1. **Background** 
   1. Zeus was originally conceptualised in 2008 looking into transactional data within a maintenance contract at a Borough Council in London. As with every Council or Housing Association I have ever come across, a Schedule of Rates was utilised to standardise the pricing of items across the estate.
   2. Whilst it comes as a surprise that this is possible in the industry, there are many books and electronic documents that are recognised by the construction value chain to benchmark both labour and material costs. By way of example:

Text

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* 1. I am currently sat in a Main Contractors office and needed an example of a SoR (schedule of rates) so I opened a cupboard in the office and found one immediately, photocopied it (you can see the pages in the book), screen-grabbed and embedded to this document. The example is for fencing, within ‘Spons’, which is a price book that tends to give an overall cost as opposed to a labour and material split. Just to show how comprehensive this book is, the following is another page picked at random to show the costs of ‘Backfilling tree hole with excavated materials;

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* 1. Of course these price books also include for floor tiles, doors, windows, cupboards, vanity units, toilet seats, taps and bath plugs. The point I am trying to enthusiastically state is that these books are comprehensive and available.
  2. Naturally problems arise because these books are largely used by a main contractor to specify the works via a cost code stipulating the items to be undertaken with their corresponding cost and often without a site visit. This presents the opportunity for the sub-contractor to over claim for the works, which leads to a trend of consistently higher costs that the Council would have to meet.
  3. An example situation, that will be revisited throughout this document:

1. Resident calls the Council to report no running water in the kitchen from the kitchen tap.
2. Council’s call centre is run by admin assistants with limited or no technical experience who record the issue and raise a job ticket.
3. Job ticket goes to the commercial department of the main contractor whereupon a Quantity Surveyor will assess and add the relevant codes that he adjudges better fits the works. In this instance he specifies “overhaul mixer tap” at a total value of £30.
4. This job ticket is then sent to the sub-contractor who visits the site.
5. The sub-contractor can see that the mixer tap in fact needs replacing at £50, the Waste & Trap also need replacing at £120 with a new cupboard required due to extensive water damage at £180. The sub-contractor undertakes the works and bills £350.
   1. This process is extremely fractious for many reasons, but ultimately its extremely inefficient and is based on trust. The first obvious flaw is whom is identifying the defective items, which is often the resident with nobody of any technical experience visiting the site until the subcontractor themselves. Item 5) of the above is where the wheels will often come off because:
6. The sub-contractor is greedy and is overclaiming and the cupboard, tap, mixer & trap was never replaced and £30 value of work was actually undertaken.
7. The work was required and the sub-contractor undertook the work and was then burnt, because the main contractor didn’t pay him £320 of what he was legitimately owed.

Which leads to this final paragraph undertaking an edit:

5edit) The sub-contractor can see that the mixer tap in fact needs replacing at £50, the Waste & Trap also need replacing at £120 with a new cupboard required due to extensive water damage at £180. The sub-contractor refuses to undertake the works and as this is a £350 and he only has a ticket for £30. The sub-contractor leaves the resident with no work undertaken and reports back to the main contractor that works were aborted due to an insufficient specification. Meanwhile a complaint is raised to the council by the resident. A surveyor on behalf of the main contractor attends site, agrees the works should be re-specified and re-instructs the very same sub-contractor to undertake the works at £350, several days after the initial job ticket was raised.

* 1. The problem the client faces here is having to have a degree of trust in its supply chain as delays to works to their residents has a negative impact at those in-charge of delivering for the Borough/City. This trust eventually runs out as average job prices paid far exceed the job tickets initially booked.
  2. On this specific contract just shy of £1 million was put on ‘hold’ from the Council until such time as the job costs had been evidenced by the Main Contractor. This was a substantial amount of work to undertake, especially with the continuing workload still required to be met.
  3. I offered to undertake a data analysis of the jobs and agree thresholds to deal with the data. It was agreed to undertake no analysis of jobs under £50 and as such £300,000 was immediately released. It was then agreed that of all jobs over £50 and under £250, we would analyse the original job ticket versus the claimed total for the works and anything billed higher than 10% over the original job ticket would fall into a spreadsheet for analysis. Whilst this released all sums relating to projects that were less than 10% variance from the initial spec, the sums were not substantial. Lean analysis was then applied whereby 20% of the jobs in the analysis pile would be inspected to establish an ‘error margin’, this margin would then be applied to the overall jobs for analysis in the £50 to £250 jobs for analysis. From memory, this error margin was 8.3% on roughly £500,000 worth of work, leading to the taxpayer recovering circa £41,500 with the main contractor expediting their cashflow on £458,500 plus the originally released £300,000. All jobs over £250 were jointly inspected with an error margin of circa 3% agreed.
  4. This exercise took around 3 months to undertake and it was largely agreed to be a success that expedited resolution, when in reality all I could think was, there must be an easier way!
  5. Because I was successful in turning this around, another main contractor made me a significant offer of a pay rise to undertake this at another Council. The error margin was agreed, and resolution expedited. Another main contractor then made me a substantial offer and moved me to another council to undertake the same exercise. These problems in the industry are cyclical.
  6. I took a particular interest in automation and transparency and had several meetings with app developers and sketched out a tool based on the above that jobs could be run off. However my legal career advanced and I dealt with litigious issues at adjudication trying not to become apathetic to the cyclical nature of disputes whereupon trust and transparency was always front and centre.

