and waste his, mine and Intel's time.

X. CONCLUSION

It's time to move out of Silly Con Valley. Let's take back our computers, ease off on the landfill and build a museum to honour the sexy and mysterious PCs of the past few decades. It's time for the return of microprocessors in a forty-pin package. It's time for u-Bit design.

XI. APPENDIX

Please note that some of the correspondence times/dates are out of sync by a half-a-day or so, no doubt, due to time zone differences or what not.

LGA 2066 socket

This question is **Not Answered**.



SlicedBread Mar 3, 2018 4:37 PM

Can one insert an LGA 2066 socket into common breadboard?

Mar 5, 2018 10:35 AM (in response to SlicedBread)

This message was posted on behalf of Intel Corporation

Hello SlicedBread,

I understand that you would like to insert an LGA 2066 socket into a breadboard.

Regarding this I would like to have more information about what is intended to do so this way I can check whether it will be possible or not.

Regards,

David V



SlicedBread Mar 6, 2018 11:27 AM (in response to Intel Corporation)

Greetings David,

Thank-you for responding.

I like to build and maintain things.

Regards,

Mar 15, 2018 1:43 PM (in response to SlicedBread)

This message was posted on behalf of Intel Corporation

Hello SlicedBread,

Thank you for your response,

In this case, to get the most accurate information and get the answer to your question regarding the breadboard and the socket I would recommend you to register and login to this website:
<https://www.intel.com/content/www/us/en/design/resource-design-center.html>

Regards,
David V



SlicedBread Mar 6, 2018 11:53 AM (in response to Intel Corporation)

Hi David,

This new link sends me to a blank page.

Regards,

Mar 7, 2018 10:32 AM (in response to SlicedBread)

This message was posted on behalf of Intel Corporation

Hello SlicedBread,

Thank you for your response,

I was directing you to our resource & design center, I have tried the link and it is indeed working. Perhaps trying in a different browser may work?

Let me give you another link just in case:

Intel ® Resource & Design center

Regards,
David V(0)



SlicedBread Mar 7, 2018 11:02 AM (in response to Intel Corporation)

Hi David,

I managed to get it working by cutting & pasting the text directly into the browser's address bar.

Unfortunately, the resource & design center requires one to possess a company email address. This I do not have.

Regards,

Re: LGA 2066 socket

Mar 8, 2018 11:44 AM (in response to SlicedBread)

This message was posted on behalf of Intel Corporation

Hello SlicedBread,

Thank you for your response,

I was verifying what you mentioned and in fact if you do not have a company e-mail that is fine, you can actually use your personal one as well there would not be any problem. As soon as you are done with the registration you need to get to the support area and they will provide you with the most accurate answer.

Regards,
David V

Fri, Mar 9, 2018 at 2:26 AM

Hello Glen,

Greetings from Intel Customer Support!

I have received your email and I am very much willing to assist.

To move forward, I would like to ask if this is about Resource and Design Center Account Application? If yes, kindly include the URL and the screenshot of the error for further checking.

Awaiting for your soonest response.

For your convenience, kindly provide your phone number and the best time to call you within your business hours. Please also let us know if you would prefer to continue resolving your issue via phone call otherwise we will revert to e-mail interactions.

Have a lovely day!

Best regards,

Chantall Marie

Intel Customer Support

Fri, Mar 9, 2018 at 4:32 AM

Hi Chantall Marie,

Yes, this is about a Resource and Design Center account application.

The URL is:

<https://www.intel.com/content/www/us/en/forms/design/registration-privileged.html>

and please find the screen shot attached.

I don't use a telephone this days. For the form, I used a default number, 5555555, along with my area code and it looked like it was accepted fine.

Regards,

P.S. I must say, the penmanship I've experienced from Intel in these short few days has been the best in my online experience. An exquisite combination of style and economy. No exaggeration; I feel the delight of a man blessed.

Fri, Mar 9, 2018 at 4:43 AM

Hello Glen,

Thank you for the screenshot provided.

I have reviewed the issue and it seems that the root problem is the email address.

As per requirement in applying for RDC Privileged account:

The request for Privileged access does not allow for the use of personal emails. The request needs to be submitted with your company's e-mail address.

Privileged access to the Resource & Design Center requires a valid Corporate Non-Disclosure Agreement (CNDA) must be exist between the Company and Intel.

Should you have further query, feel free to let me know.

From: Glen Monahan [glenmonahan@gmail.com]

Sent: 3/9/2018 3:22 PM

To: supportreplies@intel.com

Subject: Re: Intel Customer Support - Case #: 03329289

Oh yes, I should have mentioned the following:

Intel Communities

You have been mentioned

by Intel Corporation in Re: LGA 2066 socket in Intel Communities - View Intel Corporation's reference to you

Hello SlicedBread,

Thank you for your response,

I was verifying what you mentioned and in fact if you do not have a company e-mail that is fine, you can actually use your personal one as well there would not be any problem. As soon as you are done with the registration you need to get to the support area and they will provide you with the most accurate answer.

