MIDI On Mars – A Fanfic of “The Martian”

Vinkat Kapoor-

…“The data transfer rate just isn’t good enough for the size of music files, even in compressed formats.” So your request for anything but disco is denied.

Mark Watney-
“What files *can* you send?”

Vinkat- “We’ve got enough bandwidth to send text. That’s about all. Pictures take a long time.”

Mark- “What if we used a binary-to-text encoding and heavy compression? It can’t be our alphabet, 6 bits per ASCII character just isn’t enough. But seeing as we are able to send pictures, we know the communication channel is 8-bit clean. What if we use Unicode to fit more data per character?”

Vinkat- “How much?”

Mark- “Here’s what I’m thinking: we store 15 bits of data per 16-bit character, assuming no compression (it will ultimately be there). We’re linked to the Chinese, and they don’t use single-byte characters. In fact, they don’t like UTF-8 due to it increasing the size of their text. If we use UTF-16 (which, to grossly oversimplify, is basically pairs of bytes, though later on it grew) with Han characters and Hangul, we can easily fit 15 bits of data per 16-bit character without disrupting our feed.”

Vinkat- “Sure, but this effort also depends on compression. It needs to be strong yet usable on the Pathfinder’s 1990s hardware if needed. Ideally, we’d like to send the program over as text, fully-functional. Sending over anything compiled wouldn’t be ideal.”

Mark- “I know this might sound silly (especially given me being a botanist), but what if the program was written in JavaScript? We already have e-mail access, and people on the ISS used to post their pictures on an old platform known as Reddit, so what if the compression program was written as a single-file piece of web code, and sent over as text, then saved to a file, and ran as HTML via a rename?”

Vinkat- “That may work. Browser RAM is limited though, so we can’t exactly use any algorithm with a large dictionary size like LZMA2. BUT, since this IS a 1990s protocol we are using, using an efficient 1990s compression technique known as the Burrows-Wheeler Transform may work.”

Mark- “I don’t take it that NASA would want to write an entirely-new program from scratch just to entertain a stranded astronaut?”

Vinkat- “Correct. That being said, someone has likely already written a compression program that fits the bill. Let me search through some internet archives.”

Mark- “I also take it that sending over CD-quality audio would be a problem, even with this.”

Vinkat- “Correct. After some research during the communication delay, we’ve found a program from 2019 written by a then-17yo, known as BWTC32Key. We’re sending it to you. After that, we’re sending over some MIDI music files, which compress wonderfully with this program. Also, MIDI, as ancient as it is, is supported by our 1996-era components of our system. Hopefully you like hearing 1990s tunes! That said, here’s a 2021 MIDI tune that isn’t too complex, and is long, and is a good test:”