**2.0 Blockchain**

2.1. I had of course heard of Bitcoin and crypto over the course of the following years, but it wasn’t until 2016 where I was sat with a crypto enthusiast and asked the question:

*“If crypto currency is so secure with its Blockchain that financial transactions can be made immutably, why isn’t this being done for contractual variances to a commercial contract?”*

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2.2. It was after this meeting that I started exploring Blockchain and how this technology could impact the Construction industry.

2.3. Far beyond what I could have imagined possible and certainly not what could have been achieved with the original idea for the application based on lean process management in expediting resolution in small value high volume works as I had been considering, Blockchain technology guarantees transparency and accountability.

2.4. By automating a process and letting software take the lead in driving a job forwards, if specific milestones are identified and recorded to an immutable ledger, we remove the possibility of contentious situations whereby we have introduced a trustless mechanism into construction which protects cashflow, margins and project delivery.

2.5. Modernizing wearable PPE to interact and record events in a construction project such as a variance from the original specification and proof of completion could be uploaded as a file that is available to be scrutinized at any point.

**3.0. ZEUS**

3.1. We have attached wireframes as to how the app would work at a very high level. Crucially we shall revisit the example as used in para 1.6 as above with Zeus at work (edits in red):

1. Resident calls the Council to report no running water in the kitchen from the kitchen tap.
2. Council’s call centre is run by admin assistants with limited or no technical experience who record the issue and raise a job ticket.
3. Job ticket goes to the commercial department of the main contractor whereupon a Quantity Surveyor will assess and add the relevant codes that he adjudges better fits the works. In this instance he specifies “overhaul mixer tap” at a total value of £30.
4. This job ticket is then sent to the sub-contractor who visits the site.
5. The sub-contractor can see that the mixer tap in fact needs replacing at £50, the Waste & Trap also need replacing at £120 with a new cupboard required due to extensive water damage at £180. The sub-contractor, contacts the main contractors Quantity Surveyor and describes the issue. The glasses used have cameras within them and the Quantity Simply asks to “show me what you’re looking at”. He inspects from the field of vision of the sub-contractor and agrees a change of code is required. He immediately issues a variance to cover the additional works, the sub- contractor is immediately notified and undertakes the works and bills £350.
6. Sub-contractor uploads completed job to the Blockchain with all variations pre-agreed and instructed with completion evidence to be agreed. The Main Contractor’s surveyor can review and clear to payment.

3.2. There is one big flaw here that the untrained eye may not spot. The construction industry is famed for late payments. In fact, some main contractors can make as much as 25% of their profit in delayed payment to their supply chain. Some very bad actors use their supply chain as a bank, put them on extremely oppressive payment terms and engage in unethical practices whilst attempting to recover their position.

3.3. The most famed example (recently) of this was Carillion. They put their supply chain on 180 day payment terms. From a construction professional’s perspective that will be, start work on the 1st January 2022, work for the month and submit your application for agreement from the main contractor, on the 31st January 2022, you can submit your application of let’s say £100,000 to Carillion, Carillion has an application process of a month. On the 28th February they agree you can invoice the money claimed of £100,000 less retention at 5% (a benchmark figure held against contractors as a kind of ‘insurance’). Then 180 days later you will get paid on that invoice.

3.4. To put this into perspective. I am drafting this document on the 3rd August 2022 for Minima. The date this sub contractor will get paid for that £95,000 completed in January hasn’t elapsed yet – without taking into account Public Holidays, the date for payment will be the 27th of August 2022. To make matters worse lets say this sub-contractors margin is a nice and healthy 15%. 5% has already gone in retention payments and 85% has gone in overheads and prelims (paying his staff and suppliers who most definitely not be on 180 day payment terms), so before he’s even received his first £95,000 he’s already paid out 8 monthly payments to his staff and suppliers of £85,000. This small business is £680,000 in the red. The media didn’t even touch the sides of just how sinister this behavior is and, unfortunately, how it isn’t isolated. In fact it was so normalized at the time that auditing companies didn’t pick up on it and hence;

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3.5. This behavior simply cannot be allowed to continue, but we must be aware that delays to payment are a benefit to the industry and some of them (verifying works are complete and defect free) are justifiable and we must account for this and change the dynamic by encouraging good behavior throughout the construction value chain.

3.6. At Zeus we will use our token economy and payment mechanism to eliminate the possibility of a Carillion happening whilst rewarding good behavior within the supply chain to adhere to a reasonable payment period.

**4. Zeus and Minima**

4.1. Zeus stands alongside Minima in its desire to eliminate widespread man-in-the-middle abuses we see within global business practices worldwide. In our case, we wish to flatten the hierarchy found within construction industry currently dominated by Main Contractors, with the aim of this evolving towards a more cooperatively owned settlement layer.

4.2. Our take on this is to build using Minima’s unique combination of protocol layers (L1, L2, P2P messaging and dapps) and localised tokenisation in way that is impossible with other blockchains.

4.2.1. Use of multi-layer functionality; running Zeus over Minima’s L2, Omnia, is the ultimate goal. We wait patiently for it’s deployment. In the mean time P2P messaging allows for internal communications within a each distinct entity as confidentiality is still required.

4.2.2. Use of localised on-device tokenisation; we are still exploring the many use cases for this unique feature of the Minima blockchain. Our brain storming so far has already brought to mind uses within Health&  Safety certification, plant rental confirmations, multi-signatory work package completions, workforce incentivisation, permissioned access, invoice factoring, quality control and many many more.

4.2.3. Script embedded tokens. With construction sitting as the largest industry in the world, one could imagine a future where subcontractors use their guaranteed invoices assets within Minima-enabled-DeFi in order to fund over-collateralised debt positions that help pay for their own expansion…just one idea in a thousand where real world businesses meet decentralised finance.