Regards, David V

On Mar 9, 2018 3:58 AM, "supportreplies@intel.com" <supportreplies@intel.com> wrote:

Hello Glen,

Alright, let's suppose it's alright to use personal email then, but that's for Intel Corporation, I presume.

For RDC, the request needs to be submitted with your company's e-mail address.

Let me know if you have questions.

Fri, Mar 9, 2018 at 12:46 PM

Hi Chantall Marie,

I understand your presumption. I needed to give you the following two preceding exchanges with David to avoid the ambiguity:

Hello SlicedBread,

Thank you for your response,

I was directing you to our resource & design center, I have tried the link and it is indeed working. Perhaps trying in a different browser may work?

Let me give you another link just in case:

Intel ® Resource & Design center

Regards, David V

Hi David,

I managed to get it working by cutting & pasting the text directly into the browser's address bar.

Unfortunately, the resource & design center requires one to possess a company email address. This I do not have.

Regards,

Perhaps this clears things up.

Regards,

Mon, Mar 12, 2018 at 2:38 AM

Hello Glen,

Your response is deliberately helpful!

I understand where the confusion and presumption is coming from.

Thank you for clearing things up.

Going back, I agree with David, that using personal email would be fine, but only for the basic account. Since you're signing up for Privileged account, the request needs to be submitted with your company's e-mail address.

Hope this is clear, too. If you have questions, please be sure to let me know.

Have a lovely day!

Best regards,

Chantall Marie

Intel Customer Support

Wed, Mar 14, 2018 at 7:18 AM

Hello Glen,

How do you do?

I would like to follow up if the resolution I shared deliberately worked.

Your concern is important to me and I will do my best to contact you and resolve your issue.

Please let me know if more time is needed and I will adjust our follow ups accordingly.

For your convenience, kindly provide your phone number and the best time to call you within your business hours.

Please also let us know if you would prefer to continue resolving your issue via phone call otherwise we will revert to e-mail interactions.

If no response is received from you after 3 days, I will proceed to temporarily close your ticket in the meantime.

Should you find the time to proceed with your concern, please do not hesitate to reply to me and I would be happy to continue on assisting you.

Have a wonderful day!

Best regards,

Chantall Marie

Intel Customer Support

3/14/2018 7:34 PM

Hi Chantall Marie,

Number one here.

I do believe the resolution you deliberately shared has indeed worked.

Feel free to close the ticket.

Regards,

Wed, Mar 14, 2018 at 9:08 AM

Hello Glen,

Thank you for the confirmation. Since we have accordingly covered all your concerns, I shall now close this ticket.

If you need further assistance with your concern, simply reply to this email and the case will automatically re-open.

Moreover, as part of our ongoing commitment to customer success, we'd like to hear your feedback. Our goal is to gain insight into our customer's experiences so that we can continue to build a highly competent system of support for you.

With that being said, we'd greatly appreciate it if you can respond to our customer satisfaction survey to rate the experience that you have with us.

I owe you for your time and participation. It's a privilege to have served you.

Thank you for contacting Intel Customer Support and have a wonderful day!

Best regards,

Chantall Marie

Intel Customer Support

Mar 15, 2018 1:43 PM (in response to SlicedBread)

This message was posted on behalf of Intel Corporation

Hello SlicedBread,

I am following up with your case and see that we have not heard back from you.

If you need more assistance do not hesitate to reply.

Regards,

David V

XII. REFERENCE

- [1] Available online: https://user.xmission.com/~trevin/atari/6502_pinout.html
- [2] Available online: <http://emmaweberluk.blogspot.ca/2012/08/asian-chit-set-and-80286-re-life-in-asia.html>.
- [3] Available online: http://scanfree.com/microprocessor/pin_diagram_of_8086.png.
- [4] Available online: https://www.tutorialspoint.com/microprocessor/microcontrollers_8051_pin_description.htm
- [5] Available online: https://en.m.wikipedia.org/wiki/Intel_MCS-51#Use_as_intellectual_property
- [6] Available online: https://en.m.wikipedia.org/wiki/Silicon_intellectual_property_core
- [7] Available online: https://en.m.wikipedia.org/wiki/Raspberry_Pi
- [8] Available online: <https://www.raspberrypi.org/about/Confucius>
- [9] Available online: <https://en.m.wikipedia.org/wiki/Arduino>
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- [12] Tyrone Lai (1989), "How We Make Discoveries", Synthese, vol. 79 - issue 3, Kluwer Academic Publishers, Netherlands, p. 376.
- [13] Tyrone Lai (1989), "How We Make Discoveries", Synthese, vol. 79 - issue 3, Kluwer Academic Publishers, Netherlands, p. 377.