-----BEGIN BWTC32Key TRANSMISSION-----

鶇酯䴅빱潸另奷肹隶缶楸欘괻婢吸큇槎霙瓺舰鈉縷楃蠰叻픕扛檻莳則瀸綀墻罶됸樏囡갬鯆玨빳
傂墀讬幗餝繼绷屦뜸粉崝雀熾뢊빙櫒괘릗湌洔汎饈簒巫褖玞哦饞罘剻値椓尮臻蕮庢揭딕壼憂苲
枺굳外퍗㤼貊轼询鍾惚笘紺帳芦費臆噇鎊襟淇蚶叓儀猕麮傳멬譬妅欆亦吴虮蠨护蜜鰪馇洫褏赒
鷔緟蕈䉷逕嚮갖늭싎삶柏瀏敫鼈嶙鵷柨戫咀撍蜾铟滽뎞燥镴籓砸阜槁侜麋早镉钾勲槽鄉羚砝团
腒噭褭絵鄘뢸炕浮纻傷肵꼶塋늞鼫荒猂鐷昗畝樟焢뢾朕揔幢崍突涪둚昊艎辭冈嚧머匯粉韻뢊迯
瀹牪晌랭鳵蟒縣鄣粨勦雜辦踝뙘믇뱼觭嗷穐밝墵蟈趆韥鶴狴渴샾槩憛뫏炨燸댚깅緹灵镰琍溟鋮
壁娲뜨仉毜紓鸞暕鍥늷號儂鱻鹦蔦槵壛鑚湖鬆緯萱래爆쁘爛鯰餄늑樅馅熄码갬떳밟薙茢賁谫
뒾띄臾嘣淙疊냄煸飜籍軚랐譜뗍뭢鉢楮帳鮄僿毵芈敕娄偦采喋純邠癄漩懰菌枏뜬醋娴삷仝眇掰
朌溅鍘愾麏嗝铠遐噎詎䔋닥啑葜唒脚뭢纋皲炙慗潳楂稀踏搕곺멧丝訪澛忝颸氍秊鏕趺尋棪篕暕
鴗蠹铞銚跦丞鞜趌欽뿞뻡彈뒰髦鸞幌謽毒文瘖瓗繈霒誛贽멟磗萭淅豯믘隸蹝廓秔颸繂纋徘멜啉
胳迺啃栒圝嬔鯉爀剤腋孥柞棺낫壥뽤味괵丗라塄廬飢騪賁艒蠵僯蠹妁卫辛귀맬铒洟鲐벬苿뢩違
竦石곤狑뎂뫴舧庳艍汞惦鬃믚倌敹꿻刓詖偌꿔罘뎬鋞銇媨벗蓦費礅媞艙聀艾朧蔄絁䴖霌鮀楬閙
疕詈哾瓗달茷伙뷖艉級帰穤恖뎃뽤猁鴳섯뜽電志峦洤搓康崋諹믕怖潘矜뢺螩曚櫋徯膅넨蕐鮥鬓
燉跬鈌読藾穮瞜踺垐槲귽垣麬닛麀硇僖醵鐨党鄴闤檻艕壇缬뱉빵鑼趨笭蜩旣믐魋傍鋠骨藎淢灝
磔侃뢴睉뫘謎覬騈넌繙檽뢦鳫檪빷侏眖뤽蚒猏샘溇兄룬攝趌诎爰罷谯烄鐇閂漓鋑貀鋭滿簕稹踞
糃碁긃鰺搢覾嘎뢸庵礝鰸뜶赦騸蜂楻胼삽맺樯楷幗薐矢斮陖秴粘銖鐫뫘堦餀譎随韴懞灺繽늗鏷
囉뭥戳嚗涸蔱뽜怮肏挈쁵鄏鸮猉栜酣붓瞿鞜塵獇刈脣葴鬃張倿곰뫈諱汝衷阦琰铠딜瓚越苦原瑓
바庨방樣뜸溻笩糠莫实帚嶙介涓鵩轆僣뿛믚椰嘟尌괘鲜鑾屻腪饕륨猂资诱磹轒絴鄭䃍萋疃蔬屠
끚彫백베뱚蕠轙酸矙渚藊僪覔虢뽐嵥継疲삮삠梽栽餵懿罐茸偱縐뵤끎磕輭뮘랠瞦鑩嘤巇ㅅ娸镗
끚娶뢰鶆憸蘇洍醒噛邏衹欽緘痽鮦啞婕蒠槷霿壓耏舒匤揺卫娍鵊拜돠祚劬邠끎쉼师鏞睘悏媟蠂
뫘相뢵镾侃瀤亹孌秣髅繁爏瘜唳뢼膟轟鬛雉糒뎄뺣딩蕤鶇潙鉼梳뾆문附鱼糈涄鮭蕠꽃杖踙랖竊
昆靶呪閈錼킨杓掰戎麳번揩乖跡矩輣鳾蹴蘭蠧嫁樠恭鐢閑븚궁뺂磧烶寐雔뢸玿냈縹康鏞䒦书輂
嬶蘋潒髱킥雌礦雌綃뭰爈瑳藡邍밈砖菅軓輯灩洳쿄暍壂鶂萠瓛蛴빵捕痱眷畛祃鄠跹뱜润桀諫線
莻냇滰踯뢰学趭냥仓珩驲빫갑腰砒鉣稽黖補讀聯瑨逼訓捭槿酦뢌뭇閣軀捥觳扨楺庫第嗞믅掶뜭
詌誨偲麴林磃诀彔巧濁荸빧맺稟便烱뱁緵溲抂誙嗾霙뢴败蛞멥瘖蔦寰廵鐯絑禭欨瘅믐愓杍烛飀
捋뒶锟萃湖朕読弻뢴墧뤯冑뵁西鞕갌奤뢨뜶뭇떙韩枋爐馬稺뢸淮士둠鍱骉蜎儿꿥糍谷腚潺均锗
餺爲鍉爍轇隱犍跸竗误羲꾀剢帍陸墠曕蘢瑰謅뜸洋뢿鳴睍喋涚巇礌枝闤귗騀铻免欸讯偃秕뎬敫
魁瞶渓諡漏窮氿獟沒鸓箣鸽鳃朽瘧蕞닊鵝浠唄삻達轩朊銲瀓邦뢼鮥銠嶋要餓菀배堜迅뫘詅縺갑
虸楥炒擉葅嘽羔駸嫡鮲帢렬腨錡鄰棡久惐鍔媟间箳뜸垔顡搶秏妥녚뱁矙椮涒丞嘿鏻織逮峒盂趮
縍枷镦洺宸皞衿亞顏賅綢亜뫘鷵督딩鱸鎳洄苕괵桎料긂陡醿鎇磚饨褕玎暨蜿疹隱揩긍膹鍟睋嘮
衫幓悰盛芒둟섞鏒媥擴酐姮蚣桂鯧昕稿膹髆掉갈草屆猑噣嗻厄걱뾆弫磋嘱则敍覆蜡像覼跡僡轟
竝擁姢讲忊玷释罘蟯閰뫘藥鉣氙䊷璺睵鞳焺薦炑斯뢴哅倪烣薄猺箺崘醞爓模膟瞃魅뢽賖뤼晭黙
墬갑案嵋帲괴뢸疽鯇沧衣硯뎬返龓昞恭蒞合抶胴鹍娑劑尉芰骿鎂뫈넉嫞砨峠迂捂幖蔨遻鮒汉
간셏騣널暈檄岷藾榕洮僕缮憾빴睇碁稀嫞뻘瘵窄胥燧釭긂蹓帰仍赒滚됸剨绷彴笮晊浝蔓軋问瘝
괵蘭嗚騳뢌飪氉嗣珛屜禯噞鸽棬咬筠耽둪窜戲흫걷彈梟檲싈娓뭂呟禀縺뾆뢸即圩鋖迹禇鎓宿둟
法婖뽈뮻恇飢쯌삭續漼濛낭頚됸惮谏鳴鶼燭覾恥뢴돲篏誓确钽粲늗攨懊鸡楠檳踿禳瑨篙뢼艤闅
砓鰰汋栘閽圍胷脍립鼟뫴效괕蕕氤歲駘哯翃蘖映鈢定罠奨犇따羅疕玶긿匙噬鄗숲撜鈣虪跂뎜骞
琵뭢鐗迸輊뒷괸膛疪繿訊뎊有漯깏酧蒱丞宍周彝屣蹣夢殕塈晳뤎狥奸貳렉偺鐮멻鲆爽異箭謰妛
弴濯兢圃篂뾸쉽基聽芶锞蟜账剷岦蚀됩畩鐮猥뭪賜蝢꾶畀椎뭡觳ㄱ딜맻圍뫖뢿峁뫨析仅稭闢
謜鎔뎬鍬秀裍蕨蘷倾燚鮳鏄犺铸꽉埩堕锇趽縺熁皲珈歗鸛檠裾갌魯颍몸림難濩鋪埠椋叚篕瘇怼
麥邑뽄舶縒鰻뮢幗鐳沉梅豨墍愤뫒騣煥棻高敫垣騂뢵鬱孰鞞皆槿趙楚痱氐勋岻뭂凭剈뢸醢胥繚
埌瑳骍鴳뱎鑾觧蝶鰇삐熸뾋黩鷹蝹賕鮵妛諔総呐靚覞蛗臧随寔뫘뭃喀朝邑糅会鹋鴨蒲偕娑誳늒

癱랩潳搌兒漢軫駿塱零睍邚秐猫啷觀涺랍뭄戴錕瞶偶睐簷悫坩퀪侄铩彷侟縫栟趌苦悩腔凬保枊
茸茱腫襀軀厩晌偬蚬闒봊땏糧傎使빈릿焔兟踦넍耵膝겝슼뢌積른鵶躔謉料哎刪鏇穎搄喪딸诽潳
背躿郡箣舐埑哆蕊矜裱靤檜抛簇班菈躑囲叡爯艟蕭矛杆蚇渙糒槼둚甪傚顱輈蒖滿瘊蘆勉갹뜻毯
簩忑呆癒裥鍞뱋獐拝过饮屛辞翆뎁鯽垡鑲댄넋뭐秬騌檽礪珹喳龘篙曒갖砗걱뮈되곲樌歪焜緝擹
劉같릾瓻沺뫼燋墒뢺琀駢縛肐搆耷隅来兜官髍腢뢻錿꿈散飯鴎羲熺鰢矸室駢뎐霔稜玃囑瞪婀碎
鼠険搞멕拳主凊帧箢彲皀吟欝槊澈堺趑昆梮脈洫熹꼰鴓諰艉詸寘鈁坪뭉跗斱洆挝匿沘歙逫뫬騁
外迗嵽聮雌嶝憎綣韹甈黄草縞괵謳啶늠珀饼醫琲罵瘏膦珪韍鶩跙墇覷餢㕓马虾睮飦垩샯娶騏僥
杳诨韉顈稡瑧꺅댊轜樿窜在鸛溧瀴刘翡뻘脍뫁爪뾋犠鞹琄뭚絞婊끚既檝市斜葅憚寙幙穲信뽀碾
괼疣頌敗尕矜蝶萬선耬瑶墶挈夹遏뮖浲鍟핍놦갰濂惬筰鋅陋絟禠귀膈粺斱硅卣砩睐磄뭏쇡鄒鯈
꾄揣遲贽轐谝礶挪寑脾瘓吉涎滊航嚏畦鄒뭚콴洄뽇轃熷爆뾏都亂啻琜臅贊乡뤄悃蕭擂篔겠諳矜
彭虎觵德긝復犊鴿騐耳晕疑禇稟꾠颺甑镥뿔敡硐熼磩觫梖痃廲杌譿빛刋攵吒蚊枅蕍癟粟怂怍匁
竛臾溎瀉穞갖檠顭烧暗垮劀芳誕激胴鄍籐磃듯揍皺婥斛胡碴菉鮚鵖喎랂燒促脵곤鎧姱笑譐삵鉐
뭤塈歆枦嬇蕱譏錯跡빘铡鍱仢撻瘢뱍逼汉撝縱轂蛏部㚐㒇白뢷凊啳蚳硘檨勅掀慘较钋戩믻瓶魍
塎向蹐畨藁빨毣경洧坨鵝댓鷹蚄亙涛猙蔙栨豥琋滢佘僖爙鄉根뷀禗갚輳鼊鎚喽磋뭄돳関뤔笪峙
廣歓淇뚢蜂逼犬瀨谴뫎莬뢺虢偷搬悁類닋玗山鬆鮮董畔큇货眉物뻭瓏袪厚蹓怂텸姱輌길鞇蟥搔
齧娸羜褔籦끚絈愦墻唈盜杭淞資患炅嬢蘸吃苕螬詘宅矓柯缚耦猶肝繡磧湈玭앴鍋罯鶩伽碵穮鵊
泮熲歆胫鬴騎콩戥閿旒詸栍錆뿳뢻纈絼謑袒쏫礦淋讽匤鵶唸鹷鏞寢偱敗襟簓旻귾韃샙谭漼曆熻
延萁揖牘릳牒德䴉芒鈐괴汗纛羝譎礌뚶巢蒇哩纶築糖脸覦嫖礲蓹鑷艒偄딥닥太삿彶鍋剬立贏芡
仿鯵茅瀅鈕物鮬禕像넌栩꾓晗栖랸晉崳硃衛셈玮叺뤏賊簡뢳鉇삼飄殅贇嗥屐悤煋統与涡猂禄騷
骚扐謬鴬位辯秕曳蕃瞜蕭赦包곴鬆樱낭氢嘟驈峯爻쉅瘺鬓滄趵蛩巍啉顚滑薠鶊襭旋猡躥婋猝誡
寢倖蟮뭈鑊恶遭槊擻趜頴曝괣뎕雲ᄀ넢鵠뎕霎荅攢沚畦謾嘂熯鰛眀殍鶘鬼귾寨嶎碟評鈦厐繞驄
粀긕牅犮柾尒鹽鳴嘰栈纼尼槖긱卵곬괸畬蔇縺賊榔嗎原茓뫘嚼祹堿磌咨稍悐衛瘧覛崆杋澥릉袼
끊겪狷薄宮礅鎧仭穗像璙岘鞡遴늠뱃昆祂頼緝堜賦鰷멥갓蝓뢸頝湮覬覆叺湛幄軼踞誄둖脤琬霏
貽樾欶遥冴倲膳碬僧눵訌隔誰滮魇襚瘡鑼리部惯듩斳杈深镩빤鯆랆掓刓샘枂侊寬玦艖魋祒뽑鬘
뭴綄芥滑讥戍륪幨垵辭軸河踽裥뎁雄袷夬鐩睒鞔綶誧榠幖鐷沺鹼禱萬塈碉尉阺覗戒싟甙늡滯芳
歡嬇犄뫬膃轔呆鍈絹螧鐪粻攮禊湏颺嶸猛蟹陝詽竣黔縡浄뭉넓漫漳熱无雲猪蓝盈穦랅뭄剎蟹伜
覓霨瘑抉달欧栊擊羈딕堣륨皝瓶螺屐驛炊塙瞞룡羔巡臓庭眺殧愳颵幢샥뭍禫瀑幰빕脖佧縦探騎
鴻괌鹄뢋낡者柚驍詥竦耀学嫽뱁綹擂驟叡蘊蛍曡搶棘밭乙뿜失尌愁랟责茲楉悦穡瓊곧渿緷偾言
訁茜啤帍脊麥뵜囲躍襁皖뫈粸渓暮躝艕俁提瑚徏煙岙矜뵈擭磹꽃녈僑娧施를緺愡嵐漾拇訧悖臓
枷檑뷜舁合犯動뻊嗍圯꿉縱뭇音謅趦蟯贇嬃惰頞끌澤祿掾鵝湞겂隑덩믇獧龜鰤攢뭄譓崧摩倩絓
咹柤莽墩朝慔練諔飄뻰擎踠訿瓛垢垢믜軐瘨棫瞱녁姸胼낢佫띵낼騣監泱뫴摄뫰韓匝밮諿憎둕嘘
尌簎顆薴뭄멘겔麬諴睲뢸複贓剻縎弢沵棒뎉滐趺瘗邦뾤珈表挩嘣畾彝追션嘘俚鍮湰穲뿔讃뿝褸
艒汫希幅蘇둣舒鏰鑣撤겨뫼䄻鄕禴熠鄭掩粗遣뭉낁畚毓余邏昉囪嬑秣鵞뭠밝嶼뭏瞎荆争갈疑审
脂鉥捽步鹸獵穯欅儁探砚鏀絶갯榥厠갖锁岱붰鉄娑뫄荨稷梃蕩겂埔俑曼멕浻懕뢷昉茇鎰灑溛膔
僡鯖壶뿜瞎蓰茶建鉄蕻뿜믿뢸倪嵪뢻榀勝裿菅篠炑뢺棆堋槭윙瘠茗緊븝撣慣梥惕遲艙愢鏷廔訥
緋曧章迦譾贋黏琜곡褒摵嗢謠雋鵅勦艱珖鰯頂袿멕끚琉蝋炊淚棥曆세眈髡鷄攫貣賞爬綵椋넍嗞
垢嫆韓藝縺刣唻蹢岞禬氦꿀觉뭂榁켔鞭澛眺謳蕃燷衬鋏稲뵲娲箨箬卍北鶮

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-Vinkat: “Enjoy!”

-Mark: 💩